Section 1.1 Proportional Reasoning, Build Your Skills, p33–36
Student Resource p21–22

Build Your Skills

1. To simplify, divide the numerator and denominator by 2 to get 4:1.
Ways to write this ratio include the following.
4 to 1
4:1
$\frac{4}{1}$

2.
$$\frac{55 \text{ words}}{1 \text{ minute}} = \frac{2000 \text{ words}}{x \text{ minutes}}$$
$$\frac{55}{1} = \frac{2000}{x}$$
Multiply each side by the common denominator, 1x, or x.
$$x(\frac{55}{1}) = (\frac{2000}{x})x$$
$$\frac{55x}{1} = \frac{2000x}{x}$$
$55x = 2000$
$$\frac{55x}{55} = \frac{2000}{55}$$
$$x = \frac{2000}{55}$$
$x = 36.36$ minutes
It will take the secretary 36 minutes, rounded to the nearest minute.

3. Each truck has 4 tires, so 5 trucks have 20 tires.
To rotate the tires on 5 trucks, use the following proportion.
$$\frac{4 \text{ tires}}{1 \text{ m}} = \frac{20 \text{ tires}}{x \text{ m}}$$
$$\frac{4}{15} = \frac{20}{x}$$
The common denominator is 15x.
$$15x(\frac{4}{15}) = (\frac{20}{x})15x$$
$$\frac{60x}{15} = \frac{300x}{x}$$
$4x = 300$
$$\frac{4x}{4} = \frac{300}{4}$$
$x = \frac{300}{4}$
$x = 75$
It would take 75 minutes to rotate the tires on 5 trucks.
Alternatively, you can multiply 15 minutes (time for one truck) by 5 (the number of trucks) to get 75 minutes.

To rotate 2 tires, divide the time for 4 tires in 2.

$$\frac{15}{2} = 7.5 \text{ minutes}$$

It would take 7.5 minutes to rotate 2 tires.

4. First, calculate what the salesperson sold in the first two days.

6 + 4 = 10 tickets

Next, calculate what she sold on the weekend.

36 – 10 = 26 tickets

Since she sold the same number of tickets on each day, calculate what was sold each day.

$2x = 26$

$$\frac{2x}{2} = \frac{26x}{2}$$

$x = \frac{26}{2}$

x = 13 tickets on each day

Alternatively, since the salesperson sold 26 tickets in two days and an equal number of tickets were sold on each day, divide 26 by 2 to get 13 tickets sold on each day.

The proportion of tickets sold on Saturday is 13:36.

5. The ratio can be written as $\frac{5}{6}$.

Let s represent Siu's height.

Use the following proportion to solve for s.

$$\frac{5}{6} = \frac{s}{145}$$

Since this is a fractional equation, multiply both sides by the lowest common denominator, 6 multiplied by 145.

$$6 \times 145\left(\frac{5}{6}\right) = \left(\frac{s}{145}\right)6 \times 145$$

$$870\left(\frac{5}{6}\right) = \left(\frac{s}{145}\right)870$$

$$\frac{4350}{6} = \frac{870s}{145}$$

$725 = 6s$

$$\frac{725}{6} = \frac{6s}{6}$$

$121 = s$

To the nearest centimetre, Siu is 121 cm tall.

6. To calculate the profits on 50 DVDs, use a fractional equation.

$$\frac{\$2550.00}{200 \text{ DVDs}} = \frac{x}{50 \text{ DVDs}}$$

$$\frac{2550}{200} = \frac{x}{50}$$

The lowest common denominator is 200.

$$200\left(\frac{2550}{200}\right) = \left(\frac{x}{50}\right)200$$

$2250 = 4x$

$\frac{2550}{4} = \frac{4x}{4}$
$637.50 = x
The total profit on the sale of 50 DVDs is $637.50.
Next, calculate the profit on 900 DVDs.
$\frac{2550}{200} = \frac{x}{900}$
The lowest common denominator is 1800.
$1800\left(\frac{2550}{200}\right) = \left(\frac{x}{900}\right)1800$
$22\ 950 = 2x$
$\frac{22\ 950}{2} = \frac{2x}{2}$
$11\ 475.00 = x
The total profit on the sale of 900 DVDs is $11 475.00.
Alternatively, students could find the profit on one DVD and then multiply the number of DVDs sold by this number.
$\frac{2550}{200} = \frac{x}{1}$
$200\left(\frac{2550}{200}\right) = \left(\frac{x}{1}\right)200$
$2550 = 200x$
$12.75 = x
$12.75 × 50 = $637.50
$12.75 × 900 = $11 475.00

7.
$\frac{\$15.00}{5\text{ kg}} = \frac{\$75.00}{x\text{ kg}}$
The numerator, 15, has been multiplied by 5 to get 75. To keep the fractions equivalent, the denominator, 5, must also be multiplied by 5 to equal x.
$5 × 5 = 25$
$x = 25$
For $75.00, the restaurant could buy 25 kg of olives.
Calculate the cost to buy 20 kg of olives.
$\frac{15}{5} = \frac{x}{20}$
The lowest common denominator is 20.
$20\left(\frac{15}{5}\right) = \left(\frac{x}{20}\right)20$
$\frac{300}{5} = \frac{20x}{20}$
$60 = x
It would cost $60.00 to buy 20 kg of olives.

8. First, determine what the proportion is for each stain.
3 Spanish oak:4 red mahogany
$3 + 4 = 7$

So, for Spanish oak, the ratio is 3:7.
For red mahogany, it is 4:7.
Let s = the amount of Spanish oak needed.

$$\frac{3}{7} = \frac{s}{12}$$

The common denominator is 7 multiplied by 12, or 84.

$$84\left(\frac{3}{7}\right) = \left(\frac{s}{12}\right)84$$

$$\frac{252}{7} = \frac{84s}{12}$$

$36 = 7s$

$$\frac{36}{7} = \frac{7s}{7}$$

$5.14 = s$, rounded off
Let r = the amount of red mahogany needed.

$$\frac{4}{7} = \frac{r}{12}$$

Again, the common denominator is 84.

$$84\left(\frac{4}{7}\right) = \left(\frac{r}{12}\right)84$$

$$\frac{336}{7} = \frac{84r}{12}$$

$48 = 7r$

$$\frac{48}{7} = \frac{7r}{7}$$

$6.86 = r$, rounded off
For 12 litres, the carpenter needs 6.86 L of red mahogany and 5.14 L of Spanish oak.

Extend Your Thinking

9. First, determine how long it would take the bullet train to travel the circumference of the Earth.

$$\frac{6}{30} = \frac{x}{40\ 074}$$

The ratio $\frac{6}{30}$ can be simplified to $\frac{1}{5}$.

$$\frac{1}{5} = \frac{x}{40\ 074}$$

The common denominator is 5 multiplied by 40 074.

$$5 \times 40\ 074\left(\frac{1}{5}\right) = \left(\frac{x}{40\ 074}\right)5 \times 40\ 074$$

Each side of the equation can be simplified to give the following equation.

$40\ 074 = 5x$

$$\frac{40\ 074}{5} = \frac{5x}{5}$$

$8015 = x$
The bullet train could travel the circumference of the earth in 8015 minutes.
Now, convert this to days.

$$\frac{8015 \text{ min}}{60} = 133.58 \text{ hours}$$

$$\frac{133.58 \text{ hours}}{24} = 5.57 \text{ days}$$

Both Keiko and Akira underestimated how fast the Shinkasen can go!