



Area (including circles and composite shapes)

Mana Maths

Start Tasks



Find the area of each shape.

1. Rectangle: length 5 cm,
width 3 cm

2. Rectangle: length 8 m,
width 4 m

3. Square: side 6 cm

4. Triangle: base 10 cm,
height 4 cm

5. Triangle: base 6 m,
height 8 m

6. Parallelogram: base
7 cm, height 5 cm

7. Trapezium: parallel
sides 5 cm and 9 cm,
height 4 cm

8. Circle: radius 3 cm (use
 $\pi \approx 3.14$)

9. Circle: diameter 10 m
(use $\pi \approx 3.14$)

Start Tasks — Answers



Find the area of each shape.

1. Rectangle: length 5 cm, width 3 cm

Solution

$$\begin{aligned}\text{Area} &= l \times w \\ &= 5 \times 3 = 15 \text{ cm}^2\end{aligned}$$

2. Rectangle: length 8 m, width 4 m

Solution

$$\begin{aligned}\text{Area} &= 8 \times 4 \\ &= 32 \text{ m}^2\end{aligned}$$

3. Square: side 6 cm

Solution

$$\begin{aligned}\text{Area} &= s^2 = 6^2 \\ &= 36 \text{ cm}^2\end{aligned}$$

4. Triangle: base 10 cm, height 4 cm

Solution

$$\begin{aligned}\text{Area} &= \frac{1}{2} \times b \times h \\ &= \frac{1}{2} \times 10 \times 4 = 20 \text{ cm}^2\end{aligned}$$

5. Triangle: base 6 m, height 8 m

Solution

$$\begin{aligned}\text{Area} &= \frac{1}{2} \times 6 \times 8 \\ &= 24 \text{ m}^2\end{aligned}$$

6. Parallelogram: base 7 cm, height 5 cm

Solution

$$\begin{aligned}\text{Area} &= b \times h = 7 \times 5 \\ &= 35 \text{ cm}^2\end{aligned}$$

7. Trapezium: parallel sides 5 cm and 9 cm, height 4 cm

Solution

$$\begin{aligned}\text{Area} &= \frac{1}{2}(5 + 9) \times 4 \\ &= \frac{1}{2} \times 14 \times 4 = 28 \text{ cm}^2\end{aligned}$$

8. Circle: radius 3 cm (use $\pi \approx 3.14$)

Solution

$$\begin{aligned}\text{Area} &= \pi r^2 = 3.14 \times 3^2 \\ &= 3.14 \times 9 = 28.26 \text{ cm}^2\end{aligned}$$

9. Circle: diameter 10 m (use $\pi \approx 3.14$)

Solution

$$\begin{aligned}r &= 5 \text{ m: Area} = 3.14 \times 5^2 \\ &= 3.14 \times 25 = 78.5 \text{ m}^2\end{aligned}$$

Start Tasks



Calculate the area using the correct formula for each shape.

1. Rectangle:
12 cm $\times$ 9 cm

2. Triangle: base 14 m,
height 6 m

3. Parallelogram: base
11 cm, height 7 cm

4. Circle: radius 5 cm (use
 $\pi \approx 3.14$)

5. Trapezium: parallel
sides 8 cm and 12 cm,
height 5 cm

6. Rectangle: length 15 m,
width 6 m

7. Triangle: base 9 cm,
height 10 cm

8. Circle: diameter 12 m
(use $\pi \approx 3.14$)

9. Parallelogram: base
13 m, height 4 m

Start Tasks — Answers



Calculate the area using the correct formula for each shape.

