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# **NUMERICAL & VERBAL ABILITY**

**PRACTICE QUESTIONS BOOKLET**



# Chapter 1

## Analytical Aptitude

(Solutions for Practice Questions Booklet)

### 1.1 Logical Puzzles

01. Ans: (a)

Sol: C person is wrong, from A, B persons statements 'X' party won the elections option (a) is correct answer.

02. Ans: (Box 1)

Sol: Box 1 message is Lies.  
Box 2 message is true.  
Box 3 message is Lies.  
∴ Box 1 has the gold.

03. Ans: 22

Sol: Rs. 15 = 15 chocolate

For 15 chocolate get 15 wrappers  $\div 3 = 5$  chocolate.

For 5 chocolate get 5 wrappers = 3 wrappers + 2 wrappers = 1 chocolate + 2 wrappers

$$= \underbrace{1 \text{ wrapper} + 2 \text{ wrappers}}_{1 \text{ Chocolate}}$$

$$= 15 + 5 + 1 + 1 = 22$$

$$= 22 \text{ chocolate}$$

04. Ans: 12

Sol: By using calendar for one year

$$31 (7) + 28 (1) + 30 \times 4 = 365 \text{ days}$$

comparing with given relation.

$$x = 7, y = 1, z = 4$$

$$x + y + z = 7 + 1 + 4 = 12$$

05. Ans: (b)

Sol: 50 P are enough. Just select random. If the machine gives you coffee then you know that's in fact the coffee button. Then coffee-labeled button can't be random because then Tea would be Tea. So coffee-labeled is Tea and Tea-labeled is random.

06. Ans: (b)

Sol: The person who is opening the boxes, he knew that all 3 are marked wrong.

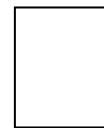
Suppose if three boxes are labelled as below.



(1) Apples



(2) Oranges



(3) Apples & Oranges

If he inspected from Box (1), picked one fruit, found orange, then he don't know whether Box contains oranges (or) both apples & oranges.

Similarly if he picked one fruit from box(2), found apple then he don't know whether box contain apples (or) both apples & oranges.

But if he picked one fruit from box(3), i.e., labelled as 'apples & oranges', if he found apple then he can decide compulsorily that box (3) contain apples and as he knew all boxes are labeled as incorrect, he can tell

box(2) contains both apples & oranges, box(1) contain remaining oranges. So, he should open box labelled 'apples & oranges' to determine contents of all the three boxes.

**07. Ans: (a)**

**Sol:**

(i)  $\xrightarrow{\hspace{2cm}}$  in 2 mins  
A, B

(ii)  $\xleftarrow{\hspace{2cm}}$  in 1 min (for torch)  
A

(iii)  $\xrightarrow{\hspace{2cm}}$  in 8 min  
C, D

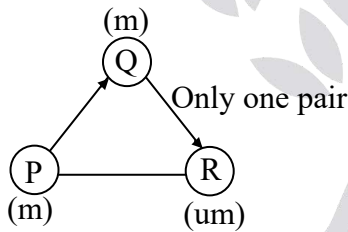
(iv)  $\xleftarrow{\hspace{2cm}}$  in 2 min (for torch)  
B

(v)  $\xrightarrow{\hspace{2cm}}$  in 2 min  
A, B

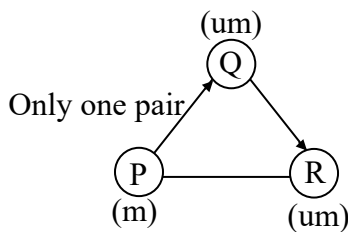
Total time  $2 + 1 + 8 + 2 + 2 = 15$  min

**08. Ans: (b)**

**Sol: Let Q be married**



**Let Q be unmarried**



$\therefore$  whether Q is married or unmarried, the number of pairs we get is only 1.

**09. Ans: (a)**

**Sol:** P states that S has atleast 3 cars  $= \geq 3$

Q believes that S has less than 3 cars  $= < 3$

R indicates that S has atleast one car  $= \geq 1$

P's and Q's statements are exactly opposite in nature and R's statement is proportional to P's statement.

From the given data, only one person statement is right as it mean that two person statements are wrong. i.e., P and R when S has zero cars.

**10. Ans: (c)**

**Sol:**  $R \rightarrow 2\left(\frac{x}{3}\right) + 4$

$S \rightarrow \frac{3}{4}\left(\frac{2x}{3} + 4\right) + 3 = \frac{x}{2} + 6$

$T = \frac{1}{2}\left(\frac{x}{2} + 6\right) + 2 = \frac{x}{4} + 5$

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

$x = 48$

**11. Ans: (c)**

**Sol:**  $7x + 8y + 3z = 20$

$3y + 4z + 5e = 21$

$4x + 4z + 6e = 25$

$11x + 11y + 11z + 11e = 66$

$\therefore x + y + z + e = 6$

**12. Ans: (c)**

**Sol:** Total distance travelled by 4 wheels

$= 4 \times 40000 = 160000$  km

So average distance travelled by the each

tyre  $= \frac{160000}{5} = 32000$

**13. Ans: (a)**

**Sol:** Let, no of 10 rupees notes =  $x$

Then, no of 20 rupees notes =  $14 - x$

Now, total value of all notes = Rs 230

i.e  $10(x) + 20(14 - x) = \text{Rs } 230$

$$\therefore x = 5$$

i.e no of 10 rupee notes = 5

**14. Ans: 3**

**Sol:** i. Divide the coins in 3 parts (9, 9, 9)

ii. Next, 9 coins as (3, 3, 3)

iii. Last step, '3' divided as (1, 1, 1)

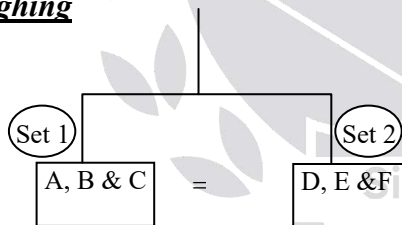
we are getting the false in minimum 3 steps.

**15. Ans: (a)**

**Sol:** Let us consider eight rice bags are A, B, C, D, E, F, G and H

**Case - I**

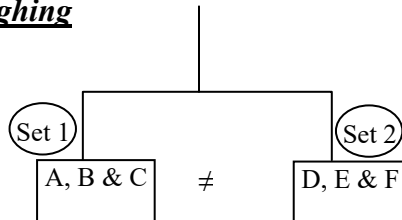
**First weighing**



If A, B & C (set 1) and D, E and F (set 2) are equal, in second weighing either G (or) H are heavier.

**Case - II**

**First weighing**



If A, B & C (set 1) and D, E & F (set 2) are not equal among set 1 and set 2 any one them is heavier than other.

If set 2 (D, E & F) is heavier than set 1, In second weighing D Vs E

- If D and E are equal, than F is heavier
- If D and E are unequal, then higher side one is heavier.

$\therefore$  From case I and case II, the minimum number of weighings required to identify the heavier bag is '2'.

**16. Ans: (b)**

**Sol:**

$$16 \times 22 \times 15 \times 50 \times 65 \times 115 \times 18 \times 90$$

$$\begin{array}{cccccccc} \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow \\ 2^4 \times & (2 \times 11) \times & (5 \times 3) \times & (2 \times 5^2) \times & (5 \times 13) \times & (5 \times 23) \times & (2 \times 9) \times & (5 \times 2^3) \end{array}$$

Total number of times a factor of 2 = 11

Total number of times a factor of 5 = 6

Minimum value of (6, 11) = 6

The number of zeros at the end of product = 6

**17. Ans: (c)**

**Sol:** Michael = 10 km

Ahmed = 5 km

Susan = 7 km

Arun > Ahmed > 5 km

Arun < Susan < 7 km

$\therefore 5 < \text{Arun} < 7$

Option (c) is correct answer.

**18. Ans: (b)**

**Sol:** (w, w), (b, b), (w, b)

19. Ans: (c)

Sol: M | N  
 $x$  |  $y$   
 $x + 1$  |  $y - 1$   
 $x + 1 = y - 1$   
 $x - y = -2 \dots\dots\dots(1)$

2<sup>nd</sup> condition

M | N  
 $x$  |  $y$   
 $x - 1$  |  $y + 1$   
 $y + 1 = 2(x - 1)$   
 $2x - y = 1 \dots\dots\dots(2)$

By solving (1) and (2) we get  
 $x = 3, y = 5$

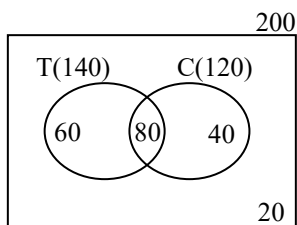
20. Ans: (b)

Sol: Rule  $\Rightarrow > 18$  years  $\Rightarrow$  Drink beer  
 P - 16 years  $\rightarrow$  P's drink  
 Q - 25 years.  
 R - Drinking milkshake  
 S  $\rightarrow$  Drinking Beer  $\rightarrow$  5's age.

**1.2 Venn Diagram**

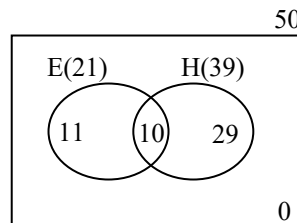
01. Ans: (i) 60 (ii) 40  
 (iii) 20 (iv) 100 (v) 180

Sol:



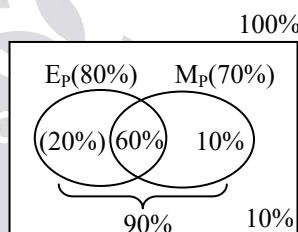
02. Ans: (a)

Sol:



03. Ans: 240

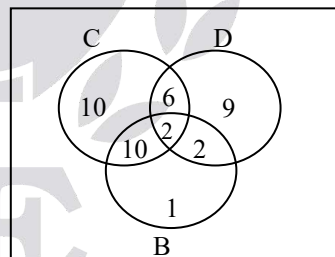
Sol:



Passed both 60% = 144  
 Total 100% = 240

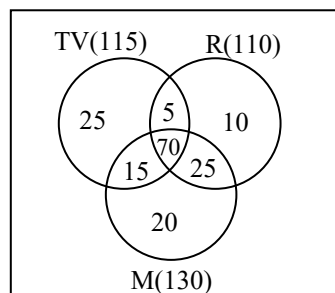
04. Ans: 12

Sol:

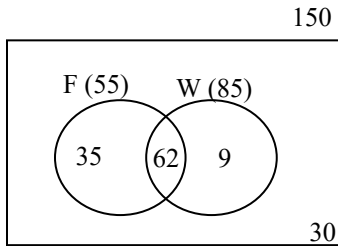


05. Ans: (i) 10 (ii) 25 (iii) 15

Sol:



06. Ans: (a)



$$n(F \cup W) = 150 - 30 = 120$$

$$n(F \cup W) = n(F) - n(W) - n(F \cap W)$$

$$n(F) - n(F \cap W) = 120 - 85 = 35$$

$\therefore n(F) - n(F \cap W)$  is the faculty that has only Facebook account

07. Ans: (a)

Sol:  $n[\text{coffee}] = 35\%$

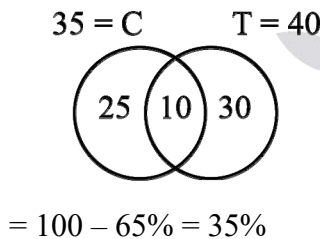
$$n[\text{Tea}] = 40\%$$

$$n[c \cap T] = 10\%$$

$$n[c \cup T] = 35 + 40 - 10 = 65\%$$

$$100 - 65\% = 35\%$$

Neither tea or coffee



08. Ans: (d)

Sol: Read books =  $n(R) = 12 + 44 + 7 + 13 = 76$

$$\text{Play sports} = n(S) = 44 + 7 + 17 + 15 = 83$$

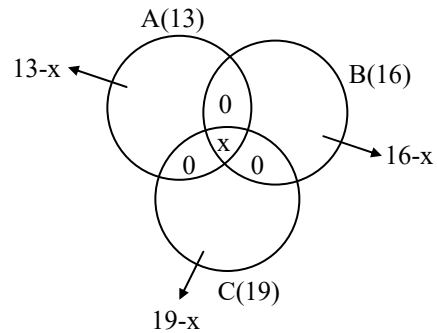
$$n(R \cap S) = 44 + 7 = 51$$

$$n(R \cup S) = n(R) + n(S) - n(R \cap S)$$

$$= 76 + 83 - 51 = 108$$

09. Ans: (c)

Sol:



$$(13 - x) + (16 - x) + (19 - x) + 0 + 0 + 0 +$$

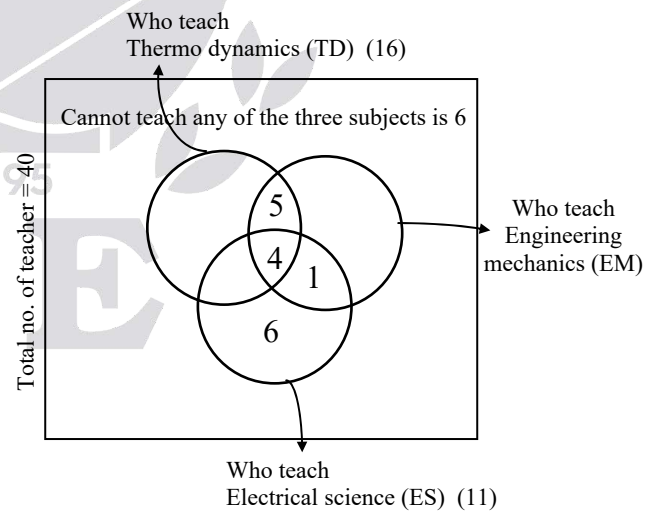
$$x = 40$$

$$x = 4$$

option 'c' is the correct answer.

10. Ans: (a)

Sol: From the given data, the following diagram is possible.



**1.3 Blood Relation**

**01. Ans: (a)**

**Sol:** The relations may be analysed as follows.

His father's wife = his mother

Only brother of his mother = his uncle

Son of his uncle = his cousin.

So, that Rohit is Anil's cousin.

Hence the answer is (a).

**02. Ans: (a)**

**Sol:** his father's wife = his mother

Only son of his mother = man

∴ she is the daughter of man.

So that the girl in the photograph is man's daughter.

Hence the answer is (a)

**03. Ans: (a)**

**Sol:** The wife of my husband = Rita

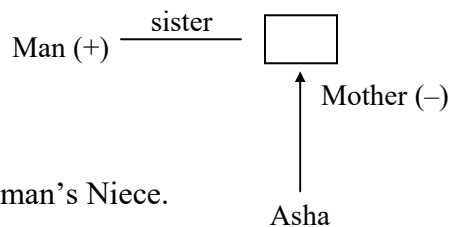
Brother of the daughter of Rita = Son

So, that the man on the stage is Rita's sons.

Hence the answer is (a)

**04. Ans: (d)**

**Sol:** By decoding the given information using symbols of family diagram we get



Asha is man's Niece.

Hence the answer is (d)

**05. Ans: (c)**

**Sol:** Her father's father = grand father

Only son of grand father = father

His brother's father = her father

So that, The women is the man's sister

Hence the answer is (c).

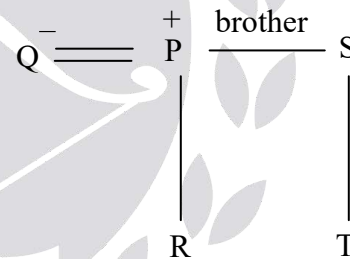
**06. Ans: (b)**

**Sol:** Q and R are the son and Daughter of M, E is the mother of P and daughter-in-law of M means Q and E are married couples in the family

∴ P is the grandchild of M

**07. Ans: (c)**

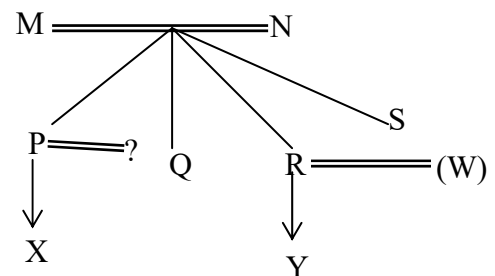
**Sol:**



∴ S is parent of 'T'.

**08. Ans: (a)**

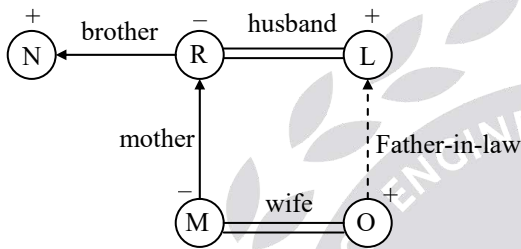
**Sol:** From given, data, the following blood relations tree can be formed



From the given information, R and W are the married couples so, option '1' is necessarily FALSE. Remaining all other options are may be true.

**09. Ans: (d)**

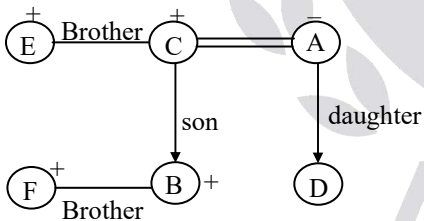
**Sol:** By decoding the given information using symbols of family of diagram.



So that L is related to O's father-in-law. Hence, the answer is (d)

**10. Ans: (d)**

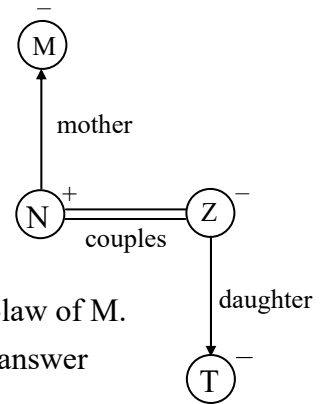
**Sol:**



A is the mother of 'B'.

**11. Ans: (b)**

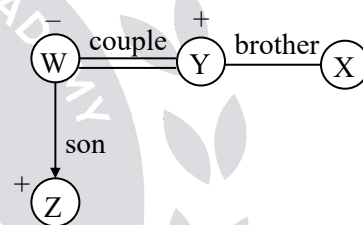
**Sol:** By decoding the given information using symbols of family diagram, we get



So that Z is daughter-in-law of M. Hence (b) is the correct answer

**12. Ans: (a)**

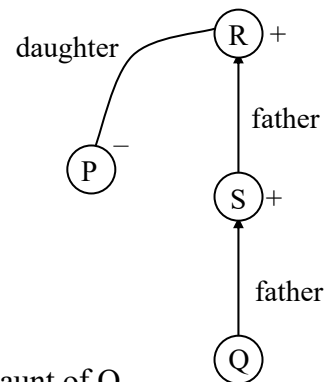
**Sol:** By decoding the given information using symbols of family diagram, we get



So, that W is X's brother's wife. Hence (a) is the correct answer.

**13. Ans: (b)**

**Sol:** By decoding the given information using symbols of family diagram, we get

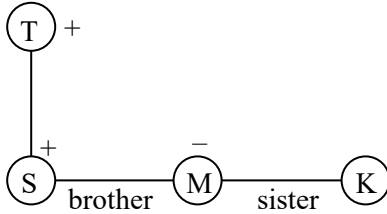


So that P is the aunt of Q. Hence (b) is the correct answer.

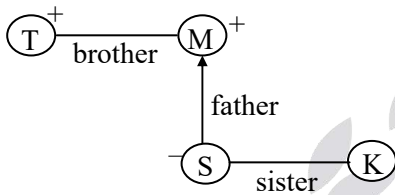


14. Ans: (b)

Sol:



So that, S is not niece of T.

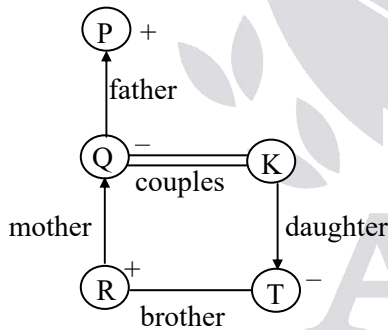


So that S is the niece of T  
Hence (b) is the correct answer.

15. Ans: (c)

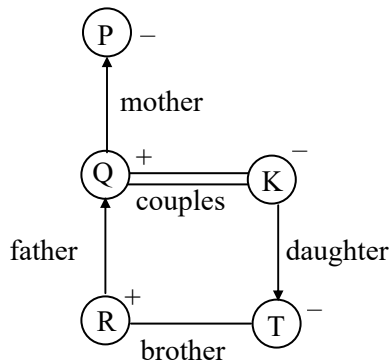
Sol: By decoding the given information symbol of family diagram, we

(a)



So that P is not mother-in-law of K.

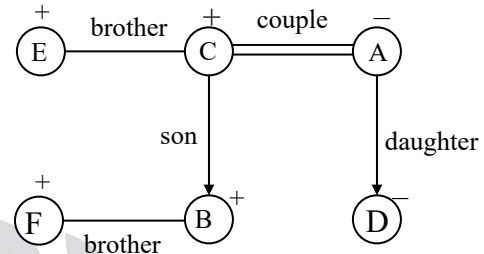
(c)



So that P is the mother-in-law of K.

Hence (c) is correction answer.

(d) By decoding the given information using symbols of family diagram, we get



So that

A is the mother of B.

Hence (d) is the correct answer.

### 1.4 Cubes & Dice

01. Ans: (a)

Sol: 6 → adjacent → 2, 3, 4, 5

6 → opposite → 1

Option (a) is the correct answer.

02. Ans: (a)

Sol: 4 → adjacent → 5, 6, 2, 3

4 → opposite → 1

Option (a) is the correct answer.

03. Ans: (c)

Sol: 4 → adjacent → 5, 6, 1, 2

4 → opposite → 3

Option (c) is correct answer.

04. Ans: (c)

Sol: 4 → adjacent → 2, 3, 1, 6

4 → opposite → 5, 5, 5

Option (c) is the correct answer.

**05. Ans: (b)**

**Sol:** 2 → adjacent → 1, 4, 3, 6

2 → opposite → 5

Option (b) is the correct answer.

**06. Ans: (b)**

**Sol:** 1 → adjacent → 4, 3, 5, 6

1 → opposite → 2

After rotating the view of dice.

Then we have one common number and same surface, then corresponding number are same so 6 opposite is 4.

**07. Ans: (c)**

**Sol:** 2 → adjacent → 4, 6, 1, 3

2 → opposite → 5

6 → adjacent → 3, 5, 2, 4

6 → opposite → 1

Option (c) is correct answer.

**08. Ans: (d)**

**Sol:** From the folded figure.

5 → opposite → 3

2 → opposite → 4

1 → opposite → 6.

Option (d) is the correct answer.

**09. Ans: (c)**

**Sol:** five dots → opposite → three dots

Option (c) is the correct answer.

**10. Ans: (d)**

**Sol:** three dots → opposite → six dots.

## 1.5 Coding and Decoding Test

**01. Ans: (c)**

**Sol:** Clearly each letter in the word AMCF is moved as follows

A	M	C	F
↓	↓	↓	↓
+4	+4	+4	+4
↓	↓	↓	↓
E	Q	G	J

and

N	K	U	F
↓	↓	↓	↓
+4	+4	+4	+4
↓	↓	↓	↓
R	O	Y	J

Similarly in the same code DHLP becomes

D	H	L	P
↓	↓	↓	↓
+4	+4	+4	+4
↓	↓	↓	↓
H	L	P	T

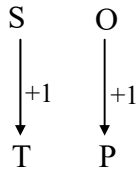
Hence, the answer is (c)

**02. Ans: (d)**

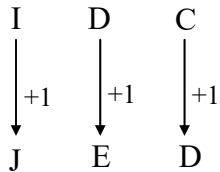
**Sol:** Clearly, each letter in the word IMH O moved as follows

I	M	H	O	and	I	D	K
↓	↓	↓	↓		↓	↓	↓
+1	+1	+1	+1		+1	+1	+1
↓	↓	↓	↓		↓	↓	↓
J	N	I	P		J	E	L

And



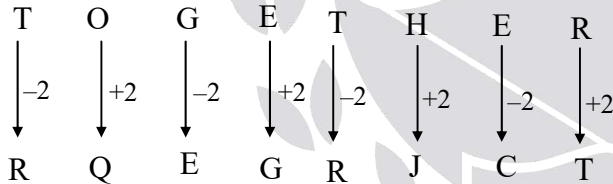
Similarly in the same code



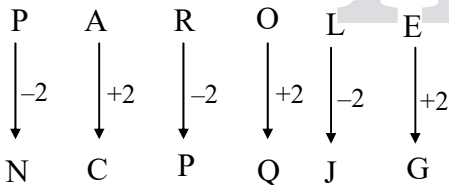
Hence, the answer is (d)

**03. Ans: (a)**

**Sol:** Clearly, each letter in the word TOGETHER is moved as follows



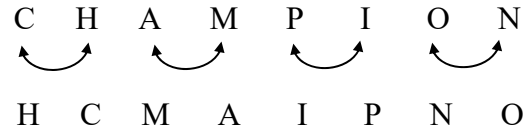
Similarly in the same code PAROLE becomes



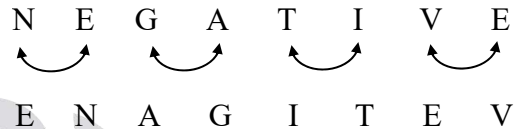
Hence, the answer is (a)

**04. Ans: (a)**

**Sol:** The letter of the words are written in a reverse order and each two letter



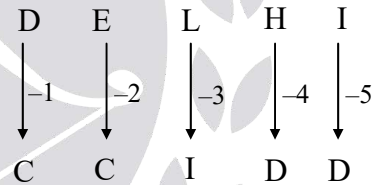
Similarly in the same code. NEGATIVE become



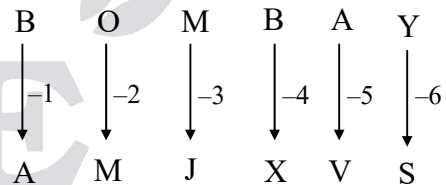
Hence Answer is (a)

**05. Ans: (b)**

**Sol:** Clearly each letter in the word DELHI is moved as follows



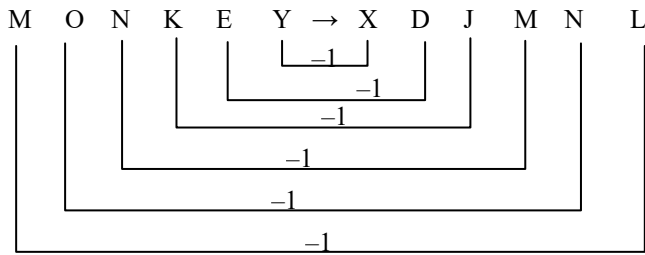
Similarly in the same BOMBAY becomes



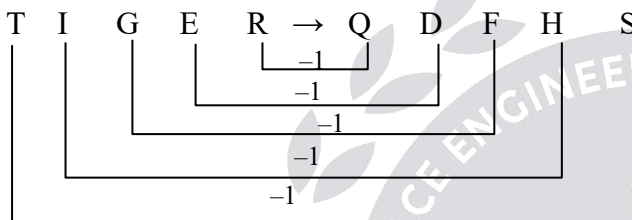
Hence, the Answer is (b)

**06. Ans: (a)**

**Sol:** Clearly each letter in the word MONKEY is moved as follows



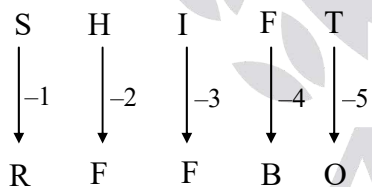
Similarly in the same code TIGER becomes



Hence, the Answer is (a)

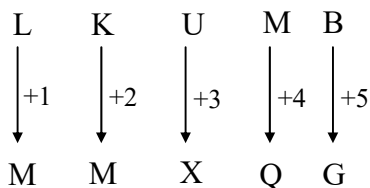
**07. Ans: (a)**

**Sol:** Clearly each letter in the word SHIFT is moved as follows



But here which word is coded as

So that



Hence, the Answer is (a)

**08. Ans: (a)**

**Sol:** Clearly each letter in the word represented as

$$R = 6, I = 1, P = 3, L = 8, E = 2$$

Then

$$PILLER = 318826$$

Hence, the answer is (a)

**09. Ans: (a)**

**Sol:** Man sleeps on Bed

So that

Bed is called Window

Hence, the Answer is (a)

**10. Ans: (b)**

**Sol:** A woman shall draw water from a “well”

So that

Well is called “ISLAND”

Hence, the Answer is (b)

**11. Ans: (b)**

**Sol:** We drink water when we are thirsty, so that

Here water is called ‘air’

Hence, the answer is (b)

**12. Ans: (d)**

**Sol:** From both statements

The common code words are

Nee = are

See = you

So that

In the second statement, the remaining code

‘ble’ means ‘where’

Hence, the Answer is (d)

**13. Ans: (b)**

**Sol:** From statements

The common code words are

8 = good

1 = fruit

So that

In the first statement, the remaining code '5' mean 'sweet'

**14. Ans: (b)**

**Sol:** D=4

COVER = 3+15+22+5+18= 63

So that

BASIS = 2+1+19+9+19 = 50

**15. Ans: (a)**

**Sol:** Clearly each letter in the word MACHINE is moved as follows

M	A	C	H	I	N	E
↓ +6	↓ +6	↓ +6	↓ +6	↓ +6	↓ +6	↓ +6
19	7	9	14	15	20	11

Similarly in the same code DANGER becomes

D	A	N	G	E	R
↓ +6	↓ +6	↓ +6	↓ +6	↓ +6	↓ +6
10	7	20	13	11	24

Hence, the Answer is (a)

**16. Ans: (d)**

**Sol:** Clearly each letter in the word ACT is moved as follows

A	C	T
↓ +22	↓ +22	↓ +22
23	25	16

Similarly in the same code BLOW becomes

B	L	O	W
↓ +22	↓ +22	↓ +22	↓ +22
24	8	11	19

Hence the Answer is (d)

**17. Ans: (a)**

**Sol:** Clearly each letter in the word is moved as follows

E	J	O	T
↓ ×2	↓ ×2	↓ ×2	↓ ×2
10	20	30	40

Similarly in the same code

P	E	S	T
↓ ×2	↓ ×2	↓ ×2	↓ ×2
32	10	38	40

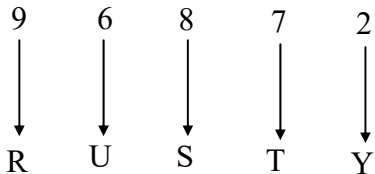
P+ E+S+T = 32+10+38+40 = 120

Hence, the answer is (a)

18. Ans: (a)

Sol: The letter of the words are written in a reverse order

So that



Hence the Answer is (a)

19. Ans: (c)

Sol: AT = (1)(20) = 20

BAT = (2)(1)(20) = 40

So that,

CAT = (3)(1)(20) = 60

Hence that Answer (c)

20. Ans: (d)

Sol: AROMA =  $\frac{1+18+15+13+1}{2} = \frac{48}{2} = 24$

GRAND =  $\frac{7+18+1+14+4}{2} = 22$

Similarly

KWALITY =

$\frac{11+23+1+12+9+20+25}{2} = \frac{101}{2} = 50.5$

Hence the Answer is (d)

21. Ans: (d)

Sol: BARS =  $\frac{2+1+18+19}{4} = \frac{40}{4} = 10$

BEERT =  $\frac{2+5+5+18+20}{5} = \frac{50}{5} = 10$

Similarly

DEEZ =  $\frac{4+5+5+26}{4} = \frac{40}{4} = 10$

∴ Logic is  $\frac{\text{Sum of letters}}{\text{number of letters}} = \text{output}$

Hence the Answer is (d)

22. Ans: (c)

Sol: Number of Letters - 1 is coded as output

So that

Number of letters in GOVERNMENT is 10

∴ 10 - 1 = 9

Hence the Answer is (c)

23. Ans: (b)

Sol: Number of letters = x

∴ x(x - 1)

Contract = 8(8 - 1) = 56

Growth = 6(6 - 1) = 30

Distribution = 12(12 - 1) = 132

24. Ans: (b)

Sol: M E A N D E R  
 ↓ ↓ ↓ ↓ ↓ ↓ ↓  
 13 5 1 14 4 5 18

(1 + 3) = 4 5 1 (1 + 4) = 5 4 5 (1 + 8 = 9)

Similarly

M A T H E M A T I C S  
 ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓  
 13 1 20 8 5 13 1 20 9 3 19

(1 + 3 = 4) 1 (2 + 0 = 2) 8 5 (1 + 3 = 4) 1 (2 + 0 = 2) 9  
 3 (1 + 9) 10 = 10 = (1 + 0) = 1

Hence, the Answer is (b)

**25. Ans: (d)**
**Sol:** ∴ Alternative Letter's number sum and then difference

BANANA

$$2 + 14 + 14 = 30$$

$$1 + 1 + 1 = 3$$

$$\therefore 30 - 3 = 27$$

MOTORE

$$13 + 20 + 18 = 51$$

$$15 + 15 + 5 = 35$$

$$\therefore 51 - 35 = 16$$

LOFERS

$$12 + 6 + 18 = 36$$

$$15 + 5 + 19 = 39$$

$$\therefore 36 - 39 = -3$$

### 1.6 Inserting the Missing Character

**01. Ans: (a)**

**Sol:**  $(2 + 3)^2 = 25$

$$(15 + 6)^2 = 441$$

$$(10 + 7)^2 = 289$$

$$(12 + 13)^2 = 625$$

**02. Ans: (d)**
**Sol:**

$$\begin{array}{ccccccc}
 & & \times 5 + 1 & & \times 5 + 1 & & \\
 & & \updownarrow & & \updownarrow & & \\
 3 & & 16 & & 81 & & 406 & \text{---} \\
 \updownarrow & & & & \updownarrow & & & \\
 \times 5 + 1 & & & & \times 5 + 1 & & & 
 \end{array}$$

$$= 405(5) + 1 = 2031$$

Option (d) is the correct Ans.

