Repeating Shape Patterns

Goal **Extend and create shape patterns.**

1. Vincenza made this pattern.

☺ ☺ ☺ ☺ ☺ ☺ ☺ ☺

  a) What attribute is changing? _____size_____

  b) How is it changing? _____big, small, ..._____

  _____

  c) Underline the part of the pattern that repeats.

2. Tell how the attributes change in each pattern.
Sketch the part that repeats to extend the pattern.

  a) $+ - \times \times \times \div + - \times \times \times \div + - \times \times \times \div + - \times \times \times \div$

    sign: +, –, x, x, x, ÷, ...

    number of signs: 1 +, 1 –, 3 x, 1 ÷, ...

  b) ○ ■ △ ● □ ▲ ○ ■ △ ● □ ▲ ○ ■ △ ● □ ▲

    shape: circle, square, triangle, ...

    colour: white, grey, ...

  c)

    object: fork, spoon, ...

    direction: up and down, up and down, sideways, ...

3. a) Draw a pattern with 2 changing attributes.
Make your pattern repeat 3 times.

    For example: ■ ▪ ▪ ■ ▪ ▪ ■ ▪ ▪

  b) Tell how the attributes change.

    For example, for the pattern shown in part a): size: big, small, small, ...

    number of each size: 1 big, 2 small, ...

At–Home Help

This pattern has 2 changing **attributes**: number of shapes and type of shape.

□ □ ○ □ □ ○

This is how the attributes change.
Number of shapes: 2 squares, 1 circle, …
Type of shape: square, square, circle, …

Exploring Patterns

Goal **Create and explore patterns that change in more than one way.**

1. Tell how the attributes change in each pattern.

a) **ZoOzOoZoOzOo ...**

letter: 1 Z, 2 Os, ...

case: capital letter, small letter, ...

b) **ZEBRAZEBRAZEBRA ...**

letter: Z, E, B, R, A, ...

colour: black, white, ...

c) **g!rᵇfʃeᴮiᴶaʃfᵊg!rᵇfʃe ...**

letter: g, i, r, a, 2 fs, e, ...

orientation: right side up, upside down, ...

2. The word BEAR is shown in a 3-by-3 grid. Tell how the attributes change.

B	E	A
R	B	E
A	R	B

letter: B, E, A, R, ...

colour: black, white, ...

3. Make a pattern by writing each animal name in the grid provided. In addition to the changing letters, include another attribute that changes.   *For example:*

a) ELK

E	Г	K	Ǝ	L
Ʞ	E	Г	K	Ǝ
L	Ʞ	E	Г	K
Ǝ	L	Ʞ	E	Г
K	Ǝ	L	Ʞ	E

b) MONKEY

M	o	n	K
e	y	M	o
n	K	e	y
M	o	n	K

3

Patterns in a 100 Chart

Goal | **Represent adding and subtracting patterns on a 100 chart.**

You will need buttons, broken toothpicks, or other small items to use as counters.

1. Place counters on the partial 100 chart to make each pattern. Describe the pattern made by the counters. *Descriptions will vary. Examples are given.*

   a) Start at 3. Skip count by 3s to 30. *3 counters in the 1st row, 3 in the 2nd row, 4 in the 3rd row. Counters make 3 lines slanting up to the right.*

   b) Start at 50. Skip count backward by 5s to 5. *2 counters in each row. Counters make 2 up and down rows in the middle and at the right side.*

   c) Start at 40. Skip count backward by 2s to 2. *5 counters in each row. Counters make 5 up and down rows. Every 2nd up and down row has counters.*

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

Patterns in T-Charts

Goal   **Use a t-chart to represent and extend growing patterns.**

1. There are 8 tricycles.

a) Use the 1st t-chart below. How many

wheels are there altogether? _____24_____

b) Write the pattern rule.

Start with 3 and add 3 each time.

2. There are 9 puppies.

a) Use the 2nd t-chart below. How many

legs are there altogether? _____36_____

b) Write the pattern rule.   _Start with 4 and add 4 each time._

At-Home Help

This **t-chart** shows the number of ears on increasing numbers of people.

Number of people	Total number of ears
1	2
2	4
3	6
4	8

The **pattern rule** is "Start at 2 and add 2 each time." This rule describes the pattern of the numbers in the 2nd column.

Question 1. Number of tricycles	Total number of wheels	Question 2. Number of puppies	Total number of legs
1	3	1	4
2	6	2	8
3	9	3	12
4	12	4	16
5	15	5	20
6	18	6	24
7	21	7	28
8	24	8	32
		9	36

5 Communicate About Patterns

Goal **Describe a pattern.**

Use the Communication Checklist.

