12 YEARS GATE SOLVED PAPERS

4 Years ESE Solved Papers

GATE
2022

UMESH DHANDE

GENERAL APTITUDE

AG BM CY CH EC IN PI EY MA MT PH TF XH
AE AR BT CE CS EE ME ES GG MN PE ST XE XL

Topic-wise Previous 12 Years GATE Solutions

- Diligent solutions of GATE previous year questions (2010-2021)
- Multi method approach for a single problem to develop crystal clear concepts
- Video solution for conspicuous questions to enhance problem solving skills

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TOPIC WISE GATE SOLUTIONS
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IMPORTANCE of GATE

GATE examination has been emerging as one of the most prestigious competitive exam for engineers. Earlier it was considered to be an exam just for eligibility for pursuing PG courses, but now GATE exam has gained a lot of attention of students as this exam open an ocean of possibilities like :

1. **Admission into IISc, IITs, IIITs, NITs**

   A good GATE score is helpful for getting admission into IISc, IITs, IIITs, NITs and many other renowned institutions for M.Tech./M.E./M.S. An M.Tech graduate has a number of career opportunities in research fields and education industries. Students get ₹ 12,400 per month as stipend during their course.

2. **Selection in various Public Sector Undertakings (PSUs)**

   A good GATE score is helpful for getting job in government-owned corporations termed as **Public Sector Undertakings** (**PSUs**) in India like IOCL, BHEL, NTPC, BARC, ONGC, PGCIL, DVC, HPCL, GAIL, SAIL & many more.

3. Direct recruitment to Group A level posts in Central government, i.e., Senior Field Officer (Tele), Senior Research Officer (Crypto) and Senior Research Officer (S&T) in Cabinet Secretariat, Government of India, is now being carried out on the basis of GATE score.

4. **Foreign universities through GATE**

   GATE has crossed the boundaries to become an international level test for entry into postgraduate engineering programmes in abroad. Some institutes in two countries **Singapore** and **Germany** are known to accept GATE score for admission to their PG engineering programmes.

5. **National Institute of Industrial Engg. (NITIE)**

   - NITIE offers **PGDIE / PGDMM / PGDPM** on the basis of GATE scores. The shortlisted candidates are then called for Group Discussion and Personal Interview rounds.
   - NITIE offers a Doctoral Level Fellowship Programme recognized by Ministry of HRD (MHRD) as equivalent to Ph.D. of any Indian University.
   - Regular full time candidates those who will qualify for the financial assistance will receive ₹ 25,000 during 1st and 2nd year of the Fellowship programme and ₹ 28,000 during 3rd, 4th and 5th year of the Fellowship programme as per MHRD guidelines.

6. **Ph.D. in IISc/ IITs**

   - IISc and IITs take admissions for Ph.D. on the basis of GATE score.
   - Earn a Ph.D. degree directly after Bachelor's degree through integrated programme.
   - A fulltime residential researcher (RR) programme.

7. **Fellowship Program in management (FPM)**

   - Enrolment through GATE score card
   - Stipend of ₹ 22,000 – 30,000 per month + HRA
   - It is a fellowship program
   - Application form is generally available in month of Sept. and Oct.

Note : In near future, hopefully GATE exam will become a mandatory exit test for all engineering students, so take this exam seriously. Best of LUCK !

GATE Exam Pattern

Section	Question No.	No. of Questions	Marks Per Question	Total Marks
General Aptitude	1 to 5	5	1	5
	6 to 10	5	2	10
Technical + Engineering Mathematics	1 to 25	25	1	25
	26 to 55	30	2	60
Total Duration : 3 hours		**Total Questions : 65**		**Total Marks : 100**

Note :
(i) 40 to 45 marks will be allotted to Numerical Answer Type Questions.
(ii) MSQ also added from GATE 2021 for which **no negative** marking.

Pattern of Questions :
GATE 2021 would contain questions of THREE different types in all the papers :
(i) **Multiple Choice Questions (MCQ)** carrying 1 or 2 marks each, in all the papers and sections. These questions are objective in nature, and each will have choice of four answers, out of which ONLY ONE choice is correct.
Negative Marking for Wrong Answers : For a wrong answer chosen in a MCQ, there will be negative marking. For 1-mark MCQ, 1/3 mark will be deducted for a wrong answer. Likewise, for 2-mark MCQ, 2/3 mark will be deducted for a wrong answer.
(ii) **Multiple Select Questions (MSQ)** carrying 1 or 2 marks each in all the papers and sections. These questions are objective in nature, and each will have choice of four answers, out of which ONE or MORE than ONE choice(s) are correct.
Note : There is **NO negative** marking for a wrong answer in MSQ questions. However, there is NO partial credit for choosing partially correct combinations of choices or any single wrong choice.
(iii) **Numerical Answer Type (NAT)** Questions carrying 1 or 2 marks each in most of the papers and sections. For these questions, the answer is a signed real number, which needs to be entered by the candidate using the virtual numeric keypad on the monitor (keyboard of the computer will be disabled). No choices will be shown for these types of questions. The answer can be a number such as 10 or -10 (an integer only). The answer may be in decimals as well, for example, 10.1 (one decimal) or 10.01 (two decimals) or -10.001 (three decimals). These questions will be mentioned with, up to which decimal places, the candidates need to present the answer. Also, for some NAT type problems an appropriate range will be considered while evaluating these questions so that the candidate is not unduly penalized due to the usual round-off errors. Candidates are advised to do the rounding off at the end of the calculation (not in between steps). Wherever required and possible, it is better to give NAT answer up to a maximum of three decimal places.
Example : If the wire diameter of a compressive helical spring is increased by 2%, the change in spring stiffness (in %) is _ (correct to two decimal places).
Note : There is NO negative marking for a wrong answer in NAT questions.
Also, there is NO partial credit in NAT questions.

COMMON TO ALL PAPERS (BRANCHES) :

Verbal Aptitude :

Basic English grammar: tenses, articles, adjectives, prepositions, conjunctions, verb-noun agreement, and other parts of speech Basic vocabulary: words, idioms, and phrases in context Reading and comprehension Narrative sequencing.

Quantitative Aptitude :

Data interpretation: data graphs (bar graphs, pie charts, and other graphs representing data), 2 and 3 dimensional plots, maps, and tables Numerical computation and estimation: ratios, percentages, powers, exponents and logarithms, permutations and combinations, and series Mensuration and geometry Elementary statistics and probability.

Analytical Aptitude :

Logic: deduction and induction Analogy.

Numerical relations and reasoning.

Spatial Aptitude :

Transformation of shapes: translation, rotation, scaling, mirroring, assembling, and grouping Paper folding, cutting, and patterns in 2 and 3 dimensions.

GATE Paper Codes

Paper Code	Paper Name
AE	Aerospace Engineering
AG	Agricultural Engineering
AR	Architecture and Planning
BM	Biomedical Engineering
BT	Biotechnology
CE	Civil Engineering
CH	Chemical Engineering
CS	Computer Science and Information Technology
CY	Chemistry
EC	Electronics and Communication Engineering
EE	Electrical Engineering
ES	Environmental Science and Engineering
EY	Ecology and Evolution
GG	Geology and Geophysics
IN	Instrumentation Engineering
MA	Mathematics
ME	Mechanical Engineering
MN	Mining Engineering
MT	Metallurgical Engineering
PE	Petroleum Engineering
PH	Physics
PI	Production and Industrial Engineering
ST	Statistics
TF	Textile Engineering and Fibre Science
XE	Engineering Sciences
XH	Humanities and Social Sciences
XL	Life Sciences

CONTENTS

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A DEDICATED TECH TEAM TO SOLVE TECH QUERIES AND HANDLE TECHNICAL ISSUES.

1 Number System & Series

A number is a tool to measure quantities in real life. Numbers are used in addition, subtraction, multiplication, division, and exponentiation operations. Their study is called **ARITHMATIC**.

CLASSIFICATION OF NUMBERS :

1. **Natural numbers :** Natural numbers are a set of non-negative numbers defined as 0, 1, 2, 3, …… and so on. Natural numbers are also called whole numbers.

2. **Integers :** Integer numbers include all positive numbers, all negative numbers and zero. It can be represented by a set shown below,

$$I = \left\{ ......, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, ... \right\}$$

   (i) **Even and odd numbers :** Any number which is divisible by 2 is considered as even number and any number which is not divisible by 2 is considered as odd number.

   Properties of even and odd numbers :

   $$\text{Even} + \text{Even} = \text{Even}$$
   $$\text{Odd} + \text{Odd} = \text{Even}$$
   $$\text{Odd} + \text{Odd} + \text{Odd} = \text{Odd}$$
   $$\text{Odd} + \text{Even} = \text{Odd}$$
   $$\text{Even} \times \text{Even} = \text{Even}$$
   $$\text{Odd} \times \text{Odd} = \text{Odd}$$
   $$\text{Odd} \times \text{Even} = \text{Even}$$

   (ii) **Prime numbers :** Any number which is divisible by either 1 or itself only is called prime number. For example : 2, 3, 5, 7, 11, 13, 17, 19 etc.
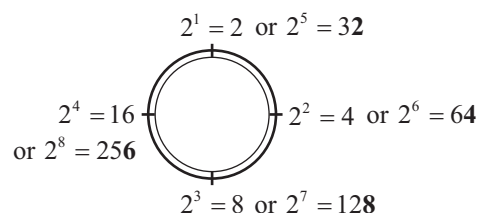
   Prime number testability :

   a. First take square root of the given number.

   b. Take prime numbers starting from 2 to the obtained square root value or nearest integer.

   c. If the given number is not divisible by any of these prime numbers then the given number is a prime number.

3. **Rational numbers :** Rational numbers are numbers represented as $\dfrac{a}{b}$ where, a and b are integer numbers and $b \neq 0$.

4.   Complex numbers : Complex numbers are numbers represented as $a + ib$ where, a and b are real numbers and $i = \sqrt{-1}$.

CYCLICITY :

Cyclicity of a number is used to find unit digit value. Power cycle of a number is defined as highest power of any number such that there is no repetition at its unit digit.
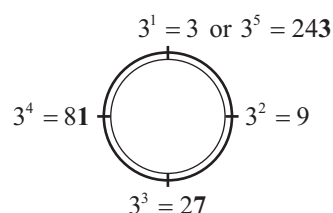
1.   Cyclicity of 2 :

$$2^1 = 2 \text{ or } 2^5 = 3\mathbf{2}$$

$$2^4 = 16 \text{ or } 2^8 = 25\mathbf{6} \qquad 2^2 = 4 \text{ or } 2^6 = 6\mathbf{4}$$

$$2^3 = 8 \text{ or } 2^7 = 12\mathbf{8}$$

Power cycle $= 4$

Unit digit value $= 6$

2.   Cyclicity of 3 :

$$3^1 = 3 \text{ or } 3^5 = 24\mathbf{3}$$

$$3^4 = 8\mathbf{1} \qquad 3^2 = 9$$

$$3^3 = 2\mathbf{7}$$

Power cycle $= 4$

Unit digit value $= 1$

3.   Cyclicity of 4 :

$$4^1 = 4 \text{ or } 4^3 = 6\mathbf{4}$$

$$4^2 = 1\mathbf{6}$$
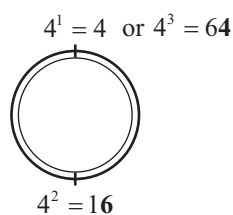
Power cycle $= 2$

Unit digit value $= 6$

4.   Cyclicity of 7 :

$$7^1 = 7$$

$$7^4 = 240\mathbf{1} \qquad 7^2 = 4\mathbf{9}$$

$$7^3 = 34\mathbf{3}$$
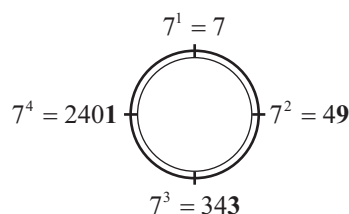
Power cycle $= 4$

Unit digit value $= 1$

5.   **Cyclicity of 8 :**

$8^1 = 8$

$8^4 = 409\textbf{6}$ $8^2 = 6\textbf{4}$

$8^3 = 51\textbf{2}$
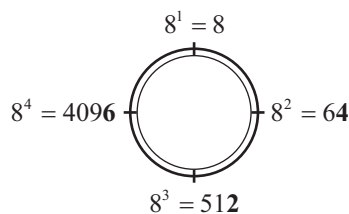
Power cycle $= 4$

Unit digit value $= 6$

6.   **Cyclicity of 9 :**

$9^1 = 9$

$9^2 = 8\textbf{1}$
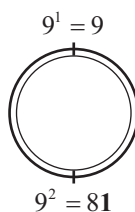
Power cycle $= 2$

Unit digit value $= 1$

Number	Power cycle	Unit digit value
2	4	6
3	4	1
4	2	6
5	1	5
6	1	6
7	4	1
8	4	6
9	2	1

Example : Find unit digit value of 8^{193}.

Solution : For to find 8^{193} its power cycle is 4.

and for any number to be divisible by 4 its last two terms should be divisible by 4.

$$193 \longrightarrow \text{Last two terms } 93$$

$$\frac{93}{4} = 23 + \frac{1}{4}$$

So we can write it

$$8^{193} = 8^{192} \times 8$$

$$8^{193} = (\text{unit digit of } 8^4) \times 8$$

$$8^{193} = 6 \times 8 = 4\textbf{8}$$

So last digit is 8.

FACTORIZATION :

The process of writing a natural number in terms of its prime factors is called factorization.

1. Let 'N' be any natural number such that $N = a^p \times b^q \times c^r$ where, a, b and c are prime factors and p, q and r are their respective powers.

2. Sum of the factors is given by,

$$S_n = \frac{(a^{p+1}-1)(b^{q+1}-1)(c^{r+1}-1)}{(a-1)(b-1)(c-1)}$$

3. Product of factors is given by,

$$P_n = (N)^{\frac{n}{2}}$$

    where, n is the number of factors.

4. Total number of natural number less than or equal to N and relatively prime to N is given by,

$$N_0 = N\left(1-\frac{1}{a}\right)\left(1-\frac{1}{b}\right)\left(1-\frac{1}{c}\right)$$

5. Let $N = a^p b^q c^r$ then the sum of all the natural numbers which are less than or equal to N and relatively prime to N is given by,

$$N_0' = \frac{N}{2}\left[N\left(1-\frac{1}{a}\right)\left(1-\frac{1}{b}\right)\left(1-\frac{1}{c}\right)\right]$$

6. The number of ways in which a composite number N may be resolved into two factors,

$$= \frac{1}{2}(p+1)(q+1)(r+1)\cdots; \qquad N = a^p b^q c^r \text{ is not a perfect square}$$

$$= \frac{1}{2}[(p+1)(q+1)(r+1)\cdots+1]; \qquad N \text{ is a perfect square}$$

DIVISIBILITY TESTS :

Following are important divisibility tests,

Divisible by	Test	Examples	
2	The unit's digit should be even or 0 (i.e. in the given number at the units place we should have 2, 4, 6, 8, 0)	26 , 48 etc.	$6 \div 3 = 2,$ $8 \div 2 = 4$
3	The sum of the digits of the number should be divisible by 3.	12729	$(1+2+7+2+9 = 21),$ $21 \div 3 = 7$
4	The number formed by the last two digits (units' and tens') of the given number should be divisible by 4.	21964	$64 \div 4 = 16$

5	The unit's digit should be 0 or 5.	1835, 15440	Last digits are 5 and 0 respectively
6	The sum of the digits of the number should be divisible by 3 and the number should be even	1272	(1+2+7+2 = 12), $12 \div 3 = 4$, Number is even
8	The number formed by the last three digits (units', tens' and hundreds') of the given number should be divisible by 8.	52672	$672 \div 8 = 84$
9	The sum of the digits of the number should be divisible by 9.	127296	(1+2+7+2+9 +6 = 27), $27 \div 9 = 3$
10	The unit's digit should be 0.	3220	Unit's digits is zero.
11	The difference between the sum of digits in the even and odd places should be zero or a multiple of 11.	54043	5+0+3 = 4+4 = 8, Hence difference is zero.
12	The sum of the digits of the number should be divisible by 3 and last 2 digits (unit's and ten's) also be divisible by 4.	1728	(1+7+2+8=18) $18 \div 3=6$, Also $28 \div 4 = 7$
15	The sum of the digits of the number should be divisible by 3 and unit's digit of the number should be 0 or 5.	810645	(8+1+0+6+4 +5 = 24), $24 \div 3 = 8$, also last digits is 5.
16	The number formed by the last four digits (units', tens' hundreds' and thousands') of the given number should be divisible by 16.	12978320	$8320 \div 16 = 520$
25	The last three number of the digits of the number should be 125, 250, 375, 500, 625, 750, 875, or 000.	1125, 1875, 15500, 35625, 76375, 22250, 49750, 5000	The last three digits are as required.

1. Divisible test for 7

The test holds good only for numbers with more than three digits and is applied as follows,

(i) Group the number in sets of three from the unit's digit.

(ii) Add the odd groups and the even groups separately.

(iii) The difference of the odd and the even groups should be either 0 or divisible by 7.

Example : Is 85437954 divisible by 7?

Dividing the given number in three sets,

85 437 954

Adding up the first and the third sets, we get

85 + 954 = 1039

Now their difference is 1039 – 437 = 602.

Since,   602 ÷ 7 = 86

Hence the number is divisible by 7.

2.   Divisibility test for 13

The test holds good only for numbers with more than three digits. The test to be applied is as follows,

1. Group the numbers in sets of three from the unit's digit.

2. Add the odd groups and the even separately.

3. The difference of the odd and the even group should be either 0 or divisible by 13.

Example : Is 136999005 divisible by 13?

Dividing the given number in three sets,

136 999 005

Adding up the first and the third sets, we get

136 + 5 = 141.

Now their difference is 999 – 141 = 858

Since, $858 \div 13 = 66$

Hence, the number is divisible by 13.

FORMULAE :

1. $a^2 - b^2 = (a+b)(a-b)$

2. $a^2 + 2ab + b^2 = (a+b)^2$

3. $a^2 - 2ab + b^2 = (a-b)^2$

4. $(a+b)^2 - (a-b)^2 = 4ab$

5. $(a+b+c)^2 = a^2 + b^2 + c^2 + 2(ab+ac+bc)$

6. $x^2 + (a+b)x + ab = (x+a)(x+b)$

7. $ac + bc + ad + bd = c(a+b) + d(a+b) = (a+b)(c+d)$

8. $(a+b)^3 = a^3 + b^3 + 3ab(a+b)$

9. $(a-b)^3 = a^3 - b^3 - 3ab(a-b)$

10. $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$

11. $a^3 + b^3 = (a+b)^3 - 3ab(a+b)$

12. $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$

13. $a^3 - b^3 = (a-b)^3 + 3ab(a-b)$

14. $a^3 + b^3 + c^3 - 3abc = (a+b+c)(a^2 + b^2 + c^2 - ab - bc - ca)$

15. $a^3 + b^3 + c^3 - 3abc = \dfrac{1}{2}(a+b+c)\left[(a+b)^2 + (b-c)^2 + (c-a)^2\right]$

16. If $a + b + c = 0$ or $a = b = c$

   then $a^3 + b^3 + c^3 = 3abc$ or $\dfrac{a^2}{bc} + \dfrac{b^2}{ca} + \dfrac{c^2}{ab} = 3$

17. $a^n + b^n = (a+b)\left(a^{n-1} - a^{n-2}b + a^{n-3}b^2 - ....\right)$ here n should be odd only

18. $a^n - b^n = (a-b)\left(a^{n+1} + a^{n+2}b + a^{n+3}b^2 + ...\right)$

19. For determining the coefficients of the terms in the expansion of $(x+a)^n$, for any positive integer n, we can use the Pascal's triangle, which is explained below.

Power	Coefficients
$n = 0$	1
$n = 1$	1 1
$n = 2$	1 2 1
$n = 3$	1 3 3 1
$n = 4$	1 4 6 4 1
$n = 5$	1 5 10 10 5 1
$n = 6$	1 6 15 20 15 6 1

Example : For $n = 4$,

In the expansion of $(x+a)^4$ the fourth coefficient will be 4 (from Pascal's triangle)

PROGRESSION :

Progression is a series consisting of terms that has a certain pattern and due to which they are predictable. Progression in mathematics is of three types as given below,

1. **Arithmetic Progression :** By an arithmetic progression of n terms, we mean a finite sequence of the form $a, a + d, a + 2d, a + 3d, . . . , a + (n - 1)d$.

where, a is called the first term of the arithmetic progression and d is called the common difference of the arithmetic progression.

The nth term in the arithmetic progression is given by,

$$T_n = a + (n-1)d$$

Sum of an arithmetic progression :

The sum of the n terms of an arithmetic progression with first term a and common difference d is given by,

$$S = \frac{n}{2}\left[2a + (n-1)d\right] = \frac{n}{2}(a+l)$$

Where $l =$ last term of the series

Important points :

(i) If three numbers are in AP then it can be assumed that these numbers are $(a-d)$, a, $(a+d)$

(ii) If four numbers are in AP then it can be assumed that these numbers are $(a-3d)$, $(a-d)$, $(a+d)$, $(a+3d)$.

(iii) If five numbers are in AP then it can be assumed that these numbers are $(a-2d)$, $(a-d)$, a, $(a+d)$, $(a+2d)$.

(iv) Arithmetic mean is given by,

$$\text{AM} = \frac{a+b}{2} \qquad \text{(for two terms)}$$

$$\text{AM} = \frac{a+b+c+\dots n \text{ terms}}{n}$$

(v) If the same quantity be added to, or subtracted from all the terms of an AP, the resulting terms will form an AP, but with the same common difference as before.

(vi) If all the terms of an AP be multiplied or divided by the same quantity, the resulting terms will form an AP, but with a new common difference, which will be the multiplication / division of the old common difference.

2.   **Geometric Progression :** In Geometric progression, every term is obtained by multiplying the previous term with a fixed value. Geometric series is given by,

$$a, \ ar, \ ar^2, \ ar^3 \cdots$$

Where, a is the first term and r is the common ratio.

The nth term in the GP series is given by,

$$T_n = ar^{n-1}$$

Sum of geometric progression :

The sum of the n terms of an geometric progression with first term a and common ratio r is given by,

$$S = a\left(\frac{r^n - 1}{r-1}\right); \qquad r > 1$$

$$S = a\left(\frac{1 - r^n}{1-r}\right); \qquad r < 1$$

Sum of infinite geometric progression series :

$$S = \frac{a}{1-r}; \qquad r < 1$$

$$S = \infty; \qquad r > 1$$

Important points :

(i) If three numbers are in GP then it can be assumed that these numbers are $\dfrac{a}{r}, a, ar$

(ii) If four numbers are in GP then it can be assumed that these numbers are $\dfrac{a}{r^3}, \dfrac{a}{r}, ar, ar^3$.

(iii) Geometric mean is given by,

$$GM = \sqrt{ab} \qquad \text{(for two terms)}$$

$$GM = (a \times b \times c \cdots n \text{ terms})^{1/n}$$

(iv) If all the terms of a GP be multiplied or divided by the same quantity, the resulting terms will form a GP with the same common ratio as before.

(v) If $a, b, c, d,$ …. are in GP, there is also continued proportion, since, by definition, $a/b = b/c = c/d = \ldots = 1/r$

3. **Harmonic Progression :** In harmonic progression, every term represents inverse of every term present in arithmetic progression. If 2, 4, 6, 8…. is an arithmetic series then harmonic series is given as $\dfrac{1}{2}, \dfrac{1}{4}, \dfrac{1}{6}, \dfrac{1}{8}, \ldots.$

The nth term of a harmonic series is calculated by,

(i) Inverse all the terms of the series.

(ii) Calculate the nth term using arithmetic progression formula.

(iii) Inverse the obtained n^{th} term.

Harmonic mean is given by,

$$HM = \frac{2ab}{a+b} \qquad \text{(for two terms)}$$

SHORTCUTS :

(i) To find the sum of the first n natural numbers :

Let the sum be denoted by S then,

$S = 1 + 2 + 3 + \ldots. + n$, is given by,

$$S = \frac{n(n+1)}{2}$$

(ii) To find the sum of the squares of the first n natural numbers :

Let the sum be denoted by S then,

$$S = 1^2 + 2^2 + 3^2 + \ldots. + n^2$$

This is given by,

$$S = \left\{ \frac{n(n+1)(2n+1)}{6} \right\}$$

(iii)   To find the sum of the cubes of the first n natural numbers :

Let the sum be denoted by S then,

$$S = 1^3 + 2^3 + 3^3 + ... + n^3$$

$$S = \left[\frac{n(n+1)}{2}\right]^2$$

Thus, the sum of the cubes of the first n natural numbers is equal to the square of the sum of these numbers.

(iv)   To find the sum of the first n odd natural numbers :

$$S = 1 + 3 + 5 + ... + (2n - 1) = n^2$$

(v)   To find the sum of the first n even natural numbers.

$$S = 2 + 4 + 6 + ... + 2n = n(n+1) = n^2 + n$$

(vi)   To find the sum of odd numbers $\leq n$, where n is a natural number :

Case A : If n is odd $\rightarrow [(n+1)/2]^2$

Case B : If n is even $\rightarrow [n/2]^2$

(vii)   To find the sum of even numbers $\leq n$, where n is a natural number :

Case A : If n is odd $\rightarrow \left\{\left(\frac{n}{2}\right)\left[\left(\frac{n}{2}\right) + 1\right]\right\}$

Case B : If n is even $\rightarrow \left[\left(\frac{n-1}{2}\right)\left(\frac{n+1}{2}\right)\right]$

(viii)   If A, G, H be the arithmetic, geometric and harmonic means between any two quantities respectively then $A > G > H$.

❖❖❖❖

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1.1 If 137 + 276 = 435 how much is 731 + 672 ?   [All branches]

(A) 534   (B) 1403

(C) 1623   (D) 1513

1.2 Given digits 2, 2, 3, 3, 3, 4, 4, 4, 4. How many distinct 4 digit numbers greater than 3000 can be formed?

[All branches]

(A) 50   (B) 51

(C) 52   (D) 54

1.3 Consider the series

$$\frac{1}{2}+\frac{1}{3}-\frac{1}{4}+\frac{1}{8}+\frac{1}{9}-\frac{1}{16}+\frac{1}{32}+\frac{1}{27}-\frac{1}{64}+....$$

The sum of the infinite series above is :

[TF]

(A) ∞ (B) $\frac{5}{6}$

(C) $\frac{1}{2}$ (D) 0

1.4 Given the sequence A, B, B, C, C, C, D, D, D, D, … etc., that is one A, Two Bs, three Cs, four Ds, five Es and so on, the 240th letter in the sequence will be :

[MN]

(A) V   (B) U

(C) T   (D) W

1.5 Consider the set of integers {1, 2, 3, …., 5000}. The number of integers that is divisible by neither 3 nor 4 is :   [MN]

(A) 1668   (B) 2084

(C) 2500   (D) 2916

1.6 A positive integer m in base 10 when represented in base 2 has the representation p and in base 3 has the representation q. We get $p - q = 990$, where the subtraction is done in base 10.

Which of the following is necessarily true :   [MN]

(A) $m \geq 14$ (B) $9 \leq m \leq 13$

(C) $6 \leq m \leq 8$ (D) $m < 6$

2011 **IIT Madras**

1.7 The sum of n terms of the series $4 + 44 + 444 + ……$ is

[AG, CY, EC, EE, IN, MA, MT, XE, XL]

(A) $\left(\frac{4}{81}\right)\left[10^{n+1} - 9n - 1\right]$

(B) $\left(\frac{4}{81}\right)\left[10^{n-1} - 9n - 1\right]$

(C) $\left(\frac{4}{81}\right)\left[10^{n+1} - 9n - 10\right]$

(D) $\left(\frac{4}{81}\right)\left[10^{n} - 9n - 10\right]$

1.8 Three friends R, S and T shares toffee from a bowl. R took 1/3rd of the toffees, but returned four to the bowl. S took 1/4th of what was left but returned three toffees to the bowl. T took half of the remainder but returned two back into the bowl. If the bowl had 17 toffees left, how many toffees were originally there in the bowl?

[AG, CY, EC, EE, IN, MA, MT, XE, XL]

(A) 38   (B) 31

(C) 48   (D) 41

2012 **IIT Delhi**

1.9 If $(1.001)^{1259} = 3.52$ and $(1.001)^{2062} = 7.85$, then $(1.001)^{3321} =$

[CY, EC, EE, IN, MA, MT, XE, XL]

(A) 2.23   (B) 4.33

(C) 11.37   (D) 27.64

1.10 Raju has 14 currency notes in his pocket consisting of only Rs. 20 notes and Rs. 10 notes. The total money value of the notes is Rs. 230. The number of Rs. 10 notes that Raju has is

     [CY, EC, EE, IN, MA, MT, XE, XL]

(A) 5   (B) 6

(C) 9   (D) 10

1.11 There are eight bags of rice looking alike, seven of which have equal weight and one is slightly heavier. The weighing balance is of unlimited capacity. Using this balance, the minimum number of weighings required to identify the heavier bag is

     [CY, EC, EE, IN, MA, MT, XE, XL]

(A) 2   (B) 3

(C) 4   (D) 8

1.12 A value of x that satisfies the equation $\log x + \log (x-7) = \log (x+11) + \log 2$ is

                    [AR, GG, TF]

(A) 1   (B) 2

(C) 7   (D) 11

1.13 The arithmetic mean of five different natural numbers is 12. The largest possible value among the numbers is :

                  [AE, AG, MN]

(A) 12   (B) 40

(C) 50   (D) 60

1.14 If a prime number on division by 4 gives a remainder of 1, then that number can be expressed as   **[AE, AG, MN]**

(A) sum of squares of two natural numbers

(B) sum of cubes of two natural numbers

(C) sum of square roots of two natural numbers

(D) sum of cube roots of two natural numbers

1.15 In the summer of 2012, in New Delhi, the mean temperature of Monday to Wednesday was 41^0C and of Tuesday to Thursday was 43^0C. If the temperature on Thursday was 15% higher than that of Monday, then the temperature in ^{0}C on Thursday was   **[EC, EE, IN]**

(A) 40   (B) 43

(C) 46   (D) 49

1.16 Find the sum to n terms of the series $10 + 84 + 734 + \dots$ **[EC, EE, IN]**

(A) $\dfrac{9(9^n + 1)}{10} + 1$ (B) $\dfrac{9(9^n - 1)}{8} + 1$

(C) $\dfrac{9(9^n - 1)}{8} + n$ (D) $\dfrac{9(9^n - 1)}{8} + n^2$

1.17 What will be the maximum sum of 44, 42, 40,……..?   **[CS, ME, PI]**

(A) 502   (B) 504

(C) 506   (D) 500

1.18 Find the sum of the expression

$\dfrac{1}{\sqrt{1}+\sqrt{2}} + \dfrac{1}{\sqrt{2}+\sqrt{3}} + \dfrac{1}{\sqrt{3}+\sqrt{4}} + \dots \dfrac{1}{\sqrt{80}+\sqrt{81}}$

                  [CS, ME, PI]

(A) 7   (B) 8

(C) 9   (D) 10

1.19 A number is as much greater than 75 as it is smaller than 117. The number is

     [AR, CE, GG, MA, MT, PH, TF]

(A) 91   (B) 93

(C) 89   (D) 96

1.20 Fill in the missing number in the series.

    2   3   6   15   _____   157.5   630

                  [EC-2, ME-2]

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1.21 At what time between 6 am and 7 am will the minute hand and hour hand of a clock make an angle closest to 60^0?

[CS-2, EE-2]

(A) 6:22 am   (B) 6.27 am

(C) 6:38 am   (D) 6:45 am

1.22 What is the next number in the series?

12 35 81 173 357 ____

[EC-1, ME-1]

1.23 Find the odd one from the following group : **[EC-1, ME-1]**

W, E, K, O   I, Q, W, A

F, N, T, X   N, V, B, D

(A) W, E, K, O   (B) I, Q, W, A

(C) F, N, T, X   (D) N, V, B, D

1.24 Find the odd one in the following group

Q, W, Z, B   B, H, K, M

W, C, G, J   M, S, V, X

[EC-2, ME-2]

(A) Q, W, Z, B   (B) B, H, K, M

(C) W, C, G, J   (D) M, S, V, X

1.25 The sum of eight consecutive odd numbers is 656. The average of four consecutive even numbers is 87. What is the sum of the smallest odd number and second largest even number?

[EC-2, ME-2]

1.26 The next term in the series is 81, 54, 36, 24___? **[EC-3, ME-3]**

1.27 In which of the following options will be expression $P < M$ be definitely true?

[EC-3, ME-3]

(A) $M < R > P > S$

(B) $M > S < P < F$

(C) $Q < M < F = P$

(D) $P = A < R < M$

1.28 Find the next term in the sequence :

$7G$, $11K$, $13M$, ___ **[EC-3, ME-3]**

(A) $15Q$ (B) $17Q$

(C) $15P$ (D) $17P$

1.29 In a sequence of 12 consecutive odd numbers, the sum of the first 5 numbers is 425. What is the sum of the last 5 numbers in the sequence?

[EC-4, ME-4]

1.30 Find the next term in the sequence :

$13M$, $17Q$, $19S$, _____

[EC-4, ME-4]

(A) $21W$ (B) $21V$

(C) $23W$ (D) $23V$

1.31 A five digit number is formed using the digits 1,3,5,7 and 9 without repeating any of them. What is the sum of all such possible five digit numbers?

[EC-4, ME-4]

(A) 6666660   (B) 6666600

(C) 6666666   (D) 6666606

1.32 If $\left(z + \dfrac{1}{z} \right)^2 = 98$, compute $\left(z^2 + \dfrac{1}{z^2} \right)$.

[CS-1, EE-1]

1.33 What is the average of all multiples of 10 from 2 to 198? **[CS-2, EE-2]**

(A) 90   (B) 100

(C) 110   (D) 120

1.34 The value of $\sqrt{12 + \sqrt{12 + \sqrt{12 + ...}}}$ is

[CS-2, EE-2]

(A) 3.464   (B) 3.932

(C) 4.000   (D) 4.444

1.35 Which number does not belong in the series below? **[CS-3, EE-3]**

2, 5, 10, 17, 26, 37, 50, 64

(A) 17   (B) 37

(C) 64   (D) 26

1.36 Consider the equation,

$$(7526)_8 - (Y)_8 = (4364)_8$$

Where $(X)_N$ stands for X to the base N.

Find Y.   **[CS-3, EE-3]**

(A) 1634   (B) 1737

(C) 3142   (D) 3162

1.37 Find the odd one in the following group

[AE, AR, CE-1, CH, CY, EY, MA, MT, PH, XE]

ALRVX, EPVZB, ITZDF, OYEIK

(A) ALRVX   (B) EPVZB

(C) ITZDF   (D) OYEIK

2015   IIT Kanpur

1.38 Find the missing sequence in the letter series below :   **[EC-3, ME-2]**

A, CD, GHI, ?, UVWXY

(A) LMN   (B) MNO

(C) MNOP   (D) NOPQ

1.39 If the list of letters, *P, R, S, T, U* is an arithmetic sequence, which of the following are also in arithmetic sequence?   **[CS-2, EE-2]**

I. $2P, 2R, 2S, 2T, 2U$

II. $P – 3, R – 3, S – 3, T – 3, U – 3$

III. P^2, R^2, S^2, T^2, U^2

(A) I only   (B) I and II

(C) II and III   (D) I and III

1.40 If $\log_x (5/7) = – 1/3$, then the value of x is

[AG, AR, BT, CH, CY, EC-1, EY, XE, XL]

(A) 343/125   (B) 125/343

(C) – 25/49   (D) – 49/25

1.41 Operators $\square$, $\diamond$ and $\rightarrow$ are defined by :

$$a \square b = \frac{a-b}{a+b};$$

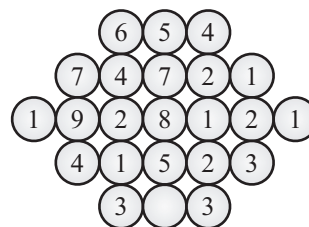$$a \diamond b = \frac{a+b}{a-b};$$

$$a \rightarrow b = ab$$

Find the value of $(66 \square 6) \rightarrow (66 \diamond 6)$

[AG, AR, BT, CH, CY, EC-1, EY, XE, XL]

(A) – 2   (B) – 1

(C) 1   (D) 2

1.42 Fill in the missing value

[AG, AR, BT, CH, CY, EC-1, EY, XE, XL]

1.43 If $a^2 + b^2 + c^2 = 1$, then $ab + bc + ac$ lies in the interval   **[EC-2, ME-1]**

(A) [1, 2/3]   (B) [–1/2, 1]

(C) [–1, 1/2]   (D) [2, –4]

1.44 If $x > y > 1$, which of the following must be true?

(i) $\ln x > \ln y$

(ii) $e^x > e^y$

(iii) $y^x > x^y$

(iv) $\cos x > \cos y$ **[EC-3, ME-2]**

(A) (i) and (ii)   (B) (i) and (iii)

(C) (iii) and (iv)   (D) (ii) and (iv)

1.45 $\log \tan 1^0 + \log \tan 2^0 + \cdots + \log \tan 89^0$ is _____.   **[EC-3, ME-2]**

(A) 1   (B) $\dfrac{1}{\sqrt{2}}$

(C) 0   (D) –1

1.46 How many four digit numbers can be formed with the 10 digits 0, 1, 2, ……..9 if no number can start with 0 and if repetitions are not allowed?   **[CE-2]**

2016   IISc Bangalore

1.47 If $q^{-a} = \dfrac{1}{r}$ and $r^{-b} = \dfrac{1}{s}$ and $s^{-c} = \dfrac{1}{q}$, the value of abc is _____.

[EC-1, ME-1]

(A) $(rqs)^{-1}$ (B) 0

(C) 1   (D) $r + q + s$

1.48 Given $(9 \text{ inches})^{1/2} = (0.25 \text{ yards})^{1/2}$, which one of the following statements is **TRUE**? **[EC-2, ME-3]**

(A) 3 inches = 0.5 yards

(B) 9 inches = 1.5 yards

(C) 9 inches = 0.25 yards

(D) 81 inches = 0.0625 yards

1.49 Two and a quarter hours back, when seen in a mirror, the reflection of a wall clock without number markings seemed to show 1:30. What is the actual current time shown by the clock?

