SpeedLabs

MATHS

CBSE 9th

TEEVRA EDUTECH PVT. LTD.

Q.1 A park, in the shape of a quadrilateral ABCD, has $\angle C = 90°$, AB = 9 m, BC = 12 m, CD = 5 m and AD = 8 m. How much area does it occupy?

Ans - Let us join BD.

In ΔBCD, applying Pythagoras theorem,

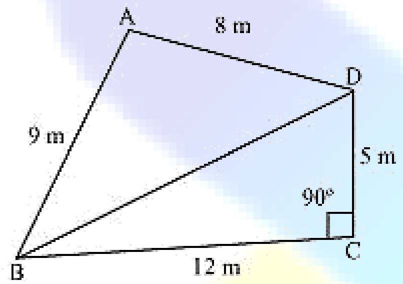
$BD^2 = BC^2 + CD^2$

$= (12)^2 + (5)^2$

$= 144 + 25$

$BD^2 = 169$

$BD = 13$ m



Area of $\Delta BCD = \frac{1}{2} \times BC \times CD = \left(\frac{1}{2} \times 12 \times 5\right) m^2 = 30m^2$

For ΔABD,

$s = \frac{\text{perimeter}}{2} = \frac{(9 + 8 + 13)m}{2} = 15$

By Heron's formula,

Area of triangle= $\sqrt{s(s-a)(s-b)(s-c)}$

Area of $\Delta ABD = \left[\sqrt{15(15-9)(15-8)(15-13)}\,\right] m^2$

$= \left(\sqrt{15 \times 6 \times 7 \times 2}\,\right) m^2$

$= 6\sqrt{35} m^2$

$= (6 \times 5.916) m^2$

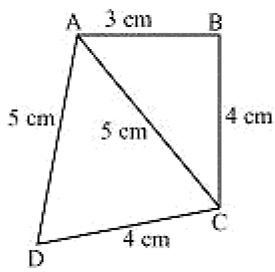
$= 35.496 m^2$

Area of the park = Area of ΔABD + Area of ΔBCD

$= 35.496 + 30\ m^2 = 65.496\ m^2 = 65.5\ m^2$ (approximately)

Q.2 Find the area of a quadrilateral ABCD in which AB = 3 cm, BC = 4 cm, CD = 4 cm, DA = 5 cm and AC = 5 cm.

Ans -



For ΔABC,

AC2 = AB2 + BC2

(5)2 = (3)2 + (4)2

Therefore, ΔABC is a right-angled triangle, right-angled at point B.

Area of ΔABC = $\frac{1}{2} \times AB \times BC = \frac{1}{2} \times 3 \times 4 = 6\text{cm}^2$

For ΔADC,

Perimeter = 2s = AC + CD + DA = (5 + 4 + 5) cm = 14 cm

s = 7 cm

By Heron's formula,

Area of triangle = $\sqrt{s(s-a)(s-b)(s-c)}$

Area of ΔABD = $\left[\sqrt{7(7-5)(7-5)(7-4)}\,\right] \text{cm}^2$

$= \left(\sqrt{7 \times 2 \times 2 \times 3}\,\right)\text{cm}^2$

$= 2\sqrt{21}\text{cm}^2$

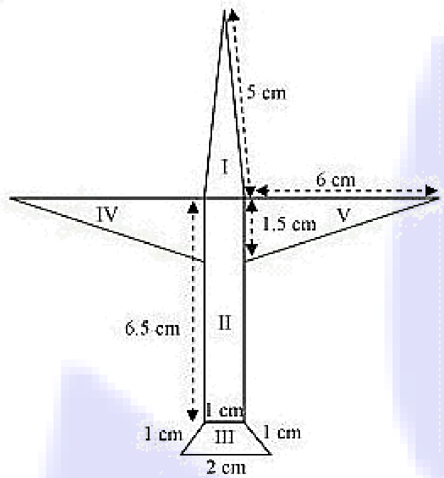
$= (2 \times 4.583)\text{cm}^2$

$= 9.166\text{cm}^2$

Area of ABCD = Area of ΔABC + Area of ΔACD

= (6 + 9.166) cm^2 = 15.166 cm^2 = 15.2 cm^2 (approximately)

Q.3 Radha made a picture of an aeroplane with coloured papers as shown in the given figure. Find the total area of the paper used.



For triangle I

Ans - This triangle is an isosceles triangle.

Perimeter = $2s = (5 + 5 + 1)$ cm = 11cm

$s = \frac{11\text{cm}}{2} = 5.5$ cm

Area of the triangle = $\sqrt{s(s-a)(s-b)(s-c)}$

$= \left[\sqrt{5.5(5.5-5)(5.5-5)(5.5-1)}\,\right]\text{cm}^2$

$= \left[\sqrt{(5.5)(0.5)(0.5)(4.5)}\,\right]\text{cm}^2$

$= 0.75\sqrt{11}\ \text{cm}^2$

$= (0.75 \times 3.317)\text{cm}^2$

$= 2.488\ \text{cm}^2$ (approximately)

For quadrilateral II

This quadrilateral is a rectangle.

Area = $l \times b = (6.5 \times 1)\ \text{cm}^2 = 6.5\ \text{cm}^2$

For quadrilateral III

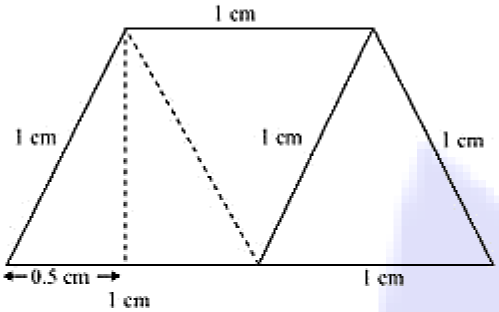
This quadrilateral is a trapezium.

Perpendicular height of parallelogram = $\left(\sqrt{1^2 - (0.5)^2}\right)$ cm

$= \sqrt{0.75}$ cm = 0.866 cm

Area = Area of parallelogram + Area of equilateral triangle

$= (0.866)1 + \frac{\sqrt{3}}{4}(1)^2 = 0.866 + 0.433 = 1.299\text{cm}^2$



Area of triangle (IV) = Area of triangle in (V)

$= \left(\frac{1}{2} \times 1.5 \times 6\right) \text{cm}^2 = 4.5 \text{ cm}^2$

Total area of the paper used = 2.488 + 6.5 + 1.299 + 4.5 × 2

= 19.287 cm2

Q.4 A triangle and a parallelogram have the same base and the same area. If the sides of triangle are 26 cm, 28 cm and 30 cm, and the parallelogram stands on the base 28 cm, find the height of the parallelogram.

Ans - For triangle

Perimeter of triangle = (26 + 28 + 30) cm = 84 cm

2s = 84 cm

s = 42 cm

By Heron's formula, $= \left[\sqrt{s(-a)(s-b)(s-c)}\right]$

Area of triangle $= \left[\sqrt{42(42-26)(42-28)(42-30)}\right] \text{cm}^2$

$= \left[\sqrt{42(16)(14)(12)}\right] \text{cm}^2 = 336 \text{cm}^2$

Let the height of the parallelogram be h.

Area of parallelogram = Area of triangle

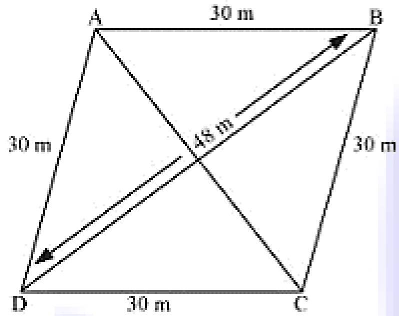
$h \times 28 \text{ cm} = 336 \text{ cm}^2$

h = 12 cm

Therefore, the height of the parallelogram is 12 cm.

Q.5 A rhombus shaped field has green grass for 18 cows to graze. If each side of the rhombus is 30 m and its longer diagonal is 48 m, how much area of grass field will each cow be getting?

Ans -



Let ABCD be a rhombus-shaped field.

For ΔBCD,

Semi-perimeter, $s = \frac{(48+30+30)\text{cm}}{2} = 54$ m

By Heron's formula,

Area of triangle $= \sqrt{s(-a)(s-b)(s-c)}$

Therefore, area of ΔBCD $= \left[\sqrt{54(54-48)(54-30)(54-30)}\right]$ m^2

$= \sqrt{54(6)(24)(24)} = 3 \times 6 \times 24 = 432$ m^2

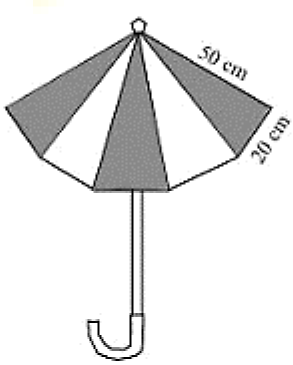
Area of field = 2 × Area of ΔBCD

$= (2 \times 432)$ m^2 = 864 m^2

Area for grazing for 1 cow $= \frac{864}{18} = 48$ m^2

Each cow will get 48 m2 area of grass field.

Q.6 An umbrella is made by stitching 10 triangular pieces of cloth of two different colours (see the given figure), each piece measuring 20 cm, 50 cm and 50 cm. How much cloth of each colour is required for the umbrella?



Ans - For each triangular piece,

Semi-perimeter, $s = \frac{(20+50+50)cm}{2} = 60cm$

By Heron's formula,

Area of triangle = $\sqrt{s(-a)(s-b)(s-c)}$

Area of each triangular piece = $[\sqrt{60(60-50)(60-50)(60-20)}\,]cm^2$

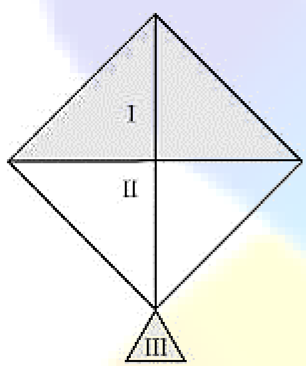
$= [\sqrt{60(10)(10)(40)}\,]cm^2 = 200\sqrt{6}cm^2$

Since there are 5 triangular pieces made of two different coloured cloths,

Area of each cloth required = $(5 \times 200\sqrt{6}\,)cm^2$

$= 1000\sqrt{6}\ cm^2$

Q.7 A kite in the shape of a square with a diagonal 32 cm and an isosceles triangles of base 8 cm and sides 6 cm each is to be made of three different shades as shown in the given figure. How much paper of each shade has been used in it?



Ans - We know that

Area of square = $\frac{1}{2}$ (diagonal)2

Area of the given kite = $\frac{1}{2}\ (32cm)^2 = 512cm^2$

Area of 1^{st} shade = Area of 2^{nd} shade

$= \frac{512cm^2}{2} = 256cm^2$

Therefore, the area of paper required in each shape is 256 cm^2.

For III^{rd} triangle

Semi-perimeter, $\frac{(6+6+8)cm}{2} = 10cm$

By Heron's formula,

Area of triangle = $\sqrt{s(-a)(s-b)(s-c)}$

Area of III^{rd} triangle = $\sqrt{10(10-6)(10-6)(10-8)}$

$= (\sqrt{10 \times 4 \times 4 \times 2}\,)cm^2$

$= \left(4 \times 2\sqrt{5}\right)\text{cm}^2$

$= 8\sqrt{5}$

$= (8 \times 2.24)\text{cm}^2$

$= 17.92\ \text{cm}^2$

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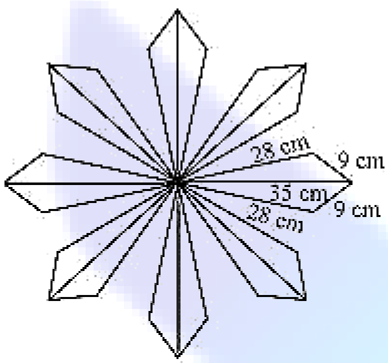
Area of paper required for IIIrd shade = 17.92 cm^2

Q.8 A floral design on a floor is made up of 16 tiles which are triangular, the sides of the triangle being 9 cm, 28 cm and 35 cm (see the given figure). Find the cost of polishing the tiles at the rate of 50p per cm^2.



Ans - It can be observed that

Semi-perimeter of each triangular-shaped tile, $s = \frac{(35+28+9)\text{cm}}{2} = 36\text{cm}$

By Heron's formula,

Area of triangle $= \sqrt{s(-a)(s-b)(s-c)}$

Area of each tile $= \sqrt{36(36-35)(36-28)(36-9)\text{cm}^2}$

$\left[\sqrt{36 \times 1 \times 8 \times 27}\right]\text{cm}^2$

$= 36\sqrt{6}\ \text{cm}^2$

$= (36 \times 2.45)\ \text{cm}^2$

$= 88.2\ \text{cm}^2$

Area of 16 tiles = $(16 \times 88.2)\ \text{cm}^2 = 1411.2\ \text{cm}^2$

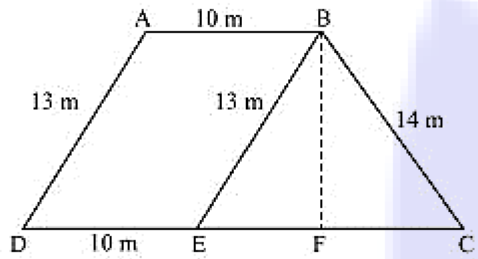
Cost of polishing per cm^2 area = 50 p

Cost of polishing 1411.2 cm^2 area = Rs (1411.2×0.50) = Rs 705.60

Therefore, it will cost Rs 705.60 while polishing all the tiles.

Q.9 A field is in the shape of a trapezium whose parallel sides are 25 m and 10 m. The non-parallel sides are 14 m and 13 m. Find the area of the field.

Ans -



Draw a line BE parallel to AD and draw a perpendicular BF on CD.

It can be observed that ABED is a parallelogram.

BE = AD = 13 m

ED = AB = 10 m

EC = 25 − ED = 15 m

For ΔBEC,

Semi-perimeter, $s = \frac{(13+14+15)}{2} = 21$

By Heron's formula,

Area of triangle $\sqrt{s(-a)(s-b)(s-c)}$

Area of $\Delta BEC = \left[\sqrt{21(21-13)(21-14)(21-15)m^2}\right]$

$= \left[\sqrt{21(8)(7)(6)}\,\right]m2 = 84\ m^2$

Area of $\Delta BEC = \frac{1}{2} \times CE \times BF$

$\Rightarrow 84 = \frac{1}{2} \times 15 \times BF$

$\Rightarrow BF = \frac{168}{15} = 11.2\ m$

Area of ABED = BF × DE = 11.2 × 10 = 112 m^2

Area of the field = 84 + 112 = 196 m^2