MATH MOTIVATORS

ISSUE NUMBER 1 September 2004

WELCOME TO THE FIRST ISSUE OF “MATH MOTIVATORS”.

This publication is intended for teachers of mathematics from K to secondary 5. It is published within the Western Quebec School Board, and will contain ideas for teaching mathematics concepts, or non-traditional problems for your students to solve. The focus will be on constructivism, problem solving, and on the fun that mathematics can provide. Suggested grade levels indicate the grade in which the math concepts are learned. However, you may want to use the same activities, adapted, in an earlier cycle for those students who are always finished early, or in a subsequent grade for students who need to review concepts and procedures. Even a cycle one activity can be used in secondary school when the numbers are integers, fractions or decimals, or algebraic terms.

Please feel free to contribute classroom-tested ideas to share with others, surtout si vous enseignez les maths en français.

NEW LOCATION FOR MATH CONSULTANT

The math consultant office is now located at the new Eardley school, room 219. The school is located just north of the McConnell-Laramé highway, on du Plateau (Take Vanier Road north and turn at the first right – no stop sign, no light). Phone number and fax have not changed. Use the board office mailing address. Secretary: Brigitte Fortin (Monday, Wednesday and morning on Friday)

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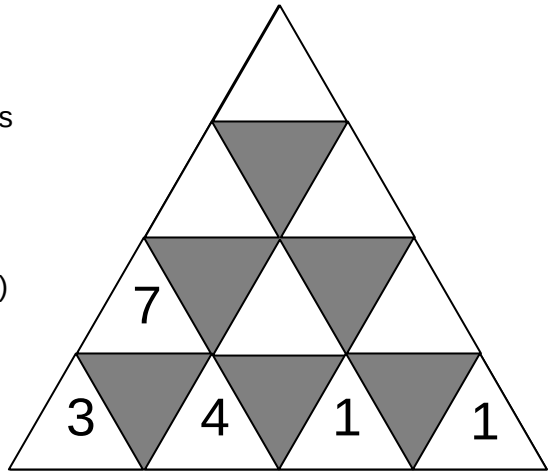
KING OF THE MOUNTAIN – Operations

This activity can be used from cycle one elementary right through to cycle one secondary, depending on the adaptation chosen. Use it during the year for practice of operations taught, or use it early in the year to review from the past grades.

The **basic activity** is as follows (adaptations are below).

Students will need a triangular grid, as shown here.



Roll 4 dice (or one die 4 times) and write the numbers in the bottom 4 triangles.
Students are to add up to the top.
For example, from this bottom row, 3 + 4 = 7

Variation: Give students a number (for example, 25) to put in the top triangle. Have them find 2 numbers which add to 25 to write in the row below. Continue to decompose the numbers until they reach the bottom row. Students can compare their solutions to note that when they add up, they will all have the same numbers, but when they decompose a number, their solutions are all different.

Adaptations:

Cycle One Year One: Use only 3 numbers on bottom. (use smaller grid)

Cycle One Year Two: Use up to 5 numbers on bottom. (use larger grid)

Cycles Two and Three: Use larger numbers – generate two digit numbers by rolling 2 dice at once, in two colors. One color represents tens, the other represents ones. In cycle three, use a larger grid.

Cycles Two and Three: Multiply rather than add.

Cycle One Secondary (year one):
Subtract instead of add (from left to right each time) to generate integers.
Or – add the first level. On the second level, take the numbers from the bottom row and divide them by the numbers in the second row up to generate fractions. In the third row, add the fractions.
Or – generate rational numbers to put in the bottom row. Roll two dice each time, in two colors. One color is the whole number portion, and the other color is the tenths.

Cycle One Secondary (year two):
Add an “x” or other variable to the number rolled in the first and third triangle on the bottom. Add or subtract up to the top – perhaps add the first row up, then subtract the next row up.

