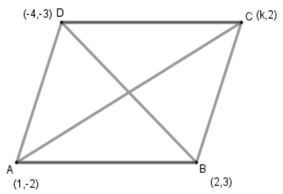
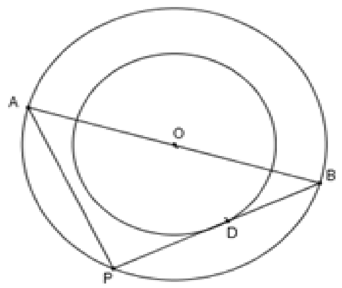
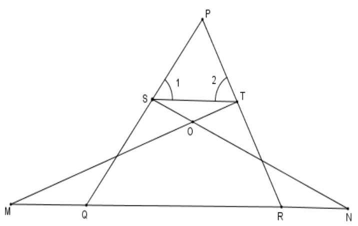
Class: X
Mathematics
Marking Scheme 2018-19

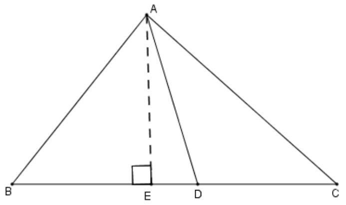
Time allowed: 3hrs **Maximum Marks: 80**

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

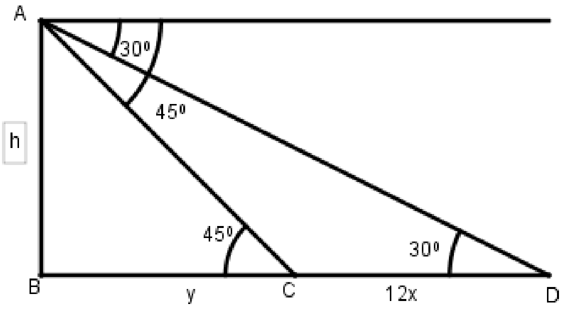
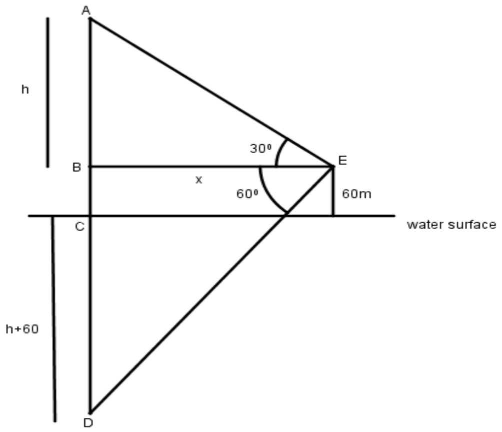
	Let us assume, to the contrary that $7-\sqrt{5}$ is irrational $7-\sqrt{5}=\frac{p}{q}$, Where p & q are co-prime and q ≠ 0 $=\sqrt{5}=\frac{7q-p}{q}$ $\frac{7q-p}{q}$ is rational = $\sqrt{5}$ is rational which is a contradiction Hence $7-\sqrt{5}$ is irrational	1 1
8	20^{th} term from the end = $l-(n-1)d$ = 253-19 ×5 = 158 **OR** $7a_7 = 11a_{11} \Rightarrow 7(a+6d) = 11(a+10d)$ $\Rightarrow a + 17d = 0 \therefore a_{18} = 0$	$^1/_2$ 1 $^1/_2$ 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 $= \frac{26+2}{52} = \frac{28}{52}$ 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 $p = \pm 6$ 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 ⇨ midpoint of AC = midpoint of BD ⇨ $\left(\frac{1+k}{2}, \frac{-2+2}{2}\right) = \left(\frac{-4+2}{2}, \frac{-3+3}{2}\right)$ ⇨ $\frac{1+k}{2} = \frac{-2}{2}$ ⇨ $k = -3$	**$1\frac{1}{2}$** **$\frac{1}{2}$** 1
	OR	
	For collinearity of the points, area of the triangle formed by given Points is zero. ⇨ $\frac{1}{2}\{(3k-1)(k-7+k+2) + k(-k-2-k+2) + (k-1)(k-2-k+7)\} = 0$ ⇨ $\{(3k-1)(2k-5) - 2k^2 + 5k - 5\} = 0$ ⇨ $4k^2-12k = 0$ ⇨ $k = 0, 3$	**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 $= \sin\theta(1+\tan\theta)+\cos\theta(1+\cot\theta)$ $= \sin\theta\left(1+\frac{\sin\theta}{\cos\theta}\right)+\cos\theta\left(1+\frac{\cos\theta}{\sin\theta}\right)$ $= \sin\theta\left(\frac{\cos\theta+\sin\theta}{\cos\theta}\right)+\cos\theta\left(\frac{\sin\theta+\cos\theta}{\sin\theta}\right)$ $= (\cos\theta+\sin\theta)\left(\frac{\sin^2\theta+\cos^2\theta}{\cos\theta\sin\theta}\right)$ $= \frac{\cos\theta+\sin\theta}{\cos\theta\sin\theta} = cosec\theta + sec\theta$ = 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) $\Delta NSQ \cong \Delta MTR$ $\Rightarrow \angle NQS = \angle MRT$ $\Rightarrow \angle PQR = \angle PRQ$ $\Rightarrow$ PR=PQ ……………………….……………….(ii) From (i) and (ii) $\frac{PT}{PR} = \frac{PS}{PQ}$ Also, $\angle TPS = \angle RPQ$ (common) $\Rightarrow \Delta PTS \sim \Delta PRQ$	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	$r = 42cm$ $\frac{2\pi r\theta}{360°} = 44$ $\theta = \frac{44\times360\times7}{2\times22\times42} = 60^0$ Area of minor segment = area of sector – area of corresponding triangle $= \frac{\pi r^2\theta}{360°} - \frac{\sqrt{3}}{4}r^2$ $= r^2[\frac{22}{7}\times\frac{60}{360}-\frac{\sqrt{3}}{4}]$ $= 42\times 42\,[\frac{11}{21}-\frac{\sqrt{3}}{4}]$ $= 42\times 42 \times[\frac{44-21\sqrt{3}}{84}]$ $= 21\,(44-21\sqrt{3})\ cm^2$	1 $^1/_2$ $^1/_2$ 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 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 = Rs. 220.59	**1** **1** **$^1/_2$** **$^1/_2$**
	Section D	
23	Let the usual speed of the train be x km/h $\frac{300}{x} - \frac{300}{x+5} = 2$ $\Rightarrow x^2+5x-750 = 0$ $\Rightarrow (x+30)(x-25) = 0$ $\Rightarrow x = -30, 25$ ∴ Usual Speed of the train = 25 km/h	**2** **1** **1**
	OR	
	$\frac{1}{(a+b+x)} - \frac{1}{x} = \frac{1}{a} + \frac{1}{b}$ $\Rightarrow \frac{x-a-b-x}{x(a+b+x)} = \frac{b+a}{ab}$ $\Rightarrow -ab = x^2+(a+b)x$ $\Rightarrow x^2+ax+bx+ab = 0$ $\Rightarrow (x+a)(x+b) = 0$ $\Rightarrow x= -a,-b$	**1** **1** **1** **1**
24	n=50, a_3 =12 and a_{50} = 106 a+2d = 12 a+49d = 106 on solving, d=2 and a= 8 a_{29}= a+28d = 8+28×2 = 64	**$^1/_2$** **1** **1** **$^1/_2$** 1
25	Correct given, To prove, figure and construction Correct proof	**$^1/_2$ × 4 = 2** **2**
26	Correct construction of ΔABC Correct construction of similar triangle	**1** **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,

