Class X Session 2025-26
Subject - Mathematics (Standard)
Sample Question Paper - 08

Time Allowed: 3 hours **Maximum Marks: 80**

General Instructions:

1. This question paper contains 38 questions.
2. This Question Paper is divided into 5 Sections A, B, C, D and E.
3. In Section A, Questions no. 1-18 are multiple choice questions (MCQs) and questions no. 19 and 20 are AssertionReason based questions of 1 mark each.
4. In Section B, Questions no. 21-25 are very short answer (VSA) type questions, carrying 02 marks each.
5. In Section C, Questions no. 26-31 are short answer (SA) type questions, carrying 03 marks each.
6. In Section D, Questions no. 32-35 are long answer (LA) type questions, carrying 05 marks each.
7. In Section E, Questions no. 36-38 are case study based questions carrying 4 marks each with sub parts of the values of 1, 1 and 2 marks each respectively.
8. All Questions are compulsory. However, an internal choice in 2 Question of Section B, 2 Questions of Section C and 2 Questions of Section D has been provided. An internal choice has been provided in all the 2 marks questions of Section E .
9. Draw neat and clean figures wherever required.
10. Take wherever required if not stated.
11. Use of calculators is not allowed.

Section A

1. If 3 is the least prime factor of number 'a' and 7 is the least prime factor of number 'b', then the least prime factor of a + b, is **[1]**

   a) 10 b) 3

   c) 5 d) 2

2. HCF of ($2^3 \times 3^2 \times 5$), ($2^2 \times 3^3 \times 5^2$) and ($2^4 \times 3 \times 5^3 \times 7$) is **[1]**

   a) 105 b) 30

   c) 60 d) 48

3. For what value of k, the product of zeroes of the polynomial $kx^2 - 4x - 7$ is 2? **[1]**

   a) $\frac{7}{2}$ b) $-\frac{2}{7}$

   c) $-\frac{1}{14}$ d) $-\frac{7}{2}$

4. If α and β are the zeroes of the polynomial $2x^2 - 13x + 6$, then $\alpha + \beta$ is equal to **[1]**

a) -3

b) $-\frac{13}{2}$

c) $\frac{13}{2}$

d) 3

5. A part of monthly expenses of a family on milk is fixed which is ₹ 700 and remaining varies with quantity of milk taken extra at the rate of ₹ 25 per litre. Taking quantity of milk required extra as x litres and total expenditure on milk as ₹ y, write a linear equation from the above information. **[1]**

a) -25x + y = 700

b) 20x + 10y = 300

c) 20x + y = 500

d) x + 25y = 900

6. The angles of a triangle are x^o, y^o and 40^o. The difference between the two angles x and y is 30^o, then **[1]**

a) $x^o = 85^o$ and $y^o = 55^o$

b) $x^o = 95^o$ and $y^o = 35^o$

c) $x^o = 75^o$ and $y^o = 45^o$

d) $x^o = 65^o$ and $y^o = 95^o$

7. Determine the value of k for which the quadratic equation $2x^2 + 3x + k = 0$ has real roots. **[1]**

a) $K = \frac{8}{9}$

b) $k \geq \frac{9}{8}$

c) $k \leq \frac{8}{9}$

d) $k \leq \frac{9}{8}$

8. The discriminant of the quadratic equation $x^2 - 4x + 3 = 0$ is: **[1]**

a) 4

b) -8

c) 2

d) 28

9. The common difference of an A.P. in which $a_{20} - a_{15} = 20$, is **[1]**

a) 4

b) 5d

c) 4d

d) 5

10. Which of the following is not an A.P.? **[1]**

a) 2, 4, 8, 16, ...

b) -1.2, -3.2, -5.2, -7.2, ...

c) 2, $\frac{5}{2}$, 3, $\frac{7}{2}$, ...

d) a, 2a, 3a, 4a, ...

11. D and E are respectively the points on the sides AB and AC of a triangle ABC such that AD = 2 cm, BD = 3 cm, BC = 7.5 cm and DE || BC. Then, length of DE (in cm) is **[1]**

a) 2.5

b) 5

c) 6

d) 3

12. A line intersects the y-axis and x-axis at the points P and Q, respectively. If (2, –5) is the mid-point of PQ, then the coordinates of P and Q are, respectively **[1]**

a) (0, – 5) and (2, 0)

b) (0, – 10) and (4, 0)

c) (0, 10) and (– 4, 0)

d) (0, 4) and (– 10, 0)

13. If cosecθ - sinθ = l and secθ - cosθ = m, then $l^2m^2(l^2 + m^2 + 3)$ = ________. **[1]**

a) sinθ cosθ

b) 2

c) 1

d) 2 sinθ

14. If $\sin\theta = \cos\theta, (0^\circ < \theta < 90^\circ)$, then value of $(\sec\theta \cdot \sin\theta)$ is: **[1]**

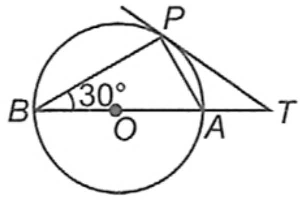
a) 1

b) 0

c) $\sqrt{2}$

d) $\frac{1}{\sqrt{2}}$

15. In the given figure, O is the centre of the circle and TP is the tangent to the circle from an external point T. If $\angle PBT = 30^o$, then AB : AT is **[1]**



a) 3 : 1

b) 2 : 1

c) 4 : 1

d) 3 : 2

16. The volume of a cylinder of radius r is 1/4 of the volume of a rectangular box with a square base of side length x. If the cylinder and the box have equal heights, what is r in terms of x? **[1]**

a) $\frac{x}{2\sqrt{\pi}}$

b) $\frac{\sqrt{2x}}{\pi}$

c) $\frac{x^2}{2\pi}$

d) $\frac{\pi}{2\sqrt{x}}$

17. If $\sum f_i u_i$ = -7, $\sum f_i$ = 25, a = 225 and h = 50, then the value of $\bar{x}$ is **[1]**

a) 213

b) 211

c) 214

d) 212

18. If P(E) = 0.05, what will be the probability of 'not E'? **[1]**

a) 0.59

b) 0.95

c) 0.55

d) 0.095

19. **Assertion (A):** ABCD is a trapezium with DC || AB. E and F are points on AD and BC respectively, such that EF || AB. Then $\frac{\text{AE}}{\text{ED}} = \frac{\text{BF}}{\text{FC}}$. **[1]**

