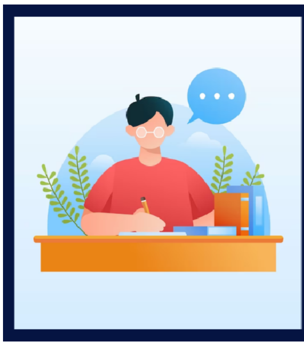


For CBSE 2025 Board Exams - Class 10 (Basic)

# SAMPLE PAPER

issued by CBSE on 05 September, 2024

# MATHEMATICS (241)

**Time Allowed : 180 Minutes** **Max. Marks : 80**

**General Instructions :**

**1.** This Question paper contains **five sections** - A, B, C, D and E.

**2.** Section A has **20 MCQs** of **1 mark** each.
Section B has **05 questions** of **2 marks** each.
Section C has **06 questions** of **3 marks** each.
Section D has **04 questions** of **5 marks** each.
Section E has **03 Case-based integrated units of assessment** with three **sub-parts** of **1, 1 and 2 marks** each.

**3.** Each section is compulsory. However, there are internal choices in some questions.
The **internal choice** has been provided in
- **02 Questions of Section B**
- **02 Questions of Section C**
- **02 Questions of Section D**
- **03 Questions of Section E**

You have to attempt only one of the alternatives in all such questions.

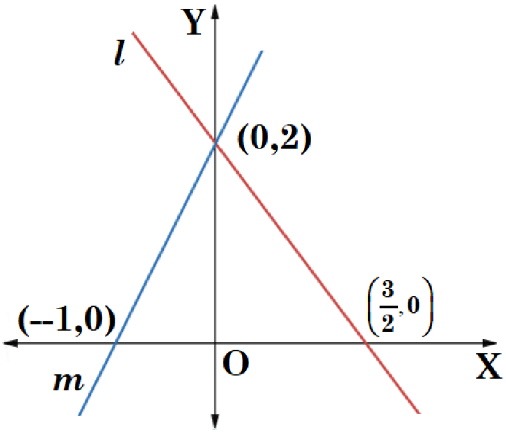
**4.** Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

## SECTION A

*(Question numbers 01 to 20 carry **1 mark** each.)*
*Followings are **multiple choice questions**. Select the correct option in each one of them.*

01. HCF of $(3^3 \times 5^2 \times 2)$, $(3^2 \times 5^3 \times 2^2)$ and $(3^4 \times 5 \times 2^3)$ is
(a) 450 (b) 90 (c) 180 (d) 630

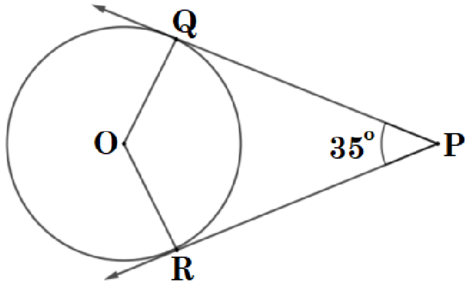
02. The system of linear equations represented by the lines $l$ and $m$ is
(a) consistent with unique solution
(b) inconsistent
(c) consistent with three solutions
(d) consistent with many solutions




03. The value of k for which the quadratic equation $kx^2 - 5x + 1 = 0$ does not have a real solution, is
(a) 0 (b) $\frac{25}{4}$ (c) $\frac{4}{25}$ (d) 7

04. The distance between the points $(a, b)$ and $(-a, -b)$ is
(a) $\sqrt{a^2+b^2}$ (b) $a^2+b^2$ (c) $2\sqrt{a^2+b^2}$ (d) $4\sqrt{a^2+b^2}$

05. In the given figure, PQ and PR are tangents to a circle centred at O. If $\angle QPR = 35°$, then $\angle QOR$ is equal to




(a) 70° (b) 90°
(c) 135° (d) 145°

06. If $\Delta ABC \sim \Delta PQR$ such that $3\,AB = 2\,PQ$ and $BC = 10$ cm, then length QR is equal to

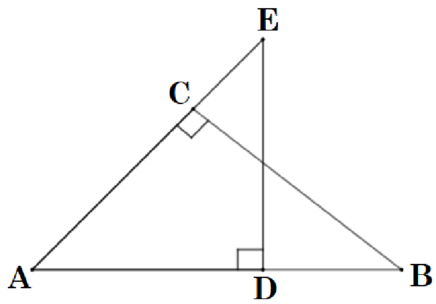
(a) 10 cm (b) 15 cm (c) $\frac{20}{3}$ cm (d) 30 cm

