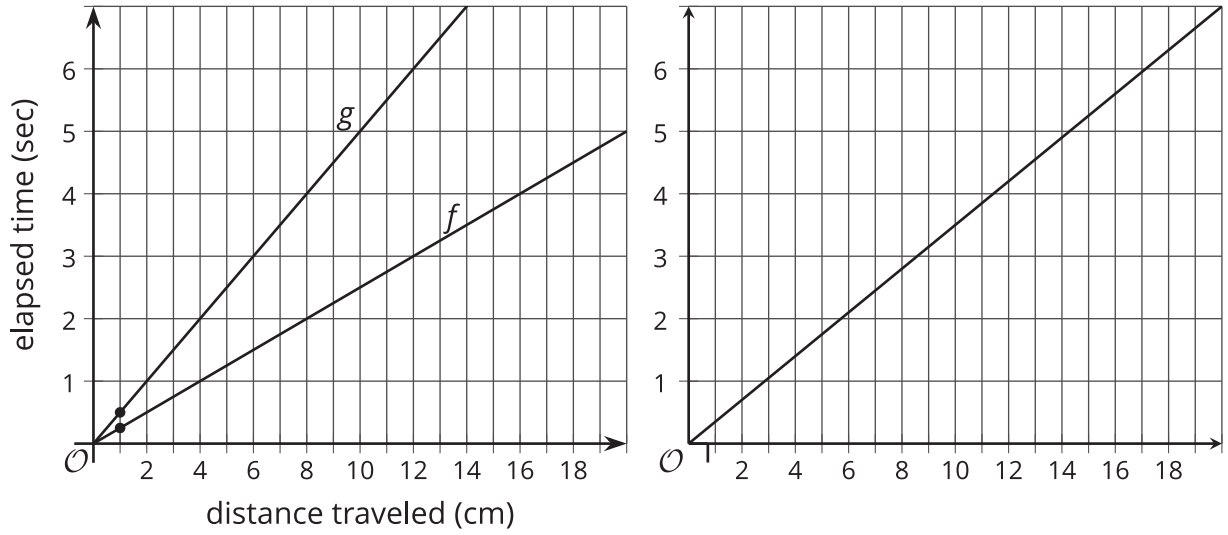
# Understanding Proportional Relationships

Let's study some graphs.

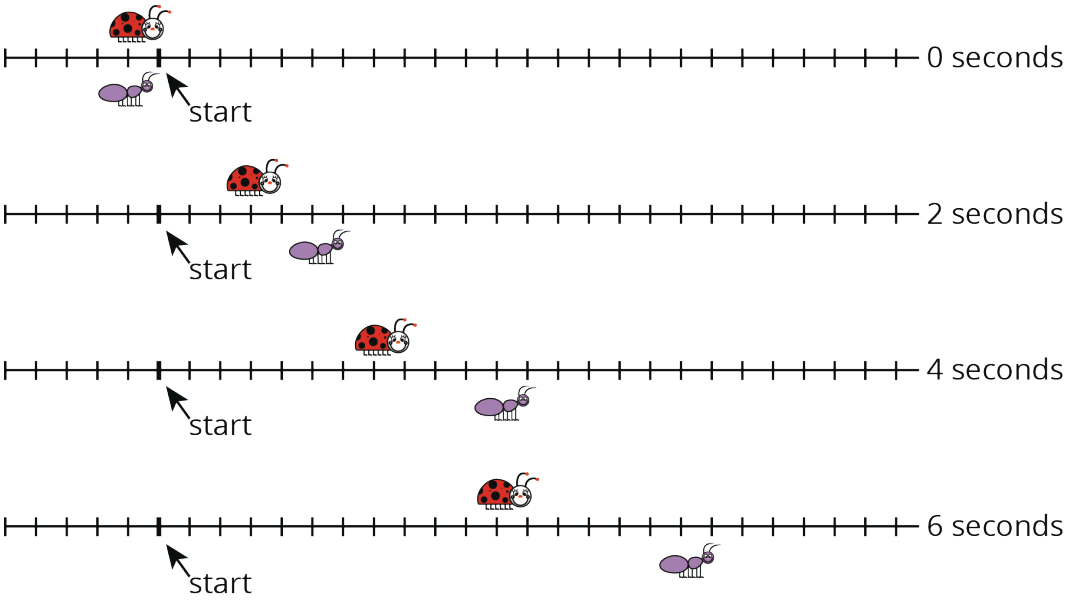
## 1.1 Notice and Wonder: Two Graphs

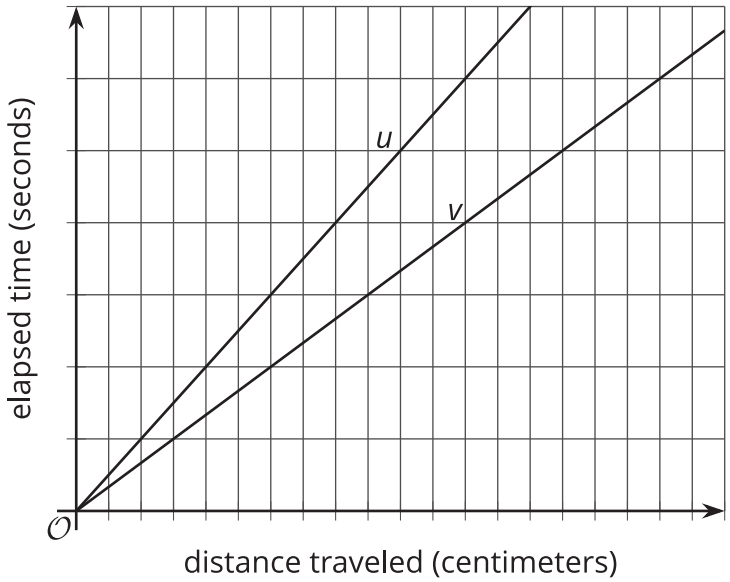



What do you notice? What do you wonder?

