

Lesson Plan
Mine Shaft Grade 6 Multiples

CCSSM: Grade 6

DOMAIN: Expressions and Equations

Cluster: Reason about and solve one-variable equations and inequalities.

Standard: 6.EE.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

CCSSM: Grade 5

DOMAIN: Operations and Algebraic Thinking

Cluster: Write and interpret numerical expressions.

Standard: 5.OA.2 Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them.

CCSSM: Grade 4

DOMAIN: Operations and Algebraic Thinking

Cluster: Gain familiarity with factors and multiples.

Standard: 4.OA.4 Find all **factor pairs** for a whole number in the range 1-100. Recognize that a whole number is a **multiple** of each of its factors. Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number.

Clarification: The clarification is an explanation of the indicator and objective and how these math concepts appear in the puzzle.

Materials and/or Set Up: *Flower Resource; Polygon Resource; Interactive Resource 1; Activity 1; Activity 2; Activity 3; Interactive Resource 2; Assessment, Number Lines Resource, counters, graph paper*

Relevant Vocabulary: multiple, polygon, triangle, square, hexagon, septagon (heptagon,) octagon, rule

Note to Teacher – Students should have attempted level 1 of the Mine Shaft puzzle before this lesson is implemented. Prepare for this lesson by cutting apart the polygons and flowers on the dotted lines.

During the implementation of this lesson, it is recommended that the *Interactive Resource* be projected to encourage a rich and active discussion of math strategies and concepts.

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Activities:

1. After students have completed level 1 of the Mine Shaft puzzle, have them share their experiences and strategies with the class.
2. Have the students sit with their chairs side by side against one side of the room. Ask the students to count off as quickly as they can. Tell the students they will count off again, but this time every 4th person will stand and remain standing. Ask students: What do the standing people represent? (*multiples of 4*) Repeat the activity several more times using multiples of 3, 6, 7, and 8.
3. With the students still sitting in their line, hand out a **Flower** to the 4th, 5th, 7th, 10th, and 20th person. Show the students the **Polygons** and explain that the number of sides of the polygon will correspond to the multiples by which they will count. Ask the students to identify which polygon would produce the correct multiple that could be used to count off people to stand while avoiding a person with a flower. (*triangle, hexagon, and octagon*) Have the students count off and stand to justify each choice.
4. Reassign the Flowers to the 1st, 4th, 11th, 17th, and 20th person. Show the students the **Polygons** again. Ask the students to identify which polygon could be used to count off people to stand while avoiding a person with a flower. (*triangle, hexagon, septagon, and octagon*) Have the students count off and stand to justify each choice.
5. Using **Interactive Resource 1**, have students complete **Activity 1** with a partner. Using **Activity 1-Answers**, facilitate a discussion of possible solutions. (*One possible solution is shown, but other solutions exist. Row 3 must use multiples of four. Row 4 must use multiples of eight. Row 1 could then use multiples of three or six. Row 2 could use multiples of three, six, or seven. Although multiples of eight would work in rows 1 and 2, it would not be a solution because multiples of eight is the only solution for row 4. Row 5 could use multiples of six or seven.*)
6. Have students should work independently to complete **Activity 2**. Facilitate a class discussion about how these tables could be useful in solving the puzzle.
7. Using **Interactive Resource 2**, have students work with a partner to complete **Activity 3**. Have partners team up to share and compare results. (*Row 3 must use a triangle, but the other rows have several options each.*)

Differentiation Suggestions:

- For the students having difficulty determining the correct multiples for each bounce, provide them with a multiplication table and assist them in locating the multiples.
- Provide students with the **Number Lines** resource and have them use counters to mark the numbers on which a bot will bounce.
- For the students who have mastered this concept quickly, have them graph each table of values from **Activity 2** on a coordinate plane. Ask the students to write a statement about how the steepness of each line is related to the number whose multiples are being used.

