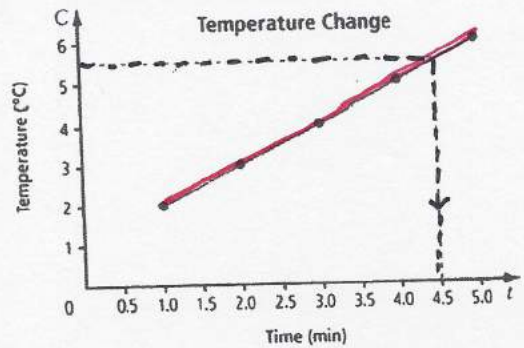
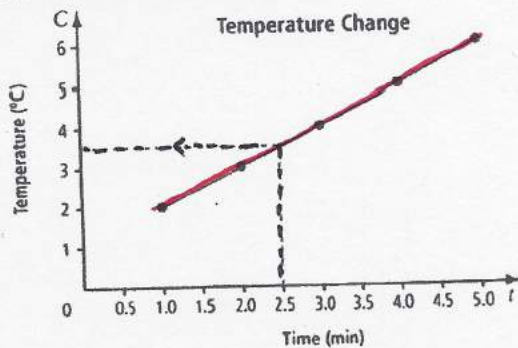


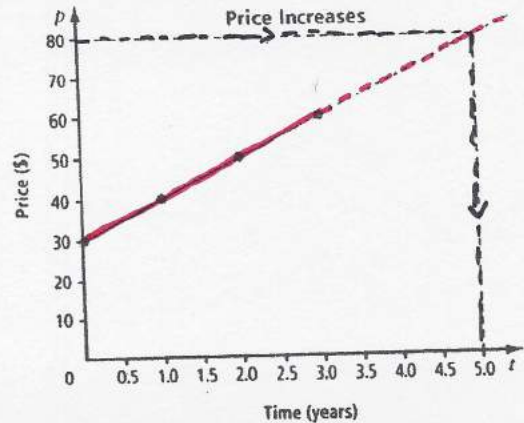
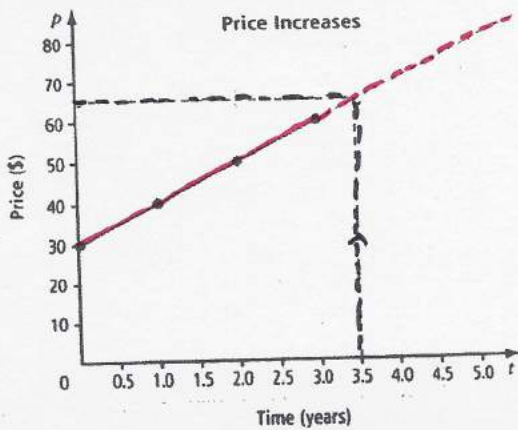
INTERPOLATION ↘

Key Ideas

- On a graph, you can use a line to interpolate values between known values.
 - Start with a known value for x .
 - Start with a known value for y .



- On a graph, you can extend a line to extrapolate values beyond known values.
 - Use a dashed line to extend the line beyond the known x -value or y -value.
 - Start with a known value for x .
 - Start with a known value for y .



- Interpolation and extrapolation should be used only when it is reasonable to have values between or beyond the values on a graph.

