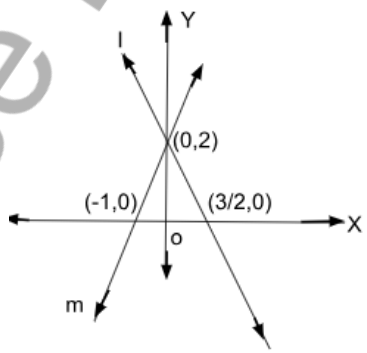
SAMPLE QUESTION PAPER
Class X Session 2024-25
MATHEMATICS BASIC (Code No.241)

TIME: 3 hours **MAX.MARKS: 80**

General Instructions:

Read the following instructions carefully and follow them:

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 Assertion- Reason 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 Questions of section B, 2 Questions of section C and 2 Questions of section D has been provided. And internal choice has been provided in all the 2 marks questions of Section E.
9. Draw neat and clean figures wherever required.
10. Take π =22/7 wherever required if not stated.
11. Use of calculators is not allowed.

	Section A	
	Section A consists of 20 questions of 1 mark each.	
1.	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	**1**
2.	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	**1**
3.	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	**1**

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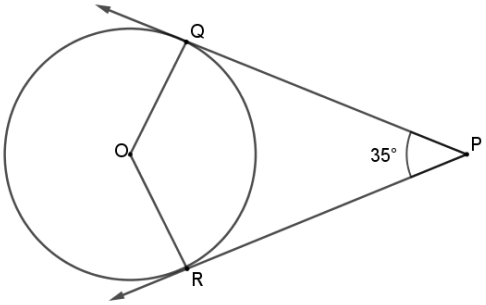
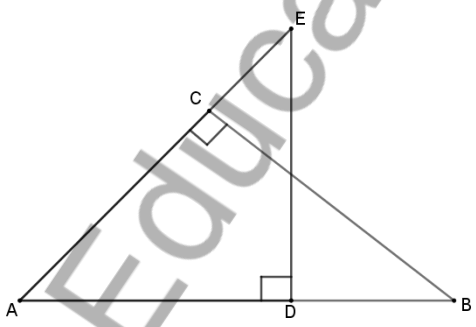
4.	The distance between the points (a, b) and $(-a, -b)$ is (A)$\sqrt{a^2+b^2}$ (B) a^2+b^2 (C) $2\sqrt{a^2+b^2}$ (D) $4\sqrt{a^2+b^2}$	**1**
5.	In the given figure, PQ and PR are tangents to a circle centred at O. If $\angle QPR=35°$ then $\angle QOR$ is equal to  (A) $70°$ (B) $90°$ (C) $135°$ (D) $145°$	**1**
6.	If $\triangle ABC \sim \triangle PQR$ such that 3AB = 2PQ and BC=10 cm, then length QR is equal to (A) 10 cm (B) 15 cm (C) $\frac{20}{3}$ cm (D) 30 cm	**1**
7.	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) $\frac{3}{4}$	**1**
8.	In the given figure, ΔBAC is similar to  (A) ΔAED (B) ΔEAD (C) ΔACB (D) ΔBCA	**1**
9.	If H.C.F(420,189) = 21 then L.C.M(420,189) is (A) 420 (B) 1890 (C) 3780 (D) 3680	**1**
10.	The 4^{th} term from the end of the A.P $-8, -5, -2, \ldots, 49$ is (A) 37 (B) 40 (C) 1 (D) 43	**1**
11.	In the given figure, if $\triangle OCA \sim \triangle OBD$ then $\angle OAC$ is equal to	**1**

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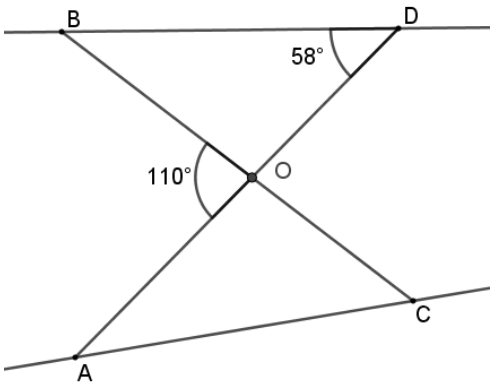
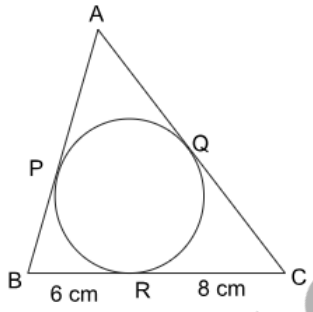


