IDEAS FOR ELEMENTARY SCHOOL PRESENTATIONS

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Have you ever been asked to come to an elementary school to give a math presentation to the students in first grade? This can be a very daunting task. You would like the presentation to be interesting, educational and fun. You can't simply teach the mathematical topics that the first graders are going to learn in second grade nor can you present any of the upper level mathematics that you would teach in your classes. It is surprisingly difficult to find good ideas and examples as well as a list of resources. We will share a few of the presentation ideas that we have used successfully in previous years.

BIRTHDAY TRICK

I can guess the day of the month in which you were born!!!

Instructions

1) Look at the 5 cards shown below. Find all of the cards that have the day of the month of your birth. For example if your birthday were July 10th then you would pick the 2nd and 4th cards because 10 is listed on those cards and not on any of the other cards.

2) Now, cover up the cards that do not contain your day of birth. Once again, if your day of birth were July 10th then you would cover the 1st, 3rd and 5th cards because they do not contain 10.

3) Finally, add the top left number on all of the cards that were not covered. You will notice that they total to be your date of birth. For example, if your date of birth were July 10th then the uncovered cards were the 2nd and 4th cards and their top left numbers are 2 and 8, respectively. Therefore, 2 + 8 = 10.

1	3	5	7
9	11	13	15
17	19	21	23
25	27	29	31

2	3	6	7
10	11	14	15
18	19	22	23
26	27	30	31

4	5	6	7
12	13	14	15
20	21	22	23
28	29	30	31

8	9	10	11
12	13	14	15
24	25	26	27
28	29	30	31

16	17	18	19
20	21	22	23
24	25	26	27
28	29	30	31

Explanation

The birthday trick is based on the binary number system. The key to the trick is that every integer between 1 and 31 can be represented as the sum of the numbers 1, 2, 4, 8 and 16.
For example: 19 = 16 + 2 + 1 and 30 = 16 + 8 + 4 + 2.

Therefore, the five cards are created using this binary representation. The 1st card contains all of the numbers between 1 and 31 which require a 1 when representing the number as a sum of values from the list of 1, 2, 4, 8, and 16. In other words, the 1st card contains all of the odd numbers. The 2nd card contains all of the numbers that require a 2 in their binary representation. The 3rd card contains all of the numbers that require an 8 in their binary representation. The 4th and 5th cards are also created similarly.

For example,
19 = 16 + 2 + 1; so 19 is on the 1st, 2nd and 5th cards.
30 = 16 + 8 + 4 + 2; so 30 is on the all but the 1st card.
11 = 8 + 2 + 1; so 11 is on the 1st, 2nd and 4th cards.

ANIMALS AND NUMBERS

I can read your mind!

Instructions

Step 1: Pick a number between 2 and 10.

Step 2: Multiply your number by 9.

Step 3: Add the two digits together.

Step 4: Subtract 4 from the number.

Step 5: Associate a letter to your number according to the following:
1 = A, 2 = B, 3 = C, 4 = D, 5 = E, 6 =F, 7 = G, 8 = H

Step 6: Pick an animal that begins with your letter.

Step 7: Think of a color for your animal.

Now, I will guess your animal and color: **(page to the bottom to see my guess)**

Explanation

The reason it works: Every multiple of nine is a number whose digits will sum to be nine. Therefore, no matter what number is chosen in step one, the resulting number in step 4 will be a five. Finally, the most common animal beginning with the letter E is an elephant (usually associated with the color grey).

This is a neat trick that can be performed on third graders (or higher grades) because children learn multiplication in third grade. Note: We were able to do this trick with first graders with the following caveat: we had the first grade teachers leave the room so that we could prepare the children for the answer "Grey Elephant". After leading the first grade teachers through the steps, we had the children scream out "grey elephant" when I asked the teachers, "Are you thinking about …".

SIMPLE CARD TRICK

I can figure out which card you have in your hand.

<u>Instructions</u>

Step 1: Remove the face cards and tens from a standard deck of cards.

Step 2: Have a student draw one card from the deck, look at it and then lay it face down on the table.

Step 3: You draw a card, look at it and then lay it face down on the table to the right of the student's card.

Step 4: Have the student multiply the value of their card by two.

Step 5: Have the student add two to the number in step 4.

Step 6: Have the student multiply the number in step 5 by five.