**03. Ans: (c)**

**Sol:**  $21 = 4^2 + 2^2 + 1^2$

$$98 = 5^2 + 3^2 + 8^2$$

$$x = 6^2 + 7^2 + 3^2$$

$$x = 94$$

(c) is the correct Ans.

**04. Ans: (a)**

**Sol:**  $1^{\text{st}} \times 3^{\text{rd}} = 2^{\text{nd}}$  (in column wise)

$$4 \times 7 = 28$$

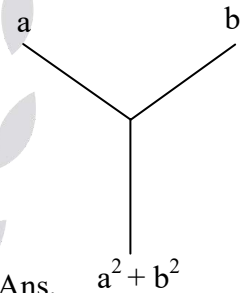
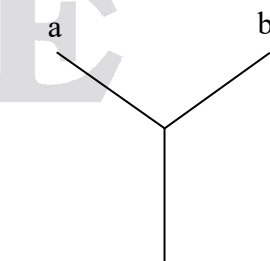
$$2 \times 5 = 10$$

$$3 \times 15 = 45$$

**05. Ans: (b)**
**Sol:**

$$\therefore 1^2 + 5^2 = 26$$

Option (b) is correct Ans.


**06. Ans: (b)**
**Sol:**


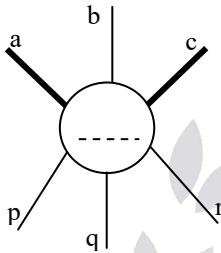
$$\begin{aligned}
 a^2 - b^2 &= (a - b)(a + b) \\
 (10 - 7)(10 + 7) &= 51
 \end{aligned}$$

Option (b) is correct Ans.

**07. Ans: (c)**
**Sol:**


$$(3 \times 4 + 5 \times 5) = 37$$

Option (c) is the correct Ans.

**08. Ans: (b)**
**Sol:**


$$\begin{aligned} \therefore & |a - p| \quad |b - q| \quad |c - r| \\ & |8 - 2| \quad |6 - 4| \quad |3 - 1| \\ & = 622 \end{aligned}$$

Option (b) is the correct Ans.

**09. Ans: (c)**

**Sol:**  $2 \times 7 = 14$

$15 \times 2 = 30$

$7 \times 9 = 63$

$9 \times 15 = 135$

Option (c) is the correct answer.

**10. Ans: (d)**

**Sol:**  $93 = 27 + 63 + 3$

$79 = 38 + 37 + 4$

$67 = 16 + 42 + x$

$x = 9$

option (d) is the correct Ans

**11. Ans: (d)**

**Sol:**  $2^2 + 2^2 + 3^2 + 4^2 = 33$

$3^2 + 4^2 + 5^2 + 2^2 = 54$

$3^2 + 4^2 + 5^2 + 6^2 = 86$

Option (d) is the correct Ans

**12. Ans: (a)**

**Sol:**

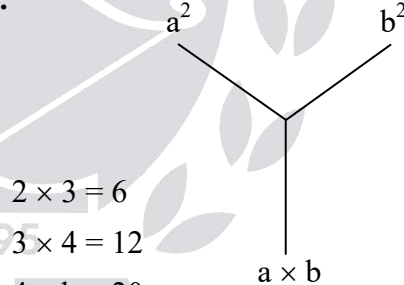
$$\begin{array}{r} a \quad b \\ - \quad + \\ c \quad d \end{array} \left. \vphantom{\begin{array}{r} a \quad b \\ - \quad + \\ c \quad d \end{array}} \right\} (a - c)(b + d)$$

$10 \times 8 = 80$

$5 \times 13 = 65$

$2 \times 24 = 48$

Option (a) is the correct Answer

**13. Ans: (c)**
**Sol:**


$2 \times 3 = 6$

$3 \times 4 = 12$

$4 \times b = 20$

$b = 5$

$\therefore b^2 = 25$

Option (c) is the correct Answer.

**14. Ans: (b)**
**Sol:**

$2 + 3 = 5 \quad \left| \quad P + 3 = S$

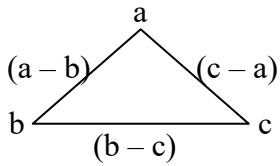
$5 + 3 = 8 \quad \left| \quad S + 3 = V$

$8 + 3 = 11 \quad \left| \quad V + 3 = Y$



15. Ans: (c)

Sol:



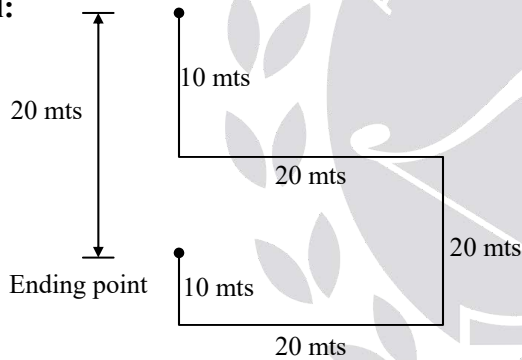
$15 - 5 = 10$

Option (c) is the correct Answer.

**1.7 Directions**

01. Ans: (b)

Sol:



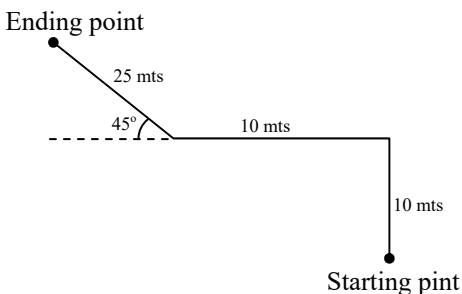
distance = 20 mts

Direction = South

Hence, the Answer is (b)

02. Ans: (c)

Sol:

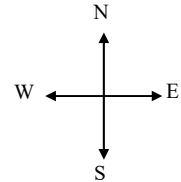
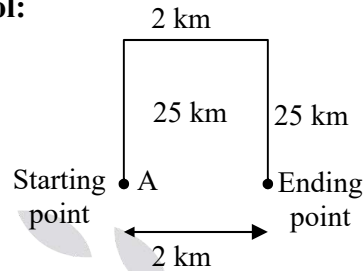


direction = North – West

Hence, the Answer is (c)

03. Ans: (b)

Sol:

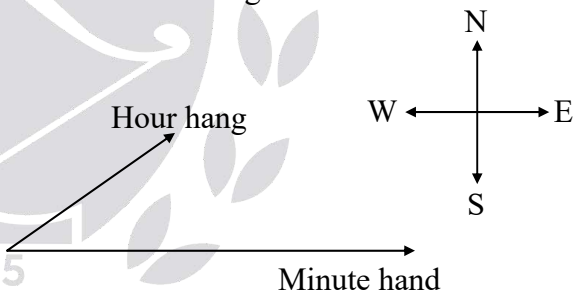


She need to drive 2 km to reach to the starting point.

Hence, the Answer is (b)

04. Ans: (a)

Sol: ∴ 4 : 30 clock diagram.



When the minute hand points to the East, hour hand points to the North – East direction

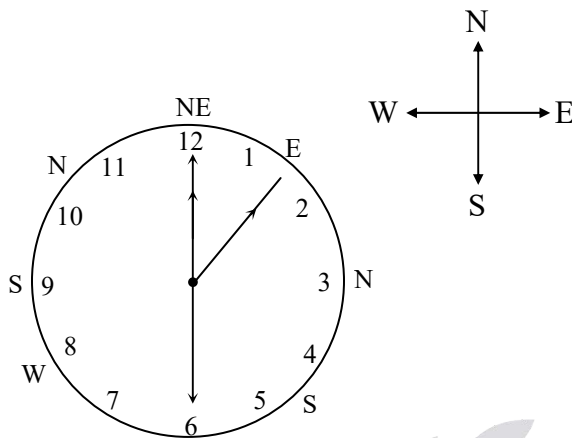
Hence, the Answer is (a)

05. Ans: (c)

Sol: Diagram is shown as per the conditions in the question

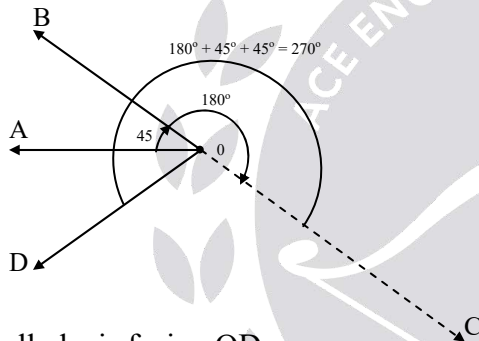
Clearly at 1:30 P.M hour hand shall point East

Hence, the Answer is (c)



**06. Ans: (a)**

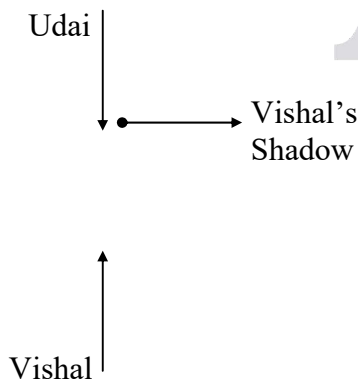
**Sol:**



Finally he is facing OD,  
Which is south west  
Hence the Answer is (a)

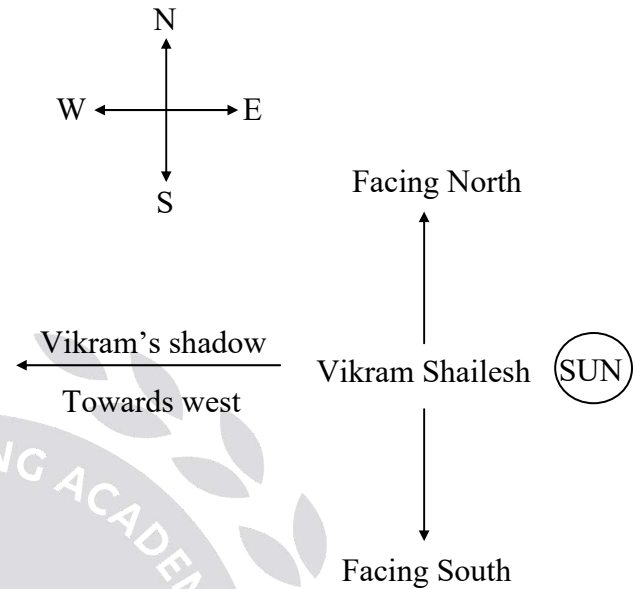
**07. Ans: (c)**

**Sol:**



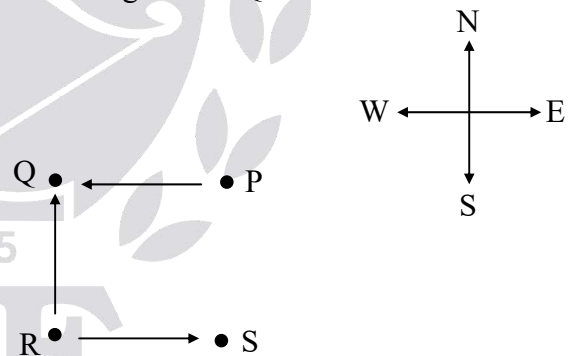
**08. Ans: (d)**

**Sol:**



**09. Ans: (d)**

**Sol:** According to  $P \% Q + R - S$



**10. Ans: (c)**

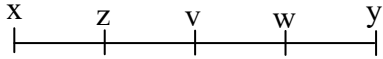
**Sol:** If south-east becomes North and North east becomes west, therefore, the whole figure moves through  $135^\circ$ . Hence, west will be south east.

See, Actual figure is rotating  $135^\circ$  anticlockwise, So, when west will be rotated by same degree anticlockwise. It will hold the place of south east.

### 1.8 Seating arrangements

01. Ans: (a)

Sol:



02. Ans: (d)

Sol:

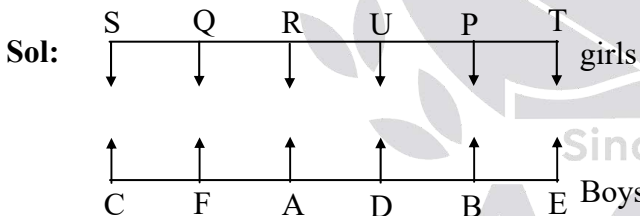


03. Ans: (a)

Sol:



04. (a) 05. (d) 06. (c)



07. Ans: (a)

Sol: Four peoples are Rahul, Mathew, Seema and Lohit and in the group one engineer, one is a doctor, one a teacher and another a dancer.

**Statement 1:**

Seema Mathew

**Statement 2:**

Lohit    —    —    —    —  
Engineer

**Statement 3:**

Rahul ≠ doctor

**Statement 4:**

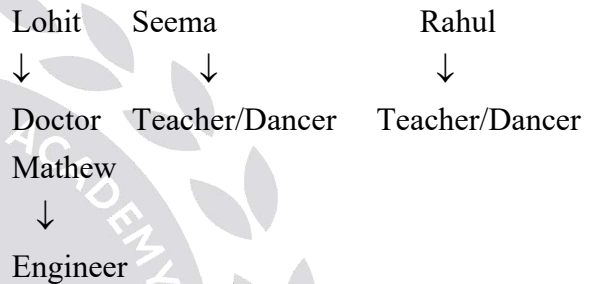
Teacher (or) Dancer   Dancer (or) Teacher

**Statement 5:**

\_\_\_\_\_ Seema

Doctor

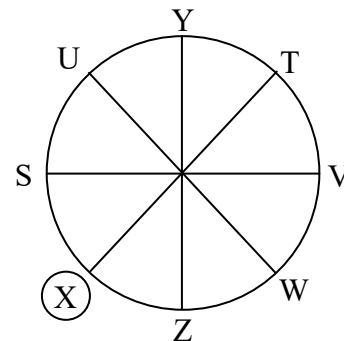
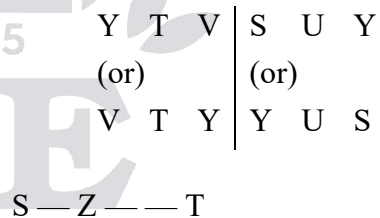
From above conditions, the following line can be formed



From above, an engineer in the group is Mathew.

08. Ans: (a)

Sol: From the given data, eight persons are seated around a circular table as follows



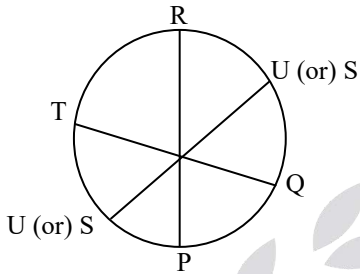
∴ X is third to the left of V

09. Ans: (c)

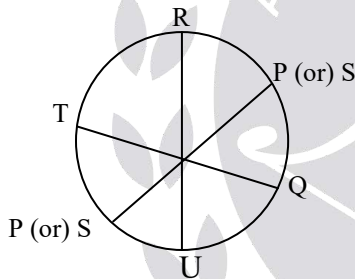
Sol: From the given data, all are seated around a circular table as follows

P Q - - R

S is opposite to U



P and U are switch seated means, they are interchange their places

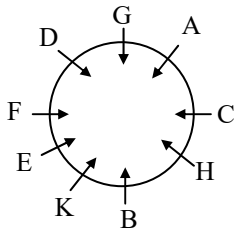


In option (c), before interchange T is immediately to the left of P and After interchange P is immediately to the right of Q.

∴ Option '(c)' is correct

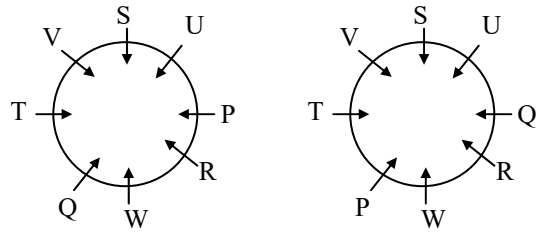
10. Ans: (d)

Sol:



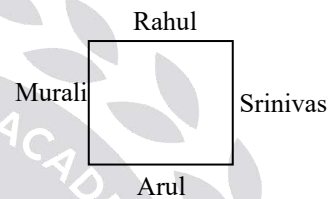
11. Ans: (a)

Sol:



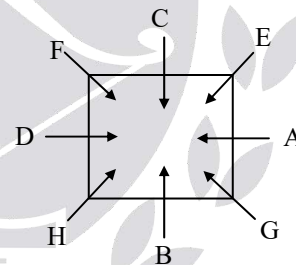
12. Ans: (c)

Sol:



13. Ans: (c, d)

Sol:



14. (c) 15. (a)

Sol:

22<sup>nd</sup> → psychology → saturday

23<sup>rd</sup> → Sunday

24<sup>th</sup> → philosophy → Monday

25<sup>th</sup> → Economics Tuesday

26<sup>th</sup> → science → wenesday

27<sup>th</sup> → Engineering → Thursday

28<sup>th</sup> → sociology → Friday

16. Ans: (b)

Sol: We get the two possible orders

RS    P    T    Q

QT    P    S    R

17. Ans: (c)

Sol:  $M = S + 2$

$$T = 3 + S = M + 1$$

$$\Rightarrow P = 1 + 5 = M - 1 = T - 2$$

$$S < P < M < T$$

18. Ans: (d)

Sol: Ages is

$$\text{Shiva} > \text{Leela} > \text{Pavithra}$$

19. Ans: (d)

Sol:

$$G > R, L$$

$$L > S$$

$$M > G$$

$$\therefore M > G > R, L > S$$

20. And: (c)

Sol: 10, 5, 4, 7, 2

**1.9 Analytical Figure/Counting figure**

01. Ans: 11

Sol:

a	b	c	d
p	q	r	s

$$A, b, c, d, p, q, r, s \rightarrow 8$$

$$Abpq, bcqr, cdrs \rightarrow 3$$

$$\underline{\hspace{2cm}}$$

$$\underline{\hspace{2cm}} \quad 11$$

02. Ans: 204

Sol: For  $8 \times 8 \Rightarrow 8^2 + 7^2 + 6^2 + 5^2 + 4^2 + 3^2 + 2^2 + 1^2$   
 $= 204$

03. Ans: 40

Sol: By using base concept

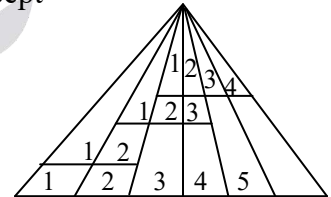
$$1+2+3+4 = 10$$

$$1+2+3 = 6$$

$$1+2 = 3$$

$$\Rightarrow 1+2+3+4+5+6 = 21$$

$$\text{Total} = 21 + 3+6+10 = 40$$



04. Ans: 16

Sol: Form with single triangles = 8

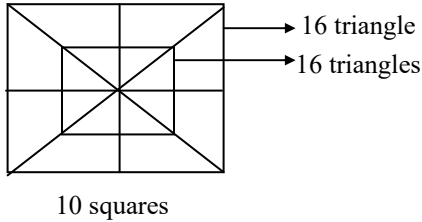
Form with double triangles = 4

Form with 4 triangles = 4

$$\text{Total} = 16$$

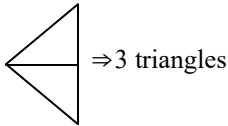
05. Ans: (c)

Sol:

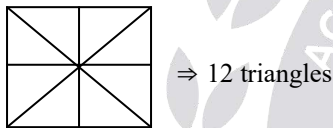


06. Ans: (c)

Sol:

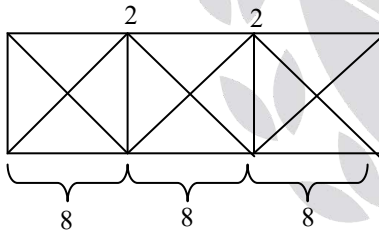


Total = 2 + 3 + 12 = 17 triangles



07. Ans: (a)

Sol:

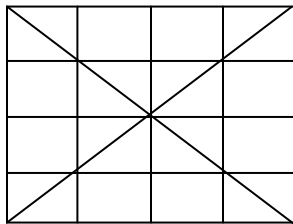


Number of triangles = 8 + 8 + 8 + 2 + 2 = 28

Number of squares = 3 + 2 = 5

08. Ans: (d)

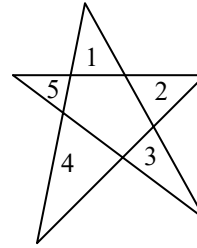
Sol:



Total number of triangle = 16 + 16 + 8 × 2 = 48

09. Ans: (d)

Sol:



$$5 + 5 = 10$$

10. Ans: 48

Sol:  $h = 5$  odd

$$\begin{aligned} &= \frac{h(h+2)(2h+1)-1}{8} \\ &= \frac{5 \times 7 \times 11 - 1}{8} = \frac{384}{8} = 48 \end{aligned}$$

11. Ans: 21

Sol:

a		x	y
b			
p	q	l	
		m	

$$a, b, x, y, p, q, r, m = 8$$

$$ab, xy, pq, ln = 4$$

$$abx, xyl, bpq, q/m = 4$$

$$abpq, abxy, pq/n, xy/m - 4$$

$$abxypq/m = 1$$

$$\text{total} = 8 + 4 + 4 + 4 + 1 = 21$$

**12. Ans: (c)**

$$\text{Sol: } 3C_2 \times 5C_2 = \frac{3!}{2!} \times \frac{5!}{3!2!}$$

$$= 3 \times 5 \times 2 = 30$$

**13. Ans: 18**

$$\text{Sol: } 3C_2 \times 4C_2 = 3 \times 6 = 18$$

**14. Ans: (c)**

$$\text{Sol: } 4C_2 \times 5C_2 = 60$$

**15. Ans: (b)**

$$\text{Sol: Horizontal lines} = 4$$

$$\text{Vertical lines} = 0$$

$$\text{Cross lines} = 7$$

$$\text{Total} = 11$$

**1.10 Syllogism/Logical Reasoning**

**01. Ans: (a)**

**Sol:** Only conclusion I follows  
Hence, the answer is (a)

**02. Ans: (a)**

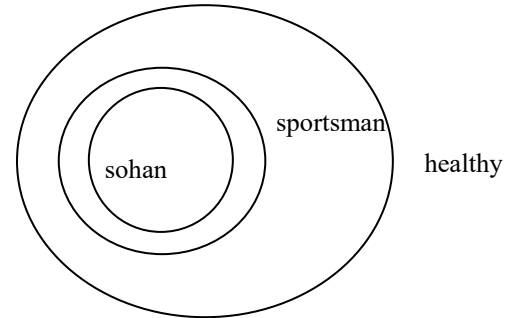
**Sol:** Only conclusion I follows  
Hence, the answer is (a)

**03. Ans: (c)**

**Sol:** Either I (or) II follows

**04. Ans: (b)**

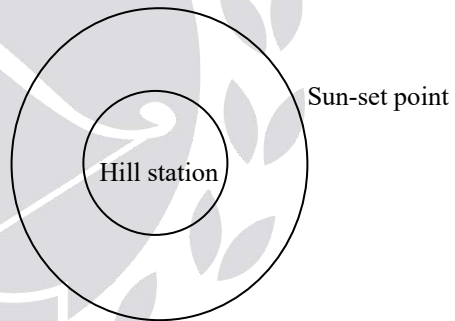
**Sol:**



Sohan is sportmen  
Sportmen is healthy  
∴ not given healthy are sportmen  
Only conclusion II follows

**05. Ans: (a)**

**Sol:**



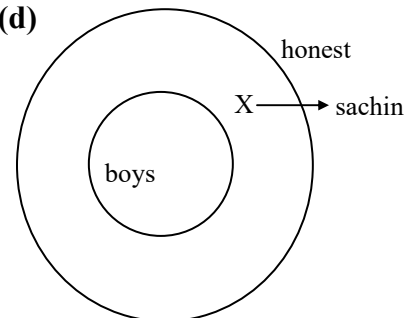
Only conclusion I is follows  
Hence, the answer is (a)

**06. Ans: (c)**

**Sol:** Either I or II follows

**07. Ans: (d)**

**Sol:**



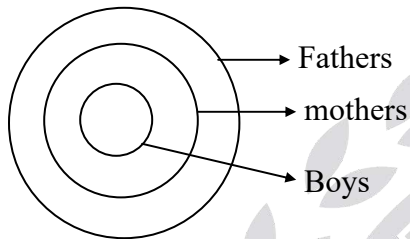
Neither I nor II follows,  
Hence, the answer is (d)

**08. Ans: (c)**

**Sol:** Either I are II follows

**09. Ans: (b)**

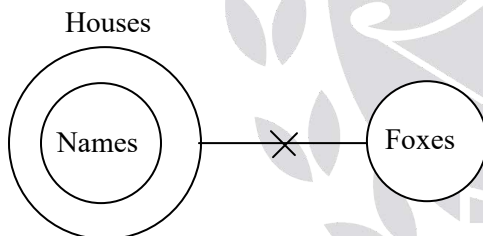
**Sol:**



Only conclusion II is follows

**10. Ans: (d)**

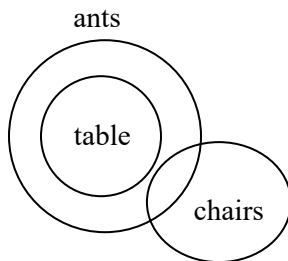
**Sol:**



Neither I nor II is follows

**11. Ans: (d)**

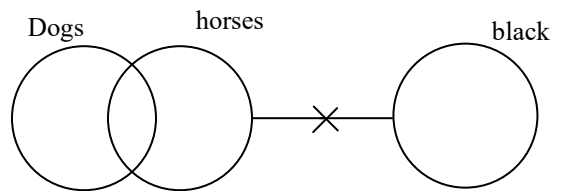
**Sol:**



Neither I nor II is follows

**12. Ans: (b)**

**Sol:**

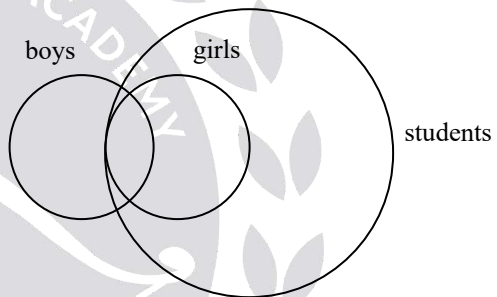


Only conclusion II follows

Hence, the correct and (b)

**13. Ans: (a)**

**Sol:**

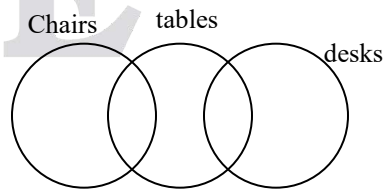


I, II, III follows

Hence, the correct and (a)

**14. Ans: (c)**

**Sol:**



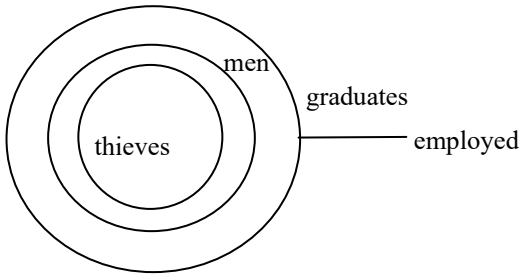
Either I and II follows

Hence, the correct ans (c)



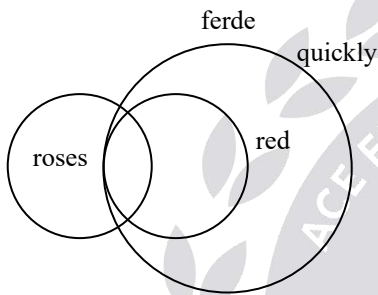
15. Ans: (a)

Sol:



16. Ans: (c)

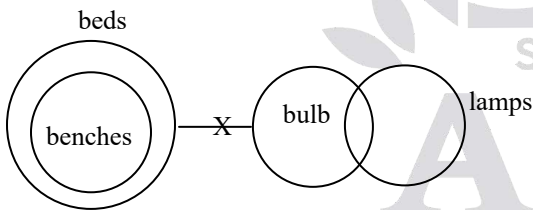
Sol:



If (i) and (ii) are true, than (iii) is true hence the correct options (c)

17. Ans: (d)

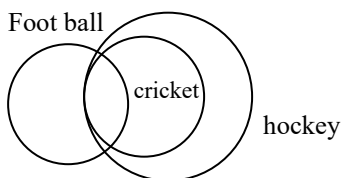
Sol:



Neither I nor ii inferred  
Hence the correct answer (d)

18. Ans: (d)

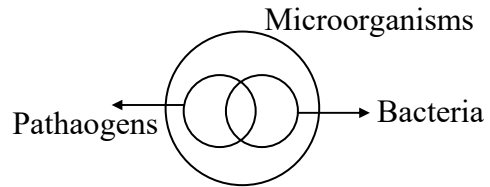
Sol:



Some football players play hockey hence, the correct answer (d)

19. Ans: (a)

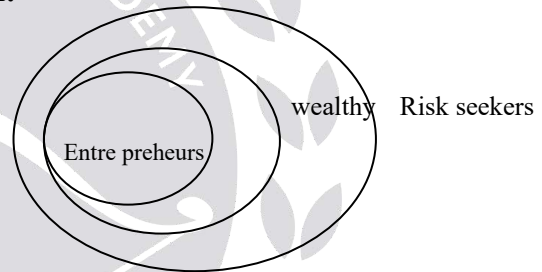
Sol:



Only conclusion I is correct.