ExTRApolaTion ↗

4.5 Using Graphs to Estimate Values

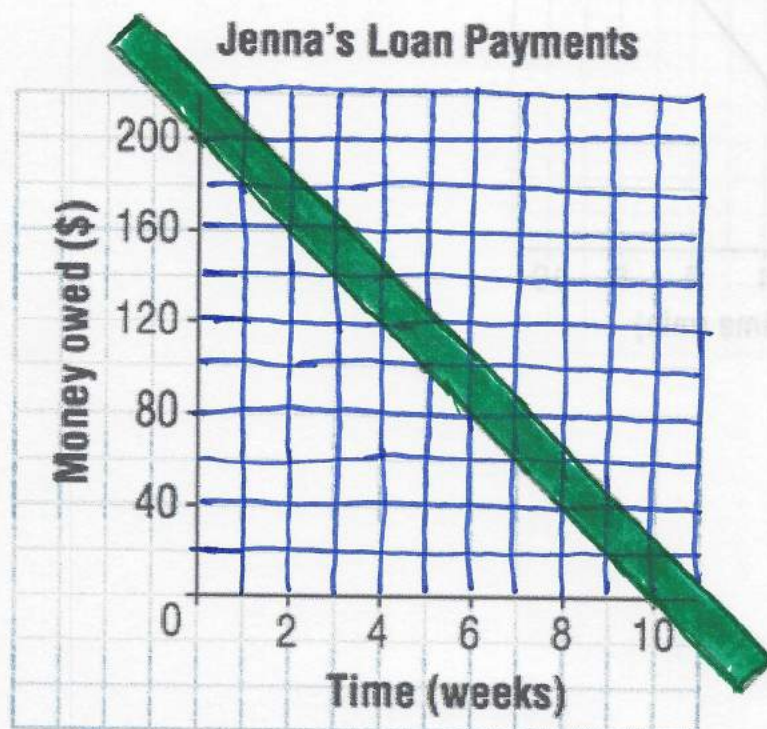
Interpolation:

Extrapolation:

Examples:

- 1) Jenna borrows money from her parents for a school trip. She repays the loan by making regular weekly payments. The graph shows how the money is repaid over time. The data are discrete because payments are made every week.

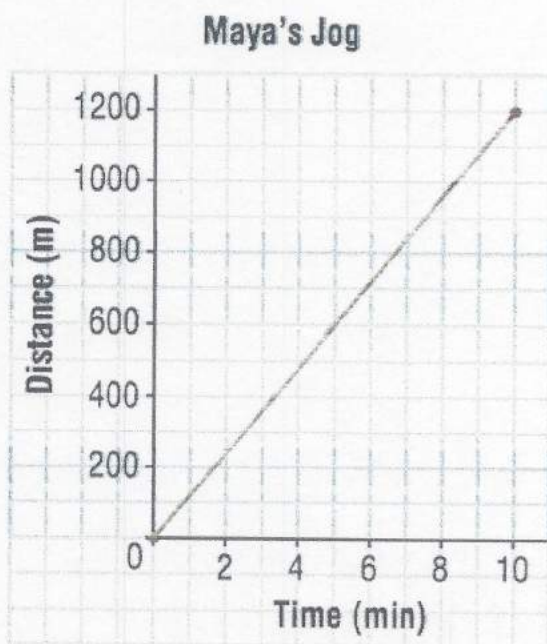
- How much money did Jenna originally borrow?
- How much money does she still owe after 3 weeks?
- How many weeks will it take Jenna to repay one-half of the money she borrowed?



- 2) Maya jogs on a running track. This graph shows how far she jogs in 10 min. Assume Maya continues to jog at the same average speed.

Use the graph.

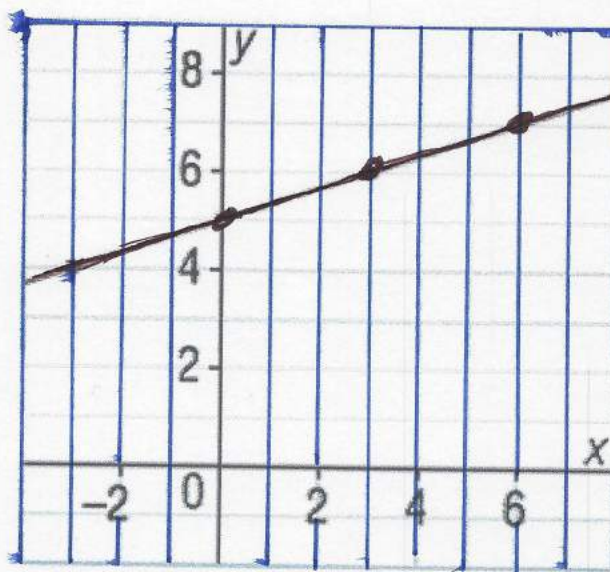
- a) Predict how long it will take Maya to jog 2000 m.
- b) Predict how far Maya will jog in 14 min.
- c) What assumption did you make?



