

Control and Experimental Variables



Variables in Experiments—Experiments demand control. If more than one variable changes at a time, the cause and effect is unclear.

Control Variables—the variables that you control (don't change) in an experiment. The control variables are all other variables than the experimental variable.

Example:
If you want to know how speed affects gas mileage, then speed is the only variable that should change. The car, tires, road, wind speed need to stay the same—be controlled. They are control variables.

Experimental Variable—the variable that you are studying (changing) in an experiment. It is the only variable you can change.

Example:
If you are studying how salt affects boiling temperature, then salt is the experimental variable. By only changing the salt you will be able to learn how it works.

Determine what the experimental variable is in these experiments.

How does salt change the freezing temperature of water?

Does ultraviolet (UV) radiation affect skin cancer?

Experiment: How does vitamin B-12 affect health?

What would be the experimental variable?

Why would this be a difficult experiment?

DATA

Question:
Does weight affect the speed of an object going downhill?

Hypothesis:

Experiment:
Experimental variable:
Control variables:

Procedure:
Make sure that the ring stand is in the 10th hole from the bottom.
Put the photogates at 10 cm and 20 cm.
Do three trials each with:
1) no weights; 2) 1 weight; 3) 2 weights.

Calculate the average speed for each.

No weights		1 weight		1 weight	
Trial	ΔT	Trial	ΔT	Trial	ΔT
1		1		1	
2		2		2	
3		3		3	
Average T		Average T		Average T	
ΔD		ΔD		ΔD	
Speed 1		Speed 2		Speed 3	

Conclusion: How does weight affect the speed of the car?

How did having control variables make the experiment easier than in the previous experiment?

Name: _____

Period: _____

Match the variables on the left with the quantities on the right	
1. S or v = _____	35 m/s ²
2. D = _____	4
3. T = _____	15 meters/sec
4. p = _____	67 meters
5. E = _____	89 kgm/s
6. MA = _____	34 sec
7. a = _____	8 newtons
8. F = _____	76 joules
9. m = _____	8 kilograms

A child walks 35 meters in 7 seconds. Calculate the child's speed.		A car drives 125 meters in 5 seconds. Calculate the car's speed.	
Variables:	Equation:	Variables:	Equation:
	Solution:		Solution:
A family drives from Boston (100 miles away) to New York (500 miles away) in 10 hours. How fast were they traveling?		A bike travels 30 m/s for 3 seconds. How far did it travel?	
Variables:	Equation:	Variables:	Equation:
	Solution:		Solution:
A person walks 2 meters/second for 30 seconds. How far did they walk?		A person walks 24 meters at 3 m/s. How long did it take them?	
Variables:	Equation:	Variables:	Equation:
	Solution:		Solution: