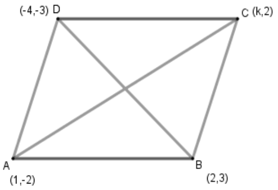
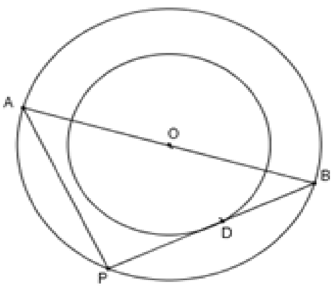
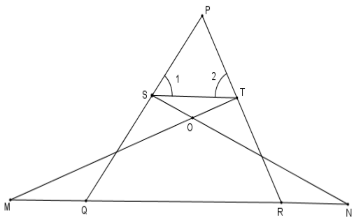
Class: X
Mathematics
Marking Scheme 2018-19

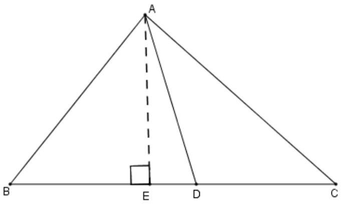
Time allowed: 3hrs **Maximum Marks: 80**

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	**½** **½**
	OR	
	For roots to be real and equal, $b^2 - 4ac = 0$ $\Rightarrow (5k)^2 - 4 \times 1 \times 16 = 0$ $k = \pm\frac{8}{5}$	**½** **½**
3	$cot^2\theta - \frac{1}{\sin^2\theta} \cdot = cot^2\theta - \text{cosec}^2\theta$ = -1	**1** **½** **½**
	OR	
	$\sin\theta = \cos\theta \quad \theta = 45^\circ$ $\therefore 2\tan\theta + \cos^2\theta = 2 + \frac{1}{2} = \frac{5}{2}$	
4	$a_1 = 3, a_3 = 7$ $S_3 = \frac{3}{2}(3 + 7) = 15$	**½** **½**
5	$\frac{AD}{DB} = \frac{AE}{EC} \qquad DE \parallel BC$ $\Rightarrow \angle ADE = \angle ABC = 48^0$	**½** **½**
6	4 places	**1**
	SECTION B	
7	HCF × LCM = Product of two numbers $9 \times 360 = 45 \times 2^{nd}$ number 2^{nd} number = 72	**1** **1**
	OR	

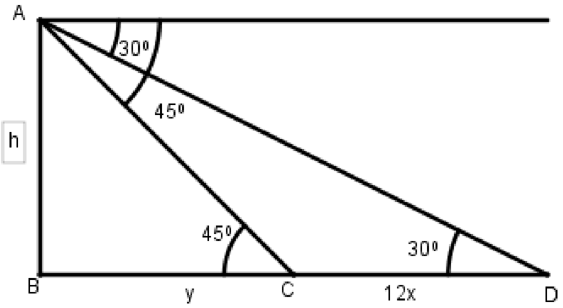
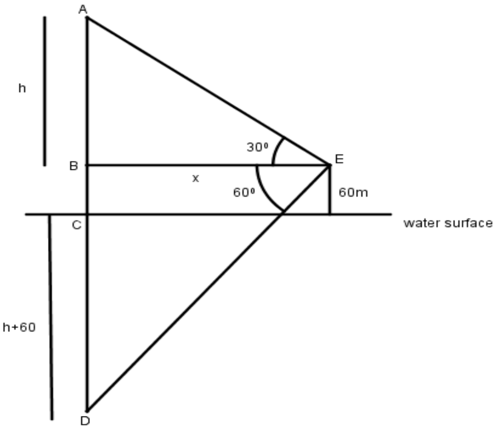
	Let us assume, to the contrary that $7-\sqrt{5}$ is irrational $7-\sqrt{5}=\frac{p}{q}$, Where p & q are co-prime and q ≠ 0 $=\sqrt{5}=\frac{7q-p}{q}$ $\frac{7q-p}{q}$ is rational = $\sqrt{5}$ is rational which is a contradiction Hence $7-\sqrt{5}$ is irrational	**1** **1**
8	20th term from the end = $l-(n-1)d$ = 253-19 ×5 = 158	$^1/_2$ **1** $^1/_2$
	OR	
	$7a_7 = 11a_{11} \Rightarrow 7(a+6d)=11(a+10d)$ $\Rightarrow a+17d=0 \;\therefore\; a_{18}=0$	**1** **1**
9	$X=\frac{6-6}{5}=0$ $Y=\frac{-10+15}{5}=1$	**1** **1**
10	Probability of either a red card or a queen $=\frac{\mathbf{26+2}}{\mathbf{52}}=\frac{\mathbf{28}}{\mathbf{52}}$ P(neither red car nor a queen) = $1-\frac{28}{52}$ $=\frac{24}{52}\ or\ \frac{7}{13}$	**1** **1**
11	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 $\frac{1}{6}$	**1** **1**
12	For infinitely many solutions $\frac{p-3}{p}=\frac{3}{p}=\frac{-p}{-12}$ $\Rightarrow p^2-3p=3p$ or $12\times3=p^2$ $\Rightarrow p^2-6p=0$ or $p=\pm6$ p = 0,6 $\Rightarrow$ p = 6	$^1/_2$ **1**
	SECTION: C	
13	By Euclid's Division lemma 726 = 275 ×2+176 275 = 176 ×1 + 99 176 = 99 ×1+77 99 = 77 × 1+22 77=22 ×3 + 11 22 = 11 × 2+0 HCF = 11	**6 × $^1/_2$ = 3**

