

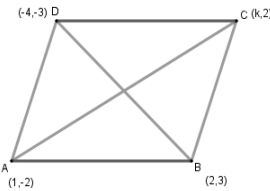
Class: X
Mathematics
Marking Scheme 2018-19

Time allowed: 3hrs

Maximum Marks: 80

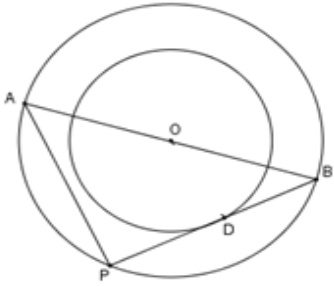
Q No	SECTION A	Marks
1	$\left(\frac{-5+(-1)}{2}, \frac{4+0}{2}\right) = \left(\frac{a}{3}, 2\right)$ $\frac{a}{3} = \frac{-6}{2} \Rightarrow a = -9 \Rightarrow$	1
2	$4K - 28 + 8 = 0$ $K = 5$	1/2 1/2
	OR	
	For roots to be real and equal, $b^2 - 4ac = 0$ $\Rightarrow (5k)^2 - 4 \times 1 \times 16 = 0$ $k = \pm \frac{8}{5}$	1/2 1/2
3	$\cot^2\theta - \frac{1}{\sin^2\theta} = \cot^2\theta - \operatorname{cosec}^2\theta$ $= -1$	1 1/2 1/2
	OR	
	$\sin\theta = \cos\theta \quad \theta = 45^\circ$ $\therefore 2\tan\theta + \cos^2\theta = 2 + \frac{1}{2} = \frac{5}{2}$	
4	$a_1 = 3, a_3 = 7$ $s_3 = \frac{3}{2}(3 + 7) = 15$	1/2 1/2
5	$\frac{AD}{DB} = \frac{AE}{EC} \quad DE \parallel BC$ $\Rightarrow \angle ADE = \angle ABC = 48^\circ$	1/2 1/2
6	4 places	1
	SECTION B	
7	HCF \times LCM = Product of two numbers $9 \times 360 = 45 \times 2^{\text{nd}} \text{ number}$ $2^{\text{nd}} \text{ number} = 72$	1 1
	OR	

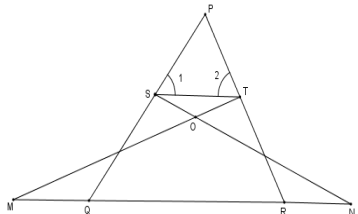
	<p>Let us assume, to the contrary that $7 - \sqrt{5}$ is irrational $7 - \sqrt{5} = \frac{p}{q}$, Where p & q are co-prime and $q \neq 0$ $= \sqrt{5} = \frac{7q-p}{q}$ $\frac{7q-p}{q}$ is rational = $\sqrt{5}$ is rational which is a contradiction Hence $7 - \sqrt{5}$ is irrational</p>	<p>1</p> <p>1</p>
8	<p>20th term from the end = $l - (n - 1)d$ $= 253 - 19 \times 5$ $= 158$</p>	<p>1/2</p> <p>1</p> <p>1/2</p>
	OR	
	<p>$7a_7 = 11a_{11} \implies 7(a + 6d) = 11(a + 10d)$ $\implies a + 17d = 0 \therefore a_{18} = 0$</p>	<p>1</p> <p>1</p>
9	<p>$X = \frac{6-6}{5} = 0$ $Y = \frac{-10+15}{5} = 1$</p>	<p>1</p> <p>1</p>
10	<p>Probability of either a red card or a queen $= \frac{26+2}{52} = \frac{28}{52}$ P(neither red card nor a queen) = $1 - \frac{28}{52}$ $= \frac{24}{52}$ or $\frac{7}{13}$</p>	<p>1</p> <p>1</p>
	11	<p>Total number of outcomes = 36 Favourable outcomes are (1,2), (2,1), (1,3), (3,1), (1,5), (5,1) i.e. 6 Required probability = $\frac{6}{36}$ or $\frac{1}{6}$</p>
12	<p>For infinitely many solutions $\frac{p-3}{p} = \frac{3}{p} = \frac{-p}{-12}$ $\implies p^2 - 3p = 3p$ or $12 \times 3 = p^2$ $\implies p^2 - 6p = 0$ or $p = \pm 6$ $p = 0, 6$ $\implies p = 6$</p>	<p>1/2</p> <p>1</p>
	SECTION: C	
	13	<p>By Euclid's Division lemma $726 = 275 \times 2 + 176$ $275 = 176 \times 1 + 99$ $176 = 99 \times 1 + 77$ $99 = 77 \times 1 + 22$ $77 = 22 \times 3 + 11$ $22 = 11 \times 2 + 0$ HCF = 11</p>

