

3.6 - Equations and Problem Solving

Vocabulary:

- Consecutive Integers
- Uniform Motion

constant motion

#'s that differ by 1

24, 25, 26

same direction



* Set the expressions
equal to each
other

round trip



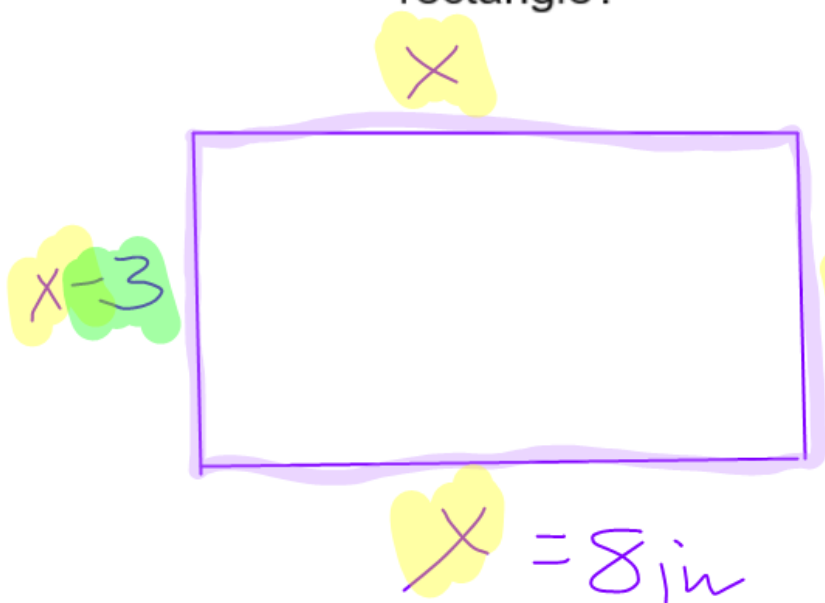
* Set them =

opp. direction



* add the
expressions

1 EXAMPLE The width of a rectangle is 3 in. less than its length. The perimeter of the rectangle is 26 in. What is the width of the rectangle?



$$(x) + (x-3) + (x) + (x-3) = 26$$

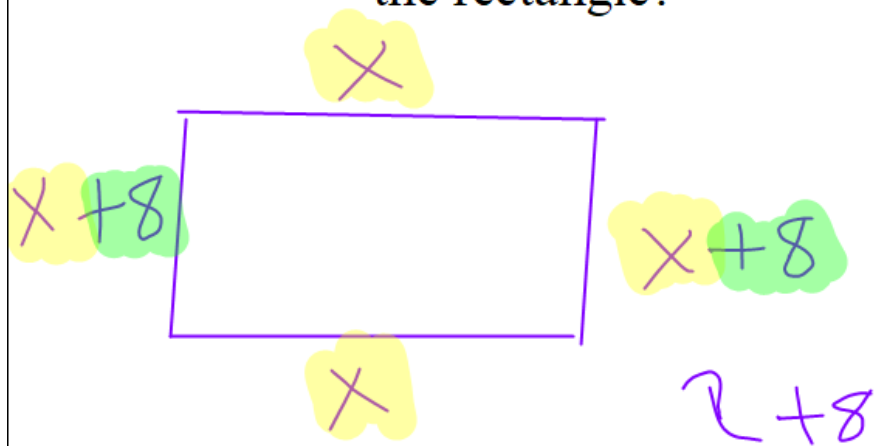
$$4x - 6 = 26$$

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

$$x = 8$$

$$8 - 3 = 5 \text{ in}$$

#3. The width of a rectangle is 8 in more than its ~~width~~. The perimeter of the rectangle is 24 in. What are the width and length of the rectangle?



$$4x + 16 = 24$$

$$\begin{array}{r} -16 \\ -16 \end{array}$$

$$\frac{4x}{4} = \frac{8}{4}$$

$$x = 2 \text{ in.}$$

$$10 \text{ in.}$$

2 EXAMPLE

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

$$x + x + 1 + x + 2 = 72$$

↑
↑
↑
 1st integer 2nd integer 3rd integer

23, 24, 25

$$\begin{array}{r}
 3x + 3 = 72 \\
 -3 \quad -3 \\
 \hline
 3x = 69 \\
 \hline
 x = 23
 \end{array}$$

7. The sum of two consecutive even integers is -298. What are the integers?

$$x + x + 2 = 298$$

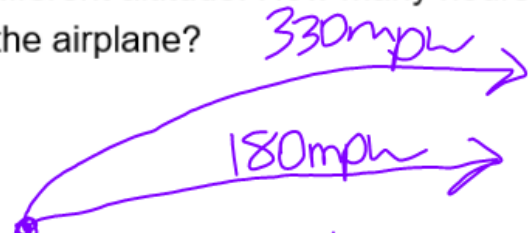
$$\begin{array}{r} 2x + 2 = 298 \\ -2 \quad -2 \end{array}$$

$$\frac{2x}{2} = \frac{296}{2}$$

$$x = -148, -150$$

Same

3 EXAMPLE An airplane left an airport flying at 180 mi/h. A jet that flies at 330 mi/h left 1 hour later. The jet follows the same route as the airplane at a different altitude. How many hours will it take the jet to catch up with the airplane?



