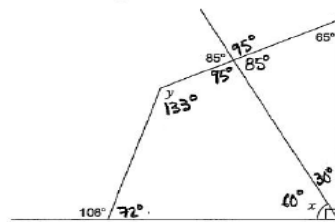


Anchor - Code 40

Academic (Question 31) Name of item: What's Missing?

What's Missing?

Consider the diagram below.



Complete the table below.

Justify your answers using geometric properties.

Angle measure	Justification
$x = 60^\circ$	85° WAS AN OPPOSITE ANGLE, SO THE DEGREES IN THE TRIANGLE WERE 85° , 65° , WAS SUBTRACTED FROM 180° GAVE ME 30° , AND THE OTHER HALF HAD TO BE 60° , SINCE IT WAS A RIGHT ANGLE.
$y = 133^\circ$	THE ANGLES I HAD WERE 95° , 60° , AND 72° , SO I ADDED (227°) AND SUBTRACTED FROM 360° B/C THE SHAPE INSIDE HAD A TOTAL OF 360° .

Annotation:

Problem-solving process demonstrates identification of all important elements of the problem; values of x and y are correct with supporting values shown in diagram and explanation is evidence of understanding of geometric properties.

Learning Goals

- To understand that with a given perimeter, the **largest area** occurs when the shape is a **square**.
- To understand that with a given area, the **smallest perimeter** occurs when the shape is a **square**.
- To understand that with a 3-sided rectangle the largest area and smallest perimeter is achieved when the length dimension is half the perimeter and the width is a quarter of the perimeter.

8.1 - Determining Optimum Area and Perimeter

Optimum - the most desirable of a number of possible choices.

Investigation #1 - Maximum Area

With a partner create as many different rectangles possible using ALL of the 16 toothpicks. Record the length, width, perimeter and area of each rectangle in the table below.

Note: A rectangle with the dimensions of 1×8 is the same as 8×1 for this experiment.

Length	Width	Area (squared units)	Perimeter (units)
6	2	12	16
5	3	15	16
7	1	7	16
4	4	16	16

What dimensions give the maximum (greatest/largest) area? What is the shape?

4x4. The square gives the max area.

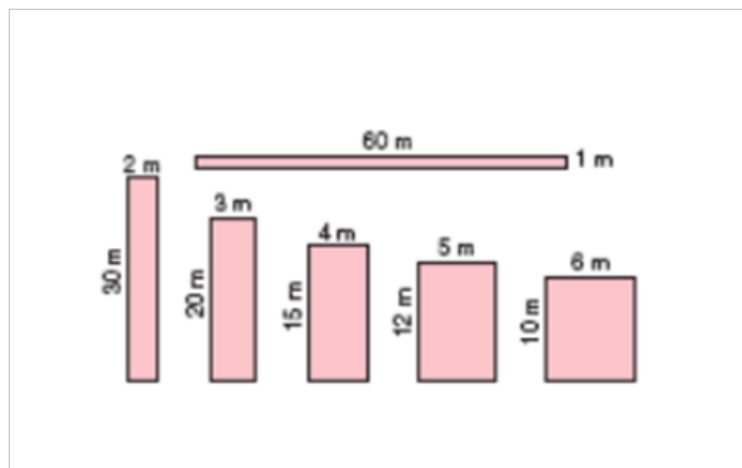
Conclusion re: Maximum Area

For a given perimeter, the max area occurs when the shape is a square or when the length + width are closest in value.

Investigation #2 - Minimum Perimeter

Eric plans to build a storage shed with a floor area of 60m^2 . He wants to use the least amount of materials. So, Eric needs the least perimeter for the floor. He will use 60 square patio stones, each with an area of 1m^2 .

Below are some rectangles that represent floors with an area of 60m^2 .



In the table below, record the dimensions and perimeters of the rectangles above.

Length	Width	Area (m ²)	Perimeter (m)
60	1	60	122
30	2	60	64
20	3	60	46
15	4	60	38
12	5	60	34
10	6	60	32

What dimensions give the minimum perimeter? Comment of the shape of this rectangle.