20. Ans: (d)

Sol:



Neither conclusion I not II is hence, the correct and (d).

**1.11 Series, Classification, Analogy**

1.11. (a) Series:

01. Ans: (b)

Sol:

3	13	33	?	153	313	633
+10	+20	+40	+80	+160	+320	
$40 + 33 = 73$						

**02. Ans: (b)**
**Sol:**

$$\begin{array}{cccccc}
 113 & ? & 83 & 68 & 53 & 38 \\
 \hline
 & & & & & \\
 -15 & -15 & -15 & -15 & -15 & \\
 \hline
 \end{array}$$

$$113 - 15 = 98$$

**03. Ans: (b)**
**Sol:**

$$\begin{array}{cccccc}
 52 & 51 & 48 & 43 & ? & 27 & 16 \\
 \hline
 & & & & & & \\
 -1 & -3 & -5 & -7 & -9 & -11 & \\
 \hline
 \end{array}$$

$$43 - 7 = 36$$

**04. Ans: (d)**
**Sol:**

$$\begin{array}{cccccc}
 8 & ? & 21 & 32 & 46 & 63 & 83 \\
 \hline
 & & & & & & \\
 +5 & +8 & +11 & +14 & +17 & +20 & \\
 \hline
 \end{array}$$

$$8 + 5 = 13$$

**05. Ans: (a)**
**Sol:**

$$\begin{array}{cccccc}
 1 & 2 & 6 & ? & 31 & 56 & 92 \\
 \hline
 & & & & & & \\
 +1^2 & +2^2 & +3^2 & +4^2 & +5^2 & +6^2 & \\
 \hline
 \end{array}$$

$$6 + 9 = 15$$

**06. Ans: (d)**
**Sol:**

$$\begin{array}{cccccc}
 789 & 645 & 545 & 481 & ? & 429 & 425 \\
 \hline
 & & & & & & \\
 +12^2 & +10^2 & +8^2 & +6^2 & +4^2 & +2^2 & \\
 \hline
 \end{array}$$

$$= 481 + 64 = 445$$

**07. Ans: (c)**
**Sol:**

$$\begin{array}{cccccc}
 4 & 9 & 19 & 39 & 79 & ? & 319 \\
 \hline
 & & & & & & \\
 +5 & +10 & +20 & +40 & +80 & +160 & \\
 \hline
 \end{array}$$

$$= 79 + 80 = 159$$

**08. Ans: (d)**
**Sol:**

$$\begin{array}{cccccc}
 15 & 33 & 104 & ? & 2124 & 12755 & 89298 \\
 \hline
 & & & & & & \\
 \times 2+3 & \times 3+5 & \times 4+7 & \times 5+9 & \times 6+11 & \times 7+13 & \\
 \hline
 \end{array}$$

$$= 104 \times 4 + 7$$

$$= 423$$

**09. Ans: (b)**
**Sol:**

$$\begin{array}{cccccc}
 ? & 15 & 49 & 201 & 1011 & 6073 \\
 \hline
 & & & & & \\
 \times 2+3 & \times 3+4 & \times 4+5 & \times 5+6 & \times 6+7 & \\
 \hline
 \end{array}$$

$$2x + 3 = 13 \Rightarrow x = 6$$

**10. Ans: (c)**
**Sol:**

$$\begin{array}{cccccc}
 8 & 36 & 152 & 620 & 2496 & 10004 & ? \\
 \hline
 & & & & & & \\
 \times 4+4 & \times 4+85 & \times 4+12 & \times 4+16 & \times 4+20 & \times 4+24 & \\
 \hline
 \end{array}$$

$$10004 \times 4 + 24 = 40040$$

**11. Ans: (d)**
**Sol:**  $4 \times 2 + 2 = 10$ 

$$10 \times 3 + 3 = 33$$

$$33 \times 4 + 4 = 136$$

$$136 \times 5 + 5 = 685$$

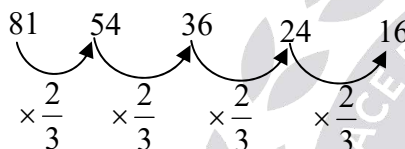
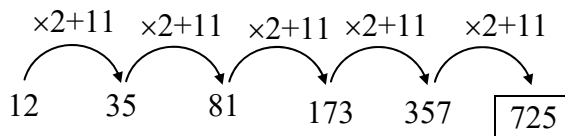
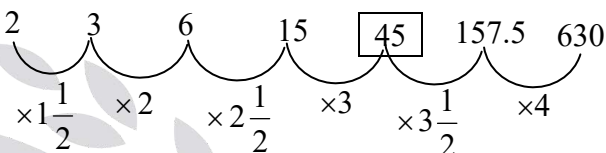
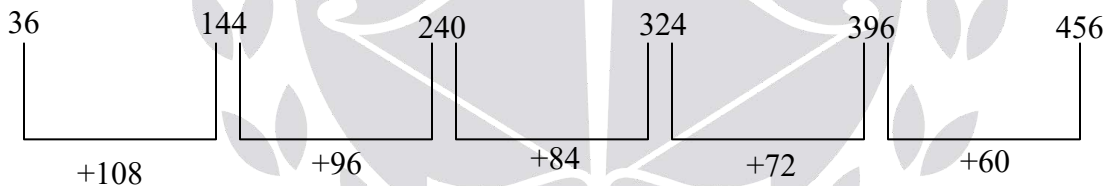
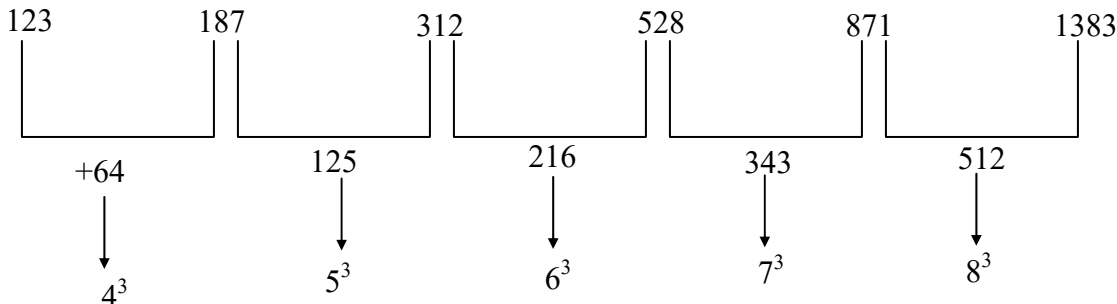
$$685 \times 6 + 6 = 4116$$

**12. Ans: (b)**
**Sol:** 343, 1331, \_\_\_\_\_, 4913

 $7^3, 11^3, 13^3, 17^3$ 

cubes of prime numbers.

343, 1331, 2197, 4913

**13. Ans: (b)**
**Sol:**  $2 \times 6, 12 \times 5, 60 \times 4, 240 \times 3, 720 \times 2, 1440$ 
 $\times 1, 1440 \times 0$ 
**14. Ans: 16**
**Sol:**

**15. Ans: 725**
**Sol:**

**16. Ans: 45**
**Sol:**

**17. Ans: (a)**
**Sol:**

**18. Ans: (b)**
**Sol:**


$$231 + 64 = 295$$

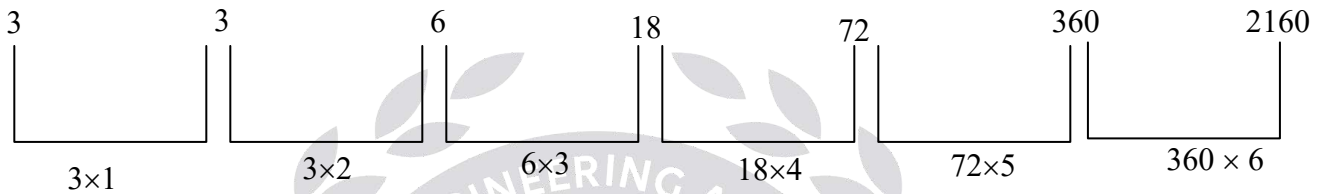
$$295 + 125 = 420$$

$$420 + 216 = 636$$

$$636 + 343 = 979$$

19. **Ans: (c)**

**Sol:**



$$9 \times 1 = 9$$

$$9 \times 2 = 18$$

$$18 \times 3 = 54$$

$$54 \times 4 = 216$$

$$216 \times 5 = 1080$$

$$1080 \times 6 = 6480$$

20. **Ans: (c)**

**Sol:** 14, 37, 611, 1016, 1522

First letter +2, +3, +4, +5

Second letter +3, +4, +5, +6

1522 = OV

21. **Ans: (b)**

**Sol:** 7G, 11K, 13 M, 17 Q

∴ Prime numbers

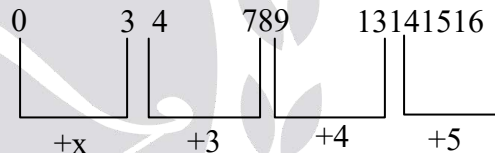
22. **Ans: (c)**

**Sol:** 13M, 17Q, 19S, 23W

∴ Prime numbers

23. **Ans: (c)**

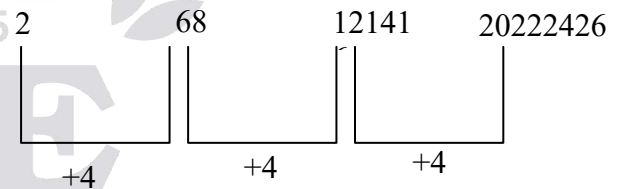
**Sol:**



13 14 15 16 = MNOP

24. **Ans: (c)**

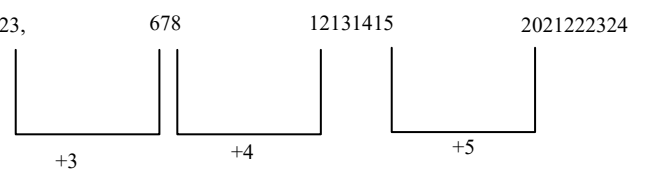
**Sol:**



20222426 = TVXZ

25. **Ans: (b)**

**Sol:** 23,



20 21 22 23 24 = TUVWX

26. Ans: (c)

Sol: a b c c b a a b c c b a

27 Ans: (b)

Sol: a b a a b aab a a b a

28. Ans: (b)

Sol: a b ba a bb a ab b a

29. Ans: (c)

Sol: abc d d a b c c d a b b c

30 Ans: (c)

Sol: P Q R P P Q R P P Q R P P Q R P

11. (b) Classification /odd one out

01. Ans: (b)

Sol: 13 23 33 43 53  
33 is not a prime number

02. Ans: (c)


Sol:  $324 = 18^2$ ,  $441 = 21^2$ ,  $64 = 8^2$   
But 97 is not square of any numbers.

03. Ans: (d)


Sol:  $5^3 = 125$ ,  $6^3 = 216$ ,  $7^3 = 343$ ,  $8^3 = 512$ ,  $9^3 = 729$

04. Ans: (d)

Sol:

13339, 13452, 13564, 13678, 13791  
  
 +113 +112 +114 +113

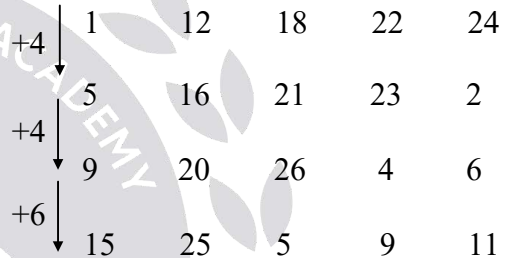
Actually

13339, 13452, 13564, 13678, 13791  
  
 +113 +113 +113

05. Ans: (d)

Sol:  $2 \times 7 - 7^2$ ,  $2 \times 8 - 8^2$ ,  $2 \times 10 - 10^2$ ,  $2 \times 12 - 12^2$

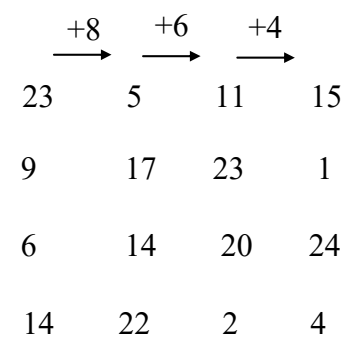
06. Ans: (d)

Sol: 

07. Ans: (c)

Sol: 

08. Ans: (d)

Sol: 

**09. Ans: (d)**

**Sol:** Nephew (male) remaining all female.

**10. Ans: (b)**

**Sol:** June (30 days) remaining all 31 days.

### 1.11 (c) Analogy

**01. Ans: (b)**

**Sol:**  $3^2 : 5^3 :: 4^3 : 6^3$

**02. Ans: (b)**

**Sol:**  $12^2 :: 12-2 :: 13^2 : 13-2$

**03. Ans: (c)**

**Sol:**  $68 = 4^3 + 4$

$$130 = 5^3 + 5$$

$$222 = 6^3 + 6$$

$$350 = 7^3 + 7$$

**04. Ans: (c)**

**Sol:**  $6 \times 7 :: 7 \times 8 :: 10 \times 11 : 11 \times 12$

**05. Ans: (b)**

**Sol:**  $\frac{20}{10} : 2 :: \frac{24}{8} : 3$

**06. Ans: (b)**

**Sol:** M  $\rightarrow$  13

O  $\rightarrow$  opposite is 12

H  $\rightarrow$  8

J  $\rightarrow$  opposite is 17

**07. Ans: (c)**

**Sol:**

A C E G : I K M O  
 $\begin{array}{cccc} \square & \square & \square & \square \\ +2 & +2 & +2 & +2 \end{array}$

Q S U W : Y A C E  
 $\begin{array}{cccc} \square & \square & \square & \square \\ +2 & +2 & +2 & +2 \end{array}$

**08. Ans: (c)**

**Sol:**

F I L M A D G H  
 $\begin{array}{cccc} \square & \square & \square & \square \\ -5 & & & -5 \end{array}$

M I L K : H D G H  
 $\begin{array}{cccc} \square & \square & \square & \square \\ -5 & & & -5 \end{array}$

**09. Ans: (b)**

**Sol:**

Son : Nephew : : Daughter : Niece

$\begin{array}{c} \square \\ \square \end{array}$

Brother's son

$\begin{array}{c} \square \\ \square \end{array}$

Brother's Daughter

**10. Ans: (c)**

**Sol:** Pen : write : : knife : cut

Pen used for writing

Knife used for cutting

# Chapter **2** Quantitative Aptitude

## 1.1 Number System

**01. Ans: (c)**

**Sol:** The unit place the square of natural number will not get 7.

Hence the correct answer 'c'

**02. Ans: (c)**

**Sol:**  $31^{42} \times 33^{72} \times 48^{61} \times 37^{51}$

$31^{42} \Rightarrow$  unit place = 1

$33^{72} \Rightarrow \frac{72}{4} \Rightarrow$  remainder = 0  $\Rightarrow 3^0 = 1$

$48^{61} \Rightarrow \frac{61}{4} \Rightarrow$  remainder = 1  $\Rightarrow 8^1 = 8$

$37^{51} = \frac{54}{4} \Rightarrow$  remainder = 3  $\Rightarrow 7^3 = 343$

$= 1 \times 1 \times 8 \times 3 = 24$

Unit place of given expansion is 4

**03. Ans: (c)**

**Sol:**  $2^{1999} \times 2^{2013}$

$2^{1999} \Rightarrow \frac{1999}{4} \Rightarrow$  remainder = 3  $\Rightarrow 2^3 = 8$

$2^{2013} \Rightarrow \frac{2013}{4} \Rightarrow$  remainder = 1  $\Rightarrow 2^1 = 2$

$= 8 \times 2 = 16$

Last digit is 6

**04. Ans: (b)**

**Sol:**  $(217)^7 + (2172)^9 + (2173)^{11} + (2174)^{13}$

$(2171)^7 \Rightarrow$  last digit = 1

$(2172)^7 \Rightarrow \frac{9}{4} \Rightarrow$  remainder = 1  $\Rightarrow 2^1 = 2$

$(2173)^{11} \Rightarrow \frac{11}{4} \Rightarrow$  remainder = 3  $\Rightarrow 3^3 = 27$

$(2174)^{13} \Rightarrow$  power is odd  $\Rightarrow 4$

$= 1 + 2 + 7 + 4 = 14$

**05. Ans: 7**

**Sol:**  $211^{870} + 146^{127} \times 3^{424}$

$211^{870} \Rightarrow$  last digit = 1

$146^{127} \Rightarrow$  last digit = 6

$3^{424} \Rightarrow \frac{424}{4} \Rightarrow$  remainder = 0  $\Rightarrow 3^0 = 1$

$= 1 + 6(1) = 7$

Hence the correct answer (7)

**06. Ans: (b)**

**Sol:**  $(26591749)^{110016}$

Given power is even so that unit place will be 1

$\therefore$  Unit digit = 9

**07. Ans: (a)**

**Sol:**  $(35)^{87} + (93)^{46}$

$(35)^{87}$  the unit place = 5

$(93)^{46} \Rightarrow \frac{46}{4} \Rightarrow$  remainder = 2  $\Rightarrow 3^2 = 9$

$= 5 + 9 = 14$

08. Ans: (d)

Sol:

$$\begin{array}{r} 2 \overline{) 1420} \\ 2 \overline{) 710} \\ 5 \overline{) 355} \\ \hline 71 \end{array}$$

$$1420 = 2^2 \times 5^1 \times 71^1$$

$$\begin{aligned} \text{Number of factors (or) divisors} &= (2+1) \\ &(1+1)(1+1) \end{aligned}$$

$$\begin{aligned} &= 3(2)(2) \\ &= 12 \end{aligned}$$

09. Ans: 8

Sol:

$$\begin{array}{r} 2 \overline{) 2014} \\ 19 \overline{) 1007} \\ \hline 53 \end{array}$$

$$2014 = 2^1 \times 19^1 \times 53^1$$

$$\begin{aligned} \text{Number of factors (or) divisors} &= (1+1) \\ &(1+1)(1+1) \end{aligned}$$

$$= 2(2)(2) = 8$$

10. Ans: 36

Sol:

$$\begin{array}{r} 2 \overline{) 2100} \\ 2 \overline{) 1050} \\ 5 \overline{) 525} \\ 5 \overline{) 105} \\ 3 \overline{) 21} \\ \hline 7 \end{array}$$

$$2100 = 2^2 \times 3^1 \times 5^2 \times 7^1$$

$$\begin{aligned} \text{Number of divisors (or) factors} &= (2+1) \\ &(1+1)(2+1)(1+1) \end{aligned}$$

$$= 3(2)(3)(2)$$

$$= 36$$

11. Ans: (d)

$$\text{Sol: } 63 = 9 \times 7 = 3^2 \times 7^1$$

$$55 = 5 \times 11 = 5^1 \times 11^1$$

Number of divisors (or) factors

$$= (2+1)(1+1)(1+1)(1+1)$$

$$= 3(2)(2)(2) = 24$$

Hence the correct answer (d)

12. Ans: (c)

$$\text{Sol: } 24 = 4 \times 6 = 2 \times 2 \times 3 \times 2$$

The given number must be divisible by 3

Hence the correct answer (c)

Divisible by 3, rule  $\frac{\text{sum of digit}}{3}$

Then total number divisible by 3

$$\frac{7+1+5+x+4+2+3}{3} = \frac{22-x}{3}$$

x – is replaced by 2, then total number divisible by -3

13. Ans: (c)

Sol: Where divisible by '3' rule.

$$\frac{4+7+6+a+b+0}{3}$$

$$\frac{17+a+b}{3}$$

So a, b values becomes (7, 4), (8, 5)

Bored on options.

$$\begin{array}{cccccc} & \boxed{4} & \boxed{7} & \boxed{6} & \boxed{a} & \boxed{b} & \boxed{0} \\ & \boxed{\phantom{0}} & \boxed{\phantom{0}} & \boxed{\phantom{0}} & \boxed{\phantom{0}} & \boxed{\phantom{0}} & \boxed{\phantom{0}} \end{array}$$

$$4 + 6 + b = 7 + a + 0$$

$$a - b = 3$$

So according to option 'c' is possible

(8, 5)

∴ option (c) is existing



14. Ans: (b)

Sol: Divisible by 3, rule  $\frac{\text{sum of digit}}{3}$

Then total number divisible by 3

$$\frac{7+1+5+x+4+2+3}{3} = \frac{22-x}{3}$$

x - is replaced by 2, then total number divisible by -3

15. Ans: (d)

Sol:  $\frac{\text{LCM}(5,8,11)}{\text{HCF}(2,9,14)} = 5 \times 8 \times 11 = 440$

Hence the correct ans (d)

16. Ans: (a)

Sol: LCM (5, 6, 10, 12, 15)

$$\begin{array}{r|l} 5 & 5, 6, 10, 12, 15 \\ \hline 2 & 1, 6, 2, 12, 15 \\ \hline 3 & 1, 3, 1, 6, 3 \\ \hline & 1, 1, 1, 2, 1 \end{array}$$

$$= 5 \times 2 \times 3 \times 2 = 60 \text{ sec}$$

Hence the correct answer (a)

17. Ans: (a)

Sol: LCM (48, 72, 108)

$$\begin{array}{r|l} 3 & 48, 72, 108 \\ \hline 4 & 16, 24, 36 \\ \hline 2 & 4, 6, 9 \\ \hline 3 & 2, 3, 9 \\ \hline & 2, 1, 3 \end{array}$$

$$\Rightarrow 3 \times 4 \times 2 \times 3 \times 2 \times 3 = 432 \text{ sec}$$

$$432 \text{ sec} = 7 \text{ min} : 12 \text{ sec}$$

$$\begin{array}{r} 8 : 20 : 00 \\ \underline{07 : 12} \\ 8 : 27 : 12 \text{ am} \end{array}$$

Hence the correct answer (a)

18. Ans: (d)

Sol: 4,  $5\frac{1}{2}$ , 8

$$\frac{4}{1}, \frac{11}{2}, \frac{8}{1}$$

LCM of numbers for fracture

$$\Rightarrow \frac{\text{LCM of numerator}}{\text{HCF of demonator}}$$

$$= \frac{\text{LCM of}(4, 11, 3)}{\text{HCF of}(1, 2, 1)}$$

$$= 88 \text{ hrs}$$

Smallest speed 4 km/h

$$\text{Then } \frac{88}{4} = 22 \text{ hrs}$$

19. Ans: (c)

Sol: Required least number = LCM of given + common remainder

$$= \text{LCM}(20, 42, 76) + 7$$

$$= 7980 + 7$$

$$= 7987$$

20. Ans: (d)

Sol:  $xy = \text{LCM} \times \text{HCF}$

$$480 y = 4800 \times 160$$

$$y = 1600$$

**21. Ans: (c)**

**Sol:** HCF (42, 49, 63)

The factors of 42 = 1, 2, 3, 6, 7, 14, 21, 42

The factors of 49 = 1, 7, 49

The factors of 63 = 1, 3, 7, 9, 21, 63

Then the greatest common factor is 7

**22. Ans: (d)**

**Sol:** HCF [408, 468, 516] = 12

**23. Ans: (c)**

**Sol:** HCF = [403, 434, 465] = 31

**24. Ans: (b)**

**Sol:**  $x + y = 9$  ..... (1)

$10x + y - 45 = 10y + x$  ..... (2)

By solving (1) and (2)  $x = 7$ ,  $y = 2$

Since number is 72

**25. Ans: (d)**

**Sol:** Given that

$$x + y = 26$$

$$xy = 165$$

$$(x+y)^2 = (x-y)^2 + 4xy$$

$$(26)^2 = (x-y)^2 + 4(165)$$

$$x - y = 4$$

Hence the correct ans (d)

## 2.2 Ratio, Proportion & Variation

**01. Ans: (d)**

**Sol:** 70 must be divisible by  $a + b$  if ratio is  $a : b$

So that 1 : 3 cannot represent the ratio of boys and girls in the class

**02. Ans: (b)**

$$\begin{aligned} \text{Sol: } A : D &= \frac{A}{B} \times \frac{B}{C} \times \frac{C}{D} \\ &= \frac{8}{15} \times \frac{5}{8} \times \frac{4}{5} \\ A : D &= \frac{4}{15} \end{aligned}$$

**03. Ans: (a)**

**Sol:** Let the number of seats for Mathematics, Physics and Biology be  $5x$ ,  $7x$  and  $8x$  respectively.

Number of increased seats are (140% of  $5x$ ), (150% of  $7x$ ) and (175% of  $8x$ ).

$$\Rightarrow \left( \frac{140}{100} \times 5x \right), \left( \frac{150}{100} \times 7x \right) \text{ and } \left( \frac{175}{100} \times 8x \right)$$

$$\Rightarrow 7x, \frac{21x}{2} \text{ and } 14x$$

$$\therefore \text{The required ratio} = 7x : \frac{21x}{2} : 14x$$

$$\Rightarrow 14x : 21x : 28x$$

$$\Rightarrow 2 : 3 : 4$$

**04. Ans: (d)**

**Sol:** Let share of A, B and C be Rs.  $(3x+5)$ ,  $(4x+10)$  and  $(5x+15)$

$$\text{Then Total amount} = 3x + 5 + 4x + 10 + 5x + 15 = 12x + 30$$

According to the question

$$\Rightarrow 12x + 30 = 2430$$

$$\Rightarrow 12x = 2400$$

$$\Rightarrow x = 200$$

$$B\text{'s share} = 4x + 10 = 4 \times 200 + 10 = 810 \text{ Rs}$$

**05. Ans: (d)**

**Sol:** Quantity of milk =  $\left(60 \times \frac{2}{3}\right)$  litres = 40

litres

Quantity of water in it =  $(60 - 40)$  litres = 20  
litres

New ratio = 1 : 2

Let the quantity of water to be added further  
be  $x$  litres

Then milk : water =  $\left(\frac{40}{20+x}\right)$

Now,  $\left(\frac{40}{20+x}\right) = \frac{1}{2}$

$\Rightarrow 20 + x = 80$

$\Rightarrow x = 60$

$\therefore$  Quantity of water to be added = 60 litres

**06. Ans: (a)**

**Sol:** Let their salaries be  $9x$  and  $7x$

Let their expenditure be  $4y$  and  $3y$

According to the question,

$9x - 4y = 2000 \rightarrow (1)$

$7x - 3y = 2000 \rightarrow (2)$

By solving above (1), (2) we get

$x = 2000, y = 4000$

So,

Salary of first person =  $9 \times 2000 = \text{Rs. } 18000$

Salary of second person =  $7 \times 2000 = \text{Rs. } 14000$

**07. Ans: (b)**

**Sol:** Quantity of tin in 60 kg of A

=  $\left(60 \times \frac{2}{5}\right)$  kg

= 24 kg

Quantity of tin in 100 kg of B

=  $\left(100 \times \frac{1}{5}\right)$  kg

= 20 kg

$\therefore$  Quantity of tin in the new alloy

=  $(24 + 20)$  kg

= 44 kg

**08. Ans: (c)**

**Sol:** There are 25 paise, 10 paise and 5 paise  
coins in a bag

Their ratio is 1 : 2 : 3

Here total value is Rs. 30

Let exact quantity of coins be  $x, 2x, 3x$   
respectively.

