

Repeating Patterns

Patterns can grow or patterns can repeat.
Repeating patterns can use numbers or shapes.
You can extend a pattern by finding a rule for the pattern.

Repeating Patterns with Shapes

Use this pattern.
What is the next shape?



Assign each shape a number. When a shape repeats use the same number.



The next shape is the second shape.



Repeating Patterns with Numbers

Use the pattern below. What is the 12th number in this pattern?

4, 7, 3, 5, 4, 7, 3, 5, 4, 7,

Find the pattern.
The pattern is 4, 7, 3, 5,
and then it repeats.

Extend the pattern until reaching the 12th number.

4, 7, 3, 5, 4, 7, 3, 5, 4, 7, 3, 5

The 12th number is 5.

1. Draw the next three shapes in the pattern.



2. What are the next three numbers in the pattern below?
5, 8, 3, 1, 5, 8, 3, 1, 5, 8

3. **Explain It** In the pattern in Exercise 2, how could you find the 15th number? What is that number?

Name _____

Repeating Patterns

Draw the next three shapes to continue the pattern.



Write the next three numbers to continue the pattern.

3. 4, 6, 2, 8, 4, 6, 2, 8, 4, ...

4. 3, 3, 5, 3, 3, 5, 3, 3, 5, ...

5. **Draw a Picture** What is the 12th shape in the pattern below?



6. **Strategy Practice** Penny has made a pattern of shapes on her bedroom walls. She drew a rectangle, 2 circles, a rectangle, and then 2 more circles until she drew 24 circles. How many shapes did she draw in all?

7. Mrs. Washington placed students in a line. The order was 1 boy, 2 girls, 2 boys, and continued. Was the 10th student a boy or a girl?

8. What is the 15th number in the pattern below?
3, 6, 5, 2, 3, 6, 5, 2, ...

A 2

B 3

C 5

D 6

Number Sequences

A number sequence is a pattern that increases or decreases while following a rule.

What are the next three numbers in this pattern?

36, 42, 48, 54, ...

Step 1

Find the pattern.

You can subtract to find the pattern.

$$54 - 48 = 6$$

$$48 - 42 = 6$$

$$42 - 36 = 6$$

Each number is 6 more than the number before it. So, a rule for the pattern is "add 6."

Step 2

Use this rule to extend the pattern.

Start with 54. Add 6.

$$54 + 6 = 60$$

$$60 + 6 = 66$$

$$66 + 6 = 72$$

So, the next three numbers are 60, 66, and 72.

Find the next three numbers in each pattern.

Write a rule for the pattern.

1. 35, 40, 45, ■, ■, ■ 2. 43, 39, 35, ■, ■, ■ 3. 32, 39, 46, ■, ■, ■

4. 13, 21, 29, ■, ■, ■ 5. 75, 65, 55, ■, ■, ■ 6. 51, 45, 39, ■, ■, ■

7. **Critical Thinking** How can you use subtraction to complete an addition pattern? Use Exercise 3 as an example.

Name _____

Number Sequences

Find the missing numbers in each pattern. Write a rule for the pattern.

1. 19, 23, 27, ■, ■

2. 32, 26, 20, ■, ■

3. 125, 150, 175, ■, ■

4. 8, 15, ■, ■, 36

5. 90, 80, ■, ■, 50

6. 84, 69, 54, ■, ■

7. 30, 50, ■, 90, ■

8. 65, 56, ■, 38, ■

9. 35, ■, 57, 68, ■

10. Reasoning The house numbers on Carr Memorial Avenue follow a pattern. The first four houses on the left side of the street are numbered 8, 14, 20, and 26. How many more houses are on the left side of the street with numbers less than 50?

11. Noreen is beginning an exercise program. The first week she exercises 25 minutes each day. The second week she exercises 30 minutes a day and the third week she increases it to 35 minutes a day. If the pattern continues, how long will she exercise each day in the fifth week?

12. Explain It What do you need to do to extend a number pattern?

13. John said that 52 is part of the pattern below. Mary said that 66 is part of the pattern below. Who is correct?
18, 26, 34, 42, ...

A Neither is correct.

B Both are correct.

C Only John is correct.

D Only Mary is correct.

Extending Tables

A table is an organized way to show a pattern.

Weeks	Days
1	7
3	21
5	35
6	42
8	?

Each pair of values follows some rule. If you can find a rule that works for all the pairs, you can extend the table.

What is the missing number in this table?

Step 1

Find a rule for the pattern.

The first 4 weeks are shown.
You can divide to find the pattern.

$$42 \div 6 = 7$$

$$35 \div 5 = 7$$

$$21 \div 3 = 7$$

$$7 \div 1 = 7$$

There are 7 days in one week.

Step 2

Use your rule to find the missing number.

Multiply the days in 1 week by the number of weeks.

$$8 \times 7 = 56$$

The missing number is 56.

Complete each table.

1.

Cars	Wheels
1	4
2	8
3	
4	16
8	32

2.

