# ICSE Board Class IX Mathematics Paper 3 – Solution

## SECTION - A (40 Marks)

Q. 1.

(a) P = Rs. 6000, R = 10% p.a., n = 
$$1\frac{1}{2}$$
 years =  $\frac{3}{2}$  years  
A = P $\left(1 + \frac{R}{2 \times 100}\right)^{2n}$  (: Interest is compounded half yearly)  
=  $6000\left(1 + \frac{10}{2 \times 100}\right)^{3}$   
=  $6000\left(1 + \frac{5}{100}\right)^{3}$   
=  $6000 \times (1.05)^{3}$   
= Rs. 6945.75  
Amount = Rs. 6945.75  
C.I. = 6945.75 - 6000 = Rs. 945.75

(b) We have

$$\frac{\left(\sqrt{11} - \sqrt{7}\right)\left(\sqrt{11} - \sqrt{7}\right)}{\left(\sqrt{11} + \sqrt{7}\right)\left(\sqrt{11} - \sqrt{7}\right)} = x - y\sqrt{77}$$
$$\Rightarrow \frac{11 - \sqrt{77} - \sqrt{77} + 7}{11 - 7} = x - y\sqrt{77}$$
$$\Rightarrow \frac{18 - 2\sqrt{77}}{4} = x - y\sqrt{77}$$
$$\Rightarrow \frac{9}{2} - \frac{1}{2}\sqrt{77} = x - y\sqrt{77}$$
$$\Rightarrow x = \frac{9}{2}, y = \frac{1}{2}$$

(c)

Sonu and Monu's field together form a quadrilateral ABCD.



Sonu's field is **ABD**,

 $s = \frac{a+b+c}{2} = \frac{52+25+63}{2} = 70$ 

s-a=70-52=18, s-b=70-25=45 and s-c=70-63=7

Area of  $\triangle ABD =$ 

$$\sqrt{s(s-a)(s-b)(s-c)} = \sqrt{70.18.45.7} = 630 \text{ sq m}$$

Monu's field is **ABCD**,

$$s = \frac{a+b+c}{2} = \frac{114+25+101}{2} = 120$$
  
s-a = 120 - 114 = 6, s-b = 120 - 25 = 95 and s-c = 120 - 101 = 19

Area of  $\triangle BCD =$ 

Total area is = 630 + 1140 = 1770 sq m

The cost of fertilization is Rs 20 per sq m.

Therefore the total cost is =  $1770 \times 20 = Rs 35,400$ .

- Q. 2. (a) In  $\Delta$ DFC, DC<sup>2</sup> = DF<sup>2</sup> + FC<sup>2</sup> [Pythagoras Theorem]  $\Rightarrow 5^2 = DF^2 + 4^2$   $\Rightarrow 5^2 - 4^2 = DF^2 \Rightarrow DF^2 = 25 - 16 \Rightarrow DF = 3$   $\therefore$  Area of  $\Delta$ DEC =  $\frac{1}{2} \times (4+4) \times 3 = \frac{1}{2} \times 8 \times 3 = 12$  cm<sup>2</sup> FX = DX - DF = 9 - 3 = 6 cm Area of trapezium CEBA =  $\frac{1}{2} \times (4+4+6+6) \times 6 = \frac{1}{2} \times 20 \times 6 = 60$  cm<sup>2</sup>  $\therefore$  Area of figure ABCDE = area of  $\Delta$ DEC + area of trapezium ECBA = 12 + 60 = 72 cm<sup>2</sup>
  - (b) Given that AB and CD are two chords of a circle with centre O, intersecting at a point E. PQ is the diameter through E, such that  $\angle AEQ = \angle DEQ$ .

To prove that AB = CD.

Draw perpendiculars OL and OM on chords AB and CD respectively.

Therefore, cords AB and CD are equidistant from the centre.

