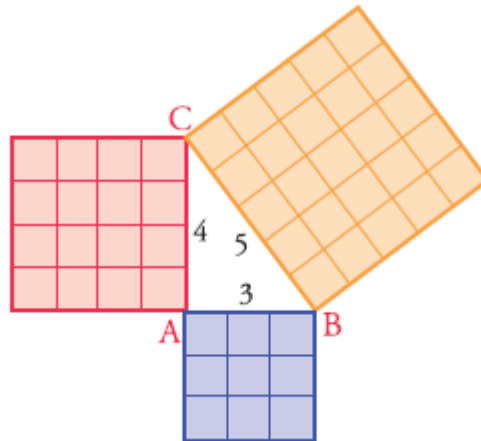


UNIT 10. AREAS AND PERIMETERS.

0. PYTHAGORAS' THEOREM.

The Pythagoras theorem says that in a right triangle the square of the hypotenuse is equal to the sum of the squares of the two legs (= catheti), as this formula shows:

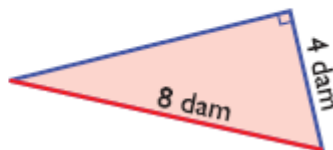
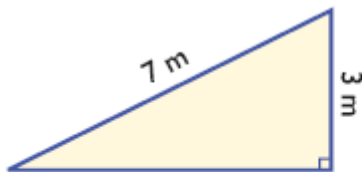
$$h^2 = c_1^2 + c_2^2$$



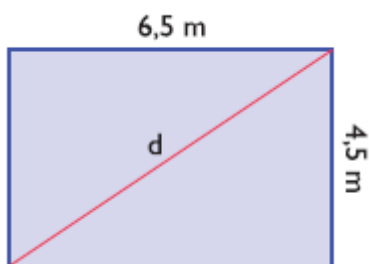
1. Calculate the length of the hypotenuse of a right triangle whose legs measure:

- 6 cm and 8 cm.
- 7 dm and 7 dm.

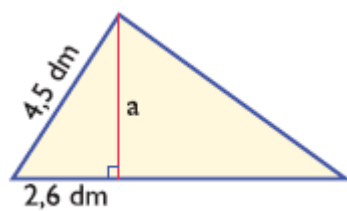
2. Calculate the length of the legs in the following right triangles:



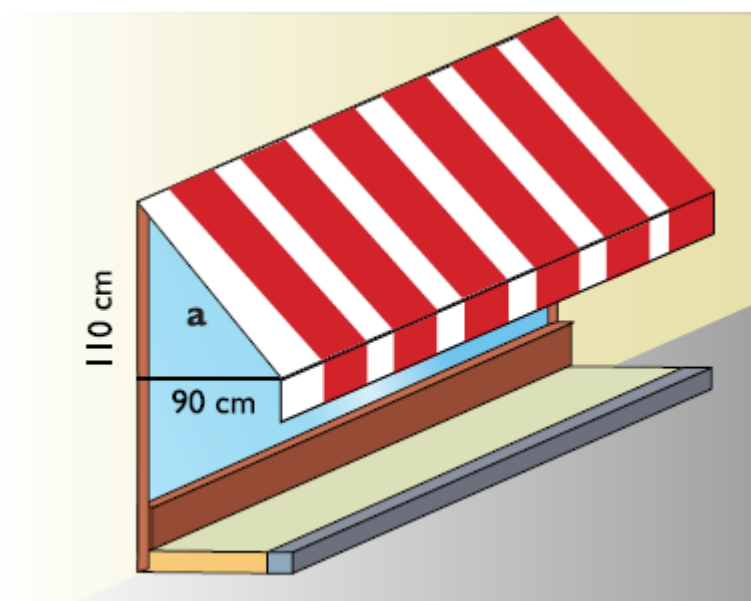
3. Calculate the length of the diagonal in this rectangle:



4. Calculate the height of this right triangle:



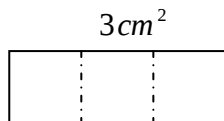
5. We want this awning to stand out from the wall 90 cm. Calculate the length (a) of the awning in the picture:



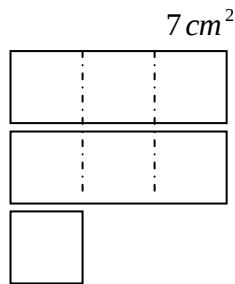
1. AREA AND PERIMETER.

