UNIT 9

AREAS AND VOLUMES

EXERCISE 9.1

1. ***Find the length of unknown side in right angled triangle ABC where $\angle C = 90^o$.***

(i) $a = 8cm,\ b = 6cm,\ c = ?$

According to Pythagoras theorem

$(Hyp)^2 = (Base)^2 + (Perp)^2$

$c^2 = a^2 + b^2$

Putting the values (i)

$c^2 = (8)^2 + (6)^2$

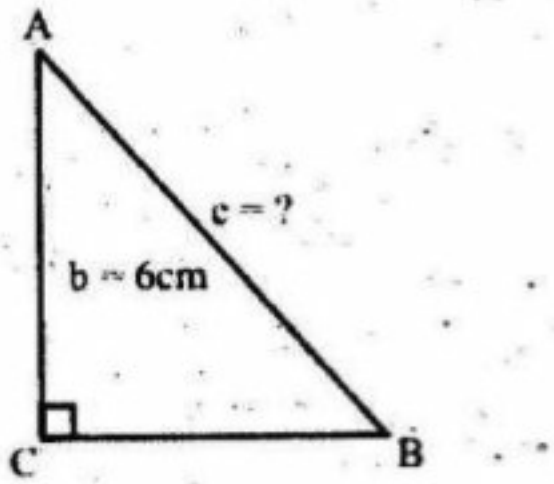
$c^2 = 64 + 36$

$c^2 = 100cm$

taking square root on both sides

$\sqrt{c^2} = \sqrt{100}$

$c = 10cm$



(ii) $a = 4cm,\ c = \sqrt{32}\ cm,\ b = ?$

According to Pythagoras theorem

$c^2 = a^2 + b^2$

Putting the values

$(\sqrt{32})^2 = (4)^2 + b^2$

$32 = 16 + b^2$

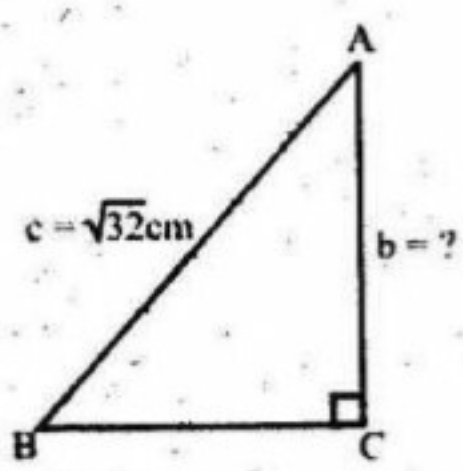
$b^2 = 32 - 16$

$b^2 = 16$

taking under root by both sides

$\sqrt{b^2} = \sqrt{16}$

$b = 4cm$



(iii) $b = 12m,\ c = 13m,\ a = ?$

According to Pythagoras theorem

$(Hyp)^2 = (Base)^2 + (Perp)^2$

$c^2 = a^2 + b^2$

$(13)^2 = (9)^2 + (12)^2$

$169 = a^2 + 144$

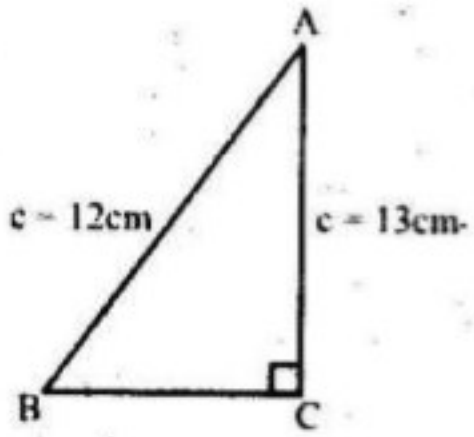
$a^2 = 169 - 144$

$a^2 = 25$

taking square root by both sides

$\sqrt{a^2} = \sqrt{25}$

$a = 5m$



(iv) $a = 1cm,\ c = \sqrt{2}\,cm,\ b = ?$

According to Pythagoras theorem

$c^2 = a^2 + b^2$

$(\sqrt{2})^2 = (1)^2 + b^2$

$2 = 12 + b^2$

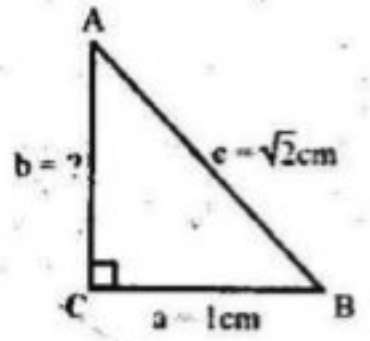
$b^2 = 2 - 1$

$b^2 = 1$

Taking square root on b/s

$\sqrt{b^2} = \sqrt{1}$

$b = 1cm$



(v) $b = 24cm,\ c = 30cm,\ a = ?$

According to Pythagoras theorem

$c^2 = a^2 + b^2$

$(30)^2 = a^2 + (24)^2$

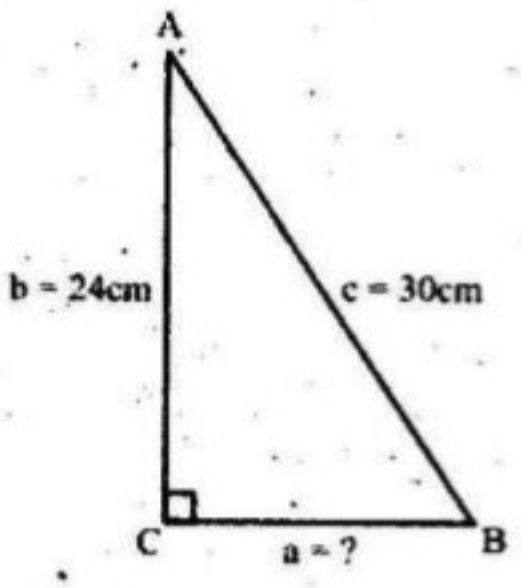
$900 = a^2 + 576$

$a^2 = 900 - 576$

$a^2 = 324$

$\sqrt{a^2} = \sqrt{324}$

$a = 18cm$



2. ***Use Pythagoras theorem to find the value of x in each of the following right triangles.***

