

# SITES-M Mathematics Challenge

## Everyday Patterns in Algebra



**Level:** Grade Three

**Standard:** Algebra

**Learning Target:** Focus on Patterns

### Grade Level Expectations

**GLE 0306.3.3** Describe and analyze patterns and relationships in contexts.  
**GLE 0306.3.4** Represent patterns using words.

### State Performance Indicators

**SPI 0306.1.1** Solve problems using a calendar.  
**SPI 0306.3.4** Describe or extend numeric patterns.



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**Grade 3—Focus on Patterns**  
**Everyday Patterns in Algebra**

The purpose of the Mathematics Challenges is to provide opportunities for students to develop and demonstrate understanding of important mathematical concepts and standards. Each Challenge includes a set of tasks that require higher-order thinking skills. Because these types of tasks may be new for students and they will have varying levels of understanding, the student responses will vary. The Challenges and guiding questions were designed to help teachers plan their implementation and elicit, analyze, and act on evidence of student understanding.

You will be able to choose which Mathematics Challenge Packet to implement each month, according to the learning needs of your students and your teaching context. Each packet contains all the materials necessary to implement the Mathematics Challenge including a grade-appropriate Challenge, the Mathematics Challenge Meeting Protocol, and the Guiding Questions for Analyzing Student Responses to Mathematics Challenges.

For each Challenge, you will complete a six step process of planning, implementation, and analysis and reflection.

**The Mathematics Challenge Process**

<b>Stage</b>	<b>Step</b>	<b>Task</b>
Planning	Step 1.	Review the Mathematics Challenge Meeting Protocol
	Step 2.	Review and solve the Mathematics Challenge prior to your Professional Learning Community (PLC) meeting. Think about your responses to the guiding questions on the Meeting Protocol
	Step 3.	Hold your PLC meeting and discuss your responses to the Guiding Questions on the Meeting Protocol
Implementation	Step 4.	Implement the Mathematics Challenge with your class
Analysis and Reflection	Step 5.	For your own planning and documentation, respond to the Guiding Questions on the Analyzing Student Responses Protocol
	Step 6.	To help us improve the Challenges and to provide recommendations for teachers implementing them in future years, complete the Mathematics Challenge Feedback Log and provide copies of all student work to the Assessment Coordinator

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**Mathematics Challenge Meeting Protocol**

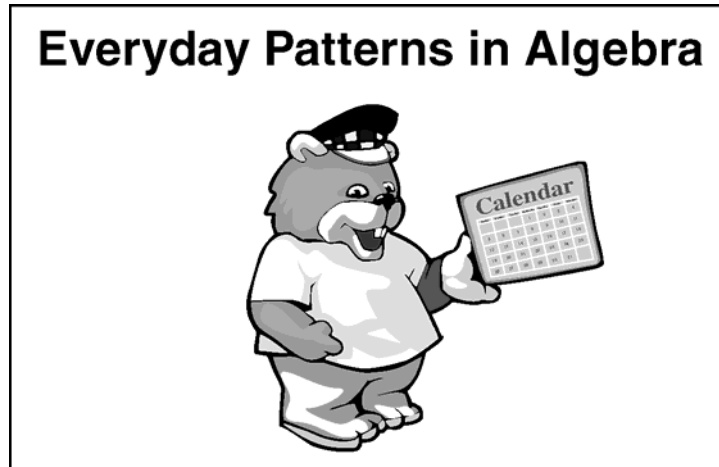
Each month, your Professional Learning Community will meet to discuss the implementation of one Mathematics Challenge. In preparation for your monthly meeting, please print and review this month's Mathematics Challenge, solve all tasks within the Challenge, and think about the guiding questions below. These questions will be used to facilitate a group discussion regarding the implementation of the upcoming Mathematics Challenge.

