CBSE Class 10 Maths (Standard) Question Paper Solution 2020 Set 3

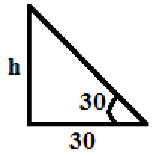
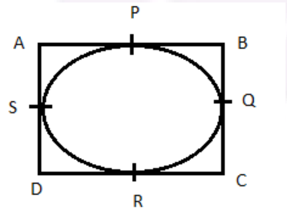
CLASS: X

MATHEMATICS STANDARD SOLVED

SET 3 (CODE: 30/5/3) SERIES: JBB/5

Q. NO	SOLUTION	MARKS
	SECTION – A	
1.	(B) ± 4	1
2.	(C) $\frac{4}{3}, \frac{7}{3}, \frac{9}{3}, \frac{12}{3}, \ldots$	1
3.	(C) $3^{\frac{2}{3}}$	1
4.	(c) $2\sqrt{m^2+n^2}$	1
5.	(B) 4 cm	1
6.	(B) $x^3 - 4x + 3$	1
7.	(B) 1.8 cm	1
8.	(D) (3, 0) OR (C) $\left(0, \frac{7}{2}\right)$	1 1
9.	(B) inconsistent	1
10.	(A) 50°	1
11.	$\tan^2 A$	1
12.	P(E) = 0.023 $P\left(\overline{E}\right) = 1 - P(E)$	1

	$=1-0.023$ $=0.977$	
13.	Similar	1
14.	1	1
15.	5 units	1
16.	$\sin^2 30+\cos^2 60=\left(\frac{1}{2}\right)^2+\left(\frac{1}{2}\right)^2=2\times\frac{1}{4}=\frac{1}{2}$	½ + ½ =1
17.	$k\left[x^2+3x+2\right]$ **OR** **No.** x^2-1 can't be remainder. Because the degree of remainder should be less than the degree of the divisor.	1 1
18.	$S_n=\frac{n(n+1)}{2}$ $S_{100}=\frac{100\times101}{2}=5050$	½ ½
19.	LCM × HCF = Product 182 × 13 = 2 6 × x $x=\frac{182\times\cancel{13}}{\cancel{26}\,2}$ x = 91	½

	Other number = 91	½
20.	 $\tan 30 = \frac{1}{\sqrt{3}} = \frac{h}{30}$ $h = \frac{30}{\sqrt{3}} = 10\sqrt{3}m$	½ ½
	SECTION – B	
21.	As per question Cone Cylinder Radius = r radius = r Height = 3h height = h $\frac{V_{cone}}{V_{\text{cylinder}}} = \frac{\frac{1}{3}\pi r^2 \times 3h}{\pi r^2 h} = 1:1$	½ 1 + ½
22.	Let P, Q, R and S be point of contact.  $\left.\begin{array}{l} AP = AS \\ BP = BQ \\ CQ = CR \\ DS = DR \end{array}\right] \text{Tangents drawn from external point of circle}$	½ ½

	AB + CD = AP + BP + CR + RD = AS + BQ + CQ + DS = AS + DS + BQ + CQ = AD + BC Hence proved. **(OR)** Perimeter of ΔABC = AB + BC + AC = AB + BD + CD + AC = AB + BP + CQ + AC [Since BD = BP and CD = CQ] = AP + AQ = 2AP [AP = AQ, Tangents drawn from external point] = 2 × 12 = 24 cm.	1 ½ ½ ½ ½
23.	Modal class : 30 – 40 $\ell = 30, \quad f_1 = 12, \quad f_0 = 7, \quad f_2 = 5, \quad h = 10$ $mod\ e = \ell + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right] \times h$ $= 30 + \left[\frac{12 - 7}{24 - 7 - 5} \times 10\right]$ $= 30 + \left[\frac{5}{12} \times 10\right]$ $= 30 + \frac{50}{12} = 30 + 4.16\ldots\ldots$	½ ½

