SUB. : Mathematics Part - I
STD. : 10 (English)
TIME: 2 hrs
DATE: 21-Sep-2021

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Q.1 A) Solve Multiple choice questions. **(4)**

1) Find the sum of first 50 natural numbers.
a. 1450 b. 1275 c. 1325 d. 1280

Ans. Option b.

2) A die is thrown. Calculate n(s).
a. 5 b. 6 c. k7 d. 8

Ans. Option b.

3) If $\frac{1}{2}$ is a root of the equation $x^2 + kx - \frac{5}{4} = 0$, then the value of k is
a. 2 b. -2 c. $\frac{1}{4}$ d. $\frac{1}{2}$

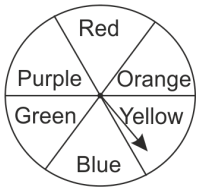
Ans. Option a.

4) x - 2y = 4 ; 2x - 4y = 8 represents.
a. One line in xy graph b. Two lines in xy graph
c. Three lines in xy graph d. Four lines in xy graph

Ans. Option a.

B) Solve the following questions. **(4)**

1)



The arrow is rotated and it stops randomly on the disc. Find out on which colour it may stop.

Ans. it is a random experiment, hence all the outcomes are equally likely. Hence the arrow may stop on any one of the following colours :
Red, Orange, yellow, Blue, Green, Purple

2) Find the values of following determinants.

$$\begin{vmatrix} 5 & 3 \\ -7 & 0 \end{vmatrix}$$

Ans.

$$\begin{vmatrix} 5 & 3 \\ -7 & 0 \end{vmatrix}$$

= (5 × 0) - (3 × -7)
= 0 - (-21)
= 0 + 21
= 21

3) Is the following equation is quadratic?

$x^2 - 2x + 5 = x^2$

Ans. $x^2 - 2x + 5 = x^2$ **is not a quadratic equation.**
On simplifying, the highest index of variable x is not 2.

4) Which of the following sequences are A.P.? If they are A.P. find the common difference.
0, - 4, - 8, - 12, ...

Ans. Here $t_1 = 0$, $t_2 = -4$, $t_3 = -8$, $t_4 = -12$
$t_2 - t_1 = -4 - 0 = -4$,
$t_3 - t_2 = -8 - (-4) = -8 + 4 = -4$,
$t_4 - t_3 = -12 - (-8) = -12 + 8 = -4$
This shows that the difference between any two consecutive terms is constant.
Hence, the given sequence is an A.P. with common difference (d) is - 4.

Q.2 A) Complete the following Activities. (Any Two) **(4)**

1) Fill up the boxes and find out the number of terms in the A. P. 1, 3, 5, ..., 149.

Here a = 1, d = _____, $t_n = 149$
$t_n = a + (n - 1) d$
$\therefore$ 149 = _____
149 = 1 + 2n - 2
$\therefore$ 149 = 2n - _____
$\therefore$ 2n = 150
$\therefore$ n = _____

Ans. Fill up the boxes and find out the number of terms in the A. P. 1, 3, 5, ..., 149.

Here a = 1, d = 2, $t_n = 149$
$t_n = a + (n - 1) d$
$\therefore$ $149 = 1 + (n - 1) \times 2$
$149 = 1 + 2n - 2$
$\therefore$ $149 = 2n - 1$
$\therefore$ $2n = 150$
$\therefore$ $n = 75$

2) Complete the following table to draw the graph of 3x - y = 2

x	_____	- 1
y	1	_____
(x, y)	_____	_____

Ans. Complete the following table to draw the graph of 3x - y = 2

x	$\boxed{1}$	- 1
y	1	$\boxed{-5}$
(x, y)	$\boxed{(1, 1)}$	$\boxed{(-1,-5)}$

3) The following table shows the blood-groups of employees in a bank.
Event C is : 'the blood-group of an employee is AB.'

Blood - group	A	B	AB	O
No. of employees	20	40	15	25

If an employee is chosen at random, what is the probability that his blood - group is AB ?
Fill in the following boxes and find the answer.

n(S) = _____
n(C) = _____
P(C) = _____ = _____

Ans. The following table shows the blood-groups of employees in a bank.
Event C is : 'the blood-group of an employee is AB.'

