ICSE Board

Class X Mathematics

Board Paper 2014 Solution

(Two and a half hours)

SECTION A

1.

(a)

Given that Ranbir borrows Rs.20000

at 12% compound interest.

For the first year,

Interest $I = \dfrac{20000 \quad 1 \quad 12}{100} \quad \text{Rs.}2400$

Thus, amount after one year = Rs.20000+Rs.2400 Rs.22400

Money repaid = Rs.8400

Balance= Rs.22400 Rs.8400 14000

For the second year,

Interest $I = \dfrac{14000 \quad 1 \quad 12}{100} \quad \text{Rs.}1680$

Thus the amount =Rs.14000+ Rs.1680 Rs.15680

Ranbir paid Rs. 9680 in the second year.

The loan outstanding at the beginning of the third year

= Rs.15680 Rs. 9680 = Rs.6000

(b)

We need to find the values of x, such that

x satisfies the inequation $2\frac{5}{6} \quad \frac{1}{2} \quad \frac{2x}{3} \quad 2, x \quad W$

Consider the given inequation:

$$2\frac{5}{6} \quad \frac{1}{2} \quad \frac{2x}{3} \quad 2$$

$$\frac{17}{6} \quad \frac{3 \quad 4x}{6} \quad \frac{12}{6}$$

$$\frac{17}{6} \quad \frac{4x \quad 3}{6} \quad \frac{12}{6}$$

$$17 \quad 4x \quad 3 \quad 12$$

$$12 \quad 4x \quad 3 \quad 17$$

$$12 \quad 3 \quad 4x \quad 3 \quad 3 \quad 17 \quad 3$$

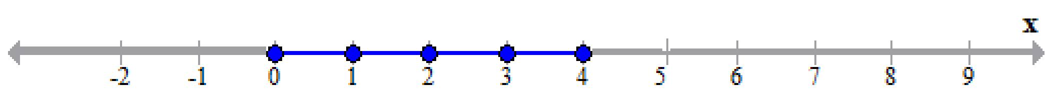
$$9 \quad 4x \quad 20$$

$$\frac{9}{4} \quad \frac{4x}{4} \quad \frac{20}{4}$$

$$\frac{9}{4} \quad x \quad 5$$

Since x W, the Required solution set= 0,1,2,3,4

And the required line is



(c)

Given that the die has 6 faces marked
by the given numbers as below:

3	2	1	1	2	3

(i)

Let us find the probability of getting a positive integer.

When a die is rolled, the total number of possible outcomes =6

For getting a positive integer, the favourable outcomes are:1,2,3

Number of favourable outcomes = 3

Required probability=$\frac{3}{6}\quad\frac{1}{2}$

(ii) Let us find the probability of getting an integer greater than 3.

When a die is rolled, the total number of possible outcomes =6

For getting getting an integer greater than 3, the favourable outcomes are: 2, 1,1,2,3

Number of favourable outcomes = 5

Required probability=$\frac{5}{6}$

(iii) Let us find the probability of getting a smallest integer

When a die is rolled, the total number of possible outcomes =6

For getting getting getting a smallest integer, the favourable outcomes are: 3

Number of favourable outcomes = 1

Required probability=$\frac{1}{6}$

2.

(a)

Consider the following equation:

$$\begin{matrix} 2 & 0 \\ 3 & 1 \end{matrix} \quad \begin{matrix} 1 \\ 2x \end{matrix} \quad 3 \quad \begin{matrix} 2 \\ 1 \end{matrix} \quad 2 \quad \begin{matrix} y \\ 3 \end{matrix}$$

Multiplying and adding the corresponding elements of the matrices, we have

$$2 \quad 1 \quad 0 \;\; 2x \quad 3 \quad 2 \quad 2y$$

$$2 \quad 6 \quad 2y$$

$$4 \quad 2y$$

$$y \quad 2$$

Similarly,

$$3 \quad 1 \quad 1 \;\; 2x \quad 3 \;\; 1 \quad 2 \;\; 3$$

$$3 \quad 2x \quad 3 \quad 6$$

$$2x \quad 6$$

$$x \quad 3$$

Thus, the values of x and y are: 3, 2

(b)

Shahrukh deposited Rs.800 per month for $n=1\frac{1}{2}$ years

Since $1\frac{1}{2}$ years = 18 months,

Total money deposited=18 800=Rs.14400

Given that the maturity value = Rs.15084

Interest = Maturity Value Total sum deposited

=15084 14400

684

We know that Interest

$$I = P \quad \frac{n \;\; n+1}{2 \;\; 12} \quad \frac{r}{100}$$

$$684 \quad 800 \quad \frac{18 \;\; 18+1}{2 \;\; 12} \quad \frac{r}{100}$$

$$\frac{684 \quad 2 \quad 12 \quad 100}{800 \quad 18 \quad 19} \quad r$$

$$r \quad 6\%$$

(c)

Let A 4, 2 and B 3, 6 be two points.

Let P x, 3 be the point which divides the line joining the line segment in the ratio k:1

Thus, we have

$$\frac{3k \quad 4}{k \quad 1} \quad x; \qquad \frac{6k \quad 2}{k \quad 1} \quad 3$$

For

$$6k \quad 2 \quad 3 \; k \quad 1$$

$$6k \quad 2 \quad 3k \quad 3$$

$$3k \quad 3 \quad 2$$

$$3k \quad 1$$

$$k \quad \frac{1}{3}$$

Now consider the equation,

$$\frac{3k \quad 4}{k \quad 1} \quad x$$

Substituting the value of k in the above equation we have,

$$\frac{3 \; \frac{1}{3} \quad 4}{\frac{1}{3} \quad 1} \quad x$$

$$\frac{3}{\frac{4}{3}} \quad x$$

$$\frac{9}{4} \quad x$$

Therefore, coordinate of P is $\frac{9}{4}, 3$

Now let us find the distance AP:

$$AP=\sqrt{\frac{9}{4} \quad 4^{\;2} \quad 3 \quad 2^{\;2}}$$

$$AP \quad \sqrt{\frac{49}{16} \quad 1}$$

$$AP \quad \sqrt{\frac{49 \quad 16}{16}}$$

$$AP \quad \sqrt{\frac{65}{16}} \quad \frac{\sqrt{65}}{4} \text{ units}$$

3.

(a) Consider the expression $\sin^2 34^o \quad \sin^2 56^o \quad 2\tan 18^o \tan 72^o \quad \cot^2 30^o$:

$$\sin^2 34^o \quad \sin^2 56^o \quad 2\tan 18^o \tan 72^o \quad \cot^2 30^o$$

$$\sin^2 34^o \quad \sin^2 \ 90^o \quad 56^o \quad 2\tan 18^o \tan \ 90^o \quad 72^o \quad \cot^2 30^o$$

$$\sin^2 34^o \quad \cos^2 34^o \quad 2\tan 18^o \cot 18^o \quad \cot^2 30^o$$

$$\sin^2 34^o \quad \cos^2 34^o \quad 2\tan 18^o \quad \frac{1}{\tan 18^o} \quad \cot^2 30^o$$

$$1 \quad 2 \quad 1 \quad \sqrt{3}^{\ 2}$$

$$1 \quad 2 \quad 3$$

$$3 \quad 3$$

$$0$$

(b)

By remainder Theorem,

For x=1, the value of the given expression is the remainder.

