NAME: _____

Math P.A.T. Prep

Graphing Linear Relations
Relations From Tables and Graphs
Interpreting Linear Relation Graphs - **SOLUTIONS**
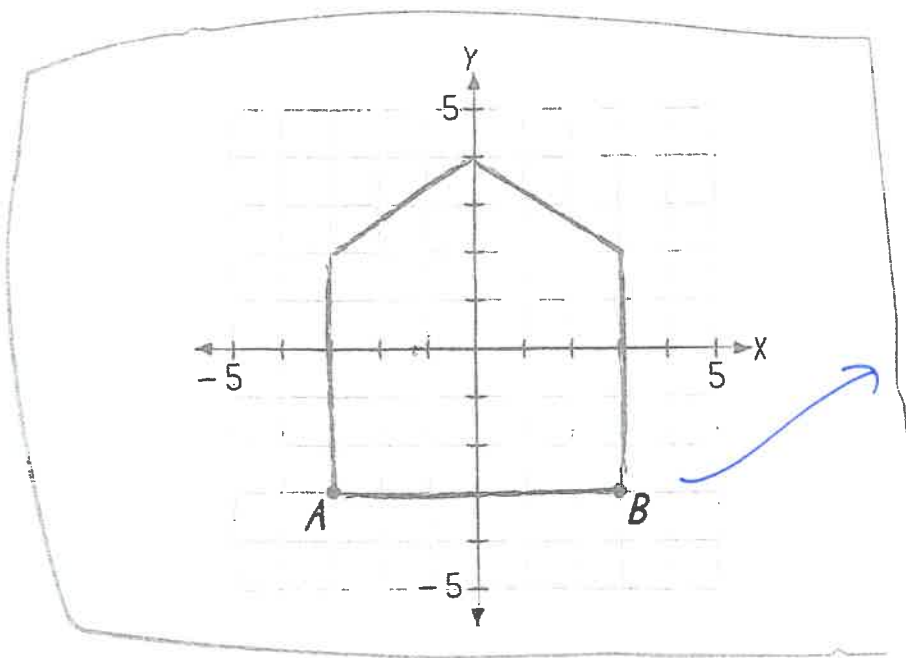

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GRAPHING LINEAR RELATIONS.

