LIBERTY PAPER SET

STD. 10 : Mathematics (Basic) [N-018(E)]

Full Solution

Time : 3 Hours **ASSIGNMENT PAPER 6**

Section-A

1. (B) 11 $x - 9$ **2.** (B) $\sqrt{x^2 + y^2}$ **3.** (D) 28 **4.** (B) 12 **5.** (C) $sec\theta$ **6.** (A) 5.5 **7.** 3 **8.** 0 **9.** 1 **10.** 9 **11.** 2 **12.** 35 **13.** True **14.** True **15.** False **16.** False **17.** –2 **18.** 8 **19.** $\frac{2}{5}$ **20.** 0 **21.** $\frac{1}{4}\pi r^2$ **22.** 60° **23.** (c) $l \times b \times h$ **24.** (b) $2(lb + bh + hl)$

Section-B

25. We have quadratic equation $ax^2 + bx + c$ with α and β as its zeroes.

$\alpha + \beta = 0$ & $\alpha \cdot \beta = -3$ is given

$\therefore -\frac{b}{a} = 0$ $\qquad \frac{c}{a} = -3$

$\therefore \frac{-b}{a} - \frac{0}{1}$ $\qquad \frac{c}{a} = \frac{-3}{1}$

then $a = 1$, $b = 0$, $c = -3$

So we can get equation,

$x^2 + 0x - 3 = x^2 - 3.$

So for each real root in form of k, $k(x^2 - 3)$ is required equation.

26. $P(x) = x^2 - 5x + 6$

$\therefore a = 1, b = -5$ and $c = 6$

Sum of the zeroes $= -\frac{b}{a} = -\frac{-5}{1} = 5$

Product of the zeroes $\frac{c}{a} = \frac{6}{1} = 6$

27. $2x^2 - 6x + 3 = 0$

$\therefore a = 2, b = -6$ and $c = 3$

$\therefore b^2 - 4ac = (-6)^2 - 4(2)(3) = 36 - 24 = 12$

Here $b^2 - 4ac > 0$, therefore, there are distinct real roots exist for given equation.

Now, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$\therefore x = \frac{-(-6) \pm \sqrt{12}}{2 \times 2}$

$\therefore x = \frac{6 \pm 2\sqrt{3}}{4}$

$\therefore x = \frac{3 \pm \sqrt{3}}{2}$

Therefore, roots of given equation : $\frac{3 + \sqrt{3}}{2}, \frac{3 - \sqrt{3}}{2}$

28. The number of rose plants in the 1st, 2nd, 3rd,....... rows are : 25, 23, 21, ..., 5 In the form of AP :

$a = 25,\ d = 23 - 25 = -2,\ a_n = 5$

Now, $a_n = a + (n - 1)\,d$

$\therefore\ 5 = 25 + (n - 1)(-2)$

$\therefore\ 5 = 25 - 2n + 2$

$\therefore\ 2n = 25 + 2 - 5$

$\therefore\ 2n = 22$

$\therefore\ n = 11$

So, there are 14 rows in the flower bed.

29. $a = -10,\ d = -5 - (-10) = 5,\ n = 10$

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

$\therefore\ S_{10} = \frac{10}{2}\ [2(-10) + (10 - 1)(5)]$

$\therefore\ S_{10} = 5[-20 + (9)(5)]$

$\therefore\ S_{10} = 5(-20 + 45)$

$\therefore\ S_{10} = 5(25)$

$\therefore\ S_{10} = 125$

So, sum of first 10 terms is 125.

30. $AB = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

$= \sqrt{(2+3)^2 + (3+9)^2}$

$= \sqrt{25 + 144}$

$= \sqrt{169}$

$= 13$

Threfore, the distance between the given points is 13.