$$x^3 \quad 10x^2 \quad 37x \quad 26$$

$$1^{\ 3} \quad 10 \ 1^{\ 2} \quad 37 \ 1 \quad 26$$

$$1 \quad 10 \quad 37 \quad 26$$

$$37 \quad 37$$

$$0$$

$x \quad 1$ is a factor of $x^3 \quad 10x^2 \quad 37x \quad 26$

$$\begin{array}{r}
x^2+11x-26 \\
x-1 \overline{\smash{\big)}\, x^3+10x^2-37x+26} \\
\underline{x^3-x^2} \qquad\qquad\quad \\
11x^2-37x \qquad \\
\underline{11x^2-11x} \qquad \\
-26x+26 \\
\underline{-26x+26} \\
0 \quad
\end{array}$$

Thus, by factor theorem,

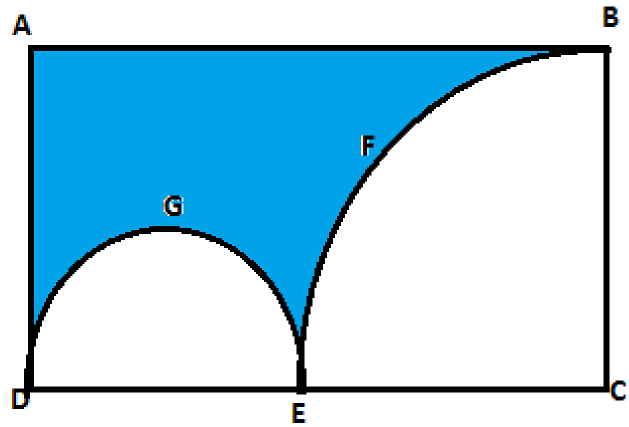
$$x^3 \quad 10x^2 \quad 37x \quad 26 \quad x \quad 1 \quad x^2 \quad 11x \quad 26$$

$$x \quad 1 \quad x^2 \quad 13x \quad 2x \quad 26$$

$$x \quad 1 \quad x \ x \quad 13 \quad 2 \ x \quad 13$$

$$x^3 \quad 10x^2 \quad 37x \quad 26 \quad x \quad 1 \quad x \quad 13 \quad x \quad 2$$

(c) Considering the given figure:



Given dimensions of the rectangle: AB=14 cm and BC=7 cm

Thus the radius of the quarter circle is 7 cm

Area of the quarter circle is = $\frac{1}{4}\quad\frac{22}{7}\quad 7^2$ sq. cm

Area of the quarter circle = $\frac{77}{2}$ sq. cm

Since EC = 7cm and DC = 14 cm, we have,

DE = DC   EC   14   7   7 cm

Therefore, radius of the semi circle is = $\frac{7}{2}$ cm

Thus the area of the semi circle is = $\frac{1}{2}\quad\frac{22}{7}\quad\frac{7}{2}^{\,2}$ sq. cm

Area of the semi circle = $\frac{77}{4}$ sq. cm

Area of the rectangle is=AB   BC=14   7=98 sq.cm

Thus, the required area=Area ABCD   Area BCEF   Area DGE

$$98\quad\frac{77}{2}\quad\frac{77}{4}\quad 40.25\text{ sq.cm}$$

4.

(a)

Consider the given set of numbers: 6,8,10,12,13,x

There are six numbers and six is even.

Thus the median of the given numbers is $\dfrac{\frac{N}{2}\text{th term} \quad \frac{N}{2} \quad 1 \ \text{ th term}}{2}$

$$\text{Median} \quad \frac{\frac{6}{2}\text{th term} \quad \frac{6}{2} \quad 1 \ \text{ th term}}{2}$$

$$\text{Median} \quad \frac{\text{3rd term} \quad \text{4th term}}{2}$$

$$\text{Median} \quad \frac{10 \quad 12}{2}$$

$$\text{Median} \quad \frac{22}{2} \quad 11$$

Given that the mean of 6,8,10,12,13,x is median of 6,8,10,12,13,x

Thus, we have

$$\frac{6+8+10+12+13+x}{6} \quad 11$$

$6+8+10+12+13+x = 66$

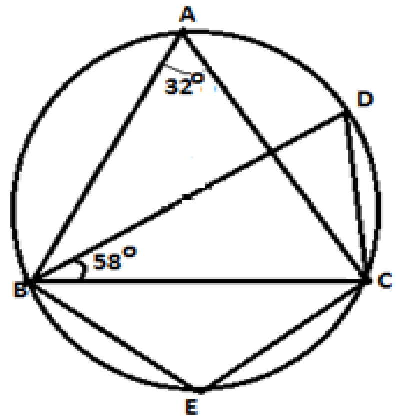
$49+x = 66$

$x = 66 \quad 49$

$x \quad 17$

(b)

Consider the following figure.



Given that BD is a diameter of the circle.

The angle in a semi circle is a right angle.

BCD=90^o

Also given that DBC=58^o

Consider the triangle BDC:

By angle sum property, we have

DBC+ BCD+ BDC=180^o

58^o 90^o+ BDC=180^o

148^o BDC=180^o

BDC=180^o 148^o

BDC=32^o

Angles in the same segment are equal.