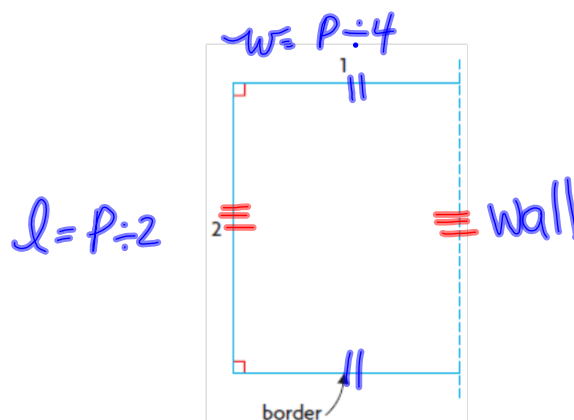
10 x 6. A rectangle but the closest of all shapes to being a square.

Conclusion re: Minimum Perimeter

For a given area, the minimum perimeter occurs when the shape is a square or when the length & width are close in value.

3-Sided Rectangles

A rectangle with a border on three sides has a maximum area and a minimum perimeter when the side opposite the wall is twice as long of the other two sides.

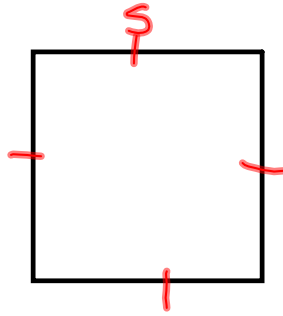


Note: For 3-sided rectangles, maximum area/minimum perimeter is achieved when $l = P \div 2$ and $w = P \div 4$, where l is the longest side and w represents each of the two short sides.

Key Formulas

1. The perimeter formula for a square is: $P = 4s$.

2. The area formula for a square is: $A = s^2$.

**Example One**

What is the maximum area ^{= square} of a rectangle with a perimeter of 30 m?

Hint: Always start with what you are given (i.e. perimeter vs. area) in the question.

$$1. P = 4s$$

$$\frac{30}{4} = \frac{4s}{4}$$

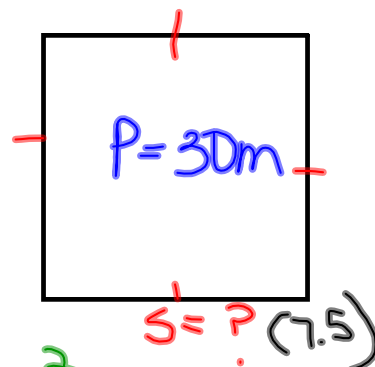
$$s = 7.5 \text{ m}$$

$$2. A = s^2$$

$$= 7.5^2$$

$$= 7.5 \times 7.5$$

$$= 56.25 \text{ m}^2$$



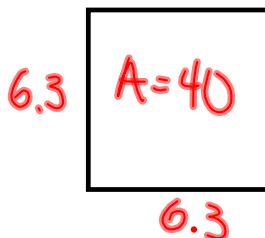
Example Two

What is the minimum perimeter for a rectangle with an area of 40 m^2 ?

$$1. \quad A = s^2$$

$$\sqrt{40} = \sqrt{s^2}$$

$$6.3 = s$$



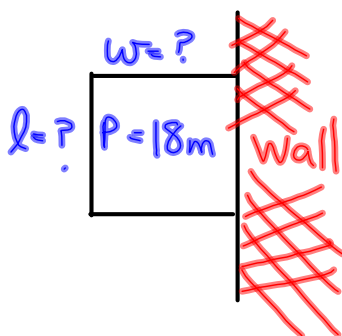
$$2. \quad P = 4s$$

$$= 4(6.3)$$

$$= 25.2 \text{ m}$$

Example Three

Woody's horticulture club is exhibiting at the city garden show. Each garden must be bordered by 18.0 m of wood against a brick display wall. What dimensions will maximize the area of the garden?



$$l = P \div 2$$

$$= 18 \div 2$$

$$= 9 \text{ m}$$

$$w = P \div 4$$

$$= 18 \div 4$$

$$= 4.5 \text{ m}$$

\therefore The dimension of the garden will be:
 9×4.5 .

Complete: p. 431 - 433 #1 - 4, 7, 10.

