

Ambiguity in Real Life Problems

Introduction

In math class, problems are usually well defined with specific problem solving steps in mind. Alternatively, real life problems are often susceptible to mathematical analysis, but require the problem solver to make crucial assumptions or interpretations that guarantee that the problem is well defined.

The following word problem is one such example.

Grade Levels and Topics

This lesson was designed for gifted 4th-6th graders, but could be used for older grades as well. This problem took about 2 hours spread over 2 days for the 4th-6th graders. Alternatively, this could be a shorter lesson with high school students. This lesson makes connections to critical thinking and problem solving and not necessarily any Common Core State Standards.

Objectives

Students will learn how to use critical thinking skills to realize how particular solutions of a problem depend on what assumptions are made.

Materials and Resources

Scratch paper and pencils.

The First Problem

If it takes 3 cats to catch 3 rats in 3 minutes, how many cats would it take to catch 100 rats in 100 minutes? Why?

The Ambiguity

What may not be obvious is that the solution to this problem relies on how the cats catch the rats. Do the 3 cats team up together, catching one rat every minute? If this is the case, that it will take the same 3 cats 100 minutes to catch 100 rats.

However, another possibility is that each cat goes off on its own and takes 3 minutes to catch a single rat. In this case, 3 cats will catch 99 rats in 99 minutes, and 102 rats in 102 minutes. But to catch 100 rats in 100 minutes, we will need somewhere between 3 and 4 cats.

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Problems

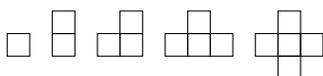
Here are some other example problems for students (recommended for older students). With each problem, students decide on what information is relevant as well as how to answer the question at hand.

Sequences

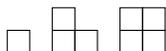
Draw the next four figures in the given patterns.

1. 1,2,4

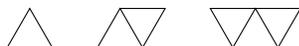
2.



3.



4.



Each of these sequences have a variety of patterns that can be developed, thus the ambiguity. Students should simply be able to determine a pattern of their own, justify the pattern, and complete the sequences.

Triangles

Draw a single triangle which has a separate side lengths of 5 inches and of 3 inches.

This problem is worded poorly enough for students to either draw one triangle with side lengths of 3 inches and 5 inches or two different triangles with at least one side length of 3 inches or 5 inches respectively. Like all the previous problems, a students answer will depend entirely on their interpretation of the posed statement.

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