

RATIO & PROPORTION

Middle School • International Curriculum Worksheet Pack

What's inside	Core skills
12 printable pages of guided practice, problem solving, puzzles and real-life applications.	Ratios • equivalent ratios • rates • unit rates • proportions • scale • percentages • reasoning

Suggested age: 11–14 years (approximately Grades 6–8 / KS3)

Curriculum alignment: Common Core 6.RP.A and 7.RP.A; compatible with typical international lower-secondary ratio, rate and proportion objectives.

Name: _____ Date: _____

Learning Targets

By the end of this pack, I can:

- describe and simplify ratios using equivalent relationships.
- calculate and interpret unit rates.
- solve missing-value proportions using more than one strategy.
- use ratios and proportions in recipes, maps, scale drawings and percent problems.
- explain whether an answer is reasonable.

Ratio Toolkit

Concept	Example	Meaning
Ratio	3 : 5	For every 3 of one quantity, there are 5 of another.
Equivalent ratio	3 : 5 = 6 : 10	Both terms are multiplied by the same non-zero number.
Unit rate	\$18 for 6 items → \$3/item	Rate for 1 unit.
Proportion	$\frac{4}{7} = \frac{x}{21}$	Two ratios are equal.
Scale	1 cm : 5 km	Each map centimetre represents 5 km.

Strategy Tip

Scale both terms together. If you multiply or divide one side of a ratio, do the same to the other side. For proportions, use equivalent ratios, a scale factor, a table, or cross multiplication.

A. Write and Interpret Ratios

1. A basket has 8 apples and 12 oranges. Write the ratio of apples to oranges in simplest form.

2. A class has 14 girls and 10 boys. Write the ratio of boys to girls in simplest form.

3. There are 6 red counters, 9 blue counters and 3 green counters. Write the ratio red : blue : green in simplest form.

4. A sports drink uses 2 cups of concentrate for every 5 cups of water. Write the ratio concentrate : water.

B. Complete the Equivalent Ratios

Ratio	$\times 2$	$\times 3$	$\div 2$
4 : 7	___ : ___	___ : ___	—
6 : 11	___ : ___	___ : ___	3 : ___
9 : 5	___ : ___	___ : ___	—
12 : 8	___ : ___	___ : ___	___ : ___

Challenge: The ratio of cats to dogs at a shelter is 3 : 5. If there are 24 cats, how many dogs are there?

A rate compares quantities with different units. A unit rate tells how much for one unit.

1. A car travels 180 km in 3 hours. What is its average speed in km/h?

2. A pack of 8 notebooks costs \$12. What is the cost per notebook?

3. A runner completes 5 km in 30 minutes. What is the rate in km per minute?

4. Which is the better buy: 6 pencils for \$3.60 or 10 pencils for \$5.50? Explain using unit price.

Mini Challenge

A printer produces 420 pages in 7 minutes. At the same rate, how many pages can it print in 12 minutes?

Solve each proportion. Choose a method that makes sense: equivalent ratios, scale factor, table or cross multiplication.

1. $\frac{3}{5} = \frac{x}{20}$. Find the missing value.

2. $\frac{7}{9} = \frac{21}{x}$. Find the missing value.

3. $\frac{4}{11} = \frac{x}{33}$. Find the missing value.

4. $\frac{8}{12} = \frac{20}{x}$. Find the missing value.

5. $\frac{5}{8} = \frac{15}{x}$. Find the missing value.

6. $\frac{9}{14} = \frac{x}{42}$. Find the missing value.

Reasoning Check: How can you tell if your answer to a proportion is reasonable?

A. Complete the tables

1. The relationship is proportional. Complete the table.

x	1	2	4	6	10
y	3	—	—	—	—

2. The relationship is proportional. Complete the table.

x	2	5	8	12	20
y	7	—	—	—	—

3. The relationship is proportional. Complete the table.

x	1	3	5	9	12
y	4	—	—	—	—

B. Explain

For the first table, what is y/x ? What does that constant ratio tell you?

1. A recipe makes 12 muffins using 300 g of flour. How much flour is needed for 20 muffins?

2. On a map, 1 cm represents 8 km. Two towns are 6.5 cm apart. What is the actual distance?

3. A school buys 15 calculators for \$450. At the same price, how much will 24 calculators cost?

4. A photograph is 12 cm wide and 8 cm high. If the width is enlarged to 18 cm while keeping the same proportions, what is the new height?