Step 7: Have the student subtract (10 – the value of your card) from the number in step 6.

Now, flip over the two cards and see that the cards match the number computed in Step 7.

<u>Example</u>:
Suppose the card chosen by the student is the 4 of hearts and you have chosen the 7 of clubs.

Step 4: Multiply 4 by 2 to produce 8

Step 5: Add 2 to 8 to produce 10.

Step 6: Multiply 10 by 5 produce 50.

Step 7: Subtract 50 by 3 to produce 47.

The final answer of 47 matches the two cards picked when laid side by side.

<u>Explanation</u>

In order to explain how the card trick works, you must represent the number of the cards using variables. For example, the number 47 could be represented by xy where x = 4 and y = 7.

Step 4: Multiply x by 2 to produce 2x

Step 5: Add 2 to 2x to produce 2x + 2.

Step 6: Multiply 2x + 2 by 5 produce 10x + 10.

Step 7: Subtract: (10x + 10) – (10 – y) = 10x + 10 – 10 + y = 10x + y.

Therefore, if we let x = 4 and y = 7 then 10x + y = 47.

FIBONACCI NUMBERS

Children are introduced to sequences very early in grade school. Most of the sequences are arithmetic with the intention of teaching multiples of integers so that multiplication will be easier to learn. That makes introducing the Fibonacci sequence so wonderful.

Give the children the first 6 terms of the sequence: 1, 1, 2, 3, 5, 8 and then ask them to determine the 7th term. You can give the hint that this sequence is similar to the sequences that they have already learned, except that the number that is added to the previous term changes each time. (Recall that each term in this sequence is computed by adding the two previous terms together.)

The Fibonacci sequence has many fun "applications" as well as occurrences in nature. There are many excellent websites to visit concerning the Fibonacci sequence, one in particular is mcs.surrey.ac.uk/Personal/R.Knott/Fibonacci/fibnat.html

We would like to focus on a different approach to discovering the Fibonacci sequence. This can be found by playing the following game and determining the winning strategy.

FIBONACCI NIM

The game of Nim is played using a pile of chips or game pieces and two players.

The objective of the game is to be the player who takes the last chip(s) out of the pile.

The rules are very simple. The two players alternate taking chips out of the pile with the following constraints. Player A goes first and can take as many chips as they want as long as they leave at least one chip. After the initial removal the next player must remove a minimum of one chip and a maximum of twice the number of chips the other player has just removed.

For example: Suppose the pile starts with 20 chips. Player A can remove between 1 and 19 chips. If player A removes 5 chips then player B can remove between 1 and 10 chips from the remaining 15 chips. If player B removes 4 chips then player A can remove between 1 and 8 chips from the remaining 11 chips. If player A removes 4 chips then player B can remove between 1 and 8 chips and therefore they would remove the remaining 7 chips from the pile and win the game.

Strategy for Nim

It is possible for player B to have a perfect strategy if the number of chips in the initial pile is a Fibonacci number. (i.e. if the number of chips in the pile is 2, 3, 5, 8, 13, 21, 34, etc…)

The strategy: Player B should divide the remaining chips into two groups whose sizes are Fibonacci numbers.*
For example: 11 chips = 3 chips + 8 chips
18 chips = 5 chips + 13 chips

Player B should then remove the smaller of the two piles.
For example: if 11 chips remain, then remove 3 chips
if 18 chips remain, then remove 5 chips

* Sometimes it is not possible to divide the chips into two groups whose sizes are Fibonacci numbers.
For example: 12, 17, 19, 20 can not be written as the sum of two Fibonacci numbers. In these special case, Player B should remove 1 chip from the pile unless all of the chips can be removed from the pile.

Example Game (starting with 21 chips):

Player A removes 3 chips (18 chips remaining) Note: 18 = 5 + 13
Player B removes 5 chips (13 chips remaining)
Player A removes 2 chips (11 chips remaining) Note: 11 = 3 + 8
Player B removes 3 chips (8 chips remaining)
Player A removes 2 chips (6 chips remaining) Note: 6 = 1 + 5
Player B removes 1 chip (5 chips remaining)
Player A removes 2 chips (3 chips remaining)
Player B removes the 3 remaining chips

** Answer to ANIMALS AND NUMBERS: Grey Elephant **