Blood - group	A	B	AB	O
No. of employees	20	40	15	25

If an employee is chosen at random, what is the probability that his blood - group is AB ?
Fill in the following boxes and find the answer.
n(S) 20 + 40 + 15 + 25 = $\boxed{100}$
n(C) = $\boxed{15}$
P(C) = $\boxed{\frac{15}{100}}$ = $\boxed{\frac{3}{20}}$

B) Solve the following questions. (Any four) **(8)**

1) 'M/s. Real Paint' sold 2 tins of lustre paint and taxable value of each tin is Rs.2800. If the rate of GST is 28%, then find the amount of CGST and SGST charged in the tax invoice.

Ans. Taxable amount of 1 box of paint = Rs. 2800
∴ Taxable amount of 2 boxes of paint = 2 × 2800
= Rs. 5600

Rate of GST = 28%
∴ Rate of CGST is 14% and rate of SGST is 14%
∴ CGST = 14% of Rs. 5600
$\frac{14}{100} \times 5600$
= Rs. 784
∴ CGST = SGST = Rs. 784
∴ The applicable CGST is Rs. 784 and SGST is Rs. 784

2) A card is drawn at random from well-shuffled pack of 52 playing cards. Find the probability that the card drawn is
a face card.

Ans. There are 52 playing cards.
∴ n(S) = 52
Let C be the event that the card drawn is a face card.
There are 3 × 4 = 12 face cards in a pack of 52 cards.
∴ n(C) = 12
$P(C) = \frac{n(C)}{n(S)}$ ∴ $P(C) = \frac{12}{52} = \frac{3}{13}$.

3) Which of the following sequences are A.P.? If they are A.P. find the common difference.
2, $\frac{5}{2}$, 3, $\frac{7}{2}$, ...

Ans. Here $t_1 = 2$, $t_2 = \frac{5}{2}$, $t_3 = 3$, $t_4 = \frac{7}{2}$

$t_2 - t_1 = \frac{5}{2} - 2 = \frac{5-4}{2} = \frac{1}{2}$,

$t_3 - t_2 = 3 - \frac{5}{2} = \frac{6-5}{2} = \frac{1}{2}$,

$t_4 - t_3 = \frac{7}{2} - 3 = \frac{7-6}{2} = \frac{1}{2}$

This shows that the difference between any two consecutive terms is constant.
Hence, the given sequence is an A.P. with common difference (d) is $\frac{1}{2}$.

4) $2x^2 - 7x + 6 = 0$ check whether $x = \frac{3}{2}$ are solutions of the equations.

Ans. Put $x = \frac{3}{2}$ in the polynomial $2x^2 - 7x + 6$

$$2x^2 - 7x + 6 = 2\left(\frac{3}{2}\right)^2 - 7\left(\frac{3}{2}\right) + 6$$

$$= 2\times\frac{9}{4} - \frac{21}{2} + 6$$

$$= \frac{9}{2} - \frac{21}{2} + \frac{12}{2} = 0$$

$\therefore$ $x = \frac{3}{2}$ is a solution of the equation.

5) Find D_y for the simultaneous equations $x - 2y = -18$; $2x - y = 9$.

Ans. $x - 2y = -18$

$2x - y = 9$

$a_1=1, b_1=-2, c_1=-18$

$a_2 = 2, b_2 =-1, c_2=9$

$$Dy = \begin{vmatrix} a_1 & c_1 \\ a_2 & c_2 \end{vmatrix}$$

$$= \begin{vmatrix} 1 & -18 \\ 2 & 9 \end{vmatrix}$$

$= 1 \times 9 - (-18) \times (2)$

$= 9 - (-36)$

$= 45$

$\therefore$ $D_y = 45$

Q.3 A) Complete the following Activity (Any one) **(3)**

1) In a game of chance, the spinning arrow rests at one of the numbers 1, 2, 3, 4, 5, 6,7 and 8. All these are equally likely outcomes.