07. If $3\cot A = 4$, where $0° < A < 90°$, then $\sec A$ is equal to

(a) $\frac{5}{4}$ (b) $\frac{4}{3}$ (c) $\frac{5}{3}$ (d) $\frac{3}{4}$

08. In the given figure, $\Delta BAC$ is similar to

(a) $\Delta AED$ (b) $\Delta EAD$
(c) $\Delta ACB$ (d) $\Delta BCA$



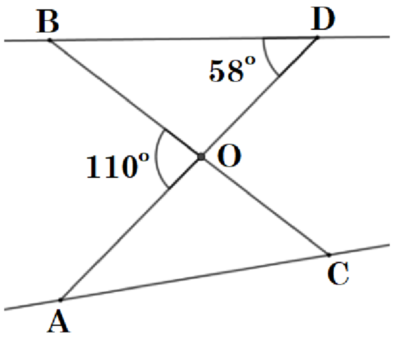

09. If H.C.F. $(420, 189) = 21$, then L.C.M. $(420, 189)$ is

(a) 420 (b) 1890 (c) 3780 (d) 3680

10. The 4th term from the end of the A.P. $-8, -5, -2, ..., 49$ is

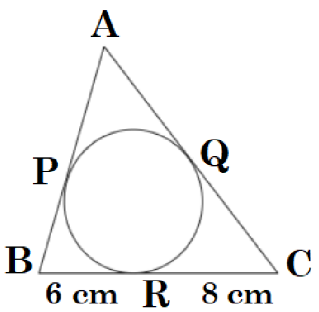
(a) 37 (b) 40 (c) 1 (d) 43

11. In the given figure, if $\Delta OCA \sim \Delta OBD$, then $\angle OAC$ is equal to




(a) 58° (b) 55°
(c) 128° (d) 52°

12. If perimeter of given triangle is 38 cm, then length AP is equal to




(a) 19 cm (b) 5 cm
(c) 10 cm (d) 8 cm

13. $\dfrac{1-\tan^2 30°}{1+\tan^2 30°}$ is equal to

(a) $\cos 60°$ (b) $\sin 60°$ (c) 1 (d) $\tan^2 60°$

14. The total surface area of solid hemisphere of radius r is

(a) $\pi r^2$ (b) $2\pi r^2$ (c) $3\pi r^2$ (d) $4\pi r^2$

15. Which of the following cannot be the probability of an event?

(a) 0.4 (b) 4% (c) 0.04% (d) 4

16. The roots of quadratic equation $3x^2 - 4\sqrt{3}x + 4 = 0$ are

(a) not real (b) real and equal

(c) rational and distinct (d) irrational and distinct

17. The following distribution shows the marks distribution of 80 students.

| Marks | Below 10 | Below 20 | Below 30 | Below 40 | Below 50 | Below 60 |
|---|---|---|---|---|---|---|
| No. of students | 2 | 12 | 28 | 56 | 76 | 80 |

The median class is

(a) 20-30 (b) 40-50 (c) 30-40 (d) 10-20

18. A quadratic polynomial whose zeroes are $\dfrac{2}{5}$ and $-\dfrac{1}{5}$ is

(a) $25x^2 + 5x - 2$ (b) $5x^2 - 2x + 1$ (c) $5x^2 + 2x - 1$ (d) $25x^2 - 5x - 2$

*Followings are* ***Assertion-Reason based questions****.*

In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

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

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

(c) A is true but R is false.

(d) A is false but R is true.

19. **Assertion (A) :** The sequence $-1, -1, -1, ..., -1$ is an A.P.

**Reason (R) :** In an A.P., $a_n - a_{n-1}$ is constant where $n \geq 2$ and $n \in N$.

20. **Assertion (A) :** $(2+\sqrt{3})\sqrt{3}$ is an irrational number.

**Reason (R) :** Product of two irrational numbers is always irrational.

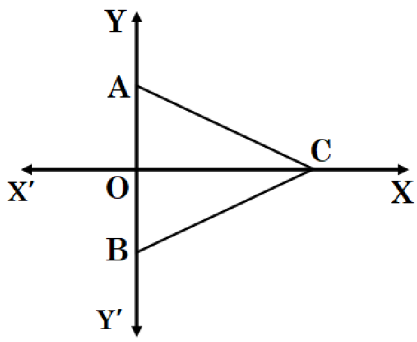
## SECTION B

*(Question numbers 21 to 25 carry* ***2 marks*** *each.)*

21. $P(x, y)$ is a point equidistant from the points $A(4, 3)$ and $B(3, 4)$. Prove that $x - y = 0$.

