18. Area of a Trapezium and a Polygon

Exercise 18A

1. Question

Find the area of a trapezium whose parallel sides are 24 cm and 20 cm and the distance between them is 15 cm.

Answer

Given:

Length of parallel sides is 24cm and 20 cm

Height (h) = 15 cm

We know that area of trapezium is $\frac{1}{2}$ × (sum of parallel sides) × height

Therefore, Area of trapezium = $\frac{1}{2} \times (24 + 20) \times 15 = 330\ cm^2$.

2. Question

Find the area of a trapezium whose parallel sides are 38.7 cm and 22.3 cm, and the distance between them is 16 cm.

Answer

Given

Length of parallel sides is 38.7cm and 22.3 cm

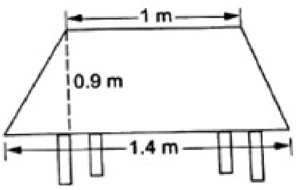
Height (h) = 16 cm

We know that area of trapezium is $\frac{1}{2}$ × (sum of parallel sides) × height

Therefore Area of trapezium = $\frac{1}{2} \times (38.7 + 22.3) \times 16 = 488\ cm^2$.

3. Question

The shape of the top surface of a table is trapezium. Its parallel sides are 1 m and 1.4 m and the perpendicular distance between them is 0.9 cm. Find its area.



Answer

Given

Length of parallel sides is 1m and 1.4m

Height (h) = 0.9m

We know that area of trapezium is $\frac{1}{2}$ × (sum of parallel sides) × height

Therefore Area of trapezium = $\frac{1}{2} \times (1 + 1.4) \times 0.9$

$= 1.08\ m^2$.

4. Question

The area of a trapezium is 1080 cm^2. If the lengths of its parallel sides be 55 cm and 35 cm, find the distance between them.

Answer

Given

Length of parallel sides is 55cm and 35 cm

Area of trapezium= 1080 cm^2

Let Height (h) =y cm

We know that area of trapezium is $\frac{1}{2}$ × (sum of parallel sides) × height

Therefore Area of trapezium is $\frac{1}{2}$ × (55 + 35) × y =1080 cm^2.

∴ $\frac{1}{2}$ × (90) × y =1080

⇒ 45 × y =1080

⇒ y =$\frac{1080}{22}$= 24

∴. Distance between the parallel lines is 24 cm.

5. Question

A field is in the form of a trapezium. Its area is 1586 m^2 and the distance between its parallel sides is 26 m. If one of the parallel sides is 84 m, find the other.

Answer

Given

Let length of parallel sides be 84cm and y cm

Area of trapezium= 1586 cm^2

Let Height (h) =26 cm

We know that area of trapezium is $\frac{1}{2}$ × (sum of parallel sides) × height

Therefore Area of trapezium is $\frac{1}{2}$ × (84 +y) × 26 =1586 cm^2.

∴ $\frac{1}{2}$ × (84 +y) × 26 =1586

⇒(84 + y) × 13 =1586

⇒ 84 + y =$\frac{1586}{13}$

⇒ y =122— 84 = 38

∴. Length of the other parallel side is 38 cm.

6. Question

The area of a trapezium is 405 cm^2. Its parallel sides are in the ration 4:5 and the distance between them is 18 cm. Find the length of each of the parallel sides.

Answer

Given

Lengths of the parallel sides are in the ratio 4:5

Therefore let one of the side length be 4X and other side length be 5X

Area of trapezium= 405 cm^2

Let Height (h) =18 cm

We know that area of trapezium is $\frac{1}{2}$ × (sum of parallel sides) × height

Therefore Area of trapezium is $\frac{1}{2}$ x (4X +5X) × 18 =405 cm^2.

∴ $\frac{1}{2}$ × (4X + 5X) × 18 =405

⇒(9X) × 9 =405

⇒ 81X = 405

⇒ X = $\frac{405}{81}$ = 5

∴. Length of the parallel sides is 4X=4 × 5 =20 cm and 5X = 5 × 5 = 25 cm.

Therefore lengths of the parallel sides are 20 cm, 25 cm.

7. Question

The area of a trapezium is 180 cm^2 and its height is 9 cm. If one of the parallel sides is longer than the other by 6 cm, find the two parallel sides.

Answer

Given

Let length of first parallel side X

Length of other parallel side is X + 6

Area of trapezium= 180 cm^2

Let Height (h) =9 cm

We know that area of trapezium is $\frac{1}{2}$ × (sum of parallel sides) × height

Therefore Area of trapezium is $\frac{1}{2}$ × (X + 6 +X) × 9 =180 cm^2.

∴ $\frac{1}{2}$ × (X + 6 +X) × 9 =180

⇒$\frac{1}{2}$ × (2X + 6) × 9 =180

⇒ 2X + 6 = $\frac{180}{9} \times 2$

⇒ 2X + 6 = 40

⇒2X = 40 – 6 =34

⇒X = 17

∴. Length of the parallel sides is X=17 cm and X + 6 = 17 + 6 = 23 cm.

Therefore lengths of the parallel sides are 17 cm, 23 cm.

8. Question

In a trapezium-shaped field, one of the parallel sides is twice the other. If the area of the field is 9450 m^2 and the perpendicular distance between the two parallel sides is 84 m, find the length of the longer of the parallel sides.