Old Price	New Price
\$63	\$53
\$48	\$38
	\$31
\$37	\$27
\$26	\$16

3.

Weight of Salad in Ounces	6	10	14	18
Total Weight of Container in Ounces	9	13	17	

Name _____

Extending Tables

Find the missing numbers.

1.

Number of Cats	Number of Legs
1	4
2	
3	12
4	16
	32

2.

Money Earned	Money Saved
\$25	\$15
\$32	\$22
\$43	
	\$47
\$73	\$63

3.

Touchdowns	Points
1	6
2	12
3	
	36
8	48

For 4 and 5, use the table at the right.

T-shirts	Cost
1	\$8
3	\$24
5	\$40

4. How much money would 9 T-shirts cost?

5. **Strategy Practice** How much more money do 10 T-shirts cost than 6 T-shirts? Explain how you found your answer.

6. **Number Sense** Bob has 3 bookshelves that hold a total of 27 books. He adds a fourth shelf and now has 36 books. If he adds 2 more shelves, how many books can he have in total?

7. What is the missing number in the table below?

In	3	5	8	15
Out	9	11	14	

A 21

B 25

C 30

D 45

Writing Rules for Situations

When working with tables, it is important to find a rule that works for all pairs of numbers. The rule tells how to find one of the numbers in a pair.

Old Price	New Price
\$15	\$10
\$22	\$17
\$28	\$23
\$37	\$32
\$51	\$46

Each pair of numbers in the table to the left follows a rule. If you can find a rule that works, you can extend the table.

Step 1

Find the pattern. Check the first pair of numbers to see how the first number changed to become the second number.

$$15 - 10 = 5$$

A rule for the first pair of numbers is “subtract 5.”

Step 2

See if this rule works for all the values.

$$22 - 17 = 5$$

$$37 - 32 = 5$$

$$28 - 23 = 5$$

$$51 - 46 = 5$$

The rule “subtract 5” works for every pair of values.

Find the missing numbers in each table.
Write a rule for the table.

1.

Earned	Spent
\$21	\$14
\$30	\$23
\$42	
\$48	\$41
\$59	

2.

Teams	Players
3	27
8	72
6	
9	
2	18

3.

Tickets	Cost
2	\$1
6	\$3
12	
10	\$5
20	

4. **Number Sense** Joe said that by using the information in Exercise 2 there would be 250 players if there were 25 teams. Is that correct? Explain.

Name _____

Writing Rules for Situations

Find the missing numbers in each table.

Write a rule for the table.

1.

Max's Age	Carol's Age
7	13
10	
14	20
18	24
	31

2.

Tricycles	Wheels
5	15
3	9
7	
	27
2	6

3.

Old Price	New Price
\$25	\$18
\$16	\$9
	\$32
\$53	\$46
\$72	

For 4 and 5, use the table at the right.

4. The table shows the number of players on a volleyball team. What is a rule for the table?

Players	Teams
24	4
48	8
36	6
30	5

5. **Explain It** If there are 12 teams, how many players will there be? Explain how you found your answer.

6. How many miles can Nick travel in 5 hours? 6 hours?

Hours	1	2	3	4
Miles	60	120	180	240

7. The table shows how many CDs Jim and Ken each own after joining a CD club. Which is a rule that works for this table?

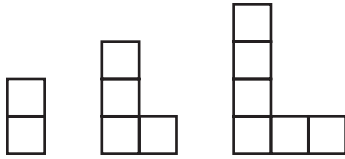
Jim	8	12	20	30
Ken	16	20	28	38

- A** Add 8 **C** Subtract 10
B Multiply by 2 **D** Divide by 2

Geometric Patterns

Like number patterns, geometric patterns can have figures that grow. To extend geometric patterns follow the same steps as you would for number patterns.

Below is a pattern of squares.



Number of Figure	1	2	3	4	5
Number of Squares	2	4	6		

Step 1

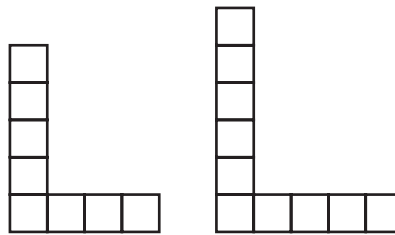
Look at the pattern. See how the figure has changed.

Each figure grows by 1 square in height and 1 square in width.

Each figure grows by 2 squares.

Step 2

Make the next two figures.



Step 3

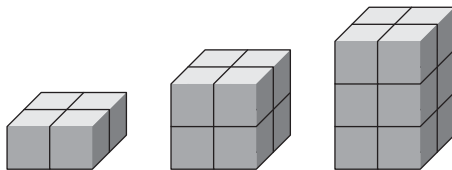
Fill in the table.

Number of Figure	1	2	3	4	5
Number of Squares	2	4	6	8	10

Draw the next two towers in the pattern. Use grid paper. Find the missing numbers in each table.

