2.10B Modelling with Algebra - Day 2

Ex. 1 Test this riddle with a few different numbers. Then create an algebraic expression for each stage of the riddle. Explain how generalizing the expressions helps you understand how the riddle works.

Example of a number riddle:

> Pick a number.
> Add 5 to your number.
> Double your result.
> Subtract 2.
> Divide your answer by 2.
> Subtract your original number.
> What is your answer?

$$\frac{2(x+5) - 2}{2} - x$$

$$= \frac{2x + 10 - 2}{2} - x$$

$$= \frac{2x + 8}{2} - x$$
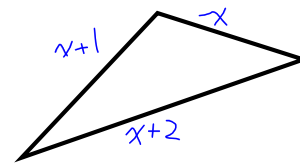
$$= x + 4 - x$$

$$= 4$$

1. Measurement Problems

Ex. 2 The sides of a triangle are 3 consecutive whole numbers. The perimeter of the triangle is 48 cm. How long is each side?

Let x be the smallest side
Let $x+1$ " " next "
Let $x+2$ " " largest "

$P = side1 + side2 + side3$
$48 = x + x+1 + x+2$
$48 = 3x + 3$
$48 - 3 = 3x$
$45 = 3x$
$\frac{45}{3} = x$
$15 = x$
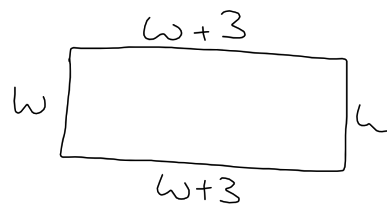
Answers
$x \rightarrow 15$
$x+1 \rightarrow 16$
$x+2 \rightarrow 17$

$\therefore$ The sides of my triangle are 15cm, 16cm and 17cm

Ex. 3   The length of a rectangle is 3 m greater than the width. The perimeter is 26 m. What are the dimensions of the rectangle?

Let w be the width
Let $w+3$ be the length

$26 = w + w+3 + w + w+3$
$26 = 4w + 6$
$26 - 6 = 4w$
$\frac{20}{4} = \frac{4w}{4}$
$5 = w$

$w+3$
$(5)+3$
$= 8$

$\therefore$ The length is 8m and width is 5m

2. Money Problems

Ex. 4 Kate earned $3 more than double the amount Jake earned. The difference of their earnings was $15. How much did each person earn?

Let   J represent the amt. that Jake earned.
Let $2J+3$ "   "   "   "   Kate   "

$$Kate - Jake = 15$$

$$2J+3 - J = 15$$

$\therefore$ Kate made $27
and Jake made $12

$$J+3 = 15$$
$$J = 15-3$$
$$= 12$$

$\underline{Kate}$
$2J+3$
$= 2(12)+3$
$= 24+3$
$= 27$

Ex. 5 A parking meter contains $27.05 in quarters and dimes. There are 146 coins in total. How many quarters are there?

Let q represent # of quarters
Let $146-q$ rep. # of dimes

Value (# coins)(value of the coin)

quarters   dimes
$$q(0.25) + (146-q)(0.10) = 27.05$$

$\times 100$

$$q(25) + (146-q)(10) = 27.05(100)$$

$$25q + 1460 - 10q = 2705$$

$$15q + 1460 = 2705$$

$$15q = 2705 - 1460$$

$$\frac{15q}{15} = \frac{1245}{15}$$

$$q = 83$$

$\therefore$ There are
83 quarters.

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Ex. 6 Rosalee's mother is 4 years older than twice Rosalee's age.
The difference of their ages is 22 years. Find their ages.

EXTENSION QUESTION! For those that want a challenge!

At the beginning of a gathering, each person in the room greets every other person exactly once.

How many greetings are there if there are 3 people in the room? 5 people in the room? 20?

What expression could you use to determine the number of greetings for any number of people in the room?

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