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

	LHS $= \sin\theta(1 + \tan\theta) + \cos\theta(1 + \cot\theta)$ $= \sin\theta\left(1 + \frac{\sin\theta}{\cos\theta}\right) + \cos\theta\left(1 + \frac{\cos\theta}{\sin\theta}\right)$ $= \sin\theta\left(\frac{\cos\theta+\sin\theta}{\cos\theta}\right) + \cos\theta\left(\frac{\sin\theta+\cos\theta}{\sin\theta}\right)$ $= (cos\theta + sin\theta)\ (\frac{\sin^2\theta+\cos^2\theta}{\cos\theta\sin\theta})$ $= \frac{\cos\theta+\sin\theta}{\cos\theta\sin\theta} = cosec\theta + sec\theta$ = RHS	**1** **1** **1**
	SECTION: E	
18	 $\angle$APB = 90^0 (angle in semi-circle) $\angle$ODB = 90^0 (radius is perpendicular to tangent) $\Delta ABP \sim \Delta OBD$ $\Rightarrow \frac{AB}{OB} = \frac{AP}{OD}$ $\Rightarrow \frac{26}{13} = \frac{AP}{8}$ $\Rightarrow$ AP = 16cm	**1** **$^1/_2$** **1**
19	 $\angle 1 = \angle 2$ $\Rightarrow$ PT=PS ……………………………..………..(i) ΔNSQ ≅ ΔMTR $\Rightarrow \angle$NQS=$\angle$MRT $\Rightarrow \angle$PQR=$\angle$PRQ $\Rightarrow$ PR=PQ ………………………..……………..(ii) From (i) and (ii) $\frac{PT}{PR} = \frac{PS}{PQ}$ Also, $\angle$TPS = $\angle$RPQ (common) $\Rightarrow \Delta$PTS~ΔPRQ	**1** **1** **1**
	OR	

	 AD is median, So BD=DC. $\left.\begin{array}{l} AB^2= AE^2+BE^2 \\ AC^2 = AE^2+EC^2 \end{array}\right\}$ Adding both, $AB^2+AC^2 = 2AE^2+BE^2+CE^2$ $= 2(AD^2-ED^2)+(BD-ED)^2+(DC+ED)^2$ $= 2AD^2-2ED^2+BD^2+ED^2-2BD.ED+DC^2+ED^2+2CD.ED$ $= 2AD^2+BD^2+CD^2$ $= 2(AD^2+ BD^2)$	**1** **1** **1**
20	r = 42cm $\frac{2\pi r\theta}{360^\circ} = 44$ $\theta = \frac{44\times360\times7}{2\times22\times42} = 60^0$ Area of minor segment = area of sector – area of corresponding triangle $= \frac{\pi r^2\theta}{360^\circ} - \frac{\sqrt{3}}{4} r^2$ $= r^2[\frac{22}{7} \times \frac{60}{360} - \frac{\sqrt{3}}{4}]$ $= 42\times 42 [\frac{11}{21} - \frac{\sqrt{3}}{4}]$ $= 42\times 42 \times[\frac{44-21\sqrt{3}}{84}]$ $= 21 (44 - 21\sqrt{3}) cm^2$	**1** $\mathbf{^1/_2}$ $\mathbf{^1/_2}$ **1**
21	Volume of water flowing through pipe in 1 hour $= \frac{22}{7} \times 15 \times 1000 \times \frac{7}{100} \times \frac{7}{100}$ $= 231 m^3$ Volume of rectangular tank $= 50 \times 44 \times \frac{21}{100}$ $= 22 \times 21 m^3$ Time taken to flow 231 m^3 of water = 1 hours ∴ Time taken to flow $22 \times 21 m^3$ of water $= \frac{1}{231} \times 22 \times 21$ = 2 hours	**1** **1** **1**
	OR	
	Number of balls $= \frac{\text{Volume of solid sphere}}{\text{Volume of 1 spherical ball}}$ $= \frac{\frac{4}{3}\times\pi\times3\times3\times3}{\frac{4}{3}\times\pi\times0.3\times0.3\times0.3}$ = 1000	**1** **1** **1**