Now,  $m \angle LOE = 180^{\circ} - 90^{\circ} - m \angle LEO$  ... [Angle sum property of a triangle]

$$= 90^{\circ} - m \angle LEO$$

$$\Rightarrow m \angle LOE = 90^{\circ} - m \angle AEQ$$

$$\Rightarrow m \angle LOE = 90^{\circ} - m \angle DEQ$$

$$\Rightarrow m \angle LOE = 90^{\circ} - m \angle MEQ$$

$$\Rightarrow \angle LOE = \angle MOE$$
In  $\triangle OLE$  and  $\triangle OME$ ,  

$$\angle LEO = \angle MEO$$

$$\angle LOE = \angle MOE$$
EO = EO  

$$\triangle OLE \cong \triangle OME$$
OL = OM



(c)  

$$\left(\sqrt[3]{4}\right)^{2x+\frac{1}{2}} = \left(\sqrt[3]{8}\right)^{5}$$

$$\Rightarrow \left[\left(4\right)^{1/3}\right]^{2x+\frac{1}{2}} = \left[8^{1/3}\right]^{5}$$

$$\Rightarrow \left(2^{2/3}\right)^{\left(2x+\frac{1}{2}\right)} = \left[8^{1/3}\right]^{5}$$

$$\Rightarrow \left(2\right)^{\frac{2}{3}\left(2x+\frac{1}{2}\right)} = \left(2\right)^{5}$$

$$\Rightarrow \frac{2}{3}\left(2x+\frac{1}{2}\right) = 5$$

$$\Rightarrow 4x+1 = 15$$

$$\Rightarrow x = \frac{7}{2}$$

Q. 3.

(a) Given, 
$$\log x = a + b$$
 and  $\log y = a - b$   
 $\log \frac{10x}{y^2} = \log 10x - \log y^2$  [Using quotient law]  
 $= \log 10 + \log x - 2 \log y$   
 $= 1 + (a + b) - 2(a - b)$   
 $= 1 + a + b - 2a + 2b$   
 $= 1 - a + 3b$ 

(b) Given : In  $\triangle$ ABC, AD is the bisector of  $\angle$ BAC and BC is produced to E



Now,  $\angle ACE = \angle ABC + \angle BAC$  ....[Exterior angle = Sum of interior opposite  $\angle s$ ]  $\Rightarrow \angle ACE = y + 2x$ In  $\triangle ABD$ ,  $\angle ADC = x + y$  ....[Exterior angle = Sum of interior opposite  $\angle s$ ]  $\therefore \angle ABC + \angle ACE = y + y + 2x = 2(x + y)$  $\Rightarrow \angle ABC + \angle ACE = 2\angle ADC$  (c) Steps of Construction:

- 1. Draw AB = 4.5 cm.
- 2. Draw  $\angle$ BAS = 120° and draw EA  $\perp$  AB.
- 3. From A, cut an arc of measure 3.3 cm on EA such that AX = 3.3 cm.
- 4. Through X, draw a line QP which is parallel to AB which cuts AS at D.
- 5. Through B draw an arc taking radius 3.6 cm at C on PQ.
- 6. Join CB.

Thus, ABCD is the required trapezium.



#### Q. 4.

(a) We can see that  $\triangle$ ABC is a right-angles triangle.

 $\Rightarrow AB^{2} + BC^{2} = AC^{2} \quad ....[By Pythagoras theorem]$   $\Rightarrow 15^{2} + BC^{2} = 25^{2}$   $\Rightarrow BC^{2} = 400$   $\Rightarrow BC = 20 \text{ cm}$ Now BC = DB + CD  $\Rightarrow 20 = DB + 7$   $\Rightarrow DB = 13 \text{ cm}$ Again ADB is a right angled triangle.  $\Rightarrow AB^{2} + DB^{2} = AD^{2} \quad ....[By Pythagoras theorem]$   $\Rightarrow 15^{2} + 13^{2} = 390$   $\Rightarrow BC = 19.8 \text{ cm}$ In the right-angled  $\triangle CDE$   $\Rightarrow ED^{2} + CE^{2} = CD^{2} \quad ....[By Pythagoras theorem]$  $\Rightarrow ED^{2} = CD^{2} - CE^{2} = 7^{2} - x^{2}$ 



In the right-angled  $\triangle AED$   $\Rightarrow ED^2 + AE^2 = AD^2$  ....[By Pythagoras theorem]  $\Rightarrow ED^2 = AD^2 - AE^2 = 19.8^2 - (25 - x)^2$ Since in both the cases length of ED is same and hence  $ED^2$  is also same in both the cases.  $\Rightarrow 7^2 - x^2 = 19.8^2 - (25 - x)^2$   $\Rightarrow 7^2 - x^2 = 19.8^2 - 625 - x^2 + 50x$   $\Rightarrow 7^2 - 19.8^2 + 625 = 50x$   $\Rightarrow 281.96 = 50x$   $\Rightarrow x = 5.63$  cm So,  $ED^2 = 7^2 - 5.6^2 = 17.64$  $\Rightarrow ED = 4.2$  cm = DE

(b)

Each interior angle of a regular pentagon  $=\frac{(2\times5-4)\times90}{5}$  [n = 5]  $=\frac{6\times90}{5}$ Each exterior angle of a regular decagon  $=\frac{360}{10}=36^{\circ}$  [n = 10]

: Each interior angle of a regular pentagon = 3(Exterior angle of a regular decagon)

# (c) Given $\tan \theta + \cot \theta = 3$ ,

Squaring both sides,

$$(\tan\theta + \cot\theta)^2 = 3^2$$
  

$$\Rightarrow \tan^2\theta + \cot^2\theta + 2\tan\theta\cot\theta = 9$$
  

$$\Rightarrow \tan^2\theta + \cot^2\theta + 2\tan\theta \times \frac{1}{\tan\theta} = 9 \quad \left[\because \cot\theta = \frac{\cos\theta}{\sin\theta}\right]$$
  

$$\Rightarrow \tan^2\theta + \cot^2\theta + 2 = 9$$
  

$$\Rightarrow \tan^2\theta + \cot^2\theta = 7$$

Q. 5.

(a) Consider equation, x - 2y = 1 ....(1)

$$\Rightarrow$$
 y =  $\frac{x-1}{2}$ 

Х	1	3	5
у	0	1	2

∴ Points are (1, 0), (3, 1) and (5, 2).

Now consider equation x + y = 4 ....(2)

х	0	2	4
У	4	2	0

∴ Points are (0, 4), (2, 2) and (4, 0).

Now plotting these points on the graph paper, we get



Since the lines intersect at (3, 1), therefore the solution is x = 3 and y = 1.

(b) In 15 days A and B together can do a piece of work.

Therefore, in 1 day they do  $\frac{1}{15}$  work Let us assume that A takes x days and B takes y days to do the work alone. So A's one day's work =  $\frac{1}{x}$ B's one day's work =  $\frac{1}{y}$   $\frac{1}{x} = \frac{3}{2} \cdot \frac{1}{y}$   $\Rightarrow 3x - 2y = 0$   $\Rightarrow 2y = 3x$   $\Rightarrow y = \frac{3x}{2}$  ....(i) Also,  $\frac{1}{x} + \frac{1}{y} = \frac{1}{15}$   $\Rightarrow \frac{1}{x} + \frac{2}{3x} = \frac{1}{15}$   $\Rightarrow \frac{3+2}{3x} = \frac{1}{15}$  $\Rightarrow 2x = 75$ 

$$\Rightarrow 3x = 73$$
$$\Rightarrow x = 25$$
$$\Rightarrow y = \frac{3 \times 25}{2} = 37.5$$

Hence, A will do the work alone in 25 days and B will do it alone 37 and half days.

(c) Let there be n sides of the polygon. Then, each interior angle is of measure

$$\left(\frac{2n-4}{n} \times 90^{\circ}\right)$$
  
$$\therefore \frac{2n-4}{n} \times 90 = 108$$
  
$$\Rightarrow (2n-4) \times 90 = 108n$$
  
$$\Rightarrow 180n - 360 = 108n$$
  
$$\Rightarrow 180n - 108n = 360$$
  
$$\Rightarrow 72n = 360$$
  
$$\Rightarrow n = 5$$

Hence the given polygon has 5 sides.

Q. 6.

(a) (i) Interest for first year = 
$$\frac{5600 \times 14 \times 1}{100}$$
 = Rs. 784  
(ii) Amount at the end of the first year = 5600 + 784 = Rs. 6384  
(iii) Interest for the second year =  $\frac{6384 \times 14 \times 1}{100}$  = Rs. 893.76 = Rs. 894 (to the nearest rupee)

(b)

(i) Since, the point P lies on the x-axis, its ordinate is 0.

(ii) Since, the point Q lies on the y-axis, its abscissa is 0.

