

Learning Unit	
Subject	Mathematics - Geometry
Title	Perimeters and Areas
Authors	Gabriela Garcia e Joana Martins
School	FORAVE – ASSOCIAÇÃO PARA A EDUCAÇÃO TECNOLÓGICA DO VALE DO AVE
Description of the unit	<p>Using a variety of situations and contexts, including the use of diverse materials and technology, students should solve tasks that require problem-solving, mathematical reasoning and communication, so that they can:</p> <ul style="list-style-type: none"> - Develop visualisation skills in a plane representation and in a three-dimensional representation of space; - Represent, read and construct models of mathematical objects; - Solve problems calculating measurements, namely lengths, perimeters and areas; - Express ideas orally and in writing, and explain and justify reasoning, procedures and conclusions.
Contents	<p>Perimeters and Areas</p> <ul style="list-style-type: none"> - Perimeter of a polygon. Perimeter of a circle; - Areas of plane shapes; - Use scales to calculate perimeters and areas; - Applying the Pythagorean Theorem to determine distances.
Learning Outcomes / Skills	<p>Students should be able to:</p> <ul style="list-style-type: none"> - Develop critical thinking and the ability to work in groups; - Develop problem-solving skills; - Develop confidence in their mathematical skills and knowledge and the ability to analyse their own work and regulate their learning; - Develop persistence, autonomy and a willingness to deal with situations involving maths in their school career and in life in society; - Develop an interest in maths and appreciate its role in the development of other sciences and areas of human and social activity.
Target students/class	Secondary School (15 – 17 years old)



Learning Unit	
Prerequisites	<p>Students should be able to:</p> <ul style="list-style-type: none"> - Take measurements using conventional units of measurement; - Determine the perimeter of a figure; - Use a scale; - Identify polygons; - Decompose polygons; - Have a notion of area; - Know the units of area; - Distinguish between area and perimeter; - Identify right-angled triangles.
Time expected	3 hours
Interdisciplinary links	Technical Drawing
Methodology	Explanation of contents, solving exercises and problems, resolution of worksheets and pair work.
Human Resources (internal and/or external)	Teacher of Mathematics and Teacher of Technical Drawing
Resources	<ul style="list-style-type: none"> ●Worksheets; ●Calculator; ●Ruler; ●Pencils ●Eraser; ●Pen.
Lesson Plan	<p><u>1st Lesson:</u></p> <p>Summary: Perimeter of a polygon. Perimeter of a circle.</p> <p>The teacher asks the students if they know how to calculate the perimeter of a polygon, revising the concepts of the perimeter of a polygon and a circle by handing out worksheet no. 1.</p> <p>After introducing the concepts and analysing the solved example, the teacher proposes solving exercises 1, 2 and 3 of the worksheet in pairs.</p> <p>The students carry out various practical exercises measuring objects in the classroom.</p> <p><u>2nd Lesson:</u></p>



Learning Unit	
	<p>Summary: Areas of plane shapes. The teacher asks the students if they know how to calculate the area of different polygons, revising the concept of area and its calculation by handing out worksheet no. 2. After introducing the concepts, reviewing the form and analysing the solved example, the teacher proposes solving exercises 1, 2 and 3 of the worksheet in pairs. The students carry out various practical exercises measuring the classroom.</p> <p><u>3rd Lesson:</u></p> <p>Summary: Pythagorean theorem. The teacher asks the students if they know how to identify a right triangle and the names of its sides, revising the concepts by handing out worksheet no. 3. After introducing the concepts and analysing the solved example, the teacher suggests solving exercises 1, 2 and 3 of the worksheet in pairs. The exercises are corrected on the board by a student.</p>
21st Century Skills	<p>Critical thinking: students should develop critical thinking by analysing, synthesising and evaluating results in the context of the problem.</p> <p>Problem-solving: students should develop the ability to solve the problems in question.</p> <p>Collaboration: students should collaborate in pairs to solve problems.</p> <p>Global knowledge: students should develop general mathematical knowledge.</p> <p>Self-directed learning: students should develop persistence, autonomy and a willingness to deal with situations involving maths.</p> <p>Thinking skills: students should develop the ability to analyse their own work and regulate their learning.</p>
Assessment	<p>Formative assessment:</p> <ul style="list-style-type: none"> - Attendance; - Punctuality; - Behaviour: - Attention and participation in class; - Observation of the student's performance in solving the proposed exercises; - Completion of worksheets (direct observation grids).