**OR**

In the given figure, $\Delta ABC$ is an equilateral triangle. Coordinates of vertices A and B are $(0, 3)$ and $(0, -3)$ respectively. Find the coordinates of points C.



22. In two concentric circles, a chord of length 8 cm of the larger circle touches the smaller circle. If the radius of the larger circle is 5 cm, then find the radius of the smaller circle.

23. The sum of the first 12 terms of an A.P. is 900. If its first term is 20, then find the common difference and $12^{th}$ term.

**OR**

The sum of first $n$ terms of an arithmetic progression is represented by $S_n = 6n - n^2$. Find the common difference.

24. If $\sin(A-B) = \frac{1}{2}$ and $\cos(A+B) = \frac{1}{2}$, $0° < A+B < 90°$ and $A > B$, then find the values of A and B.

25. Calculate mode of the following distribution.

| Class | 5-10 | 10-15 | 15-20 | 20-25 | 25-30 | 30-35 |
|---|---|---|---|---|---|---|
| Frequency | 5 | 6 | 15 | 10 | 5 | 4 |

## SECTION C

*(Question numbers 26 to 31 carry **3 marks** each.)*

26. Prove that $\sqrt{5}$ is an irrational number.

27. Find the ratio in which the y-axis divides the line segment joining the points $(4, -5)$ and $(-1, 2)$. Also find the point of intersection.

**OR**

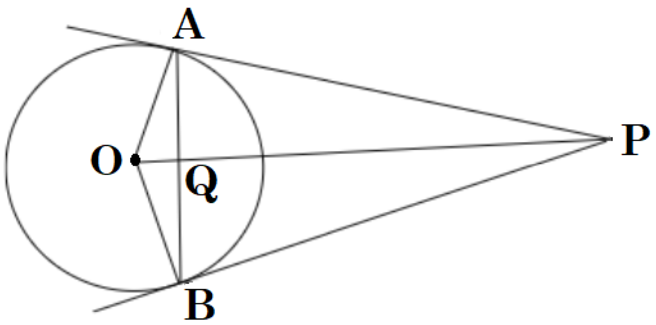
Line $4x + y = 4$ divides the line segment joining the points $(-2, -1)$ and $(3, 5)$ in a certain ratio. Find the ratio.

28. Prove that $(\operatorname{cosec} A - \sin A)(\sec A - \cos A) = \frac{1}{\tan A + \cot A}$.

29. Find the mean using the step deviation method.

| Class | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 |
|---|---|---|---|---|---|
| Frequency | 6 | 10 | 15 | 9 | 10 |

30. In the given figure, PA and PB are tangents to a circle centred at O.




Prove that (i) OP bisects $\angle APB$ (ii) OP is the right bisector of AB.

**OR**

Prove that the lengths of tangents drawn from an external point to a circle are equal.

31. The sum of a two-digit number and the number obtained by reversing the order of its digits is 99. If ten's digit is 3 more than the unit's digit, then find the number.

## SECTION D

*(Question numbers 32 to 35 carry **5 marks** each.)*

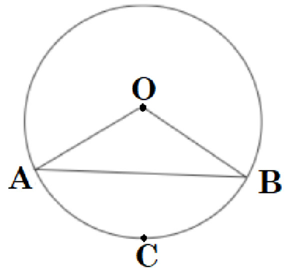
32. Amita buys some books for ₹1920. If she had bought 4 more books for the same amount each book would cost her ₹24 less. How many books did she buy? What was the initial price of one book?

**OR**

A train travels at a certain average speed for a distance of 132 km and then travels a distance of 140 km at an average speed of 4 km/h more than the initial speed. If it takes 4 hours to complete the whole journey, what was the initial average speed? Determine the time taken by train to cover the distances separately.

33. If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then prove that the other two sides are divided in the same ratio.

34. The perimeter of sector OACB of the circle centred at O and of radius 24 cm, is 73.12 cm.




(i) Find the central angle $\angle AOB$.

(ii) Find the area of the minor segment ACB.

(Use $\pi = 3.14$ and $\sqrt{3} = 1.73$).