Answer

Given

Let length of first parallel side X

Length of other parallel side is 2X

Area of trapezium= 9450 m^2

Let Height (h) =84 m

We know that area of trapezium is $\frac{1}{2}$ × (sum of parallel sides) × height

Therefore Area of trapezium is $\frac{1}{2}$ × (X + 2X) × 84 =9450 cm^2.

∴ $\frac{1}{2}$ × (X + 2X) × 84 =9450

⇒ (3X) × 42 =9450

⇒ 126X = 9450

⇒ 2X + 6 = $\frac{9450}{126}$ = 75

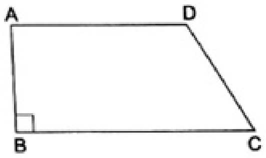
⇒X = 17

∴ Length of the parallel sides is X=75 m and 2X = 150 m.

Therefore length of the longest is 150 m.

9. Question

The length of the fence of a trapezium-shaped field ABCD is 130 m and side AB is perpendicular to each of the parallel sides AD and BC. If $BC = 54$ m, $CD = 19$ m and $AD = 42$ m, find the area of the field.



Answer

Given

Length of parallel sides

AD = 42 m

BC = 54 m

Given that total length of fence is 130 m

That is AB + BC +CD +DA = 130

AB + 54 + 19 + 42 = 130

Therefore AB = 15

Height (AB) = 15 m

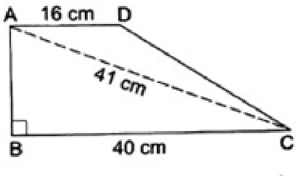
We know that area of trapezium is $\frac{1}{2}$ × (sum of parallel sides) × height

Therefore Area of trapezium = $\frac{1}{2}$ × (42 + 54) × 15 = 720 m^2

10. Question

In the given figure, ABCD is a trapezium in which $AD \parallel BC$, $\angle ABC = 90°$, $AD = 16$ cm,

$AC = 41$ cm and $BC = 40$ cm. find the area of the trapezium.



Answer

Given

AD = 16 cm

BC = 40 cm

AC = 41 cm

∠ABC = 90

Height = AB =?

Here in ΔABC using Pythagoras theorem

$AC^2 = AB^2 + BC^2$

$41^2 = AB^2 + 40^2$

$AB^2 = 41^2 - 40^2$

$AB^2 = 1681 - 1600 = 81$

∴AB = 9

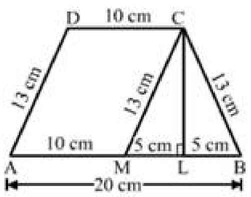
We know that area of trapezium is $\frac{1}{2}$ × (sum of parallel sides) × height

Therefore Area of trapezium = $\frac{1}{2} \times (16 + 40) \times 9 = 252$ cm^2.

11. Question

The parallel sides of a trapezium are 20 cm and 10 cm. Its nonparallel sides are both equal, each being 13 cm. Find the area of the trapezium.

Answer



Let ABCD be the given trapezium in which AB|| DC,

AB = 20 cm, DC = 10 cm and AD=BC=13cm

Draw CL ⊥ AB and CM || DA meeting AB at L and M, respectively.

Clearly, AMCD is a parallelogram.

Now,

AM = DC =10cm

MB = (AB-Am)

= (20-10) = 10 cm

Also,

CM = DA = 13cm

Therefore, ΔCMB is an isosceles triangle and CL $\perp$ MB.

And L is midpoint of B.

$\Rightarrow$ML = LB = $\left(\frac{1}{2} \times MB\right)$ = $\left(\frac{1}{2} \times 10\right)$ = 5 cm

From right ΔCLM, we have:

CL^2 = (CM2 – ML^2)

CL^2 = (132 – 5^2)

CL^2 = (169 – 25)

CL^2 = 144

CL = 12

Therefore length of CL is 12 cm that is height of trapezium is 12 cm

There fore

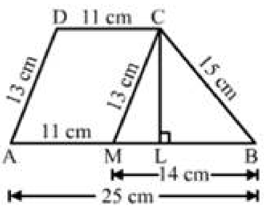
We know that area of trapezium is $\frac{1}{2}$ × (sum of parallel sides) × height

Therefore Area of trapezium = $\frac{1}{2}$ × (20 + 10) × 12 = 180 cm^2.

12. Question

The parallel sides of a trapezium are 25 cm and 11 cm, while its nonparallel sides are 15 cm and 13 cm. find the area of the trapezium.

Answer



Let ABCD be the given trapezium in which AB|| DC,

AB = 25 cm, CD = 11 cm and AD= 13 cm, BC=15cm

Draw CL $\perp$ AB and CM || DA meeting AB at L and M, respectively.

Clearly, AMCD is a parallelogram.

