# LIBERTY PAPER SET

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

**Full Solution**

**Time : 3 Hours** **ASSIGNTMENT PAPER 9**

## Section-A

**1.** (C) $x + y + 15$ **2.** (D) (–3, 2) **3.** (A) 10 **4.** (B) –2 **5.** (B) **6.** (B) 23 **7.** 24 **8.** 3 **9.** 8 **10.** 60° **11.** 9 **12.** 16 **13.** True **14.** True **15.** False **16.** False **17.** 45 **18.** 70° **19.** P($\overline{E}$) = 0.37 **20.** 7 **21.** (c) $\pi r(l + r)$ **22.** (a) $3\pi r^2$ **23.** (c) $\pi r^2$ **24.** (a) $\frac{\pi r\theta}{180}$

## Section-B

**25.** $\therefore$ $4x(x + 2) = 0$

$\therefore$ $4x = 0$ and $x + 2 = 0$

$\therefore$ $x = 0$ and $x = -2$

Sum of the zeroes = $0 - 2 = -2 = -\frac{2 \times 4}{4} = -\frac{8}{4} = -\frac{b}{a} = -\frac{\text{coefficient of } x}{\text{coefficient of } x^2}$

Product of the zeroes = $0 \times (-2) = 0 = \frac{0}{4} = \frac{c}{a} = \frac{\text{constant term}}{\text{coefficient of } x^2}$

**26.** Let the quadratic polynomial be $ax^2 + bx + c$ and its zeroes be $\alpha$ and $\beta$.

$\therefore$ $\alpha + \beta = -\frac{b}{a}$ and $\alpha\beta = \frac{c}{a}$

$\therefore$ $\alpha + \beta = \frac{8}{5} = -\frac{b}{a}$ and $\alpha\beta = \frac{3}{5} = \frac{c}{a}$

$\therefore$ $a = 5$, $b = -8$, $c = 3$

So, one quadratic polynomial which fits the given conditions is $5x^2 - 8x + 3$. You can check that any other quadratic polynomial which fits these conditions will be of the form $k(5x^2 - 8x + 3)$, where $k$ is real.

**27.** $x^2 + 5x + 6 = 0$

$\therefore$ $x^2 + 2x + 3x + 6 = 0$

$\therefore$ $x(x + 2) + 3(x + 2) = 0$

$\therefore$ $(x + 2)(x + 3) = 0$

$\therefore$ $x + 2 = 0$ and $x + 3 = 0$

$\therefore$ $x = -2$ and $x = -3$

Roots of quadratic $eq^n$ : –2, –3

**28.** $a = 2$, $d = 7 - 2 = 5$, $n = 10$, $S_n = S_{10} =$ ______

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

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

$= \frac{10}{2}[4 + 45]$

$= \frac{10}{2}(49)$

$\therefore S_{10} = 245$

**29.** Here, $a = 3$, $d = 8 - 3 = 5$, $a_n = 78$

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

$\therefore\ 78 = 3 + (n - 1)\ 5$

$\therefore\ 78 - 3 = (n - 1)\ 5$

$\therefore\ \frac{75}{5} = n - 1$

$\therefore\ n - 1 = 15$

$\therefore\ n = 16$

**30.** In a circle, centre is the midpoint of every diameter.

Suppose, A $(x, y)$ and B $(1, 4)$ be the midpoints of the diameter $(2, -3)$.

Co-ordinates from the midpoint of AB = $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

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

$\therefore\ 2 = \frac{x+1}{2}$ and $-3 = \frac{y+4}{2}$

$\therefore\ x + 1 = 4$ $\quad y + 4 = -6$

$\therefore\ x = 3$ $\quad y = -10$

Hence, the co-ordinates of A are $(3, -10)$.

**31.** Let the given points be A $(2, -3)$ and B $(7, 9)$

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

$= \sqrt{(2-7)^2 + (-3-9)^2}$

$= \sqrt{(-5)^2 + (-12)^2}$

$= \sqrt{25 + 144}$

$= \sqrt{169}$

$= 13$

Threfore, the distance between the given points is 13.

**32.** $\sin B = \frac{1}{2} = \sin 30°$

$\therefore\ B = 30°$

L.H.S. $= 3 \cos B - 4 \cos^3 B$

$= 3 \cos 30° - 4 \cos^3 30°$

$= 3\left(\frac{\sqrt{3}}{2}\right) - 4\left(\frac{\sqrt{3}}{2}\right)^3$

$= \frac{3\sqrt{3}}{2} - 4\left(\frac{3\sqrt{3}}{8}\right)$

$= \frac{3\sqrt{3}}{2} - \frac{3\sqrt{3}}{2}$

$= 0$

= R.H.S.