(i) $a = 4,\ b = 3,\ c = x$

According to Pythagoras theorem

$c^2 = a^2 + b^2$

$(x)^2 = (4)^2 + (3)^2$

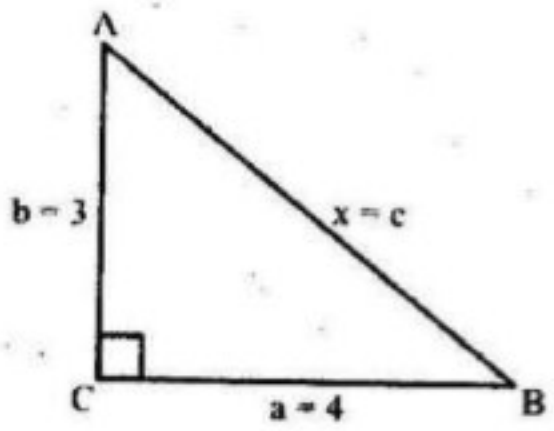
$x^2 = 16 + 9$

$x^2 = 25$

Taking square root on b/s

$\sqrt{x^2} = \sqrt{25}$

$x = 5$



(ii) $a = 12,\ b = x,\ c = 13$

According to Pythagoras theorem

$c^2 = a^2 + b^2$

$(13)^2 = (12)^2 + (x)^2$

$169 = 144 + x^2$

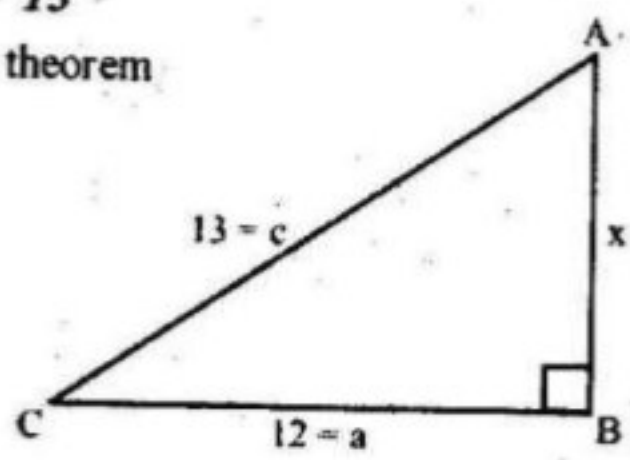
$x^2 = 169 - 144$

$x^2 = 25$

Taking square root on b/s

$\sqrt{x^2} = \sqrt{25}$

$x = 5$



(iii) $a = 2,\ b = 2,\ c = x$

According to Pythagoras theorem

$c^2 = a^2 + b^2$

$(x)^2 = (2)^2 + (2)^2$

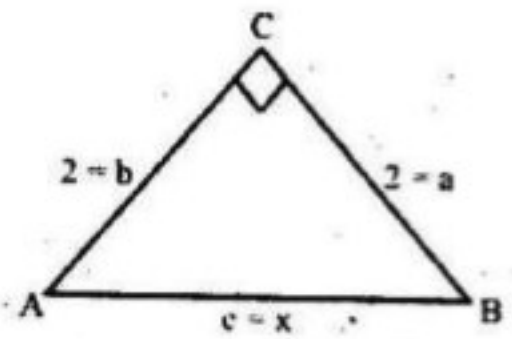
$x^2 = 4 + 4$

$x^2 = 8$

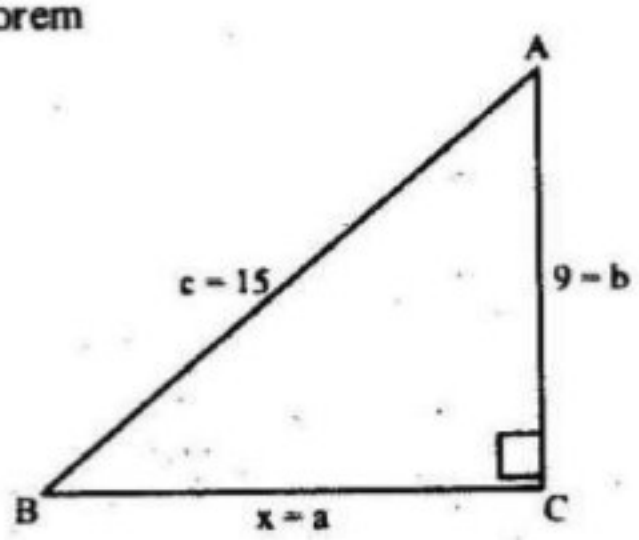
Taking square root on b/s

$\sqrt{x^2} = \sqrt{8}$

$x = \sqrt{8}$



(iv) $a = x,\ b = 9,\ c = 15$



According to Pythagoras theorem

$c^2 = a^2 + b^2$

$(15)^2 = (x)^2 + (9)^2$

$x^2 = 225 - 81$

$x^2 = 144$

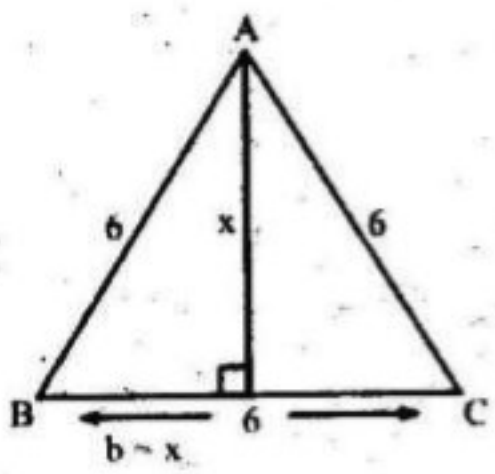
Taking square root on b/s

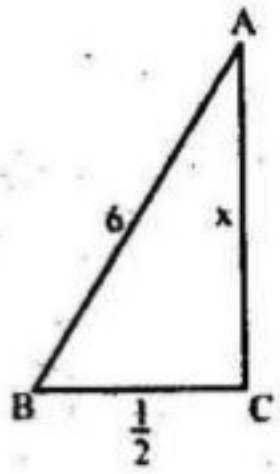
$\sqrt{x^2} = \sqrt{144}$

$x = 12$

3. ***Find x, y in cm, in the following figures by using Pythagoras theorem.***

(i) $a = \frac{6}{2},\ c = 6cm$





According to Pythagoras theorem

$c^2 = a^2 + b^2$

$(6)^2 = (3)^2 + (x)^2$

$36 = 9 + x^2$

$x^2 = 36 - 9$

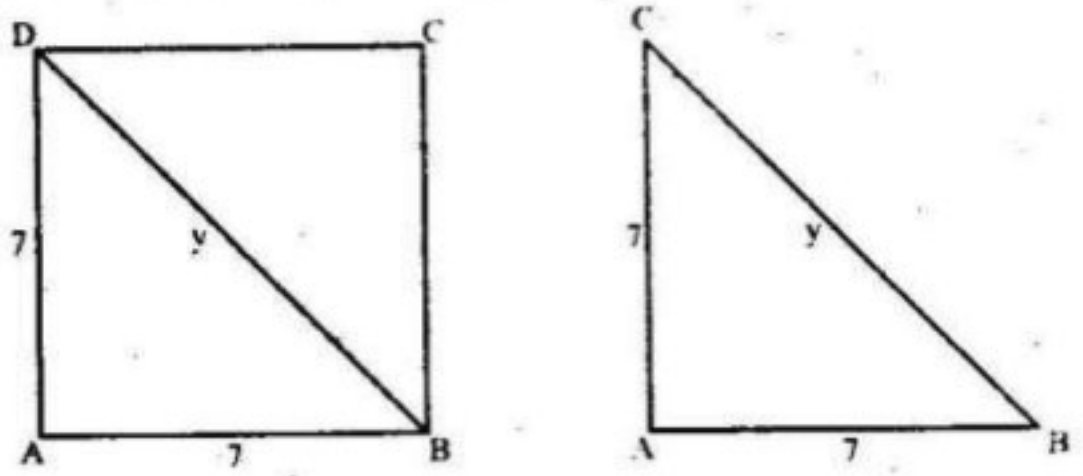
$x^2 = 27$

Taking square root on b/s

$\sqrt{x^2} = \sqrt{27}$