The **area** of a shape or figure is the amount of surface enclosed within its sides. For example:

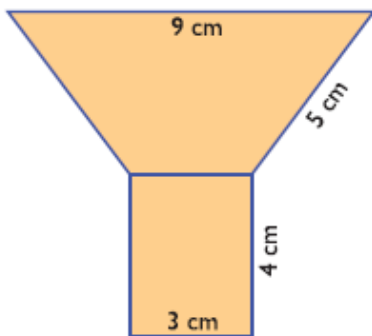
If $1\text{ cm}^2 = \square$ we can write down the area of each figure:



or



The **perimeter** of a figure is the total distance round its sides. For example:

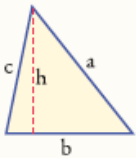
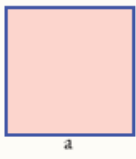
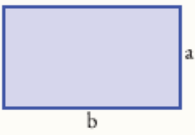
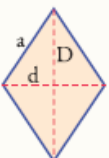
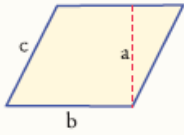
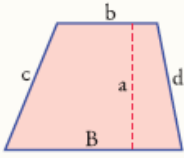
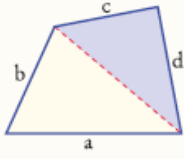
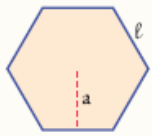


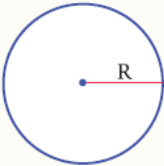
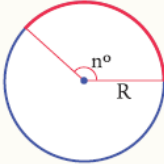
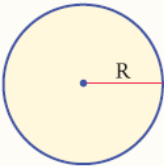
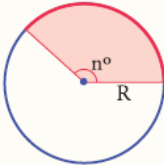
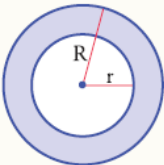
The perimeter of this shape is:

$$\text{Perimeter} = 4 + 3 + 4 + 5 + 9 + 5 = 30\text{ cm}$$

Here, you have the areas of the main figures:

LEARN THEM !

Polígono	Dibujo	Perímetro	Área
Triángulo		$P = a + b + c$	$A = \frac{b \cdot h}{2}$ Fórmula de Herón: $A = \sqrt{p(p-a)(p-b)(p-c)}$ $p = \text{semiperímetro}$
Cuadrado		$P = 4a$	$A = a^2$
Rectángulo		$P = 2(b + a)$	$A = b \cdot a$
Rombo		$P = 4a$	$A = \frac{D \cdot d}{2}$
Romboide		$P = 2(b + c)$	$A = b \cdot a$
Trapezio		$P = B + c + b + d$	$A = \frac{B + b}{2} \cdot a$
Trapezoide		$P = a + b + c + d$	$A = \text{suma de las áreas de los dos triángulos}$
Polígono regular		$P = n\ell$ $n = \text{número de lados}$	$A = \frac{P \cdot a}{2}$

Nombre	Dibujo	Longitud	Área
Circunferencia		$L = 2\pi R$	
Arco		$L_{\text{Arco}} = \frac{2\pi R}{360^\circ} \cdot n^\circ$	
Círculo			$A = \pi R^2$
Sector circular			$A_{\text{Sector}} = \frac{\pi R^2}{360^\circ} \cdot n^\circ$
Corona circular			$A_{\text{Corona}} = \pi (R^2 - r^2)$

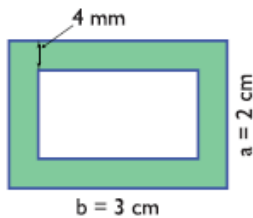
Exercise 1. Calculate in your mind the area of a square whose side is 7 m long.

Exercise 2. Calculate in your mind the perimeter of a rectangle whose sides are 5 metres and 7 metres long.