Reason (R): Any line parallel to parallel sides of a trapezium divides the non-parallel sides proportionally.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

20. **Assertion (A):** Point A is on the y-axis at a distance of 4 units from the origin. If the coordinates of the point B are (-3, 0), then the length of AB is 5 units. **[1]**

Reason (R): Distance between points A(x_1, y_1) and B(x_2, y_2) is $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

Section B

21. Find the LCM of the following polynomials: $22x(x+1)^2$ and $36x^2\left(2x^2+3x+1\right)$ **[2]**

22. 5 books and 7 pens together cost Rs.79 whereas 7 books and 5 pens together cost Rs.77. find the total cost of 1 book and 2 pens. **[2]**

23. Find the value of y for which the distance between the points P (2, -3) and Q(10, y) is 10 units. **[2]**

OR

If A and B are (-2, -2) and (2, -4) respectively, find the coordinates of P such that AP = $\frac{3}{7}$ AB and P lies on the line segment AB.

24. If tan A = 1 and sin B = $\frac{1}{\sqrt{2}}$, find the value of cos(A+B) where A and B are both acute angles. **[2]**

OR

Evaluate: $\frac{5\cos^2 60^\circ + 4\sec^2 30^\circ - \tan^2 45^\circ}{\sin^2 30^\circ + \sin^2 60^\circ}$

25. A bag contains 3 red balls and 5 black balls. A ball is drawn at random from the bag. What is the probability that the ball drawn is **[2]**

i. red ?

ii. not red ?

Section C

26. Solve for x and y : **[3]**

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

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

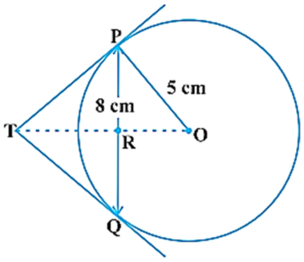
OR

A man sold a chair and a table together for ₹1520 thereby making a profit of 25% on the chair and 10% on table. By selling them together for ₹1535 he would have made a profit of 10% on the chair and 25% on the table. Find the cost price of each.

27. Find k so that the point P (-4, 6) lies on the line segment joining A (k, 10) and B (3, - 8). Also, find the ratio in which P divides AB. **[3]**

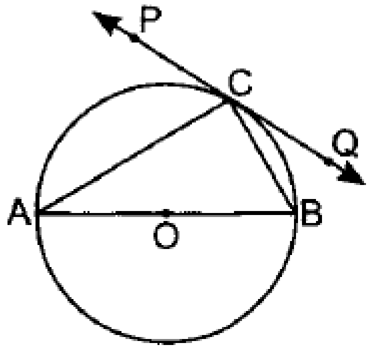
28. If sinθ + sin$^2\theta$ + sin$^3\theta$ = 1, then prove that cos$^6\theta$ - 4cos$^4\theta$ + 8cos$^2\theta$ = 4 **[3]**

29. PQ is a chord of length 8 cm of a circle of radius 5 cm. The tangents at P and Q intersect at a point T. Find the length TP. **[3]**



OR

In figure, PQ is a tangent at a point C to a circle with centre O. If AB is a diameter and ∠CAB = 30°, find ∠PCA.

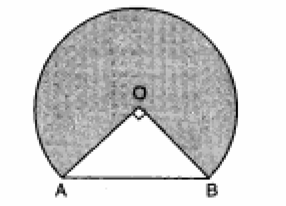


30. Below figure shows the cross-section of railway tunnel. The radius OA of the circular part is 2 m. If ∠AOB = 90°, calculate **[3]**

i. the height of the tunnel

ii. the perimeter of the cross-section

iii. the area of the cross-section



31. Determine the general term of an A.P. whose 7^{th} term is -1 and 16^{th} term 17. **[3]**

Section D

32. If the price of a book is reduced by ₹ 5, a person can buy 4 more books for ₹ 600. Find the original price of the book. **[5]**

OR

The difference of squares of two numbers is 204. The square of the smaller number is 4 less than 10 times the larger number. Find the two numbers.

33. In trapezium ABCD, $AB \| DC$ and DC = 2AB. EF drawn parallel to AB cuts AD in F and BC in E such that $\frac{BE}{EC} = \frac{3}{4}$. Diagonal DB intersects EF at G. Prove that 7 FE = 10 AB. **[5]**

34. A girl on a ship standing on a wooden platform, which is 50 m above water level, observes the angle of elevation of the top of a hill as 30^o and the angle of depression of the base of the hill as 60^o. Calculate the distance of the hill from the platform and the height of the hill. **[5]**

OR

From the top of a tower, the angles of depression of two objects on the same side of the tower are found to be α and β $(\alpha > \beta)$. If the distance between the objects is 'p' metres, Show that the height 'h' of the tower is given by $h = \frac{p \tan \alpha \tan \beta}{\tan \alpha - \tan \beta}$. Also determine the height of the tower, if p = 50 m, $\alpha = 60^\circ, \beta = 30^\circ$.

35. 250 apples of a box were weighed and the distribution of masses of the apples is given in the following table: **[5]**

Mass (in grams)	80 - 100	100 - 120	120 - 140	140 - 160	160 - 180
Number of apples	20	60	70	x	60

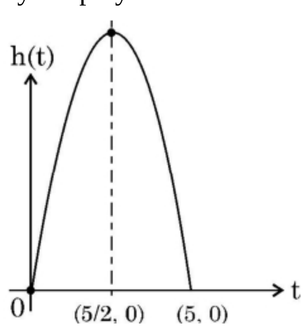
i. Find the value of x and the mean mass of the apples.

ii. Find the modal mass of the apples.

Section E

36. **Read the following text carefully and answer the questions that follow:** **[4]**

A ball is thrown in the air so that t seconds after it is thrown, its height h metre above its starting point is given by the polynomial h = 25t - 5t^2.



