

Chapter 6: Graphing and solving linear relations

CH 6.2 - Graphing linear relations

Graphing a linear relationship (Pattern → Graph; Pattern → Equation)

Example

The fuel consumption (f), in liters, is recorded every hour (t).

- Graph the data
- Approximately how much fuel is used in 11 hours?
- How long can the ship travel if it only has 49,600 L of fuel?
- Write an equation that represents the this relationship and use it to verify your estimates from b) and c)

Amount of fuel burned (f) = (Rate of consumption) × (# hours) × Time (t)

Rate of consumption = Liters burned / hours

= 5210 L / h

Unit rate.

$f = 5210t$

Key Points

Graphing

- Independent variable (x) = Time (t)
- Dependent variable (y) = Fuel Consumption (L)

Time, t (h)	Fuel Consumption, f (L)
0	0
1	5 210
2	10 420
3	15 630
4	20 840
5	26 050
6	31 260
7	36 470

Rate of consumption
↓

5210

5210

5210

...

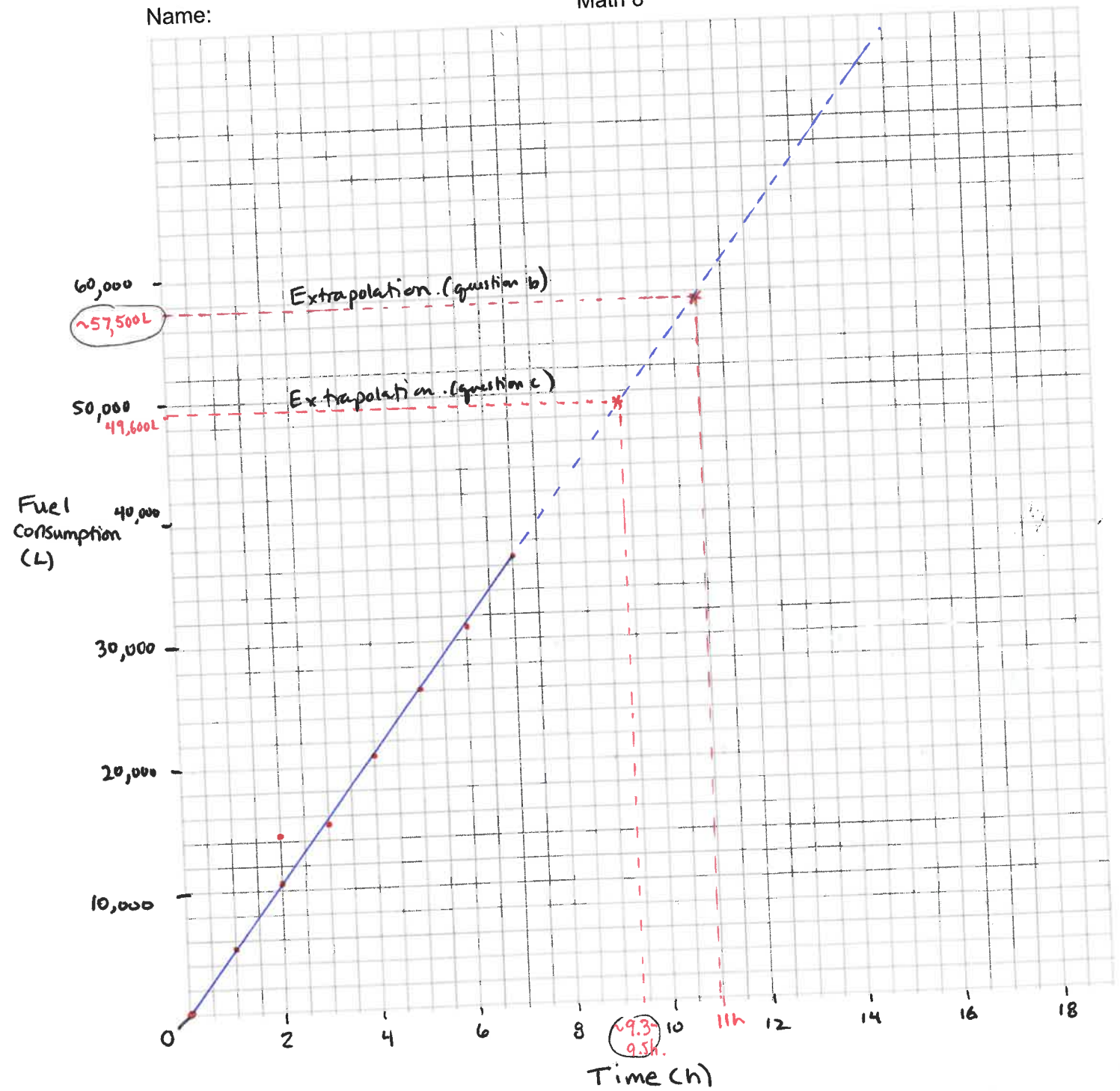
Graphing Reminders

- Use at least $\frac{1}{2}$ of the graph paper
- Scales on each axis must be consistent
 - Count by the same number (ex. 1's, 2's, 5's, 10's, 100's, etc.)
 - Same # of boxes between numbers
- Use a ruler!
- ALWAYS** start your counting at 0 for both axis

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Interpolation - use a graph to estimate data points within a given data range.

↳ Inside

Find points between points

t	d
0	0
1	5
2	10
3	15

} data range.