(iii) The co-ordinates of P and Q are (-12, 0) and (0, -16) respectively.

$$PQ = \sqrt{(-12-0)^{2} + (0+16)^{2}}$$
$$= \sqrt{144 + 256}$$
$$= \sqrt{400}$$
$$= 20$$

(c) Here 
$$m \angle A + m \angle C = 90^{\circ}$$
 as  $m \angle B = 90^{\circ}$   
 $\Rightarrow 30^{\circ} + m \angle C = 90^{\circ}$   
 $\Rightarrow m \angle C = 60^{\circ}$   
In right-angled  $\triangle ABC$ ,  
 $\tan 30^{\circ} = \frac{BC}{AB}$   
 $\Rightarrow \frac{1}{\sqrt{3}} = \frac{8}{AB}$   
 $\Rightarrow AB = 8\sqrt{3} \text{ cm}$   
 $\sin 30^{\circ} = \frac{BC}{AC}$   
 $\Rightarrow \frac{1}{2} = \frac{8}{AC}$ 

 $2 \quad AC \Rightarrow AC = 16 \text{ cm}$ 



Q. 7.  
(a)  

$$\frac{3^{n+1}}{3^{n(n-1)}} \div \frac{9^{n+1}}{(3^{n+1})^{n-1}}$$

$$= \frac{3^{n+1}}{3^{n(n-1)}} \times \frac{(3^{n+1})^{n-1}}{9^{n+1}}$$

$$= \frac{3^{n+1}}{3^{n(n-1)}} \times \frac{3^{(n+1)(n-1)}}{(3\times3)^{n+1}}$$

$$= \frac{3^{n+1}}{3^{n^2-n}} \times \frac{3^{(n^2-1)}}{(3^2)^{n+1}}$$

$$= \frac{3^{n+1}}{3^{n^2-n}} \times \frac{3^{(n^2-1)}}{3^{2n+2}}$$

$$= 3^{n+1+n^2-1-(n^2-n)-(2n+2)}$$

$$= 3^{n+1+n^2-1-n^2+n-2n-2}$$

$$= 3^{-2}$$

$$= \frac{1}{3^2}$$

$$= \frac{1}{9}$$

(b)

Area of an isosceles  $\Delta = \frac{1}{4} b\sqrt{4a^2 - b^2}$ 

(where b is the base and a is the length of equal sides) Given, b = 8 cm and area =12 cm<sup>2</sup>

$$\Rightarrow \frac{1}{4} \times 8 \times \sqrt{4a^2 - 8^2} = 12$$
  

$$\Rightarrow \sqrt{4a^2 - 8^2} = 6$$
  

$$\Rightarrow 4a^2 - 8^2 = 36$$
  

$$\Rightarrow 4a^2 = 100$$
  

$$\Rightarrow a^2 = 25$$
  

$$\Rightarrow a = 5 \text{ cm}$$
  

$$\therefore \text{ Perimeter} = 2a + b = 2 \times 5 + 8 = 18 \text{ cm}$$

(c) Given AC = CD To prove: BC < CD Proof: In  $\triangle ACD$ ,  $m \angle ACD = 180^{\circ} - 70^{\circ} = 110^{\circ}$  [Linear pair]  $\angle CAD = \angle ADC = \frac{70^{\circ}}{2} = 35^{\circ}$  [Angles opposite to equal sides are equal] In ∆ABC,  $m \angle BAC = 70^{\circ} - 35^{\circ} = 35^{\circ}$  [ $\angle BAC = \angle BAD - \angle CAD$ ]  $m \angle ABC = 180^{\circ} - (70^{\circ} + 35^{\circ})$  [Sum of all  $\angle s$  of a  $\triangle$  is  $180^{\circ}$ ] = 75° ∴ ∠BAC < ∠ABC ∴ BC < AC [Since AC = CD] So, BC < CD С

D

в

(a)  

$$\cos \theta = \frac{2\sqrt{mn}}{m+n}$$
Now,  

$$\sin^2 \theta + \cos^2 \theta = 1$$

$$\Rightarrow \sin^2 \theta = 1 - \cos^2 \theta$$

$$= 1 - \left(\frac{2\sqrt{mn}}{m+n}\right)^2$$

$$= 1 - \left(\frac{4mn}{(m+n)^2}\right)$$

$$= \frac{(m+n)^2 - 4mn}{(m+n)^2}$$

$$= \frac{m^2 + n^2 - 4mn}{(m+n)^2}$$

(b) Mean = 20 Number of terms = 5 ∴ Total sum = 20 × 5 = 100 Let the excluded number be x. Then,  $\frac{(100-x)}{4} = 23$   $\Rightarrow 100 - x = 23 \times 4 = 92$  $\Rightarrow x = 8$ 

Hence, the excluded number is 8.

