

Lesson 2 Graphing Relations

November 14, 2018 3:46 PM

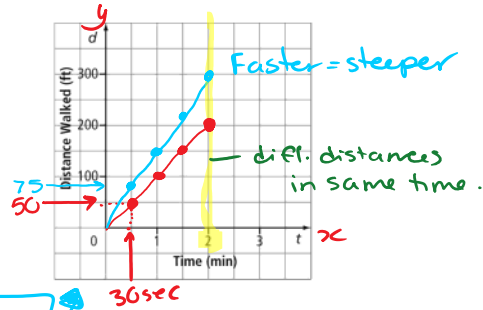
2) RELATIONS & FUNCTIONS: GRAPHING RELATIONS

Warm-Up #1: You are walking to school at a rate of 100 ft/min.

- a) Copy and complete the table of values for this scenario.
- b) Graph your data on the grid below.

| Time, t (s) | Distance Walked, d (ft) |
|---------------|---------------------------|
| 30 | 50 |
| 60 | 100 |
| 90 | 150 |
| 120 | 200 |

Handwritten notes: x and y axes labeled above the table. A red arrow points to the 60s mark with the text "1 min".



Warm-Up #2: You are walking to school at a rate of 150 ft/min.

- a) Copy and complete the table of values for this scenario.
- b) On the same grid as warm-up #1, graph the new walking data in a different colour.

| Time, t (s) | Distance Walked, d (ft) |
|---------------|---------------------------|
| 30 | 75 |
| 60 | 150 |
| 90 | 225 |
| 120 | 300 |

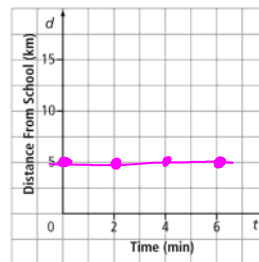
Handwritten notes: x and y axes labeled above the table. A blue arrow points to the 60s mark with the text "1 min". To the right of the table, a bracket groups the values 75, 150, 225, and 300 with the text "75" and "75".

Warm-Up #3: You live 5 km from school. You sleep in for the first 10 min of class.

- a) Complete the table of values for this scenario.
- b) Graph your data on the grid below.

| Time (min), t | Distance From School, d (km) |
|-----------------|--------------------------------|
| 0 | 5 |
| 2 | 5 |
| 4 | 5 |
| 6 | 5 |
| 7 | 5 |
| 8 | 5 |
| 9 | 5 |
| 10 | 5 |

Handwritten notes: A green bracket on the left side of the table covers the time values from 0 to 10, with the text "10 min of class ... still sleeping". A pink bracket on the right side covers the distance values, with the text "have not moved.".



What is a Relation??

| | |
|------------|---|
| "Relation" | The relationship between two groups of numbers (variable) |
|------------|---|

Relations can be Represented in Many Ways:

- In Words: *for every x-value, there are 3 times as many y-values.*
- A Table of Values:

| x | y |
|----|----|
| -3 | -9 |
| -2 | -6 |
| -1 | -3 |
| 0 | 0 |
| 1 | 3 |
| 2 | 6 |
| 3 | 9 |

- A Set of Ordered Pairs: (x, y) $(-3, -9)$ $(-2, -6)$ $(-1, -3)$ $(0, 0)$ $(1, 3)$ $(2, 6)$ $(3, 9)$
- An Equation: $y = 3x$

- A Graph: *continuous, line, not a line segment*

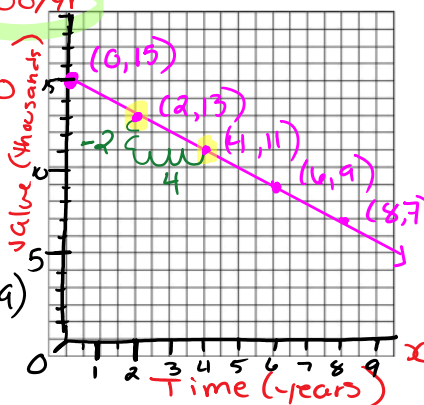
Cartesian Plane

Example 1: The value of a car depreciates with each year. Using the information from the table of values, present the relation in each of the other ways.

| Time (years) | Value (thousands of dollars) |
|--------------|------------------------------|
| 0 | 15 |
| 2 | 13 |
| 4 | 11 |
| 6 | 9 |
| 8 | 7 |

