

2.4: Applications of Linear Equations (cont'd)

2.4.2

Note Title

2/19/2018

Example

One number is six more than twice another.
(if their sum is decreased by 10, the result is 23. Find the numbers.)

one number: $= 2x + 6$

another number: x

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

$$\underbrace{(\text{one number}) + (\text{another number})}_{\text{sum}} - 10 = 23$$

$$(2x + 6) + (x) - 10 = 23$$

$$2x + 6 + x - 10 = 23$$

$$3x - 4 = 23$$

$$+ 4 \quad + 4$$

$$3x = 27$$

$$\frac{3x}{3} = \frac{27}{3}$$

$$x = 9$$

another number: $x = 9$

one number: $2x + 6$

substitute $x = 9 \Rightarrow 2(9) + 6$

"implies" $= 18 + 6$

"leads to" $= 24$

Write answer in a complete sentence:

The numbers are 9 and 24.

Check it!

Ex: Five times the sum of a ^xnumber and seven ⁼is thirty. Find the number.

2.4.3

The number: x

$$5(\underbrace{x+7}_{\text{sum}})$$

$$= 30$$

$$5x + 35$$

$$= 30$$

$$-35$$

$$-35$$

$$5x$$

$$= -5$$

$$\frac{5x}{5}$$

$$\frac{-5}{5}$$

$$x = -1$$

The number is -1.

Check it:

$$\begin{array}{r} \text{Sum: number} + 7 \\ -1 + 7 \\ \hline 6 \end{array}$$

$$5 \text{ times Sum: } 5(6) = 30 \quad \checkmark \text{ sentence checks.}$$

Consecutive Integer Problems

2.4.1

Example: Find four consecutive integers whose sum is 74.

1st integer: x

2nd integer: $x+1$

3rd integer: $x+2$

4th integer: $x+3$

$$\text{Sum} = 74$$

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

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

$$4x + 6$$

$$4x = 68$$

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

$$x = 17$$

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

1st integer: $x = 17$

2nd integer: $x+1$

$$x = 17 \Rightarrow 17 + 1 = 18$$

3rd integer: $x+2$

$$= 17 + 2 = 19$$

4th:

$$x+3 = 17+3 = 20$$

The integers are
17, 18, 19, 20.

Check A: integers? Yes

consecutive? Yes

Is their sum 74?

$$\begin{array}{r} 17 \\ + 18 \\ + 19 \\ + 20 \\ \hline 74 \end{array}$$

✓ OK!

Ex. Find 3 consecutive even integers whose sum is 120.

2.4.5

1st integer: x

2nd integer: $x+2$

3rd integer: $x+4$

$$(x) + (x+2) + (x+4) = 120$$

$$x + x+2 + x+4 = 120$$

$$3x + 6 = 120$$

$$3x = 114$$

$$\frac{3x}{3} = \frac{114}{3}$$

$$x = 38$$

1st integer: $x = 38$

2nd integer: $x+2$
 $= 38+2 = 40$

3rd : $x+4$
 $= 38+4 = 42$

The even integers are 38, 40, and 42.

Check: integers? Yes
consecutive evens? Yes
3 of them? Yes
Is their sum 120? Yes ✓

$$38 + 40 + 42 = 78 + 42 = 120$$

Note: consecutive integers:

x
 $x+1$
 $x+2$
 $x+3$
 $x+4$ etc

Consecutive even integers:

x
 $x+2$
 $x+4$
 $x+6$ etc

Consecutive odd integers:

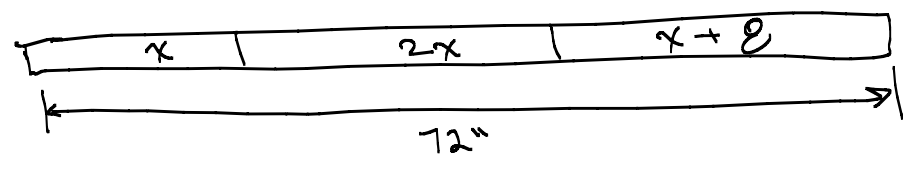
x
 $x+2$
 $x+4$
 $x+6$ etc

2.4.6

Ex. A 72-inch board is cut into 3 pieces.
The second piece is twice as long as the first piece.
The third piece is 8 inches longer than the first piece.
How long are the pieces?

