

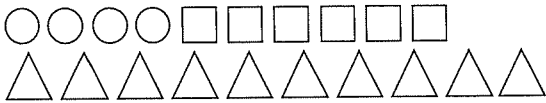
5.5

Exploring Ratios



Quick Review

The picture shows 4 circles, 6 squares, and 10 triangles.



Here are some ways you can use ratios, fractions, and percents to compare the shapes.

➤ **Part-to-Whole Ratios**

The ratio of circles to all of the shapes is 4 to 20 or 4:20.

This part-to-whole ratio can be written as the fraction $\frac{4}{20}$ or $\frac{1}{5}$.

It can also be written as a percent. $\frac{4}{20} = \frac{20}{100} = 20\%$

20% of the shapes are circles.

➤ **Part-to-Part Ratios**

The ratio of circles to squares is 4 to 6 or 4:6. 4 and 6 are the terms of the ratio.

The ratio of circles to squares to triangles is 4 to 6 to 10 or 4:6:10.

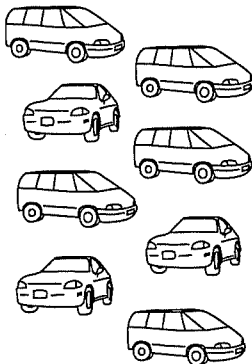
This is called a three-term ratio.

A part-to-part ratio cannot be written in fraction or percent form, as it is not comparing one part to the whole.

Practice

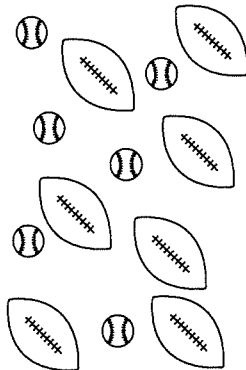
1. Write each ratio.

a) cars to vans

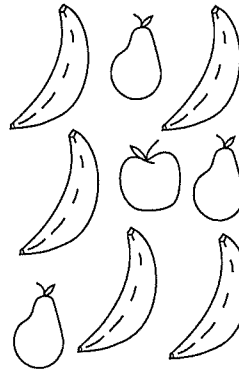


_____ : _____

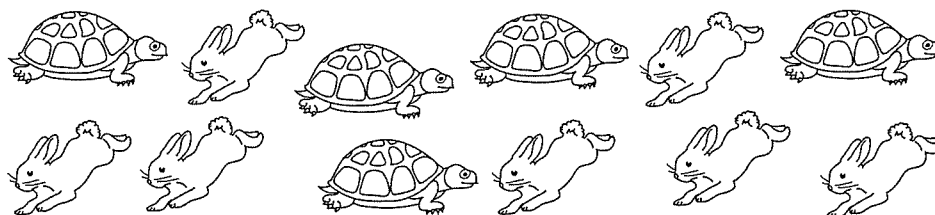
b) footballs to baseballs



c) bananas to fruit



2. Write each part-to-whole ratio as a ratio, a fraction, and a percent. Round percents to 2 decimal places.



- a) turtles to total animals $\underline{\quad} : \underline{\quad}, \underline{\quad}, \underline{\quad}$
 b) rabbits to total animals $\underline{\quad} : \underline{\quad}, \underline{\quad}, \underline{\quad}$

H I N T

What is the total number of rabbits? of turtles? of animals?



3. Franny has only dimes and quarters in her pocket. The ratio of dimes to total coins is 8 to 11.

H I N T

Sketch the coins. Use $\textcircled{10\phi}$ for a dime and $\textcircled{25\phi}$ for a quarter.



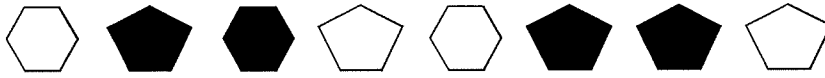
- a) How many quarters might be in Franny's pocket? _____
 b) What is the ratio of dimes to quarters? _____
 c) What is the ratio of quarters to the total number of coins? _____

4. Make a sketch to show that the ratio of triangles to circles is 6:13.

Write 3 ratios to compare the figures.

