Support Coach™

5 TARGET Foundational Mathematics

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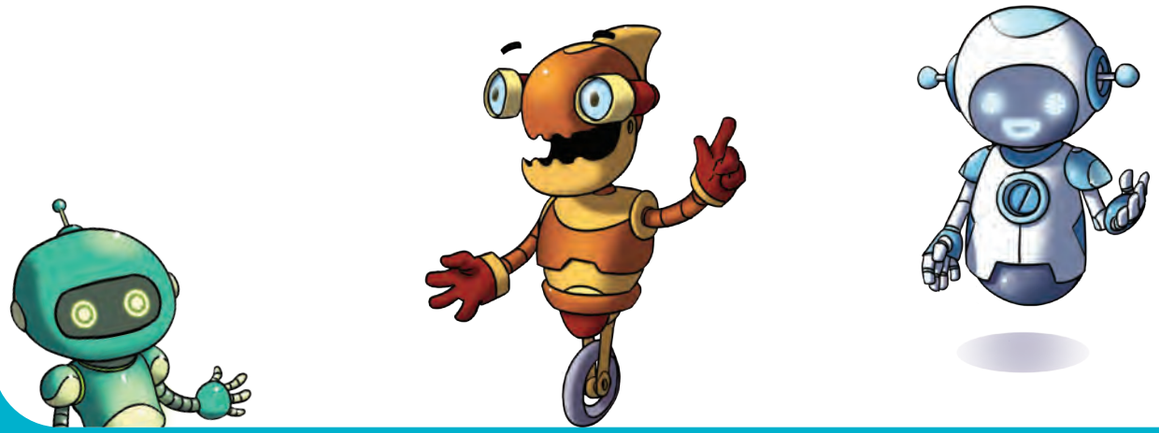
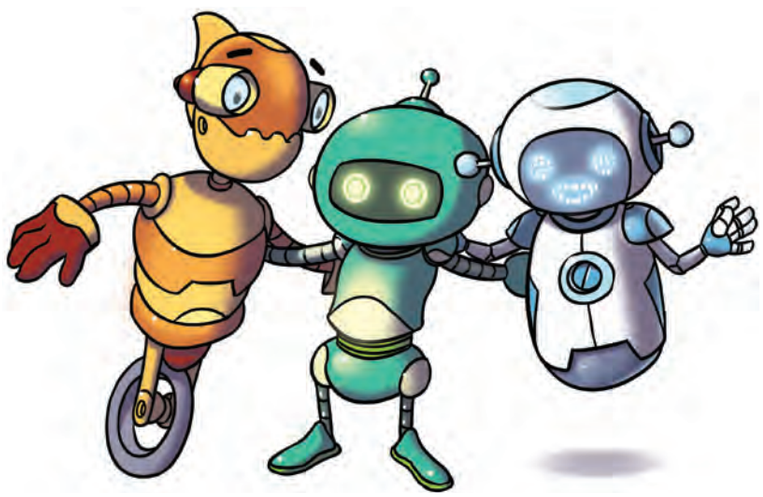




LESSON 1

Analyzing Numerical Patterns

PLUG IN Number and Shape Patterns

A **rule** tells you how to get from one **term** to the next in a pattern.

This is a numerical pattern.

3, 6, 9, 12, 15

Each term in the pattern is 3 more than the term before it. The rule is *add 3*.

This is a shape pattern.

The rule is triangle, square, pentagon, hexagon.

Notice that the terms alternate between even numbers and odd numbers.

I can figure out the rule by looking at the shape of each figure in the pattern.

Words to Know

rule
tells how the numbers or figures in a pattern are related

4, 8, 12, 16, 20

The rule is *add 4*.

term
a number or figure in a pattern

4, 8, 12, 16, 20

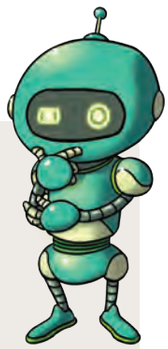
The pattern has five terms.

DISCUSS When finding a rule for a numerical pattern, how do you know whether the rule is to add, to subtract, or to multiply?

A You can use a rule to create a number pattern.

DO Create the number pattern.
The first term is 3. The rule is *multiply by 2*.

1. Multiply the first term, 3, by 2 to find the second term. ___3___ × ___2___ = _____
2. Multiply each term by 2 to find three more terms. _____ × _____ = _____
   _____ × _____ = _____
   _____ × _____ = _____
3. Write the five terms in the pattern. _____, _____, _____, _____, _____
4. Describe the terms in the pattern. _____



B You can use a rule to create a shape pattern.

DO

Create the shape pattern.
The rule is small triangle, large triangle, small square, large square.