$x = 5.20cm$

(ii) $a = 7,\ b = 7,\ c = y$



According to Pythagoras theorem

$c^2 = a^2 + b^2$

$(y)^2 = (7)^2 + (7)^2$

$y^2 = 49 + 49$

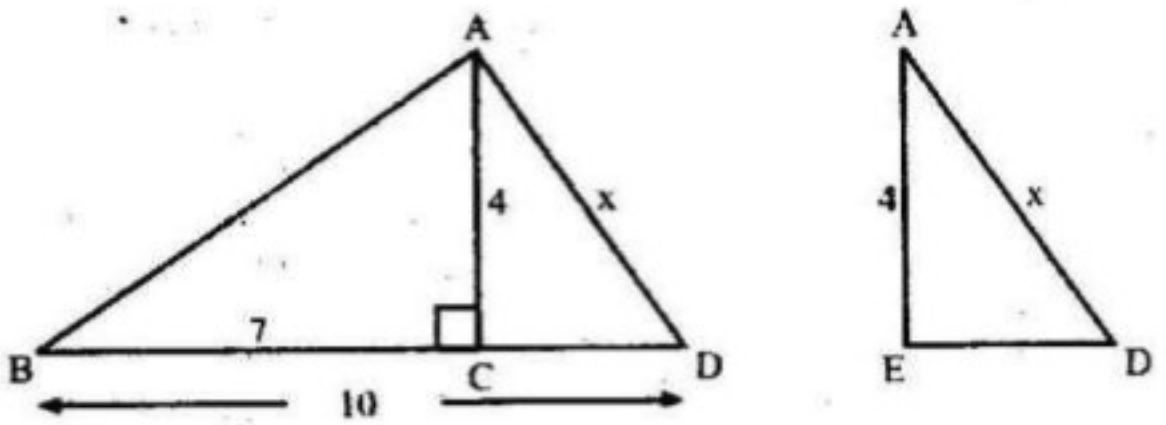
$y^2 = 98$

Taking square root on b/s

$\sqrt{y^2} = \sqrt{98}$

$y = 9.81\text{cm}$

(iii) $c = x,\ b = 4,\ a = 10 - 7 = 3\text{cm}$



According to Pythagoras theorem

$c^2 = a^2 + b^2$

$(x)^2 = (3)^2 + (4)^2$

$x^2 = 9 + 16$

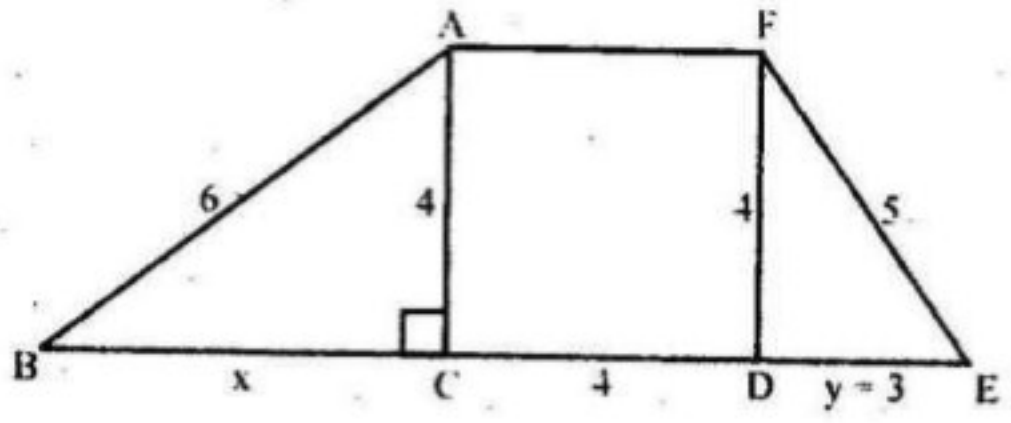
$x^2 = 25$

Taking square root on b/s

$\sqrt{x^2} = \sqrt{25}$

$x^2 = \sqrt{5} \Rightarrow x = 5cm$

(iv) $a = y, \ b = 4, \ c = 5$



According to Pythagoras theorem

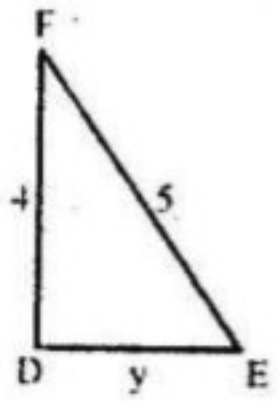
$c^2 = a^2 + b^2$

$(5)^2 = (y)^2 + (4)^2$

$25 = y^2 + 16$

$y^2 = 25 - 16$

$y^2 = 9$



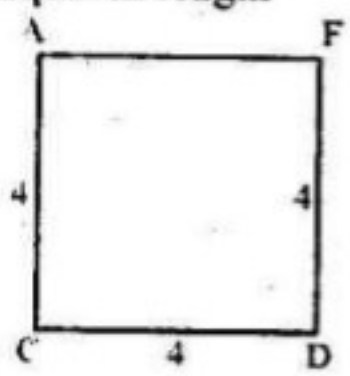
Taking square root on b/s

$\sqrt{y^2} = \sqrt{9}$

$y = 3$

Now, ACDF is square, and square has four sides equal in length

$\overline{FD} = 4$, than $\overline{AC} = 4$



Now, $a = x$

$b = 4$

$c = 6$

Ace. To Pythagoras theorem

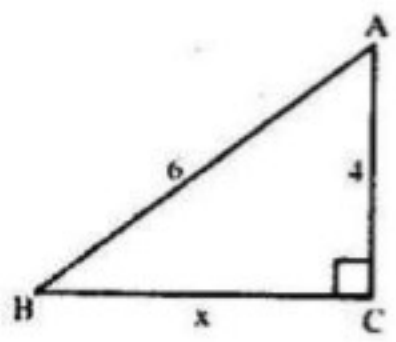
$c^2 = a^2 + b^2$

$(6)^2 = x^2 + (4)^2$

$36 = x2 + 16$

$\Rightarrow \quad x^2 + 16$

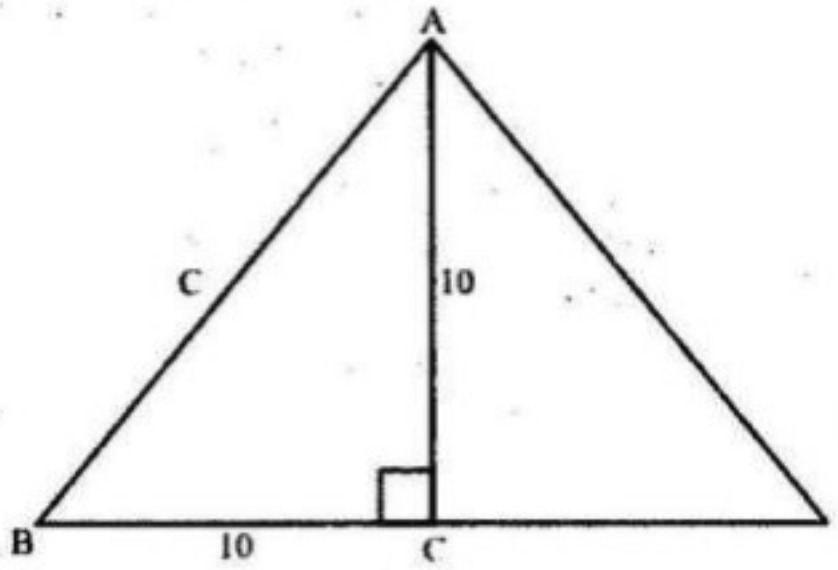
$\Rightarrow \quad x^2 = 36 - 16$



$\Rightarrow \quad x^2 = \sqrt{20}$

$x^2 = 4.47\text{cm}$

4. ***One side of a right isosceles triangle is 10cm long. Find the length of side opposite to the right angle.***



