

Stage 1

Identify Desired Results

Catchy Title: Villainy Inc Mission One

Theme/Topic of Lesson: math

Time Commitment: 4 days of 90 minutes each

Subject Area(s):

Mathematics - Algebra

Mathematics - Geometry

Grade Level(s): 5,6,7,8

Standards Alignment:

Class Challenge Question:

How can you use algebra and geometry to stop the evil Dr. Wick I.D.?

Overview:

By completing this multi-day lesson, students will work through the various activities featured on the innovative mathematics web site, Villainy Inc. The site is divided into two missions. This lesson plan will address Mission 1: The Golf of Mexico. Carefully coordinated with national and state content standards, this mission contains activities that explore composite figures, problem solving, algebraic expressions, numeric patterns, calculating area, geometric figures, order of operations and more.

Villainy, Inc is an animated story about Dr. Eugene Wick, ID, and his sidekick Platypus. Wick and “Platy” have ridiculously goofy plans to take over the world. Your students will take on the role of an advisor to Dr. Wick’s company, Villainy, Inc. Outwardly, they seem to go along with Wick’s schemes. But, secretly, they are really working with the Anti-Villainy Unit (the AVU) as double agents, using their math skills to make sure Wick never succeeds.

Stage 2

Determine Acceptable Evidence

Knowledge of Algebra, Patterns and Functions (6-8)	Maryland Content Standards Students will algebraically represent, model, analyze, and solve mathematical and real-world problems involving patterns and functional relationships.	Maryland State Indicators 1.8.4 a. <i>represent and interpret quantitative relationships in a table or graph.</i> b. <i>graph ordered pairs in the four quadrants of a coordinate plane</i> -graph linear equations on a
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		coordinate plane (MLO 1.6) c. <i>solve inequalities and graph the solutions on a number line</i>
Knowledge of Algebra, Patterns and Functions (6-8)	Maryland Content Standards Students will algebraically represent, model, analyze, and solve mathematical and real-world problems involving patterns and functional relationships.	Maryland State Indicators 1.8.3 a. evaluate algebraic expressions and apply formulas . (MLO 1.4.) b. solve linear equations and inequalities in one variable <i>using mathematical properties</i> . (MLO 1.5.) c. <i>describe a real-world situation represented by an algebraic expression or equation</i> d. <i>solve problems involving direct and inverse variation</i> e. <i>determine the slope of a linear function represented graphically, numerically, or algebraically</i>
Knowledge of Algebra, Patterns and Functions (6-8)	Maryland Content Standards Students will algebraically represent, model, analyze, and solve mathematical and real-world problems involving patterns and functional relationships.	Maryland State Indicators 1.8.1 a. <i>recognize, describe, and extend patterns and functional relationships</i> • identify and extend a simple arithmetic or geometric sequence . (MLO 1.1.) • describe the recursive relationship of simple arithmetic and geometric sequences <i>verbally</i> , in a table, or a graph . (MLO 1.2.) b. <i>produce rules</i> that explain how a change in one variable in a relationship affects the other variable (MLO 1.3) c. <i>determine whether functions are discrete or continuous</i> d. <i>determine whether functions are linear or nonlinear when given graphic examples</i>
Knowledge of Geometry (6-8)	Maryland Content Standards Students will apply the properties of one-, two-, and three- dimensional geometric figures to describe, reason, and solve problems about shape, size, position, and motion of objects.	Maryland State Indicators 2.8.2 a. <i>use the properties of angles and triangles</i> • <i>classify triangles by sides and by angles</i> • <i>determine missing angle measures</i>

		<ul style="list-style-type: none"> • determine angle measure using estimation, direct, and indirect measurements. (MLO 2.2.) • use the Pythagorean theorem to solve problems by <i>determining the missing side of a right triangle</i> (MLO 2.3.) • <i>identify and determine missing angle measures for adjacent, vertical, complimentary and supplementary angles</i> • <i>identify and determine the missing angle measures for corresponding, alternate interior and alternate exterior angles when parallel lines are cut by a transversal .</i>
Knowledge of Geometry (6-8)	Maryland Content Standards Students will apply the properties of one-, two-, and three- dimensional geometric figures to describe, reason, and solve problems about shape, size, position, and motion of objects.	Maryland State Indicators 2.8.5 apply properties of congruence and similarity to solve problems. (MLO 2.6.)
Knowledge of Measurement (6-8)	Maryland Content Standards Students will identify attributes, units, and systems of measurements and apply a variety of techniques, formulas, tools and technology for determining measurements.	Maryland State Indicators 3.8.3 a. estimate and determine the circumference and area of circles. (MLO 2.8.) b. estimate and determine the area of figures by measuring, partitioning, and using formulas. (MLO 2.9.) c. estimate and determine the volume and surface area of cylinders, triangular prisms and other solids. (MLO 2.10.) <i>determine relationships between length, area, and volume and describe how a change in one measure affects the others</i>
Process of Problem Solving (4-5)	Maryland Content Standards Students will demonstrate their ability to apply a wide variety of mathematical concepts, processes, and skills to solve a broad range of problems.	Maryland State Indicators 7.5.1 In order to solve problems, students will be able to: -use information to identify and define the question(s) within a problem