Now,

MC = AD = 13cm

AM = DC =11cm

MB = (AB—Am)

= (25—11) = 14 cm

Thus, in ΔCMB, we have:

CM = 13 cm

MB = 14 cm

BC = 15 cm

Here let ML = X, hence LB = 14 – X and let CL = Y cm

Now in ΔCML, using Pythagoras theorem

CL^2 = ($CM2$ – ML^2)

Y^2 = (132 – X^2) eq – 1

Again in ΔCLB, using Pythagoras theorem

CL^2 = (CB2 – LB^2)

Y^2 = (152 – (14—X) ^{2}) eq – 2

Sub eq 1 in 2, we get

(132 – X^2) = (152 – (14—X) ^{2})

169 – X^2 = 225 – (196 + X^2 – 28 X)

169 – X^2 = 225 – 196 – X^2 + 28 X

28X = 169 + 196 – 225 + X^2 – X^2

28X = 140

X = 5 cm

Now substitute X value in eq –1

That is Y^2 = (132 – X^2)

Y^2 = (132 – 5^2)

Y^2 = (169 – 25)

Y^2 = 144

Y = 12 cm

Therefore CL = 12 cm that is height of the trapezium = 12 cm

Therefore

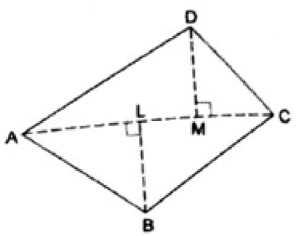
We know that area of trapezium is $\frac{1}{2}$ × (sum of parallel sides) × height

Therefore Area of trapezium = $\frac{1}{2}$ × (25 + 11) × 12 = 216 cm^2.

Exercise 18B

1. Question

In the given figure, ABCD is a quadrilateral in which $AC = 24$ cm, $BL \perp AC$ and $DM \perp AC$ such that $BL = 8$ cm and $DM = 7$ cm. find the area of quad. ABCD.



Answer

Given: A quadrilateral ABCD

$BL \perp AC$ and $DM \perp AC$

AC = 24 cm

BL = 8 cm

DM = 7 cm

Here,

Area (quad. ABCD) = area (ΔABC) + area (ΔADC)

Area of triangle = $\frac{1}{2}$ × (base) × (height).

Therefore

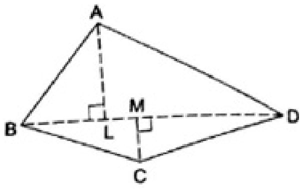
Area of quad ABCD = $\frac{1}{2}$ × (AC) × (BL) + $\frac{1}{2}$ × (AC) × (DM)

= $\frac{1}{2}$ × (24) × (8) + $\frac{1}{2}$ × (24) × (7) = 96 + 84 = 180 cm^2

Therefore area of the quadrilateral ABCD is 180 cm^2

2. Question

In the given figure, ABCD is a quadrilateral-shaped field in which diagonal BD is 36 m, $AL \perp BD$ and $CM \perp BD$ such that $AL = 19$ m and $CM = 11$ m. Find the area of the field.



Answer

Given: A quadrilateral ABCD

$AL \perp BD$ and $CM \perp BD$

AL = 19 cm

BD = 36 cm

CM = 11 cm

Here,

Area (quad. ABCD) = area (ΔABD) + area (ΔACD)

Area of triangle = $\frac{1}{2}$ × (base) × (height).

Therefore

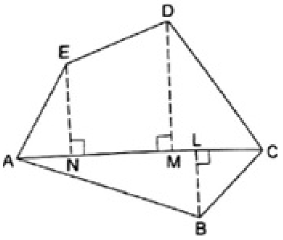
Area of quad ABCD = $\frac{1}{2}$ × (BD) × (AL) + $\frac{1}{2}$ × (BD) × (CM)

= $\frac{1}{2}$ × (36) × (19) + $\frac{1}{2}$ × (36) × (11) = 342 + 198 = 540 cm^2

Therefore area of the quadrilateral ABCD is 540 cm^2.

3. Question

Find the area of pentagon ABCDE in which $BL \perp AC$, $DM \perp AC$ and $EN \perp AC$ such that $AC = 18$ cm, $AM = 14$ cm, $AN = 6$ cm, $BL = 4$ cm, $DM = 12$ cm and $EN = 9$ cm.



Answer

Given: A pentagon ABCDE

$BL \perp AC$, $DM \perp AC$ and $EN \perp AC$

$AC = 18$ cm

$AM = 14$ cm

$AN = 6$ cm

$BL = 4$ cm

$DM = 12$ cm

$EN = 9$ cm

MC = AC – AM = 18 – 14 = 4 cm

MN = AM – AN = 14 – 6 = 8 cm

Here,

Area (Pent. ABCDE) = area (ΔAEN) + area (ΔDMC) + area (ΔABC) + area (Trap. DMNE)

Area of triangle = $\frac{1}{2}$ × (base) × (height).

Area of trapezium is $\frac{1}{2}$ × (sum of parallel sides) × height

Here,

Area (ΔAEN) = $\frac{1}{2}$ × (AN) × (EN) = $\frac{1}{2}$ × (6) × (9) = 27 cm^2.

Area (ΔDMC) = $\frac{1}{2}$ × (MC) × (DM) = $\frac{1}{2}$ × (4) × (12) = 24 cm^2.

Area (ΔABC) = $\frac{1}{2}$ × (AC) × (BL) = $\frac{1}{2}$ × (18) × (4) = 36 cm^2.

Area (Trap. DMNE) = $\frac{1}{2}$ × (DM + EN) × MN = $\frac{1}{2}$ × (12 + 9) × 8 = 84 cm^2.

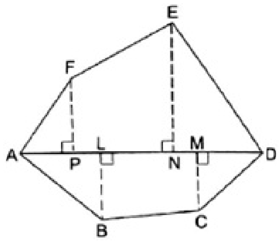
∴ Area (Pent. ABCDE) = area (ΔAEN) + area (ΔDMC) + area (ΔABC) + area (Trap. DMNE)

= 27 + 24 + 36 + 84 =171 cm^2.