Observe the graph of the polynomial and answer the following questions:

i. Write zeroes of the given polynomial. **(1)**

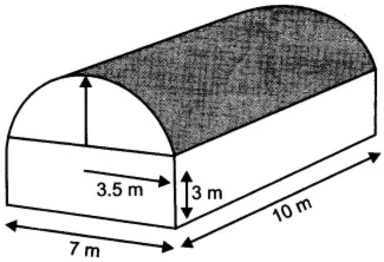
ii. Find the maximum height achieved by ball. **(1)**

iii. a. After throwing upward, how much time did the ball take to reach to the height of 30 m? **(2)**

OR

b. Find the two different values of t when the height of the ball was 20 m. **(2)**

37. A godown building is in the form as shown in Fig. The vertical crosssection parallel to the width side of the building is a rectangle $7m \times 3m$, mounted by a semicircle of radius 3.5 m. The inner measurements of the cuboidal portion of the building are $10m \times 7m \times 3m$. **[4]**



i. Find the volume of the godown. (Take π = 22/7)

ii. Find the total interior surface area excluding the floor (base).

38. **Read the following text carefully and answer the questions that follow:** **[4]**

Statue of a Pineapple: The Big Pineapple is a heritage-listed tourist attraction at Nambour Connection Road, Woombye, Sunshine Coast Region, Queensland, Australia. It was designed by Peddle Thorp and Harvey, Paul Luff, and Gary Smallcombe and Associates. It is also known as Sunshine Plantation. It was added to the Queensland Heritage Register on 6 March 2009.

Kavita last year visited Nambour and wanted to find the height of a statue of a pineapple. She measured the pineapple's shadow and her own shadow. Her height is 156 cm and casts a shadow of 39 cm. The length of shadow of pineapple is 4 m.

i. What is the height of the pineapple? (1)

ii. What is the height Kavita in metres? (1)

iii. Write the type of triangles used to solve this problem. (2)

OR

Which similarity criterion of triangle is used? (2)

Solution

Section A

1.

(d) 2

Explanation:

Since 7 + 3 = 10

The least prime factor of a + b has to be 2; unless a + b is a prime number greater than 2.

Suppose a + b is a prime number greater than 2. Then a + b must be an odd number

and one of 'a' or 'b' must be an even number.

Suppose that 'a' is even. Then the least prime factor of a is 2; which is not 3 or 7. So 'a' can not be an even number nor can b be an even number. Hence a + b can not be a prime number greater than 2 if the least prime factor of a is 3 and b is 7.

Thus the answer is 2.

2.

(c) 60

Explanation:

HCF = $(2^3 \times 3^2 \times 5, 2^2 \times 3^3 \times 5^2, 2^4 \times 3 \times 5^3 \times 7)$

HCF = Product of smallest power of each common prime factor in the numbers

$= 2^2 \times 3 \times 5 = 60$

3.

(d) $-\frac{7}{2}$

Explanation:

Product of zeros = $\frac{c}{a}$

$2 = \frac{(-7)}{k}$

$k = (\frac{-7}{2})$

4.

(c) $\frac{13}{2}$

Explanation:

$\frac{13}{2}$

5. **(a)** -25x + y = 700

Explanation:

Since, x litres is the extra quantity of milk and y be total expenditure on milk.

$\therefore$ Required linear equation is,

700 + 25x = y $\Rightarrow$ y - 25x = 700

or -25x + y = 700

6. **(a)** $x^o = 85^o$ and $y^o = 55^o$

Explanation:

According to the question,

$x^o + y^o + 40^o = 180^o$

$x^o + y^o = 140^o$ ... (i)

and $x^o + y^o = 30^o$ ... (ii)

and $y^o = 55^o$

On solving eq. (i) and eq. (ii),

$x + y + x - y = 140 + 30$

$2x = 170$

$x = 85^o$

Putting the value of x in equation (i), we get

$85^o + y = 140^o$

$y = 140^o - 85^o$

$y = 55^o$

we get $x^o = 85^o$ and $y^o = 55^o$

7.

(d) $k \leq \frac{9}{8}$

Explanation:

We have, $2x^2 + 3x + k = 0$

For real roots, $D \geq 0$

$\therefore D = b^2 - 4ac = (3)^2 - 4 \times 2 \times k = 9 - 8k$

$\Rightarrow 9 - 8k \geq 0 \Rightarrow k \leq \frac{9}{8}$

8. **(a)** 4

Explanation:

$p(x) = x^2 - 4x + 3$

$D = b^2 - 4ac$

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

$= 16 - 12$

$D = 4$

9. **(a)** 4

Explanation:

$a_{20} - a_{15} = 20$

$a + 19d - (a + 14d) = 20$

$a + 19d - a - 14d = 20$

$5d = 20$

$d = 4$

10. **(a)** 2, 4, 8, 16, ...

Explanation:

In 2, 4, 8, 16, ...

$d = a_2 - a_1 = 4 - 2 = 2$

And $d = a_3 - a_2 = 8 - 4 = 4$

Also $d = a_4 - a_3 = 16 - 8 = 8$

Here, the common difference is not the same for all terms, therefore, it is not an AP.

11.

(b) 5

Explanation:

In $\triangle$ADE and ABC

angle A common

angle D=B angle (DE || BC then, d = b)

by AA similarity criteria

$\triangle$ADE similar $\triangle$ABC.

$\frac{AD}{DB} = \frac{DE}{BC}$

$\frac{2}{3} = \frac{DE}{7.5}$

DE= 5 cm.

12.

(b) (0, – 10) and (4, 0)

Explanation:

Let the coordinates of P (0, y) and Q (x, 0).

So, the mid - point of P (0, y) and Q (x, 0) = M

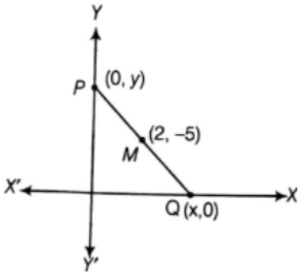
Coordinates of M = $\left(\frac{0+x}{2}, \frac{y+0}{2}\right)$

∴ Mid - point of a line segment having points (x_1, y_1) and (x_2, y_2)

= $\left(\frac{(x_1+x_2)}{2}, \frac{(y_1+y_2)}{2}\right)$

Given,

Mid - point of PQ is (2, - 5)



$\therefore 2 = \frac{x+0}{2}$ = 4 = x + 0

x = 4

$-5 = \frac{y+0}{2}$ = - 10 = y + 0

- 10 = y

So,

x = 4 and y = - 10

Thus, the coordinates of P and Q are (0, - 10) and (4, 0)

13.

