Name _____

Date _____

Lifting a Lion

Focus: Use proportions to determine the effort needed to lift a real lion.

The Problem: How much effort will it take to lift a lion with a lever?

Lifting a real lion would be a difficult and dnagerous task. So you are going to lift a small, toy lion instead. You will use a meter stick as the lever and 3 pencils as the fulcrum. Using the information you gather, your team will predict how much work it will take to lift a real lion.

The Facts

- The position of the fulcrum makes a difference in how much effort it takes to lift an object.
- Effort can be measured in terms of weight, such as grams or ounces.
- Proportions can help compare different things, such as comparing a toy lion to a real lion.
- An average full-grown adult lion weighs between 265 and 500 lbs.
- An average full-grown adult lion is between 8 and 10 feet in length.
- One pound is equal to about 454 grams.
- One kilogram (1,000) grams is equal to about 2.2 pounds.

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The Task

1. Your team will create a chart showing the following information:
   - The amount of work it takes to lift the toy lion with the fulcrum at 50 cm from the to lion
   - The amount of work it takes to lift the toy lion with the fulcrum at 25 cm from the to lion
   - The amount of work it takes to lift the toy lion with the fulcrum at 75 cm from the to lion
   - The predicted amuont of work it will take to lift a real lion using a 100-foot lever with the fulcrum at 25 feet, 50 feet, and 75 feet from the lion
2. Each person on the team will write an explanation of the team's solution. This explanation will answer these questions:
   - *How did you measure the amount of work it took to lift the toy lion? Did the position of the fulcrum make a difference? Why do you suppose that happened?*
   - *How did you calculate the amount of work it would take to lift a real lion? How did knowing the weight of the toy lion help you in your calculations?*
   - *If you were going to lift a real lion, where would you place the fulcrum? Why?*

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Things to Consider

Understanding the Problem

Read the *Lifting a Lion* problem page, and then answer these questions.

- *How much weight did your teacher lift with the 12-inch lever?*

- *How much mass was used to lift the load?*

- *What difference did the placement of the fulcrum make?*

Making a Plan

Before you make your plan, answer these questions.

- *How will you keep the masses on the lever?*

- *How will you keep the toy lion on the lever?*

- *How will you use the information from the toy lion to answer the question about the real lion?*

- *The weight for the real lion is a range. What number will you use when you calculate the amount of force needed to lift the lion?*

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Carrying Out the Plan

Before you begin planning your presentation, answer these questions.

- *What does your presentation have to include? Do you have all of the necessary information? What other calculations do you need to make?*

- *How will you display your information? What type of chart could you make to display the information? What calculations are needed to make your predictions for the real lion?*

Evaluating the Solution

- *Did you answer the question? How do you know?*

- *Does your answer make sense? If you move the fulcrum away from the load, does it take more or less effort to lift the lion? Did this happen with all of the different loads?*

- *Did everyone in the group write an explanation?*

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Using the Calculator

Using proportions

Use the TI-15 calculator to solve the following problems:

Ms. Kleid is helping plan the refreshments for Field Day. She wanted to know everyone's favorite ice cream flavor so she could order enough ice cream. She surveyed her class. Out of her class of 22 students, 10 students preferred chocolate ice cream, 8 preferred vanilla, and 4 preferred strawberry. Ms. Kleid knows there are 531 students at school. How can she predict how many ice cream cups in each flavor she needs?

1 Ms. Kleid decided she needs to know the fractional part of her class that likes each flavor. Since there are 22 students in her class, $\frac{10}{22}$ like chocolate, $\frac{8}{22}$ like vanilla, and $\frac{4}{22}$ like strawberry. She decides to simplify the fractions.

Press	The display shows:
10 [n] 22 [d] Simp Enter	

How does the result help Ms. Kleid?

2 Ms. Kleid decided that simplifying the fractions doesn't help at all. She needs to know what $\frac{10}{22}$ of 531 students is. Next she tries this:

Press	The display shows:
10 [n] 22 [d] [×] 531 Enter	

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Does this answer make sense for the number of people in the school who like chocolate ice cream? How do you know? What should Ms. Klein do about the fractional part? What would happen if she simplified the mixed number?

Press	The display shows:
Simp Enter	

Does the simplified fraction help?

3 Try the other two fractions and multiply by 531 to predict the number osf students who will prefer vanilla or strawberry ice cream. Do you have fractional parts? What should Ms. Kleid do with the fractional parts to make sure there is enough icecream for everyone?

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