Find the probabilities of the following events.

a. The arrow rests at an odd number.

b. It rests at a prime number.

c. It rests at a multiple of 2.

s = {_____}

$\therefore$ n(s) = 8

A = {_____}

$\therefore$ n(A) = 4

$\therefore$ $p(A) = \frac{n(A)}{n(S)} = \frac{4}{8} = \frac{1}{2}$

B = {_____}

$\therefore$ n(B) = 4

$\therefore$ $p(B) = \frac{n(B)}{n(S)} = \frac{4}{8} =$ _____

C = {_____}

$\therefore$ n(C) = 4

$P(C) = \frac{n(C)}{n(S)} = \frac{4}{8} =$ _____

Ans. In a game of chance, the spinning arrow rests at one of the numbers 1, 2, 3, 4, 5, 6,7 and 8. All these are equally likely outcomes.

Find the probabilities of the following events.

a. The arrow rests at an odd number.
b. It rests at a prime number.
c. It rests at a multiple of 2.

s = {1, 2, 3, 4, 5, 6, 7, 8}
∴ n(s) = 8
A = {1, 3, 5, 7}
∴ n(A) = 4
∴ $p(A) = \frac{n(A)}{n(S)} = \frac{4}{8} = \frac{1}{2}$
B = {2, 3, 5, 7}
∴ n(B) = 4
∴ $p(B) = \frac{n(B)}{n(S)} = \frac{4}{8} = \frac{1}{2}$
C = {2, 4, 6, 8}
∴ n(C) = 4
$P(C) = \frac{n(C)}{n(S)} = \frac{4}{8} = \frac{1}{2}$

2) There is an auditorium with 35 rows of seats. There are 20 seats in the first row, 22 seats in the second row, 24 seats in the third row and so on. Find the numbers of seats in the twenty-second row.

The number of seats in consecutive rows increases by 2.
∴ 20, 22, 24 ..., is an A.P.
∴ d = _____ = _____
There are 20 seats in the first row. ∴ a = 20.
We have to find the number of seats in the twenty-second row, i. e. we have fund t_{22}.
t_n = _____ ... (Formula)
∴ t_{22} = 20 + (22 - 1) × 2 .. (Substituting the values)
= _____
= _____
∴ t_{22} = _____.
The numbers of seats in the twenty-second row is _____.

Ans. There is an auditorium with 35 rows of seats. There are 20 seats in the first row, 22 seats in the second row, 24 seats in the third row and so on. Find the numbers of seats in the twenty-second row.

The number of seats in consecutive rows increases by 2.
∴ 20, 22, 24 ..., is an A.P.
∴ d = 22 - 20 = 2
There are 20 seats in the first row. ∴ a = 20.
We have to find the number of seats in the twenty-second row, i. e. we have fund t_{22}.
$t_n = a + (n - 1) d$ ... (Formula)
∴ t_{22} = 20 + (22 - 1) × 2 .. (Substituting the values)
= 20 + 21 × 2
= 20 + 42
∴ t_{22} = 62.
The numbers of seats in the twenty-second row is 62.

B) Solve the following questions. (Any two) **(6)**

1) A bag contains 6 red balls and some blue balls. If the probability of drawing a blue ball is twice that of a red ball, find the number of balls in the bag.

Ans. In a bag, there are 6 red balls, and some blue balls
Probability of blue ball = 2x probability of red ball
Let number if blue balls = x

and number of red balls = 6

∴ Total balls = x + 6

Probability of a blue ball = 2x (Probability of red ball)

$$\frac{x}{x+6} = 2 \times \frac{6}{x+6}$$

$$\frac{x}{x+6} = \frac{12}{x+6}$$

x = 12

∴ Number of balls = x + 6 = 12 + 6 = 18

2) The sum of first 55 terms in an A.P. is 3300, find its 28^{th} term.

Ans. Here $S_n = S_{55} = 3300$.

Let the first term of the A.P. be a and the common difference d.