(c) 1

Explanation:

We have, $l^2m^2(l^2 + m^2 + 3)$

= $(\operatorname{cosec}\theta - \sin\theta)^2 (\sec\theta - \cos\theta)^2 \{(\operatorname{cosec}\theta - \sin\theta)^2 + (\sec\theta - \cos\theta)^2 + 3\}$

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

= $\frac{\cos^4\theta}{\sin^2\theta} \times \frac{\sin^4\theta}{\cos^2\theta} \left\{\frac{\cos^4\theta}{\sin^2\theta} + \frac{\sin^4\theta}{\cos^2\theta} + 3\right\}$

= $\cos^6\theta + \sin^6\theta + 3\cos^2\theta\sin^2\theta \times 1$

= $\{(\cos^2\theta)^3 + (\sin^2\theta)^3 + 3\cos^2\theta\sin^2\theta(\sin^2\theta + \cos^2\theta)\}$

= $(\cos^2\theta + \sin^2\theta)^3 = 1$

14. **(a)** 1

Explanation:

$\sin\theta = \cos\theta$

$\sin\theta = \sin(90 - \theta^\circ)$

$\theta = 90 - \theta^\circ$

$2\theta = 90^\circ$

$\theta = 45^\circ$

Now

$\sec\theta \cdot \sin\theta$

$= \sec 45^\circ \cdot \sin 45^\circ$

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

= 1

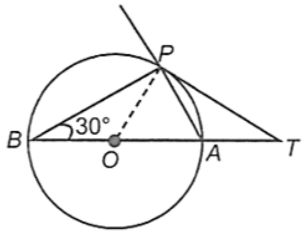
15.

(b) 2 : 1

Explanation:

$\angle BPA = 90^\circ$ (Angle in semicircle)

In △BPA, ∠ABP + ∠BPA + ∠PAB = 180^o



$\Rightarrow 30^\circ + 90^\circ + \angle PAB = 180^\circ$

$\Rightarrow \angle PAB = 60^\circ$

Also, $\angle POA = 2\angle PBA$

$\Rightarrow \angle POA = 2 \times 30^\circ = 60^\circ$

⇒ OP = AP ...(i)

(side opposite to equal angles)

In $\triangle OPT, \angle OPT = 90^\circ$

$\angle POT = 60^\circ$ and ∠PTO = 30^o [angle sum property of a △]

Also $\angle APT + \angle ATP = \angle PAO$ [exterior angle property]

$\therefore \angle APT + 30^\circ = 60^\circ \Rightarrow \angle APT = 30^\circ$

∴ AP = AT ...(ii) (side opposite to equal angles)

From (i) and (ii), AT = OP = radius of the circle; and AB = 2r

⇒ AB = 2AT ⇒ $\frac{AB}{AT}$ = 2 ⇒ AB : AT = 2 : 1

16. **(a)** $\frac{x}{2\sqrt{\pi}}$

Explanation:

Let V_1 be the volume of the cylinder with radius r and height h, then

$V_1 = \pi r^2 h$ .... (i)

Now, let V_2 be the volume of the box, then

$V_2 = x^2h$

It is given that $V_1 = 1/4\ V_2$. Therefore,

$\pi r^2 h = \frac{1}{4}x^2 h$

$\Rightarrow r^2 = \frac{x^2}{4\pi} \Rightarrow r = \frac{x}{2\sqrt{\pi}}$

17.

(b) 211

Explanation:

$\overline{x} = a + \frac{\sum f_i u_i}{\sum f_i} \times h$

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

= 225 - 14

= 211

18.

(b) 0.95

Explanation:

We know that

P(E) + P(not E) = 1

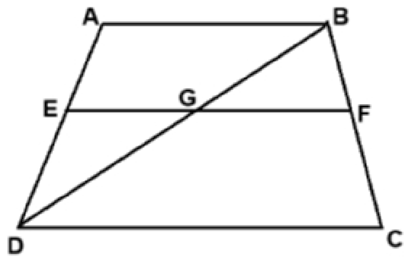
∴ P(not E) = 1 - P(E)

= 1 - 0.05

= 0.95

19. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation:



In $\triangle BDC$

$GF \| DC$

$\frac{BG}{GD} = \frac{BF}{FC}$ ...(1) (By BPT)

In $\triangle DAB$

$EF \| AB$

$\frac{GD}{GB} = \frac{DE}{AE}$ (By BPT)

$\frac{GB}{GD} = \frac{AE}{DE}$ ...(2)

from (1) and (2)

$\frac{AE}{DE} = \frac{BF}{FC}$

20. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation:

Both A and R are true and R is the correct explanation of A.

Section B

21. $P(x) = 22x(x+1)^2 = 2 \times 11 \times x \times (x+1)^2$

and $Q(x) = 36x^2\left(2x^2+3x+1\right)$

$= 2^2 \times 3^2 \times x^2\left(2x^2+2x+x+1\right)$

$= 2^2 \times 3^2 \times x^2 \times [2x(x+1)+1(x+1)]$

$= 2^2 \times 3^2 \times x^2 \times (x+1)(2x+1)$

$\therefore LCM = 2 \times 11 \times x \times (x+1) \times (x+1) \times 2 \times 3^2 \times x \times (2x+1)$

$= 2^2 \times 3^2 \times 11 \times x^2 \times (x+1)^2(2x+1) = 396x^2(x+1)^2(2x+1)$

22. Let the cost of 1 book be Rs.x and that of 1 pen be Rs.y.

Then, according to the question,

5x + 7y = 79 ...(1)

and 7x + 5y = 77 ...(2)

Let us draw the graphs of the equation (1) and (2) be finding two solutions.

These two solutions of the equations (1) and (2) are given below in table 1 and table 2 respectively.