Guiding Questions for Implementing the Mathematics Challenges

1. What is the title of the Challenge that you will use this month?
2. What skills or standards is this Challenge measuring?
3. Where does this Challenge fit within your curriculum? Within which unit?
4. At what point during the unit will you administer this Challenge (e.g., At the beginning of a unit to determine what students do or do not know, at the end of a unit to assess what students have or have not learned, in the middle of a unit to determine where to go next instructionally)?
5. How will your students complete this Challenge (e.g., individually, one-on-one, in small groups, as a class)? Why?
6. Are there any prerequisite skills, common misunderstandings, or vocabulary needs that you will have to address? What are they?
7. What difficulties do you anticipate your students will have with the Challenge? How will you address them?
8. Are these skills and difficulties different for special needs students, ELL students, etc.? How? Will you do anything different for these students? What?
9. How will you evaluate student responses (e.g., grade responses with the provided rubric, scan responses to identify common mistakes/misconceptions, have students evaluate one another's responses, have students evaluate their own response)?
10. What will student responses to this Challenge tell you about student understanding?
11. How might you use this evidence of student understanding to adapt your teaching and learning?
12. What other materials, resources, or support might you need? Where can you get them?
13. How can your colleagues assist you in the analysis of student understanding?
14. What other questions or concerns do you have about this Mathematics Challenge?

After you have implemented the challenge with your class, be sure to respond to the Guiding Questions on the Analyzing Student Responses Protocol.

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Grade 3–Focus on Patterns



**Standard:** Algebra

**Learning Target:** Focus on Patterns

**Claims:**

Students should understand and be able to explain or demonstrate how to:

- ✓ Solve problems using a calendar;
- ✓ Describe and analyze patterns and relationships in contexts;
- ✓ Represent patterns using words;
- ✓ Describe or extend numeric patterns.

**Task Preparation:**

Each student will need a copy of the Student Response Sheet, the Calendar for December, and a pencil.

**Stimulus Cards (Drawing or Word Description):**

Calendar for December

**Manipulatives/Supplies:**

Pencils

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**Cues/Directions:**

Distribute student response sheets and copies of the calendar for December. Students should be directed to look carefully at each figure. Allow students time to answer.

Instruct students to follow along as you read aloud and say: **Mr. Patel’s class is planning a trip to the crayon factory. The factory gives tours on Mondays. The class has selected Monday, December 20, for the trip.** Have students look at the calendar for December.

1. Say: **Mr. Patel’s class needs to send invitations to parents and guardians who will go to the factory with the class. The invitations must be sent at least 2 weeks before the trip. Look at the December calendar. What is the latest date the class can send the invitations? (TEACHER NOTE: Students should write the correct date on the blank.) Tell how you got your answer. (TEACHER NOTE: Students should write their explanations in the box.)**
2. **Look at the December calendar. Notice that the Tuesday dates form a pattern. Write the dates. (TEACHER NOTE: Students should write the 4 correct dates on the blanks.) Describe the pattern. (TEACHER NOTE: Students should write their descriptions in the box.)**
3. **Now look at the Friday dates in December. These numbers also form a pattern. Write the dates. (TEACHER NOTE: Students should write the 5 correct dates on the blanks.) Describe the pattern. (TEACHER NOTE: Students should write their descriptions in the box.)**
4. **Look at the patterns for the Tuesday dates and for the Friday dates on the December calendar. How are the patterns alike? (TEACHER NOTE: Students should write their explanations in the box.) How are the patterns different? (TEACHER NOTE: Students should write their explanations in the box.)**
5. **The crayon factory asks the class to select a different date in January for the tour. What are the Monday dates in January? Write the dates. (TEACHER NOTE: Students should write the 5 correct dates on the blanks. The hope is that students will be able to write the dates by using the pattern instead of the calendar, but the calendar is there for students who need it.) Tell how you got your answer. (TEACHER NOTE: Students should write their explanations in the box.)**

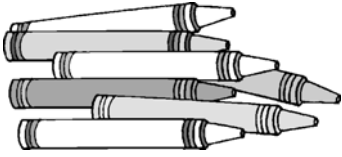
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6. **(TEACHER NOTE:** This task may be a stretch for some students. If you feel it is beyond the scope of your class, you may omit it, use it as enrichment, or use it as a whole-class or small-group activity.)

**A person who works at the crayon factory wants to talk to the class before they take their trip. She can come on Tuesdays in November. You know that November 30 is a Tuesday. What are the other Tuesday dates in November? Write the dates. (TEACHER NOTE:** Students should write the 4 correct dates, other than November 30, on the blanks. The hope is that students will be able to write the dates by using the pattern instead of the calendar, but the calendar is there for students who need it.) **Tell how you got your answer. (TEACHER NOTE:** Students should write their explanations in the box.)