(coordinates)
Ordered Pairs: $(0, 15)$ $(2, 13)$ $(4, 11)$ $(6, 9)$ $(8, 7)$

Equation: $y = -\frac{1}{2}x + 15$



$y = mx + b$
 slope (rate of change) $= -1000/yr = -1/yr$
 y-intercept $= 15$ (\$15000)
 $-slope = \frac{rise}{run} = \frac{-2}{4} = -\frac{1}{2}$

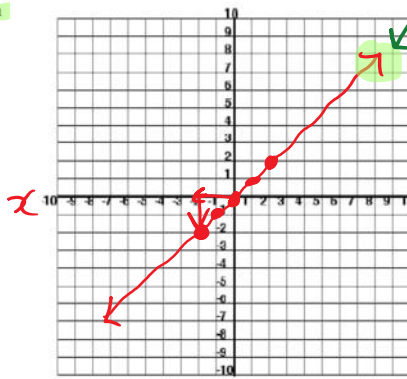
Words: *The value of a car decreases at a rate of \$1000 /yr where the initial cost is \$15000*

Example 2: Using a table of values, plot the relation described by $y = x$.

$y = (-2)$

sub-in x values + solve
 \Rightarrow negative
 \Rightarrow zero
 \Rightarrow positive

| x | y |
|----|----|
| -2 | -2 |
| -1 | -1 |
| 0 | 0 |
| 1 | 1 |
| 2 | 2 |



arrows show a continuous LINE
 \neq line segment (part)

Example 3: Using a table of values, plot the relation described by $y = 3x - 4$.

$y = 3(-2) - 4 = -6 - 4 = -10$

$y = 3(-1) - 4 = -3 - 4 = -7$

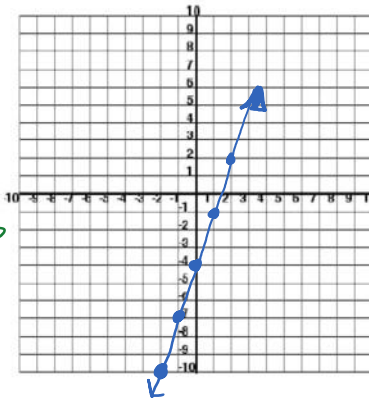
$y = 3(0) - 4 = -4$

$y = 3(1) - 4 = -1$

$y = 3(2) - 4 = 2$

where $x=0$ on the y-axis

| x | y |
|----|-----|
| -2 | -10 |
| -1 | -7 |
| 0 | -4 |
| 1 | -1 |
| 2 | 2 |



Example 4: Using a table of values, plot the relation described by $y = -\frac{3}{2}x$.

use multiple of 2 to cancel fraction

$y = -\frac{3}{2}(\quad)$

$y = -\frac{3}{2}(4) = \frac{-12}{2} = -6$

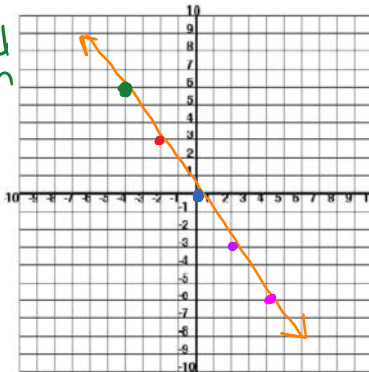
$y = -\frac{3}{2}(-2) = \frac{6}{2} = 3$

$y = -\frac{3}{2}(0) = 0$

$y = -\frac{3}{2}(2) = \frac{-6}{2} = -3$

$y = -\frac{3}{2}(4) = \frac{-12}{2} = -6$

| x | y |
|----|----|
| -4 | 6 |
| -2 | 3 |
| 0 | 0 |
| 2 | -3 |
| 4 | -6 |



ASSIGNMENT # 2
 pages 6-12 Questions #8-35

What is a relation?

Definition 1:

If two groups of items are related, the set of all possible pairings is called a **relation**.

For example:

- A person's height and their arm span.
- Distance travelled and driving time.
- Exam score and study time.

Definition 2:

A **relation** is the set of ordered pairs that connects two sets.

Definition 3:

- 7. Write your own...

Domain:

The set of first items in a relation.

Range:

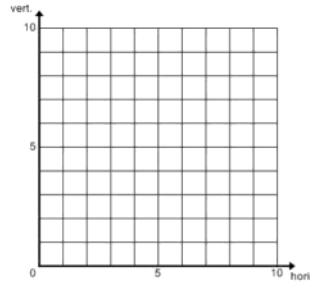
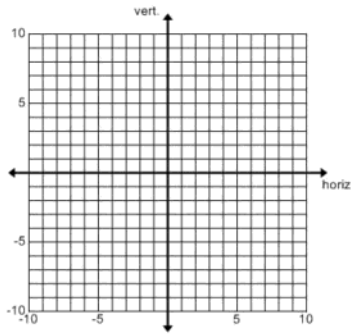
The set of second items in a relation.