For equation (1) 5x + 7y = 79

$\Rightarrow$ 7y = 79 - 5x $\Rightarrow y = \frac{79-5x}{7}$

Table 1 of solutions

X	6	-8
Y	7	17

For equation (2) 7x + 5y = 77

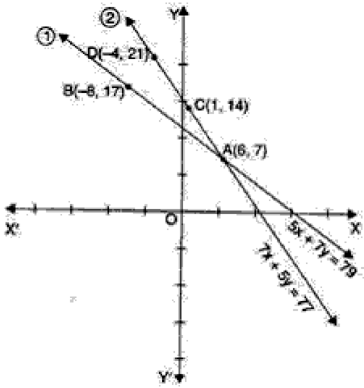
$\Rightarrow$ 5y = 77 - 7x

$\Rightarrow y = \frac{77-7x}{5}$

Table 2 of solutions

x	1	-4
y	14	21

We plot the points A(6, 7) and B(-8, 13) on a graph paper and join these points to form the line AB representing the equation (1) as shown in the figure. Also, we plot the points C(1, 14) and D(-4, 21) on the same graph paper and join these points to form the line CD representing the equation (2) as shown in the same figure.



In the figure, we observe that the two lines intersect at the points A(6, 7). So, x = 6 and y = 7 is the required solution of the pair of linear equation formed, i.e., the cost of 1 book is Rs.6 and of 1 pen is Rs.7.

Therefore the cost of 1 book and 2 pens = 6 + 2 × 7 = Rs.20.

23. PQ = 10

$PQ^2 = 10^2 = 100$

$\Rightarrow (10 - 2)^2 + \{y - (-3)\}^2 = 100$

$\Rightarrow (8)^2 + (y + 3)^2 = 100$

$\Rightarrow 64 + y^2 + 6y + 9 = 100$

$\Rightarrow y^2 + 6y - 27 = 0$

$\Rightarrow y^2 + 9y - 3y - 27 = 0$

$\Rightarrow y(y + 9) - 3(y + 9) = 0$

$\Rightarrow (y + 9)(y - 3) = 0$

$\Rightarrow y + 9 = 0$ or $y - 3 = 0$

$\Rightarrow y = -9$ or $y = 3$

$\Rightarrow y = -9, 3$

Hence, the required value of y is -9 or 3.

OR

A = (-2, -2) and B=(2, -4)

It is given that AP= $\frac{3}{7}$ AB

PB = AB - AP = AB $-\frac{3}{7}$AB = $\frac{4}{7}$AB

So, we have AP:PB = 3:4

Let coordinates of P be (x, y)

Using Section formula to find coordinates of P, we get

$x = \frac{(-2)\times4+2\times3}{3+4} = \frac{6-8}{7} = \frac{-2}{7}$

$y = \frac{(-2)\times4+(-4)\times3}{3+4} = \frac{-8-12}{7} = \frac{-20}{7}$

Therefore, Coordinates of point P are $\left(\frac{-2}{7}, \frac{-20}{7}\right)$.

24. Given tan A = 1 and sin B = $\frac{1}{\sqrt{2}}$

$\Rightarrow$ tan A = tan 45° and sin B = sin 45°

$\Rightarrow$ A = 45° and B = 45°

Now cos(A+ B) = cos(45° + 45°) = cos 90° = 0.

OR

$$\frac{5\left(\frac{1}{2}\right)^2+4\left(\frac{2}{\sqrt{3}}\right)^2-(1)^2}{\left(\frac{1}{2}\right)^2+\left(\frac{\sqrt{3}}{2}\right)^2}$$

$= \frac{67}{12}$

25. There are 3 + 5 = 8 balls in a bag. Out of these 8 balls, one can be chosen in 8 ways.

∴Total number of elementary events = 8

$Proabibilty\ of\ the\ event = \frac{Number\ of\ favourble\ outcomes}{Total\ number\ of\ possible\ outcomes}$

i. Since the bag contains 3 red balls, therefore, one red ball can be drawn in 3 ways.

∴Favourable number of elementary events = 3

Hence P (getting a red ball) = $\frac{3}{8}$

ii. Since the bag contains 5 black balls along with 3 red balls, therefore one black (not red) ball can be drawn in 5 ways.

∴Favourable number of elementary events = 5

Hence P (getting "not a red ball") = $\frac{5}{8}$

Section C

26. It is given that

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

$\frac{3x+4y}{6}=-1$

3x + 4y = - 6 .....(i)

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

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

3 x - y = 9 ....(ii)

We have to find out the values of x and y from these two given equations

On subtracting eqn (ii) from eqn (i),

$$\begin{array}{r} 3x+4y=-6 \\ 3x-y=\ \ 9 \\ -\ \ +\qquad\ \ - \\ \hline 5y=-15 \\ y=-3 \end{array}$$

Putting y = - 3 in eq (i), we get

3x + 4 (- 3) = - 6

3x -12 = - 6

3x = 12 - 6

3x = 6

∴x = 2

Hence x = 2 and y = - 3

OR

Let the cost price of one chair be ₹x and that of one table be ₹y.

Profit on a chair = 25%

$\therefore$ Selling price of one chair $=x+\frac{25}{100}x=\frac{125}{100}x$

Profit on a table = 10%

$\therefore$ Selling price of one table $=y+\frac{10y}{100}=\frac{110}{100}y$

According to the given condition, we have

$\frac{125}{100}x+\frac{110}{100}y=1520\Rightarrow 125x+110y=152000\Rightarrow 25x+22y=30400$ ....(i)

If profit on a chair is 10% and on a table is 25%, then total selling price is ₹1535.