1. Improve the description of each pattern.
   Descriptions will vary. Examples are given.
   a) 2, 4, 6, 8, …, 20, 22, 24
   The pattern skip counts to 24.

   Start at 2 and skip count by 2s to 24.

When describing a pattern, it is important to tell
• how the pattern starts
• how the pattern changes
• what the attributes of the pattern are, if appropriate

Communication Checklist
☑ Did you show the right amount of detail?
☑ Did you use math language?

b) ★ ● ☆ ● ★ ○ ★ ● ☆ **...**

   The pattern has 2 shapes, stars and circles.
   The pattern has 2 colours, black and white.

   The pattern has 2 attributes: shape: star, circle, ...

   colour: black, black, white, ...

c) ▢ □ △ △ □ □ △ △ □ ▢ △ △ **...**

   The pattern starts with a big shape, followed by 2 small shapes,
   and then repeats. The shapes are squares and triangles.

   The pattern has 2 attributes: shape: 2 squares, 2 triangles, ...

   size: 1 big, 2 small, ...

2. Describe the pattern. **M m m m M m m m M m m m M m m m** **...**

   The pattern has 2 attributes: case: capital letter, small letter, small letter, small letter, ...

   number of each case: 1 capital, 3 small letters, ...

Modelling Patterns

Goal **Display models of repeating patterns on charts.**

1. Patrick runs a movie theatre.
He keeps track of how full the theatre is
for the first 21 days of the month.

Full: 3, 6, 7, 10, 13, 14, 17, 20, 21
Almost full: 1, 5, 8, 12, 15, 19
Half full or less: 2, 4, 9, 11, 16, 18

At-Home Help

By collecting information about
everyday events and organizing
the information in a chart or a
calendar, you might find patterns
in the events.

a) Make a symbol for each item in Patrick's chart.

Full ▢   Almost full ▢   Half full or less ▢

b) Put the symbols in the calendar below.

c) Describe the pattern in the Friday column.

all full

d) Describe the pattern in the 3rd row.

almost full, half full or less, full, half full or less, almost full, full, full

e) Why do you think these patterns occur?

The patterns show that people go to movies most often on Tuesdays, Fridays,

and Saturdays, less often on Sundays and Thursdays, and least often on

Mondays and Wednesdays.

f) Continue the pattern for another week on the calendar.

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

b) ⎰

row →

f) ⎰

column

Test Yourself Page 1

Circle the correct answer.
Use this pattern for Questions 1 to 4.

☆ ⬡ ☆ ⬡ ☆ ⬡ ☆ ⬡ ☆

1. Which attributes are changing in the pattern?

   A. position and colour   **C.** big and small

   B. shape and size   **D.** big and star

2. Which description tells how the shapes change?

   E. 2 stars, 2 hexagons, …   **G.** big, small, …

   F. star, hexagon, …   **H.** big, small, small, …

3. Which description tells how the sizes change?

   A. 2 stars, 2 hexagons, …   **C.** big, small, …

   B. star, hexagon, …   **D.** big, small, small, …

4. What are the next 3 shapes in the pattern?

   E. big star, small hexagon, small star

   F. small hexagon, small star, big hexagon

   G. big hexagon, small star, small hexagon

   H. small star, small hexagon, big star

5. Which statement is **not** true about this 100 chart pattern?

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30

   A. The number pattern is 3, 6, 9, 12, 15, …, 24, 27.

   B. A pattern rule is "Start at 1 and skip count by 3s to 27."

   C. The counters make a pattern of 3 diagonals.

   D. Another pattern rule is "Start at 27 and skip count backward by 3s to 3."

Test Yourself Page 2

Circle the correct answer.
Use this pattern for Questions 6 and 7.

C	Ɐ	T	Ɔ	A
⊥	C	Ɐ	T	Ɔ
A	⊥	C	Ɐ	T
Ɔ	A	⊥	C	Ɐ

6. Which attributes are changing?

E. letter and orientation

F. letter and case

G. letter and colour

H. case and colour

7. What is the next row in the pattern?

A. ⊥ C Ɐ T Ɔ

B. Ɐ T Ɔ A ⊥

C. T Ɔ A ⊥ C

D. A ⊥ C Ɐ T

8. Which t-chart shows the number of points on 5 stars? ☆

E.

Number of stars	Total number of points
1	5
2	10
3	15
4	20
5	25

G.

Number of stars	Total number of points
1	2
2	4
3	6
4	8
5	10

F.

Number of stars	Total number of points
1	4
2	8
3	10
4	14
5	16

H.

Number of stars	Total number of points
1	6
2	12
3	18
4	24
5	30