(c) Let the side of each of the three equal cubes be 'a' cm.

Surface area of one cube =  $6a^2 \text{ cm}^2$ 

Therefore, sum of surface areas of the three cubes =  $3 \times 6a^2 = 18a^2 \text{ cm}^2$ 

Now,

Length of the new cuboid = 3a cm

Breadth of the new cuboid = a cm

Height of the new cuboid = a cm

Total surface area of the new cuboid =  $2[(3a \times a) + (a \times a) + (a \times 3a)]$ 

 $= 2[3a^2 + a^2 + 3a^2]$ 

$$= 2[7a^2]$$
  
= 14a<sup>2</sup> cm<sup>2</sup>

Thus, the required ratio of T.S.A. of the new cuboid to that of the sum of the S.A. of the 3 cubes =  $14a^2$ :  $18a^2 = 7$ : 9.

#### Q. 9.

(a) Given: In quadrilateral ABCD; AD = BC. P, Q, R, S are the mid-points of AB, BD, CD and AC respectively.

To Prove: PQRS is a rhombus.

Proof: In 
$$\triangle$$
ACD, RS||AD and RS =  $\frac{1}{2}$ AD ....(i)

[Line joining the mid-points of the two sides of triangle is parallel and half of the third side.] Similarly,

In  $\triangle ABD$ , PQ||AD and PQ =  $\frac{1}{2}AD$  ....(ii) In  $\triangle BCD$ , QR||BC and QR =  $\frac{1}{2}BC$  ....(iii) In  $\triangle ABC$ , SP||BC and SP =  $\frac{1}{2}BC$  ....(iv) A P B

As AD = BC [Given] RS = PQ = QR = SP and RS||PQ and QR||SP [From (i), (ii), (iii) and (iv)] Hence PQRS is a rhombus. 12 (b) Given that we have to construct a grouped frequency distribution table of class size 5. So, the class intervals will be as 0 - 5, 5 - 10, 10 - 15, 15 - 20, and so on. Required grouped frequency distribution table is as follows:

Distance (in km)	Tally marks	Number of engineers
0 – 5	N	5
5 - 10		11
10 –15		11
15 – 20	NIII	9
20 – 25		1
25 – 30		1
30 - 35		2
Total		40

Only 4 engineers have homes at a distance of more than or equal to 20 km from their work place.

Most of the engineers have their workplace at a distance of upto 15 km from their homes.

## (c)

$$\log_{x} (8x-3) - \log_{x} 4 = 2$$
  

$$\Rightarrow \log_{x} \left(\frac{8x-3}{4}\right) = 2$$
  

$$\Rightarrow \frac{8x-3}{4} = x^{2}$$
  

$$\Rightarrow 8x-3 = 4x^{2}$$
  

$$\Rightarrow 4x^{2} - 8x + 3 = 0$$
  

$$\Rightarrow 4x^{2} - 6x - 2x + 3 = 0$$
  

$$\Rightarrow 2x(2x-3) - 1(2x-3) = 0$$
  

$$\Rightarrow (2x-3)(2x-1) = 0$$
  

$$\Rightarrow 2x - 3 = 0 \text{ or } 2x - 1 = 0$$
  

$$\Rightarrow x = \frac{3}{2} \text{ or } x = \frac{1}{2}$$

## Q. 10.

(a)

Let us assume, on the contrary that  $\sqrt{5}$  is a rational number.

Therefore, we can find two integers a, b (b  $\neq$  0) such that  $\sqrt{5} = \frac{a}{b}$ 

Where a and b are co-prime integers.

$$\sqrt{5} = \frac{a}{b}$$
$$\Rightarrow a = \sqrt{5}b$$
$$\Rightarrow a^{2} = 5b^{2}$$

Therefore, a<sup>2</sup> is divisible by 5 then a is also divisible by 5.

So a = 5k, for some integer k.

Now, 
$$a^2 = (5k)^2 = 5(5k^2) = 5b^2$$
  
 $\Rightarrow b^2 = 5k^2$ 

This means that b<sup>2</sup> is divisible by 5 and hence, b is divisible by 5.

This implies that a and b have 5 as a common factor.

And this is a contradiction to the fact that a and b are co-prime.

So our assumption that  $\sqrt{5}$  is rational is wrong.