		<p>(MLO 5.1, SFS 2.2, SFS 2.4) - make a plan and decide what information <i>is needed or missing</i> and steps needed to solve the problem (MLO 5.2, SFS 2.4) -choose the appropriate operation(s) for a given problem situation (MLO 5.3) -<i>create or</i> select and then apply appropriate problem-solving strategies to solve a problem from visual (draw a picture, create a graph), numerical (guess and check, look for a pattern), and symbolic (write an equation) perspectives (MLO 5.4, SFS 2.4) <i>analyze multi-step problem-solving situations (SFS 2.4)</i> -organize, interpret, and use relevant information (MLO5.5, SFS 2.2, SFS 2.4) -select and use appropriate tools and technology (MLO 5.6, SFS 2.4) -<i>persevere through to a solution</i> -<i>verify the conclusion based on the data and the processes used (SFS 2.4)</i> - <i>communicate the conclusion with appropriate mathematical justification (SFS 3.2)</i> -show that no solution or multiple solutions may exist (MLO 5.7, SFS 3.2) -<i>ascribe a meaning to the solution in the context of the problem</i> -identify alternate ways to find a solution (MLO 5.8, SFS 2.4) -apply what was learned to a new <i>and/or more complex</i> problem (MLO 5.9, SFS 2.4)</p>
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Learning Objectives:

The Students will:

- write and evaluate algebraic expressions.
- construct a graph.
- find the area of various geometric figures.
- arrange numbers from least to greatest.

Assessment

Students will complete each of the four activities on the Villainy Inc. Mission Two Web site along with the companion *Field Log* worksheet and *Mission Simulation* activities. Additionally, the students will complete the *Villainy Inc. Reflection Log* at the conclusion of the four-day lesson.

Stage 3

Plan Learning Experiences

Resources

Internet Sites	Villainy Inc. This interactive mathematics online field trip provides the framework for this multi-day lesson. http://villainyinc.thinkport.org/
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Materials

Per Student

- a writing utensil
- *Training Mission: Cookie Confusion* and *Training Mission: Cookie Confusion Answer Key*

[\(View\)](#)

- *Field Log: Dr. Wick's Area* and *Field Log: Dr. Wick's Area Answer Key*

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- *Mission Simulation: Operation Inner Harbor*

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- *Mission Simulation: Operation Inner Harbor Answer Key*

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- *Training Mission: Producing the Moose*

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- *Training Mission: Producing the Moose Answer Key*

[\(View\)](#)

- *Field Log: Choose the Building Material and Field Log: Choose the Building Material Answer Key*

[\(View\)](#)

- *Mission Simulation: Operation Uni-calculation and Mission Simulation: Operation Uni-calculation Answer Key*

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- *Training Mission: Floorplan Mayhem and Training Mission: Floorplan Mayhem Answer Key*

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- *Field Log: How Many Holes on the Course and Field Log: How Many Holes on the Course Answer Key*

[\(View\)](#)

- *Mission Simulation: Operation Bricklayer and Mission Simulation: Operation Bricklayer Answer Key*

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- *Training Mission: Table Tumble and Training Mission: Table Tumble Answer Key*

[\(View\)](#)

- *Mission Simulation: Operation Ice Cream Machine*

[\(View\)](#)

- *Field Log: Admission Price and Field Log: Admission Price Answer Key*

[\(View\)](#)

- *Mission Simulation: Operation Ice Cream Machine*

[\(View\)](#)

- *Finding the Area of a Triangle handout* [\(View\)](#)

- *Finding the Area of a Triangle* handout Answer Key ([View](#))
- 45 colored chips

Vocabulary

- **Area** - The number of square units needed to cover a surface or figure.
- **Constant** - In equations, a quantity that does not change its value. Numbers such as 1, 2.5, 117, 10,000 etc. are constants.
- **Data** - A collection of information that has been gathered to study and analyse.
- **Equation** - A number sentence that uses an equal sign to show that two mathematical expressions are equivalent.
- **Formula** - An equation that states a rule or a fact about a relationship.
- **Graph** - A drawing or diagram that shows information.
- **Grid** - A pattern of equally spaced vertical and horizontal lines.
- **Guess and Check** - A problem-solving strategy where you guess an answer and check to see if it's correct. You repeat the process until you find the correct answer. Also called "guess and test."
- **Horizontal** - Parallel with the horizon (the line at which the Earth and the sky appear to meet.)
- **Length** - The distance from one end to the other.
- **Number Sentence** - A statement that shows equality or inequality using numbers, signs, and symbols.
- **Rectangle** - A parallelogram (a four-sided figure with parallel opposite sides) with four right angles.
- **Repeated Addition** - Add, and then add again and again.
- **Scale** - A ratio between the size of an object or the distance in a drawing or model to its actual size or distance.
- **Square** - A special kind of rectangle with all sides the same length.
- **Square Mile** - A unit used to measure area; a square whose sides are all a mile long.
- **Tessellation** - A pattern of repeated shapes that completely cover a plane with no gaps or overlapping.
- **Triangle** - A polygon (many-sided figure) that has three sides and three angles.
- **Variable** - In equations, a symbol or letter that is used to stand in for one or more numbers.
- **Vertical** - Forming a right angle (perpendicular) with the horizon (the line at which the Earth and the sky appear to meet.)
- **Width** - The distance from one side to the other.
- **X-Axis** - The horizontal (left-to-right) axis (central point) of a coordinate plane.
- **Y-Axis** - The vertical (up-and-down) axis (central point) of a coordinate plane