35. From the top of a 9 m high building, the angle of elevation of the top of a cable tower is $60°$ and angle of depression of its foot is $45°$. Determine the height of the tower and distance between building and tower. Use $\sqrt{3} = 1.732$.

**OR**

As observed from the top of a 75 m high lighthouse from the sea level, the angles of depression of two ships are $30°$ and $45°$. If one ship is exactly behind the other on the same side of the lighthouse, find the distance between the two ships. Use $\sqrt{3} = 1.732$.

## SECTION E

*(Question numbers 36 to 38 carry **4 marks** each.)*
*This section contains **three Case-study / Passage based questions**.*
*Each question has **three sub-parts** (i), (ii) and (iii). Two sub-parts are of **1 mark each** while the remaining third sub-part (with internal choice) is of **2 marks**.*

36. A group of students conducted a survey to find out about the preferred mode of transportation to school among their classmates. They surveyed 200 students from their school.
The results of the survey are as follows.

120 students preferred to walk to school.
25% of the students preferred to use bicycles.
10% of the students preferred to take the bus.

Remaining students preferred to be dropped off by car.

Based on the above information, answer the following questions.

**(i)** What is the probability that a randomly selected student does not prefer to walk to school?

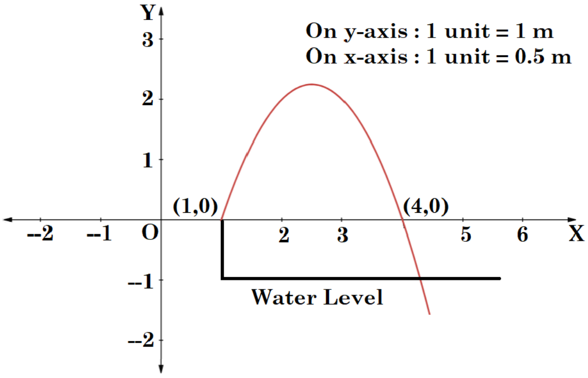
**(ii)** Find the probability of a randomly selected student who prefers to walk or use a bicycle.

**(iii)** One day 50% of walking students decided to come by bicycle. What is the probability that a randomly selected student comes to school using a bicycle on that day?

**OR**

**(iii)** What is the probability that a randomly selected student prefers to be dropped off by car?

37. Radha, an aspiring landscape designer, is tasked with creating a visually captivating pool design that incorporates a unique arrangement of fountains.
The challenge entails arranging the fountains in such a way that when water is thrown upwards, it forms the shape of a parabola. The graph of one such parabola is given below.




The height of each fountain rod above water level is 10 cm.

The equation of the downward-facing parabola representing the water fountain is given by $p(x) = -x^2 + 5x - 4$.

Based on the above information, answer the following questions.

**(i)** Find the zeroes of the polynomial $p(x)$ from the graph.

**(ii)** Find the value of $x$ at which water attains maximum height.

**(iii)** If $h$ is the maximum height attained by the water stream from the water level of the pool, then find the value of h.

**OR**

**(iii)** At what point (s) on x-axis, the height of water above x-axis is 2 m?

38. Rinku was very happy to receive a fancy jumbo pencil from his best friend Rohan on his birthday. Pencil is a basic writing tool, when sharpened its shape is a combination of cylinder and cone as given in the picture.

Cylindrical pencil with conical head is a common shape worldwide since ages. Commonly pencils are made up of wood and plastic but we should promote pencils made up of eco-friendly material (many options available in the market these days) to save environment.

The dimensions of Rinku's pencil are given as follows.

Length of cylindrical portion is 21 cm. Diameter of the base is 1 cm and height of the conical portion is 1.2 cm.

Based on the above information, answer the following questions.

**(i)** Find the slant height of the sharpened part.

**(ii)** Find curved surface area of sharpened part (in terms of $\pi$).

**(iii)** Find the total surface area of the pencil (in terms of $\pi$).

**OR**

**(iii)** The pencil's total height decreases by 8.2 cm after sharpening it many times, what is the volume of the cylindrical part of the shortened pencil (in terms of $\pi$)?

