

## BATTLE OF THE BATTERIES

### Teaching Guidelines

**Subject:** Mathematics

**Topics:** Problem Solving, Ratios and Proportions

**Grades:** 7-9

**Concepts:**

- Ratio
- Proportion

**Knowledge and Skills:**

- Can use proportional reasoning to solve problems.
- Can set up and compare ratios.
- Can set up and solve a proportion.

**Procedure:**

Prepare for presentation the Futures Channel movie, “The Shape of Phones.” Tell students that as they watch the movie, you want them to think about this question (which should be posted):

*What qualities or characteristics would you look for in the battery for a cell phone?*

At the end of the movie, ask students to work in teams of two or three for a few minutes to list answers to this question. Generate a list of answers, and be sure that it includes the characteristics of “size,” “weight,” and “how long it will last.”

Distribute the handout to the teams. Ask the teams to study the chart on the handout and talk it over for a few minutes. Then, as a class, discuss the information shown in the chart, so that it is clear to everyone what that data means.

Then have the teams begin the task of answering the questions on the handout. Circulate as they work, and ask questions to guide them to think about the ratios of “capacity to weight” and “capacity to cost” as they evaluate the batteries, and to use proportional reasoning to answer questions 2 and 3.

Answers:

- 1) Battery E is most expensive because it has the highest “capacity to weight” ratio.
- 2) Battery A is the least expensive, with the highest ratio of “capacity to cost.” Using proportional thinking, you would expect that a battery of that type with twice the capacity (2400 mAh) would have about twice the weight (80 grams) and cost (\$30).
- 3) Battery E is the lightest, with the highest ratio of “capacity to weight.” Using proportional thinking, you would expect that a battery of that type with about three times capacity (2400 mAh) would have three times its weight (about 30 grams) and cost (\$75)
- 4) Answers will vary, depending on whether cost or size is considered to be the most important factor.

## Battle of the Batteries

This chart shows the characteristics of five different batteries.

Battery	Capacity	Weight	Thickness	Cost
A	1200 mAh	40 grams	13 mm	\$15
B	1000 mAh	35 grams	8 mm	\$14
C	900 mAh	20 grams	7 mm	\$20
D	830 mAh	25 grams	7 mm	\$13
E	780 mAh	10 grams	5 mm	\$25

Note: The **capacity** of a battery is the quantity of electrical current it can produce for a length of time, measured in a unit called "milli-ampere hours" (abbreviated as "mAh"). This determines how long the battery lasts.

Suppose you are designing a new cell phone, and you want to have a battery with a capacity of around 2400 mAh. Answer these questions to help make a decision as to what type of battery you will use.

- 1) Why do you suppose battery E is the most expensive? What ratio could you use to explain this?
- 2) Suppose you want your battery to have the lowest possible price. Which of the above battery types would you want to have your battery be most similar to? About how much would you expect it to weigh? To cost?
- 3) Suppose you want your battery to have the lowest possible weight. Which of the above battery types would you want to have your battery be most similar to? About how much would you expect it to weigh? To cost?
- 4) Which battery type would you choose as a model, and why?