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*Student Response Sheet*

**Everyday Patterns in Algebra**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Mr. Patel’s class is planning a trip to the crayon factory. The factory gives tours on Mondays. The class has selected Monday, December 20, for the trip.**

- 1. Mr. Patel’s class needs to send invitations to parents and guardians who will go to the factory with the class. The invitations must be sent at least 2 weeks before the trip.**

**Look at the December calendar. What is the latest date the class can send the invitations?**

**December \_\_\_\_\_**

**Tell how you got your answer.**

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- 2. Look at the December calendar. Notice that the Tuesday dates form a pattern.**

**Write the dates:** \_\_\_\_\_

**Describe the pattern.**



- 3. Now look at the Friday dates in December. These numbers also form a pattern.**

**Write the dates:** \_\_\_\_\_

**Describe the pattern.**



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4. Look at the patterns for the Tuesday dates and for the Friday dates on the December calendar.

**How are the patterns alike?**

**How are the patterns different?**

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**5. The crayon factory asks the class to select a different date in January for the tour. What are the Monday dates in January?**

Calendar		January				
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

**Write the dates:** \_\_\_\_\_

**Tell how you got your answer.**

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6. A person who works at the crayon factory wants to talk to the class before they take their trip. She can come on Tuesdays in November.

You know that November 30 is a Tuesday. What are the other Tuesday dates in November?

Calendar		November				
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

Write the dates: \_\_\_\_\_ 30

Tell how you got your answer.

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**Calendar for December**

<b>Calendar</b>	<b>December</b>					
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>
<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>18</b>
<b>19</b>	<b>20</b>	<b>21</b>	<b>22</b>	<b>23</b>	<b>24</b>	<b>25</b>
<b>26</b>	<b>27</b>	<b>28</b>	<b>29</b>	<b>30</b>	<b>31</b>	

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**Learning and Teaching Considerations**

**Task 1:**

- A) Be sure that students understand the concept of counting on and counting back (beginning counts with numbers other than 1). In this case, the students may begin with 20 and count backward (14 squares) or use trial and error by counting 14 squares forward, beginning at different numbers, until they land on 20.
- B) Students may subtract 14 from 20 to find the latest date. The teacher could encourage the students to use manipulatives such as base ten blocks or unifix cubes to subtract 14 from 20, and then ask students to explain their thinking to the class.
- C) Students may realize that they could skip count by a factor or multiple of the chart's width (seven in the case of the calendar because there are 7 days in a week). The student may, therefore, move two squares upward on the calendar, beginning with 20.

**Task 2:**

- A) Be sure that students understand that the number patterns found in number sequences are based on a particular rule.
- B) Be sure that students understand that a rule is something that will always work. For example, the student might notice a recursive pattern in which the previous number is operated on to get the next number.
- C) Students may have the misconception that the core of the repeating pattern is shorter or longer than the shortest string of elements that repeats.
- D) Students may answer in words, symbols (such as the addition symbol), numbers, or by using manipulatives. They may also use number lines or charts. Be sure they understand that they can get the correct answer using any of these strategies. The teacher can also encourage them to link these strategies and/or representations to each other as a way to provide a convincing solution.
- E) Students may describe multiples of seven.
- F) Students may add 7 to the previous date each time to get the next date.
- G) Students may multiply the row number by 7 to get each date. This is an example of a “closed” rule; that is, a rule in which the term can be found directly from the row number. Students who produce a closed rule are thinking at a slightly higher level than those who produce a recursive rule.



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**Task 3:**

- A) Students may add 7 to the previous date each time to get the next date.
- B) Students may multiply the row number by 7 then subtract 4 to get each date or multiply the row number minus 1 by 7 then add 3 (which is the start number) to get each date. These are examples of “closed” rules; that is, a rule in which the term can be found directly from the row number. Students who produce a closed rule are thinking at a slightly higher level than those who produce a recursive rule.
- C) If a student says or writes, “I just know,” prompt him or her by saying something like, “I’m glad you know, but it’s important in math to be able to explain your answers so other people can understand what you’re thinking.”
- D) If a student says or writes, “I don’t know,” say something positive like, “Let’s start with what you do know about this problem.” Students often know more than they think or say, and encouraging them to vocalize or write about that knowledge is all they may need.
- E) Be sure that students understand that the number pattern appears in that order and the numbers cannot be reversed or switched.