Thus, BDC=32^o BAC=32^o

Now, □BACE is a cyclic quadrilateral,

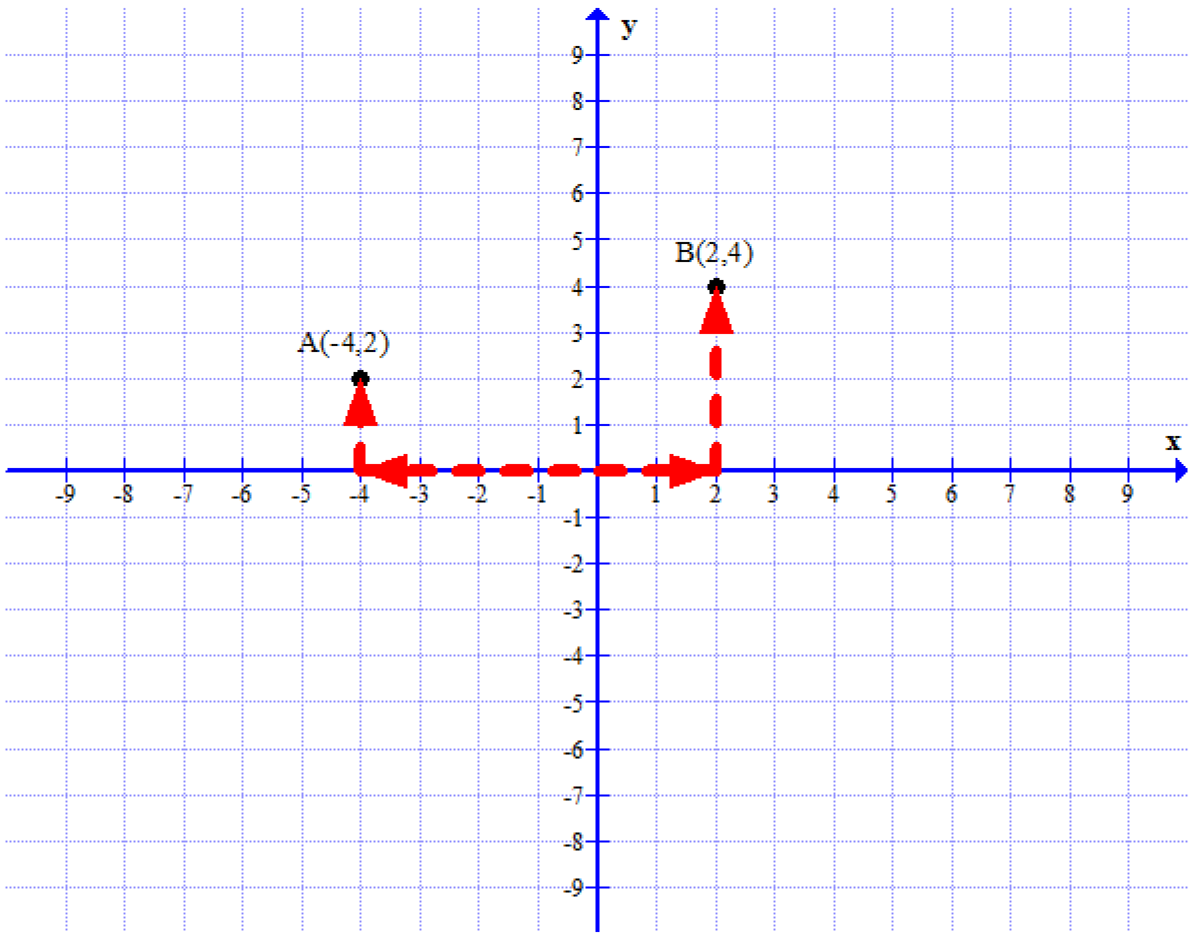
m BAC + m BEC = 180°

32 + m BEC = 180°

□ m□BEC = 180° - 32 = 148°

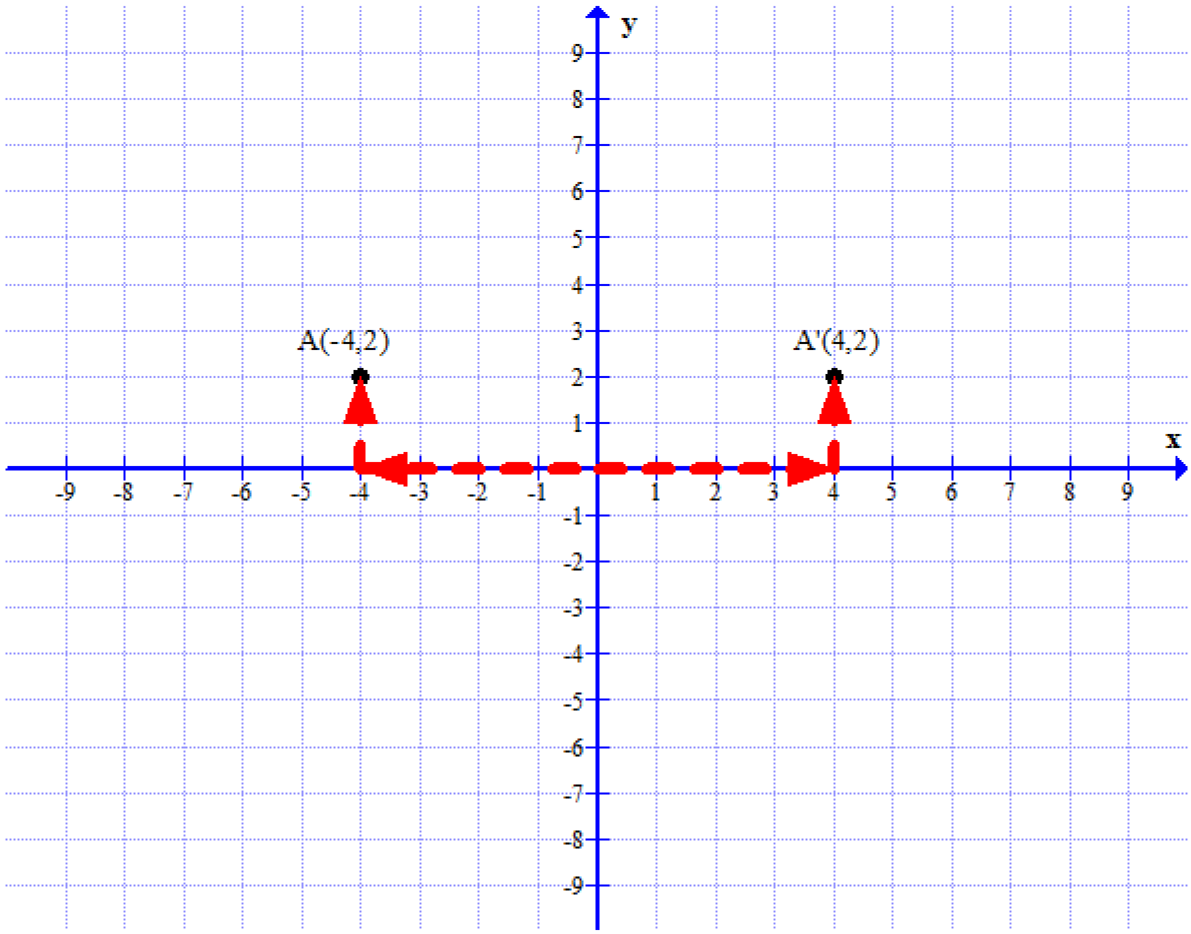
(c) Consider 1 unit on the graph to be 2 cm.

(i)To plot the point A(-4,2), move 4 units along the negative x-axis. Then move 2 units along the positive y axis.
To plot the point B(2,4), move 2 units along the positive x-axis. Then move 4 units along the positive y axis.