According to Pythagoras theorem

$c^2 = a^2 + b^2$

$c^2 = (10)^2 + (10)^2$

$c^2 = 100 + 100$

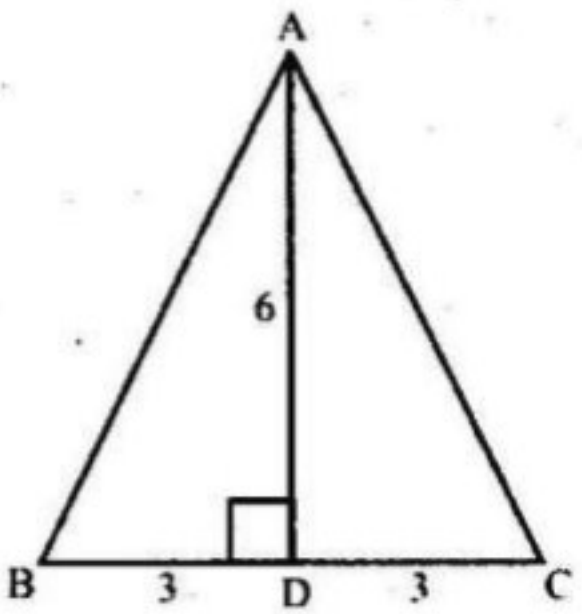
$c^2 = 200$

Taking square root on b/s

$\sqrt{c^2} = \sqrt{200}$

$c = 14.14\text{cm}$

5. ***Height of an equilateral triangle is 6cm. Find length of each side.***



$d^2 = a^2 + c^2$

$(d)^2 = (3)^2 + (6)^2$

$d^2 = 9 + 36$

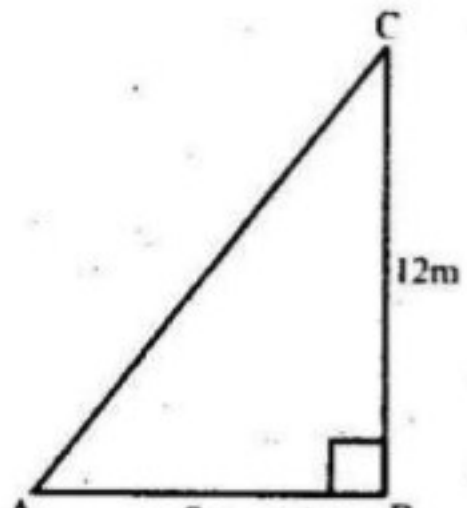
$d^2 = 45$

Taking square root on b/s

$\sqrt{d^2} = \sqrt{45}$

$d = 6.7cm$

6. ***A ladder is put against a wall at a height of 12m. Its foot is at a distance of 9m from the foot of the wall. Find the length of ladder.***



According to Pythagoras theorem

$a = 9cm$

$b = 12cm$

According to Pythagoras

$c^2 = a^2 + b^2$

$c^2 = (12)^2 + (9)^2$

$c^2 = 144 + 81$

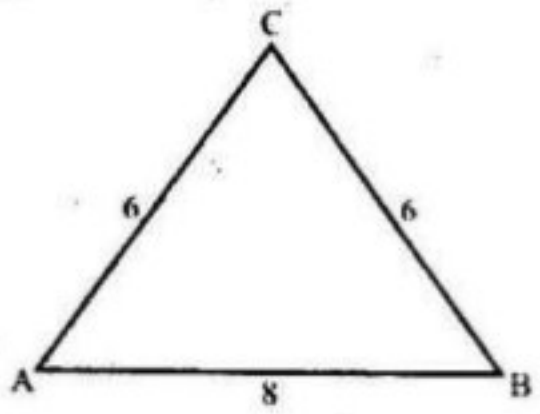
$c^2 = 225$

$c = 15m$

EXERCISE 9.2

1. ***Find the area of following triangular region when all lengths are measured in cms.***

(i) $a = cm,\ b = 6cm,\ c = 8cm$



$s = \frac{a+b+c}{2}$

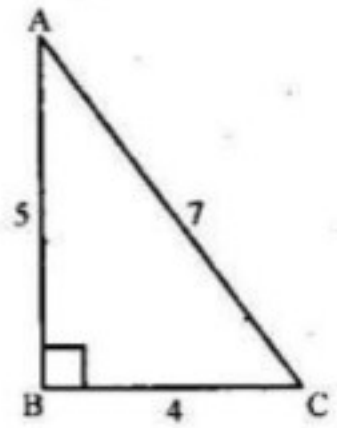
$s = \frac{6+6+8}{2}$

$s = \frac{20}{2}$

$s = 10cm$

$$\therefore \quad \text{Area of } \Delta ABC = \sqrt{s(s-a)(s-b)(s-c)}$$
$$= \sqrt{10(10-6)(10-6)(10-8)}$$
$$= \sqrt{10(4)(4)(2)}$$
$$= \sqrt{320} = 17.89\text{cm}^2$$

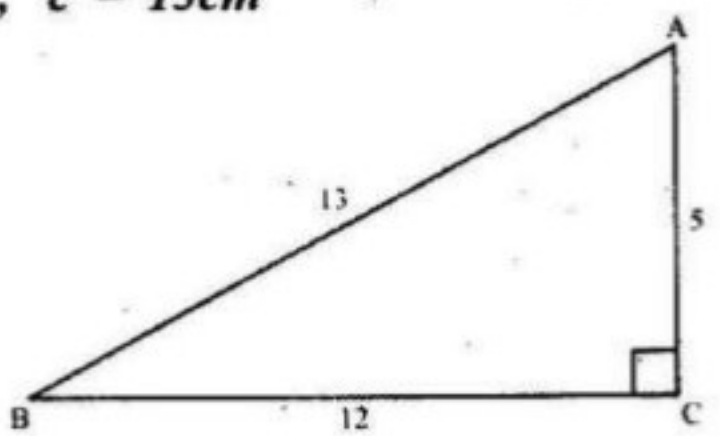
(ii) $a = 4cm,\ b = 7cm,\ c = 5cm$



$$s = \frac{a+b+c}{2}$$
$$s = \frac{4+7+5}{2}$$
$$s = \frac{16}{2}$$
$$s = 8\text{cm}$$
$$\therefore \quad \text{Area of } \Delta ABC = \sqrt{s(s-a)(s-b)(s-c)}$$
$$= \sqrt{8(8-4)(8-7)(8-5)}$$
$$= \sqrt{8(4)(1)(3)}$$
$$= \sqrt{96} = 9.79\text{cm}^2$$

(iii) $a = 12cm,\ b = 5cm,\ c = 13cm$

$$s = \frac{a+b+c}{2}$$
$$s = \frac{12+5+13}{2}$$
$$s = \frac{30}{2}$$
$$s = 15\text{cm}$$



$$\therefore \quad \text{Area of } \Delta ABC = \sqrt{s(s-a)(s-b)(s-c)}$$
$$= \sqrt{15(15-12)(15-5)(15-13)}$$

$= \sqrt{15\,(3)\,(10)\,(2)}$

$= \sqrt{900} = 30\text{cm}^2$

2. ***Find the area of the triangular regions when lengths of sides are given as***