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	$= 34.17$	1
24.	Given, $PQ \parallel BC$ in ΔABC By BPT, $\frac{AQ}{BQ}=\frac{AP}{PC}$ … (1) $PR \parallel CD$ in ΔADC By BPT, $\frac{AR}{DR}=\frac{AP}{PC}$ … (2) From (1) and (2) $\frac{AQ}{BQ}=\frac{AR}{DR}$ $\frac{DR}{AR}=\frac{BQ}{AQ}$ Hence proved.	½ ½ 1
25.	Let $5+2\sqrt{7}$ be rational. So $5 + 2\sqrt{7} = \frac{a}{b}$, where'a'and'b'are integers and $b \neq 0$ $2\sqrt{7}=\frac{a}{b}-5$ $2\sqrt{7}=\frac{a-5b}{5}$ $\sqrt{7}=\frac{a-5b}{2b}$ Since ‘a’ and ‘b’ are integers a – 5b is also an integer. $\frac{a-5b}{2b}$ is rational. So RHS is rational. LHS should be rational. but it is given that $\sqrt{7}$ is irrational .Our assumption is wrong. So $5+2\sqrt{7}$ is an irrational number.	½ ½ 1

	(OR) $12^n = (2 \times 2 \times 3)^n$ If a number has to and with digit 0. It should have prime factors 2 and 5. By fundamental theorem of arithmetic, $12^n = (2 \times 2 \times 3)^n$ It doesn't have 5 as prime factor. So 12^n cannot end with digit 0.	1 1
26.	Given A, B and C are interior angles of ΔABC, A + B + C = 180° (Angle sum property of triangle) B + C = 180 – A $\frac{B+C}{2}=\frac{180-A}{2}=90-A/2$ $\cos\left(\frac{B+C}{2}\right)=\cos\left(90-A/2\right)$ $\cos\left(\frac{B+C}{2}\right)=\sin A/2$	1 1
SECTION – C		
27.	$\left[\left(\sin^2\theta\right)^2-\left(\cos^2\theta\right)^2+1\right]\cos ec^2\theta$ $\left[\left(\sin^2\theta+\cos^2\theta\right)\left(\sin^2\theta-\cos^2\theta\right)+1\right]\cos ec^2\theta$ $\left(\sin^2\theta-\cos^2\theta+1\right)\cos ec^2\theta$	½ ½

	$\left(\sin^2\theta-\left(1-\sin^2\theta\right)+1\right)\cos ec^2\theta$ $\left(\sin^2\theta-1+\sin^2\theta+1\right)\cos ec^2\theta$ $2\sin^2\theta\times\cos ec^2\theta=2$ Hence proved.	2
28.	$(-5)+(-8)+(-11)+....(-230)$ $a=-5$ $d=-8+5=-3$ $a_n=l=-230$ Number of terms $n=\frac{l-a}{d}+1$ $=\frac{-230+5}{-3}+1=\frac{-225}{-3}+1$ $n=75+1=76$ $S_n=\frac{n}{2}[a+l]$ $=\frac{76}{2}[-5-230]=38\times-235$ Sum $=-8930$	1 1 1

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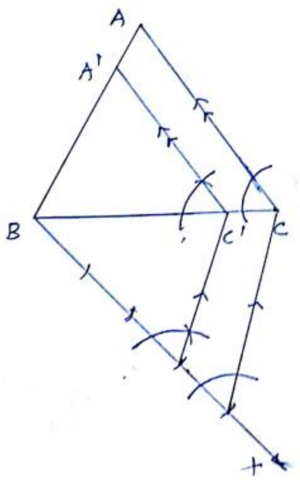
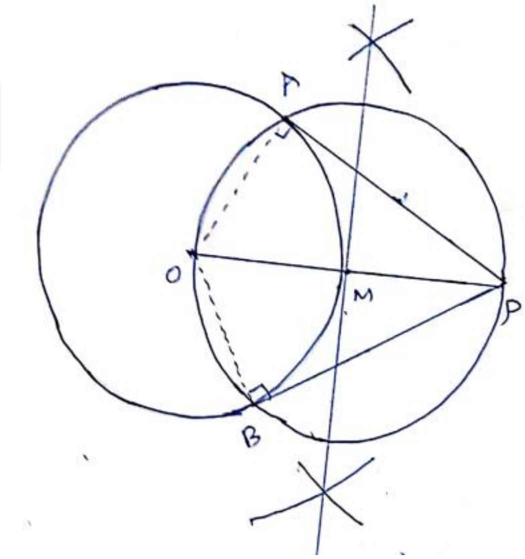
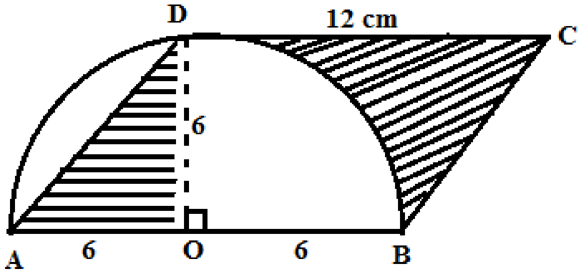
29.	For correct construction of Δ ABC AB = 5 cm, BC= 6 cm , $\angle B = 60°$  A'B C' is required similar Δ. A' B C' is similar to ABC $$\frac{A'B}{AB} = \frac{BC'}{BC} = \frac{A'C'}{AC} = \frac{3}{4}$$	1
	For correct construction of similar triangle with scale factor ¾	2
	OR  For correct construction of given circle OP = 7cm , OA = OB = 3.5 cm.	1