length of 1st piece: x
length of 2nd piece: $2x$
length of 3rd piece: $x + 8$

2nd $\xrightarrow{\text{compared to}}$ 1st x
3rd $\xrightarrow{\text{compared to}}$ 1st x



$$\begin{aligned}(x) + (2x) + (x+8) &= 72 \\ x + 2x + x + 8 &= 72 \\ 4x + 8 &= 72 \\ 4x &= 72 - 8 \\ 4x &= 64 \\ \frac{4x}{4} &= \frac{64}{4} \\ x &= 16\end{aligned}$$

1st piece: $x = 16$
2nd piece: $2x$
 $x = 16 \Rightarrow 2(16) = 32$
3rd piece: $x + 8$
 $x = 16 \Rightarrow 16 + 8 = 24$

The pieces are 16", 32" and 24".

Check it!

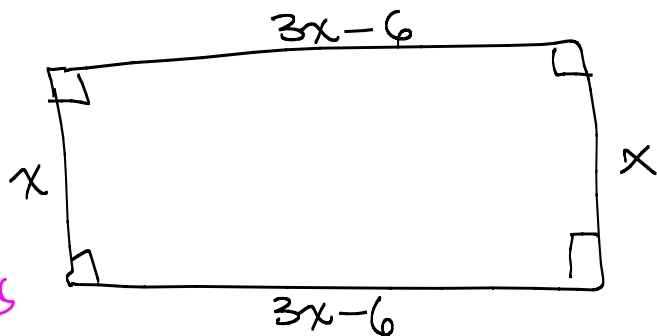
2.6: More applications of Linear Application

2.6.1

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



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

$$\begin{aligned} x + 3x - 6 + x + 3x - 6 &= 100 \\ 8x - 12 &= 100 \\ &+12 \end{aligned}$$

$$8x = 112$$

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

$$x = 14$$

OR

$$\begin{aligned} 2(\text{length}) + 2(\text{width}) &= \text{Perimeter} \\ 2(3x - 6) + 2(x) &= 100 \\ 6x - 12 + 2x &= 100 \\ 8x - 12 &= 100 \end{aligned}$$

same!

width: $x = 14$

length: $3x - 6$

$$\begin{aligned} x=14 &\Rightarrow 3(14) - 6 \\ &= 42 - 6 \\ &= 36 \end{aligned}$$

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

5.1: multiplying and Dividing Expressions with Common Bases

5.1.1

Recall: Powers of positive and negative numbers

$$-3^2 = -(3)(3) = -9$$

$$(-3)^2 = (-3)(-3) = 9$$

$$(-2)^6 = \underbrace{(-2)(-2)}_{+} \underbrace{(-2)(-2)}_{+} \underbrace{(-2)(-2)}_{+} = 4 \cdot 4 \cdot 4 = 16 \cdot 4 = \boxed{64}$$

$$(-2)^5 = \underbrace{(-2)(-2)}_{+} \underbrace{(-2)(-2)}_{+} \underbrace{(-2)}_{-} = 4(4)(-2) = 16(-2) = \boxed{-32}$$

$$-2^6 = -(2)(2)(2)(2)(2)(2) = \boxed{-64}$$

$$-2^5 = -(2)(2)(2)(2)(2) = \boxed{-32}$$

Important:

* If you raise a negative number to an even exponent, you get a positive number.

* If you raise a negative number to an odd exponent, you get a negative number.

Know these powers:

5.1.2

In calculator:
look for
 x^y or y^x
key

$$2^2 = 4$$

$$2^3 = 8$$

$$2^4 = 16$$

$$2^5 = 32$$

$$2^6 = 64$$

$$2^7 = 128$$

$$2^8 = 256$$

$$2^9 = 512$$

$$2^{10} = 1024$$

$$10^2 = 100$$

$$10^3 = 1000$$

$$10^4 = 10000$$

$$10^5 = 100000$$

etc

$$3^2 = 9$$

$$3^3 = 27$$

$$3^4 = 81$$

$$3^5 = 243$$

$$3^6 = 729$$

$$4^2 = 16$$

$$4^3 = 64$$

$$4^4 = 256$$

$$9^2 = 81$$

$$9^3 = 729$$

$$5^2 = 25$$

$$5^3 = 125$$

$$5^4 = 625$$

$$6^2 = 36$$

$$6^3 = 216$$

$$7^2 = 49$$

$$7^3 = 343$$

$$8^2 = 64$$

$$8^3 = 512$$