(i) 5m, 12m, 13m

$a = 5\text{m},\ b = 12\text{m},\ c = 13\text{m}$

$s = \dfrac{a+b+c}{2} = \dfrac{5+12+13}{2} = \dfrac{30}{2} = 15\text{cm}$

$\therefore$ Area of Δ ABC $= \sqrt{s\,(s-a)\,(s-b)\,(s-c)}$

$= \sqrt{15\,(15-5)\,(15-12)\,(15-13)}$

$= \sqrt{15\,(10)\,(3)\,(2)}$

$= \sqrt{900} = 30\text{cm}^2$

(ii) 18cm, 24cm, 30cm

$a = 18\text{cm},\ b = 24\text{cm},\ c = 30\text{cm}$

$s = \dfrac{a+b+c}{2} = \dfrac{18+24+30}{2} = \dfrac{72}{2} = 36\text{cm}$

$\therefore$ Area of Δ ABC $= \sqrt{s\,(s-a)\,(s-b)\,(s-c)}$

$= \sqrt{36\,(36-18)\,(36-24)\,(36-30)}$

$= \sqrt{36\,(18)\,(12)\,(6)}$

$= \sqrt{46656} = 216\text{cm}^2$

3. ***Find the area of the triangular regions ABC when:***

(i) a = 7cm, b = 7cm, s = 10cm

$s = \dfrac{a+b+c}{2} =$

$2s = a + b + c = 2\,(10) = 7+7+c$

$c = 20 - 14$

$c = 6$

Area of Δ ABC $= \sqrt{s\,(s-a)\,(s-b)\,(s-c)}$

$= \sqrt{10\,(10-7)\,(10-\ldots\,(10-6)}$

$= \sqrt{10\,(3)\,(3)\,(4)}$

$= \sqrt{360} = 18.97\text{cm}^2$

(ii) $s = 20cm,\ b = 13cm,\ c = 12cm$

$$s = \frac{a+b+c}{2}$$

$2s = a+b+c$

$a = 2s-b-c = 2\,(20)-13-12 = 40-13-12 = 15$

$\therefore$ Area of Δ ABC $= \sqrt{s\,(s-a)\,(s-b)\,(s-c)}$

$= \sqrt{20\,(20-15)\,(20-13)\,(20-12)}$

$= \sqrt{20\,(5)\,(7)\,(8)}$

$= \sqrt{5600} = 74.83\text{cm}^2$

(iii) $Perimeter = 18cm,\ a = 6cm,\ c = 8cm$

Perimeter $= 2s$

$2s = 18\text{cm}$

$a = 6\text{cm}$

$c = 8\text{cm}$

$2s = a+b+c$

$18 = 6+b+8$

$18 = 14+b$

$b = 18-14$

$b = 4$

$$s = \frac{18}{2} = 9\text{cm}$$

$\therefore$ Area of Δ ABC $= \sqrt{s\,(s-a)\,(s-b)\,(s-c)}$

$= \sqrt{9\,(9-6)\,(9-4)\,(9-8)}$

$= \sqrt{9\,(3)\,(5)\,(1)}$

$= \sqrt{135} = 11.61\text{cm}^2$

(iv) $a = 5cm,\ c = 8cm,\ a = b$

$$s = \frac{a+b+c}{2} = \frac{5+5+8}{2} = \frac{18}{2} = 9$$

$\therefore$ Area of Δ ABC $= \sqrt{s\,(s-a)\,(s-b)\,(s-c)}$

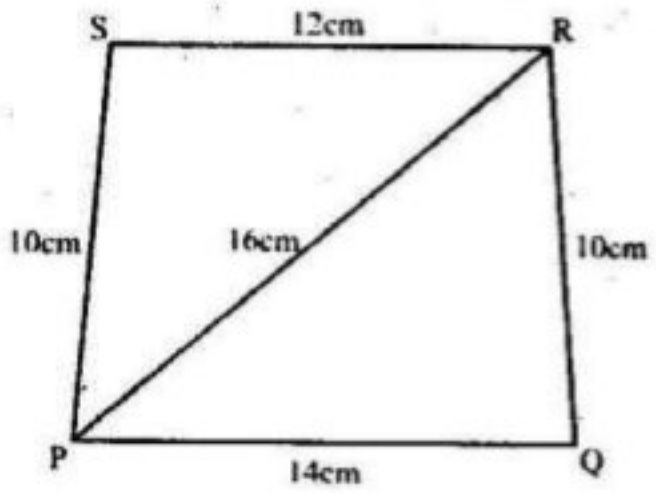
$= \sqrt{9\,(9-5)\,(9-5)\,(9-8)}$

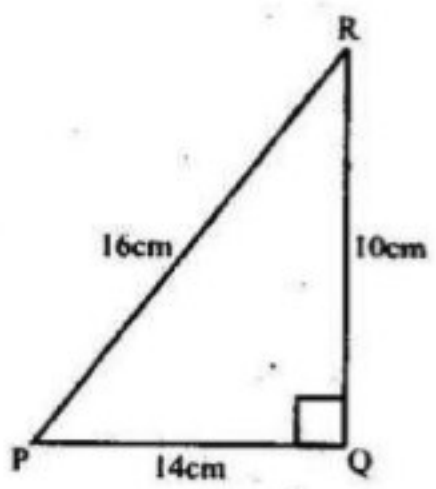
$$= \sqrt{9\,(4)\,(4)\,(1)}$$
$$= \sqrt{144} = 12\text{cm}^2$$

4. *Find the area of quadrilateral regions ABCD in the following cases correct to two decimal places.*

S.No.	AB	BC	CD	DA	AC	BD
(i)	10cm	14cm	12cm	10cm	16cm	**129.20cm²**
(ii)	8cm	7cm	9cm	6cm	**54.59cm²**	10cm
(iii)	15cm	16cm	18cm	21cm	25cm	**300.20cm²**

(i) a = 14cm, b = 10cm, c = 16cm





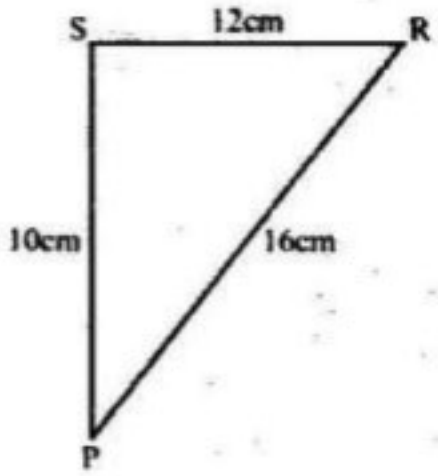
$$s = \frac{a+b+c}{2} = \frac{14+10+16}{2} = \frac{40}{2} = 20\text{cm}$$

$$\therefore \quad \text{Area of } \Delta \text{ ABC} = \sqrt{s\,(s-a)\,(s-b)\,(s-c)}$$
$$= \sqrt{20\,(20-14)\,(20-10)\,(20-16)}$$
$$= \sqrt{20\,(6)\,(10)\,(4)}$$
$$= \sqrt{4800} = 69.28\text{cm}^2$$

Now triangle PSR

$$s = \frac{10+12+16}{2} = \frac{38}{2} = 19\text{cm}$$

$$\therefore \quad \text{Area of } \Delta \text{ PSR} = \sqrt{19\,(19-10)\,(19-12)\,(19-16)}$$
$$= \sqrt{19\,(9)\,(7)\,(3)}$$
$$= \sqrt{3591} = 59.92\text{cm}^2$$

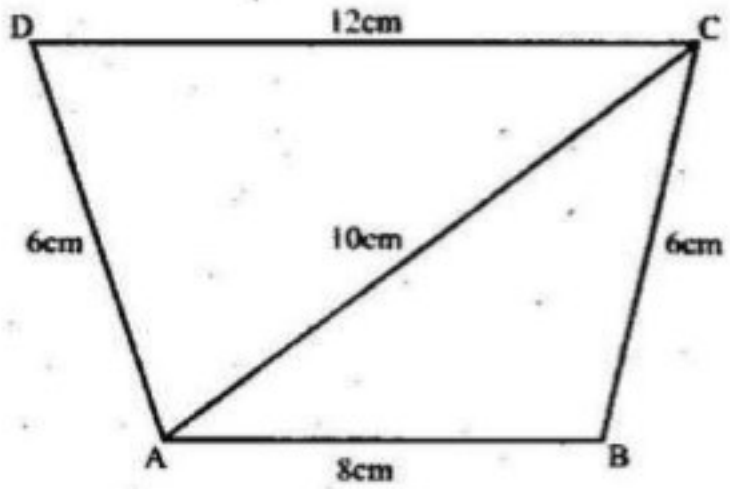


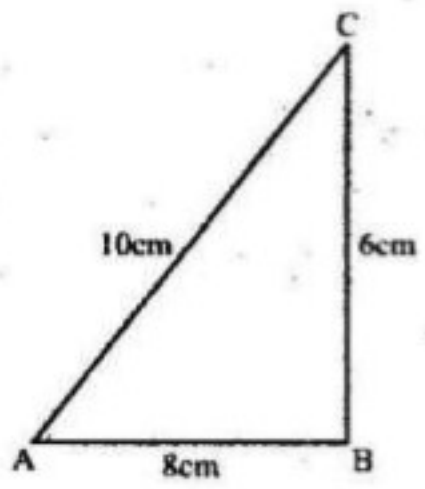
Therefore the area of the quadrilateral region SRPU.