Procedures

This four-day set of lesson plans focuses on the completion of the mathematics activities in the highly interactive Web site, Villainy Inc. The teacher will begin by offering the students an

overview of the Web site and having the students work in groups to explore the various AVU field agents. Each of the activities in a mission has a training mission activity that can be done prior to the online activity to introduce the mathematical concepts that will be covered in the activity. Each activity has a *Field Log* handout that can be used in conjunction with the online activity to record the solutions and each activity has a *Mission-Simulation* worksheet which reinforces and extends the mathematical concepts involved in the online activity. Each day, the students will complete one of the online activities after first completing the *Training Mission* and will conclude the day's activities by completing the *Mission-Simulation*.

The students will be completing the various activities individually and in groups. All of the activities accommodate students with various learning abilities by peer interaction either through teacher-led questioning or in the group activity. Additionally, students who need extra support can be assigned to work with a partner. Students should be grouped heterogeneously.

An Internet-connected computer lab with enough computers for each student is the most favorable technology configuration to complete this lesson. If this set-up is not feasible, the students can work in pairs or teams of about four or the activities can be set up as a station through which the teams rotate .

Day One: The Golf of Mexico: Activity A

Daily Challenge Question: How can you find the area of Dr. Wick's proposed golf course?

90 Minutes

Set-up Directions:

Today, the students will complete the *training mission*, *field log* and *mission-simulation* assignments that accompany the first activity in the 1st Mission of the Villainy Inc. Web site. Ideally, the teacher will secure an Internet-connected computer with a projection device in order to introduce the Web site and will also reserve the computer lab. Ideally, each student will have their own internet-connected computer to work on. The Villainy Inc. Web site can be found online (see Resources). The teacher should bookmark the Web site and have it ready prior to the arrival of the students. The teacher should arrange the students into heterogeneous groups of about four students. These groups should remain constant for the duration of the four-day lesson.

If this technology configuration is not possible, the teacher can introduce the Web site using materials printed off of the Web site. Students can work in pairs or teams if there are not enough computers available for each student to work at one individually.

The teacher will also need to gather enough chips for each student to have 45.

The teacher will need to duplicate copies of the following handouts for each student for today's lesson:

Finding the Area of a Triangle handout

Training Mission: Cookie Confusion

Field Log: Dr. Wick's Area

Mission-Simulation Assignment: Operation Inner Harbor

The teacher should also duplicate one copy of each of the following answer keys:

Finding the Area of a Triangle Answer Key

Training Mission: Cookie Confusion Answer Key

Field Log: Dr. Wick's Area Answer Key

Mission-Simulation Assignment: Operation Inner Harbor Answer Key

Teacher Presentation & Motivation:

The teacher will tell the students that today they are going to learn about an evil man named Dr. Wick I.D. and that it is going to be their job over the next four days to save the world from chaos and bedlam by being savvy problem-solvers. The teacher will explain that they have each been hand-selected to become a member of the Anti-Villainy Unit, or AVU, and that their first mission involves finding the area of Dr. Wick's proposed golf course.

Activity 1 - Welcome to Villainy Inc.

(10 Minutes) Before your students log onto the computers, you will want to familiarize them with the world of Dr. Wick. The teacher will introduce the plot, characters, and setting. All of this information can be found in the About the Story section <http://villainyinc.thinkport.org/default.asp>.

Summarize the major points for your students. Hard copies of this page can be printed by using your browser's "Print" function. In Internet Explorer, this function is listed on the pull-down menu under "File." Next, assign each team of 3-4 students to a computer and have them explore one assigned AVU field agents as well as one Villainy Inc. member.

Focus for Media Interaction

Focus for Media Interaction: The focus for media interaction is a specific task to complete and/or information to identify during or after viewing of video segments, Web sites or other multimedia elements.

The students will be told that today's focus for media interaction is learn about their assigned

Villainy Inc. member and their assigned AVU field agent.

Viewing Activities

What will your students be responsible for while viewing this piece of multi-media or video?

While viewing the Web site, the group will be responsible for taking notes on the strengths of the assigned AVU field agent as well as notes on the story of the assigned Villainy Inc. member.

