LIBERTY PAPER SET

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

Full Solution

Time : 3 Hours **ASSIGNMENT PAPER 2**

Section-A

1. (D) No solution **2.** (A) 16 **3.** (C) 44 **4.** (C) 5 **5.** (B) 45° **6.** (D) 2.88 **7.** 3 **8.** 6 **9.** 0.38 **10.** $\frac{AB}{AC}$ **11.** 2 **12.** 40 **13.** False **14.** True **15.** True **16.** False **17.** 4 **18.** 14 **19.** 1 **20.** 17.5 **21.** (c) $\frac{\pi r\theta}{180}$ **22.** (a) $2\pi r$ **23.** (c) 100π **24.** (a) 200π

Section-B

25. Suppose the quadratic polynomial $ax^2 + bx + c$ of zeroes is α and β.

$\therefore \alpha + \beta = -3$ and $\alpha\beta = 2$

$\therefore -\frac{b}{a} = \frac{-3}{1}$ and $\frac{c}{a} = \frac{2}{1}$

$\therefore a = 1, b = 3, c = 2$

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

26. $4x^2 + 8x = 0$

$\therefore 4x(x + 2) = 0$

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

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

27. $\therefore 2x^2 + 4x - 3x - 6 = 0$

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

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

$\therefore 2x - 3 = 0$OR $x + 2 = 0$

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

$x = \frac{3}{2}$

$\therefore$ The roots of this equation : $-2, \frac{3}{2}$

28. 7, 13, 19, ...

So, here $a = 7, d = 6, n = 20$

We have, $an = a + (n - 1) d$

$\therefore a_{20} = 7 + (20 - 1) 6$

$\therefore a_{20} = 7 + 114$

$\therefore a_{20} = 121$

29. $a = 0.6$, $d = 1.7 - 0.6 = 1.1$, $n = 100$, $S_n = S_{100} =$ ___

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

$$\therefore S_{100} = \frac{100}{2}[2(0.6) + (100-1)(1.1)]$$

$$= 50\,[1.2 + 108.9]$$

$$= 50\,(110.1)$$

$$\therefore S_{100} = 5505$$

30. Let the given points be A(a, b) & B($-a$, $-b$)

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

$$= \sqrt{(a+a)^2 + (b+b)^2}$$

$$= \sqrt{4a^2 + 4b^2} = 2\sqrt{a^2 + b^2}$$

Thus, the distance between the given points is $2\sqrt{a^2+b^2}$.

31. 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

$$P = \left(\frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}, \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2}\right)$$

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

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

$$= (1, 3)$$

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

32. $\cos A = \frac{5}{13}$

In right angled Δ ABC, ∠B = 90°

$$\therefore \frac{AB}{AC} = \frac{5}{13}$$

$$\therefore \frac{AB}{5} = \frac{AC}{13} = k, \quad k = \text{positive Real Number}$$

$\therefore AB = 5k$, $AC = 13k$

According to pythagoras,

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

$$\therefore BC^2 = (13k)^2 - (5k)^2$$

$$\therefore BC^2 = 169^2 - 25k^2$$

$$\therefore BC^2 = 144k^2$$

$$\therefore BC = 12k$$

$$\therefore \sin A = \frac{BC}{AC} = \frac{12k}{13k} = \frac{12}{13} \text{ and}$$

$$\tan A = \frac{BC}{AB} = \frac{12k}{5k} = \frac{12}{5}$$

33. $= \left(\frac{\sqrt{3}}{2}\right)\left(\frac{\sqrt{3}}{2}\right)+\left(\frac{1}{2}\right)\left(\frac{1}{2}\right)$

$= \frac{3}{4}+\frac{1}{4}$

$= 1$

34. Here, AB represents the tower, CB = 15m is the point from the tower and $\angle ACB$ is the angle of elevation = 60°.

Now, $\tan 60° = \frac{AB}{BC}$

$\therefore \sqrt{3} = \frac{AB}{15}$

$\therefore AB = 15\sqrt{3}$ m

Hence, the height of the tower is $15\sqrt{3}$ m.

35. We have r = 7 cm and h = 24 cm

Now, $l = \sqrt{r^2 + h^2}$

$\therefore l = \sqrt{(7)^2 + (24)^2}$

$\therefore l = \sqrt{49 + 576}$

$\therefore l = \sqrt{625}$

$\therefore l = 25$ cm

The surface area of the cone = πrl

$= \frac{22}{7} \times 7 \times 25$

$= 550\ cm^2$

36. Volume of hemisphere = $\frac{2}{3}\pi r^3$

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

$= 19404\ cm^3$

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

$= 60 + \left(\frac{\frac{53}{2} - 22}{7}\right) \times 10$

$= 60 + \left(\frac{26.5 - 22}{7}\right) \times 10$

$= 60 + \frac{4.5 \times 10}{7}$

$= 60 + 6.43$

$= 66.43$

38. By the method of elimination,

$3x + 4y = 10$ ...(1)

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

multiply equation (1) by 1 and equation (2) by 2 and add

$3x + 4y = 10$

$4x - 4y = 4$

$\therefore\ 7x = 14$

$\therefore\ x = 2$

Put $x = 2$ in equation (1)

