Physics 100 Name: _____
Finding Spool Car Forces

Formulas: $a = \frac{\Delta v}{\Delta t}$ $F_{Net} = ma$ $w = mg$

Hypothesis: More winding causes average force to _____ and friction to _____.

Part 1: Data Collection

0. Winding distance _____ **feet**

1. Find the mass of the pushed spool car:

   Mass = _____ *g*

2. Use video analysis to find the spool car's top speed, time to reach top speed, and total travel time.

Top speed = _____ m/s Time to reach Top Speed = _____ s Total Travel Time = _____ s

Part 2: Calculations and Finding Forces

3. Convert the mass of your spool car to **kg**. 1kg = 1,000g.

   Spool car Mass = _____

4. Calculate the weight of your spool car, in **Newtons**.

   Spool car Weight = _____

5. Calculate your spool car's average acceleration during the "speeding up" phase.

   Acceleration during Speeding Up Phase = _____

6. Calculate the average net force acting on your spool car while it is speeding up.

   F_{Net} = _____

7. Calculate your spool car's acceleration during the "slowing down" phase.

   Acceleration during Slowing Down Phase = _____

8. Calculate the average net force acting on your spool car while it is slowing down. Show your work.

   F_{Net} = _____

Part 3: Force Diagrams

9. Create a diagram showing all of the forces acting on your spool car while it is slowing down.
    A. Draw your spool car traveling rightward.
    B. Label your spool car with its mass in kilograms.
    C. Use arrows to show every individual force that is acting on the spool car.
    D. Label each individual force with correct units and its correct name.
    E. Off to the side somewhere, write the Net force and acceleration. Don't use arrows for these. Just include correct signs and units.

10. Create the same type of diagram showing all of the forces acting on your spool car while it is speeding up. Assume here that the force of friction is the same when the spool car is speeding up and slowing down.