Post Viewing Activities

How will students utilize the information they gathered while viewing the multi-media or video?

After the students have spent a few minutes online, have each team report the information that they found to the whole class.

Activity 2 - Training Mission: Cookie Confusion

(20 minutes) The teacher will distribute copies of the *Training Mission – Cookie Confusion* handout to each student. The teacher will also distribute 45 colored chips to each student. The teacher read through the directions while the students read them quietly to themselves. The teacher will tell the students that they can use the colored chips to model each box of cookies. The teacher will also share that one strategy for working through the handout would be to write how many cookies can fit into each box on the left before working on the boxes on the right. The teacher should encourage the students to use the chips, at least at the beginning of the activity, until they discover a faster way to do it.

After giving the students about 15 minutes to complete the handout, the teacher should call students up to the chalkboard to share their answers. The students will offer additional solutions and will confirm the solutions that are shared by each student. Lastly, students will be asked to discuss, in groups, a quick way for finding out how many cookies each box can hold. Then, each team will present their ideas.

Activity 3 - Field Log: Dr. Wick's Area

(30 minutes) The students will each need to be at a computer with internet access and with the Villainy Inc. Web site bookmarked. The students will pull the Web site up and click on the link "Begin Mission #1 The Golf of Mexico." The students will view the short introduction and then type in their AVU agent name. The students will read through the letter from headquarters (HQ) while they listen to it being read by the computer. They will then be prompted to select 2 of the 5 field agents to comprise their team. The teacher will remind them to pick team members whose strengths will benefit them as they work on the activities throughout the mission. Next, the

students will read the AVU agreement statement and click on the link that says, "I accept the mission." Next, the students will listen to and watch the discussion between Dr. Wick and Platypus which will set up the activity. The students will next listen to and read through the HQ e-mail which details the plan of how to thwart Dr. Wick's golf course plan. The teacher will advise the students to next open the FAWN letter. This letter explains the three conditions of the golf course – a. that it must not touch any of mainland U.S. b. that it does not go beyond the bounds of US water space and c. that it is rectangular in shape. After the students have read through the FAWM letter and have indicated that they understand these requirements the teacher will go around and make sure that the students understand how to work the border lines on the activity. The teacher will distribute the handout entitled ***Field Log: Dr. Wick's Area***. The students will work through the activity while writing down information on the Field Log handout. The teacher will let the students know that they must first find the boundaries of the golf course, then use the various tools to find the dimensions of the area, then use the formula they learned in the Training Mission Activity.

Focus for Media Interaction

Focus for Media Interaction: The focus for media interaction is a specific task to complete and/or information to identify during or after viewing of video segments, Web sites or other multimedia elements.

The students will be told that today's focus for media interaction is to work through the first activity in Mission 2: Drive Through Deceit on the Villainy Inc. Web site. They will first focus on what they are being asked to do by Head Quarters in order to ruin Dr. Wick's plans. Then, they will use the blue border lines to find the boundaries of the proposed golf course.

Viewing Activities

What will your students be responsible for while viewing this piece of multi-media or video?

While viewing the Web site, the group will be responsible for completing the Field Log handout while they complete the four outlined steps on their To-Do list for the activity.

Post Viewing Activities

How will students utilize the information they gathered while viewing the multi-media or video?

After the students have completed the activity, students will be asked to share the dimensions of the rectangle and the various tools and processes that they used to find the dimensions.

Activity 4 - Finding the Area of a Triangle

The teacher will say to the students, "You just learned a shortcut for finding the area of a rectangle. Who can tell me how to find the area of a rectangle?" The teacher will call on a

student and the student should respond, "In order to find the area of a rectangle, you multiply the length times the width." The teacher will continue, "Next, using what we know about rectangles, we are going to learn how to find the area of a triangle. The teacher will distribute the ***Finding the Area of a Triangle*** handout and will tell the students to write their name at the top. The teacher will read the directions aloud while the students follow along. Next, the teacher will go through the first example with the class. The teacher will help the students to see that the triangle takes up half of the space of the rectangle. If any of the students are skeptical, the teacher can pass out scissors and the students can cut out the red triangle and lay it on top of the white triangle to prove that they are indeed identical in size. The students will work through the rest of the handout individually while the teacher circulates the classroom assisting students in need of help.

Activity 5 - Mission Simulation: Operation Inner Harbor

(15 minutes) For this activity, the students will work in teams of 3 to 4 students. The teacher will distribute the ***Mission Simulation - Operation Inner Harbor*** handout. The teacher will say, "Using what you learned about finding the area of a rectangle and a triangle, you are going to help the Anti-Villainy Unit once again. It seems that Dr. Wick is intending to build a miniature golf course in Baltimore's inner harbor. It is your job to find the area of his oddly shaped gold course." The teacher will read the introduction and directions from the handout while the students follow along. The teacher will ask students to take about 3 minutes to brainstorm strategies for finding the area of this oddly shaped figure before beginning to work. After about 3 minutes have passed, the teacher will ask each team to share how they plan to proceed. It is likely that several of the group will decide to break the figure into rectangles and triangles. The teacher should encourage this strategy.