∴ Area (Pent. ABCDE) = 171 cm^2.

4. Question

Find the area of hexagon ABCDEF in which $BL \perp AD$, $CM \perp AD$, $EN \perp AD$ and $FP \perp AD$ such that $AP = 6$ cm, $PL = 2$ cm, $LN = 8$ cm, $NM = 2$ cm, $MD = 3$ cm, $FP = 8$ cm, $EN = 12$ cm, $BL = 8$ cm and $CM = 6$ cm.



Answer

Given: A Hexagon ABCDE

$BL \perp AD$, $CM \perp AD$, $EN \perp AD$ and $FP \perp AD$

$AP = 6$ cm

$PL = 2$ cm

$LN = 8$ cm

$NM = 2$ cm

$MD = 3$ cm

$FP = 8$ cm

$EN = 12$ cm

$BL = 8$ cm

$CM = 6$ cm

AL = AP + PL = 6 + 2 = 8 cm

PN = PL + LN = 2 + 8 = 10 cm

LM = LN + NM = 8 + 2 = 10 cm

ND = NM + MD =2 + 3 = 5 cm

Here,

Area (Hex. ABCDEF) = area (ΔAPF) + area (ΔDEN) + area (ΔABL) + area (ΔCMD)

+ area (Trap. PNEF) + area (Trap. LMCB)

Area of triangle = $\frac{1}{2}$ × (base) × (height).

Area of trapezium is $\frac{1}{2}$ × (sum of parallel sides) × height

Here,

Area (ΔAPF) = $\frac{1}{2}$ × (AP) × (FP) = $\frac{1}{2}$ × (6) × (8) = 24 cm^2.

Area (ΔDEN) = $\frac{1}{2}$ × (ND) × (EN) = $\frac{1}{2}$ × (5) × (12) = 30 cm^2.

Area (ΔABL) = $\frac{1}{2}$ × (AL) × (BL) = $\frac{1}{2}$ × (8) × (8) = 32 cm^2.

Area (ΔCMD) = $\frac{1}{2}$ × (MD) × (CM) = $\frac{1}{2}$ × (3) × (6) = 9 cm^2.

Area (Trap. PNEF) = $\frac{1}{2}$ × (FP + EN) × PN = $\frac{1}{2}$ × (8 + 12) × 10 = 100 cm^2.

Area (Trap. LMCB) = $\frac{1}{2}$ × (BL + CM) × LM = $\frac{1}{2}$ × (8 + 6) × 10 = 70 cm^2.

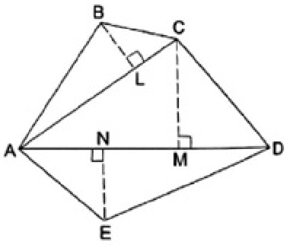
∴ Area (Hex. ABCDEF) = area (ΔAPF) + area (ΔDEN) + area (ΔABL) + area (ΔCMD)

+ area (Trap. PNEF) + area (Trap. LMCB) = 24 + 30 + 32 + 9 + 100 + 70 =265 cm^2.

∴ Area (Hex. ABCDEF) = 265 cm^2

5. Question

Find the area of pentagon ABCDE in which $BL \perp AC$, $CM \perp AD$ and $EN \perp AD$ such that $AC = 10$ cm, $AD = 12$ cm, $BL = 3$ cm, $CM = 7$ cm and $EN = 5$ cm.



Answer

Given: A pentagon ABCDE

$BL \perp AC$, $CM \perp AD$ and $EN \perp AD$

$AC = 10$ cm

$AD = 12$ cm

$BL = 3$ cm

$CM = 7$ cm

$EN = 5$ cm

Here,

Area (Pent. ABCDE) = area (ΔABC) + area (ΔACD) + area (ΔADE)

Area of triangle = $\frac{1}{2}$ × (base) × (height).

Here,

Area (ΔABC) = $\frac{1}{2}$ × (AC) × (BL) = $\frac{1}{2}$ × (10) × (3) = 15 cm^2.

Area (ΔACD) = $\frac{1}{2}$ × (AD) × (CD) = $\frac{1}{2}$ × (12) × (7) = 42 cm^2.

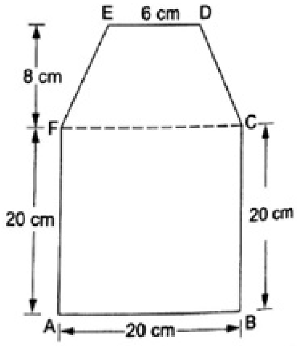
Area (ΔADE) = $\frac{1}{2}$ × (AD) × (EN) = $\frac{1}{2}$ × (12) × (5) = 30 cm^2.

∴ Area (Pent. ABCDE) = area (ΔABC) + area (ΔACD) + area (ΔADE) = 15 + 42 + 30 = 87 cm^2.

∴ Area (Pent. ABCDE) = 87 cm^2.

6. Question

Find the area enclosed by the given figure ABCDEF as per dimensions given herewith.



Answer

Given: A figure ABCDEF

AB = 20 cm

BC = 20 cm

ED = 6 cm

AF = 20 cm

AB || FC

FC = 20 cm

Let distance between FC and ED be h = 8 cm

FC || ED

Here,

From the figure we can see that ABCF forms a square and EFCD forms a trapezium.

