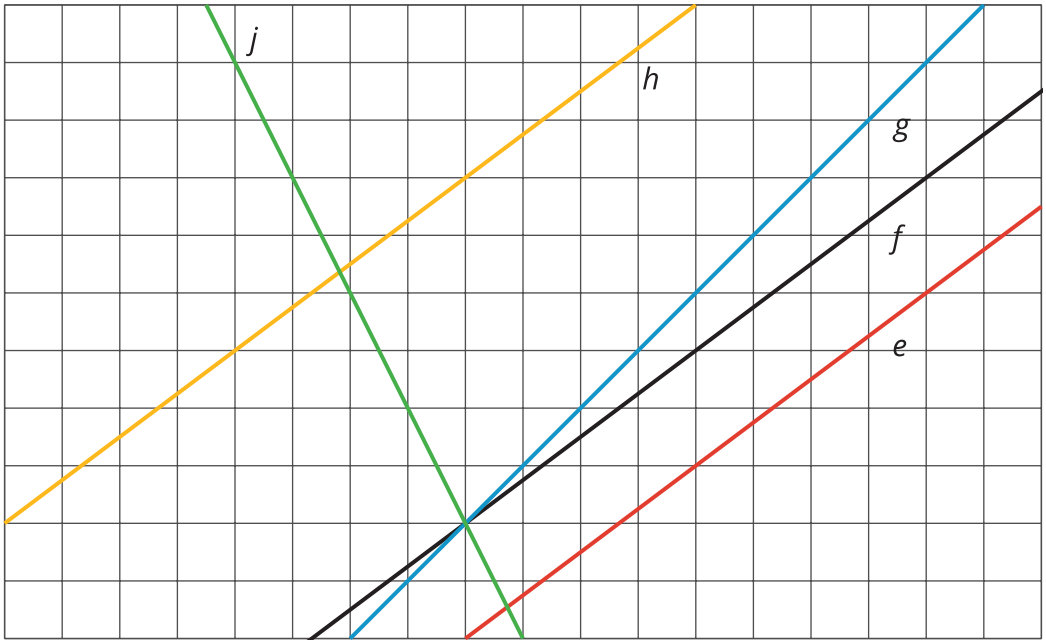
# Translating to $y = mx + b$

Let's see what happens to the equations of translated lines.

## 7.1 Lines that Are Translations

The diagram shows several lines. You can only see part of the lines, but they actually continue forever in both directions.

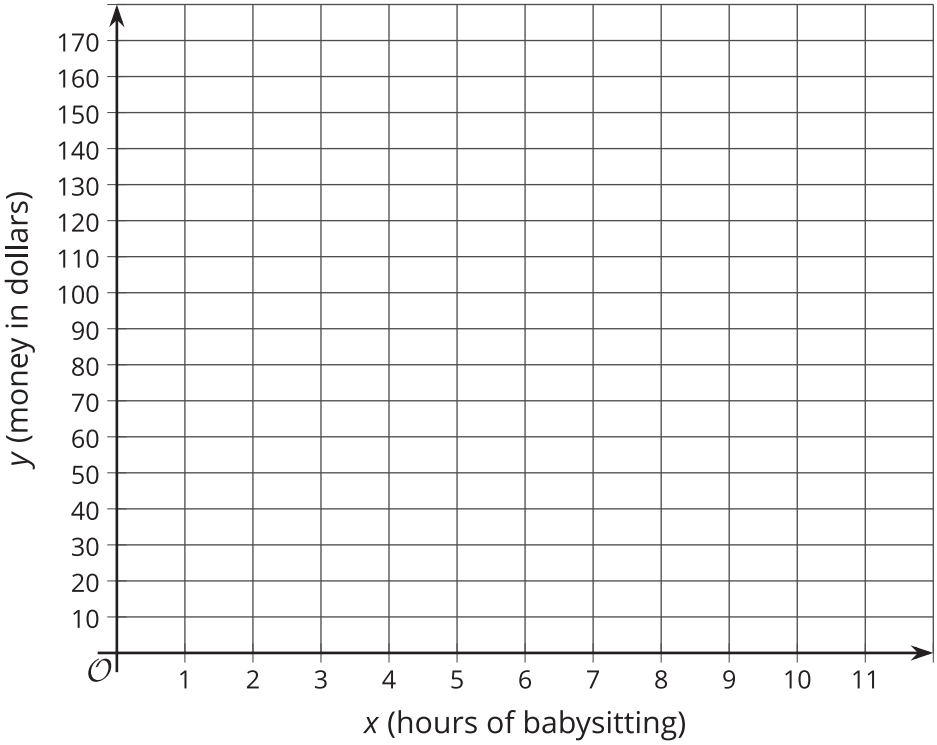



1. Which lines are images of line $f$ after a translation?

2. For each line that is a translation of $f$, draw an arrow on the grid that shows the vertical translation distance.

# 7.2 Increased Savings

1. Diego earns $10 per hour babysitting. He has no money saved before he starts babysitting and plans to save all of his earnings. Graph how much money, $y$, he has after $x$ hours of babysitting.