# 1.2 Moving Through Representations

A ladybug and ant move at constant speeds. The diagrams with tick marks show their positions at different times, as measured by the front of each bug's head. Each tick mark represents 1 centimeter.




1. Lines $u$ and $v$ also show the positions of the two bugs. Which line shows the ladybug's movement? Which line shows the ant's movement? Explain your reasoning.

2. How long does it take the ladybug to travel 12 centimeters? The ant?

3. Scale the vertical and horizontal axes by labeling each grid line with a number. You will need to use the time and distance information shown in the tick-mark diagrams.
4. Mark and label the point on line $u$ and the point on line $v$ that represent the time and position of each bug after traveling 1 centimeter.

### Are you ready for more?

1. How fast is each bug traveling?

2. Will there ever be a time when the ant is twice as far away from the start as the ladybug? Explain or show your reasoning.

## 1.3 Moving Twice as Fast

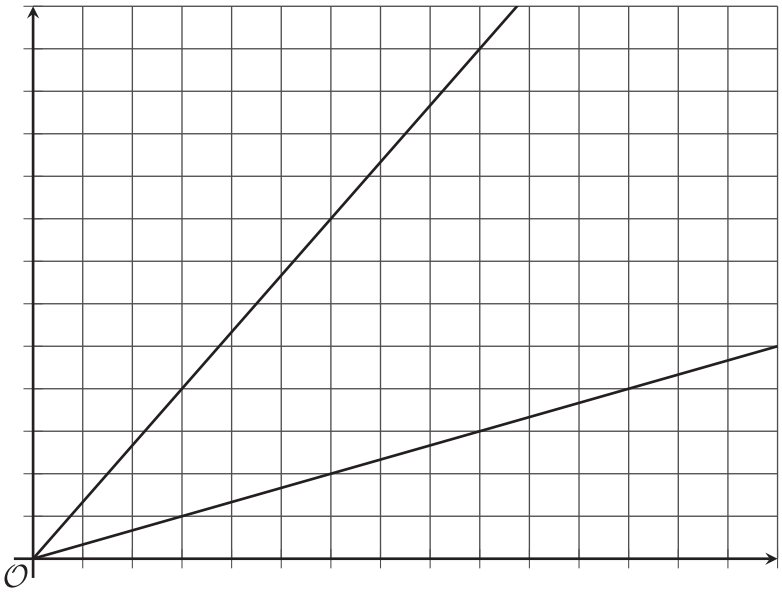
Refer to the tick-mark diagrams and graph in the earlier activity.

1. Imagine a bug that is moving twice as fast as the ladybug. On each tick-mark diagram, mark the position of this bug.
2. Plot this bug's positions on the coordinate axes with lines $u$ and $v$, and connect them with a line.
3. Write an equation for each of the three lines where $x$ represents the distance traveled by each bug and $y$ represents the elapsed time.

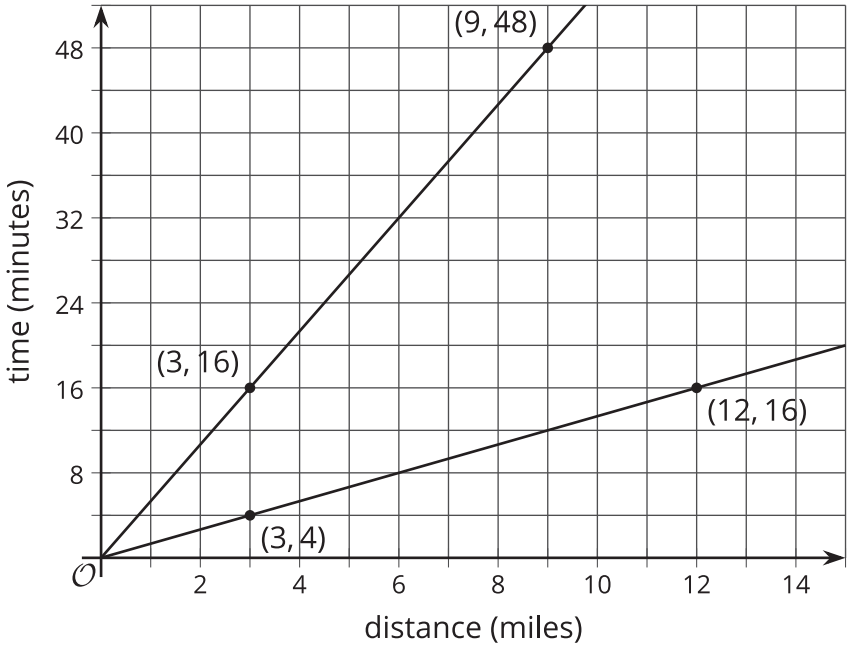
## Lesson 1 Summary

Graphing is a way to help make sense of relationships.

But the graph of a line on a coordinate plane without labels or a scale isn't very helpful. Without labels, we can't tell what the graph is about or what units are being used. Without an appropriate scale, we can't tell any specific values.




Here are the same graphs, but now with labels and a scale:




Notice how adding labels lets us know that the relationship compares time and distance and helps to understand both the speed and pace of two different items. When adding labels to axes, be sure to include units, such as minutes and miles.

Notice how adding a scale makes it possible to identify specific points and values. When adding a scale to an axis, be sure that the space between each grid line represents the same amount.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