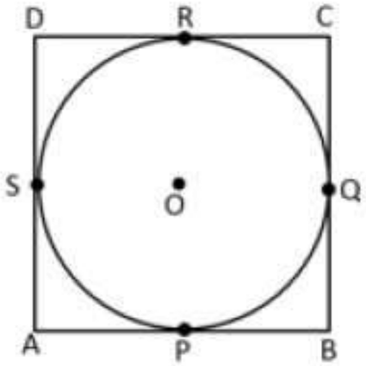
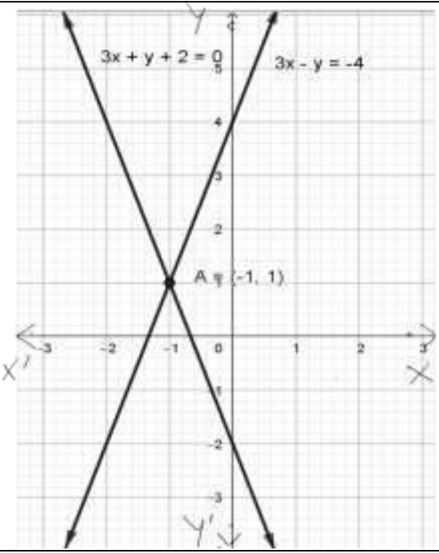
ANSWER KEY

Q.No	Value Points	Marks allocated to each part	Total Marks
	SECTION A		
1.	(C) $6+\sqrt{5}$		1
2.	(C) $\frac{5\sqrt{5}}{2}$		1
3.	(a)		1
4.	(A) $40°$		1
5.	(D) 18 units		1
6.	(D) 6		1
7.	(B) $84\ \text{cm}^2$		1
8.	(D) $\frac{7}{9}$		1
9.	(D) $\frac{34}{3}$		1
10.	(A) $2\times3^2\times5^3\times p^2$		1
11.	(c)		1
12.	(D) $\frac{1}{2}(x-2)(x+4)$		1
13.	(C) $(60)^{\circ}$		1
14.	(C) 10		1
15.	(D) $\frac{7}{16}$		1
16.	(B) $\frac{1}{2}$ ab		1
17.	(B) 7		1
18.	(A) $\frac{9}{\sqrt{2}}$ cm		1

19.	(C) Assertion (A) is true, but Reason (R) is false.		1
20.	(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).		1
	SECTION B This section comprises Very Short Answer (VSA) type questions of 2 marks each.		
21.	(a) $a_9 = 6a_2$ or $a + 8d = 6(a + d)$		
	$8d - 6d = 6a - a$ or $2d = 5a$ ---------- (1)	0.5	
	$a + 4d = 22$ ---------------- (2)	0.5	
	From (1) and (2) , $a = 2$, $d = 5$	0.5	
	AP is 2 , 7 , 12, … … … … … … … ..	0.5	2
	OR		
	(b) $d = -8$		
	$37 = 213 + (n - 1)(-8)$	0.5	
	$n - 1 = (213 - 37)/8$ or $n = 23$	0.5	
	Middle term = $(23 + 1)/2 = 12\text{th}$	0.5	
	$a_{12} = 213 + 11(-8) = 125$	0.5	2
22.	$\cos(15° + x + y) = \frac{1}{2} = \cos 60°$	0.5	
	$(15 + x + y) = 60$ *or* $x + y = 45$	0.5	
	$\tan(25° + x) = \sqrt{3} = \tan 60°$ $x = 60 - 25$ or $x = 35°$	0.5	
	$y = 10°$	0.5	2
23.	As XZ ∥ BC Therefore $\frac{AX}{XB} = \frac{3}{2} = \frac{AZ}{ZC}$ ------- (i)	0.5	
	$\Delta AXY \sim \Delta ABM$	0.5	
	$\Rightarrow \frac{AX}{AB} = \frac{XY}{BM}$ *or* $\frac{3}{5} = \frac{XY}{3}$	0.5	
	$\Rightarrow XY = \frac{9}{5}$ or 1·8 cm	0.5	2
24	(a)Area of sector $= \frac{90}{360} \times 3.14 \times 20 \times 20 = 314 cm^2$	1	
	Area of right Δ = $1/2 \times 20 \times 20 = 200\ cm^2$	0.5	
	Area of minor segment $= (314 - 200) = 114 cm^2$	0.5	2
	OR		
	(b)Area of outer sector $= \frac{300}{360} \times \frac{22}{7} \times 42 \times 42 = 4620\ cm^2$	1	
	Area of inner sector $= \frac{300}{360} \times \frac{22}{7} \times 21 \times 21 = 1155\ cm^2$	0.5	

