Math 9

5.2 Interpreting Graphs

Name: Ms. B

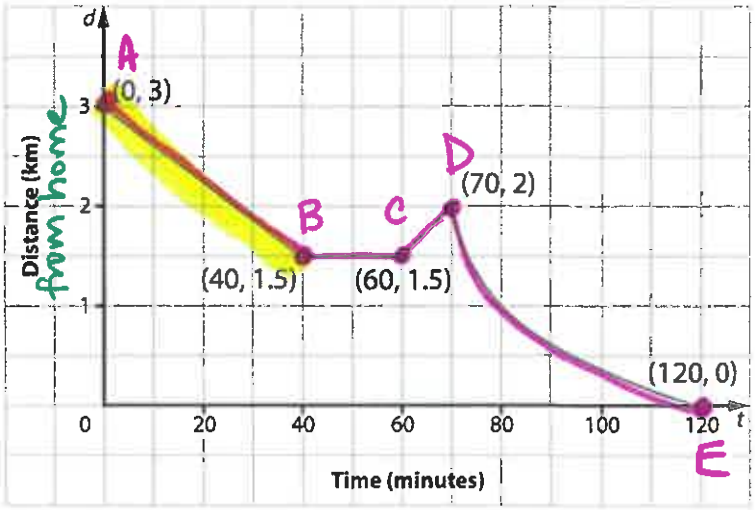
Date: May. 2/3

Learning Goals: *I will learn to*

- describe patterns and trends for given linear graphs
- estimate values between known values on a graph
- extend graphs to estimate values beyond known values on a graph

Explore and Analyze

Rowan is at the park with his dog. The graph shows the distance from home as he walks the dog back home.



1. Describe Rowan's walk home. When was he walking at a steady pace? When was he speeding up or slowing down? When did he stop and rest? How do you know? Add any other information about his walk home.

A-B walked towards home for 40 min, travelled 1.5 km at a steady pace (straight line)

B-C took a 20 min break (distance didn't change)

C-D walked away from home for 10 min, travelled 0.5 km at a steady pace (faster than from A-B)

D-E walked the rest of the way home; took 50 min to travel 2 km; started quickly and slowed down as he got close to home

(steeper line → faster speed, flatter/shallower line → slower speed)

2. Look at the section of the graph from zero to forty minutes. At what speed (in m/s) is Rowan walking?

distance: 1.5 km × 1000 = 1500 m

time: 40 min × 60 = 2400 s

$$\text{Speed} = \frac{\text{distance}}{\text{time}}$$

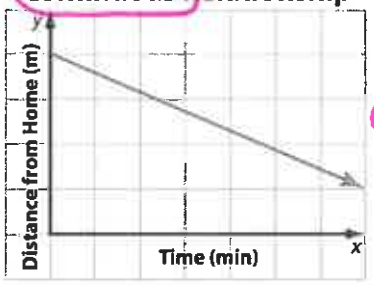
$$= \frac{1500}{2400}$$

$$= 0.625 \text{ m/s}$$

Develop Understanding

On a graph, points in a **continuous** relationship are joined with a straight line or curve. A line continues on if there are arrows on the ends of the line. With **discrete** relationships, the points may not be connected.

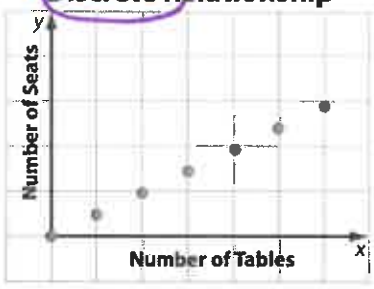
Continuous Relationship



things we measure (all of the values make sense)

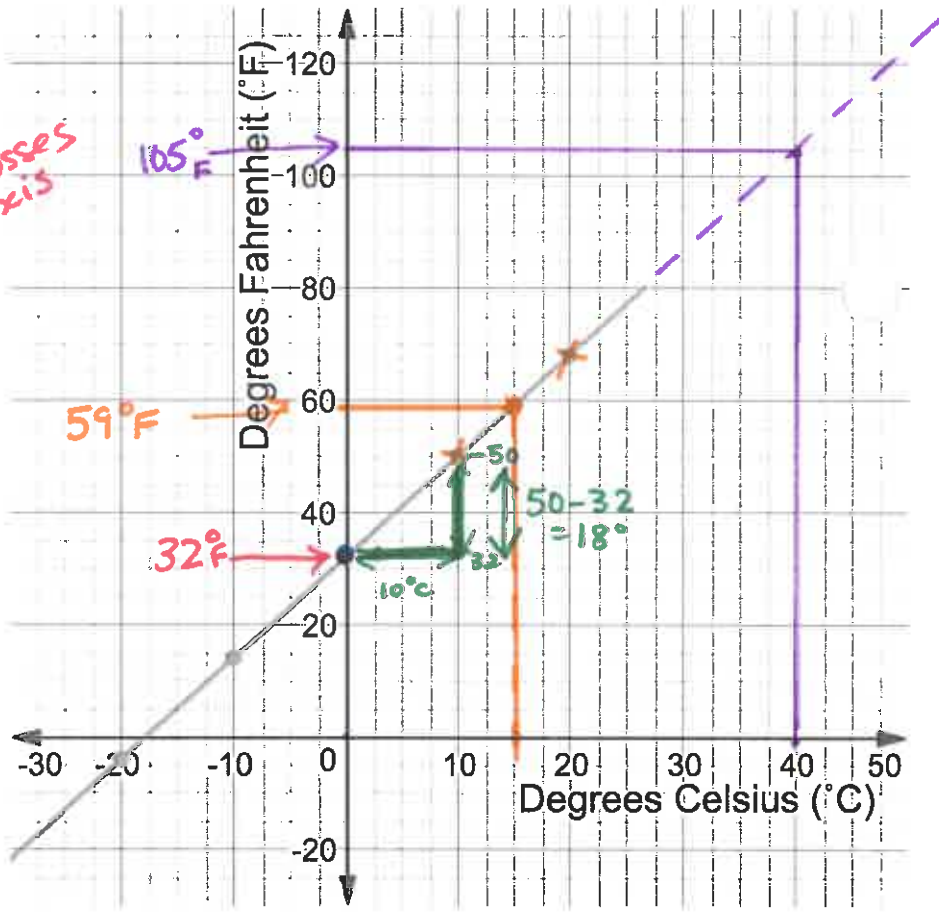
things we count (not all values make sense)