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MATHO – Operations on numbers or algebraic terms

This game works like BINGO, but with math facts.

Kindergarten: question cards show dots, MATHO cards show numerals.

Cycle one: use addition or subtraction facts.

Cycle two: use multiplication or division facts, and addition facts such as 60 + 20

Cycle three: use any of addition, subtraction, multiplication and division. Find common factors (example: 25 and 30 have a lowest common factor of 6).

Cycle one secondary: use integers, decimals, fractions, exponents and any operation. Solve simple one-step algebraic equations such as 3n = 30, n + 6 = 20.

Secondary III, IV and V: use algebraic factoring, or exponent laws, or log laws, etc.

PROCEDURE: Give each group of students a list of 24 "questions". Give different lists to each group. Students calculate the answers to the questions, and write the answers in different locations on MATHO gameboards. For example, if you have groups of 4 students, they will make 4 or 8 gameboards so that another group or two can play their particular game. It makes sense to laminate the gameboards.

Exchange games with another group and play the game. One student draws questions out of a paper bag, and shows the question to the group. All other students have a gameboard, and they put a marker on the answer to the question. As in BINGO the first person to have a complete line in any direction is the winner.

Here are two examples of MATHO questions and boards.

First MATHO board: exponent questions, such as 4^2 , 8^2 , 2^5 , $-(2)^2$ etc.
Second MATHO board: factoring trinomial questions, such as $x^2 - 9$, $x^2 - 6x + 9$, etc. that can be done mentally.

25	100	1	225	16
144	400	- 4	81	625
-27	27	MATHO	169	9
64	32	8	125	36
49	- 9	4	- 8	121

(x+6)(x+4)	(x+2)(x+2)	(x-3)(x-3)	(x+4)(x-3)	(x-4)(x+2)
(x+3)(x-3)	(x-5)(x+5)	(x+5)(x-2)	(x+5)(x+1)	(x-5)(x-2)
(x+2)(x-2)	(x-6)(x-4)	MATHO	(x+5)(x+2)	(x-2)(x-2)
(x-4)(x+3)	(x-5)(x-1)	(x-5)(x+2)	(x+4)(x+3)	(x+3)(x+3)
(x-5)(x+1)	(x-4)(x-3)	(x-4)(x+4)	(x+5)(x-1)	(x+4)(x-2)

Note: once you set one game up, students can make up their own questions and game boards fitting specific criteria.

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KINDERGARTEN

BIG AND LITTLE - concepts of size

Put your students into two equal groups.
One group is the “Big” group, and one group is the “Little” group.
Choose an object in the room, and then the groups take turns, student by student, naming something that is “big” compared to the object, or “small” compared to the object.

Extension: later in the year, the first child in the “Big” group names something just a bit bigger than the object. The next “Big” child names something bigger than the previous child, and so on until the last child names a very big object. It’s important not to get too big too quickly, or the rest of the children will find it hard to think of things.

Use variations on the vocabulary, like “large and small” for example, “tiny and huge”, etc. You could also do “HOT” and “COLD” – have them feel water at room temperature, then list things that are hotter and colder than water.

CYCLE ONE YEAR ONE

NUMBER GROUPS - concepts of quantity

Bring in old catalogues, store flyers, etc.
Make very large number cut-outs – at least 8.5 x 11of the numbers from 1 to 9. Each child needs one number cut-out.
Ask students to find pictures of objects that are packaged in that number.
For example, if the number is 2, they could find shoes.
They are to cut out the pictures and glue them onto the large number shape.

CYCLE ONE YEAR TWO

MAKE TEN - addition facts

Material: either a deck of cards with face cards removed, or a deck of cards that has 4 sets of numbers 1 to 10.

Students are in groups of 3 or 4, with one deck of cards per group.
One student mixes the cards, then deals 9 cards face up. The first person to play removes one set of cards that “makes” (adds up to) 10 (for example: 5, 2, 3). The “dealer” replaces the cards that were taken, and the next person tries to make 10.
The player with the most cards at the end wins.

