Lesson: Talking About Distance, Rate and Time

Standards: Standards: 6NS1.2, 6AF2.3, 6MS2.4, 7MG1.3, 7AF1.3, AF4.2, 7MR2.5, Alg.15.0

Warm-up or Activity:
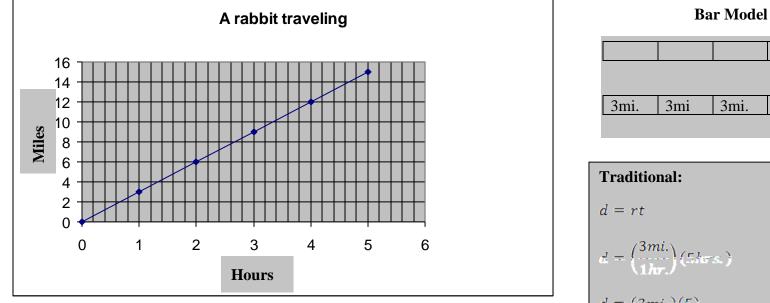## Distance/Rate/Time Chart
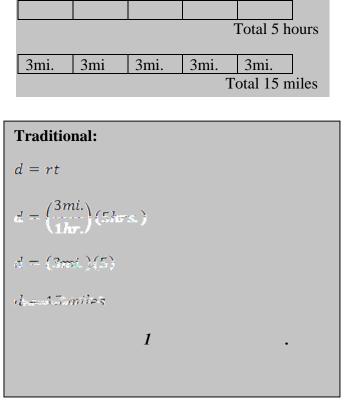The chart can be completed as a whole class activity, partner Think-Pair-Share, or

How far?	How fast? (speed)	How long?
Inches Feet Centimeters Yards Meters Miles Kilometers Knot (nautical mile = 1.15 miles)	Feet per second, $\frac{ft.}{sec.}$ Yards per minute Miles per hour, $\frac{miles}{hr.}$ Kilometers per hour, $\frac{km.}{hr.}$ Knots per hour	Seconds Minutes Hours Days Weeks Months Years
Example	**Example**	**Example**
A car **traveled 20 miles.**	A car traveled 20 miles at an **average rate of 60 miles per hour.**	A car traveled 20 miles at an average rate of 60 miles per hour **for 3 hours**.
A runner **traveled 15 kilometers.**	A runner traveled 15 kilometers at a **speed of 5 kilometers per hour.**	A person ran for 15 kilometers at a speed of 5 kilometers per hour for **2 hours**.
Question	**Question**	**Question**
How far did the car travel?	**How fast** was the car traveling?	For **how long** did the car travel? **How long** did it take for the car to get there?

You Try: A rabbit hops and jumps at a speed of 3 miles per hour. How far did the rabbit travel in five hours?

Interpreting a graph:

A rabbit traveling

Bar Model

Total 5 hours

3mi.	3mi	3mi.	3mi.	3mi.

Total 15 miles

Traditional:

$d = rt$

$d = \left(\dfrac{3mi.}{1hr.}\right)(5hrs.)$

$d = (3mi.)(5)$

$d = 15 \, miles$

1   .

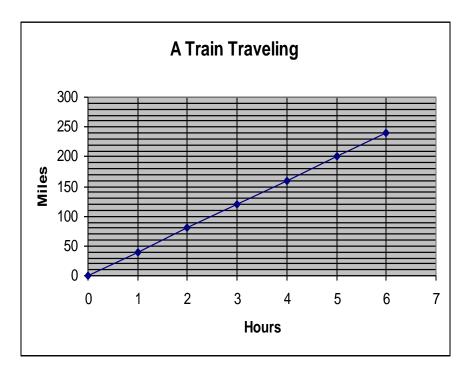**Example 3: A passenger train left the train station in Sacramento and traveled at an average speed of 40 miles per hour. In six hours it reached its destination. How far did it travel?**

Graph Interpretation

Bar Model

A Train Traveling

(graph: Miles vs. Hours)

Total 6 hours

40mi.	40mi.	40mi.	40mi	40 mi	40 mi

Total 240 miles

2 0 .

Traditional Method

$d = rt$

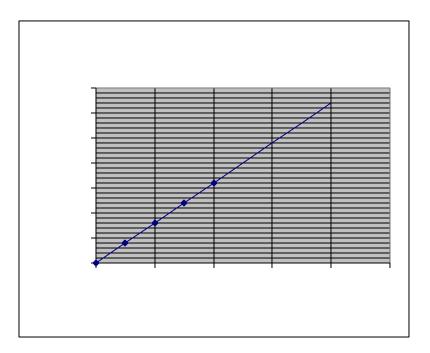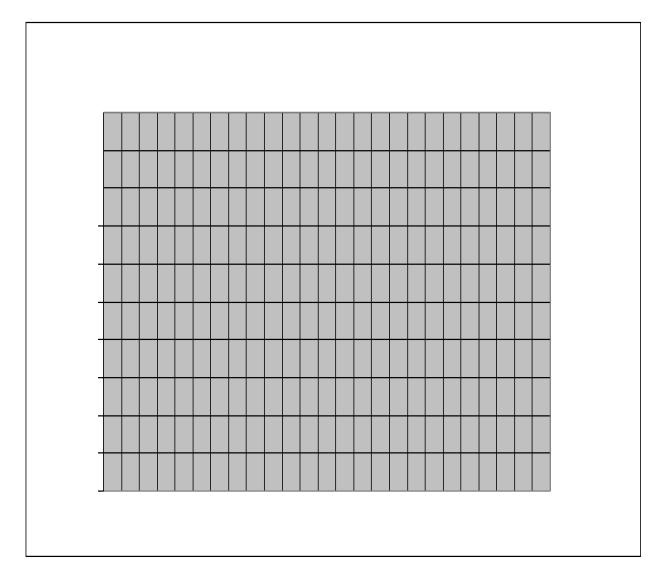**Example 4: What if we knew that a train traveled 320 miles in eight hours, what was the average speed of the train?**