$\therefore\left(x+\frac{10}{100}x\right)+\left(y+\frac{25}{100}y\right)=1535$

$\Rightarrow\quad \frac{110}{100}x+\frac{125}{100}y=1535$

$\Rightarrow 110x+125y=153500$

$\Rightarrow 22x+25y=30700$ ....(ii)

Subtracting equation (ii) from equation (i), we get

$3x-3y=-300$ ⇒ x - y = -100 ....(iii)

Adding equation (ii) and (i), we get

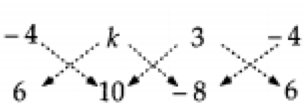
47x + 47y = 61100 ⇒ x + y = 1300 ....(iv)

Solving equations (iii) and (iv), we get

x = 600 and y = 700

Hence, the cost price of a chair is ₹600 and that of a table is ₹700

27. If P (-4, 6) lies on the line segment joining A (k, 10) and B (3, -8), then P, A and B are collinear.



$\therefore$(-4 $\times$ 10 + k $\times$ -8 + 3 $\times$ 6) - (6k + 30 + -4 $\times$ -8) = 0

$\Rightarrow$(-40 - 8k + 18) - (6k + 30 + 32) = 0

$\Rightarrow$(-22 - 8k) - (6k + 62) = 0

$\Rightarrow$ -14k - 84 = 0

$\Rightarrow$ k = - 6

Suppose P divides AB in the ratio λ: 1. Then, the coordinates of Pare $\left(\frac{3\lambda-6}{\lambda+1}, \frac{-8\lambda+10}{\lambda+1}\right)$.But, the coordinates of P are (-4, 6).

$\therefore \quad \frac{3\lambda-6}{\lambda+1} = -4$ and $\frac{-8\lambda+10}{\lambda+1} = 6$

$\Rightarrow \quad \lambda = \frac{2}{7}$

Hence, P divides AB in the ratio $\frac{2}{7}$: 1 or 2: 7.

28. We have,

$\sin\theta + \sin^2\theta + \sin^3\theta = 1$

$\Rightarrow \sin\theta + \sin^3\theta = 1 - \sin^2\theta$

$\Rightarrow \sin\theta\,(1 + \sin^2\theta) = \cos^2\theta$

$\Rightarrow \sin^2\theta\,(1 + \sin^2\theta)^2 = \cos^4\theta$

$\Rightarrow (1 - \cos^2\theta)\{1 + (1 - \cos^2\theta)\}^2 = \cos^4\theta$

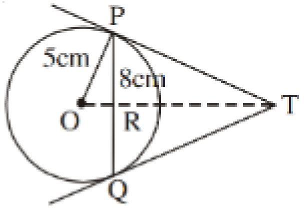
$\Rightarrow (1 - \cos^2\theta)(2 - \cos^2\theta)^2 = \cos^4\theta$

$\Rightarrow (1 - \cos^2\theta)(4 - 4\cos^2\theta + \cos^4\theta) = \cos^4\theta$

$\Rightarrow 4 - 4\cos^2\theta + \cos^4\theta - 4\cos^2\theta + 4\cos^4\theta - \cos^6\theta = \cos^4\theta$

$\Rightarrow -\cos^6\theta + 4\cos^4\theta - 8\cos^2\theta + 4 = 0$

$\Rightarrow \cos^6\theta - 4\cos^4\theta + 8\cos^2\theta = 4$

29. 

Let TR be x cm and TP be y cm

OT is perpendicular bisector of PQ

So PR = 4 cm (PR = $\frac{PQ}{2} = \frac{8}{2}$)

In $\triangle$OPR, $OP^2 = PR^2 + OR^2$

$5^2 = 4^2 + OR^2$

OR = $\sqrt{25-16}$

$\therefore$ OR = 3 cm

In $\triangle$PRT, $PR^2 + RT^2 = PT^2$

$y^2 = x^2 + 4^2$ .....(1)

In $\triangle$OPT, $OP^2 + PT^2 = OT^2$

$(x + 3)^2 = 5^2 + y^2$ (OT = OR + RT = 3 + x)

$\therefore (x + 3)^2 = 5^2 + x^2 + 16$ [using (1)]

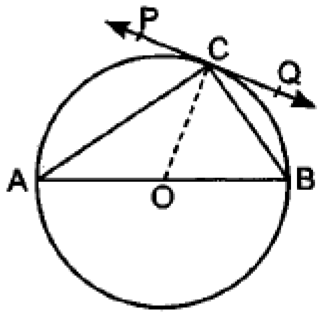
Solving, we get x = $\frac{16}{3}$ cm

From (1), $y^2 = \frac{256}{9} + 16 = \frac{400}{9}$

So, y = $\frac{20}{3}$cm = 6.667 cm

OR

Given,



In $\triangle$AOC,

$AO = CO$ [radius of circle]

$\therefore \angle OCA = \angle CAB = 30^\circ$

$\text{OC} \perp \text{PQ}$,

$\Rightarrow \angle\text{OCP} = 90^\circ$

$\Rightarrow \angle PCA + \angle OCA = 90^\circ$

$\Rightarrow \angle\text{PCA} + 30^\circ = 90^\circ$

$\Rightarrow \angle\text{PCA} = 60^\circ$

30. Radius OA = OB = 2m

$\angle$AOB = 90°

In $\angle$ AOB, by pythagoras theorem

$AB^2 = OA^2 + OB^2$

$\Rightarrow AB^2 = 2^2 + 2^2$

$\Rightarrow AB^2 = 8$

$\Rightarrow AB = \sqrt{8} = 2\sqrt{2}$m

Area of $\triangle$AOB = $\frac{1}{2} \times$ OA $\times$ OB = $\frac{1}{2} \times 2 \times 2 = 2m^2$

Again area of $\triangle$AOB = $\frac{1}{2} \times$ AB $\times$ OC = $\frac{1}{2} \times 2\sqrt{2} \times$ OC = $\sqrt{2} \times$ OC m^2

$\therefore \sqrt{2} \times$ OC = 2

$\Rightarrow$ OC = $\frac{2}{\sqrt{2}} = \sqrt{2}$ m

i. $\therefore$ height of tunnel = DO + OC

= (2 + $\sqrt{2}$)m

ii. perimeter of cross- section = AB + area of major arc AB

$= 2\sqrt{2} + \frac{270}{360} \times 2\pi r$

= $2\sqrt{2} + \frac{3}{4} \times 2\pi \times 2$

$= (2\sqrt{2} + 3\pi)m$

iii. the area of cross-section = Area of major sector + Area of $\triangle$AOB

= $\frac{270^\circ}{360} \times \pi(2)^2 + 2$

= $\frac{3}{4}\pi \times 4 + 2$

= $(3\pi + 2)\ m^2$

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

Let the A.P. be $a_1, a_2, a_3, \ldots, a_n, \ldots$

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

It is given that

$a_7 = -1$

$\Rightarrow$ a + (7 - 1) d = -1

$\Rightarrow$ a + 6d = - 1 ..... (i)

and $a_{16} = 17$

$\Rightarrow$ a + (16 - 1)d = 17

$\Rightarrow$ a + 15d = 17 ..... (ii)