- EQUATION WITH **TWO** VARIABLES $\rightarrow$ $y = 2x + 4$

GRAPH

OBLIQUE / DIAGONAL

- EQUATION $x = 2$ (1 Variable) $\rightarrow$ Vertical line at $x = 2$

- EQUATION $y = 4$ $\rightarrow$ Horizontal at $y = 4$

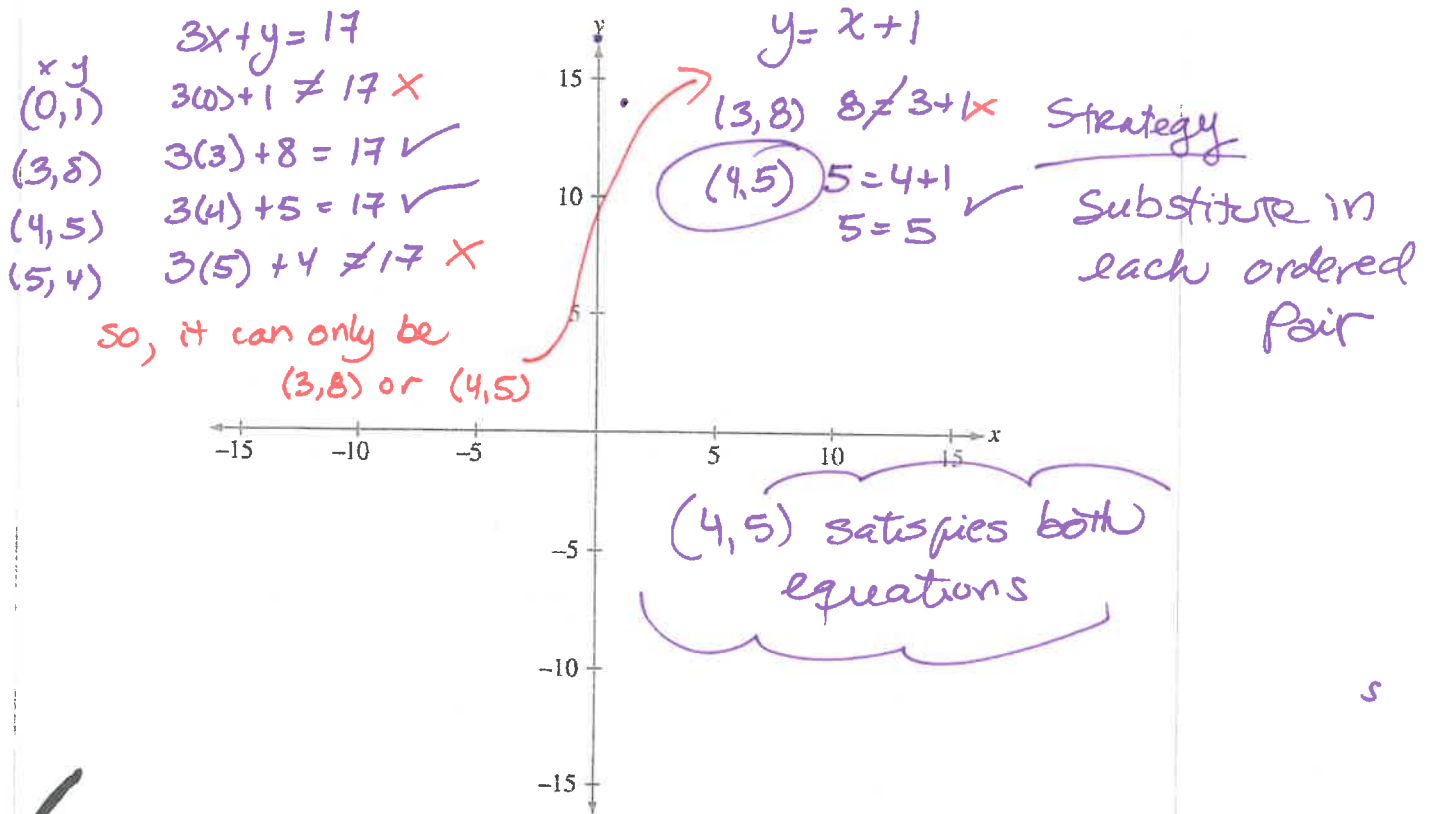✓ Carly drew a design on the Cartesian plane shown below.

$\overline{AB}$ crosses the y-axis at -3

$y = -3$

A. $y = -3$
B. $y = 3$
C. $x = -3$
D. $x = 3$

33. Which of the following equations describes line segment AB on the Cartesian plane shown above?

When Given an Equation and NO GRAPH → MAKE A TABLE OF VALUES

$3x + y = 17$

x	y
(0, 1)	$3(0) + 1 \neq 17$ ✗
(3, 8)	$3(3) + 8 = 17$ ✓
(4, 5)	$3(4) + 5 = 17$ ✓
(5, 4)	$3(5) + 4 \neq 17$ ✗

so, it can only be (3, 8) or (4, 5)

$y = x + 1$

(3, 8) $8 \neq 3 + 1$ ✗

(4, 5) $5 = 4 + 1$ ✓
$5 = 5$

Strategy
Substitute in each ordered pair

(4, 5) satisfies both equations

24. The graphs of the relations $3x + y = 17$ and $y = x + 1$ intersect at the point with the coordinates

- A. (0, 1)
- B. (3, 8)
- C. (4, 5)
- D. (5, 4)

UNLESS TOLD OTHERWISE, USE $x = 0, 1, 2, 3$

For $3x + y = 17$

x	y
0	17
1	14
2	
3	

For $y = x + 1$

x	y
0	
1	
2	
3	

Relations From Tables

Strategy 1 (Easiest)

- Choose an ordered pair on the table
- Substitute these values on each of the answers.
- Only one, the Right one will match!

