

2.5 Equations and Problem Solving

Often times, there can be two unknowns in a problem. However, we cannot have two variables unless we are planning to set up two equations... Sometimes there just isn't enough information to do that!

When we're lucky, the two unknowns are somehow related to one another like length and width of a rectangle, time and distance traveled, and consecutive integers. Let's take a look...

The width of a **rectangle** is 3 inches less than its length. The **perimeter** of the rectangle is 26 inches. What is the width of the rectangle?

When you have a problem with a **shape** you know how to draw, start your thinking process by drawing that shape! Label everything you can. Reread the problem and see if you can identify any words that you know a **formula** for. After you do that, you have a plan, and the math is easy from there!

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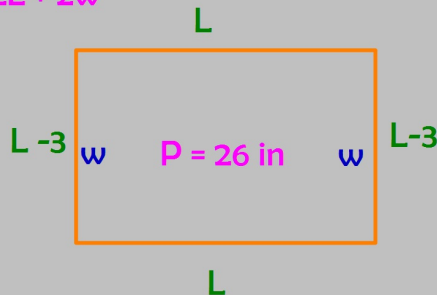
OK, let's look at this again.

$$w = L - 3$$

The width of a **rectangle** is 3 inches less than its length. The **perimeter** of the rectangle is 26 inches. What is the **width** of the rectangle?

$$P = 2L + 2w$$

$$26 = 2L + 2w$$



We don't know anything about the length, so it stays a variable. All that we know about the width is related to the length.

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Now, plug in what you know to the perimeter formula and solve!

$$26 = 2L + 2(L-3)$$

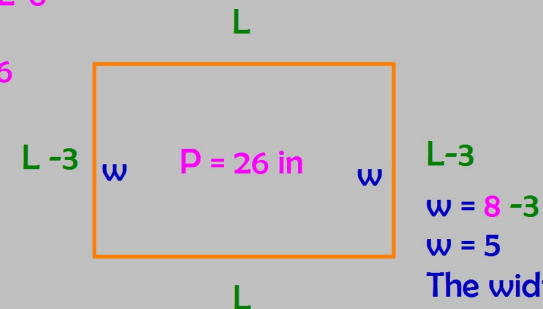
$$26 = 2L + 2L - 6$$

$$26 = 4L - 6$$

$$26 + 6 = 4L - 6 + 6$$

$$\frac{32}{4} = \frac{4L}{4}$$

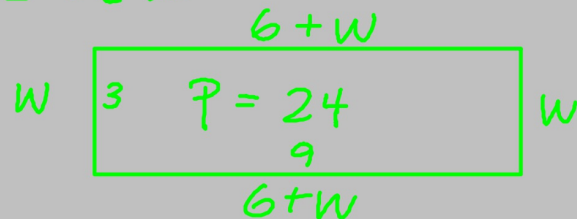
$$8 = L$$



Don't forget to answer the right question.

Now you try one. The length of one rectangle is 6 cm more than its width. The perimeter of the rectangle is 24 cm. What is the length of the rectangle?

$$P = 2L + 2W$$



$$4W + 12 = 24$$

$$\begin{array}{r} -12 \\ -12 \end{array}$$

$$4W = 12$$

$$\begin{array}{r} \div 4 \\ \div 4 \end{array}$$

$$W = 3$$

$$l = 9 \text{ cm}$$

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The sum of three consecutive integers is 48. Find the integers.

x = 1st unknown
 x+1 = 2nd unknown
 x+2 = 3rd unknown

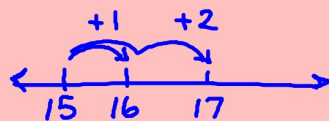
$$x + (x+1) + (x+2) = 48$$

$$3x + 3 = 48$$

$$3x + 3 - 3 = 48 - 3$$

$$3x = 45$$

$$x = 15$$



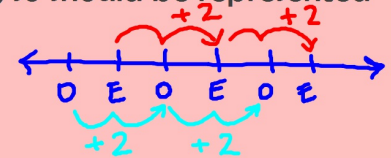
The integers are 15, 16, and 17.

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Consecutive Integers vary by 1. For example 50 and 51 are consecutive integers. Consecutive *even* integers vary by 2 (i.e. 4 and 6) as do consecutive *odd* integers.

When working with consecutive integers, the variables again are related to each other.

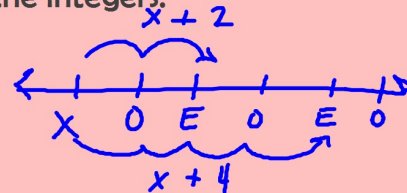
All the integers are unknowns, so should be represented by variables.



First integer = n
 Second integer = n + 1
 Third integer = n + 2 and so on.

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The sum of three consecutive *even* integers is 72. Find the integers.



$$x + x + 2 + x + 4 = 72$$

$$3x + 6 = 72$$

$$\begin{array}{r} -6 \\ -6 \end{array}$$

$$3x = 66$$

$$\begin{array}{r} \div 3 \\ \div 3 \end{array}$$

$$x = 22$$

22
 24
 26

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Homework:
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