Mathematics

I a.

$$A+2x=2B+C$$

$$\begin{bmatrix}2 & -6\\2 & 0\end{bmatrix}+2x=2x\begin{bmatrix}-3 & 2\\4 & 0\end{bmatrix}+\begin{bmatrix}4 & 0\\0 & 2\end{bmatrix}$$

$$\begin{bmatrix}2 & -6\\2 & 0\end{bmatrix}+2x=\begin{bmatrix}-6 & 4\\8 & 0\end{bmatrix}+\begin{bmatrix}4 & 0\\0 & 2\end{bmatrix}$$

$$\begin{bmatrix}2 & -6\\2 & 0\end{bmatrix}+2x=\begin{bmatrix}-2 & 4\\8 & 2\end{bmatrix}$$

$$2x=\begin{bmatrix}-2 & 4\\8 & 2\end{bmatrix}-\begin{bmatrix}2 & -6\\2 & 0\end{bmatrix}$$

$$2x=\begin{bmatrix}-4 & 10\\6 & 2\end{bmatrix}$$

$$x=\begin{bmatrix}-2 & 5\\3 & 1\end{bmatrix}$$

b. Principal, P= Rs.4000, Time =3yrs

C.I= Rs.1324

A=P+C.I=Rs.4000+Rs.1324=Rs. 5324

$$A = P\left[1+\frac{R}{100}\right]^{N}$$

$$5324 = 4000\left[1+\frac{R}{100}\right]^{3}$$

$$\frac{5324}{4000} = \left[1+\frac{R}{100}\right]^{3}$$

$$\frac{1331}{1000} = \left[1+\frac{R}{100}\right]^{3}$$

$$\frac{11^3}{10^3} = \left[1+\frac{R}{100}\right]^{3}$$

$$\left[\frac{11}{10}\right]^{3} = \left[1+\frac{R}{100}\right]^{3}$$

$$\frac{11}{10} = \frac{100+R}{100}$$

$$10(100+R) = 11\times 100$$

$$100+R = \frac{11\times 100}{10} = 110$$

$$R = 10\%$$

c. Observation = 11, 12,14, (x-2), (x+4), (x+9), 32, 38, 47

Given median = 34

If n is odd, Median = $\left[\frac{n+1}{2}\right]^{th} item$

$$ie \left[\frac{9+1}{2}\right]^{th} item = 5^{th} item$$

$$ie\ x+4 = 24$$

$$x = 24-4 = 20$$

$$Mean = \frac{11+12+14+18+24+29+32+38+47}{9}$$

$$= \frac{225}{9} = 25$$

II. a. Let the number added to be then

6+x, 15+x, 20+x, 43+x

Product of extremes = Product of means

ie (6+x) (43+x) = (15+x) (20+x)

$258+6x+43x+x^2 = 300+15x+20x+x^2$

$258+49x = 300+35x$

$49x-35x = 300-25$

$14x = 42$

$x = {}^{42}/_{14}=3$

b. $P(2) = 2(2)^3+a(2)^2+2b-14 = 0$

$16+4a+2b-14 = 0$

$4a+2b = -2$ -------------- 1

$P(3) = 2(3)^3+a(3)^2+3b-14 = 52$

$54+9a+3b-14 = 52$

$9a+3b+40 = 52$

$9a+3b = 12$ ------------- 2

$$1\times 3 \quad 12a+6b=-6$$

$$2\times 2 \quad \underline{{}^{-}18^{-}+6b={}^{-}24}$$

$$-6a \quad =-30$$

$$a=5$$

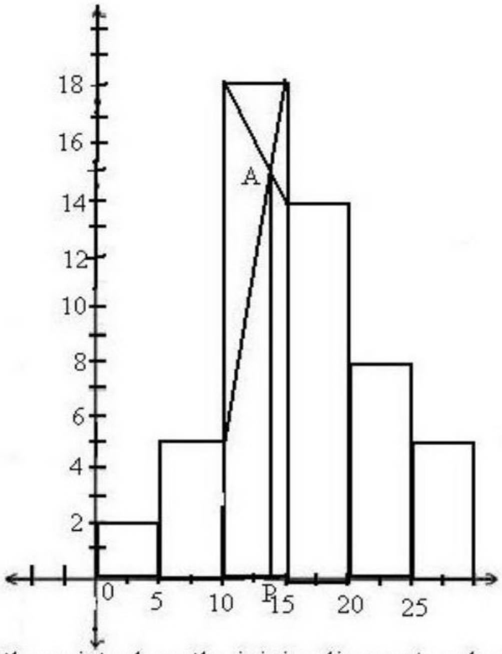
$$1 \Rightarrow \quad 20+2b=-2$$

$$2b=-22$$

$$b=\frac{-22}{2}=-11$$

$$a=5,\ b=-11$$

c.