**Task 4:**

- A) Be sure the students understand that the same recursive rule works for both patterns (even though the dates are different).
- B) Students may recognize that the start number is different in each pattern.
- C) Students may multiply the previous number by 7 to get the next number. This is a mistake that mixes together a recursive rule and a closed rule.
- D) Students may realize that the total number of dates listed for each column is different but the pattern would continue on forever (even though it stops on the calendar because of the total number of days in each month).
- E) Students may realize that the closed rules for each pattern are different (even though they are able to multiply the row number by 7 in each closed rule).

**Task 5:**

- A) Students may use the last date in December to find the first date in January, and then count on.
- B) Students may use the recursive rule (previous number plus 7) or closed rule (row number times 7 minus 11 or row number minus 1 times 7 plus 3) to find the Mondays in January (after finding the first Monday in January).

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- C) Students may have the misconception that the month begins before the first Saturday in January.

**Task 6:**

- A) Students may use the recursive rule backward to find the Tuesdays in November (beginning at 30 and subtracting 7 each time to get the number in the square above).
- B) Students may count backward to get each date in the pattern.
- C) Students may use the closed rule backward to find the Tuesdays in November (using trial and error), by adding 5 to the date then dividing by 7 to get the row number (e.g.,  $(30+5)/7 = \text{row } 5$ ) or by subtracting 2 from the date, then dividing by 7 to get the row number minus 1. For example  $(30-2)/7 = 4$  (which is the row number minus 1).

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Name: ANSWER KEY

Date: \_\_\_\_\_

Mr. Patel's class is planning a trip to the crayon factory. The factory gives tours on Mondays. The class has selected Monday, December 20 for the trip.

1. Mr. Patel's class needs to send invitations to parents and guardians who will go to the factory with the class. The invitations must be sent at least 2 weeks before the trip.

Look at the December calendar. What is the latest date the class can send the invitations?

December 6

Tell how you got your answer.

2 WEEKS IS 14 DAYS, SO  $20 - 14 = 6$ .  
OR  
I COUNTED UP 2 ROWS FROM 20  
ON THE CALENDAR.  
  
ANSWERS WILL VARY.

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2. Look at the December calendar. Notice that the Tuesday dates form a pattern.

Write the dates: 7 14 21 28

Describe the pattern.

THEY ARE MULTIPLES OF 7.  
OR  
THEY ARE 7 APART.  
  
ANSWERS MAY VARY.

3. Now look at the Friday dates in December. These numbers also form a pattern.

Write the dates: 3 10 17 24 31

Describe the pattern.

THEY ARE 7 APART. OR ADD 7  
TO GET THE NEXT NUMBER.  
  
HIGH LEVEL:  $7n - 4$ , WHERE  $n = 1$   
IS ROW 1, ETC. 5 ROWS IN DEC.

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4. Look at the patterns for the Tuesday dates and for the Friday dates on the December calendar.

How are the patterns alike?

THE NUMBERS IN EACH ARE  
7 APART. OR  
FOR BOTH, YOU ADD 7 TO GET  
THE NEXT NUMBER.

How are the patterns different?

THE BEGINNING NUMBER IS  
DIFFERENT. TUESDAY  
STARTS AT 7 AND  
FRIDAY STARTS AT 3.  
HIGH LEVELS; ONE IS  $7n$  AND  
THE OTHER IS  $7n - 4$ , WHERE  
 $n = 1$  IS ROW 1, ETC.

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5. The crayon factory asks the class to select a different date in January for the tour. What are the Monday dates in January?

Calendar		January					
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
row 1							1
2	2	3					
3		10					
4		17					
5		24					
6		31					

STUDENTS DO NOT NEED TO WRITE ALL DATES, BUT CAP IF IT HELPS.

Write the dates: 3 10 17 24 31

Tell how you got your answer.

MAY SAY THEY FILLED IN THE CALENDAR STARTING WHERE DEC. ENDS.  
MAY SAY THEY GOT THE FIRST MONDAY & ADDED 7.  
HIGH LEVEL:  $7n - 11$ , WHERE  $n = 1$  IS ROW 1, ETC.