Hence,  $\sqrt{5}$  cannot be a rational number. Therefore,  $\sqrt{5}$  is irrational.

$$\tan(\theta_1 + \theta_2) = \frac{\tan\theta_1 + \tan\theta_2}{1 - \tan\theta_1 \tan\theta_2} = \frac{\frac{1}{2} + \frac{1}{3}}{1 - \left(\frac{1}{2} \times \frac{1}{3}\right)}$$
$$\Rightarrow \tan(\theta_1 + \theta_2) = \frac{\frac{3+2}{6}}{1 - \frac{1}{6}} = \frac{\frac{5}{6}}{\frac{6-1}{6}} = \frac{5}{6} \times \frac{6}{5} = 1$$
$$\Rightarrow \tan(\theta_1 + \theta_2) = 1 = \tan 45^\circ$$
$$\Rightarrow (\theta_1 + \theta_2) = 45^\circ$$

(c) 
$$\frac{x^2 + 1}{x} = 4$$
$$\Rightarrow x^2 + 1 = 4x$$
$$\Rightarrow x^2 - 4x + 1 = 0 \dots (i)$$

On dividing equation (i) by x, we have

$$x-4+\frac{1}{x}=0$$
$$\Rightarrow x+\frac{1}{x}=4 \dots (ii)$$

On cubing equation (ii) both sides, we have

$$\left(x + \frac{1}{x}\right)^3 = (4)^3$$
  

$$\Rightarrow x^3 + \frac{1}{x^3} + 3 \times x \times \frac{1}{x} \left(x + \frac{1}{x}\right) = 64$$
  

$$\Rightarrow x^3 + \frac{1}{x^3} + 3 \times 4 = 64$$
  

$$\Rightarrow x^3 + \frac{1}{x^3} = 64 - 12$$
  

$$\Rightarrow x^3 + \frac{1}{x^3} = 52$$
  

$$\therefore \left(2x^3 + \frac{2}{x^3}\right) = 2\left(x^3 + \frac{1}{x^3}\right) = 2 \times 52 = 104$$

Q. 11.  
(a) 
$$4a^{3}b - 44a^{2}b + 112b$$
  
 $= 4ab[a^{2} - 11a + 28]$   
 $= 4ab[a^{2} - 7a - 4a + 28]$   
 $= 4ab[a(a - 7) - 4(a - 7)]$   
 $= 4ab(a - 7)(a - 4)$ 

## (b) Construction: Draw TM $\perp$ QS

Area of 
$$\triangle RQS = \frac{1}{2} \times QS \times RN = \frac{1}{2} \times 35 \times 20 = 350 \text{ cm}^2$$
  
Now,  $QS = QM + MS$   
 $\Rightarrow 35 = 25 + MS$   
 $\Rightarrow MS = 10 \text{ cm}$   
In  $\triangle STM$ ,  
 $MS^2 + TM^2 = ST^2$   
 $\Rightarrow TM^2 = ST^2 - MS^2 = (26)^2 - (10)^2 = 676 - 100 = 576$   
 $\Rightarrow TM = 24 \text{ cm} = PQ$ 



∴ Area of trapezium PQST = 
$$\frac{1}{2}$$
 × (PT + QS) × PQ =  $\frac{1}{2}$  × (25 + 35) × 24 = 720 cm<sup>2</sup>  
Thus, area of given figure = Area of  $\Delta$ RQS + Area of trapezium PQST  
= 350 cm<sup>2</sup> + 720 cm<sup>2</sup>  
= 1070 cm<sup>2</sup>

(c) Given: In 
$$\triangle ABC$$
,  $AB = AC = x$ ,  $BC = 20$  cm, Area of  $\triangle ABC = 250$  cm<sup>2</sup>  
To find: x  
Construction: Draw AD  $\perp$  BC  
Since  $\triangle ABC$  is an isosceles triangle. AD bisects BC.  
BD = DC = 20/2 = 10cm  
Area of  $\triangle ABC = \frac{1}{2} \times BC \times AD = 250 \text{ cm}^2$ [Given]  
 $\frac{1}{2} \times 20 \times AD = 250 \Rightarrow AD = 25cm$   
In rt.  $\triangle ADC$ ,  
 $AD^2 + DC^2 = AC^2$   
 $25^2 + 10^2 = x^2$   
 $x^2 = 625 + 100 = 725$   
 $\Rightarrow x = 5\sqrt{29}$  cm