Subtracting equation (i) from equation (ii), we get

15d - 6d = 17 - (-1)

9d = 18

$\Rightarrow$ d = 2

Putting d = 2 in equation (i), we get

a + 6(2) = -1

a + 12 = -1

$\Rightarrow$ a = - 13

Hence, General term = a_n = a + (n - 1) d

= - 13 + (n - 1) 2

= -13 + 2n - 2

= 2n - 15

Section D

32. Let the original price of the book = ₹ x

$\therefore$ Number of books bought for ₹ 600 = $\frac{600}{x}$

Reduced price of the book = ₹ (x - 5)

$\therefore$ Number of books bought for ₹ 600 = $\frac{600}{x-5}$

It is given that

$\frac{600}{x-5} - \frac{600}{x} = 4$

$\Rightarrow \frac{600x - 600x + 3000}{x^2 - 5x}$ = 4

$\Rightarrow$ 3000 = $4x^2$ - 20x

$\Rightarrow$ $4x^2$ - 20x - 3000 = 0

$\Rightarrow$ x^2 - 5x - 750 = 0

$\Rightarrow$ x^2 - 30x + 25x - 750 = 0

$\Rightarrow$ x(x - 30) + 25(x - 30) = 0

$\Rightarrow$ x - 30 = 0 or x + 25 = 0

$\Rightarrow$ x = 30 or x = -25

Since the price of a book cannot be negative, x $\neq$ -25

$\Rightarrow$ x = 30

Hence, the original price of a book is ₹ 30

OR

Let the numbers are x and (x > y)

x^2 - y^2 = 204 ...(i)

y^2 = 10x - 4 ...(ii)

By (i) and (ii)

x^2 - 10x + 4 - 204 = 0

x^2 - 10x + 200 = 0

(x - 20) (x + 10) = 0

x = 20, x = -10 (rejected)

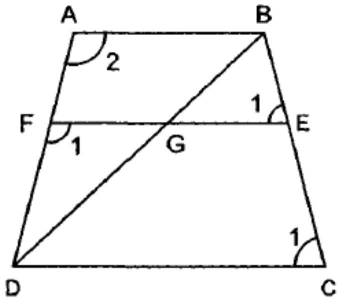
y = 14

33. In ΔDFG and Δ DAB, we have

$\angle$1 = $\angle$2 [$\because AB \| DC \| EF \therefore \angle 1$ and $\angle$2 are corresponding angles]

$\angle$FDG = $\angle$ADB [Common]

Therefore, by AA-criterion of similarity, we have



$\therefore \quad \Delta DFG \sim \Delta DAB$

$\Rightarrow \quad \frac{DF}{DA} = \frac{FG}{AB}$ ....(i)

In trapezium ABCD, we have

$EF \| AB \| DC$

$\therefore \quad \frac{AF}{DF} = \frac{BE}{EC}$

$\Rightarrow \quad \frac{AF}{DF} = \frac{3}{4} \quad \left[\because \frac{BE}{EC} = \frac{3}{4}(\text{ given })\right]$

$\Rightarrow \quad \frac{AF}{DF} + 1 = \frac{3}{4} + 1$ [Adding 1 on both sides]

$\Rightarrow \quad \frac{AF+DF}{DF} = \frac{7}{4}$

$\Rightarrow \quad \frac{AD}{DF} = \frac{7}{4} \Rightarrow \frac{DF}{AD} = \frac{4}{7}$ ....(ii)

From (i) and (ii), we get

$\frac{FG}{AB} = \frac{4}{7} \Rightarrow FG = \frac{4}{7}AB$ ....(iii)

So far as the given figure is concerned , in ΔBEG and ΔBCD, we have

∠BEG = ∠BCD [Corresponding angles]

∠B = ∠B [Common]

$\therefore \quad \Delta BEG \sim \Delta BCD$ [By AA-criterion of similarity]

$\Rightarrow \quad \frac{BE}{BC} = \frac{EG}{CD}$

$\Rightarrow \quad \frac{3}{7} = \frac{EG}{CD} \quad \left[\because \frac{BE}{EC} = \frac{3}{4} \Rightarrow \frac{EC}{BE} = \frac{4}{3} \Rightarrow \frac{EC}{BE} + 1 = \frac{4}{3} + 1 \Rightarrow \frac{BC}{BE} = \frac{7}{3}\right]$

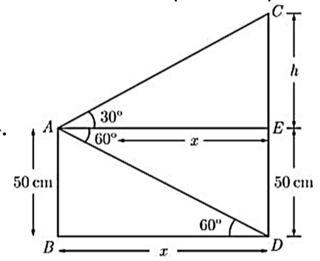
$\Rightarrow \quad EG = \frac{3}{7}\text{CD}$

$\Rightarrow \quad EG = \frac{3}{7} \times 2AB$ [∵ CD = 2 AB (given)]

$\Rightarrow \quad EG = \frac{6}{7}AB$ ....(iv)

Adding (iii) and (iv), we get

$FG + EG = \frac{4}{7}AB + \frac{6}{7}AB \Rightarrow EF = \frac{10}{7}AB \Rightarrow 7FE = 10AB$

34. 