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6. A person who works at the crayon factory wants to talk to the class before they take their trip. She can come on Tuesdays in November.

You know that November 30 is a Tuesday. What are the other Tuesday dates in November?

Calendar November

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
row 1			2				
2			9		AGAIN,		
3			16		STUDENTS DO		
4			23		NOT NEEDED TO		
5			30		COMPLETE CALENDAR		

Write the dates: 2 9 16 23 30

Tell how you got your answer.

POT 30 IN TUESDAY AND SUBTRACTED  
7.  
OR FILLED IN THE CALENDAR  
BACKWARDS.  
HIGH LEVEL 2  $7n - 5$  WHERE  $n = 1$  IS ROW 1

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Rubric

CATEGORY	4	3	2	1
<b>Mathematical concepts</b>	<b>Response shows complete understanding of the mathematical concepts used to solve the problem(s).</b>	<b>Response shows substantial understanding of the mathematical concepts used to solve the problem(s).</b>	<b>Response shows some understanding of the mathematical concepts needed to solve the problem(s).</b>	<b>Response shows very limited understanding of the underlying concepts needed to solve the problem(s), OR the response is not written.</b>
	<p>Response shows evidence in at least 5 of the following 6 tasks.</p> <p><b>Task 1.</b> Student answers 6, and shows evidence of counting dates backward from Dec. 20.</p> <p><b>Task 2.</b> Student lists 7, 14, 21, 28 in that order, and shows evidence of using multiples of 7.</p> <p><b>Task 3.</b> Student lists 3, 10, 17, 24, 31 in that order, and shows evidence of understanding pattern.</p> <p><b>Task 4.</b> Student shows evidence of similarities and differences in patterns.</p> <p><b>Task 5.</b> Student lists 3, 10, 17, 24, 31 in that order, and shows evidence for finding Mondays in January.</p> <p><b>Task 6.</b> Student lists 2, 9, 16, 23 in that order, and shows evidence for finding Tuesdays in November.</p>	<p>Response shows evidence in only 4 of the tasks described; may exhibit the following errors.</p> <p><b>Task 1.</b> Student subtracts 7 or 14 from a different number (not 20) or adds 14 or 7 to 20 instead.</p> <p><b>Tasks 2 and 3.</b> Student multiplies, divides, or subtracts the previous number in the pattern by 7 to get the next number in the pattern, or adds a different number (not 7) to the previous number in the pattern, or makes a computation error.</p> <p><b>Task 4.</b> Student describes adding 7 to the previous number as a difference.</p> <p><b>Task 5.</b> Student begins by writing 1 in a box that is not the first box in row 1 of the Saturday column.</p> <p><b>Task 6.</b> Student begins by writing 1 in a box that is not the first box in row 1 of the Monday column, or writes 30 in a box that is not a box in the last row in the Tuesday column.</p>	<p>Response shows evidence in only 3 of the tasks described; may exhibit errors as described in category 3.</p>	<p>Response shows evidence in only 2 or fewer of the tasks described; may exhibit errors as described in category 3.</p>

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Rubric

CATEGORY	4	3	2	1
<b>Strategy and procedures</b>	<b>Student typically uses an efficient and effective strategy to solve the problem(s).</b>	<b>Student typically uses an effective strategy to solve the problem(s).</b>	<b>Student sometimes uses an effective strategy to solve the problem(s), but not consistently.</b>	<b>Student rarely uses an effective strategy to solve the problem(s).</b>
	<p>Response shows evidence in ALL of the following tasks.</p> <p><b>Task 1.</b> Student shows evidence of moving up 2 rows from Dec. 20 on calendar, or shows <math>20 - 14</math>, or <math>20 - (2 \times 7)</math>.</p> <p><b>Task 2.</b> Student shows evidence of adding 7 to the previous number, or evidence of multiples of 7. Higher-level thinking: <math>7n</math> beginning at row <math>n = 1</math>.</p> <p><b>Task 3.</b> Student shows evidence of beginning with 3, then adding 7 to the previous number. Higher-level thinking: <math>7n - 4</math> beginning at row <math>n = 1</math>.</p> <p><b>Task 5.</b> Student shows evidence of correctly filling in calendar with January 1 on Saturday, or evidence of counting forward from December 31. Student may show evidence of adding 7 to 27 (last Monday of December) to get 34 and then subtracting 31 to get the first Monday in January is 3. Higher-level thinking: <math>7n - 4</math> beginning at row <math>n = 1</math>.</p> <p><b>Task 6.</b> Student shows evidence of correctly filling in calendar with November 30 in last Tuesday, or evidence of counting backward from December 31. Student may show evidence of beginning with 30 and subtracting 7 to get remaining dates. Higher-level thinking: <math>7n - 5</math>, beginning at row <math>n = 1</math>.</p>	<p>Response shows evidence in only 3 or 4 of the tasks described in category 4.</p>	<p>Response shows evidence in only 1 or 2 of the tasks described in category 4.</p>	<p>Response shows no evidence of a correct strategy or rule.</p>