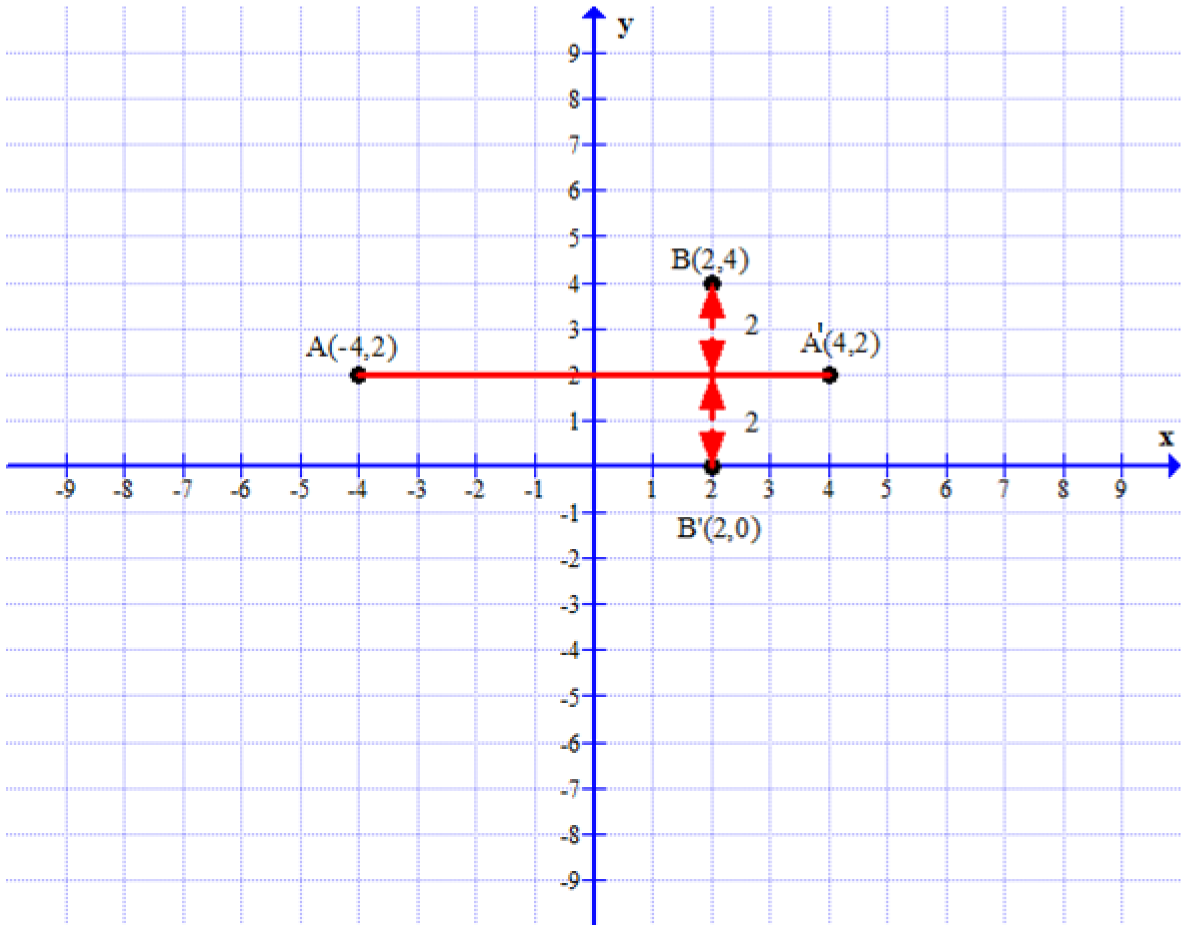


(ii) The y-axis acts as a line of symmetry between A and A'. Thus, perpendicular distance of A from y-axis = perpendicular distance of A' from y-axis. Thus, the y-coordinate of A' will be same as A, and the x-coordinate of A' will be the negative of the x-coordinate of A.

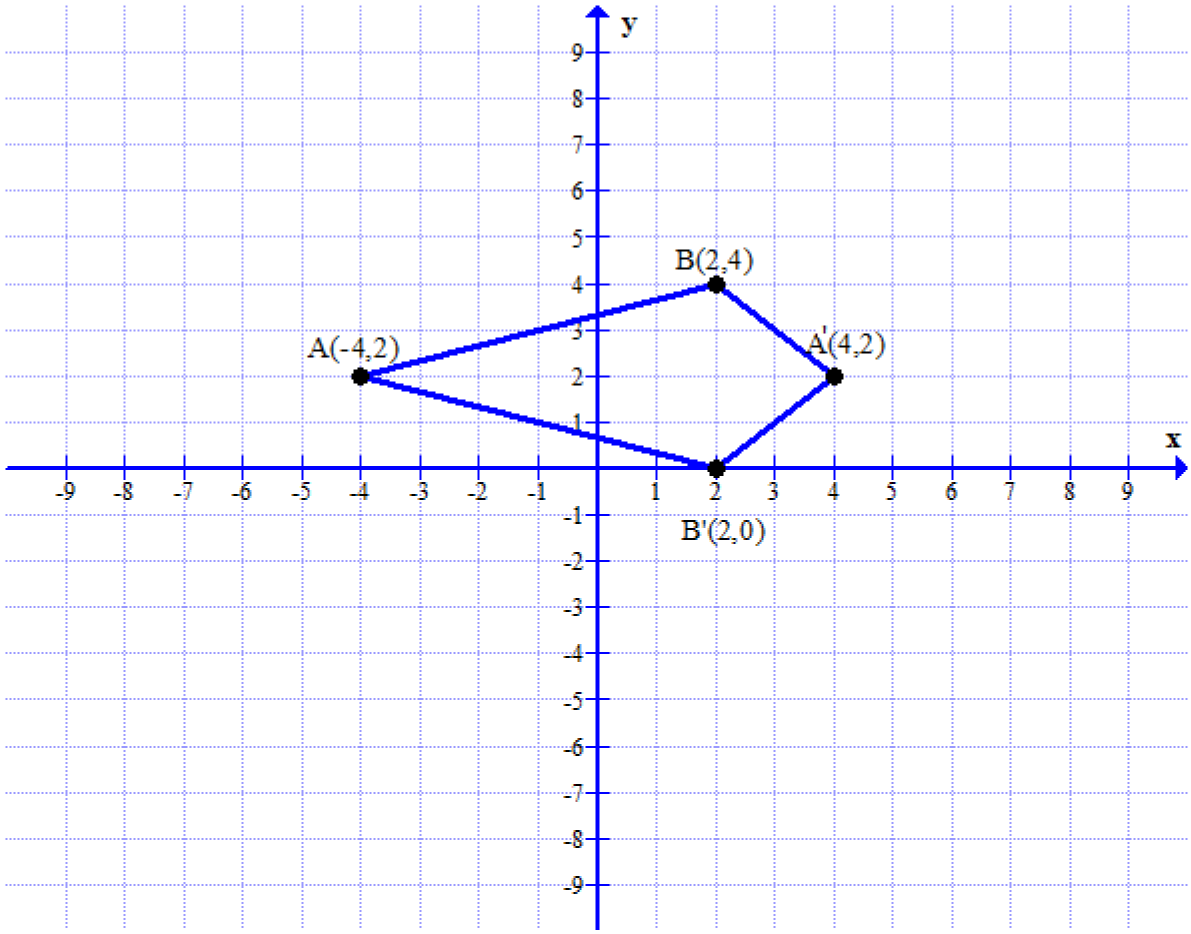
Thus, the coordinates of A' will be (4,2). Plot these in the same way as was done in (i).



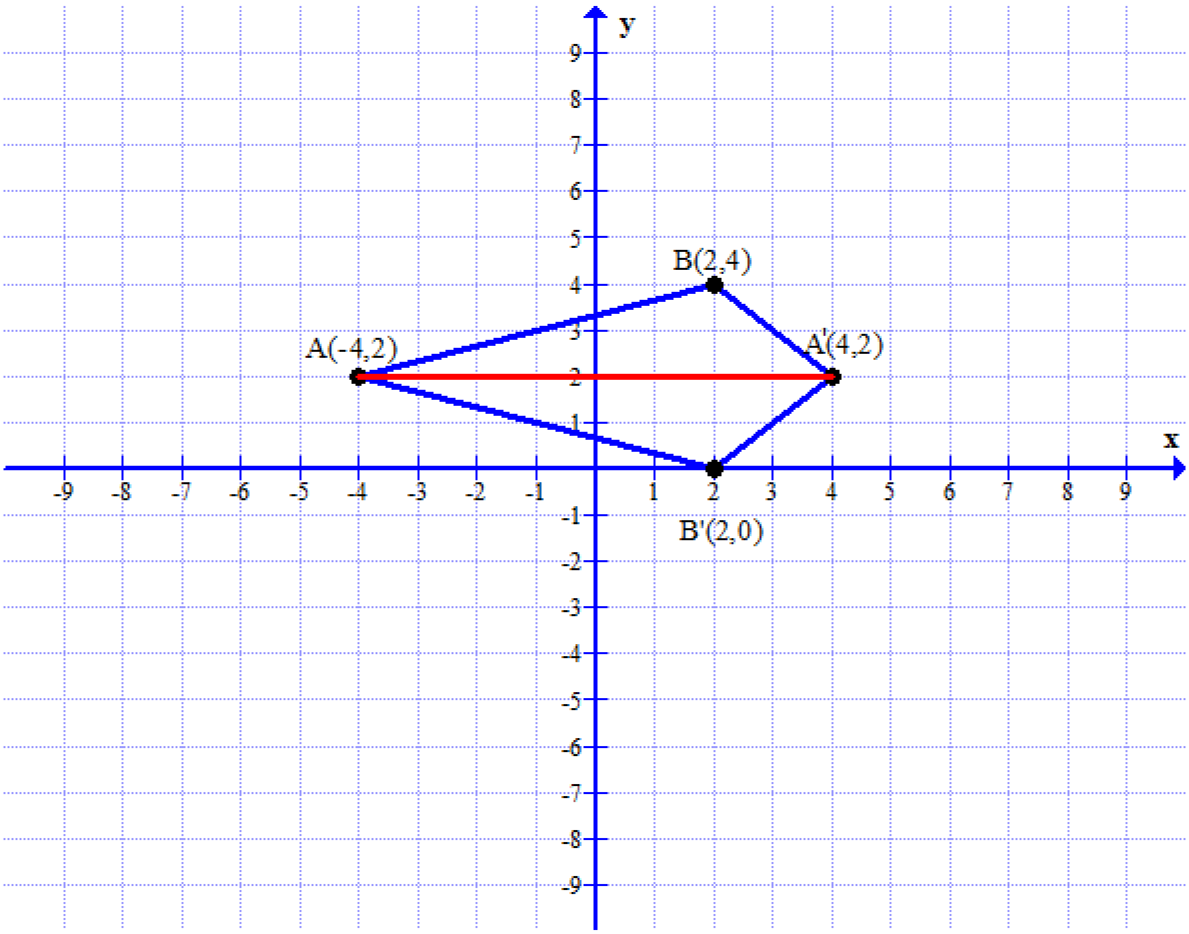
(iii) The line AA’ acts as a line of symmetry between B and B’. Thus, perpendicular distance of B from AA’ = perpendicular distance of B’ from AA’. Thus, the x-coordinate of B’ will be same as B, and the y-coordinate of B’ will be the same distance away from AA’ as B is.
Thus, the coordinates of B’ will be (2,0). Plot these in the same way as was done in (i)