Then value of all coins combined =  $25x +$   
 $10(2x) + (5)3x = 30 \times 100$  paise

$\Rightarrow 60x = 30 \times 100$  paise

$\Rightarrow x = 50$

Number of 5 paise coins =  $3x = 150$

**09. Ans: (d)**

**Sol:**

Alloy (A)		Alloy (B)		Alloy (C)	
Gold	Copper	Gold	Copper	Gold	Copper
2	: 3	3	: 7	$\frac{2}{5} + \frac{3}{10}$	$\frac{3}{5} + \frac{7}{10}$
$\frac{2}{5}$	: $\frac{3}{5}$	$\frac{3}{10}$	: $\frac{7}{10}$	$\frac{4+3}{10}$	$\frac{6+7}{10}$
				7	: 13

**10. Ans: (d)**

**Sol:** Let number of boys participated =  $4x$

Number of girls participated =  $3x$

$$\text{Total passed candidates} = \frac{80}{100} \times 7x = \frac{28}{5}x$$

Girls candidate who passed

$$= \frac{90}{100} \times 3x = \frac{27}{10}x$$

Boys candidate who passed = Total passed candidate - Girls candidate who passed

$$\begin{aligned} &= \frac{28}{5}x - \frac{27}{10}x \\ &= \frac{29}{10}x \\ &= \frac{29x}{10 \times 4x} \times 100 = 72.5\% \end{aligned}$$

**11. Ans: (d)**

**Sol:** Number of hens in farm Q =  $\frac{5}{32} \times 416 = 65$

Number of ducks in farm

$$Q = \frac{14}{32} \times 416 = 182$$

Number of goats in farm

$$Q = \frac{13}{32} \times 416 = 169$$

Initially, the number of hens, ducks and goats in farm P are 65, 91 and 169 respectively.

All the hens, ducks, and goats are sent from farm Q to farm P.

$$\text{Number of hens} = 65 + 65 = 130$$

$$\text{Number of ducks} = 91 + 182 = 273$$

$$\text{Number of goats} = 169 + 169 = 338$$

$$\therefore \text{the required ration} = 130 : 273 : 338 = 10 : 21 : 26$$

**12. Ans: (b)**

**Sol:** Let the third proportional to 12 and 30 be  $x$ .

Then,

$$\Rightarrow 12 : 30 :: 30 : x$$

$$\Rightarrow x = \frac{(30 \times 30)}{12} = 75$$

$\therefore$  Third proportional to 12 and 30 = 75

Mean proportional between 9 and 25

$$= \sqrt{9 \times 25} = 15$$

$\therefore$  Required ratio =  $75 : 15 = 5 : 1$

**13. Ans: (b)**

**Sol:**  $P^2 - 1 = K(q + 2)$

$$4^2 - 1 = K(3 + 2)$$

$$15 = k(5)$$

$$K = 3$$

$$\therefore P^2 - 1 = 3(q + 2)$$

$$P^2 - 1 = 3(14 + 2)$$

$$P^2 = 49 \Rightarrow P = 7$$

**14. Ans: (a)**

**Sol:**  $P + 3 = \frac{K}{\sqrt{q}}$

$$-2 + 3 = \frac{k}{\sqrt{4}}$$

$$\therefore k = 2$$

$$p + 3 = \frac{2}{\sqrt{q}}$$

$$p + 3 = \frac{2}{\sqrt{9}}$$

$$p + 3 = \frac{2}{3}$$

$$p = \frac{2}{3} - 3 = -\frac{7}{3}$$

$$p = -\frac{7}{3}$$

**15. Ans: (b)**

**Sol:** Price  $\propto$  (Length)<sup>2</sup>

$\therefore$  Price = K (Length)<sup>2</sup>, where K is constant  
 i.e 1600 Rs = K (10)<sup>2</sup>

$\therefore$  K = 16

$$\begin{aligned} \text{Total price of 2 pieces} &= K(L_1^2) + K(L_2^2) \\ &= K(L_1^2 + L_2^2) \\ &= 16(4^2 + 6^2) \\ &= \text{Rs. } 832 \end{aligned}$$

## 2.3 Partnership

**01. Ans: (d)**

**Sol:** Just take care of the months of investment, rest all will be simple.

$$\begin{aligned} \text{Yogesh : Pranab : Atul} \\ &= 45000 \times 12 : 60000 \times 9 : 90000 \times 3 \\ &= 2 : 2 : 1 \end{aligned}$$

Atul's share

$$\begin{aligned} &= \text{Rs. } 20000 \times \frac{1}{5} \\ &= \text{Rs. } 4000 \end{aligned}$$

**02. Ans: (c)**

$$\begin{aligned} \text{Sol: A : B : C} &= [(3 \times 16000) + (9 \times 11000)] : \\ &[(3 \times 12000) + (9 \times 17000)] : [(6 \times 21000)] \\ &= (48000 + 99000) : (36000 + 153000) : \\ &(126000) \\ &= 147000 : 189000 : 126000 \\ &= 49 : 63 : 42 = 7 : 9 : 6 \end{aligned}$$

$$\begin{aligned} \text{Therefore, Amount} &= 26400 \times \left( \frac{9-6}{7+9+6} \right) \\ &= 26400 \times \frac{3}{22} = 1200 \times 3 = \text{Rs. } 3600 \end{aligned}$$

**03. Ans: (a)**

**Sol:** A : B : C

$$\begin{aligned} &= (25 \text{ lakhs} \times 1 + 35 \text{ lakhs} \times 2) : (35 \text{ lakhs} \times \\ &2 + 25 \text{ lakhs} \times 1) : (30 \text{ lakhs} \times 3) \\ &= 95 \text{ lakhs} : 95 \text{ lakhs} : 90 \\ &= 19 : 19 : 18 \end{aligned}$$

**04. Ans: (a)**

**Sol:** Let A invest Rs 14a for 10 months and B invest Rs 15a for b months

$$\begin{aligned} \text{The, } \frac{14a \times 10}{15a \times b} &= \frac{7}{6} \\ b &= \frac{840}{105} = 8 \end{aligned}$$

Hence B invested money for 8 months

**05. Ans: (b)**

**Sol:** For managing, A received = 5% of Rs. 7400  
 = Rs. 370

Balance = Rs. (7400 - 370) = Rs. 7030

$$\begin{aligned} \text{Ratio of their investments} &= (6500 \times 6) : \\ &(8400 \times 5) : (10000 \times 3) \\ &= 39000 : 42000 : 30000 \\ &= 13 : 14 : 10 \end{aligned}$$

$\therefore$  B's share

$$\begin{aligned} &= \text{Rs. } 7030 \times \frac{14}{37} \\ &= \text{Rs. } 2660 \end{aligned}$$

**06. Ans: (c)**

**Sol:**

	A		B
Investments	3	:	2

10% profit → foundation  
 ↓ 100-10  
 90% → both A and B

Let total profit = x

Profit

$$\Rightarrow A : B = 3 : 2$$

$$A's \text{ share} = \frac{3}{3+2} \times 90\% \text{ of } x$$

$$\Rightarrow \frac{3}{5} \times \frac{90}{100} \times x$$

$$\Rightarrow \frac{27}{50} \times x$$

$$\frac{27}{50} x = 810$$

$$x = 1500$$

**07. Ans: (d)**
**Sol:** Suppose B invested Rs. x for y months

Then, A invested Rs. 3x for 2y months

So, A : B

$$= (3x \times 2y) : (x \times y)$$

$$= 6xy : xy$$

$$= 6 : 1$$

$$\therefore B's \text{ profit} : \text{Total profit} = 1 : 7$$

Let the total profit is Rs. X

$$\text{Then, } \frac{1}{7} = \frac{4000}{x}$$

$$x = 28000$$

**08. Ans: (d)**
**Sol:** Let B join after 'x' months

A joins for 12 months with Rs 4,500

B joins for (12-x) months with Rs 5,400

$$\Rightarrow \frac{4500 \times 12}{5400 \times (12-x)} = \frac{2}{1} \Rightarrow x = 7$$

**09. Ans: (a)**
**Sol:** Let A invests  $\frac{x}{6}$  for  $\frac{y}{6}$  Month

 B invests  $\frac{x}{3}$  for  $\frac{y}{3}$  Month

 C invests  $\left[ x - \left( \frac{x}{6} + \frac{x}{3} \right) \right]$  for y months

Ratio of their investments

$$= \left( \frac{x}{6} \times \frac{y}{6} \right) : \left( \frac{x}{3} \times \frac{y}{3} \right) : \left( \frac{x}{2} \times y \right)$$

$$= \frac{1}{36} : \frac{1}{9} : \frac{1}{2} = 1 : 4 : 18$$

$$\therefore B's \text{ share} = \text{Rs} \left( 4600 \times \frac{4}{23} \right) = \text{Rs} 800$$

**10. Ans: (a)**
**Sol:** For management A receive = 960

Balance amount = (9600 - 960) = 86400

 Ratio of their investment = 12000: 20000 =  
 3 : 5

$$\therefore A's \text{ share} = 8640 \times \left( \frac{3}{8} \right) = 3240$$

$$\text{So, A receive} = (3240 + 960) = 4200$$

## 2.4 Averages

**01. Ans: (a)**

**Sol:** Now each student awarded 4-grace marks.

So average also increased by 4

$$\text{New average} = 69 + 4 = 73$$

**02. Ans: (b)**

**Sol:** If each number is trippled

Then average in also trippled

$$\text{Old average} = 32$$

$$\text{New average} = 3(32) = 96$$

**03. Ans: (b)**

**Sol:** 10, 20, 30, ..... 190

$$\text{Avg} = \frac{\text{first term} + \text{last term}}{2}$$

$$= \frac{10 + 190}{2} = 100$$

**04. Ans: (a)**

**Sol:** First 4 days average

$$\text{Average} = \frac{A + B + C + D}{4} = 58$$

$$A + B + C + D = 4(58) = 232 \rightarrow (1)$$

Average 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> day  $\Rightarrow$

$$\frac{B + C + D + E}{4} = 60$$

$$B + C + D + E = 240 \rightarrow (2)$$

$$(2) - (1) = E - A = 8 \rightarrow (3)$$

Ratio of 1<sup>st</sup> and 5<sup>th</sup> = A : E = 7 : 8  $\Rightarrow$  7x, 8x

say

From (3)

$$8x - 7x = 8$$

$$x = 8$$

$$\text{So fifth day} = 8x = 8(8) = 64$$

**05. Ans: (c)**

**Sol:**  $\frac{\text{sum}_9}{9} = x$  say

$$\frac{\text{sum}_8 + 9^{\text{th}}}{9} = x$$

$$\frac{8[30] + (x + 20)}{9} = x \quad [\because 9^{\text{th}} \text{ person spent 20}$$

more than average of '9' persons]

$$260 + x = 9x$$

$$8x = 260$$

$$x = \frac{260}{8} = 32.5$$

$$\begin{aligned} \text{Total expenditure} &= 8[30] + (x + 20) \\ &= 240 + 32.5 + 20 = 292.50 \end{aligned}$$

**06. Ans: (c)**

**Sol:**  $\frac{\text{sum}_{11}}{11} = 50 \Rightarrow \text{sum}_{11} = 550$

$$\frac{\text{sum}[\text{First 6 results}]}{6} = 49 \Rightarrow \text{sum}_6 = 6[49] = 294$$

$$\frac{\text{sum}[\text{Last 6 results}]}{6} = 52 \Rightarrow \text{sum}_6 \Rightarrow 6(52) = 312$$

$$\begin{aligned} \text{Sixth result is} &= [\text{sum}_{(\text{first}-6)} + \text{sum}_{(\text{least } 6)}] - \text{sum}_{11} \\ &= 294 + 312 - 550 \\ &= 56 \end{aligned}$$

**07. Ans: (d)**

**Sol:** Total 30 days

Day – 1 is Sunday

So next Sundays are 8, 15, 22, 29

i.e., (1, 8, 15, 22, 29) = 5 Sundays

$$\text{Average} = \frac{5[510] + 25[240]}{30} = 285$$

**08. Ans: (c)**

**Sol:** 'M' observations average is 'n'

But there wrong observations, instead of correct observations.

Then

$$\begin{aligned} \text{Original average} &= \frac{Mn - (\text{wrong} - \text{correct})}{M} \\ &= \frac{14(71) - [(42 + 74) - (56 + 32)]}{14} = 69 \end{aligned}$$

**09. Ans: (c)**

**Sol:**  $\frac{A + B + C}{3} = 84$

$$A + B + C = 252 \rightarrow (1)$$

$$\frac{A + B + C + D}{4} = 80 \Rightarrow A + B + C + D = 320$$

$$252 + D = 320$$

$$D = 68$$

$$E = D + 3 = 68 + 3 = 71$$

$$\frac{B + C + D + E}{4} = 79 \Rightarrow B + C + D + E$$

$$= 4(79) = 316$$

$$B + C + 68 + 71 = 316$$

$$B + C = 316 - 139 \Rightarrow 177$$

From (1)  $A + B + C = 252$

$$A = 252 - (B + C) = 252 - 177 = 75$$

**10. Ans: (b)**

**Sol:** In a family = 7 members

$$\frac{\text{sum}_7}{7} = 29$$

$$\text{Sum}_7 = 7(29) = 203$$

5 years ago, every person in family also back.

$$7(5) = 35 \text{ yrs less}$$

$$203 - 35 = 168$$

$$\text{So average of 6 members} = \frac{168}{6} = 28$$

(∵ 5 years ago, boy was not there, so remaining 6 members)

**11. Ans: (a)**

**Sol:**  $\frac{\text{sum}_{11}}{11} = x$

$$\frac{\text{sum}_9 + 26 + 29}{11} = x$$

Average of 9 persons

$$\frac{\text{sum}_9}{9} = x - 1$$

(∵ 1 year less than average of whole team

$$\text{So} \Rightarrow x - 1)$$

$$\text{Sum}_9 = 9x - 9$$

$$\frac{9x - 9 + 26 + 29}{11} = x$$

After simplify  $x = 23$

i.e. whole team average = 23

**12. Ans: 495**

**Sol:**  $x, x + 2, x + 4, x + 6, x + 8, \dots$

$$5x + 20 = 425$$

$$5x = 405$$

$$x = 81$$



Hence 12 odd numbers  
 81,83,85, 87, 89, 91,93, 95, 97, 99, 101, 103  
 Sum of last 5 numbers = 495

**13. Ans: 163**

**Sol:** Let us suppose 8 consecutive odd numbers  
 be  $x, x + 2, x + 4, \dots, x + 14$ .

Given that their Sum = 656

$$8x + 56 = 656$$

$$8(x+7) = 656$$

$$x + 7 = \frac{656}{8} = 82$$

$x = 75$  (also smallest odd number)

Now let us consider fore even numbers be

$x, x+2, x+4, x+6$

Given that Average = 87

$$\frac{4x + 12}{4} = 87$$

$$\frac{4(x + 3)}{4} = 87 \Rightarrow x = 84$$

second largest even number =  $x + 4 = 88$

sum of smallest odd number & second

largest even number =  $75 + 88 = 163$

**14. Ans: (d)**

**Sol:** Concept Adding and removing

$$= \frac{\text{MP - removing + adding}}{M} = \text{Avg}$$

$$= \frac{45[52] - 5[48] + 5[54]}{45}$$

$$= 52.66 \text{ or } 52\frac{2}{3}$$

**15. Ans: (d)**

$$\text{Sol: } \frac{\text{sum}_{24}}{24} = 16$$

$$\frac{\text{sum}_{23} + B}{24} = 17$$

$$\text{Sum}_{23} + T + B = 384 \dots (1)$$

$$\text{Sum}_{23} + B = 4080 \dots (2)$$

From (1) & (2)

Student weight not given  $T - B = 24$

So not sufficient

**2.5 Problem on Ages**

**01. Ans: (a)**

**Sol:** Let the present age of the man be  $x$  years

Then,

$$\Rightarrow 3(x+3) - 3(x-3) = x$$

$$\Rightarrow x = 18$$

$\therefore$  The present age of the man is 18 years

**02. Ans: (c)**

$$\text{Sol: } \frac{5x - 4}{3x + 4} = \frac{1}{1}$$

$$\therefore x = 4$$

$$\frac{5x + 4}{3x - 4} = \frac{24}{8} = 3:1$$

**03. Ans: (d)**

$$\text{Sol } \therefore 10x - 13 = 3(2x + 5)$$

$$\Rightarrow 6x + 15 = 10x - 13$$

$$\Rightarrow 15 + 13 = 10x - 6x$$

$$\Rightarrow x = 7$$

$\therefore$  Hema's age =  $2x + 5 = 2 \times 7 + 5 = 19$  years

**04. Ans: (c)**

**Sol:** Let the ages of Kunal and Sugar 6 years ago be  $6x$  and  $5x$  years respectively.

$$\text{Then, } \frac{(6x+6)+4}{(5x+6)+4} = \frac{11}{10}$$

$$\Rightarrow 10(6x+10) = 11(5x+10)$$

$$\Rightarrow 5x = 10$$

$$\Rightarrow x = 1$$

$$\therefore \text{Sagar's present age} = (5x+6) = 16 \text{ years}$$

**05. Ans: (a)**

**Sol:** Let the son's present age be  $x$  years. Then,

$$(38-x) = x$$

$$\Rightarrow 2x = 38$$

$$\Rightarrow x = 19$$

$$\therefore \text{Son's age 5 years back } (19-5) = 14 \text{ years}$$

## 2.6 Time and Work

**01. Ans: (c)**

**Sol:** A  $\rightarrow$  32 pages  $\rightarrow$  8 hr  $\Rightarrow \frac{32}{8} = 4$  pages 1 hr

B  $\rightarrow$  40 pages  $\rightarrow$  5 hr  $\Rightarrow \frac{40}{5} = 8$  pages 1 hr

So, A + B = 4+8 pages in 1 hr

12P  $\rightarrow$  1 hr

120p  $\rightarrow$  ?

$$\frac{120}{12} = 10 \text{ hrs}$$

**02. Ans: (b)**

**Sol:** A  $\rightarrow$  100 pages in 5 hrs =  $\frac{100}{5} = 20$  pg/hr

A & B  $\rightarrow$  100 pages in 4 hr =  $\frac{100}{4} = 25$

pages/hr

So, B  $\Rightarrow$  (A+B) - A

$$= 25 - 20 = 5 \text{ pages/hour}$$

For 20 pages  $\Rightarrow$  4 hours

**03. Ans: (c)**

**Sol:** Equation Method

$$\frac{1}{10} + \frac{1}{15} + \frac{1}{12} \Rightarrow 1 \text{ day work}$$

$$\frac{12+8+10}{120}$$

$$= \frac{30}{120}$$

$$= \frac{1}{4} \text{ (1 day work)}$$

$$= \frac{1}{4} \text{ (1 day work)}$$

$$\therefore \text{Total 4 days}$$

(OR)

$$\frac{60}{60} + \frac{60}{15} + \frac{60}{15} = \frac{60}{15} = 4 \text{ days}$$

(OR)

Formula

$$\frac{xyz}{xy + yz + zx} = \frac{10[15][12]}{150 + 120 + 180} = 4 \text{ days}$$

**04. Ans: (b)**

**Sol:** A  $\rightarrow \frac{1}{3}(w) = 5 \Rightarrow 15$  days [for complete work]

B  $\rightarrow \frac{2x}{5}(w) = 10 \Rightarrow 25$  days for complete work

$$\text{A and B} = \frac{\text{product}}{\text{sum}} = \frac{15[25]}{40} = \frac{75}{8} \Rightarrow 9\frac{3}{8}$$

**05. Ans: (d)**

**Sol:** P  $\Rightarrow$  12 (8) = 96 hrs

Q  $\Rightarrow$  8 (6) = 48 hrs

P & Q Together =  $\frac{96(48)}{144} \Rightarrow 32$  hrs

But they work 8 hrs per day

$$\frac{32}{8} = 4 \text{ days}$$

**06. Ans: (d)**

**Sol:** 5 Skilled workers can build a wall in 20 days  
 1 skilled workers  $5 \times 20 = 100$  days

1 day work of skilled worker =  $\frac{1}{100}$

8 semi-skilled workers can build-wall = 25

1 semi-skilled worker =  $8 \times 25 = 200$  days

1 day work of semi-skilled worker =  $\frac{1}{200}$

10 unskilled workers can build a wall  
 = 30 days

1 unskilled workers  
 =  $10 \times 30 = 300$  days

1 day work of unskilled worker  
 =  $\frac{1}{300}$

$\therefore$  2 skilled + 6 semi- killed + 5unskilled

$$= 2\left(\frac{1}{100}\right) + 6\left(\frac{1}{200}\right) + 5\left(\frac{1}{300}\right)$$

$$= \frac{1}{50} + \frac{3}{100} + \frac{1}{60} = \frac{6+9+5}{300} = \frac{1}{15}$$

$\therefore$  2 skilled+6 semi+skilled + 5 unskilled  
 can build a wall = 15 days

**07. Ans: (a)**

**Sol:**  $2 \left[ \frac{\text{L.C.M of (given)}}{\frac{\text{L.C.M}}{x} + \frac{\text{L.C.M}}{y} + \frac{\text{L.C.M}}{z}} \right]$

$$2 \left[ \frac{60}{\frac{60}{12} + \frac{60}{15} + \frac{60}{20}} \right] \Rightarrow 2 \left[ \frac{60}{5+4+3} \right] = 2[5] = 10$$

days

**08. Ans: (a)**

**Sol:**  $\frac{1}{9} + \frac{1}{12} = [A + B] = 2$  days

$$2 \text{ days} = \frac{4+3}{36}$$

$$2 \text{ days} = \frac{7}{36}$$

$$10 \text{ days} = \frac{35}{36}$$

$$\text{Remaining Work} = \frac{1}{36}$$

11<sup>th</sup> day start with A

$$\frac{9}{1} = \frac{?}{1} \quad \left[ \therefore \frac{D_1}{W_1} = \frac{D_2}{W_2} \right]$$

$$9 \times \frac{1}{36} = \frac{1}{4}$$

So 10 days +  $\frac{1}{4} = 10 \frac{1}{4}$  days

**09. Ans: (d)**

$$\text{Sol: } 2\left[\frac{1}{8} + \frac{1}{10} + \frac{1}{12}\right] + x\left[\frac{1}{10} + \frac{1}{12}\right] = 1$$

$$\Rightarrow \frac{2[15 + 12 + 10] + x[12 + 10]}{120} = 1$$

$$22x = 120 - 74 = 46$$

$$x = \frac{46}{22} = 2 \text{ hrs (approximate)}$$

$$9 \text{ am} + 2 \text{ hr} + 2 \text{ hr} = 1 \text{ pm}$$

**10. Ans: (b)**
**Sol:** Equation Method:

$$3\left[\frac{1}{12}\right] + x\left[\frac{1}{12} + \frac{1}{15}\right] + 3\left[\frac{1}{15} + \frac{1}{30}\right] = 1$$

$$\frac{15 + x[5 + 4] + 3[4 + 2]}{60} = 1$$

$$\Rightarrow 9x = 60 - 33$$

$$x = \frac{27}{9} = 3$$

So total days

$$\Rightarrow 3 + 3 + 3 = 9$$

**11. Ans: 100**
**Sol:** A and C completed the work :  $\frac{19}{23}$ 

(Difference 4 parts out of 23 done by B)

$$\frac{4}{23} \times 575 \Rightarrow 100/-$$

 [ $\therefore$  Amount shows is equal to working

Ratio]

**12. Ans: (c)**

$$\text{Sol: } 5\left[\frac{1}{10} + \frac{1}{15}\right] \times 2\left[\frac{1}{x}\right] = 1$$

$$\frac{25}{30} + \frac{2}{x} = 1$$

$$\frac{2}{x} = \frac{1 - 25}{30} = \frac{5}{30}$$

$$\frac{2}{x} = \frac{1}{6}$$

$$x = 12 \text{ days}$$

Days 10, 15, 12

$$= \frac{1}{10} : \frac{1}{15} : \frac{1}{12}$$

$$= \frac{5}{10} : \frac{5}{15} : \frac{2}{12}$$

$$= \frac{30}{60} : \frac{20}{60} : \frac{10}{60}$$

$$= 30 : 20 : 10$$

$$= 3 : 2 : 1$$

$$A = \frac{3}{6} \times 450 = 225$$

**13. Ans: (b)**

$$\text{Sol: } \frac{\text{LCM of (given)}}{\frac{\text{L.C.M}}{x} + \frac{\text{L.C.M}}{y} + \frac{\text{L.C.M}}{z}}$$

$$A = 18$$

$$B = 6 \quad \therefore \left(\frac{18}{3} = 6\right)$$

$$C = 3.6 \quad \therefore \left(\frac{18}{5} = 3.6\right) \text{ days}$$

$$= \frac{18}{\frac{18}{18} + \frac{18}{6} + \frac{18}{3.6}}$$

$$= \frac{18}{1 + 3 + 5} = 2 \text{ days}$$

Hint: (For L.C.M)

$$\text{L.C. M of } (3.6, 6, 18) = 18$$

14. **Ans: (b)**

**Sol:** Chain rule

$$\frac{M_1 D_1 H_1}{W_1} = \frac{M_2 D_2 H_2}{W_2}$$

$$\frac{7[7]}{7} = \frac{100(x)}{100}$$

$$x = 7$$

15. **Ans: (a)**

**Sol:** Chain rule

$$\frac{M_1 D_1 H_1 x\%}{W_1} = \frac{M_2 D_2 H_2 y\%}{W_2}$$

$$\frac{2[12][8][90]}{9000} = \frac{3[6][80][x]}{12000}$$

$$x = 16 \text{ hr/day}$$

16. **Ans: (d)**

**Sol:** 
$$\frac{30[104][8]}{\frac{2}{5}} = \frac{26[104+x]9}{\frac{3}{5}}$$

$$160 = 104 + x$$

$$X = 56 \text{ men (additional men)}$$

17. **Ans: (c)**

**Sol:** 
$$\frac{Q}{300} \cdot \frac{R}{600}$$

$$20 : 21$$

Here 'Q' participated only '5' days only

**Hint:**

$$Q - \text{Total capability} = 12(25) = 300$$

$$R = 12 \times 50 = 600$$

18. **Ans: (a)**

**Sol:**  $M_1 D_1 = M_2 D_2$

$$52[10] = 40 [x]$$

$$x = 13 \text{ days}$$

but we need (here many more)

$$13 - 10 = 3 \text{ days}$$

(OR)

$$52[10] = 40[10+x]$$

$$10+x = 13$$

$$x = 3$$

19. **Ans: (c)**

**Sol:**  $1200 M + 500 W = \frac{1}{2} \times 1$

$$900 M + 250 = \frac{1}{3} \times 2$$

$$1200 M + 500 W = \frac{1}{2}$$

$$1800 m + 500 W = \frac{2}{3}$$

$$600 m = \frac{2}{3} - \frac{1}{2} = \frac{4-3}{6} = \frac{1}{6}$$

$$600 m = 6 \text{ weeks}$$

$$? = 1 \text{ week}$$

$$600(6) = x(1)$$

$$x = 3600$$

20. **Ans: (a)**

**Sol:**  $x + y = 8 \text{ days}$

$$\Rightarrow x + y = \frac{1}{8} \rightarrow (1)$$

$$\frac{x}{2} + 2y = 5 \text{ day} \Rightarrow \frac{x+4y}{2} = \frac{1}{5}$$

$$x + 4y = \frac{2}{5} \rightarrow (2)$$

From (1) & (2)

$$x = 30 \text{ days}$$

## 2.7 Pipes and Cisterns

**01. Ans: (a)**

**Sol:** If 3-pipes are opened

$$\begin{aligned} \text{Then 1 hr work} &= \frac{1}{10} + \frac{1}{12} - \frac{1}{20} \\ &= \frac{6+5-3}{60} = \frac{8}{60} \Rightarrow \frac{2}{15} \end{aligned}$$

$$\begin{aligned} \text{Then total tank filled in} &= \frac{15}{2} \text{ hr} \\ &= 7\frac{1}{2} \text{ hrs} \end{aligned}$$

**02. Ans: (a)**

**Sol:**  $\frac{1}{10} - \frac{1}{6} \Rightarrow \frac{6-10}{60} = \frac{-4}{60} = \frac{-1}{15}$

i.e., tank empty in 15 min

but  $\frac{2}{5}$  tank only field

so  $\frac{2}{5}$  the of tank empty in - ?

t → 15 min

$$\frac{2}{5}(t) - ?$$

$$15 \times \frac{2}{5} = 6 \text{ min for empty tank}$$

**03. Ans: (b)**

**Sol:**  $\frac{1}{5} + \frac{1}{4} - \frac{1}{20} \Rightarrow \frac{4+5-1}{20} = \frac{8}{20} = \frac{2}{5}$

Tank filled in =  $\frac{5}{2}$  hrs

$$2\frac{1}{2} \text{ hrs} = 2.50 \text{ hrs}$$

**04. Ans: (b)**

**Sol:** P            Q            R

$$\frac{1}{30} \quad \frac{1}{20} \quad \frac{1}{10}$$

All are opened 3-min ⇒

$$3\left[\frac{1}{30}\right] : 3\left[\frac{1}{20}\right] : 3\left[\frac{1}{10}\right]$$

$$\Rightarrow \frac{1}{30} : \frac{1}{20} : \frac{1}{10} \Rightarrow \frac{2:3:5}{60}$$

i.e.,  $\frac{2}{60} : \frac{3}{60} : \frac{5}{60}$

$$\Rightarrow 2 : 3 : 5$$

So, proportion of solution 'R' is  $\frac{5}{12}$

**05. Ans: (b)**

**Sol:** Half tank already filled, so 3 hrs

Remaining half tank - ?