31. Let, a point on the y-axis is of the form $(0, y)$. So, let the point $M(0, y)$ be equidistant from P and Q.

$\therefore\ PM = MQ$

$\therefore\ PM^2 = MQ^2$

$\therefore\ (6 - 0)^2 + (5 - y)^2 = (-4 - 0)^2 + (3 - y)^2$

$\therefore\ 36 + 25 - 10y + y^2 = 16 + 9 - 6y + y^2$

$\therefore\ 36 + 25 - 16 - 9 = 10y - 6y$

$\therefore\ 4y = 36$

$\therefore\ y = 9$

So, the required point is (0, 9).

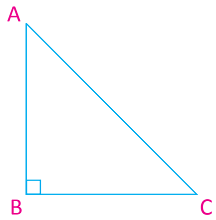
32. $2tan^2 45° - cos^2 30° + \sin^2 60°$

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

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

$= 2$

33.



$sin\ A = \frac{3}{4}$

In right angled Δ ABC, $\angle B = 90°$

$sin\ A = \frac{BC}{AC} = \frac{3}{4}$

$\therefore \frac{BC}{3} = \frac{AC}{4}$ k, k = Positive Real Number

$\therefore BC = 3k, AC = 4k$

According to pythagoras

$AB^2 = AC^2 - BC^2$

$\therefore AB^2 = (4k)^2 - (3k)^2$

$\therefore AB^2 = 16k^2 - 9k^2$

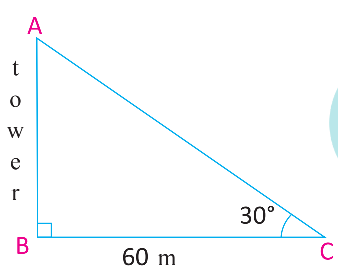
$\therefore AB^2 = 7k^2$

$\therefore AB = \sqrt{7}\ k$

$\therefore cos\ A = \frac{AB}{AC} = \frac{\sqrt{7}\,k}{4k} = \frac{\sqrt{7}}{4}$

$tan\ A = \frac{sin\ A}{cos\ A} = \frac{\frac{3}{4}}{\frac{\sqrt{7}}{4}} = \frac{3}{\sqrt{7}}$

34.



Here in ΔABC, $\angle B = 90°$

$\therefore tan\ 30° = \frac{AB}{BC}$

$\therefore \frac{1}{\sqrt{3}} = \frac{AB}{60}$

$\therefore \frac{60}{\sqrt{3}} = AB$

$\therefore \frac{20 \times 3}{\sqrt{3}} = AB$

$\therefore AB = \frac{20 \times \sqrt{3} \times \sqrt{3}}{\sqrt{3}}$

$\therefore AB = 20\sqrt{3}$ m

So, the height of the tower is $20\sqrt{3}$ m

35. $l = 2 \times 5 = 10$ cm

$b = 5$ cm, $h = 5$ cm

Curved surface area of cuboid

$= 2(lb + bh + hl)$

$= 2[(10 \times 5) + (5 \times 5) + (5 \times 10)]$

$= 2[50 + 25 + 50]$

$= 2(125)$

$= 250 \text{ cm}^2$

36. Hemisphere Cone

$r = 1$ cm $r = 1$ cm

$h = r = 1$ cm

Volume of solid = Volume of hemisphere + Volume of cone

$= \frac{2}{3}\pi r^3 + \frac{1}{3}\pi r^2 h$

$= \frac{1}{3}\pi r^2 (2r + h)$

$= \frac{1}{3} \times \pi \times (1)^2 \times [(2 \times 1) + 1]$

$= \frac{1}{3} \times \pi \times 1(2 + 1)$

$= \frac{1}{3} \times \pi \times 3$

$= \pi \text{ cm}^3$

Hence, the volume of the solid is π cm^3.

37. Here, the maximum class frequency is 7 and the class corresponding to this frequency 40 – 55.

So, the modal class is 40 – 55.