(iv) It can be observed that the figure that is formed by all the 4 points has 4 sides and thus, is a quadrilateral. Since the four sides can be grouped into two pairs of equal-length sides that are adjacent to each other, it is a kite.



(v) A line of symmetry is a line which creates a mirror image on both sides. Thus, in the image, line AA' is the line of symmetry.



SECTION B (40 Marks)

Attempt any four questions from this section

5.

(a)

Printed price of the washing machine = Rs. 18,000

Discount = 20% of 18,000 = $\frac{20}{100}\times 18000=3600$

Thus, sale price for the wholesaler = 18000 – 3600 = Rs. 14,400

Sales tax paid by shopkeeper = 8% of 14,400 = $\frac{8}{100}\times 14400=1152$

The shopkeeper sells the washing machine for 10%disount on printed price.
Thus, the shopkeeper sells the washing machine to the customer at the price :

$18000-\frac{10}{100}\times 18000=18000-1800=16200$

Thus, the tax charged by the shopkeeper = 8% of 16,200 = $\frac{8}{100}\times 16200=1296$

i. Thus, VAT paid by the shopkeeper = Tax charged – Tax paid = 1296 – 1152 = Rs. 144
ii. Total amount that the customer pays for the washing machine is:
Price at which the shopkeeper sells the washing machine + Tax charged by the shopkeeper = 16,200 + 1296 = Rs. 17,496

(b) It is given that:

$$\frac{x^2+y^2}{x^2-y^2}=\frac{17}{8}$$

Applying componendo and dividendo,

$$\frac{x^2 \quad y^2 \quad x^2 \quad y^2}{x^2 \quad y^2 \quad x^2 \quad y^2} \quad \frac{17 \quad 8}{17 \quad 8}$$

$$\frac{2x^2}{2y^2} \quad \frac{25}{9}$$

$$\frac{x}{y} \quad \sqrt{\frac{25}{9}}$$

$$\frac{x}{y} \quad \frac{5}{3}$$

i. Thus, $\frac{x}{y} \quad \frac{5}{3}$

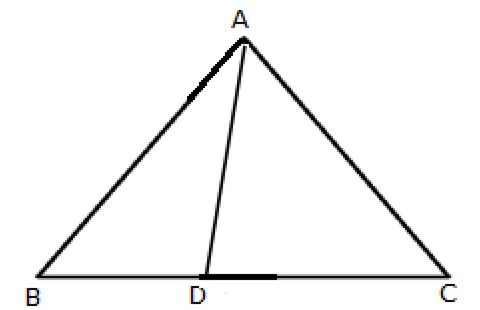
ii. Now, consider $\frac{x^3}{y^3}=\ \frac{x}{y}\ ^3 =\pm\ \frac{5}{3}\ ^3 =\pm\frac{125}{27}$

Again, applying componendo and dividendo,

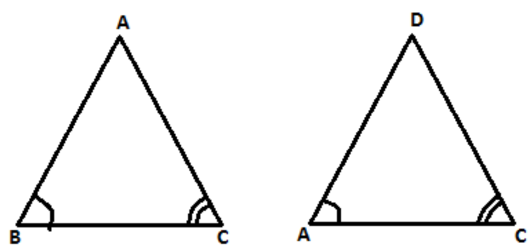
$$\frac{x^3 \quad y^3}{x^3 \quad y^3} \quad \frac{125 \quad 27}{125 \quad 27} \text{ or } \frac{125 \quad 27}{125 \quad 27}$$

$$\frac{x^3 \quad y^3}{x^3 \quad y^3} \quad \frac{152}{98} = \frac{76}{49} \text{ or } \frac{49}{76}, \text{ depending upon the sign of x and y}$$

(c) Consider the given triangle



Given that ABC= DAC.



(i) Consider the triangles ABC and DAC.

ABC= DAC given

C= C common

By AA-Similarity, ABC ~ DAC.

(ii) Hence the corresponding sides are proportional.

$$\frac{AB}{DA} \quad \frac{AC}{DC} \quad \frac{BC}{AC}$$

$$\frac{8}{5} \quad \frac{4}{DC}$$

$$DC \quad \frac{4 \quad 5}{8}$$

$$DC \quad \frac{5}{2} \text{ cm} = 2.5\text{cm}$$

$$\because \frac{AB}{DA} \quad \frac{BC}{AC}$$

$$\frac{8}{5} \quad \frac{BC}{4}$$

$$BC \quad \frac{8 \quad 4}{5}$$

$$BC \quad \frac{32}{5} \text{ cm} = 6.4\text{cm}$$

(iii) We need to find the ratios of the area of the triangles ABC and DAC.

Since the triangles ABC and DAC are similar triangles, we have

$$\frac{AB}{DA} \quad \frac{AC}{DC} \quad \frac{BC}{AC}$$

If two similar triangles have sides in the ratio, a:b,

then their areas are in the ratio $a^2 : b^2$

Thus, $\dfrac{\text{Area} \quad ACD}{\text{Area} \quad ABC} \quad \dfrac{AB^2}{DA^2} \quad \dfrac{AC^2}{DC^2} \quad \dfrac{BC^2}{AC^2}$

So, $\dfrac{\text{Area} \quad ACD}{\text{Area} \quad ABC} \quad \dfrac{4^2}{8^2}$

$$\frac{\text{Area} \quad ACD}{\text{Area} \quad ABC} \quad \frac{16}{64} \quad 1:4$$

6.