Graph Interpretation   **Bar Model**
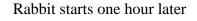
Graphs can be used to show a story. Here is a graph that represents a race between a turtle and a rabbit. From the information in the graph write a story.

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Example 5: In a race between a turtle and a rabbit, the turtle travels at average rate of 2 miles per hour. The rabbit knew it was going to win so it gave the turtle a chance by starting one hour later, and it traveled at an average rate of 3 miles per hour. How long did it take the rabbit to catch the turtle?

Draw a picture:

Rabbit starts one hour later   rabbit catches turtle

Traditional: Bar Model

let x = time it takes the rabbit to catch turtle

let $x + 1$ = the time the turtle will travel until overtaken

$$\left(\frac{2\ miles}{hr}\right)(x + 1) = \frac{3\ miles}{hr}(x)$$

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

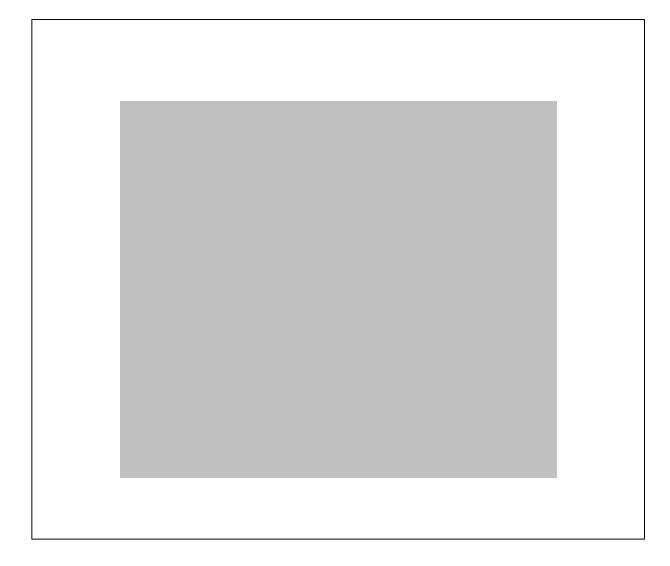$$(2x) + (2) - (2x) = (3x) - (2x)$$

$$(2) = (x)$$

$$2 = x$$

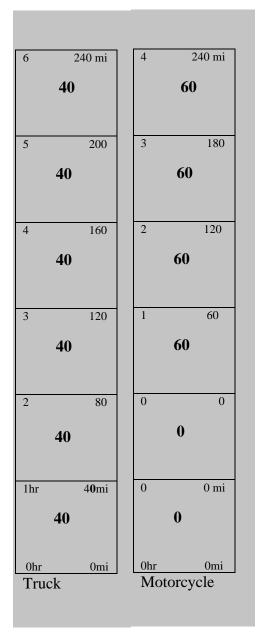**It took the rabbit 2 hours to catch the turtle.**

Enhanced question: How long did the turtle go before being overtaken by the rabbit?

Here is a graph that is titled "Traveling to Los Angles". From the information in the graph write a detailed story (assume both vehicles are traveling on the same road).

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Using POST –ITs for the Bar Model:

A truck leaves San Jose for Los Angeles traveling at an average of 40 mph. Two hours later a motorcycle leaves the same place in San Jose for Los Angeles at 60 miles per hour. How long will it be before the motorcycle overtakes the truck?

Truck		Motorcycle	
6 240 mi **40**		4 240 mi **60**	
5 200 **40**		3 180 **60**	
4 160 **40**		2 120 **60**	
3 120 **40**		1 60 **60**	
2 80 **40**		0 0 **0**	
1hr 40mi **40**		0 0 mi **0**	
0hr 0mi		0hr 0mi	

Place each post-it one at a time and label each one as you go. Start with the truck and then do the motorcycle. Notice that the motorcycle has two Post-Its with zero hours and miles. Those represent leaving two hours later. Each post-it represents one hour and the rate will remain the same. Label the top left hand corner for each hour. This means an increase by one hour for each post it.The top right hand corner will total the miles and when both vehicles have reached the same distance; the time it takes the motorcycle to overtake the truck is on the top left corner of the post-it. The example can be done from bottom to top, top to bottom or on its side. **NOTE: Because students do not know the number of Post-Its needed you can place 5 or 7 for the truck and let students experiment until they find the number of post its until the distance is equal.**

Traditional:

$$40(x+2) = 60x$$

$$40x + 80 = 60x$$

$$40x + 80 - 40x = 60x - 40x$$

$$80 = 20x$$

$$\frac{80}{20} = \frac{20x}{20}$$

$$4 = x$$

∴ *The time it takes the motorcycle to overtake the truck is 4 hours.*