$\therefore\ l = 40,\ h = 15,\ f_1 = 7,\ f_0 = 3,\ f_2 = 6$

Mode $Z = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$

$\therefore\ Z = 40 + \left(\frac{7-3}{2(7)-3-6}\right) \times 15$

$= 40 + \frac{4 \times 15}{5}$

$= 40 + 12$

$= 52$

38. $2x + 3y = 7$ ...... (1)

$3x - 4y = 2$ ...... (2)

Multipy eq^n (1) by 4 and eq^n (2) by 3 and add them,

$8x + 12y = 28$

$+ \quad 9x - 12y = 6$

$\therefore\ 17x = 34$

$\therefore\ x = 2$

put $x = 2$ in eq^n (1)

$2x + 3y = 7$

$\therefore \quad 2(2) + 3y = 7$

$\therefore \quad 4 + 3y = 7$

$\therefore \quad 3y = 3$

$\therefore \quad y = 1$

The Solution of the equation : $x = 2, y = 1$

39. Let, the larger no $= x$,

smaller no $= y$.

$\therefore \quad x + y = 18 \quad$ ...(1)

$x - y = 2 \quad$ ...(2)

Add (1) & (2),

$x + y = 18$

$x - y = 2$

$\therefore 2x = 20$

$\therefore x = 10$

Put $x = 10$ in eq^n (1),

$10 + y = 18$

$\therefore \quad y = 18 - 10$

$\therefore \quad y = 18 - 10$

$\therefore \quad y = 8$

Largen no = 10

Smaller no = 8

40. Here, $a_2 = a + d = 14$ and $a_3 = a + 2d = 18$.

$\therefore \quad a + d = 14$

$a + 2d = 18$

$- \quad - \qquad -$

$\therefore -d = -4$

$\therefore \quad d = 4$

Put $d = 4$ in $a + d = 14$

$a + d = 14$

$\therefore \quad a + 4 = 14$

$\therefore \quad a = 14 - 4$

$\therefore \quad a = 10$

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

$$\therefore \quad S_{51} = \frac{51}{2}[2(10) + (51-1)4]$$

$$= \frac{51}{2}[20 + 200]$$

$$= \frac{51}{2} \times 220$$

$$= 51 \times 110$$

$$\therefore \quad S_{51} = 5610$$

41. Suppose, A (1, 2), B (4, y), C (x, 6) and D (3, 5) are the vertices of parallelogram ABCD.

Co-ordinates from the midpoint of the diagonal AC

= Co-ordinates from the midpoint the diagonal BD.

$$\therefore \left(\frac{1+x}{2}, \frac{2+6}{2}\right) = \left(\frac{4+3}{2}, \frac{y+5}{2}\right)$$

$$\therefore \frac{1+x}{2} = \frac{4+3}{2} \quad , \quad \frac{2+6}{2} = \frac{y+5}{2}$$

$\therefore$ $1 + x = 7$, $8 = y + 5$

$\therefore$ $x = 7 - 1$, $y = 8 - 5$

$\therefore$ $x = 6$, $y = 3$

42. Suppose, the line dividing the line segment AB connecting A (–1, 7) and B (4, –3) in the ratio $m_1 : m_2 = 2 : 3$ is P.
The co-ordinate of point

$$P = \left(\frac{m_1x_2 + m_2x_1}{m_1 + m_2}, \frac{m_1y_2 + m_2y_1}{m_1 + m_2}\right)$$

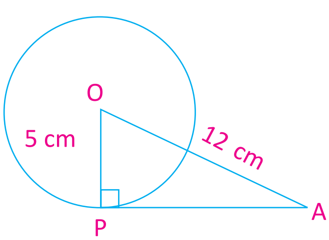
$$= \left(\frac{2(4) + 3(-1)}{2+3}, \frac{2(-3) + 3(7)}{2+3}\right)$$

$$= \left(\frac{8-3}{5}, \frac{-6+21}{5}\right)$$

$$= (1, 3)$$

Therefore, the co-ordinates of the required point are given by (1, 3).

43.