[EC-2, ME-3]

(A) 8 : 15   (B) 11 : 15

(C) 12 : 15   (D) 12 : 45

1.50 The number that least fits this set: (324, 441, 97 and 64) is

[AR, CY, EC-3, IN, MA, PE]

(A) 324   (B) 441

(C) 97   (D) 64

1.51 Pick the odd one out in the following :

13, 23, 33, 43, 53

[AE, EE-2, TF, XE, XL]

(A) 23   (B) 33

(C) 43   (D) 53

1.52 If $|9y - 6| = 3$, they $y^2 - 4y/3$ is

[AE, EE-2, TF, XE, XL]

(A) 0   (B) +1/3

(C) −1/3   (D) undefined

1.53 The numeral in the units position of $211^{870} + 146^{127} \times 3^{424}$ is _____.

[AE, EE-2, TF, XE, XL]

1.54 The sum of the digits of a two-digit number is 12. If the new number formed by reversing the digits is greater than the original number by 54, find the original number. **[AG, CE-2, EY, MT, PI]**

(A) 39   (B) 57

(C) 66   (D) 93

2017   IIT Roorkee

1.55 The number of 3 digit numbers such that the digit 1 is never to the immediate right of 2 is **[AE, EC-2, MA, MT, PE, PH]**

(A) 781   (B) 791

(C) 881   (D) 891

1.56 Find the smallest number y such that $y \times 162$ is a perfect cube. **[CS-1, EE-1]**

(A) 24   (B) 27

(C) 32   (D) 36

1.57 The probability that a k-digit number does NOT contain the digits 0, 5 or 9 is

[CS-1, EE-1]

(A) 0.3^k (B) 0.6^k

(C) 0.7^k (D) 0.9^k

1.58 X is a 30 digit number starting with the digit 4 followed by the digit 7. Then the number X^3 will have, **[CS-2, EE-2]**

(A) 90 digits   (B) 91 digits

(C) 92 digits   (D) 93 digits

1.59 What is the value of x when

$$81 \times \left(\frac{16}{25}\right)^{x+2} \div \left(\frac{3}{5}\right)^{2x+4} = 144$$

[CE-2, IN, XE, XL]

(A) 1

(B) −1

(C) −2

(D) Cannot be determined

1.60 What is the sum of the missing digits in the subtraction problem below?

[AR, ME-1, TF]

$$\begin{array}{r} 5\_\_\_\_ \\ -48\_89 \\ \hline 1111 \end{array}$$

(A) 8   (B) 10

(C) 11

(D) Cannot be determined

1.61 If a and b are integers and $a-b$ is even, which of the following must always be even? **[AG, GG, ME-2]**

(A) ab　　　　　　(B) a^2+b^2+1

(C) a^2+b+1　　　(D) $ab-b$

1.62 The last digit of $(2171)^7+(2172)^9$ $+(2173)^{11}+(2174)^{13}$ is **[CE-1, CH, MN]**

(A) 2　　　　　　　(B) 4

(C) 6　　　　　　　(D) 8

2018　IIT Guwahati

1.63 If the number 715 ■ 423 is divisible by 3 (■ denotes the missing digit in the thousand's place), then the smallest whole number in the place of ■ is _____. **[EC]**

(A) 0　　　　　　　(B) 2

(C) 5　　　　　　　(D) 6

1.64 What is the value of **[EC]**

$$1+\frac{1}{4}+\frac{1}{16}+\frac{1}{64}+\frac{1}{256}+....?$$

(A) 2　　　　　　　(B) $\dfrac{7}{4}$

(C) $\dfrac{3}{2}$　　　　　　(D) $\dfrac{4}{3}$

1.65 For what values of k given below is $\dfrac{(k+2)^2}{k-3}$ an integer? **[EE]**

(A) 4, 8, 18　　　　(B) 4, 10, 16

(C) 4, 8, 28　　　　(D) 8, 26, 28

1.66 Given that a and b are integers and $a+a^2b^3$ is odd then, which one of the following statements is correct?

[EY, ME-1, PE, XE, XL]

(A) a and b are both odd

(B) a and b are both even

(C) a is even and b is odd

(D) a is odd and b is even

1.67 A number consists of two digits, the sum of digits is 9. If 45 is subtracted from the number, its digits are interchanged. What is the number? **[EY, ME-1, PE, XE, XL]**

(A) 63　　　　　　　(B) 72

(C) 81　　　　　　　(D) 90

1.68 Find the missing group of letters in the following series : BC, FGH, LMNO, _____. **[AE, MA, ME-2, PI]**

(A) UVWXY　　　　(B) TUVWX

(C) STUVW　　　　(D) RSTUV

1.69 Consider a sequence of numbers a_1, a_2, $a_3, ...a_n$ where $a_n=\dfrac{1}{n}-\dfrac{1}{n+2}$, for each integer ($n > 0$). What is the sum of the first 50 terms? **[CE-1]**

(A) $\left(1+\dfrac{1}{2}\right)-\dfrac{1}{50}$　　(B) $\left(1+\dfrac{1}{2}\right)+\dfrac{1}{50}$

(C) $\left(1+\dfrac{1}{2}\right)-\left(\dfrac{1}{51}+\dfrac{1}{52}\right)$

(D) $1-\left(\dfrac{1}{51}+\dfrac{1}{52}\right)$

1.70 For non-negative integers, a, b, c, what would be the value of $a+b+c$ if $\log a+\log b+\log c=0$? **[CE-2]**

(A) 3　　　　　　　(B) 1

(C) 0　　　　　　　(D) -1

1.71 $\underbrace{\dfrac{a+a+a+...+a}{n \text{ times}}}=a^2b$ and $\underbrace{\dfrac{b+b+b+...+a}{m \text{ times}}}=ab^2$, where a, b, n and m are natural numbers. What is the value of $\left(\dfrac{\overbrace{m+m+m+...+m}}{n \text{ times}}\right)$ $\left(\dfrac{\overbrace{n+n+n+...+n}}{m \text{ times}}\right)$? **[CE-2]**

(A) $2a^2b^2$ (B) a^4b^4

(C) $ab(a+b)$ (D) a^2+b^2

1.72 A faulty wall clock is known to gain 15 minutes every 24 hours. It is synchronized to the correct time at 9 AM on 11th July. What will be the correct time to the nearest minute when the clock shows 2 PM on 15th July of the same year? **[CE-2]**

(A) 12:45 PM (B) 12:58 PM

(C) 1:00 PM (D) 2:00 PM

1.73 If $pqr \neq 0$ and $p^{-x} = \dfrac{1}{q}$, $q^{-y} = \dfrac{1}{r}$,

$r^{-z} = \dfrac{1}{p}$, what is the value of the product

xyz? **[CS, MN]**

(A) -1 (B) $\dfrac{1}{pqr}$

(C) 1 (D) pqr

1.74 What would be the smallest natural number which when divided either by 20 or by 42 or by 76 leaves a remainder of 7 in each case? **[CS, MN]**

(A) 3047 (B) 6047

(C) 7987 (D) 63847

1.75 What is the missing number in the following sequence? **[CS, MN]**

2, 12, 60, 240, 720, 1440, _____, 0

(A) 2880 (B) 1440

(C) 720 (D) 0

1.76 In appreciation of the social improvements completed in a town, a wealthy philanthropist decided to gift Rs 750 to each male senior citizen in the town and Rs 1000 to each female senior citizen. Altogether, there were 300 senior citizens eligible for this gift. However, only 8/9th of the eligible men and 2/3rd of the eligible women claimed the gift. How much money (in Rupees) did the philanthropist give away in total?

[CS, MN]

(A) 1,50,000 (B) 2,00,000

(C) 1,75,000 (D) 1,51,000

2019   IIT Madras

1.77 On a horizontal ground, the base of a straight ladder is 6 m away from the base of a vertical pole. The ladder makes an angle of 45^0 to the horizontal. If the ladder is resting at a point located at one – fifth of the height of the pole from the bottom, the height of the pole is _____ meters. **[CE-1]**

(A) 15 (B) 25

(C) 35 (D) 30

1.78 Two design consultants, P and Q, started working from 8 AM for a client. The client budgeted a total of USD 3000 for the consultants. P stopped working when hour hand moved by 210 degrees on the clock. Q stopped working when the hour hand moved by 240 degrees. P took two tea breaks of 15 minutes each during her shift, but took no lunch break. Q took only one lunch break for 20 minutes, but no tea breaks. The market rate for consultants is USD 200 per hour and breaks are not paid. After paying the consultants, the client shall have USD _____ remaining in the budget. **[EC]**

(A) 000.00 (B) 300.00

(C) 166.67 (D) 433.33

1.79 Given two sets $X = \{1, 2, 3\}$ and $Y = \{2, 3, 4\}$, we construct a set Z of all possible fractions where the numerators belong to set X and the denominators belong to set Y. The product of elements having

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minimum and maximum values in the set Z is _____.   **[EE]**

(A) 1/8   (B) 3/8

(C) 1/12   (D) 1/6

1.80 The missing number in the given sequence 343, 1331, _____, 4913 is _____   **[EE]**

(A) 4096   (B) 2744

(C) 2197   (D) 3375

1.81 How many integers are there between 100 and 1000 all of whose digits are even?   **[EE]**

(A) 90   (B) 100

(C) 80   (D) 60

1.82 Five numbers 10, 7, 5, 4 and 2 are to be arranged in a sequence from left to right following the directions given below:

1. No two odd or even numbers are next to each other.
2. The second number from the left is exactly half of the left-most number.
3. The middle number is exactly twice the right-most number.

Which is the second number from the right?

[AE, AG, AR, BT, EY, GG, IN, MA, MT, PE, PH, PI, ST]

(A) 2   (B) 4

(C) 7   (D) 10

2020   IIT Delhi

1.83 It is quarter past three in your watch. The angle between the hour hand and the minute hand is _____.

[AE, AG, EC, GG]

(A) 22.5^0 (B) 15^0

(C) 7.5^0 (D) 0^0

1.84 In four-digit integer numbers from 1001 to 9999, the digit group "37" (in the same sequence) appears _____ times.

[EE, EY, TF]

(A) 270   (B) 299

(C) 279   (D) 280

1.85 The sum of the first n terms in the sequence 8, 88, 888, 8888, ….. is _____.   **[IN, ME-1, MT, PE, PH]**

(A) $\dfrac{81}{80}(10^n - 1) + \dfrac{9}{8}n$

(B) $\dfrac{81}{80}(10^n - 1) - \dfrac{9}{8}n$

(C) $\dfrac{80}{81}(10^n - 1) + \dfrac{8}{9}n$

(D) $\dfrac{80}{81}(10^n - 1) - \dfrac{8}{9}n$

1.86 Find the missing element in the following figure.   **[CY, ME-2, PI]**
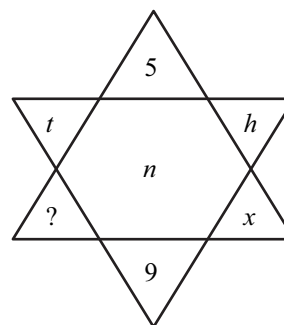
(A) e (B) y

(C) d (D) w

1.87 Insert seven numbers between 2 and 34, such that the resulting sequence including 2 and 34 is an arithmetic progression. The sum of these inserted seven numbers is _____.   **[CE-1]**

(A) 130   (B) 120

(C) 124   (D) 126

1.88 The difference between the sum of the first 2n natural numbers and the sum of the first n odd numbers is

[AR, BM, BT, CH, MA, MN, ST, XE, XL]

(A) $2^n - n$ (B) $n^2 - n$

(C) $2^n + n$ (D) $n^n + n$

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1.89 p and q are positive integers and $\dfrac{p}{q}+\dfrac{q}{p}=3$, then, $\dfrac{p^2}{q^2}+\dfrac{q^2}{p^2}=$

[EC, ES, PE, PI, ST]

(A) 7   (B) 11

(C) 9   (D) 3

1.90 Which one of the following numbers is exactly divisible by $(11^{13}+1)$?

[AG, EE, EY, GG]

(A) $11^{26}+1$ (B) $11^{52}-1$

(C) $11^{39}-1$ (D) $11^{33}+1$

1.91 Let $\oplus$ and $\odot$ are two operators on numbers p and q such that $p \oplus q = \dfrac{p^2+q^2}{pq}$ and $p \odot q = \dfrac{p^2}{q}$,

if $x \oplus y = 2 \odot 2$, then x : **[CE-1, CY, IN]**

(A) y (B) $2y$

(C) $\dfrac{y}{2}$ (D) $\dfrac{3y}{2}$

1.92 $\oplus$ and $\odot$ are two operators on numbers p and q such that $p \odot q = p - q$ and $p \oplus q = p \times q$. Then

$$\big(9 \odot (6 \oplus 7)\big) \odot \big(7 \oplus (6 \odot 5)\big) =$$

[AE, AR, BM, CE-2, MN, PH]

(A) 40   (B) −40

(C) −33   (D) −26

1.93 If $\begin{cases} "\oplus" \text{ means "–",} \\ "\otimes" \text{ means "÷",} \\ "\Delta" \text{ means "+",} \\ "\nabla" \text{ means "×",} \end{cases}$

then, the value of the expression $\Delta 2 \oplus 3\Delta((4 \otimes 2)\nabla 4) =$ **[ME-1, XH]**

(A) 7   (B) – 0.5

(C) – 1   (D) 6

1.94 If $\oplus \div \odot = 2$, $\oplus \div \Delta = 3$, $\odot + \Delta = 5$, $\Delta \times \otimes = 10$ then, the value of $(\otimes - \oplus)^2$ is

[ME-2, MT]

(A) 4   (B) 1

(C) 0   (D) 16

1.95 A digital watch X beeps every 30 seconds while watch Y beeps 32 seconds. They beeped together at 10 AM. The immediate next time that they will beep together is _____. **[ME-2, MT]**

(A) 10 : 42 AM   (B) 11 : 00 AM

(C) 10 : 00 PM   (D) 10 : 08 AM

1.96 If $\left(x-\dfrac{1}{2}\right)^2-\left(x-\dfrac{3}{2}\right)^2=x+2$, then the value of x is **[CS-2, XE, XL]**

(A) 6   (B) 4

(C) 8   (D) 2

❖❖❖❖

Answers   **Number System & Series**

1.1	C	1.2	B	1.3	B	1.4	A	1.5	C
1.6	B	1.7	C	1.8	C	1.9	D	1.10	A
1.11	A	1.12	D	1.13	C	1.14	A	1.15	C
1.16	D	1.17	C	1.18	B	1.19	D	1.20	45
1.21	A	1.22	725	1.23	D	1.24	C	1.25	163
1.26	16	1.27	D	1.28	B	1.29	495	1.30	C
1.31	B	1.32	96	1.33	B	1.34	C	1.35	C
1.36	C	1.37	D	1.38	C	1.39	B	1.40	A
1.41	C	1.42	3	1.43	B	1.44	A	1.45	C
1.46	4536	1.47	C	1.48	C	1.49	D	1.50	C
1.51	B	1.52	C	1.53	7	1.54	A	1.55	C
1.56	D	1.57	C	1.58	A	1.59	B	1.60	D
1.61	D	1.62	B	1.63	B	1.64	D	1.65	C
1.66	D	1.67	B	1.68	B	1.69	C	1.70	A
1.71	B	1.72	B	1.73	C	1.74	C	1.75	B
1.76	B	1.77	D	1.78	C	1.79	B	1.80	C
1.81	B	1.82	C	1.83	C	1.84	D	1.85	D
1.86	C	1.87	D	1.88	D	1.89	A	1.90	B
1.91	A	1.92	B	1.93	A	1.94	B	1.95	D
1.96	B								

Explanations   **Number System & Series**

1.1   (C)

Given : $137 + 276 = 435$

7 and 6 added is becoming 5 means the given two numbers are added on base 8.

$$\begin{array}{r} (137)_8 \\ + \ (276)_8 \\ \hline (435)_8 \end{array}$$

Add another two given set of numbers also on base 8.

$$\begin{array}{r} (731)_8 \\ + \ (672)_8 \\ \hline (1623)_8 \end{array}$$

Thus, the overall problem was based on identifying base which was 8 and adding numbers on base 8.

Hence, the correct option is (C).

1.2   (B)

Given : Digits are 2, 2, 3, 3, 3, 4, 4, 4, 4

As the number is greater than 3000. So thousand's place can be either 3 or 4

Let us consider the following two cases.

Case 1 : When thousand's place is 3

3 a b c

If there is no restriction on number of two's, three's and four's. Then each of a, b, c can be filled with 2 or 3 or 4 each in 3 ways.

So, $3 \times 3 \times 3 = 27$ numbers are there. Out of which 3222, 3333 are invalid as 2 can be used twice and 3 thrice only.

So number of such valid numbers beginning with 3 are $27 - 2 = 25$

Case 2 : When thousand's place is 4

$$\underline{4} \ \underline{a} \ \underline{b} \ \underline{c}$$

Without restriction on number of 2's, 3's and 4's a, b, c can be filled in 27 ways (as explained in case 1)

Out of these 27 numbers, 4222 is only invalid as two have to be used twice only. So valid numbers are $27 - 1 = 26$

Total numbers from case 1 and case 2 is

$$25 + 26 = 51$$

Hence, the correct option is (B).

1.3   (B)

We can observe that there is sum of two series.

$$\left(\frac{(1)}{2} + \frac{(-1)}{2^2} + \frac{(1)}{2^3} + \frac{(-1)}{2^4} + \frac{(1)}{2^5} + \frac{(-1)}{2^6} + \frac{(1)}{2^7} + ... \right)$$

$$+ \left(\frac{1}{3^1} + \frac{1}{3^2} + \frac{1}{3^3} + \frac{1}{3^4} + \frac{1}{3^5} + ... \right)$$

Both parts are in G.P. series

First series with $a = \frac{1}{2}$ and $r = \frac{(-1)}{2}$

Infinite sum $= \dfrac{a}{1-r} = \dfrac{\frac{1}{2}}{1 - \frac{(-1)}{2}} = \dfrac{1}{3}$

Second series with $a = \frac{1}{3}$ and $r = \frac{1}{3}$

Infinite sum $= \dfrac{a}{1-r} = \dfrac{\frac{1}{3}}{1 - \frac{1}{3}} = \dfrac{1}{2}$

Final sum $= \dfrac{1}{3} + \dfrac{1}{2} = \dfrac{5}{6}$

Hence, the correct option is (B).

1.4   (A)

Given : A, B, B, C, C, C, D, D, D, D, …etc

Here, each alphabets is repeated as many times as its position in the alphabetical order.

Alphabet	Position in alphabetical order	Position in the given sequence
A	1	1st
B	2	2nd and 3rd
C	3	4th, 5th and 6th
D	4	7th, 8th, 9th and 10th
…	…	…
Some alphabet	n	$\left(\frac{n(n+1)}{2} - n + 1 \right),$ $\left(\frac{n(n+1)}{2} - n + 2 \right),$ … , 240th , … , $\left(\frac{n(n+1)}{2} - n + n \right)$

Here, $\dfrac{n(n+1)}{2}$ is the last position in the given sequence for an alphabet whose position is n in the alphabetical order. So, if we have to find an alphabet whose position is i^{th} in the given sequence and whose position is n in the alphabetical order then we have to find smallest integer value of n such that $\dfrac{n(n+1)}{2} \geq i$.

For example, if $i = 5$, it means we have to find alphabet whose position is 5th in the given sequence, then we have to find minimum value of n such that $\dfrac{n(n+1)}{2} \geq 5$, So, minimum value of $n = 3$ means it will be alphabet C.

Similarly, if $i = 8$ means we have to find alphabet whose position is 8th in the given sequence, then we have to find minimum value of n such that $\dfrac{n(n+1)}{2} \geq 8$, So, minimum value of $n = 4$ means it will be alphabet D.

Now, in this question, we have to find smallest integer value of n such that

$$\dfrac{n(n+1)}{2} \geq 240$$

$$\left\{ \text{Sum of first } n \text{ natural numbers} = \dfrac{n(n+1)}{2} \right\}$$

$$n(n+1) \geq 480$$

Options given are V, U, T, W. So, value of n can be 22, 21, 20 or 23.

For V, $n = 22 \Rightarrow n(n+1) = 506 \geq 480$

For U, $n = 21 \Rightarrow n(n+1) = 462 \leq 480$

For T, $n = 20 \Rightarrow n(n+1) = 420 \leq 480$

For W, $n = 23 \Rightarrow n(n+1) = 552 \geq 480$

Smallest value of n for $\dfrac{n(n+1)}{2} \geq 240$ is 22.

For $n = 22$, alphabet is V.

Hence, the correct option is (A).

1.5   **(C)**

Given :

$S = \{1, 2, 3...., 4999, 5000\}$

Let $'A'$ be the set of integers divided by '3' is

$\qquad A = \{3, 6, 9, 12, 15, ..., 4998\}$

Let $'B'$ be the set of integers divided by '4' is

$\qquad B = \{4, 8, 12, 16, ..., 5000\}$

Let $'C'$ be the set of integers divisibly by both '3' and '4' is

$\qquad C = \{12, 24, 36, ..., 4992\}$

$$|A| = 3 + (n-1) \times 3 = 4998 \Rightarrow n = \dfrac{4998}{3} = 1666$$

$$|B| = 4 + (n-1) \times 4 = 5000 \Rightarrow n = \dfrac{5000}{4} = 1250$$

$$|C| = 12 + (n-1) \times 12 = 4992 \Rightarrow n = \dfrac{4992}{12} = 416$$

Divisible by '3' or '4' is $\{3, 4, 6, 8 ...5000\}$:

$$|D| = |A| + |B| - |C|$$

$$= 1666 + 1250 - 416$$

$$= 2500$$

Number of integers that is divisible by neither '3' nor '4' is :

$$= |S| - |D| \qquad\qquad \{|S| = 5000\}$$

$$= 5000 - 2500$$

$$= 2500$$

Hence, the correct option is (C).

1.6   **(B)**

Given : $p - q = 990$

Hence, $p = 1100$, $q = 110$

In base 10 subtraction, we are getting result 990. Since, p is in base 2, it can have digits 0 or 1 only. And since q is in base 3, it can have digits 0, 1, 2 only.

We can get result digit '0' by either '0 – 0' or '1 – 1'

We can get result digit '9' by either '10 – 1' or '11 – 2'

So, possible value of p and q can be (their decimal values must be same too)

$$(1100)_2 \text{ and } (110)_3 = (12)_{10}$$

$$(1101)_2 \text{ and } (111)_3 = (13)_{10}$$

So, only option (B) is matching the answer.

Hence, the correct option is (B).

1.7   **(C)**

Given : n^{th} series is,

$$4 + 44 + 444 + ...$$

Method 1

First term of series $= 4$

So, sum upto 1st term $= 4$

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Put, $n = 1$ (first term) only option (C) satisfies.

$$S = \frac{4}{81}\left[10^{n+1} - 9n - 10\right]$$

At $n = 1$,

$$S = \frac{4}{81}\left[10^{1+1} - (9 \times 1) - 10\right]$$

$$S = \frac{4}{81} \times 81 = 4$$

Hence, the correct option is (C).

Method 2

$$S = \frac{4}{9}[9 + 99 + 999 + ...]$$

$$S = \frac{4}{9}\left[(10 - 1) + (10^2 - 1) + (10^3 - 1) + ...\right]$$

$$S = \frac{4}{9}\left[(10 + 10^2 + 10^3 ......10^n) - (1 + 1 + 1....)\right]$$

$$S = \frac{4}{9}\left[10(1 + 10 + 10^2 ......10^{n-1}) - (1 + 1 + 1....)\right]$$

$$S = \frac{4}{9}\left[10\left(\frac{10^n - 1}{10 - 1}\right) - n\right] = \frac{4}{9}\left[\frac{10^{n+1} - 10 - 9n}{9}\right]$$

$$S = \frac{4}{81}\left[10^{n+1} - 9n - 10\right]$$

Hence, the correct option is (C).

1.8   (C)

Given : Three friends R, S and T share toffees as below,

Firstly, R took 1/3rd and returned 4.

Then, S took 1/4th and returned 3.

Then, T took 1/2nd and returned 2.

Now, the bowl has 17 toffees left.

Method 1

The question can be done orally as R took 1/3rd of toffees initially. So, the total number of toffees have to be a multiple of 3.

Only the number 48 is multiple of 3, from the options.

Hence, the correct option is (C).

Method 2

Let x be the total number of toffees in bowl initially.

And r, s and t are toffees taken by R, S and T respectively.

According to question,

$$r = \frac{x}{3} - 4$$

Number of toffees left,

$$y = x - \left(\frac{x}{3} - 4\right) = \frac{2x}{3} + 4 \qquad ...(i)$$

S took 1/4th of y and returned 3

So, $$s = \frac{y}{4} - 3$$

Number of toffees left,

$$z = y - \left(\frac{y}{4} - 3\right) = \frac{3y}{4} + 3$$

$$z = \frac{3}{4}y + 3$$

From equation (i),

$$z = \frac{3}{4}\left(\frac{2x}{3} + 4\right) + 3$$

$$z = \frac{x}{2} + 6 \qquad ...(ii)$$

T took 1/2 of z and returned 2 back,

So, $$t = \frac{z}{2} - 2$$

Finally, number of toffees left

$$17 = z - \left(\frac{z}{2} - 2\right) = \frac{z}{2} + 2$$

$$17 = \frac{1}{2}\left(\frac{x}{2} + 6\right) + 2 \quad \text{[from equation (ii)]}$$

$$17 = \frac{x}{4} + 5$$

$$x = 48$$

Hence, the correct option is (C).

| 1.9 | (D) |

Given :

$$(1.001)^{1259} = 3.52 \text{ and } (1.001)^{2062} = 7.85$$

Method 1

Let $S = (1.001)^{3321}$

Since, $a^n \times a^m = a^{n+m}$

$$S = (1.001)^{1259+2062}$$

$$S = (1.001)^{1259} \times (1.001)^{2062}$$

$$S = 3.52 \times 7.85 = 27.64$$

Hence, the correct option is (D).

Method 2

Taking the product of greatest integer values i.e. $3 \times 7 = 21$, it is concluded that the correct answer is obviously greater than 21.

Hence, the correct option is (D).

| 1.10 | (A) |

Let number of Rs. 20 notes be x

Number of Rs. 10 notes be y.

$$20x + 10y = 230$$

$$2x + y = 23 \hspace{3cm} …(i)$$

and $x + y = 14 \hspace{2.5cm} …(ii)$

From equation (i) and (ii),

$$x = 9 \text{ and } y = 5$$

Thus, the numbers of 10 rupee notes are 5.

Hence, the correct option is (A).

| 1.11 | (A) |

Let, the eight bags are

$$A_1, A_2, A_3, A_4, A_5, A_6, A_7, A_8$$

Let three are placed on one side of balance and three on other side; say A_1, A_2, A_3 on one and A_4, A_5, A_6 on another. If they are equal obviously A_7 or A_8 is heavier means one additional trial is required. Hence, total two trials are required.

If they are unequal, let A_1, A_2, A_3 is heavier than A_4, A_5, A_6 obviously heavier one is among A_1, A_2 and A_3.

Now put A_1 on one of the side of balance and A_2 on another side.

If $A_1 = A_2$ obviously A_3 is heavier.

If $A_1 > A_2$ or $A_1 < A_2$ obviously A_1 or A_2 is heavier, then atleast two trials needed.

Hence, the correct option is (A).

| 1.12 | (D) |

Given :

As we know that, $\log m + \log n = \log m.n$

$$\log x + \log(x - 7) = \log(x + 11) + \log 2$$

So, $\log x(x - 7) = \log 2(x + 11)$

$$x(x - 7) = 2(x + 11)$$

$$x^2 - 9x - 22 = 0$$

$$x^2 - 11x + 2x - 22 = 0$$

$$x(x - 11) + 2(x - 11) = 0$$

$$(x - 11)(x + 2) = 0$$

$$x = 11$$

$x \neq -2$, log is undefined for negative number.

Hence, the correct option is (D).

| 1.13 | (C) |

Given : Number of terms $= 5$, Average = 12

The sum of natural numbers = 60

Thus, the largest possible values among the numbers must be less than 60.

By options, answer must be 50.

Hence, the correct option is (C).

> 📖 **Key Point**
>
> Sum of natural numbers
> $$= \text{Number of terms} \times \text{average}$$

1.14 **(A)**

Theorem : If p is a prime number which has remainder 1 when divided by 4, then p can be written as a sum of two squares.

Example:
- $5 = 1 + 4$
- $13 = 9 + 4$
- $17 = 16 + 1$
- $29 = 25 + 4$
- $37 = 36 + 1$
- $41 = 25 + 16$
- and so on.

Hence, option (A) is correct.

From option (B) : Sum of cubes of two natural numbers.

Counter example : 5 cannot be represented as cubes of two natural numbers.

$$(1^3 = 1, \ 2^3 = 8 \Rightarrow 1 + 8 = 9 \neq 5)$$

Hence, option (B) is not correct.

From option (C) : Sum of square roots of two natural numbers.

Let, $p = 4n + 1, \ n \geq 0$ and p is a prime number.

The smallest value of p is 5.

So, any p can be written as $p = p_1 + p_2$ where p_1 and p_2 are natural numbers. Now existence of p_1^2 and p_2^2 makes the option (C) correct.

From option (D) : Sum of cube roots instead of p_1^2 and p_2^2 in above explanation we just need to change to p_1^3 and p_2^3.

Hence, the correct options are (A), (C) and (D).

It is better to pick option (A) here, because Options (C) and (D) seem to be given by mistake. This question can also be asked in MSQ type.

Hence, the correct option is (A).

1.15 **(C)**

Given : The mean temperatures for a certain week are :

Monday to Wednesday $= 41^0 \text{C}$

Tuesday to Thursday $= 43^0 \text{C}$

Let the temperatures on Monday, Tuesday, Wednesday and Thursday is M, T, W and Th respectively.

So, $\dfrac{M + T + W}{3} = 41$

$M + T + W = 123$ …(i)

And also, $\dfrac{T + W + Th}{3} = 43$

$T + W + Th = 129$ …(ii)

Subtracting equation (i) from equation (ii),

$Th - M = 6$ …(iii)

According to question, temperature on Thursday was 15% higher than that of Monday.

$Th = 1.15 \times M$ …(iv)

From equations (iii) and (iv),

$1.15M - M = 6$

$0.15M = 6$

$M = \dfrac{6}{0.15}$

$Th = 1.15 \times \dfrac{6}{0.15} = 46^0 \text{C}$

Hence, the correct option is (C).

1.16 **(D)**

Given : Series is $10 + 84 + 734 + ...$

Method 1

Check from the options by substituting

$n = 1, 2…$

For $n = 1$:

From option (A),

$\dfrac{9(9^1 + 1)}{10} + 1 = 10$

From option (B),

$\dfrac{9(9^1 - 1)}{8} + 1 = 10$

From option (C),

$$\frac{9(9^1-1)}{8}+1=10$$

From option (D),

$$\frac{9(9^1-1)}{8}+1^2=10$$

For $n=1$, all options are right.

For $n=2$, sum must be $10+84=94$.

Only option (D) is correct for this and we can go through that.

Hence, the correct option is (D).

| Method 2 |

Sum of n terms of series

$$S_n = 10+84+734+....$$

$$S_n = (9+1)+(81+3)+(729+5)+....$$

$$S_n = (9+81+729+....)+(1+3+5+....)$$

$$S_n = (9+9^2+9^3+....n \text{ terms})$$
$$\qquad\qquad +(1+3+5+....n \text{ terms})$$

$$S_n = 9\left[\frac{9^n-1}{9-1}\right]+\frac{n}{2}[2\times1+(n-1)2]$$

$$S_n = \frac{9}{8}(9^n-1)+n^2$$

Hence, the correct option is (D).

| **1.17** | **(C)** |

Given : $44, 42, 40 …$

The given series is decreasing by 2. For the sum to be maximum, the series should not include negative numbers. So, the series should be $44, 42, 40, 38 …2, 0$

$$\text{Sum} = 0+2+4…44$$

$$\text{Sum} = 2(1+2+3…22)$$

Given series is an A.P. series.

Therefore, sum of the series is given by,

$$\text{Sum} = \frac{n}{2}(a+l)$$

where, $n=$ number of terms

$\qquad a=$ first term, $l=$ last term

$$\text{Sum} = 2\times\left[\frac{22}{2}(1+22)\right]=506$$

Hence, the correct option is (C).

| **1.18** | **(B)** |

Let $S = \dfrac{1}{\sqrt{1}+\sqrt{2}}+\dfrac{1}{\sqrt{2}+\sqrt{3}}+\dfrac{1}{\sqrt{3}+\sqrt{4}}+$

$$.........+\frac{1}{\sqrt{80}+\sqrt{81}}$$

$$S = \left(\frac{\sqrt{2}-\sqrt{1}}{\left(\sqrt{2}\right)^2-\left(\sqrt{1}\right)^2}\right)+\left(\frac{\sqrt{3}-\sqrt{2}}{\left(\sqrt{3}\right)^2-\left(\sqrt{2}\right)^2}\right)$$

$$+......+\left(\frac{\sqrt{81}-\sqrt{80}}{\left(\sqrt{81}\right)^2-\left(\sqrt{80}\right)^2}\right)$$

$$S = \left(\sqrt{2}-\sqrt{1}\right)+\left(\sqrt{3}-\sqrt{2}\right)+.....\left(\sqrt{81}-\sqrt{80}\right)$$

$$S = \sqrt{81}-1 = 9-1 = 8$$

Hence, the correct option is (B).

| **1.19** | **(D)** |

Let the unknown, number be y.

According to question,

$$y = 75+x \qquad\qquad\qquad …\text{(i)}$$
$$y = 117-x \qquad\qquad\qquad …\text{(ii)}$$

From equation (i) and (ii),

$$y = 96$$

Hence, the correct option is (D).

| **1.20** | **45** |

Given : Series is

$$2 \quad 3 \quad 6 \quad 15 \quad x \quad 157.5 \quad 630$$

Let the missing number is 'x'

Here $\dfrac{3}{2}=1.5$, $\dfrac{6}{3}=2$, $\dfrac{15}{6}=2.5$, $\dfrac{630}{157.5}=4$

Series : $1.5, \quad 2, \quad 2.5, \quad \dfrac{x}{15}, \quad \dfrac{157.5}{x}, \quad 4$

The ratio of consecutive numbers is in AP where,

Common difference $d = 0.5$

First term $a = 1.5$
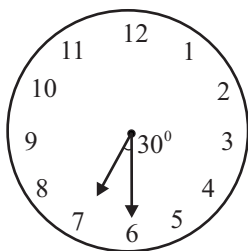
Then according to the given series,

$$\frac{x}{15} = a + 3d$$

$$\frac{x}{15} = 3 \Rightarrow x = 45$$

Hence, the missing number in the series is **45**.

1.21 (A)

Method 1

For any clock the angle between any two consecutive numbers (out of 1 to 12) $= 30^0$.

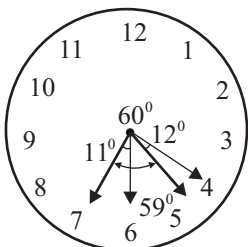As hour needle moves in one hour or 60 mins from 6 to 7 i.e. 30^0.

At 6 : 22 am, The hour needle moves by angle

$$\frac{22}{60^0} \times 30^0 = 11^0$$

The minute needle moves from 4 to 5 i.e. in 5 minutes by 30^0.

Thus, within 2 min (from 6 : 20 to 6 : 22), the angle by which it moves

$$= \frac{2}{5} \times 30^0 = 12^0$$

Thus, the angle between two needles at 6:22 am is 59^0.

Hence, the correct option is (A).

Method 2

We can also measure the angle by this formula.

$$\text{Angle} = 30 \, \text{H} - \frac{11}{2} \, \text{M}$$

From option (A) :

Here, Hour (H) = 6 and minute (M) = 22

Hence, Angle $= 30 \times 6 - \frac{11}{2} \times 22 = 59^0$

From option (B) :

$$\text{Angle} = 30 \times 6 - \frac{11}{2} \times 27 = 31.5^0$$

From option (C) :

$$\text{Angle} = 30 \times 6 - \frac{11}{2} \times 38 = 29^0$$

From option (D) :

$$\text{Angle} = 30 \times 6 - \frac{11}{2} \times 45 = 67.5^0$$

Hence, the correct option is (A).

1.22 725

Given : Series is 12 35 81 173 357 __ __

In the given series consecutive difference doubles with each term.

So,

$$\begin{array}{r} 357 \\ + 368 \\ \hline 725 \end{array}$$

Hence, the next number in the series is **725**.

1.23 (D)

The alphabets can be numbered as given below,

A	B	C	D	E	F	G	H	I
1	2	3	4	5	6	7	8	9
J	K	L	M	N	O	P	Q	R
10	11	12	13	14	15	16	17	18
S	T	U	V	W	X	Y	Z	
19	20	21	22	23	24	25	26	

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Notice the pattern of given options using the above table.