14	$5\sqrt{5}x^2+30x+8\sqrt{5}$ $= 5\sqrt{5}x^2+20x+10x+8\sqrt{5}$ $= 5x(\sqrt{5}x + 4)+2\sqrt{5}(\sqrt{5}x + 4)$ $= (\sqrt{5}x + 4) (5x+2\sqrt{5})$ <p>Zeroes are $\frac{-4}{\sqrt{5}} = \frac{-4\sqrt{5}}{5}$ and $\frac{-2\sqrt{5}}{5}$</p>	<p>1</p> <p>1</p> <p>1</p>
15	<p>Let the speed of car at A be x km/h And the speed of car at B be y km/h</p> <p>Case 1 $8x-8y = 80$ $x-y = 10$</p> <p>Case 2 $\frac{4}{3}x + \frac{4}{3}y = 80$ $x+y = 60$</p> <p>on solving $x= 35$ and $y = 25$ Hence, speed of cars at A and B are 35 km/h and 25 km/h respectively.</p>	<p>1</p> <p>1</p> <p>1</p>
16	<div style="text-align: center;">  </div> <p>Diagonals of parallelogram bisect each other</p> <p>\Rightarrow midpoint of AC = midpoint of BD</p> <p>$\Rightarrow \left(\frac{1+k}{2}, \frac{-2+2}{2}\right) = \left(\frac{-4+k}{2}, \frac{-3+3}{2}\right)$</p> <p>$\Rightarrow \frac{1+k}{2} = \frac{-2}{2}$</p> <p>$\Rightarrow k = -3$</p> <p style="text-align: center;">OR</p> <p>For collinearity of the points, area of the triangle formed by given Points is zero.</p> <p>$\Rightarrow \frac{1}{2} \{(3k - 1)(k - 7 + k + 2) + k(-k - 2 - k + 2) + (k - 1)(k - 2 - k + 7)\} = 0$</p> <p>$\Rightarrow \{(3k - 1)(2k - 5) - 2k^2 + 5k - 5\} = 0$</p> <p>$\Rightarrow 4k^2 - 12k = 0$</p> <p>$\Rightarrow k = 0, 3$</p>	<p>1^{1/2}</p> <p>1/2</p> <p>1</p> <p>1</p> <p>1</p>
17	<p>LHS = $\cot\theta - \tan\theta$</p> <p>= $\frac{\cos\theta}{\sin\theta} - \frac{\sin\theta}{\cos\theta}$</p> <p>= $\frac{\cos^2\theta - \sin^2\theta}{\sin\theta \cos\theta}$</p> <p>= $\frac{\sin\theta \cos\theta}{\cos^2\theta - 1 + \cos^2\theta}$</p> <p>= $\frac{\sin\theta \cos\theta}{2\cos^2\theta - 1} = \text{RHS}$</p> <p style="text-align: center;">OR</p>	<p>1</p> <p>1/2</p> <p>1</p> <p>1/2</p>

