

4.5 Using Graphs to Estimate Values

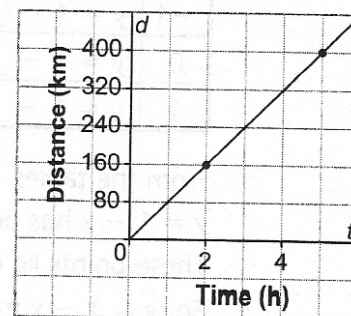
FOCUS Use interpolation and extrapolation to estimate values on a graph.

When we estimate values between 2 given data points on a graph of a linear relation, we use **interpolation**.

Example 1 Using Interpolation to Solve Problems

This graph shows the distance travelled by Bobbie's family on a trip from Calgary to Moose Jaw. How long did it take his family to travel 320 km?

Bobbie's Family Trip



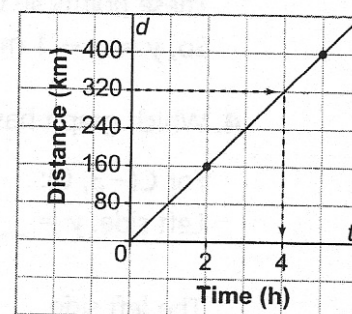
Solution

To find how long it took to travel 320 km:

- Locate the point on the vertical axis that represents 320 km.
 - Draw a horizontal line to the graph.
 - Then draw a vertical line from the graph to the horizontal axis.
- Read the value where the vertical line meets the horizontal axis.

It took about 4 h to travel 320 km.

Bobbie's Family Trip



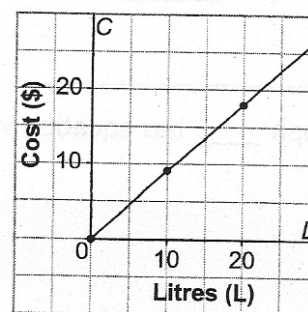
We could follow the same process to find that, after 3 h, the family has travelled about 240 km.

Check

1. Use the graph to find the following values.

- The cost of 15 L of fuel.
About \$_____.
- The quantity of fuel that can be purchased for \$10.
About _____ L.

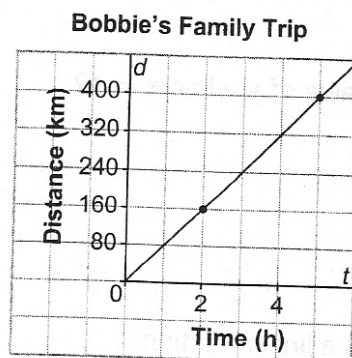
Cost of Fuel



When we extend a graph of a linear relation to estimate values that lie beyond the graph, we use **extrapolation**.

Example 2 Using Extrapolation to Solve Problems

On his family trip from Calgary to Moose Jaw, Bobbie wants to predict how long it will take to travel 640 km.



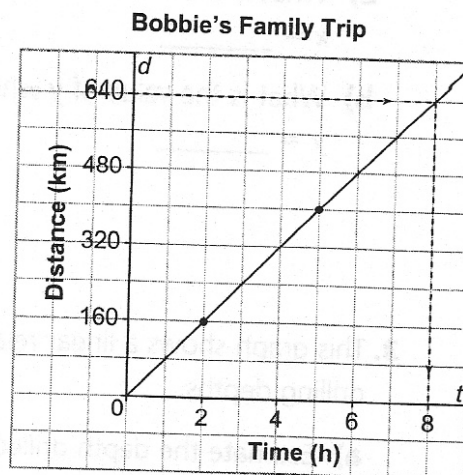
We assume that Bobbie's family will continue to travel at the same average speed.

Solution

Since the relation appears to be linear, we can extend the graph.

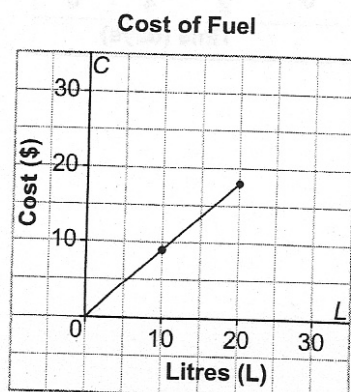
- Locate the point on the vertical axis that represents 640 km.
- Draw a horizontal line to the graph.
- Then draw a vertical line from the graph to the horizontal axis.

Read the value where the vertical line meets the horizontal axis. It will take about 8 h to travel 640 km.



Check

1. Use the graph to find the cost of 30 L of fuel.



Practice

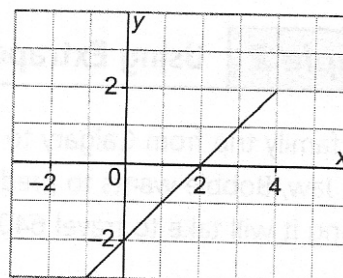
1. Use this graph of a linear relation.

a) What is the value of x when $y = 3$?

$x =$ _____

b) What is the value of y when $x = 1$?

$y =$ _____



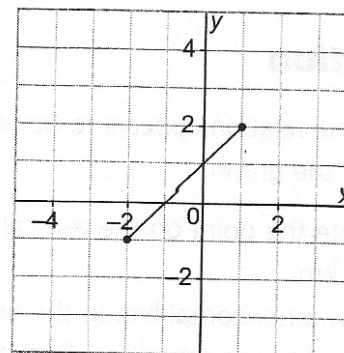
2. This graph shows a linear relation.

a) What is the value of x when $y = 4$?

$x =$ _____

b) What is the value of y when $x = -4$?

$y =$ _____



3. This graph shows a linear relation for different drilling depths.

a) Estimate the depth drilled in 1 day.

About _____ m

b) Estimate the time taken to drill to a depth of 750 m.

About _____ days

c) Estimate the depth that will be drilled in 3 days.

About _____ m

d) Estimate the time it will take to drill 2000 m.

About _____ days

Drilling Depths