- a) circles to triangles _____
 b) circles to total figures _____
 c) triangles to total figures _____

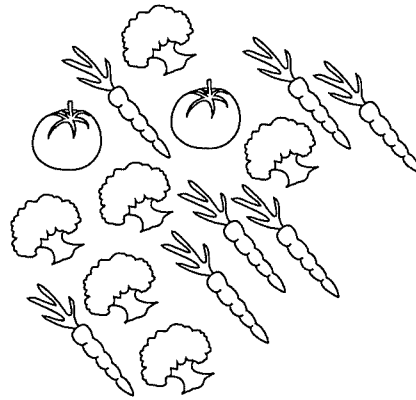
5. Write each ratio.



- a) hexagons to pentagons _____
- b) pentagons to hexagons _____
- c) hexagons to total shapes _____
- d) pentagons to total shapes _____
- e) black figures to white shapes _____
- f) white hexagons to black hexagons to white pentagons _____

6. What objects are being compared in each ratio?

- a) 7:15 _____ to total vegetables
- b) 2:7 tomatoes to _____
- c) 2:7:6 _____ to carrots to _____
- d) 6:7 _____ to _____
- e) $\frac{2}{15}$ _____ to _____
- f) $\frac{6}{15}$ _____ to _____



7. A pencil case contains 7 yellow, 3 red, 1 black, and 5 green pencil crayons.

a) Write each ratio.

- red:green _____
- yellow:red _____
- black:total pencil crayons _____
- yellow:total pencil crayons _____
- yellow:red:green _____

b) What is the ratio of yellow and red pencil crayons to total pencil crayons? _____

What percent of all the pencil crayons are red or yellow? _____

c) What is the ratio of green pencil crayons to black and red pencil crayons? _____

d) Suppose 2 yellow and 2 green pencil crayons are lost.

Rewrite the ratios in part a).

- red:green _____
- yellow:red _____
- black:total pencil crayons _____
- yellow:total pencil crayons _____
- yellow:red:green _____

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Equivalent Ratios



Quick Review

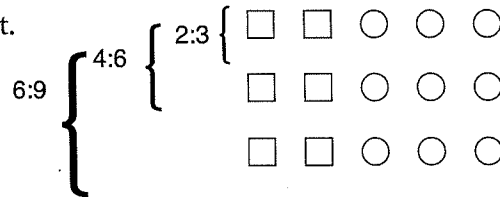
- You can find **equivalent ratios** by multiplying. Multiply the terms by the same number.

1st term	2	4	6	8	10
2nd term	3	6	9	12	15

Diagram showing arrows from the first ratio (2:3) to the others with multipliers: 2:3 to 4:6 (x2), 2:3 to 6:9 (x3), 2:3 to 8:12 (x4), 2:3 to 10:15 (x5).

Four equivalent ratios of 2:3 are: 4:6, 6:9, 8:12, and 10:15.

Picture it.



- You can also find equivalent ratios by dividing. Divide the terms by the same number.

1st term	20	10	4	2
2nd term	30	15	6	3

Diagram showing arrows from the first ratio (20:30) to the others with divisors: 20:30 to 10:15 (÷2), 20:30 to 4:6 (÷5), 20:30 to 2:3 (÷10).

Three equivalent ratios of 20:30 are: 10:15, 4:6, and 2:3.

- To write a ratio in its simplest form, divide the terms by their GCF.
 $21:14 = (21 \div 7):(14 \div 7)$
 $= 3:2$

HINT

The GCF of 21 and 14 is 7. Divide by 7.



Practice

1. Write three ratios that are equivalent to each ratio.

a) 4:5

1st term	4	8		
2nd term	5	10		

Diagram showing arrows from 4 to 8 labeled $\times 2$, from 5 to 10 labeled $\times 2$, from 4 to 10 labeled $\times 3$, and from 5 to 8 labeled $\times 3$.