(a) If 3 points are collinear, the slope between any 2 points is the same. Thus, for A(a,3), B(2,1) and C(5,a) to be collinear, the slope between A and B and between B and C should be the same.

$$\frac{1 \quad 3}{2 \quad a} \quad \frac{a \quad 1}{5 \quad 2}$$

$$\frac{2}{2 \quad a} \quad \frac{a \quad 1}{3}$$

$$\frac{2}{a \quad 2} \quad \frac{a \quad 1}{3}$$

$$6 \quad a \quad 2 \quad a \quad 1$$

$$a^2 \quad 3a \quad 2 \quad 6$$

$$a^2 \quad 3a \quad 4 \quad 0$$

$$a \quad 1 \text{ or } 4$$

Rejecting a = -1 as it does not satisfy the equation, we have a = 4

Thus, slope of BC :

$$\frac{a \quad 1}{5 \quad 2} \quad \frac{4 \quad 1}{3} \quad \frac{3}{3} \quad 1 \quad m$$

Thus, the equation of the line can be :

$$\frac{y \quad 1}{x \quad 2} \quad 1$$

$$y \quad x \quad 1$$

$$x \quad y \quad 1$$

(b) Given :

Nominal Value (NV) of each share = Rs. 50

Since the shares are quoted at 20% premium, the market value of each share is:

Market Value (MV) of each share = $50+\frac{20}{100}\times 50=\text{Rs}.60$

(i) Dividend = Number of shares × dividend percentage × NV

Let n be the number of shares.

Thus,

$$600 \quad n \quad 15\% \quad 50$$

$$600 \quad n \quad \frac{15}{100} \quad 50$$

$$n \quad \frac{600 \quad 2}{15}$$

$$n \quad 80$$

(ii) Total investment = n X MV

Thus, total investment is: 80 × 60 = 4800

(iii) Rate of interest = $\frac{\text{Dividend}}{\text{Total Investment}} \quad 100$

$$\frac{600}{4800} \quad 100$$

$$12.5\%$$

(c)

(i) Total surface area of the sphere = $4 \quad r^2$, where r is the radius of the sphere.

Thus,

$$4 \quad r^2 \quad 2464 \text{ cm}^2$$

$$4 \quad \frac{22}{7} \quad r^2 \quad 2464$$

$$r^2 \quad 196$$

$$r \quad 14 \text{ cm}$$

(ii) Since the sphere is melted and recast into cones,

Volume of a sphere = n × Volume of a cone, where n is the number of cones.

$\frac{4}{3} \quad r^3 \quad n \quad \frac{1}{3} \quad r_c^2 \quad h_c$, where r_c and h_c are the radius and height of the cone.

Thus,

$$\frac{4}{3} \quad 14^3 \quad n \quad \frac{1}{3} \quad 3.5^2 \quad 7$$

$$4 \quad 14^3 \quad n \quad 3.5^2 \quad 7$$

$$n \quad 128$$

7.

(a) Let A be the assumed mean and d be the deviation of x from the assumed mean.
Let A = 40.
d = x – A

Marks (C.I.)	No. of students (Frequency f)	Mid-point of C.I. (x)	d = x – A A = 45.5	f X d
11-20	2	15.5	-30	-60
21-30	6	25.5	-20	-120
31-40	10	35.5	-10	-100
41-50	12	45.5	0	0
51-60	9	55.5	10	90
61-70	7	65.5	20	140
71-80	4	75.5	30	120
	Total f = 50			Total f_d=70

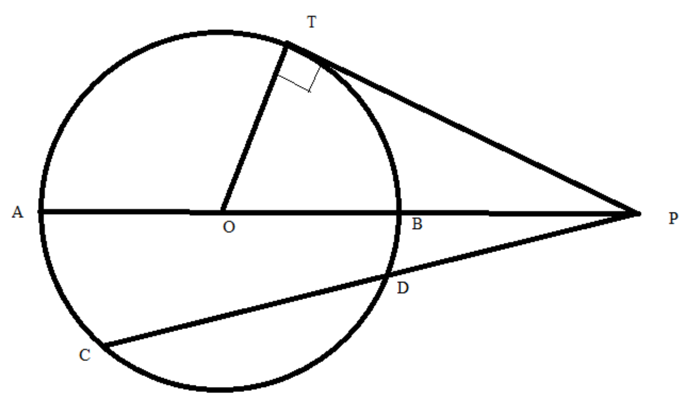
$$\text{Mean} = A + \frac{\text{Total } f_d}{\text{Total } f}$$

$$\text{Mean} = 45.5 + \frac{70}{50}$$

$$\text{Mean} = 45.5 + 1.4$$

$$\text{Mean} = 46.9$$

(b) Theorem used: Product of the lengths of the segments of the chord is equal to the square of the length of the tangent from the point of contact to the point of intersection.



(i) As chord CD and tangent at point T intersect each other at P,
$PC \times PD = PT^2$ ..... (i)
AB is the diameter and tangent at point T intersect each other at P,
$PA \times PB = PT^2$ ....(ii)
From (i) and (ii), $PC \times PD = PA \times PB$ ... (iii)

Given: PD = 5cm, CD = 7.8 cm
PA = PB + AB = 4 + AB, and PC = PD + CD = 12.8 cm
Subs. these values in (iii),
12.8 × 5 = (4 + AB) × 4

$$4 + AB = \frac{12.8 \quad 5}{4}$$

4 + AB = 16
AB = 12cm

(ii)

$$PC \quad PD \quad PT^2$$

$$PT^2 \quad 12.8 \quad 5 \quad 64$$

$$PT \quad 8 \text{ cm}$$

Thus, the length of the tangent is 8 cm.

(c) Given :

$$A \quad \begin{matrix} 2 & 1 \\ 0 & 2 \end{matrix}$$

$$B \quad \begin{matrix} 4 & 1 \\ 3 & 2 \end{matrix}$$

$$C \quad \begin{matrix} 3 & 2 \\ 1 & 4 \end{matrix}$$

Thus,

$$A^2 \quad \begin{matrix} 2 & 1 \\ 0 & 2 \end{matrix} \quad \begin{matrix} 2 & 1 \\ 0 & 2 \end{matrix} \quad \begin{matrix} 4 & 0 & 2 & 2 \\ 0 & 0 & 0 & 4 \end{matrix} \quad \begin{matrix} 4 & 0 \\ 0 & 4 \end{matrix}$$

$$AC \quad \begin{matrix} 2 & 1 \\ 0 & 2 \end{matrix} \quad \begin{matrix} 3 & 2 \\ 1 & 4 \end{matrix} \quad \begin{matrix} 6 & 1 & 4 & 4 \\ 0 & 2 & 0 & 8 \end{matrix} \quad \begin{matrix} 7 & 8 \\ 2 & 8 \end{matrix}$$

$$5B \quad 5 \quad \begin{matrix} 4 & 1 \\ 3 & 2 \end{matrix} \quad \begin{matrix} 20 & 5 \\ 15 & 10 \end{matrix}$$

Thus,

$$A^2 \quad AC \quad 5B$$

$$\begin{matrix} 4 & 0 \\ 0 & 4 \end{matrix} \quad \begin{matrix} 7 & 8 \\ 2 & 8 \end{matrix} \quad \begin{matrix} 20 & 5 \\ 15 & 10 \end{matrix}$$

$$\begin{matrix} 23 & 3 \\ 17 & 6 \end{matrix}$$

8.