## 🕮 DETAILED SOLUTIONS (Mathematics Basic - 241)

### SECTION A

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01. | (b) | 02. | (a) | 03. | (d) | 04. | (c) | 05. | (d) | 06. | (b) | 07. | (a) |
| 08. | (b) | 09. | (c) | 10. | (b) | 11. | (a) | 12. | (b) | 13. | (a) | 14. | (c) |
| 15. | (d) | 16. | (b) | 17. | (c) | 18. | (d) | 19. | (a) | 20. | (c) | | |

### SECTION B

21. Since $PA = PB$

So, $PA^2 = PB^2$

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

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

$\Rightarrow x = y$ i.e., $x - y = 0$.

**OR**

Note that, $AB = OA + OB = 3 + 3 = 6$ cm

Also $AB = AC = BC = 6$ cm (as the triangle ABC is equilateral

Observe that CO is perpendicular to AB.

Hence, $OC = \frac{\sqrt{3}}{2} \times 6 = 3\sqrt{3}$ cm.

Therefore, the point C is $(3\sqrt{3}, 0)$.

22. Consider the diagram.

Since $AB = 8$ cm $\quad \therefore AM = 4$ cm

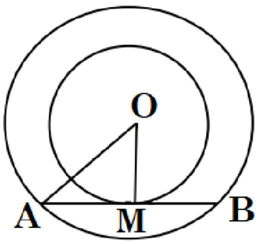
(As OM bisects AB)

Now $OM = \sqrt{OA^2 - AM^2}$ (Using Pythagoras theorem

$= \sqrt{5^2 - 4^2}$

$= \sqrt{25 - 16}$

$= 3$ cm.




23. Given that $a = 20$, $S_{12} = 900$.

So, $\frac{12}{2}[2 \times 20 + 11d] = 900$, where d is the common difference.

$\Rightarrow 40 + 11d = 150$

$\Rightarrow 11d = 110$

$\Rightarrow d = 10$

Also $a_{12} = a + (12-1)d = 20 + 11 \times 10 = 130$.

**OR**

Given that $S_n = 6n - n^2$

Putting $n = 1$, $S_1 = a_1 = 6 - 1^2 = 5$ i.e., $a = 5$ ... (i)

Putting $n = 2$, $S_2 = a_1 + a_2 = 2a + d = 6 \times 2 - 2^2 = 8$ ... (ii)

Solving (i) and (ii), we get $d = -2$.

**Alternatively**, $a_n = S_n - S_{n-1} = \left[6n - n^2\right] - \left[6(n-1) - (n-1)^2\right]$

$\Rightarrow a_n = \left[6n - n^2\right] - \left[(6n-6) - (n^2 - 2n + 1)\right] = 6n - n^2 - 6n + 6 + n^2 - 2n + 1 = 7 - 2n$

So, $a_1 = 7 - 2 \times 1 = 5$, $a_2 = 7 - 2 \times 2 = 3$.

Hence, $d = a_2 - a_1 = 3 - 5 = -2$.

24. $\sin(A-B) = \frac{1}{2} \Rightarrow A - B = 30°$ ... (i)

$\cos(A+B)=\frac{1}{2}\Rightarrow A+B=60^\circ$ ... (ii)

Solving (i) and (ii), we get $A=45^\circ, B=15^\circ$.

25. Consider the table given below.

| Class | 5-10 | 10-15 | 15-20 | 20-25 | 25-30 | 30-35 |
|---|---|---|---|---|---|---|
| Frequency | 5 | 6 | 15 | 10 | 5 | 4 |

Modal class is 15-20.

$\text{Mode}=15+5\times\left(\frac{15-6}{2\times15-6-10}\right)=18.21$ (approx.).

## SECTION C

26. Let $\sqrt{5}$ be a rational number.

$\therefore \sqrt{5}=\frac{p}{q}$, where $q\neq 0$ and p and q are coprime numbers.

Then $5q^2=p^2$

$\Rightarrow p^2$ is divisible by 5

$\Rightarrow p$ is divisible by 5 … (i)

$\Rightarrow p=3a$, where 'a' is a positive integer

So, $5q^2=25a^2$ $\Rightarrow q^2=5a^2$

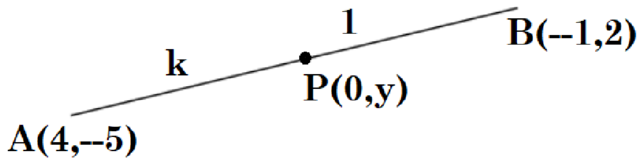
$\Rightarrow q^2$ is divisible by 5

$\Rightarrow q$ is divisible by 5 … (ii)

Clearly, (i) and (ii) leads to contradiction as 'p' and 'q' coprimes, which is due to our wrong assumption. Hence, $\sqrt{5}$ is an irrational number.