5. A mixture uses blue and white paint in the ratio 2 : 7. If 35 cups of white paint are used, how many cups of blue paint are needed?

Percent can be viewed as a ratio out of 100.

1. 25% of 80 students choose basketball. How many students is that?

2. A jacket costs \$60 and is discounted by 20%. What is the discount and sale price?

3. 18 out of 30 students completed a challenge. What percentage completed it?

4. A test has 40 questions. A student scores 85%. How many questions were correct?

5. A town's population increases from 20,000 to 22,000. What is the percentage increase?

Think Deeper

Explain why 20% is equivalent to the ratio 1 : 5. Give another percent and an equivalent ratio.

Crack the code! Solve each question. Convert whole-number answers to letters using 1=A, 2=B, ... 26=Z.

A. The ratio 2 : 5 is equivalent to 8 : ____.

Answer: _____

B. A \$24 item is discounted by 25%. What is the sale price?

Answer: _____

C. 12 apples cost \$6. What is the cost per apple?

Answer: _____

D. If $\frac{3}{4} = \frac{x}{20}$, find x.

Answer: _____

E. A map scale is 1 cm : 10 km. What distance does 7 cm represent?

Answer: _____

F. Simplify 18 : 24 to a ratio with first term 3.

Answer: _____

Secret Message: _ _ _ _ _

Teacher note: C produces a fractional answer, so use this as a discussion about why not every numerical answer fits a simple letter code.

Identify the error and correct it. Explain your reasoning.

1. Mia says: $4 : 6 = 5 : 7$ because both ratios increase by 1. Is she correct?

What is the mistake?

Correct solution:

2. Leo says: $\frac{3}{8} = \frac{12}{24}$ because $3 \times 4 = 12$ and $8 \times 3 = 24$. Find the correct equivalent ratio.

What is the mistake?

Correct solution:

3. Sam says: 5 notebooks cost \$20, so 8 notebooks cost \$28. Explain why the answer is incorrect and find the correct cost.

What is the mistake?

Correct solution:

4. A map uses 1 cm : 5 km. Ava measures 9 cm and says the real distance is 14 km. Correct her reasoning.

What is the mistake?

Correct solution:

1. Simplify 36 : 48.

2. Find the missing value: $\frac{5}{6} = \frac{x}{30}$.

3. A cyclist travels 72 km in 4 hours. Find the unit rate.

4. A recipe for 8 people uses 600 g of rice. How much rice for 14 people?

5. Which ratio is equivalent to 7 : 9? A) 14:18 B) 21:24 C) 28:35

6. A school has 240 students. The ratio of students in Club A to Club B is 3 : 5. How many are in Club A?

7. A map scale is 1 : 50,000. A road is 4 cm on the map. What is its actual length in km?

8. A \$90 bicycle is reduced by 15%. What is the new price?

Page 3

1. 2:3 • 2. 5:7 • 3. 2:3:1 • 4. 2:5. Equivalent ratios: 4:7→8:14, 12:21; 6:11→12:22, 18:33, 3:5.5; 9:5→18:10, 27:15; 12:8→24:16, 36:24, 6:4. Challenge: 40 dogs.

Page 4

1. 60 km/h • 2. \$1.50/item • 3. 1/6 km/min (≈ 0.167) • 4. 10 pencils at \$0.55 each is better. Challenge: 720 pages.

Page 5

1. 12 • 2. 27 • 3. 12 • 4. 30 • 5. 24 • 6. 27.

Page 6

Table 1: 6, 12, 18, 30. Table 2: 17.5, 28, 42, 70. Table 3: 12, 20, 36, 48. First-table $y/x = 3$.

Page 7

1. 500 g • 2. 52 km • 3. \$720 • 4. 12 cm • 5. 10 cups.

Page 8

1. 20 • 2. \$12 discount; \$48 sale price • 3. 60% • 4. 34 • 5. 10%.

Page 9

A=16, B=18, C=0.5, D=15, E=70, F=4. C is deliberately fractional; use it to discuss the limitation of a strict 1–26 code.

Page 11

1. 3:4 • 2. 25 • 3. 18 km/h • 4. 1050 g • 5. A • 6. 90 • 7. 2 km • 8. \$76.50.

Teacher note

Encourage students to show a strategy, label units, and check whether answers are reasonable. Accept equivalent representations when mathematically correct.