1. Draw the first four figures in the pattern: a small triangle, a large triangle, a small square, and a large square.
2. Repeat the pattern.
3. Describe the terms in the pattern. Study the pattern.

△ _____ _____ _____ _____ _____ _____ _____

_____

_____

_____

PRACTICE

Use the rule to complete the pattern. Then describe the terms in the pattern.

1 The rule is *add 5*.

10, **15**, _____, _____, _____

_____

_____

2 The rule is *subtract 4*.

30, _____, _____, _____, _____

_____

_____

3 The rule is *add 10*.

0, _____, _____, _____, _____

_____

_____

4 The rule is *multiply by 3*.

1, _____, _____, _____, _____

_____

_____

5 The rule is to add 3 squares to the top of the figure.

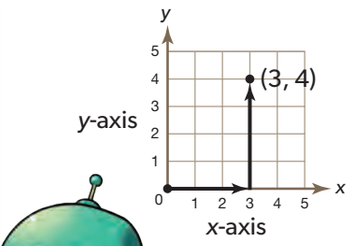
□□□ _____ _____ _____ _____

_____

POWER UP Understanding Ordered Pairs

A coordinate plane is a grid formed by a horizontal number line and a vertical number line. An **ordered pair** of numbers is used to name the location of a point on a coordinate plane.

- The first number is the **x-coordinate**.
- The second number is the **y-coordinate**.
- The **origin** (0, 0) is the point where the *x*-axis and *y*-axis meet.
- To plot a point at (3, 4), start at the origin. Move 3 units to the right. Then move 4 units up. Draw a point and label the ordered pair.



I see! The ordered pair (3, 4) lines up with 3 on the x-axis, and with 4 on the y-axis.

Words to Know

ordered pair
two numbers that give a location on a coordinate plane

(2, 3)

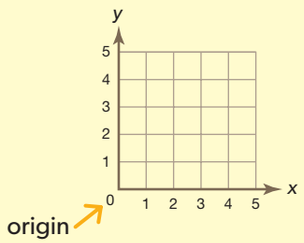
***x*-coordinate**
tells how many units to move to the right along the *x*-axis

(2, 3)

***y*-coordinate**
tells how many units to move up along the *y*-axis

(2, 3)

origin
point located at (0, 0)

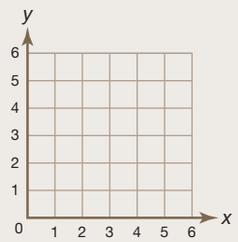


DISCUSS Explain where the point (4, 1) would be located on a coordinate plane.

A You can use ordered pairs to plot a point on a coordinate plane.

DO Plot a point at (1, 6) on the coordinate plane.

1. Start at the origin.
2. Use the *x*-coordinate to move to the right.
3. Use the *y*-coordinate to move up.
4. Plot and label the point.



The origin is at (0, 0).

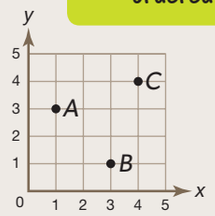
The *x*-coordinate is _____, so move _____ unit to the right.

The *y*-coordinate is _____, so move _____ units up.

B You can use an ordered pair to name a point on the coordinate plane.

DO Name the point located at (3, 1) on the coordinate plane.

1. Start at the origin.
2. The *x*-coordinate tells how many units to move to the right.
3. The *y*-coordinate tells how many units to move up.
4. Name the point.



The origin is at (_____, _____).

The *x*-coordinate is 3, so move _____ units to the right.

The *y*-coordinate is _____, so move _____ unit up.

Point _____ is located at (3, 1).

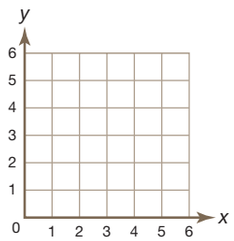
x comes before y in the alphabet, and the x-coordinate comes before the y-coordinate in an ordered pair.

DISCUSS Gabriella says the point (2, 4) is 4 units to the right and 2 units up from the origin. Is she correct? What can you tell Gabriella?

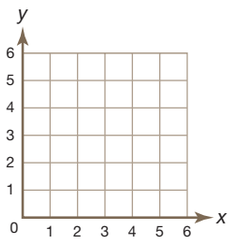
PRACTICE

Plot and label the ordered pair on the coordinate plane.

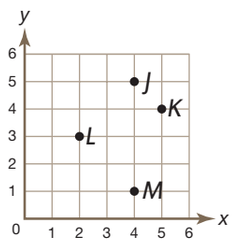
1 (2, 5)



2 (6, 3)



Use the coordinate plane below for problems 3–6. Name the point.