27. Let the required point on the y-axis be $P(0, y)$.

Let $AP:PB$ be $k:1$.




So, $P\left(\frac{-k+4}{k+1}, \frac{2k-5}{k+1}\right)$.

Therefore, $\frac{-k+4}{k+1}=0$

$\Rightarrow -k+4=0$

$\Rightarrow k=4$

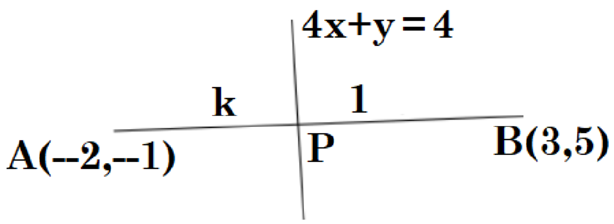
Hence, the required ratio is $4:1$.

Also, $y=\frac{2k-5}{k+1}=\frac{8-5}{5}=\frac{3}{5}$.

Hence, the point of intersection is $\left(0, \frac{3}{5}\right)$.

**OR**

Let the line $4x+y=4$ intersects AB at $P(x_1, y_1)$ such that $AP:PB=k:1$.




So, $x_1=\frac{3k-2}{k+1}$ and $y_1=\frac{5k-1}{k+1}$

As $(x_1, y_1)$ lies on the line $4x+y=4$.

Therefore, $4\left(\frac{3k-2}{k+1}\right)+\left(\frac{5k-1}{k+1}\right)=4$

$\Rightarrow 12k-8+5k-1=4k+4$

$\Rightarrow k = 1$.

Hence, the required ratio is $1:1$.

28. LHS $= (\operatorname{cosec} A - \sin A)(\sec A - \cos A)$

$$= \left(\frac{1}{\sin A} - \sin A\right)\left(\frac{1}{\cos A} - \cos A\right)$$

$$= \frac{1-\sin^2 A}{\sin A} \times \frac{1-\cos^2 A}{\cos A}$$

$$= \frac{\cos^2 A}{\sin A} \times \frac{\sin^2 A}{\cos A}$$

$$= \cos A \sin A$$

$$= \frac{\cos A \sin A}{\sin^2 A + \cos^2 A}$$

$$= \frac{\frac{\cos A \sin A}{\cos A \sin A}}{\frac{\sin^2 A + \cos^2 A}{\cos A \sin A}}$$ (Diving Nr & Dr both by $\cos A \sin A$

$$= \frac{1}{\tan A + \cot A} = \text{RHS}.$$

29. Consider the table given below.

| Class | x | Frequency (f) | $u = \frac{x-25}{10}$ | f u |
|---|---|---|---|---|
| 0-10 | 5 | 6 | $-2$ | $-12$ |
| 10-20 | 15 | 10 | $-1$ | $-10$ |
| 20-30 | 25 | 15 | 0 | 0 |
| 30-40 | 35 | 9 | 1 | 9 |
| 40-50 | 45 | 10 | 2 | 20 |
| | | $\Sigma f = 50$ | | $\sum f u = 7$ |

Hence, the Mean $= 25 + 10 \times \left(\frac{7}{50}\right) = 26.4$.

30. (i) $\Delta OAP \cong \Delta OBP$

So, $\angle APO = \angle BPO$

Hence, OP bisects $\angle P$.

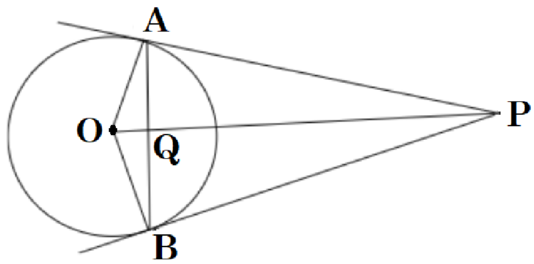
(ii) $\Delta AQP \cong \Delta BQP$

$\Rightarrow AQ = QB$ and $\angle AQP = \angle BQP$

Since AB is a straight line.

Therefore, $\angle AQP = \angle BQP = 90°$.

Hence, OP is right bisector of AB.




**OR**

Refer Q33 - Official CBSE Sample Paper (Standard) for 2024-25; Page-10.