	PA and PB are required tangents to the circle with centre O. For correct construction of tangents	2
30.	ABCD is a parallelogram. AB = 12 cm = diameter Radius = 6 cm  Area of shaded = ar(parallelogram) – ar(quadrant) $= AB\times OD-\frac{1}{4}\times\pi\times6^2$ $=12\times6-\frac{1}{4}\times3.14\times6\times6$ $=72-28.26$ $=43.74cm^2$	1 1 1
31.	(i) P(to pick a marble from the bag) = P(spinner stops an even number) A = {2, 4, 6, 8, 10} n (A) = 5 n (S) = 6 $\Rightarrow P(A)=\frac{n(A)}{n(S)}=\frac{5}{6}$	½ 1

	(ii) P(getting a prize) = P(bag contains 20 balls out of which 6 are black) $= \frac{6}{20} = \frac{3}{10}$	½ 1
32.	Let the fraction be $\frac{x}{y}$ as per the question, $\frac{x-1}{y} = \frac{1}{3}$ 3x – y = 3 ……………. 1 and, $\frac{x}{y+8} = \frac{1}{4}$ 4x = 8 + y 4x – y = 8 …………… 2 By elimination, $\Theta \begin{array}{l} 3x - y = 3 \\ \underline{4x - y = 8} \\ -x = -5 \\ x = 5 \end{array}$ $Put\ x = 5 in 1$ $15 - y = 3$ $y = 12$ $\therefore The required\ fraction is \frac{5}{12}$	1 ½ 1 + ½

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OR
Let the present age of son be ‘x’ years
<table>
<tr><td></td><td>Father</td><td>Son</td></tr>
<tr><td>Present age</td><td>3x + 3</td><td>X</td></tr>
<tr><td>Three years hence</td><td>3x + 6</td><td>x + 3</td></tr>
</table>
As per question,
$3x + 6 = 10 + 2(x + 3)$
$3x + 6 = 10 + 2x + 6$
$x = 10$
Father’s present age = $3x + 3$
$= 3 \times 10 + 3 = 33$
$\therefore$ Present age of son = 10 years
Present age of father = 33 years
</td>
<td>1
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1</td>
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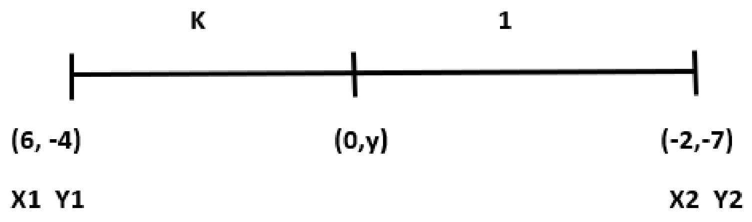
<td>33.</td>
<td>
Y axis divides the line segment any point on y – axis is of the form (o, y)
As per the question


</td>
<td>½
½</td>
</tr>
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	As per section formula,	
	$P(x,y)=\left(\frac{kx_2+x_1}{k+1},\frac{ky_2+y_1}{k+1}\right)$	
	$=\left(\frac{-2k+6}{k+1},\frac{-7k-4}{k+1}\right)$	
	$\frac{-2k+6}{k+1}=0$	
	$-2k+6=0$	
	$2k=6$	
	$k=3$	1
	$\therefore Ratio\,3:1$	
	$y=\frac{-7k-4}{k+1}=\frac{-21-4}{4}=\frac{-25}{4}$	1
	$\therefore Point\ of\ intersection\left(0,\frac{-25}{4}\right)$	
	(OR)	
	Let A (7, 10) B(-2, 5) C(3, -4) be the vertices of triangle.	½
	Distance between 2 points $=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ $(x_1,y_1)\ \ (x_2,y_2)$	
	$AB=\sqrt{9^2+5^2}=\sqrt{81+25}=\sqrt{106}$	
	$BC=\sqrt{5^2+9^2}=\sqrt{25+81}=\sqrt{106}$	1 + ½
	$CA=\sqrt{4^2+14^2}=\sqrt{16+196}=\sqrt{212}$	
	(by pythagoren theorem)	
	$AB^2+BC^2=AC^2$	
	$\left(\sqrt{106}\right)^2+\left(\sqrt{106}\right)^2=\left(\sqrt{212}\right)^2$ 106 + 106 = 212	
	$\therefore$ ABC is an isosceles right angled Δ.	1