Let the point where the joining lines cut each other be 'A'.
Draw a perpendicular line from point A onto the x-axis.
The point 'P' where the perpendicular will meet the x-axis will give the mode.

Hence mode = 14.2 appro:

In the Graph paper

III. a.

$$\cos 80 = \cos(90-10)$$
$$= \sin 10$$
$$\sin 59 = \sin(90-31)$$
$$= \cos 31$$
$$\therefore 3\cos 80^0.\operatorname{cosec}10^0 + 2\sin 59^0.\sec 31^0$$
$$= 3\sin 10^0.\operatorname{cosec}10^0 + 2\cos 31^0.\sec 31^0$$
$$= 3+2$$
$$= 5$$

b.

$\angle BAD = 65^0, \ \angle ABD = 70^0, \ \angle BDC = 45^0$

(i) In $\Delta \ ABD$

$\angle A = 65^0$ and $\angle B = 70^0$ (given)

$\angle A + \angle B + \angle ADB = 180^0$

$65 + 70 + \angle ADB = 180^0$

$135 + \angle ADB = 180^0$

$\angle ADB = 180 - 135 = 45^0$

$\therefore \ \angle D = 45^0 + 45^0 = 90^0$

$\Rightarrow$ A From ΔABD

ii)

$\angle BAD + \angle ADB + \angle DNBA = 18^0$

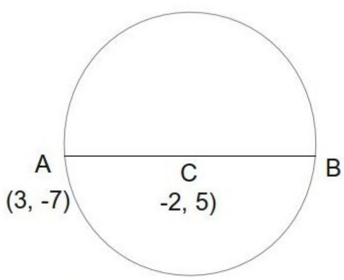
$65^0 + \angle ADB + 70^0 = 180^0$

$\angle ADB = 180^0 - (65^0 + 70^0)$

$= 180^0 - 135^0 = 45^0$

Since $\angle ADB = 45^0, \angle ACB = 45^0$ (angle on the same are)

c.



A=(3,-7) and centre (-2,5)

(i) Length of radius $AC = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$$= \sqrt{(3+2)^2 + (-7-5)^2}$$

$$= \sqrt{25+144} = \sqrt{169} = 13cm$$

(ii) Coordinate of point B be(x, y)

$\therefore$ Coordinate of 0 = coordinates of midpoint of AB (Since $AB \rightarrow$ diameter O – centre)

$$-2, 5 = \frac{3+x}{2}, \frac{-7+y}{2}$$

$$\frac{3+x}{2} = -2 \Rightarrow 3 + x = -4$$

$$\Rightarrow x = -4 - 3 = -7$$

$$5 = \frac{-7+y}{2} \Rightarrow y = 10 + 7 = 17$$

$\therefore$ coordinate of B are $(-1, 17)$

IV. a.

$$x^2 - 5x - 10 = 0$$

Using Formula

$$x = \frac{5 \pm \sqrt{25 - 4 \times 1 \times -10}}{2 \times 1}$$

$$= \frac{5 \pm \sqrt{25+40}}{2}$$

$$= \frac{5 \pm \sqrt{65}}{2}$$

$$= \frac{5 \pm 8.062}{2}$$

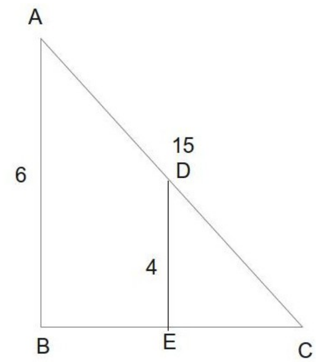
$$= \frac{5+8.062}{2}, \frac{5-8.062}{2}$$

$$= \frac{13.062}{2}, \frac{-3.062}{2}$$

$$= 6.531, -1.531$$

$$= 6.53, -1.53$$

b. (I)



$$\Delta\ ABC \sim \Delta DEC$$

$In\ \Delta ABC\ and\ \Delta DEC$

$\angle CDE = \angle CAB$

$(DE \parallel AB)$

$\angle CED = \angle CBA\ (DE \parallel AB)$

$\therefore\ \Delta\ ABC \sim \Delta DEC\ (by\ AA\ similarity)$

ii) AB=6cm, DE=4cm

Ac=15cm, CD=?