1. Rectangle: $12\text{ cm} \times 9\text{ cm}$

Solution

$$\begin{aligned}\text{Area} &= 12 \times 9 \\ &= 108\text{ cm}^2\end{aligned}$$

2. Triangle: base 14 m , height 6 m

Solution

$$\begin{aligned}\text{Area} &= \frac{1}{2} \times 14 \times 6 \\ &= 42\text{ m}^2\end{aligned}$$

3. Parallelogram: base 11 cm , height 7 cm

Solution

$$\begin{aligned}\text{Area} &= 11 \times 7 \\ &= 77\text{ cm}^2\end{aligned}$$

4. Circle: radius 5 cm (use $\pi \approx 3.14$)

Solution

$$\begin{aligned}\text{Area} &= 3.14 \times 5^2 \\ &= 3.14 \times 25 = 78.5\text{ cm}^2\end{aligned}$$

5. Trapezium: parallel sides 8 cm and 12 cm , height 5 cm

Solution

$$\begin{aligned}\text{Area} &= \frac{1}{2}(8 + 12) \times 5 \\ &= \frac{1}{2} \times 20 \times 5 = 50\text{ cm}^2\end{aligned}$$

6. Rectangle: length 15 m , width 6 m

Solution

$$\begin{aligned}\text{Area} &= 15 \times 6 \\ &= 90\text{ m}^2\end{aligned}$$

7. Triangle: base 9 cm , height 10 cm

Solution

$$\begin{aligned}\text{Area} &= \frac{1}{2} \times 9 \times 10 \\ &= 45\text{ cm}^2\end{aligned}$$

8. Circle: diameter 12 m (use $\pi \approx 3.14$)

Solution

$$\begin{aligned}r &= 6\text{ m: Area} = 3.14 \times 6^2 \\ &= 3.14 \times 36 = 113.04\text{ m}^2\end{aligned}$$

9. Parallelogram: base 13 m , height 4 m

Solution

$$\begin{aligned}\text{Area} &= 13 \times 4 \\ &= 52\text{ m}^2\end{aligned}$$

Develop Tasks



Calculate the area. Show all working.

1. Circle: radius 7 cm (use $\pi = 3.14$)

2. Trapezium: parallel sides 6 cm and 14 cm, height 8 cm

3. Parallelogram: base 9 m, height 12 m

4. Circle: diameter 16 cm (use $\pi = 3.14$)

5. Triangle: base 20 cm, height 13 cm

6. Composite: Rectangle $10\text{ cm} \times 8\text{ cm}$ with triangle on top (base 10 cm, height 6 cm)

7. L-shape: tall part $4\text{ m} \times 12\text{ m}$, wide part $8\text{ m} \times 3\text{ m}$ (non-overlapping)

8. Composite: Rectangle $15\text{ cm} \times 6\text{ cm}$ with circular hole, radius 2 cm (use $\pi = 3.14$)

9. Sector: find area of rectangle $12\text{ m} \times 7\text{ m}$ minus triangle with base 12 m and height 3 m

Develop Tasks — Answers



Calculate the area. Show all working.

1. Circle: radius 7 cm (use $\pi = 3.14$)

Solution

$$\begin{aligned}\text{Area} &= \pi r^2 = 3.14 \times 7^2 \\ &= 153.86 \text{ cm}^2\end{aligned}$$

2. Trapezium: parallel sides 6 cm and 14 cm, height 8 cm

Solution

$$\begin{aligned}\text{Area} &= \frac{1}{2}(6 + 14) \times 8 \\ &= \frac{1}{2} \times 20 \times 8 = 80 \text{ cm}^2\end{aligned}$$

3. Parallelogram: base 9 m, height 12 m

Solution

$$\begin{aligned}\text{Area} &= b \times h = 9 \times 12 \\ &= 108 \text{ m}^2\end{aligned}$$

4. Circle: diameter 16 cm (use $\pi = 3.14$)

Solution

$$\begin{aligned}r &= 8 \text{ cm: Area} = 3.14 \times 8^2 \\ &= 200.96 \text{ cm}^2\end{aligned}$$

5. Triangle: base 20 cm, height 13 cm

Solution

$$\begin{aligned}\text{Area} &= \frac{1}{2} \times 20 \times 13 \\ &= 130 \text{ cm}^2\end{aligned}$$

6. Composite: Rectangle $10 \text{ cm} \times 8 \text{ cm}$ with triangle on top (base 10 cm, height 6 cm)

Solution

$$\begin{aligned}&= (10)(8) + \frac{1}{2}(10)(6) \\ &= 80 + 30 = 110 \text{ cm}^2\end{aligned}$$