Wrap Up:

The teacher will end the lesson with praise for the AVU team who was able to thwart Dr. Wick's plans for at least one more day. The teacher will return to the daily challenge question which was, "How can you find the area of Dr. Wick's golf course?" The teacher will call on various students for responses and then will ask the students how they were able to foil his progress today.

Day 2: The Golf of Mexico: Activity B

Daily Challenge Question: What is the difference between a variable and a constant and why are they important when it comes to writing and evaluating algebraic expressions?

90 Minutes

Set-up Directions:

Today, the students will complete the *training mission*, *field log* and *mission-simulation*

assignments that accompany the second activity in the 1st Mission of the Villainy Inc. Web site. Ideally, the teacher will secure an Internet-connected computer with a projection device in order to introduce the Web site and will also reserve the computer lab. Ideally, each student will have their own internet-connected computer to work on. The Villainy Inc. Web site can be found online (see Resources). The teacher should bookmark the Web site and have it ready prior to the arrival of the students. The teacher should arrange the students into heterogeneous groups of three to four students. These groups should remain constant for the duration of the four-day lesson.

If this technology configuration is not possible, students can work in pairs or teams if there are not enough computers available for each student to work at one individually.

The teacher will need to duplicate copies of the following handouts for each student for today's lesson:

Training Mission: Producing the Moose

Field Log: Choose the Building Material

Mission-Simulation Assignment: Uni-Calculation

The teacher should also duplicate one copy of each of the following answer keys:

Training Mission: Producing the Moose Answer Key

Field Log: Choose the Building Material Answer Key

Mission-Simulation Assignment: Uni-Calculation Answer Key

Teacher Presentation & Motivation:

The teacher will explain, "Today, Dr. Wick would like your help to find the best building material for his golf course. Of course, you are going to complete all of the calculations and lead him astray. You will be using algebraic expressions to help you to figure out the best and worst deals for Dr. Wick. Good luck on your mission!"

Activity 1 - Training Mission: Producing the Moose

(25 minutes) The teacher will distribute copies of the ***Training Mission – Producing the Moose*** handout to each student. The teacher will read through the directions while the students read them quietly to themselves. The teacher will ask the class, "How many artists does Kotori need?" The students should reply "four." The teacher will ask the class, "How many studios does Kotori need?" The students should reply, "one." The teacher will work through the first studio proposal from Shogun Productions with the students. The teacher should pay special attention to the pictorial representation of the expression for the cost of hiring 4 artists and the use of a studio from Shogun Productions. After the students have calculated the total cost of Shogun Productions, the teacher will ask the students to translate the pictorial expression into an algebraic expression. The teacher may need to help the students set up the expression, depending on the students' prior exposure to algebra. The teacher will make sure that the students select a variable

for the number of artists and will ask the students if a variable needs to be selected for the cost of the studio. The students should recognize that no variable is needed for the cost of the studio because in the case of Shogun Productions, the cost of the studio is a fixed cost, or a constant. After going through Shogun Productions as a class, the students can finish up the handout on their own. The teacher should encourage the students to show all of their work in the space provided on the handout.

Activity 2 - Field Log: Choose the Building Material

(30 minutes) The students will each need to be at a computer with internet access and with the Villainy Inc. Web site bookmarked. The students will pull the Web site up and click on the link "Begin Mission #1 The Golf of Mexico." The students will click the green right arrow to by pass the introduction, then type in their AVU agent name, use the green arrow again, then they will be prompted to select 2 of the 5 field agents to comprise their team. The teacher will remind them to pick team members whose strengths will benefit them as they work on the activities throughout the mission. Next, the students will read the AVU agreement statement and click on the link that says, "I accept the mission." Using the secret key stroke, **holding down control, shift and the right arrow**, the students will skip activity A and will get to the second activity. Next, the students will listen to and watch the discussion between Dr. Wick and Platypus which will set up the activity. The students will next listen to and read through the HQ e-mail which details the plan of how to thwart Dr. Wick's plan. The teacher will make sure that all of the students understand what is expected, will distribute the handout entitled ***Field Log: Choose the Building Material***. The students will work through the activity while writing down information on the Field Log handout.

Focus for Media Interaction

Focus for Media Interaction: The focus for media interaction is a specific task to complete and/or information to identify during or after viewing of video segments, Web sites or other multimedia elements.

The students will be told that today's focus for media interaction is to work through the second activity in Mission 1: The Golf of Mexico on the Villainy Inc. Web site. They will first focus on what they are being asked to do by Head Quarters in order to ruin Dr. Wick's plans. Specifically, the students should read through the three steps they must follow to complete the to-do list.

Viewing Activities

What will your students be responsible for while viewing this piece of multi-media or video?