✓ Raj saves a part of his earnings each week. He uses the pattern below to decide how much of his weekly earnings he will save.

	Weekly Earnings (e)	Weekly Savings (s)
1	$10	$7
2	$12	$8
3	$14	$9
4	$16	$10

11. Which of the following equations could represent the relationship between Raj's weekly savings, s, and his weekly earnings, e?

A. $s = e - 3$

B. $s = e - 6$

C. $s = 2.0(e-5) - 3$

D. $s = 0.5(e+10) - 3$

Try $(10, 7)$

$7 = (0.5)(10+10) - 3$ ✓

$7 = 7$

$(12, 8)$

$8 = (0.5)(12+10) - 3$

$8 = 11 - 3$

$8 = 8$ ✓

Strategy 2

- Notice that s goes up by 1.
- Using first pair
  from 10 to 7 = −3
- Second term is −3

Try Strategy 1

Pair 1   e=10   s=7

A. $7 = 10 - 3$ ✓

B. $7 = 10 - 6$ ✗

C. $7 = 2(10-5) - ?$

D. $7 = 0.5(10+10) \cdot$
   $7 = 0.5(20) -$
   $7 = 7$ ✓

So it's A, C, D

Pair 2
   e=12   s=8

A. $8 = 12 - 3$ ✗

C. $8 = 2(12-5) -$
   $8 = 2(7) - 3$

D. $8 = 0.5(22) \cdot$
   $8 = 11 - 3$
   $8 = 8$

Since 2 pairs fit, this must be

David creates the table of values shown below based on designs he assembles using black and white 2-D shapes.

Number of Black Shapes (b)	Number of White Shapes (w)
2	7
3	9
4	11

+2 → 1st term is 2b

• 2(2) + 3 = 7

25. Which of the following equations represents the linear relationship between the number of black shapes and the number of white shapes?

Try 2(2) + 3 = 7 ✓   Substitute

- A. $5b - 3 = w$
- B. $4b - 1 = w$
- C. $3b + 1 = w$
- **D. $2b + 3 = w$**

An art store is having a sale. The table below shows the regular price, r, and the sale price, s, of several items.

Item	Regular Price (r)	Sale Price (s)
Glue	$5.00	$4.25
Brushes	$7.00	$5.95
Paper	$10.00	$8.50
Crayons	$12.00	$10.20

6 → 0.85r

11. Which of the following equations was used to calculate the sale prices?

Try (5, 4.25)
4.25 = 0.85(5) ✓
(7, 5.95)
5.95 = 0.85(7) ✓

- A. $s = 0.15r$
- **B. $s = 0.85r$**
- C. $s = r - 0.75$
- D. $s = r - 0.85$

Members of a recreation centre pay a one-time registration fee in addition to a fixed monthly fee of $15. The following table shows the total amount paid to be a member of the centre for a certain number of months.

Number of Months	Total Amount Paid
4	$135
6	$165
12	$255

20 $ increase means 10 $ per month

$40 for 4 months

6m) 15×6 = 90
165 - 90 = 75

$15m → 4 months
4$60

4m) 135 - 60 = 75/

Numerical Response

1. According to the information above, what is the cost of the one-time registration fee?

Answer: **75** dollars

(Record your answer in the numerical-response section on the answer sheet.)
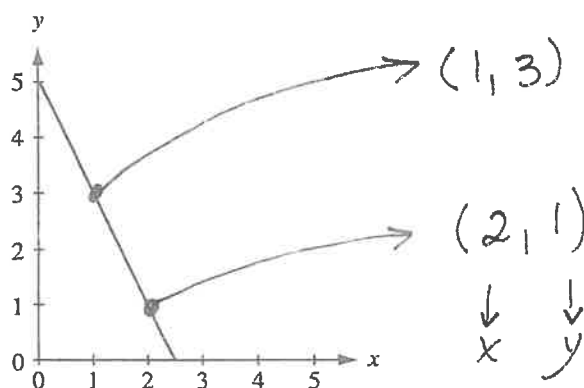
RELATIONS FROM GRAPHS

