MATH

PROBLEM SOLVING LESSONS THAT ARE AN EXCELLENT WAY TO CONDITION YOUR STUDENTS INTO HIGHER LEVEL THINKING SKILLS NEED ON THE NEW COMMON CORE TESTS!

TEACHING THE “GUESS AND CHECK” METHOD

GRADES 3-12

Guess and check is an important critical thinking process that is becoming increasingly prevalent within new math texts. It is usually introduced in some form in third grade, and is used in some form all the way up through senior high.

There are four major steps involved in the “Guess and Check” method:

1. Make a plan
2. Create a chart or table
3. Eliminate possibilities
4. Look for a pattern

The following are a number of examples you can use. (Additional examples can be found in virtually any math text book). They are listed in developmental order, less sophisticated to those more sophisticated. Pick those most appropriate to your students. (The numbers can easily be changed to provide additional examples).

With practice your students will develop a self confidence that will enable them to obtain solutions ranging from a variety of correct answers to one correct answer. This will serve as a preparation for high order thinking skills as those used in Algebra, Geometry, etc.

EXAMPLE 1

Using pennies, nickles and dimes, how many different combinations can be used to obtain 25 cents? (HINT: there are 12 ways)

Make a chart with pennies, nickles, dimes and “total” as column headings.

> *TEACHER NOTE: This problem introduces all four of the steps and adherence to ONE CONDITION—the combination must total 25 cents. The students should be able to put these combinations in any order they choose. As they practice this type of problem, they will find that using a particular system or order, (i.e. concentrating on pennies from greatest to least) will emerge as a faster, more accurate method. Initially, in the earlier grades, students should use actual coins and record their findings.*

EXAMPLE 2

Using nickles, dimes and quarters, how many different combinations (where at least one of each coin is used), can make 50 cents? Before you start, make a prediction. Compare your prediction to your findings.

TEACHER NOTE: There are only 2 combinations. This example introduces TWO CONDITIONS—at least one of each coin AND a total of 50 cents.

EXAMPLE 3

Using 17 coins—including AT LEAST ONE NICKLE, DIME AND QUARTER—how many different combinations can be used to make $2.25? Before you start, make a prediction. Compare your prediction to your findings.

TEACHER NOTE: There are only 3 combinations. This example introduces THREE CONDITIONS—at least one of each coin, 17 coins AND a total of $2.25.

EXAMPLE 4

Using 17 coins—including AT LEAST ONE NICKLE, DIME AND QUARTER—how many different combinations can be used to make $2.25—WHERE THERE ARE 4 MORE DIMES THAN NICKELS? Before you start, make a prediction. Compare your prediction to your findings.

TEACHER NOTE: There is only 1 combination. This example introduces FOUR CONDITIONS—at least one of each coin, 17 coins, a total of $2.25 AND a relationship of one variable (dimes) to another (nickles).

submitted by

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USING A SYSTEMATIC APPROACH TO THE GUESS AND CHECK METHOD

GRADES 3-12

Last time we traced the developmental stages of guess and check (“Teaching the Guess and Check Method”), utilizing four components. These components involved:

- Making a plan
- Creating a chart or table
- Eliminating possibilities
- Looking for a pattern

The purpose of these components is to demonstrate to the student that through an organized, *systematic* process, answers to seemingly “impossible” problems can be found. The key is the *systematic approach*, because all four components evolve around the system.

Having already explored the wonderful world of coin problems, the following examples are concerned with consecutive numbers and age problems. Also available are very basic problem solving examples that highlight each of the seven approaches originally addressed two weeks ago (“Setting a Foundation for Problem Solving”).

EXAMPLE 1

5 years ago, Jay was seven times older than Mary. In five years, Mary will be half as old as Jay (or Jay will be twice as old as Mary). How old is each now?

Make a horizontal chart with the following headings. (discuss the construction of the heading with the students):

J5YA—M5YA—J7XOLDER?—JNOW—MNOW—JIN5Y—MIN5Y—M1/2J?

KEY:

J5YA (John's age 5 years ago)
M5YA (Mary's age 5 years ago)
J7XOLDER? (Is John 7 times Mary's age?)
JNOW (John's age now)
MNOW (Mary's age now)
JIN5Y (John's age in five years)
MIN5Y (Mary's age in five years)
M1/2J? (Is Mary half of John's age?)

TWO POSSIBLE ANSWERS: (Numbers are in order of the columns above)

7—1—YES—12—6—17—11—NO

14—2—YES—19—7—24—12—YES

Therefore, Jay is 19 and Mary is 7

EXAMPLE 2

Make a chart similar to the one above.

Let's make up a consecutive number problem—your choice.

- Using whole numbers: Four consecutive whole numbers have a sum of 14 and a product of 120. What is the second number? (2, 3, 4, 5)
- Using odd, whole numbers: Three consecutive odd, whole numbers have a sum of 9 and a product of 15. What is the third number? (1, 3, 5)
- Using even whole numbers: Three consecutive even, whole numbers have a sum of 12 and a product of 48. What are the numbers? (2, 4, 6)

- Using integers: Three consecutive integers have a sum of 0 and a product of 0. What is the first consecutive integer? (-1, 0, 1) ***submitted by*****ROB SCHUCK**
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GUESS AND CHECK—FINAL PROJECT—MULTIPLE VARIABLES AND CONDITIONS

GRADES: 6-12

This is the last of the problem solving contributions that will be submitted, unless there is a sudden outcry for more! more! more! I hope that what has been presented so far has been of use for some of you. So…for the grand finale of problem solving utilizing the guess and check (trial and error) method, I present to you the infamous chickens, pigs, and sheep problem.

TEACHER NOTE: Remember that the "guess and check" method utilizes four components. These components involve:

1. Making a plan
2. Creating a chart or table
3. Eliminating possibilities
4. Looking for a pattern

The purpose of these components is to demonstrate to the student that through an organized, systematic process, answers to seemingly "impossible" problems can be found. The key is the systematic approach because all four components evolve around the system. Also, by using a systematic approach, it becomes increasingly easier to eliminate possibilities. This is especially true of the problem presented here.

THE PROBLEM: You are given $100 to buy 100 farm animals (at least one each of three animals—chickens, pigs, and sheep). If chickens cost 10 cents, pigs cost $2, and sheep cost $5, how many of each animal must you purchase so that the total is 100 animals for $100?

THE CHART: There should be five (5) column headings to represent the problem components. You might want to add a few more to make the students check to see which direction they need to make their “guesses”.

CHICKENS (.10)——PIGS ($2)——SHEEP ($5)——100 ANIMALS?——$100

CHICKENS: 35 ($3.50)
PIGS: 40 ($80)
SHEEP: 25 ($125)
100 ANIMALS?: YES
$100: NO ($208.50)

CHICKENS: 50 ($5)
PIGS: 35 ($70)
SHEEP: 15 ($75)
100 ANIMALS?: YES
$100: NO ($150)

TEACHER NOTE: These two lines represent a wealth of information. In addition to each column beginning to show a potential pattern of direction for future guesses, a viewer should be able to see the plan I am using. Also, what possibilities have already been eliminated? What other possibilities can be eliminated as a result? If your students become frustrated with their own attempts, you might consider using these two lines (or your own) to help them get back on track.

THE SOLUTION: Do you really want me to tell you? Okay, I’ll meet you half way. The number of chickens is a multiple of 10 (Why must this be so?). It is not 50 chickens. The number of pigs feet is almost = the number of chickens. There are less sheep than the other two animals (approximately 1/7 of chickens and 1/2 of pigs).

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