



Small Group Collaboration

Modeling

SKILL: 108

NAME: _____

Practice Standard: Look for and make use of structure.

INTRODUCTION

INDEPENDENTLY, READ THIS PAGE WHILE YOU'RE WAITING FOR YOUR GROUP.

Pick a Job for Yourself.

When you see this icon, you'll know you have something especially important to do for that page.



Journalist: _____

Make sure information is being written down and take notes if needed.



Questioner: _____

Ask questions to make things more clear or to challenge others to think differently.



Time-Tracker: _____

Notice the time, help remind others to keep focused, and move the group forward.



Materials Manager: _____

Make sure everyone has their materials, uses them properly, and puts them away.

Materials needed: pen/pencil

What is this skill?

This skill is about finding the pattern in a series of numbers or shapes and identifying the features of the pattern.

What is the learning goal?

Your goal is to create patterns that follow certain guidelines.

Why is this learning goal important?

This learning goal is important because recognizing patterns allows us to more easily understand complex situations.

What mathematical vocabulary is important for this activity?

Pattern A regular, repeating design or sequence of shapes or numbers

Rule A statement that describes a relationship between numbers or objects

Sequence A set of numbers arranged in a special order or pattern

As soon as everyone is ready to go – turn the page and get started!



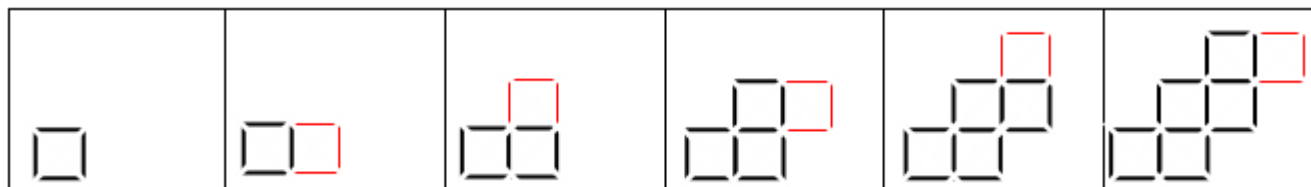
INDEPENDENTLY, READ THE INFORMATION BELOW OR ONE PERSON CAN READ ALOUD.

Playing With Patterns

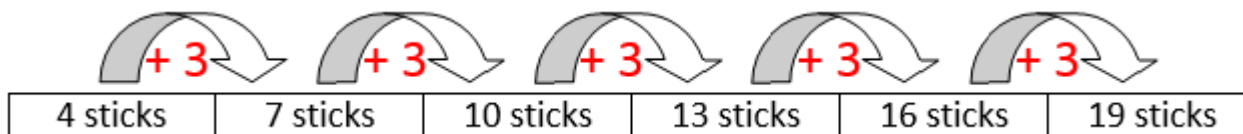


< 5 minutes

A student was playing with popsicle sticks and started to notice they were creating a pattern. Eventually her pattern looked like this:



The student also saw that there was a pattern if she counted the sticks. It took 4 sticks to make the first box and 3 sticks to make every box after that.



She wanted to know if she could use math to predict how many sticks she would need to find a later part of her pattern.

She starts with 4 then follows that rule +3 nine times

$$4 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 = 31$$

The student determines she needs **31** popsicle sticks for 10 boxes

TIP!

Common rules in patterns can be to add or subtract the same number each time, multiply or divide by the same number each time OR a combination of these.

Quick Check:

☐ I have read the information on this page with my group.

Go on to the next page.



WHOLE GROUP

TALK ABOUT IT: Would it be better to continue using popsicle sticks to find how many it took to make 20 boxes or follow the rule? Why do you think this way is better?



INDEPENDENTLY, READ THE INFORMATION BELOW OR ONE PERSON CAN READ ALOUD.

Modeling Patterns

GROUP CHALLENGE GOAL

1. In your small groups, create several patterns using different guidelines.
2. Come back together as a large group and share each pattern. Determine the rule for each pattern and predict what might happen later in each pattern.

In your own words: Based on your current math knowledge and what you've read so far, explain how you will **predict** what might happen in a pattern?



SMALL TEAM BREAK-OUT: Break into ***smaller thinking teams*** so that you're working with 1 or 2 other people. The whole group will reconvene for page six.

Who will be in your **small team** for the work on pages four and five? Write their names below.



< 5 minutes

Quick Check

☐ I understand what I need to do for the challenge!

TIP!

For the work on pages 4 & 5, you'll be in small teams.

Reconvene: Get back together

Quick Check

☐ We've divided up into small thinking teams.

Go on to the next page.



SOLVE THIS PART WITH YOUR SMALL TEAM OR INDEPENDENTLY.