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Rubric

CATEGORY	4	3	2	1
<b>Explanation and communication</b>	<b>Explanation is detailed and clear; uses appropriate terminology and/or notation.</b>	<b>Explanation is clear; uses some appropriate terminology and/or notation.</b>	<b>Explanation is a little difficult to understand, but includes critical components; shows little use of appropriate terminology and/or notation.</b>	<b>Explanation is difficult to understand, is missing several components, and does not use or include appropriate terminology and/or notation.</b>
	<p>Response shows evidence in at least 5 of the following 6 tasks.</p> <p><b>Task 1.</b> Student explains that 2 weeks is 14 days, so subtract 14 from 20, or multiply 7 by 2 then subtract 14 from 20, or each row is a week of 7 days and you can just move up 2 rows from December 20.</p> <p><b>Task 2.</b> Student describes adding 7 to the previous number to get the next number, or that the numbers are multiples of 7. Higher-level thinking: begin at row 1 and multiply each row number by 7.</p> <p><b>Task 3.</b> Student describes beginning with 3 and then adding 7. Higher-level thinking: begin at row 1, multiply the row number by 7, then subtract 4.</p> <p><b>Task 4.</b> Patterns are the same because the numbers are each 7 apart. Patterns are different because they begin at different numbers. Student may also say one has 4 numbers and the other has 5 numbers. Higher-level thinking: begin at row 1, Tuesday is 7 times row number and Friday is 7 times row number minus 4.</p> <p><b>Task 5.</b> Student may describe counting forward from December 31 and filling in the January dates, or may explain that the first Monday is 3 and then add 7. Higher-level thinking: begin at row 1, Monday is 7 times row number minus 11 (as there are 6 rows in the January calendar).</p> <p><b>Task 6.</b> Student may describe counting backward from December 1 to fill in November dates, or may fill in November 30 and count backward. May describe subtracting 7 from 30 each time. Higher-level thinking: begin at row 1, Tuesday is row number times 7 minus 5.</p>	<p>Response shows evidence in only 3 or 4 of the tasks described in category 4.</p>	<p>Response shows evidence in only 1 or 2 of the tasks described in category 4.</p>	<p>Response shows no explanations.</p>

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Rubric

CATEGORY	4	3	2	1
<b>Mathematical Accuracy</b>	<b>All or almost all of the steps and solutions have no mathematical errors.</b>	<b>Most of the steps and solutions have no mathematical errors.</b>	<b>Some of the steps and solutions have no mathematical errors.</b>	<b>Few of the steps and solutions have no mathematical errors.</b>
	<p>Student provides correct answers for ALL of the following tasks.</p> <p><b>Task 1.</b> Student answers 6.</p> <p><b>Task 2.</b> Student answers 7, 14, 21, 28 in that order.</p> <p><b>Task 3.</b> Student answers 3, 10, 17, 24, 31 in that order.</p> <p><b>Task 5.</b> Student answers 3, 10, 17, 24, 31 in that order.</p> <p><b>Task 6.</b> Student answers 2, 9, 16, 23 in that order.</p>	<p>Student provides correct answers for only 4 of the tasks described in category 4.</p>	<p>Student provides correct answers for only 2 or 3 of the tasks described in category 4..</p>	<p>Student provides a correct answer for only 1 task or none of the tasks described in category 4.</p>

