Conceptual Physics Labs – Chapter 5

Name _____

Where appropriate – ALWAYS show your formulas and your work!
Use the back of your paper if you need to.

Vector vs. Scalar

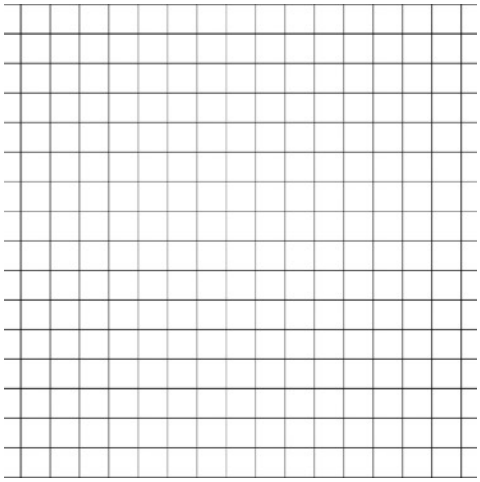
Identify each of these as either Vector or Scalar:

	Is it vector or scalar?	Check here if the quantity is magnitude only	Check here if the quantity has both magnitude and direction
Distance			
Displacement			
Speed			
Velocity			

What symbol do we use to represent a vector in a diagram?

Free Body Diagrams

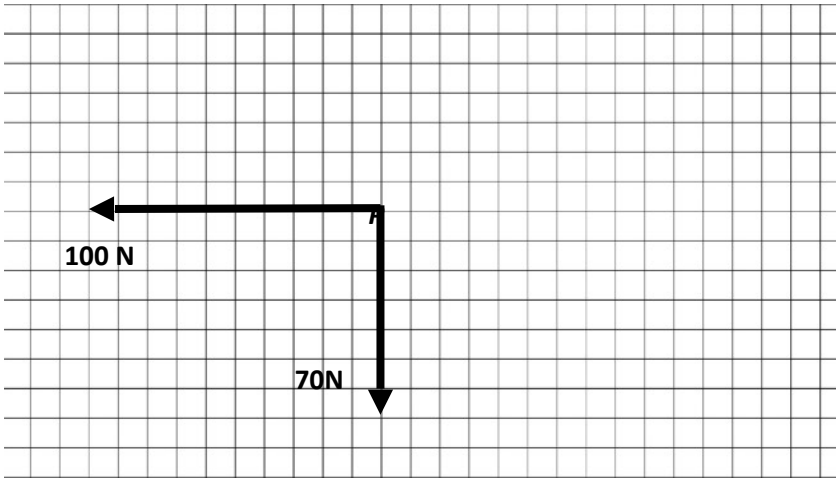
A monkey hangs motionless by one arm from a tree branch. Draw and label the free-body diagram.
Don't overcomplicate this one – a tree branch is not a rope. ☺

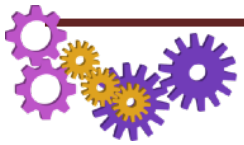


Equilibrium

This portrait weighs 200 N and is suspended by two cables. What is the tension on each of the two cables?

The diagram represents two forces acting at point *P*. Sketch in and label the vector that would create a condition of equilibrium with the forces shown, calculating the appropriate forces.





Friction

Tape sandpaper and wax paper in place on your table to create two different sliding surfaces. Attach the wooden block to the spring scale and using a constant velocity, drag the block across each surface. *If you pull at a constant velocity, you will have no acceleration – meaning you will be in equilibrium.* Draw a free-body diagram for each situation and record the forces in newtons.

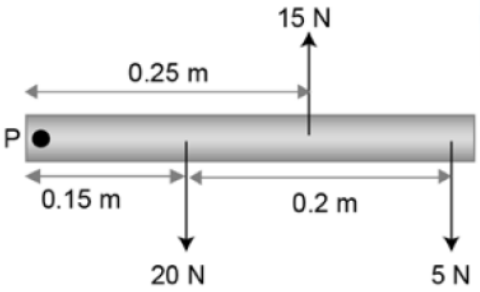
Was there a difference in the two surfaces? In *great detail* explain why.

Hooke's Law

Using the spring scale and a ruler, stretch the spring a distance of 2 cm and calculate the spring constant. Record your calculations below.

Torque

Forces are applied on the beam as shown on the figure at the right.



1) Find the torque about point P produced by each of the three forces .

20N	15N	5N

2) Find the net torque about point P.

3) A fourth force is applied to the beam at a distance of 0.30m to the right of point P. What must the magnitude and direction of this force be to make the beam in rotational equilibrium?

Rotational Equilibrium

Using the Demonstration Balance Kit, set your stand up on a couple of books to give it a little height.

- Be sure the knife-edge clamp in the center is lined up at the 25-cm mark and the knob is pointing downwards. Test the stick's balance. Due to anomalies in the wood, you may need to move the stick lightly off center from the 25-cm mark so that it stays balanced.
- Now – slide a knife-edge clamp on the left and one onto the right. You'll want to tighten the one on the left as you work to balance the one on the right for each of the following circumstances.
- **Do the math first** – then set up the balance to see if you've calculated correctly. Show your work below. ***To simplify, calculate torque in g·cm***

Mass on Left	Knife Edge Mark on Left	Mass on Right	Knife Edge Mark on Right	Works!
100 g	3cm	200g		☐
150g	10 cm	125g		☐
250g	15 cm		50 cm	☐

Note –for some reason, the hook breaks easily on the weights when dropped, so work carefully when trying to balance them. Thanks!