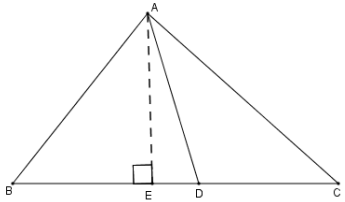
	$\begin{aligned} \text{LHS} &= \sin\theta(1 + \tan\theta) + \cos\theta(1 + \cot\theta) \\ &= \sin\theta \left(1 + \frac{\sin\theta}{\cos\theta}\right) + \cos\theta \left(1 + \frac{\cos\theta}{\sin\theta}\right) \\ &= \sin\theta \left(\frac{\cos\theta + \sin\theta}{\cos\theta}\right) + \cos\theta \left(\frac{\sin\theta + \cos\theta}{\sin\theta}\right) \\ &= (\cos\theta + \sin\theta) \left(\frac{\sin^2\theta + \cos^2\theta}{\cos\theta\sin\theta}\right) \\ &= \frac{\cos\theta + \sin\theta}{\cos\theta\sin\theta} = \text{cosec}\theta + \text{sec}\theta = \text{RHS} \end{aligned}$	<p>1</p> <p>1</p> <p>1</p>
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SECTION: E

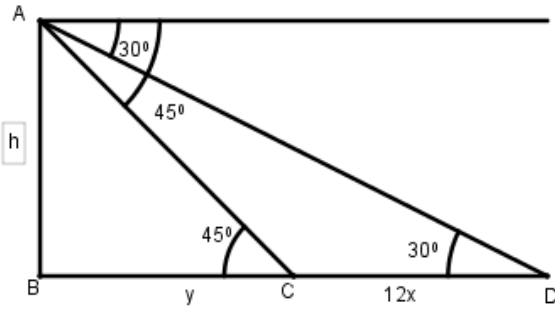
18	 <p> $\angle APB = 90^\circ$ (angle in semi-circle) $\angle ODB = 90^\circ$ (radius is perpendicular to tangent) $\triangle ABP \sim \triangle OBD$ $\Rightarrow \frac{AB}{OB} = \frac{AP}{OD}$ $\Rightarrow \frac{26}{13} = \frac{AP}{8}$ $\Rightarrow AP = 16\text{cm}$ </p>	<p>1</p> <p>1/2</p> <p>1</p>
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19	 <p> $\angle 1 = \angle 2$ $\Rightarrow PT = PS \dots\dots\dots(i)$ $\triangle NSQ \cong \triangle MTR$ $\Rightarrow \angle NQS = \angle MRT$ $\Rightarrow \angle PQR = \angle PRQ$ $\Rightarrow PR = PQ \dots\dots\dots(ii)$ From (i) and (ii) $\frac{PT}{PR} = \frac{PS}{PQ}$ Also, $\angle TPS = \angle RPQ$ (common) $\Rightarrow \triangle PTS \sim \triangle PRQ$ </p>	<p>1</p> <p>1</p> <p>1</p>
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OR

	<div style="text-align: center;">  </div> <p>AD is median, So $BD=DC$.</p> $\left. \begin{aligned} AB^2 &= AE^2 + BE^2 \\ AC^2 &= AE^2 + EC^2 \end{aligned} \right\}$ <p>Adding both,</p> $\begin{aligned} AB^2 + AC^2 &= 2AE^2 + BE^2 + CE^2 \\ &= 2(AD^2 - ED^2) + (BD - ED)^2 + (DC + ED)^2 \\ &= 2AD^2 - 2ED^2 + BD^2 + ED^2 - 2BD \cdot ED + DC^2 + ED^2 + 2CD \cdot ED \\ &= 2AD^2 + BD^2 + CD^2 \\ &= 2(AD^2 + BD^2) \end{aligned}$	<p>1</p> <p>1</p> <p>1</p>
20	<p>$r = 42\text{cm}$</p> $\frac{2\pi r\theta}{360^\circ} = 44$ $\theta = \frac{44 \times 360 \times 7}{2 \times 22 \times 42} = 60^\circ$ <p>Area of minor segment = area of sector – area of corresponding triangle</p> $\begin{aligned} &= \frac{\pi r^2 \theta}{360^\circ} - \frac{\sqrt{3}}{4} r^2 \\ &= r^2 \left[\frac{22}{7} \times \frac{60}{360} - \frac{\sqrt{3}}{4} \right] \\ &= 42 \times 42 \left[\frac{11}{21} - \frac{\sqrt{3}}{4} \right] \\ &= 42 \times 42 \times \left[\frac{44 - 21\sqrt{3}}{84} \right] \\ &= 21 (44 - 21\sqrt{3}) \text{ cm}^2 \end{aligned}$	<p>1</p> <p>1/2</p> <p>1/2</p> <p>1</p>
21	<p>Volume of water flowing through pipe in 1 hour</p> $\begin{aligned} &= \frac{22}{7} \times 15 \times 1000 \times \frac{7}{100} \times \frac{7}{100} \\ &= 231 \text{ m}^3 \end{aligned}$ <p>Volume of rectangular tank = $50 \times 44 \times \frac{21}{100}$</p> $= 22 \times 21 \text{ m}^3$ <p>Time taken to flow 231 m^3 of water = 1 hours</p> <p>\therefore Time taken to flow $22 \times 21 \text{ m}^3$ of water = $\frac{1}{231} \times 22 \times 21 = 2$ hours</p> <p style="text-align: center;">OR</p> <p>Number of balls = $\frac{\text{Volume of solid sphere}}{\text{Volume of 1 spherical ball}}$</p> $\begin{aligned} &= \frac{\frac{4}{3} \times \pi \times 3 \times 3 \times 3}{\frac{4}{3} \times \pi \times 0.3 \times 0.3 \times 0.3} \\ &= 1000 \end{aligned}$	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>