Three ratios equivalent to 4:5 are 8:10, _____, and _____.

b) 32:24

1st term	32			
2nd term	24			

Diagram showing arrows from 32 to the next empty cell labeled $\div 2$, and from 24 to the next empty cell labeled $\div 2$.

Three ratios equivalent to 32:24 are _____, _____, and _____.

c) 16:28

1st term				
2nd term				

H I N T

Multiply or divide
the terms by the
same number.



2. Write two ratios that are equivalent to each ratio.

a) 8:5:2

b) 24:16:12

3. Write each ratio in simplest form.

a) 10:4

GCF of 10 and 4 is 2.

$$10:4 = (10 \div 2):(4 \div 2)$$

$$= 5: \underline{\hspace{1cm}}$$

b) 6:15

GCF of 6 and 15 is _____.

$$6:15 = (6 \div \underline{\hspace{1cm}}):(15 \div \underline{\hspace{1cm}})$$

$$= \underline{\hspace{1cm}} : \underline{\hspace{1cm}}$$

c) 14:28

d) 25:10

Tip
Divide the terms
by the GCF.

4. a) Match the pairs of equivalent ratios.

i) 5:6 ————— 1:2
 18:3 ————— 15:18
 9:18 ————— 8:40
 4:20 ————— 6:1

ii) 1:8 ————— 1:9
 3:27 ————— 1:3
 12:36 ————— 9:1
 18:2 ————— 2:16

b) How do you know that 12:36 and 1:3 are equivalent?

5. The ratio of cats to dogs at the animal shelter is 4 to 5.
 How many cats could there be? How many dogs?
 Write six different answers.

4 cats and 5 dogs

8 cats and _____ dogs

_____ cats and _____ dogs

Tip
Multiply each term
by the same
number.

6. The length-to-width ratio of Colby's poster is 3:2.
 The poster is 90 cm long. How wide is it?



HINT
Find a ratio equivalent
to 3:2 in which the
first term is 90.



$$3 : 2 = 90 : \underline{\hspace{1cm}}$$

$\xrightarrow{\times 30}$
 $\xleftarrow{\times 30}$

The poster is _____ cm wide.

5.7

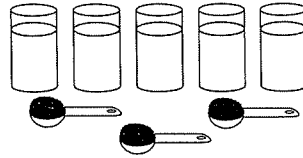
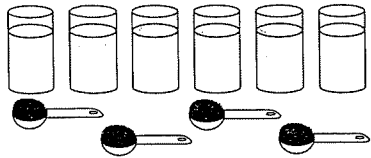
Comparing Ratios



Quick Review

You can use equivalent ratios to compare ratios.

Joe and Petra make orange punch with different ratios of crystals to water.



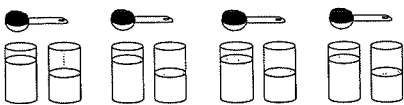
Joe makes orange punch with 4 scoops of crystals and 6 cups of water.

Petra makes orange punch with 3 scoops of crystals and 5 cups of water.

► Method 1

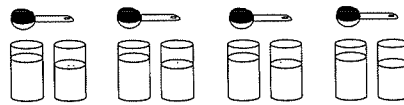
Draw a picture. Find out how much water for 1 scoop of orange crystals.

Joe



Orange crystals to water: $1:1\frac{1}{2}$

Petra



Orange crystals to water: $1:1\frac{2}{3}$

► Method 2

Equivalent Ratios

To find out whose orange punch is stronger:

- Write each mixture as a ratio.
- Write each ratio with the same second term.
- Compare the first terms.

Joe	Petra
4:6	3:5

The LCM of 6 and 5 is 30.

Use equivalent ratios.

$$4:6 = (4 \times 5):(6 \times 5)$$

$$= 20:30$$

Joe uses 20 scoops of crystals with 30 cups of water.

$$3:5 = (3 \times 6):(5 \times 6)$$

$$= 18:30$$

Petra uses 18 scoops of crystals with 30 cups of water.