Filled by 4 - pipes

Let, by using 4-pipes tank filled in

$$= \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6}$$

$$= \frac{4}{6} = \frac{2}{3} \text{ (1 hr work)}$$

Tank filled in =  $\frac{3}{2} \Rightarrow 1 : 30$

We need half tank only, so

$$\frac{3}{2} = \frac{3}{4} \text{ hrs} = \frac{3}{4} \times 60 = 45 \text{ min}$$

Total time = 3hr + 45 mm = 3 : 45

06. Ans: (b)

$$\text{Sol: } (A+B)\text{'s 1 hr work} = \frac{1}{12} + \frac{1}{15} = \frac{5+4}{60} = \frac{9}{60}$$

→ (1)

$$(A+C)\text{'s 1 hr work} = \frac{1}{12} + \frac{1}{20} = \frac{5+3}{60} = \frac{8}{60}$$

→ (2)

(1) + (2) means 2 hrs work

$$\frac{9}{60} + \frac{8}{60} = \frac{17}{60}$$

$$2\text{hr} = \frac{17}{60}$$

$$6\text{hr} = \frac{51}{60}$$

$$\text{Remaining work} = 1 - \frac{51}{60} \Rightarrow \frac{9}{60}$$

This remaining work done by ne xT hrs

With (A + B), (through-1)

$$\text{So } 6 + 1 = 7 \text{ hrs}$$

07. Ans: (a)

$$\text{Sol: } 4\left[\frac{1}{6} - \frac{1}{12}\right] + 6\left[\frac{1}{9} - \frac{1}{12}\right] + x\left[\frac{1}{9}\right] = 1$$

$$\frac{4(6-3) + 6(4-3) + 4x}{36} = 1$$

$$4x = 36 - 18 = 18$$

$$x = \frac{18}{4} = 4.50 \text{ hr}$$

$$\text{Total time} = 4 + 6 + 4.50 = 14.50$$

08. Ans: (d)

$$\text{Sol: } 3\left(\frac{1}{12} + \frac{1}{15}\right) + x\left(\frac{1}{15}\right) = 1$$

$$\frac{3(5+4) + 4x}{60} = 1$$

$$4x = 60 - 27$$

$$x = \frac{33}{4} = 8\frac{1}{4} = 8 \text{ min. } \frac{1}{4} \times 60 \text{ sec}$$

$$= 8 \text{ min. } 15 \text{ sec}$$

09. Ans: (a)

$$\text{Sol: } 10\left(\frac{1}{15} + \frac{1}{20} - \frac{1}{25}\right) + x\left(\frac{1}{15} + \frac{1}{20}\right) = 1$$

$$\frac{10(20+15-12) + x(20+15)}{300} = 1$$

$$35x = 300 - 230$$

$$x = \frac{70}{35} = 2 \text{ hrs}$$

$$\text{Total time} = 10 + 2 = 12 \text{ hrs}$$

10. Ans: (c)

$$\text{Sol: } \frac{1}{20} + \frac{1}{24} - \frac{1}{x} = \frac{1}{15}$$

$$\frac{1}{20} + \frac{1}{24} - \frac{1}{15} = \frac{1}{x}$$

$$\frac{6+5-8}{120} = \frac{1}{x}$$

$$\frac{1}{40} = \frac{1}{x}$$

$$x = 40 \text{ min}$$

i.e., pipe 'c' can empty the tank in 40 min

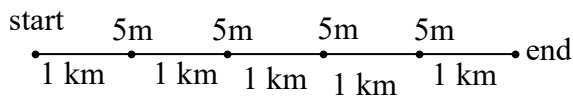
∴ each min – 3 gallons water out

$$= 40 \times 3 = 120 \text{ gallons}$$

## 2.8 Time, Speed and Distance

**01. Ans: (c)**

**Sol:**



$$10 \text{ km} \rightarrow 60 \text{ min}$$

$$5 \text{ km} \rightarrow 30 \text{ min}$$

$$30 \text{ m} + 20 \text{ min (for rest)} = 50 \text{ min}$$

**02. Ans: (c)**

**Sol:**  $5 + 2 = 7 \text{ hrs}$

**03. Ans: (d)**

**Sol:**  $21 \rightarrow$  Poles i.e., 20 spaces

$$20 \times 50 = 1000 \text{ meters}$$

$$1000 \rightarrow 1 \text{ min}$$

$$1000 \rightarrow 60 \text{ sec}$$

$$\text{Speed} = \frac{1000}{60} \text{ m/s}$$

$$= \frac{1000}{60} \times \frac{18}{5} \Rightarrow 60 \text{ km/s}$$

**04. Ans: (a)**

**Sol:**  $A \xrightarrow{D=ST} B$

$$D = \frac{5}{4}(S)(T-6)$$

$$ST = \frac{5}{4}(S)(T-6)$$

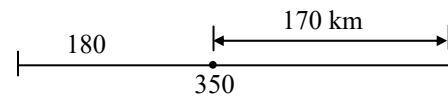
$$4T = 5(T-6)$$

$$T = 30$$

**05. Ans: (d)**

**Sol:** Speed = 80 km/h  $\rightarrow$  2hr : 15 min  $\rightarrow$  160 + 20 = 180

Next speed = 60 kmph



$$60 \text{ km} \xrightarrow{\hspace{2cm}} 60 \text{ min}$$

$$170 \text{ km} \xrightarrow{\hspace{2cm} ? \hspace{2cm}}$$

$$\frac{60 \times 170}{60} = 170 \text{ min}$$

$$\frac{170}{60} = 2 \text{ hr } 50 \text{ min}$$

$$5 : 20 + 2 : 15 + 2 : 50 = 10 : 25$$

**06. Ans: (b)**

**Sol:** 60 km  $\rightarrow$  60 min

$$48 \text{ km} \rightarrow 60 \text{ min}$$

$$12 \text{ km} \rightarrow ?$$

$$\frac{60 \times 12}{60} = 12 \text{ min}$$

**07. Ans: (c)**

**Sol:**  $T_1 \sim T_2 = 2 \text{ hr}$

$$\frac{715}{s} - \frac{715}{s+10} = 2$$

Use options,  $s = 55 \text{ km/h}$

**08. Ans: (c)**

**Sol:**  $D = 20(T)$       [  $\because$  D = speed  $\times$  Time ]

$$D = 30 \left( T - 1\frac{1}{2} - 2\frac{1}{2} \right)$$

$$20T = 30(T-4)$$



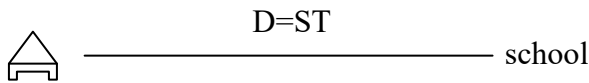
$$2T = 3T - 12$$

$$T = 12$$

$$\text{So distance} = 20(12) = 240 \text{ km}$$

**09. Ans: (c)**

**Sol:**



$$D = \frac{3(T+5)}{60} \rightarrow 1^{\text{st}} \text{ day } (\because \text{convert into hr's})$$

so  $\div 60$

$$D = \frac{4(T-10)}{60} \rightarrow 2^{\text{nd}} \text{ day}$$

$$\frac{3(T+5)}{60} = \frac{4(T-10)}{60}$$

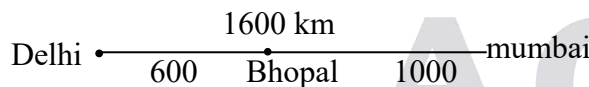
$$D = \frac{3(55+3)}{60} = 3 \text{ km}$$

$$3T+15 = 45-40$$

$$T = 55$$

**10. Ans: (a)**

**Sol:**



$$\frac{S_1}{S_2} = \frac{\frac{600}{T}}{\frac{1000}{T}}$$

$$\frac{S_1}{S_2} = \frac{600}{1000} \Rightarrow \frac{3}{5} \text{ Travelling time equal}$$

$$\therefore S_1 : S_2 = 3:5$$

**11. Ans: (b)**

$$\begin{aligned} \text{Sol: Average speed} &= \frac{\text{Total distance}}{\text{Total Time}} \\ &= \frac{200 + 300 + 500}{3 + 4 + 3} \\ &= 100 \text{ km/h} \end{aligned}$$

**12. Ans: (a)**

**Sol:**

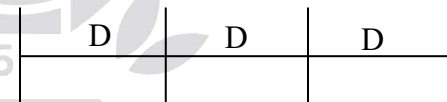


$$\begin{aligned} \text{Average speed} &= \frac{2xy}{x+y} \\ \Rightarrow \frac{2(36)(24)}{60} &= 28.8 \end{aligned}$$

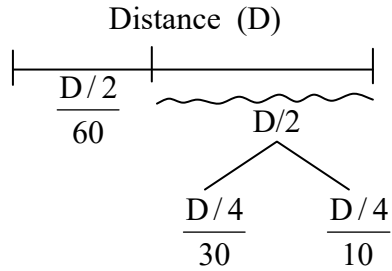
Where two distance are same, then we have to apply same formula.

**13. Ans: (c)**

**Sol:**



$$\begin{aligned} \text{Average speed} &= \frac{\text{Total Distance}}{\text{Total Time}} = \frac{3D}{\frac{D}{80} + \frac{D}{60} + \frac{D}{30}} \\ &= \frac{3}{\frac{3+4+8}{240}} = \frac{3(240)}{15} = 48 \text{ km/h} \end{aligned}$$

**14. Ans: (c)**
**Sol:**


$$\frac{D}{\frac{D}{120} + \frac{D}{120} + \frac{D}{40}} = \frac{1}{\frac{1}{120} + \frac{1}{120} + \frac{1}{40}} \Rightarrow 24 \text{ km/h}$$

**15. Ans: (b)**

**Sol:** Average speed =  $\frac{T.D}{T.Time}$

$$= \frac{1(50) + 2(48) + 3(50)}{1 + 2 + 3}$$

$$\Rightarrow 50\frac{1}{3} \text{ km/h}$$

**16. Ans: (a)**

**Sol:**  $7 \text{ sec} = \frac{L(T)}{S(T)}$

$$25 \text{ sec} = \frac{L(T) + 378}{S(T)}$$

$$(1) \text{ and } (2) \quad \frac{7}{25} = \frac{L}{L + 378}$$

$$7L(T) + 7(378) = 25 L(T)$$

$$L(T) = 147$$

$$\text{From (1) } S(T) = \frac{L(T)}{\text{Time}} = \frac{147}{7} \times \frac{18}{5}$$

$$\Rightarrow 75.6 \text{ km/h}$$

**17. Ans: (a)**

**Sol:**  $10 = \frac{L(T)}{40}$

$$L(T) = 400 \text{ meter}$$

$$30 = \frac{400 + L(\text{Bridge})}{40}$$

$$1200 = 400 + L(B)$$

$$L(B) = 800 \text{ m}$$

**18. Ans: (d)**

**Sol:**  $25 = \frac{L(T) + L(P)}{15} \rightarrow (1)$

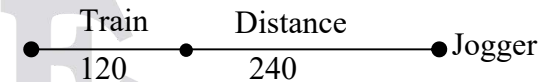
$$14 = \frac{L(T)}{(54 - 9) \times \frac{5}{18}}$$

$$L(T) = 14 \times 45 \times \frac{5}{18} \Rightarrow 175$$

$$\text{From (1), } 25 = \frac{175 + L(P)}{15} \dots\dots\dots$$

(L(P) = length of platform)

Then L(P) = 200

**19. Ans: (c)**
**Sol:**


$$= \frac{T.D}{R.S} = \frac{\text{total distance}}{\text{relative speed}}$$

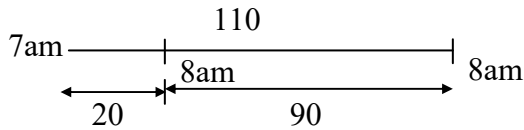
$$\Rightarrow \frac{120 + 240}{(45 - 9) \times \frac{5}{18}}$$

$$= \frac{360(18)}{36 \times 5}$$

$$\Rightarrow 36 \text{ sec}$$

20. Ans: (d)

Sol:



Compare with 8 am

$$= = \frac{T.D}{R.S} = \frac{90}{20+25} = 2\text{hrs}$$

$$8 \text{ am} + 2 \text{ hrs} = 10 \text{ am}$$

21. Ans: (b)

Sol: In 1 hr, one car cover 10 km more than other. So at the time of meeting one car cover 120 km more than other car.

$$\begin{array}{l} 1\text{hr} \quad \longrightarrow \quad 10 \text{ km} \\ ? \quad \longrightarrow \quad - 120 \text{ km} \end{array}$$

$$\frac{120 \times 1}{10} = 12 \text{ hrs}$$

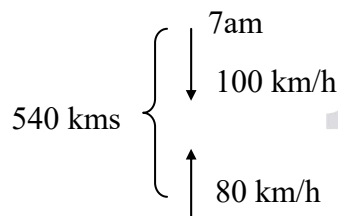
$$\text{First car} \Rightarrow 12 \times 50 = 600$$

$$2^{\text{nd}} \text{ car} \Rightarrow 12 \times 60 = 720$$

$$\text{Total covered distance} = 1320$$

22. Ans: (b)

Sol:



$$T = \frac{T.D}{R.S} = \frac{540}{100+80} = 3 \text{ hrs}$$

$$7 \text{ am} + 3 \text{ hrs} = 10 \text{ am}$$

23. Ans: (c)

$$\text{Sol: Time} = \frac{T.D}{R.S} \Rightarrow \frac{30 \text{ km}}{75-60} = 2 \text{ hrs}$$

$$\text{Distance} = 95 \text{ km/hr} \times 2 \text{ hr} = 150 \text{ km}$$

(after started the first train 2<sup>nd</sup> train start 75 km/h. and also gap between at the time of 2<sup>nd</sup> train start 30 kms.

$$\Rightarrow T_2 \left( \frac{\text{Travelled}}{1/2 \text{ hr}} \right) T_1$$

24. Ans: (a)

Sol:



$$\text{Train (speed}_1) = \frac{D}{1}$$

$$\text{Train (speed}_2) = \frac{D}{1.5}$$

$$\text{Total distance (D)} = S_1 T + S_2 T$$

$$D = S_1 T + \frac{D}{1.5} T \quad (\text{they travel same 'T' hrs})$$

than they are meet each other)

$$D = DT \left[ 1 + \frac{1}{\frac{3}{2}} \right]$$

$$1 = T \left[ \frac{5}{3} \right]$$

$$T = \frac{3}{5} \text{ hr} = \frac{3}{5} \times 60 = 36 \text{ min}$$

$$= 4 \text{ hr and } 36 \text{ min}$$

25. Ans: (c)

Sol: Down Stream Speed =  $\frac{32}{6}$  (i.e.,  $x + y = \frac{32}{6}$ )

Up Stream Speed =  $\frac{14}{6}$  (i.e.,  $x - y = \frac{14}{6}$ )

$$\text{Stream speed (y)} = \frac{1}{2} \left[ \frac{32}{6} - \frac{14}{6} \right] = \frac{1}{2} \left[ \frac{18}{6} \right]$$

$$= 1 \frac{1}{2}$$

26. Ans: (c)

Sol: Down Stream Speed = Up Stream Speed

$$\frac{20}{16+x} = \frac{12}{16-x}$$

Clearly, we are getting  $x = 4$  km/h

27. Ans: (a)

Sol: Distance =

$$\frac{T(x^2 - y^2)}{2x} = \frac{10(20^2 - 10^2)}{2(20)} = 75 \text{ km}$$

28. Ans: (d)

Sol:  $x = 10$

$$y = ?$$

$$T = 20$$

$$75 = \frac{20(10^2 - y^2)}{2(10)}$$

$$75 = 100 - y^2$$

$$y^2 = 25$$

$$y = \sqrt{25} = 5$$

29. Ans: (a)

Sol: Down Stream speed = 3 (Up stream speed)

$$20 + y = 3(20 - y)$$

$$4y = 40$$

$$y = 10 \text{ km/h}$$

## 2.9 Mixture and Allegation

01. Ans: (a)

Sol:

Cost of 1 kg of Type 1 rice

Rs.15

Cost of 1 kg of Type 2 rice

Rs.20

Mean price

(20-x)

(x-15)

By rule of allegation,

$$\frac{20-x}{x-15} = \frac{2}{3}$$

$$x = 18$$

02. Ans: (d)

Sol:

CP of 1 kg sugar of 1<sup>st</sup> kind

Rs.9

CP of 1 kg sugar of 2<sup>nd</sup> kind

Rs.7

Mean price  
Rs. 8.4

8.4-7=1.4

9-8.4 = 6

i.e., to get a cost price of 8.4, the sugars of kind 1 and kind 2 should be mixed in the ratio  $1.4 : 0.6 = 14 : 6 = 7 : 3$

Suppose  $x$  kg of kind 1 sugar is mixed with 27 kg of kind 2 sugar.

Then  $x : 27 = 7 : 3$

$$\Rightarrow 3x = 27 \times 7$$

$$\Rightarrow x = 63$$

**03. Ans: (d)**

**Sol:** Let the cost price of spirit be Rs. 1 per litre

Spirit in 1 litre mixture in A =  $\frac{5}{7}$  litre;

Cost price of 1 litre mixture in A = Rs.  $\frac{5}{7}$

Spirit in 1 litre mixture in B = Rs.  $\frac{7}{13}$  litre;

Cost price of 1 litre mixture in B = Rs.  $\frac{7}{13}$

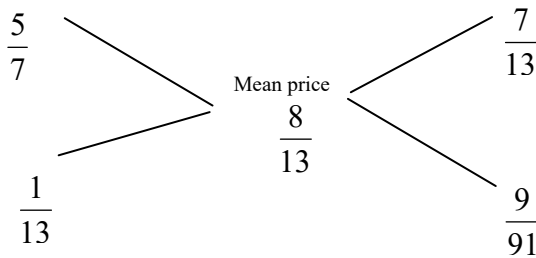
Spirit in 1 litre mixture of C =  $\frac{8}{13}$  litre;

Mean price = Rs.  $\frac{8}{13}$

By the rule of allegation, we have:

CP of 1 litre mixture in A

CP of 1 litre mixture in B



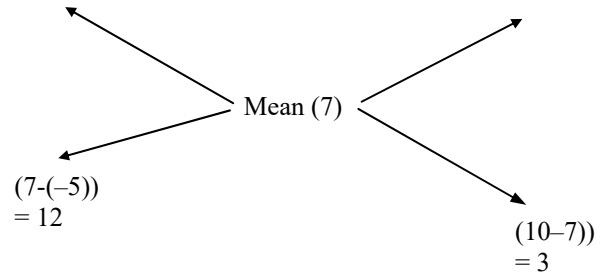
$$\therefore \text{Request ratio} = \frac{1}{13} : \frac{9}{19} = 7 : 9$$

**04. Ans: (a)**

**Sol:**

Pulse sold at profit (10)

Pulse sold at loss (-5)



Therefore, ratio of pulses sold at 10% profit 5% loss =  $12 : 3 = 4 : 1$

Therefore, quantity of pulse sold at 10% profit

$$= \frac{4}{4+1} \times 50$$

$$= \frac{4}{5} \times 50$$

and quantity of pulse sold at 5% loss

$$= \frac{1}{4+1} \times 50$$

$$= \frac{1}{5} \times 50 = 10 \text{ kg}$$

**05. Ans: (b)**

**Sol:** Let the cost of 1 litre milk be Rs.1

Milk in 1 litre mixture in 1<sup>st</sup> can =  $\frac{3}{4}$  litre,

C.P. of 1 litre mixture in 1<sup>st</sup> can Rs  $\frac{3}{4}$

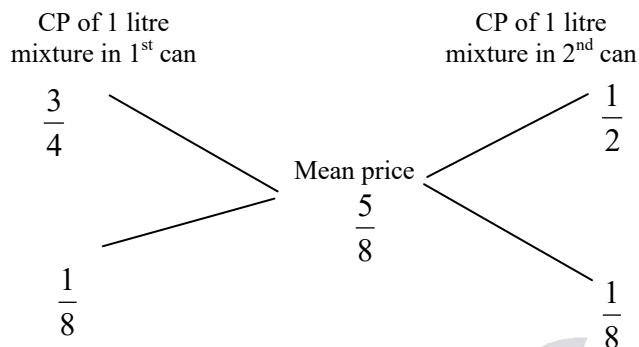
Milk in 1 litre mixture in 2<sup>nd</sup> can =  $\frac{1}{2}$  litre,

C.P. of 1 litre mixture in 2<sup>nd</sup> can Rs.  $\frac{1}{2}$

Milk in 1 litre of final mixture =  $\frac{5}{8}$  litre,

Mean price = Rs.  $\frac{5}{8}$

By the rule of allegation, we have:



$$\therefore \text{Ratio of two mixtures} = \frac{1}{8} : \frac{1}{8} = 1 : 1$$

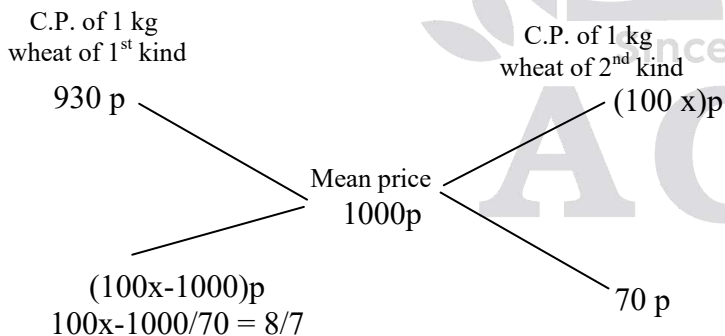
So, quantity of mixture taken from each can

$$= \left(\frac{1}{2} \times 12\right) = 6 \text{ litres}$$

**06. Ans: (c)**

**Sol:** Let the rate of the second quantity be Rs. X per kg

By the rule of allegation we have:



So

$$700x - 7000 = 560$$

$$700x = 7560$$

$$x = \text{Rs. } 10.80$$

**07. Ans: (c)**

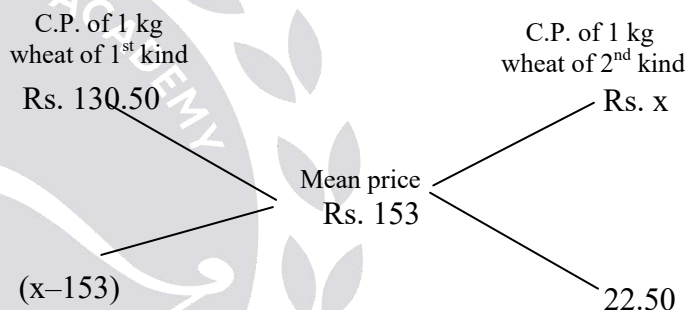
**Sol:** Since first and second varieties are mixed in equal proportions.

$$\text{So, their average price} = \text{Rs. } \left(\frac{126 + 135}{2}\right) =$$

Rs. 130.50

So, the mixture is formed by mixing two varieties, one at Rs. 130.50 per kg and the other at say, Rs x per kg in the ratio 2 : 2, i.e., 1 : 1. We have to find x.

By the rule of allegation, we have:



$$\therefore \frac{x - 153}{22.50} = 1$$

$$\Rightarrow x - 153 = 22.50$$

$$\Rightarrow x = 175.50$$

**08. Ans: (d)**

**Sol:** Milk contained by the container now

$$= 40 \left(1 - \frac{4}{40}\right)^3$$

$$= 40 \left(1 - \frac{1}{10}\right)^3$$

$$= 40 \times \frac{9}{10} \times \frac{9}{10} \times \frac{9}{10} = 29.16$$

09. Ans: (d)

Sol: Quantity left after n operation

$$= x \left(1 - \frac{y}{x}\right)^n$$

Where, x = initial quantity

y = amount of mixture with drawn each time (this should be same every time)

n = no. of times operation performed

$$= 10 \left(1 - \frac{1}{10}\right)^n$$

$$= 10 \left(\frac{9}{10}\right)^3$$

$$= 10 \times 0.9 \times 0.9 \times 0.9$$

$$= 10 \times 0.729 = 7.29 \text{ litres}$$

Hence, option d is correct

10. Ans: (b)

Sol: Let the quantity of the wine in the cask originally be x litres

The, quantity of wine left in cask after 4

operations =  $\left[ x \left(1 - \frac{8}{x}\right)^4 \right]$  litres

$$\therefore \left[ \frac{x \left(1 - \frac{8}{x}\right)^4}{x} \right] = \frac{16}{81}$$

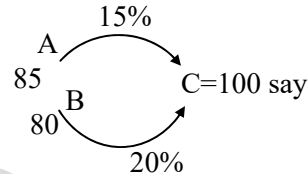
$$\Rightarrow \left[ 1 - \frac{8}{x} \right]^4 = \left( \frac{2}{3} \right)^4$$

$$\Rightarrow x = 24$$

**2.10 Percentages**

01. Ans: (b)

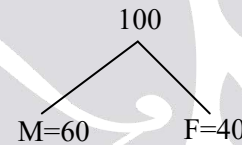
Sol:



$$\frac{85}{80} \times 100 \Rightarrow 106.25$$

02. Ans: (b)

Sol:



Let people 100 say

80% invited i.e. 80

all female attended the party

80 - 40 = 40 belongs to male

M: F = 40 : 40 = 1:1

03. Ans: (d)

Sol:

X=3000	y=100
3	2

$$\frac{5}{400} \times 100 = 1.25$$

04. Ans: (a)

Sol:

$$\frac{P}{40}$$

$$= \frac{60}{100} \times 25 = 15$$

$$= 40 - 6 + 15,$$

$$= 49\%$$

$$\frac{Q}{60}$$

$$= 40 \times \frac{15}{100} = 6$$

$$= 30 - 15 + 6$$

$$= 51\%$$

$$51 - 49 = 2\%$$

$$2\% = 2 \text{ votes}$$

$$100\% = 100 \text{ votes}$$

05. Ans: (c)

Sol: Let = 100  $\xrightarrow{50\%}$  infected  $50 \times \frac{30}{100} = 15$

developed the disease

$$\text{Remaining} = 50 - 15 = 35$$

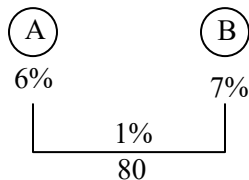
06. Ans: (d)

Sol: Delay %  $\Rightarrow 75\% = 1200$

Then 25% = 400 (correct time flying flights)

07. Ans: (b)

Sol:



$$1\% = 80$$

$$100\% = 8000$$

08. Ans: (a)

Sol:  $= \frac{147}{1400} \times 100$

$$= 10.50$$

09. Ans: (c)

Sol: 23% = 92 marks

$$100\% \Rightarrow 400$$

$$[\because 22\% \rightarrow 52 \text{ (failed)}]$$

$$45\% \rightarrow 40 \text{ (passed)}$$

$$23\% \rightarrow 52 + 40$$

$$23\% = 62 \text{ marks}$$

$$\text{So } 100\% = ?$$

$$\frac{92 \times 100}{62} = 400]$$

10. Ans: (d)

Sol:  $S + T = 95 \rightarrow (1)$

$$1.23 + 0.9T = 90 \rightarrow (2)$$

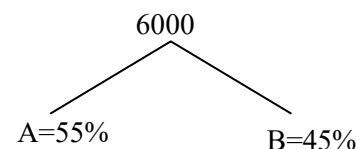
By solving (1) and (2)

$$T = 80$$

11. Ans: (a)

Sol: 7500  $\xrightarrow{20\%}$  invalid i.e., 1500

$$7500 - 1500 = 6000$$

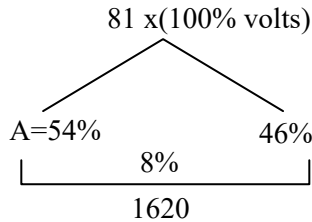


$$\frac{45}{100} \times 6000 = 2700$$



12. Ans: (a)

Sol:  $100x - 10 \Rightarrow 90x - 9x$  (10% invalid)  
 $= 81x$  (100% votes)



$$8\% = 1620$$

$$100\% = ?$$

With respect votes

$$20250 = 81\%$$

We need = 100%

$$= \frac{20250 \times 100}{80} = 25,000$$

13. Ans: (c)

Sol:  $10,000 (1.1) (0.8) (1.3) \Rightarrow 11,440$

14. Ans: (a)

Sol:

	2015		2016
GDP	100	$\xrightarrow{10\%}$	110
F.D	4	$\xrightarrow{?}$	5.5(5%)

$$= \frac{1.5}{4} \times 100 \Rightarrow 37.5$$

15. Ans: (a)

Sol:  $x$  2001      20011  
 $1000 \rightarrow 100 + u$   
 $y$  10       $\rightarrow 100 + y$

$$\text{(ratio) } P = \frac{x}{y} \quad \frac{100}{100} \quad \frac{100+u}{100+y}$$

$$1 \quad ? \quad \frac{100+x}{100+y}$$

$$\frac{100+x}{100+y} - 1 \times 100 \Rightarrow \frac{100+x-100-y}{100+y} \times 100$$

$$\Rightarrow \frac{x-y}{100+y} \times 100$$

16. Ans: (c)

Sol: Let  $D = 100x$

$$P = 100x \xrightarrow{-20\% \text{ less}} C = 80\% \xrightarrow{+25\% \text{ more}} B = 100x \xrightarrow{-10\%} \frac{90x}{A}$$

$$90x = 360$$

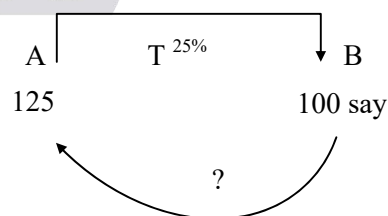
$$x = 4$$

Then  $D = 400$

$$\% \text{ of } D, \text{ in } 300 = \frac{400}{500} \times 100 = 80\%$$

17. Ans: (d)

Sol:



$$= \frac{25}{125} \times 100 = 20\%$$

18. Ans: (b)

$$\text{Sol: } 18,400 \times \frac{(100-30)}{100} \times \frac{(100-40)}{100} \times \frac{100-50}{100} = 3864$$

19. Ans: (c)

$$\text{Sol: } 10\% \rightarrow 3 \text{ kg}$$

$$100\% \rightarrow 30 \text{ kg}$$

$$30 \text{ kg} = 225$$

$$\text{kg} = \frac{225}{30} \Rightarrow 7.5$$

20. Ans: (c)

$$\text{Sol: } = \frac{25}{125} \times 100 \quad \therefore \left( \frac{x}{100+x} \times 100 \right)$$

$$= 20\%$$

### 2.11 Profit and Loss

01. Ans: (a)

$$\text{Sol: } 90\% = 450/-$$

$$? = 540/-$$

$$= \frac{90 \times 540}{450} \Rightarrow 108\% \quad \text{i.e., 8\% profit}$$

02. Ans: (d)

$$\text{Sol: } 120 \text{ (reems)} \times 80 = 9600$$

$$\text{Transport} = 280$$

$$\text{Coold} = 72/-$$

$$120(40P) = 4800 \text{ (Paise)} = 48/-$$

$$10,000$$

$$100\% = \frac{10,000}{120} \text{ (per reem)}$$

We need 108% = ?

$$= \frac{10,000 \times 108}{100 \times 120}$$

$$= 90/- \text{ (each reem)}$$

03. Ans: (b)

$$\text{Sol: } \text{CP (40 ranges)} = \text{SP}(50)$$

$$\frac{\text{CP}}{8P} = \frac{50}{40} \quad (\because \text{CP} = 50, \text{SP} = 40)$$

$$\text{Loss \%} = \frac{10}{50} \times 100 = 20\%$$

04. Ans: (c)

$$\text{Sol: } \frac{\text{Diff}}{\text{Least}} \times 100$$

$$\frac{200}{800} \times 100 = 25\%$$

05. Ans: (c)

$$\text{Sol: } \text{C.P of 12 balloons} = 10/-$$

$$1 \text{ balloon} = \frac{10}{12} /-$$

$$\text{S.p of 10 balloons} = 12/-$$

$$1 \text{ balloon} = \frac{12}{10} /-$$

Have sp > cp, so we are getting profits

$$P\% = \frac{\frac{12}{10} - \frac{10}{12}}{\frac{10}{12}} \times 100$$

$$= \frac{144 - 100}{120} \times 100$$

$$= \frac{44}{12} \times 100$$

$$= 44\%$$

**06. Ans: (a)**

**Sol:** For A

$$100\% = ?$$

$$125\% = 100$$

$$CP \Rightarrow \frac{1000 \times 100}{125} \Rightarrow 800$$

$$\text{So profit} = 200$$

For B

25% profit on S.P

$$\frac{25}{100} \times 1000 = 250$$

$$\text{B's profit} = 250$$

Compare with A, B is getting 50/- more profit

**07. Ans: (c)**

**Sol:** % SP

$$111\% = x / -$$

$$118\% = x + 175 / -$$

$$7\% = 175$$

$$100\% = ? \Rightarrow \frac{175 \times 100}{7} \Rightarrow 2500$$

**08. Ans: (c)**

**Sol:**  $87.5\% = x / -$  (say)

$$110\% = x + 108$$

$$22.5\% = 108 / -$$

We need 12.5%, because loss%

$$12.5\% = ?$$

$$\frac{108 \times 12.5}{22.5} \Rightarrow 60 / -$$

**09. Ans: (e)**

**Sol:** Profit =  $575 - CP$

$$\text{Loss} = CP - 295$$

$$575 - CP = CP - 295$$

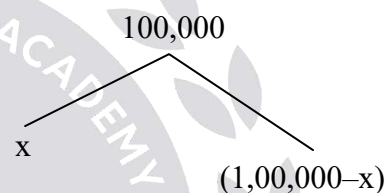
(∵ profit amount = loss amount)

$$2(CP) = 870$$

$$CP = \frac{870}{2} = 435$$

**10. Ans: (a)**

**Sol:**



$$[0.1x + 0.12(1,00,000-x)]$$

$$- \{ [0.12x + 0.1(1,00,000-x)] \} = 120$$

$$0.2x - 0.24x + 12000 - 10000 = 120$$

$$2000 - 120 = 0.04x$$

$$x = \frac{1880}{0.04} \Rightarrow 47000$$

$$\text{Remaining} = 53000$$

$$47000 : 53000 = 47 : 53$$

**11. Ans: (d)**

**Sol:**  $\frac{x^2}{100}$  % always loss

$$\frac{10^2}{100} = 1\% \text{ loss}$$

12. Ans: (c)

Sol: 2 fans cost =  $2 \times 1200 = 2400$

S.P<sub>1</sub> ⇒

$$1200 \times \frac{(100-5)}{100}, 1200 \times \frac{100+10}{100} = SP_2$$

$$1140 + 1320 = 2460$$

So 60 rupees profit

$$P\% = \frac{60}{2400} \times 100 \Rightarrow 2.5\% \text{ (Profit)}$$

13. Ans: (d)

Sol:  $30 - 10 - \frac{30(10)}{100} = 17\%$

14. Ans: (a)

Sol: In 500, 10% discount 450/-

$$125\% = 450$$

$$100\% = ? \Rightarrow \frac{450 \times 100}{125} \Rightarrow 360$$

15. Ans: (b)

Sol:  $252 = CP \times \frac{100-30}{100} \times \frac{100-20}{100} \times \frac{100-10}{100}$

$$252 = CP \times \frac{70}{100} \times \frac{80}{100} \times \frac{90}{100}$$

$$CP = 500$$

## 2.12 Simple & Compound Interest

01. Ans: (a)

Sol: 5% per annum for 3 years = 15% p

4% per annum for 4 years = 16% p

$$\text{Difference} = 1\% \text{ p} = \frac{500}{100} = 5$$

02. Ans: (a)

Sol:  $P \frac{R\% \text{ pa}}{2 \text{ years}} I_1 = (2R\%)P$

$$P \frac{(R+4)\% \text{ P.a}}{2 \text{ years}} I_2 = (2R\% + 8\%)P$$

$$I_2 - I_1 = 8\%P = 72$$

$$\frac{8}{100} P = 72$$

$$P = 900$$

03. Ans: (d)

Sol: For 100% increment in 12 years

More 100% increment in 12 years

So that 200% increment in 24 years

04. Ans: (a)

Sol:  $P + 2I = 1260$

$$P + 5I = 1350$$

$$3I = 90$$

$$I = 30$$

$$I = \frac{PTR}{100} \Rightarrow 30 = \frac{1200 \times 1 \times R}{100}$$

$$R = 2.5\% \text{ Pa}$$

**05. Ans: (b)**

$$\text{Sol: } S.I = \frac{PTR}{100}$$

$$\text{First 2 years 4\% pa} = \frac{P(2 \times 4)}{100} = \frac{8P}{100}$$

$$\text{Next 4 years 6\% pa} = \frac{P(6 \times 4)}{100} = \frac{24P}{100}$$

$$\text{Next (9-6) years 8\% pa} = \frac{P(3 \times 8)}{100} = \frac{24P}{100}$$

$$\frac{8P}{100} + \frac{24P}{100} + \frac{24P}{100} = 1120$$

$$P = 2000$$

**06. Ans: (a)**

$$\text{Sol: } 10\% \rightarrow 1 \text{ year} = 365 \text{ days}$$

$$\downarrow \div 5$$

$$\downarrow \div 5$$

$$2\% \rightarrow 73 \text{ days}$$

$$\text{Time} = 2 \text{ years } 73 \text{ days}$$

$$I = (22\% + 2\%) P$$

$$I = 22\% P$$

$$I = 2200$$

**07. Ans: (d)**

$$\text{Sol: } 800 \frac{R\%Pa}{3 \text{ years}} 956$$

$$800 \frac{(R+4)\%pa}{3 \text{ years}} 956 + 12\%p$$

$$= 956 + \frac{12}{100}(800)$$

$$= 1052$$

**08. Ans: (a)**

$$\text{Sol: } P \times 105\% \times 110\% \times 120\% = 1386$$

$$P \left( \frac{105}{100} \right) \left( \frac{110}{100} \right) \times \left( \frac{120}{100} \right) = 1386$$

$$P = 1000$$

**09. Ans: (b)**

$$\text{Sol: } R = 10\% \rightarrow 1 \text{ year}$$

$$\div 4 \downarrow$$

$$\downarrow \div 4$$

$$2.5\%$$

$$\rightarrow 3 \text{ months}$$

$$T = 2 \text{ years } 3 \text{ months}$$

$$CI = 4000 (110\%)^2 (102.5\%) - 4000$$

$$CI = 961$$

**10. Ans: (c)**

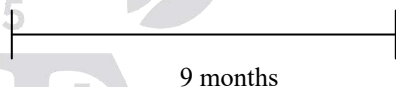
$$\text{Sol: } R = 2\% \rightarrow 1 \text{ year (12 months)}$$

$$\div 4 \downarrow$$

$$\downarrow \div 4$$

$$5\%$$

$$\rightarrow 3 \text{ months}$$



$$CI = 16000 (105\%)^3 - 16000 = 2522$$

$$CI = 2522$$

**11. Ans: (b)**

$$\text{Sol: } P \rightarrow 10\% \rightarrow 10\% \rightarrow 10\% \rightarrow 10\% \rightarrow 10\% \rightarrow 10 \text{ lakhs}$$

$$P (110\%)^5 = 10,00,000$$

$$P = \frac{1000000}{(1.1)^5} = 620920.9$$

$$P = 6,21,000$$

**12. Ans: (c)**

**Sol:**  $P \frac{4 \text{ years}}{\times 3} 3P$

$$P \frac{4 \text{ years}}{\times 3} 3P \frac{4 \text{ years}}{\times 3} 3^2 P \frac{4 \text{ years}}{\times 3} 3^3 P \frac{4 \text{ years}}{\times 3} 3^4 P$$

16 years = 81 P

**13. Ans: (a)**

**Sol:**

P ——— 0 yrs  
 $\times 2$  ——— 3 yrs

2200 ——— 3 yrs  
 $\times 2$  ——— 6 yrs

P = 1100

**14. Ans: (d)**

**Sol:** 12500  $\frac{\text{1st year}}{20\%}$  12500  
 $\quad \quad \quad +2500$   
 $\quad \quad \quad \hline$   
 $\quad \quad \quad 15000$   
 $\quad \quad \quad -2000$   
 $\quad \quad \quad \hline$   
 $\quad \quad \quad 13000$

13000  $\frac{2^{\text{nd}} \text{ year}}{20\%}$  13000  
 $\quad \quad \quad +2600$   
 $\quad \quad \quad -2000$   
 $\quad \quad \quad \hline$   
 $\quad \quad \quad 13600$

13600  $\frac{3^{\text{rd}} \text{ year}}{20\%}$  13600  
 $\quad \quad \quad +2720$   
 $\quad \quad \quad -2000$   
 $\quad \quad \quad \hline$   
 $\quad \quad \quad 14320$

**15. Ans: (a)**

**Sol:** Simple interest = 10% P = 60  $\Rightarrow$  P = 600

Compound interest =  $5 + 5 + \frac{5 \times 5}{100} = 10.25\%$

= 10.25(60) = 615

**2.13 Areas and Volumes**

**01. Ans: (c)**

**Sol:** 12 + 1+6+3+1+2+1+6 = 32

**02. Ans: (b)**

**Sol:**



Diagonal of square = diameter of circle

( $\because$  14 = 14)

Area of square =  $\frac{1}{2}$  (diagonal)<sup>2</sup>

=  $\frac{1}{2}(14)^2 = 98\text{m}^2$

**03. Ans: (a)**

**Sol:**  $2\pi r = 4a = 35 = k$

$r = \frac{k}{2\pi} \mid a = \frac{k}{4} \mid s = \frac{k}{3}$

Area of circle =  $\pi r^2 = \frac{\pi k^2}{4\pi^2} = \frac{k^2}{4\pi}$

Area of square =  $a^2 = \frac{k^2}{16}$

Area of equilateral triangle

=  $\frac{\sqrt{3}}{4} s^2 = \frac{k^2 \sqrt{3}}{36} = \frac{k^2}{12\sqrt{3}}$

$\therefore$  The circle has the largest area

04. Ans: (a)

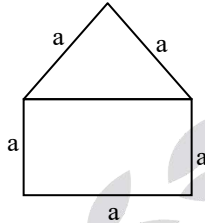
Sol: Area of parallelogram = area of triangle

$$b \times h_2 = \frac{1}{2} \times b \times h_1$$

$$h_1 = 2h_2$$

05. Ans: (b)

Sol:



$$5a = 6$$

$$a = \frac{6}{5} = 1.2$$

Area of window = area of equilateral triangle + area of square

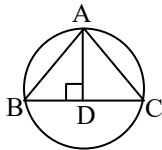
$$= \frac{\sqrt{3}}{4} a^2 + a^2$$

$$= \frac{\sqrt{3}}{4} (1.2)^2 + (1.2)^2$$

$$= 2.06$$

06. Ans: (c)

Sol:



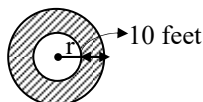
$$\text{Area of triangle} = \frac{AB \times BC \times CA}{4R} = \frac{1}{2} \times BC \times AD$$

$$\frac{17.5 \times 9}{4R} = \frac{3}{2}$$

$$R = 26.25 \text{ m}$$

07. Ans: (a)

Sol:



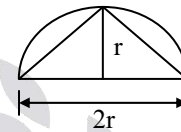
$$\text{Area of path} = \frac{11}{25} \text{ area of pool}$$

$$\pi(r+10)^2 - \pi r^2 = \frac{11}{25} (\pi r^2)$$

$$r = 50$$

08. Ans: (c)

Sol:



$$\text{Area of triangle} = \frac{1}{2} \times 2r \times r = r^2$$

09. Ans: (d)

Sol: (i)  $V = lwh = 10 \times 8 \times 6 = 480 \text{ cm}^3$

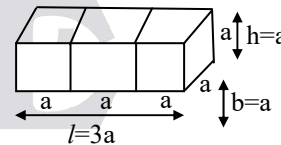
(ii)  $V = a^3 = 8^3 = 512 \text{ cm}^3$

(iii)  $V = \pi r^2 h = \pi(7)^2(7) = 343\pi \text{ cm}^3$

(iv)  $V = \frac{4}{3} \pi r^3 = \frac{4}{3} \pi(7^3) = 343\left(\frac{4}{3}\right)\pi$

10. Ans: (a)

Sol:



Total surface area of cuboid

$$= 2(3a^2 + a^2 + 3a^2)$$

$$= 14a^2 \rightarrow (1)$$

Sum of total surface area at 3 cubes

$$= 6a^2 + 6a^2 + 6a^2 = 18a^2 \rightarrow (2)$$

$$= \frac{14a^2}{18a^2} = \frac{7}{9}$$

**11. Ans: (c)**

**Sol:**

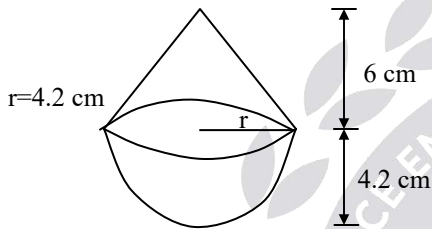
Volume of 6 spherical balls = volume of cylinder

$$6\left(\frac{4}{3}\pi r^3\right) = \pi r^2 h$$

$$h = 8r$$

**12. Ans: (a)**

**Sol:**



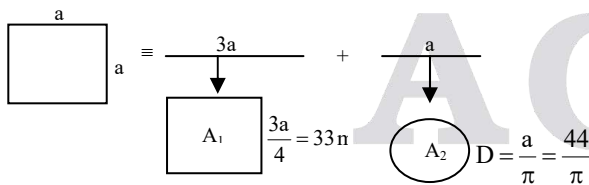
Volume of toy = volume of cone + volume of hemisphere

$$\text{Volume of toy} = \frac{1}{3}\pi(4.2)^2 \times 6 + \frac{2}{3}\pi(4.2)^3$$

$$\text{Volume of toy} = 266 \text{ cm}^3$$

**13. Ans: (c)**

**Sol:**



$$a^2 = 1936$$

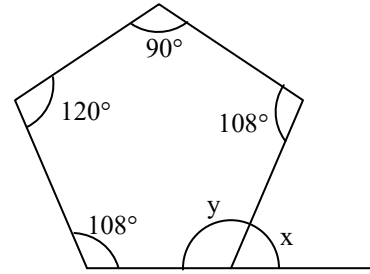
$$\therefore a = 44$$

$$A_1 + A_2 = 33^2 + \frac{\pi}{4} \times \left(\frac{44}{\pi}\right)^2 = 33^2 + \frac{\pi}{4} \times \frac{44^2}{\pi}$$

$$= 33^2 + \frac{44^2}{4\pi} = 1243.06 \text{ m}^2$$

**14. Ans: 58°**

**Sol:**



$$x + y = 180^\circ$$

$$\text{Sum of all interior angles} = (5-2) \times 180^\circ$$

$$918 + y = 540$$

$$y = 122^\circ$$

$$x = 58^\circ$$

**15. Ans: (c)**

**Sol:** Volume of cone =  $\frac{1}{3}\pi r^2 h$

As per question, radius and height both increase by 10%

We know that, change in volume = Successive change of increase in radius and height.

$$\therefore \text{Successive change of } 10\%, 10\% \text{ and } 10\% = \text{successive of } 10 + 10 + \frac{10(10)}{100} = 21\%$$

$$\text{and } 10\% = 21 + 10 + \frac{21(10)}{100} = 33.1\%$$

Thus, change in volume = 33.1%

**16. Ans: (a)**

**Sol:** OM = ON ( $\therefore$  radius of circle)

Given that  $\frac{1}{2}(\text{OM})(\text{ON}) = 50$

$$\frac{1}{2}(\text{OM})^2 = 50$$

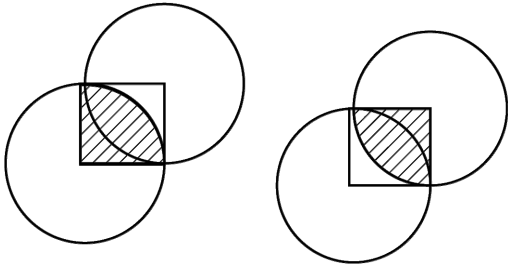
$$\text{OM} = 10$$

Then area of circle =  $\pi(10)^2 = 100\pi$



17. **Ans: (d)**

**Sol:** Area of Shaded region from the figure is



Area of shaded region from the figure is

$$r^2 - \frac{\pi r^2}{4}$$

Area of shaded part in the question

$$= r^2 - 2\left(r^2 - \frac{\pi r^2}{4}\right)$$

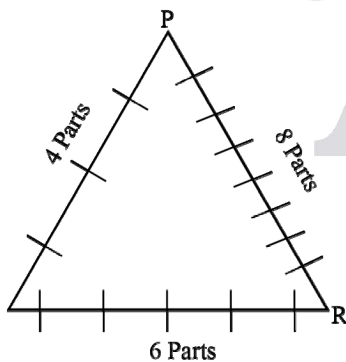
$$= \frac{\pi r^2}{4} - r^2$$

Required probability

$$= \frac{\frac{\pi r^2}{4} - r^2}{r^2} = \frac{\pi}{4} - 1$$

18. **Ans: (d)**

**Sol:**



Minimum area of triangle

$$= \text{L.C.M of } (4, 6, 8) = 24$$

$$A = \frac{\sqrt{3}}{4} a^2 = \frac{\sqrt{3}}{4} (24^2)$$

$$= \frac{\sqrt{3}}{4} (576)$$

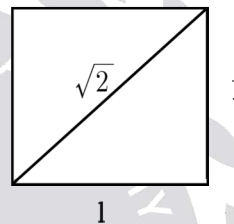
$$= \sqrt{3} (144)$$

$$= 144\sqrt{3}$$

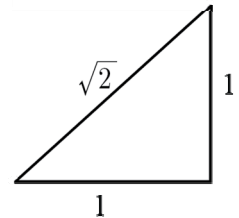
19. **Ans: (c)**

**Sol:**

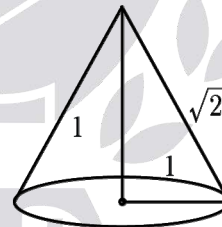
Square



Triangle



Solid core formed by revolving triangle about its short edge



$$r = 1, h = 1$$

$$\text{Volume of solid cone} = \frac{1}{3} \times \pi \times 1^2 \times 1 = \frac{\pi}{3}$$

20. **Ans: (d)**

**Sol:** When a square is formed by joining the midpoints of the next larger square, the area of inner square is exactly of the area of the larger square.

$$\text{Area of 1}^{\text{st}} \text{ square} = 10 \times 10 = 100 \text{ Sq.cm}$$

Area of 2<sup>nd</sup> square =  $\frac{1}{2} \times 100 = 50$  Sq.cm

Area of 3<sup>rd</sup> square =  $\frac{1}{2} \times 50 = 25$  Sq.cm

Area of 4<sup>th</sup> square =  $\frac{1}{2} \times 25 = 12.5$  Sq.cm

Area of 5<sup>th</sup> square =  $\frac{1}{2} \times 12.5 = 6.25$  Sq.cm

Area of the smallest square is 6<sup>th</sup> square =  $\frac{1}{2} = 3.125$  Sq.cm

Option (d) is the correct answer.

**21. Ans: (d)**

**Sol:** Each interior angle in a regular polygon

$$= \frac{(2n - 4)90^\circ}{n}$$

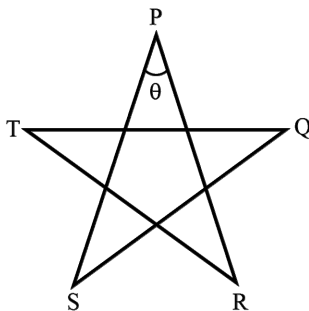
Where n is the number sides.

∴ Each interior angle

$$= \frac{[(2 \times 10) - 4]90^\circ}{10} = 144^\circ$$

**22. Ans: (d)**

**Sol:**

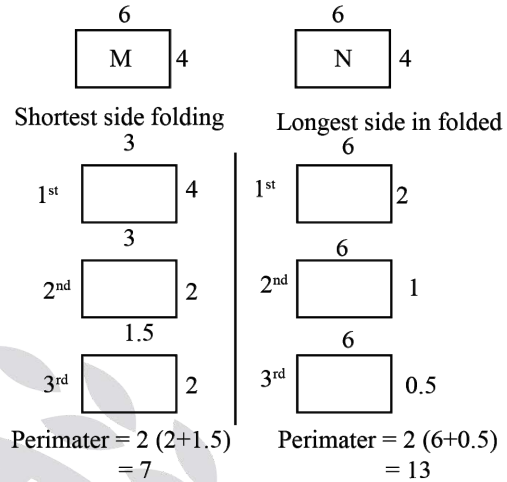


Sum of the angles =  $180^\circ$

Each angle =  $\frac{180}{5} = 36^\circ$

**23. Ans: (b)**

**Sol:**



But requirement is N : M

$$13 : 7$$

**24. Ans: (b)**

**Sol:** R = radius of circumscribed circle =  $\frac{a}{\sqrt{3}}$

r = radius of inscribed circle =  $\frac{a}{2\sqrt{3}}$

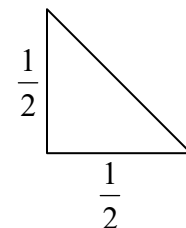
$\Rightarrow \pi r^2 : \pi R^2$  ∴ a = side of triangle

$$\Rightarrow \pi \left( \frac{a}{2\sqrt{3}} \right)^2 = \pi \left( \frac{a}{\sqrt{3}} \right)^2$$

$$= 1 : 4$$

**25. Ans: (c)**

**Sol:** Final shape will be



Area of triangle =  $\frac{1}{2} \times \left( \frac{1}{2} \right) \left( \frac{1}{2} \right) = \frac{1}{8}$

### 2.14 Logarithm

**01. Ans: (b)**

$$\text{Sol: } \log \left( \frac{\tan 1^\circ \times \tan 2^\circ \times \tan 3^\circ \dots}{\times \tan 45^\circ \times \dots \times \tan 88^\circ \times \tan 89^\circ} \right)$$

$$\therefore \tan 88^\circ = \cot 2^\circ$$

$$\therefore \tan 89^\circ = \cot 1^\circ$$

$$\therefore \tan \theta = \cot(90 - \theta)$$

$$\tan \theta \times \cot \theta = 1$$

$$= \log \tan 45^\circ = \log 1 = 0$$

(b) is the correct Ans.

**02. Ans: (a)**

$$\text{Sol: } \log_x \left( \frac{5}{7} \right) = -\frac{1}{3}$$

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

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

Option (a) is the correct Ans.

**03. Ans: (d)**

$$\text{Sol: } \log_2 [\log_3 (\log_2 x)] = 1$$

$$\log_3 (\log_2^2) = 2^1 = 2$$

$$\log_2^x = 3^2 = 9$$

$$x = 2^9 = 512$$

Option (d) is the correct answer

**04. Ans: (b)**

$$\text{Sol: } \therefore \frac{1}{\log_x^y} = \log_y^x$$

$$\begin{aligned} \frac{1}{\log_{c+a}^b} + \frac{1}{\log_{c-a}^b} &= \log_b^{c+a} + \log_b^{c-a} \\ &= \log_b (c^2 - a^2) \\ &= \log_b^{b^2} = 2. \end{aligned}$$

**05. Ans: (d)**

$$\begin{aligned} \text{Sol: } \log_4^2 - \log_8^2 + \log_{16}^2 &\dots \dots \dots \text{to } \infty \\ &= \log_2^2 2^2 - \log_2^2 3^2 + \log_2^2 4^2 \dots \dots \dots \text{to } \infty \\ &= \frac{1}{2} - \frac{1}{3} + \frac{1}{4} - \frac{1}{5} + \frac{1}{6} \dots \dots \dots \\ &= e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \dots \dots \dots + \frac{x^n}{n!} + \dots \dots \dots \infty \end{aligned}$$

$$\ln(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots \dots \dots \infty$$

$$\ln 2 = 1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \dots \dots \dots \infty$$

$$\therefore x = 1$$

$$1 - \ln 2 = \frac{1}{2} - \frac{1}{3} + \frac{1}{4} \dots \dots \dots \infty$$

$$= 1 - \ln 2$$

Option (d) is the correct answer.

**06. Ans: (b)**

$$\text{Sol: } \log P = \frac{p}{2} \log Q = \frac{1}{3} \log R = k(\text{constan } t)$$

$$P = 10^k, Q = 10^{2k}, R = 10^{3k}$$

$$\therefore 10^{4k} = PR = Q^2$$

Option (b) is the correct answer

**07. Ans: (a)**

**Sol:**  $\log a + \log b + \log c = a$

$$\log^{abc} = Q$$

$$abc = 10^0 = 1$$

$$abc = 1 \Rightarrow a = 1, b = 1, c = 1$$

$\therefore a, b, c$  non-ve integers

$$A + b + c = 3$$

option (a) is the correct Ans .