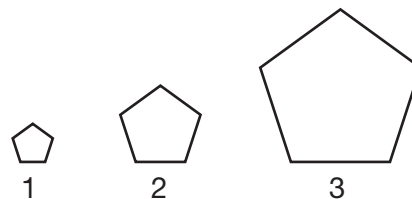
1.

Number of Stories	1	2	3	4	5
Number of Blocks	4	8	12		



2.

Length of Sides	1	2	3	4	5
Sum of All Sides	5	10	15		



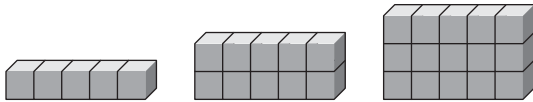
3. **Number Sense** If there were 10 stories in Exercise 1, how many blocks would there be? Explain.

Geometric Patterns

Draw the next two figures in the pattern.
Find the missing numbers in each table.

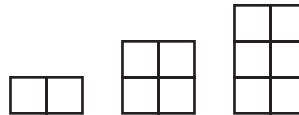
1.

Number of Stories	1	2	3	4	5
Number of Blocks	5	10	15		



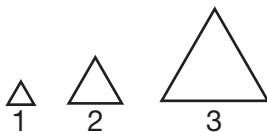
2.

Number of Stories	1	2	3	4	5
Number of Blocks	2	4	6		



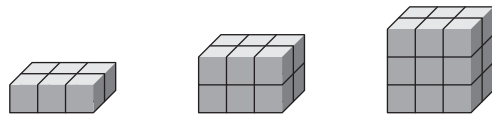
3.

Length of Each Side	1	2	3	4	5
Sum of All Sides	3	6	9		



4.

Number of Stories	1	2	3	4	5
Number of Blocks	6	12	18		



5. **Explain It** Use Exercise 4. How could you find how many blocks there were in 20 stories? How many blocks would there be?

6. Which is a rule for the table below?

In	3	9	4	7
Out	7	13	8	11

- A Add 4
- B Multiply 2
- C Multiply 4
- D Add 5

Problem Solving: Act It Out and Use Reasoning

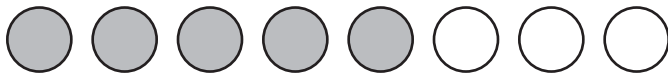
Izzie has 12 coins. Four of the coins are quarters. He has 2 more dimes than nickels. How many of each coin does he have?

You can use logical reasoning to find the answer. You may be able to determine information that is not told.

What do I know?	What do I need to find out?	What can I determine from the information?
Izzie has 12 coins. 4 of the coins are quarters. Izzie has 2 more dimes than nickels.	How many dimes does Izzie have? How many nickels does Izzie have?	If 4 of the 12 coins are quarters, Izzie has a total of 8 dimes and nickels.

You can act it out to find how many dimes and nickels Izzie has.

Take 8 two-color counters. Find combinations so that one color will have 2 more than the other. If you try 4 and 4, the difference is 0, so try 5 and 3. It works.



So, Izzie has 4 quarters, 5 dimes, and 3 nickels.

Solve. Find the number of each kind of object in the collection.

1. Kim's Music Video Collection

- 13 videos in all
- 4 concert videos
- 3 more rap videos than pop videos

Concert videos =

Rap videos =

Pop videos =

2. Molly's Art Collection

- 5 paintings
- 3 more sculptures than mosaics
- 16 pieces in all

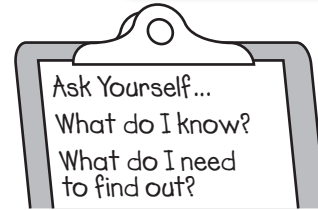
Paintings =

Sculptures =

Mosaics =

Problem Solving: Act It Out and Use Reasoning

Solve. Find the number of each kind of object in the collection.



1. Sue's Card Collection

8 packs of baseball cards
3 fewer packs of hockey cards
than football cards
17 packs in all

Baseball cards =

Hockey cards =

Football cards =

2. Drew's DVD Collection

7 comedy DVDs
4 more drama DVDs than horror
DVDs
15 DVDs in all

Comedy DVDs =

Drama DVDs =

Horror DVDs =

3. Strategy Practice Mike is 8 years older than Kyle. Kyle is 6 years old. The sum of Mike's, Kyle's, and Jamal's ages is 23. How many years old is Jamal?

4. Miranda has 24 CDs in her collection. Of those CDs, 10 are pop CDs. She has 6 more country CDs than jazz CDs. How many country CDs does Miranda have?

5. Curt has 12 models in all. Three of the models are airplanes. Curt has 5 more models of cars than boats. How many models of cars does Curt have?

6. Stevie, Lindsey, and Christine are the lead singers in a band. They will sing 18 songs. Lindsey will sing 8 songs. Christine will sing 6 fewer songs than Stevie. How many songs will Stevie sing?

A 2

B 4

C 6

D 8