$20 > 18$, so Joe's orange punch is stronger.

HINT

A quick way to do this is to find the LCM of the second terms.



➤ **Method 3**

Write each ratio with a second term of 1.

For each ratio, divide each term by the second term.

Joe

$$4:6 = \frac{4}{6} : \frac{6}{6}$$

$$= 0.\bar{6} : 1$$

Petra

$$3:5 = \frac{3}{5} : \frac{5}{5}$$

$$= 0.6 : 1$$

Since $0.\bar{6} > 0.6$, Joe's orange punch is stronger.

➤ **Method 4**

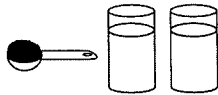
Compare the part-to-whole ratios and change both ratios to percents.

	Joe	Petra
Ratio (part to whole)	4:10	3:8
Ratio expressed as a fraction	$\frac{4}{10}$	$\frac{3}{8}$
Percent	40%	37.5%

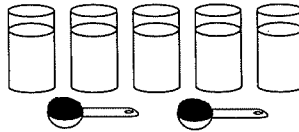
Joe has a higher percent of orange crystals in his punch, so his orange punch is stronger.

Practice

1.



A



B

Which mixture is stronger, A or B?

- a) Draw a picture to show how much water is used for each scoop of powder in Mixture A and Mixture B.

A

B


- b) Which mixture is stronger? Explain how you know.

Mixture _____ is stronger because _____.

2. Two cages contain white mice and brown mice.
 In one cage, the ratio of white mice to brown mice is 2:3.
 In the other cage, the ratio is 3:1.
 The cages contain the same number of mice.
- a) What could the total number of mice be?

H I N T

Multiply to find equivalent ratios. Add to find the total numbers of mice. Keep going until you get two totals that match.



White	Brown	Total
2	3	5
4	6	10
6		

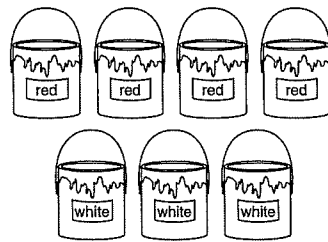
White	Brown	Total
3	1	
6		

The number of mice in each cage could be _____.

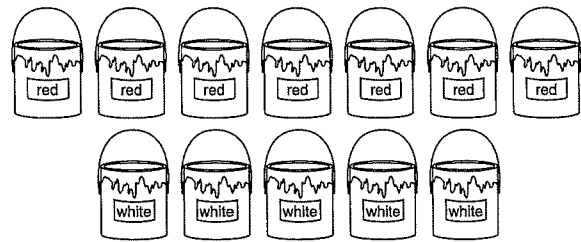
The total number of mice could be _____.

- b) Which cage contains more white mice?
- Number of white mice in A: _____ Number of white mice in B: _____
- Cage _____ contains more white mice.

3.



A



B

The red paint and white paint in each picture will be mixed.

Write the ratio of red paint to white paint. A _____ B _____

Write each ratio with the same second term. A _____ B _____

Compare the first terms. _____

Which mixture will give a darker shade of red? _____

Tip

Use the LCM of the second terms to write equivalent ratios.

4. The ratio of computers to students at Jan's school is 3:5.
 The ratio of computers to students at Karl's school is 2:3.
 Both schools have the same number of students.
 Which school has more computers? Show your work.

Jan's School

3:5

$$= (3 \times 3):(5 \times \underline{\quad})$$

$$= \underline{\quad} : \underline{\quad}$$

 computers to students

 school has more computers.

Karl's School

2:3

$$= (2 \times 5):(3 \times \underline{\quad})$$

$$= \underline{\quad} : \underline{\quad}$$

 computers to students

5. Hamid jogs 5 laps in 6 min.
 Amelia jogs 8 laps in 11 min.
 Which person jogs faster? Show your work.

-
6. The Rebels hockey team has won 9 of its first 15 games. No game was tied. The Sabres' record is 7 wins and 5 losses.

Which team has the better record? Show your work.
