



Connect and Reflect

Key Ideas

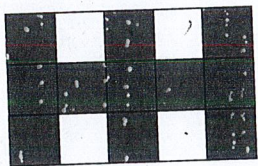
- A two-term ratio compares two quantities.
red squares to blue squares is 6:3
- A three-term ratio compares three quantities.
red:blue:green is 6:3:3
- A part-to-part ratio compares different parts of a group.
red:green is 6:3
- A part-to-whole ratio compares one part of a group to the entire group.
blue:total is 3:12
- You can represent ratios using words, symbols, or pictures.
- You can write a part-to-whole ratio as a fraction, decimal, or percent.
- You can write an equivalent ratio by dividing or multiplying each term by the same number.



Practise

For help with #1 to #4, refer to Example 1 on pages 223–224.

- ✓ 1. Use the tile pattern to answer the questions.



- What is the ratio of blue tiles to white tiles?
 - What is the ratio of red to white to blue tiles?
 - What tiles can be represented with a ratio of 1 to 2? Show how you know.
 - What is the ratio of blue tiles to total tiles? Write your answer in lowest terms using ratio notation and as a fraction.
2. Tyler counts 20 cars in the school parking lot. Of these, 6 are red, 4 are green, and 1 is yellow.
- Draw a diagram to represent the situation.
 - How many cars are not red, green, or yellow?
- What is the ratio of yellow to green to red cars?
 - What is the ratio of red to total cars? Write the ratio as a fraction and as a percent.
3. Write each ratio using ratio notation. Then, rewrite each ratio in lowest terms.
- \$2 compared to \$8
 - the width of the cover of this book compared to its length, in centimetres
 - the ratio of boys to girls to total students in a class where 14 of 30 students are girls
- ✓ 4. Write each ratio as a fraction and a percent.
- You spend \$4 out of \$10.
 - A team wins 3 games and loses 6 games. What is the ratio of games won to games played?
 - A bag contains 12 red and 3 blue beads. Compare blue beads to total beads.

For help with #5 to #7, refer to Example 2 on pages 225–226.

5. Tamara is making fruit punch using the recipe shown.

Tamara's Fruit Punch

2 parts orange juice concentrate
 1 part raspberry juice concentrate
 1 part lemon juice
 12 parts soda water

- a) What is the ratio of juice concentrate to soda water, in lowest terms?
 b) Tamara thinks the punch will be more than 5% raspberry juice concentrate. Is she correct? How do you know?
 c) If Tamara makes 1600 mL of punch, how much of each ingredient will she need?
6. Ava bought a 250-mL bottle of concentrated cleaner. It must be mixed with water in a 1 : 7 ratio before it can be used. She plans to mix it in a 400-mL spray bottle.
- a) How much cleaner does Ava need to add to the bottle before she fills it with water?

- b) She thinks the mixed cleaner is less than 75% water. Is she correct? Show how you know.
 c) If Ava uses all the cleaner, how many full spray bottles can she make?

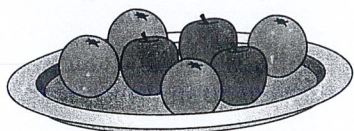
7. Use the data to answer the questions.

Sport	Wins	Losses
Soccer	9	6
Volleyball	6	10
Basketball	12	8

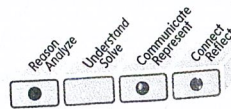
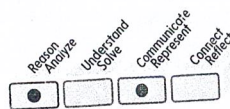
- a) Which sports have equivalent win–loss ratios? Show how you know.
 b) What is the ratio of wins to total games played for soccer? Give your answer as a fraction, a decimal, and a percent.
 c) If the volleyball team plays 40 games in total for the season, how many wins might they expect based on their play so far?
 d) Early in the season, the athletic coordinator predicted that the school's overall winning percent would be more than 60%. Was this prediction accurate? Show how you know.

Apply

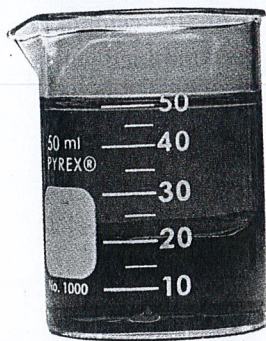
8. Janine uses a ratio to compare the number of oranges to the number of apples.



- a) How does she know whether to write 3 : 4 or 4 : 3?
 b) Would it make sense to write this ratio as a fraction? Why or why not?
9. **Competency Check** Use a diagram and your own example to explain how the fraction $\frac{2}{5}$ can be interpreted as a part-to-whole ratio.



10. A beaker contains 2 liquids that do not mix. Instead, they form layers as shown.
- What part-to-part ratio(s) could you write using this situation?
 - What part-to-whole ratio(s) could you write using this situation?
 - Which ratios from parts a) and b) are appropriate to write as fractions and percents? Explain why. Then, determine those percents.