Discrete Relationship



Example 1: Use Interpolation and Extrapolation to Analyze a Graph

The graph shows the equivalent temperature in degrees Fahrenheit to the temperature in degrees Celsius.



a) What is the freezing point of water in degrees Fahrenheit?

0°C

32°F (y-intercept) where our graph crosses the y-axis

b) Describe the relationship between degrees Fahrenheit and degrees Celsius.

- linear relationship (continuous)

every increase in 10°C is an increase in 18°F

c) A weather report predicts a high of 15 °C. How could you use the graph to find the equivalent temperature in Fahrenheit?

about 59°F

INTERPOLATE (estimate between known values)

"inside" our data points

d) Extend the graph to determine the Fahrenheit equivalent to 40 °C

about 105°F

EXTRAPOLATE (estimating beyond known values)

extend the line

Example 2: Interpolating and Extrapolating Data

The table of values shows the height and velocity of a football after it is kicked until the moment it is caught.

x x y y

Time (s)	Height (m)	Velocity (m/s)
0.0	1.0	12.0
0.4	5.0	8.1
0.8	7.5	4.2
1.2	8.3	0.3
1.6	7.7	-3.6
2.0	5.4	-7.5
2.4	1.6	-11.4

+0.4 ↓ -3.9 ↓

$\frac{-3.9}{0.4} = -9.75$

a) Plot height vs. time (done) and velocity vs. time on separate grids.

b) Describe the pattern and type of relationship in each graph.

Height (non-linear) → started at 1.0m, increased to a maximum, then decreased

Velocity (linear) → started at 12 m/s then decreased at a consistent rate. (-9.75 m/s/s)

c) Estimate the height and velocity of the football after 1.0 s.

height ≈ 8.0 or 8.1 m

INTERPOLATE (see graphs)

velocity ≈ 2.2 m/s

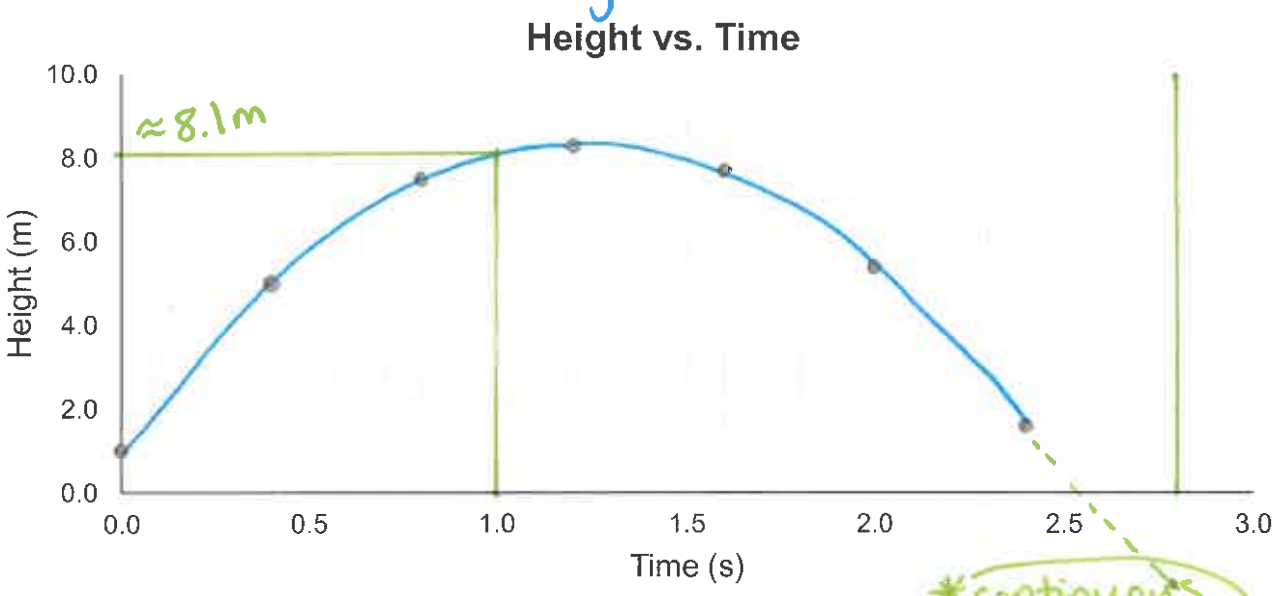
d) Would it be accurate to extrapolate either the distance or velocity to a time of 2.8 s? Explain.

Extend curve/line.

No → 2.8s is after the ball is caught

(relationships have changed. it does not make sense to extend our graphs beyond 2.4s) ← when ball is caught

y vs. x



*continuous relationship (join points)