Lesson 1
Ratios

Prerequisite: Relating Patterns

Study the example showing how to describe the relationship between two patterns. Then solve problems 1–6.

Example

The school store sells headbands for $2 each and T-shirts for $8 each. Write ordered pairs to compare the cost of headbands to T-shirts for 0, 1, 2, 3, 4, and 5 of each item.

Use a table to show the two numerical patterns.

The cost of headbands follows the rule “add 2.”

Cost of Headbands ($) | Cost of T-shirts ($) | Ordered Pairs
---|---|---
0 | 0 | (0, 0)
2 | 8 | (2, 8)
4 | 16 | (4, 16)
6 | 24 | (6, 24)
8 | 32 | (8, 32)
10 | 40 | (10, 40)

The cost of T-shirts follows the rule “add 8.”

0, 2, 4, 6, 8, 10

Then write the corresponding terms as ordered pairs.

Use the rule “add 8” to find the cost of 6 T-shirts.

$48; Possible answer: I would use the rule “add 8” to the cost of 5 T-shirts to get the cost of 6 T-shirts. The cost of 5 T-shirts plus $8 is $40 + $8 = $48.

For each ordered pair in the table, how does the second number compare to the first number?

The second number is 4 times the first number.

If the cost of headbands is $20, what is the corresponding cost for T-shirts?

$80

Solve.

M 1 One pattern starts at 0 and follows the rule “add 2.” Another pattern starts at 0 and follows the rule “add 5.” Write the first 6 numbers in each pattern. How do the terms in the first pattern compare to the corresponding terms in the second pattern?

Show your work.

Pattern 1: 0, 2, 4, 6, 8, 10

Pattern 2: 0, 5, 10, 15, 20, 25

Solution: Possible answer: Each term in the second pattern is 2.5 times as much as the corresponding term in the first pattern.

M 2 Complete the table below. Then describe the relationship between corresponding terms.

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
<th>Ordered pairs (x, y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>(0, 0)</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>(6, 3)</td>
</tr>
<tr>
<td>12</td>
<td>6</td>
<td>(12, 6)</td>
</tr>
<tr>
<td>18</td>
<td>9</td>
<td>(18, 9)</td>
</tr>
<tr>
<td>24</td>
<td>12</td>
<td>(24, 12)</td>
</tr>
<tr>
<td>30</td>
<td>15</td>
<td>(30, 15)</td>
</tr>
</tbody>
</table>

Possible student answer: Each second term is half the corresponding first term.

C 3 A shop sells matching hats and scarves. The scarves cost 1.5 times as much as the hats. Write two patterns that could represent the costs of 1, 2, 3, 4, and 5 hats and scarves. List the first 5 terms of each pattern. Then explain how to find the cost of 6 hats and scarves, using the patterns you wrote.

Show your work.

Possible work:

Hat Cost Pattern: 4, 8, 12, 16, 20, . . .
Scarf Cost Pattern: 6, 12, 18, 24, 30, . . .

The rule for the hat pattern is “add 4.” The rule for the scarf pattern is “add 6.” Use the rules to extend each pattern for 6 hats and 6 scarves.

$20 + $4 = $24 and $30 + $6 = $36

Solution: Possible answer: The cost of 6 hats is $24, and the cost of 6 scarves is $36.

Vocabulary

corresponding terms numbers that are in the same place in two or more related patterns

ordered pair a pair of numbers that locate a point on a coordinate plane

Key

B Basic  M Medium  C Challenge
Lesson 1

Ratios

Name: ____________________________

Compare Quantities Using Ratios

Study the example problem showing how to compare quantities using ratios. Then solve problems 1–8.

Example

A florist makes a bouquet using 4 roses, 5 carnations, and 3 daffodils. What is the ratio of roses to the total number of flowers in the bouquet?

There are 4 roses in the bouquet.
The total number of flowers is $4 + 5 + 3 = 12$.

There are 12 flowers in the bouquet.
You can express the ratio “4 roses to 12 total flowers” as $\frac{4}{12}$, 4:12, or 4 to 12.

B 1 Write the ratio of carnations to daffodils in three different ways.

Carnations: Daffodils
5 to 3, 5 : 3, 5

B 2 What is the ratio of the total number of flowers to carnations? Write the ratio in three different ways.

Total flowers: Carnations
12 to 5, 12 : 5, $\frac{12}{5}$

M 3 Describe a ratio in words about the flowers that compares one part of the bouquet to another part. Write the ratio in at least two different ways.

Possible answer: roses to daffodils; 4 : 3, 4 to 3 or $\frac{4}{3}$

Solve.

Ben has a collection of 15 coins in quarters and dimes. There are 7 quarters in the collection.

M 4 Write the ratio of quarters to dimes in at least two different ways.

$7 : 8$, $7 : 8$, or $\frac{7}{8}$

M 5 Write the ratio of dimes to total number of coins in at least two different ways.

$8 : 15$, $\frac{8}{15}$, or $\frac{8}{15}$

M 6 Describe a ratio in words about the coins that compares the whole coin collection to one part of it. Then write the ratio in at least two different ways.

Possible answer: total number of coins to dimes; 15 : 8, 15 to 8, or $\frac{15}{8}$

M 7 Is the ratio of quarters to dimes the same as the ratio of dimes to quarters? Explain.

No; Possible explanation: The ratio of quarters to dimes is $\frac{7}{8}$ and the ratio of dimes to quarters is $\frac{8}{7}$. Since the two fractions are not equivalent, the ratios are not the same.

M 8 Pradip and Pam each have a plate of apple slices and orange slices. The ratio of apple slices to the total number of slices on Pradip’s plate is 13 : 6. Neither person has more than 20 total slices. Who has more orange slices? Explain.

Pradip has more orange slices; Possible explanation: Pradip has $11 \div 4 = 7$ orange slices and Pam has 6 orange slices. Since $7 > 6$, Pradip has more.
Ratios

Solve the problems.

1. Alicia has pencils and markers as shown in the tape diagram. Write the ratio of markers to pencils in three different ways.
   - Pencils
   - Markers
   - 8 to 6, 8 : 6, \( \frac{8}{6} \)

2. Kenny has 2 red marbles, 3 blue marbles, and 4 black marbles. Which ratio compares a part to the whole?
   - A: 2 to 7
   - B: 3 : 9
   - C: 5 to 4
   - D: 9 : 5

3. Mrs. Adams buys 4 bananas and 6 apples. Tell whether each statement is True or False.
   - a. The ratio of bananas to apples is 6 : 4.
   - b. The ratio of apples to total fruit is 10 to 6.
   - c. The ratio of bananas to total fruit is 4 to 10.
   - d. The ratio of total fruit to apples is \( \frac{10}{6} \).

4. For his exercise last weekend, Benito walked 5 miles and jogged 2 miles. What is the ratio of the miles walked to the total number of miles of exercise?
   - A: 5 to 2
   - B: 2 : 7
   - C: 5 : 7
   - D: 7 to 5

Elsa chose A as the correct answer. How did she get that answer?
   - Possible answer: Elsa used the numbers 5 and 2 for the ratio, but 2 is the number of miles jogged, not the total number of miles. Elsa should have found the sum of 5 and 2 for the second term of the ratio and written the ratio as 5 : 7.

5. The ratio of boys to girls in Mr. Smith’s class is 3 : 2. Which statement is correct? Circle all that apply.
   - A: For every 3 boys, there are 2 girls.
   - B: For every 2 boys, there are 3 girls.
   - C: There are exactly 5 students in Mr. Smith’s class.
   - D: The ratio of the number of boys in the class to the total number of students is 3 : 5.
   - E: The ratio of the number of students in the class to the number of girls is 5 to 2.

6. Kelly buys a hat and gloves. The price of the hat is 4 times as much as the gloves. The hat costs \$8. What is the ratio of the cost of the gloves to the total cost for both items?

   **Show your work.**
   - Possible work:
     - Cost of gloves: cost of hat ÷ 4 = \$8 ÷ 4 = \$2
     - Total cost: cost of gloves + cost of hat = \$2 + \$8 = \$10
   - Solution: The ratio of the cost of the gloves to the total cost for both items is \( \frac{2}{10} \) or 1 to 5.