While viewing the Web site, the group will be responsible for completing the ***Field Log - Choose the Building Material*** handout while they complete the two outlined steps on their To-Do list for the activity.

Post Viewing Activities

How will students utilize the information they gathered while viewing the multi-media or video?

After the students have completed the activity, several students will be asked to share the math terms and or formulae that they used to determine the most expensive building material option that they recommended to Dr. Wick. A list of terms and formulae will be written on the chalkboard.

Activity 3 - Mission Simulation: Operation Uni-Calculation

For the duration of this activity, the students will work in teams. The teacher will distribute the *Mission Simulation - Operation Uni-Calculation* handout. The teacher will say, "You did a fantastic job using your algebra skills to give Dr. Wick the run-around about which company he should hire to complete the golf course. Using what you learned today about evaluating algebraic expressions, you are going to help Coach figure out how much new uniforms for the basketball team are going to cost." The teacher will read the introduction and directions from the handout while the students follow along. The teacher will ask the students to share any questions that they have and will then tell the students to work as a team to help get Coach the information that he has requested.

Wrap Up:

The teacher will end the lesson by reading the following short note from Coach. *Dear AVU agents, Thank you so much for running the numbers on the basketball uniform. I always knew that Everitt was trouble. Perhaps I will charge the guy a couple of bucks to cover his expensive uniform. Then that darn Trung would probably ask for some money back. Anyway, I appreciate all of your help.* Next, the teacher will return to the daily challenge question which was, "What is the difference between a variable and a constant and why are they important when it comes to writing and evaluating algebraic expressions?" The teacher will call on various students for responses and then will ask the students strategies that they used while working through the various activities today.

Day 3: The Golf of Mexico: Activity C

Daily Challenge Question: How can you find the area of a large space when you only know information about smaller pieces of the large space?

90 Minutes

Set-up Directions:

Today, the students will complete the *training mission*, *field log* and *mission-simulation* assignments that accompany the third activity in the 1st Mission of the Villainy Inc. Web site.

Ideally, the teacher will secure an Internet-connected computer with a projection device in order to introduce the Web site and will also reserve the computer lab. Ideally, each student will have their own internet-connected computer to work on. The Villainy Inc. Web site can be found online (see Resources). The teacher should bookmark the Web site and have it ready prior to the arrival of the students. The teacher should arrange the students into heterogeneous groups of about four students. These groups should remain constant for the duration of the four-day lesson.

If this technology configuration is not possible, the teacher can introduce the Web site using materials printed off of the Web site. Students can work in pairs or teams if there are not enough computers available for each student to work at one individually.

Additionally, the teacher will need access to an overhead projector and an overhead marker.

The teacher will need to duplicate copies of the following handouts for each student for today's lesson:

Training Mission: Floorplan Mayhem

Field Log: How Many Holes on the Course

Mission-Simulation Assignment: Operation Bricklayer

The teacher should also duplicate one copy of each of the following answer keys:

Training Mission: Floorplan Mayhem Answer Key

Field Log: How Many Holes on the Course Answer Key

Mission-Simulation Assignment: Operation Bricklayer Answer Key

Additionally, the teacher will need to make one **transparency** of the ***Training Mission: Floorplan Mayhem*** handout

Teacher Presentation & Motivation:

The teacher will say, "Today, you are going to use your skills in finding the area of squares, rectangles and triangles to further help the AVU to stop Dr. Wick. Take out a piece of paper and a pencil and write down how you find the area of a square, a rectangle and a triangle." The teacher will give the students about 2 minutes to complete this task. While the students are working, the teacher will circulate around the room to offer assistance and feedback. After the 2 minutes are up, the teacher will ask a variety of students to share their ideas. The formulae for the area of a square, rectangle and triangle will be written on the chalkboard.

Activity 1 - Training Mission: Floorplan Mayhem

(25 minutes) The teacher will distribute the ***Training Mission - Floorplan Mayhem*** handouts and will place the **transparency** of the ***Floorplan Mayhem*** worksheet onto the overhead projector. The teacher will read the directions aloud to the students while they follow along. The teacher will explain to the students that while there is not a lot of information provided on the

floorplan, a lot of clues have been left and that all of the other dimensions that are needed can be found by going through **Mathbot's Instruction List** on the right-hand side of the paper and by using what they know about squares and rectangles. The teacher will say, "Look at the floorplan and tell me what dimension is given." The teacher will call on a student who should reply something like, "Segment AD is 3 units long." The teacher will ask the students if knowing that provides any additional information. Students should offer that Segments EF and QJ are also 3 segments long. The teacher should at that point, label Segements EF and QJ with a 3 on the overhead transparency and instruct the students to do the same on the handout. Next, the teacher will ask the students to look at Mathbot's Instruction List. The second instruction says, that the area of ABCD is 12. The students should place a 12 in the middle of rectangle ABCD. The teacher will ask the students if that offers any additional information about the rectangle. The students should share that knowing the area is 12 and that the width is 3, that makes the length equal to 4. Segment AB should be labeled with a 4. The teacher may wish to proceed in this fashion for one or two more instructions on the list or may wish to have the students begin working in groups at this point, depending on the comfort level of the students with the material. The students will be given about 15 minutes to complete the remainder of the handout.