**33.** $\operatorname{cosec}^2 30° \cdot \sin^2 45° - \sec^2 60°$

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

$= 2 - 4$

$= -2$

**34.** Here, AB is the pole and AC is the rope.

In $\Delta$ ABC, $\angle B = 90°$, AC = 20 m and $\angle C = 30°$.

$$\therefore \quad \sin C = \frac{AB}{AC}$$

$$\therefore \quad \sin 30° = \frac{AB}{20}$$

$$\therefore \quad \frac{1}{2} = \frac{AB}{20}$$

$$\therefore \quad AB = 10$$

Hence, the height of pole is 10 m.

**35.** $h = 21$ cm, $r = 6$ cm

$$\text{Volume of cone} = \frac{1}{3}\pi r^2 h$$

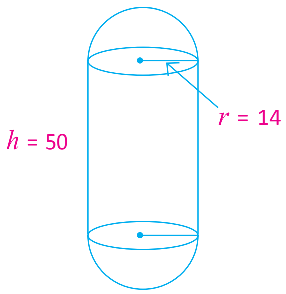
$$= \frac{1}{3} \times \frac{22}{7} \times 6^2 \times 21$$

$$= \frac{22 \times 6 \times 6 \times 7 \times 3}{3 \times 7}$$

$$= 22 \times 36$$

$$= 792 \text{ cm}^3$$

**36.**




$r = 14$ cm, $h = 50$ cm

$$\text{Total surface area} = 2\pi rh + 2(2\pi r^2)$$

$$= 2\pi rh + 4\pi r^2$$

$$= 2\pi r(h + 2r)$$

$$= 2 \times \frac{22}{7} \times 14\,[50 + 2(14)]$$

$$= 44 \times 2(50 + 28)$$

$$= 88 \times 78$$

$$= 6864 \text{ cm}^2$$

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

$$\therefore\ 25 = a + \frac{-50 \times 10}{100}$$

$$\therefore\ 25 = a - 5$$

$$\therefore\ a = 25 + 5$$

$$\therefore\ a = 30$$

**38.** By the method of elimination :

$$\frac{x}{2} + \frac{2y}{3} = -1$$

$\therefore\ 3x + 4y = -6$ ...(1)

$$x - \frac{y}{3} = 3$$

$\therefore\ 3x - y = 9$ ...(2)

Subtract equation (1) and (2),

$$\begin{array}{rl} 3x + 4y &= -6 \\ 3x - y &= 9 \\ - \quad + & \quad - \\ \hline \end{array}$$

$\therefore\ 5y = -15$

$\therefore\ y = -3$

Put $y = -3$ in equation (2)

$3x - y = 9$

$\therefore\ 3x - (-3) = 9$

$\therefore\ 3x + 3 = 9$

$\therefore\ 3x = 6$

$\therefore\ x = 2$

The solution of the equation : $x = 2$, $y = -3$

**39.** Suppose, the unit digit is $y$ and the tens digit of number is $x$

$\therefore$ Original number = $10x + y$

Now, when the digits are reversed $y$ becomes the ten's digit and $x$ become unit digit.

$\therefore$ New number = $10y + x$

According to the first condition;

$x + y = 9$ ...(1)

According to the second condition;

$9(10x + y) = 2(10y + x)$

$\therefore\ 90x + 9y = 20y + 2x$

$\therefore\ 88x - 11y = 0$

$\therefore\ 8x - y = 0$ ...(2)

Add equation (1) & (2)

$$\begin{array}{l} x + y = 9 \\ 8x - y = 0 \\ \hline \end{array}$$

$\therefore\ 9x = 9$

$\therefore\ x = 1$

Put $x = 1$ in equation (1)