**08. Ans: (a)**

**Sol:**  $\log|a| + \log|b| + \log|c| = 0$

$$\log |a| |b| |c| = 0$$

$$|a| |b| |c| = 1$$

$$(a + b + c)_{\text{minimum}} = -1 - 1 - 1 = -3$$

$$(a + b + c)_{\text{maximum}} = 1 + 1 + 1 = 3$$

Option (a) is the correct Ans

**09. Ans: (c)**

$$\begin{aligned} \text{Sol: } & \frac{1}{\log_w^w + \log_w^{vw}} + \frac{1}{\log_v^v + \log_v^{vw}} + \frac{1}{\log_v^v + \log_v^{wu}} \\ &= \frac{1}{\log_w^{uvw}} + \frac{1}{\log_u^{uvw}} + \frac{1}{\log_v^{uvw}} \\ &= \log_w^{uvw} + \log_u^{uvw} + \log_v^{uvw} \\ &= \log_{uvw}^{uvw} = 1 \end{aligned}$$

Option (c) is the correct Ans

**10. Ans: (b)**

$$\text{Sol: } \log^P = 10^{(y-z)} \Rightarrow P = 10^{10^{(y-z)}}$$

$$\log^Q = 10^{(z-x)} \Rightarrow Q = 10^{10^{(z-x)}}$$

$$\log^R = 10^{(x-y)} \Rightarrow R = 10^{10^{(x-y)}}$$

$$PQR = 10^{10^y - 10z + 10z - 10x + 10x - 10y}$$

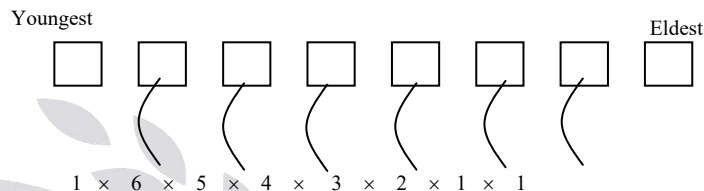
$$PQR = 10^0$$

$$PQR = 1$$

**2.15 Permutation & Combinations**

**01. Ans: 720**

**Sol:** We have children to be seated



$$\text{No. ways} = 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 720 \text{ ways}$$

**02. Ans: 6336**

**Sol:**

Girls – 6  
Boys – 8  
Treasurer (Girl)  ← 6 ways

Girls – 5  
Boys – 8  
Secretary (Boy)  ← 8 ways

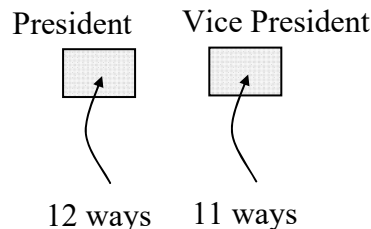
Treasurer (Girl) – 6 ways

Secretary (Boy) – 8 ways

Girls – 5

Boys – 7;

Total = 12



$$\text{Total} = 6 \times 8 \times 12 \times 11$$

03. Ans: (b)

Sol:

$$57 \overbrace{\quad \quad \quad \quad \quad}^{8P_5 = 8 \times 7 \times 6 \times 5 \times 4}$$

$$= 56 \times 120 = 6720$$

04. Ans: (i) 240 (ii) 120 (iii) 60 (iv) 180

Sol: (a) 3, 4, 5, 6, 7, 8

Digits available

Digits available	Position	Arrangements
5	3	$3 \quad - \quad - \quad - \quad   \quad {}^5P_3$
5	3	$- \quad 3 \quad - \quad - \quad   \quad {}^5P_3$
5	3	$- \quad - \quad 3 \quad - \quad   \quad {}^5P_3$
5	3	$- \quad - \quad - \quad 3 \quad   \quad {}^5P_3$

Number of 4 digit numbers with 3 =  $4 \times {}^5P_3$

(b) Digits available – 5(4, 5, 6, 7, 8)

Number of 4 digit number without 3 =  ${}^5P_4 = 120$  ways

(c) 3 \_ \_ \_

Number of digits available = 5

Number of position available = 3

Number of 4 digit number start with '3' =  ${}^5P_3 = 60$  ways

(d) 4 digit numbers contain '3' but not at first  
 = 4 digit number with '3' – 4 digit number with '3' at  
 = solution (a) – solution (c)  
 =  $4 \cdot {}^5P_3 -$

05. Ans: (i) 48 (ii) 100

Sol: (i) Hundred's place can be filled in 4 ways.

Ten's place can be filled in 4 ways.

Unit's place can be filled in 3 ways.

Required number =  $4 \times 4 \times 3 = 48$

(ii) Similarly, the required number

$$= 4 \times 5 \times 5 = 100$$

06. Ans: 4464

Sol: Number of four-digit numbers =  $9 \times 10 \times 10 \times 10 = 9000$

Number of four-digit numbers with no repetition =  $9 \times 9 \times 8 \times 7 = 4536$

$\therefore$  Number of four-digit numbers what at least one digit repeated =  $9000 - 4536 = 4464$

07. Ans: (c)

Sol: Total number of three digit numbers possible are  $9 \times 10 \times 10 = 900$

Number of possibilities for digit '1' to be immediate right of digit '2' are

2	1	x
---	---	---

$$1 \times 1 \times 10 = 10$$

x	2	1
---	---	---

$$9 \times 1 \times 1 = 9$$

---


$$= 19$$

So, number of possibilities such that the digit '1' is never to the immediate right of '2' are  $900 - 19 = 881$

**08. Ans: (b)**

**Sol:** Each letter can be posted in 4 ways. So, total number of ways in which all the 7 letters can be posted

$$\Rightarrow 4 \times 4 \times 4 \times 4 \times 4 \times 4 \times 4 = 4^7$$

**09. Ans: (d)**

**Sol:**

$${}^5P_4 \times 2 \times 3$$

$\underbrace{\hspace{10em}}_{\substack{\uparrow \\ \text{even} \\ \uparrow \\ 2/4/6 \\ \uparrow \\ \text{even}}}$

$$= 120 \times 6 = 720$$

**10. Ans: (c)**

**Sol:**

$${}^4P_3 \div 4$$

$\underbrace{\hspace{10em}}_{\div 4}$

8 ways (12, 16, 24, 32, 36, 52, 56, 64)

$$= 24 \times 8 = 192$$

**11. Ans: (c)**

**Sol:** Given data,

Password must contain 3 characters.

One character ( $C_1$ ) has to be a number from 0 to 9

One character ( $C_2$ ) has to be an upper case English A to Z

One character ( $C_3$ ) has to be a lower case English a to z.

Let  $C_1, C_2, C_3$  be the 3 characters

Total possibilities for  $C_1 = 10$

Total possibilities for  $C_2 = 26$

Total possibilities for  $C_3 = 26$

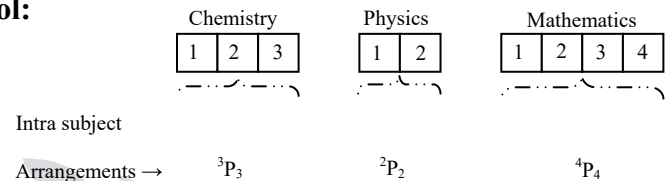
$C_1, C_2, C_3$  can be arranged in 3! Permutations

$\therefore$  Total number of distinct passwords possible =  $10 \times 26 \times 26 \times 3! = 40,560$

Total distinct possible passwords = 40,560.

**12. Ans: 1728**

**Sol:**



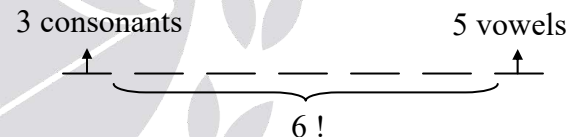
Inter subject arrangement

Phy Chem Maths  $\rightarrow$  Arrangement =  ${}^3P_3$

Total number of arrangements =  ${}^3P_3 ({}^3P_3 \times {}^2P_2 \times {}^4P_4) = 3! \times 3! \times 2!$

**13. Ans: (b)**

**Sol:**



$$6 \times 3 \times 5 = 720 \times 15 = 10800$$

**14. Ans: 60480**

**Sol:** Treating the vowels as one unit, we have 7 units.

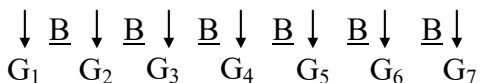
These can be arranged in 7! Ways.

The vowels can be arranged in 4! Ways.

Total ways =  $7! \times 2! \times 2! = 60480$  ways.

**15. Ans: (a)**

**Sol:**



$$6! \cdot {}^7C_4 \cdot 4!$$

$$= 6! \cdot {}^7P_4$$

16. Ans: (b)

Sol: -----

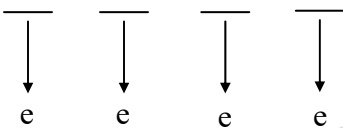
Starting  $\rightarrow$  b

Starting  $\rightarrow$  g

So that  $\Rightarrow 5! \times 5! \times 2$  ways

17. Ans: (c)

Sol:



4 men = 4 even place

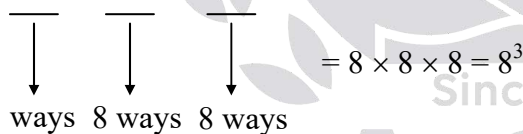
So that  $4! 5!$

18. Ans: (c)

Sol:  ${}^5P_1 + {}^5P_2 + {}^5P_3 + {}^5P_4 + {}^5P_5 = 325$

19. Ans: (c)

Sol: The work 'LAUNCHER' has 8 different Letters



$\therefore$  (Repetition of Letters is allowed)

20. Ans: (b)

Sol: Total number of people  $h = 8$

We know that,

Total number of arrangements in an circular table  $-(n - 1)!$

$(8 - 1)! = 7! = 5040$  ways

21. Ans: (b)

Sol: If select 8 persons first, make them seat an one table. The other 6 persons sit on the next table.

$$= \frac{14!}{8! 6!}$$

22. Ans: (a)

Sol: by using circular permutation  $= \frac{(n-1)!}{2}$

$$= \frac{(11-1)!}{2} = \frac{10!}{2}$$

23. Ans: (d)

Sol:  ${}^nC_r = {}^nC_3 = \frac{9!}{3!6!} = \frac{9 \times 8 \times 7}{3 \times 2} = 84$

24. Ans: (b)

Sol:  $\underbrace{6}_{\text{men}} + \underbrace{1}_{\text{P, VP}} = 7$   
 $= 6! \times 2!$

25. Ans: (b)

Sol:  ${}^nC_r = {}^nC_{n-r}$

Here  $r = 7$

$$n - r = 5$$

$$\Rightarrow n = 12$$

26. Ans: (c)

Sol: i. 1 boy + 3 girls  $= {}^5C_1 \times {}^4C_3 = 5 \times 4 = 20$

ii. 2 boy + 2 girls  $= {}^5C_2 \times {}^4C_3 = 60$

iii. 3 boy + 1 girls  $= {}^5C_3 \times {}^4C_1 = 40$

$$= 20 + 60 + 40 = 120$$

27. **Ans: (c)**

**Sol:**  $nc_2 = 66$

$$\Rightarrow \frac{n(n-1)}{2} = 66 \Rightarrow n(n-1) = 132 = 12 \times 11$$

28. **Ans: (d)**

**Sol:** Total number of balloons =  $5 + 4 + 2 = 11$

Since color are repeating so we used this

formula  $\frac{n!}{p! q! r!}$

$$\text{The number of arrangement} = \frac{11!}{5! 4! 2!} = 6930$$

29. **Ans: (b)**

**Sol:**  $7C_3 = 35$

30. **Ans: (i) 105 (ii) 96**

**Sol:** Through two given point and unique straight line

(a)  ${}^{15}C_2$

(b) 5 points collinear

$\equiv {}^5C_2$  distinct line  $\rightarrow$  considered as one number of straight line  $= {}^{15}C_2 - {}^5C_2 + 1$ .

31. **Ans: (a)**

**Sol:**  $r + r + 2 = 18$

$$r = 8$$

$${}^8C_5 = 56$$

32. **Ans: (c)**

**Sol:**  $P(\text{dice roll} = \text{Green}) = \frac{4}{6} = \frac{2}{3} = P_g$

$$P(\text{dice roll} = \text{Red}) = \frac{2}{6} = \frac{1}{3} = P_r$$

$$\therefore P_g = \frac{2}{3} \qquad P_r = \frac{1}{3}$$

$$(a) P(G = 3, R = 4) = {}^7C_4 \left(\frac{2}{3}\right)^3 \left(\frac{1}{3}\right)^4 = \frac{280}{3^7}$$

$$(b) P(G = 4, R = 3) = {}^7C_3 \left(\frac{2}{3}\right)^4 \left(\frac{1}{3}\right)^3 = \frac{560}{3^7}$$

$$(c) P(G = 5, R = 2) = {}^7C_5 \left(\frac{2}{3}\right)^5 \left(\frac{1}{3}\right)^2 = \frac{672}{3^7}$$

$$(d) P(G = 6, R = 1) = {}^7C_6 \left(\frac{2}{3}\right)^6 \left(\frac{1}{3}\right)^1 = \frac{448}{3^7}$$

From the above analysis the most likely outcome is the one with highest probability which in this case is option (c) i.e. **Five green and Two red balls.**

33. **Ans: (b)**

**Sol:** The sum of all 'n' digit numbers that can be formed by using 'n' distinct non zero digits.

$$= (n-1)! \times (\text{sum of digits}) \times (111 \dots n \text{ times})$$

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

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

$$= 6666600$$

34. **Ans: (d)**

**Sol:** More than 3000, 4 digit number means, the First digit may be 3 (or) 4, the second third and fourth digits are three in each (i,e)

2	3	3	3
---	---	---	---

$$= 2 \times 3 \times 3 \times 3 = 54$$

35. **Ans: (d)**

**Sol:** Total ways in which shirts can be distributed among Arun, Gulab, Neel and Shweta (T) =  $4! = 24$



Number of ways in which shirts are distributed so that only Arun gets a shirt color he dislikes (red) are  $(A) = 2 \times 2 \times 1 = 4$

Number of ways in which shirts are distributed so that only Shweta gets a shirt color she dislikes (white) are  $(S) = 2 \times 2 \times 1 = 4$

Number of ways in which shirts are distributed so that both Arun and Shweta gets a shirt color he/she dislikes (red and white respectively) are  $(B) = 2 \times 1 = 2$

Total number of cases in which shirts can be distributed so that no one has a shirt with a colour he or she dislikes  $= T - (A + S + B) = 24 - (4 + 4 + 2) = 14$

**36. Ans: (b)**

**Sol:** P, Q, R, S → Women

V, W, X, Y, Z → Men

P is not to be paired with Z

Y must necessarily be paired with some one.

The possible ways P can be paired with men  $= 4 \times 4$  (without z) = 16

The possible ways Q can be paired with men  $= 4 \times 5 = 20$

The possible ways S can be paired with men  $= 4 \times 5 = 20$

The total no. of ways  $= 16 + 20 + 20 + 20 = 76$

**37. Ans: (b)**

**Sol:**  $(3!)^3 = 18$  chances

(∵ 'R' should not be seated at second position from the left end)

(  , (R),   ,   )

×

**38. Ans: (b)**

**Sol:** P and R can not adjacent ..... 'S' is seated right of Q.

(i) P Q S R

After interchanging 'P' and 'R' we get one more chance.

R Q S P

(i) Q    S    (here two chances)

(ii)    Q    S (here two chances)

**39. Ans: (d)**

**40. Ans: (a)**

**Sol:**

1. S	R	P	T	Q
2. Q	R	P	T	S
3. S	R	T	P	Q

## 2.16 Probability

**01. Ans: (c)**

**Sol:** The number of ways of randomly picking 3 cards out of 52 cards

$$n(s) = {}^{52}C_3 = 22100$$

Total number of spades = 13

Total number of red green = 2

Total number of black king = 2

Probability of getting 1 spade, 1 red queen and 1 black king

$$= \frac{{}^{13}C_1 \cdot {}^2C_1 \cdot {}^2C_1}{{}^{52}C_3} = \frac{52}{22100}$$

$$= 0.00235$$

Hence the correct and 'c'

**02. Ans: (c)**

**Sol:** Total chances =  $6 \times 6 = 36$

Sum is a multiple either of 3 (or) 4

Event getting a multiple of 3 as the sum  
 (1, 2), (1, 5), (2,1), (2,4), (3, 3), (3, 6),  
 (4, 2), (4, 5), (5, 1), (5, 4), (6, 3), (6, 6) = 2

Event of getting a multiple of 4 as the sum  
 (1, 3), (2, 2), (3,1), (4, 4), (3, 5), (5,3),(2, 6),  
 (6, 2), (6, 6) = 9

But (6, 6) we get already

Total number of cases sum is a multiple  
 either of 3 (or) 4 = 20

The probability that their sum is a multiple  
 either of 3 (or) 4 =  $\frac{20}{36} = \frac{5}{9}$

Hence the correct answer option c

**03. Ans: 0.81**

**Sol:** Total number at bulbs non-defective =  $100 - 5 = 95$

The probability that the current batch is  
 accepted

$$= \frac{95}{100} \times \frac{94}{99} \times \frac{93}{98} \times \frac{95}{97} = 0.82 = 0.812$$

$$\text{(or)} \quad \frac{{}^{95}C_4}{{}^{100}C_4} = \frac{95!}{100!} \times \frac{96!}{96!} = 0.812$$

**04. Ans: (a)**

**Sol:** Let total no at students in the  
 Class = 100

Then girls = 60% of 100 = 60

Poor girls = 25% of 60 = 15

Probability that a poor girl is selected leader  
 $= \frac{15}{100} = 15\%$

**05. Ans: (b)**

**Sol:** Let n(E) = even of the sum 9 from two  
 throws at a dice (3,6), (6, 3), (5, 4) = 4

Two throws at a dice n(s) =  $6 \times 6 = 36$

$$P(E) = \frac{n(E)}{n(s)} = \frac{4}{36} = \frac{1}{9}$$

**06. Ans: (a)**

**Sol:** Total chances n(6) =  $6 \times 6 = 36$

Let E = Event that the sum is a prime  
 number then

$E = \{ (1,1), (1, 2), (1, 4), (1,6), (2, 1), (2,3),$   
 $(2,5), (3, 2), (3, 4), (4, 1), (4, 3), (5, 2),$   
 $(5,6), (6, 1), (6,5) \}$

$\therefore n(E) = 15$

The probability that the total score is a  
 prime number is =  $\frac{15}{36} = \frac{5}{12}$

**07. Ans: (b)**

**Sol:** Total outcomes of when two dice are  
 thrown simultaneously n(s) =  $6 \times 6 = 36$

Let E = event of getting two numbers whose  
 product is even

$E = \{ (1,2), (1,4), (1,6), (2, 1), (2, 2), (2, 3),$   
 $(2, 4), (2,5), (2,6), (3, 2), (3,4), (3,6), (4,1),$   
 $(4, 2), (4,3), (4, 4), (4, 5), (4, 6), (5,2), (5,4),$   
 $(5,6), (6,1), (6,2), (6,3), (6,4), (6,5), (6,6) \}$

$n(E) = 27$

$$\therefore P(E) = \frac{n(E)}{n(s)} = \frac{27}{36} = \frac{3}{4}$$

**08. Ans: (b)**

**Sol:** Total number of face cards in pack of 52 cards is 12 cards

$$\frac{12C_1}{52C_1} = \frac{12}{52} = \frac{3}{13}$$

**09. Ans: (c)**

**Sol:** Total number of outcomes possible

$$n(s) = 10 + 25 = 35$$

$$\text{Total number of prizes } n(E) = 10$$

$$P(E) = \frac{10C_1}{35C_1} = \frac{10}{35} = \frac{2}{7}$$

**10. Ans: 1/7**

**Sol:** Required probability =  $\frac{5! \times 3!}{7!} = \frac{1}{7}$

$\therefore$  When the case of three vowels being together is taken, then three vowels are considered as one unit, so the number of ways in which 5 letters can be arranged =  $5!$

Also the 3 vowels can be arranged amongst themselves in  $3!$  Ways.

**11. Ans: (c)**

**Sol:** Total chances  $n(s) = 52$

Let  $E$  = event of getting a queen of club or a king of heart

$$\therefore n(E) = 2$$

$$\therefore P(E) = \frac{n(E)}{n(s)} = \frac{2}{52} = \frac{1}{26}$$

**12. Ans: (i) 1 : 11 (ii) 1 : 8 (iii) 5 : 31**

**Sol:** (i)  $n(s) = 6 \times 6 = 36$

$$\text{Let } E = \{(1, 3), (2, 2), (3, 1)\}$$

Favourable outcomes = 3

Unfavourable outcomes =  $36 - 3 = 33$

$$\therefore \text{odds in favour of sum of 4} = \frac{3}{33} = \frac{1}{11}$$

(ii)  $E = \{(1, 4), (2, 3), (3, 2), (4, 1)\}$

Favourable outcomes = 4

Unfavourable outcomes =  $36 - 4 = 32$

$$\therefore \text{odds in favour of sum } S = \frac{4}{32} = \frac{1}{8}$$

(iii)  $E = \{(1, 5), (2, 4), (3, 3), (4, 2), (5, 1)\}$

$$n(E) = 5$$

Total chances  $n(s) = 6 \times 6 = 36$

$$\text{Odds in favour} = \frac{5}{36 - 5} = \frac{5}{31}$$

**13. Ans: (b)**

**Sol:** Leap year has 366 days (i.e.,  $7 \times 52 + 2$ )

52 weeks and 2 extra days

The sample space for these 2 days

The two odd days can be {Sunday, Monday},

{Monday, Tuesday}, {Tuesday, Wednesday},

{Wednesday, Thursday}, {Thursday, Friday},

{Friday, Saturday}, {Saturday, Sunday}

So

There are 7 possibilities out of which 2 have

Sundays.

So the probability of 2 Sundays in a leap year is  $\frac{2}{7}$

in a leap year is  $\frac{2}{7}$

**14. Ans: (d)**

**Sol:** Let

Event E = numbers are divisible by 7 in 1 to 100.

$E = \{7, 14, 21, 28, 35, 42, 49, 56, 63, 70, 77, 84, 91, 98\}$

$$P(E) = \frac{14}{100}$$

Probability that selected number is not divisibly by 7 =  $1 - n(E)$

$$= 1 - \frac{14}{100}$$

$$= \frac{86}{100} = \frac{43}{50}$$

**15. Ans: (a)**

**Sol:** Given that

$$P(F) = \frac{60}{100} = \frac{3}{5}$$

$$P(S) = \frac{50}{100} = \frac{1}{2}$$

$$CP(F \cap S) = \frac{30}{100} = \frac{3}{10}$$

$P(F \cup S)$  = Probability that a student selected at random has passed in both examinations

$$P(F \cup S) = P(F) + P(S) - P(F \cap S)$$

$$= \frac{3}{5} + \frac{1}{2} - \frac{3}{10} = \frac{8}{10} = \frac{4}{5}$$

The probability that a student selected at random has failed in both the examination

$$= 1 - P(F \cup S)$$

$$= 1 - \frac{4}{5} = \frac{1}{5}$$

**16. Ans: (b)**

$$\text{Sol: Required probability} = 1 - \frac{{}^6C_3}{{}^{14}C_3}$$

**17. Ans: (a)**

$$\text{Sol: Required probability} = 1 - \frac{{}^{11}C_3}{{}^{14}C_3}$$

**18. Ans: (b)**

$$\text{Sol: Required probability} = \frac{{}^5C_3}{{}^{14}C_3}$$

**19. Ans: (d)**

$$\text{Sol: Required probability} = \frac{{}^6C_2 \times {}^3C_1}{{}^{14}C_3}$$

**20. Ans: (d)**

$$\text{Sol: Required probability} = \frac{{}^3C_2 + {}^4C_2 + {}^3C_2}{{}^{11}C_2}$$

$$= \frac{4}{15}$$

**21. Ans: (a)**

$$\text{Sol: Required probability} = \frac{10}{25} \times \frac{15}{24} + \frac{15}{25} \times \frac{10}{24} = \frac{1}{2}$$

**22. Ans: (d)**

$$\text{Sol: Required probability}$$

$$= \frac{{}^4C_1 + {}^4C_1 + {}^4C_1}{{}^{52}C_3} = \frac{16}{5525}$$

23. Ans: (a)

Sol:  $H_1 H_2 H_3 + H_2 H_1 H_3 + H_3 H_1 H_2$

$$= \frac{1}{7} \times \frac{7}{8} \times \frac{6}{7} + \frac{1}{8} \times \frac{6}{7} \times \frac{6}{7} + \frac{1}{7} \times \frac{6}{7} \times \frac{7}{8}$$

$$= \frac{120}{7 \times 7 \times 8}$$

$$= \frac{15}{49}$$

24. Ans: (b)

Sol: Given 4 men throw a die and 2 people get the same number.

1. The first die can give any of the 6 numbers.
2. The second die can give any of the remaining 5 numbers.
3. The third die can give any of the remaining 4 numbers.
4. The fourth die can give any of the remaining 3 numbers.

So, the total possible outcomes will be

$$= 6 \times 5 \times 4 \times 3$$

Probability of all getting different numbers

$$= (6 \times 5 \times 4 \times 3) / 6^4 = 5/18$$

Probability of 2 people get the same number

$$= 1 - 5/18$$

25. Ans: (a)

Sol: with replacement  $= \frac{8}{15} \times \frac{8}{15} \times \frac{8}{15} = \frac{512}{2197}$

Without replacement  $= \frac{8}{5} \times \frac{7}{4} \times \frac{6}{3}$

26. Ans: (b)

Sol: (1,1), (1, 4), (4, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6)  $\Rightarrow n(E) = 8$

$$n(s) = 6 \times 6 = 36$$

$$\text{required probability} = \frac{8}{36}$$

27. Ans: 42

Sol: Let the probability that A and B speak truth be P(A) and P(B) respectively.

Therefore,

$$P(A) = \frac{60}{100} = \frac{3}{5} \text{ and } P(B) = \frac{90}{100} = \frac{9}{10}$$

A and B can contradict in stating a fact when one is pecking the truth and other is not speaking the truth.

**Case 1:** A is speaking the truth and B is not speaking the truth.

$$\text{Required probability} = P(A) \times (1 - P(B))$$

$$= \frac{3}{5} \times \left(1 - \frac{9}{10}\right) = \frac{3}{50}$$

**Case 2:** A is not speaking the truth and B is separately the truth.

$$\text{Required probability} = (1 - P(A)) \times P(B)$$

$$= \left(1 - \frac{3}{5}\right) \times \frac{9}{10} = \frac{9}{25}$$

Therefore, percentage of cases in which they are likely to contradict in stating the same fact

$$= \left(\frac{3}{50} + \frac{9}{25}\right) \times 100\% = \left(\frac{3+18}{50}\right) \times 100\% = 42\%$$

From case 1, it is clear that it not necessary that the statement of B will carry more weight as he speaks truth in more number of cases than A.