	Area of shaded region $= 4620 - 1155 = 3465\ cm^2$	0.5	2
25.		Fig 0.5	
	As the length of tangents from an external point to a circle are equal Thus, $AP = AS$ $BP = BQ$ $DR = DS$ $CR = CQ$	0.5	
	Adding the above equations, $AB + CD = BC + AD$ $As\ AB = CD\ \&\ BC = AD$ (opp. sides of rectangle)	0.5	
	$\Rightarrow AB = AD$ Therefore , ABCD is a square.	0.5	2
	SECTION C This section comprises Short Answer (SA) type questions of 3 marks each.		
26.	Correct figure, given, to prove	1.5	
	Correct proof	1.5	3
27.	Let us assume that $3 + 5\sqrt{2}$ is a rational number $3 + 5\sqrt{2} = \frac{p}{q}$; p, q are coprimes and $q \neq 0$	1	
	$\Rightarrow \sqrt{2} = \frac{p-3q}{5q}$ RHS is rational $\Rightarrow \sqrt{2}$ is rational	1	3
	Which contradicts the fact that $\sqrt{2}$ is an irrational number5 $\therefore$ Our assumption is wrong. Hence $3 + 5\sqrt{2}$ is an irrational number.	1	3
28.	Sum of zeroes: $\alpha + \beta = -\frac{9}{1} = -9$ Product of zeroes: $\alpha\beta = \frac{20}{1} = 20$	1	
	New sum of zeroes: $\alpha + 1 + \beta + 1 = -9 + 2 = -7$ New product of zeroes: $\alpha\beta + \alpha + \beta + 1 = 20 - 9 + 1 = 12$	1	

	Required Quadratic polynomial is $k(x^2+7x+12)$, where k is a real number$(k \neq 0)$.	1	
29.a	$= \dfrac{\frac{1}{2}+1-\frac{2}{\sqrt{3}}}{\frac{2}{\sqrt{3}}+\frac{1}{2}+1}$	1.5	
	$\dfrac{\frac{3}{2}-\frac{2}{\sqrt{3}}}{\frac{2}{\sqrt{3}}+\frac{3}{2}}$ $= \dfrac{\frac{3\times\sqrt{3}-2\times 2}{2\times\sqrt{3}}}{\frac{2\times 2+3\times\sqrt{3}}{2\times\sqrt{3}}}$ $= \dfrac{(3\sqrt{3}-4)}{3\sqrt{3}+4}$	1	
	$\dfrac{(3\sqrt{3}-4)}{3\sqrt{3}+4} \times \dfrac{(3\sqrt{3}-4)}{3\sqrt{3}+4}$		
	$\dfrac{(43-24\sqrt{3})}{11}$	0.5	3
	OR		
	(b) Let PA = ‘x ‘ cm Thus PT = $x + 2$	0.5	
	Using the Pyth. theorem, $PA^2 + AT^2 = PT^2$: $x^2+(8)^2=(x+2)^2$ $x^2+64=x^2+4x+4$ $64=4x+4$ $60=4\text{x}$ $x=\dfrac{60}{4}$ $x = 15$ cm	1	
	$PT = PA + 2 = 15 + 2 = 17$ cm.	0.5	
	$\sin P = \dfrac{AT}{PT} = \dfrac{8}{17}$ $\cos P = \dfrac{PA}{PT} = \dfrac{15}{17}$	1	3
30.	Total number of balls = 21	1	
	(i) Prime numbers are 59 ,61 , 67, 71 , 73 P(Prime number) = $\frac{5}{21}$	0.5 0.5	

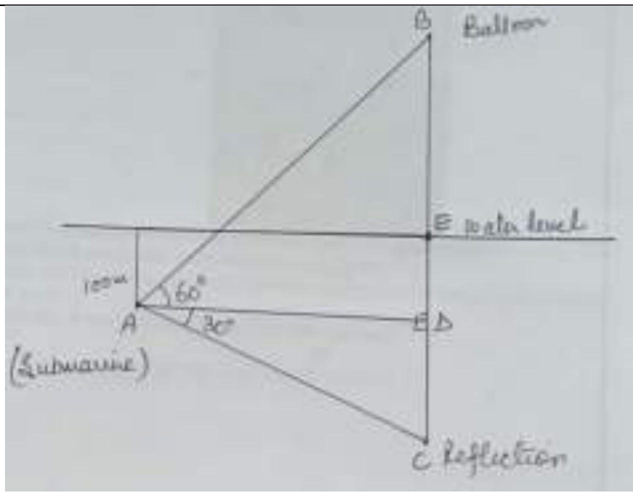
	Nos not divisible by 2 are 57 ,59 , …., 77 (total = 11) (ii) P(not divisible by 2) = $\frac{11}{21}$	0.5 0.5	 3
31 .	(a) Let tens digit be x and ones digit be y No. Formed = $10x + y$	 0.5	
	ATQ $7(x+y)+3=10x+y$ $3x-6y=3$ ------- (1)	 1	
	$19(x-y)-1=10x+y$ $9x-20y=1$ ------(2)	 1	
	Solving (1) and (2) , we get $x=9, y=4$ Reqd no. is 94	0.5 0.5	 3
	OR		
(b)	 	1 marks for each correct line	
	Correct Solution $x=-1$, $y=1$	1	3
	SECTION D This section comprises Long Answer (SA) type questions of 5 marks each.		
32.	For real and equal roots, $\mathrm{D}=0$	0.5	
	$\therefore [-(p+1)]^2-4(p+4)=0$	0.5	
	$\Rightarrow \mathrm{p}^2-2\mathrm{p}-15=0$ $\Rightarrow (\mathrm{p}-5)(\mathrm{p}+3)=0$ $\therefore \mathrm{p}=5,-3$	0.5 1	
	For $\mathrm{p}=5$, $9\mathrm{x}^2-6\mathrm{x}+1=0$ $\Rightarrow (3\mathrm{x}-1)(3\mathrm{x}-1)=0$ $\therefore \mathrm{x}=\frac{1}{3},\frac{1}{3}$	 1	