In Δ OPA; $\angle P = 90°$

Applying Pythagoras Theorem,

$OA^2 = OP^2 + PA^2$

$\therefore$ $PA^2 = OA^2 - OP^2$

$\therefore$ $PA^2 = (12)^2 - (5)^2$

$\therefore$ $PA^2 = 144 - 25$

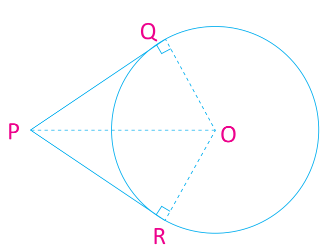
$\therefore$ $PA^2 = 119$

$\therefore$ $PA = \sqrt{119}$ m

44. Given : A circle with centre O, a point P lying outside the circle with two tangents PQ, PR on the circle from P.

To prove : PQ = PR

Figure :



Proof : Join OP, OQ and OR. Then ∠OQP and ∠ORP are right angles because these are angles between the radii and tangents and according to theorem 10.1 they are right angles.

Now, in right triangles OQP and ORP,

OQ = OR (Radii of the same circle)

OP = OP (Common)

∠OQP = ∠ORP (Right angle)

Therefore, Δ OQP ≅ Δ ORP (RHS)

This gives, PQ = PR (CPCT)

45. Here we get the information as shown in the table below using $a = 225$ and $h = 50$ to use the deviation method.

Daily expenditure (in ₹)	(f_i)	x_i	$u_i = \frac{x_i - a}{h}$	$f_i u_i$
100 – 150	4	125	– 2	– 8
150 – 200	5	175	– 1	– 5
200 – 250	12	225 = a	0	0
250 – 300	2	275	1	2
300 – 350	2	325	2	4
Total	$\Sigma f_i = 25$	–	–	$\Sigma f_i u_i = -7$

Mean $\bar{x} = a + \frac{\Sigma f_i u_i}{\Sigma f_i} \times h$

$\therefore \bar{x} = 225 + \frac{-7}{25} \times 50$

$\therefore \bar{x} = 225 - 14$

$\bar{x} = 211$

So, mean daliy expenditure on food is ₹ 211.

46. Total number of plates = 90.

(i) Suppose event A of inscribed two digit number. (10 to 90 = 81)

$\therefore P(A) = \frac{\text{Total number of two digit number}}{\text{Total number of outcomes}}$

$\therefore P(A) = \frac{81}{90} = \frac{9}{10} = 0.9$

(ii) Suppose event B of inscribed perfect square number. (1, 4, 9, 16, 25, 36, 49, 64, 81 = 9)

$\therefore P(B) = \frac{\text{Total number of perfect square}}{\text{Total number of outcomes}}$

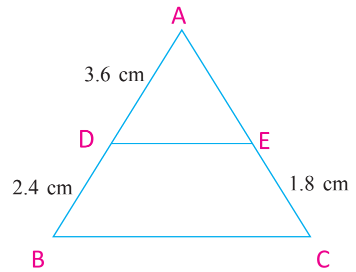
$\therefore P(B) = \frac{9}{90} = \frac{1}{10} = 0.1$

(iii) Suppose event C of inscribed a number divisible by 3. (3, 6, 9,............,90 = 30)

$\therefore P(C) = \frac{\text{Total number of number of divisible by 3}}{\text{Total number of outcomes}}$

$\therefore P(C) = \frac{30}{90} = \frac{1}{3}$

47.



$\frac{AD}{DB} = \frac{AE}{EC}$ (Theoren – 6.1)

$\therefore \frac{3.6}{2.4} = \frac{AE}{1.8}$

$\therefore AE = \frac{3.6 \times 1.8}{2.4}$

$\therefore AE = 2.7$ cm

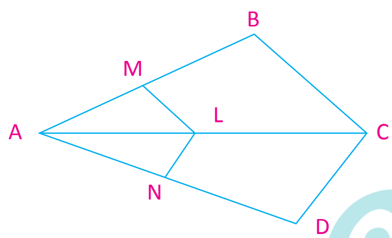
Now, A – D – B

$\therefore AB = AD + DB$

$\therefore AB = 3.6 + 2.4$

$\therefore AB = 6$ cm

48.