3)

Use this graph of a linear relation.

- a) Determine the value of x when $y = 3$.
- b) Determine the value of y when $x = 5$.



Assignment: Pg. 196-198 #4-8, 13 & 14

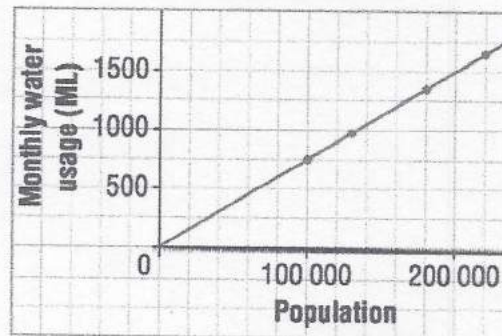
Set Activity:

A city has grown over the past few years. This table and graph show how the volume of water used each month is related to the population.

Population	Monthly Water Usage (ML)
100 000	750
130 000	975
180 000	1350
220 000	1650

1 ML is 1 000 000 L.

Water Usage in One City



Use these data to:

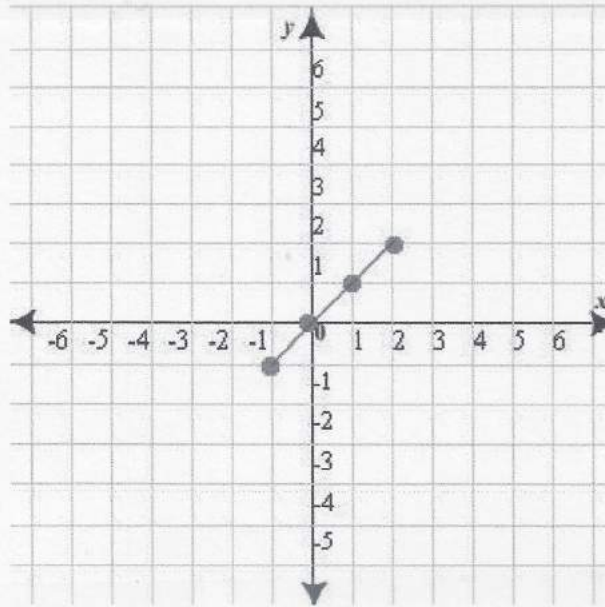
- Estimate the monthly water usage for a population of 150 000 people.
- Estimate the population when the monthly water usage is 1400 ML.
- Predict the water usage for 250 000 people.

7. A) Create a table from this graph.

x	y

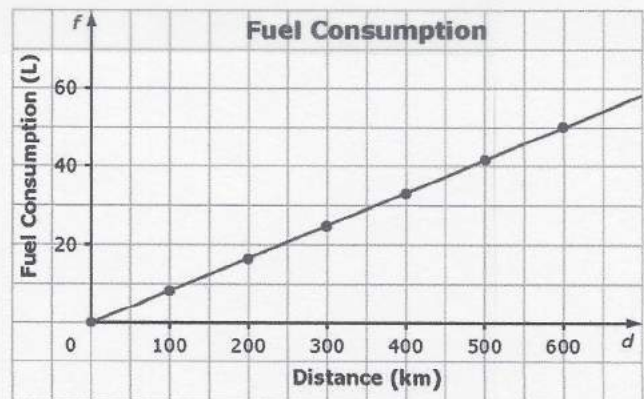
B) Interpolate from the graph y if $x = 1.5$.

C) Extrapolate from the graph y if $x=5$.



TRY THESE PROBLEMS!

4. The graph shows the relationship between the fuel consumption, f , in litres (L), and the distance driven, d , in kilometres (km).



a) What is the linear equation?

b) How far could you drive with 34 L of gas?

c) Is it appropriate to interpolate or extrapolate values on this graph? What assumption is being made? Explain.