$In\ \Delta ACB\ and\ \Delta DCE$

$$\frac{AB}{DE} = \frac{AC}{DC}$$

$ie \quad \frac{6}{4} = \frac{15}{x}\ (Let\ DC\ be\ x)$

$\Rightarrow \quad 6x = 60$

$$x = \frac{60}{6} = 10$$

$\therefore \quad CD = 10cm$

iii) Ratio of area of two similar Triangle is equal to the squares of their corresponding sides

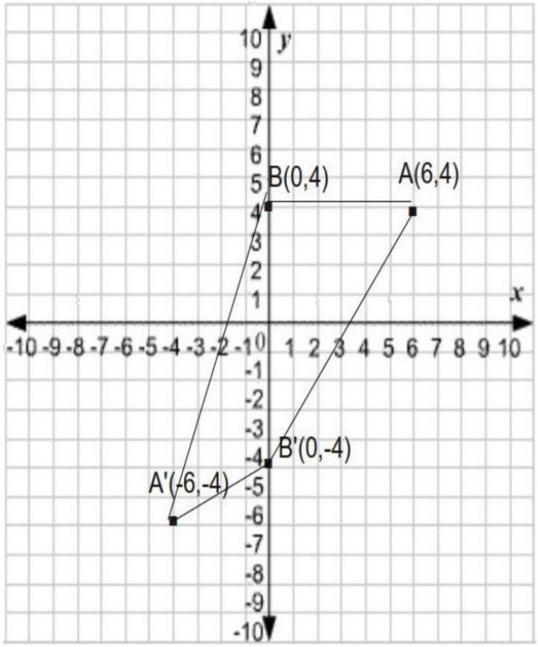
$\therefore\ Area\ of\ \Delta\ ABC : area\ of\ \Delta DEC$

$= 6^2 : 4^2$

$= 36 : 16$

$= 18 : 8 \ = 9 : 4$

c. (I)



ii) A'=(-6,-4) and B'=(0,-4)

iii) ABA'B' is a quadrilateral.

iv) AB=4cm, BA'=10cm, A'B'=6cm, B'A=10cm

therefore perimeter = 4+10+6+10 = 30cm

V. a.

$$\frac{-x}{3} \le \frac{x}{2} - 1\frac{1}{3} < \frac{1}{6}$$

$$\frac{-x}{3} < \frac{x}{2} - 1\frac{1}{3} \ \textit{and}\ \frac{x}{2} - 1\frac{1}{3} < \frac{1}{6}$$

$$\frac{-x}{3} - \frac{x}{2} \le \frac{-4}{3} \ \textit{and}\ \frac{x}{2} < \frac{1}{6} + \frac{4}{3}$$

$$\frac{-5x}{6} \le \frac{-4}{3} \textit{and}\ \frac{x}{2} < \frac{27}{18}$$

$$\frac{5x}{6} \ge \frac{4}{3} \textit{and}\ \frac{x}{2} < \frac{27}{18}$$

$$x \ge \frac{24}{15} \textit{and}\ x < \frac{27}{9}$$

$$\textit{Solution set} = \left\{ \frac{24}{15} \le x < \frac{27}{9} \right\}$$

b.

$$time = \frac{n(n+1)}{2} months = \frac{36\times 37}{2\times 12} = \frac{111}{2} yrs$$

$$I = \frac{P\times R\times T}{100} = \frac{P\times 8\times 111}{200} = \frac{888P}{200}$$

$$A = np + I$$

$$8088 = 36P + \frac{888P}{200}$$

$$\frac{8088}{1} = \frac{7200P + 888P}{200}$$

$$8088P = 8088\times 200$$

$$P = \frac{8088\times 200}{8088} = Rs.200$$

c.