(A) $58°$ (B) $55°$ (C) $128°$ (D) $52°$

12. If perimeter of given triangle is 38 cm, then length AP is equal to **1**



(A)19 cm (B) 5 cm (C) 10 cm (D)8 cm

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

(A) $\cos 60°$ (B) $\sin 60°$ (C) 1 (D) $tan^2 60°$

14. The total surface area of solid hemisphere of radius r is **1**

(A) πr^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? **1**

(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 **1**

(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. **1**

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 $\frac{2}{5}$ and $\frac{-1}{5}$ is **1**

(A) $25x^2 + 5x - 2$ (B) $5x^2 - 2x + 1$

(C) $5x^2 + 2x - 1$ (D) $25x^2 - 5x - 2$

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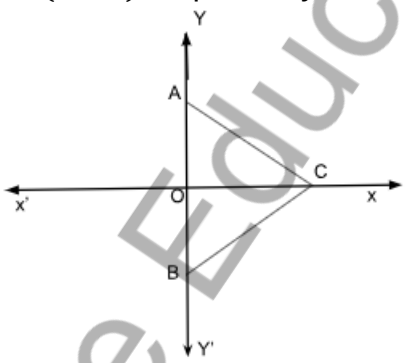
	DIRECTION: In the question number 19 and 20, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**. Choose the correct option A) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A) B) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A) C) Assertion (A) is true but reason (R) is false. D) Assertion (A) is false but reason (R) is true.	
19.	Assertion(A): The sequence $-1, -1-1, \ldots, -1$ is an AP. Reason(R): In an AP, $a_n - a_{n-1}$ is constant where $n \geq 2$ and $n \in N$	**1**
20.	Assertion(A): $(2+\sqrt{3})\sqrt{3}$ is an irrational number. Reason(R): Product of two irrational numbers is always irrational.	**1**
	Section B	
	Section B consists of 5 questions of 2 marks each.	
21 (A).	$P(x, y)$ is a point equidistant from the points $A(4,3)$ and $B(3,4)$. Prove that $x - y = 0$.	**2**
	OR	
21 (B).	In the given figure, ΔABC 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.	**2**
23 (A).	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 12th term.	**2**
	OR	
23 (B).	The sum of first n terms of an A.P. 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.	**2**

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25. Calculate mode of the following distribution: **2**

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

Section C

Section C consists of 6 questions of 3 marks each.

26. Prove that $\sqrt{5}$ is an irrational number. **3**

27 (A). 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. **3**

OR

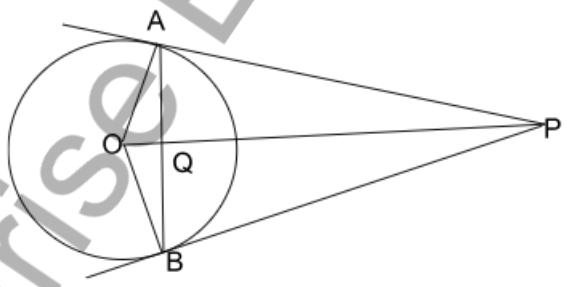
27 (B). Line $4x + y = 4$ divides the line segment joining the points $(-2,-1)$ and $(3,5)$ in a certain ratio. Find the ratio.

28. Prove that: $(cosecA - sinA)(secA - cosA) = \frac{1}{\tan A + \cot A}$. **3**

29. Find the mean using the step deviation method. **3**

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

30. (A) 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. **3**



OR

30 (B). Prove that the lengths of tangents drawn from an external point to a circle are equal. **3**