Variations: add to make a different number; multiply to a target number; add decimals (starting at cycle 3 and using decimal cards) or integers to a target number (secondary cycle one).

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CYCLE TWO ELEMENTARY

TEN QUESTIONS - number properties

Write down a number from 1 to 100. Put it in an envelope so that you can show it to your students later.
Invite students to ask questions about your number that can only be answered by "yes" or "no". Do not let them ask – "is your number 35?" – they must ask questions that focus on properties. Here are some sample questions:
Is the number larger than (or smaller than) 87?
Does the number begin with a 6?
Is the number even?
Is the first digit smaller than the second digit?
The goal is to "know" (rather than "guess") the number by the 10^{th} question. In fact, when they think they know the number, they can write it down, then as more questions are asked they can check to see if the number they write down meets the criteria that follow.

You might want to first model this type of questioning by asking a student to hide a number, and you ask the questions.
Have them brainstorm about good questions to ask – in fact, you could make a list of them on chart paper that they can refer to whenever you play this game.
When students get good at this, divide them into teams of 4, and let them play in small groups where one person hides a number, and the other 3 take turns asking a question.

CYCLE THREE ELEMENTARY

NUMBER LINE-UP – math vocabulary, place value, properties of numbers, comparing numbers, etc.

Have each student write down a 3 digit number on a sheet of paper – large enough for the whole class to see from a distance.
Ask students to hold up their number if it meets certain criteria. (Examples of criteria follow. Have students come up with other criteria as well.) You could then ask the rest of the class to help put these numbers in order – the students would come forward with their number and stand in a line according to either ascending or descending order.

Sample Criteria (be sure to move towards more than one property for the number):
A number that is a multiple of 5
An even number
A number whose digits total 10
A number whose digits are in consecutive order (such as 789) either ascending or descending
A number with digits that are all prime numbers
An even number which is a multiple of 3
A number greater than 500 which contains double digits

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CYCLE ONE SECONDARY

BIG DEAL – Order of Operations and Probability

Bring in a deck of cards for each 4 students (or use the option listed below).
Have students remove the "face" cards.
Here are the rules.
Number of Players: 2 to 6
Each person needs a piece of paper and pencil.
One person shuffles the cards, and deals 4 cards, face up, to each person.
The dealer places the next card face up in the middle.
The card in the middle is the "target" number.
All players try to use all 4 of their cards, and the order of operations to reach the target number. They can use exponents as well as the 4 operations, and brackets.

Here is an example: the target number is 6
I have been dealt 8, 3, A, 10.
I write: $(3 - 1) \times 8 - 10 = 6$

Points are scored in the following way:
Order of operations correct, and all 4 cards used: 10 points
Order of operations correct, and only 3 cards used: 5 points
Only 2 cards used: 1 point

Options: If you do not want to purchase decks of cards, keep an old phone book in your classroom. Have each group tear a page from the phone book, and assign each student a phone number. The last 4 digits are their 4 numbers, and you can choose the target number from a 10-sided die or by putting 10 numbers in a bag.

WEB RESOURCES

Middle School Mathematics Glossary (Canadian – from University of Regina)
http://mathcentral.uregina.ca/RR/glossary/middle/

http://www.sms.sevier.org/math.html
I have just discovered this website, and it has links to math activities by theme, both elementary and secondary. Check it out! Pass on some of the math game websites to your students.

http://www.aplusmath.com/games/
Here you will find an interactive version of MATHO for addition, subtraction, multiplication or division (as well as a concentration game).

http://www.eduplace.com/math/brain/index1.html
This site has weekly math problems divided into cycle two, cycle three, cycle one secondary. These are good examples of "application" problems that you can expect to have on June exams, and that students should be exposed to during the year. Measurements are not always metric, so sometimes substitutions will have to be made.

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