$$(i)\ Total\ investment = Market\ value \times number\ of\ shares$$

$$= 132\times 50$$

$$= 6600$$

$$(ii)\ Dividend = 7.5\%$$

$$So\ his\ income\ from\ one\ share = 7.5\%\ of\ Rs.100$$

$$= \frac{7.5}{100}\times 100 = Rs.7.50$$

$$His\ annual\ income = 7.50\times 50$$

$$= Rs.375$$

$$(iii)\ Rs.7.50\ can\ be\ earned\ from\ one\ share$$

$$\therefore Rs.150\ can\ be\ earned\ from$$

$$\frac{1}{7.50}\times 150 = 20 shares$$

VI. a.

$$\sqrt{\frac{1-\cos A}{1+\cos A}} = \frac{\sin A}{1+\cos A}$$

Multiplying congigate on both sides on L.H.S

$$L.H.S = \sqrt{\frac{1-\cos A(1-\cos A)}{1+\cos A \times 1-\cos A}}$$

$$= \sqrt{\frac{(1-\cos A)^2}{1-\cos^2 A}} = \sqrt{\frac{(1-\cos A)^2}{\sin^2 A}} = \frac{1-\cos A}{\sin A}$$

$$= \frac{1-\cos A}{\sin A} \times \frac{1+\cos A}{1+\cos A} = \frac{1-\cos^2 A}{\sin A(1+\cos A)}$$

$$= \frac{\sin^2 A \sin A}{\sin A(1+\cos A)} = \frac{\sin A}{1+\cos A}$$

$$= R.H.S$$

b.

$$\text{given } \angle ABC = 100^0$$

$$\angle ACD = 40^0$$

$$\text{Since } \angle ABC = 100^0$$

$$\angle ADC = 180^0 - 100^0 = 80^0$$

CT is a tan *gent to the circle at C*

$$\angle BCD = 90^0$$

$$\angle BCA + \angle ACD = 90^0$$

$$\angle BCA + 40 = 90^0$$

$$\angle BCA = 50^0$$

c.

Month	Min. balance between 10^{th} day and last day	Min. balance in nearest multiple of 10
February	Rs. 4500	Rs. 4500
March	Rs. 4500	Rs. 4500
April	Rs. 4500	Rs. 4500
May	Rs. 6738	Rs. 6740
June	Rs. 1738	Rs. 1740
July	Rs. 7738	Rs. 7740
		Adding P= Rs. 29720

$$P = Rs.29720\ , R = 4\frac{1}{2} = \frac{9}{2}, T = \frac{1}{12}$$

$$I = \frac{29720 \times \frac{9}{2} \times \frac{1}{12}}{100} = Rs.111.45$$

$$= Rs.111 (Rounding)$$

VII. a. The Coordinates of the midpoints D of the side be are

$$\frac{7+1}{2}, \frac{8+(-10)}{2}$$

$$ie\ (4,-1)$$

$$Equation\ of\ AD\ is\ y-5 = \frac{-1-5}{4-3}(x-3)$$

$$ie\ y-5 = \frac{-6}{1}(x-3)$$

$$y-5 = -6(x-3)$$

$$y = -6x+18+5$$

$$y = -6x+23$$

b. As the VAT is paid on the value added to 12% of value added by the shopkeeper = Rs. 36

Value added by the shopkeeper = Rs.36x$^{100}/_{12}$=Rs.300

Profit = Rs.300

price of article paid by shopkeeper to the wholesaler = Rs. 1500-300=Rs.1200

therefore VAT paid by the shopkeeper to the wholesaler = 12% of Rs. 1200

=$^{12}/_{100}$x1200=Rs.144

Hence price of article inclusive of VAT which the shopkeeper paid to the wholesaler

= Rs. 1200+Rs.144

=Rs.1344

c.