Option (A) :

$$\begin{array}{cccc} W & E & K & O \\ 23 & 5 & 11 & 15 \end{array}$$
$$\begin{array}{ccc} 7 & 5 & 3 \end{array}$$

Option (B) :

$$\begin{array}{cccc} I & Q & W & A \\ 9 & 17 & 23 & 1 \end{array}$$
$$\begin{array}{ccc} 7 & 5 & 3 \end{array}$$

Option (C) :

$$\begin{array}{cccc} F & N & T & X \\ 6 & 14 & 20 & 24 \end{array}$$
$$\begin{array}{ccc} 7 & 5 & 3 \end{array}$$

The numbers 7, 5 and 3 represent the number of alphabets in between.

Option (D) :

Odd

$$\begin{array}{cccc} N & V & B & D \\ 14 & 22 & 2 & 4 \end{array}$$
$$\boxed{\begin{array}{ccc} 7 & 5 & 1 \end{array}}$$

Hence, the correct option is (D).

1.24　**(C)**

The alphabets can be numbered as given below,

A	B	C	D	E	F	G	H	I
1	2	3	4	5	6	7	8	9
J	K	L	M	N	O	P	Q	R
10	11	12	13	14	15	16	17	18
S	T	U	V	W	X	Y	Z	
19	20	21	22	23	24	25	26	

Notice the pattern of given options using the above table.

Option (A) :

$$\begin{array}{cccc} Q & W & Z & B \\ 17 & 23 & 26 & 2 \end{array}$$
$$\begin{array}{ccc} 5 & 2 & 1 \end{array}$$

Option (B) :

$$\begin{array}{cccc} B & H & K & M \\ 2 & 8 & 11 & 13 \end{array}$$
$$\begin{array}{ccc} 5 & 2 & 1 \end{array}$$

The numbers 5, 2 and 1 represent the number of alphabets in between.

Option (C) :

$$\begin{array}{cccc} W & C & G & J \\ 23 & 3 & 7 & 10 \end{array}$$ Odd one
$$\begin{array}{ccc} 5 & 3 & \boxed{2} \end{array}$$

Option (D) :

$$\begin{array}{cccc} M & S & V & X \\ 13 & 19 & 22 & 24 \end{array}$$
$$\begin{array}{ccc} 5 & 2 & 1 \end{array}$$

Hence, the correct option is (C).

1.25　**163**

Method 1

(i)　For odd numbers :

Let 1st term $= a_0$

Common difference, $d = 2$

$n = 8$

Sum of AP series,

$$S_n = na_0 + \frac{n(n-1)}{2}d = 656$$

$$S_n = 8a_0 + \frac{8 \times 7}{2} \times 2 = 656$$

$$a_0 = 75$$

(ii)　For even numbers :

Let 1st term $= a_e$

Common difference, $d = 2$

$n = 4$

Average of n consecutive numbers $= \dfrac{S_n}{n} = 87$

$$\frac{1}{n} \times S_n = \frac{1}{n}\left[na_e + \frac{n(n-1)}{2}d \right]$$

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$$87 = a_e + \frac{(n-1)}{2} \times d$$

$$87 = a_e + \frac{(4-1)}{2} \times 2$$

$$a_e = 84$$

Hence, the sequence is,

84, 86, 88, 90

The second largest number is 88.

Sum of smallest odd number and second largest even number is,

$$= 75 + 88 = 163$$

Hence, the sum of the following numbers is **163**.

| Method 2 |

Let us consider eight consecutive odd numbers, they are

$$a-6, a-4, a-2, a, a+2, a+4, a+6, a+8$$

Sum of eight consecutive odd numbers $= 656$

$$a-6+a-4+a-2+a+a+2+a+4+$$

$$a+6+a+8 = 656$$

$$8a+8 = 656$$

$$a+1 = 82$$

$$a = 81$$

Smallest odd number

$$a-6 = 81-6 = 75 \qquad \ldots(i)$$

Again consider four consecutive even number,

$$b-2, b, b+2, b+4$$

Average of these numbers :

$$\frac{b-2+b+b+2+b+4}{4} = 87$$

$$4b+4 = 87 \times 4$$

$$b+1 = 87$$

$$b = 86$$

And second largest even number

$$b+2 = 86+2 = 88 \qquad \ldots(ii)$$

Adding equations (i) and (ii),

$$75 + 88 = 163$$

Hence, the sum of the following numbers is **163**.

| **1.26** | **16** |

Given : Series is 81, 54, 36, 24, ...

Let 5th term is x.

Then 81, 54, 36, 24, x

Therefore,

$$\frac{54}{81} = \frac{2}{3}, \frac{36}{54} = \frac{2}{3}, \frac{24}{36} = \frac{2}{3}$$

Hence, $\dfrac{x}{24} = \dfrac{2}{3}$

$$x = 16$$

Hence, the next term in the series is **16**.

| **1.27** | **(D)** |

In option (A), P and M both are less than R but there is no clear relation between P and M.

In option (B), P and M both are greater than is but again there is no clear relation between P and M.

In option (C), $P = F$ and $F > M$, so $P > M$ therefor it is incorrect.

In option (D), $P = A$ and $A < M$ therefore $P < M$ is definitely true.

Hence, the correct option is (D).

| **1.28** | **(B)** |

Given : Sequence is,

7G, 11K, 13M, ___

A	B	C	D	E	F	G	H	I
1	2	3	4	5	6	7	8	9
J	K	L	M	N	O	P	Q	R
10	11	12	13	14	15	16	17	18
S	T	U	V	W	X	Y	Z	
19	20	21	22	23	24	25	26	

Here, 7, 11, 13 are consecutive prime number.

Thus next prime number will be 17.

and G is 7th alphabet, K is 11th alphabet and M is 13th alphabet.

7th, 11th and 13th are again consecutive prime number.

So, the next alphabet will be 17th alphabet which is *Q*.

Thus the next term will be $17Q$.

Hence, the correct option is (B).

1.29	**495**

Given : In a sequence of 12 consecutive odd numbers, sum of the first 5 numbers is 425.

Let the sequence is :

$$a, a+2, a+4, a+6, \ldots.. a+22$$

Method 1

Sum of first five odd numbers is,

$$425 = a + (a+2) + (a+4) + (a+6) + (a+8)$$

$$425 = 5a + 20$$

$$a = 81$$

Sum of last five odd numbers is given by,

$$= (a+14) + (a+16) + (a+18)$$

$$+(a+20) + (a+22)$$

$$= 5a + 90$$

$$= (5 \times 81) + 90 = 495$$

Hence, the sum of the last 5 numbers in the sequence is **495**.

Method 2

It is an AP series where,

First term $= a$ (let)

Common difference, $d = 2$

Thus Sum of first n terms is given by,

$$S_n = na + \frac{n(n-1)d}{2}$$

Sum of 5 consecutive numbers,

$$S_5 = 5 \times a + \frac{5 \times 4}{2} \times 2$$

According to question,

$$425 = 5a + 20$$

$$a = 81$$

Sum of 12 consecutive numbers is,

$$S_{12} = 12a + \frac{12 \times 11}{2} \times 2 = 1104$$

Sum of first 7 consecutive numbers is,

$$S_7 = 7a + \frac{7 \times 6}{2} \times 2 = 609$$

So, the sum of last 5 terms is given by,

$$= S_{12} - S_7 = 1104 - 609 = 495$$

Hence, the sum of the last 5 numbers in the sequence is **495**.

1.30	**(C)**

Given : Sequence is

$$13M, 17Q, 19S, \_\_\_\_$$

A	B	C	D	E	F	G	H	I
1	2	3	4	5	6	7	8	9
J	K	L	M	N	O	P	Q	R
10	11	12	13	14	15	16	17	18
S	T	U	V	W	X	Y	Z	
19	20	21	22	23	24	25	26	

Checking from the options, only option (C) has the correct combination of number and alphabet. Hence, the correct option is (C).

1.31	**(B)**

Overall there will be $5! = 120$ numbers

Digit 1 will appear at unit, tenth, hundredth, thousandth and ten thousandth place 4! times each. So sum received due to all 1's will be

$$4! \times (1 + 10 + 100 + 1000 + 10000)$$

$$= 4! \times 11111$$

Similarly, sum received due to all 3's

$$= 4!(3 + 30 + 300 + 3000 + 30,000)$$

$$= 4! \times 33333$$

Similarly, sum received due to all 5's

$$= 4!(5 + 50 + 500 + 5000 + 50,000)$$

$$= 4! \times 55555$$

Similarly, sum received due to all 7's

$$= 4!(7+70+700+7000+70,000)$$

$$= 4! \times 77777$$

Similarly, sum received due to all 9's

$$= 4!(9+90+900+9000+90,000)$$

$$= 4! \times 99999$$

So, overall sum received due to all digits

$$= 4! \times 11111 \times (1+3+5+7+9)$$

$$= 4! \times 11111 \times 25 = 6666600$$

Hence, the correct option is (B).

1.32 **96**

Given : $\left(z + \dfrac{1}{z} \right)^2 = 98$

$$z^2 + \dfrac{1}{z^2} + \left(2 \times z \times \dfrac{1}{z} \right) = 98$$

$$z^2 + \dfrac{1}{z^2} = 96$$

Hence, the correct answer is **96**.

1.33 **(B)**

The all multiple of 10 from 2 to 198 are

$$10, 20, 30 \dots 190$$

It is an A.P. series :

First term $(a) = 10$

Common difference $(d) = 10$

Number of terms $(n) = 19$

The sum of A.P. series for n terms is,

$$S_n = \dfrac{n}{2} \big[2a + (n-1)d \big]$$

$$S_n = \dfrac{19}{2} \big[20 + 18 \times 10 \big] = 1900$$

$$\text{Average} = \dfrac{\text{Sum of terms}}{\text{Number of terms}} = \dfrac{1900}{19} = 100$$

Hence, the correct option is (B).

1.34 **(C)**

Let $\quad y = \sqrt{12 + \sqrt{12 + \sqrt{12 + \dots \infty}}}$

$$y = \sqrt{12 + y}$$

$$y^2 = 12 + y$$

$$y^2 - y - 12 = 0$$

$$y = \dfrac{1 \pm \sqrt{1+48}}{2} = \dfrac{1 \pm 7}{2} = 4, -3$$

Since, square root of a positive number is always a positive number. Therefore, y should also be a positive number.

Thus, the value of given sum must be,

$$y = 4 \qquad\qquad [y \neq -ve]$$

Hence, the correct option is (C).

1.35 **(C)**

Given :

The series $2, 5, 10, 17, 26, 37, 50, 64$.

The difference in consecutive numbers is

$$5 - 2 = 3, \qquad\qquad 10 - 5 = 5,$$

$$17 - 10 = 7, \qquad\qquad 26 - 17 = 9,$$

$$37 - 26 = 11, \qquad\qquad 50 - 37 = 13,$$

$$64 - 50 = 14$$

The difference is $3, 5, 7, 9, 11, 13$ and thus next difference should be 15 (not 14).

So, the last number should be $50 + 15 = 65$

Which means that 64 doesn't belong to the given series.

Hence, the correct option is (C).

1.36 **(C)**

 Method 1

Given : $(7526)_8 - (Y)_8 = (4364)_8$

$$(Y)_8 = (7526)_8 - (4364)_8$$

$$(7526)_8 \xrightarrow{\text{convert to decimal}}$$

$$\big[7 \times 8^3 + 5 \times 8^2 + 2 \times 8^1 + 6 \times 8^0 \big] = (3926)_{10}$$

$(4364)_8 \xrightarrow{\text{convert to decimal}}$

$\left[4 \times 8^3 + 3 \times 8^2 + 6 \times 8^1 + 4 \times 8^0\right] = (2292)_{10}$

Now,

$(3926)_{10}$
$-(2292)_{10}$
$\overline{(1634)_{10}}$

$(1634)_{10} \xrightarrow{\text{convert to octal}}$

8	1634	
8	204	2
8	25	4
	3	1

$(y_8) = (3142)_8$

Hence, the correct option is (C).

Method 2

$(Y)_8 = (7526)_8 - (4364)_8$

$(Y)_8 = \begin{array}{r} 7526 \\ -4364 \\ \hline 3142 \end{array} = (3142)_8$

Hence, the correct option is (C).

1.37   (D)

Given : ALRVX, EPVZB, ITZDF, OYEIK

Method 1

Option (A) : It consists of only one vowel.

Option (B) : It consists of only one vowel.

Option (C) : It consists of only one vowel.

Option (D) : It consists of three vowels.

Hence, the correct option is (D).

Method 2

Option (A) : A – L – R – V – X

    A – L : 10 alphabets between A and L.

    L – R : 5 alphabets between L and R.

    R – V : 3 alphabets between R and V.

    V – X : 1 alphabet between V and X.

Similar for option (B) and (C).

Option (D) : OYEIK

    O – Y : 9 alphabets between O and Y.

    Y – E : 5 alphabets between Y and E.

    E – I : 3 alphabets between E and I.

    I – K : 1 alphabet between I and K.

Hence, the correct option is (D).

1.38   (C)

In the alphabetical sequence, the missing word is as follows
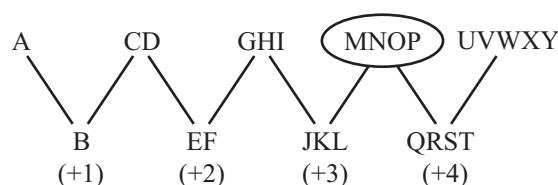
Therefore, the missing word in the sequence is 'MNOP'.

Hence, the correct option is (C).

1.39   (B)

P, R, S, T, U is an arithmetic sequence.

They must have a common difference as,

$$R - P = S - R = T - S = U - T \quad \ldots(i)$$

(i)   Multiplying equation (i) by 2,

$2R - 2P = 2S - 2R = 2T - 2S = 2U - 2T$

This shows that sequence (I) $\{2P, 2R, 2S, 2T, 2U\}$ is an arithmetic sequence.

(ii)   From sequence (II),

$(R-3) - (P-3) = R - P$

$(S-3) - (R-3) = S - R$

$(T-3) - (S-3) = T - S$

$(U-3) - (T-3) = U - T$

So, from equation (i),

$(R-3) - (P-3) = (S-3) - (R-3)$

$\quad = (T-3) - (S-3) = (U-3) - (T-3)$

This shows that sequence (II) $\{P-3, R-3, S-3, T-3, U-3\}$ is also an arithmetic sequence.

As $R - P = S - R$

(iii) From sequence (III),

$$R^2 - P^2 = (R-P)(R+P)$$

$$R^2 - P^2 = (S-R)(R+P)$$

So, $R^2 - P^2 \neq S^2 - R^2$

Therefore, sequence (III) is not an arithmetic sequence.

Hence, the correct option is (B).

1.40 (A)

Given : $\log_x \left(\dfrac{5}{7}\right) = \dfrac{-1}{3}$

$$x^{-1/3} = \dfrac{5}{7} \qquad \left\{ \begin{array}{l} \log_e m = n \\ \Rightarrow e^n = m \end{array} \right\}$$

$$x^{1/3} = \dfrac{7}{5}$$

$$x = \left(\dfrac{7}{5}\right)^3 = \dfrac{343}{125}$$

Hence, the correct option is (A).

1.41 (C)

The operators are defined as,

$$a \,\square\, b = \dfrac{a-b}{a+b}, \quad a \,\diamondsuit\, b = \dfrac{a+b}{a-b}$$

and $a \rightarrow b = ab$

$$66 \,\square\, 6 = \dfrac{66-6}{66+6} = \dfrac{5}{6}$$

and $66 \,\diamondsuit\, 6 = \dfrac{66+6}{66-6} = \dfrac{6}{5}$

So, $(66 \,\square\, 6) \rightarrow (66 \,\diamondsuit\, 6)$

$$= \dfrac{5}{6} \times \dfrac{6}{5} = 1$$

Hence, the correct option is (C).

1.42 3

The central number is the half of sum of numbers that are on the sides

$$5 = \dfrac{6+4}{2}$$

$$7 = \dfrac{(7+4)+(2+1)}{2} = \dfrac{11+3}{2}$$

$$8 = \dfrac{(1+9+2)+(1+2+1)}{2} = \dfrac{12+4}{2}$$

$$5 = \dfrac{(4+1)+(2+3)}{2} = \dfrac{5+5}{2}$$

So unknown number,

$$x = \dfrac{3+3}{2} = 3$$

Hence, the missing value is **3**.

1.43 (B)

Given : $a^2 + b^2 + c^2 = 1$

Since, $(a+b+c)^2 = a^2 + b^2 + c^2$

$$+ 2(ab+bc+ca)$$

$$ab+bc+ca = \dfrac{(a+b+c)^2 - (a^2+b^2+c^2)}{2}$$

For minimum value of $ab+bc+ca$,

Put $a+b+c = 0$

Minimum $(ab+bc+ca) = \dfrac{-1}{2}$

$$(\text{Since, } a^2+b^2+c^2 = 1)$$

Only option (B) has minimum value as $\dfrac{-1}{2}$.

Hence, the correct option is (B).

1.44 (A)

Given : $x > y > 1$

For $x > y > 1$, $\ln x > \ln y$ and also $e^x > e^y$

Since e^x and $\ln x$ are monotonically increasing function.

Example :

Assume $x = 3$, $y = 2$

(i) $\ln x > \ln y$

$\ln 3 = 1.0986$, $\ln 2 = 0.693$

$\ln x > \ln y$ is true

(ii) $e^x > e^y$

$e^3 = 20.08$, $e^2 = 7.38$

$e^x > e^y$ is true

(iii) $y^x > x^y$

$(2)^3 = 8$, $(3)^2 = 9$

$y^x > x^y$ is false

(iv) $\cos x > \cos y$

$\cos 3 = 0.998$

$\cos 2 = 0.999$

$\cos x > \cos y$ is false.

Hence, the correct option is (A).

| 1.45 | (C) |

Let $x = \log\tan 1^0 + \log\tan 2^0 + \cdots + \log\tan 89^0$

$x = \log(\tan 1^0 \times \tan 2^0 \times \cdots \tan 89^0)$

$\{$Since, $\log m + \log n = \log(\text{mn})$

and $\tan(90^0 - \theta) = \cot\theta$

$\tan 89^0 = \tan(90^0 - 1^0)\}$

$x = \log(\tan 1^0 \times \tan 2^0 \times \cdots \tan 45^0$

$\times \cot 45^0 \times \cdots \cot 2^0 \times \cot 1^0)$

$\left[\cot\theta = \dfrac{1}{\tan\theta} \Rightarrow \tan\theta\cot\theta = 1\right]$

$x = \log(1 \times 1 \times 1 ..... \times 1) = \log(1) = 0$

Hence, the correct option is (C).

| 1.46 | 4536 |

Given :

(i)   No number can start with zero.

(ii)   Repetition is not allowed.

In thousandth place, 9 digits excepts 0 can be placed.

In hundredth place, 9 digits can be placed (including 0, excluding the one used in thousandth place).

In tenth place, 8 digit can be placed (excluding the ones used in thousandth and hundredth place)

In ones place, 7 digits can be placed (excluding the ones used in thousandth, hundredth and tenth place)

Total number of combinations,

$= 9 \times 9 \times 8 \times 7 = 4536$

Hence, 4 digit numbers that can be formed are **4536.**

| 1.47 | (C) |

Given : $q^{-a} = \dfrac{1}{r}$, $r^{-b} = \dfrac{1}{s}$, $s^{-c} = \dfrac{1}{q}$,

$q^a = r, r^b = s, s^c = q$

Taking log on both sides,

$\log q^a = \log r, \quad \log r^b = \log s,$

$\log s^c = \log q$

$a \times \log q = \log r \Rightarrow a = \dfrac{\log r}{\log q}$

$b \times \log r = \log s \Rightarrow b = \dfrac{\log s}{\log r}$

$c \times \log s = \log q \Rightarrow c = \dfrac{\log q}{\log s}$

So, $a \times b \times c = \dfrac{\log r}{\log q} \times \dfrac{\log s}{\log r} \times \dfrac{\log q}{\log s} = 1$

Hence, the correct option is (C).

| 1.48 | (C) |

Given :

$(9 \text{ inches})^{1/2} = (0.25 \text{ yards})^{1/2}$

Squaring both sides,

$9 \text{ inches} = 0.25 \text{ yards}.$

Hence, the correct option is (C).

| 1.49 | (D) |

The following diagram, shows the clock when its reflection seemed like 1 : 30, two and a quarter hours (2 hr. and 15 min) back.

Actual wall clock : Mirror image of wall clock
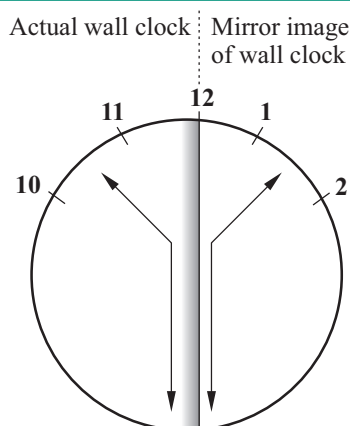
Mirror image of 1 : 30 is 10 : 30

So, the actual current time shown by the clock will be,

$$(10 : 30) + (2 : 15) = 12 : 45$$

Hence, the correct option is (D).

1.50   (C)

In the given set of numbers, all are perfect squares but 97 is not.

$$324 \text{ is square of } 18 \Rightarrow (18)^2 = 324$$
$$441 \text{ is square of } 21 \Rightarrow (21)^2 = 441$$
$$64 \text{ is square of } 8 \Rightarrow (8)^2 = 64$$

97 is not the square of any number

Hence, the correct option is (C).

1.51   (B)

In the group of given numbers, all are prime numbers except 33.

33 has [1, 3, 11 and 33] as its factors.

Hence, the correct option is (B).

📖 Key Point

A prime number has only two factors **'1'** and **'the number itself'**.

1.52   (C)

Given : $|9y - 6| = 3$

$$9y - 6 = \pm 3 \qquad \text{since } |x| = \pm x$$

Taking positive value,

$$9y - 6 = 3$$

$$y = 1$$

Put $y = 1$,

$$y^2 - \frac{4y}{3} = 1^2 - \frac{4(1)}{3} = 1 - \frac{4}{3} = -\frac{1}{3}$$

Taking negative value,

$$9y - 6 = -3$$

$$y = \frac{1}{3}$$

Put $y = \frac{1}{3}$,

$$y^2 - \frac{4y}{3} = \left(\frac{1}{3}\right)^2 - \frac{4\left(\frac{1}{3}\right)}{3} = \frac{1-4}{9} = -\frac{1}{3}$$

Thus, in both cases, the obtained value of

$$\left[y^2 - \frac{4}{3}y\right] \text{ is } -\frac{1}{3}$$

Hence, the correct option is (C).

1.53   7

Cyclicity of 1 is always 1.

Cyclicity of 6 is always 6.

Cyclicity of 3 is,

$$3^1 \rightarrow 3$$
$$3^2 \rightarrow 9$$
$$3^3 \rightarrow 7$$
$$3^4 \rightarrow 1$$

Unit digit of $211^{870} = 1$

Unit digit of $146^{127} = 6$

Unit digit of $3^{424} = (3^4)^{106} = 1$

Hence, the correct answer is $\mathbf{1 + 6 \times 1 = 7}$.

1.54   (A)

Given :

(i)   Sum of digits of two digit number is 12

(ii)   Reverse of the two-digit number is greater than original number by 54.

Method 1

The new number formed by reversing the digits is greater than the original number is possible in options A and B only because reverse of 93 will be a smaller number and reverse of 66 will be similar to itself.

From option (A) :

Sum of two digits in the number = 3 + 9 = 12

After reversing the two digits number = 93

The difference between the new number formed and original number = 93 – 39 = 54

Hence, the correct option is (A).

Method 2

Let original number be xy.

Then, $(10x+y)+54=10y+x$

$$9x+54=9y$$

$$9x-9y=-54$$

$$x-y=-6 \qquad \text{… (i)}$$

Also, $x+y=12 \qquad \text{… (ii)}$

From equations (i) and (ii),

$$x=3, \ y=9$$

Hence, the correct option is (A).

Method 3

Let the digit at one's place will be x and ten's place will be $(12 - x)$.

Hence, the original number $=10(12-x)+x$

$$=120-10x+x$$

$$=120-9x \quad \text{… (i)}$$

The number obtained by interchanging the digits

$$=10x+12-x$$

$$=9x+12$$

As per given condition,

$$9x+12=54+120-9x$$

$$9x+9x=174-12$$

$$18x=162$$

$$x=9$$

From equation (i),

Original number $=120-9\times9=120-81=39$

Hence, the correct option is (A).

1.55   (C)

Total number of 3 digit numbers

$$=900\left[100\,\text{to}\,999\right]$$

Numbers which have 1 on immediate right of 2

$$\{210,211,........,219\}=10\,\text{numbers}$$

and $\quad \{121,221,321,.....921\}=9$ numbers

So, number of 3 digit number such that digit 1 is never on the immediate right of 2 is given by,

$$900-(10+9)=881$$

Hence, the correct option is (C).

1.56   (D)

Given : $X=y\times162$

Method 1

Checking from the options,

Option (A) :

$$X=24\times162=3888$$

$$(X)^{1/3}=15.7$$

Incorrect option.

Option (B) :

$$X=27\times162=4374$$

$$(X)^{1/3}=16.3$$

Incorrect option.

Option (C) :

$$X=32\times162=5184$$

$$(X)^{1/3}=17.3$$

Incorrect option.

Option (D) :

$$X=36\times162=5832$$

$$(X)^{1/3}=18$$

Hence, the correct option is (D).

Method 2

Take the prime factor of $162 = 2 \times 81 = 2 \times 9 \times 9$

$$= 2 \times 3 \times 3 \times 3 \times 3$$

Hence, to make it perfect cube, the value of y should be $y = 2 \times 2 \times 3 \times 3 = 36$

Hence, the correct option is (D).

1.57 (C)

To find a k-digit number that does NOT contain the digits 0, 5 or 9.

The total number of ways to fill any place
$$= 10 \ (0, 1, 2, 3, 4, 5, 6, 7, 8, 9)$$

Now, if this number does not contain (0, 5, 9) then there are 7 other ways to fill each of the k digits.

These remaining digits are following :
$$1, 2, 3, 4, 6, 7, 8$$

Probability of filling these 7 digits will be,

$$= \left(\frac{7}{10}\right)^k = (0.7)^k$$

Hence, the correct option is (C).

1.58 (A)

Let the number X is 47×10^{28}.

Then, $X^3 = 47^3 \times 10^{84} = 103823 \times 10^{84}$

$$X^3 = 1.03823 \times 10^{89}$$

So, there are 90 i.e. (1 + 89) digits in X^3.

Hence, the correct option is (A).

1.59 (B)

Given : $81 \times \left(\frac{16}{25}\right)^{x+2} \div \left(\frac{3}{5}\right)^{2x+4} = 144$

$$\left[\left(9 \times \frac{4}{5}\right)^2\right]^{x+2} \div \left(\frac{3}{5}\right)^{2x+4} = 144$$

$$\left[\left(\frac{36}{5}\right)^{x+2}\right]^2 \div \left[\left(\frac{3}{5}\right)^{x+2}\right]^2 = 144$$

$$\left[\frac{36}{5} \times \frac{5}{3}\right]^{x+2} = 12$$

$$12^{x+2} = 12$$

So, $x + 2 = 1$

$$x = -1$$

Hence, the correct option is (B).

1.60 (D)

Given :

$$\begin{array}{cccccc}
 & 5 & \_ & \_ & \_ & \_ \\
- & 4 & 8 & \_ & 8 & 9 \\
\hline
 & & 1 & 1 & 1 & 1 \\
\end{array}$$

Case (i) :

$$\begin{array}{cccccc}
 & 5 & \underline{0} & \underline{0} & \underline{0} & \underline{0} \\
- & 4 & 8 & \underline{8} & 8 & 9 \\
\hline
 & & 1 & 1 & 1 & 1 \\
\end{array}$$

Sum of missing digits $= 0 + 0 + 0 + 0 + 8$

$$S = 8$$

Case (ii) :

$$\begin{array}{cccccc}
 & 5 & \underline{0} & \underline{1} & \underline{0} & \underline{0} \\
- & 4 & 8 & \underline{9} & 8 & 9 \\
\hline
 & & 1 & 1 & 1 & 1 \\
\end{array}$$

Sum of missing digits $= 0 + 1 + 0 + 0 + 9$

$$S = 10$$

Since, the sum can either be 8 or 10, therefore it can not be determined.

Hence, the correct option is (D).

1.61 (D)

Given :

(i) a and b are integers.

(ii) $a - b$ is even.

Let $a = 5$ and $b = 3$ where both are integers and their difference is even.

From option (A) :
$$ab = 15 \qquad \text{[not even, incorrect]}$$

From option (B) :
$$a^2 + b^2 + 1 = 25 + 9 + 1 = 35$$
$$\text{[not even, incorrect]}$$

From option (C) :

$$a^2 + b + 1 = 25 + 3 + 1 = 29$$

[not even, incorrect]

From option (D) :

$$ab - b = 15 - 3 = 12 \quad [\text{even}]$$

Hence, the correct option is (D).

1.62 **(B)**

Cyclicity of 1 is always 1.

Cyclicity of 2 is,

$$2^1 \rightarrow 2$$

$$2^2 \rightarrow 4$$

$$2^3 \rightarrow 8$$

$$2^4 \rightarrow 6$$

$$2^5 \rightarrow 2$$

Cyclicity of 3 is,

$$3^1 \rightarrow 3$$

$$3^2 \rightarrow 9$$

$$3^3 \rightarrow 7$$

$$3^4 \rightarrow 1$$

Cyclicity of 4 is,

$$4^1 \rightarrow 4$$

$$4^2 \rightarrow 6$$

Unit digit of $2171^7 = 1$

Unit digit of $2172^9 = 2$

Unit digit of $2173^{11} = 7$

Unit digit of $2174^{13} = 4$

Therefore, the last digit of $(2171)^7 + (2172)^9$ $+(2173)^{11} + (2174)^{13} = 1 + 2 + 7 + 4 = 1\mathbf{4}$

Hence, the correct option is (B).

1.63 **(B)**

Divisibility rule : For a given number, if sum of digits is divisible by 3, then the number will be divisible by 3.

Number is 7 1 5 __ 4 2 3

Let, the missing number is x.

Now we check whether the sum of number is divisible by 3 or not.

$$7 + 1 + 5 + x + 4 + 2 + 3 = 22 + x$$

From options :

When $x = 2$,

$$22 + 2 = 24 \text{ (which is divisible by 3)}$$

When $x = 5$,

$$22 + 5 = 27 \text{ (which is divisible by 3)}$$

Here we see that the value of x satisfied in above equation is 2.

Note : Here in this question only option (B) and (C) are satisfying the equation i.e. (2 and 5). But smallest number is asked in question. So, correct answer is 2.

Hence, the correct option is (B).

1.64 **(D)**

Given series, $1 + \dfrac{1}{4} + \dfrac{1}{16} + \dfrac{1}{64} + \dfrac{1}{256} ....$ is in G.P. form.

Geometric progression (G.P.) form

$$= a_1 + a_1 r + a_1 r^2 + ...$$

Here, the first term is $a_1 = 1$ and the ratio of 2nd and 1st term is $r = \dfrac{1}{4}$ $(r < 1)$.

The sum of infinite G.P. series is given by,

$$S = \frac{a_1}{1-r} = \frac{1}{1-\dfrac{1}{4}} = \frac{4}{3}$$

Hence, the correct option is (D).

1.65 **(C)**

Given : $f(k) = \dfrac{(k+2)^2}{k-3}$

From options :

When $k = 4$, $f(k) = \dfrac{(4+2)^2}{4-3} = \dfrac{36}{1} = 36$

which is integer

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When $k = 8$, $f(k) = \dfrac{(8+2)^2}{8-3} = \dfrac{10^2}{5} = 20$

which is integer

When $k = 28$, $f(k) = \dfrac{(28+2)^2}{28-3} = \dfrac{30^2}{25} = 36$

which is integer

When $k = 18$, $f(k) = \dfrac{(18+2)^2}{18-3} = \dfrac{20^2}{15} = 26.67$,

which is decimal number

When $k = 10$, $f(k) = \dfrac{(10+2)^2}{10-3} = \dfrac{12^2}{7} = 20.57$

which is decimal number

When $k = 16$, $f(k) = \dfrac{(16+2)^2}{16-3} = \dfrac{18^2}{13} = 24.92$

which is decimal number

When $k = 26$, $f(k) = \dfrac{(26+2)^2}{26-3} = \dfrac{28^2}{23} = 34.08$

which is decimal number

Hence, the correct option is (C).

1.66 (D)

Given :

(i) a and b are integer.

(ii) $a + a^2 b^3$ is odd

So, $a(1 + ab^3)$ is also odd.

Method 1

Since, multiplication of odd and odd number is odd.

Therefore, a and $(1 + ab^3)$ will be odd. If $1 + ab^3$ is odd, then ab^3 will be even.

Since, a is odd, so ab^3 to be even, b must be even.

Therefore, a is odd and b is even.

Hence, the correct option is (D).

Method 2

Checking from the options :

Options	a	b	$a + a^2 b^3$ (Odd)
Option (A)	1(odd)	3(odd)	28(incorrect)
Option (B)	2(even)	4(even)	258(incorrect)
Option (C)	2(even)	1(odd)	6(incorrect)
Option (D)	1(odd)	2(even)	9(correct)

Hence, the correct option is (D).

1.67 (B)

Given :

(i) Sum of a two-digit number is 9.

(ii) When the number is subtracted by 45, the digits of the number are interchanged.

Let the two digit number be xy.

Then $x + y = 9$ … (i)

and $(10x + y) - 45 = 10y + x$

$x - y = 5$ … (ii)

From equation (i) and (ii),

$x = 7$, $y = 2$

So, the number is 72

Hence, the correct option is (B).

1.68 (B)

Given : Series is BC, FGH, LMNO,……….

It is clear from the given series that each term has one more alphabet previous each term. Also, gap between each term increases by one alphabet as well.

BC, <u>DE</u>, FGH, <u>IJK</u>, LMNO, <u>PQRS</u>

So, next term will be TUVWX.

Hence, the correct option is (B).

1.69 (C)

Given :

Sequence of numbers $a_1, a_2 ..... a_n$

Where $a_n = \dfrac{1}{n} - \dfrac{1}{n+2}$

So, $a_1 = 1 - \dfrac{1}{3}$, $a_2 = \dfrac{1}{2} - \dfrac{1}{4}$, $a_3 = \dfrac{1}{3} - \dfrac{1}{5}$

$$\text{Sum} = \left(1 - \frac{1}{3}\right) + \left(\frac{1}{2} - \frac{1}{4}\right) + \ldots + \frac{1}{50} - \frac{1}{52}$$

$$\text{Sum} = \left(1 + \frac{1}{2} + \frac{1}{3} \ldots \frac{1}{50}\right) - \left(\frac{1}{3} + \frac{1}{4} + \frac{1}{5} \ldots \frac{1}{52}\right)$$

$$\text{Sum} = 1 + \frac{1}{2} - \frac{1}{51} - \frac{1}{52}$$

$$\text{Sum} = 1 + \frac{1}{2} - \left(\frac{1}{51} + \frac{1}{52}\right)$$

Hence, the correct option is (C).

1.70   (A)

Given : $\log a + \log b + \log c = 0$

$\quad\quad \log abc = 0$

$\quad\quad abc = 1$

Since, a, b and c are non-negative numbers and their product is 1, their sum can not be negative or 0.

So, option (C) and (D) are incorrect.

Since, a, b and c are greater than equal to zero, their sum can not be 1.

So, if $a + b + c = 1 + 1 + 1 = 3$ [option (A)]

Hence, the correct option is (A).

1.71   (B)

Given :

(i) $\quad \underbrace{a + a + \ldots + a}_{n \text{ times}} = a^2 b$

$\quad\quad n \times a = a^2 b$

$\quad\quad n^2 a^2 = a^4 b^2 \quad\quad\quad\quad\quad \ldots \text{(i)}$

(ii) $\quad \underbrace{b + b + \ldots + b}_{m \text{ times}} = ab^2$

$\quad\quad m \times b = ab^2$

$\quad\quad m^2 b^2 = a^2 b^4 \quad\quad\quad\quad\quad \ldots \text{(ii)}$

$$\underbrace{m + m + \ldots + m}_{n \text{ times}} \times \underbrace{n + n + \ldots + n}_{m \text{ times}} = m \times n \times n \times m$$

$$\underbrace{m + m + \ldots + m}_{n \text{ times}} \times \underbrace{n + n + \ldots + n}_{m \text{ times}} = m^2 n^2$$

Multiplying equation (i) and (ii),

$\quad\quad m^2 n^2 a^2 b^2 = a^6 b^6$

$\quad\quad m^2 n^2 = a^4 b^4$

Hence, the correct option is (B).

1.72   (B)

Given : Faulty clock gains 15 minutes every 24 hours

On 11th July at 9 am, clock is synchronized to the correct time.

From 11th July, 9 am to 15th July 9 am = 4 days

Total minutes gain $= 15 \times 4 = 60$ min $= 1$ hour .

Every hour the clock gains $\dfrac{15}{24}$ min $= 0.625$ min

From 15th July 9 am to 15th July 2 pm, total minutes gain $= 5 \times 0.625$ min $= 3.125$ min .

So, from 11th July at 9 am to 15th July 2 pm, clock has gain 63.125 minutes, which means the correct time is 12.57 pm or approximately 12:58 pm.

Hence, the correct option is (B).

1.73   (C)

Given :

$$p^{-x} = \frac{1}{q}$$

$$p^x = q \quad\quad\quad\quad \ldots \text{(i)}$$

Similarly, $q^y = r \quad\quad\quad \ldots \text{(ii)}$

$$r^z = p \quad\quad\quad\quad \ldots \text{(iii)}$$

From equation (i), (ii) and (iii)

$\quad\quad p = q = r = 1$

And $\quad x = y = z = 1$

Thus, the product of $xyz = 1 \times 1 \times 1 = 1$.