7. L-shape: tall part $4 \text{ m} \times 12 \text{ m}$, wide part $8 \text{ m} \times 3 \text{ m}$ (non-overlapping)

Solution

$$\begin{aligned}&= (4)(12) + (8)(3) \\ &= 48 + 24 = 72 \text{ m}^2\end{aligned}$$

8. Composite: Rectangle $15 \text{ cm} \times 6 \text{ cm}$ with circular hole, radius 2 cm (use $\pi = 3.14$)

Solution

$$\begin{aligned}&= (15)(6) - 3.14(2^2) \\ &= 90 - 12.56 = 77.44 \text{ cm}^2\end{aligned}$$

9. Sector: find area of rectangle $12 \text{ m} \times 7 \text{ m}$ minus triangle with base 12 m and height 3 m

Solution

$$\begin{aligned}&= (12)(7) - \frac{1}{2}(12)(3) \\ &= 84 - 18 = 66 \text{ m}^2\end{aligned}$$

Develop Tasks



Solve each area problem. Express answers with correct units.

1. Circle: radius 9 m
(leave answer in terms of π)

2. Composite shape:
rectangle $20\text{ cm} \times 10\text{ cm}$
with semicircle on one
side (diameter 20 cm, use
 $\pi = 3.14$)

3. Trapezium: parallel
sides 11 m and 19 m,
height 6 m

4. Right triangle: base
16 cm, height 9 cm

5. Composite: Two
rectangles joined:
 $8\text{ m} \times 5\text{ m}$ and $4\text{ m} \times 7\text{ m}$

6. Circle: diameter 14 cm
(leave answer in terms of π)

7. Composite L-shape:
vertical part
 $3\text{ cm} \times 15\text{ cm}$, horizontal
extension $10\text{ cm} \times 4\text{ cm}$
(find total area)

8. Parallelogram: base
18 m, perpendicular
height 11 m

9. Rectangle with
rectangular hole: outer
 $20\text{ cm} \times 12\text{ cm}$, hole
 $8\text{ cm} \times 5\text{ cm}$

Develop Tasks — Answers



Solve each area problem. Express answers with correct units.

1. Circle: radius 9 m (leave answer in terms of π)

Solution

$$\begin{aligned}\text{Area} &= \pi r^2 = \pi \times 9^2 \\ &= 81\pi \text{ m}^2\end{aligned}$$

2. Composite shape: rectangle $20 \text{ cm} \times 10 \text{ cm}$ with semicircle on one side (diameter 20 cm, use $\pi = 3.14$)

Solution

$$\begin{aligned}&= (20)(10) + \frac{1}{2}(3.14)(10^2) \\ &= 200 + 157 = 357 \text{ cm}^2\end{aligned}$$

3. Trapezium: parallel sides 11 m and 19 m, height 6 m

Solution

$$\begin{aligned}\text{Area} &= \frac{1}{2}(11 + 19) \times 6 \\ &= \frac{1}{2} \times 30 \times 6 = 90 \text{ m}^2\end{aligned}$$

4. Right triangle: base 16 cm, height 9 cm

Solution

$$\begin{aligned}\text{Area} &= \frac{1}{2} \times 16 \times 9 \\ &= 72 \text{ cm}^2\end{aligned}$$

5. Composite: Two rectangles joined: $8 \text{ m} \times 5 \text{ m}$ and $4 \text{ m} \times 7 \text{ m}$

Solution

$$\begin{aligned}&= (8)(5) + (4)(7) \\ &= 40 + 28 = 68 \text{ m}^2\end{aligned}$$

6. Circle: diameter 14 cm (leave answer in terms of π)

Solution

$$\begin{aligned}r &= 7 \text{ cm: Area} = \pi \times 7^2 \\ &= 49\pi \text{ cm}^2\end{aligned}$$

7. Composite L-shape: vertical part $3 \text{ cm} \times 15 \text{ cm}$, horizontal extension $10 \text{ cm} \times 4 \text{ cm}$ (find total area)

Solution

$$\begin{aligned}&= (3)(15) + (10)(4) \\ &= 45 + 40 = 85 \text{ cm}^2\end{aligned}$$

8. Parallelogram: base 18 m, perpendicular height 11 m

Solution

$$\begin{aligned}\text{Area} &= b \times h = 18 \times 11 \\ &= 198 \text{ m}^2\end{aligned}$$

9. Rectangle with rectangular hole: outer $20 \text{ cm} \times 12 \text{ cm}$, hole $8 \text{ cm} \times 5 \text{ cm}$

Solution

$$\begin{aligned}&= (20)(12) - (8)(5) \\ &= 240 - 40 = 200 \text{ cm}^2\end{aligned}$$

Extend Tasks



Solve these problems involving area. Justify your reasoning.