In Δ ABC, A–M–B & A–L–C also LM || CB.

$\therefore \frac{AM}{AB} = \frac{AL}{AC}$ (theorem : 6.1) ...(i)

In Δ ADC, A–L–C and A–N–D also LN || CD.

$\therefore \frac{AL}{AC} = \frac{AN}{AD}$ (theorem : 6.1) ...(ii)

From equation (i) and (ii), we get, $\frac{AM}{AB} = \frac{AN}{AD}$

49. Suppose, Jayesh's present age is x years.

Three years ago, his age is $(x - 3)$ years.

Inverse of his three years ago age is $\frac{1}{x-3}$ years.

Five years from present age is $(x+5)$ years.

Inverse of this age is $\frac{1}{x+5}$ years.

Sum of Inverse of age three years ago and Inverse of age give years from present years is $\frac{1}{3}$.

$\therefore \frac{1}{x-3} + \frac{1}{x+5} = \frac{1}{3}$

$\therefore 3(x + 5) + 3(x - 3) = (x - 3)(x + 5)$

$\therefore 3x + 15 + 3x - 9 = x^2 + 2x - 15$

$\therefore 6x + 6 = x^2 + 2x - 15$

$\therefore x^2 + 2x - 15 - 6x - 6 = 0$

$\therefore x^2 - 4x - 21 = 0$

$\therefore x^2 - 7x + 3x - 21 = 0$

$\therefore x(x - 7) + 3(x - 7) = 0$

$\therefore (x - 7)(x + 3) = 0$

$\therefore x - 7 = 0$ and $x + 3 = 0$

$\therefore x = 7$ and $x = -3$

But $x = -3$ is not possible

$\therefore x = 7$

Therefore, Jayesh's present age is 7 years.

50. Simple Interest = $\frac{P \times R \times N}{100}$

So, the interest at the end of the 1st year, = ` $\frac{1000 \times 8 \times 1}{100}$ = ` 80

The interest at the end of the 2nd year = ` $\frac{1000 \times 8 \times 2}{100}$ = ` 160

The interest at the end of the 3rd year = ` $\frac{1000 \times 8 \times 3}{100}$ = ` 240

So, the interest at the end of the 1st, 2nd, 3rd..... years, respectively are 80, 160, 240, ...

Here, $d_1 = 160 - 80 = 80$

$d_2 = 240 - 160 = 80$

i.e. common difference $d = 80$ and it is AP. Also $a = 80$.

So, the interest at the end of 30 years,

$a_{30} = a + (n - 1)d$

$= 80 + (30 - 1) 80$

$= 80 + 2320$

$=$ ₹ 2400

So, the interest at the end of 30 years will be ₹ 2400.

51.

Class	Frequency	Cumulative frequency
0 – 10	5	5
10 – 20	8	5 + 8 = 13
20 – 30	20	13 + 20 = 33
30 – 40	15	33 + 15 = 48
40 – 50	7	48 + 7 = 55
50 – 60	5	55 + 5 = 60

$n = 60$

$n = 60,\ \frac{n}{2} = 30,$

Here 30 lies with in cf value 33.

$\therefore$ class = 20 – 30, $l = 20$

$cf = 13, f = 20, h = 10$

$$\text{Median M} = l + \left(\frac{\frac{n}{2} - cf}{f}\right) \times h$$

$$= 20 + \left[\frac{30 - 13}{20}\right] \times 10$$

$$= 20 + \frac{7 \times 10}{20}$$

$$= 20 + \frac{7}{2}$$

$$= 20 + 3.5$$

$$\text{M} = 23.5$$

Median of given data is 23.5.