Activity 2 - Field Log: How Many Holes on the Course

(30 minutes) The students will each need to be at a computer with internet access and with the Villainy Inc. Web site bookmarked. The students will pull the Web site up and click on the link "Begin Mission #1 The Golf of Mexico." The students will click the green right arrow to by pass the introduction, then type in their AVU agent name, use the green arrow again, then they will be prompted to select 2 of the 5 field agents to comprise their team. The teacher will remind them to pick team members whose strengths will benefit them as they work on the activities throughout the mission. Next, the students will read the AVU agreement statement and click on the link that says, "I accept the mission." Using the secret key stroke, holding down control, shift and the right arrow, the students will skip activities A and B and will get to the third activity. Next, the students will listen to and watch the discussion between Dr. Wick and Platypus which will set up the activity. The students will next listen to and read through the HQ e-mail which details the plan of how to thwart Dr. Wick's plan. The teacher will make sure that all of the students understand what is expected, will distribute the handout entitled ***Field Log: How Many Holes on the Course***. The students will work through the activity while writing down information on the Field Log handout.

Focus for Media Interaction

Focus for Media Interaction: The focus for media interaction is a specific task to complete and/or information to identify during or after viewing of video segments, Web sites or other multimedia elements.

The students will be told that today's focus for media interaction is to work through the third activity in Mission 1: The Golf of Mexico on the Villainy Inc. Web site. They will first focus on what they are being asked to do by Head Quarters in order to ruin Dr. Wick's plans. Specifically,

the students should read through and execute the two steps on the to-do list.

Viewing Activities

What will your students be responsible for while viewing this piece of multi-media or video?

While viewing the Web site, the group will be responsible for completing the ***Field Log - Frantic Franchise handout*** while they complete the two outlined steps on their To-Do list for the activity.

Post Viewing Activities

How will students utilize the information they gathered while viewing the multi-media or video?

After the students have completed the activity, the students will be asked to complete the **Sum It Up** section of the Field Log handout with their teams. The teams will then share the various ways that they computed the number of holes that would fit on the course. These strategies will be recorded on the chalkboard.

Activity 3 - Mission Simulation: Operation Bricklayer

For this activity, the students will work with a partner. The teacher will distribute the ***Mission Simulation - Operation Bricklayer*** handout. The teacher will say, "Using what you know about finding the area of geometric figures, you are going to help the Anti-Villainy Unit once again. Dr. Winnie has decided to redo her front walk and needs to know the area." The teacher will read the introduction and directions from the handout while the students follow along. The teacher will ask the students to share any questions that they have and will then tell the students to work with their partner to complete the Mission Simulation Assignment.

Wrap Up:

The teacher will end the lesson with praise for the AVU team who was able to thwart Dr. Wick's plans for at least one more day. The teacher will return to the daily challenge question which was, "How can you find the area of a large space when you only know information about smaller pieces of the large space?" The teacher will ask the students to respond to the question, thinking about all three of the activities completed during the class period.

Day 4: The Golf of Mexico: Activity D

Daily Challenge Question: How can you translate a mathematical expression into words?

90 Minutes

Set-up Directions:

Today, the students will complete the *training mission*, *field log* and *mission-simulation* assignments that accompany the fourth activity in the 1st Mission of the Villainy Inc. Web site. Ideally, the teacher will secure an Internet-connected computer with a projection device in order to introduce the Web site and will also reserve the computer lab. Ideally, each student will have their own internet-connected computer to work on. The Villainy Inc. Web site can be found online (see Resources). The teacher should bookmark the Web site and have it ready prior to the arrival of the students. The teacher should arrange the students into heterogeneous groups of about four students. These groups should remain constant for the duration of the four-day lesson.

If this technology configuration is not possible, the teacher can introduce the Web site using materials printed off of the Web site. Students can work in pairs or teams if there are not enough computers available for each student to work at one individually.

The teacher will need to duplicate copies of the following handouts for each student for today's lesson:

Training Mission: Table Tumble

Field Log: Admission Price Report

Mission-Simulation Assignment: Operation Ice Cream Machine

Villainy Inc.

Reflection Journal

The teacher should also duplicate one copy of each of the following answer keys:

Training Mission: Table Tumble Answer Key

Field Log: Dr. Admission Price Report Answer Key

Mission-Simulation Assignment: Operation Ice Cream Machine Answer Key

Teacher Presentation & Motivation:

The teacher will say, "Today, you are going to become a translator. Does anyone know another language?" Students may look puzzled or some students who do speak another language may share their knowledge of another language with the class. The teacher will say, "Don't worry. You all know the language I am talking about. I am talking about math. Today you will be writing and reading rules that are in English and mathematics and you will go between both 'languages.'"