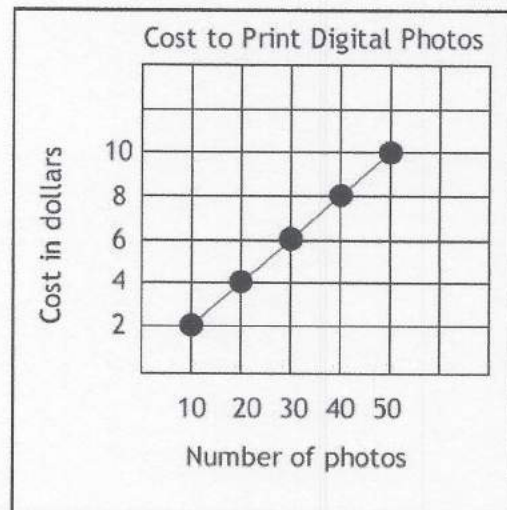
21. The cost to print digital photos at an online store is shown in the graph below.

- a. Extrapolate to estimate the cost of printing 60 photos

- b. Extrapolate to estimate the number of photos you could print for \$1.00

- c. Interpolate to estimate the cost of printing 45 photos

- d. Interpolate to estimate the number of photos you could print for \$5.50.



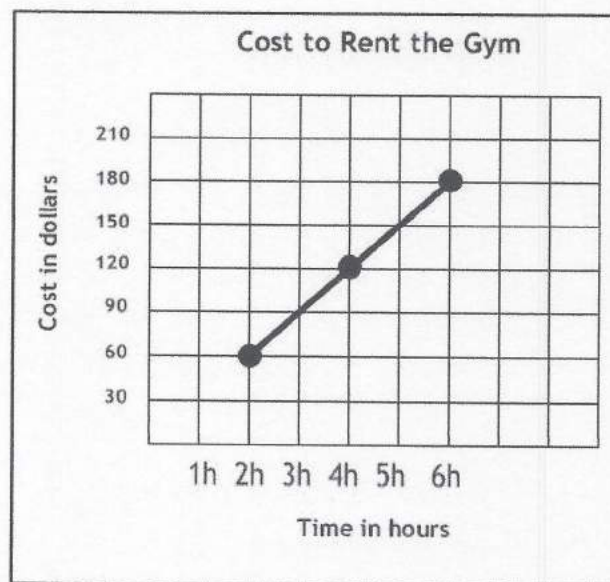
22. The following graph shows the cost to rent the gym for 2, 4 or 6 hours at \$30.00 per hour.

- a. Extrapolate to find the cost to rent the gym for 8 hours.

- b. Extrapolate to find how long you could rent the gym for \$30.00.

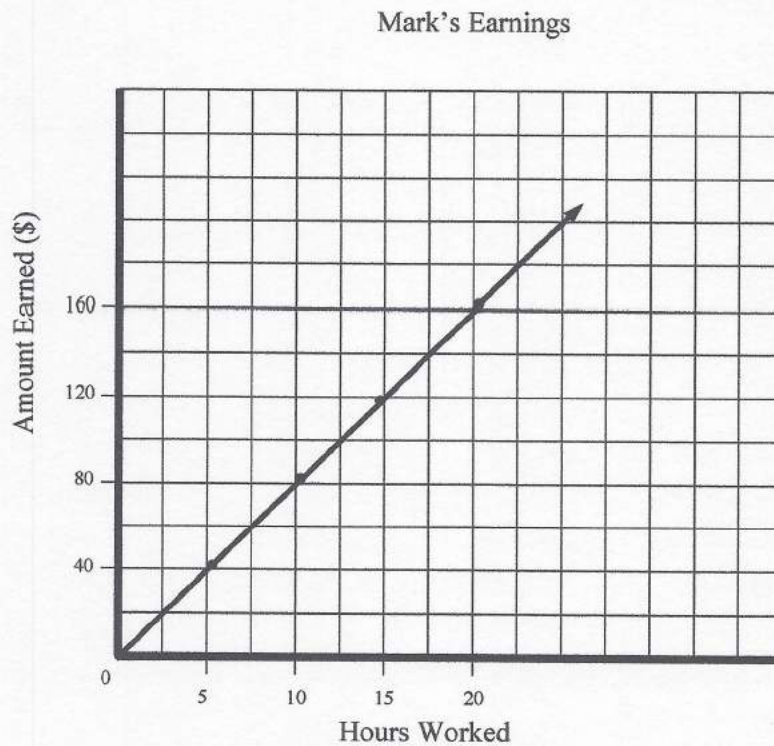
- c. Interpolate to find cost to rent the gym for 2.5 hours

- d. Interpolate to find how long you could rent the gym for \$135.00.