$= 69.28 + 57.92$

$= 127.20\text{cm}^2$

(ii) $a = 8\text{cm},\ b = 6\text{cm},\ c = 10\text{cm}$





$$s = \frac{a+b+c}{2} = \frac{8+6+10}{2} = \frac{24}{2} = 12\text{cm}$$

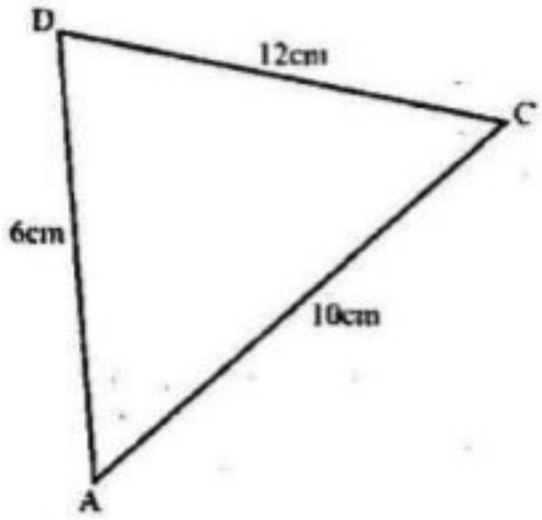
$$\therefore \quad \text{Area of } \Delta \text{ ABC} = \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{12(12-8)(12-6)(12-10)}$$

$$= \sqrt{12(4)(6)(2)}$$

$$= \sqrt{576} = 24\text{cm}^2$$

$$s = \frac{a+b+c}{2} = \frac{6+12+10}{2} = \frac{28}{2} = 14\text{cm}$$



$\therefore$ Area of Δ PSR $= \sqrt{14\,(14-6)\,(14-12)\,(14-10)}$

$= \sqrt{14\,(8)\,(2)\,(4)}$

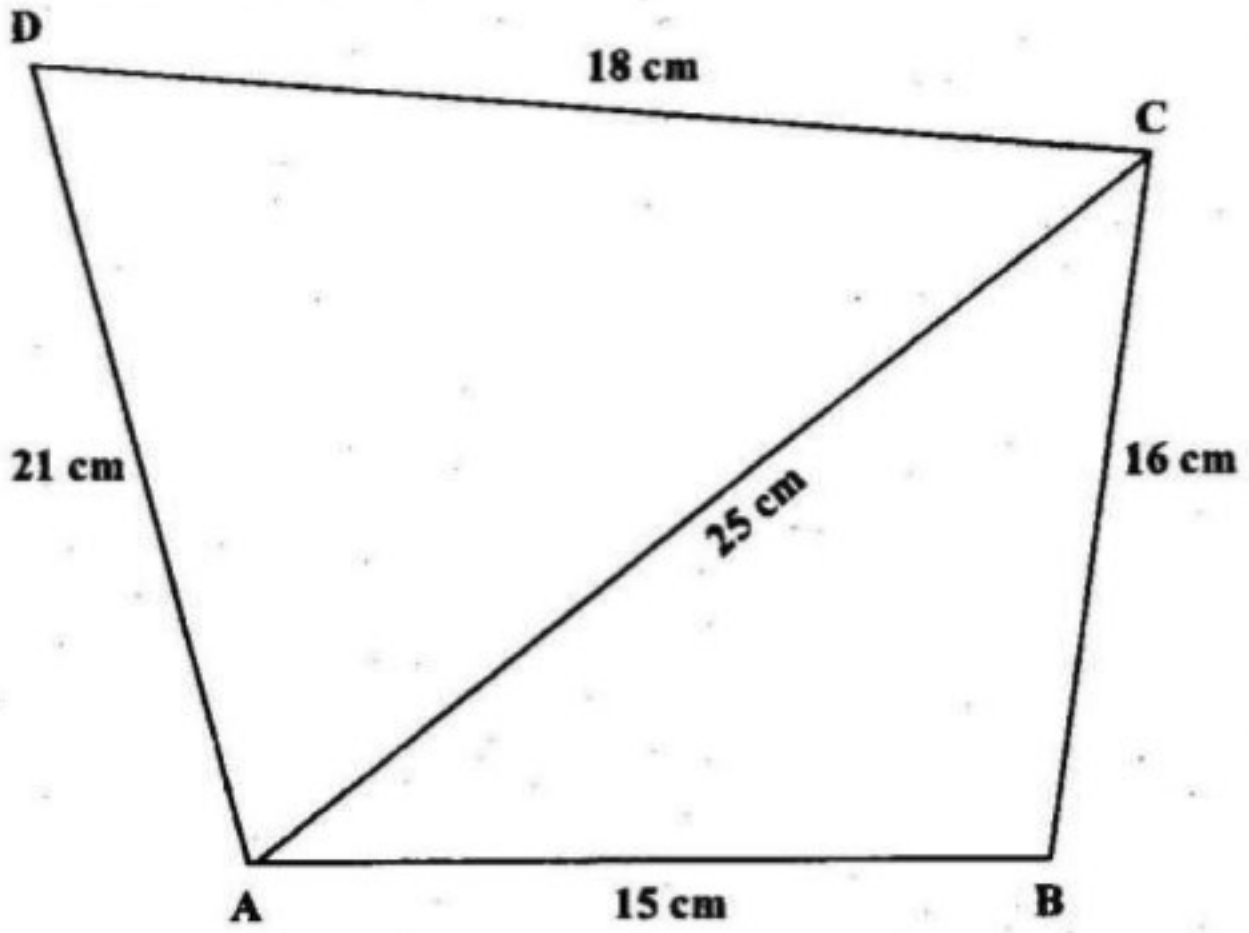
$= \sqrt{896} = 29.93\text{cm}^2$

Therefore the area of the quadrilateral region ABCD.

$= 24\text{cm} + 29.93\text{cm}^2$

$= 53.93\text{cm}^2$

(iii) $AB = 15cm, BC = 16cm, CD = 18cm, DA = 21cm,$
$AC = 25cm, BD = 300.20\ cm^2$



In triangle ABC

$a = 16cm \qquad b = 25cm \qquad c = 15cm$

$$S = \frac{a+b+c}{2}$$

$$S = \frac{16+25+15}{2}$$

$$S = \frac{56}{2}$$

$$S = 28cm$$

$$\text{Area of } \Delta ABC = \sqrt{S(S-a)(S-b)(S-c)}$$
$$= \sqrt{28(28-16)(28-25)(28-15)}$$
$$= \sqrt{28(12)(3)(13)}$$
$$= \sqrt{13104}$$
$$= 114.47cm^2$$

In triangle ACD

$a = 18cm \qquad c = 21cm \qquad d = 25cm$

$$S = \frac{a+b+c}{2}$$

$$S = \frac{18+21+25}{2}$$

$$S = \frac{64}{2}$$

$$S = 32cm$$

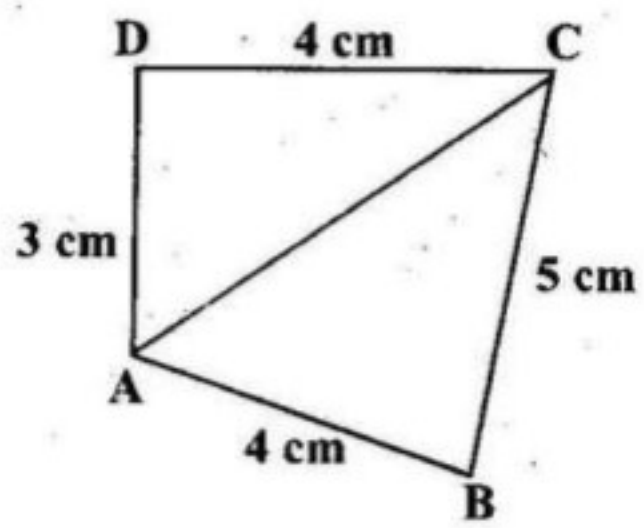
Area of triangle ACD

$$= \sqrt{S(S-a)(S-c)(S-d)}$$
$$= \sqrt{32(32-18)(32-21)(32-25)}$$
$$= \sqrt{32(14)(11)(7)}$$
$$= \sqrt{34496}$$
$$= 18573cm^2$$

Area of ABCD = $114.47 + 157.73 = 300.20cm^2$

Q.5 Find the area of the following quadrilateral regions.