Create a **shape** pattern of your own.

| | | | |
|--|--|--|--|
| | | | |
|--|--|--|--|

Now, create **numeric** patterns that meet the following conditions:

1.) A pattern where each term gets smaller.

| | | | | |
|--|--|--|--|--|
| | | | | |
|--|--|--|--|--|

What is the rule? _____ What would the 10th term be: _____

2.) A pattern that starts with an even number and either increases or decreases by an odd number.

| | | | | |
|--|--|--|--|--|
| | | | | |
|--|--|--|--|--|

What is the rule? _____ What would the 15th term be: _____

3.) A pattern that has a division rule.

| | | | | |
|--|--|--|--|--|
| | | | | |
|--|--|--|--|--|

What is the rule? _____ What would the 20th term be: _____

4.) A pattern that includes the following numbers.

| | | | | |
|---|--|---|--|--|
| 2 | | 8 | | |
|---|--|---|--|--|

What is the rule? _____ What would the 50th term be: _____



10 minutes

Term:

Each stage of a pattern is known as a term.

TIP!

You can start with any shape you like as long as the amount you change stays the same from term to term

TIP!

In a division pattern eventually the terms will become numbers less than 1 whole.

Quick Check

☐ Use the opposite operation to see if your pattern works in reverse

Go on to the next page and continue working in your small team.



SOLVE THIS PART WITH YOUR SMALL TEAM OR INDEPENDENTLY.

Use the following pattern to answer the next two questions: 32, _____, 20, _____, 8, 2

A classmate looked at the last 2 terms in the pattern above and said the rule is, "Divide by 4."

Explain how you know that this can't be the rule. _____

Fill in the missing terms of the pattern. Describe how you determined the missing numbers without knowing the second term. _____



TALK ABOUT IT: *Each person should be prepared to share something with the whole group.* What clues do you look for to help you understand a pattern?

One thing I plan to say is: _____

One question I might want to ask another team about their work is: _____



10 minutes

TIP!

The numbers in a pattern decrease when the operation is subtraction or division.

Quick Check

☐ Our small team is ready to share with the whole group.

Once the other teams are ready, go to the next page.



AS A WHOLE GROUP, DISCUSS AND ANSWER THE CHALLENGE GOAL QUESTION.

Discuss and Decide

SHARE-OUT PROCEDURE:

- **30 seconds:** One person talks – everyone else respectfully listens.
 - ✓ *Does anyone have questions about what they just heard?*
 - ✓ **30 more seconds** to answer questions if needed.
- **Repeat** until everyone has shared.
- **5 minutes:** Anyone can ask questions or speak about the topic.
 - ✓ Discuss & answer the Group Challenge question below.

CHALLENGE GOAL: CONCLUSION

1. What is the next term in the pattern 3, 12, 21, 30, _____

a. What is the rule? _____

b. Using the rule, the 10th number in the pattern is _____.

2. Describe your strategy for finding future terms in a pattern.

3. The 12th number in a pattern is 32 and the rule is “add 2.” Show how to determine what number the pattern started with?



10 minutes

TIP!

Use a stopwatch or clock to help track time.

Quick Check

☐ *Everyone* in the group had a chance to speak.

Quick Check

☐ *Everyone* in the group helped complete the Group Challenge.

Go on to the next page.



INDEPENDENTLY, COMPLETE THE REFLECTION.

Reflection

Circle all of the possible operations that can go with the rule: 9, 3...

+ - × ÷

Explain how you know: _____

If the rule is $\div 2$ and the first number in the pattern is **48** circle all of the following numbers in the pattern.

96 24 36 3 1.5

How do you know? _____

Math Practice Standard: Look for and make use of structure.

Doug is working out. He starts off able to do 4 pull-ups. Every week he is able to do 6 more pull-ups than the week before. How many weeks until he can do 52 pull ups?



5 minutes

Skill Check

One on a scale of 1-5, how well do you NOW understand finding the pattern in a series of numbers or shapes?

1 = low
5 = high

Quick Check

☐ I've answered these questions thoughtfully.

Go on to the next page.



INDEPENDENTLY, SOLVE THE PROBLEM.

Ending Problem

Which of the following is a numeric pattern that starts with an even number and increases by 3?

- a) 1, 4, 7, 10...
- b) 12, 15, 19, 24...
- c) 18, 21, 24, 27...
- d) 2, 6, 18, 54...

What would be the 10th term in the pattern you selected? _____

Pick another pattern above that was NOT the correct answer. Write a rule for this pattern



< 5 minutes

TIP!

This question is similar to the types of questions you'll see on your skill assessment.

Clean-Up Check

☐ I've cleaned up my working space and put all materials away.