Hence, the correct option is (C).

1.74 **(C)**

The LCM of 20, 42 & 76 are :

$$20 = 2 \times 2 \times 5$$
$$42 = 2 \times 3 \times 7$$
$$76 = 2 \times 2 \times 19$$

$$\text{LCM} = 2 \times 2 \times 3 \times 5 \times 7 \times 19$$
$$= 7980$$

Thus, the smallest natural number which when divided either by 20 or by 42 or by 76 leaves a remainder of 7 in each case = 7980 + 7 = 7987

Hence, the correct option is (C).

> 📖 **Key Point**
>
> The smallest natural number which divided by 20, or by 42 or by 76 must be its "Least common multiple".

1.75 **(B)**

2,   12,   60,   240,   720,   1440,   _____,   0

2 × 6   12 × 5   60 × 4   240 × 3   720 × 2   1440 × 1   1440 × 0

So, 1440 is the missing number.

Hence, the correct option is (B).

1.76 **(B)**

Given :

The number of Male = M

The number of Female = F

$$M + F = 300$$

According to condition

Total money given by philanthropist

$$= \frac{8}{9}M \times 750 + \frac{2}{3}F \times 1000$$

$$= \frac{6000}{9}M + \frac{2000}{3}F$$

$$= \frac{6000}{9} \times 300$$

$$= 2,00,000$$

Hence, the correct option is (B).

1.77 **(D)**

According to given data, the figure can be drawn as shown below,
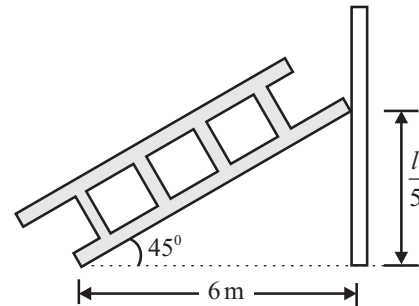
Let length of pole be l (in meters).

Then, $\tan 45^0 = \dfrac{l/5}{6}$

$$\frac{l}{5} = 6 \Rightarrow l = 30\,\text{m}$$

Hence, the correct option is (D).

1.78 **(C)**

Given :

(i)   Total budget = 3000 USD.

(ii)   P and Q started working from 8 AM.

(iii)   P stopped working when hour hand moved by 210 degrees.

(iv)   Q stopped working when the hour hand moved by 240 degrees.

(v)   P took two tea breaks of 15 minutes.

(vi)   Q took only one lunch break for 20 minutes.

The angle made by hour hand of watch in 1 hour

$$= \frac{360^0}{12} = 30^0$$

Working hour of $P = \dfrac{210^0}{30^0} = 7$ hrs.

P took two breaks of 15 min $= 0.5$ hrs.

Net working hours of $P = 7 - 0.5 = 6.5$

$$P = \frac{13}{2}\,\text{hrs.}$$

Working hour of $Q = \dfrac{240^0}{30^0} = 8\,\text{hrs.}$

Q took one break of 20 min $= \dfrac{1}{3}\,\text{hrs.}$

Net working hour of $Q = 8 - \dfrac{1}{3} = \dfrac{23}{3}\,\text{hrs.}$

Total working hour of P and Q

$$= \dfrac{13}{2} + \dfrac{23}{3} = \dfrac{39+46}{6} = \dfrac{85}{6}\,\text{hrs.}$$

Amount paid for one hour = USD 200

Total amount paid $= \dfrac{200 \times 85}{6} = \dfrac{8500}{3}$

Amount remained

$$= 3000 - \dfrac{8500}{3} = \dfrac{500}{3} = 166.66\,\text{USD}$$

Hence, the correct option is (C).

1.79   (B)

Given : Two sets $X = \{1,\,2,\,3\}$ and $Y = \{2,\,3,\,4\}$

Therefore, set of all possible fractions

$$Z = \left\{ \dfrac{1}{2},\,\dfrac{1}{3},\,\dfrac{1}{4},\,\dfrac{2}{2},\,\dfrac{2}{3},\,\dfrac{2}{4},\,\dfrac{3}{2},\,\dfrac{3}{3},\,\dfrac{3}{4} \right\}$$

Where the numerators belongs to set X and the denominators belong to set Y.

$$Z = \left\{ \dfrac{1}{4},\,\dfrac{1}{3},\,\dfrac{1}{2},\,\dfrac{2}{4},\,\dfrac{2}{3},\,\dfrac{3}{4},\,\dfrac{2}{2},\,\dfrac{3}{3},\,\dfrac{3}{2} \right\}$$

$$\underset{\substack{0.2 \\ \text{Minimum}}}{\downarrow} \qquad\qquad\qquad\qquad \underset{\substack{1.5 \\ \text{Maximum}}}{\downarrow}$$

The required product $= \dfrac{1}{4} \times \dfrac{3}{2} = \dfrac{3}{8}$

Hence, the correct option is (B).

1.80   (C)

$$343 = 7^3$$

$$1331 = 11^3$$

$$4913 = 17^3$$

Since 7, 11, 17 are prime numbers so checking from the options,

$$2197 = 13^3$$

Hence, the correct option is (C).

1.81   (B)

Integers between 100 and 1000 all of whose digits are even $= 100$

Since, $100 - 199 \rightarrow$ No integers

$\qquad 200 - 300 \rightarrow 25$ integers

[200, 202, 204, 206, 208, 220, 222, 224, 226, 228, 240, 242, 246, 248, 260, 262, 264, 266, 268, 280, 282, 284, 286, 288].

Similarly, $\quad 400 - 500 \rightarrow 25$ integers

$\qquad\qquad 600 - 700 \rightarrow 25$ integers

$\qquad\qquad 800 - 900 \rightarrow 25$ integers

Total $\rightarrow 100$ integers

Hence, the correct option is (B).

1.82   (C)

(i)   No two odd or even numbers are next to each other.

(ii)   The second number from the left is exactly half of the left most number.

(iii)   The middle number is exactly twice the right most number.

According to the first direction, odd numbers will be at even positions and even numbers will be at odd positions.

Number	2/4/10	5/7	2/4/10	5/7	2/4/10
Position	I	II	III	IV	V

According to second direction,

Number	10	5	2/4	7	2/4
Position	I	II	III	IV	V

According to third direction,

Number	10	5	4	7	2
Position	I	II	III	IV	V

Therefore, the second number from the right is 7.
Hence, the correct option is (C).

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1.83 (C)

Positions of hour and minute hands of water is shown in figure
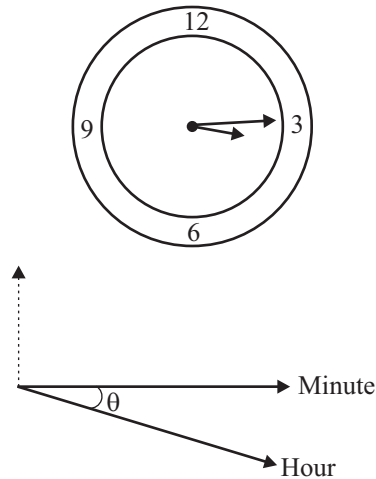
The displacement of hour hand during every 12 hours is 360^0.

The required angle between the hands at quarter past 3^0 is equal to the angle made by hour hand in 15 minutes as the minute hand is now at the same position where, the hour hand was present at 3'O clock.

In 12×60 min, angle made $= 360^0$

In 1 min, angle made $= \left(\dfrac{360}{12 \times 60}\right)^0$

In 15 min, angle made $= \left(\dfrac{360}{12 \times 60} \times 15\right)^0 = 7.5^0$

Hence, the correct option is (C).

1.84 (D)

Number of ways by which 37 can appear in numbers 1000 to 9999 are shown below,

9 ways 10 ways
(1 to 9) (0 to 9)   3   7 $\Rightarrow 9 \times 10 = 90$ ...(i)

9 ways   10 ways
(1 to 9)   3   7   (0 to 9) $\Rightarrow 9 \times 10 = 90$ ...(ii)

9 ways   10 ways 10 ways
   3   7   (0 to 9) (0 to 9) $\Rightarrow 10 \times 10 = 100$ ...(iii)

There is no common numbers in case (i) - case (ii) or in case (ii) - case (iii) but there exist a common number between case (iii) and case (i), that is 3737.

So, if the total number of numbers is asked in which 37 appears in this sequence, then the answer would be,

$$90 + 90 + 100 - 1 = 279$$

Which is as given in IIT answer key but the required value is asked only for repetition of 37, not the numbers which contains 37, so in the number "3737", 37 must be counted 3 times, then the correct answer would be,

$$90 + 90 + 100 = 280$$

IIT has changed their answer for this question from option (C) to option (D) in the final answer key, but they do not considered it as MTA.

So, students must read the statement given in the question, before going to select the correct option in such type of problems.

1.85 (D)

Given : $S_n = 8 + 88 + 888 + ... + n$

$S_n = 8(1 + 11 + 111 + ...)$

$S_n = \dfrac{8}{9}(9 + 99 + 999 + ...)$

$S_n = \dfrac{8}{9}[(10 - 1) + (100 - 1) + (1000 - 1) + ...]$

$S_n = \dfrac{8}{9}[(10 + 100 + 1000 + ...) - n]$

$S_n = \dfrac{8}{9}[(10^1 + 10^2 + 10^3 + ...) - n]$

$S_n = \dfrac{8}{9}\left[\left(\dfrac{10(10^n - 1)}{10 - 1}\right) - n\right]$ $\left\{\because S_n = \dfrac{a(r^n - 1)}{r - 1}\right\}$

$\therefore \quad S_n = \dfrac{80}{81}(10^n - 1) - \dfrac{8}{9}n$

Hence, the correct option is (D)

1.86 **(C)**

Codes :

1 - a

2 - b

3 - c

⋮ - ⋮

26 - z
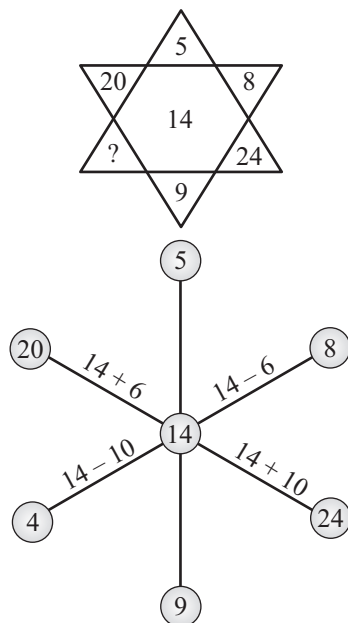
Here, 4 is denoted as d.

Hence, the correct option is (C).

1.87 **(D)**

Given : Seven numbers are inserted between 2 and 34 such that the nine numbers are in AP.

Sum of n terms in an AP $= \dfrac{n}{2}$ [First term + Last term]

Sum of 9 terms $= \dfrac{9}{2}(2+34)=162$

Sum of 7 terms inserted $=162-(2+34)=126$

Hence, the correct option is (D).

1.88 **(D)**

The difference between the sum of first '$2n$' natural numbers and the sum of the first 'n' odd positive integers are as follows

First '$2n$' natural numbers are as follows :

$$1, 2, 3, ... 2n$$

$$\text{Sum} = \frac{\text{Number of terms}}{2} \times [\text{First term} \times 2$$

$$+ (\text{Number of terms} - 1) \times \text{Common difference}]$$

$$= \frac{2n}{2}[2 \times 1 + (2n-1) \times 1]$$

$$= n(2+2n-1) = n(2n+1) = 2n^2 + n$$

First 'n' odd positive integers are : $1, 3, 5, ...n$

$$\text{Sum} = \frac{n}{2}[2 \times 1 + (n-1) \times 2]$$

$$= \frac{n}{2}[2 + 2n - 2] = n^2$$

Difference $= 2n^2 + n - n^2 = n^2 + n$

Hence, the correct option is (D).

1.89 **(A)**

Given : $\dfrac{p}{q} + \dfrac{q}{p} = 3$

By squaring above equation we get,

$$\frac{p^2}{q^2} + \frac{q^2}{p^2} + 2\frac{p}{q} \cdot \frac{q}{p} = 9$$

$$\frac{p^2}{q^2} + \frac{q^2}{p^2} + 2 = 9$$

$$\frac{p^2}{q^2} + \frac{q^2}{p^2} = 9 - 2 = 7$$

Hence, the correct option is (A).

1.90 **(B)**

Given :

Divisor $= (11^{13} + 11)$

Writing in the form of $(a+b)$

Where, $a = 11^{13}$

$b = 1$

The possibilities of dividend $(a+b)$ as one of the factor :

$$(a+b)^2 = (a+b)(a+b) \qquad \qquad …(i)$$

$(a^2 - b^2) = (a+b)(a-b)$ …(ii)

$(a^4 - b^4) = (a^2 + b^2)(a+b)(a-b)$ …(iii)

$(a+b)^3 = (a+b)(a^2 + b^2)$ …(iv)

Checking from options

Option (A) $11^{26} + 1$: Not following any possibility. So it is incorrect.

Option (B) $11^{52} - 1$: Following possibility of $(a^4 - b^4)$ i.e. $[(11^{13})^4 - 1^4]$. So it is correct.

Option (C) $11^{39} - 1$: Not following any possibility. So it is incorrect.

Option (D) $11^{33} + 1$: Not following any possibility. So it is incorrected.

Hence, the correct option is (B).

1.91 (A)

Given : $p \oplus q = \dfrac{p^2 + q^2}{pq}$

$x \oplus y = \dfrac{x^2 + y^2}{xy}$ …(i)

and $p \odot q = \dfrac{p^2}{q}$

$2 \odot 2 = \dfrac{2^2}{2} = 2$ …(ii)

From equation (i) and (ii),

$\dfrac{x^2 + y^2}{xy} = 2$

$x^2 + y^2 - 2xy = 0$

$(x - y)^2 = 0$

Thus, $x = y$ satisfy the condition.

Hence, the correct option is (A).

1.92 (B)

Given :

"$\oplus$" means "$\times$"

"$\odot$" means "$-$"

As per the given data the new equation will be,

$[9 - (6 \times 7)] - [7 \times 1]$

$-33 - 7 = -40$

Hence, the correct option is (B).

1.93 (A)

Given :

"$\oplus$" means "$-$",

"$\otimes$" means "$\div$",

"Δ" means "$+$",

"∇" means "$\times$",

As per the data new equation will be :

$+2 - 3 + ((4 \div 2) \times 4)$

$2 - 3 + 8 = 7$

Hence the correct option is (A).

1.94 (B)

Given :

$\oplus \div \odot = 2$,

$\oplus \div \Delta = 3$,

$\odot + \Delta = 5$,

By given information we can conclude

$\odot = \dfrac{\oplus}{2}$ and $\Delta = \dfrac{\oplus}{3}$

Put these values on $\odot + \Delta = 5$

We get, $\dfrac{\oplus}{2} + \dfrac{\oplus}{3} = 5$

$\dfrac{3 \oplus + 2 \oplus}{6} = 5$

$5 \oplus = 30$

$\oplus = 6$

By equation,

$\oplus \div \Delta = 3$

$\downarrow$

$6 \div 2 = 3$

By equation,

$\Delta \div \otimes = 10$

$\downarrow$

$2 \times 5 = 10$

So, that $(\otimes - \oplus)^2$

$(5 - 6)^2 = 1$

Hence, the correct option is (B).

1.95   (D)

Given : $X = 30$ sec/beep

$Y = 32$ sec/beep

By taking L.C.M. of X and Y we get, 480 sec

Convert it into minute, $\dfrac{480}{60}\sec = 8$ min

Earlier they beeped together at 10 am

Next they will beep after 08 min

       $10 : 00 + 00 : 08$ m

       $10 : 08$ AM

Hence, the correct option is (D).

1.96   (B)

Given : $\left(x - \dfrac{1}{2} \right)^2 - \left(x - \dfrac{3}{2} \right)^2 = x + 2$

$\left[x^2 + \dfrac{1}{4} - x \right] - \left[x^2 + \dfrac{9}{4} - 3x \right] = x + 2$

$2x - \dfrac{8}{4} = x + 2$

$\therefore$ $x = 4$

Hence, the correct option is (B).

❖❖❖❖

GATE ACADEMY
TEST SERIES STRUCTURE (EC)
(One Year Program)

SINCE 2004

Get Registered

Stage - I
Topic Wise Tests (20)

Stage - II
Subject Wise Tests (20)

Test - 1
Test - 2

Both tests individually cover entire syllabus of the subject but differ in difficulty level.

Test - 1   **Test - 2**

The complete GATE syllabus of each subject is divided in two parts to form Test - 1 and Test - 2, containing easy to moderate level questions covering all important formulae and concepts

Stage - III
Combined Subject Tests (10)

Final Stage
Full Length Mock Tests (10)

Mock - 1
Mock - 2
Mock - 3
Mock - 4
Mock - 5
Mock - 6
Mock - 7
Mock - 8
Mock - 9
Mock - 10

Comm^n.+EMT   **EDC+Analog**   **Maths.+Apti.**

Test - 1 **Test - 2**   **Test - 1** **Test - 2**   **Test - 1** **Test - 2**

Network + Control   **Digital + Signals**

Test - 1 **Test - 2**   **Test - 1** **Test - 2**

Difficulty level of test 2 will be higher

GATE ACADEMY
TEST SERIES STRUCTURE (EE)
(One Year Program)

Get Registered

Stage - I
Topic Wise Tests (29)

Stage - II
Subject Wise Tests (24)

Test - 1
Test - 2

Both tests individually cover entire syllabus of the subject but differ in difficulty level.

Test - 1   Test - 2   Test - 3   Test - 6

The complete GATE syllabus of each subject is divided into parts, to form Test-1 to Test-6 (6 tests for electrical machines, 3 tests for power electronics and 2 tests for all other subjects), containing easy to moderate level questions covering all important formulae and concepts.

Stage - III
Combined Subject Tests (14)

Final Stage
Full Length Mock Tests (10)

Mock - 1
Mock - 2
Mock - 3
Mock - 4
Mock - 5
Mock - 6
Mock - 7
Mock - 8
Mock - 9
Mock - 10

Common Subjects

Core Subjects

Network + Control

Digital + Signals + Analog Elex.

Maths + Aptitude

Moderate Level Test | Advance Level Test

Moderate Level Test | Advance Level Test

Moderate Level Test | Advance Level Test

Machines + PSA

Machines + PE

PSA + PE

Machines + PSA + PE

Moderate Level Test | Advance Level Test

Moderate Level Test | Advance Level Test

Moderate Level Test | Advance Level Test

Moderate Level Test | Advance Level Test

Special focus on core subjects

G A T E
SINCE 2004

Data Interpretation

1

1.1 Hari (*H*), Gita (*G*), Irfan (*I*) and Saira (*S*) are siblings (i.e. brothers and sisters). All were born on 1st January. The age difference between any two successive siblings (that is born one after another) is less than 3 years. Given the following facts :

(i) Hari's age + Gita's age > Irfan's age + Saira's age.

(ii) The age difference between Gita and Saira is 1 year. However, Gita is not the oldest and Saira is not the youngest.

(iii) There are no twins.

In what order were they born (oldest first)? **[All branches]**

(A) *HSIG*

(B) *SGHI*

(C) *IGSH*

(D) *IHSG*

1.2 The fuel consumed by a motorcycle during a journey while traveling at various speeds is indicated in the graph below.
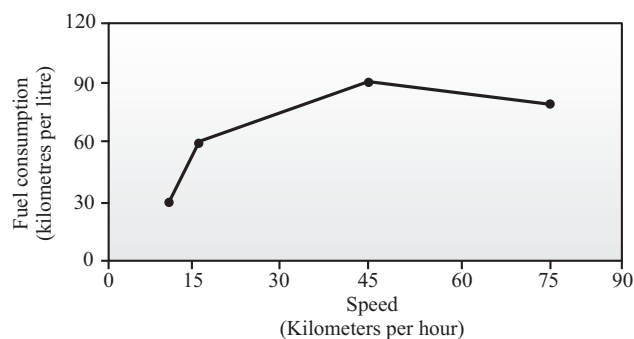
The distances covered during four laps of the journey are listed in the table below :

Lap	Distance (Kilometers)	Average Speed (Kilometers per hour)
P	15	15
Q	75	45
R	40	75
S	10	10

From the given data, we can conclude that the fuel consumed per kilometers was least during the lap

[AG, CY, EC, EE, IN, MA, MT, XE, XL]

(A) *P*   (B) *Q*

(C) *R*   (D) *S*

1.3 P, Q, R and S are four types of dangerous microbes recently found in a human habitat. The area of each circle with its diameter printed in brackets represents the growth of a single microbe surviving human immunity system within 24 hours of entering the body. The danger to

human beings varies proportionately with the toxicity, potency and growth attributed to a microbe shown in the figure below,

P(50 mm), Q(40 mm), R(30 mm), S(20 mm)

y-axis: Toxicity (milligrams of microbe required to destroy half of the body mass in kilograms) — 0, 200, 400, 600, 800, 1000

x-axis: Probability that microbe will overcome human immunity system — 0.2, 0.4, 0.6, 0.8, 1
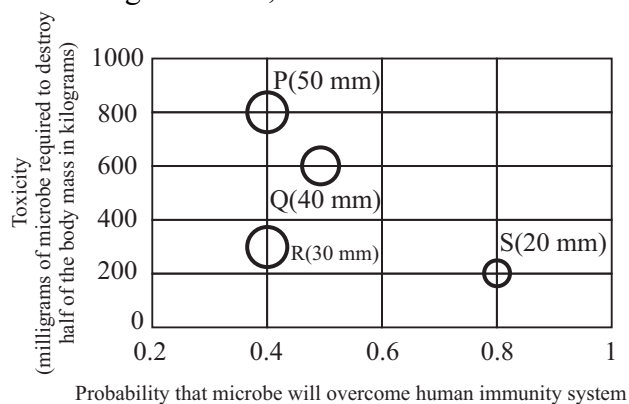
A pharmaceutical company is contemplating the development of a vaccine against the most dangerous microbe. Which microbe should the company target in its first attempt?

[AR, BT, CE, CH, CS, ME, PH, PI]

(A) P   (B) Q
(C) R   (D) S

1.4 Three sisters (R, S, and T) received a total of 24 toys during Christmas. The toys were initially divided among them in a certain proportion. Subsequently, R gave some toys to S which doubled the share of S. Then S in turn gave some of her toys to T, which doubled T's share. Next, some of T's toys were given to R, which doubled the number of toys that R currently had. As a result of all such exchanges, the three sisters were left with equal number of toys. How many toys did R have originally? **[GG, TF]**

(A) 8   (B) 9
(C) 11   (D) 12

1.5 The quality of services delivered by a company consists of six factors as shown below in the radar diagram. The dots in the figure indicate the score for each factor on a scale of 0 to 10. The standardized coefficient for each factor is given in the parentheses. The contribution of each factor to the overall service quality is directly proportional to the factor score and its standardized coefficient.

Outcome (0.8), Tangibles (0.4), Reliability (0.7), Responsiveness (0.6), Empathy (0.6), Assurance (0.5)
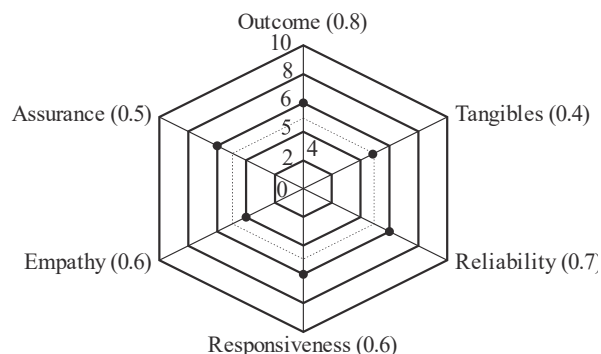
The lowest contribution among all the above factors to the overall quality of services delivered by the company is

[GG, TF]

(A) 10%   (B) 20%
(C) 24%   (D) 40%

1.6 Four archers P, Q, R and S try to hit a bull's eye during a tournament consisting of seven rounds. As illustrated in the figure below, a player receives 10 points for hitting the bulls' eye, 5 points for hitting within the inner circle and 1 point for hitting within the outer circle.

Outer circle 1 point
Inner circle 5 points
Bull's eye 10 points
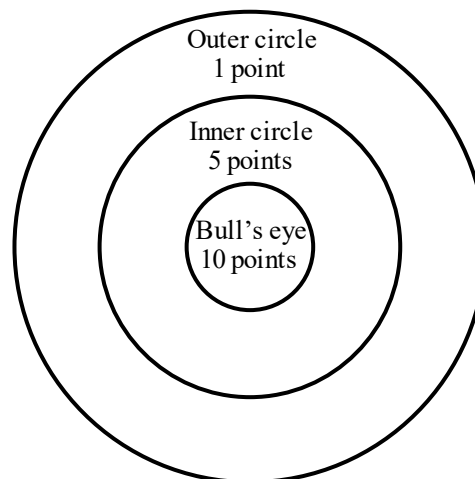
The final scores received by the players during the tournament are listed in the table below.

Round	*P*	*Q*	*R*	*S*
1	1	5	1	10
2	5	10	10	1
3	1	1	1	5
4	10	10	1	1
5	1	5	5	10
6	10	5	1	1
7	5	10	1	1

The most accurate and the most consistent players during the tournament are respectively **[AE, MN]**
(A) *P* and *S* (B) *Q* and *R*
(C) *Q* and *S* (D) *R* and *Q*

2012 IIT Delhi

1.7 Given the sequence of terms, AD CG FK JP, the next term is
[BT, CE, CH, CS, ME, PH, PI]
(A) OV (B) OW
(C) PV (D) PW

2013 IIT Bombay

1.8 Following table gives data on tourists from different countries visiting India in the year 2011.

Country	Number of Tourists
USA	2000
England	3500
Germany	1200
Italy	1100
Japan	2400
Australia	2300
France	1000

Which two countries contributed to the one third of the total number of tourists who visited India in 2011?
[AE, AG, BT, CH, CY, MN, XE, XL]

(A) USA and Japan
(B) USA and Australia
(C) England and France
(D) Japan and Australia

1.9 Abhishek is elder to Savar. Savar is younger to Anshul.
Which of the given conclusions is logically valid and is inferred from the above statements?
[AR, CE, GG, MA, MT, PH, TF]
(A) Abhishek is elder to Anshul
(B) Anshul is elder to Abhishek
(C) Abhishek and Anshul are of the same age
(D) No conclusions follows

2014 IIT Kharagpur

1.10 The multi-level hierarchical pie chart shows the population of animals in a reserve forest.
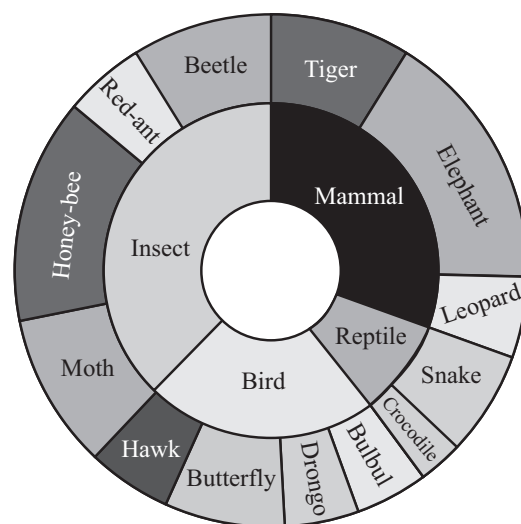
The correct conclusions from this information are :
(i) Butterflies are birds.
(ii) There are more tigers in this forest than red ants.
(iii)All reptiles in this forest are either snakes or crocodiles.
(iv)Elephants are the largest mammals in this forest. **[EC-3, ME-3]**

(A) (i) and (ii) only.

(B) (i), (ii), (iii) and (iv).

(C) (i), (iii) and (iv) only.

(D) (i), (ii) and (iii) only.

1.11 If "KCLFTSB" stands for "best of luck" and "SHSWDG" stands for "good wishes", which of the following indicates "ace the exam"? **[EC-4, ME-4]**

(A) MCHTX   (B) MXHTC

(C) XMHCT   (D) XMHTC

1.12 The statistics of runs scored in a series by four batsmen are provided in the following table. Who is the most consistent batsman of these four?

[EC-1, ME-1]

Batsman	Average	Standard deviation
K	31.2	5.21
L	46.0	6.35
M	54.4	6.22
N	17.9	5.90

(A) K (B) L

(C) M (D) N

1.13 The ratio of male to female students in a college for five years is plotted in the following line graph. If the number of female students doubled in 2009, by what percent did the number of male students increase in 2009? **[CS-2, EE-2]**
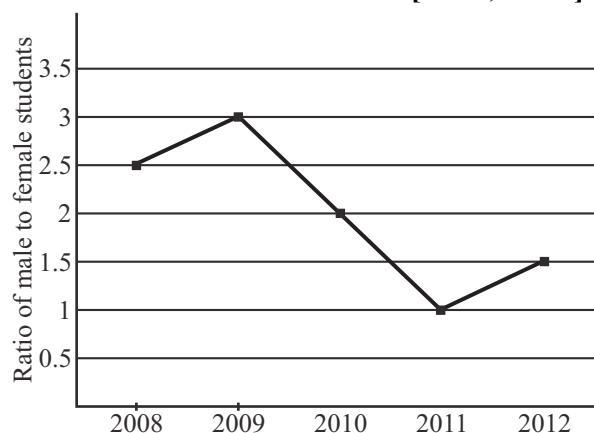
1.14 In a group of four children, Som is younger to Riaz. Shiv is elder to Ansu. Ansu is youngest in the group. Which of the following statements is /are required to find the eldest child in the group?

Statements :

[AG, BT, CE-2, GG, IN, MN, PI, TF, XL]

1. Shiv is younger to Riaz.

2. Shiv is elder to Som.

(A) Statement 1 by itself determines the eldest child.

(B) Statement 2 by itself determines the eldest child.

(C) Statements 1 and 2 are both required to determine the eldest child.

(D) Statements 1 and 2 are not sufficient to determine the eldest child.

1.15 The total exports and revenues from the exports of a country are given in the pie charts below. The pie chart for exports shows the quantity of each item as a percentage of the total quantity of exports. The pie chart for the revenues shows the percentage of the total revenue generated through export of each item. The total quantity of exports of all the items is 5 lakh tons and the total revenues are 250 crore rupees. What is the ratio of the revenue generated through export of item 1 per kilogram to the revenue generated through export of the item 4 per kilogram?

[AG, BT, CE-2, GG, IN, MN, PI, TF, XL]

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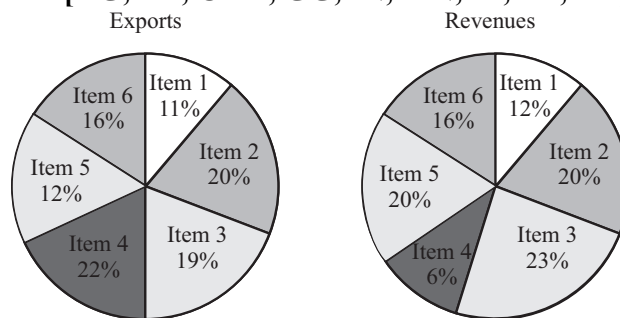
(A) 1:2   (B) 2:1

(C) 1:4   (D) 4:1

1.16 For submitting tax returns, all resident males with annual income below Rs. 10 lakh should fill up form *P* and all resident females with income below Rs. 8 lakh should fill up form *Q*. All people with incomes above Rs. 10 lakh should fill up form *R*, except non-residents with income above Rs. 15 lakhs, who should fill up form *S*. All others should fill form *T*. An example of a person who should fill form *T* is,   **[EC-1, ME-1]**

(A) A resident male with annual income Rs. 9 lakh.

(B) A resident female with annual income Rs. 9 lakh.

(C) A non-resident male with annual income Rs. 16 lakh.

(D) A non-resident female with annual income Rs. 16 lakh.

1.17 The exports and imports (in crores of Rs.) of a country from 2000 to 2007 are given in the following bar chart. If the trade deficit is defined as excess of imports over exports, in which year is the trade deficit $1/5^{th}$ of the exports?

                                [EC-1, ME-1]

(A) 2005   (B) 2004

(C) 2007   (D) 2006
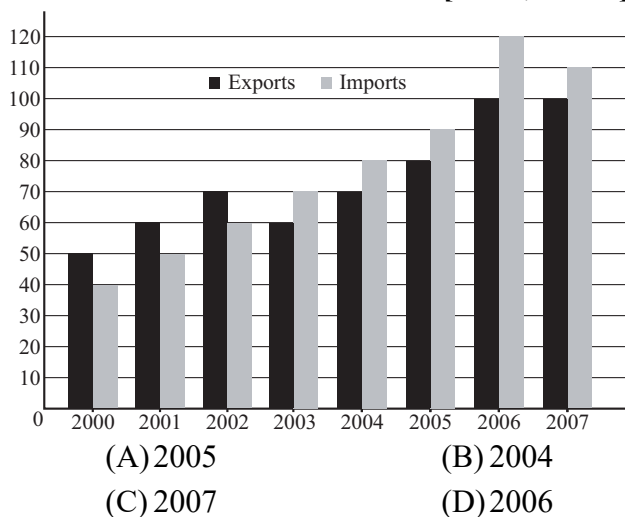
1.18 Lights of four colors (red, blue, green, yellow) are hung on a ladder. On every step of the ladder there are two lights. If one of the lights is red, the other light on that step will always be blue. If one of the lights on a step is green, the other light on that step will always be yellow. Which of the following statements is not necessarily correct?   **[EC-2, ME-2]**

(A) The number of red lights is equal to the number of blue lights.

(B) The number of green lights is equal to the number of yellow lights.

(C) The sum of the red and green lights is equal to the sum of the yellow and blue lights.

(D) The sum of the red and blue lights is equal to the sum of the green and yellow lights.

1.19 The total exports and revenues from the exports of a country are given in the two charts shown below. The pie chart for exports shows the quantity of each item exported as a percentage of the total quantity of exports. The pie chart for the revenues shows the percentage of the total revenue generated through export of each item. The total quantity of exports of all the items is 500 thousand tonnes and the total revenues are 250 crore rupees. Which item among the following has generated the maximum revenue per kg?   **[EC-2, ME-2]**
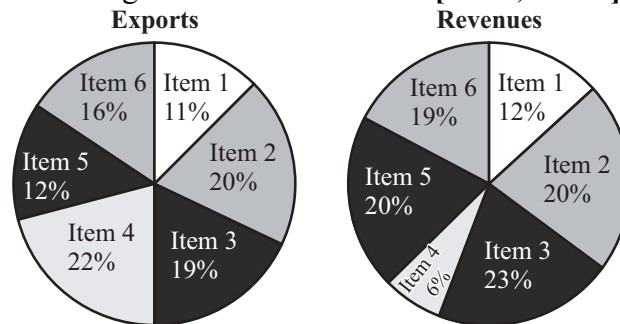
(A) Item 2   (B) Item 3

(C) Item 6   (D) Item 5

1.20   A firm producing air purifiers sold 200 units in 2012. The following pie chart presents the share of raw material, labour, energy, plant and machinery, and transportation costs in the total manufacturing cost of the firm in 2012. The expenditure on labour in 2012 is Rs. 4,50,000. In 2013, the raw material expenses increased by 30% and all other expenses increased by 20%. If the company registered profit of Rs. 10 lakhs in 2012, at what price in Rs. was each air purifier sold?   **[EC-3, ME-3]**
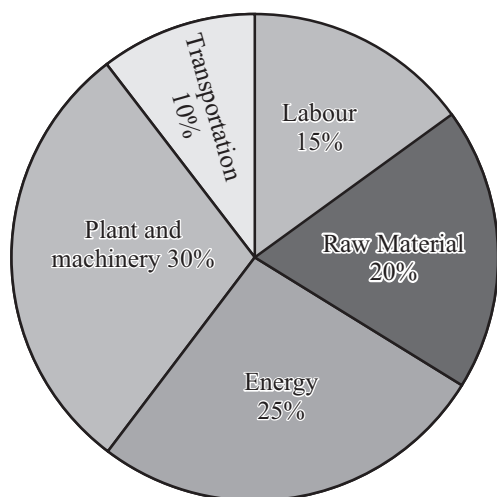
1.21   A firm producing air purifiers sold 200 units in 2012. The following pie chart presents the share of raw material, labour, energy plant and machinery, and transportation costs in the total manufacturing cost of the firm in 2012. The expenditure on labour in 2012 is Rs. 450000. In 2013, the raw material expenses increased by 30% and all other expenses increased by 20%. What is the percentage increase in total cost for the company in 2013?   **[EC-4, ME-4]**
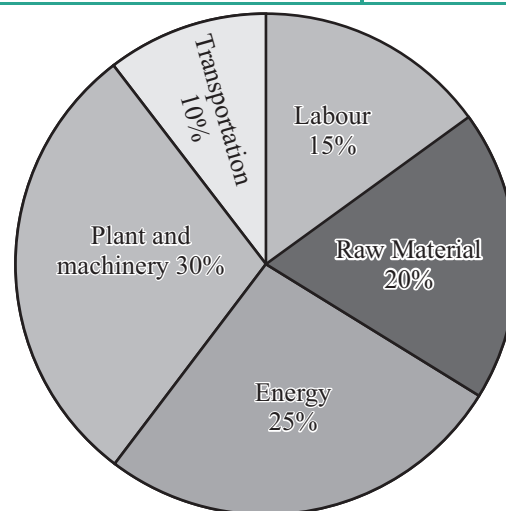
1.22   The ratio of male to female students in a college for five years is plotted in the following line graph. If the number of female students in 2011 and 2012 is equal, what is the ratio of male students in 2012 to male students in 2011?

[CS-3, EE-3]
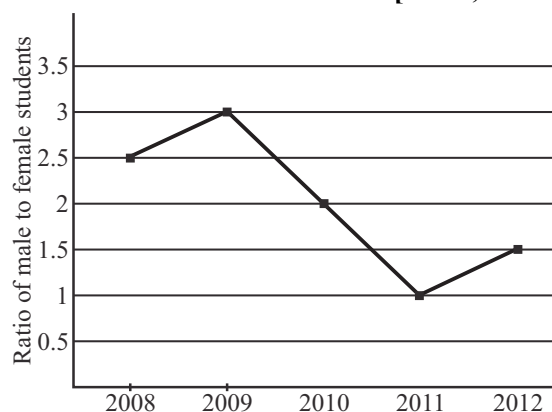
(A) 1 : 1   (B) 2 : 1

(C) 1.5 : 1   (D) 2.5 : 1

1.23   Anuj, Bhola, Chandan, Dilip, Eswar and Faisal live on different floors in a six-storeyed building (the ground floor is numbered 1, the floor above it 2, and so on). Anuj lives on an even-numbered floor. Bhola does not live on an odd numbered floor. Chandan does not live on any of the floors below Faisal's floor. Dilip does not live on floor number 2. Eswar does not live on a floor

immediately above or immediately below Bhola. Faisal lives three floors above Dilip. Which of the following floor-person, combinations is correct?

[AE, AR, CE-1, CH, CY, EY, MA, MT, PH, XE]

	Anuj	Bhola	Chandan	Dilip	Eswar	Faisal
(A)	6	2	5	1	3	4
(B)	2	6	5	1	3	4
(C)	4	2	6	3	1	5
(D)	2	4	6	1	3	5

1.24 The monthly rainfall chart based on 50 years of rainfall in Agra is shown in the following figure. Which of the following are true? (k percentile is the value such that k percent of the data fall below that value)
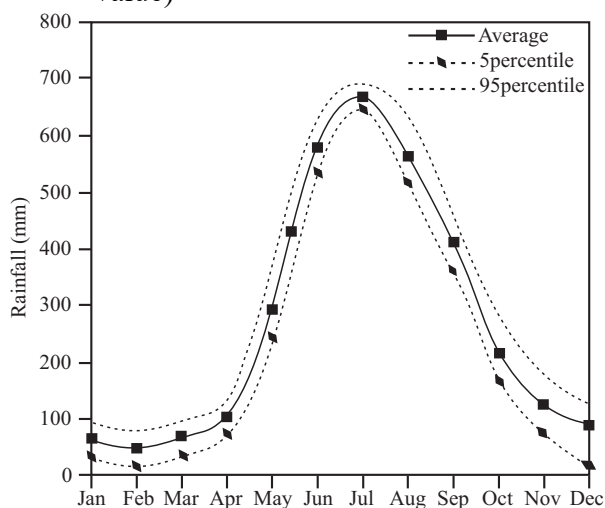
(i) On average, it rains more in July than in December

(ii) Every year, the amount of rainfall in August is more than that in January

(iii) July rainfall can be estimated with better confidence than February rainfall

(iv) In August, there is at least 500 mm of rainfall

[AE, AR, CE-1, CH, CY, EY, MA, MT, PH, XE]

(A) (i) and (ii)   (B) (i) and (iii)

(C) (ii) and (iii)   (D) (iii) and (iv)

1.25 In the following question, the first and the last sentence of the passage are in order and numbered 1 and 6. The rest of the passage is split into 4 parts and numbered as 2, 3, 4 and 5. These 4 parts are not arranged in proper order. Read the sentences and arrange them in a logical sequence to make a passage and choose the correct sequence from the given options.

1. On Diwali, the family rises early in the morning.

2. The whole family, including the young and the old enjoy doing this.

3. Children let off fireworks later in the night with their friends.

4. At sunset, the lamps are lit and the family performs various rituals.

5. Father, mother and children visit relatives and exchange gifts and sweets.

6. Houses looks so pretty with lighted lamps all around.   **[EC-3, ME-2]**

(A) 2, 5, 3, 4   (B) 5, 2, 4, 3

(C) 3, 5, 4, 2   (D) 4, 5, 2, 3

1.26 An electric bus has onboard instruments that report the total electricity consumed since the start of the trip as well as the total distance covered. During a single day of operation, the bus travels on stretches M, N, O and P, in that order. The cumulative distance travelled and the corresponding electricity consumption are shown in the Table below :

Stretch	Cumulative distance (km)	Electricity used (kWh)
M	20	12
N	45	25
O	75	45
P	100	57

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The stretch where the electricity consumption per km is minimum is

[EC-2, ME-1]

(A) M (B) N
(C) O (D) P

1.27 Ms. X will be in Bagdogra from 01/05/2014 to 20/05/2014 and from 22/05/2014 to 31/05/2014. On the morning of 21/05/2014, she will reach Kochi via Mumbai. Which one of the statements below is logically valid and can be inferred from the above sentences? **[EC-3, ME-2]**

(A) Ms. X will be in Kochi for one day, only in May.
(B) Ms. X will be in Kochi for only one day in May.
(C) Ms. X will be only in Kochi for one day in May.
(D) Only Ms. X will be in Kochi for one day in May.

1.28 Based on the given statements, select the most appropriate option to solve the given question.

If two floors in a certain building are 9 feet apart, how many steps are there in a set of stairs that extends from the first floor to the second floor of the building? **[CS-1, EE-1]**

Statements :

I. Each step is 3/4 foot high.
II. Each step is 1 foot wide.

(A) Statement I alone is sufficient, but statement II alone is not sufficient.
(B) Statement II alone is sufficient, but statement I alone is not sufficient.
(C) Both statements together are sufficient, but neither statement alone is sufficient.
(D) Statement I and II together are not sufficient.

1.29 The given statement is followed by some courses of action. Assuming the statement to be true decide the correct option.

Statement :

There has been a significant drop in the water level in the lakes supplying water to the city. **[CS-1, EE-1]**

I.   The water supply authority should impose a partial cut in supply to tackle the situation.
II. The government should appeal to all the residents through mass media for minimal use of water.
III. The government should ban the water supply in lower areas.

(A) Statements I and II follow.
(B) Statements I and III follow.
(C) Statements II and III follow.
(D) All statements follow.

1.30 The pie chart below has the breakup of the number of students from different departments in an engineering college for the year 2012. The proportion of male to female students in each department is 5 : 4. There are 40 males in Electrical Engineering. What is the difference between the number of female students in the Civil department and the female students in the Mechanical department? **[CS-1, EE-1]**
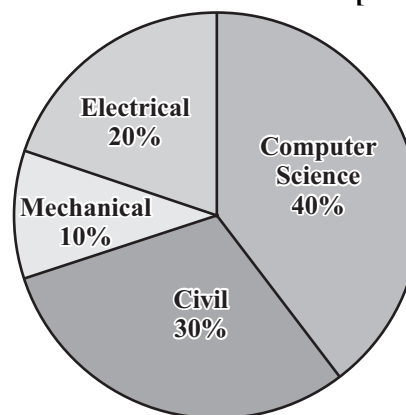
1.31 Based on the given statements, select the most appropriate option to solve the given question.

What will be the total weight of 10 poles each of same weight?   [CS-2, EE-2]

Statements :

I.   One fourth of the weight of a pole is 5 kg.

II. The total weight of these poles is 160 kg more than the total weight of two poles.

(A) Statement I alone is not sufficient.

(B) Statement II alone is not sufficient.

(C) Either I or II alone is sufficient.

(D) Both statement I and II together are not sufficient.

1.32 Four branches of a company are located at *M*, *N*, *O* and *P*. *M* is north of *N* at a distance of 4 km; *P* is south of *O* at a distance of 2 km; *N* is south-east of *O* by 1 km. What is the distance between *M* and *P* in km?   [CS-2, EE-2]

(A) 5.34   (B) 6.74

(C) 28.5   (D) 45.49

1.33 Tanya is older than Eric. Cliff is older than Tanya. Eric is older than Cliff. If the first two statements are true, then the third statement is

[AE, GG, IN, MA, ME-3, MN, MT, PH, PI, TF]

(A) True   (B) False

(C) Uncertain

(D) Data insufficient

1.34 If ROAD is written as URDG, then SWAN should be written as

[CE-1, CS-3]

(A) VXDQ   (B) VZDQ

(C) VZDP   (D) UXDQ

1.35 The head of a newly formed government desires to appoint five of the six selected members P, Q, R, S, T and U to portfolios of Home, Power, Defense, telecom and Finance. U does not want any portfolio if S gets one of the five. R wants either Home or Finance or no portfolio. Q says that if S gets either Power or Telecom, then she must get the other one. T insists on a portfolio if P gets one.

Which is the valid distribution of portfolio?   [CE-1, CS-3]

(A) P-Home, Q-Power, R-Defense, S-Telecom, T-Finance

(B) R- Home, S-Power, P-Defense, Q-Telecom, T-Finance

(C) P- Home, Q-Power, T-Defense, S-Telecom, U-Finance

(D) Q- Home, U-Power, T-Defense, R-Telecom, P-Finance

1.36 The given question is followed by two statements: select the most appropriate option that solves the question

Capacity of a solution tank A is 70% of the capacity of tank B. How many gallons of solution are in tank A and tank B?   [CE-2]

Statement :

I.   Tank A is 80% full and tank B is 40% full

II. Tank A if full contains 14,000 gallons of solution

(A) Statement I alone is sufficient

(B) Statement II alone is sufficient

(C) Either statement I or II alone is sufficient

(D) Both the statements I and II together are sufficient

| **2016** | **IISc Bangalore** |

1.37 In a huge pile of apples and oranges, both ripe and unripe mixed together, 15% are

unripe fruits. Of the unripe fruits, 45% are apples. Of the ripe ones, 66% are oranges. If the pile contains a total of 5692000 fruits, how many of them are apples? **[EC-1, ME-1]**
(A) 2029198   (B) 2467482
(C) 2789080   (D) 3577422

1.38 The Venn diagram shows the preference of the student population for leisure activities.
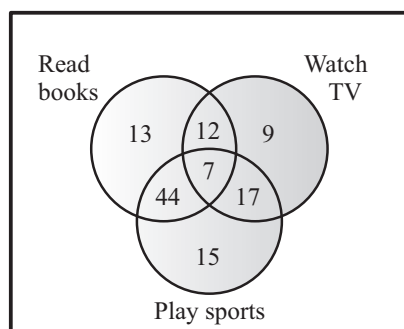
From the data given, the number of students who like to read books or play sports is ____. **[EC-2, ME-3]**
(A) 44   (B) 51
(C) 79   (D) 108

1.39 A flat is shared by four first year undergraduate students. They agreed to allow the oldest of them to enjoy some extra space in the flat. Manu is two month older than Sravan, who is three months younger than Trideep. Pavan is one month older than Sravan. Who should occupy the extra space in the flat?
[AR, CY, EC-3, IN, MA, PE]
(A) Manu   (B) Sravan
(C) Trideep   (D) Pavan

1.40 **M** has a son **Q** and a daughter **R**. He has no other children. **E** is the mother of **P** and daughter-in-law of **M**. How is **P** related to **M**?
[AR, CY, EC-3, IN, MA, PE]
(A) **P** is the son-in-law of **M**.
(B) **P** is the grandchild of **M**.

(C) **P** is the daughter-in law of **M**.
(D) **P** is the grandfather of **M**.

1.41 Among 150 faculty members in an institute, 55 are connected with each other through Facebook® and 85 are connected through WhatsApp®. 30 faculty members do not have Facebook® or WhatsApp® accounts. The number of faculty members connected only through Facebook® accounts is _____.
[CS-2, EE-1]
(A) 35   (B) 45
(C) 65   (D) 90

1.42 Pick the odd one from the following options. **[CS-2, EE-1]**
(A) *CADBE*   (B) *JHKIL*
(C) *XVYWZ*   (D) *ONPMQ*

1.43 In a 2×4 rectangle grid shown below, each cell is a rectangle. How many rectangles can be observed in the grid?
[CS-2, EE-1]

(A) 21   (B) 27
(C) 30   (D) 36

1.44 The following graph represents the installed capacity for cement production (in tonnes) and the actual production (in tonnes) of nine cement plants of a cement company. Capacity utilization of a plant is defined as ratio of actual production of cement to installed capacity. A plant with installed capacity of at least 200 tonnes is called a large plant and a plant with lesser capacity is called a small plant. The difference between total production of large plants and small plants, in tonnes is _____. **[AE, EE-2, TF, XE, XL]**
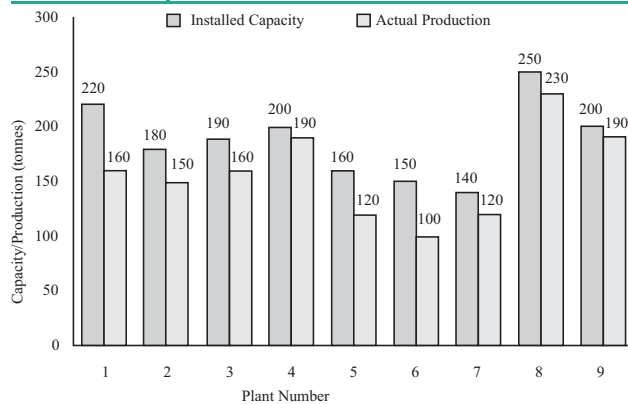
1.45 If 'relftaga' means carefree, 'otaga' means careful and 'fertaga' means careless, which of the following could mean 'aftercare'? **[CE-1, CS-1]**
(A) Zentaga (B) Tagafer
(C) Tagazen (D) Relffer

1.46 A shaving set company sells 4 different types of razors, Elegance, Smooth, Soft and Executive. Elegance sells at Rs. 48, Smooth at Rs. 63, Soft at Rs.78 and Executive at Rs. 173 per piece. The table below shows the numbers of each razor sold in each quarter of a year.

Quarter/Product	Elegance	Smooth	Soft	Executive
Q1	27300	20009	17602	9999
Q2	25222	19392	18445	8942
Q3	28976	22429	19544	10234
Q4	21012	18229	16595	10109

Which product contributes the greatest fraction to the revenue of the company in that year? **[CE-1, CS-1]**
(A) Elegance (B) Executive
(C) Smooth (D) Soft

1.47 Consider the following statements relating of the level of poker play of four players P, Q, R and S.
I. P always beats Q
II. R always beats S
III. S loses to P only sometimes
IV. R always loses to Q
Which of the following can be logically inferred from the above statements?

(i) P is likely to beat all the three other players
(ii) S is the absolute worst player in the set **[CE-1, CS-1]**
(A) (i) only (B) (ii) only
(C) (i) and (ii)
(D) neither (i) nor (ii)

1.48 Find the missing sequence in the letter series. **[BT, CH, GG, ME-2, MN, PH]**
B, FH, LNP, _____.
(A) SUWY (B) TUVW
(C) TVXZ (D) TWXZ

2017 **IIT Roorkee**

1.49 S, T, U, V, W, X, Y and Z are seated around a circular table. T's neighbors are Y and V. Z is seated third to the left of T and second to the right of S. U's neighbors are S and Y ; and T and W are not seated opposite each other. Who is third to the left of V ?
[BT, CY, EC-1, EY, PI]
(A) X (B) W
(C) U (D) T

1.50 Each of P, Q, R, S, W, X, Y and Z has been married at most once. X and Y married and have two children P and Q, Z is grandfather of the daughter 'S' of P. Further Z and W married and are parents of R. Which one of the following must necessarily be FALSE?
[AE, EC-2, MA, MT, PE, PH]
(A) X is the mother-in-law to R
(B) P and R are not married to each other
(C) P is son of X and Y
(D) Q cannot be married to R

1.51 Rahul, Murali, Srinivas and Arul are seated around a square table. Rahul is sitting to the left of Murali, Srinivas is sitting to the right of Arul. Which of the following pairs are seated opposite each other? **[CS-1, EE-1]**

(A) Rahul and Murali

(B) Srinivas and Arul

(C) Srinivas and Murali

(D) Srinivas and Rahul

1.52 There are three boxes. One contains apples, another contains oranges and the last one contains both apples and oranges. All three are known to be incorrectly labelled. If you are permitted to open just one box and then pull out and inspect only one fruit, which box would you open to determine the contents of all three boxes?   **[CS-2, EE-2]**

(A) The box labelled 'Apples'

(B) The box labelled 'Apples and Oranges'

(C) The box labelled 'Oranges'

(D) Cannot be determined

1.53 Four cards lie on a table. Each card has a number printed on one side and a colour on the other. The faces visible on the cards are 2, 3, red and blue.

Proposition : If a card has an even value on one side, then its opposite face is red.   **[CE-2, IN, XE, XL]**

The cards which must be turned over to verify the above proposition are

(A) 2, red   (B) 2, 3, red

(C) 2, blue   (D) 2, red, blue

1.54 The points in the graph below represent the halts of a lift for durations of 1 minute, over a period of 1 hour.
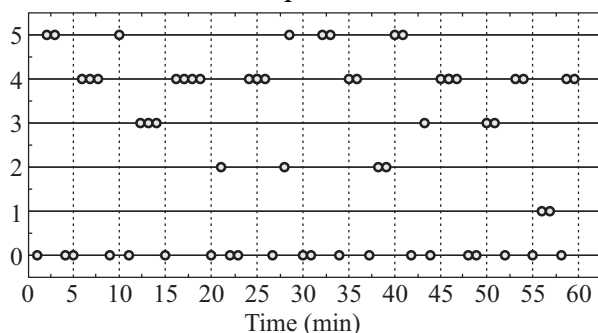
Which of the following statements are correct?   **[CE-2, IN, XE, XL]**

(i) The elevator never moves directly from any non-ground floor to another non-ground floor over the one hour period.

(ii) The elevator stays on the fourth floor for the longest duration over the one hour period.

(A) Only (i)

(B) Only (ii)

(C) Both (i) and (ii)

(D) Neither (i) nor (ii)

1.55 40% of deaths on city roads may be attributed to drunken driving. The number of degrees needed to represent this as a slice of a pie chart is

                    [BT, CY, EC-1, EY, PI]

(A) 120   (B) 144

(C) 160   (D) 212

1.56 A contour line joins locations having the same height above the mean sea level. The following is a contour plot of a geographical region. Contour lines are shown at 25 m intervals in this plot.
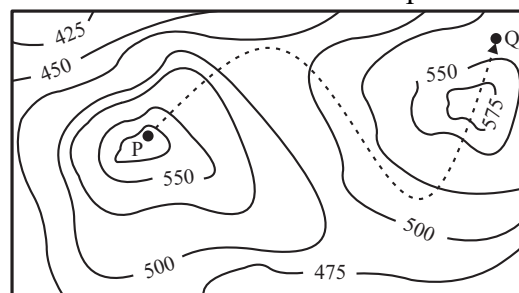
The path from P to Q is best described by,   **[BT, CY, EC-1, EY, PI]**

(A) Up-Down-Up-Down

(B) Down-Up-Down-Up

(C) Down-Up-Down

(D) Up-Down-Up

1.57 500 students are taking one or more courses out of Chemistry, Physics and Mathematics. Registration records

indicate course enrolment as follows : Chemistry (329), Physics (186), Mathematics (295), Chemistry and Physics (83), Chemistry and Mathematics (217), and Physics and Mathematics (63). How many students are taking all 3 subjects?

[AE, EC-2, MA, MT, PE, PH]

(A) 37 (B) 43
(C) 47 (D) 53

1.58 A rule states that in order to drink beer, one must be over 18 years old. In a bar, there are 4 people P is 16 years old, Q is 25 years old, R is drinking milkshake and S is drinking a beer. What must be checked to ensure that the rule is being followed?

[AE, EC-2, MA, MT, PE, PH]

(A) Only $P's$ drink
(B) Only $P's$ drink and $S's$ age
(C) Only $S's$ age
(D) Only $P's$ drink, $Q's$ drink and $S's$ age

1.59 A contour line joins locations having the same height above the mean sea level. The following is a contour plot of a geographical region. Contour lines are shown at 25 m intervals in this plot.
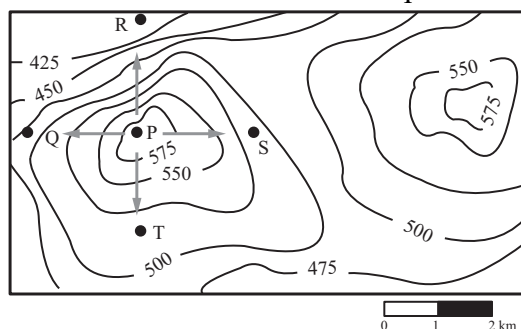
Which of the following is the steepest path leaving from P?

[AE, EC-2, MA, MT, PE, PH]

(A) P to Q (B) P to R
(C) P to S (D) P to T

1.60 A contour line joins locations having the same height above the mean sea level. The following is a contour plot of a geographical region. Contour lines are shown at 25 m intervals in this plot. If in a flood the water level rises to 525 m, which of the villages P, Q, R, S, T gets submerged? **[CS-1, EE-1]**
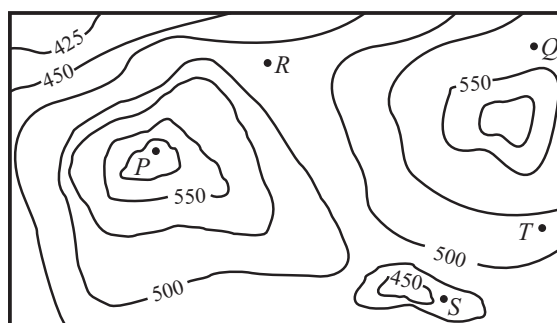
(A) P, Q (B) P, Q, T
(C) R, S, T (D) Q, R, S

1.61 An air pressure contour line joins locations in a region having the same atmospheric pressure. The following is an air pressure contour plot of a geographical region. Contour lines are shown at 0.05 bar intervals in this plot.
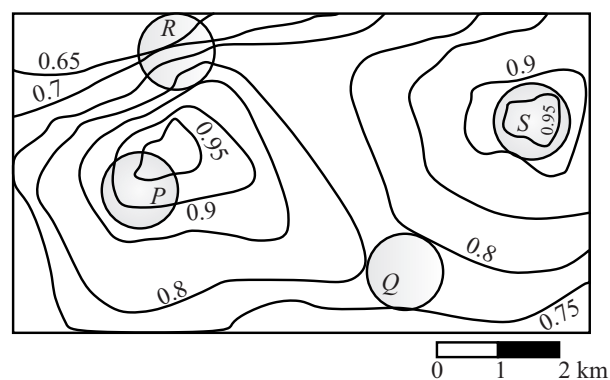
If the possibility of a thunderstorm is given by how fast air pressure rises or drops over a region, which of the following regions is most likely to have a thunderstorm? **[CS-2, EE-2]**

(A) P (B) Q
(C) R (D) S

1.62 P, Q, R, S, T and U are seated around a circular table. R is seated two places to the right of Q. P is seated three places to the left of R. S is seated opposite U. If P and U now switch seats, which of the following must necessarily be true?

[CE-2, IN, XE, XL]

(A) P is immediately to the right of R.

(B) T is immediately to the left of P.

(C) T is immediately to the left of P or P is immediately to the right of Q.

(D) U is immediately to the right of R or P is immediately to the left of T.

1.63   Students applying for hostel rooms are allotted rooms in order of seniority. Students already staying in a room will move if they get a room in their preferred list. Preferences of lower ranked applicants are ignored during allocation.

Given the data below, which room will Ajit stay in   **[CE-1, CH, MN]**

Names	Student seniority	Current room	Room preference list
Amar	1	P	R, S, Q
Akbar	2	None	R, S
Anthony	3	Q	P
Ajit	4	S	Q, P, R

(A) P

(B) Q

(C) R

(D) S

1.64   The bar graph below shows the output of five carpenters over one month, each of whom made different items of furniture : chairs, tablet, and beds.
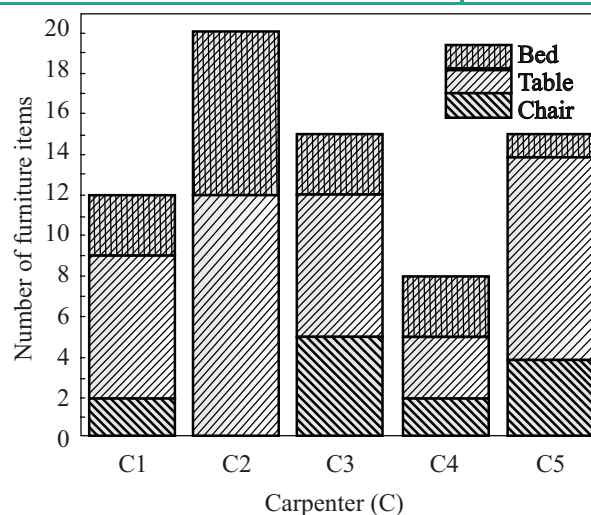
Consider the following statements :

(i) The number of beds made by carpenter C2 is exactly the same as the number of tables made by carpenter C3.

(ii) The total number of chairs made by all carpenters is less than total number of tables.

Which one of the following is true?

[CE-1, CH, MN]

(A) Only i

(B) Only ii

(C) Both i and ii

(D) Neither i nor ii

1.65 P, Q, and R talk about S's car collection. P states that S has at least 3 cars. Q believes that S has less than 3 cars. R indicates that to his knowledge, S has at least one car. Only one of P, Q and R is right. The number of cars owned by S is

[AR, ME-1, TF]

(A) 0

(B) 1

(C) 3

(D) Cannot be determined

1.66   The growth of bacteria (lactobacillus) in milk leads to curd formation. A minimum bacterial population density of 0.8 (in

suitable units) is needed to form curd. In the graph below, the population density of lactobacillus in 1 litre of milk is plotted as a function of time, at two different temperatures, 25^0C and 37^0C .
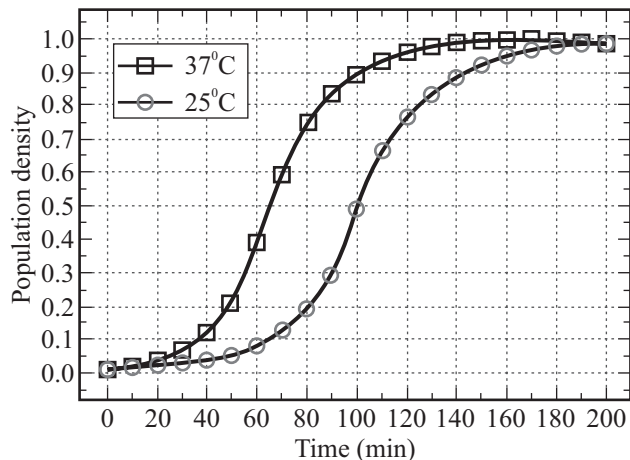
Consider the following statements based on the data shown above :

(i) The growth in bacterial population stops earlier at 37^0C as compared to 25^0C

(ii) The time taken for curd formation at 25^0C is twice the time taken at 37^0C

Which one of the following options is correct? **[AR, ME-1, TF]**

(A) Only (i)

(B) Only (ii)

(C) Both (i) and (ii)

(D) Neither (i) nor (ii)

1.67 P looks at Q while Q looks at $R.P$ is married R is not. The number of pairs of people in which a married person is looking at an unmarried person is

[AG, GG, ME-2]

(A) 0

(B) 1

(C) 2

(D) Can not be determined

1.68 In the graph below, the concentration of a particular pollutant in a lake is plotted over (alternate) days of a month in winter (average temperature 10^0C) and a month in summer (average temperature 30^0C)
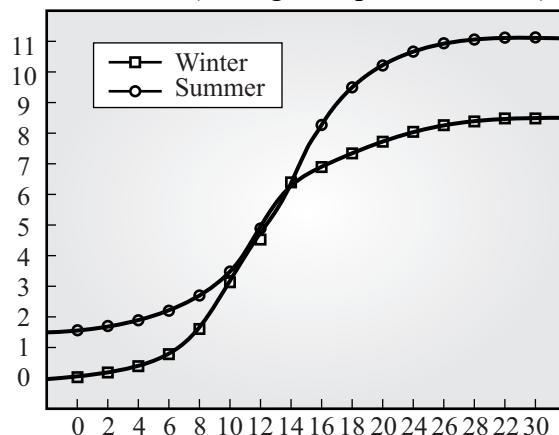
Consider the following statements based on the data shown above :

(i) Over the given months, the difference between the maximum and the minimum pollutant concentrations is the same in both winter and summer.

(ii) There are at least four days in the summer month such that the pollutant concentration on those days are within 1 ppm of the pollutant concentrations on the corresponding days in the winter month.

Which one of the following option is correct? **[AG, GG, ME-2]**

(A) Only (i)

(B) Only (ii)

(C) Both (i) and (ii)

(D) Neither (i) nor (ii)

2018 IIT Guwahati

1.69 In a certain code, *AMCF* is written as *EQGJ* and *NKUF* is written as *ROYJ*. How will *DHLP* be written in that code?

[EE]

(A) *RSTN*　　　　　　(B) *TLPH*
(C) *HLPT*　　　　　　(D) *XSVR*

1.70 *P*, *Q*, *R* and *S* crossed a lake in a boat that can hold a maximum of two persons, with only one set of oars. The following additional facts are available.

(i) The boat held two persons on each of the three forward trips across the lake and one person on each of the two return trips.

(ii) *P* is unable to row when someone else is in the boat.

(iii) *Q* is unable to row with anyone else except *R*.

(iv) Each person rowed for at least one trip

(v) Only one person can row during a trip

Who rowed twice?　　　　　　**[EE]**

(A) *P*　　　　　　(B) *Q*
(C) *R*　　　　　　(D) *S*

1.71 In a detailed study of annual crow births in India, it was found that there was relatively no growth during the period 2002 to 2004 and a sudden spike from 2004 to 2005. In another unrelated study, it was found that the revenue from cracker sales in India which remained fairly flat from 2002 to 2004, saw a sudden spike in 2005 before declining again in 2006. The solid line in the graph below refers to annual sale of crackers and the dashed line refers to the annual crow births in India. Choose the most appropriate inference from the above data. **[AG, AR, BT, CH, CY, GG, IN, MT, PH, TF]**
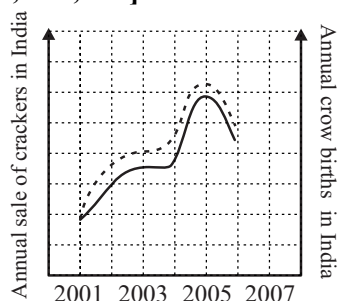
(A) There is a strong correlation between crow birth and cracker sales.

(B) Cracker usage increases crow birth rate.

(C) If cracker sale declines, crow birth will decline.

(D) Increased birth rate of crows will cause an increase in the sale of crackers

1.72 To pass a test, a candidate needs to answer at least 2 out of 3 questions correctly. A total of 6,30,000 candidates appeared for the test. Question *A* was correctly answered by 3,30,000 candidates. Question *B* was answered correctly by 2,50,000 candidates, Question *C* was answered correctly by 2,60,000 candidates. Both questions *A* and *B* were answered correctly by 1,00,000 candidates. Both questions *B* and *C* were answered correctly by 90,000 candidates. Both questions *A* and *C* were answered correctly by 80,000 candidates. If the number of students answering all questions correctly is the same as the number answering none, how many candidates failed to clear the test?

[AG, AR, BT, CH, CY, GG, IN, MT, PH, TF]

(A) 30,000　　　　　　(B) 2,70,000
(C) 3,90,000　　　　　　(D) 4,20,000

1.73 The temperature *T* in a room varies as a function of the outside temperature T_0 and the number of persons in the room *p*, according to the relation $T = K(\theta p + T_0)$, where θ and *K* are constants. What would be the value of θ, which gives the following data?　　**[CE-1]**

T_0	p	T
25	2	32.4
30	5	42.0

(A) 0.8 (B) 1.0

(C) 2.0 (D) 10.0

1.74 Each of the letters arranged as below represents a unique integer from 1 to 9. The letters are positioned in the figure such that $(A \times B \times C)$, $(B \times G \times E)$ and $(D \times E \times F)$ are equal. Which integer among the following choices cannot be represented by the letters A, B, C, D, E, F and G? **[CE-1]**

A		D
B	G	E
C		F

(A) 4 (B) 5

(C) 6 (D) 9

1.75 Each of the letters in the figure below represents a unique integer from 1 to 9. The letters are positioned in the figure such that each of $(A + B + C)$, $(C + D + E)$, $(E + F + G)$ and $(G + H + K)$ is equal to 13. Which integers does E represent? **[CE-2]**

```
A B C
    D
    E F G
        H
        K
```

(A) 1 (B) 4

(C) 6 (D) 7

1.76 The annual average rainfall in a tropical city is 1000 mm. On a particular rainy day (24-hour period), the cumulative rainfall experienced by the city is shown in the graph. Over the 24-hour period, 50% of the rainfall falling on a rooftop, which had an obstruction-free area of 50 m^2 was harvested into a tank. What is the total volume of water collected in the tank in liters? **[CE-2]**
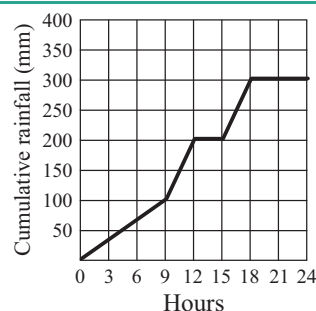
(A) 25,000 (B) 18,750

(C) 7500 (D) 3125

1.77 A house has a number which needs to be identified. The following three statements are given that can help in identifying the house number.

(i) If the house number is a multiple of 3, then it is a number from 50 to 59.

(ii) If the house number NOT a multiple of 4, then it is a number from 60 to 69.

(iii) If the house number is NOT a multiple of 6, then it is a number from 70 to 79.

What is the house number?

[AE, MA, ME-2, PI]

(A) 54 (B) 65

(C) 66 (D) 76

2019 IIT Madras

1.78 If $E = 10$; $J = 20$; $O = 30$; $T = 40$, what will be $P + E + S + T$? **[CE-1]**

(A) 51 (B) 120

(C) 82 (D) 164

1.79 P, Q, R, S and T are related and belong to the same family. P is the brother of S. Q is the wife of P, R and T are the children of the siblings P and S respectively. Which one of the following statements is necessarily FALSE? **[CE-1]**

(A) S is the sister-in-law of Q

(B) S is the aunt of R

(C) S is the brother of P

(D) S is the aunt of T

1.80 Mohan, the manager, wants his four workers to work in pairs. No pairs should work for more than 5 hours. Ram and John have worked together for 5 hours. Krishna and Amir have worked as a team for 2 hours. Krishna does not want to work with Ram. Whom should Mohan allot to work with John, if he wants all the workers to continue working?   **[CE-2]**

(A) Amir

(B) Krishna

(C) Ram

(D) None of the three

1.81 The police arrested four criminals – *P*, *Q*, *R* and *S*. The criminals knew each other. They made the following statements :

P says "*Q* committed the crime"

Q says "*S* committed the crime"

R says "I did not do it"

S says "What *Q* said about me is false"

Assume only one of the arrested four committed the crime and only one of the statements made above is true. Who committed the crime?   **[CH, CS]**

(A) *P*   (B) *R*

(C) *S*   (D) *Q*

1.82 Three of the five students allocated to a hostel put in special requests to the warden. Given the floor plan of the vacant rooms, select the allocation plan that will accommodate all their requests.

Request by X: Due to pollen allergy, I want to avoid a wing next to the garden.

Request by Y : I want to live as far from the washrooms as possible, since I am very sensitive to smell.

Request by Z: I believe in Vaastu and so want to stay in the South – west wing.

[CH, CS]

(A)

(B)

(C)

(D)
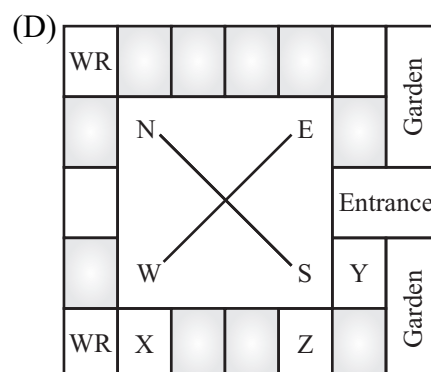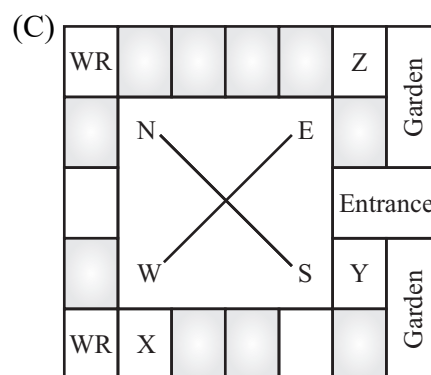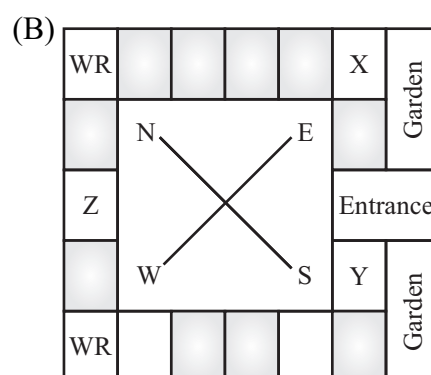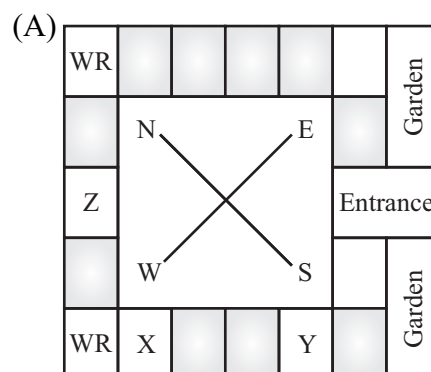
1.83 Four people are standing in a line facing you. They are Rahul, Mathew, Seema

and Lohit. One is engineer, one is a doctor, one a teacher and another a dancer. You are told that :

1. Mathew is not standing next to Seema.
2. There are two people standing between Lohit and the engineer.
3. Rahul is not a doctor.
4. The teacher and the dancer are standing next to each other.
5. Seema is turning to her right to speak to the doctor standing next to her.

Who among them is an Engineer? **[EC]**

(A) Lohit   (B) Seema

(C) Rahul   (D) Mathew

1.84 Five people P, Q, R, S and T work in a bank. P and Q don't like each other but have to share an office till T gets a promotion and moves to the big office next to the garden. R, who is currently sharing an office with T, wants to move to the adjacent office with S, the handsome new intern.

Given the floor plan, what is the current location of Q, R and T ? [O = office, WR = Wash room] **[EC]**

(A)

WR	01 P,Q	02	03 R,T	04 S

Manager	Entry	Teller 1	Teller 2

Garden

(B)

WR	01 P,Q	02	03 R	04 S

Manager T	Entry	Teller 1	Teller 2

Garden

(C)

WR	01 P,Q	02	03 T	04 R,S

Manager	Entry	Teller 1	Teller 2

Garden

(D)

WR	01 P	02 Q	03 R	04 S

Manager T	Entry	Teller 1	Teller 2

Gardan

1.85 Consider five people – Mita, Ganga, Rekha, Lakshmi and Sana. Ganga is taller than both Rekha and Lakshmi. Lakshmi is taller than Sana. Mita is taller than Ganga.

Which of the following conclusions are true? **[EE]**

1. Lakshmi is taller than Rekha
2. Rekha is shorter than Mita
3. Rekha is taller than Sana
4. Sana is shorter than Ganga

(A) 2 and 4   (B) 1 only

(C) 1 and 3   (D) 3 only

1.86 If IMHO = JNIP, IDK = JEL and SO = TP then IDC = _____.

[ME-2, TF, XE, XL]

(A) JDE   (B) JED

(C) JCE   (D) JEC

1.87 M and N had four children (P, Q, R and S) of them, only P and R are married. They had children X and Y respectively. If Y is the legitimate child of W, which one of the following statement is necessarily FALSE? **[CY, ME-1, MN]**

(A) W is the wife of P

(B) W is the wife of R

(C) M is the grandmother of Y

(D) R is the father of Y

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1.88 The following figure shows the data of students enrolled in 5 years (2014 to 2018) for two schools P and Q. During this period, the ratio of the average number of the students enrolled in school P to the average of the difference of the number of students enrolled in schools P and Q is　　**[AE, AG, EC, GG]**
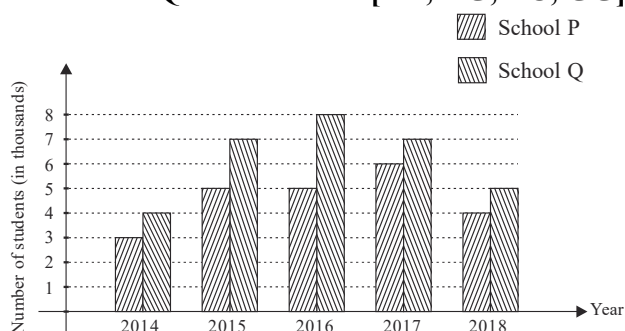
(A) 31 : 23　　　　　(B) 23 : 8

(C) 23 : 31　　　　　(D) 8 : 23

1.89 The revenue and expenditure of four different companies P. Q, R and S in 2015 are shown in the figure. If the revenue of company Q in 2015 was 20% more than that in 2014 and company Q had earned a profit of 10% on expenditure in 2014, then its expenditure (in million rupees) in 2014 was _____.　　**[EE, EY, TF]**

Revenue and Expenditure (in million Rupees) of four companies P, Q, R and S in 2015
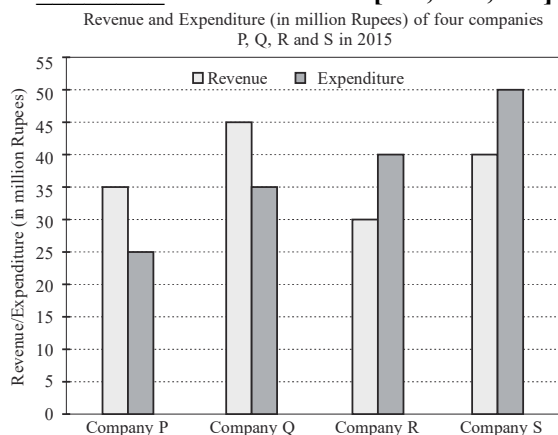
(A) 34.1　　　　　(B) 35.1

(C) 33.7　　　　　(D) 32.7

1.90 Select the next element of the series : Z, WV, RQP, _____　　**[EE, EY, TF]**

(A) LKJI　　　　　(B) KJIH

(C) NMLK　　　　　(D) JIHG

1.91 P, Q, R and S are to be uniquely coded using α and β. If P is coded as $\alpha\alpha$ and Q as $\alpha\beta$, then R and S respectively, can be coded as _____.

　　　　[IN, ME-1, MT, PE, PH]

(A) $\beta\alpha$ and $\beta\beta$　　　(B) $\alpha\beta$ and $\beta\beta$

(C) $\beta\beta$ and $\alpha\alpha$　　　(D) $\beta\alpha$ and $\alpha\beta$

1.92 The bar graph shows the data of students who appeared and passed in an examination for four schools P, Q, R and S. The average of success rate (in percentage) of these four schools is _____.　　**[IN, ME-1, MT, PE, PH]**

Performance of school, P, Q, R and S
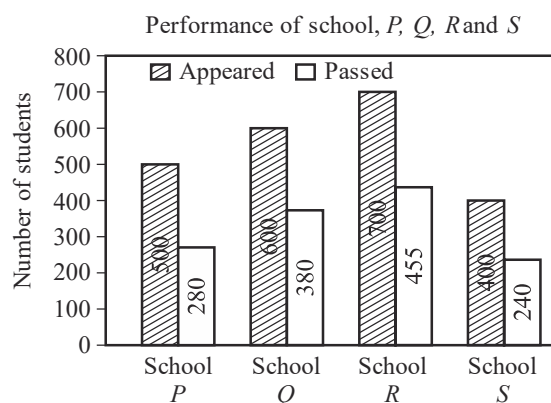
(A) 59.3 %　　　　　(B) 58.8 %

(C) 59.0 %　　　　　(D) 58.5 %

1.93 An Engineer measures THREE quantities X, Y and Z in an experiment. She finds that they follow a relationship that is represented in the figure below : (the product of X and Y linearly varies with Z).
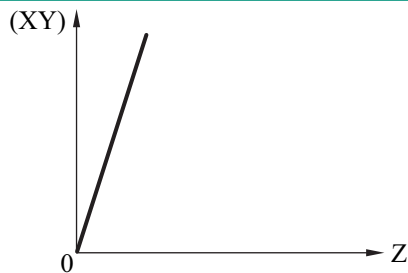
Then, which of the following statements is FALSE? **[CY, ME-2, PI]**

(A) For fixed Y; X is proportional to Z

(B) For fixed Z; X is proportional to Y

(C) XY/Z is constant

(D) For fixed X; Z is proportional to Y

1.94 The two pie-charts given below. Show the data of total students and only girls registered in different streams in a university. If the total number of students registered in the university students is 5000, and the total number of the registered girls is 1500; then the ratio of boys enrolled in Arts to the girls enrolled in the Management is _____.

[CY, ME-2, PI]

Percentage of students enrolled in different streams in a University
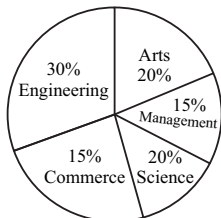
Percentage of girls enrolled in different streams
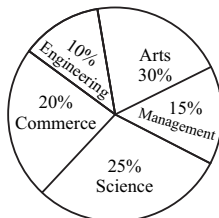
(A) 2 : 1   (B) 9 : 22

(C) 11 : 9   (D) 22 : 9

1.95 If 0, 1, 2, …, 7, 8, 9 are coded as O, P, Q, …, V, W, X, then 45 will be coded as _____. **[CE-1]**

(A) SU   (B) ST

(C) SS   (D) TS

1.96 The total expenditure of a family, on different activities in a month, is shown in the pie-chart. The extra money spent on education as compared to transport (in percent) is _____. **[CE-1]**
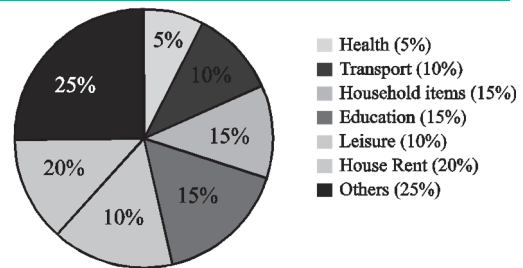
(A) 100   (B) 50

(C) 33.3   (D) 5

1.97 Five friends P, Q, R, S and T went camping. At night, they had to sleep in a row inside the tent. P, Q, and T refused to sleep next to R since he snored loudly. P and S wanted to avoid Q as he usually hugged people in sleep.

Assuming everyone was satisfied with the sleeping arrangements, what is the order in which they slept? **[CE-1]**

(A) RSPTQ   (B) QRSPT

(C) QTSPR   (D) SPRTQ

1.98 After the inauguration of the new building, the Head of the Department (HoD) collated faculty preferences for office space. P wanted a room adjacent to the lab. Q wanted to be close to the lift. R wanted a view of the playground and S wanted a corner office.

Assuming that everyone was satisfied, which among the following shows a possible allocation? **[CE-2]**

(A)

(B)

	PLAYGROUND			
HoD	Q	R	S	
P			LIFT	
	LAB			

ROAD

(C)

	PLAYGROUND			
S	R	HoD	Q	
P			LIFT	
	LAB			

ROAD

(D)

	Play ground			
HOD	S	R	Q	
P			Lift	
	Lab			

Road
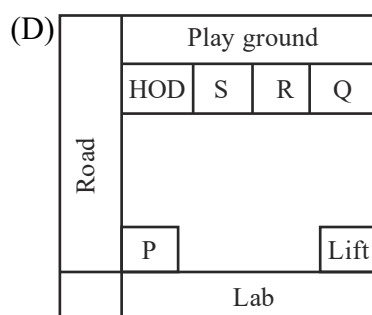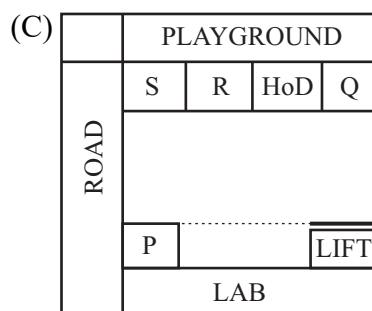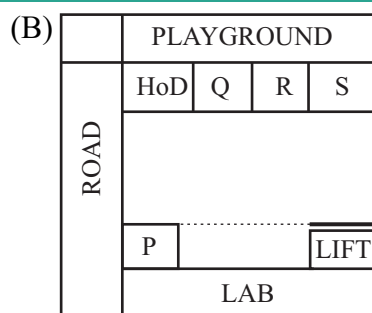
1.99 The monthly distribution of 9 Watt LED bulbs sold by two firms X and Y from January to June 2018 is shown in the pie-chart and the corresponding table. If the total number of LED bulbs sold by two firms during April-June 2018 is 50000, then the number of LED bulbs sold by the firm Y during April-June 2018 is _____. **[CE-2]**

Pie chart:
- January (15%) — 15%
- February (20%) — 20%
- March (30%) — 30%
- April (15%) — 15%
- May (10%) — 10%
- June (10%) — 10%
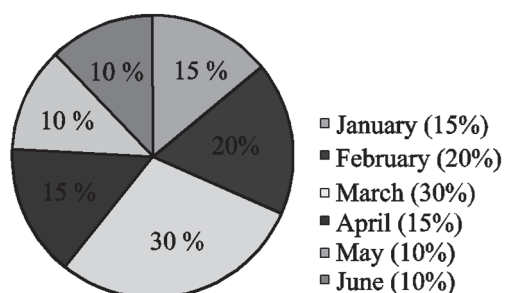
Month	Ratio of LED bulbs sold by two firms (X:Y)
January	7:8
February	2:3
March	2:1
April	3:2
May	1:4
June	9:11

(A) 8250　　　　　　　(B) 9750
(C) 8750　　　　　　　(D) 11250

1.100 Nominal interest rate is defined as the amount paid by the borrower to the lender for using the borrowed amount for a specific period of time. Real interest rate calculated on the basis of actual value (inflation-adjusted), is approximately equal to the difference between nominal rate and expected rate of inflation in the economy.

Which of the following assertions is best supported by the above information?

[CE-2]

(A) Under high inflation, real interest rate is low and borrowers get benefited.
(B) Under low inflation, real interest rate is low and borrowers get benefited.
(C) Under low inflation, real interest rate is low and borrowers get benefited.
(D) Under high inflation, real interest rate is low and lenders get benefited.

1.101 If P = 3, R = 27, T = 243, then Q + S = _____. **[CS]**

(A) 40　　　　　　　(B) 110
(C) 90　　　　　　　(D) 80

1.102 The total revenue of a company during 2014-2018 is shown in the bar graph. If the total expenditure of the company in each year is 500 million rupees, then the aggregated profit or loss (in percentage)

on the total expenditure of the company during 2014-2018 is _____. **[CS]**
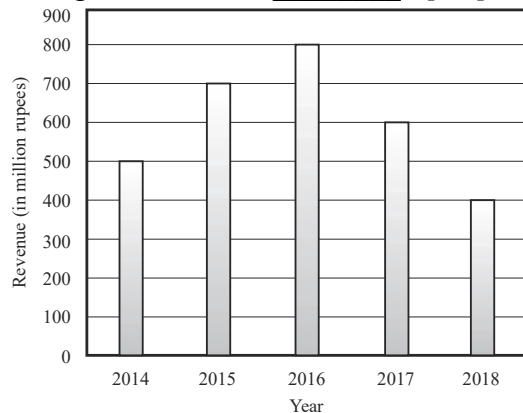
(A) 20% profit   (B) 20% loss
(C) 16.67 % loss   (D) 16.67% profit

1.103 The profit shares of two companies P and Q are shown in the figure. If the two companies have invested a fixed and equal amount every year, then the ratio of the total revenue of company P to the total revenue of company Q, during 2013 – 2018 is _____.
[AR, BM, BT, CH, MA, MN, ST, XE, XL]
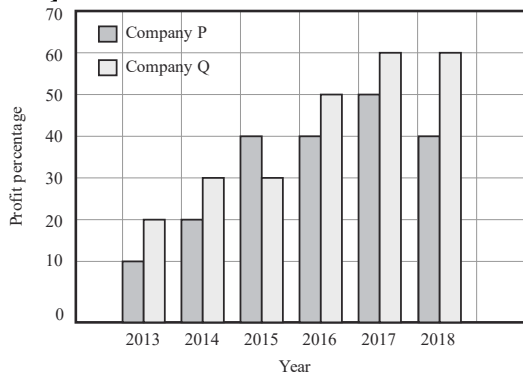
(A) 15 : 17   (B) 16 : 17
(C) 17 : 15   (D) 17 : 16

1.104 P, Q, R, S, T, U, V and W are seated around a circular table.
(i) S is seated opposite to W.
(ii) U is seated at the second place to the right of R.
(iii)T is seated at the third place to the left of R.
(iv) V is a neighbor of S.

Which of the following must be true?
[AR, BM, BT, CH, MA, MN, ST, XE, XL]
(A) P is not seated opposite to Q
(B) R is the left neighbor of S
(C) Q is a neighbor of R
(D) P is a neighbor of R

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1.105
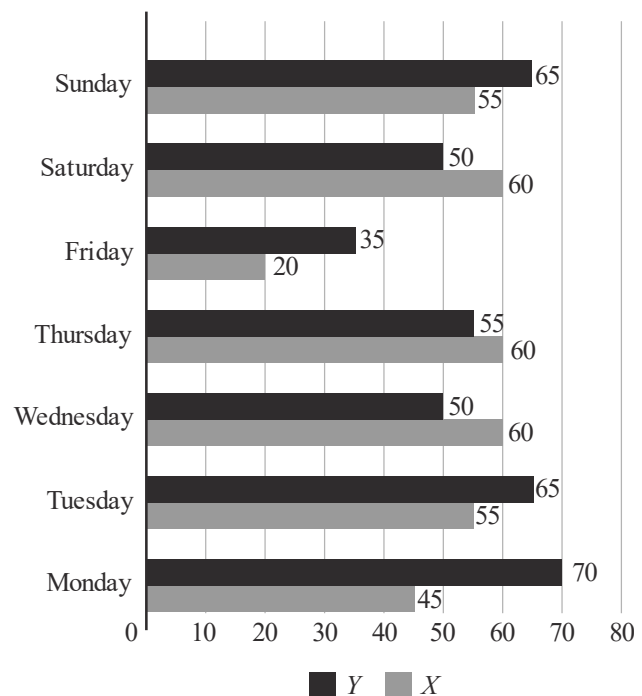
The number of minutes spent by two Students, X and Y, exercising every day in a given week are shown in the bar chart above.

The number of days in a given week in which one of the students spent a minimum of 10% more than the other student, on a given day, is
[EC, ES, PE, PI, ST]
(A) 5   (B) 4
(C) 7   (D) 6

1.106 The number of student passing or failing in an exam for a particular subject are presented in the bar chart above. Students

who pass the exam cannot appear for the exam again. Students who fail the exam in the first attempt must appear for the exam in the following year. Students always pass the exam in their second attempt. The number of students who took the exam for the first time in the year 2nd and the year 3rd respectively, are _____. **[AG, EE, EY, GG]**
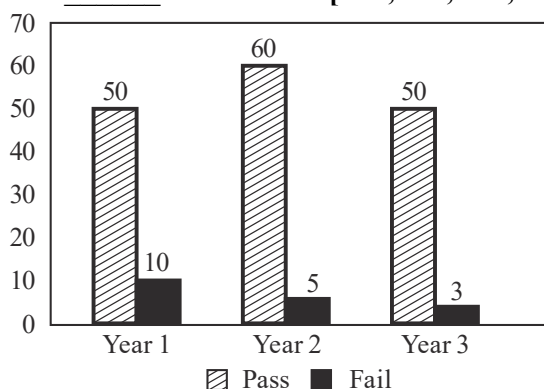
(A) 65 and 53   (B) 55 and 53
(C) 55 and 48   (D) 60 and 50

1.107
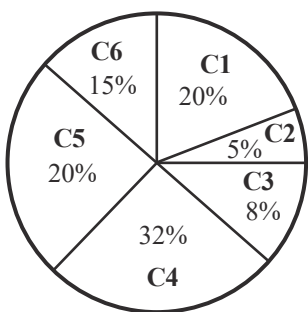
Company	Ratio
C1	3 : 2
C2	1 : 4
C3	5 : 3
C4	2 : 3
C5	9 : 1
C6	3 : 4

The distribution of employees at the rank of executives, across different companies C1, C2, ….., C6 is presented in the chart given above. The ratio of executives with a management degree to those without a management degree in each of these companies is provided in the table above. The total number of executives across all companies is 10,000.

The total number of management degree holders among the executives in companies C2 and C5 together is _____ . **[ME-1, XH]**

(A) 2500   (B) 600
(C) 1900   (D) 225

1.108
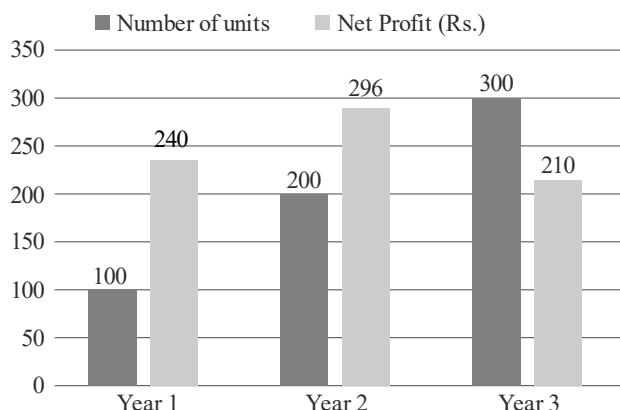
The number of units of a product sold in three different years and the respective net profits are presented in the figure above. The cost/unit in Year 3 was Rs.1, which was half the cost/unit in Year 2. The cost/unit in Year 3 was one-third of the cost/unit in Year 1. Taxes were paid on the selling price at 10%, 13% and 15% respectively for the three years. Net profit is calculated as the difference between the selling price and the sum of cost and taxes paid in that year. The ratio of the selling price in Year 2 to the selling price in Year 3 is_____ **[CS-2, XE, XL]**

(A) 3 : 4   (B) 1 : 1
(C) 1 : 2   (D) 4 : 3

❖❖❖❖

Answers		Data Interpretation							
1.1	B	1.2	B	1.3	D	1.4	C	1.5	A
1.6	B	1.7	A	1.8	C	1.9	D	1.10	D
1.11	B	1.12	A	1.13	140	1.14	A	1.15	D
1.16	B	1.17	D	1.18	D	1.19	D	1.20	20000
1.21	22	1.22	C	1.23	B	1.24	B	1.25	B
1.26	D	1.27	B	1.28	A	1.29	A	1.30	32
1.31	C	1.32	A	1.33	B	1.34	B	1.35	B
1.36	D	1.37	A	1.38	D	1.39	C	1.40	B
1.41	A	1.42	D	1.43	C	1.44	120	1.45	C
1.46	B	1.47	A	1.48	C	1.49	A	1.50	B
1.51	C	1.52	B	1.53	C	1.54	D	1.55	B
1.56	C	1.57	D	1.58	B	1.59	B	1.60	C
1.61	C	1.62	C	1.63	B	1.64	C	1.65	A
1.66	A	1.67	D	1.68	B	1.69	C	1.70	C
1.71	A	1.72	D	1.73	B	1.74	B	1.75	B
1.76	C	1.77	D	1.78	B	1.79	D	1.80	B
1.81	B	1.82	D	1.83	D	1.84	A	1.85	A
1.86	B	1.87	A	1.88	B	1.89	A	1.90	B
1.91	A	1.92	C	1.93	B	1.94	D	1.95	B
1.96	B	1.97	A	1.98	C	1.99	B	1.100	A
1.101	C	1.102	A	1.103	B	1.104	A	1.105	D
1.106	C	1.107	C	1.108	D				

Explanations		Data Interpretation

1.1 (B)

Suppose : Hari's age : H, Gita's age : G, Saira's age : S, Irfan's age : I

According to question,

1. $H + G > I + S$

2. G can't be oldest and S can't be youngest.

   $G - S = 1$ or $S - G = 1$

3.   There are no twins. Thus using statement (2) either GS or SG possible.

Checking from the options,

Option (A) : $HSIG$

Not possible as there is I between S and G which is not possible using statement (2).

So, incorrect option.

Option (B) : $SGHI$

SG order is possible.

$$S > G > H > I$$

Therefore, $S = G + 1$ and $H + G > I + S$

$$H + G > I + G + 1 \implies H > I + 1$$

and $H \neq I$ which is possible

[From statement (3)] satisfying all the facts.

So, correct option.

Option (C) : $IGSH$

According to this $G = S + 1$ and

$$H + G > I + S$$

$$H + S + 1 > I + S$$

$H+1>I$

and　　$H \neq I$ [from statement (3)]

Therefore, $H>I$

But in option $H<I$.

So, incorrect option.

Option (D) : $IHSG$

According to this $I>H$ and $S>G$ thus adding both inequalities $I+S>H+G$ which is opposite to statement (1), thus not possible.

Hence, the correct option is (B).

1.2　　**(B)**

Fuel consumed per km will be least when mileage (kilometers per litres) mentioned on y axis of graph will be maximum irrespective of number of kilometers travelled.

From the graph (y axis), the mileage (kilometers per litres) is maximum when vehicle is driven at 45 kilometers per hour. Hence the stretch which Q covered at 45 kmph, mileage was highest and fuel consumption per kilometers was lowest.

Hence, the correct option is (B).

1.3　　**(D)**

Method 1

In the given graph,

X - Coordinate : Number of miligrams of microbe required to destroy half of the body mass in kilogram.

Therefore, lesser the miligrams of microbe required, more is the danger to humans.

Y - Coordinate : Probability that microbe will overcome human immunity system. Therefore, more probability is danger to humans.

In the given graph, microbe S requires only 200 mg of toxicity to destroy half of the body mass in kg and it has highest probability to overcome human immunity system.

Hence, the correct option is (D).

Method 2

According to given information,

Most dangerous microbe

$\propto$ probability that microbe will over come human immune system

$\propto$ Area (growth of microbe)

$\propto \dfrac{1}{\text{quantity required}}$

So, most dangerous microbe

$\propto \dfrac{\text{Probability} \times \text{Area}}{\text{quantity required}}$

$= \dfrac{K \times \text{Probability} \times \text{Area}}{\text{quantity required}}$

Where K is proportionality constant

$= \dfrac{K \times \text{Probability} \times \pi d^2}{4 \times \text{quantity required}}$

For microbe P

Most dangerous microbe $= \dfrac{\pi K}{4}\left(\dfrac{0.4 \times 50^2}{800}\right)$

$= \dfrac{\pi K}{4}\left(\dfrac{5}{4}\right)$

For microbe Q

Most dangerous microbe $= \dfrac{\pi K}{4}\left(\dfrac{0.5 \times 40^2}{600}\right)$

$= \dfrac{\pi K}{4}\left(\dfrac{4}{3}\right)$

For microbe R

Most dangerous microbe $= \dfrac{\pi K}{4}\left(\dfrac{0.4 \times 30^2}{300}\right)$

$= \dfrac{\pi K}{4}\left(\dfrac{6}{5}\right)$

For microbe S

Most dangerous microbe $= \dfrac{\pi K}{4}\left(\dfrac{0.8 \times 20^2}{200}\right)$

$= \dfrac{\pi K}{4}\left(\dfrac{8}{5}\right)$

From this we can say that most dangerous microbe is S.
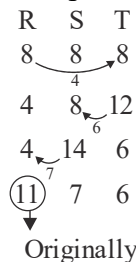
Hence, the correct option is (D).

1.4 (C)

Given : In the last, three sisters were left with equal number of Toys.

And total Toys is 24.

At the last R S T will have 8, 8, 8 Toys.

If we reverse the process of gift exchange, we get

```
      R    S    T
      8    8    8
         4
      4    8    12
            6
      4    14   6
         7
     (11)  7    6
```
Originally

Hence, the correct option is (C).

1.5 (A)

Given :

The contribution of each factor to the overall service quality is directly proportional to the factor score and its standardized coefficient.

So, contribution $\propto$ (factor score) $\times$ (standardized coefficient)

1. Contribution of outcome factor

$= Q \times$ factor score $\times$ standardized coefficient

$= Q \times 6 \times 0.8$

$= 4.8 \times Q = 4.8$ (Here, Q is the proportional constant assumed to be 1...)

Similarly,

2. Contribution of tangibles

$= 5 \times 0.4 = 2$

3. Contribution of reliability

$= 6 \times 0.7 = 4.2$

4. Contribution of responsiveness

$= 6 \times 0.6 = 3.6$

5. Contribution of empathy

$= 4 \times 0.6 = 2.4$

6. Contribution of assurance

$= 6 \times 0.5 = 3$

So, we can see here lowest contribution is "2" and total contribution is

$4.8 + 2 + 4.2 + 3.6 + 2.4 + 3 = 20$

The lowest contribution among all the above factors to the overall quality of services delivered by the company

$= \left(\dfrac{2}{20}\right) \times 100 = 10\%$

Hence, the correct option is (A).

1.6 (B)

Given :

Round	P	Q	R	S
1	1	5	1	10
2	5	10	10	1
3	1	1	1	5
4	10	10	1	1
5	1	5	5	10
6	10	5	1	1
7	5	10	1	1

Here the most accurate player will be the one who makes the highest score.

Q has the maximum score of 46 points among all other players, so Q is the most accurate player.

The most consistent player will be the one who has the minimum standard deviation. [The standard deviation is given by the square root of the sum of the squares of the individual deviations from mean divided by the number of items.] Here, mean values for P, Q, R and S are :

$\dfrac{33}{7} = 4.71, \dfrac{46}{7} = 6.57, \dfrac{20}{7} = 2.85$

and $\dfrac{29}{7} = 4.14$ respectively.

For P, the standard deviation is :

$\sqrt{\dfrac{3 \times 3.71^2 + 2 \times 0.29^2 + 2 \times 5.29^2}{7}} = 3.73$

For Q, the standard deviation is :

$$\sqrt{\frac{1\times5.57^2+3\times1.57^2+3\times3.43^2}{7}}=3.24$$

For R, the standard deviation is :

$$\sqrt{\frac{5\times1.85^2+1\times2.15^2+1\times7.15^2}{7}}=3.22$$

For S, the standard deviation is :

$$\sqrt{\frac{4\times3.14^2+1\times0.86^2+2\times5.86^2}{7}}=3.93$$

R has the minimum standard deviation and is the most consistent player.

Hence, the correct option is (B).

📖 **Key Point**

Mean :

$$\bar{x}=\frac{1}{n}\times\sum_{i=1}^{n}x_i$$

Standard Deviation (SD) :

$$\sigma=\sqrt{\frac{1}{n}\sum_{i=1}^{n}(x_i-\bar{x})^2}$$

1.7 (A)

Given sequence : AD CG FK JP

(i)   A _ _ D   (2 spaces)

(ii)   C _ _ _ G   (3 spaces)

(iii)   F _ _ _ _ K   (4 spaces)

(iv)   J _ _ _ _ _ P   (5 spaces)

The space between each term is increasing by 1 and the 1st alphabet of the consecutive term is one less than last alphabet of the previous term.

Therefore, the 5th term will have 6 spaces and start from $'P'-1$ i.e. 'O'.

So, the next term is OV.

Hence, the correct option is (A).

1.8 (C)

Given :

Country	Number of Tourists
USA	2000
England	3500
Germany	1200
Italy	1100
Japan	2400
Australia	2300
France	1000

Total number of tourists who visited India in

$2011 = 2000+3500+1200+1100+2400$
$\qquad\qquad\qquad\qquad +1000+2300$
$\qquad = 13500$

One-third of total tourists $=\dfrac{13500}{3}=4500$

The two countries contributed to $\frac{1}{3}^{rd}$ of total tourists are England and France

Since, England $=3500$

France $=1000$

and $E+F=4500$

Hence, the correct option is (C).

1.9 (D)

According to the question,
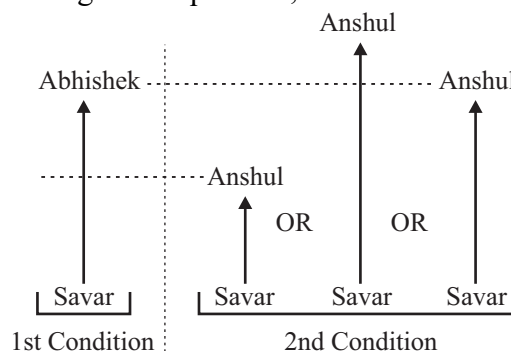
Since, there is no information given about the relationship between Anshul and Abhishek. So no conclusion can be made from the given information.

Hence, the correct option is (D).

1.10 **(D)**

Following statements can be derived from the given diagram :

(i)   Butterflies are shown in birds category.

(ii)   The area corresponding to the tiger in pie chart is larger than that of red ants.

(iii)   There are only two types of reptiles i.e. snakes and crocodiles.

(iv)   It is not correct as the size of animals is not specified in the pie chart but the numbers are specified.

Elephants are in largest number in mammals.

Hence, the correct option is (D).

1.11 **(B)**

BEST OF LUCK

$\quad$ B_ST$\quad$ _F$\quad$ L_CK $\rightarrow$ KCLFTSB

GOOD WISHES

$\quad$ G _ _D$\quad$ W_SH_S $\rightarrow$ SHSWDG

From above two we can conclude that vowels are missing and then reversed.

Hence,

ACE THE EXAM

$\quad$ _C_$\quad$ TH_$\quad$ _X_M

and reverse is MXHTC.

Hence, the correct option is (B).

1.12 **(A)**

Batsman 'K' is the most consistent because it has minimum standard deviation. Average has no relationship with consistency.

Hence, the correct option is (A).

> 📖 **Key Point**
>
> Standard deviation is the difference of a particular value with the calculated mean of all the values (here averages of the batsmen) so the batsman with minimum deviation should be the most consistent batsman.

1.13 **140**

Ratio of male to female students in year 2008,

$$\frac{M_{2008}}{F_{2008}} = 2.5$$

['F' denotes female and 'M' denotes male]

In year 2009,

$$\frac{M_{2009}}{F_{2009}} = 3$$

$$\frac{\dfrac{M_{2009}}{F_{2009}}}{\dfrac{M_{2008}}{F_{2008}}} = \frac{3}{2.5}$$

$$\frac{M_{2009}}{M_{2008}} \times \frac{F_{2008}}{F_{2009}} = 1.2 \qquad \ldots \text{(i)}$$

Number of female students get doubled in 2009

i.e.$\quad$ $F_{2009} = 2F_{2008}$

From equation (i),

$$\frac{M_{2009}}{M_{2008}} \times \frac{1}{2} = 1.2$$

$$\frac{M_{2009}}{M_{2008}} = 2.4$$

% increase of students in year 2009

$$= \frac{M_{2009} - M_{2008}}{M_{2008}} \times 100$$

$$= \left(\frac{M_{2009}}{M_{2008}} - 1 \right) \times 100$$

$$= (2.4 - 1) \times 100 = 140\%$$

Hence, the correct answer is **140**.

1.14 **(A)**

Given : A group has 4 children.

Som is younger to Riaz and Shiv is elder to Ansu.

Ansu is youngest in the group.

$\quad$ Riaz $\qquad$ Shiv

$\quad$ ↑ $\qquad\quad$ ↑

$\quad$ Som $\quad$ Ansu (youngest)

Statement 1 : Shiv is younger to Riaz.

Riaz

↑

Shiv, Som

↑

Ansu

Hence, it is clear from statement 1 that Riaz is the eldest children without the requirement of statement 2.

Hence, the correct option is (A).

| 1.15 | **(D)** |

Revenue : It is the income that a business has from its normal business activities, usually from the sales of goods and services to customers; money regularly received by a company.

Given : Total quantity of exports of all the items
= 5 lakh tons.

1 ton = 907.185 kg

5 lakh tons $= 4.53 \times 10^8$ kg

Total revenue generated = 250 crore rupees.

11% of total export belongs to item 1. Therefore, the quantity of item 1 is given by,

$$Q_1 = 4.53 \times 10^8 \times \frac{11}{100} = 4.98 \times 10^7 \text{ kg}$$

Revenue generated by item 1 is given by,

$$R_1 = 250 \times 10^7 \times \frac{12}{100} = 3 \times 10^8 \text{ Rs.}$$

Hence, the revenue generated through export of item 1 per kg

$$= \frac{3 \times 10^8}{4.98 \times 10^7} \cong \frac{3}{5} \times 10 = 6$$

22% of total exports belongs to item 4. Therefore, the quantity of item 4 is given by,

$$Q_4 = 4.53 \times 10^8 \times \frac{22}{100} = 9.96 \times 10^7 \text{ kg}$$

Revenue generated by item 4 is given by,

$$R_4 = 250 \times 10^7 \times \frac{6}{100} = 15 \times 10^7 \text{ Rs.}$$

Hence, the revenue generated through export of item 4 per kg

$$= \frac{15 \times 10^7}{9.96 \times 10^7} \cong \frac{15}{10} = 1.5$$

Therefore, the ratio of revenue generated through export of item 1 per kg to the revenue generated through export of item 4 per kg is given by,

$$\text{Ratio} = \frac{6}{1.5} = \frac{4}{1}$$

Hence, the correct option is (D).

| 1.16 | **(B)** |

Form	Category
P	Resident male income < 10 lakh
Q	Resident female income < 8 lakh
R	Resident male/female income > 10 lakh
S	Non resident income > 15 lakh

Since, a resident female with income in range 8 to 10 lakh does not fall in above categories.

Hence, the correct option is (B).

| 1.17 | **(D)** |

Since, for year 2000, 2001 and 2002 exports are more than imports hence, the concept of trade deficit does not exist.

$$\% \text{ Trade deficit } = \frac{\text{Import} - \text{Export}}{\text{Export}}$$

From option (B) : In 2004,

$$\frac{\text{Import} - \text{Export}}{\text{Export}} = \frac{10}{70} = \frac{1}{7}$$

From option (A) : In 2005,

$$\frac{90 - 80}{80} = \frac{10}{80} = \frac{1}{8}$$

From option (D) : In 2006,

$$\frac{120 - 100}{100} = \frac{20}{100} = \frac{1}{5}$$

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From option (C) : In 2007,

$$\frac{110-100}{100} = \frac{10}{100} = \frac{1}{10}$$

Hence, the correct option is (D).

1.18 (D)

There are two lights on every step of ladder if one of the light is red (R), the another will be blue (B).

And if one of the light is green (G), the another will be yellow (Y).

Therefore, the number of red lights will be equal to blue lights and the number of green lights will be equal to yellow lights.

Hence, statement 1 and 2 are correct.

$$R = B,\ G = Y \qquad\qquad \dots\text{(i)}$$

Sum of red and green lights $= R + G$

From equation (i),

$$R + G = B + Y$$

Hence, statement 3 is also correct.

It is very much possible that sum of red and blue lights is not equal to sum of green and yellow lights.

Let us assume that one step of the ladder has one red light, so the other light will be blue.

Now, any number of steps can have green lights.

Therefore, statement four is not necessarily correct.

Hence, the correct option is (D).