Assessment

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- Distribute the *Assessment* resource sheet.
- Answers:

1. 30, 36, 42
2. $y = 8x$
3. 20

Follow Up:

- Have students return to the puzzle to apply what they learned in the lesson. Ask: Did the lesson help you to clarify the math in the puzzle? How? What other strategies could you have used to help you solve the puzzle? Additionally, check student game progress through the Administrator's Tool to determine students' level of understanding.
- Provide the students with the following scenario:

You are standing at the end of a school hallway that has 100 lockers that are numbered 1 to 100. The student government wants to advertise an upcoming event. You have been assigned to tape a flier on every 6th locker. Make a list of the locker numbers that will have a flier. Write a rule that would help you figure out where the 50th flier would be if the school had more than 100 lockers. (*Lockers with fliers: 6, 12, 18, 24, 36, 42, 48, 54, 60, 66, 72, 78, 84, 90, 96. A rule could be $y = 6x$ where x is the flier number and y is the locker number. The 50th flier would be on locker 300 because $6 \times 50 = 300$.)*

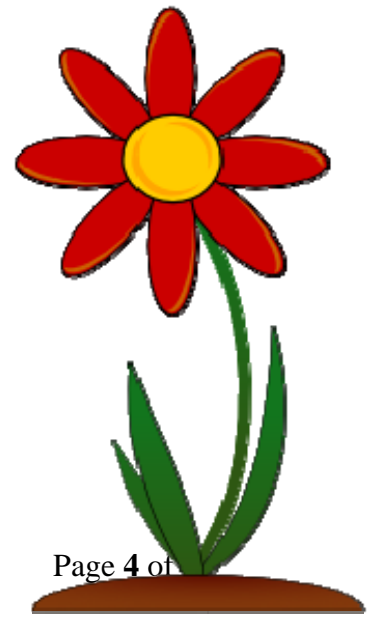
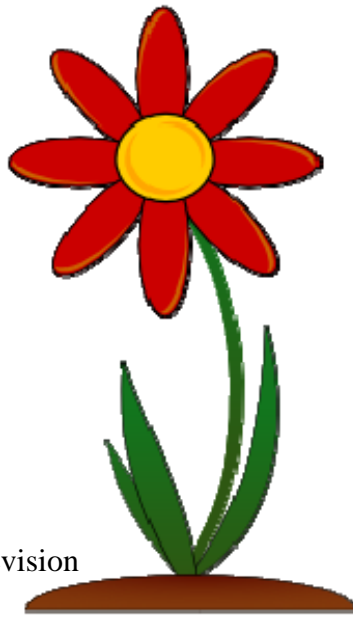
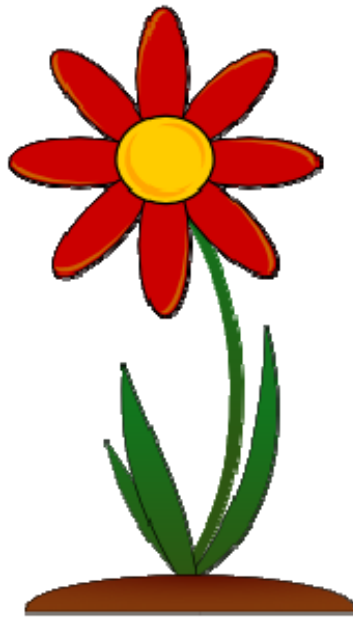
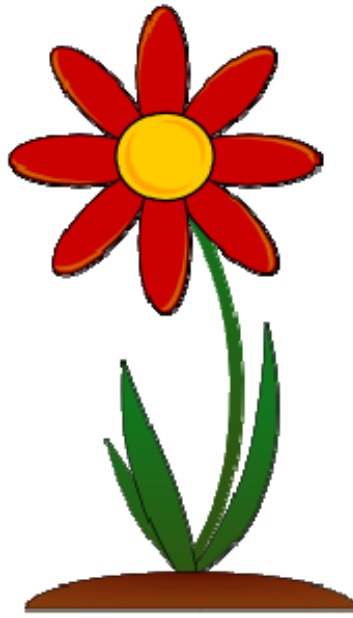
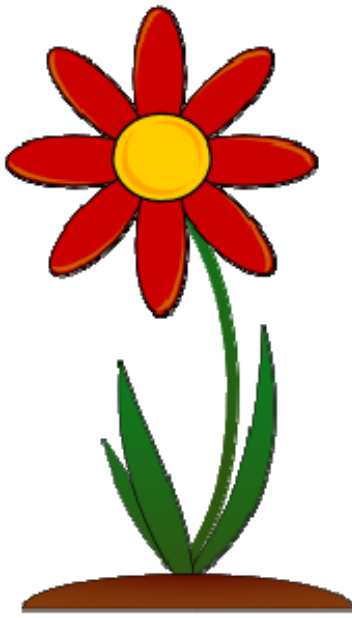
Real World Connection:

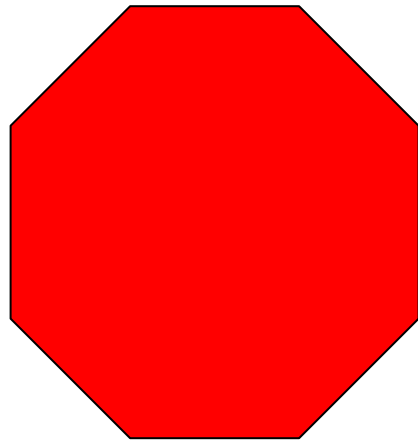
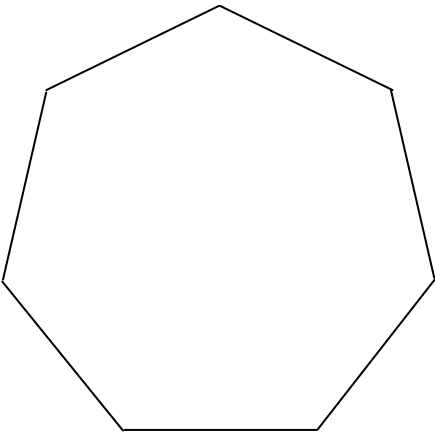
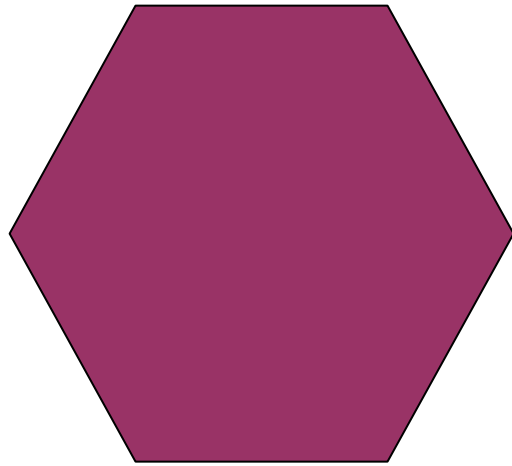
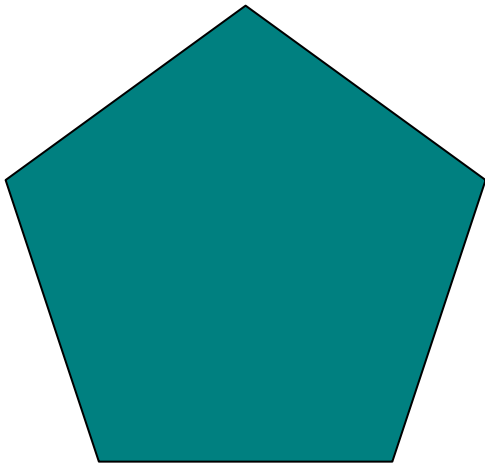
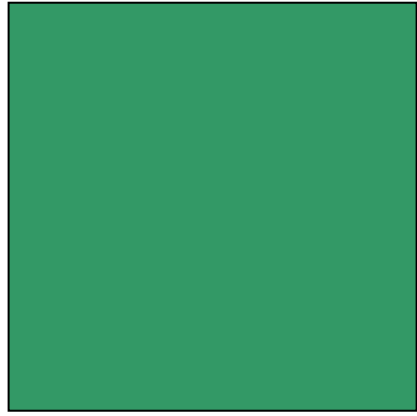
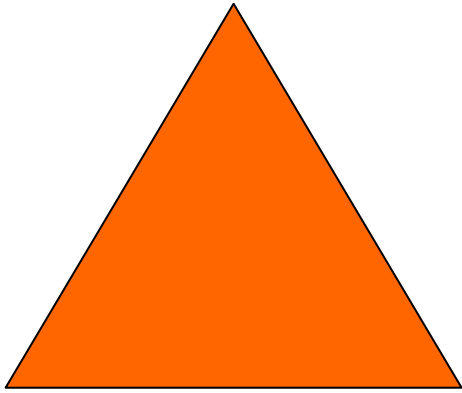
- Provide the students with the following scenario:

Mr. Your Teacher assigns every fourth problem for homework. Write a function table for the first ten problems. Is problem #31 part of the assignment? (*The function table is:*

x	1	2	3	4	5	6	7	8	9	10
$4x$	4	8	12	16	20	24	28	32	36	40

Problem #31 would not be part of the assignment.)