$3x + 4y = 10$

$\therefore\ 3(2) + 4y = 10$

$\therefore\ 6 + 4y = 10$

$\therefore\ 4y = 4$

$\therefore\ y = 1$

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

39. $\frac{3x}{2} - \frac{5y}{3} = -2$

$\therefore\ 9x - 10y = -12$ ...(1)

$\therefore\ y = \frac{9x+12}{10}$ ...(2)

$\frac{x}{3} + \frac{y}{2} = \frac{13}{6}$

$\therefore\ 2x + 3y = 13$ ...(3)

Put value of equation (2) in equation (3)

$2x + 3y = 13$

$\therefore\ 2x + 3\left(\frac{9x+12}{10}\right) = 13$

$\therefore\ 2x + \frac{27x+36}{10} = 13$

$\therefore\ 20x + 27x + 36 = 130$

$\therefore\ 20x + 27x = 130 - 36$

$\therefore\ 47x = 94$

$\therefore\ x = 2$

Put $x = 2$ in equation (2),

$y = \frac{9x+12}{10}$

$\therefore\ y = \frac{9(2)+12}{10} = \frac{18+12}{10} = \frac{30}{10} = 3$

$\therefore\ y = 3$

Therefore, the solution is : $x = 2$, $y = 3$

40. Here, $S_{14} = 1050$, $n = 14$, $a = 10$

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

$\therefore S_{14} = \frac{14}{2}[2(10) + (14-1)d]$

$\therefore \frac{1050 \times 2}{14} = 20 + 13d$

$\therefore 13d = 130$

$\therefore d = 10$

Now, $a_{20} = a + 19d \quad = 10 + (19 \times 10)$

$= 10 + 190 = 200$

Therefore, 20^{th} term is 200.

41. Suppose, the point P (x, y) is equidistant from A (3, 6) and B (–3, 4).

$\therefore$ PA = PB

$\therefore PA^2 = PB^2$

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

$\therefore x^2 - 6x + 9 + y^2 - 12y + 36$

$= x^2 + 6x + 9 + y^2 - 8y + 16$

$\therefore -6x - 12y + 36 = 6x - 8y + 16$

$\therefore -6x - 12y + 36 - 6x + 8y - 16 = 0$

$\therefore -12x - 4y + 20 = 0$

$\therefore 3x + y - 5 = 0$

Hence, the relation between x & y is $3x + y - 5 = 0$.

42. 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.

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

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

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

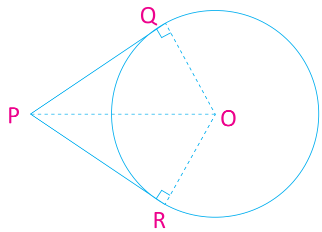
$\therefore x = 7 - 1 \quad , \quad y = 8 - 5$

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

43. 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)

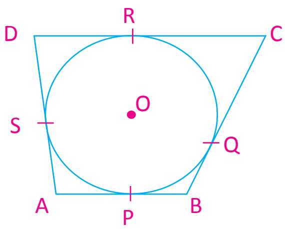
OP = OP (Common)

∠OQP = ∠ORP (Right angle)

Therefore, Δ OQP ≅ Δ ORP (RHS)

This gives, PQ = PR (CPCT)

44.



Let the sides AB, BC, CD and DA of the quadrilateral ABCD touch the O centric circle at points P, Q, R and S respectively.

∴ AP = AS ...(1)

BP = BQ ...(2)

CR = CQ ...(3)

DR = DS ...(4)

Add equation (1), (2), (3) and (4)

AP + BP + CR + DR = AS + BQ + CQ + DS

∴ (AP + BP) + (CR + DR) = (AS + DS) + (BQ + CQ)

∴ AB + CD = AD + BC

45. **Mode :**

Here, maximum class frequency is 23 which belong to class interval 35-45.

∴ l = lower limit of modal class = 35

h = class size = 10

f_1 = frequency of modal class = 23

f_0 = frequency of class prceeding the modal class = 21

f_2 = frequency of class succeeding the modal class = 14

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

$\therefore\ Z = 35 + \left(\frac{23 - 21}{2(23) - 21 - 14}\right) \times 10$

$\therefore\ Z = 35 + \frac{2 \times 10}{11}$

$\therefore\ Z = 35 + 1.82$

$\therefore\ Z = 36.82$ (Approx)

46. Total number of cards = 52

(i) Suppose event A is the king of red colour.

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

$\therefore\ P(A) = \frac{2}{52} = \frac{1}{26}$

(ii) Suppose event B is the slave of red colour.

$\therefore\ P(B) = \frac{\text{Number of slave of red colour}}{\text{Total number of card}}$

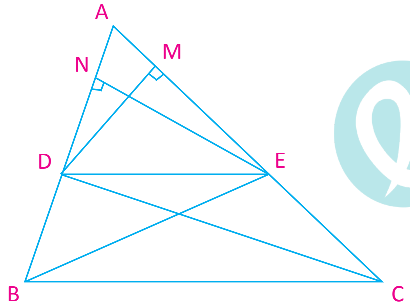
$\therefore\ P(B) = \frac{2}{52} = \frac{1}{26}$

(iii) Suppose event C is the card of club.