(i) *In right angled* ΔABC

$$\tan 60^0 = \frac{AB}{BC}$$

$$\sqrt{3} = \frac{60}{BC}$$

$$BC = \frac{60}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{60\sqrt{3}}{3}$$

$$= 20 \times 1.732 = 34.64m$$

(ii) *In right angled* ΔAED

$$\tan 30^0 = \frac{AE}{ED} = \frac{AE}{BC}$$

$$\frac{1}{\sqrt{3}} = \frac{AE}{20\sqrt{3}}$$

$$\therefore \ AE = 20m$$

$$CD = BE = AB - AE = 60 - 20 = 40m$$

$$\text{height of lamp post} = 40m$$

$$\begin{bmatrix} x & 3x \\ y & 4y \end{bmatrix} \begin{bmatrix} 2 \\ 1 \end{bmatrix} = \begin{bmatrix} 5 \\ 12 \end{bmatrix}$$

$$\begin{bmatrix} 2x + 3x \\ 2y + 4y \end{bmatrix} = \begin{bmatrix} 5 \\ 12 \end{bmatrix}$$

$$5x = 5, x = 1$$

VIII. a. $6y = 12, y = 2$

b.

$$Radius\ of\ sphere = 15cm$$

$$Volume\ of\ sphere = \frac{4}{3} \times \frac{22}{7} \times 15 \times 15 \times 15$$

$$= \frac{22}{7} \times 20 \times 225cm^3$$

$$Radius\ of\ cone = 2.5cm$$

$$Height\ of\ cone = 8cm$$

$$Volume\ of\ cone = \frac{1}{3} \times \frac{22}{7} \times 2.5 \times 2.5 \times 8$$

$$No.of\ cones\ recast = \frac{Volume\ of\ sphere}{Volume\ of\ cone}$$

$$= \frac{\frac{22}{2} \times 20 \times 225}{\frac{1}{3} \times \frac{22}{7} \times 2.5 \times 2.5 \times 8}$$

$$= \frac{225 \times 3}{2.5} = 270$$

c. Equation has real and equal roots

$$\therefore b^2 - 4ac = 0$$

$$Here\ b = p - 3, a = 1,\ C = p$$

$$ie\,(P-3)^2 - 4 \times 1 \times P = 0$$

$$P^2 - 6P + 9 - 4P = 0$$

$$P^2 - 10P + 9 = 0$$

$$(P-9)\ (P-1) = 0$$

$$P = 9\ or\ 1$$

IX.

$$a.\ Area\ of\ \frac{1}{4}th\ portion\ of\ circle = \frac{1}{4}\pi r^2$$

$$= \frac{1}{4} \times \frac{22}{7} \times 3.5 \times 3.5$$

$$= \frac{11 \times 0.5 \times 3.5}{2} = 9.625cm^2$$

$$Area\ of\ \Delta OAD = \frac{1}{2}bh$$

$$= \frac{1}{2} \times 3.5 \times 2cm^2 = 3.5cm^2$$

$$Area\ of\ portion = 9.625 - 3.5 = 6.125cm^2$$

$$b.\ Let\ the\ number\ of\ black\ balls\ be\ n$$

$$Number\ of\ white\ balls = 30$$

$$\therefore\ probability\ of\ drawing\ a\ black\ ball\ a = \frac{n}{30+n}$$

$$\Pr obability\ of\ drawing\ a\ white\ ball = \frac{30}{30+n}$$

$$Now,\ from\ question$$

$$\frac{n}{30+n} = \frac{1}{5} \times \frac{30}{30+n}$$

$$\therefore\ n = 6$$

$$\therefore No.of\ black\ balls = 6$$

c. Shop Deviation method

$$A = a + l\frac{\sum difi}{\sum}$$

$$di = mi - ss \quad di = \frac{di}{10}$$

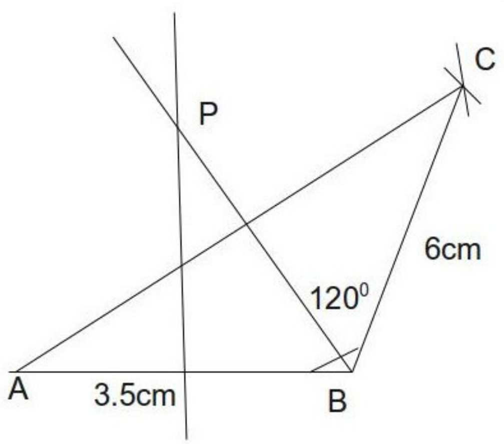
$Classin\,level$	$ClassMark$	$Frequency$	$di = mi - a$	$di = \frac{di}{l}$	$difi$
$20-30$	25	10	-30	-3	-75
$30-40$	35	6	-20	-2	-70
$40-50$	45	8	-10	-1	-45
$50-60$	55	12	0	0	0
$60-70$	65	5	10	1	65
$70-80$	75	9	20	2	150
		$\sum fi = 50$		$\sum difi = 25$	

$$\Rightarrow A = a + l.\frac{\sum di'fi}{\sum fi}$$

$$= 55 + 10.\frac{25}{50}$$

$$= 55 + 5 = 60$$

X. a.



I)

ii) Draw a circle with BC as diameter.