Example 3 :

Use the graph to answer each of the following questions and state whether you used interpolation or extrapolation to find the answer.

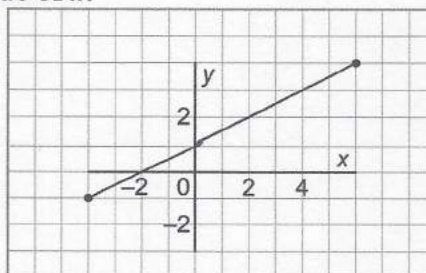


- a) How many hours must Mark work to earn \$140?
- b) How much would Mark earn if he worked 30 hours?
- c) How many hours did Mark work if he earned \$200 last week?

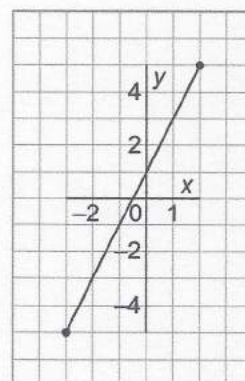
Extra Practice 5

Lesson 4.5: Using Graphs to Estimate Values

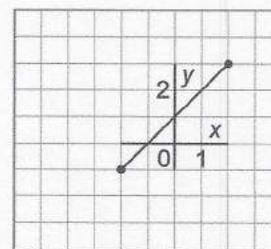
1. This graph represents a linear relation.
 - a) Determine the value of x for each value of y .
 - i) $y = 1$
 - ii) $y = 3$
 - iii) $y = 0$
 - b) Determine the value of y for each value of x .
 - i) $x = 2$
 - ii) $x = 8$
 - iii) $x = -6$



2. This graph represents a linear relation.
 - a) Determine the value of x for each value of y .
 - i) $y = 3$
 - ii) $y = -2$
 - iii) $y = 7$
 - b) Determine the value of y for each value of x .
 - i) $x = 0$
 - ii) $x = -2$
 - iii) $x = -4$

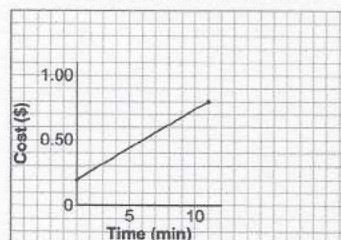


3. This graph represents a linear relation.
 - a) Determine the value of x for each value of y .
 - i) $y = 2$
 - ii) $y = 0$
 - iii) $y = 5$
 - b) Determine the value of y for each value of x .
 - i) $x = 0$
 - ii) $x = 3$
 - iii) $x = -5$



4. The graph shows how the cost of a long distance call changes with the time for the call.
 - a) Estimate the cost of a 7-min call.
Is this interpolation or extrapolation? Explain.
 - b) The cost of a call was \$1.00.
Estimate the time for the call.
 - c) The cost of a call was \$1.50.
Estimate the time for the call.