Area of square = (side length) ^{2}

Area of trapezium = $\frac{1}{2}$ × (sum of parallel sides) × height

Therefore,

Area of the figure ABCDEF = Area of square (ABCF) + Area of trapezium (EFCD)

Here,

Area of square (ABCF) = $(AB)^2 = (20)^2 = 400$ cm^2

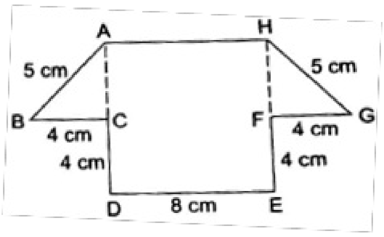
Area of trapezium (EFCD) = $\frac{1}{2} \times (FC + ED) \times h = \frac{1}{2} \times (6 + 20) \times 8 = 104$ cm^2

∴ Area (ABCDEF) = Area of square (ABCF) + Area of trapezium (EFCD) = 400 + 104 = 504 cm^2.

∴ Area (Fig. ABCDEF) = 504 cm^2.

7. Question

Find the area of given figure ABCDEFGH as per dimensions given in it.



Answer

Given: A figure ABCDEFGH

BC = FG = 4 cm

AB = HG = 5 cm

CD = EF = 4 cm

ED = 8 cm

ED || AH

AH = 8 cm

Here

ΔABC and GHF are equal and right angled

AC = AH = ?

In ΔABC using Pythagoras theorem

$AB^2 = BC^2 + AC^2$

$5^2 = 4^2 + AC^2$

$25 = 16 + AC^2$

$AC^2 = 25 - 16 = 9$

AC = 3

AH = 3

Area(ABCDEFGH) = area(Rect. ADEH) + 2 X area (ΔABC)

Area of rectangle = (length × breadth)

Area of triangle = $\frac{1}{2}$ × (base) × (height).

Area(Rect. ADEH) = (DE × AD) = (DE × (AC + AD)) = (8 × (3 + 4)) = 56 cm^2

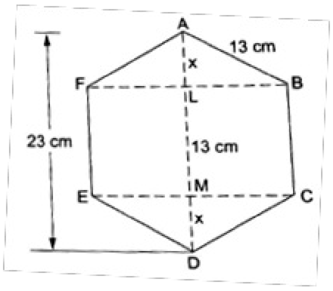
Area(ΔABC) = $\frac{1}{2}$ × (BC) × (AC) = $\frac{1}{2}$ × (4) × (3) = 6 cm^2

∴ Area(ABCDEFGH) = area(Rect. ADEH) + 2 × area (ΔABC) = 56 + (2 × 6) = 68 cm^2

∴ Area(ABCDEFGH) = 68 cm^2.

8. Question

Find the area of a regular hexagon ABCDEF in which each side measures 13 cm and whose height is 23 cm, as shown in the given figure.



Answer

Given: a regular hexagon ABCDEF

AB = BC = CD = DE = EF = FA = 13 cm

AD = 23 cm

Here AL = MD

Therefore Let AL = MD = x

Here AD = AL + LM + MD

23 = 13 + 2x

2x = 23 – 13 = 10

x = 5

Now,

In ΔABL using Pythagoras theorem

$AB^2 = AL^2 + LB^2$

$13^2 = x^2 + LB^2$

$13^2 = 5^2 + LB^2$

$169 = 25 + LB^2$

$LB^2 = 169 - 25 = 144$

LB = 12

Here area (Trap. ABCD) = area (Trap. AFED)

Therefore,

Area (Hex. ABCDEF) = 2 × area (Trap. ABCD)

Area of trapezium = $\frac{1}{2}$ × (sum of parallel sides) × height

Area (Trap. ABCD) = $\frac{1}{2}$ × (BC + AD) × LB = $\frac{1}{2}$ × (13 + 23) × 12 = 216 cm^2.

∴ Area(ABCDEFGH) = 2 × area (Trap. ABCD) = 2 × 216 = 432 cm^2

∴ Area(ABCDEFGH) = 432 cm^2.

Exercise 18C

1. Question

The parallel sides of a trapezium measure 14 cm and 18 cm and the distance between them is 9 cm. The area of the trapezium is

A. 96 cm^2

B. 144 cm^2

C. 189 cm^2

D. 207 cm^2

Answer

Given

Length of parallel sides is 14cm and 18 cm

Height (h) = 9 cm

We know that area of trapezium is $\frac{1}{2}$ × (sum of parallel sides) × height

Therefore Area of trapezium = $\frac{1}{2}$ × (14 +18) × 9 = 144 cm^2.

2. Question

The length of the parallel sides of a trapezium are 19 cm and 13 cm and its area is 128 cm^2. The distance between the parallel sides is

A. 9 cm

B. 7 cm

C. 8 cm

D. 12.5 cm

Answer

Given

Length of parallel sides is 19 cm and 13 cm

Area of trapezium= 128 cm^2

Let Height (h) =y cm

We know that area of trapezium is $\frac{1}{2}$ × (sum of parallel sides) × height

Therefore Area of trapezium is $\frac{1}{2}$ × (19 +13) × y =128 cm^2.

∴ $\frac{1}{2}$ × (19 +13) × y =128

⇒$\frac{1}{2}$ × (32) × y =128

⇒ 16 × y =128

⇒ y =$\frac{128}{16}$ = 8 cm

∴ Distance between the parallel lines is 8 cm.