1. Circle: radius r ; find area in terms of π and r

2. If a circle has area $49\pi \text{ cm}^2$, find its radius.

3. Composite: quarter circle (radius 8 cm) inside a square (side 8 cm); find shaded area (use $\pi = 3.14$)

4. Parallelogram has base b and height h ; triangle has same base b and same height h ; explain ratio of areas.

5. Trapezium with parallel sides 5 m and 15 m, and area 100 m^2 ; find height.

6. Complex composite: rectangle $20 \text{ cm} \times 15 \text{ cm}$ with semicircles removed from each end (diameter 15 cm); use $\pi = 3.14$.

7. Derive why trapezium area $= \frac{1}{2}(a + b)h$ by using two triangles.

8. Irregular hexagon composed of rectangle ($12 \text{ cm} \times 8 \text{ cm}$) and two triangles (each base 12 cm, height 3 cm); find

9. Circle with diameter 10 m; find area leaving answer in exact form as π expression.

Extend Tasks — Answers



Solve these problems involving area. Justify your reasoning.

- 1.** Circle: radius r ; find area in terms of π and r

Solution

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

- 2.** If a circle has area $49\pi \text{ cm}^2$, find its radius.

Solution

$$\begin{aligned}\pi r^2 &= 49\pi \Rightarrow r^2 = 49 \\ r &= 7 \text{ cm (positive root)}\end{aligned}$$

- 3.** Composite: quarter circle (radius 8 cm) inside a square (side 8 cm); find shaded area (use $\pi = 3.14$)

Solution

$$\begin{aligned}\text{Shaded} &= 8^2 - \frac{1}{4}(3.14)(8^2) \\ &= 64 - 50.24 = 13.76 \text{ cm}^2\end{aligned}$$

- 4.** Parallelogram has base b and height h ; triangle has same base b and same height h ; explain ratio of areas.

Solution

$$\begin{aligned}\text{Parallelogram} &= bh; \text{triangle} = \frac{1}{2}bh \\ \text{Ratio} &= 2 : 1 \text{ (parallelogram is twice)}\end{aligned}$$

- 5.** Trapezium with parallel sides 5 m and 15 m, and area 100 m^2 ; find height.

Solution

$$\begin{aligned}\frac{1}{2}(5 + 15)h &= 100 \Rightarrow 10h = 100 \\ h &= 10 \text{ m}\end{aligned}$$

- 6.** Complex composite: rectangle $20 \text{ cm} \times 15 \text{ cm}$ with semicircles removed from each end (diameter 15 cm); use $\pi = 3.14$.

Solution

$$\begin{aligned}&= (20)(15) - 3.14(7.5^2) \\ &= 300 - 176.625 = 123.375 \text{ cm}^2\end{aligned}$$

- 7.** Derive why trapezium area $= \frac{1}{2}(a + b)h$ by using two triangles.

Solution

$$\begin{aligned}\text{Two triangles: } &\frac{1}{2}ah + \frac{1}{2}bh \\ &= \frac{1}{2}(a + b)h\end{aligned}$$

- 8.** Irregular hexagon composed of rectangle ($12 \text{ cm} \times 8 \text{ cm}$) and two triangles (each base 12 cm, height 3 cm); find total area.

Solution

$$\begin{aligned}&= (12)(8) + 2 \cdot \frac{1}{2}(12)(3) \\ &= 96 + 36 = 132 \text{ cm}^2\end{aligned}$$

- 9.** Circle with diameter 10 m; find area leaving answer in exact form as π expression.

Solution

$$\begin{aligned}r &= 5 \text{ m: Area} = \pi \times 5^2 \\ &= 25\pi \text{ m}^2\end{aligned}$$