34.	Let 'a' be any positive integer and b = 3, if a is divided by b by EDL, $a = 3m + r$, m is any positive integer and $0 \leq r < 3$ If $r = 0$, $a = 3m$ $a^2 = (3m)^2 = 3 \times 3m^2$ $a^2 = 3q$, where $3m^2 = q$ $r = 1$, $a = 3m + 1$ $a^2 = (3m + 1)^2 = 9m^2 + 6m + 1$ $= 3(3m^2 + 2m) + 1$ $a^2 = 3q + 1$ where $q = 3m^2 + 2m$ $r = 2$, $a = 3m + 2$ $a^2 = (3m + 2)^2 = 9m^2 + 12m + 4$ $= 9m^2 + 12m + 3 + 1$ $= 3(3m^2 + 4m + 1) + 1$ $a^2 = 3q + 1$,where $q = 3m^2 + 4m + 1$ ∴ The square of any positive integer is of the form 3q or 3q + 1 for some integer q.	1 1 + ½ ½
	SECTION – D	

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35.	Let the sides of the two squares be x and y (x > Y) difference of perimeter is = 32 $4x – 4y = 32$ $X – y = 8$ ➔ $y = x – 8$ Sum of area of two squares = 544 $x^2 + y^2 = 544$ $x^2 + (x – 8)^2 = 544$ $x^2 + x^2 + 64 – 16x = 544$ $2x^2 – 16x = 480$ ÷2, $x^2 – 8x = 240$ $x^2 – 8x – 240 = 0$ $(x – 20)(x + 12) = 0$ $X = 20,- 12$ Side can't be negative. So $x = 20$ $y = x – 8 = 20 – 8 = 12$ ∴ Sides of squares are 20 cm,12cm	1 2 1

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(OR)

Speed of boat = 18 km/hr

Let speed of the stream be =x km/hr

Speed of upstream $=(18-x)km/hr$

Speed of downstream $=(18+x)km/hr$

Distance = 24 km

Time $=\frac{\text{Distance}}{\text{Speed}}$ 1

As per question,

$$\frac{24}{18-x}-\frac{24}{18+x}=1$$

1

$$24\left[\frac{1}{18-x}-\frac{1}{18+x}\right]=1$$

$$\frac{18+x-18+x}{(18-x)(18+x)}=\frac{1}{24}$$

$$\frac{2x}{324-x^2}=\frac{1}{24}$$

$$324-x^2=48x$$

$$x^2+48x-324=0$$

$$(x+54)(x-6)=0$$

$$x=6,\ -54$$

$\therefore$ $x=6\ km/hr$

Speed of stream $=6\ km/hr$ 2

36.

Age	No. of persons	Class	CF
0 – 10	5	Less than 10	5
10 – 20	15	Less than 20	20
20 – 30	20	Less than 30	40
30 – 40	25	Less than 40	65
40 – 50	15	Less than 50	80
50 – 60	11	Less than 60	91
60 – 70	9	Less than 70	100

Coordinates to plot less than ogive: (10, 5) (20, 20) (30, 40) (40, 65) (50, 80) (60, 91)(70, 100)