**28. Ans:**
**Sol:** (1, 2, 3) (2, 3, 4) ..... (28, 29, 30)

There are total 28 sets

 1 set is selected in  ${}^{28}C_1$  ways = 28

 Total outcomes is  ${}^{30}C_3$ 

$$= 30 \times 29 \times 28 / 3 \times 2 \times 1$$

$$= 4060$$

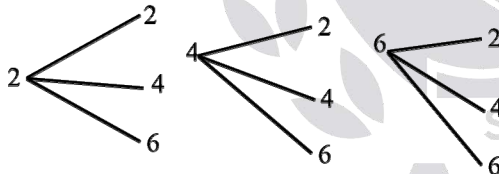
$$\text{Probability} = 28/4060 = 1/145$$

**29. Ans: (c)**
**Sol:** The even numbers on the dice are 2, 4, 6

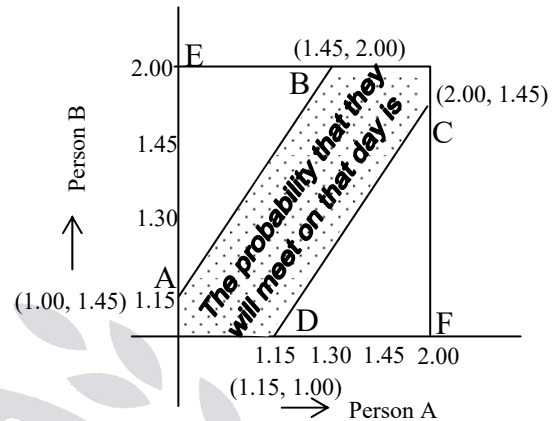
The probability of even number on a dice

$$= \frac{3}{6}$$

 $\therefore$  The probability that an even number is

 rolled out on each dice is  $\frac{3}{6} \times \frac{3}{6} = \frac{1}{4}$ 

**30. Ans: (4/11)**
**Sol:** Required probability =  $\frac{5C_2 \times 7C_1 + 5C_3}{12C_3}$ 

$$= \frac{80}{220} = \frac{4}{11}$$

**31. Ans: (c)**
**Sol:** Two friends A and B


The probability that they will meet on that day

$$= 1 - 2 \left[ \frac{1}{2} \times \frac{45}{60} \times \frac{45}{60} \right]$$

(Area of ABCD)

$$= \left[ 1 - \left( \frac{3}{4} \times \frac{3}{4} \right) \right] = 1 - \frac{9}{16} = \frac{16-9}{16} = \frac{7}{16}$$

**32. Ans: (a)**
**Sol:** (2, 14), (14, 2), (3, 13), (13, 3), (4, 12), (12, 4), (5, 11), (11, 5).

$$\text{Required probability} = \frac{8}{40} = 0.20$$

**33. Ans: (c)**
**Sol:** Probability =  $\frac{\text{no. of favorable cases}}{\text{total no. of possible cases}}$ 

Among two children's (boys), the older one is a boy = 1 and two children's are boys only.

$$\therefore \text{Probability} = \frac{1}{2}$$

34. Ans: (a)

Sol: There are total 100 numbers, out of which  
 50 numbers are divisible by 2,  
 33 numbers are divisible by 3,  
 20 numbers are divisible by 5

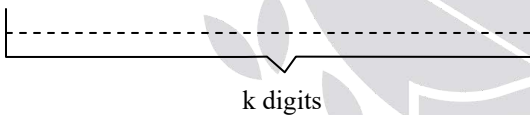
Following are counted twice above  
 16 numbers are divisible by both 2 and 3  
 10 numbers are divisible by both 2 and 5  
 6 numbers are divisible by both 3 and 5

Following is counted thrice above  
 3 numbers are divisible by all 2, 3 and 5  
 So total numbers divisible by 2, 3 and 5 are  
 $= 50 + 33 + 20 - 16 - 10 - 6 + 3 = 74$

$$\text{Required probability} = \frac{100 - 74}{100} = 0.26$$

35. Ans: (c)

Sol:



Each digit can be filled in 7 ways as 0, 5 and 9 is not allowed so, each of these places can be filled by 1, 2, 3, 4, 6, 7, 8.

$$\text{So, required probability} = \left(\frac{7}{10}\right)^k = (0.7)^k$$

**2.17 Progressions**

01. Ans: (b)

Sol:  $1+2+3+\dots$  12 times in 12 hrs

$$\frac{12(12+1)}{2} = 78 \text{ times in 12 hrs}$$

So in a day =  $2(78) = 156$

In 2 days =  $2(156) = 312$

02. Ans: (c)

Sol:  $a_n = a + (n - 1)d$

$$-54 = 11 + (n - 1)(-5)$$

$$n = 14$$

03. Ans: 100

Sol: 201, 204, .....498

$$n = \frac{498 - 201}{3} + 1 = \frac{297}{3} + 1 = 100$$

04. Ans: (a)

Sol: divisible by 3, 4 and 8

Means checking with L.CM of (3, 4, 8) = 24

72, 96, .....288 are multiples of 24

$$S_n = \frac{n}{2}(a + \ell)$$

$$n = \frac{288 - 72}{24} + 1 \Rightarrow \frac{216}{24} + 1 = 10$$

$$S_n = \frac{10}{2}(72 + 288) \Rightarrow 5(360) = 1800$$

**05. Ans: (c)**

**Sol:**  $t_{12} = a + 11d = 22 \rightarrow (1)$

$$\begin{aligned} \text{Let sum of 23 terms} &= S_{23} = \frac{n}{2}(a + \ell) \\ &= \frac{23}{2}(a + a + (n-1)d) \\ &= \frac{23}{2}(a + a + 22d) \\ &= \frac{23}{2}(2(a + 11d)) \\ &= \frac{23}{2}(2)(22) \text{ from (1)} \\ &= 506 \end{aligned}$$

**06. Ans: (a)**

**Sol:**  $11(a + 10d) = 16(a + 15d)$

$$5a + 130d = 0 \quad \therefore (a + 26d = 0)$$

$$27^{\text{th}} \text{ term} = a + 26d$$

$$a + 26d = 0$$

$$\text{Then } 27^{\text{th}} \text{ term} = 0$$

**07. Ans: (d)**

**Sol:** Common ...  $\frac{34-2}{7+1} = \frac{52}{8} = 4$

$$2, 6, 10, 14, 18, 22, 26, 30, 34$$

$$S_n = \frac{1}{2}[30 + 6] = 7(18) = 126$$

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

$$n = 23 \text{ terms } (\because 44, 42, 40, \dots, 2, 0)$$

$$S_n = \frac{23}{2}[44 + 0] = 23(22) = 506$$

**08. Ans: (c)**

**09. Ans: (a)**

**Sol:**  $S_1 = c$ , diff = 4

$$S_2 = c$$
, diff = 5

L. CM of (4, 5) = 20, so we need coefficient = 20

$$21, 41, 61, 81, \dots$$

$$S_n = \frac{n}{2}(2a + (n-1)d) = \frac{100}{2}[2(21) + 99(20)]$$

$$= 50(42 + 1980)$$

$$= 50(2022)$$

$$= 1,01,100$$

**10. Ans: (c)**

**Sol:**  $S_\infty = \frac{a}{1-r} = \frac{1}{1-\frac{1}{2}} = 2$

**11. Ans: 144**

**Sol:**  $3(24 + 12 + 6 + 3 + \dots)$

$$3 \left( \frac{24}{1-\frac{1}{2}} \right) = 3(24)2 = 144 \quad \therefore$$

$$S_\infty = \frac{a}{1-r}$$

**12. Ans: (d)**

**Sol:**  $B = 2^{54} + 2^{53} + \dots + 2^0$

$$a = 1$$

$$r = 2$$

$$n = 55$$

$$S_n = \frac{1(2^{55} - 1)}{1} = 2^{55} - 1$$

$$\text{But } A \Rightarrow 2^{55}$$

$$A \text{ is larger than 'B' by (1)}$$



**13. Ans: 3960**

**Sol:**  $= 360 + 2(300 + 250 + \dots + \dots + 2)$

$$= 360 + 2 \left( \frac{300}{1 - \frac{5}{6}} \right)$$

$$[\because 36 \times \frac{5}{6} = 300, 300 \times \frac{5}{6} = 250]$$

$$= 360 + 2 \left( \frac{300}{\frac{1}{6}} \right)$$

$$= 360 + 2(300)6 \Rightarrow 360 + 3600$$

$$= 3960$$

**14. Ans: 1**

**Sol:**  $\frac{1}{a+9d} = 21 \Rightarrow 21a + 189d = 0 \rightarrow (1)$

$$\frac{1}{a+20d} = 10 \Rightarrow 10a + 200d = 0 \rightarrow (2)$$

By solving (1) and (2)  $a = d, a = \frac{1}{210},$

$$d = \frac{1}{10}$$

We need 210<sup>th</sup> term

$$= \frac{1}{a + (n-1)d} = \frac{1}{\frac{1}{210} + \frac{209 \times 1}{210}} = \frac{1}{\frac{210}{210}} = 1$$

**15. Ans: (b)**

**Sol:** The reciprocal of 11 terms of HP as = A.P

Sum of 11 terms

$$= \frac{n}{2}(2a + (n-1)d) = \frac{11}{2}(2a + (10)d) = 110$$

$$\Rightarrow 2a + 10d = 20$$

$$a + 5d = 10 \quad \text{which is } (T_6)$$

$$\text{again reciprocal} = \frac{1}{10} \text{ is in HP}$$

**16. Ans: 20/9**

**Sol:**  $S = 1 + \frac{3}{4} + \frac{5}{4^2} + \dots \infty \rightarrow (1)$

$$\frac{S}{4} = \frac{1}{4} + \frac{3}{4^2} + \frac{5}{4^3} + \dots \infty \rightarrow (2)$$

$$(1) - (2)$$

$$= 1 + \frac{3}{4} - \frac{1}{4} + \frac{5}{4^2} - \frac{3}{4^2} + \dots \infty$$

$$= 1 + \frac{2}{4} + \frac{2}{4^2} + \dots$$

$$= S - \frac{S}{4} = 1 + \frac{2}{4} \left( 1 + \frac{1}{4} + \frac{1}{4^2} + \dots \infty \right)$$

$$= 1 + \frac{2}{4} \left( \frac{4}{3} \right)$$

$$\frac{3S}{4} = \frac{5}{3}$$

$$S = \frac{20}{9}$$

**17. Ans: (b)**

**Sol:**  $8 [1 + 11 + 111 + \dots + n]$

$$= 8 \cdot \frac{9}{9} (1 + 11 + 111 + \dots + n)$$

$$= \frac{8}{9} (9 + 99 + \dots + n)$$

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

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

$$= \frac{8}{9} \left( \frac{10(10^n - 1)}{10 - 1} - n \right)$$

$$\Rightarrow \frac{8}{9} \left( \frac{10(10^n - 1)}{9} - n \right)$$

18. Ans: (d)

$$\begin{aligned} \text{Sol: } 10 + 84 + 734 + \dots &= (9+1) + (9^2+3) + \\ &(9^3+5) + \dots \\ &= 9 + 9^2 + 9^3 + \dots + (1+3+5+\dots+n) \\ &= \frac{9(9^n - 1)}{9 - 1} + n^2 \\ &= \frac{9(9^n - 1)}{8} + n^2 \end{aligned}$$

19. Ans: (c)

$$\begin{aligned} \text{Sol: } 11 + 103 + 1005 + \dots &= (10 + 1) + (10^2 + 3) + (10^3 + 5) + \dots \\ &= (10 + 10^2 + \dots + 10^n) + (1+3+5+\dots+n) \\ &= \frac{10(10^n - 1)}{10 - 1} + n^2 \\ &= \frac{10(10^n - 1)}{9} + n^2 \end{aligned}$$

20. Ans: (d)

$$\text{Sol: } A.m = \frac{a+b}{2} = p$$

$$G.m = \sqrt{ab} = q$$

$$\text{Quadratic Equation} = x^2 - (\alpha + \beta)x + \alpha\beta = 0$$

$$x^2 - 2px + q^2 = 0 \quad \text{is satisfied}$$

## 2.18 Data Interpretation

01. Ans: (b)

Sol: Sum of angles in a pie chart =  $360^\circ$  Since 1995

The relation between angle and percentage is

$$100\% = 360^\circ$$

$$1\% = 3.6^\circ$$

$$\therefore 40\% = ?$$

$$= 40 \times 3.6 = 144^\circ$$

02. Ans: (d)

Sol: The total monthly budget of an average household =  $4000+1200+2000+1500+1800 = \text{Rs. } 10500$

Percentage of the monthly budget spent on savings

$$= \frac{\text{savings amount}}{\text{Total expenses}} \times 100 = \frac{1500}{10500} \times 100 = 14.285\%$$

$\therefore$  The approximate percentage of the =  $100 - 14.285 = 85.714 \approx 86\%$  monthly budget NOT spent on savings

03. Ans: (d)

Sol:

Category	Years		Increment	% of increment
	2010	2011		
Raw material	5200	6240	1040	$\frac{1040}{5200} \times 100 = 20\%$
Power & fuel	7000	9450	2450	$\frac{2450}{7000} \times 100 = 35\%$
Salary & wages	9000	12600	3600	$\frac{3600}{9000} \times 100 = 40\%$
Plants & Machinery	20000	25000	5000	$\frac{5000}{20000} \times 100 = 25\%$
Advertising	15000	19500	4500	$\frac{4500}{15000} \times 100 = 30\%$
Research & development	22000	26400	4400	$\frac{4400}{22000} \times 100 = 20\%$

∴ Raw material and research and development are increased by same percentage in year 2010- 2011

04. Ans: 48

Sol: Men & Women who do not own any vehicle

$$= 20 + 50 = 70$$

Men & Women who own only a car but not scooter =  $40 + 34 = 74$

Total respondents who do not own a scooter = 144

Total respondents who participated in survey = 300

$$\text{percentage} = \frac{144}{300} \times 100 = 48\%$$

05. Ans: (c)

Sol: Total Revenues of Mola from all types of Rides =  $170 + 320 + 215 + 190(\text{pool}) + 110 + 220 + 180 + 70(\text{Mini}) + 75 + 180 + 120 + 90(\text{prime}) = 1940$

Revenue contribute by prime ride =  $75 + 180 + 120 + 90 = 465$

∴ The percentage of share of revenue contributed by prime to the total revenue of Mola

$$= \frac{465}{1940} \times 100 = 23.97$$

06. Ans: (b)

	Elegance	Smooth	Soft	Executive
	27300	20009	17602	9999
	25222	19392	18445	8942
	28976	22429	19544	10234
	21012	18229	16595	10109
	<b>102510</b>	<b>80059</b>	<b>72186</b>	<b>39284</b>
<b>Total Sum</b>	<b>Rs. ×48</b>	<b>Rs. ×63</b>	<b>Rs. ×78</b>	<b>Rs. ×173</b>
<b>Total Revenue</b>	<b>4920480</b>	<b>5043717</b>	<b>5630508</b>	<b>6796132</b>

More revenue is on executive

07. Ans: (d)

Sol:

Stretch	Distance (km)	Consumption (kwh)
M	20	12
N	45 – 20 = 25	25 – 12 = 13
O	75 – 45 = 30	45 – 25 = 20
P	100 – 75 = 25	57 – 45 = 12

$$\text{Cost per km (sketch M)} = \frac{12}{20} = 0.6$$

$$\text{Cost per km (sketch N)} = \frac{13}{25} = 0.52$$

$$\text{Cost per km (sketch O)} = \frac{20}{30} = 0.66$$

$$\text{Cost per km (sketch P)} = \frac{12}{25} = 0.48$$

∴ Stretch P has least consumption per km

**08. Ans: (c)**

**Sol:** From the given bar graph,

(i) The number of beds made by carpenter  $C_2$  = The number tables made by carpenter  $C_3$

$$8 \text{ Nos} = 8 \text{ Nos}$$

$\therefore$  Statement (i) is true

(ii) The total number of chairs made by all carpenters =  $C_1 + C_2 + C_3 + C_4 + C_5$

$$= 2 + 10 + 5 + 2 + 4 = 23 \text{ Nos}$$

The total numbers of tables made by all carpenters =  $C_1 + C_2 + C_3 + C_4 + C_5$

$$= 7 + 2 + 8 + 3 + 9 = 29 \text{ Nos}$$

$$23 \text{ Nos} < 29 \text{ Nos}$$

$\therefore$  Statement (ii) is also true

$\therefore$  Both the statements (i) and (ii) are true

**09. Ans: 6**

**Sol:** Sunday  $65 > 110\%$  (55) ( $Y > X$ )

Saturday  $60 > 110\%$  (50) ( $X > Y$ )

Friday  $35 > 110\%$  (20) ( $Y > X$ )

Wednesday  $60 > 110\%$  (50) ( $X > Y$ )

Tuesday  $65 > 110\%$  (55) ( $Y > X$ )

Monday  $70 > 110\%$  (45) ( $Y > X$ )

Total 6 days, one student is 10% more than another student.

**10. Ans: (c)**

**Sol:** Average number of students enrolled in school P in 5 years

$$= \frac{3000 + 5000 + 5000 + 6000 + 4000}{5} = 4600$$

Average number of students enrolled in school Q in 5 years

$$= \frac{4000 + 7000 + 8000 + 7000 + 5000}{5} = 6200$$

Average of the difference of the number of students in school,

$$P \text{ and } Q = 6200 - 4600 = 1600$$

$$\text{Desired ratio} = \frac{4600}{1600} = \frac{23}{8}$$

Answer is 23 : 8

**11. Ans: (b)**

**Sol:** Suppose Rs x (amount) invested every year by Company P, and Company Q, then the total revenue by P from 2013-2018 is

$$[110 + 120 + 140 + 140 + 150 + 140] \times \frac{x}{100} = 8x \quad \therefore \text{The revenue} = \text{Investment} + \text{Profit}$$

And the total revenue by Q company from 2013-2018 is

$$[120 + 130 + 130 + 150 + 160 + 160] \times \frac{x}{100} = \frac{17x}{2}$$

$$\therefore \text{Required ratio is } 8x : \frac{17x}{2} \Rightarrow 16 : 17$$

**12. Ans: (c)**

**Sol:** P - Success rate =  $\frac{280}{500} \times 100 = 56\%$

Q - Success rate =  $\frac{330}{600} \times 100 = 55\%$

R - Success rate =  $\frac{455}{700} \times 100 = 65\%$

S - Success rate =  $\frac{240}{400} \times 100 = 60\%$

Average success rate of four schools

$$= \frac{56 + 55 + 65 + 60}{4} = 59\%$$

**13. Ans: (b)**

**Sol:** From the given bar chart,

The total expenditure =  $500 \times 5 = 2500$  million

The total revenue from 2014-2018 =  $500 + 700 + 800 + 600 + 400 = 3000$  million

$\therefore$  Profit = Revenue – Expenditure =  $3000 - 2500 = 500$  million

$\therefore$  The profit on the total expenditure

$$= \frac{500}{2500} \times 100 = 20\%$$

14. Ans: 2006

Sol:

Year	Trade deficit (Imp–Exp)		$\frac{1}{5}$ (Exports)
2005	20	$\neq$	$14 = \frac{1}{5} \times 70$
2004	10	$\neq$	$14 = \frac{1}{5} \times 70$
2007	10	$\neq$	$22 = \frac{1}{5} \times 110$
2006	20	$=$	$20 = \frac{1}{5} \times 100$

15. Ans: 120

Sol: Installed capacity  $\geq 200$  tonnes  $\Rightarrow$  large plant

Installed capacity  $< 200$  tonnes  $\Rightarrow$  small plant

From given multiple pie chart, 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

$\therefore$  The difference between total production of large plants and small plants in tonnes

$$= 770 - 650 = 120$$

16. Ans: 1900

Sol: Total number of management degree holder among the executive in companies

$$C_2 = \frac{5}{100} \times \frac{1}{5} \times 1000 = 100$$

$$C_5 = \frac{20}{100} \times \frac{9}{10} \times 10000 = 1800$$

$$C_2 + C_5 = 1900$$

17. Ans: (c)

Sol: Money spent on Education = 15%

Money spent on transport = 10%

Extra money spent on Education compared to transport

$$= \frac{15-10}{10} \times 100 = 50\%$$

18. Ans:(a)

Sol: Total number of students registered in the university = 5000

Total number of the registered girls = 1500

The boys enrolled in arts = 20% of 5000 – 30% of 1500 = 550

The girls enrolled in management = 15 % of 1500 = 225

∴ The ratio of boys enrolled in arts to the girls enrolled in management =  $\frac{550}{225} = \frac{22}{9} \Rightarrow 22 : 9$

Hence option (a) is correct.

19. Ans: (b)

Sol: The total employment in 2010 at all skill level = 600

Total employment increased from 2010 to 2016

$$= 15\% \text{ of } 600 = \frac{15}{100} \times 600 = 90$$

∴ The employment increased from 2010 to 2016 at S and T skill level = 90

(The total employment at skill levels P, Q and R remained unchanged during this period)

The employment at skill level 'S' in 2010

$$= 25 \times 6 = 150 \quad (\because 100\% = 600, 1\% = 6)$$

The employment at skill level S increased by 40 % from 2010 to 2016 = 40% of 150

$$= \frac{40}{100} \times 150 = 60$$

Increased number of employees at skill level T from 2011 to 2016 = 90 – 60 = 30

Total employee at level T in 2016

$$= 600 \times 5\% + 30$$

$$= 30 + 30 = 60$$



20. Ans: (b)

Sol: Panel (a), Bar diagram represents, proportion of illiterates (%) dark shaded represents female and male illiterates in 2001 and light shaded represents female and male illiterates in 2011. Panel (b) and panel (c) male and females in 2001 and 2011 respectively.

Assume population in 2001 = 100 nos

from given data, population in 2011 also 100.

From the given Bar charts and pie charts, the following table can be possible.

	2001		2011	
	Males	Females	Males	Females
<b>Total</b>	<b>60</b>	<b>40</b>	<b>50</b>	<b>50</b>
Illiterates	50% of 60 = 30	60% of 40 = 24	40% of 50 = 20	40% of 50 = 20
Literates	60 - 30 = 30	40 - 24 = 16	50 - 20 = 30	50 - 20 = 30

Total literates in 2001 = 30 + 16 = 46

Total literates in 2011 = 30 + 30 = 60

∴ The percentage increase in the total number of literates from 2001 to 2011

$$\begin{aligned}
 &= \frac{60 - 46}{46} \times 100 \\
 &= \frac{14}{46} \times 100 = 30.43\%
 \end{aligned}$$

21. Ans: (d)

Sol: Revenue generated through export of item per kilogram

$$= \frac{\text{Total Revenue from Item}}{\text{Export of the item}}$$

Ratio of the revenue generated per kg through export of

$$\frac{\text{Item 1}}{\text{Item 4}} = \frac{12\% \text{ of } 250 \text{ crores}}{11\% \text{ of } 5 \text{ lakh tonnes}} : \frac{6\% \text{ of } 250 \text{ crores}}{22\% \text{ of } 5 \text{ lakh tonnes}}$$

$$\frac{12}{11} : \frac{6}{22} \Rightarrow 4:1$$

**22. Ans: 22000**

**Sol:** The expense on labour in 2012 is 4,50,000

Labour = 15% of total cost = 4,50,000

$$= \frac{15}{100} \times \text{total cost} = 4,50,000$$

Total cost = 30,00,000

Expense on Raw material in 2012

= 20% of 3000000 = 6,00,000

Expense on all other expenses in 2012

= 80% of 3000000 = 2400000

Expense on Raw material in 2013

= 6000000 + 30% of 6000000

= 7800000

Exp on all other exp in 2013

= 2400000 + 20% of 2400000

= 2880000

Total cost in 2013

= 7800000 + 2880000 = 10,68,00,000

Percentage increase in the total cost for company in 2013

$$= \frac{10680000 - 3000000}{3000000} \times 100 = 22000$$

**23. Ans: (d)**

**Sol:** The amounts invested in the companies of, P and Q in 2006 = 8 : 9

The rate of interest of company 'P' in 2006 = 6%

The rate of interest of company 'Q' in 2006 = 4%

The amounts received after one year by P and Q companies in 2006 year

P	Q
6% of 8 :	4% of 9
$\frac{6}{100} \times 8$ :	$\frac{4}{100} \times 9$
4	3

24. Ans: (a)

Sol: From the graph statement (i) is correct

- the time taken for curd formation @ 25°C = 120 min
- the time taken for curd formation @ 37°C = 80 min

∴ Statement (ii) is not correct.

25. Ans: (b)

Sol: From the given graph ,

The difference between the maximum and the minimum pollutant concentrations in the winter = 8 - 0 = 8 ppm

The difference between the maximum and the minimum pollutant concentrations in the summer = 10.5 - 1.5 = 9 ppm

Over the given months, these differences are not equal.

∴ Therefore statement (i) is not correct.

From the given graph, the statement (ii) is correct.

26. Ans: (c)

Sol: The total rainfall during the day = 300 mm = 0.3 m

Obstruction free area = 50 m<sup>2</sup>

50% of rain fall = 50% of 0.3 m = 0.15 m

Volume of water collected = Area × Depth

$$= 50 \times 0.15 \text{ m} = 7.5 \text{ m}^3 = 7500 \text{ L}$$

27. Ans: (d)

Sol: The odometer reading increases from starting point to end point

Area of the given diagram = Odometer reading

Area of the velocity and time graph per second

$$1^{\text{st}} \text{ sec} \Rightarrow \text{triangle} = \frac{1}{2} \times 1 \times 1 = \frac{1}{2}$$

$$2^{\text{nd}} \text{ sec} \Rightarrow \text{square} = 1 \times 1 = 1$$

$$3^{\text{rd}} \text{ sec} \Rightarrow \text{square} + \text{triangle}$$

$$= 1 \times 1 + \frac{1}{2} \times 1 \times 1 = 1\frac{1}{2}$$

$$4^{\text{th}} \text{ sec} \Rightarrow \text{triangle} = \frac{1}{2} \times 1 \times 2 = 1$$

$$5^{\text{th}} \text{ sec} \Rightarrow \text{straight line} = 0$$

$$6^{\text{th}} \text{ sec} \Rightarrow \text{triangle} = \frac{1}{2} \times 1 \times 1 = \frac{1}{2}$$

$$7^{\text{th}} \text{ sec} \Rightarrow \text{triangle} = \frac{1}{2} \times 1 \times 1 = \frac{1}{2}$$

Total Odometer reading at 7 seconds

$$= \frac{1}{2} + 1 + 1 + \frac{1}{2} + 1 + 0 + \frac{1}{2} + \frac{1}{2} = 5$$

28. Ans: (d)

Sol: P, Q, R and S are four types of dangerous microbes recently found in a human habitat

**In the graph**

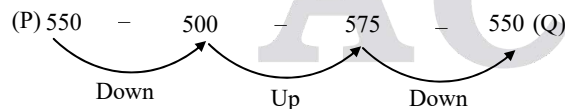
- on X-axis represents probability that microbe will overcome human immunity system and
- on Y-axis represents Toxicity (in milligrams of microbe required to destroy half of the body mass in kilograms)

Microbe ‘S’ will have 80% of probability that microbe will overcome human immunity system and less weight of milligrams of microbe required to destroy half of the body mass in kgs.

∴ Microbe ‘S’ is danger to human beings.

29. Ans: (c)

Sol: Contour lines can be observed to cross region with height from P to Q is as follows



∴ The path from P to Q is Down-Up-Down option (c) is satisfies this path

30. Ans: (c)

Sol: The given contour is a hill station, the peak point of this hill station is P, it is under a contour of 550. At floods, the water level is 525 m. So, the village of R, S and T are under a contour of 525. Therefore these villages are submerged.

31. Ans: (c)

Sol:

Region	Air pressure difference
P	$0.95 - 0.90 = 0.05$
Q	$0.80 - 0.75 = 0.05$
R	$0.8 - 0.65 = 0.15$
S	$0.95 - 0.90 = 0.05$

In general thunderstorms are occurred in a region where suddenly air pressure changes (i.e.,) sudden rise (or) sudden fall of air pressure. From the given contour map in 'R' Region only more changes in air pressure so, the possibility of a thunderstorms in this region.

32. Ans: (d)

Sol: (i) is incorrect as it has move directly

(ii) is incorrect as it stayed for maximum duration on the ground floor

33. Ans: (a)

Sol: Before getting promotion 'T' sharing with R and P and Q's are working together means they are in same office.

Option '(b)' is not correct due to T is sharing with R (i.e.) before getting promotion T is not worked alone.

Option '(c)' is not correct due to 'T' place of work is not defined.

Option '(d)' is also not correct due to after 'T' getting promotion P and Q is are not working together.

34. Ans: (a)

$$\begin{aligned} \text{Sol: } &= \frac{20}{100} \times 2040 : \frac{20}{100} \times 1450 \\ &= 240 : 145 \end{aligned}$$

35. Ans: (a)

# Chapter **3** Spatial Aptitude

## KEY for 3.1 Series

01. (c)	02. (c)	03. (c)	04. (e)	05. (d)	06. (d)	07. (c)	08. (b)	09. (d)	10. (d)
11. (c)	12. (d)	13.(a)	14. (c)	15. (c)	16. (c)	17. (e)	18. (c)		

## KEY for 3.2 Pattern Completion

01. (a)	02. (c)	03. (d)	04. (a)	05. (c)	06. (a)	07. (a )	08. (b)	09. (b)	10. (d)
11. (c)	12. (a)	13.(a)	14. (a)						

## KEY for 3.3 Spotting out Embedded Figure

01. (b)	02. (c)	03. (c)	04. (b)	05. (b)	06. (d)	07. (b)	08. (a)	09. (a)	10. (d)
11. (d)	12. (b)	13.(a)	14. (c)						

## KEY for 3.4 Odd one out / Classification

01. (d)	02. (d)	03. (d)	04. (b)	05. (d)	06. (d)	07. (c)	08. (c)	09. (c)	10. (c)
11. (b)	12. (c)	13.(d)	14. (b)	15. (d)					

**KEY for 3.5 Mirror & Water Images**

01. (a)	02. (d)	03. (c)	04. (c)	05. (b)	06. (d)	07. (b)	08. (d)	09. (d)	10. (d)
11. (d)	12. (c)	13.(b)	14. (d)	15. (c)	16. (d)	17. (b)	18. (b)	19. (b)	20. (c)
21. (d)	22. (a)	23. (d)	24. (c)	25. (b)	26. (d)	27. (a)			

**KEY for 3.6 Analogy**

01. (c)	02. (c)	03. (a)	04. (b)	05. (b)	06. (d)	07. (c)	08. (b)	09. (d)	10. (b)
11. (e)	12. (a)	13.(e)							

**KEY for 3.7 Paper Folding**

01. (a)	02. (b)	03. (b)	04. (d)	05. (c)	06. (c)	07. (c)	08. (d)	09. (b)	10. (a)
11. (d)	12. (c)	13.(d)	14. (b)	15. (a)	16. (b)	17. (c)	18. (d)	19. (a)	20. (b)

**KEY for 3.8 Paper Folding & Cutting**

01. (b)	02. (b)	03. (b)	04. (b)	05. (b)	06. (c)	07. (c)	08. (a)	09. (b)	10. (b)
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**KEY for 3.9 Grouping of Figures**

01. (d)	02. (a)	03. (d)	04. (b)	05. (b)	06. (c)	07. (a)	08. (b)	09. (a)	10. (a)
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**KEY for 3.10 Figure Formation / Assembling**

01. (c)	02. (c)	03. (c)	04. (a)	05. (b)	06. (b)	07. (a)
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**KEY for 3.11 Figure Matrix**

01. (d)	02. (b)	03. (a)	04. (a)	05. (a)	06. (c)	07. (b)
08. (d)	09. (b)	10. (d)	11. (b)	12. (b)	13. (b)	

**KEY for 3.12 Rotation**

01. (d)	02. (c)	03. (d)	04. (b)	05. (d)	06. (d)	07. (c)
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**KEY for 3.13 Diagrammatic Logical Thinking**

01. (a)	02. (b)	03. (a)	04. (a)	05. (b)	06. (b)	07. (c)	08. (c)	09. (b)	10. (d)
11. (c)	12. (a)	13. (a)	14. (c)						

\* Verbal Ability Explanations already included in the practice booklet.