Date: KEY

9.3 Linear Relationships

Evaluate each expression if $x = 3$

a) $5x$ $= 5(3)$ $= 15$

b) $x + 10$ $= (3) + 10$ $= 13$

c) $4x - 1$ $= 4(3) - 1$ $= 12 - 1$ $= 11$

Is the following relationship linear? Explain how you know.

1 x 3	5	6	7	9	11
3 y 7	11	13	15	19	23

+2, +2, +2 / +4, +4, +4 / -1, -2 / -2, -4

Yes

$\frac{4}{2} = \frac{4}{2} = \frac{4}{2} = 2$

Write an expression for this table.

RATE OF CHANGE $y = 2x + 1$ STARTING VALUE

$y = 2x + 1$

What would y be if x was 15?

$y = 2x + 1$
$= 2(15) + 1$
$y = 30 + 1$
$y = 31$

Graphing a Formula

The speed of sound is 300m per second. This is expressed using the formula:

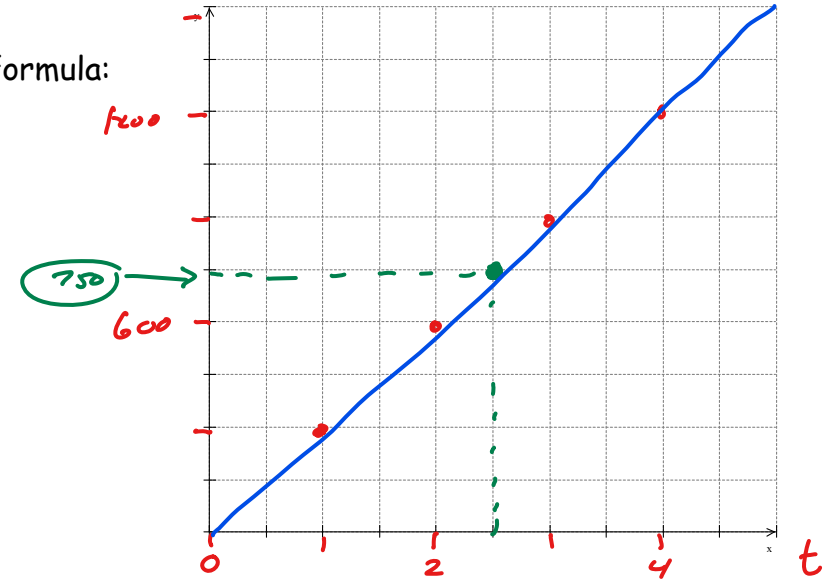
$$d = 300t$$

where d is the distance in meters and t is the time in seconds.

Construct a table of values for this formula:

t	1	2	3	4
d	300	600	900	1200

Considerations:



Use your table to draw the graph.

Could you make a prediction for how far the sound travels in 2.5 seconds?

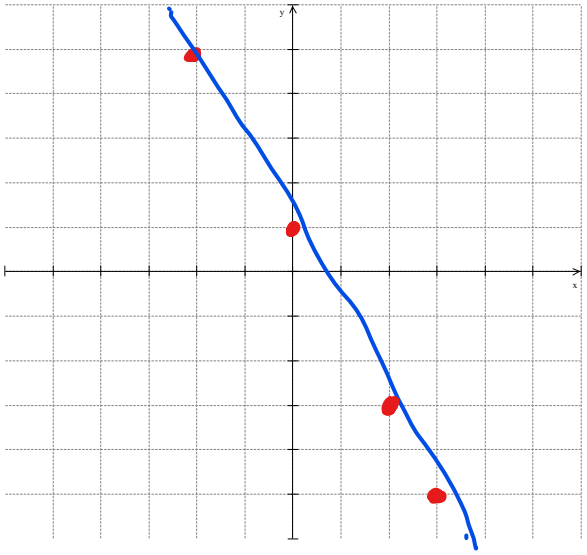
750m

Graphing a Relationship using Integers

Sometimes, you may use integers instead of whole numbers:

Use the linear equation $y = -2x + 1$ to make a table and construct a graph

x	0	3	-3	-2	2
y	1	-5	7	5	-3



$y = -2(3) + 1$
$-6 + 1$
$\boxed{-5}$

$y = -2(-3) + 1$
$= 6 + 1$
$= \boxed{7}$

$y = -2(-2) + 1$
$= 4 + 1$
$= \boxed{5}$

$y = -2x + 1$
$= -2(2) + 1$
$= -4 + 1$
$y = -3$

Considerations:

What number should I use for x?

How many numbers should I pick?

↳ strictly speaking, you only need 2, however, use 3 to avoid mistakes

Use your relationship to determine the missing number in (4 , y)

$y = -2x + 1$
$= -2(4) + 1$

$y = -8 + 1$
$\boxed{y = -7}$

Summary

A formula is: an equation relating two (or more) variables.

A graph can be made from a formula or relationship by:

constructing a table of values

Translating Algebraic Phrases:

A number decreased by ninety-two	$n - 92$
The sum of eighty-nine and a number	$89 + n$
A number added to thirty-six	$36 + n$
The sum of a number and twenty-six	$n + 26$
The difference between forty-six and a number	$46 - n$
The product of forty-three and a number	$43n$
The quotient of twenty and a number	$20 \div n$
A number increased by sixty-five	$n + 65$
The product of seventy and a number	$70n$
A number decreased by eighteen	$n - 18$
Fifty-five times a number	$55n$
Twice a number	$2n$
Sixty-five more than a number	$n + 65$
Seventy-five less than a number	$n - 75$
A number less than seventy-five	$75 - n$
One third of a number	$\frac{1}{3}n$
Three times a number	$3n$
The quotient of a number and twelve	$n \div 12$

1) Given $y = 3x - 6$, solve for y when

x = -2

$y = 3(-2) - 6$

$= -6 - 6$

$y = -12$

x = 0

$y = 3(0) - 6$

$= 0 - 6$

$y = -6$

x = 2

$y = 3(2) - 6$

$= 6 - 6$

$y = 0$

2) Given $d = 15t$, solve for t when

d = 10

$\frac{(10)}{15} = \frac{15t}{15}$

$\frac{2}{3} = t$

d = 20

$\frac{(20)}{15} = \frac{15t}{15}$

$\frac{4}{3} = t$

d = 30

$\frac{(30)}{15} = \frac{15t}{15}$

$2 = t$

3) If the equation is $y = -4x + 2$, the value for y in (-1, y) is 6

$y = -4x + 2$

$y = -4(-1) + 2$

$= 4 + 2$

$y = 6$