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. **3**

Section -D

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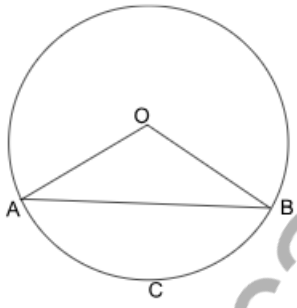
	Section D consists of 4 questions of 5 marks each	
32 (A).	Amita buys some books for ₹1920. If she had bought 4 more books for the same amount each book would cost her ₹ 24 less. How many books did she buy? What was the initial price of one book?	**5**
	OR	
32 (B).	A train travels at a certain average 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.	**5**
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.	**5**
34.	The perimeter of sector OACB of the circle centred at O and of radius 24, is 73.12 cm.  (i) Find the central angle $\angle AOB$. (ii) Find the area of the minor segment ACB. (Use $\pi = 3.14\ and\ \sqrt{3} = 1.73$)	**5**
35 (A).	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 $\sqrt{3} = 1.732$)	**5**
	OR	
35 (B).	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 $\sqrt{3} = 1.732$)	**5**
	Section E	
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.	

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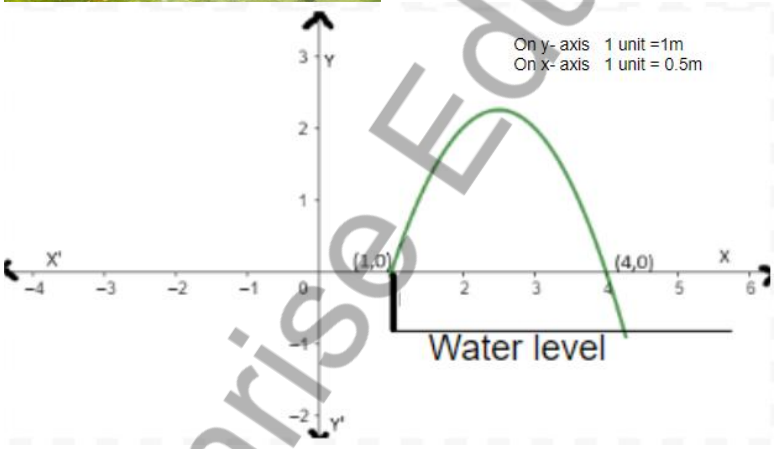
	Remaining students preferred to be dropped off by car. Based on the above information, answer the following questions:	
(i)	What is the probability that a randomly selected student does not prefer to walk to school?	**1**
(ii)	Find the probability of a randomly selected student who prefers to walk or use a bicycle.	**1**
(iii)(A)	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**	**2**
(B)	What is the probability that a randomly selected student prefers to be dropped off by car?	**2**
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.	**1**
(ii)	Find the value of x at which water attains maximum height.	**1**

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(iii)(A)	If h is the maximum height attained by the water stream from the water level of the pool, then find the value of h.	**2**
	OR	
(B)	At what point(s) on x- axis, the height of water above x- axis is 2 m?	**2**
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 & 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 & 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 21cm. 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.	**1**
(ii)	Find curved surface area of sharpened part (in terms of π).	**1**
(iii)(A)	Find the total surface area of the pencil (in terms of π).	**2**
	OR	
(B)	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 π)?	**2**

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Marking Scheme
Class X Session 2024-25
MATHEMATICS BASIC (Code No.241)

TIME: 3 hours **MAX.MARKS: 80**

Q. No.	Section A	Marks
1.	B) 90	**1**
2.	A) consistent with unique solution	**1**
3.	D) 7	**1**
4.	C) $2\sqrt{a^2+b^2}$	**1**
5.	D) $145°$	**1**
6.	B) 15 cm	**1**
7.	A) $\frac{5}{4}$	**1**
8.	B) ΔEAD	**1**
9.	C) 3780	**1**
10.	B) 40	**1**
11.	D) $52°$	**1**
12.	B) 5 cm	**1**
13.	A) $\cos 60°$	**1**
14.	(C) $3\pi r^2$	**1**
15.	D) 4	**1**
16.	B) real and equal	**1**
17.	C) 30 - 40	**1**
18.	D) $25x^2 - 5x - 2$	**1**
19.	A) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)	**1**
20.	C) Assertion (A) is true but reason (R) is false.	**1**
	Section B	

