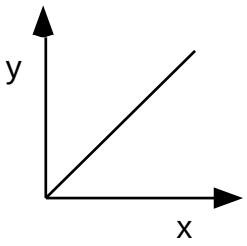
Proportional Reasoning "Walk " Version 2

Direct Proportionality **y = 3 x**



x	3x	y
1	3	3
2	6	6
3	9	9
4	12	12

As x increases, y increases proportionally.

Y is directly proportional to x because when x = 0, y = 0.

1) IF you double X, (X = 1 to X = 2) by what factor does Y change? **by 2 since Y changed from 3 to 6**

Multiplicative Change Factors: X by __2____ Y by ____2_____

2) If you triple X , (X = 1 to X = 3) by what factor does Y change?

Change Factors: X by _____ Y by _____

3) If you quadruple X , (X = 1 to X = 4) by what factor does Y change?

Change Factors: X by _____ Y by _____

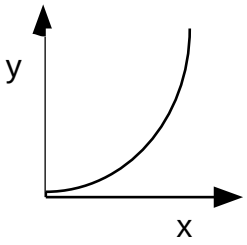
4) For this Data, is Y proportional to X ? If so, by what factor? _____

This factor is called the constant of proportionality.

Hint: If you graph ___Y_____ vs _____X____, how can you obtain the proportionality constant mathematically? Compute the _____ of the line whose formula is ΔY/ΔX.

KEY IDEA: 1,2, and 3 illustrate linear proportionality, as you change X, Y changes the same way. Do you realize that the "linear" equation is Y = 3 X where Y is on the vertical axis and X is on the horizontal axis? That's a straight line and straight lines are easy to analyze!

Squared Proportionality



Y is proportional to the square of x.

x	$Y = 3x^2$		X^2	$Y = 3x^2$
1	3		1	3
2	12		4	12
3	27		9	27
4	48		16	48
5	75		25	75
6	108		36	108
7	147		49	147

1) IF you double X, (X = 1 to X = 2), by what factor does Y change?

Multiplicative Change Factors: X by _____ Y by _____

2) If you triple X , (X = 1 to X = 3) , by what factor does Y change?

Change Factors: X by _____ Y by _____

3) If you increase X^2 4 times (X^2 = 1 to X^2 = 4) by what factor does Y change?

Change Factors: X^2 by _____ Y by _____

4) If you increase X^2 9 times(X^2 = 1 to X^2 = 9) by what factor does Y change?

Change Factors: X^2 by _____ Y by _____

5) Which question set has the simpler pattern? Between questions 1 & 2 or between questions 3 & 4?

6) Based on the pattern, is Y proportional to X or is Y proportional to X^2 ? Why?

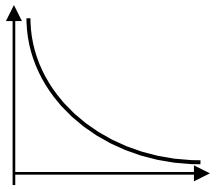
7) Using your choice from question (6), what is the value of the proportionality constant?

Hint: If you graph _____ vs _____, how can you obtain the constant mathematically?

KEY IDEA: Do you realize that the "linear" equation is $Y = 3X^2$ where Y is on the vertical axis and X^2 is on the horizontal axis. That's how one obtains a straight line from a curvy line. Beautiful!

Inverse Proportionality

Fill Time(hr)



HoseArea(cm)^2

As Hose Area increases, Fill time decreases.

Side Opening Parabola

Filling the Swimming Pool			
Hose Area Opening(cm)^2	Fill Time (hours)	1/Hose Area (cm)$^{-2}$	Fill Time (hours)
3	72	0.3333	72
18	12	0.0556	12
33	7	0.0303	7
48	4.5	0.0208	4.5
63	3.5	0.0159	3.5
108	2	0.0093	2

1) As the Hose Area increases from 3 cm^2 to 18 cm^2, by what factor does the Fill Time change?

Multiplicative Change Factors: Hose Area by ___6____ Fill Time by ___1/6_____

2) **As the Hose Area increases from 3 cm^2 to 48 cm^2**, by what factor does the Fill Time change?

Change Factors: Hose Area by _____ Fill Time by _____

3) **As the 1/Hose Area decreases from 0.3333 cm^{-2} to 0.0556 cm^{-2}** , by what factor does the Fill Time change?

Change Factors: 1/Hose Area by _____ Fill Time by _____

4) **As the 1/Hose Area decreases from 0.3333 cm^{-2} to 0.0208 cm^{-2}** , by what factor does the Fill Time change?

Change Factors: 1/Hose Area by _____ Fill Time by _____

5) Which is the simpler pattern, between questions 1 & 2 or between questions 3 & 4?

6) Is Fill Time proportional to Hose Area or is Fill Time proportional to 1/Hose Area?

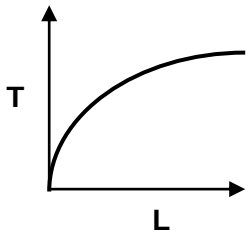
7) If you graph _____ vs _____, how can you obtain the constant mathematically?

8) Optional: Based on your answer to (6), what is the value of the constant of proportionality?

Optional: Write the "linear" equation for this relationship between Fill Time & Hose Area:

_____

Pendulum Period(T) vs Length(L)



L(cm)	T(s)	L(cm)	$T^2(s^2)$
1	2	1	4
5	4.47	5	19.98
10	6.32	10	39.94
20	8.90	20	79.21
40	12.6	40	158.8
80	17.9	80	320.4
120	21.9	120	480

1) As L changes by a factor of 5 from 1 cm to 5 cm, by what factor does T change?

Multiplicative Change Factors: L by _____ T by _____

2)) As L changes by a factor of 5 from 1 cm to 5 cm, by what factor does T^2 change?

Change Factors: L by _____ T^2 by _____

3) As L changes by a factor of 20 from 1 cm to 20 cm, by what factor does T change?

Change Factors: L by _____ T by _____

4) As L changes by a factor of 20 from 1 cm to 20 cm, by what factor does T^2 change?

Change Factors: L by _____ T^2 by _____

5) Based on your answers to the questions above, is T proportional to L or is T^2 proportional to L? Explain Why?

6) Based on your answer to (5), what is the value of the constant of proportionality?

7) If you graph _____ vs _____, how can you obtain the constant mathematically?

Optional: Write the "linear" equation for this relationship between T & L: _____