Patterns with Multiple Attributes

Goal Describe, extend, and create patterns that change in many ways.

1. a) Complete the pattern.

★★□○★★□○**★ ★ □**

b) Describe it. <u>2 asterisks, then a square,</u>

<u>then a circle, then repeat</u>

c) Write a letter model for it.

<u>AABCAABCAAB</u>

2. a) Complete the pattern.

△▲○△▲○○<u>△</u> <u>▲</u> <u>○</u> <u>○</u> <u>○</u>

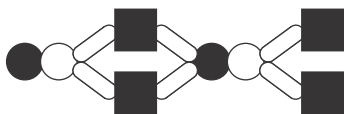**b)** Describe it. <u>a white triangle, a black triangle,</u>

<u>a white circle, then a white triangle, a black triangle, 2 white circles, then a</u>

<u>white triangle, a black triangle, 3 white circles; with each repeat there is one</u>

<u>more white circle</u>

c) Write a letter model for it. <u>ABCABCCABCCC</u>

3. Write a letter model for the pattern.

CDC CD
AB   AB
CDC CD

4. Create a pattern with at least 2 shapes and 2 colours.

For example:

△□▼□△□▼

At–Home Help

Patterns made with shapes can be
• described by the shapes and colours and how they change
• represented with a letter model

For example,

■△□■△□■△□

A black square is followed by a white triangle and then a white square. Then the shapes repeat.

A – B – C – A – B – C – A – B – C

2 Number Patterns

Goal Create, describe, and extend number patterns.

1. Describe each pattern. Write the next 3 numbers.

   a) 50, 54, 58, 62, 66, __70__, __74__, __78__

   increase by 4

   b) 45, 40, 35, 30, 25, __20__, __15__, __10__

   decrease by 5

   c) 3, 6, 10, 15, 21, __28__, __36__, __45__

   increase by 3, then 4, then 5, then 6,

   and so on

2. Circle the letter of the statement that describes the pattern 8, 10, 13, 17, 22, 28.

   A. The numbers increase by the same amount each time.

   B. The numbers decrease by the same amount each time.

   C. The numbers increase by 1 more each time.

   D. The numbers increase by 2 each time.

3. Write another description for the pattern in Question 2.

   The numbers increase by 2, then 3, then 4, then 5, then 6.

4. Mary wants to increase her exercise time every day. She starts with 5 minutes and adds 5 minutes each day. How long will she exercise on the 7th day?

   a) Write the pattern. _5, 10, 15, 20, 25, 30, 35_

   b) Describe the pattern. _Start with 5 and increase each number by 5._
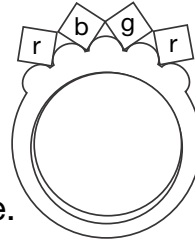
   c) How long will she exercise on the 7th day? _35 minutes_

3 Patterns in T–Charts

Goal Use t-charts to identify and extend patterns.

You will need coloured pencils or markers.

1. This ring has 4 birthstones—
ruby (red), sapphire (blue),
emerald (green), and ruby (red).

   a) Colour the stones in this picture.

   b) Complete the t-chart below to show how
many stones of all types are in 8 rings.

   c) Look at the numbers in the 2nd column.
Write a pattern rule.

   Start with 4 and increase each number by 4.

   d) Complete the t-chart below to show how many ruby stones
are in 8 rings.

   e) Look at the numbers in the 2nd column. Write a pattern rule.

   Start with 2 and increase each number by 2.

At–Home Help

A pendant has
these shapes.

This **t-chart** shows
how many ◇ are
in increasing
numbers of pendants.

Number of pendants	Total number of ◇
1	2
2	4
3	6
4	8
5	10

part b)	Number of rings	Total number of stones	part d)	Number of rings	Total number of ruby stones
	1	4		1	2
	2	8		2	4
	3	12		3	6
	4	16		4	8
	5	20		5	10
	6	24		6	12
	7	28		7	14
	8	32		8	16

Measurement Patterns

Goal **Extend time patterns in t-charts.**

1. Josef reads for 25 minutes each school night.

   a) Complete the t-chart below to show many minutes he read in 10 nights.

   b) Look at the numbers in the 2nd column. Write a pattern rule.

   Start at 25 and increase each number by 25.

2. Lina takes piano lessons 4 times a month.

   a) Complete the t-chart below to find the number of piano lessons she takes in 1 year.

   b) Look at the numbers in the 2nd column. Write a pattern rule.

   Start at 4 and increase each number by 4.

At–Home Help

George practises the piano for 15 minutes each day. This t-chart shows how many minutes he practises in increasing numbers of days.

Days	Total number of minutes
1	15
2	30
3	45
4	60
5	75

Question 1.

Days	Total number of minutes
1	25
2	50
3	75
4	100
5	125
6	150
7	175
8	200
9	225
10	250

Question 2.