STRATEGY :
- FROM THE graph, choose 2 ordered pairs
- Substitute on each possible answer given

NOTE
Use the pairs that are the easiest to see

→ (1, 3)

(2, 1)

↓   ↓
x   y

36. Which of the following equations represents the relationship between the variables x and y in the graph shown above?

A. $y = 5 - 2x$

B. $y = 2x - 5$

C. $y = 5 - x$

D. $y = x - 5$

sub

$3 = 5 - 2(1)$ ✓

$3 = 2(1) - 5 = -3$ ✗ ⟹

$3 = 5 - 1$ ✗

$3 = 1 - 5$ ✗

Since $y = 5 - 2x$ worked, use (2, 1)

$1 = 5 - 2(2)$ ✓

It checks!

So far, Ⓐ is the only possible solution

- Find easy to find ordered pairs
- Substitute

(2, 3)

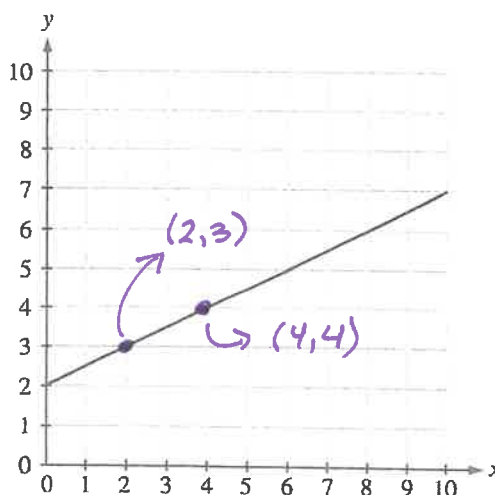A. $3 = (0.5)2 + 2$ ✓

B. $3 = (0.5)2 - 2 ⟹ 3 ≠ -1$ ✗

C. $3 = 2(2) + 4 ⟹ 3 ≠ 8$ ✗

D. $3 = 2(2) - 4 ⟹ 3 ≠ 0$ ✗

(2, 3)

(4, 4)

A. $y = 0.5x + 2$

B. $y = 0.5x - 2$

C. $y = 2x + 4$
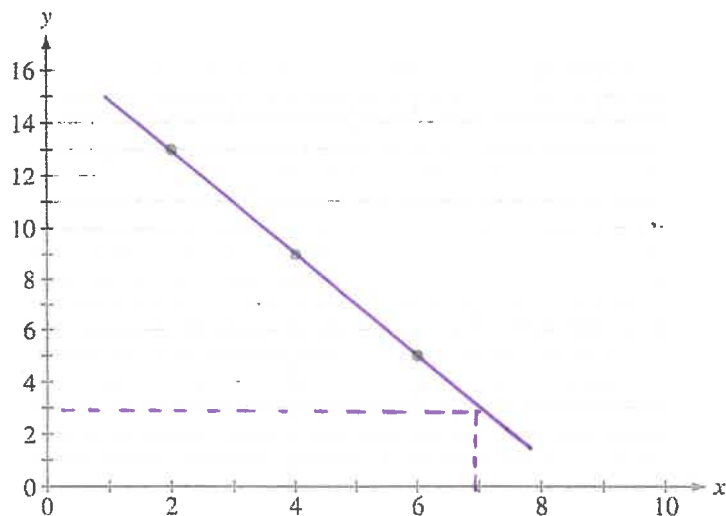
D. $y = 2x - 4$

(4, 4)

A. $4 = (0.5)4 + 2$

$4 = 4$ ✓

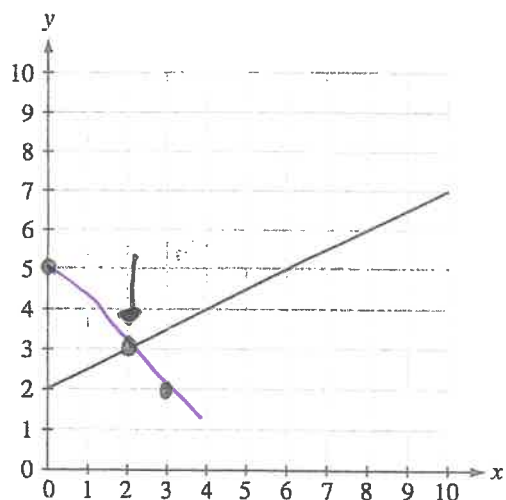**38.** The equation representing the linear relation on the graph shown above is

SO $y = 0.5x + 2$

The following graph represents a linear relation.