31. Let the two-digit number be $10x + y$, where x is the 10's place digit and y is the 1's place digit.

Therefore $(10x + y) + (10y + x) = 99$

$\Rightarrow x + y = 9$ … (i)

Also, $x = 3 + y$ ... (ii)

Solving (i) and (ii), we get $y = 3,\ x = 6$

Therefore, required number is $10 \times 6 + 3 = 63$.

## SECTION D

32. Let the number of books purchased be $x$.

Therefore, cost price of 1 book $=\frac{1920}{x}$.

Therefore $\frac{1920}{x}-\frac{1920}{x+4}=24$

$\Rightarrow 1920\times 4=24x(x+4)$

$\Rightarrow x^2+4x-320=0$

$\Rightarrow (x+20)(x-16)=0$

$\Rightarrow x=16,\ x\neq -20$

Number of books bought $=16$

So, the price of each book $=\frac{1920}{16}=₹120$.

**OR**

Let the initial average speed of the train be $x$ km/hr.

Therefore, $\frac{132}{x}+\frac{140}{x+4}=4$

$\Rightarrow 4x^2-256x-528=0$

$\Rightarrow x^2-64x-132=0$

$\Rightarrow (x-66)(x+2)=0$

$\Rightarrow x=66,\ x\neq -2$

Initial average speed of train $=66$ km/hr

Time taken to cover the distances separately $=\frac{132}{66}$ and $\frac{140}{70}$ i.e., 2 hours each.

33. **GIVEN:** A $\Delta ABC$ in which $DE \parallel BC$, and DE intersects AB in D and AC in E.

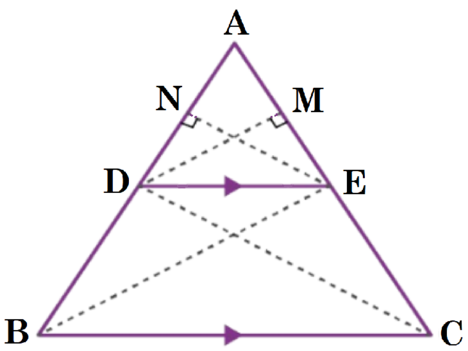
**TO PROVE:** $\frac{AD}{DB}=\frac{AE}{EC}$.

**CONSTRUCTION:** Join BE and CD. Also draw $EN\perp BA$ and $DM\perp CA$.

**PROOF:** As $EN\perp BA$, therefore EN is the height of the triangles ADE and DBE.

Now, $ar(ADE)=\frac{1}{2}(AD\times EN)$ $[\because$ Area of $\Delta=\frac{1}{2}(Base\times Height)$

and, $ar(DBE)=\frac{1}{2}(DB\times EN)$




$$\Rightarrow \frac{ar(ADE)}{ar(DBE)}=\frac{\frac{1}{2}(AD\times EN)}{\frac{1}{2}(DB\times EN)}=\frac{AD}{DB} \quad \ldots(i)$$

Similarly, $ar(ADE)=\frac{1}{2}(AE\times DM)$ and,

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

$$\Rightarrow \frac{ar(ADE)}{ar(DEC)}=\frac{\frac{1}{2}(AE\times DM)}{\frac{1}{2}(EC\times DM)}=\frac{AE}{EC} \quad \ldots(ii)$$

Since $\Delta DBE$ and $\Delta DEC$ are on the same base DE and between the same parallels DE and BC.
Therefore, $ar(DEC) = ar(DBE)$ …(iii)

By (i), (ii) and (iii), we get $\frac{AD}{DB} = \frac{AE}{EC}$.

34. (i) Perimeter of sector $= 2r + \frac{2\pi r\theta}{360} = 73.12$

$\Rightarrow 2(24) + \frac{2\times 3.14\times 24\times\theta}{360} = 73.12$

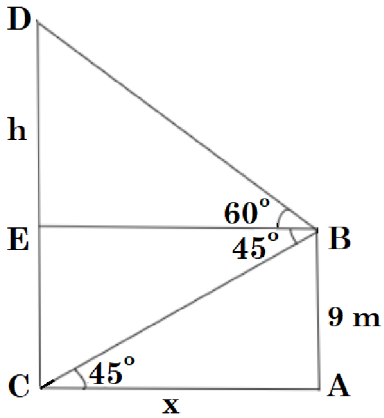
$\Rightarrow \theta = 60°$

(ii) Area of minor segment $= \left(\frac{3.14\times 24\times 24\times 60}{360} - \frac{1.73}{4}\times 24\times 24\right)\ cm^2$

$= (301.44 - 249.12)\ cm^2$

$= 52.32\ cm^2$.