	For $p = -3$, $$x^2 + 2x + 1 = 0$$ $$\Rightarrow (x+1)(x+1) = 0$$ $$\therefore x = -1, -1$$	1	
	Hence roots are $\frac{1}{3}, \frac{1}{3}$ and $-1, -1$ for $p = 5$ and $p = -3$ respectively.	0.5	5
33.	Correct statement of converse of Basic Proportionality Theorem.	1	
	In Δ ADC, EG $\parallel$ DC $\Longrightarrow$ AE/ED = AG/GC = 2/3	1	
	In Δ ABC, GF $\parallel$ AB $\Longrightarrow$ AG/GC = BF/FC = 2/3 Δ AEG $\sim$ Δ ADC	1 0.5	
	AE/AD = AG/AC = EG/DC $\Longrightarrow$ 2/5 = EG/DC $\Longrightarrow$ CD $= \frac{5}{2} \times 6 = 15$ cm	0.5	
	Similarly, Δ CFG $\sim$ Δ CBA and FC/BF = 3/2 $\Longrightarrow$ FC/BC = GF/AB = 3/5 $\Longrightarrow$ AB $= \frac{5}{3} \times 6 = 10$ cm	1	5
34.a	Total number of cylinders = $\frac{14 \times 14}{2.8 \times 2.8}$ = 25	2	
	Total Surface Area of remaining solid = Surface Area of Cube + Curved Surface Area of 25 cylinders $= 6 \times 14 \times 14 + 25 \times 2 \times \frac{22}{7} \times 1.4 \times 7$ $=1176 + 1540$ $= 2716\ cm^2$ $\therefore$ Total surface area of remaining solid is $2716\ cm^2$.	2 1	5
	OR		
(b)	Volume of remaining solid = Volume of cylinder -Vol of cone-Vol of hemisphere $=\frac{22}{7} \times 5 \times 5 \times 24 - \frac{1}{3} \times \frac{22}{7} \times 5 \times 5 \times 12 - \frac{2}{3} \times \frac{22}{7} \times 5 \times 5 \times 5$ $=\frac{13200}{7} - \frac{2200}{7} - \frac{5500}{21} = \text{cm}^3$ approx . $= \frac{27500}{21} = 1309.5\ \text{cm}^3$ approx .	2	

<table>
<tr><td></td><td>$l = \sqrt{(12)^2 + (5)^2} = 13 \text{ cm}$</td><td>1</td><td></td></tr>
<tr><td></td><td>SA of rem solid = CSA of cyl + CSA of cone + CSA of hemi sphere
$= 2 \times \frac{22}{7} \times 5 \times 24 + \frac{22}{7} \times 5 \times 13 + 2 \times \frac{22}{7} \times 5 \times 5$
$= \frac{5280}{7} + \frac{1430}{7} + \frac{1100}{7}$
$= \frac{7810}{7}\ cm^2$ =115.71 cm^2</td><td>1