Here, CD = CE + ED = h + 50

Now, In △ABD

$\tan 60^\circ = \frac{AB}{BD}$

$\sqrt{3} = \frac{50}{x}$

$x = \frac{50}{\sqrt{3}} = \frac{50\sqrt{3}}{3}$ m

In △CEA

$\tan 30^\circ = \frac{CE}{AE}$

$\frac{1}{\sqrt{3}} = \frac{h}{x}$

$h = \frac{x}{\sqrt{3}} = \frac{50\sqrt{3}}{3\times\sqrt{3}}$

$h = \frac{50}{3}$ m

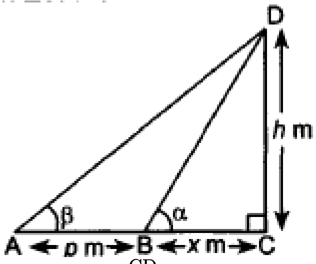
CD = h + 50

$CD = \frac{50}{3} + 50 = \frac{50+150}{3}$

CD = 66.66 m

OR

Let us suppose that A and B are the objects p m apart, DC is the tower of height h. Suppose BC =xmeter



In △ACD, $\frac{\text{CD}}{\text{AC}} = \tan\beta$

$\Rightarrow \quad \frac{h}{p+x} = \tan\beta$ ....(i)

In BCD, $\frac{CD}{BC} = \tan\alpha$

$\Rightarrow \quad \frac{h}{x} = \tan\alpha \Rightarrow x = \frac{h}{\tan\alpha}$

Substituting the value of x in (i), we get

$\frac{h}{p+\frac{h}{\tan\alpha}} = \tan\beta$

$\Rightarrow \quad h = p\tan\beta + \frac{h\tan\beta}{\tan\alpha}$

$\Rightarrow h\tan\alpha = p\tan\alpha\tan\beta + h\tan\beta$

$\Rightarrow h(\tan\alpha - \tan\beta) = p\tan\alpha\tan\beta$

$\Rightarrow h = \frac{p\tan\alpha\tan\beta}{\tan\alpha - \tan\beta}$

When p = 50 m, $\alpha = 60^\circ, \beta = 30^\circ$

$h = \frac{50\times\tan 60^\circ\cdot\tan 30^\circ}{\tan 60^\circ - \tan 30^\circ}$

$= \frac{50\times\sqrt{3}\times\frac{1}{\sqrt{3}}}{\sqrt{3}-\frac{1}{\sqrt{3}}} = \frac{50\sqrt{3}}{2} = 25\sqrt{3}\text{m}$.

Therefore, the height of the tower is 25√3 m

35. i. Given, total number of apples = 250

$\therefore$ 20 + 60 + 70 + x + 60 = 250

$\Rightarrow$ x = 250 - 210 = 40

Mass (in grams) C.I.	**Number apples (f)**	**Mid value (x)**	**d = (x_i - A)**	**f $\times$ d**
80 - 100	20	90	-40	-800
100 - 120	60	110	-20	-1200
120 - 140	70	130(A)	0	0
140 - 160	40	150	20	800
160 - 180	60	170	40	2400
	$\sum$f = 250			$\sum$fd = 1200

Now, mean $\bar{x} = A + \frac{\sum fd}{\sum f}$

= 130 + $\frac{1200}{250}$

= 130 + $\frac{24}{5}$

= 130 + 4.8

= 134.8

ii. Mode = $l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$ ...(i)

Where I = lower class limit of modal class = 12

Modal class is (120 - 140), Since it consists highest frequency

$\therefore$ I = 120

h = class size = 20

f_1 = frequency of modal class = 70

f_0 = frequency of class preceding the modal class = 60

f_2 = frequency of class succeeding the modal class = 40

On putting these values in (i), we get

Modal mass or mode

= 120 + $\left(\frac{70-60}{2\times70-60-40}\right) \times 20$

= 120 + $\frac{10}{40} \times 20$

= 120 + $\frac{10}{2}$

= 120 + 5

= 125

Section E

36. i. Zeroes of the polynomial are 0 and 5

ii. Maximum height achieved by ball

$= 25 \times \frac{5}{2} - 5 \times \left(\frac{5}{2}\right)^2$

$= \frac{125}{4}$ or 31.25 m

iii. a. $-5t^2 + 25t = 30$

$\Rightarrow t^2 - 5t + 6 = 0$

$\Rightarrow$ (t - 2)(t - 3) = 0

$t \neq 3, t = 2$

OR

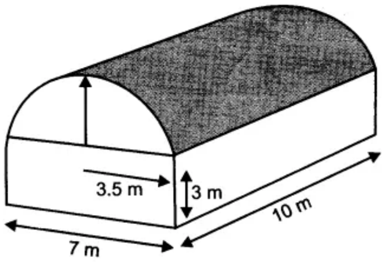
b. $-5t^2 + 25t = 20$

$\Rightarrow t^2 - 5t + 4 = 0$

$\Rightarrow$ (t - 4)(t - 1) = 0

$\Rightarrow$ t = 4, 1

37.



Since the top of the building is in the form of half of the cylinder of radius 3.5 m and height 10 m., split along the diameter.

Dimensions of the cuboidal portion of the building are $10m \times 7m \times 3m$.

Let us suppose that V be the volume of the godown.

So, V = Volume of the cuboid + $\frac{1}{2}$(Volume of the cylinder)

$\Rightarrow V = \left\{10 \times 7 \times 3 + \frac{1}{2}\left(\frac{22}{7} \times 3.5 \times 3.5 \times 10\right)\right\} m^3$

= 210 + 192.5

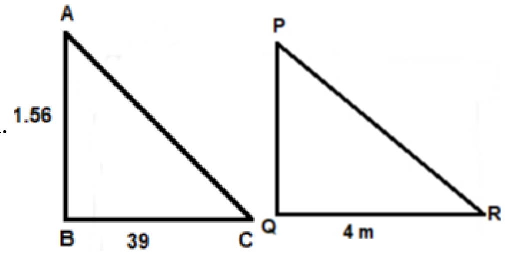
= 402.5 m^3

Let S be the total interior surface area excluding the base floor.

So, S = Area of four walls + $\frac{1}{2}$(Curved surface area of cylinder) + 2(Area of the semi-circles)

= 2(10 + 7) $\times$ 3 + $\frac{1}{2}$(2 $\times$ $\frac{22}{7}$ $\times$ 3.5 $\times$ 10) + 2($\frac{1}{2}$ $\times$ $\frac{22}{7}$ $\times$ 3.5^2) = 250.5 m^2

38. i.



$\triangle ABC \sim \triangle PQR$

$\frac{1.56}{0.39} = \frac{PQ}{4}$

$\frac{1.56 \times 4}{0.39}$ = PQ

PQ = 16 m

$\therefore$ height of Pine apple = 16 m.

ii. Height of Kavita = 1.56 m

iii. Right triangle

OR

AA criteria