Use the graph (Interpolate)

2. Based on the linear relation shown above, when the y-coordinate is 3, the x-coordinate is ___7___.

Make a table

30. The line created by the relation $y = 5 - x$ will intersect the line shown on the graph above at

x	y
0	5
2	3
3	2

A. (0, 5)
B. (5, 0)
C. (2, 3)
D. (3, 2)

try each of the ordered pairs given.

SOMETIMES ... MAKING A TABLE IS THE WAY TO go!

Nathan completed a 5 km run on his first day of training for a cross-country race. He increased the length of his next training runs by 1.5 km each time.

21. Which of the following equations could be used to determine the distance (d) that Nathan ran on each training run (r)?

A. $d = 1.5r$

B. $d = 5r$

C. $d = 1.5 + 3.5r$

D. $d = 3.5 + 1.5r$
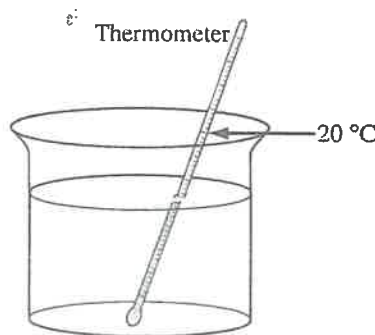
STRATEGY : MAKE IT EASIER FOR yourself and start with 1

Day 1 — 5 km
Run 2 — 6.5 km → Now try substitution
Run 3 — 8 km

Try Run 3
D. d = 3.5 + 1.5r
8 = 3.5 + 1.5(3)
8 = 3.5 + 4.5 ⟹ 8 = 8

A. 5 = 1.5(1) ✗
B. 6.5 = 5(2) ✗
C. 6.5 = 1.5 + 3.5(2)
D. 6.5 = 3.5 + 1.5(2) ✓

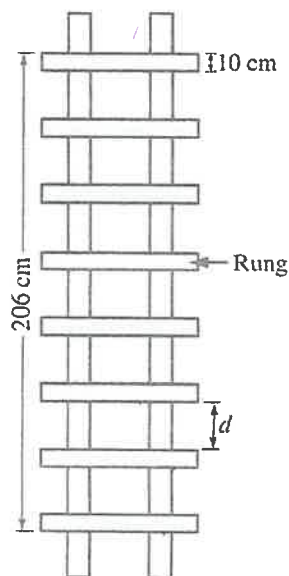In a science experiment, a solution has an initial temperature of 20 °C, as shown below.

Thermometer

—20 °C

35. If the temperature, T, of the solution drops 2.8 °C/h, then which of the following equations can be used to calculate the temperature of the solution after 4 hours?

A. $T = 20 \,°C - (2.8 \,°C/h \times 4 \,h)$

B. $T = 20 \,°C + (2.8 \,°C/h \times 4 \,h)$

C. $T = (20 \,°C - 2.8 \,°C/h) \times 4 \,h$

D. $T = (20 \,°C + 2.8 \,°C/h) \times 4 \,h$

A ladder with equally spaced rungs is shown below.

* d represents distance between rungs

Which of the following equations can be used to calculate the distance, d, between each ladder rung?