$\therefore\ P(C) = \frac{\text{Number of card of club}}{\text{Total number of card}}$

$\therefore\ P(C) = \frac{13}{52} = \frac{1}{4}$

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, Δ BDE and Δ 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. It is given that $\frac{AM}{MB} = \frac{AN}{NC}$

$\therefore$ MN || BC (Theorem – 6.2)

$\therefore \angle AMN = \angle ABC$ (corresponding angle) .... (1)

Also it is given that, $\angle AMN = \angle ACB$ .... (2)

As per eq^n (1) and (2)

$\therefore \angle ACB = \angle ABC$

$\therefore$ AB = AC (sides opposite the equal angles)

i.e., Δ ABC is an isosceles triangle.

49. Suppose, first number be x,

According the first condition,

second number + first number = 27

$\therefore$ second number + x = 27

$\therefore$ second number = 27 – x

According to second condition,

First number × second number = 182

$x(27 - x) = 182$

$\therefore 27x - x^2 = 182$

$\therefore x^2 - 27x + 182 = 0$

$\therefore x^2 - 13x - 14x + 182 = 0$

$\therefore x(x - 13) - 14(x - 13) = 0$

$\therefore (x - 13)(x - 14) = 0$

$\therefore x - 13 = 0$ OR $x - 14 = 0$

$\therefore x = 13$ OR $x = 14$

If $x = 13$ i.e. first number = 13

then second number $= 27 - x$

$= 27 - 13$

$= 14$

If first number = 14

then, second number $= 27 - x$

$= 27 - 14$

$= 13$

50. $a = 17$, $a_n = l = 350$, $d = 9$, $n =$ ____, $S_n =$ ____

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

$\therefore\ 350 = 17 + (n - 1)\ 9$

$\therefore\ 350 - 17 = (n - 1)\ 9$

$\therefore\ \frac{333}{9} = n - 1$

$\therefore\ n - 1 = 37$

$\therefore\ n = 38$

Now, $S_n = \frac{n}{2}(a + a_n)$

$\therefore\ S_{38} = \frac{38}{2}(17 + 350)$

$= 19\ (367)$

$\therefore\ S_{38} = 6973$

51. 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.

52.

Weight (in kg)	Number of students (fi)	cf
40 – 45	2	2
45 – 50	3	5
50 – 55	8	13
55 – 60	6	19
60 – 65	6	25
65 – 70	3	28
70 – 75	2	30
	$n = 30$	

Here, n = 30 $\therefore \frac{n}{2} = \frac{30}{2} = 15$

$\therefore$ Since the 15th observation is contained in class 55-60, the median class is 55-60.

Then, l = lower limit of median class = 55

cf = Cumulative frequency of class preceding the median class = 13

f = frequency of median class = 6

h = class size = 5

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

$$\therefore \text{M} = 55 + \left(\frac{15 - 13}{6}\right) \times 5$$

$$\therefore \text{M} = 55 + \frac{2 \times 5}{6}$$

$\therefore$ M = 55 + 1.67

$\therefore$ M = 56.67

So, median weight is 56.67 kg.

53. Total number of marbles = 5 + 8 + 7 = 20

(i) Suppose event A is not getting red marble.

i.e. getting white or green marbles.

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

$$\therefore P(A) = \frac{8+7}{20} = \frac{15}{20} = \frac{3}{4}$$

(ii) Suppose event B is not getting white marble.

i.e. getting red or green marbles.

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

$$\therefore P(B) = \frac{5+7}{20} = \frac{12}{20} = \frac{3}{5}$$

(iii) Suppose event C is getting green marble.

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

$$\therefore P(C) = \frac{7}{20}$$

(iv) Suppose event D is getting red and white marble.

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

$$\therefore P(D) = \frac{5+8}{20} = \frac{13}{20}$$

54. A box contains 100 circular tablets which are numberd from 1 to 100.

$\therefore$ Total number of tablets = 100

(i) Suppose event A of drawing a perfect square numbers.

(1, 4, 9, 16, 25, 36, 49, 64, 81, 100 = 10)

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

$$\therefore P(A) = \frac{10}{100} = \frac{1}{10} = 0.1$$

(ii) Suppose event B of drawing a perfect cube numbers.

(1, 8, 27, 64 = 4)

$$\therefore P(B) = \frac{\text{Total number of cube number}}{\text{Total number of tablets}}$$

$$\therefore P(B) = \frac{4}{100} = 0.04$$

(iii) Suppose event C of drawing a number divisible by 10

(10, 20, 30, 40, 50, 60, 70, 80, 90, 100 = 10)

$$\therefore P(C) = \frac{\text{Total number of divisible by 10}}{\text{Total number of tablets}}$$

$$\therefore P(C) = \frac{10}{100} = \frac{1}{10} = 0.1$$

(iv) Suppose event D of drawing three digit number

That is only 100

$$\therefore P(D) = \frac{1}{100} = 0.01$$