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

∴ $S_{55} = \frac{55}{2}[2a + (55 - 1)d]$

∴ $3300 = \frac{55}{2}[2a + 54d]$

∴ $3300 = \frac{55}{2} \times 2[a + 27d]$

∴ $3300 = 55(a + 27d)$

∴ $a + 27d = \frac{3300}{55}$

∴ $a + 27d = 60$ ... I

Now $t_n = a + (n - 1)d$

∴ $t_{28} = a + (28 - 1)d$

∴ $t_{28} = a + 27d$

∴ $t_{28} = 60$ ... [From I]

Thus, the 28^{th} term is 60.

3) There are three dealers A, B and C in Maharashtra. Suppose, the trade of each of them in september 2018 was as shown in the following table.

The rate of GST on each transaction was 5%.

Dealer	GST collected on the sale	GST paid at the time of purchase	ITC	Tax paid to the Govt.	Tax balance with the Govt.
A	Rs. 5000	Rs. 6000	Rs. 5000	Rs. 0	Rs. 1000
B	Rs. 5000	Rs. 4000	Rs. 4000	Rs. 1000	Rs. 0
C	Rs. 5000	Rs. 5000	Rs. 5000	Rs. 0	Rs. 0

i) How much amount did the dealer A get by sale?

ii) For how much amount did the dealer B buy the articles?

iii) How much is the balance of CGST and SGST left with the government that was paid by A?

Ans. i) The sale of dealer A $= \frac{100}{5} \times 5000$ = 1,00,000 rupees

ii) The purchase of dealer B $= \frac{100}{5} \times 4000$ = 80,000 rupees

iii) Balance of CGST paid by A= $\frac{1000}{2}$ = Rs.500 and

SGST= Rs. 500

4) Solve: $5x^2 - 4x - 3 = 0$ by completing square method.

Ans. $5x^2 - 4x - 3 = 0$

Dividing the equation by 5,

$x^2 - \frac{4}{5}x - \frac{3}{5} = 0$

$x^2 - \frac{4}{5}x - \frac{3}{5} = 0$

$\therefore \quad x^2 - \frac{4}{5}x + \frac{4}{25} - \frac{4}{25} - \frac{3}{5} = 0$

$\therefore \quad \left(x - \frac{2}{5}\right)^2 - \left(\frac{4}{25} + \frac{3}{5}\right) = 0$

$\therefore \quad \left(x - \frac{2}{5}\right)^2 - \left(\frac{19}{25}\right) = 0$

$\therefore \quad \left(x - \frac{2}{5}\right)^2 = \left(\frac{19}{25}\right)$

$\therefore \quad x - \frac{2}{5} = \frac{\sqrt{19}}{5}$ or $x - \frac{2}{5} = -\frac{\sqrt{19}}{5}$

$\therefore \quad x = \frac{2}{5} + \frac{\sqrt{19}}{5}$ or $x = \frac{2}{5} - \frac{\sqrt{19}}{5}$

$\therefore \quad x = \frac{2+\sqrt{19}}{5}$ or $x = \frac{2-\sqrt{19}}{5}$

$\therefore \quad \frac{2+\sqrt{19}}{5}$ and $\frac{2-\sqrt{19}}{5}$ are roots of the equation.

Q.4 Solve the following questions. (Any two) **(8)**

1) Two taps A and B can together fill a swimming pool in 15 days. A and B are kept open for 12 days and then B is closed. It takes another 8 days for the pool to be filled. How many days does each tap require to fill the pool?

Ans. Let taps A and B take x and y days respectively to fill the swimming pool.

In one day tap A fills $\frac{1}{x}$ part of the swimming pool

In one day tap B fills $\frac{1}{y}$ part of the swimming pool

Both taps together fill the swimming pool in 15 days

$\therefore$ Both taps together fill $\frac{1}{15}$ part of the swimming pool in 1 day.

$\therefore \quad \frac{1}{x} + \frac{1}{y} = \frac{1}{15}$ ... (1)

Taps A and B are kept open for 12 days.

$\therefore$ in 12 days these taps fill $\frac{12}{x} + \frac{12}{y}$ part of the swimming pool.

Now, tap B is closed and tap A takes another 8 days to fill the swimming pool.