Months	Total number of lessons
1	4
2	8
3	12
4	16
5	20
6	24
7	28
8	32
9	36
10	40
11	44
12	48

5 Solve Problems Using a Patterning Strategy

Goal Look for a pattern to solve a problem.

Show the events on the 100 chart using the mark indicated.

1. Every 2nd day the class has gym. Mark all the day numbers with \.

2. Every 3rd day the class has art. Mark all the day numbers with /.

3. Every 5th day the class has an hour of math games. Circle all the day numbers.

4. **a)** Describe the pattern of the days when the class has gym and art.

   <u>6, 12, 18, ..., 90, 96 is every 6th number</u>

At-Home Help

A **100 chart** is another way to find patterns.

100 Days of School

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	㊼
51	52	53	54	㊌	56	57	58	59	㊿
61	62	63	64	㉖	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

b) How many times in 100 days does the class have gym and art?

<u>16</u>

5. **a)** Describe the pattern of the days when the class has gym, art, and an hour of math games. <u>30, 60, 90 is every 30th number</u>

b) How many times in 100 days does the class have gym, art, and an hour of math games? <u>3</u>

6 Multiple Number Patterns

Goal Extend and describe special number patterns.

1. a) Complete this number chain.
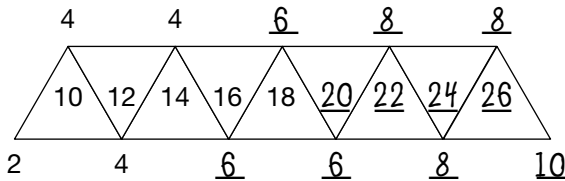
b) Write each number pattern.

inside the triangles:

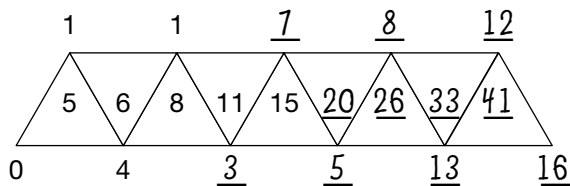10, 12, 14, 16, 18, 20, 22, 24, 26

top corner numbers:

4, 4, 6, 8, 8

bottom corner numbers:

2, 4, 6, 6, 8, 10

zig-zag numbers:

2, 4, 4, 4, 6, 6, 6, 8, 8, 8, 10

At–Home Help

This is a **number chain**.

The numbers at the corners of each triangle add to give the number inside the triangle.

$1 + 1 + 1 = 3$
$1 + 1 + 4 = 6$

Patterns in this number chain are

inside triangles:
3, 6, 9, 12, 15, 18, 21, 24

top corner numbers:
1, 4, 4, 7, 10

bottom corner numbers:
1, 1, 4, 7, 7

zig-zag numbers:
1, 1, 1, 4, 4, 4, 7, 7, 7, 10

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2. Complete this number chain.
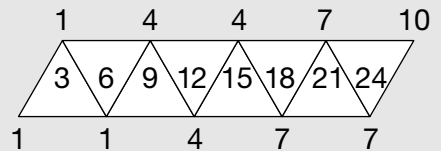

Write each number pattern.

inside the triangles: 5, 6, 8, 11, 15, 20, 26, 33, 41

top corner numbers: 1, 1, 7, 8, 12

bottom corner numbers: 0, 4, 3, 5, 13, 16

zig-zag numbers: 0, 1, 4, 1, 3, 7, 5, 8, 13, 12, 16

7 Finding Missing Terms

Goal **Find the missing number in a pattern and in an equation.**

1. Use the equation to find the missing number in each pattern. Then write the pattern rule.

   a) _23_ + 5 = 28   3, 8, 13, 18, _23_, 28, …

   numbers increase by 5

   b) _35_ + 10 = 45   25, _35_, 45, 55, 65, …

   numbers increase by 10

   c) _19_ + 4 = 23   3, 7, 11, 15, _19_, 23, 27, …

   numbers increase by 4

   d) _45_ + 6 = 51   _45_, 51, 57, 63, 69, 75, …

   numbers increase by 6

   e) _54_ − 4 = 50   _54_, 50, 46, 42, 38, 34, …

   numbers decrease by 4

   f) _56_ − 3 = 53   62, 59, _56_, 53, 50, 47, …

   numbers decrease by 3

2. Fill in the blank in each equation.

   a) 5 + _15_ = 20   **c)** 27 + _4_ = 31   **e)** 82 − _6_ = 76

   b) 23 − _4_ = 19   **d)** _26_ + 8 = 34   **f)** _35_ − 9 = 26

At–Home Help

4, 8, 12, 16, _____, 24, …
In this pattern, the numbers increase by 4.
4 + 4 = 8, 8 + 4 = 12,
12 + 4 = 16, so ask,
"What number + 4 = 24?"
20 + 4 = 24
Also, 16 + 4 = 20.
So the missing number must be 20.

19, 17, 15, 13, _____, 9, 7, …
In this pattern, the numbers decrease by 2.
19 − 2 = 17, 17 − 2 = 15,
15 − 2 = 13, so ask,
"What number − 2 = 9?"
11 − 2 = 9
Also, 13 − 2 = 11.
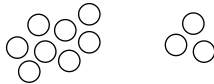So the missing number must be 11.

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8 Equivalent Equations

Goal Use patterns to create equations.

You will need counters, such as toothpicks, bread tags, or dry cereal.

1. You can use counters to find all the number pairs for ● and ■ that make 8 + 3 = ● + ■ true.

   a) Show 8 + 3 using counters.

   b) Rearrange the counters to show the number pairs given in the At-Home Help box.

   c) Keep rearranging the counters to find all the number pairs. ● = 1 and ■ = 10 is a different number pair than ● = 10 and ■ = 1. Continue the pattern and record the other number pairs in this t-chart.

   d) Describe any patterns you see in the t-chart.

   As ● increases by 1, ■ decreases by 1.

   The sum of the pairs is always 11.

At-Home Help

A t-chart can be used to list number pairs that make this equation true.

8 + 3 = ● + ■

●	■
0	11
1	10
2	9
3	8
4	7

●	■
5	6
6	5
7	4
8	3
9	2
10	1
11	0

2. Use a t-chart and patterns to find all the number pairs for ● and ■ that make 5 + 5 = ● + ■ true.

●	■
0	10
1	9
2	8
3	7
4	6
5	5

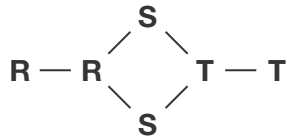| ●	■
6	4
7	3
8	2
9	1
10	0

Test Yourself Page 1

Circle the correct answer.

1. Which letter pattern describes this bead pattern?

○ ○ ▲▼ ○ ■ ○ ○ ▲▼ ○ ■

A.
```
          S
R — R        T — T
          S
```

C.
```
          S
R — R        R — T
          S
```
(circled)

B.
```
          S
R — R        U — V
          T
```

D.
```
          S
R — R        R — U
          T
```
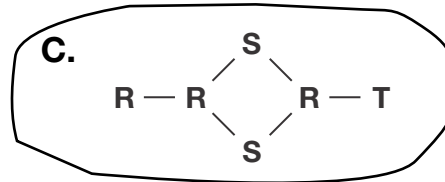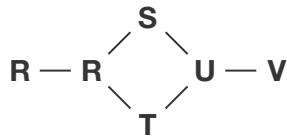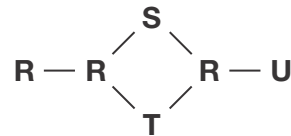
2. What are the next 3 numbers in this pattern?
36, 33, 30, 27, …

E. 24, 21, 18 (circled)   **F.** 21, 18, 15   **G.** 30, 33, 36   **H.** 26, 25, 24

3. What is the pattern in the 2nd column of this t-chart?

A. The numbers increase by 1.

B. The numbers increase by 2.

C. The numbers increase by 3. (circled)

D. The numbers double.

Number of bracelets	Total number of charms
1	3
2	6
3	9
4	12
5	15

4. What is the pattern for the black squares?

□ △ ■ ○ □ ▲ □ ○ ■ △ □ ● □ △ ■ ○

E. 2, 4, 6, 8, …   **G.** 1, 3, 5, 7, 9, …

F. 3, 6, 9, 12, …   **H.** 3, 9, 15, … (circled)

Test Yourself Page 2

Circle the correct answer.

5. Sari can make 3 paper flowers in 1 hour.
Which t-chart shows how many flowers she can make
in increasing numbers of hours?

A.

Hours	Total number of flowers
0	1
1	3
2	6
3	9
4	12

C.

Hours	Total number of flowers
0	3
1	6
3	12
4	15

B.

Hours	Total number of flowers
1	3
2	6
3	9
4	12
5	15

D.

Hours	Total number of flowers
1	3
2	3
3	3
4	3
5	3

6. What is the next number in the zig-zag pattern?

```
 1     4     5     7     ■
 4  7  10  13  16  19
 1    2    4    7    8
```
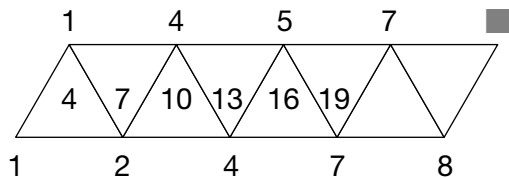
E. 10   **F.** 25   **G.** 8   **H.** 9

7. What is the missing number in this pattern?
32, 35, ■, 41, 44, 47, …

A. 36   **B.** 37   **C. 38**   **D.** 39

8. Which of these could be the right side of the equation
14 + 9 = ● + ■?

E. 14 + 10   **F. 13 + 10**   **G.** 13 + 9   **H.** 13 + 8