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

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

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

$2h = 120$

$h = 60$

$\therefore$ *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

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

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

⟹ $(14 - x) \times 5 = 25$

⟹ x = 9

⟹ from (1), y = 5.96

OR

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 **1**
Drawing correct Ogive **2**
Median=64 **1**

29

$r_1 = 15cm$, $r_2 = 5cm$

h = 24cm

$l = \sqrt{h^2 + (r_1 - r_2)^2}$ **1**

$= \sqrt{24^2 + 10^2} = 26cm$

Curved surface area of bucket = $\pi(r_1 + r_2)l$ **1**

$= \frac{22}{7} \times (15 + 5) \times 26$

$= \frac{22 \times 20 \times 26}{7}$ **1**

$= \frac{11440}{7} cm^2$ or $1634.3cm^2$ **1**

30

1. $Sec\theta + tan\theta = p$

$\frac{1}{\cos\theta} + \frac{\sin\theta}{\cos\theta} = p$

$1+\sin\theta = p\cos\theta$

$= p\sqrt{1 - \sin^2\theta}$

$(1+\sin\theta)^2 = p^2(1 - \sin^2\theta)$

$1 + sin^2\theta + 2sin\theta = p^2 - p^2\sin^2\theta$ **1**

$(1 + p^2)\, sin^2\theta + 2sin\theta + (1 - p^2) = 0$

$D = 4 - 4(1+p^2)(1-p^2)$

$= 4 - 4(1-p^4) = 4p^4$ **1**

$\sin\theta = \frac{-2\pm\sqrt{4p^4}}{2(1+p^2)} = \frac{-1\pm p^2}{(1+p^2)}$ **$\frac{1}{2}$**

$= \frac{p^2-1}{p^2+1}$, - 1

$\therefore Cosec\,\theta = \frac{p^2+1}{p^2-1}, -1$ **1**