(a) C. I. for the third year = Rs. 1452.
C. I. for the second year = Rs. 1320
S.I. on Rs. 1320 for one year = Rs. 1452 – Rs. 1320 = Rs. 132

$$\text{Rate of Interest} = \frac{132 \quad 100}{1320} \quad 10\%$$

Let P be the original sum of money and r be the rate of interest.
Amount after 2 years – Amount after one year = C.I. for second year.

$$P \ 1 \quad \frac{10}{100}^{2} \quad P \ 1 \quad \frac{10}{100} \quad 1320$$

$$P \quad \frac{110}{100}^{2} \quad \frac{110}{100} \quad 1320$$

$$P \quad \frac{11}{10}^{2} \quad \frac{11}{10} \quad 1320$$

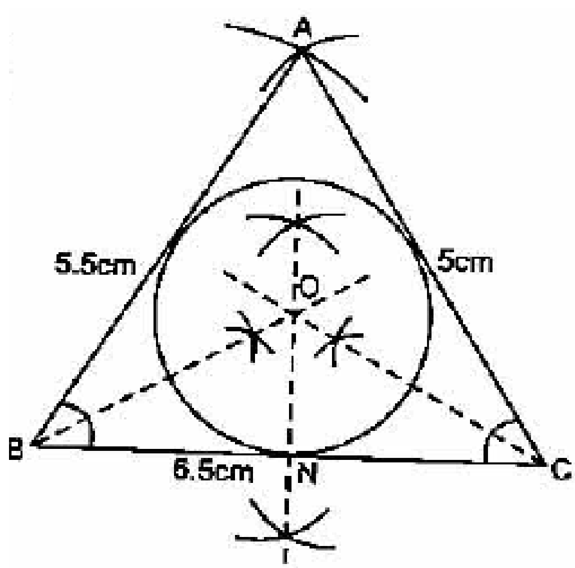
$$P \quad \frac{121}{100} \quad \frac{11}{10} \quad 1320$$

$$P \quad \frac{1320 \quad 100}{11} \quad \text{Rs.}12{,}000$$

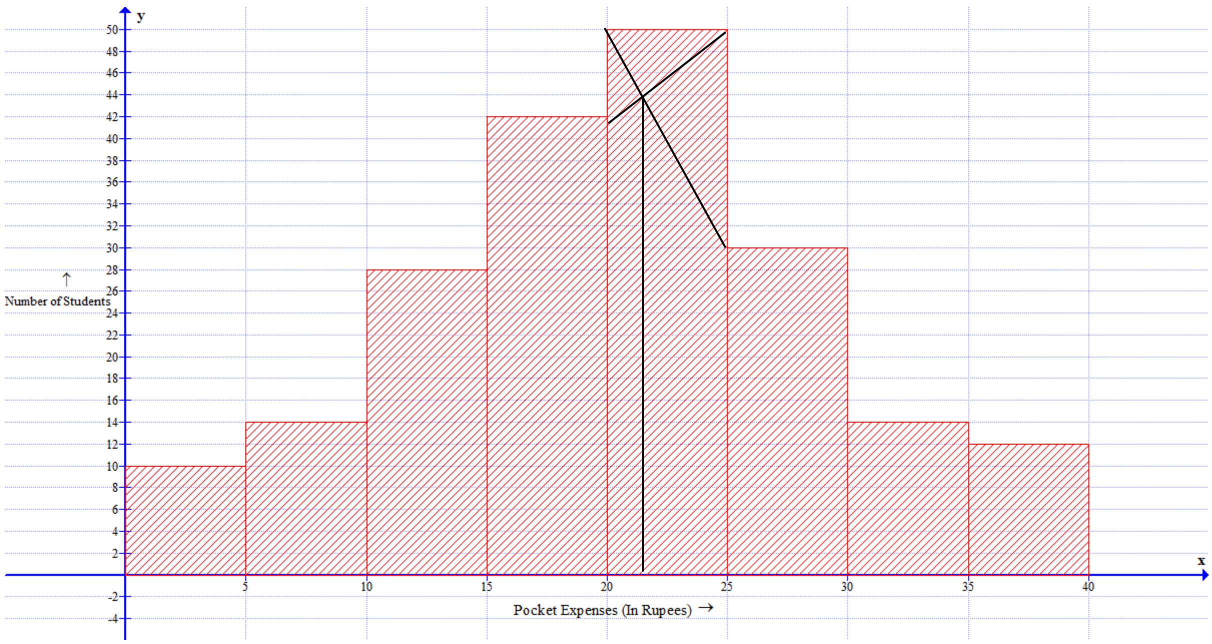
Thus, rate of interest is 10% and original sum of money is Rs.12,000.

(b) The incircle of the triangle is drawn with the joining point of all angular bisectors as the center.

Construct a ΔABC with the given data.
Draw the angle bisector of B and C. Let these bisectors cut at O.
Taking O as centre. Draw a incircle which touches all the sides of the ΔABC
From O draw a perpendicular to side BC which cut at N.
Measure On which is required radius of the incircle. ON = 1.5cm



(c)



Mode = 21

9.

(a)Duplicate ratio of a:b is $a^2 : b^2$

It is given that the duplicate ratio of $(x \quad 9):(3x \quad 6) \quad 4:9$

Thus,

$(x \quad 9)^2 : (3x \quad 6)^2 \quad 4:9$

$$\frac{x \quad 9}{3x \quad 6} \quad \frac{4^2}{9^2}$$

$$\frac{x \quad 9}{3x \quad 6} \quad \frac{16}{81}$$

$$81x \quad 729 \quad 48x \quad 96$$

$$81x \quad 48x \quad 96+729$$

$$33x \quad 825$$

$$x \quad \frac{825}{33} \quad 25$$

(b)

The given quadratic equation is :

$x-1^{2}-3x+4=0$

$x^2-2x+1-3x+4=0$

$x^2-5x+5=0$

The roots of the quadratic equation $ax^2+bx+c=0$ are:

$$x \quad \frac{b \quad \sqrt{b^2 \quad 4ac}}{2a}$$

In the given equation,

a = 1, b = -5, c=5

Thus, the roots of the equation are :

$$x \quad \frac{5 \quad \sqrt{5^{2} \quad 4\ 1 \quad 5}}{2\ 1}$$

$$x \quad \frac{5 \quad \sqrt{25 \quad 20}}{2}$$

$$x \quad \frac{5 \quad \sqrt{5}}{2}$$

$$x \quad \frac{5 \quad \sqrt{5}}{2} \text{ or } x \quad \frac{5 \quad \sqrt{5}}{2}$$

$$x \quad 3.618 \text{ or } x \quad 1.382$$

(c) Qualifying principal for various months:

Month	Principal
April	6000
May	7000
June	10000
July	6000
August	6000
September	7000
Total	42000

Here, P= Rs.42,000

Let R% be the rate of interest and T=$\frac{1}{12}$ year

Given that the interest , I=Rs.175

Thus, we have

$$I=\frac{P \quad R \quad T}{100}$$

$$175 \quad \frac{42000 \quad R \quad 1}{100 \quad 12}$$

$$\frac{175 \quad 100 \quad 12}{42000} \quad R$$

$$R \quad 5\%$$

Thus the rate of interest is 5%

10.

(a)

Let the digit at the tens place be ‘a’ and at units place be ‘b’.
The two-digit so formed will be 10a+b.

According to given conditions, product of its digits is 6.
Thus,

$$a \quad b \quad 6$$

$$a \quad \frac{6}{b} \qquad ....(1)$$

9 is added to the number = 10a+b+9

It is given that this new value is equal to the value of the reversed number.
If the digits are reversed, the new number formed = 10b+a.