1</td><td></td></tr>
<tr><td>35.(a</td><td><table>
<tr><th>Daily pocket allowance (in ₹)</th><th>x_i</th><th>f_i</th><th>$f_i\, x_i$</th></tr>
<tr><td>20 – 25</td><td>22.5</td><td>7</td><td>157.5</td></tr>
<tr><td>25– 30</td><td>27.5</td><td>6</td><td>165</td></tr>
<tr><td>30 – 35</td><td>32.5</td><td>9</td><td>292.5</td></tr>
<tr><td>35 – 40</td><td>37.5</td><td>13</td><td>487.5</td></tr>
<tr><td>40 – 45</td><td>42.5</td><td>f</td><td>42.5f</td></tr>
<tr><td>45 – 50</td><td>47.5</td><td>5</td><td>237.5</td></tr>
<tr><td>50 – 55</td><td>52.5</td><td>4</td><td>210</td></tr>
<tr><td></td><td></td><td></td><td>$1550 + 42.5f$</td></tr>
</table></td><td>2</td><td></td></tr>
<tr><td></td><td>$36.10 = \frac{1550 + 42.5f}{44 + f}$
$1588.4 + 36.10f = 1550 + 42.5f$
$38.4 = 6.4f$ or $f = 6$</td><td>2</td><td></td></tr>
<tr><td></td><td>$3\text{Median} = 2\text{x}36.1 + 33.1$
$\text{Median} = ₹35.1$</td><td>1</td><td>5</td></tr>
<tr><td></td><td>OR</td><td></td><td></td></tr>
<tr><td>(b)</td><td>$Modal\ class = 45 - 60$
$l = 45$, $h = 15$
$f_0 = x$, $f_1 = 15$, $f_1 = 10$
$Mode = 45 + \frac{15 - x}{30 - x - 10} \times 15$</td><td>2</td><td></td></tr>
<tr><td></td><td>$55 = 45 + \frac{15 - x}{30 - x - 10} \times 15$</td><td>0.5</td><td></td></tr>
<tr><td></td><td>$\frac{10}{15} = \frac{15 - x}{30 - x - 10}$
$x = 5$</td><td>0.5</td><td></td></tr>
</table>

	$38 + x + y = 51$ $y = 8$	1	
	$3\text{Median} = 2\text{x}53.5 + 55$ $\text{Median} = 54$	1	5
	SECTION E		
36(i)	12 , 19 , 26 ,…………………. $a = 12$, $d = 7$	0.5	
	$a_5 = (12 + 4 \times 7) = 40$	0.5	
(ii)	6 , 11 , 16 ,…………………. $a = 6$, $d = 5$	0.5	
	$96 = 6 + (n - 1)5$ or n = 19	0.5	
(iii)	(a) $S_{11} - S_6 = \frac{11}{2}[24 + (10)7] - \frac{6}{2}[24 + (5)7]$		
	$= \frac{11}{2}[94] - 3[59]$ =340	1	
	$S_3 = \frac{3}{2}[24 + (2\ \ )7] = 57$	0.5	
	Difference = $340 - 57 = 283$	0.5	
	OR		
	(b) For hexagons a = 6 , d = 5 , $S_{20} = 10(12 + 19 \times 5) = 1070$	1	
	For vertices a = 6 , d = 2 , $S_{20} = 10(12 + 19 \times 2) = 500$	0.5	
	Difference , $1070 - 500 = 570$	0.5	4
37.(i)	$OA = \sqrt{16 + 25} = \sqrt{41}$ units	1	
(ii)	$\left(\frac{22}{7}\ ,0\right)$	1	
(iii)	Let ratio be k:1 Let point of division be $\left(\frac{12k}{k+1}\right)$, $\left(\frac{-2k}{k+1}\right)$	1	
	$7\left(\frac{12k}{k+1}\right) - 10\left(\frac{-2k}{k+1}\right) = 22$ $84k + 20k = 22k + 22$ $k = 11/41$ or required ratio is 11: 41	1	
	OR		
	$BC = \sqrt{(12 - 6)^2 + (-2 - 2)^2}$ $BC = \sqrt{36 + 16} = \sqrt{52} = 2\sqrt{13}$	1	
	$OC = \sqrt{144 + 4} = \sqrt{148} = 2\sqrt{7}$	0.5	

	$\frac{BC}{OC} = \frac{\sqrt{13}}{\sqrt{7}}$	0.5	4
38.(i)		1	
(ii)	$BE = (\text{h})m$ & $CE = (h)m.$ $BD = (h + 100)$ $CD = (h - 100)$ In rt. triangle BDA OR In rt. triangle CDA $\frac{h-100}{\tan\ 30°} = AD$ $\frac{h+100}{\tan\ 60°} = AD$	1	
(iii) (a)	$\frac{h+100}{\tan\ 60°} = \frac{h-100}{\tan\ 30°}$ $\frac{h+100}{\sqrt{3}} = \sqrt{3}(h - 100)$ $h + 100 = 3h - 300$ $h = 200$ distance of point B from water surface $= 200$ m.	1 1	
	OR		
(b)	$\frac{h+100}{\tan\ 60°} = \frac{h-100}{\tan\ 30°}$ $\frac{h+100}{\sqrt{3}} = \sqrt{3}(h - 100)$ $h + 100 = 3h - 300$ $h = 200$ distance of point C from water surface $= 200$ m.	1 1	4