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# High School or Advanced Middle School Math Lesson: Solving a Word Problem

Word Problem: A can containing 40 marbles weighs 160 grams. The same can is emptied and refilled with 30 marbles and now weighs 132 grams. How much does the empty can weigh?

## Solving the Problem Using Questions for Life

- Read the problem and *notice* all its parts (Perception).
- *Visualize* the problem in your mind (Perception).
- *Sort* out the important information that is given (Analysis).
- *Sum up* what the problem is asking for in your own words (Summary).
- *List* the givens (important information) in a table or chart (Analysis).
- *Compare* (check) the numbers you recorded with those in the problem (Same/Different).

## Possible Table

| First Can Fill | Second Can Fill |
|---|---|
| 20 Marbles | 15 Marbles |
| 80 Grams | 66 Grams |

- How is the first can fill *different* from the second can fill? (Same/Different*)*
- *List* (record) those differences on your chart (Analysis).

| First Fill | Second Fill | Differences |
|---|---|---|
| 20 Marbles | 15 Marbles | 5 Marbles |
| 80 Grams | 66 Grams | 14 Grams |

- What *generalizations* can you draw from your chart? (Induction)
- What are some *ways* in which your chart and your generalizations can help you solve the problem? (Idea)
- *Weigh* and then decide which way might be the *best* approach for solving the problem. (Appraisal)

(Many would suggest finding 1 marble weight and multiplying by 20 or 15. Others would suggest multiplying the 10 marble weight by 4 and by 3.)

- Test *(compute)* your choice. (Action)

| 1 Marble Weight | Process for 30 Marbles | Process for 40 Marbles |
|---|---|---|
| 1 Marble | | |
| 2.8 Grams | 2.8 x 20 = 56 Grams | 2.8 x 15 = 42 Grams |

Or

| 5 Marble Weight | Process for 30 Marbles | Process for 40 Marbles |
|---|---|---|

| | | |
|---|---|---|
| 5 Marbles | | |
| 14 Grams | 14 x 4 = 56 Grams | 14 x 3 = 42 Grams |

- Check (*compare*) the chart's accuracy. (Same/Different)
- *Compare* the two action steps. (Same/Different)
- Which is the *best* of the two ways? (Appraisal)
- Now that we know the weight of both 30 and 40 marbles, what is the next *step* of the problem? (Analysis)

| First Can Fill | Second Can Fill |
|---|---|
| 20 Marbles + Can | 15 Marbles + Can |
| 80 Grams | 66 Grams |
| 20 Marbles | 15 Marbles |
| 56 Grams | 42 Grams |

- *List* the data pieces in the table that are necessary for a solution. (Analysis)

(The answer appears in gray above in column one (80/56) and in gray in column two (66/42). Either way shows the can weighs 24 grams.)

- *Predict* how organizing the table differently might help in the final solution. (Prediction)
- *Redo* the table to better represent the data. (Action)

| | Marbles + Can Weight | Marbles Weight | Can Weight |
|---|---|---|---|
| First Can Fill 20 Marbles | 80 Grams | 56 Grams | 24 Grams |
| Second Can Fill 15 Marbles | 66 Grams | 42 Grams | 24 Grams |

# High School Lesson: Product Design

## Overview

This lesson was included in a high school course on Interpersonal Communications within a unit on Consensus Decision Making.

## Students Choose and Analyze an Advertisement

Students *sorted* through a variety of magazines and chose the advertisement that *most* grabbed their attention (Appraisal). Then they reflected and answered the following Perception questions before they formed and worked in groups.

- What elements did you *notice* first in the advertisement—what caught your attention?
- What did you *see* in the advertisement after you examined it more carefully?
- What *feelings* did the advertisement invoke in you?

In groups students shared their chosen advertisements and their perceptions about the advertisements as they used the following Questions for Life thinking skills:

- Students *compare*d and *contrasted* their chosen advertisements (Same/Different).
- Students made a *list* of various elements in their advertisements (Analysis).
- Students made *generalizations* about the *common elements* of effective advertisements (Induction).

## Students Create a New Product

Each group was then asked to *create* an imaginary product for its contemporaries from a nontoxic, low-cost gel, and *design* an advertisement to market the product. (Action) Students responded to the following questions and statements from Questions for Life:

- Brainstorm *options* for potential product ideas (Idea). (Each group generated at least 10 to 15 potential ideas.)
- Make *connections* to students your age (Insight).
- *Prioritize* the list in order to focus your attention on the *best* ideas (Appraisal).
- *Predict* the appeal of your ideas (Prediction).
- *Compare* and *contrast* the various ideas (Same/Different).
- Share *opinions* regarding the various ideas (Evaluation).
- *Weigh* ideas, then select what the group feels is its *best* idea (Appraisal).

## Students Design the New Product

- Brainstorm *ideas* for potential features of the product (Idea).
- Make *connections* to students in your age group (Insight).
- *List* components you want in the new product (Analysis).
- *Predict* the outcome of using the various design components (Prediction).
- *Compare* and *contrast* the various ideas (Same/Different).
- Share *opinions* regarding the various ideas (Evaluation).
- Select the *best* elements for the new product (Appraisal).
- *Design* the new product (Action).

## Students Design an Advertisement for the New Product

- Brainstorm *ideas* for potential elements of an advertisement of the new product (Idea).
- Make *connections* to your age group and to other advertisements studied (Insight).
- *List* components you want in the advertisement (Analysis).
- *Predict* the outcome of using the various advertising components (Prediction).
- *Compare* and *contrast* the advertisement ideas (Same/Different).
- Share *opinions* regarding the various ideas (Evaluation).
- Select the *best* elements for the advertisement (Appraisal).
- *Design* the advertisement (Action).

In the brainstorming sessions the teacher looked for a large number of potential ideas and then looked at the group's ability to analyze information and refine their choices to the best one. As you may have noticed, the Questions for Life process was repeated several times as students:

1. Selected an idea.
2. Designed the product.

3. Designed the advertisement.

Each time students went through the process, they practiced well-thought-out, informed decision making. Students experienced the reality of less creative, less innovative, and less effective choices when shortcuts were taken and the process was not developed in its entirety.

*Reference:*

Barkley, S. G. (2009). *Questions for life: Powerful strategies to guide critical thinking* (pp. 166-171). Cadiz, KY: Performance Learning Systems.