



HAVING FUN WITH TRICKY ALGEBRA

NAME:

GRADE:

ROOM NUMBER:

TRICKY ALGEBRA PERFORMANCE TASK

"GRADES 5 TO 8 MATHEMATICS" "A FOUNDATION FOR IMPLEMENTATION"

Specific Learning Outcomes

- **PR-I.3.8** Substitutes numbers for variables in
- **PR-1.4.8** Translates between an oral or a written expression and an equivalent algebraic expression.
- **PR-II.2.7** Solves and verifies one-step linear equations, using a variety of techniques.
- **PR-II.3.7** Writes mathematical expressions/equations that arise from problem-solving contexts. Explains how to solve simple problems, using informal algebraic methods.

HOW I CAN SUCCEED

TRICKY ALGEBRA

Name: _____ Teacher: _____

Date : _____

Criteria Points	4	3	2	1	Points Earned
Explanation	Everything is completed with a very clear explanations.	Most everything is completed with clear explanations.	Explanations are not very clear.	Missing a lot of key points.	
Use Of Visuals	Very clear and effective diagrams or sketches are used to help explain the solutions.	Clear diagrams or sketches are used.	Inappropriate or unclear diagrams are used.	No diagrams or sketches are used.	
Calculations	No math mistakes.	No major math mistakes or serious problems in explaining answers.	May be some serious math mistakes or problems with some explanations.	Major math errors or serious problems with explanations.	
Understanding	Show a complete understanding of the questions and mathematical solutions.	Show a pretty good understanding of the questions and the mathematical solutions.	Show some understanding of the problem.	Show a complete lack of understanding of the problem.	
Requirements	Goes beyond what the students were asked to do.	Meets the requirements of the problem.	Hardly meets the requirements of the problem.	Does not meet the requirements of the problem.	
Cooperation	Was a very cooperative group member that tried their best at all times.	Was a cooperative group member that tried to help	At times was not a cooperative group member.	Didn't cooperate with the rest of the group.	
Overall Effort	Gave their very best effort to complete the assignment.	Gave a good effort in completing the assignment.	Effort was not always good.	Poor effort.	

Total point earned:

128

GUESS MY RULE

<i>YOU SAY</i>	<i>I SAY</i>

My rule in words was...

My rule using symbols was...

The rules of the game:

- Roll one die to determine who will go first.
- Player 1 rolls the dice and writes down the number they rolled in the "your roll" column.
- Player 1 writes out their question under the "your question" column.
- Player 1 will answer their question and place the answer under the "your answer" column. (Example: If player 1 rolls a 4 and 3, their roll would be 7 and their first question would be $7 + 3 =$, and their answer would be 10.)
- Player 2 goes through the same procedure as player 1.
- Each player takes turns until they have both completed the ten questions.
- Both players will add their own "your answer" columns.
- The player with the largest total is the winner!

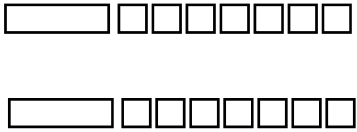
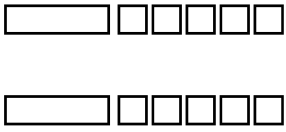
ROLLING THE UNKNOWN

ALGEBRAIC EXPRESSION	YOUR ROLL	YOUR QUESTION	YOUR ANSWER
$\heartsuit + 3$			
$\square + 5$			
$N + 10$			
$X - 2$			
$W - 5$			
$A + 10 - 1$			
$N - 1 + 12$			
$2(x)$			
$4(n)$			
$5(a) + 10$			
THE TOTAL OF YOUR ANSWERS			

CHECKING FOR UNDERSTANDING 1

DIRECTIONS	WORK WITH NUMBERS AND SYMBOLS	PICTURE
Choose any of the following whole numbers 1,2,3,4,5,6,7,8,9,10.		
Add 7 to the whole number that you chose.		
Multiply your new answer by 2 (double it)		
Subtract 4 from your changing number.		
Divide your new answer by 2 (split it in half).		
Subtract the original whole number that you started with.		

CHECKING FOR UNDERSTANDING 2

DIRECTIONS	QUESTION/ EXPRESSION	PICTURE
Choose any of the following whole numbers 1,2,3,4,5,6,7,8,9,10.		
	$x + 7$	
		
Subtract 4 from your changing number.		
	$x + 5$	
Subtract the original whole number that you started with.		

CHECKING FOR UNDERSTANDING 3

DIRECTIONS	QUESTION/EXPRESSION	PICTURE



HAVING FUN WITH TRICKY ALGEBRA

(TEACHER PACKAGE)

Ideas were humbly borrowed from a number of sources,
written, piloted, and rewritten by
Ms. N. Horsman,
Mr. C. Linski,
and their Grade 7&8 classes at
David Livingston and William Whyte Schools.