22	<p>200-250 is the modal class</p> $\text{Mode} = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$ $= 200 + \frac{12-5}{24-5-2} \times 50$ $= 200 + 20.59 = \text{Rs. } 220.59$	<p>1</p> <p>1</p> <p>1/2</p> <p>1/2</p>
Section D		
23	<p>Let the usual speed of the train be x km/h</p> $\frac{300}{x} - \frac{300}{x+5} = 2$ $\Rightarrow x^2 + 5x - 750 = 0$ $\Rightarrow (x+30)(x-25) = 0$ $\Rightarrow x = -30, 25$ <p>\therefore Usual Speed of the train = 25 km/h</p> <p style="text-align: center;">OR</p> $\frac{1}{(a+b+x)} - \frac{1}{x} = \frac{1}{a} + \frac{1}{b}$ $\Rightarrow \frac{x-a-b-x}{x(a+b+x)} = \frac{b+a}{ab}$ $\Rightarrow -ab = x^2 + (a+b)x$ $\Rightarrow x^2 + ax + bx + ab = 0$ $\Rightarrow (x+a)(x+b) = 0$ $\Rightarrow x = -a, -b$	<p>2</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>
24	<p>n=50, $a_3 = 12$ and $a_{50} = 106$</p> $\left. \begin{aligned} a+2d &= 12 \\ a+49d &= 106 \end{aligned} \right\}$ <p>on solving, $d=2$ and $a= 8$</p> $a_{29} = a+28d$ $= 8+28 \times 2 = 64$	<p>1/2</p> <p>1</p> <p>1</p> <p>1/2</p> <p>1</p>
25	<p>Correct given, To prove, figure and construction</p> <p>Correct proof</p>	<p>1/2</p> <p>× 4</p> <p>= 2</p> <p>2</p>
26	<p>Correct construction of ΔABC</p> <p>Correct construction of similar triangle</p>	<p>1</p> <p>3</p>