35. Let AB be the building and CD be the tower.




In $\Delta DEB$,

$\tan 60° = \sqrt{3} = \frac{h}{x}$

$\Rightarrow h = x\sqrt{3}$ … (i)

Also in $\Delta CAB$,

$\tan 45° = \frac{9}{x} = 1$

$\Rightarrow x = 9$ m ... (ii)

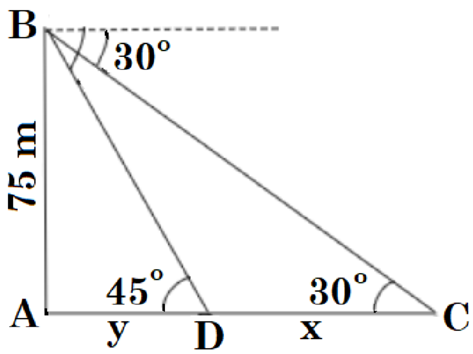
(Distance between tower and building)

Solving (i) and (ii), we get $h = 9\times 1.732 = 15.588$ m.

Therefore, the height of the tower $= h + 9 = 24.588$ m.

**OR**

Let AB be the light house and C and D be positions of ships.




In $\Delta BAC$,

$\tan 30° = \frac{75}{x+y}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{75}{x+y}$

$\Rightarrow x + y = 75\sqrt{3}$ ... (i)

Also in $\Delta BAD$, $\tan 45° = 1 = \frac{75}{y}$

$\Rightarrow y = 75$ ... (ii)

Solving (i) and (ii), we get $x = 75(\sqrt{3} - 1)$

$\Rightarrow x = 75\times 0.732 = 54.9$ m

Distance between the ships is 54.9 m.

## SECTION E

36. (i) Number of students who do not prefer to walk $= 200 - 120 = 80$

$\therefore$ P(selected student doesn't prefer to walk) $= \frac{80}{200} = \frac{2}{5}$

(ii) Total number of students who prefer to walk or use bicycle $= 120 + 50 = 170$

$\therefore$ P(selected student prefers to walk or use bicycle) $= \frac{170}{200} = \frac{17}{20}$

(ii) 50% of walking students who used bicycle $= 60$
Number of students who already use bicycle $= 50$

$\therefore$ P(selected student uses bicycle) $= \frac{110}{200} = \frac{11}{20}$.

**OR**

(b) Number of students who preferred to be dropped by car $= 200 - (120 + 50 + 20)$
$= 10$ students

$\therefore$ P(selected student is dropped by car) $= \frac{10}{200} = \frac{1}{20}$.

37. (i) Zeroes of the polynomial p(x) are 1 and 4. Note that the graph cuts x-axis at (1, 0) and (4, 0).

(ii) At $x = \frac{5}{2}$, value of p(x) is maximum. That is, at $x = \frac{5}{2}$ the water attains maximum height.

(iii) At $x = \frac{5}{2}$, $p(x) = 2.25$

Therefore, $h = 0.10 + 2.25 = 2.35$ m.

**OR**

(iii) $-x^2 + 5x - 4 = 2$
$\Rightarrow x^2 - 5x + 6 = 0$
$\Rightarrow (x-2)(x-3) = 0$
$\Rightarrow x = 2$ and $x = 3$
Therefore, required points are $(2, 0)$ and $(3, 0)$.

38. (i) $l^2 = (1.2)^2 + (0.5)^2 = 1.44 + 0.25$
$\therefore\ l = \sqrt{1.69} = 1.3$ cm.

(ii) Curved surface area of sharpened part
$= \pi \times 0.5 \times 1.3 = (0.65\pi)$ cm$^2$.

(iii) Total surface area of pencil
$=$ CSA of cylinder + CSA of cone + area of base circle
$= \pi \times 0.5 \times 0.5 \times 21 + 0.65\pi + \pi \times (0.5)^2$
$= (5.25 + 0.65 + 0.25)\pi$
$= (6.15\pi)$ cm$^2$.

**OR**

(iii) Length of cylindrical part of shortened pencil
$= (21 - 8.2)$ cm $= 12.8$ cm
So, volume of cylindrical part of shortened pencil
$= \pi \times 0.5 \times 0.5 \times 12.8$
$= (3.2\pi)$ cm$^3$.