1.19 (D)

Let, Total reports, $x = 500$ thousand tonnes

Total revenues, $y = 250$ crore rupees

From the given pie charts :

Item	kg	Revenues	Revenue/kg
1.	$0.11x$	$0.12y$	$1.0909(y/x)$
2.	$0.2x$	$0.2y$	(y/x)

3.	$0.19x$	$0.23y$	$1.21(y/x)$
4.	$0.22x$	$0.06y$	$0.27(y/x)$
5.	$0.12x$	$0.2y$	$1.67(y/x)$
6.	$0.16x$	$0.19y$	$1.19(y/x)$

From the table, item-5 has maximum ratio.

Hence, the correct option is (D).

1.20 20000

Let total cost in $2012 = x$

Total number of air purifiers sold $= 200$

Consider x be the total manufacturing cost in 2012.

From pie chart, share of labor in cost $= 15\%$

Expenditure on labour

$$= 15\%\ \text{of}\ x = 4,50,000$$

$$x = 4,50,000 \times \frac{100}{15} = 30,00,000$$

Total profit in 2012 $= \text{Rs.}10,00,000$

Selling price $= \text{Rs.}30,00,000 + 10,00,000$

$$= \text{Rs. }40,00,000$$

Selling price of one air purifiers

$$= \frac{40,00,000}{200} = \text{Rs.}20,000$$

Hence, the price of each air purifier is **Rs. 20,000**.

1.21 22

Method 1

Let, total cost in 2012 is Rs. 100

Raw material increases in 2013 by 30%,

$$1.3 \times 20 = 26$$

Other expenses increased in 2013 by 20%,

$$1.2 \times 80 = 96$$

Total cost in 2013 = 96 + 26 = 122

Total cost increased by 22%.

Hence, the percentage increased in the total cost for the company in 2013 is **22**.

Method 2

Let total expenses $= x$

Sr.	Product	Cost	Increment
1.	Raw material	$0.2x$	$0.3 \times 0.2x = 0.06x$ [@30%]
2.	Energy	$0.25x$	$0.2 \times 0.25x = 0.05x$ [@20%]
3.	Plant & Machinery	$0.3x$	$0.2 \times 0.3x = 0.06x$ [@20%]
4.	Transportation	$0.1x$	$0.2 \times 0.1x = 0.02x$ [@20%]
5.	Labour	$0.15x$	$0.2 \times 0.15x = 0.03x$ [@20%]
	Total	x	$0.22x$

Hence, % increment in total cost $= 22\%$

Hence, the percentage increased in the total cost for the company in 2013 is **22**.

1.22   (C)

Let, $x_1 =$ Number of male students in 2011

$x_2 =$ Number of male students in 2012

$y_1 =$ Number of female students in 2011

$y_2 =$ Number of female students in 2012

According to the question,

$y_1 = y_2 = y$

From the graph,
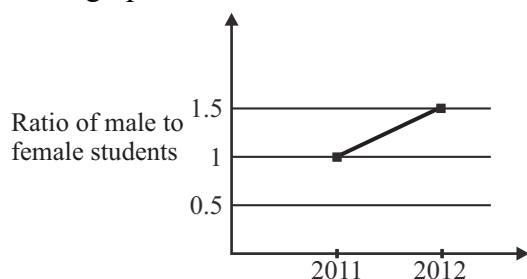
The ratio of male to female student in 2011,

$$\frac{x_1}{y_1} = \frac{x_1}{y} = 1$$

$x_1 = y$ …(i)

and the ratio of male to female students in 2012,

$$\frac{x_2}{y_2} = \frac{x_2}{y} = 1.5$$

$x_2 = 1.5y$ …(ii)

So the required ratio,

$$\frac{x_2}{x_1} = \frac{1.5y}{y} = 1.5 : 1$$

Hence, the correct option is (C).

1.23   (B)

Given : Total number of floors $= 06$

(i)   Anuj : Lives on an even-numbered floor. (2, 4, 6)

(ii)   Bhola : Lives on an even-numbered floor (2, 4, 6)

(iii)   Chandan : Lives on any of the floor above Faisal's.

(iv)   Dilip : Does not live on floor number 2.

(v)   Eshwar : Does not live on any of the floor above or below bhola.

(vi)   Faisal : Lives 3 floor above Dilip

According to options, Dilip lives either on floor 1 or 3 and Faisal lives either on floor 4 or 5. If Dilip lives on 1st floor then Faisal lives on 4th floor and if Dilip lives on 3rd floor then Faisal lives on 6th floor (not possible because Chandan lives on any of the floor above Faisal's, but there is only 6th floors).

Hence, Dilip $\rightarrow$ 1st floor

Faisal $\rightarrow$ 4th floor

From options, option (C) and (D) are incorrect.

Now, Chandan $\rightarrow$ 5th floor

$\{$From options (A) and (B)$\}$

Eshwar $\rightarrow$ 3rd floor

Since, Eshwar can not be immediately above or below, Bhola, So Bhola must be living on 6th floor which means Anuj lives on 2nd floor.

Hence, the correct option is (B).

1.24 (B)

Given : The monthly rainfall chart based on 50 years of rainfall in Agra is shown below,

Statement 1 : On average, it rains more in July than in December.

According to the graph, above statement is correct.

Statement 2 : Every year, the amount of rainfall in August is more than that in January.

The graph shows the average rainfall so it is impossible to predict if every years amount of rainfall in August is more than that in January.

Statement 3 : July rainfall can be estimated with better confidence than February rainfall.

Since, the graph shows that the gap between 5 percentile and 95 percentile from average is higher in February than in July. Therefore, July rainfall can be better estimated than February.

Statement 4 : In August, there is at least 500 mm of rainfall.

This statement may or may not be correct. Since, the graph is average of 50 years.

Hence, the correct option is (B).

1.25 (B)

Given : As per the question, the first and the last sentence of the passage are in proper order and number 1 and 6.

The above question is based on time sequence. Thus, the sentence should be organized in a chronological order clockwise.

Hence, the proper order of above paragraph is,

Sentence	Order
On Diwali, the family rises early in the morning.	1
Father, mother and children visit relatives and exchange gifts and sweets.	5
The whole family, including the young and the old enjoy doing this.	2

At **sunset**, the lamps are lit and the family performs various rituals.	4
Children let off fireworks later in the **night** with their friends.	3
Houses looks so pretty with lighted lamps all around.	6

This arrangement makes a logical sequence (5, 2, 4, 3) in clockwise order.

Hence, the correct option is (B).

1.26 (D)

Following table can be drawn from cumulative table :

Stretch	Distance	Electricity used (kWh)	Electricity Consumption per km
M	20	12	$\frac{12}{20} = 0.6$
N	$45 - 20 = 25$	$25 - 12 = 13$	$\frac{13}{25} = 0.52$
O	$75 - 45 = 30$	$45 - 25 = 20$	$\frac{20}{30} = 0.66$
P	$100 - 75 = 25$	$57 - 45 = 12$	$\frac{12}{25} = 0.48$

The electricity consumption per km is minimum for P.

Hence, the correct option is (D).

1.27 (B)

If you look into the given statement there is a gap of one day between 20/5/2014 and 22/5/2014. This means Ms. X will be in Kochi for only one day in may.

Hence, the correct option is (B).

1.28 (A)

Given :

Two floors in a certain buildings are 9 feet apart.

Thus, the height of successive floors = 9 feet

And, the height of each step $= \frac{3}{4}$ feet

So, number of steps $= \dfrac{9}{(3/4)} = 12$ steps

To find the number of steps, width of step is not required. Hence, only statement I is needed.

Hence, the correct option is (A).

1.29   (A)

The first two statements are appropriate to tackle the situation.

The third statement implies to put a ban on water supply in lower areas which is morally wrong and should not be done.

Hence, the correct option is (A).

1.30   32

Let total number of students $= x$

Then according to the given pie chart, the number of students are :

Branch	Number of students (In % of x)
Electrical	20% of x = 0.2x
Mechanical	10% of x = 0.1x
Civil	30% of x = 0.3x
Computer Science	40% of x = 0.4x

According to question,

The ratio of male to female students in each department $= 5:4$.

and the number of male students in Electrical is,

$$= \frac{5}{5+4} \times 0.2\,x = 40$$

So, $\dfrac{x}{9} = 40$

$x = 360$

So, the number of female students in Civil

$$= \frac{4}{5+4} \times 0.3\,x = \frac{4}{9} \times 0.3 \times 360 = 48$$

and the number of female students in Mechanical

$$= \frac{4}{5+4} \times 0.1\,x = \frac{4}{9} \times 0.1 \times 360 = 16$$

Thus, the required difference is given by,

$$= \text{Female}_{(\text{Civil})} - \text{Female}_{(\text{Mechanical})}$$

$$= 48 - 16 = 32$$

Hence, the correct answer is **32**.

1.31   (C)

Let the weight of each pole $= x$

Statement (I) : One fourth of the weight of a pole is 5 kg.

$$\frac{x}{4} = 5 \text{ kg} \qquad \Rightarrow \qquad x = 20 \text{ kg}$$

Total weight of 10 poles $= 10x = 200$ kg

Which means that statement (I) is alone sufficient.

Statement (II) :

Total weight of 10 poles $= 10x$

Total weight of 2 poles $= 2x$

Given $10x - 2x = 160$ kg

$\Rightarrow$ $x = 20$ kg

Total weight $= 10x = 200$ kg

Which means that statement (II) is alone sufficient.

So, either (I) or (II) alone is sufficient.

Hence, the correct option is (C).

1.32   (A)
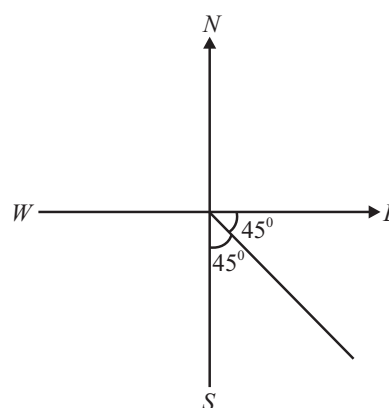
M is north of N, at a distance of 4 km.

P is south of O, at a distance of 2 km

N is south-east of O by 1 km

Distance between M and P is
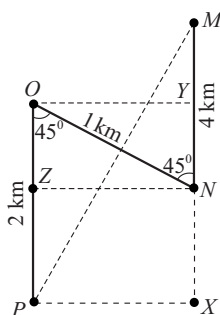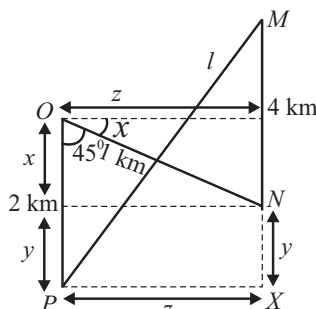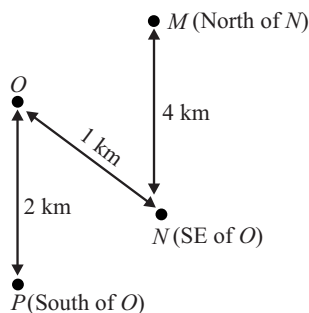
From ONY triangle,

$$NY = NO\cos 45^0 = \frac{1}{\sqrt{2}}$$

$$PX = OY = NO\sin 45^0 = \frac{1}{\sqrt{2}}$$

$$NY = OZ = \frac{1}{\sqrt{2}}$$

Thus, $ZP = NX = 2 - \dfrac{1}{\sqrt{2}} = 1.3$

$$MX = 4 + 1.3 = 5.3$$

By Pythagoras theorem in ΔMXP,

$$(MP)^2 = (MX)^2 + (PX)^2$$

$$(MP)^2 = 5.3^2 + 0.707^2 \quad [PX = OY]$$

$$MP = 5.34 \text{ km}$$

Hence, the correct option is (A).

1.33 (B)

Given : Tanya is older than Eric and Cliff is older than Tanya.

$$\text{Cliff}$$
$$\uparrow$$
$$\text{Tanya}$$
$$\uparrow$$
$$\text{Eric}$$

From above figure, Cliff is older than Eric if first two statements are true.

Statement 3 : Eric is older than Cliff.

So, it is a false statement.

Hence, the correct option is (B).

1.34 (B)

Given : ROAD is written as URDG.

By following A – Z alphabetic chart :

R – U : In between two alphabets
O – R : In between two alphabets
A – D : In between two alphabets
D – G : In between two alphabets

So,
S	T	U	V
W	X	Y	Z
A	B	C	D
N	O	P	Q

Hence, the correct option is (B).

1.35 (B)

Given :

(i) There are 5 portfolios, home, power, defense, telecom and finance.

(ii) 6 selected members P, Q, R, S, T and U are to be appointed in 5 portfolios.

(iii) U does not want any portfolio if S gets one of the five.

(iv) R wants either Home or Finance or no portfolio.

(v) Q says that if S gets either Power or Telecom, then she must get the other one. T insists on a portfolio if P gets one.

R wants Home or Finance or no portfolio. In option (A) and (D), R has Defense and Telecom. So, both options are incorrect.

U does not want a portfolio if S gets one of the five. In option (C), S and U both have portfolios. So, option (C) is also incorrect.

Hence, the correct option is (B).

1.36   (D)

Given : Capacity of a solution tank A is 70% of the capacity of tank B.

Statement I : Tank A is 80% full and tank B is 40% full.

Statement II : Tank A if full contains 14,000 gallons of solution.

Statement I can be used to solve the question if capacity of both tanks is already known and statement II can be used if it is known how much each tank is full/empty.

Therefore, by using both statements,

Let capacity of tank B is x,

Then, $\dfrac{70}{100} x = 14000$

$x = 20000$ gallons

Since, tank A was 80% full,

$A = \dfrac{80}{100} \times 14000 = 11200$ gallons

Since, tank B was 40% full,

$B = \dfrac{40}{100} \times 20000 = 8000$ gallons

Total solution $= 11200 + 8000$

$= 19200$ gallons

Hence, the correct option is (D).

1.37   (A)

Given : Total fruits = 5692000

Unripe fruits = 15%

Apples in unripe fruits = 45%

Oranges in ripe fruits = 66%

According to the question, following tree diagram can be made.
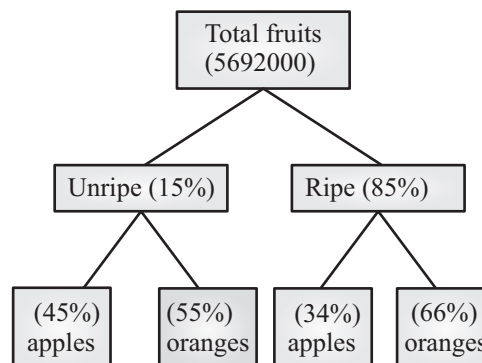
Total number of apples

= Ripe apples + Unripe apples

$= [(0.85 \times 0.34) + (0.15 \times 0.45)]$

$\times 5692000$

$= 2029198$

Hence, the correct option is (A).

1.38   (D)
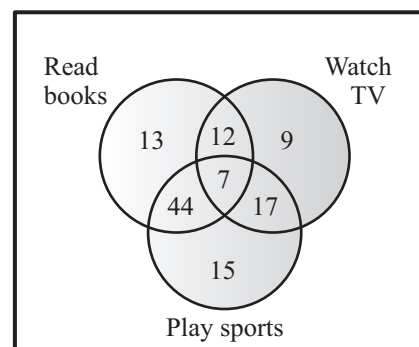
The number of students who read books,

$n(R) = 12 + 44 + 7 + 13 = 76$

The number of students who play sports,

$n(S) = 44 + 7 + 17 + 15 = 83$

The number of students who read books and play sports.

$n(R \cap S) = 44 + 7 = 51$

The number of students who read books or play sports is given by,

$n(R \cup S) = n(R) + n(S) - n(R \cap S)$

$n(R \cup S) = 76 + 83 - 51 = 108$

Hence, the correct option is (D).

1.39 **(C)**

Given : Total number of students = 04
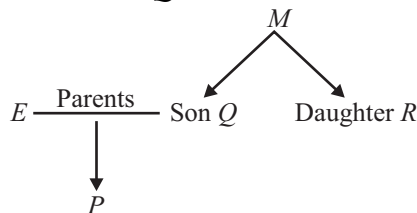
According to question,
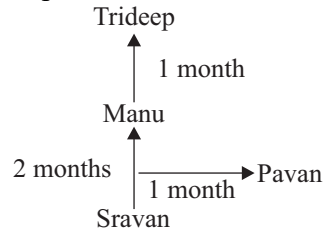
The oldest of all the students occupies the extra space. From above figure, it is clear that Trideep is the oldest.

Hence, the correct option is (C).

1.40 **(B)**

Given : M has a son Q and a daughter R only.

E is the mother of P and daughter-in-law of M i.e. E is the wife of Q.

From above figure, it is clear that P is the grandchild of M.

Hence, the correct option is (B).

1.41 **(A)**

Total faculty members = 150

The faculty members having Facebook® account = FB = 55

The faculty members having WhatsApp®
    = W = 85

The faculty members do not have Facebook® (or) WhatsApp® accounts = 30.

The faculty members having any account
    = 150 – 30 = 120.

The faculty members having both the accounts
    = (FB + W) – 120 = (55 + 85) – 120 = 20

Therefore, the number of faculty members connected only through Facebook® accounts
    = 55 – 20 = 35
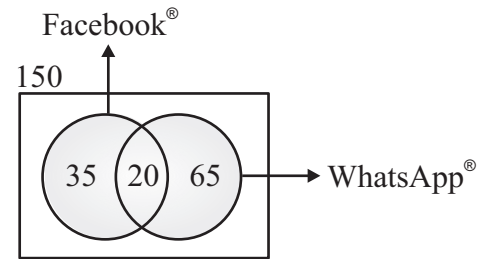
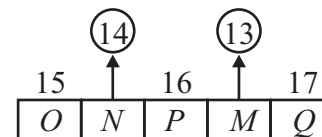

Hence, the correct option is (A).

1.42 **(D)**

(A)
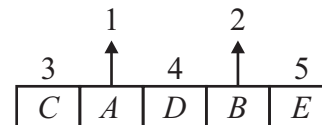
(B)
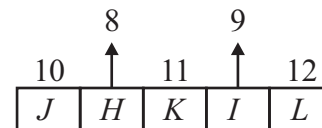
(C)
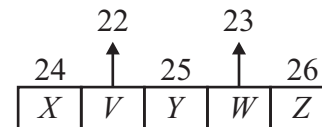
(D)

For options (A), (B) and (C) a common pattern follows.

The 2nd, 4th, 1st, 3rd, 5th letters are consecutive alphabets.

For example, in option (B) : *JHKIL*

    H - 2nd letter

    I - 4th letter

    J - 1st letter

    K - 3rd letter

    L - 5th letter

Option (D) does not follow this pattern.

Hence, the correct option is (D).

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1.43 (C)

Method 1

In given 2×4 rectangle grid, the following type of rectangles are present :

One figured rectangles = 8
Two figured rectangles = 10
Three figured rectangles = 4
Four figured rectangles = 5
Six figured rectangles = 2
Eight figured rectangles = 1

So, total number of rectangles = 30

Hence, the correct option is (C).

Method 2

No. of rows in given cell = 2
No. of column in given cell = 4

Formula :

Total number of cells $= \dfrac{R(R+1)}{2} \times \dfrac{C(C+1)}{2}$

$= \dfrac{2(2+1)}{2} \times \dfrac{4(4+1)}{2} = 30$

Hence, the correct option is (C).

Method 3

Formula : Total number of cells =

Addition of no. of rows × Addition of no. of columns

$= (1+2) \times (1+2+3+4) = 3 \times 10 = 30$

Hence, the correct option is (C).

1.44 120

Installed capacity ≥ 200 tonnes
$\Rightarrow$ large plant

Installed capacity < 200 tonnes
$\Rightarrow$ small plant

From given graph, the large plants are 1, 4, 8 & 9

Total production of large plants
= 160 + 190 + 230 + 190 = 770 tonnes

Total production of small plants
= 150 + 160 + 120 + 100+ 120
= 650 tonnes

The difference between total production of large plants and small plants in tonnes
= 770 – 650 = 120

Hence, the correct answer is **120**.

1.45 (C)

Given :

(i)   'relftaga' means carefree.
(ii)   'otaga' means careful.
(iii)   'fertaga' means careless.

Here, it is clear that 'taga' means care and if taga comes at the end in code language then meaning has 'care' at the front.

So, option (A) and (D) are incorrect.

In 'fertaga', 'fes' means less.

So, 'Tagafer' means less care.

Therefore, 'Tagazen' means aftercare.

Hence, the correct option is (C).

1.46 (B)

Elegance	Smooth	Soft	Executive
27300	20009	17602	9999
25222	19392	18445	8942
28976	22429	19544	10234
21012	18229	16595	10109
102510	**80059**	**72186**	**39284**
Rs. 48	**Rs. 63**	**Rs. 78**	**Rs. 173**
102510 ×48	80059 ×63	72186 ×78	39284 ×173
=4920480	=5043717	=5630508	=6796132

From the above table it is clear that, more revenue is obtained from executive.

Hence, the correct option is (B).

1.47 (A)

Given :

	Winner		Loses
P v/s Q	P	Always	Q
R v/s S	R	Always	S

S v/s P	P/S	Sometimes	P/S
R v/s Q	Q	Always	R

From the given data, it can be clearly inferred that P always beats Q. Since, Q always beats R, P can also beat R. P only sometimes beats S. Hence, P is likely to beat all the other three player. So, statement (i) can be logically inferred.

S only sometimes loses to P i.e. sometimes S wins as well, meaning S beats the best player sometimes. Hence, S can't be absolute worst player in the set.

So, statement (ii) can not be logically inferred.

Hence, the correct option is (A).

1.48 (C)

Given : B, FH, LNP …

Position of $B = 02$

$$B + 04 = 02 + 04 = 06\,(F)$$

Position of F and H $= 06$ and 08

$$H + 4 = 8 + 4 = 12\,(L)$$

Position of L, N and P $= 12$, 14 and 16

$$P + 4 = 16 + 4 = 20\,(T)$$

It is clear that alphabets in the series have single alphabet spacing between them. So,

     T   U   **V**   W   **X**   Y   **Z**
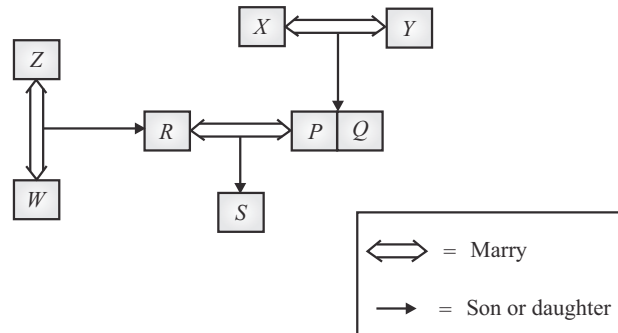
Hence, the correct option is (C).

1.49 (A)

Following circular seating arrangement can be drawn
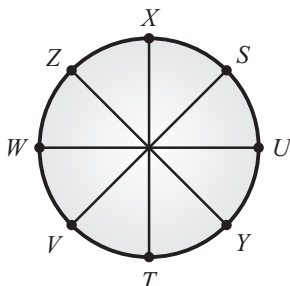
Only one such arrangement can be drawn. The person on third to the left of V is X.
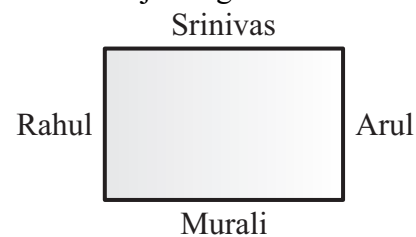
Hence, the correct option is (A).

1.50 (B)

(i) X is mother-in-law to R. Therefore option (A) is true.

(ii) P and R can marry. Therefore option (B) is false.

(iii) Q and R cannot marry. Therefore option (C) is true.

(iv) P is son of X and Y. Therefore option (D) is true.

Hence, the correct option is (B).

1.51 (C)

Given :

(i)   Rahul, Murali, Srinivas and Arul are sitting around a square table.

(ii)   Rahul is just left to Murali.

(iii)   Srinivas is just right to Arul.

It can be concluded that Rahul is opposite to Arul and Srinivas is opposite to Murali.

Hence, the correct option is (C).

1.52 (B)

Given : All boxes have been labelled incorrectly. So,

Statement 1 : Box labelled "Apples" is either "Oranges" or "Apples and Oranges".

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Statement 2 : Box labelled "Oranges" is either "Apples" or "Apples and Oranges".

Statement 3 : Box labelled "Apples and Oranges" is either "Apples" or "Oranges".

After opening the box labelled "Apples and Oranges", if we get Apple in it then it is sure that the box labelled "Apples and Oranges" is actually Apple.

So, Box labelled "Oranges" can have either only 'oranges' or 'apples and oranges'. Since, all boxes are incorrectly labelled, box labelled as oranges can not have only oranges. Therefore, it must be having oranges and apple and box labelled "Apples" has to be "Oranges".

Hence, the correct option is (B).

1.53   (C)

To verify the proposition the least number of cards that must be turned will be two.

(i)   Card with visible face of a colour.

(ii)   Card with visible face of a number.

Case 1 : Blue card and '2' card :

If the blue card has number 2 on the other side then proposition is incorrect but if the other side has number 3 then next card has to be turned.

Now, if card '2' has colour red on the other side then proposition is correct but if other side has colour blue then the proposition is wrong.

Case 2 : Red card and '3' card :

If the red card has number 2 on the other side then we need a confirmation whether a number card has a red colour on the other side or blue colour. For that we must turn card '3'. If card '3' has red colour on the other side then the proposition is wrong but if on the other side has blue colour then the proposition is correct.

Case - 2 does not match with any of the options.

Hence, the correct option is (C).

1.54   (D)

From the given graph it is clear that,

(i)   The halt at fourth floor is of 19 minutes over the period of one hour and at the ground floor the halt is of 21 minutes. So, statement (ii) is wrong.

(ii)   It is clear from the graph that the left moves directly from any non-ground floor to another non-ground floor over the one hour period multiple times such as,

(a) At $t = 5$, from 1st to 5th floor

(b) At $t = 10$, from 1st to 4th floor and so on.

So, statement (i) is also wrong.

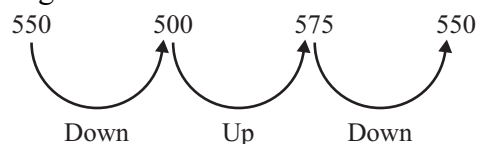Hence, the correct option is (D).

1.55   (B)

$$40\% \text{ of } 360^0 = \frac{40}{100} \times 360^0 = 144^0$$

So, the angle subtended on pie chart $= 144^0$.

Hence, the correct option is (B).

1.56   (C)

Contour lines can be observed to cross region with height

550   500   575   550

Down   Up   Down

Down-Up-Down satisfies.

Hence, the correct option is (C).

1.57   (D)

Given : The table below shows number of students taking respective subjects.

Subject	Number of students
Chemistry	329
Physics	186
Mathematics	295

Chemistry & Physics	83
Chemistry & Mathematics	217
Mathematics & Physics	63

This information is represented in a Venn diagram as given below,

(Assume x number of students are taking all the three subject.)
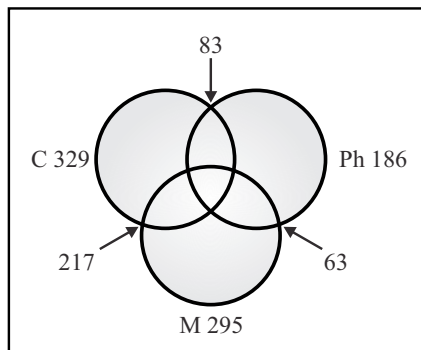
$$P(C \cup Ph \cup M) = P(C) + P(Ph)$$
$$+P(M) - P(C \cap Ph) - P(C \cap M)$$
$$-P(Ph \cap M) + P(C \cap Ph \cap M)$$
$$P(C \cup Ph \cup M) = 329 + 186 + 295$$
$$-83 - 63 - 217 + x$$
$$P(C \cup Ph \cup M) = 447 + x \qquad …(i)$$

Also, total number of students is 500.

So, $P(C \cup Ph \cup M) = 500$ …(ii)

From equations (i) and (ii),

$x = 500 - 447 = 53$

Hence, the correct option is (D).

1.58 (B)

Given : P is 16 years old, Q is 25 years old, R is drinking milkshake and S is drinking beer.

Since, age of P is less than 18 year, so checking $P's$ drink and since S is drinking a beer so it is required to check age of S for the rule to be followed.

Also, since Q is 25 years old, he may have any drink and since R is drinking milk shake so there are no issues.

Therefore, P's and S's age should be checked to ensure that the rule is being followed.

Hence, the correct option is (B).

1.59 (B)

Given : Contour lines are plotted at a distance of 25 m.

Since, from figure it is clear that 'R' (425 m) is the only point which is very far from 'P'.

Steep path means a path which is rising or falling very rapidly.

$P \rightarrow R$ is a very narrow distance of about 150 m. Therefore, steepest path from 'P' is 'R'.

Hence, the correct option is (B).

1.60 (C)

It is given that contour lines are at 25 m interval in the given figure.

On calculating distance,

$P = 575$ m

$Q = 525$ m

$R = 475$ m

$S = 475$ m

$T = 500$ m

Also, given that flood level rises to 525 m i.e. a village with a height less than 525 m will gets submerged.

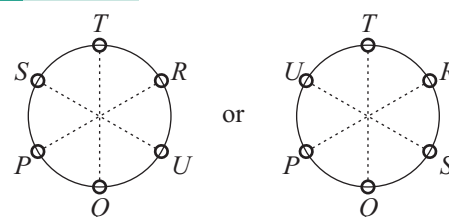Thus, the villages which will be submerged if water level rises to 525 m are R, S and T.

Hence, the correct option is (C).

1.61 (C)

Most number of contours is passing through the region R. So, this region is most likely to have a thunderstorm.

Hence, the correct option is (C).
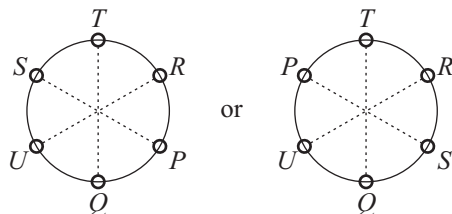
1.62 (C)

Now, P and U switch seats,

Fig. (a)		**Fig. (b)**

(i)   In both figure,
       P is not immediately to the right of R.

(ii)   In figure (a), T is not immediately to the left of P.

(iii) In figure (a), P is immediately to the right of Q.
       In figure (b), T is immediately to the left of P.

(iv)   In both figure, U is not immediately to right of R and P is not immediately to the left of T.

Hence, the correct option is (C).

1.63   **(B)**

Given table is shown below,

Names	Student seniority	Current room	Room preference list
Amar	1	P	R, S, Q
Akbar	2	None	R, S
Anthony	3	Q	P
Ajit	4	S	Q, P, R

Amar is the most senior student and his first preference is room R. So, he will move to room R. Akbar is second in the seniority list. Since, R is allotted to Amar, Akbar will get room S. Next in line is Anthony, who will move to room P. So, Ajit will get room Q.

Hence, the correct option is (B).

1.64   **(C)**

Given figure is shown below,

(i)   Number of beds made by carpenter C2
       $= 20 - 12 = 8$

Number of tables made by carpenter C3
       $= 13 - 5 = 8$

So, statement (i) is true.

(ii)   Total number of chairs made by all components
       $= C1 + C2 + C3 + C4 + C5$
       $= 2 + 10 + 5 + 2 + 4$
       $= 23$

Total number of tables made by all carpenters
       $= C1 + C2 + C3 + C4 + C5$
       $= 7 + 2 + 8 + 3 + 10$
       $= 30$

So, statement (ii) is also true.

Hence, the correct option is (C).

1.65   **(A)**

Given :

(i) P states that S has at least 3 cars
       i.e. $S \geq 3 \Rightarrow S = 3, 4....$

(ii) Q believes that S has less than 3 cars
       i.e. $S < 3 \Rightarrow S = 0, 1, 2$

(iii) R believes that S has at least 1 car
       i.e. $S \geq 1 \Rightarrow S = 1, 2, 3....$

(iv)   Only one of P, Q and R is right

If we assume P is right then S can have 4, 5, 6, ….. cars but not 3 because then R will be right as well but only one of them can be right. But 4, 5, 6, …. are not given in the options.

If we assume Q is right then S will have 0 cars because $S = 1, 2$ is also present in R.

If we assume R is right then P and Q will be right as well.

Therefore, the number of cars owned by S is 0.

Hence, the correct option is (A).

1.66   **(A)**

Given : Minimum bacterial population density of 0.8 is needed to form curd.

According to the given graph,

(i)   Growth in bacterial population stops at 150 min. at $37^0 C$ and for $25^0 C$, it stops at 180 min.

        So, statement (i) is true.

(ii)   The time taken for curd formation at $25^0 C$ is a little more than 120 min. At $37^0 C$, it is 90 min.

        So, statement (ii) is not true.

Hence, the correct option is (A).

1.67   **(D)**

Given :

(i) P looks at Q and Q looks at R.

(ii) P is married and R is unmarried.

Since, the martial status of Q is unknown, it can not be determined that how many pairs of people in which a married person is looking at an unmarried person.

Hence, the correct option is (D).

1.68   **(B)**

Given plot is shown below,

According to the above plot,

(i)   In winter, the difference between maximum and minimum pollutant concentration

        $= 8 - 0 = 8$

        In summer, the difference between maximum and minimum pollutant concentration
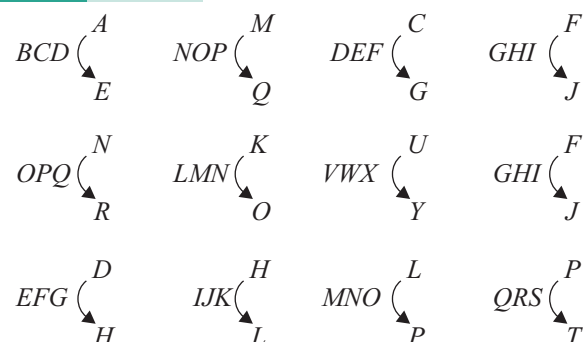
        $= 10.5 - 1.5 = 9$

        So, statement (i) is incorrect.

(ii)   Between 10th day and 14th day (4 days) in the summer month, the pollutant concentrations on the corresponding days in the winter month.

        So, statement (ii) is correct.

Hence, the correct option is (B).

1.69   **(C)**

$$BCD \binom{A}{E} \quad NOP \binom{M}{Q} \quad DEF \binom{C}{G} \quad GHI \binom{F}{J}$$

$$OPQ \binom{N}{R} \quad LMN \binom{K}{O} \quad VWX \binom{U}{Y} \quad GHI \binom{F}{J}$$

$$EFG \binom{D}{H} \quad IJK \binom{H}{L} \quad MNO \binom{L}{P} \quad QRS \binom{P}{T}$$

Hence, the correct option is (C).

1.70   **(C)**

P has to row on return journey as he can not row with anyone else. On next trip P will be leaving R and R will row. After this R will return back to pickup Q so on the last trip Q and R will go together in which Q will be rowing the boat.

Therefore, R will be rowing the boat twice.

Hence, the correct option is (C).

1.71   **(A)**

From the above graph, it is clear that during the period 2002 to 2004, there was relatively no crow birth and cracker sales also remained flat during the same.

From 2004 to 2005, there was a sudden spike in crow birth as well as cracker sales.

In 2006 crow birth and sales of crackers decrease simultaneously.

Therefore, it can be said that there is strong correlation between crow birth and cracker sales.

Increase or decrease in sales of crackers does not affect the increase or decrease in birth of crows.

Hence, the correct option is (A).

1.72   **(D)**

Given :

(i)   Total number of candidates appeared = 6,30,000

(ii)   Question A was answered correctly by 3,30,000 candidates.

(iii) Question *B* was answered correctly by 2,50,000 candidates

(iv) Question *C* was answered correctly by 2,60,000 candidates.

(v) Both questions *A* and *B* were answered correctly by 1,00,000 candidates.

(vi) Both questions *B* and *C* were answered correctly by 90,000 candidates.

(vii) Both questions *A* and *C* were answered correctly by 80,000 candidates.
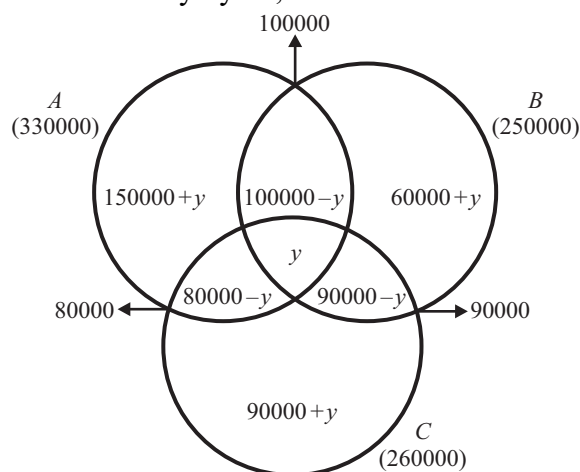
$y =$ Total number of candidates attempted all questions correctly.

Number of students answering all questions correctly = Number of students answering zero questions correctly $= y$

According to question,

Total number of candidates

= Number of candidates with only one correct answer + With only two correct answers + With all correct answers + No correct answers.

$630000 = (150000 + y + 60000 + y$

$\qquad +90000 + y) + (100000 - y + 80000 - y$

$\qquad\qquad +90000 - y) + y + y$

$630000 = 2y + 150000 + 100000 + 80000$

$\qquad\qquad +60000 + 90000 + 90000$

$630000 - 570000 = 2y$

$y = 30000$

The students failed to clear the test = Number of students answered only one question correctly + Number of students answered zero questions correctly

$= (150000 + y + 60000 + y + 90000 + y) + y$

$= 150000 + 60000 + 90000 + 4y$

$= 300000 + 4 \times 30000 = 420000$

Hence, the correct option is (D).