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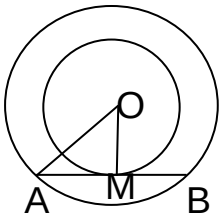
21 (A).	$PA^2 = PB^2$ $\Rightarrow (x-4)^2 + (y-3)^2 = (x-3)^2 + (y-4)^2$ $\Rightarrow x = y \quad or \quad x - y = 0$	**1** **1**
	OR	
21 (B).	AB = 6 cm = AC OC = $\sqrt{36-9}$ = $3\sqrt{3}$ cm Point C is ($3\sqrt{3}$, 0)	½ **1** ½
22.	Correct figure  AM = 4 cm OM = $\sqrt{OA^2 - AM^2}$ = $\sqrt{5^2 - 4^2}$ = 3 cm	½ ½ **1**
23 (A).	$\frac{12}{2}[2 \times 20 + 11d]$=900 $\Rightarrow d = 10$ Also $a_{12} = 20 + 11 \times 10 = 130$	½ **1** ½
	OR	
23 (B).	Putting $n = 1,\ S_1 = a = 6 - 1^2 = 5 \ldots\ldots\ldots\ldots (i)$ Putting $n = 2,\ S_2 = 2a + d = 6 \times 2 - 2^2 = 8 \ldots\ldots\ldots\ldots (ii)$ Solving (i) & (ii) $d = -2$	½ **1** ½
24.	$sin(A-B) = \frac{1}{2} \Rightarrow A - B = 30°$ ……..(i) $cos(A+B) = \frac{1}{2} \Rightarrow A + B = 60°$ ……..(ii) Solving (i) & (ii) to get $A = 45°, B = 15°$	½ ½ ½+½
25.	<table><tr><td>Class</td><td>5-10</td><td>10-15</td><td>15-20</td><td>20-25</td><td>25-30</td><td>30-35</td></tr><tr><td>Frequency</td><td>5</td><td>6</td><td>15</td><td>10</td><td>5</td><td>4</td></tr></table> Modal class is 15-20. $Mode = 15 + 5 \times (\frac{15-6}{2\times15-6-10})$ $= 18.21$(approx.)	 ½ **1** ½
	Section-C	

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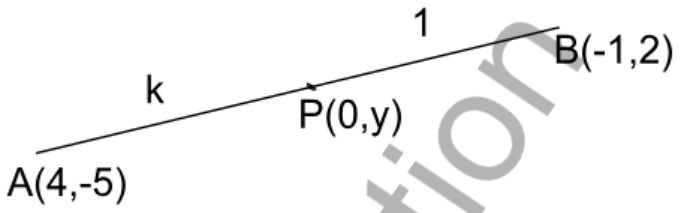
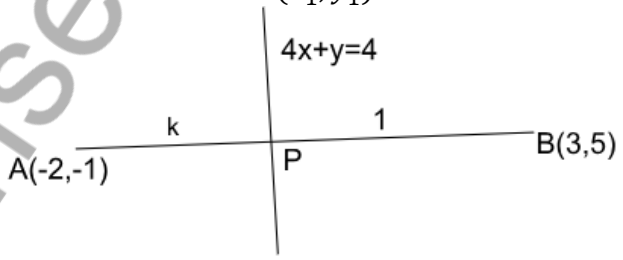
26.	Let $\sqrt{5}$ be a rational number. $\therefore \sqrt{5} = \frac{p}{q}$, where q≠0 and p & q are coprime. $5q^2 = p^2 \Longrightarrow p^2$ is divisible by 5 $\Longrightarrow$ p is divisible by 5----- (i) $\Longrightarrow$ p = 3a, where 'a' is a postive integer $25a^2 = 5q^2 \Longrightarrow q^2 = 5a^2 \Longrightarrow q^2$ is divisible by 5 $\Longrightarrow$ q is divisible by 5 ----- (ii) (i) and (ii) leads to contradiction as 'p' and 'q' are coprime. $\therefore \sqrt{5}$ is an irrational number.	½ **1** **1** ½
27(A).	Let the required point on the y axis be P(0,y).  Let AP : PB be k : 1 Therefore, $\frac{-k+4}{k+1} = 0$ ⇒k=4 Therefore, required ratio is 4:1 & $y = \frac{8-5}{5} = \frac{3}{5}$ Hence point of intersection is $(0,\frac{3}{5})$.	½ **1** ½ ½ ½
	OR	
27 (B).	Let the line $4x + y = 4$ intersects AB at $P(x_1, y_1)$ such that AP: PB=k:1  $x_1=\frac{3k-2}{k+1}$ and $y_1=\frac{5k-1}{k+1}$ (x_1, y_1) lies on $4x + y = 4$ Therefore, $4(\frac{3k-2}{k+1})+(\frac{5k-1}{k+1})=4$ $\Rightarrow k=1$ Required ratio is 1:1	**1** ½ **1** ½

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28.