$x + y = 9$

$\therefore\ 1 + y = 9$

$\therefore\ y = 8$

Hence, the numbers is 18

**40.** The odd numbers between 5 and 205 are 7, 9, 11,......, 203

$a = 7$, $d = 9 - 7 = 2$, $a_n = 203$

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

$\therefore\ 203 = 7 + (n - 1)\ 2$

$\therefore\ 203 - 7 = (n - 1)\ 2$

$\therefore\ \frac{196}{2} = n - 1$

$\therefore\ n - 1 = 98$

$\therefore\ n = 99$

Now, $Sn = \frac{n}{2}(a + an)$

$\therefore S_{99} = \frac{99}{2}(7+203)$

$\therefore S_{99} = \frac{99}{2} \times 210$

$\therefore S_{99} = 99 \times 105$

$\therefore S_{99} = 10395$

**41.** $AB = \sqrt{(1-4)^2+(7-2)^2} = \sqrt{9+25} = \sqrt{34}$

$BC = \sqrt{(4+1)^2+(2+1)^2} = \sqrt{25+9} = \sqrt{34}$

$CD = \sqrt{(-1+4)^2+(-1-4)^2} = \sqrt{9+25} = \sqrt{34}$

$DA = \sqrt{(-4-1)^2+(4-7)^2} = \sqrt{25+9} = \sqrt{34}$

$AC = \sqrt{(1+1)^2+(7+1)^2} = \sqrt{4+64} = \sqrt{68}$

$BD = \sqrt{(4+4)^2+(2-4)^2} = \sqrt{64+4} = \sqrt{68}$

Since, AB = BC = CD = DA = $\sqrt{34}$ and AC = BD = $\sqrt{68}$, all the four sides of the quadrilateral ABCD are equal and its diagonals AC and BD are also equal. So A(1, 7), B(4, 2), C(–1, –1) and D(–4, 4) are their vertices of a square.

**42.** Let the point P on X – axis be (x, 0) which is at equidistant from points A (–1, 2) and B (5, 4)

$\therefore$ PA = PB

$\therefore PA^2 = PB^2$

$\therefore (x + 1)^2 + (0 - 2)^2 = (x - 5)^2 + (0 - 4)^2$

$\therefore x^2 + 2x + 1 + 4 = x^2 - 10x + 25 + 16$

$\therefore 2x + 5 = -10x + 41$

$\therefore 2x + 10x = 41 - 5$

$\therefore 12x = 36$

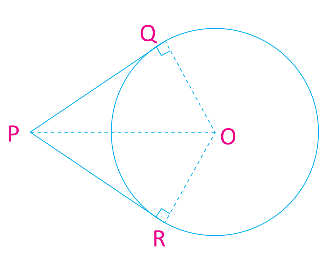
$\therefore x = 3$

Hence, the required point on the X – axis is (3, 0)

**43.** Given : A circle with centre O, a point P lying outside the circle with two tangents PQ, QR 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)

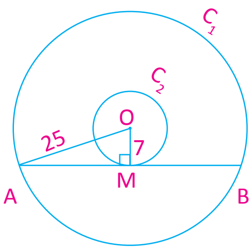
OP = OP (Common)

∠OQP = ∠ORP (Right angle)

Therefore, Δ OQP ≅ Δ ORP (RHS)

This gives, PQ = PR (CPCT)

**44.**




The radii of the two O concentric circles are $C_1$ and $C_2$.

Radius of $C_1 = r_1$ = OA = 25 cm

Radius of $C_2 = r_2$ = OM = 7 cm

The chord AB of $C_1$ touches $C_2$ the point M.

In $\Delta$ OMA; $\angle M = 90°$

$\therefore$ AM $= \sqrt{OA^2 - OM^2}$

$= \sqrt{r_1^2 - r_2^2}$

$= \sqrt{(25)^2 - (7)^2}$

$= \sqrt{625 - 49}$

$= \sqrt{576}$

$\therefore$ AM = 24

But, AB = 2 AM

$\therefore$ AB = 2 $\times$ 24

$\therefore$ AB = 48

Thus, the length of the chord is 48 cm.

**45.**

| Literacy rate (class) | Number of cities ($f_i$) | $x_i$ | $u_i$ | $f_iu_i$ |
|---|---|---|---|---|
| 45 – 55 | 3 | 50 | –2 | –6 |
| 55 – 65 | 10 | 60 | –1 | –10 |
| 65 – 75 | 11 | 70 = $a$ | 0 | 0 |
| 75 – 85 | 8 | 80 | 1 | 8 |
| 85 – 95 | 3 | 90 | 2 | 6 |
| Total | $\Sigma f_i = 35$ | – | – | $-2 = \Sigma f_iu_i$ |

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

$\therefore \bar{x} = 70 + \frac{-2}{35} \times 10$

$\therefore \bar{x} = 70 - \frac{4}{7}$

$\therefore \bar{x} = 70 - 0.57$

$\bar{x} = 69.43$

So, mean literacy rate is 69.43%.