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Interactive Resource 1



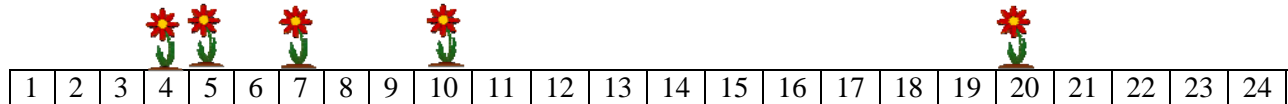
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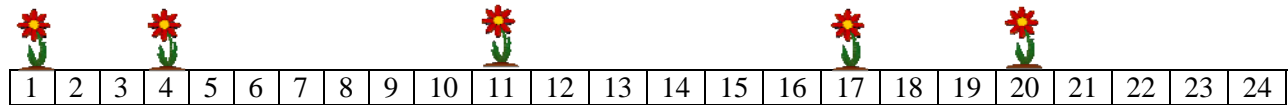
Activity 1

Directions: Choose a multiple for each row from the following possibilities: 3, 4, 6, 7, 8. Each number can be used only once. Circle the multiples on each row to justify your answer.

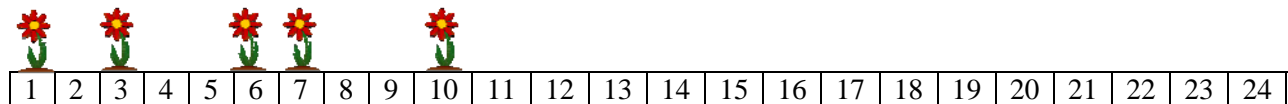
Row 1 will use multiples of _____ to hop along the row and still avoid landing on a flower.



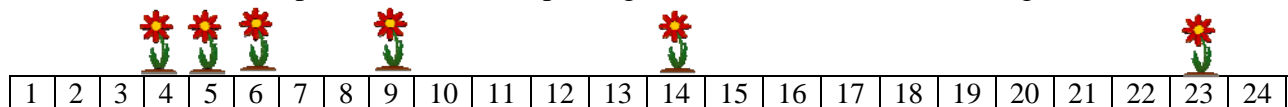
Row 2 will use multiples of _____ to hop along the row and still avoid landing on a flower.



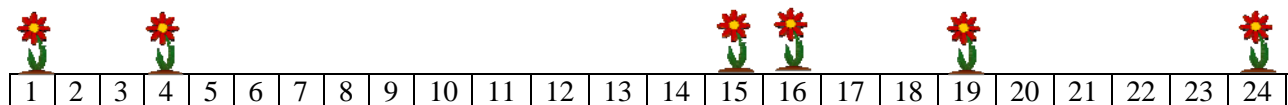
Row 3 will use multiples of _____ to hop along the row and still avoid landing on a flower.



Row 4 will use multiples of _____ to hop along the row and still avoid landing on a flower.



Row 5 will use multiples of _____ to hop along the row and still avoid landing on a flower.



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Activity 1 Answers

Row 1



Row 2



Row 3



Row 4



Row 5



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Activity 2

Directions: Complete the table and rule for each Bot.



Number of Bounces	0	1	2	3	4	5
Landing Spot						

Rule for Triangle Bot: (number of bounces) x _____ = (landing spot)



Number of Bounces	0	1	2	3	4	5
Landing Spot						

Rule for Square Bot: (number of bounces) x _____ = (landing spot)



Number of Bounces	0	1	2	3	4	5
Landing Spot						

Rule for Hexagon Bot: (number of bounces) x _____ = (landing spot)



Number of Bounces	0	1	2	3	4	5
Landing Spot						

Rule for Septagon Bot: (number of bounces) x _____ = (landing spot)



Number of Bounces	0	1	2	3	4	5
Landing Spot						

Rule for Octagon Bot: (number of bounces) x _____ = (landing spot)

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Activity 2 Answers

Directions: Complete the table and rule for each Bot.