$\therefore \quad \frac{12}{x} + \frac{12}{y} + \frac{8}{x} = 1 \quad \therefore \frac{20}{x} + \frac{12}{y} = 1$ ... (2)

Substituting m for $\frac{1}{x}$ and n for $\frac{1}{y}$, we get,

$m + n = \frac{1}{15} \quad \therefore 15m + 15n = 1$ ... (3)

and $20m + 12n = 1$ ... (4)

Multiplying equation (3) by 4 and equation (4) by 3.

$60m + 60n = 4$ ... (5)

$60m + 36n = 3$ ... (6)

$- \quad - \quad -$ ... [Subtracting equation (6) from equation (5)]

$24n = 1$

$\therefore n = \frac{1}{24}$

Substituting n = $\frac{1}{24}$ in equation (4),

30m + 12 × $\frac{1}{24}$ = 1 ∴ 20m + $\frac{1}{2}$ = 1 ∴ 20m = $\frac{1}{2}$

∴ m = $\frac{1}{40}$

Re-substituting the values of m and n, we get,

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

and n = $\frac{1}{y} = \frac{1}{24}$ ∴ y = 24

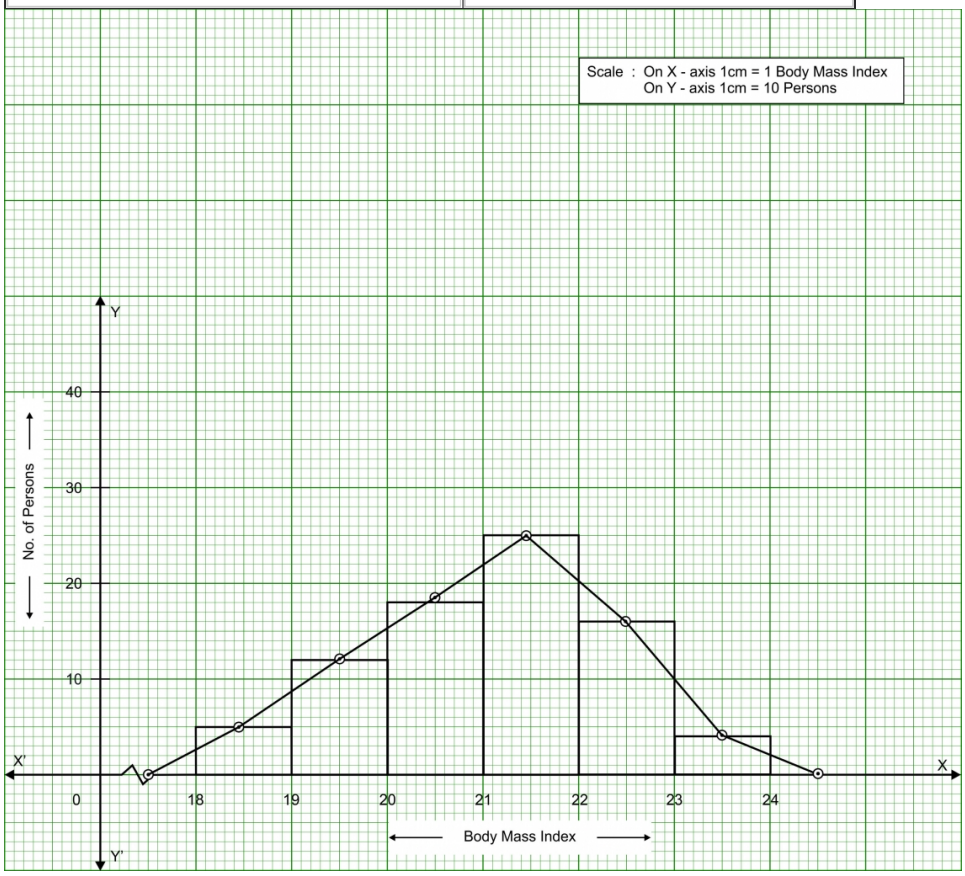
Individually tap A and tap B requires **40 days** and **24 days** respectively to fill the swimming pool.

2) Draw histogram and frequency polygon for the following data :

Body mass index	18-19	19-20	20-21	21-22	22-23	23-24
No. of persons	5	12	18	25	16	4

Ans.