Learning Unit	
Remarks	--



Learning Unit	Geometria – Áreas de figuras planas.
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Áreas de figuras planas

The area, **A**, of a plane shape is the measure of the portion of the space that the figure occupies.

Forms:

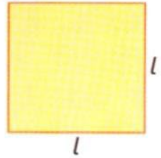

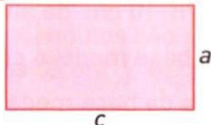
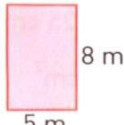
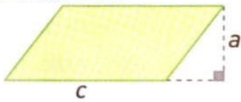
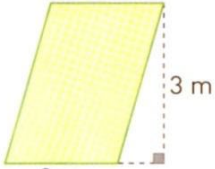
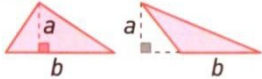
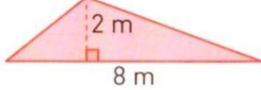
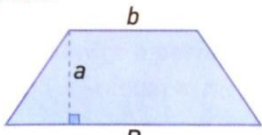
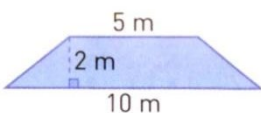
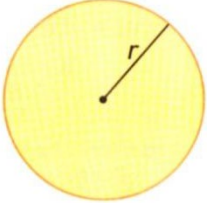
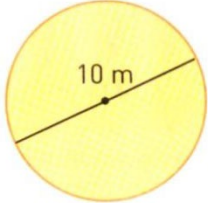
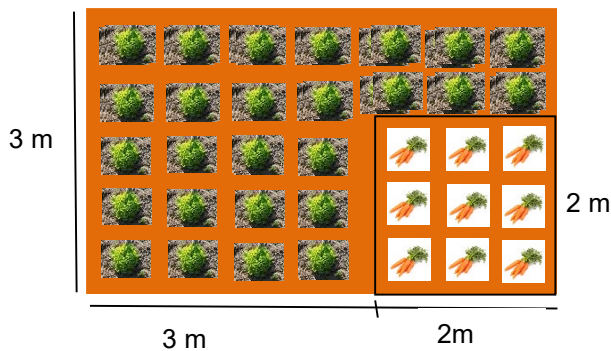
Figura	Exemplo
<p>Quadrado</p>  <p>$A = l^2$ $A = \text{Área}; l = \text{lado}$</p>	 <p>$A = 5^2 \text{ m}^2 = 25 \text{ m}^2$</p>
<p>Retângulo</p>  <p>$A = c \times a$ $A = \text{Área}; c = \text{comprimento};$ $a = \text{altura}$</p>	 <p>$A = (5 \times 8) \text{ m}^2 = 40 \text{ m}^2$</p>
<p>Paralelogramo</p>  <p>$A = c \times a$ $A = \text{Área}; c = \text{comprimento};$ $a = \text{altura}$</p>	 <p>$A = (2 \times 3) \text{ m}^2 = 6 \text{ m}^2$</p>



Figura	Exemplo
<p>Triângulo</p>  $A = \frac{b \times a}{2}$ <p>$A = \text{Área}; b = \text{base}; a = \text{altura}$</p>	 $A = \left(\frac{8 \times 2}{2}\right) \text{ m}^2 = 8 \text{ m}^2$
<p>Trapézio</p>  $A = \frac{B + b}{2} \times a$ <p>$A = \text{Área}; B = \text{base maior}; b = \text{base menor}; a = \text{altura}$</p>	 $A = \left(\frac{10 + 5}{2} \times 2\right) \text{ m}^2 = 15 \text{ m}^2$
<p>Círculo</p>  $A = \pi \times r^2,$ <p>em que r é o raio do círculo.</p>	 <p>$d = 10 \text{ m}; r = \frac{10}{2} \text{ m} = 5 \text{ m}$</p> $A = (\pi \times 5^2) \text{ m}^2; A \approx 78,54 \text{ m}^2$

Example:



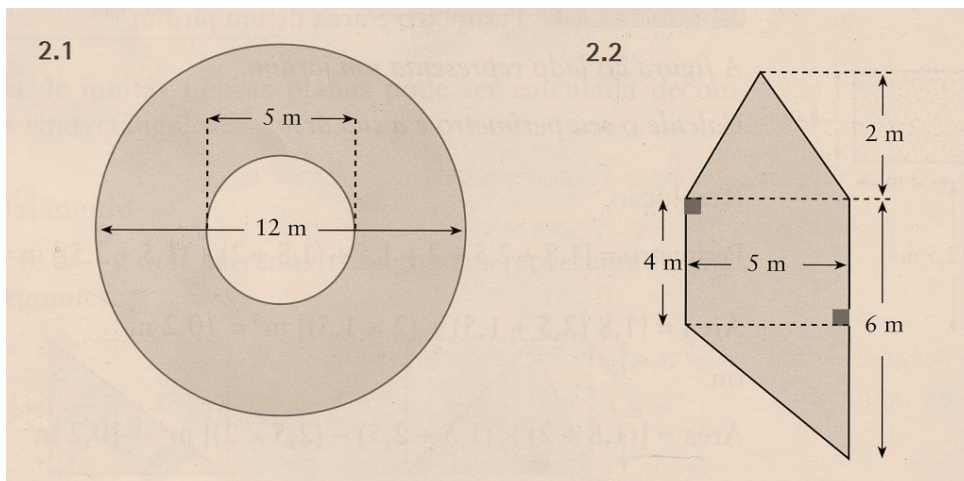
Calculation of the area for planting lettuces

Exercises

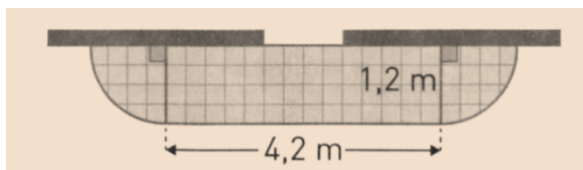
1. The figure opposite, drawn in squares, represents Joaquim's plot of land, on which he grows different species of organic plants. Calculate the total area of Joaquim's plot.



2. For each of the following figures, determine the area.



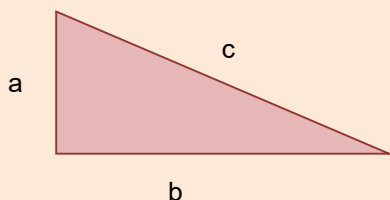
3. Look at the diagram of a balcony project and calculate the area the balcony will have. Give the result in square metres, rounded to the nearest tenth.



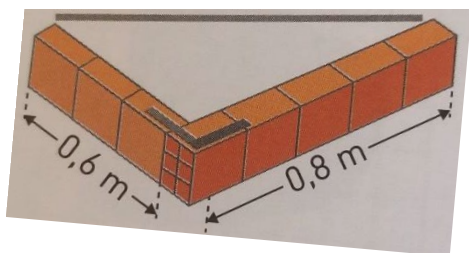
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Pythagoras' theorem

In a right-angled triangle, the square of the hypotenuse's length is equal to the sum of the squares of the sides' lengths.



Example:



Calculation of x:

$$x^2 = 0,6^2 + 0,8^2 \Leftrightarrow x^2 = 0,36 + 0,64 \Leftrightarrow x^2 = 1 \Leftrightarrow x = 1m$$



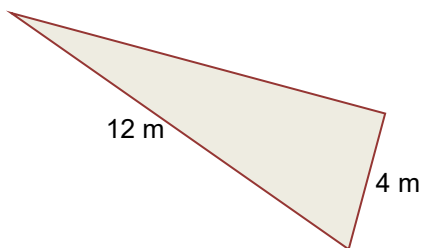
Exercises

1. Calculate the value of x .

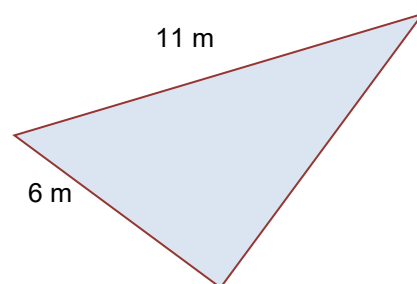


2. Calculate the value of x .

2.1.

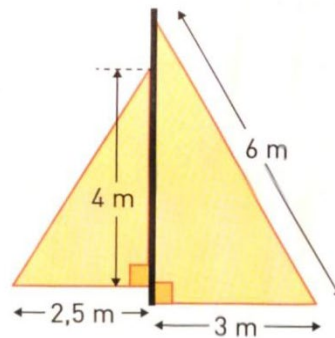


2.2.



3. A sailing ship has two sails in the shape of right-angled triangles. In the photograph, you can see the sailboat and next to it the geometric model of the sails.

According to the data, calculate to the nearest tenth:



- 3.1. the area of the sails;

- 3.2. the cost of the sails, knowing that each square metre of fabric costs 80 euros.