2

N = 100 , N/2 = 50, Median = 34

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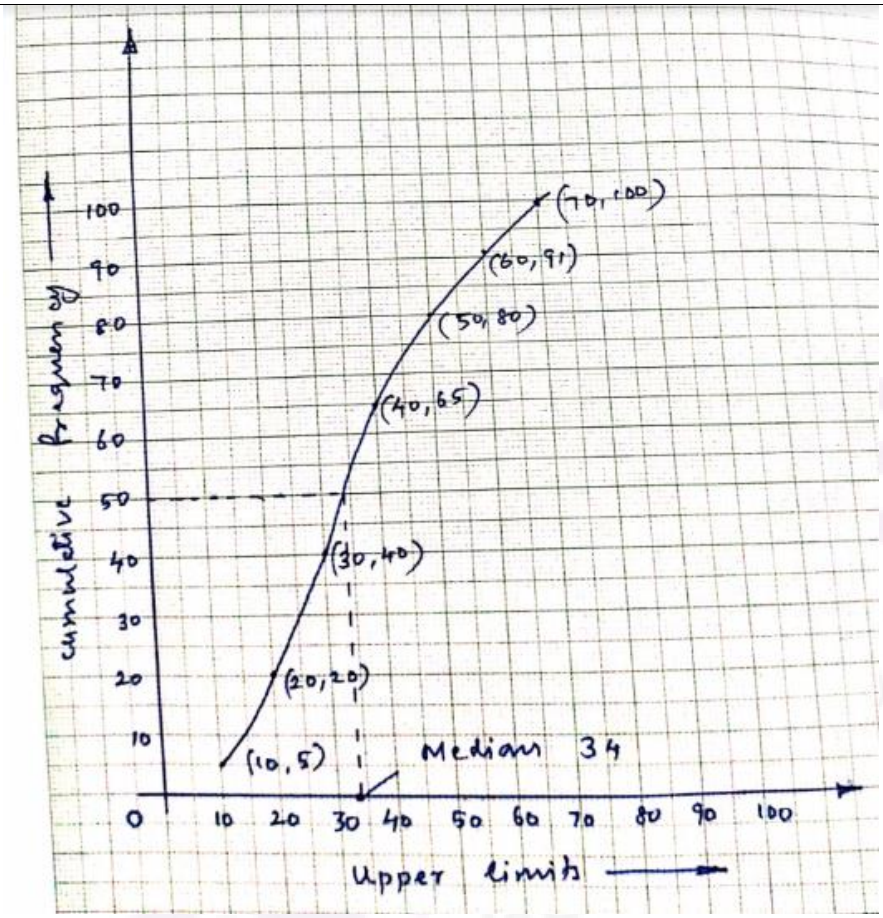


2

(OR)

To find mean

Number of wickets	**Number of bowlers (f)**	**xi**	$u_i = \frac{x_i - a}{h}$	**u_i f_i**
20 – 60	7	40	-3	-21
60 – 100	5	80	-2	-10
100 – 140	16	120	-1	-16
140 – 180	12	160	0	0
180 – 220	2	200	1	2
220 – 260	3	240	2	6
	45			**-39**

1

Assumed mean a = 160

Class size h = 40

$$Mean\ \bar{x} = a + \left(\frac{\sum f_i u_i}{\sum f_i} \times h \right)$$

$$= 160 + \left(\frac{\cancel{-39}\ -13}{\cancel{45}\ \cancel{9}\ 3} \times \cancel{40} \right)$$

$$= 160 + \left(\frac{-104}{3} \right)$$

$$= 160 - 34.66\ \ldots$$

$$= 160 - 34.67$$

$$\bar{x} = 125.33$$

1

To find median,

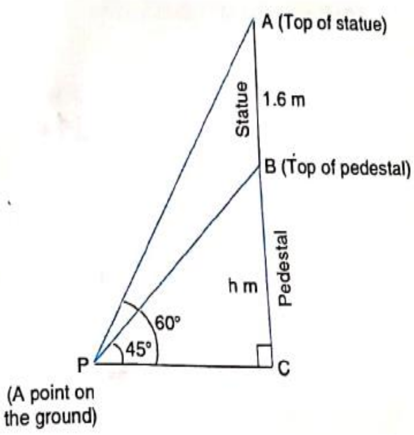
Number of workers CI	No. of bowlers (f)	CF
20 – 60	7	7
60 – 100	5	12
100 – 140	16	28
140 – 180	12	40
180 – 220	2	42
220 – 260	3	45