3. Question

The parallel sides of a trapezium are in the ration 3:4 and the perpendicular distance between them is 12 cm. If the area of the trapezium is 630 cm^2, then its shorter length of the parallel sides is

A. 45 cm

B. 42 cm

C. 60 cm

D. 36 cm

Answer

Given

Lengths of the parallel sides are in the ratio 3:4

Therefore let one of the side length be 3X and other side length be 4X

Area of trapezium= 630 cm^2

Let Height (h) =12 cm

We know that area of trapezium is $\frac{1}{2}$ × (sum of parallel sides) × height

Therefore Area of trapezium is $\frac{1}{2}$ × (3X +4X) × 12 =630 cm^2.

∴ $\frac{1}{2}$ × (3X + 4X) × 12 = 630

⇒(7X) × 6 =630

⇒ 42X = 630

⇒ X =$\frac{630}{42}$ = 15

∴ length of the parallel sides is 3X = 3 × 15 =45 cm and 4X = 4 × 15 = 60 cm.

Therefore shortest length of the parallel sides is 45 cm.

4. Question

The area of a trapezium is 180 cm^2 and its height is 9 cm. If one of the parallel sides is longer than the other by 6 cm, the length of the longer parallel sides is

A. 17 cm

B. 23 cm

C. 18 cm

D. 24 cm

Answer

Given

Let length of first parallel side X

Length of other parallel side is X + 6

Area of trapezium= 180 cm^2

Let Height (h) =9 cm

We know that area of trapezium is $\frac{1}{2}$ × (sum of parallel sides) × height

Therefore Area of trapezium is $\frac{1}{2}$ × (X + 6 +X) × 9 =180 cm^2.

∴ $\frac{1}{2}$ × (X + 6 +X) × 26 =180

⇒ $\frac{1}{2}$ × (2X + 6) × 9 =180

⇒ 2X + 6 = $\frac{180}{9} \times 2$

⇒ 2X + 6 = 40

⇒2X = 40 – 6 =34

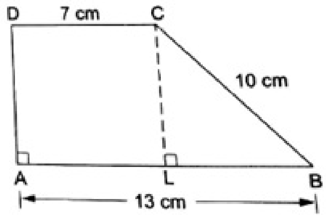
⇒X = 17

∴ length of the parallel sides is X=17 cm and X + 6 = 17 + 6 = 23 cm.

Therefore length of the longer parallel side is 23 cm.

5. Question

In the given figure, AB||DC and DA ⊥ AB If DC = 7 cm, BC = 10 cm, AB = 13 cm and CL ⊥ AB the area of trap. ABCD is



A. 84 cm^2

B. 72 cm^2

C. 80 cm^2

D. 91 cm^2

Answer

Given:

AB||DC, DA ⊥ AB and CL ⊥ AB

DC = 7 cm

BC = 10 cm

AB = 13 cm

Therefore here AL = DC

That is AL = 7 cm

Hence LB = AB – AL = 13 – 7 = 6cm

In Δ LCB using Pythagoras theorem

$BC^2 = BL^2 + CL^2$

$10^2 = 6^2 + CL^2$

$100 = 36 + CL^2$

$CL^2 = 100 – 36$

$CL^2 = 64$

CL = 8

Here CL = AD = height of the trapezium

Therefore height = 8 cm

Now,

We know that area of trapezium is $\frac{1}{2}$ × (sum of parallel sides) × height

Therefore Area of trapezium = $\frac{1}{2}$ × (7 +13) × 8 = 80 cm^2.

CCE Test Paper-18

1. Question

The base of a triangular field is three times its height and its area is 1350 m^2. Find the base and height of the field.

Answer

Given

Area of triangle = 1350 m^2

Let the length of the height of triangle be Y cm

Therefore its base is 3Y cm

Area of the triangle = $\frac{1}{2}$ × base × height = 1350

$\frac{1}{2}$ × (3Y) × (Y) = 1350

$3Y^2$ = 1350 × 2 = 2700

$Y^2 = \frac{2700}{3} = 900$

Y = 30 cm

Therefore height of triangle is 30 cm and base is 3×30 = 90cm

That is

Base = 90 m, Height = 30 m .

2. Question

Find the area of an equilateral triangle of side 6 cm.

Answer

Given

Side length of equilateral triangle is 6 cm

We know that area of the equilateral triangle is given by $\frac{\sqrt{3}}{4}a^2$,where a is side length

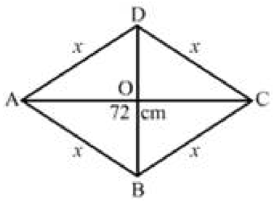
Therefore area of the triangle is

$\Rightarrow \frac{\sqrt{3}}{4} \times 6^2 = \frac{\sqrt{3}}{4} \times 36 = \sqrt{3} \times 9 = 9\sqrt{3}\,cm^2$.

3. Question

The perimeter of a rhombus is 180 cm and one of its diagonals is 72 cm. Find the length of the other diagonal and the area of the rhombus.

Answer



Given: A rhombus

Diagonal AC = 72 cm

Perimeter = 180 cm

Perimeter of the rhombus = 4x

Therefore 4x = 180

x= 45

hence, the side length of the rhombus is 45 cm

We know that diagonals of the rhombus bisect each other right angles.