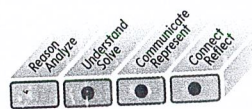


11. A lacrosse team played 28 games and won 4 out of every 7 games. There were no games that ended in a tie.
- How many games did they lose?
 - What is the team's win-loss ratio?
 - If this trend continues, how many losses would you expect the team to have once they have won 20 games?

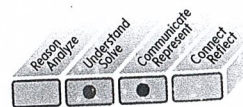


12. Sarah is attending a family reunion. Three eighths of the 48 people at the reunion are younger than 16 years old.
- Does the statement represent a part-to-part or part-to-whole ratio? Explain.
 - Rewrite the information given in this situation using the word *ratio*.
 - How many people are 16 or older? Explain your thinking.

13. Diana and John are making three-cheese lasagna. The recipe calls for 100 g of Romano, 300 g of mozzarella, and 250 g of ricotta.
- Write a ratio in lowest terms to compare the amounts of the 3 cheeses. State the order of the cheeses.
 - What amounts of Romano and ricotta do you need to make a lasagna that contains 900 g of mozzarella cheese?

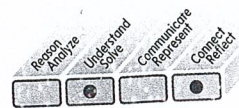


14. There are 48 passengers on a transit bus. At the next stop, 16 passengers get off and 12 new passengers get on the bus.
- What is the ratio of the passengers who get off the bus compared to the original number on the bus?
 - What is the ratio of new passengers on the bus compared to the new total that are now on the bus?
 - Which ratios from parts a) and b) would be appropriate to write as percents? Explain why. Then, determine these percents to the nearest whole number.



15. Concrete mix is made by mixing cement powder, sand, and gravel in a ratio of 1 : 2 : 4 before the mix is combined with water.

- Joseph has 50 kg of sand. How much of the other two ingredients does he need to add?
- Joseph has 12 bags of cement powder, where each one contains 25 kg. How much mix in total can he make? How much of the other two ingredients does he need to add?



16. Not all flags have the same ratio of dimensions. The table shows the official height-to-length ratio for the flags of three North American countries.

Country	Ratio (height:length)
Canada	1:2
Mexico	4:7
United States	10:19

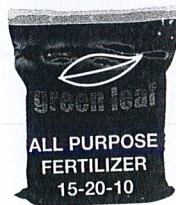
- A Canadian flag on Gyp Mountain near Falkland, BC, is the largest in Western Canada. If it is 17 m long, what is its height?

- The Peace Arch monument at the Douglas border crossing south of Vancouver, BC, has a Canadian and a U.S. flag on top. If both flags are 120 cm high, which one is longer?



- Which of the three countries has a flag that is the closest to being a square? Explain your thinking.

17. A 30-kg bag of fertilizer is labelled 15-20-10. This means that it contains 15% nitrogen, 20% phosphorus, and 10% potassium by weight. How many kilograms of nitrogen, phosphorus, and potassium are in the bag?



18. Cam has a yard trimmer that runs on a mixture of oil and gas. The instructions say that the mixture of oil to gas needs to be 1 : 40.

- Cam has an 80-mL bottle of oil. How much gas does he need to mix with it?
- How could this instruction be given using a percent instead of a ratio?
- If he fills the 200-mL tank with the mixture, how much of it will be oil?

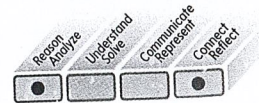
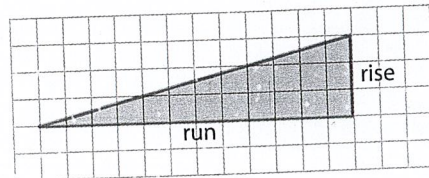
Extend

19. The golden rectangle is used often in art and architecture. For example, the front of the Parthenon, a temple in Athens, Greece, fits into a golden rectangle. A golden rectangle has a length-to-width ratio called the golden ratio, which is approximately 1.62 : 1.



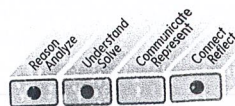
- a) Which of these dimensions of rectangles are examples of golden rectangles?
- 24 m × 38.9 m
 - 52 cm × 120.5 cm
 - 348 mm × 565 mm
- b) If the width of a golden rectangle is 6.4 m, what is its length? Give your answer to the nearest tenth of a metre.

20. The side view of a ramp is shown.



- a) Express the ratio of rise to run in lowest terms. This ratio describes the slope of the ramp.
- b) Express the slope ratio as a fraction, a decimal, and a percent.
- c) Predict what effect each of the following would have on the slope of the ramp:
- i) increasing the rise
 - ii) decreasing the rise
 - iii) increasing the run
 - iv) decreasing the run
- d) Verify your predictions in part c).

21. **Competency Check** In North America and in many other places in the world, the slope of a road is given as a percent, as shown in the yellow sign. In some other places in the world, the slope of a road is indicated by a ratio, as shown in the red and black sign.



- a) Which of these two roads is steeper?
- b) Which type of sign do you think is more effective to show drivers how steep a hill is? Justify your decision.