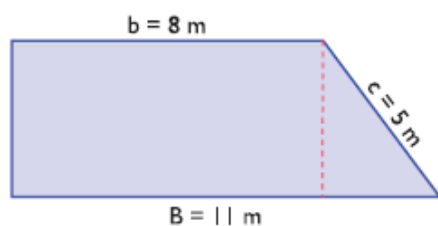
Exercise 3. A farmer has a square field. Its side is 24 metres long and he wants to put three lines of wire around it. If a metre of wire costs €1.8, how much is the wire in total?

Exercise 4. A football pitch is 105 metres long and 65 metres wide. We want to cover it with grass, and it costs € 25 / m^2 . How much is it?

Exercise 5. Calculate the area of this coloured shape.



Exercise 6. Calculate the area of this trapezium.



Exercise 7. Find the height of each of the following rectangles:

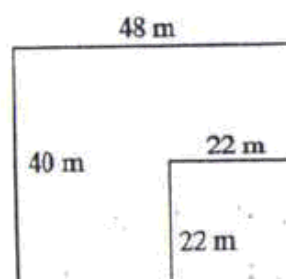
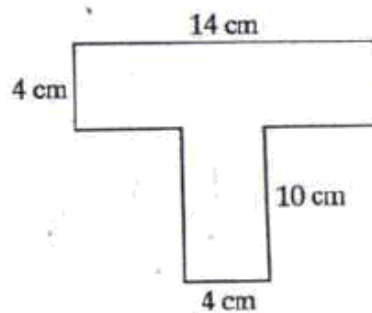
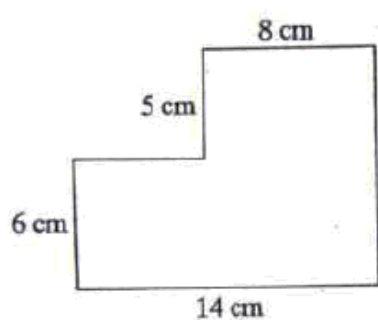
12 cm

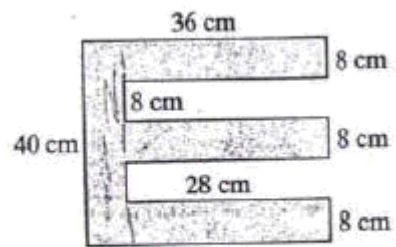
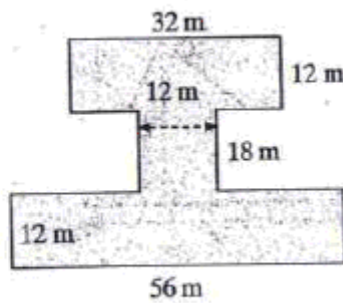
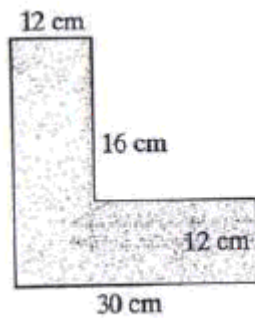
Area: 96 cm^2

12 m

Area: 240 m^2

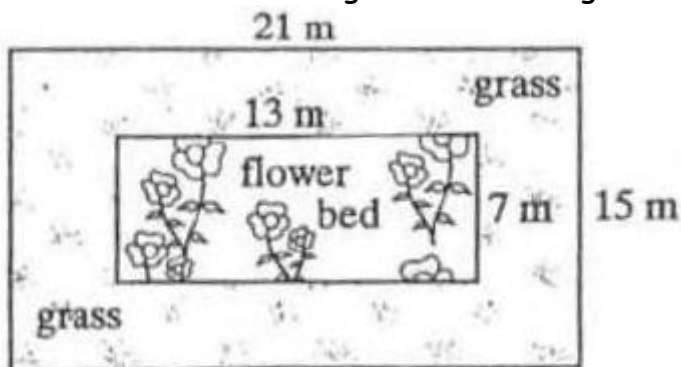
Exercise 8. Find the area of each of the following figures.