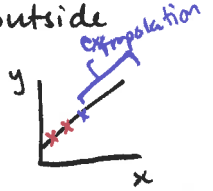
Extrapolation - use a graph to estimate data points outside a given data range.

↳ outside.

t	d
0	0
1	5
2	10
3	15

} data range

Find points beyond data range.



Name:

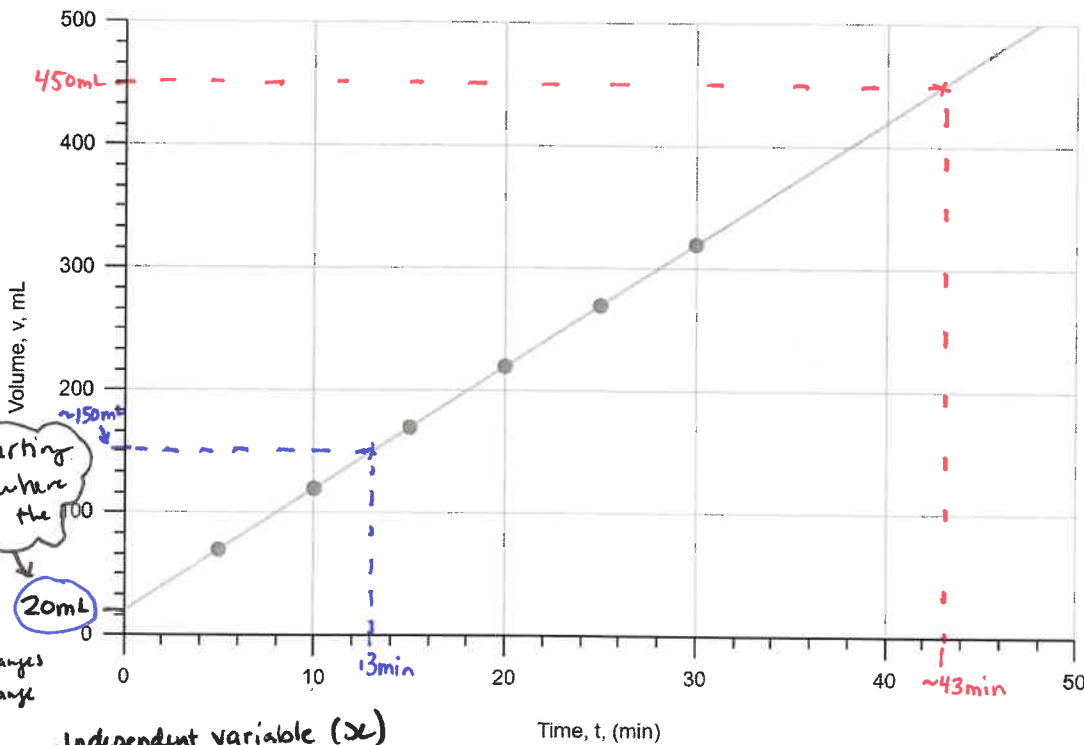
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Determining a linear equation from a graph (Graph → Equation)

You have a hole in the bottom of your boat and water is slowly leaking in. Below is a graph that displays this relationship and a table of values to show the volume of water (ml) in the boat over time (min).

Volume of water (mL) leaking into boat over time (min)

dependent
Variable
(y)

Independent variable (x)

1. Come up with an equation that represents the change in volume (ml), v , over time (min), t .

Constant/y-intercept
"starting point of pattern"

$$y = ax + b$$

$$v = 10t + 20$$

x Time, t , (min)	y Volume, v , mL	Multiplier/ Rate of change (a) $10t$	Constant/ $10t + 20$ starting point (b)
5	70	$10t = 10(5) = 50$	$10(5) + 20 = 70$
10	120	$10t = 10(10) = 100$	$10(10) + 20 = 120$
15	170	$10t = 10(15) = 150$	$10(15) + 20 = 170$
20	220	$10t = 10(20) = 200$	$10(20) + 20 = 220$
25	270	$10t = 10(25) = 250$	$10(25) + 20 = 270$
30	320	$10t = 10(30) = 300$	$10(30) + 20 = 320$

Rate of change.

change in volume over time.

$$= \frac{50\text{mL}}{5\text{min}} = \frac{10\text{mL}}{1\text{min}} \text{ Unit rate.}$$

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2. How much water was in the boat before you put it in the water? How do you know?

20 mL

Our constant/y-intercept is 20 mL. If the rate of change for water entering the boat is 10 mL/min we should have had only 50 mL in 5 min but we had 70 mL. This means there must have been 20 mL in the boat to start.

3. Using the graph, estimate how much time it will take to reach a volume of 450 mL. Check your answer by using your equation.

~ 43 min (extrapolation)

Verify

$$V = 10t + 20$$

$$450 \text{ mL} = 10t + 20$$

$$\frac{430 \text{ mL}}{10} = \frac{10t}{10}$$

$$43 = t \quad \checkmark$$

4. Using the graph, estimate how much water will leak into the boat after 13 min. Check your answer by using your equation.

~ 150 mL (interpolation)

Verify

$$V = 10t + 20$$

$$V = 10(13) + 20$$

$$V = 130 + 20$$

$$V = 150 \text{ mL} \quad \checkmark$$

Assignment

- Section 6.2 extra practice worksheet
- pg 194 # 1, 5, 6, 8, 9, choose 2 apply (if not in class to receive worksheet)