Draw angle bisector of

iii) Measure the angle

b.

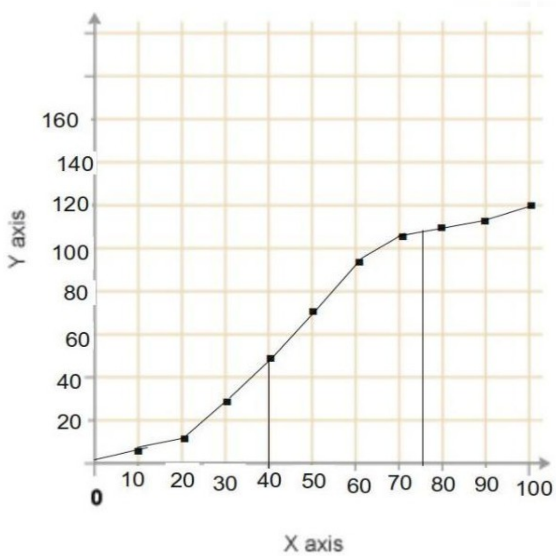
I)

Marks	No.of students	c.f
0 – 10	5	5
10 – 20	9	14
20 – 30	16	30
30 – 40	22	52
40 – 50	26	78
50 – 60	18	96
60 – 70	11	107
70 – 80	6	113
80 – 90	4	117
90 – 100	3	120

$$Median = \frac{n}{2}^{th} \ term$$

$$= \frac{120}{2}^{th} \ term$$

$$= 60^{th} term$$



ii) Using graph we can find number of students who obtained more than 75% marks in the text (120-113=7)

iii) Write from the graph (52)

iv)

XI.

a. Point P ($^{-3}/_{4}$) on AB divides

AB in ratio 2:3 ie L : M =2:3

Let the co-ordinate of A be (x,0) and B be (o,y)

then

$$\frac{lx_2+mx_1}{l+m}, \frac{ly_2+my_1}{l+m} = -3, 4$$

$$\frac{2\times 0+3\times x}{2+3}, \frac{2\times y+3\times 0}{2+3} = -3, 4$$

$$ie \quad \frac{3x}{5} = -3, \frac{2y}{5} = y2$$

$$x = -5, \quad y = 10$$

$$\therefore \textit{ Coordinate of A and B are } (-5, 0) \textit{ and } (0, 10)$$

b.

$$\frac{x^4+1}{2x^2} = \frac{17}{8}$$

$$By\ u\sin g\ componends\ and\ dividends$$

$$\frac{x^4+1+2x^2}{x^4+1-2x^2} = \frac{17+8}{17-8}\left[\frac{a+b}{a-b} = \frac{c+d}{c-d}\right]$$

$$\Rightarrow \frac{(x^2+1)^2}{(x^2-1)^2} = \frac{25}{9}$$

$$\frac{x^2+1}{x^2-1} = \frac{5}{3}$$

$$\Rightarrow x^2 = 5-1 = 4$$

$$or \quad x = \pm 2$$

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

$$x = \pm 2$$

c.

$Let\ the\ no.\ of\ books\ be\ y$

$and\ cost\ of\ are\ book = x$

$\therefore\ xy = 960 \ ----------- \ 1$

$According\ to\ qn.$

$(x-8)(y+4) = 960$

$xy + yx - 8y - 32 = 960$

$960 + yx - 8y - 32 = 960\ [\because xy = 960]$

$yx - 8y = 32$

$ie\ \ x - 2y = 8 ------------- 2$

$x = 8 + 2y$

$Put\ 2\ in\ 1$

$(8+2y)y = 960$

$2y^2 + 8y - 960 = 0$

$y^2 + 4y - 480 = 0$

$(y+2y)\ (y-20) = 0$

$y = 20 [\because y\ cannot\ be\ negative]$

$\therefore\ x = \frac{960}{20} = 48$