Body mass index class interval	No. of persons Frequency
18-19	5
19-20	12
20-21	18
21-22	25
22-23	16
23-24	4



3) A man repays a loan of Rs. 3,250 by paying Rs. 305 in the first month and then decreases the payment by Rs.15 every month. How long will it take to clear his loan?

Ans. Let the time required to clear his loan be n months. The monthly payment decreases by Rs. 15. Therefore the payments are in A.P. with first term a = 305 and common difference d = -15.

$\therefore$ a = 305, d = -15, Sn = 3,250

We have to find n, using the formula for S_n.

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

$\therefore$ $3250 = \frac{n}{2}[2 \times 305 + (n - 1)(-15)]$

$\therefore$ $6500 = n[610 - 15n + 15]$

$\therefore$ $6500 = n[625 - 15n]$

$\therefore$ $6500 = 625n - 15n^2$

$\therefore$ $15n^2 - 625n + 6500 = 0$

$\therefore$ $3n^2 - 125n + 1300 = 0$

$\therefore$ $3n^2 - 60n - 65n + 1300 = 0$

$\therefore$ $3n(n - 20) - 65(n - 20) = 0$

$\therefore$ $(n - 20)(3n - 65) = 0$

$\therefore$ $n - 20 = 0$ or $3n - 65 = 0$

$\therefore$ $n = 20$ or $n = \frac{65}{3}$

Here n is a natural number.

$\therefore$ n = 20

Hence the time required to clear the loan is 20 months.

Q.5 Solve the following questions. (Any one) **(3)**

1) Iraa wants to buy a car. She want to select a car depends on usage of petrol by it. Car A travels x km for every litre of petrol, while car B travels (x + 5) km for every litre of petrol.
Help her to choose perfect car for her by finding litres of petrol used by car A and car B in covering a distance of 400km. If car A uses 4 litres of petrol more than car B in covering 400 km, write down an equation, in x and solve it to determine the number of litres of petrol by car B for the journey.

Ans. Distance travelled by car A in one litre = x km

and distance travelled by car B in one litre = (x + 5) km

Consumption of car A in covering 400 km = $\frac{400}{x}$ litres and

According to the condition, we have

$\frac{400}{x} - \frac{400}{x + 5} = 4$

$400\left(\frac{x + 5 - x}{x(x - 5)}\right) = 4$

$\frac{400(x + 5 - x)}{x(x + 5)} = 4$

$\frac{400 \times 5}{x^2 + 5x} = 4$

$2000 = 4x^2 + 20x$

$4x^2 + 20x - 2000 = 0$

$x^2 + 5x - 500 = 0$ (Dividing by 4)

$x^2 + 25x - 20x - 500 = 0$

$x(x + 25) - 20(x + 25) = 0$

$(x + 25)(x - 20) = 0$

Either x + 25 = 0, then x = -25, but it is not possible as it is in negative

or x - 20 = 0, then x = 20.

$\therefore$ Petrol used by car B = 20 - 4

= 16 litres.

2) Nayana want to measure the weight of the bucket but was not able to, as there was water in it.

The weight of a bucket shows 19 kg when it is filled with water up to $\frac{5}{7}$ of its capacity and shows 22 kg when it is filled with water up to $\frac{6}{7}$ of its capacity. Help her to find weight of bucket, when it is completely filled with water.

Ans. Let the weight of the bucket be x kg and the weight of water when the bucket is completely filled be y kg.

Then from the first condition, $x + \frac{5y}{7} = 19$

$\therefore$ $7x + 5y = 133$ ... (1)

From the second condition, $x + \frac{6y}{7} = 22$

$\therefore$ $7x + 6y = 154$ ... (2)

Subtracting equation (1) from equation (2),

$7x + 6y = 154$ ... (2)

$7x + 5y = 133$ ... (1)

$- \quad - \quad -$

$y \quad = 21$

Subtracting y = 21 in equation (1),

$7x + 5(21) = 133$

$\therefore$ $7x + 105 = 133$

$\therefore$ $7x = 133 - 105$

$\therefore$ $7x = 28$

$\therefore$ $x = 4$.

When the bucket is completely filled with water, its weight will be x + y = 4 + 21 = 25 kg.