Cost of Long Distance Calls



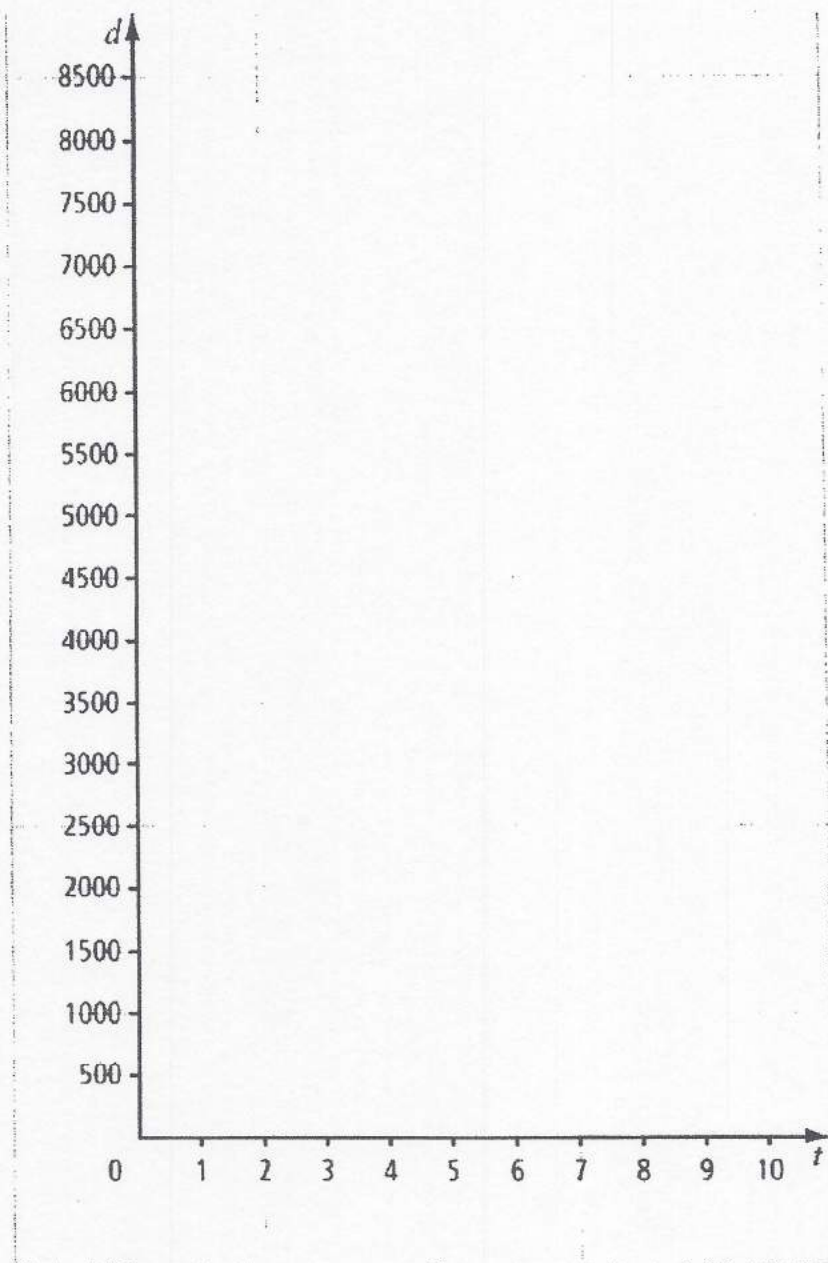
Name: _____

ID: A

13. A jet flies from Toronto to Rome. Its flight can be modelled by the linear equation $d = 7200 - 800t$, where d is the distance, in kilometres, from Rome and t is the time, in hours.

a) Graph the linear relation.

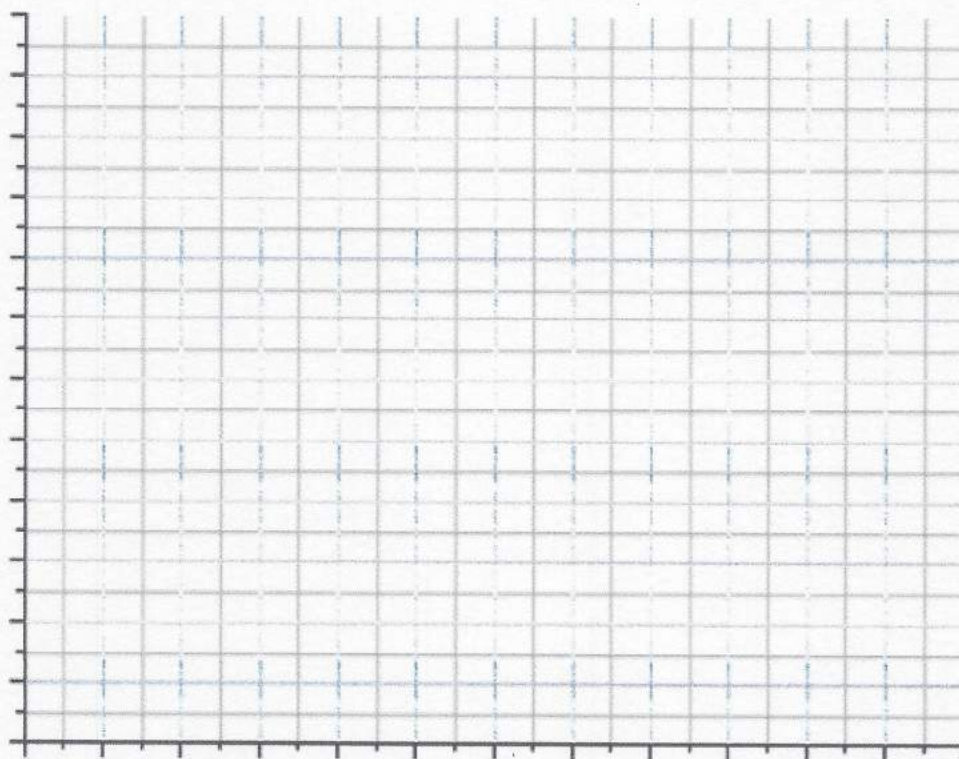
b) How long does it take to fly 4000 km?



GRAPHING

1. a) Create a table of values for the relation $y = 1\frac{1}{2}x + 3$, then graph the relation.

x	y
0	
2	
4	
6	
8	
10	



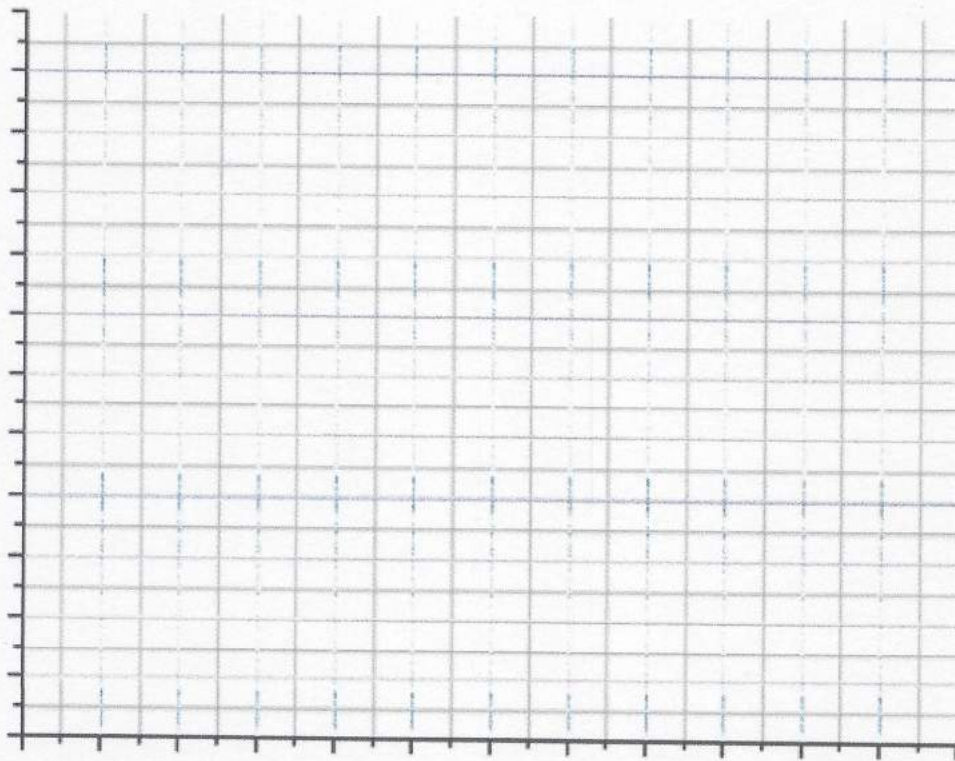
- b) Is the relation linear? How do you know?
- c) Extrapolate the value of y when $x = 33$.

2. Sam has \$100 in his savings account. Each week he adds \$20.

a. Write an equation that relates the amount of money in his account, A dollars, after t weeks.

b. Create a table of values for the relation, then graph it. Will you join the points on this graph? Explain.

t	0	1	2	3	4	5
A						



c. At what point will Sam have \$50.00 in his account?