Some notes here (possibly)...

Graphing Relations on a Coordinate Plane

Below are two examples of the Coordinate Plane

8. The vertical line with numbers on it is called the _____
9. The horizontal line with numbers on it is called the _____



10. What is the difference between each of the graphs shown above?

.....

11. Describe a scenario where it is more appropriate to use the graph on the right.

.....

12. Describe a scenario where it is more appropriate to use the graph on the left.

.....

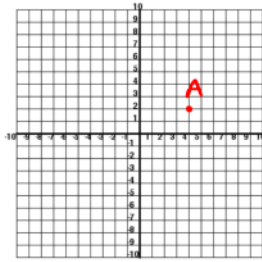
13. How could you describe to another student where to plot a point on the plane? For example: (2, 5)

.....

14. Plot and label the following ordered pairs on each of the grids above (whenever possible):
A(1,2), B(-3,5), C(10, 4), D(-3, -7), E(8, -2)

Coordinate Geometry (Cartesian Coordinate Geometry)

Based on the *coordinate plane*.



The coordinate plane has two **axes**.

The vertical ***y-axis***.

The horizontal ***x-axis***.

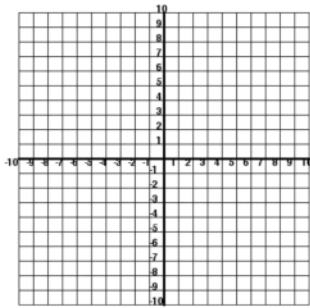
The point where the axes meet is called the ***origin***.

Every point on the plane can be located using two numbers called ***coordinates*** or an ***ordered pair***.

The ordered pair is always given as (x, y) . The coordinates of the origin are $(0, 0)$.

Example: Point A has coordinates $(4, 2)$.
4 is an ***element*** of the domain. 2 is an ***element*** of the range.

15. Challenge Question:
Using the graph below, plot the relation described by the equation $y = 2x$.



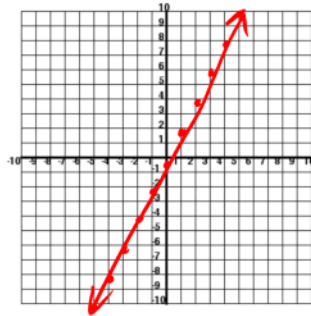
Graphing relations using a *Table of Values*.

Using the graph below, plot the relation described by the equation $y = 2x$.

| $y = 2x$ | |
|----------|----|
| x | y |
| -2 | -4 |
| -1 | -2 |
| 0 | 0 |
| 1 | 2 |
| 2 | 4 |

A Table of Values:
Choose a few reasonable input values (x), then calculate output values (y).

This produces some ordered pairs to plot our relation.

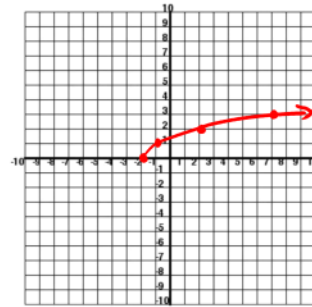


17. Are there any input values that would not make sense? Are there any that are "not permitted"?

Using the graph below, plot the relation described by the equation $y = \sqrt{x + 2}$.

| $y = \sqrt{x + 2}$ | |
|--------------------|---|
| x | y |
| -2 | 0 |
| -1 | 1 |
| 2 | 2 |
| 7 | 3 |

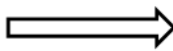
Can you see why I chose these particular input (x) values?



18. Are there any input values that would not make sense? Are there any that are "not permitted"?

19. Consider your answers to the previous two questions. What effect do "not permitted" input values have on the graph of the relation?

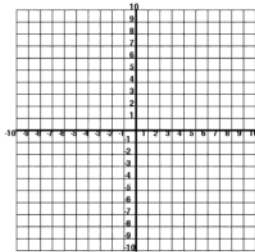
When creating a table of values, you should consider:



- Positive Inputs (domain)
- Negative Inputs (domain)
- Zeros
- Non-permitted input values

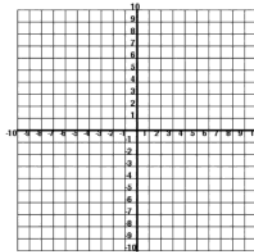
Graphing Relations continued...