Thus,

$$10a \quad b \quad 9 \quad 10b \quad a$$

$$9a \quad 9b \quad 9$$

$$a \quad b \quad 1$$

Substitute (1) in the above equation

Thus,

$$a \quad \frac{6}{a} \quad 1$$

$$a^2 \quad a \quad 6 \quad 0$$

Thus,

$$a \qquad 3 \text{ or } 2$$

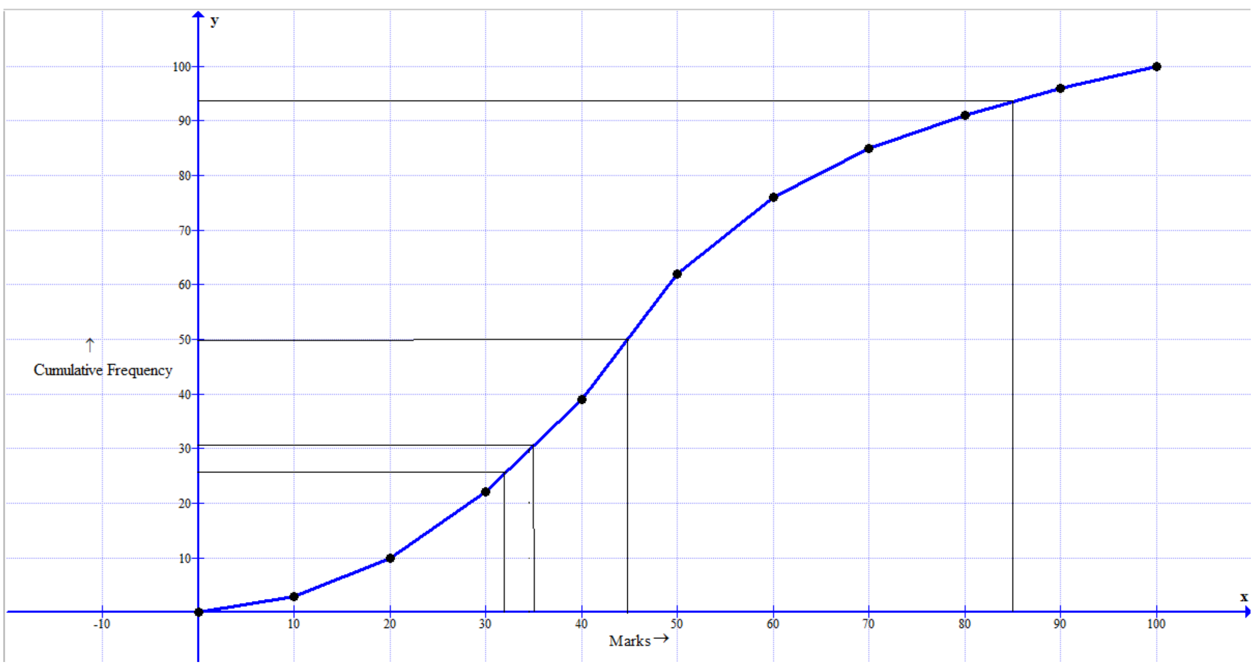
Since a digit cannot be negative, a = 2.

$$b \quad \frac{6}{a} \quad \frac{6}{2} \quad 3$$

Thus, the required number is : 10a + b = 23

(b) Draw the cumulative frequency table.

Marks	Number of Students (Frequency)	Cumulative Frequency
0-10	3	3
10-20	7	10
20-30	12	22
30-40	17	39
40-50	23	62
50-60	14	76
60-70	9	85
70-80	6	91
80-90	5	96
90-100	4	100



Scale : x-axis : 1 unit = 10marks
y-axis : 1 unit = 10 students

(i) Median = $\dfrac{N}{2}^{th}$ term $\dfrac{100}{2}^{th}$ term 50^{th} term

Draw a horizontal line through mark 50 on y-axis. The, draw a vertical line from the point it cuts on the graph. The point this line touches the x-axis is the median.
Thus, median = 45

(ii) Lower quartile = $\dfrac{N}{4}^{th}$ term $\dfrac{100}{4}^{th}$ term 25^{th} term

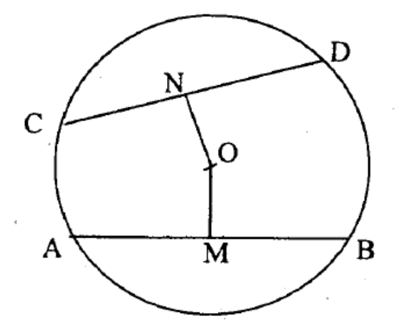
Draw a horizontal line through mark 25 on y-axis. The, draw a vertical line from the point it cuts on the graph. The point this line touches the x-axis is the lower quartile.
Thus, lower quartile = 31

(iii) Draw a vertical line through mark 85 on x-axis. The, draw a horizontal line from the point it cuts on the graph.
The point this line touches the y-axis is the number of students who obtained less than 85% marks =93
Thus, number of students who obtained more than 85% marks =7

(iv) Draw a vertical line through mark 35 on x-axis. The, draw a horizontal line from the point it cuts on the graph.
The point this line touches the y-axis is the number of students who obtained less than 35% marks =21

11.

(a) A line from center to a chord that is perpendicular to it, bisects it.
It is given that AB = 24 cm
Thus, MB = 12 cm



(i) Applying Pythagoras theorem for ΔOMB,

$$OM^2 \quad MB^2 \quad OB^2$$

$$5^2 \quad 12^2 \quad OB^2$$

$$OB \quad 13$$

Thus, radius of the circle = 13 cm.

(ii) Similarly, applying Pythagoras theorem for ΔOND,

$$ON^2 \quad ND^2 \quad OD^2$$

OD is the radius of the circle

$$12^2 \quad ND^2 \quad 13^2$$

$$ND \quad 5$$

A line from center to a chord that is perpendicular to it, bisects it.
ND = 5 cm
Thus, CD = 10 cm

(b) Consider LHS:

$\sin \quad \cos \quad \tan \quad \cot$

$\sin \quad \cos \quad \frac{\sin}{\cos} \quad \frac{\cos}{\sin}$

$\sin \quad \cos \quad \frac{\sin^2 \quad \cos^2}{\cos \ \sin}$

$\frac{\sin \quad \cos}{\cos \ \sin}$

$\frac{\sin}{\cos \ \sin} \quad \frac{\cos}{\cos \ \sin}$

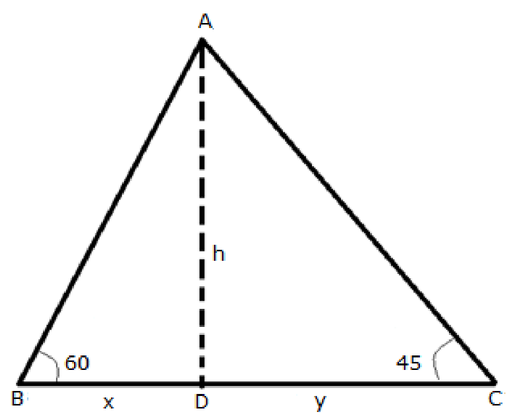
$\frac{1}{\cos} \quad \frac{1}{\sin}$

$\sec \quad \operatorname{cosec}$

=RHS

Thus, L.H.S. = R.H.S.

(c) Let A be the position of the airplane and let BC be the river. Let D be the point in BC just below the airplane.



For ΔADC,

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

$1 \quad \frac{250}{y}$

$y \quad 250$

For ΔADB,

$\tan 60^{\circ}$

$\frac{AD}{DB}$

$\frac{h}{x}$

$\frac{250}{x}$

$x \quad \frac{250}{\tan 60^{\circ}} \quad \frac{250}{\sqrt{3}}$ m

Thus, the width of the river = DB + DC = $250 \quad \frac{250}{\sqrt{3}} \quad 394$ m