3 Point _____ is located at (4, 1).

4 Point _____ is located at (5, 4).

5 Point _____ is located at (2, 3).

6 Point _____ is located at (4, 5).

READY TO GO Analyzing Numerical Patterns

You can use ordered pairs to show relationships between two numerical patterns.

The table shows two patterns.

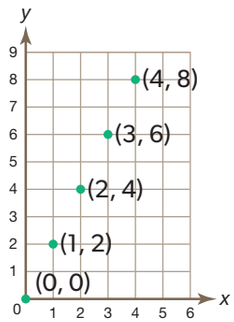
Rule: Add 1	Rule: Add 2
0	0
1	2
2	4
3	6
4	8

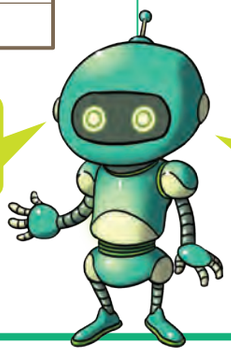
Write the pairs of values as ordered pairs.

Rule: Add 1	Rule: Add 2	Ordered Pairs
0	0	(0, 0)
1	2	(1, 2)
2	4	(2, 4)
3	6	(3, 6)
4	8	(4, 8)

You can graph the ordered pairs on a coordinate plane.

For each unit you move to the right, you move twice as many units up.





The terms in the table form pairs of values.

The terms of the first pattern are the x-coordinates, and the terms of the second pattern are the y-coordinates.

I see! Each term in the second pattern is 2 times the corresponding term in the first pattern.

DISCUSS How would the graph change if the rule of the second pattern were to add 3?

LESSON LINK

PLUG IN

You can follow a rule to create a pattern.

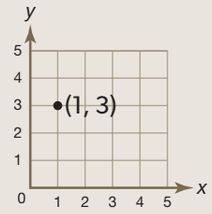
The first term is 0.

The rule is *add 2*.

0, 2, 4, 6, 8

POWER UP

An ordered pair is used to name a point on a coordinate plane.



GO!

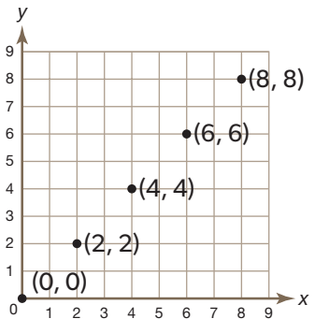
I get it! I can use two patterns to make ordered pairs. Then I can graph the ordered pairs to show the relationship between the patterns.

WORK TOGETHER

Use Grid Paper to graph the numerical pattern.

- Use the terms in the table to create ordered pairs.
- Graph each ordered pair on the coordinate plane.
- Each term in the second pattern is 1 times the corresponding term in the first pattern. Each point on the graph moves to the right and up 2 units from the previous point.

Rule: Add 2	Rule: Add 2	Ordered Pairs
0	0	(0, 0)
2	2	(2, 2)
4	4	(4, 4)
6	6	(6, 6)
8	8	(8, 8)



Ordered pairs are in the form (x, y).

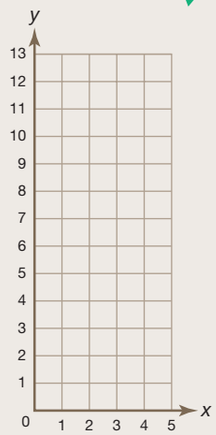
Grid Paper can be found on p. 211.

A You can use a table to help you graph and label ordered pairs.

DO Complete the pattern in the table. Graph the pattern.

1. Write the terms in each pattern.
2. Use the terms to create ordered pairs.
3. Graph and label the ordered pairs.
4. Describe the pattern.

Rule: Add 1	Rule: Add 3	Ordered Pairs
0	0	(0, 0)
		(,)
		(,)
		(,)
		(,)



Each term in the second pattern is _____ times the corresponding term in the first pattern.

Each point on the graph moves _____ unit to the right and _____ units up from the previous point.

DISCUSS Look at these ordered pairs: (0, 0), (1, 4), (2, 8), (3, 12), (4, 16). What is the relationship between the ordered pairs?

Look at how the x- and y-coordinates change from one ordered pair to the next.

READY TO GO

PRACTICE

Use the patterns to create ordered pairs.

1

Rule: Add 3	Rule: Add 6	Ordered Pairs
0	0	(,)
3	6	(,)
6	12	(,)
9	18	(,)
12	24	(,)

2

Rule: Add 1	Rule: Add 5	Ordered Pairs
0	0	**(0, 0)**
1	5	**(1, 5)**
2	10	(,)
3	15	(,)
4	20	(,)

REMEMBER
Look at the first pattern for the *x*-coordinates.

Complete each pattern and create ordered pairs. Then describe the ordered pairs of the patterns.