1.73   **(B)**

Given : $T = K\left(\theta_p + T_0\right)$

Table is shown below,

T_0	p	T
25	2	32.4
30	5	42.0

According to the given data,

$32.4 = K\left(\theta \times 2 + 25\right)$ … (i)

$42 = K\left(\theta \times 5 + 30\right)$ … (ii)

From equation (i) and (ii),

$\dfrac{42}{32.4} = \dfrac{5\theta + 30}{2\theta + 25}$

$84\theta + 1050 = 162\theta + 972$

$78\theta = 78$

$\theta = 1$

Hence, the correct option is (B).

1.74   **(B)**

Prime factorization of digit 1 to 9 can be written as,

$1 = 1$ $2 = 2$

$3 = 3$ $4 = 2 \times 2$

$5 = 5$ $6 = 3 \times 2$

$7 = 7$ $8 = 2 \times 2 \times 2$

$9 = 3 \times 3$

If $A \times G \times E = B \times G \times E = D \times E \times F$

Will be equal only when prime factorization of all 3 term should be equal.

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But in between 1 to 9 we can observe that 5 and 7 are not present as a prime factor of any term.

To become 5 and 7 as a part of these multiplication there should be a common alphabet, but we can observe there is no any alphabet common in these three.

Therefore, 5 and 7 can't be as a part of these multiplication.

Since, 7 is not present in option.

So, 5 will be correct option.

Hence, the correct option is (B).

1.75 (B)

Given :

(i) Each of the letters represent a unique integer from 1 to 9.

So, $A+B+C......+K = 45$ … (i)

(ii) $A+B+C = 13$ … (ii)

$C+D+E = 13$ … (iii)

$E+F+G = 13$ … (iv)

$G+H+K = 13$ … (v)

Adding all four equation,

$A+B+2C+D+2E+F+2G+H+K = 52$

From equation (i),

$C+E+G = 52-45$

$C+E+G = 7$ … (vi)

and $E+F+G = 13$

From option (A),

$E = 1$

Then, $C+G = 6$

and $F+G = 12$

Now, C and G should be less than 6.

Since, $E = 1$, $C \neq 1$

So, $C = 2$, $G = 4$ or $C = 4$, $G = 2$

When $C = 2$ and $E = 1$, then D has to be 10 for the sum 13 which is not possible.

When $C = 4$ and $G = 2$, then F has to be 10, which is also not possible.

Hence, option (A) is incorrect.

From option (B),

$E = 4$

Then, $C+G = 3$ and $F+G = 9$

Now, C and G should be less than 3.

Let $C = 1$, $G = 2$ or $C = 2$, $G = 1$

When $C = 1$, $G = 2 \Rightarrow F = 7$ [Possible]

$C+D+E = 13$

$1+D+4 = 13$

$D = 8$

So, $C = 1$, $D = 8$, $E = 4$, $F = 7$, $G = 2$

Now, $A+B+C = 13$

So, $A = 9$, $B = 3$ or $A = 3$, $B = 9$

$G+H+K = 13$

So, $H = 6$, $K = 5$ or $H = 5$, $K = 6$

It is clear that every alphabet has unique number.

Hence, the correct option is (B).

1.76 (C)

Given : Annual average rainfall = 1000 mm

Rainfall falling on a rooftop = 50%

Obstruction-free area = 50 m^2

Cumulative rainfall (from the graph) = 300 mm

50% of the cumulative rainfall

$= \dfrac{50}{100} \times 300 = 150 \text{ mm} = 150 \times 10^{-3} \text{ m}$

Total volume of water collected in the tank = Obstruction-free area × 50% of cumulative rainfall

Total volume of water collected in the tank
$= 50 \times 150 \times 10^{-3} = 7.5 \text{ m}^3 = 7500 \text{ liters}$

Hence, the correct option is (C).

1.77 (D)

Given :

A house has a number which needs to be identified, using 3 given conditions.

According to statement (i) :

Possible numbers are $\rightarrow$ 51, 54, 57

According to statement (ii) :
Possible numbers are
→ 61, 62, 63, 65, 66, 67, 69

According to statement (iii) :
Possible numbers are
→ 70, 71, 73, 74, 75, 76, 77, 79

From option (A) : 54 is a multiple of 3 and it is a number from 50 to 59 [first condition satisfied]. 54 is not a multiple of 4 but it does not belong to the range 60-69. Therefore, it is incorrect.

From option (B) : Condition 1 can not be applied for 65. 65 is not a multiple of 4 and belongs to rage 60-69 [Second condition satisfied]. Also, 65 is not a multiple of 6 but it does not belong to the range 70 -79. Therefore, it is also incorrect.

From option (C) : 66 is a multiple of a 3 but does not belong to the range 50 – 59 . Therefore it is incorrect

From option (D) : Condition (i) and (ii) can not be applied here because 76 is not a multiple of 3 but it is a multiple of 4. 76 though, it is not a multiple of 6 and belongs to the range 70-79 [Third condition satisfied]
Hence, the correct option is (D).

1.78 (B)

Given : $E = 10$, $J = 20$, $O = 30$, $T = 40$
Here, $E = 2 \times$ Position of $E(5^{th}) = 10$
$J = 2 \times$ Position of $J(10^{th}) = 20$ and so on.
Therefore, $P = 2 \times$ Position of $P(16^{th}) = 32$
$S = 2 \times$ Position of $S(19^{th}) = 38$
So, $P + E + S + T = 32 + 10 + 38 + 40 = 120$
Hence, the correct option is (B).

1.79 (D)

Given :
(i) Q is wife of P.
(ii) R is child of P and T is child of S.
Since, T is child of S, S can not be aunt of T.
Hence, the correct option is (D).

1.80 (B)

Given :
(i)   No pair should work for more than 5 hours.
(ii)   Ram and John have worked together for 5 hours.
(iii)   Krishna and Amir have worked as a team for 2 hours.
(iv)   Krishna does not want to work with Ram.
John can not work with Ram anymore since his 5 hours have been completed with Ram. Now, John can either work with Krishna or Amir. If John works with Amir, Krishna will have to work with Ram but since it is clearly mentioned that Krishna does not want to work with Ram, Krishna has to work with John and Amir will then work with Ram for all workers to continue working.
Hence, the correct option is (B).

1.81 (B)

Given :
(i)   Out of four criminals P, Q, R and S, only one committed the crime
(ii)   Only one criminal is telling the truth.
If P is telling the truth then Q and R both committed the crime which is not possible.
If Q is telling the truth then S and R both committed the crime which is again not possible.
If R is telling the truth then Q and S will contradict each other.
If S is telling the truth only R committed the crime.
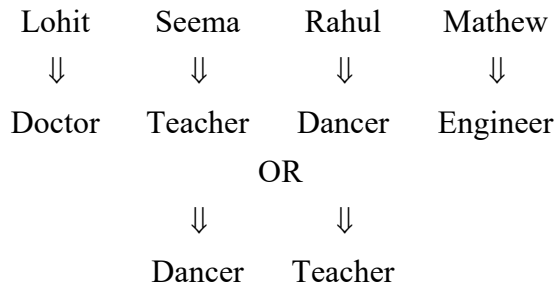Hence, the correct option is (B).

1.82 (D)

According to given data, Z believes in vastu and wants to stay in the south-west wing. In all the given options, Only option (D) satisfies this request.
Hence, the correct option is (D).

1.83 **(D)**

According to the given data,

Lohit	Seema	Rahul	Mathew
⇓	⇓	⇓	⇓
Doctor	Teacher	Dancer	Engineer

OR

⇓	⇓
Dancer	Teacher

According to the given statements, the positions with profession of different peoples are shown above.

Only Mathew can be the engineer and Lohit can be the doctor, Seema and Rahul are teacher and dancer but we cannot surely tell about them.
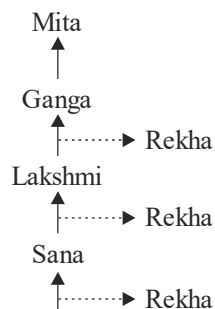
Hence, the correct option is (D).

1.84 **(A)**

It is given that P and Q share the same office, R and T share the same office and S is in the adjacent office of R. Only option (A) satisfies the given conditions.

Hence, the correct option is (A).

1.85 **(A)**

From the given information, we can draw as follows

Mita
↑
Ganga
⋮·······► Rekha
Lakshmi
⋮·······► Rekha
Sana
⋮·······► Rekha

There is no clear information about height of Rekha except that Rekha is shorter than Mita and Ganga. Sana is shorter than Mita, Ganga and Lakshmi.
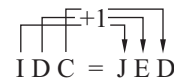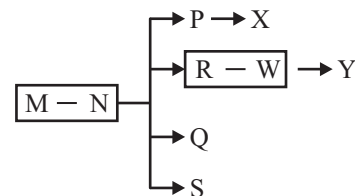
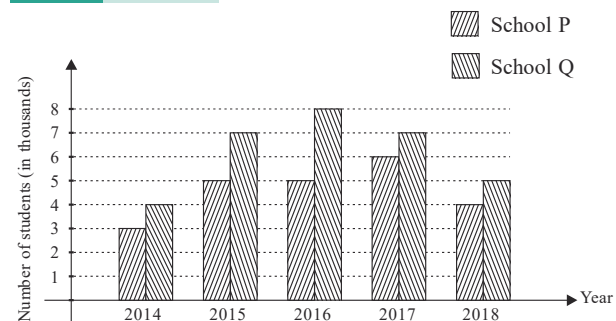Hence, the correct option is (A).

1.86 **(B)**

Given :

I M H O = J N I P   I D K = J E L   S O = T P

Hence,

I D C = J E D

Hence, the correct option is (B).

1.87 **(A)**

M − N → P → X
       → R − W → Y
       → Q
       → S

Since, only P and R married and the both have child X and Y respectively whereas Y is also child of W. So, there is no relation between P and W i.e. W can't be wife of P.

Hence, the correct option is (A).

1.88 **(B)**

School P
School Q

Average students enrolled in

$$P = \frac{3+5+5+6+4}{5} = \frac{23}{5}$$

Average of difference of students enrolled in school

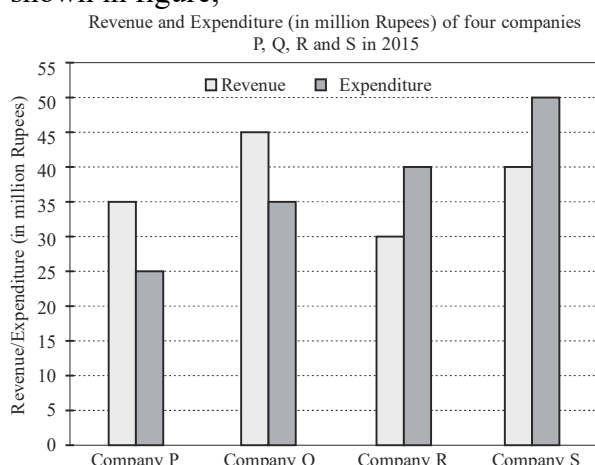$$P \text{ and } Q = \frac{2+1+3+1+1}{5} = \frac{8}{5}$$

Ratio of average students enrolled in school P to the ratio of average of difference of students enrolled in school P and Q

$$= \frac{23/5}{8/5} = 23:8$$

Hence, the correct option is (B).

1.89 (A)

Given : Bar chart showing line revenue and expenditure of four companies P, Q, R & S is shown in figure,

Revenue and Expenditure (in million Rupees) of four companies P, Q, R and S in 2015

Revenue of company Q in 2015 = 45 million

Given that it is 20% more than that in 2014.

Let revenue of Q in 2014 is x million

Then, $x + x \times \dfrac{20}{100} = 45$

$\Rightarrow$ $x + \dfrac{x}{5} = 45$

$\Rightarrow$ $6x = 45 \times 5$

     $x = 37.5$ million

$(\text{Expenditure}) + \left(\text{Expenditure} \times \dfrac{10}{100} \right) = 37.5$
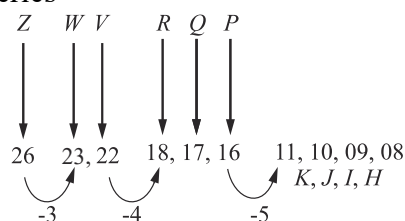
$\Rightarrow$ $\dfrac{11}{10} \times \text{Expenditure} = 37.5$

$\therefore$ $\text{Expenditure} = \dfrac{37.5}{1.1} = 34.09 \approx 34.1$

Hence, the correct option is (A).

1.90 (B)

Given series

Z $W\ V$ $R\ Q\ P$

26   23, 22   18, 17, 16   11, 10, 09, 08
                                  K, J, I, H

     -3   -4   -5

Hence, the correct option is (B)

1.91 (A)

Since, it is asked in the question that P, Q, R and S are to be uniquely coded.

According to question,

     $P \rightarrow \alpha\alpha$

     $Q \rightarrow \alpha\beta$

Therefore, by observation option (B), (C) and (D) are eliminated.

Hence, the correct option is (A)

1.92 (C)

According to question :

1st case pass $\% = \dfrac{280}{500} \times 100 = 56$

2nd case pass $\% = \dfrac{330}{600} \times 100 = 55$

3rd case pass $\% = \dfrac{455}{700} \times 100 = 65$

4th case pass $\% = \dfrac{240}{400} \times 100 = 60$

Total average passing percentage of students

$= \dfrac{56 + 55 + 65 + 60}{4} = 59.0\%$

Hence, the correct option is (C).

1.93 (B)

According to question,

     $XY \propto Z$

     $XY = KZ$

By the observation from above equation, statement of option (B) is false.

Hence, the correct option is (B)

1.94 (D)

Ratio of boys enrolled in arts to the girls enrolled in management

$= \dfrac{\text{Total students in art} - \text{Girls in art}}{\text{Girls in management}}$

$= \dfrac{5000 \times 0.20 - 1500 \times 0.30}{1500 \times 0.15} = 22 : 9$

Hence, the correct option is (D)

1.95 (B)

0, 1, 2, 3, [4, 5,] 6, 7, 8, 9
O, P, Q, R, [S, T,] U, V, W, X

4, 5 will be coded as S, T.
Hence, the correct option is (B).

1.96 (B)

The amount spent on transportation is 10%
The amount spent on education is 15 %
The extra amount spent on education compared to transportation

$$= \frac{15-10}{10} \times 100 = 50\%$$

Hence, the correct option is (B).

1.97 (A)

Given statement : P, Q and T refuses to sleep next to R.

$\therefore$ Options (B), (C) and (D) are incorrect.
       Only option (A) follows the given condition.

Hence, the correct option is (A)

1.98 (C)

Given statement : 'P' wanted a room adjacent to the bas
Therefore option (A) is incorrect.
The statement 'Q wanted to be close to the lift'
Therefore, option (B) is incorrect.
The statement 'S wanted a corner office'
Therefore, option (D) is incorrect.
Only option (C) satisfies all the statements.
Hence, the correct option is (C).

1.99 (B)

From the given pie chart and corresponding table

Month	$X : Y$	Sales $(X + Y)$	X	Y
April	3 : 2	15%	9%	6%
May	1 : 4	10%	2%	8%
June	9 : 11	10%	4.5%	5.5%

Total LED bulbs $= 50000$
The number of LED bulbs sold by the firm Y during April - June 2018 is given by,

$$Y = 19.5\% \text{ of } 50000$$

$$Y = \frac{19.5}{100} \times 50000 = 9750$$

Hence, the correct option is (B).

1.100 (A)

Under high inflation, the real interest rate world be law, hence it is the borrowers and not the lenders who get benefited.
Hence, the correct option is (A).

1.101 (C)

Given : P = 3, R = 27, T = 243
The series of consecutive letters are
     P, Q, R, S and T

Now, $P = 3^1$, $Q = 3^2$, $R = 3^3$, $S = 3^4$, $T = 3^5$

i.e., $Q + S = 3^2 + 3^4 = 9 + 81 = 90$

Hence, the correct option is (C).

1.102 (A)

The total expenditure of the company during 2014 to 2018 $= 500 \times 5 = \text{Rs.} 2000$ millions

Total revenue of the company during 2014 to 2018 $= 500 + 700 + 800 + 600 + 400 = \text{Rs.} 3000$ millions

So, profit % $= \frac{3000 - 2500}{2500} \times 100 = 20\%$

Hence, the correct option is (A).

1.103 (B)

Basic concept : Revenue = Profit + Investment

According to the question, a basic amount is invested by the two companies, let it be 100 and the profit of both the companies is given in the graph.
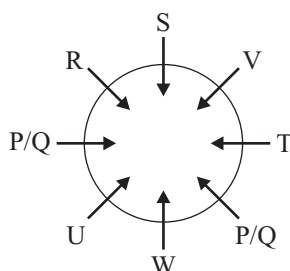
So according to the graph,

$$\frac{\text{Total revenue of company } P}{\text{Total revenue of company } Q} = ?$$

$$= \frac{\begin{array}{l}(100+10)+(100+20)+(100+40)\\+(100+40)+(100+50)+(100+40)\end{array}}{\begin{array}{l}(100+20)+(100+30)+(100+30)\\+(100+50)+(100+60)+(100+60)\end{array}}$$

$$= 16:17$$

Hence, the correct option is (B)

1.104   **(A)**

The seating arrangement of P, Q, R ,S ,T, U, V and W around a circular table can be as follows :

So, the statement which must be true is P is not seated opposite to Q.

Hence, the correct option is (A).

1.105   **(D)**

Given :

According to the data in the question we can form the table as shown below,

| Days	Y	X	%more than the other students
Sunday	65	55	$\dfrac{65-55}{55}\times100\% = 18.18\%$
Saturday	50	60	$\dfrac{60-50}{50}\times100\% = 20\%$
Friday	35	20	$\dfrac{35-20}{20}\times100\% = 75\%$
Thursday	55	60	$\dfrac{60-55}{55}\times100\% = 9.09\%$
Wednesday	50	60	$\dfrac{60-50}{50}\times100\% = 20\%$
Tuesday	65	55	$\dfrac{65-55}{55}\times100\% = 18.18\%$
Monday	70	45	$\dfrac{70-45}{45}\times100\% = 55.55\%$

Except Thursday, there are total 6 days in which one of the students spent a minimum of 10% more than the other student.

Hence, the correct option is (D).

1.106   **(C)**

Given :
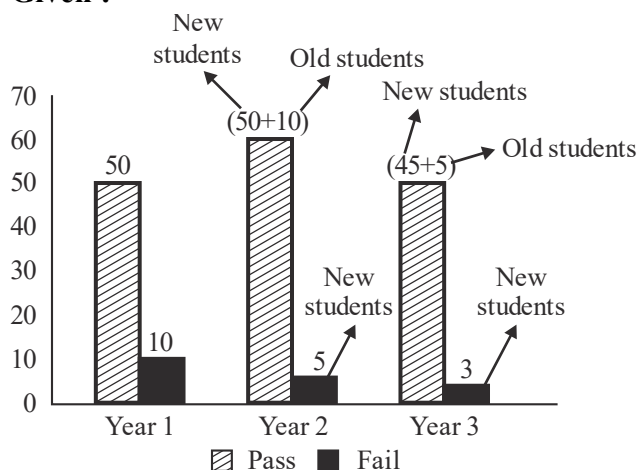
The number of students who took exam for 1st time in year 2nd is,

$$50+5 = 55$$

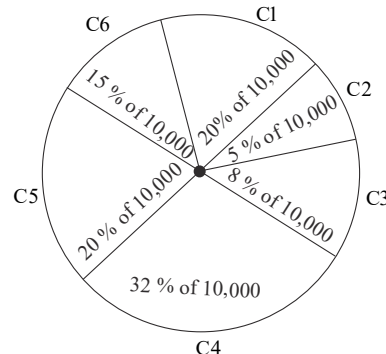The number of students who took exam for 1st time in year 3rd is,

$$45+3 = 48$$

Thus, the number of students who took the exam for the first time in the year 2nd and in the year 3rd respectively are 55 and 48.
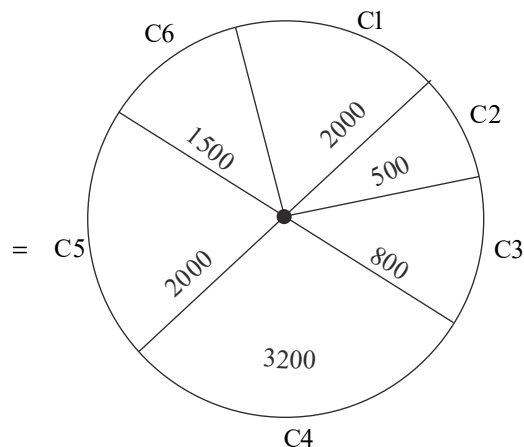
Hence, the correct option is (C).

1.107   **(C)**

Given : Total number of employees = 10000

According to the question,

The ratio of executives with a management degree to those without a management degree in company C2 and C5 are 1 : 4 and 9 : 1 respectively,

Therefore number of executives with management degree in C2 is, $500 \times \dfrac{1}{5} = 100$

And number of executives with management degree in C5 is, $2000 \times \dfrac{9}{10} = 1800$

Thus, the total number of management degree holders among the executives in companies C2 and C5 together is, $100 + 1800 = 1900$

Hence, the correct option is (C).

1.108   **(D)**

Given :

Cost per unit of year 3 = Rs.1

and Cost per unit of year 3

$= \dfrac{\text{cost per unit of year 2}}{2}$

So, cost per unit of year 2

$= 2 \times$ cost per unit of year 3

$= 2 \times 1 = 2.$

Let, Selling price of year 2 = SP2 and

Selling price of year 3 = SP3.

We have taxes in year 2 and year 3 as 13% and 15% of selling price respectively.

So, Tax in year 2 $= 13 \times \dfrac{\text{SP2}}{100} = 0.13 \times \text{SP2}$

Tax in year 3 $= 15 \times \dfrac{\text{SP3}}{100} = 0.15 \times \text{SP3}$

Profit in year 2 = Selling price in year 2 − (cost of all units + tax in year 2)

$296 = \text{SP2} - (200 \times 2 + 0.13 \times \text{SP2})$

$296 = \text{SP2} - 400 - 0.13 \ \text{SP2}$

$296 + 400 = 0.87 \times \text{SP2}$

$696 \times \dfrac{100}{87} = \text{SP2}$

$\text{SP2} = 800.$

Profit in year 3 = Selling price in year 3 − (cost of all units + tax in year 3)

$210 = \text{SP3} - (300 \times 1 + 0.15 \times \text{SP3})$

$210 = \text{SP3} - 300 - 0.15 \times \text{SP3}$

$210 + 300 = 0.85 \times \text{SP3}$

$510 \times \dfrac{100}{85} = \text{SP3}$

$\text{SP3} = 600$

So, ratio of Selling Price in year 2 to Selling Price in year 3

$= \dfrac{800}{600} = \dfrac{4}{3}$

Hence, the correct option is (D).

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1 Synonyms & Antonyms

1.1   Which of the following options is the closest in meaning to the word below?

Circuitous   **[All branches]**

(A) Cyclic   (B) Indirect

(C) Confusing   (D) Crooked

1.2   Which of the following options is the closest in meaning to the word below?

Ephemeral   **[TF]**

(A) Effeminate   (B) Ghostlike

(C) Soft   (D) Short-lived

1.3   Which of the following options is the closest in meaning to the word below?

Exhort   **[MN]**

(A) Urge   (B) Condemn

(C) Restrain   (D) Scold

1.4   Choose the word from the options given below that is most nearly opposite in meaning to the given word:

Polemical   **[GG, TF]**

(A) Imitative   (B) Conciliatory

(C) Truthful   (D) Ideological

1.5   Choose the word from the options given below that is most nearly opposite in meaning to the given word:

Deference   **[AE, MN]**

(A) aversion   (B) resignation

(C) suspicion   (D) contempt

1.6   Choose the word from the options given below that is most nearly opposite in meaning to the given word:

Frequency

[AG, CY, EC, EE, IN, MA, MT, XE, XL]

(A) Periodicity   (B) Rarity

(C) Gradualness   (D) Persistency

1.7   Choose the word from the options given below that is most nearly opposite in meaning to the given word :

Amalgamate

[AR, BT, CE, CH, CS, ME, PH, PI]

(A) Merge   (B) Split

(C) Collect   (D) Separate

1.8   Which of the following options is the closet in meaning to the word below :

Inexplicable

[AR, BT, CE, CH, CS, ME, PH, PI]

(A) Incomprehensible   (B) Indelible

(C) Inextricable   (D) Infallible

1.9   Which one of the following options is the closest in meaning to the word given below?

[CY, EC, EE, IN, MA, MT, XE, XL]

Latitude

(A) Eligibility

(B) Freedom

(C) Coercion

(D) Meticulousness

1.10 Which one of the following option is the closest in meaning to the word given below? **[BT, CE, CH, CS, ME, PH, PI]**

Mitigate

(A) Diminish   (B) Divulge

(C) Dedicate   (D) Denote

1.11 Which one of the following options is the closest in meaning to the word given below? **[AR, GG, TF]**

Pacify

(A) Excite   (B) Soothe

(C) Deplete   (D) Tire

2013   **IIT Bombay**

1.12 They were requested not to **quarrel** with others. Which one of the following options is the closest in meaning to the word **quarrel**? **[EC, EE, IN]**

(A) Make out   (B) Call out

(C) Dig out   (D) Fall out

1.13 Which of the following options is the closest in meaning to the word given below **[AR, CE, GG, MA, MT, PH, TF]**

Primeval

(A) Modern   (B) Historic

(C) Primitive   (D) Antique

1.14 Which one of the following option is the closest in meaning to the word given below? **[CS, ME, PI]**

Nadir

(A) Highest   (B) Lowest

(C) Medium   (D) Integration

2014   **IIT Kharagpur**

1.15 Which of the following option is the closest in meaning to the word underlined in the sentence below?

In a democracy, everybody has the freedom to **disagree** with the government. **[EC-4, ME-4]**

(A) dissent   (B) descent

(C) decent   (D) decadent

1.16 While receiving the award, the scientist said, "I feel vindicated". Which of the following is closest in meaning to the word "Vindicated"? **[EC-4, ME-4]**

(A) Punished   (B) Substantiated

(C) Appreciated   (D) Chastened

1.17 Match the columns. **[CS-2, EE-2]**

Column 1	Column 2
1. Eradicate	P. Misrepresent
2. Distort	Q. Soak Completely
3. Saturate	R. Use
4. Utilize	S. Destroy utterly

(A) 1:S, 2:P, 3:Q, 4:R

(B) 1:P, 2:Q, 3:R, 4:S

(C) 1:Q, 2:R, 3:S, 4:P

(D) 1:S, 2:P, 3;R, 4:Q

1.18 Choose the word that is opposite in meaning to the word "coherent". **[CS-3, EE-3]**

(A) sticky

(B) well-connected

(C) rambling

(D) friendly

1.19 A student is required to demonstrate a high level of **comprehension** of the subject, especially in the social sciences.

The word closest in meaning to **comprehension** is
[AE, AR, CE-1, CH, CY, EY, MA, MT, PH, XE]

(A) Understanding (B) Meaning

(C) Concentration (D) Stability

2015 IIT Kanpur

1.20 Choose the word most similar meaning to the given word :
[AG, AR, BT, CH, CY, EC-1, EY, XE, XL]

Educe

(A) Exert (B) Educate

(C) Extract (D) Extend

1.21 Choose the word most similar in meaning to the given word :

Awkward [EC-2, ME-1]

(A) Inept (B) Graceful

(C) Suitable (D) Dreadful

1.22 Which word is not a synonym for the word *vernacular*? [CE-2]

(A) regional (B) indigeneous

(C) indigent (D) colloquial

1.23 The word similar in meaning to 'dreary' is [CE-2]

(A) cheerful (B) dreamy

(C) hard (D) dismal

2016 IISc Bangalore

1.24 The Buddha said, "Holding on to anger is like **grasping** a hot coal with the intent of throwing it at someone else; you are the one who gets burnt."

Select the word below which is closest in meaning to the word underlined above.

[AR, CY, EC-3, IN, MA, PE]

(A) burning (B) igniting

(C) clutching (D) flinging

2017 IIT Roorkee

1.25 Choose the option with words that are not synonyms. [CS-2, EE-2]

(A) Aversion, dislike

(B) Luminous, radiant

(C) Plunder, loot

(D) Yielding, resistant

1.26 There was no doubt that their work was **thorough**.

Which of the words below is closest in meaning to the underlined word above?

[CE-2, IN, XE, XL]

(A) Pretty (B) Complete

(C) Sloppy (D) Haphazard

2020 IIT Delhi

1.27 Select the most appropriate word that can replace the underlined word without changing the meaning of the sentence :

Now-a-days, most children have a tendency to **belittle** the legitimate concerns of their parents. [CE-2]

(A) disparage (B) begrudge

(C) reduce (D) applaud

❖❖❖❖

Answers		Synonyms & Antonyms					
1.1	B	**1.2**	D	**1.3**	A	**1.4**	B	**1.5**	D
1.6	B	**1.7**	B	**1.8**	A	**1.9**	B	**1.10**	A
1.11	B	**1.12**	D	**1.13**	C	**1.14**	B	**1.15**	A
1.16	B	**1.17**	A	**1.18**	C	**1.19**	A	**1.20**	C
1.21	A	**1.22**	C	**1.23**	D	**1.24**	C	**1.25**	D
1.26	B	**1.27**	A						

Explanations		Synonyms & Antonyms

1.1   (B)

Circuitous : Deviating from a straight course; indirect.

Cyclic : Recurring in cycle.

Indirect : Not leading by straight line.

Confusing : Lacking clarity.

Crooked : Bent or irregular in shape.

Here, indirect is closest in meaning to circuitous.

Hence, the correct option is (B).

1.2   (D)

Ephemeral : Lasting or used for only a short period of time.

Effeminate : Having feminine qualities untypical of a man.

Ghostlike : Resembling or characteristic of a phantom.

Soft : Pleasing or agreeable to the senses.

Short-lived : Not living or lasting long.

Hence, the correct option is (D).

1.3   (A)

Exhort : To incite by argument or advice; urge strongly.

Urge : To advise or try hard to persuade somebody to do something.

Condemn : To declare to be reprehensible, wrong, or evil usually after weighing evidence and without reservation.

Restrain : To keep somebody or something under control; to prevent somebody or something from doing something.

Scold : To speak angrily to somebody because he/she has done something bad or wrong.

Hence, the correct option is (A).

1.4   (B)

Polemical : A strong verbal or written attack on someone or something.

Imitative : copying or following a model or example.

Conciliatory : Making someone less angry or hostile.

Truthful : Telling or expressing the truth.

Ideological : Relating to or concerned with ideas.

Hence, the correct option is (B).

1.5   (D)

Deference : Polite behavior that you show towards somebody.

Aversion : A strong feeling of not liking somebody/something.

Resignation : An act or instance of resigning something.

Suspicion : An act or instance of suspecting or the state of being suspected.

Contempt : The feeling that somebody / something does not deserve any respect.

Hence, the correct option is (D).

1.6 (B)

Frequency : Means occurring at frequent intervals. So opposite of it, is **'rarity'** which means infrequency of occurrence.

Periodicity : The quality or state of being periodic; recurrence at regular intervals.

Rarity : The quality or state of being rare; infrequency of occurrence.

Gradualness : The quality of change in ascending or descending in a moderate rate.

Persistency : Persistent determination; the quality of being determined to do or achieve something.

Here, rarity is nearly opposite in meaning to frequency.

Hence, the correct option is (B).

1.7 (B)

Amalgamate : Process of merging or combining, blending, collecting or turning into a single mass. The opposite of the word amalgamate are disjoin, disunite, sever, rupture, scatter, split, separate etc.

Split : To divide something into multiple parts.

Separate : Means not connected, apart.

Merge : Process of combining individual elements.

Collect : Means keeping a number of things together.

The most nearly opposite in meaning to amalgamate is **Split** because splitting means turning a single mass into multiple one.

Hence, the correct option is (B).

1.8 (A)

Inexplicable : Something that can not be explained; puzzling, abstruse or unsolvable.

Incomprehensible : Unclear, confusing, puzzled (similar to inexplicable).

Indelible : Something that can not be erased.

Inextricable : Something that can not be separated or released.

Infallible : Incapable of making mistakes or being wrong.

Here, only option (A) is closest in meaning to the word inexplicable.

Hence, the correct option is (A).

1.9 (B)

Latitude : Freedom from normal restraints, limitations or regulations.

Eligibility : The quality or state of being eligible.

Freedom : The condition of being free of restraints.

Coercion : Refer to force.

Meticulousness : Extremely careful and precise.

Hence, the correct option is (B).

1.10 (A)

Mitigate : To reduce or to lessen.

Diminish : Reduced in size or importance.

Divulge : To make something known.

Dedicate : To give all energy or time.

Denote : To represent something.

Diminish is closest in meaning to the word mitigate.

Hence, the correct option is (A).

1.11 (B)

Pacify : To make somebody who is angry or upset be calm or quiet.

Excite : To make somebody react in a particular way.

Soothe : To make somebody calmer or less upset.

Deplete : To reduce the amount of something so that there is not much left.

Tire : To feel that you need to rest or sleep,

Hence, the correct option is (B).

1.12 (D)

Quarrel : disagreement; argument.

Make out : To cause to exist or happen; bring about; to understand.

Call out : To cause to assemble ; summon.

Dig out : To remove ; unearth.

Fall out : To quarrel, brawl, part with, spar.

The closest option is fall out.

Hence, the correct option is (D).

1.13 (C)

Primeval : Earliest time in history.

Modern : Recent times; something of the present time.

Historic : Something that is famous or important in history.

Primitive : Early stage of development in history.

Antique : Very old and valuable.

Its synonyms are Ancient, Prehistoric, antique, primitive and primordial.

But the closest meaning of primeval is primitive because primitive means early stage in the historic development.

Hence, the correct option is (C).

1.14 (B)

Nadir : It means the lowest point which is in opposite to the word Zenith (highest point).

Hence, the correct option is (B).

1.15 (A)

Dissent : To fail to agree, to differ in opinion, to cause discomfort or distress.

Descent : To move downward, lineage, origin.

Decent : Satisfactory, civilized, proper.

Decadent : To decline, retrogressive, tending to fall.

Hence, the correct option is (A).

1.16 (B)

Vindicated : To set free, to free from allegation, confirm, to provide justification.

Substantiated : Means to show to be true, justified, providing evidence.

Appreciated : To recognize how good something or someone is.

Chastened : To bring down.

Here, closest in meaning to the word vindicated is substantiated.

Hence, the correct option is (B).

1.17 (A)

Eradicate : Destroy utterly, root out, uproot, abolish.

Distort : Misrepresent, subvert, warp.

Saturate : Soak completely, fill something so thoroughly that no more can be absorbed.

Utilize : Use, consume, tap, make a good thing.

This indicates that the correct sequence must be S, P, Q and R.

Hence, the correct option is (A).

1.18 (C)

Coherent : clear and easy to understand.

Sticky : Something that attaches itself or stick to things.

Well-connected : Properly joint together.

Friendly : Behaving in pleasant and kind way.

Rambling : Lengthy and confusing.

Rambling is clearly opposite in meaning to coherent.

Hence, the correct option is (C).

1.19 (A)

Comprehension : Ability to understand something.

Hence, the correct option is (A).

1.20 (C)

Educe : Take out or extract.

Exert : Apply a force, influence or quality.

Educate : Give intellectual or moral instruction to.

Extract : Remove with care or effort.

Extend : Make larger or longer.

Hence, the correct option is (C).

1.21　(A)

Awkward : Clumsy, unskilled, **inept**.

Graceful : A way of moving that is smooth and attractive and is not stiff or awkward.

Suitable : Proper; appropriate.

Dreadful : Very bad or unpleasant.

Hence, the correct option is (A).

1.22　(C)

Vernacular : A form of language spoken by particular group of people or region or country.

Indiginous : Something that naturally exists in a place or country rather then coming from another place.

Indigent : Poor, needy.

Colloquial : Language, word or expression which is familiar, not formal.

Regional : Something that is from a particular region or place.

Except indigent, all other options are synonym of vernacular.

Hence, the correct option is (C).

1.23　(D)

Dreary : Dull, unattractive, nothing of interest.

Cheerful : Excited, joyful

Dreamy : Having qualities such as gorgeous, fabulous, incredible.

Dismal : Sad or without hope, dull.

Hence, the correct option is (D).

1.24　(C)

The underlined word 'grasping' means clutching or holding something tightly.

Burning : Producing flames.

Igniting : Catching fire.

Clutching : Holding something tightly.

Flinging : To throw something suddenly with a lot of force.

Hence, the correct option is (C).

1.25　(D)

Yielding : Tending to give up under pressure.

Resistant : Offer resistance or opposing.

Luminous : Bright or shining.

Radiant : Glowing brightly

Aversion : Strong dislike

Plunder : Rob or steal goods

Loot : Rob, sack

Yielding and resistant are not synonyms.

Hence, the correct option is (D).

1.26　(B)

The underlined word **thorough** means complete with regard to every detail.

Pretty : Attractive, Lovely.

Sloppy : Careless, Negligent.

Haphazard : Unsystematic.

Hence, the correct option is (B).

1.27　(A)

Disparage : To depreciate or to lower in rank or reputation.

Begrudge : Displeasure, disapproval or envy.

Reduce : Decrease or diminish in size, amount, extend or number.

Applaud : To express approval, praise.

Belittle : To speak slightingly of.

To depreciate or to seem little or less.

Option (A) is closest in meaning to the word belittle.

Hence, the correct option is (A).

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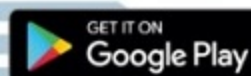### Live Classroom/VOD/Pen Drive/G-Drive/ Tablet Course
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