LHS= $(\frac{1}{sinA} - sinA)(\frac{1}{cosA} - cosA)$ — ½

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

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

$=cosA\ sinA$ — ½

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

$=cosA\ sinA$ = LHS — 1

29.

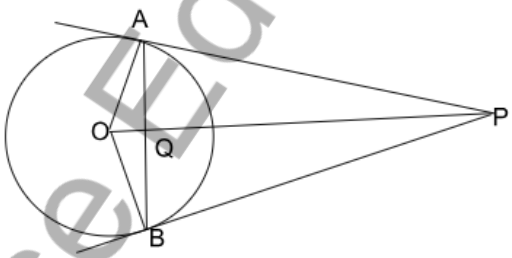
Class	x	frequency(f)	$u = \frac{x-25}{10}$	fu
0-10	5	6	-2	-12
10-20	15	10	-1	-10
20-30	25	15	0	0
30-40	35	9	1	9
40-50	45	10	2	20
		$\sum f$ =50		$\sum fu = 7$

Correct table $1\frac{1}{2}$

$Mean = 25 + 10 \times (\frac{7}{50})$ — 1

= 26.4 — ½

30 (A).



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

$\angle APO = \angle BPO$

Or OP bisects $\angle P$ — 1

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

⇒AQ=QB and $\angle AQP = \angle BQP$ — 1

AB is a straight line

therefore $\angle AQP = \angle BQP = 90°$ — 1

Hence OP is right bisector of AB

OR

30 (B).

Correct Given, to prove, figure and construction — 1

Correct proof — 2

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31.	Let the two-digit number be $10x + y$ Therefore $(10x + y) + (10y + x) = 99$ $\Rightarrow x + y = 9$ …….(i) Also, $x = 3 + y$……..(ii) Solving (i) & (ii) to get $y = 3, x = 6$ Therefore, required number is 63	½ ½ ½ ½ ½ ½
	Section D	
32 (A).	Let the number of books purchased be x Therefore, cost price of 1 book = $\frac{1920}{x}$ Therefore $\frac{1920}{x} - \frac{1920}{x+4} = 24$ $\Rightarrow 1920 \times 4 = 24x(x + 4)$ or $x^2 + 4x - 320 = 0$ $\Rightarrow (x + 20)(x - 16) = 0$ $\Rightarrow x = 16, x \neq -20$ Number of books bought=16 Price of each book =$\frac{1920}{16} = ₹120$	**1** **1** **1** **1** **1**
	OR	
32 (B).	Let the initial average speed of the train be x km/hr. Therefore $\frac{132}{x} + \frac{140}{x+4} = 4$ $\Rightarrow 4x^2 - 256x - 528 = 0$ or $x^2 - 64x - 132 = 0$ $\Rightarrow (x - 66)(x + 2) = 0$ $\Rightarrow x = 66,\ x \neq -2$ Initial average speed of train= 66 km/hr Time taken to cover the distances separately=$\frac{132}{66}$ & $\frac{140}{70}$ i.e. 2 hours each	**1** **1** **1** **1** **1**
33.	Correct Given, to prove, Construction and figure Correct Proof	$\frac{1}{2} \times$ **4=2** **3**
34.	(i) Perimeter of sector = $2r + \frac{2\pi r\theta}{360} = 73.12$ $\Rightarrow 2(24) + \frac{2\times3.14\times24\times\theta}{360} = 73.12$ $\Rightarrow \theta = 60^\circ$ (ii)Area of minor segment = $\left(\frac{3.14\times24\times24\times60}{360} - \frac{1.73}{4} \times 24 \times 24\right)\ cm^2$ $= (301.44 - 249.12)\ cm^2$ $= 52.32\ cm^2$	**1** **1** **2** **1**