20. Using the table and graph below, plot the relation described by the equation $y = 3x$.



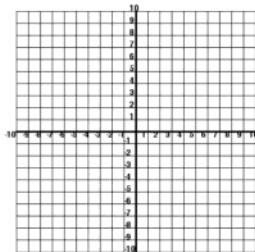
| $y = 3x.$ | |
|-----------|---|
| x | y |
| | |
| | |
| | |
| | |
| | |

21. Using the table and graph below, plot the relation described by the equation $y = x + 2$.



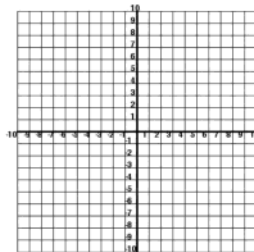
| $y = x + 2.$ | |
|--------------|---|
| x | y |
| | |
| | |
| | |
| | |
| | |

24. Using the table and graph below, plot the relation described by the equation $y = 3 - x$.



| $y = 3 - x$ | |
|-------------|---|
| x | y |
| | |
| | |
| | |
| | |
| | |

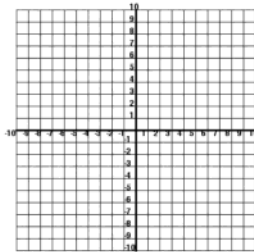
25. Using the table and graph below, plot the relation described by the equation $y = 2x + 1$.



| $y = 2x + 1$ | |
|--------------|---|
| x | y |
| | |
| | |
| | |
| | |
| | |

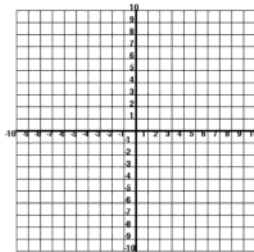
Graphing Relations continued...

26. Using the table and graph below, plot the relation described by the equation $y = x^2$.



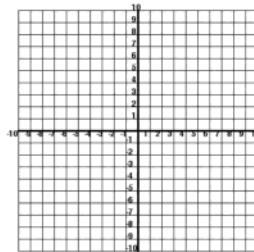
| $y = x^2$ | |
|-----------|---|
| x | y |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

30. Using the table and graph below, plot the relation described by the equation $y = -2x - 1$.



| $y = -2x - 1$ | |
|---------------|---|
| x | y |
| | |
| | |
| | |
| | |
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| | |
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| | |
| | |

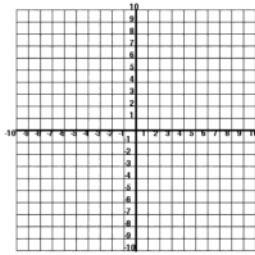
31. Using the table and graph below, plot the relation described by the equation $y = \frac{3}{2}x$.



| $y = \frac{3}{2}x$ | |
|--------------------|---|
| x | y |
| | |
| | |
| | |
| | |
| | |
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| | |
| | |

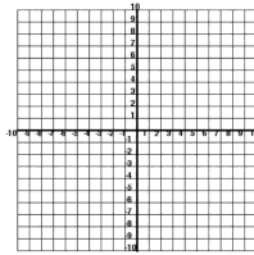
Graphing Relations continued...

32. Using the table and graph below, plot the relation described by the equation $y = 1 - 2x$.



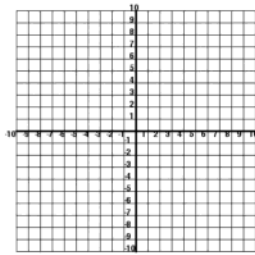
| $y = 1 - 2x$ | |
|--------------|---|
| x | y |
| | |
| | |
| | |
| | |
| | |

33. Using the table and graph below, plot the relation described by the equation $y = x$.



| $y = x$ | |
|---------|---|
| x | y |
| | |
| | |
| | |
| | |
| | |

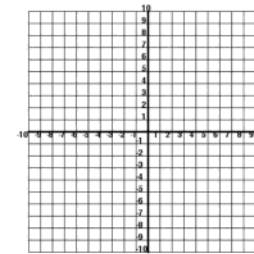
34. Using the table and graph below, plot the relation described by the equation $x = 2y$.



| $x = 2y$ | |
|----------|---|
| x | y |
| | |
| | |
| | |
| | |
| | |

35. ****CHALLENGE**** Using the table and graph below, plot the relation described by the equation $y = |x|$

(where x is an absolute value, meaning the magnitude of a real number without regard to its sign)



| $y = x $ | |
|-----------|---|
| x | y |
| | |
| | |
| | |
| | |
| | |