	rate	time	$r \cdot t = \text{distance}$
air plane	180	x	$180x$
jet	330	$x - 1$	$330(x - 1)$

$$2.2 - 1 = 1.2 \text{ hrs.}$$

$$180x = 330(x - 1)$$

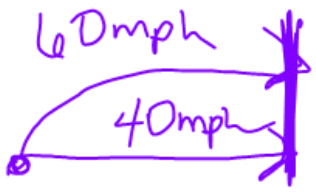
$$180x = 330x - 330$$

$$\begin{array}{r} 180x \\ -330x \\ \hline -150x = -330 \end{array}$$

$$\begin{array}{r} -150x = -330 \\ \hline -150 \end{array}$$

$$x = 2.2$$

9. A moving van leaves a house traveling at an average rate of 40 mi/h. The family leaves the house 1/2 hour later following the same route in a car. They travel at an average rate of 60 mi/h. How long will it take the car to catch up to the van?



	rate	time	distance $r \cdot t$
van	40mph	x	$40x$
car	60mph	$x - 0.5$	$60(x - 0.5)$

$$40x = 60x - 30$$

$$-60x \quad -60x$$

$$-20x = -30$$

$$\frac{-20x}{-20} = \frac{-30}{-20}$$

$$x = \frac{1}{2}$$

$$\frac{1}{2} - 0.5 = \boxed{1 \text{ hr.}}$$

4 EXAMPLE Suppose you hike up a hill at 4 km/h. You hike back down at 6 km/h. Your hiking trip took 3 hours. How long was your trip up the hill?



	rate	time	distance
uphill	4 km/h	x	$4x$
downhill	6 km/h	$3-x$	$6(3-x)$

$$4x = 18 - 6x$$

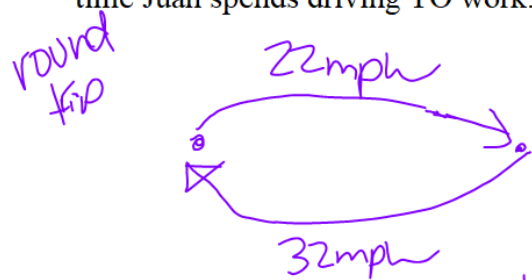
$$+6x \quad \quad +6x$$

$$\frac{10x}{10} = \frac{18}{10}$$

$$x = \frac{18}{10}$$

$$x = \frac{4}{5}$$

11. Juan drives to work. Because of traffic conditions, he averages 22 miles per hour. He returns home averaging 32 miles per hour. The total travel time is 2.25 hours. Find the time Juan spends driving TO work.



	rate	time	r · t
to work	22	x	22x
home from work	32	2.25 - x	32(2.25 - x)

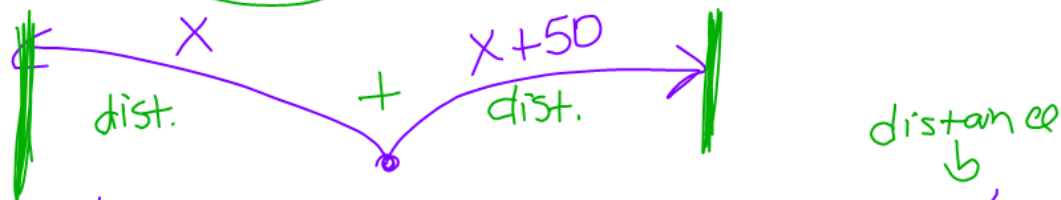
$$22x = 72 - \cancel{32x} + \cancel{32x}$$

$$\frac{54}{54}x = \frac{72}{54}$$

$$x = 1.\bar{3} \text{ hrs.}$$

5 EXAMPLE Two jets leave Dallas at the same time and fly in opposite directions. One is flying west 50 mi/h faster than the other. After 2 hours, they are 2500 miles apart. Find the speed of each jet.

opp.



	rate	time	distance rot
west	$X + 50$	2	$2(X + 50)$
east	X	2	$2X$

$$X = \boxed{600 \text{ mph}}$$

$$\boxed{650 \text{ mph}}$$

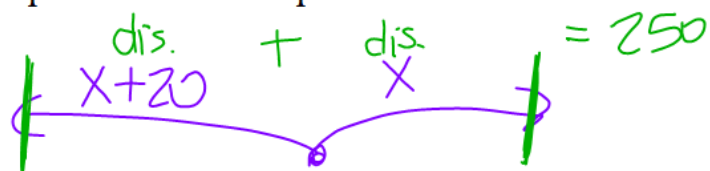
$$2x + 100 + 2x = 2500$$

$$4x + 100 = 2,500$$

$$\frac{4x}{4} = \frac{2400}{4}$$

$$x = 600$$

13. John and William leave their home traveling in opposite directions on a straight road. John drives 20 miles per hour faster than William. After 4 hours, they are 250 miles apart. Find John's speed and William's speed.



	rate	time	rate \cdot time
John	$20+x$	4	$4(20+x)$
William	x	4	$4x$

Will 21.25 mph
John 41.25 mph

$$80 + 4x + 4x = 250$$

$$80 + 8x = 250$$

$$\begin{array}{r} -80 \\ \hline \end{array}$$

$$8x = 170$$

$$\frac{8x}{8} = \frac{170}{8}$$

$$x = 21.25$$

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