A. $d = 206 - 8(10) \div 7$

B. $d = 206 - 8(10) \times 7$

C. $d = \dfrac{7}{206 - 8(10)}$

D. $d = \dfrac{206 - 8(10)}{7}$

(handwritten annotations:) 206 total ⎱ whatever is left is minus 8(10) Rungs ⎰ the total distance filled by d, which are 7

So distance left / 7

(D is circled)

A truck heads north at a constant speed of 80 km/h. A car leaves 20 minutes later heading north along the same road and travelling at a constant speed of 90 km/h.

2. Which of the following equations could be used to determine how much time in hours, t, the car travels until it catches up to the truck?

A. $90t = 80\left(t - \dfrac{1}{3}\right)$

B. $90t = 80\left(t + \dfrac{1}{3}\right)$

C. $90t = 80(t - 20)$

D. $90t = 80(t + 20)$

(handwritten annotations:) $\frac{1}{3}$ h Represents 20 minutes

• Looking for when 90t is equal to 80t − 20 min ↓ $\frac{1}{3}$ h

(A is circled)

INTERPRETING LINEAR REL. GRAPHS

The cost of renting a car includes the base fee and a charge for each kilometre driven. The graph below represents the total cost of renting a vehicle at four different rental car companies.

Cost of a Rental Car
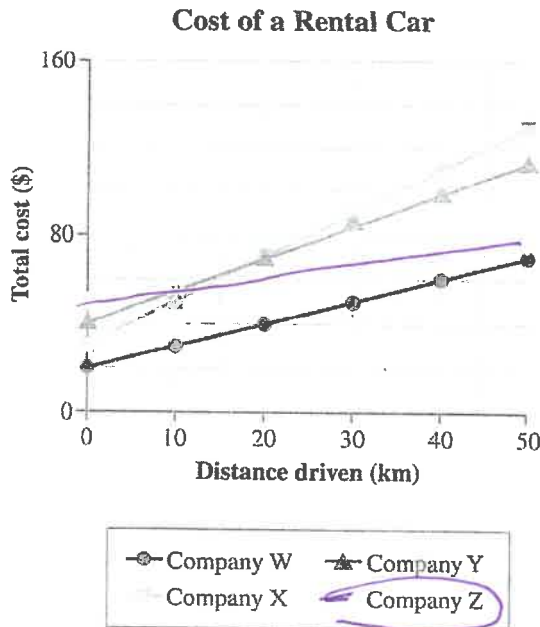
Company Z covers the same distance), but the increase or change in price is the least steep

Legend:
- Company W
- Company X
- Company Y
- Company Z

13. Which rental car company has the smallest charge for each kilometre driven?

   A. Company W
   B. Company X
   C. Company Y
   D. Company Z

Various points have been plotted on the graph below. The title of the graph and the labels of the axes have been omitted.

$ Price

 # cards
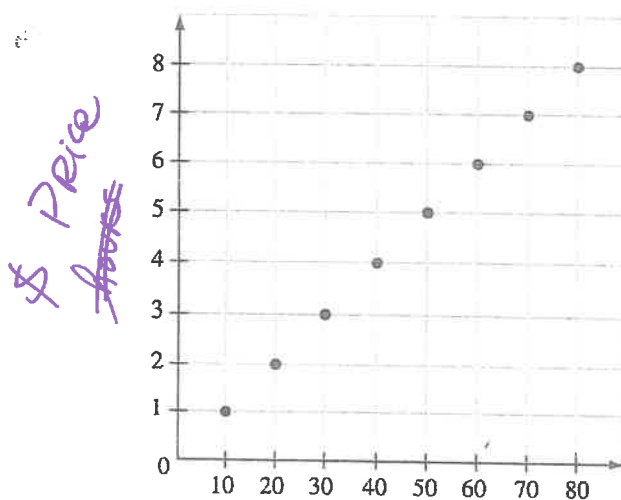
33. Which of the following statements is a possible interpretation of the graph above?

   A. Nicole earns $20 for each hour she works.   *No she earns 10*
   B. For every 10 swimmers, 2 lifeguards are needed.   *NO, 1 is needed*
   C. For every 10 pieces of candy Simone buys, she pays $1.   *yes)*
   D. ~~A runner runs at a constant speed of 2 Km every 30 minutes~~