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

27	 Correct figure Let the speed of car be x m/ minutes In ΔABC, $\frac{h}{y} = \tan 45^0$ $\Rightarrow$ h = y In ΔABD, $\frac{h}{y+12x} = \tan 30^0$ $\Rightarrow$ $h\sqrt{3} = y+12x$ $y\sqrt{3} - y = 12x$ $y = \frac{12x}{\sqrt{3}-1} = \frac{12x(\sqrt{3}+1)}{2}$ $\Rightarrow$ $y = 6x(\sqrt{3}+1)$ Time taken from C to B = $6(\sqrt{3}+1)$ minutes	1 1 $^1/_2$ 1 $^1/_2$
	OR	
	 Correct figure In ΔABE, $\frac{h}{x} = \tan 30^0$ $\Rightarrow$ $x = h\sqrt{3}$	1 1 $^1/_2$ 1 $^1/_2$

In ΔBDE,

$$\frac{\mathrm{h+60+60}}{\mathrm{x}} = \tan 60^0$$

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

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

$$2h = 120$$

$$h = 60$$

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

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

1

N=100 ⟹ 76+x+y =100 **$^1/_2$**
⟹ x+y = 24……………………………………………(i)

Median = 525 ⟹ 500 – 600 is median class **$^1/_2$**

60-80 is the median class 1

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

$$\Longrightarrow 500 + \left(\frac{50-36-\mathrm{x}}{20}\right) \times 100 = 525$$ 1

$$\left.\begin{aligned} &\Longrightarrow (14 - x) \times 5 = 25 \\ &\Longrightarrow x = 9 \\ &\Longrightarrow \text{from (1)},\ y = 5.96 \end{aligned}\right\}$$

OR

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<tr><th>Marks</th><th>Number of students</th><th>cf</th></tr>
<tr><td>0-10</td><td>5</td><td>5</td></tr>
<tr><td>10-20</td><td>3</td><td>8</td></tr>
<tr><td>20-30</td><td>4</td><td>12</td></tr>
<tr><td>30-40</td><td>3</td><td>15</td></tr>
<tr><td>40-50</td><td>3</td><td>18</td></tr>
<tr><td>50-60</td><td>4</td><td>22</td></tr>
<tr><td>60-70</td><td>7</td><td>29</td></tr>
<tr><td>70-80</td><td>9</td><td>38</td></tr>
<tr><td>80-90</td><td>7</td><td>45</td></tr>
<tr><td>90-100</td><td>8</td><td>53</td></tr>
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Drawing correct Ogive
Median=64
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$r_1 = 15$cm , $r_2 = 5$cm
h = 24cm
$l = \sqrt{h^2 + (r_1 - r_2)^2}$
$= \sqrt{24^2 + 10^2} = 26$cm
Curved surface area of bucket = $\pi(r_1 + r_{2)}l$
$= \frac{22}{7} \times (15 + 5) \times 26$
$= \frac{22\times20\times26}{7}$
$= \frac{11440}{7}$ cm^2 or 1634.3cm^2
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1. $Sec\theta + tan\theta = p$
$\frac{1}{\cos\theta} + \frac{\sin\theta}{\cos\theta} = \text{p}$
$1+\sin\theta = \text{p}\cos\theta$
$= \text{p}\sqrt{1-\sin^2\theta}$
$(1+\sin\theta)^2 = \text{p}^2(1-\sin^2\theta)$
$1 + sin^2\theta + 2sin\theta = \text{p}^2 - \text{p}^2\sin^2\theta$
$(1 + \text{p}^2)\, sin^2\theta + 2sin\theta + (1 - \text{p}^2) = 0$
$D = 4 - 4(1+\text{p}^2)(1-\text{p}^2)$
$= 4 - 4(1-\text{p}^4) = 4\text{p}^4$
$\text{Sin}\theta = \frac{-2\pm\sqrt{4\text{p}^4}}{2(1+\text{p}^2)} = \frac{-1\pm\text{p}^2}{(1+\text{p}^2)}$
$= \frac{\text{p}^2-1}{\text{p}^2+1}$, - 1
$\therefore Cosec\,\theta = \frac{p^2+1}{p^2-1}$, -1
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½
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