Number of Bounces	0	1	2	3	4	5
Landing Spot	0	3	6	9	12	15

Rule for Triangle Bot: (number of bounces) x **3** = (landing spot)



Number of Bounces	0	1	2	3	4	5
Landing Spot	0	4	8	12	16	20

Rule for Square Bot: (number of bounces) x **4** = (landing spot)



Number of Bounces	0	1	2	3	4	5
Landing Spot	0	6	12	18	24	30

Rule for Hexagon Bot: (number of bounces) x **6** = (landing spot)



Number of Bounces	0	1	2	3	4	5
Landing Spot	0	7	14	21	28	35

Rule for Septagon Bot: (number of bounces) x **7** = (landing spot)



Number of Bounces	0	1	2	3	4	5
Landing Spot	0	8	16	24	32	40

Rule for Octagon Bot: (number of bounces) x **8** = (landing spot)

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Interactive Resource 2



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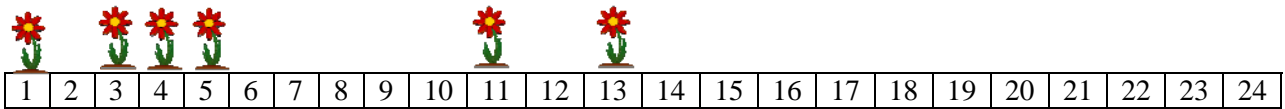
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Activity 3

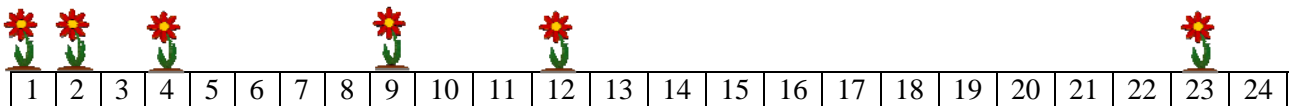
Directions: Choose a Bot for each row. Circle the multiples on each row to justify your answer.



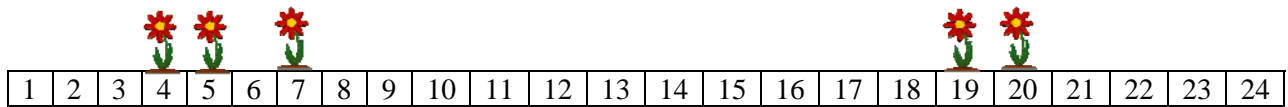
Row 1: Bot _____



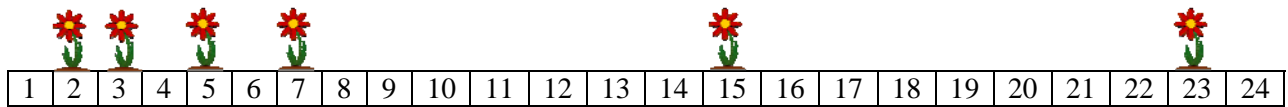
Row 2: Bot _____



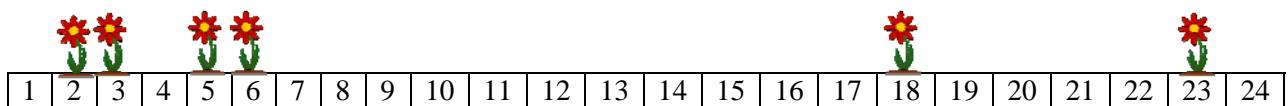
Row 3: Bot _____



Row 4: Bot _____



Row 5: Bot _____



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Assessment

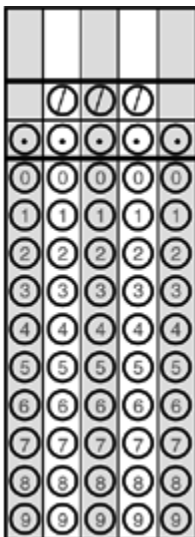
1. Complete the function table below:

1	2	3	4	5	6	7
6	12	18	24			

2. Write a rule for the function table below:

1	2	3	4	5	6	7
8	16	24	32	40	48	56

3. The rule for a function is $y = 5x$. What is the value of y when x is 4?



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Number Lines

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
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