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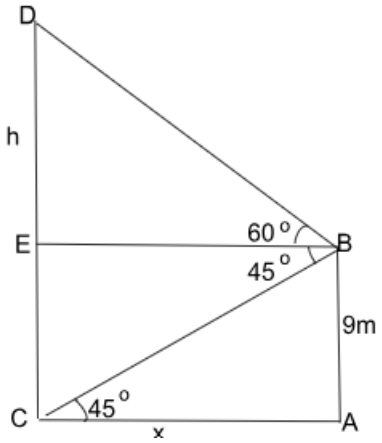
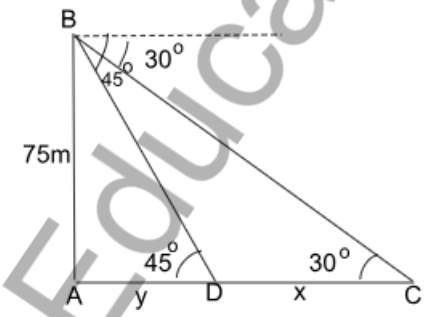
35 (A).	 Let AB be the building and CD be the tower. Here $tan60° = \sqrt{3} = \frac{h}{x}$ $\Rightarrow h = x\sqrt{3}$…….(i) $tan45° = \frac{9}{x} = 1$ $\Rightarrow\ x = 9$ m……(ii) (Distance between tower and building) Solving (i) & (ii) to get $h = 9 \times 1.732 = 15.588m$ Therefore, the height of the tower $= h + 9 = 24.588\ m.$	**1 mark for correct figure** **1** **½** **1** **½** **½** **½**
	OR	
35 (B).	 Let AB be the light house and C & D be positions of ships. $tan30°=\frac{1}{\sqrt{3}} = \frac{75}{x+y}$ $\Rightarrow x + y = 75\sqrt{3}$…….(i) $tan45°=1=\frac{75}{y}$ $\Rightarrow\ y\ = 75$……(ii) Solving (i) & (ii) to get $x = 75(\sqrt{3} - 1)$ $\Rightarrow x = 75 \times 0.732$ $\ = 54.9\ m$ Distance between the ships is $54.9\ m$	**1 mark for correct figure** **1** **½** **1** **½** **1**
	Section E	
36.	(i) Number of students who do not prefer to walk = $200 - 120\ =\ 80$ P (selected student doesn't prefer to walk) = $\frac{80}{200}$ or $\frac{2}{5}$	**½** **½**

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	(ii) Total number of students who prefer to walk or use bicycle = 120 + 50 = 170 P (selected student prefers to walk or use bicycle) = $\frac{170}{200}$ or $\frac{17}{20}$ (iii) (A) 50% of walking students who used bicycle = 60 Number of students who already use bicycle = 50 P (selected student uses bicycle) = $\frac{110}{200}$ or $\frac{11}{20}$ **OR** (B) Number of students who preferred to be dropped by car $= 200 - (120 + 50 + 20)$ = 10 students P (selected student is dropped by car) = $\frac{10}{200}$ or $\frac{1}{20}$	½ ½ ½ ½ 1 1 1
37.	(i) 1 and 4 (ii) $x = 5/2$ (iii) (A) At $x = 5/2, p(x) = 2.25$ Therefore, $h = 0.10 + 2.25 = 2.35m$ **OR** (B) $-x^2 + 5x - 4 = 2$ $x^2 - 5x + 6 = 0$ $(x-2)(x-3) = 0$ $\Rightarrow x = 2 \; and \; x = 3$ Therefore, required points are $(2,0)$ and $(3,0)$	1 1 1 1 ½ ½ ½ ½
38.	(i) $l^2 = (1.2)^2 + (0.5)^2$ $= 1.44 + 0.25$ $\Rightarrow l = \sqrt{1.69} = 1.3cm$ (ii) Curved surface area of sharpened part $= \pi \times 0.5 \times 1.3$ $= (0.65\,\pi)\; cm^2$ (iii) (A) 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** (B) Length of cylindrical part of shortened pencil $= (21 - 8.2)\; cm = 12.8\; cm$ So, volume of cylindrical part of shortened pencil $= \pi \times 0.5 \times 0.5 \times 12.8$ $= (3.2\,\pi)\; cm^3$	½ ½ ½ ½ ½ 1 ½ ½ 1 ½

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