**46.** Total numbers of balls = 10 + 5 + 7 = 22

(i) Suppose event A is selected a red ball.

$$\therefore P(A) = \frac{\text{Number of red balls}}{\text{Total number of balls}}$$

$$\therefore P(A) = \frac{10}{22} = \frac{5}{11}$$

(ii) Suppose event B is selected a green ball.

$$\therefore P(B) = \frac{\text{Number of green balls}}{\text{Total number of balls}}$$

$$\therefore P(B) = \frac{7}{22}$$

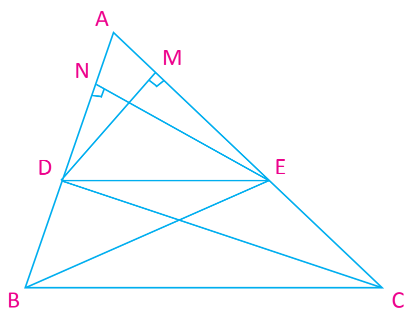
(iii) Suppose event C is selected not a brown balls.

$$\therefore P(C) = \frac{\text{Number of not a brown balls}}{\text{Total number of balls}}$$

$$\therefore P(C) = \frac{10+7}{22} = \frac{17}{22}$$

**47.** Given: In ABC, a line parallel to side BC intersects AB and AC at D and E respectively.

To prove: $\frac{AD}{DB} = \frac{AE}{EC}$




Proof: Join BE and CD and also draw DM $\perp$ AC and EN $\perp$ AB.

Then, $ADE = \frac{1}{2} \times AD \times EN$,

$BDE = \frac{1}{2} \times DB \times EN$,

$ADE = \frac{1}{2} \times AE \times DM$ and

$DEC = \frac{1}{2} \times EC \times DM$

$$\therefore \frac{ADE}{BDE} = \frac{\frac{1}{2} \times AD \times EN}{\frac{1}{2} \times DB \times EN} = \frac{AD}{DB} \quad ...(1)$$

$$\text{and } \frac{ADE}{DEC} = \frac{\frac{1}{2} \times AE \times DM}{\frac{1}{2} \times EC \times DM} = \frac{AE}{EC} \quad ...(2)$$

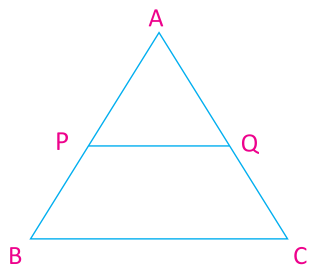
Now, $\Delta$ BDE and $\Delta$ DEC are triangles on the same base DE and between the parallel BC and DE.

then, BDE = DEC ...(3)

Hence from eq$^n$. (1), (2) and (3),

$$\frac{AD}{DB} = \frac{AE}{EC}$$

**48.**




(i) $\frac{AP}{PB} = \frac{AQ}{QC}$

$\therefore \frac{3}{6} = \frac{7}{QC}$

$\therefore QC = \frac{7 \times 6}{3}$

$\therefore QC = 14$ cm

Now, A – Q – C,

AC = AQ + QC

$\therefore$ AC = 7 + 14

$\therefore$ AC = 21 cm

(ii) Here A – P – B,

AP = AB – PB

$\therefore$ AP = 8 – 3

$\therefore$ AP = 5 cm

$\frac{AP}{PB} = \frac{AQ}{QC}$

$\therefore \frac{5}{3} = \frac{15}{QC}$

$\therefore QC = \frac{3 \times 15}{5}$

$\therefore QC = 9$ cm

**49.** $\sqrt{3}x^2 + 2x - \sqrt{3} = 0$

$\therefore \sqrt{3}x^2 + 3x - x - \sqrt{3} = 0$

$\therefore \sqrt{3}x(x + \sqrt{3}) - 1(x + \sqrt{3}) = 0$

$\therefore (x + \sqrt{3})(\sqrt{3}x - 1) = 0$

$\therefore x + \sqrt{3} = 0$ and $\sqrt{3}x - 1 = 0$

$\therefore x = -\sqrt{3}$ and $x = \frac{1}{\sqrt{3}}$

Threfore, the zeroes of the quadratic eqn : $-\sqrt{3}, \frac{1}{\sqrt{3}}$

Now, $a = \sqrt{3}$, $b = 2$, $c = -\sqrt{3}$

$b^2 - 4ac = (2)^2 - 4(\sqrt{3})(-\sqrt{3}) = 4 + 12 = 16 > 0$

They have real solutions

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

$x = \frac{-2 \pm \sqrt{16}}{2 \times \sqrt{3}}$

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

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

$x = \frac{2}{2\sqrt{3}}$ and $x = \frac{-6}{2\sqrt{3}}$

$x = \frac{1}{\sqrt{3}}$ and $x = -\sqrt{3}$

**50.** Here, the 3rd term; $a_3 = 4$

and the 9th term; $a_9 = -8$

$\therefore\ a_3 = a + 2d = 4$

$a_9 = a + 8d = -8$

$\quad - \quad - \qquad +$

$\therefore\ -6d = 12$

$\therefore\ d = -2$

Put $d = -2$ in $a + 2d = 4$

$a + 2d = 4$

$\therefore\ a + 2(-2) = 4$

$\therefore\ a - 4 = 4$

$\therefore\ a = 4 + 4$

$\therefore\ a = 8$

Let the $n$th term of this AP be zero, i.e. $a_n = 0$.