$\therefore$ AO = $\frac{1}{2}$ AC

$\Rightarrow$AO = ($\frac{1}{2}$ × 72) cm

$\Rightarrow$AO = 36 cm

From right ΔAOB, we have :

$BO^2 = AB^2 - AO^2$

$\Rightarrow BO^2 = AB^2 - AO^2$

$\Rightarrow BO^2 = 45^2 - 36^2$

$\Rightarrow BO^2 = 2025 - 1296$

$\Rightarrow BO^2 = 729$

BO = 27 cm

∴ BD = 2× BO

BD = 2 × 27 = 54 cm

Hence, the length of the other diagonal is 54 cm.

Area of the rhombus = $\frac{1}{2}$ × 72 × 54 = 1944 cm^2

4. Question

The area of a trapezium is 216 m^2 and its height is 12 m. If one of the parallel sides is 14 m less than the other, find the length of each of the parallel sides.

Answer

Given

Let length of first parallel side X

Length of other parallel side is X – 14

Area of trapezium= 216 m^2

Let Height (h) =12 m

We know that area of trapezium is $\frac{1}{2}$ × (sum of parallel sides) × height

Therefore Area of trapezium is $\frac{1}{2}$ × (X – 14 +X) × 12 =216 m^2.

∴ $\frac{1}{2}$ × (X – 14 +X) × 12 =216

⇒$\frac{1}{2}$ × (2X – 14) × 12 =216

⇒ 2X – 14 = $\frac{216}{12}$ $X\ 2$

⇒ 2X – 14 = 36

⇒2X = 36 + 14 =50

⇒X = 25

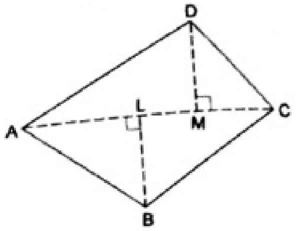
∴ length of the parallel sides is X=25 cm and X — 14 = 25 – 14 = m.

Therefore lengths of the parallel sides are 25 m, 11 m.

5. Question

Find the area of a quadrilateral one of whose diagonals is 40 cm and the lengths of the perpendiculars drawn from the opposite vertices on the diagonal are 16 cm and 12 cm.

Answer



Given : A quadrilateral

Diagonal AC = 40 cm

Perpendiculars to diagonal AC are: BL = 16 cm and DM = 12 cm

Now,

Area (quad. ABCD) = area (ΔABC) + area (ΔADC)

Area of triangle = $\frac{1}{2}$ × (base) × (height).

Therefore

Area of quad ABCD = $\frac{1}{2}$ × (AC) × (BL) + $\frac{1}{2}$ × (AC) × (DM)

= $\frac{1}{2}$ × (40) × (16) + $\frac{1}{2}$ × (40) × (12) = 320 + 240 = 560 cm^2

Therefore area of the quadrilateral ABCD is 560 cm^2.

6. Question

A field is in the form of a right triangle with hypotenuse 50 m and one side 30m. Find the area of the field.

Answer

Given

A right angled triangle with hypotenuse = 50 cm and one of the side = 30 cm

Let base = 30 cm

Height = Y cm

Area = ?

By using hypotenuse theorem

$Hypotenuse^2 = base^2 + height^2$

$50^2 = 30^2 + Y^2$

$Y^2 = 50^2 – 30^2 = 2500 – 900 = 1600$

Therefore $X^2 = 1600$

Y = 40cm

Area of the triangle = $\frac{1}{2}$ × base × height

Area = $\frac{1}{2}$ × 30 × Y

= $\frac{1}{2}$ × 30 ×40 = 600 m^2.

7. Question

The base of a triangle is 14 cm and its height is 8 cm. The area of the triangle is

A. 112 cm^2

B. 56 cm^2

C. 122 cm^2

D. 66 cm^2

Answer

Given

Length of the base of the triangle = 14 cm

Length of the heigth of the triangle = 8 cm

Area of the triangle = $\frac{1}{2}$ × base × height

Therefore area = $\frac{1}{2}$ × base × height

= $\frac{1}{2}$ × 14 × 8 = 7 × 8 = 56 cm

8. Question

The base of a triangle is four times its height and its area is 50 m^2. The length of its base is

A. 10 m

B. 15 m

C. 20 m

D. 25 m

Answer

Given

Area of triangle = 50 m^2

Let the length of the height of triangle be Y cm

Therefore its base is 4Y cm

Area of the triangle = $\frac{1}{2}$ × base × height = 50

$\frac{1}{2}$ × (4Y) × (Y) = 50

$4Y^2$ = 50 × 2 = 100

$Y^2 = \frac{100}{4} = 25$

Y = 5 cm

Therefore length of base is 4 × 5 = 20 cm

9. Question

The diagonal of a quadrilateral is 20 cm in length and the lengths of perpendiculars on it from the opposite vertices are 8.5 cm and 11.5 cm. The area of the quadrilateral is

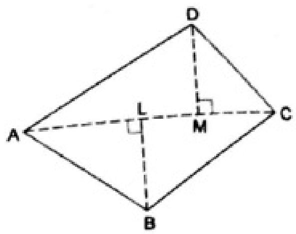
A. 400 cm^2

B. 200 cm^2

C. 300 cm^2

D. 240 cm^2

Answer



Given : A quadrilateral

Diagonal AC = 20 cm

Perpendiculars to diagonal AC are: BL = 11.5 cm and DM = 8.5 cm

Now,

Area (quad. ABCD) = area (ΔABC) + area (ΔADC)

Area of triangle = $\frac{1}{2}$ × (base) × (height).