(i)



In Δ ACD

$$(\overline{AC})^2 = (\overline{AD})^2 + (\overline{DC})^2$$

$$(\overline{AC})^2 = (3)^2 + (4)^2$$

$$(\overline{AC})^2 = 9 + 16$$

$$\left(\overline{AC}\right) = 25$$

$$\sqrt{\left(\overline{AC}\right)^2} = \sqrt{25}$$

$$\overline{AC} = 5\text{cm}$$

Area of Δ ACD

$$S = \frac{a+c+d}{2}$$

$$S = \frac{4+3+5}{2}$$

$$S = \frac{12}{2}$$

$$S = 6\text{cm}$$

$$\text{Area} = \sqrt{S(S-a)(S-c)(S-d)}$$

$$= \sqrt{6(6-4)(6-3)(6-5)}$$

$$= \sqrt{6(2)(3)(1)}$$

$$= \sqrt{36}$$

$$= 6\text{cm}^2$$

Area of Δ ABC

$$\text{Area} = \sqrt{S(S-a)(S-b)(S-c)}$$

$$= \sqrt{7(7-5)(7-5)(7-4)}$$

$$= \sqrt{7(2)(2)(3)}$$

$$= \sqrt{84}$$

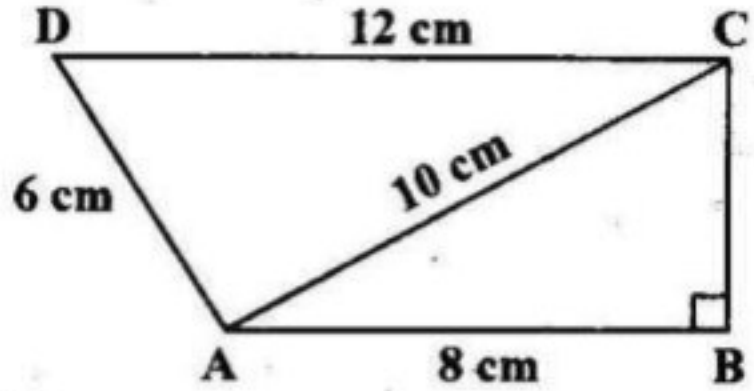
$$= 9.17\text{cm}^2$$

Total area of ABCD = ΔABC + ΔACD

$$= 9.17 + 6$$

$$= 15.17\text{cm}^2$$

(ii)



In Δ ABC

$$(\overline{AB})^2 + (\overline{BC})^2 = (\overline{AC})^2$$

$$(8)^2 + (\overline{BC})^2 = (10)^2$$

$$64 + (\overline{BC})^2 = 100$$

$$(\overline{BC})^2 = 100 - 64$$

$$(\overline{BC})^2 = 36$$

$$\sqrt{(\overline{BC})^2} = \sqrt{36}$$

$$\overline{BC} = 6\text{cm}$$

$a = 6\text{cm}$ $b = 10\text{cm}$ $c = 8\text{cm}$

$$S = \frac{a+b+c}{2}$$

$$S = \frac{6+10+8}{2}$$

$$S = \frac{24}{2}$$

$$S = 12\text{cm}$$

$$\text{Area} = \sqrt{S(S-a)(S-b)(S-c)}$$

$$= \sqrt{12(12-6)(12-10)(12-8)}$$

$$= \sqrt{12(6)(2)(4)}$$

$$= \sqrt{576}$$

$$= 24\text{cm}^2$$

Area of triangle ACD

$a = 12 \qquad c = 6 \qquad d = 10$

$$S = \frac{a+b+c}{2}$$

$$S = \frac{12+6+10}{2}$$

$$S = \frac{28}{2}$$

$$S = 14cm$$

$$\text{Area of ACD} = \sqrt{S(S-a)(S-c)(S-d)}$$

$$= \sqrt{14(14-12)(14-6)(14-10)}$$

$$= \sqrt{14(2)(8)(4)}$$

$$= \sqrt{896}$$

$$= 29.93cm^2$$

$$\text{Area of ABCD} = \text{Area of ABC} + \text{Area of ACD}$$

$$= 24 + 29.93$$

$$= 53.93cm^2$$

EXERCISE 9.3

1. Find surface area of the spheres having

(i) Radius = 14cm

$$\text{Surface area of the spheres} = 4\pi r^2$$

$$= 4 \times \frac{22}{7} \times (14)^2 \quad \left(\because \pi = \frac{22}{7}\right)$$

$$= 4 \times \frac{22}{7} \times 14 \times 14$$

$$= 4 \times 22 \times 2 \times 14$$

$$= 2464cm^2$$

(ii) Radius = 2.1m

$$\text{Surface area of the spheres} = 4\pi r^2$$

$$= 4 \times \frac{22}{7} \times (2.1)^2$$

$= 4 \times \frac{22}{7} \times 2.1 \times 2.1$

$= 55.44m^2$

(iii) Diameter = 56cm

Radius $= \frac{d}{2} = \frac{56}{2} = 28cm$

Surface area of the spheres $= 4\pi r^2$

$= 4 \times \frac{22}{7} \times (28)^2$

$= 4 \times \frac{22}{7} \times 28 \times 28$

$= 9856cm^2$

(iv) Diameter = 2.8dm

Radius $= \frac{d}{2} = \frac{2.8}{2} = 1.4dm$

Surface area of the spheres $= 4\pi r^2$

$= 4 \times \frac{22}{7} \times (1.4)^2$

$= 4 \times \frac{22}{7} \times 1.4 \times 1.4$

$= 24.64dm^2$

2. Find area of curved surface of the hemispheres with.

(i) Radius = 5.6cm

Area of curved surface $= 2\pi r^2$

$= 2 \times \frac{22}{7} \times (5.6)^2$

$= 2 \times \frac{22}{7} \times 5.6 \times 5.6$

$= 197.12cm^2$

(ii) Diameter = 7m

$r = \frac{d}{2} = \frac{7}{2} m$

Area of curved surface $= 2\pi r^2$

$$= 2 \times \frac{22}{7} \times \left(\frac{7}{2}\right)^2$$

$$= 2 \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}$$

$$= 77m^2$$

3. *Find radii and diameters of spheres when area is given as.*

(i) $5544cm^2$

As we know

$$\text{Area} = 4\pi r^2 = 5544$$

$$5544 = 4 \times \frac{22}{7} r^2$$

$$5544 = \frac{88}{7} \times r^2$$

$$r^2 \times \frac{88}{7} = 5544$$

$$r^2 = 5544 \times \frac{7}{88} = 693 \times 7 = 441$$

Taking square root on b/s

$$\sqrt{r^2} = \sqrt{444}$$

$$r = 21cm$$

$$d = 2x$$

$$d = 2\,(21) = 42cm$$

(ii) $15400cm^2$

As we know

$$\text{Area} = 4\pi r^2$$

$$15400 = 4 \times \frac{22}{7} r^2$$

$$15400 = \frac{88}{7} \times r^2$$

7. ***Radius of a sphere is r. How many times does the area increase if radius is doubled.***

Radius = r

Area of sphere = $4\pi r^2$

If radius double = 2r

Area of sphere = $4\pi(r)^2$

Area increases 4 times = $4\pi (2r)^2 \Rightarrow 4\pi \times 4r^2 = 16\pi r^2$

EXERCISE 9.4

1. ***Find the volume of spheres whose radii are***

(i) ***2.8cm***

r = 2.8cm

$$\text{Volume of sphere} = \frac{4}{3}\pi r^3$$

$$= \frac{4}{3} \times \frac{22}{7} \times (2.8)^3$$

$$= \frac{4}{3} \times \frac{22}{7} \times 2.8 \times 2.8 \times 2.8$$

$$= 91.99\text{cm}^3$$

(ii) ***4.2m***

r = 4.2m

$$\text{Volume of sphere} = \frac{4}{3}\pi r^3$$

$$= \frac{4}{3} \times \frac{22}{7} \times (4.2)^3$$

$$= \frac{4}{3} \times \frac{22}{7} \times 4.2 \times 4.2 \times 4.2$$

$$= 310.46\text{cm}^3$$

(iii) ***5.6cm***

r = 5.6cm

$$\text{Volume of sphere} = \frac{4}{3}\pi r^3$$

$$= \frac{4}{3} \times \frac{22}{7} \times (5.6)^3$$

$$= \frac{4}{3} \times \frac{22}{7} \times 5.6 \times 5.6 \times 5.6$$

$$= 66.90\text{cm}^3$$

(iv) ~~*6.3m*~~

$r = 6.3\text{m}$

$$\text{Volume of sphere} = \frac{4}{3}\pi r^3$$

$$= \frac{4}{3} \times \frac{22}{7} \times (6.3)^3$$

$$= \frac{4}{3} \times \frac{22}{7} \times 6.3 \times 6.3 \times 6.3$$

$$= 1047.82\text{cm}^3$$

2. ***Find the volume of spheres whose surface area are given as***

(i) 6.16m^2

Surface area of sphere $= A = 6.16\text{m}^2$

Volume $= ?$

$$\text{Surface area} = 4\pi r^2$$

$$4 \times \frac{22}{7} \times r^2 = 6.16$$

$$\frac{88}{7}\pi r^2 = 6.16$$

$$r^2 = 6.16 \times \frac{7}{88}$$

$$\sqrt{r^2} = \sqrt{0.49}$$

$$r = 0.7$$

$$\text{Now, } v = \frac{4}{3}\pi r^3 = \frac{4}{3} \times \frac{22}{7}(0.7)^3$$

$$= \frac{4}{3} \times \frac{22}{7} \times 0.7 \times 0.7 \times 0.7 = 1.44\text{cm}^3$$

4851 cm^2 contain water $= \frac{4851}{1000} = 4.851$ litre

5. ***Radius of spherical iron ball is 2.1cm. Find the weight of 5 such balls @ 40gm/cm^3.***

Radius of iron ball = 2.1cm

Volume of spherical iron ball $= v = \frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \frac{22}{7} \times (2.1)^3$

$= \frac{4}{3} \times \frac{22}{7} \times 2.1 \times 2.1 \times 2.1$

$= 38.808 cm^3$

Weight of on ball $= 40 \times 38.808 cm^3 = 1552.32/cm^3$

Weight of 5 such balls $= 5 \times 1552.32 gm/cm^3$

$= 7761.6 gm/cm^3$

6. ***How many times does the volume of sphere becomes of radius is made?***

(i) Double

Radius = r

Radius doubled = 2r

Volume of sphere $= \frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \frac{22}{7} \pi \times (2r)^3 = \frac{4}{3} \times \pi^2 \times 8r^3$

Volume increase 8 times if radius is doubled.

(ii) Half

Radius is half $= \frac{r}{2}$

Volume $= \frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi\left(\frac{r}{2}\right)^3$

$$= \frac{1}{3}\pi\frac{1}{8} = \frac{1}{3}\pi r^2\frac{1}{8}$$

Volume would be $\frac{1}{8}$ if radius is half.

EXERCISE 9.5

1. Find

(a) Curved surface area.

(b) Total surface area of a right circular cone if:

(i) Radius of base = 7cm, Slant height = 10cm

(a) Curved surface area $= \pi r l$

$$= \frac{22}{7} \times 7 \times 10 = 220\text{cm}^2$$

(b) Total surface area $= \pi r (l + r)$

$$= \frac{22}{7} \times 7 (10 + 7)$$

$$= 22 (17) = 374\ \text{cm}^2$$

(ii) Radius of base = 2.1cm, Slant height = 5m

(a) Curved surface area $= \pi r l$

$$= \frac{22}{7} \times 2.1 \times 5 = 3\text{m}^3$$

(b) Total surface area $= \pi r (l + r)$

$$= \frac{22}{7} \times 2.1 (5 + 2.1)$$

$$= \frac{22}{7} \times \frac{21}{10} (7.1) = 46.86\text{m}^2$$

(iii) Diameter of base = 15cm, Slant height = 14cm

(a) Curved surface area $= \pi r l$

$$= \frac{22}{7} \times 7.5 \times 14 = 330\text{cm}^2$$

Base area $= \pi r^2$

$$= \frac{22}{7} \times (2)^2 = \frac{22}{7} \times 4 = 12.57\text{cm}^2$$

4. ***Radius of base and height of a right circular cone are 5m and 12m respectively. Find the cost of painting the curved surface of the cone @ Rs. 20 per m^2.***

Radius of base $= r = 5\text{m}$

height $= h = 12\text{m}$

$$l = \sqrt{r^2 + h^2}$$

$$= \sqrt{(5)^2 + (12)^2}$$

$$= \sqrt{25 + 144} = \sqrt{169} = 13\text{m}$$

Curved surface area $= \pi r l$

$$= \frac{22}{7} \times 5 \times 13 = 204.285\text{m}^2$$

Cost of painting 1m^2 = Rs. 20

Cost of painting $204.26\text{m}^2 = 20 \times 204.255$

= Rs. 4085.71

5. ***Height of a right circular conical tent is 4m. Its lateral height is 5m. Find the cost of cementing its floor @ Rs. 10 per m^2. Also find the cost of canvas used @ Rs. 80 per m^2.***

Height of conical tent $= h = 4\text{m}$

Lateral height $= l = 5\text{m}$

Slant height $= \sqrt{l^2 - h^2}$

$$= \sqrt{(5)^2 - (4)^2}$$

$$= \sqrt{25 - 16} = \sqrt{9} = 3\text{m}$$

(i) Base area $= \pi r^2 = \frac{22}{7} \times (13)^2 = 28.286\text{m}^2$

$1\ \text{m}^2$ tent – Rs. 80

Cost of cementing $10\text{m}^2 = 10 \times 28.286 =$ Rs. 282.86

(ii) Curved surface area $= \pi r l = \frac{22}{7} \times 3 \times 5 = 47.143 m^2$

Cost of convexing m^2 = Rs. 80

Cost of convex at $47.143 m^2 = 80 \times 47.143$ = Rs. 3771.43

6. Diameter of the base of a right circular hollow cone made of iron sheet is 14dm. Its slant height is 3m. Find the cost of iron sheet @ Rs. 4 per dm^2.

Diameter of base = 14dm

Radius of base $= r = \frac{14}{2} = 7dm$

Slant height $= l = 3m$

Curved surface area $= \pi r l = \frac{22}{7} \times 7 \times 3 = 66 dm^2$

Cost of 1 dm^2 iron sheet = Rs. 4

Cost of 66 dm^3 iron sheet $= 4 \times 66$ = Rs. 264

EXERCISE 9.6

1. Find the missing elements of the cones in the following:

S.No.	Radius base (r)	Height (h)	Slant height (l)	Volume = $\frac{1}{3}\pi r^2 h$
(i)	6cm	8cm	10cm	$301.71 cm^3$
(ii)	3cm	4cm	5cm	$37.71 cm^3$
(iii)	3cm	7cm	7.62cm	$66 cm^3$
(iv)	6cm	14cm	15.23cm	$528 cm^3$

2. An ice cream cup is of right circular conical shape. Its radius of base and height are 15mm and 28mm respectively. Find quantity of ice cream present in 100 cups of same size in litres. (1000 cm^3 = 1 litre)

r = 15mm

h = 28mm

Volume of a cup = v = ?

$v = \frac{1}{3}\pi r^2 h = \frac{1}{3} \times \frac{22}{7} \times (15)^2 \times 28$