Correct figure

Let the speed of car be x m/ minutes

In $\triangle ABC$,

$$\frac{h}{y} = \tan 45^\circ$$

$$\Rightarrow h = y$$

In $\triangle ABD$,

$$\frac{h}{y+12x} = \tan 30^\circ$$

$$\Rightarrow h\sqrt{3} = y+12x$$

$$y\sqrt{3} - y = 12x$$

$$y = \frac{12x}{\sqrt{3}-1} = \frac{12x(\sqrt{3}+1)}{2}$$

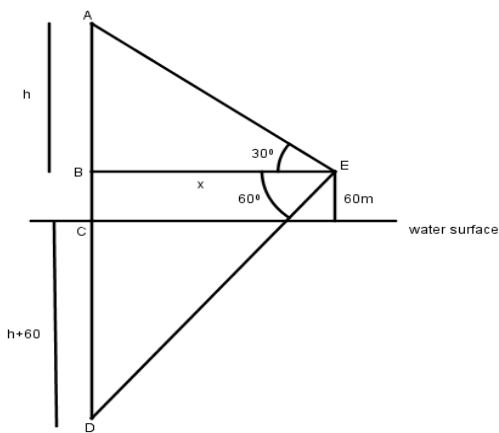
$$\Rightarrow y = 6x(\sqrt{3} + 1)$$

Time taken from C to B = $6(\sqrt{3} + 1)$ minutes

1
1

1/2
1
1/2

OR



Correct figure

In $\triangle ABE$,

$$\frac{h}{x} = \tan 30^\circ$$

$$\Rightarrow x = h\sqrt{3}$$

1
1

1/2
1
1/2

In $\triangle BDE$,

$$\frac{h+60+60}{x} = \tan 60^\circ$$

$$h+120 = x\sqrt{3}$$

$$h+120 = h\sqrt{3} \times \sqrt{3}$$

$$2h = 120$$

$$h = 60$$

\therefore height of cloud from surface of water = $(60 + 60)m = 120m$

28

Class Interval	Frequency	cf
0-100	2	2
100-200	5	7
200-300	x	7+x
300-400	12	19+x
400-500	17	36+x
500-600	20	56+x
600-700	y	56+x+y
700-800	9	65+x+y
800-900	7	72+x+y
900-1000	4	76+x+y

$$N=100 \Rightarrow 76+x+y=100$$

$$\Rightarrow x+y = 24 \dots\dots\dots(i)$$

$$\text{Median} = 525 \Rightarrow 500 - 600 \text{ is median class}$$

60-80 is the median class

$$\text{Median} = l + \frac{\frac{n}{2} - cf}{f} \times h$$

$$\Rightarrow 500 + \left(\frac{50 - 36 - x}{20} \right) \times 100 = 525$$

$$\Rightarrow (14 - x) \times 5 = 25$$

$$\Rightarrow x = 9$$

$$\Rightarrow \text{from (1), } y = 5.96 \quad \left. \vphantom{\begin{matrix} \Rightarrow \\ \Rightarrow \\ \Rightarrow \end{matrix}} \right\}$$

OR

1

1/2

1/2

1

1

	Marks	Number of students	cf		
	0-10	5	5		
	10-20	3	8		
	20-30	4	12		
	30-40	3	15		
	40-50	3	18		
	50-60	4	22		
	60-70	7	29		
	70-80	9	38		
	80-90	7	45		
	90-100	8	53		
	Correct table Drawing correct Ogive Median=64				1 2 1
29	$r_1 = 15\text{cm} , r_2 = 5\text{cm}$ $h = 24\text{cm}$ $l = \sqrt{h^2 + (r_1 - r_2)^2}$ $= \sqrt{24^2 + 10^2} = 26\text{cm}$ Curved surface area of bucket $= \pi(r_1 + r_2)l$ $= \frac{22}{7} \times (15 + 5) \times 26$ $= \frac{22 \times 20 \times 26}{7}$ $= \frac{11440}{7} \text{cm}^2 \text{ or } 1634.3\text{cm}^2$				1 1 1 1
30	1. $\text{Sec}\theta + \tan\theta = p$ $\frac{1}{\cos\theta} + \frac{\sin\theta}{\cos\theta} = p$ $1 + \sin\theta = p\cos\theta$ $= p\sqrt{1 - \sin^2\theta}$ $(1 + \sin\theta)^2 = p^2(1 - \sin^2\theta)$ $1 + \sin^2\theta + 2\sin\theta = p^2 - p^2\sin^2\theta$ $(1 + p^2)\sin^2\theta + 2\sin\theta + (1 - p^2) = 0$ $D = 4 - 4(1+p^2)(1-p^2)$ $= 4 - 4(1-p^4) = 4p^4$ $\text{Sin}\theta = \frac{-2 \pm \sqrt{4p^4}}{2(1+p^2)} = \frac{-1 \pm p^2}{(1+p^2)}$ $= \frac{p^2-1}{p^2+1}, -1$ $\therefore \text{Cosec}\theta = \frac{p^2+1}{p^2-1}, -1$				1 1 1/2 1