

**Acme Scale's
Mathematical Analysis of
Marist Corp. and Immaculata Corp. Springs**

The Problem: The cost of the springs we presently use in our mass scales have doubled. We have identified two companies that sell a comparable spring at a substantially lower price. The Marist Spring Corporation spring is 22 cm in length and the spring from the Immaculata Spring Corporation has a length of 4 cm. We have decided to evaluate the quality of these springs based on the criteria below. We will pick the spring that best meets the criteria below.

The following objectives need to be met before we decide which spring to purchase.

Purpose:

To:

- a) determine the mathematical relationship between force and stretch for both springs.
- b) calculate the spring constant of each spring using the slope of an F vs. x plot (NOTE: $k=F/x$ - the slope of line = spring constant)
- c) identify the spring that comes closest to exhibiting the properties of an ideal spring (**NOTE $x = stretch$**)

Notes from teacher discussion:

Each person in your group should:

1. Plot F vs. x (stretch) for **each** spring
 - a) put stretch on the (x axis and Force data on the y axis
 - b) Include a title for each plot, i.e. Marist Spring Data or Immaculata Spring Data
 - c) Add a best fit line for both plots

Spring Constants Lab

Introduction (Use your notes and summarize, in a paragraph, what you know about an Ideal Spring. Define the term and describe the F vs x plots that this type of spring produces. Do this in a paragraph.)

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Materials

- Immaculata Spring, Marist Spring
- Spring Mount
- Variety of Masses

Procedure

1. _____

2. _____

3. _____

4. _____

Name _____ # _____ # _____

_____ # _____ # _____

Spring Scales Analysis

Full Sentence (3 pt) Correct Answer (**6 pts**)

1. If you were making a scale to measure the weight of an object, why would it be important to use an ideal spring?

2. Which of the two springs you tested was most ideal? Marist or Immaculata? **Explain**

3. What is the mathematical relationship between force and stretch for the spring that was most ideal?

4. What is the value of the spring constant for the spring that was most ideal? (include units)

Equation

Substitution with Units

Answer with units

5. What stretch would be produced if the Immaculata spring had a 2 N weight on it?

Equation

Substitution with Units

Answer with units

6. What stretch would be produced if the Immaculata spring had a 250 gram weight on it? (Be sure to convert)

Equation

Substitution with Units

Answer with units

7. If you stretched both springs by 4.0 cm, which spring would have the greater potential energy? **(3 pts)**
Write the PE formula for a spring and use it to explain your answer. **(6 pts)**

8. Which spring was stiffer, Marist or Immaculata? Use your data to support your answer.