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**Scoring Notes Checklist**

Task	Check Yes	Category
<b>Task 1</b>		
Answers 6 and shows evidence of counting dates backward from Dec. 20.		Concept
Evidence of moving up 2 rows from Dec. 20 on calendar, or shows $20 - 14$ , or $20 - (2 \times 7)$ .		Strategy
Explains that 2 weeks is 14 days, so subtract 14 from 20, or multiply 7 by 2 then subtract 14 from 20, or each row is a week of 7 days and you can just move up 2 rows from December 20.		Explanation
Answers 6.		Accuracy
<b>Task 2</b>		
Lists 7, 14, 21, 28 in that order and shows evidence of multiples of 7.		Concept
Evidence of adding 7 to the previous number, or evidence of multiples of 7. Higher-level thinking: $7n$ beginning at row $n = 1$ .		Strategy
Describes adding 7 to the previous number to get the next number, or that the numbers are multiples of 7. Higher-level thinking: begin at row 1 and multiply each row number by 7.		Explanation
Answers 7, 14, 21, 28 in that order.		Accuracy
<b>Task 3</b>		
Lists 3, 10, 17, 24, 31 in that order and shows evidence of understanding pattern.		Concept
Evidence of beginning with 3, then adding 7 to the previous number. Higher-level thinking: $7n - 4$ or $7(n - 1) + 3$ beginning at row $n = 1$ .		Strategy
Describes beginning with 3 and then adding 7. Higher-level thinking: begin at row 1, multiply the row number by 7, then subtract 4.		Explanation
Answers 3, 10, 17, 24, 31 in that order.		Accuracy
<b>Task 4</b>		
Shows evidence of similarities and differences in patterns.		Concept
Patterns are the same because the numbers are each 7 apart. Patterns are different because they begin at different numbers. May also say one has 4 numbers and the other has 5 numbers. Higher-level thinking: begin at row 1, Tuesday is 7 times row number and Friday is 7 times row number minus 4.		Explanation

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Task	Check Yes	Category
<b>Task 5</b>		
Lists 3, 10, 17, 24, 31 in that order and shows evidence for finding Mondays in January.		Concept
Evidence of correctly filling in calendar with January 1 on Saturday, or evidence of counting forward from December 31. May show evidence of adding 7 to 27 (last Monday of December) to get 34 and then subtracting 31 to get the first Monday in January is 3. Higher-level thinking: $7n - 4$ or $7(n - 1) + 3$ beginning at row $n = 1$ .		Strategy
May describe counting forward from December 31 and filling in the January dates, or may explain that the first Monday is 3 and then add 7. Higher-level thinking: begin at row 1, Monday is 7 times row number minus 4.		Explanation
Answers 3, 10, 17, 24, 31 in that order.		Accuracy
<b>Task 6</b>		
Lists 2, 9, 16, 23 in that order and shows evidence for finding Tuesdays in November.		Concept
Evidence of correctly filling in calendar with November 30 in last Tuesday, or evidence of counting backward from December 31. May show evidence of beginning with 30 and subtracting 7 to get remaining dates. Higher-level thinking: $7n - 5$ , or $7(n - 1) + 2$ beginning at row $n = 1$ .		Strategy
May describe counting backward from December 1 to fill in November dates, or may fill in November 30 and count backward. May describe subtracting 7 from 30 each time. Higher-level thinking: begin at row 1, Tuesday is row number times 7 minus 5.		Explanation
Answers 2, 9, 16, 23 in that order.		Accuracy



SITES-M Mathematics Challenge  
Grade 3—Focus on Patterns

4. What, if any, patterns (e.g., common errors/misconceptions) did you observe across your student responses?
  
  
  
  
  
  
  
  
  
  
5. What questions or concerns did your students have when working through this Challenge or a particular task? Are these things you should address for the class as a whole?
  
  
  
  
  
  
  
  
  
  
6. What, if any, feedback did you provide to your class? How did you provide it?
  
  
  
  
  
  
  
  
  
  
7. What did you learn about your students' mathematical understanding based on their responses to this Challenge?

**Reminders:**

- 1) After you have completed the Challenge with your class and responded to these Guiding Questions for Analyzing Student Responses, please complete the Challenge Feedback Log. A link to this Log is e-mailed to you each month. Responses will be used to improve the Challenges and to provide recommendations for teachers implementing the Challenges in future years.
  
- 2) Please provide copies of all student work to the Assessment Coordinator.