MAKING SENSE OF ORAL EXPRESSIONS IN ALGEBRA**I) WARM-UP ACTIVITY****YOU SAY, I SAY (GUESS MY RULE)**

This fun warm-up activity will lead students from the recognition of a pattern to an oral expression. This will be accomplished by having the students determining the operation(s) that the leader of the activity has applied to the number given. Decide, in advance, on an expression/rule that you will apply to any number (between 1 and 10) given by the students.

e.g. Multiply every number given by 2 and then increase that product by 5.
My rule is $(2n+5)$

Choose a student to pick a number from 1 to 10 and place it on a chart under the column titled "You Say". Silently apply your rule to the number given and place the answer under the column titled "I Say".

e.g.

YOU SAY	I SAY
2	9

The first student chose 2 so the teacher silently determined that $2 \times 2 + 5 = 9$ and placed the 9 in the second column.

Each time a student gives a number, it is placed in the first column, the expression is applied, and the answer is placed in the second column. This continues until a student discovers what rule you are applying every time.

e.g. "I know your rule. You are multiplying every number we gave you by 2 and then adding 5."

At this time the class can check that this rule works for each response. At this point script the oral expression that the student has discovered. Students can work in pairs to create their own rules to challenge each other. The oral expressions that the students create will be used in the next activity.

USING ORAL EXPRESSIONS TO CREATE A NUMBER TRICK

II) "MIND READER" ACTIVITY

This activity will now take the students from an oral expression, to expressions modeled with manipulatives, pictures and algebraic expressions. Review with students some of the oral expressions that they used to describe their rule during their "You Say, I Say" warm-up activity. Identify and script the mathematical vocabulary used.

e.g. add, increase, plus, decrease, subtract, reduce, take away, multiply, times, double, triple, divide, in half, equal groups, $\frac{1}{8}$, $\frac{1}{8}$, $\frac{1}{6}$, $2(3)$, 2×3 , etc.

Tell the class that you are a "mind reader" and have them follow the following oral instructions:

- 1) Choose any of the following whole numbers 1,2,3,4,5,6,7,8,9,10.
- 2) Add 7 to the whole number that you chose.
- 3) Multiply your new answer by 2 (Double it).
- 4) Subtract 4 from your changing number.
- 5) Divide your new answer by 2 (split it in half)
- 6) Subtract the original whole number that you started with.

Ask the students one by one to tell you the number that they started with. Once you get a variety of start numbers, tell the students that you already know that they all got an answer of 5. Give students time to try to determine how you may have done this before you begin a visual/concrete explanation.

CONCRETE

Provide pairs of students with a box of raisins and have them remove all the raisins from the box, and place a certain number of raisins back into the box. Have the groups exchange the boxes containing different numbers of raisins so they end up in possession of a box containing an unknown number of raisins.

Tell the students that they have chosen "any whole number" but have given it to someone else so the number they have now is unknown. Eventually we want students to think of the box as "some unknown number or value" rather than a specific number.

Lead the students through the original "mind reader" problem using their boxes and left over raisins.

- e.g. 1) Choose any of the following whole numbers 1,2,3,4,5,6,7,8,9,10.
- 2) Add 7 to the whole number that you chose.
- 3) Multiply your new answer by 2 (double it)
- 4) Subtract 4 from you changing number.
- 5) Divide your new answer by 2 (split it in half).
- 6) Subtract the original whole number that you started with.

Note: Students can see that the original box with an unknown number of raisins is NOT in the solution because no matter what number they start with, they always end up with the number 5 due to the fact that the last step requires them to subtract whatever they chose for an original whole number.

Concrete cont.

Once the students understand the concept of how the number trick works, change the manipulative that they are using to model from raisin boxes and raisins to algebra tiles. Square tiles will be used to represent the raisins, and the rectangle pieces will be used to represent the boxes that contained an unknown number of raisins. Allow the students to become proficient with modeling the tricks by creating their own and having other groups solve them using their tiles.

PICTORIAL

Once students are proficient with modeling (manipulatives), it is time to move to drawing visual/pictorial representations of the modeling they have done. This step is the BRIDGE between the modeling using concrete materials that was done in the previous activity and the symbolic algebraic method that will be used in the next activity. Students will now use drawings that will look like the concrete models used.

e.g.  for the unknown number and  for the units.

Note: Continue the discussion concerning vocabulary. Consider the different ways that instructions could be given:

1. Double the number and take away two
2. Take twice the number, then decrease by two
3. Multiply by two, then subtract two

SYMBOLIC

The final step that the students will take is using symbolic algebraic notation. The transition should be clear from the raisin box/rectangular algebra tile/rectangular drawing holding an unknown number. This box can be symbolically represented by the letter "n" called the variable. The individual raisins/tiles/square drawings can be represented by a number. Use the chart on the following page to have students observe the connection/bridge between the pictorial and a symbolic algebraic notation.

III) CHECKING FOR UNDERSTANDING

Have students complete the checking for understanding worksheet.