1

N = 45, > N/2 ➔ > 22.5

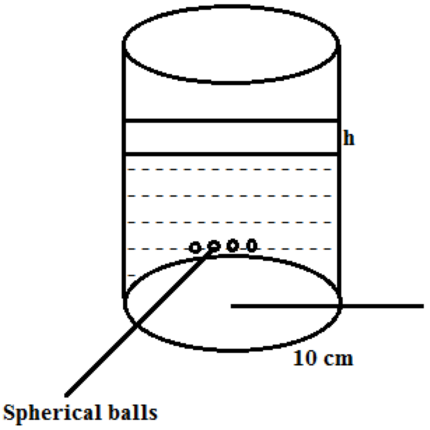
Median class: 100 – 140

F = 16 h = 40

	CF = 12 l = 100 $Median = \ell + \left(\frac{N/2 - CF}{f} \times h \right)$ $= 100 + \left(\frac{\frac{45}{2} - 12}{\cancel{16}\,4} \times \cancel{40}\,10 \right)$ $= 100 + \frac{105}{4} = 100 + 26.25$ $= 126.25$	1
37.	As per figure, BC = h m  In right triangle ACP, $\tan 60^\circ = \frac{AC}{PC}$ $\Rightarrow \quad \sqrt{3} = \frac{AB + BC}{PC}$ $\Rightarrow \quad \sqrt{3} = \frac{1.6 + h}{PC}$ … (1) In right triangle BCP, $\tan 45^\circ = \frac{BC}{PC}$ $\Rightarrow \quad 1 = \frac{h}{PC}$ … (2)	1 1

	Dividing (1) by (2), we get $\frac{\sqrt{3}}{1}=\frac{1.6+h}{h}$ $\Rightarrow \quad h\sqrt{3}=1.6+h$ $\Rightarrow \quad h\left(\sqrt{3}-1\right)=1.6$ $\Rightarrow \quad h=\frac{1.6}{\sqrt{3}-1}$ $\Rightarrow \quad h=\frac{1.6\left(\sqrt{3}+1\right)}{\left(\sqrt{3}-1\right)\left(\sqrt{3}+1\right)}$ $\Rightarrow \quad h=\frac{1.6\left(\sqrt{3}+1\right)}{3-1}$ $\Rightarrow \quad h=\frac{1.6\left(\sqrt{3}+1\right)}{2}$ $\Rightarrow \quad h=0.8\left(\sqrt{3}+1\right)$ h=0.8(1.73+1)=0.8 x 2.73 =2.184m Hence, the height of the pedestal is 2.184 m	1+ ½ ½
38.	p(x) = $2x^4 - x^3 - 11x^2 + 5x + 5$ Two zeros are $\sqrt{5}\,and -\sqrt{5}$ $\therefore x=\sqrt{5} \quad x=-\sqrt{5}$ $\left(x-\sqrt{5}\right)\left(x+\sqrt{5}\right)=x^2-5$ is a factor of p(*x*) To find other zeroes	1

	$2x^2 - x - 1$ $x^2 - 5 \;\big|\; 2x^4 - x^3 - 11x^2 + 5x + 5$ $\overset{-}{2x^4} \quad \overset{+}{-\,10x^2}$ $-x^3 - x^2 + 5x$ $\overset{+}{-\,x^3} \quad \overset{-}{+\,5x}$ $-x^2 + 5$ $-x^2 + 5$ 0 $\therefore 2x^2 - x - 1 \text{ is a factor}$	2
	$2x^2 - 2x + x - 1 = 0$ $2x(x - 1) + 1(x - 1) = 0$ $(2x + 1) \qquad (x - 1) = 0$ $x = -1/2 \qquad x = 1$ $\therefore$ Other zeroes are -1/2, 1	1
	(OR) $2x + 5$ $x^2 - 4x + 8 \;\big|\; 2x^3 - 3x^2 + 6x + 7$ $\overset{-}{2x^3} \overset{+}{-\,8x^2} \overset{-}{+\,16x}$ $5x^2 - 10x + 7$ $\overset{-}{5x^2} \overset{+}{-\,20x} \overset{-}{+\,40}$ $10x - 33$	3
	So -10x + 33 has to be added	1

39.	Volume of cylinder = $=\pi r^2 h$ Volume of sphere $=\frac{4}{3}\pi r^3$ Cylinder: Radius r = 10 cm Raise in water level = h Sphere: Radius = 0.5 cm $=\frac{1}{2}$ cm  Volume of water raised in cylinder = 9000 × volume of sphere $\pi\times10\times10\times h=9000\times\frac{4}{3}\times\pi\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}$ $\cancel{\pi}\times\cancel{10}\times\cancel{10}\times h=\overset{30}{\cancel{90}}\,\cancel{0}\,\cancel{0}\times\frac{\cancel{4}}{\cancel{3}}\times\cancel{\pi}\times\frac{1}{\cancel{2}}\times\frac{1}{\cancel{2}}\times\frac{1}{2}$ $h=15cm$ Rise in the level of water in vessel = 15 cm.	1 1 2
40.	For correct Given, to prove, Construction and figure For Correct proof Refer NCERT text book pg no. 124	½ x 4 =2 2