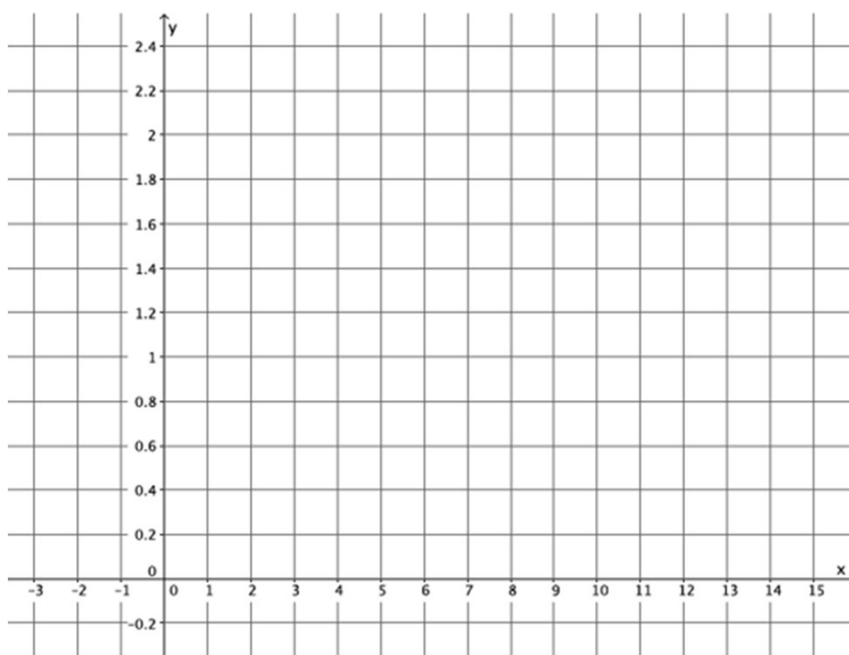# System of Equations Word Problems (Graphs)

Jessica and Karl run at constant speeds. Jessica can run 3 miles in 24 minutes. Karl can run 2 miles in 14 minutes. They decide to race each other. As soon as the race begins, Karl trips and takes 2 minutes to recover.

a) Write the linear equation that represents Jessica's constant speed. Make sure to include in your equation the extra time that Jessica was able to run.

b) Write the linear equation that represents Karl's constant speed.

c) Write the system of linear equations that represents this situation.

d) Sketch the graphs of the two linear equations.

System of Equations Word Problems (Graphs)

e) Use the graph to answer the questions below.

 i. If Jessica and Karl raced for 3 miles, who would win? Explain.

 ii. At approximately what point would Jessica and Karl be tied? Explain.

System of Equations Word Problems (Graphs)

Jessica and Karl run at constant speeds. Jessica can run 3 miles in 24 minutes. Karl can run 2 miles in 14 minutes. They decide to race each other. As soon as the race begins, Karl trips and takes 2 minutes to recover.

a) Write the linear equation that represents Jessica's constant speed. Make sure to include in your equation the extra time that Jessica was able to run.

Jessica's rate is $\frac{3}{24}$ miles per minute, which is equivalent to $\frac{1}{8}$ miles per minute. If Jessica runs y miles x minutes at that constant speed, then $y = \frac{1}{8}x$. To account for her additional 2 minute of running that Jessica gets, we write the equation

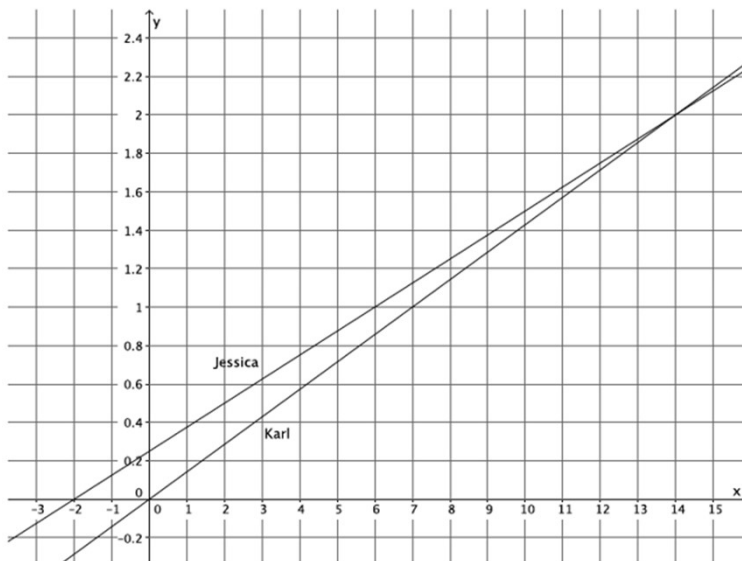$$y = \frac{1}{8}(x + 2)$$
$$y = \frac{1}{8}x + \frac{1}{4}$$

b) Write the linear equation that represents Karl's constant speed.

Karl's rate is $\frac{2}{14}$ miles per minute, which is the same as $\frac{1}{7}$ miles per minute. If Karl runs y miles in x minutes at that constant speed, then $y = \frac{1}{7}x$.

c) Write the system of linear equations that represents this situation.

$$\begin{cases} y = \frac{1}{8}x + \frac{1}{8} \\ y = \frac{1}{7}x \end{cases}$$

d) Sketch the graphs of the two linear equations.

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System of Equations Word Problems (Graphs)

e) Use the graph to answer the questions below.

 i. If Jessica and Karl raced for 3 miles, who would win? Explain.

 If the race were 3 miles, then Karl would win. It only takes Karl 21 minutes to run 3 miles, but it takes Jessica 24 minutes to run the distance of 3 miles.

 ii. At approximately what point would Jessica and Karl be tied? Explain.

 Jessica and Karl would be tied after about 4 minutes or a distance of 1 mile. That is where the graphs of the lines intersect.