$\therefore\ a_n = 0$

$\therefore\ a + (n-1)d = 0$

$\therefore\ 8 + (n-1)(-2) = 0$

$\therefore\ (n-1)(-2) = -8$

$\therefore\ n - 1 = \dfrac{-8}{-2} = 4$

$\therefore\ n = 4 + 1$

$\therefore\ n = 5$

Hence, the 5th term of AP is 0.

**51.** Here, the maximum class frequency is 27 and the class corresponding to this frequency 200 – 300. So, the modal class is 200 – 300.

$\therefore\ l$ = the lower limit of the modal class = 200

$h$ = class size = 100

$f_1$ = the frequency of modal class = 27

$f_0$ = the frequency of the class preceding the modal class = 18

$f_2$ = the frequency of the class succeeding the modal class = 20

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

$$\therefore\ Z = 200 + \left(\frac{27 - 18}{2(27) - 18 - 20}\right) \times 100$$

$$\therefore\ Z = 200 + \frac{9 \times 100}{16}$$

$\therefore\ Z = 200 + 56.25$

$\therefore\ Z = 256.25$

Thus, the daily profit is ₹ 256.25.

**52.**

| Class | Frequency ($f_i$) | *cf* |
|---|---|---|
| 10 – 20 | 42 | 42 |
| 20 – 30 | 38 | 80 |
| 30 – 40 | $a$ | $80 + a$ |
| 40 – 50 | 54 | $134 + a$ |
| 50 – 60 | $b$ | $134 + a + b$ |
| 60 – 70 | 36 | $170 + a + b$ |
| 70 – 80 | 32 | $202 + a + b$ |

Here, $n = 400$ $\therefore \frac{n}{2} = \frac{400}{2} = 200$

$\therefore 202 + a + b = 400$

$\therefore a + b = 400 - 202$

$\therefore a + b = 198$ .... (1)

We have, M = 38

$\therefore$ Median class - 30 – 40

$l = 30$, $cf = 80$, $f = a$, $h = 10$

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

$$\therefore 38 = 30 + \left(\frac{200 - 80}{a}\right) \times 10$$

$$\therefore 38 - 30 = \frac{120 \times 10}{a}$$

$$\therefore 8 = \frac{120 \times 10}{a}$$

$$\therefore a = \frac{120 \times 10}{8}$$

$\therefore a = 150$

Put, $a = 150$ in result (1)

$\therefore a + b = 198$

$\therefore 150 + b = 198$

$\therefore b = 198 - 150$

$\therefore b = 48$

**53.** (i) We have,

P(A) + P(B) = 1 for two such events A : Sania will win.

P(A) = 0.57

$\therefore$ P(A) + P(B) = 1

$\therefore$ 0.57 + P(B) = 1

P(B) = 1 – 0.57

P(B) = 0.43

Sangeeta will win by having probablity 0.43.

(ii)

Total number of fishes in the tank = 5 + 8 = 13

∴ Total number of outcomes = 13

Suppose event A is a male fish is taken out.

$$\therefore P(A) = \frac{\text{Number of male fishes in the tank}}{\text{Total number of fishes in the tank}}$$

$$\therefore P(A) = \frac{5}{13}$$

**54.** Total number of marbles = 10 + 20 + 30 + 40 = 100

(i) Suppose event A is red marble.

$$\therefore P(A) = \frac{\text{Number of red marbles}}{\text{Total number of marbles}}$$

$$\therefore P(A) = \frac{10}{100} = 0.1$$

(ii) Suppose event B is white marble.

$$\therefore P(B) = \frac{\text{Number of white marbles}}{\text{Total number of marbles}}$$

$$\therefore P(B) = \frac{20}{100} = 0.2$$

(iii) Suppose event C is not green marble.

$$\therefore P(C) = \frac{\text{Number of red, white and brown marbles}}{\text{Total number of marbles}}$$

$$\therefore P(C) = \frac{10 + 20 + 40}{100} = \frac{70}{100} = 0.7$$

(iv) Suppose event D is beither red nor brown marble.

$$\therefore P(D) = \frac{\text{Number of white and green marbles Total}}{\text{number of marbles}}$$

$$\therefore P(D) = \frac{20 + 30}{100} = \frac{50}{100} = 0.5$$