

2.5: Applications of Linear Equations

Note Title

1/22/2015

Problem from prereading assignment:

One number is 4 more than twice another.
Their sum is 22. Find the numbers. x
 $2x$

One number: $2x+4$

Another number: x

one number $\xrightarrow[\text{to}]{\text{compare}}$ another number
 x

$$(2x+4) + x = 22$$

[parentheses are optional]

$$2x+4+x = 22$$

$$3x+4 = 22$$

$$3x = 18$$

$$x = 6$$

Another number: $x=6$

One number: $2x+4 = 2(6)+4 = 12+4=16$

The numbers are 6 and 16.

Check: 1st sentence: twice 6: 12
4 more: 16 ✓ 1st sentence checks

2nd sentence:
$$\begin{array}{r} 16 \\ +6 \\ \hline 22 \end{array}$$
 ✓ 2nd sentence checks

2.5 #10] One number is five more than twice ^{2x} another. If their sum is decreased by 10, the result is 22. Find the numbers.

One number: $2x + 5$

another number: x

one number $\xrightarrow[\text{to}]{\text{compare}}$ another ^x#

$$\underbrace{2x + 5 + x}_{\text{their sum}} - 10 = 22$$

$$3x - 5 = 22$$

$$3x = 27$$

$$x = 9$$

another number: $x = 9$

one number: $2x + 5 = 2(9) + 5 = 18 + 5 = 23$

The numbers are 9 and 23.

Check: 1st sentence: twice 9: 18
5 more: 23 ✓ 1st sentence checks

$$\begin{array}{r} \text{Sum: } 9 \\ + 23 \\ \hline 32 \end{array}$$

Decrease by 10: 22 ✓ 2nd sentence checks.

Ex.: The perimeter of a rectangle is 100 ft. The length is 6 ft less than three times the width.
Find the length and width.

length: $3x - 6$

width: x

length $\xrightarrow[\text{to}]{\text{compare}}$ width
 x

$$x + 3x - 6 + x + 3x - 6 = 100$$

$$8x - 12 = 100$$

$$8x = 112$$

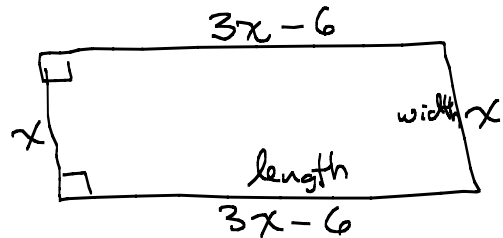
$$x = \frac{112}{8}$$

$$x = 14$$

$$\begin{array}{r} 14 \\ 8 \overline{) 112} \\ \underline{8} \\ 32 \\ \underline{32} \\ 0 \end{array}$$

width: $x = 14$

length: $3x - 6$
 $= 3(14) - 6$
 $= 42 - 6 = 36$



Could also write:

$$2(\text{width}) + 2(\text{length}) = \text{Perimeter}$$

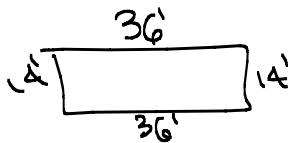
$$2(x) + 2(3x - 6) = 100$$

$$2x + 6x - 12 = 100$$

$$8x - 12 = 100$$

The length is 36 ft and the width is 14 ft.

Check: 1st sentence.



$$2(14') + 2(36')$$

$$28' + 72' = 100' \quad \checkmark \text{ 1st sentence checks.}$$

Check 2nd Sentence:

3 times

the width: $3(14) = 42$

6' less: $42 - 6 = 36 \quad \checkmark \text{ 2nd sentence checks}$

2.5 #28 One side of a triangle is 6 meters more than twice the shortest side. The third side is 9 meters more than the shortest side. The perimeter is 75 meters. Find all the sides.

one side: $2x + 6$
 shortest side: x
 third side: $x + 9$

one side $\xrightarrow[\text{to}]{\text{compare}}$ shortest side
 3rd side $\xrightarrow[\text{to}]{\text{compare}}$ x

$$2x + 6 + x + x + 9 = 75$$

$$4x + 15 = 75$$

$$4x = 60$$

$$x = 15$$

shortest side: $x = 15$

one side: $2x + 6 = 2(15) + 6 = 30 + 6 = 36$

3rd side: $x + 9 = 15 + 9 = 24$

The sides are 15 m, 36 m, and 24 m long.

2.5 #16 Tim is 5 years older than JoAnn. Six years from now the sum of their ages will be 79.

How old are they now?

	Age now	Age in 6 years
Tim	$x + 5$	$x + 5 + 6 = x + 11$
JoAnn	x	$x + 6$

Tim's age now $\xrightarrow[\text{to}]{\text{compared}}$ JoAnn's age now

$$x + 11 + x + 6 = 79$$

$$2x + 17 = 79$$

$$2x = 62$$

$$x = 31$$

JoAnn's age now: $x = 31$

Tim's age now: $x + 5 = 31 + 5 = 36$

JoAnn is 31 now and

Tim is 36 now

We'll do the money problems from 2.5 Tuesday
Now, we'll do a consecutive integer problem
from 2.6

Ex: Find four consecutive integers whose sum is 74.

1st integer: x

2nd integer: $x+1$

3rd integer: $x+2$

4th integer: $x+3$

$$x + x + 1 + x + 2 + x + 3 = 74$$

$$4x + 6 = 74$$

$$4x = 68$$

$$x = \frac{68}{4}$$

$$x = 17 \text{ 1st integer}$$

$$\begin{array}{r} 17 \\ 4 \overline{) 68} \\ \underline{4} \\ 28 \\ \underline{28} \\ 0 \end{array}$$

$$2^{\text{nd}}: x+1 = 17+1 = 18$$

$$3^{\text{rd}}: x+2 = 17+2 = 19$$

$$4^{\text{th}}: x+3 = 17+3 = 20$$

The integers are 17, 18, 19, and 20.

Check that the sum is 74.

Consecutive even integers: $x, x+2, x+4, x+6, \dots$

Consecutive odd integers: $x, x+2, x+4, x+6, \dots$

Prereading Assignment:

Read Section 2.7, pp 206 - 211 (stop at D: compound inequalities)

Rework Example 7.

Similar example: Matched Problem #7 (in grey margin)