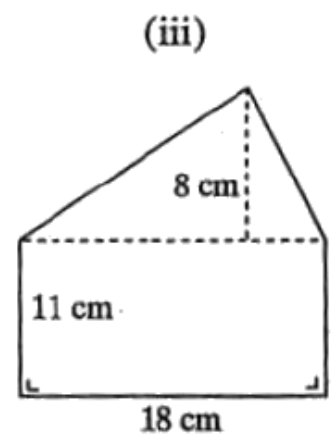
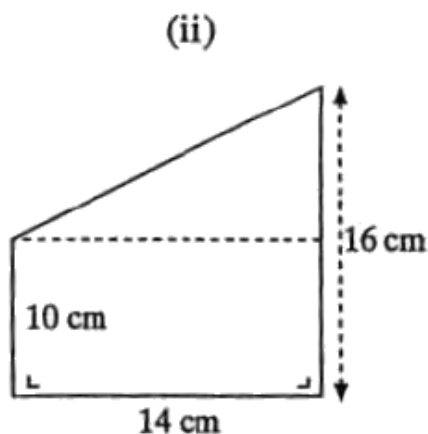
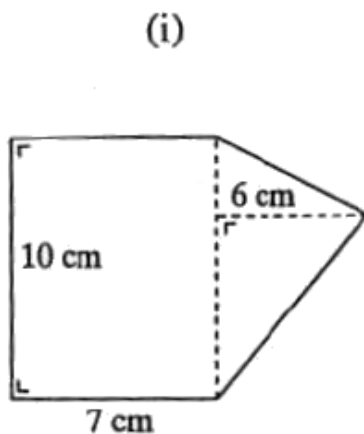


Exercise 9. The garden on the figure below consists of a rectangular flower bed surrounded with grass. Find:

- The area of the garden.
- The area of the portion with grass.
- The cost of re-seeding the area with grass if it costs € 150.50 for every 8 m^2 .

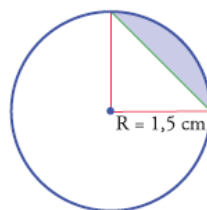


Exercise 10. Find the area of each of the following figures:

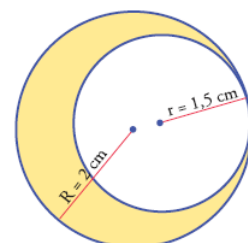


EXERCISES

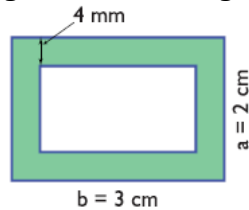
1. Calculate the area of a triangle whose base is 8 m long, and whose height is 5 m.
2. Calculate the perimeter of a square whose side is 12 m. long.
3. Calculate the area of a rectangle whose sides are 8 m. and 6 m. long.
4. Calculate the area of a right triangle whose legs (=catheti) are 22 m. and 16 m. long.
5. A triangular field has sides which are 9 m., 11 m., and 12 m. long. Calculate its area.
6. The perimeter of a square is 84 m. How long is one side?
7. A book has 272 pages. Each sheet is 21 cm. wide and 29 cm. high. What surface can the book cover if we tear out all the pages and arrange them side by side?
8. Calculate the perimeter of a rhombus whose side is 6.5 m. long.
9. Calculate the area of a rhomboid whose base is 9 m. long and which is 7 m. high.
10. Calculate the perimeter of an isosceles trapezium whose bases are 8 m. and 7 m. long, and whose legs are 5 m. long.
11. The diagonals of a rhombus are 14.6 cm. and 9.8 cm. Calculate its perimeter and its area.
12. In a right trapezium, the bases are 12.5 m. and 8.5 m., and it is 6.2 m. high. Calculate its perimeter and its area.
13. Find the perimeter and area of a regular hexagon whose side is 8.6 m. long.
14. Calculate the length of a circle whose radius is 5.25 m.
15. Calculate the length of an arc of a circle whose radius is 7.8 m. and whose angle is 125° .
16. Calculate the radius of a circle which is 35.82 m. long.
17. In the *Giro d'Italia* a stage is 155 km. long, and the wheels of a bicycle have a radius of 35 cm. How many times do the wheels turn?
18. The circumference of a peach tin's lid is 37.68 cm. long. What is the radius?
19. A 60° arc measures 23 m. Calculate its radius.
20. Calculate the area of a circle with a 6.7 cm. radius.
21. Calculate the area of a circular sector with a 12.5 m. radius and a 165° angle.
22. Calculate the area of the coloured circular segment below:



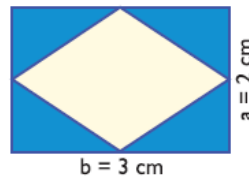
23. Calculate the area of an annulus (= *corona circular*) whose radii are 5 and 7 cm.
24. Calculate the area of the coloured region in the picture on the right:



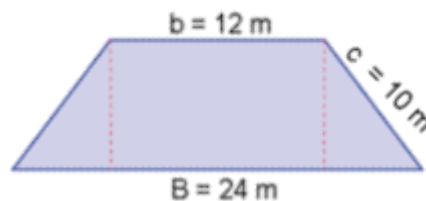
25. Calculate the area of a square whose side is 7 cm. long.
26. Calculate the perimeter of a rectangle whose sides are 5 m. and 7 m. long.
27. Calculate the perimeter of a right triangle whose legs are 15 m. and 20 m. long.
28. A farmer has a square field whose sides are 24 m. long, and he wants to surround it with three rows of wire. Each metre of wire costs € 1.80. How much does the wire cost?
29. A football pitch is 105 m. long and 65 m. wide. We want to replace the grass, which costs € 25/m². How much do we have to pay?
30. Calculate the area coloured in green in the figure below:



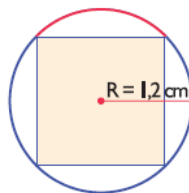
31. Calculate the area of a rhombus whose diagonals are 9 m. and 5 m.
32. Calculate the perimeter of a rhomboid whose sides are 7 m. and 5 m. long.
33. Calculate the area of a trapezium whose bases are 5.5 m. and 4.5 m., and whose height is 2 m.
34. Calculate the perimeter of a regular decagon whose side is 12 m. long.
35. Calculate the area of the rhombus below, and the coloured region between the rectangle and the rhombus. Which one is bigger? Why?



36. Find the area of the trapezium below:



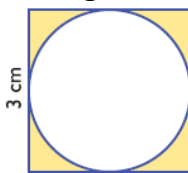
37. Calculate the length of a circle whose radius is 23.5 m.
38. Calculate the length of an arc of a circle with a 5.3 m. radius and a 63° angle.
39. Calculate the length of the arc of a circle which corresponds to one side of the square in the picture below:



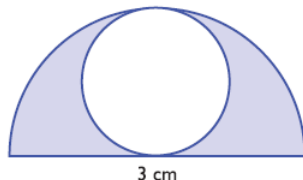
40. Calculate the area of a semicircle with a 5.2 cm. radius.
41. Calculate the area of a circular sector with a 7.25 cm. radius and a 72° angle.
42. Calculate the area of an annulus whose diameters are 12 cm. and 16 cm.



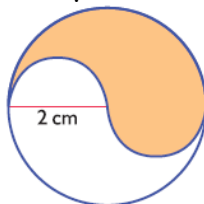
43. The area of a circle is 25 cm^2 . What is its radius?
44. Calculate the area of the coloured region in the shape below:



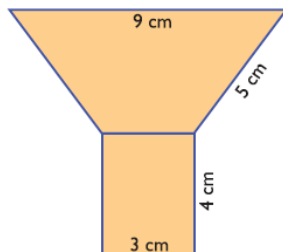
45. Calculate the area of the coloured region in the shape below:



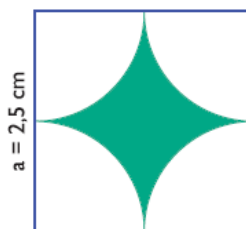
46. Calculate the shaded area in the shape below:



47. The area of a square is 225 m^2 . How long is one side?
48. The perimeter of a rectangle is 47.6 m. If the base is 15.2 m., what is its height?
49. In a rhombus we know one side, which is 5 m. long, and a diagonal, which is 6 m. Calculate its area.
50. Calculate the area of the figure below:



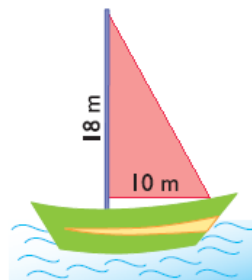
51. In an isosceles trapezium the bases are 16.7 and 11.3 m., and the height is 8.5 m. Calculate its perimeter and its area.
52. The perimeter of a regular pentagon is 75.8 m. Calculate the length of one side.
53. Calculate the length of a circle whose radius is 7.2 cm.
54. Calculate the length of the arc of a circle which has a 13.5 cm radius and a 230° angle.
55. The front wheels of a tractor are 70 cm in diameter, and the back wheels are 1.5 m. If the tractor travels 25 km, how many times do the front wheels turn? What about the back wheels?
56. The area of a circle is 1 m^2 . What is its radius?
57. Calculate the coloured area in the shape on the right:



58. Calculate the perimeter of a right triangle whose hypotenuse is 8.5 cm. and one of whose legs is 6.7 cm.
59. Calculate the area of a triangle whose sides are 23.5 m, 25.7 m., and 32.8 m.



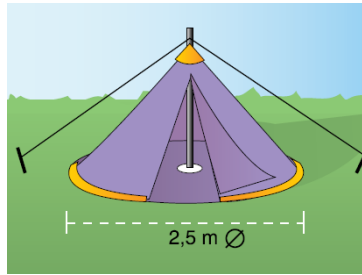
60. Calculate the side of a square whose area is 534.75 m^2 . Round the result to two decimal places.
61. The area of a rectangle is 431.25 m^2 . If its base is 34.5 m ., what is its height?
62. We want to make a kite whose diagonals are 95 cm . and 65 cm . Find its area.
63. Calculate the radius of a circle whose length is 86.75 cm .
64. Calculate the length of the arc of a circle with a 11.2 cm . radius and a 45° angle.
65. Calculate the area of a circle with a 23.45 m . radius.
66. Calculate the area of a circular sector with a 17.8 cm . radius and a 163° angle.
67. The area of a circle is 47.22 cm^2 . What is its radius?
68. Calculate the area of a square inscribed in a circle with a 3 cm . radius. What would be its area if the circle was inscribed in the square?
69. Find the area of an equilateral triangle whose side is 24 m . long.
70. The sail of a boat is made of tarpaulin (=lona) and it is the shape of a right triangle; its legs are 10 m . and 18 m . The square metre of tarpaulin costs € 18.50. How much does the tarpaulin to make the sail cost?



71. The perimeter of a cuadrangular field is 56 m , and it is on sale for € 15 per m^2 . How much does the field cost?
72. We have a rectangular field which is 52 m . long and 27 m . wide. We want to surround it with a fence that costs € 12 per metre. How much does the fence cost?
73. Calculate the perimeter of a rhombus whose diagonals are 18 m . and 12 m .
74. A piece of cloth to make a coat is the shape of a rhomboid; its base is 85 cm , and its area is $2,975 \text{ cm}^2$. What is its height?
75. A room is the shape of an isosceles trapezium; its bases are 1.35 m . and 85 cm ., and its height is 65 cm . We want to decorate its walls with an adhesive stripe which costs 1.25 € per metre. How many metres do we have to buy and how much does it cost?
76. A table is the shape of a regular hexagon whose side is 1.2 m ., and it has one leg only. The wood for the leg costs € 35, and the square metre of wood to make the hexagonal board, € 54. How much does the wood to make the table cost?
77. A copper coil (=bobina de cobre) which has a radius of 3.5 cm . has 50 coils (=vueltas). If a metre of copper wire (=hilo de cobre) costs € 1.7, how much does all the wire in the copper coil cost?



78. The circumference of a tree trunk is 1 m. What is the diameter of the tree?
79. The base of a tent is made of tarpaulin and it has a circular shape; its diameter is 2.5 m. If the square metre of tarpaulin costs € 48, how much does the tarpaulin for the base cost?



80. Calculate the area of the shape below:



81. A square office has walls 7 m. long. If there are 28 workers in the office, what surface corresponds to each worker?
82. A tomato can is 12 cm. high and 6 cm. in diameter. Calculate the area of a label that covers the whole side of the can.
83. Calculate the shaded area in the shape below:

