

UNIT

2

Ratio and Rate

The animal kingdom provides much interesting information. We use information to make comparisons. What comparisons can you make from these facts?

A sea otter eats about $\frac{1}{3}$ of its body mass a day.

A Great Dane can eat up to 4 kg of food a day.

A cheetah can reach a top speed of 110 km/h.

A human can run at 18 km/h.

The heart of a blue whale is the size of a small car.

One in 5000 North Atlantic lobsters is born bright blue.



What You'll Learn

- Understand what a ratio is.
- Find equivalent ratios.
- Compare ratios and use them to solve problems.
- Understand what a rate is.
- Find unit rates.
- Compare rates and use them to solve problems.

Why It's Important

You use ratios and rates to compare numbers and quantities; and to compare prices when you shop.



Key Words

- ratio
- part-to-whole ratio
- part-to-part ratio
- terms of a ratio
- equivalent ratios
- simplest form
- rate
- unit rate
- average speed



Skills You'll Need

Greatest Common Factor

Recall that the greatest common factor (GCF) of a set of numbers is the greatest number that will divide exactly into the given numbers.

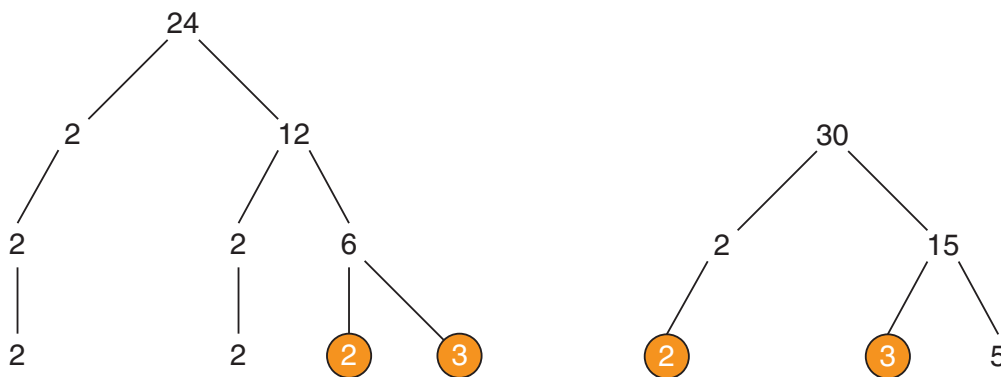
For example, 6 is the greatest common factor of 18 and 24.

Example 1

Find the GCF of 24 and 30.

Solution

Draw a factor tree for each number.



Circle the numbers that appear in the bottom row of both factor trees.

2 and 3 are common to both factor trees.

The GCF of 24 and 30 is $2 \times 3 = 6$.

✓ Check

1. Find the GCF of the numbers in each set.

a) 30, 75

b) 27, 63

c) 42, 56

d) 12, 18, 42

Lowest Common Multiple

Recall that the lowest common multiple (LCM) of a set of numbers is the least number that is a multiple of each number in the set.

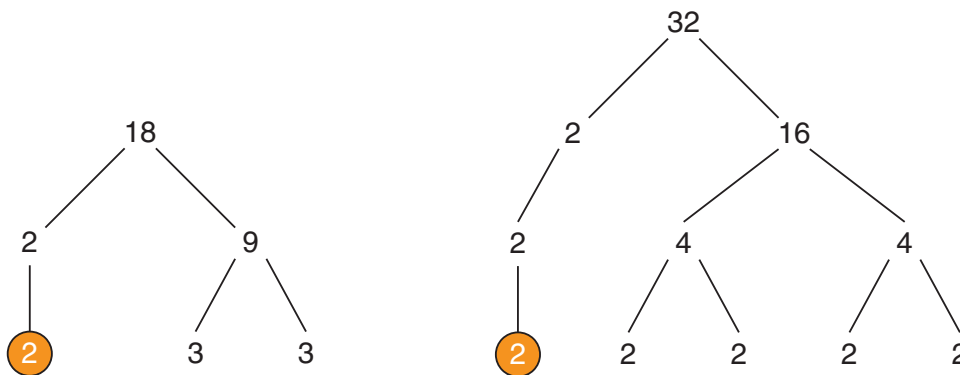
This also means that each number in the set is a factor of the lowest common multiple.

Example 2

Find the LCM of 18 and 32.

Solution

Draw a factor tree for each number.



Circle the numbers that appear in the bottom row of both factor trees.

Multiply the numbers not circled and one each of the circled numbers:

$$3 \times 3 \times 2 \times 2 \times 2 \times 2 = 288$$

The LCM of 18 and 32 is 288.

✓ Check

- Write the first 6 multiples of each number.
a) 4 b) 7 c) 9 d) 12
- Find the LCM of the numbers in each pair.
a) 9, 12 b) 14, 35 c) 16, 40
- Find the LCM of the numbers in each set.
a) 36, 45 b) 3, 4, 6 c) 12, 15, 20

Converting among Metric Units

$$100 \text{ cm} = 1 \text{ m}$$

$$1000 \text{ g} = 1 \text{ kg}$$

$$1000 \text{ m} = 1 \text{ km}$$

$$1000 \text{ mL} = 1 \text{ L}$$

- To convert centimetres to metres, divide by 100.
- To convert:
 - metres to kilometres
 - grams to kilograms
 - millilitres to litres } Divide by 1000. **Divide to convert to a larger unit.**
- To convert metres to centimetres, multiply by 100.
- To convert:
 - kilometres to metres
 - kilograms to grams
 - litres to millilitres } Multiply by 1000. **Multiply to convert to a smaller unit.**

Example 3

Convert.

a) 650 cm to metres

b) 82 km to metres

c) 2.4 kg to grams

d) 2840 mL to litres

Solution

$$\begin{aligned} \text{a) } 650 \text{ cm} &= \frac{650}{100} \text{ m} \\ &= 6.5 \text{ m} \end{aligned}$$

$$\begin{aligned} \text{b) } 82 \text{ km} &= 82 \times 1000 \text{ m} \\ &= 82\,000 \text{ m} \end{aligned}$$

$$\begin{aligned} \text{c) } 2.4 \text{ kg} &= 2.4 \times 1000 \text{ g} \\ &= 2400 \text{ g} \end{aligned}$$

$$\begin{aligned} \text{d) } 2840 \text{ mL} &= \frac{2840}{1000} \text{ L} \\ &= 2.84 \text{ L} \end{aligned}$$

✓ Check

5. Convert.

a) 1280 cm to metres

b) 680 m to kilometres

c) 2454 g to kilograms

d) 1987 mL to litres

e) 8.2 m to centimetres

f) 1.25 km to metres

g) 0.45 kg to grams

h) 2.3 L to millilitres