Therefore

Area of quad ABCD = $\frac{1}{2}$ × (AC) × (BL) + $\frac{1}{2}$ × (AC) × (DM)

= $\frac{1}{2}$ × (20) × (11.5) + $\frac{1}{2}$ × (20) × (8.5) = 115 + 85 = 200 cm^2

Therefore area of the quadrilateral ABCD is 200 cm^2.

10. Question

Each side of a rhombus is 15 cm and the length of one of its diagonals is 24 cm. The area of the rhombus is

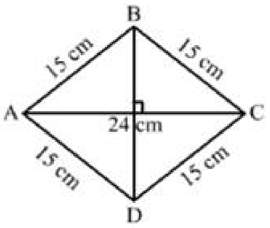
A. 432 cm^2

B. 216 cm^2

C. 180 cm^2

D. 144 cm^2

Answer



Given: A rhombus ABCD

Diagonal AC = 24 cm

Side length : AB = BC = CD = DA = 15 cm

We know that diagonals of the rhombus bisect each other right angles.

∴ AO = $\frac{1}{2}$ AC

⇒AO = ($\frac{1}{2}$ × 24) cm

⇒AO = 12 cm

From right ΔAOB, we have :

$BO^2 = AB^2 - AO^2$

⇒$BO^2 = AB^2 - AO^2$

⇒$BO^2 = 15^2 - 12^2$

⇒BO^2 = 225 – 144

⇒BO^2 = 81

⇒BO = 9 cm

∴ BD = 2 × BO

BD = 2 × 9 = 18 cm

Hence, the length of the other diagonal is 18 cm.

Area of the rhombus = $\frac{1}{2}$ × 24 × 18 = 216 cm^2

11. Question

The area of a rhombus is 120 cm^2 and one of its diagonals is 24 cm. Each side of the rhombus is

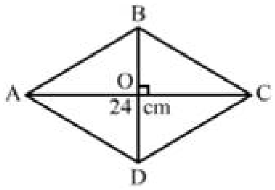
A. 10 cm

B. 13 cm

C. 12 cm

D. 15 cm

Answer



Given: A rhombus ABCD

Diagonal AC = 24 cm

Area = 120 cm^2

Area of the rhombus = $\frac{1}{2}$ × AC × BD

Therefore,

$\frac{1}{2}$ × AC × BD = $\frac{1}{2}$ × 24 × BD = 120

24 × BD = 120 × 2

BD = $\frac{240}{24}$ = 10 cm

OB = $\frac{BD}{2}$ = $\frac{10}{2}$ = 5 cm

OA = $\frac{AC}{2}$ = $\frac{24}{2}$ = 12 cm

Now,

In Δ AOB using Pythagoras theorem

$AB^2 = OA^2 + OB^2$

$AB^2 = 12^2 + 5^2$

$AB^2 = 144 + 25$

$AB^2 = 169$

AB = 13

Therefore length of each side of the rhombus = 13 cm

12. Question

The parallel sides of a trapezium are 54 cm and 26 cm and the distance between them is 15 cm. The area of the trapezium is

A. 702 cm^2

B. 810 cm^2

C. 405 cm^2

D. 600 cm^2

Answer

Given

Length of parallel sides is 54cm and 26 cm

Height (h) = 15 cm

We know that area of trapezium is $\frac{1}{2}$ × (sum of parallel sides) × height

Therefore Area of trapezium = $\frac{1}{2}$ × (54 +26) × 15 = 600 cm^2.

13. Question

The area of a trapezium is 384 cm^2. Its parallel sides are in the ratio 5:3 and the distance between them is 12 cm. the longer of the parallel sides is

A. 24 cm

B. 40 cm

C. 32 cm

D. 36 cm

Answer

Given

Lengths of the parallel sides are in the ratio 5:3

Therefore let one of the side length be 5X and other side length be 3X

Area of trapezium= 384 cm^2

Let Height (h) =12 cm

We know that area of trapezium is $\frac{1}{2}$ × (sum of parallel sides) × height

Therefore Area of trapezium is $\frac{1}{2}$ × (5X +3X) × 12 =384 cm^2.

∴ $\frac{1}{2}$ × (5X + 3X) × 12 =384

⇒ (8X) × 6 =384

⇒ 48X = 384

⇒ X = $\frac{384}{48}$ = 8

∴ length of the parallel sides is 5X=5 × 8 =40 cm and 3X = 3 × 8 = 24 cm.

Therefore length of the longest side is 40 cm.

14. Question

Fill in the blanks.

(i) Area of triangle = $\frac{1}{2}$ × (......) × (......).

(ii) Area of a ||gm = (............)× (.............)

(iii) Area of a trapezium $= \frac{1}{2} \times (......) \times (......)$.

(iv) The parallel sides of a trapezium are 14 cm and 18 cm and the distance between them is 8 cm. The area of the trapezium is ...... cm^2.

Answer

(i) Area of triangle = $\frac{1}{2}$ × (base) × (height).

(ii) Area of || gm = (base) × (height).

(iii) Area of trapezium is $\frac{1}{2}$ × (sum of parallel sides) × (height)

(iv) Given

Length of parallel sides is 14cm and 18 cm

Height (h) = 8 cm

We know that area of trapezium is $\frac{1}{2}$ × (sum of parallel sides) × height

Therefore Area of trapezium = $\frac{1}{2} \times (14 + 18) \times 8 = 128\ cm^2$.