Activity 1 - Training Mission: Table Tumble

(25 minutes) The teacher will tell the students, "I have a math rule in my head. Raise your hand and give me a number, I will apply my math rule to your number and tell you the output number." (Note, for the first example the rule will be $2n$, where n = the number given by the students.) The students will offer numbers and each time the teacher will give back the number doubled. After several practice problems, the teacher will ask the students to write down the rule

in their notes. The students will be encouraged to write it both in words (multiply the number by two) and in mathematical language ($2n$). The teacher will go through two more examples next using the rule $n-5$ and then a two-step rule $2x + 1$.

The teacher will distribute copies of the ***Training Mission – Table Tumble*** handout to each student. The teacher will read through the directions while the students read them quietly to themselves. The teacher should encourage the students to first look at the five reports on the right of the handout to figure out the rule, then look for the translation of the rule on the right. The students can work in groups on this activity. The students will be given 10-15 minutes to complete the handout. Next, the teacher will ask each group to share which rule should Molly suggest to Dr. Wick in order to make sure he makes the **smallest** possible profit given 100 golfers.

Activity 2 - Field Log: Admission Price Report

(30 minutes) The students will each need to be at a computer with internet access and with the Villainy Inc. Web site bookmarked. The students will pull the Web site up and click on the link "Begin Mission #1 The Golf of Mexico." The students will click the green right arrow to bypass the introduction, then type in their AVU agent name, use the green arrow again, then they will be prompted to select 2 of the 5 field agents to comprise their team. The teacher will remind them to pick team members whose strengths will benefit them as they work on the activities throughout the mission. Next, the students will read the AVU agreement statement and click on the link that says, "I accept the mission." Using the secret key stroke, holding down control, shift and the right arrow, the students will skip activity A, B, and C and will get to the fourth activity. Next, the students will listen to and watch the discussion between Dr. Wick and Platypus which will set up the activity. The students will next listen to and read through the HQ e-mail which details the plan of how to thwart Dr. Wick's plan. The teacher will make sure that all of the students understand what is expected, will distribute the handout entitled ***Field Log: Admission Price Report***. The students will work through the activity while writing down information on the Field Log handout.

Focus for Media Interaction

Focus for Media Interaction: The focus for media interaction is a specific task to complete and/or information to identify during or after viewing of video segments, Web sites or other multimedia elements.

The teacher will say, "Today's focus for media interaction is to work through the fourth activity in Mission 1: The Golf of Mexico on the Villainy Inc. Web site." They will first focus on what they are being asked to do by Head Quarters in order to ruin Dr. Wick's plans. Specifically, the students should read through the four steps they must follow to complete the to-do list.

Viewing Activities

What will your students be responsible for while viewing this piece of multi-media or video?

While viewing the Web site, the group will be responsible for completing the ***Field Log - Admission Price Report*** handout while they complete the four outlined steps on their To-Do list for the activity.

Post Viewing Activities

How will students utilize the information they gathered while viewing the multi-media or video?

After the students have completed the activity, the students will be asked to share which admission price they would select if they were opening a golf course. The teacher should also lead a brief discussion about how cost affects profit. The students can share their consumer patterns. Do they look for sales, use coupons, etc.?

Activity 3 - Mission Simulation: Operation Ice Cream Machine

For this activity, the students will work in teams of 3 to 4 students. The teacher will distribute the ***Mission Simulation - Operation Ice Cream Machine*** handout. The teacher will say, "For this final activity, you are going to use your skill at writing mathematical rules once again." The teacher will read the introduction and directions from the handout while the students follow along. The teacher will ask the students to share any questions that they have and will then tell the students to work as a team to complete Steps A and B. Lastly, the students can write a two-operation rule that will produce even more ice cream (the last problem on the page) individually.

Wrap Up:

The teacher will ask the students to share the two-operation rule that they came up with that will be more productive than Platypus' ice cream machine. The rest of the students will then confirm that this is indeed a more productive than the Platypus Ice Cream Machine.

Enrichment Options

Community Connection

Invite a local business person in to speak about how algebraic expressions are used everyday in the line of work they are in. For example, a grocery store owner has certain fixed, or constant costs, and other costs that are variable. For example, if there is a big winter storm, the merchant will have to place a larger than usual order for toilet paper and bread.

Parent-Home Connection

Field Experiences

Take the students on a field trip to a miniature golf course. The students can have a great deal of fun while also discussing angles and velocity.

Cross-Curricular Extensions

Environmental Science - Have the students research the environmental impact that a golf course makes. Make sure the students answer questions about how building a new golf course affects the area wildlife as well and how difficult is it to keep a golf course so green.

Stage 4

Teacher Reflection

As a reflective practitioner, note how this lesson could be adjusted after its initial implementation. How successful were the students? What did the assessment demonstrate about the students' learning? What skills do the students need to revisit? What instructional strategies worked and what made them successful? What will you change the next time you use this lesson? Why?

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