2. Now imagine that Diego started with $30 saved before he starts babysitting. On the same set of axes, graph how much money, $y$, he would have after $x$ hours of babysitting.

3. Compare the second line with the first line. How much *more* money does Diego have after 1 hour of babysitting? 2 hours? 5 hours? $x$ hours?

# 7.3 Translating a Line

Your teacher will give you a set of cards containing 4 graphs showing line $a$ and its image, line $h$, after a translation. Match each graph with an equation describing the translation and either a table or description. Record your matches and be prepared to explain your reasoning. For the line with no matching equation, write one on the blank card.

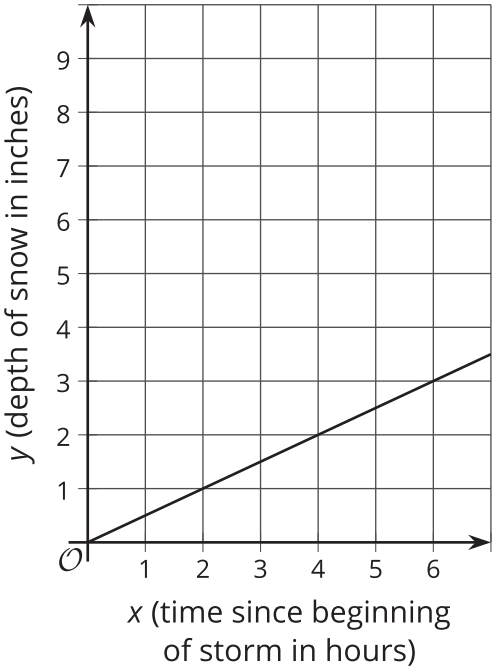
## Are you ready for more?

A student says that the graph of the equation $y = 3(x + 8)$ is the same as the graph of $y = 3x$, only translated upwards by 8 units. Do you agree? Explain your reasoning.

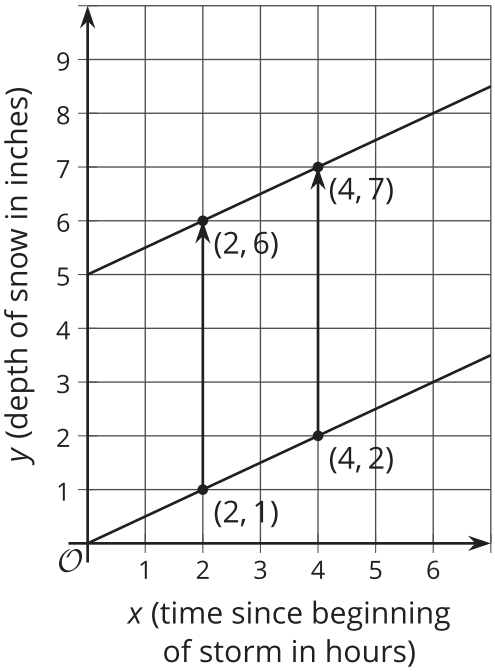
## Lesson 7 Summary

During an early winter storm, snow falls at a rate of $\frac{1}{2}$ inch per hour. The rate of change, $\frac{1}{2}$, can be seen in both the equation $y = \frac{1}{2}x$ and in the slope of the line representing this storm.

The time since the beginning of the storm and the depth of the snow is a linear relationship. This is also a proportional relationship since the depth of snow is 0 inches at the beginning of the storm.




During a mid-winter storm, snow again falls at a rate of $\frac{1}{2}$ inch per hour, but this time there were already 5 inches of snow on the ground.




The rate of change, $\frac{1}{2}$, can still be seen in both the equation and in the slope of the line representing this second storm.

The 5 inches of snow that were already on the ground can be graphed by translating the graph of the first storm up 5 inches, resulting in a vertical intercept at $(0, 5)$. It can also be seen in the equation $y = \frac{1}{2}x + 5$.

This second storm is also a linear relationship, but unlike the first storm, is not a proportional relationship since its graph has a vertical intercept of 5.