52.

Class	Frequency	Cumulative frequency
1 – 4	6	6
4 – 7	a	$6 + a$
7 – 10	40	$6 + a + 40 = 46 + a$
10 – 13	16	$46 + a + 16 = 62 + a$
13 – 16	b	$62 + a + b$
16 – 19	4	$62 + a + b + 4 = 66 + a + b$
	$n = 100$	

Here, $n = 100 \quad \therefore \frac{n}{2} = \frac{100}{2} = 50$

$\therefore\ a + b + 66 = 100$ is must

$\therefore\ a + b = 100 - 66$

$\therefore\ a + b = 34$ ... (1)

We have, M = 8.05 which is between 7 – 10.

$\therefore\ l = 7, cf = 6 + a, f = 40, h = 3$

$$\text{M} = l + \left(\frac{\frac{n}{2} - cf}{f}\right) \times h$$

$$\therefore\ 8.05 = 7 + \left[\frac{50 - (a + 6)}{40}\right] \times 3$$

$$\therefore\ 8.05 - 7 = \left[\frac{50 - a - 6}{40}\right] \times 3$$

$$\therefore\ 1.05 = \left(\frac{44 - a}{40}\right) \times 3$$

$$\therefore\ \frac{1.05 \times 40}{3} = 44 - a$$

$\therefore \quad \dfrac{105 \times 40}{100 \times 3} = 44 - a$

$\therefore \quad \dfrac{35 \times 4}{10} = 44 - a$

$\therefore \quad \dfrac{140}{10} = 44 - a$

$\therefore \quad 14 = 44 - a$

$\therefore \quad a = 44 - 14$

$\therefore \quad a = 30$

Put $a = 30$ in result (1),

$a + b = 34$

$\therefore \quad 30 + b = 34$

$\therefore \quad b = 34 - 30$

$\therefore \quad b = 4$

So, a = 30 & b = 4 for given data.

53. Total number of possible outcomes = 36.

(i) The outcomes possible to the event multiplying of the two numbers is 6' denoted by A = 4 [(1, 6), (2, 3), (3, 2), (6, 1)]

$\therefore \; P(A) = \dfrac{4}{36} = \dfrac{1}{9}$

$\therefore \; P(A) = \dfrac{81}{90} = \dfrac{9}{10} = 0.9$

(ii) The outcomes possible to the event multiplying of the two numbers is 12' denoted by B = 4 [(2, 6), (3, 4), (4, 3), (6, 2)]

$\therefore \; P(B) = \dfrac{4}{36} = \dfrac{1}{9}$

(iii) The outcomes possible to the event multiplying of the two numbers is 10' denoted by C = 2 [(2, 5), (5, 2)]

$\therefore \; P(C) = \dfrac{2}{36} = \dfrac{1}{18}$

(iv) There is not outcomes possible to the event D is, multiplying of the two numebr of 7.

$\therefore \; P(D) = \dfrac{0}{36} = 0$

54. Total number of roses = 5 + 2 + 3 = 10.

(i) Suppose event A is selected rose is red.

$\therefore \; P(A) = \dfrac{\text{Number of red roses}}{\text{Total Number of roses}}$

$\therefore \; P(A) = \dfrac{5}{10} = 0.5$

(ii) Suppose event B is selected rose is yellow.

$\therefore \; P(B) = \dfrac{\text{Number of yellow roses}}{\text{Total Number of roses}}$

$\therefore \; P(B) = \dfrac{2}{10} = 0.2$

(iii) Suppose event C is selected rose is white.

$\therefore \; P(C) = \dfrac{\text{Number of white roses}}{\text{Total Number of roses}}$

$\therefore \; P(C) = \dfrac{3}{10} = 0.3$

(iv) Suppose event D is selected rose is non-white. So, event D is complementary event C.

$\therefore \; P(D) = 1 - P(C)$

$\therefore \; P(D) = 1 - 0.3 = 0.7$