3

Rule: Add 1	Rule: Add 4	Ordered Pairs
0	0	(,)
		(,)
		(,)
		(,)
		(,)

_____

_____

4

Rule: Add 2	Rule: Add 6	Ordered Pairs
0	0	**(0, 0)**
2	6	**(2, 6)**
		(,)
		(,)
		(,)

_____

_____

HINT
Look at the second pattern for the *y*-coordinates.

5

Rule: Add 3	Rule: Add 3	Ordered Pairs
0	0	(,)
		(,)
		(,)
		(,)
		(,)

_____

_____

6

Rule: Add 4	Rule: Add 8	Ordered Pairs
0	0	(,)
		(,)
		(,)
		(,)
		(,)

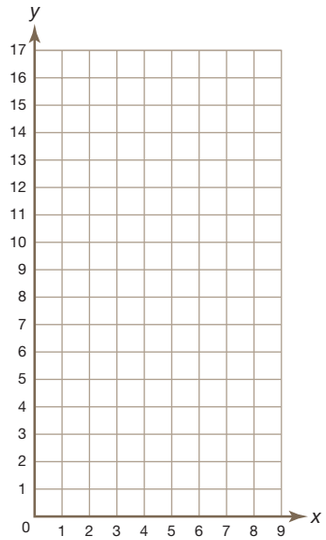
_____

_____

Complete each pattern and create ordered pairs. Then graph and label the ordered pairs.

7

Rule: Add 2	Rule: Add 4	Ordered Pairs
0	0	(,)
		(,)
		(,)
		(,)
		(,)



What do you notice about the points on the graph?

_____

_____

_____

_____

Solve.

8 Thomas plotted the points (0, 0), (1, 6), (2, 12), (3, 18), and (4, 24) on a coordinate plane. What do you notice about the ordered pairs?

_____

_____

9 Avery used the rule *add 3* to create one pattern, and the rule *add 6* to create another pattern. Then she wrote ordered pairs. What is the relationship between the corresponding terms?

_____

_____

DISCUSS

Find the Pattern

Mato used terms from two patterns to write these ordered pairs: (0, 0), (2, 8), (4, 16), (6, 24), (8, 32). Lillian says the next ordered pair will be (16, 34). What can you tell Lillian?

What were the rules for Mato's patterns?

READY TO GO

PROBLEM SOLVING

NUMBER GAMES

READ

Abby uses the rule *add 5* to make a pattern. Jayden uses the rule *add 10* to make a pattern. If both girls start at 0, which number would Jayden say when Abby says 40?

Abby's Pattern Rule: Add 5	Jayden's Pattern Rule: Add 10
0	0
5	10
10	20
15	30
20	40

PLAN

- What is the problem asking you to find?

  Which _____ Jayden would say when Abby says 40

- What do you need to know to solve the problem?

  What is the rule for Abby's pattern? _____

  What is the rule for Jayden's pattern? _____

  The number that Abby says _____

- How can you solve the problem?

  You can identify the relationship between the corresponding terms of the two patterns.

SOLVE

Look for a relationship between the terms of the two patterns.

$0 \times$ _____ $= 0$

$5 \times$ _____ $= 10$

$10 \times$ _____ $=$ _____

$15 \times$ _____ $=$ _____

$20 \times$ _____ $=$ _____

The terms in Jayden's pattern are _____ times the terms in Abby's pattern.

When Abby says 40, Jayden says $40 \times$ _____ $=$ _____.

CHECK

Find the next 4 terms for each pattern.

Abby: 0, 5, 10, 15, 20, _____, _____, _____, _____

Jayden: 0, 10, 20, 30, 40, _____, _____, _____, _____

Jayden will say _____ when Abby says 40.

PRACTICE

Use the problem-solving steps to help you.

I will look for a relationship between the terms of the two patterns.

1 Jenna writes this pattern: 0, 10, 20, 30, 40. Bailey writes this pattern: 0, 100, 200, 300, 400. If the girls continue their patterns, what number will Bailey write when Jenna writes 90?

CHECKLIST
- ☐ READ
- ☐ PLAN
- ☐ SOLVE
- ☐ CHECK

2 Robert uses the rule *add 5* to create a pattern. Kento uses the rule *add 15* to create a pattern. Both patterns start at 0. What number will Kento say when Robert says 25?

CHECKLIST
- ☐ READ
- ☐ PLAN
- ☐ SOLVE
- ☐ CHECK

3 Kyle and Jake each use a pattern to decide how many pages to read each night. Kyle's rule is to add 3 pages each night. Jake's rule is to add 6 pages each night. If Kyle reads 9 pages in a night, how many pages will Jake read?

CHECKLIST
- ☐ READ
- ☐ PLAN
- ☐ SOLVE
- ☐ CHECK