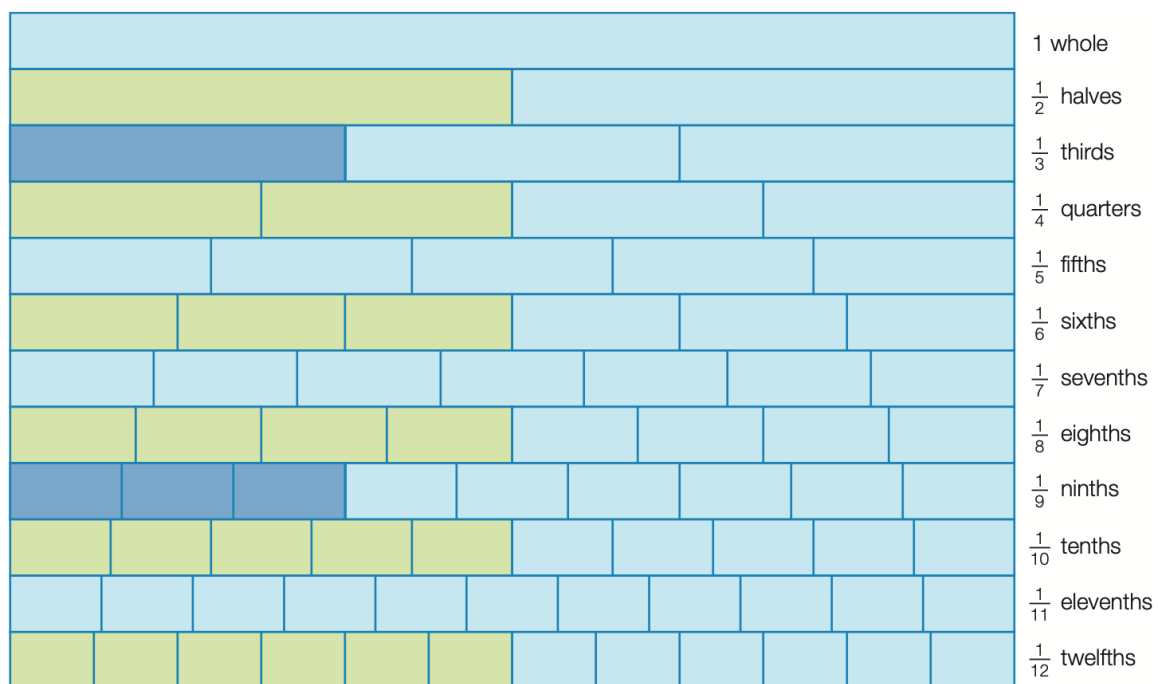**WALT** understand and write equivalent fractions
**Success** Criteria  I can

- Multiply both numerator and denominator by the same number to create an equivalent fraction
- I can simplify the fraction by dividing both numerator and denominator by a common factor

## The fraction wall

This fraction wall is made up of 12 layers of identical rectangles. One layer is left whole at the top, then each layer is divided into halves ($\frac{1}{2}$), thirds ($\frac{1}{3}$), quarters ($\frac{1}{4}$), fifths ($\frac{1}{5}$) … all the way down to twelfths ($\frac{1}{12}$). We can see that the size of the individual fractions (the 'bricks' in the wall) get smaller as we divide the whole into a greater number of pieces.

| | |
|---|---|
| | 1 whole |
| | $\frac{1}{2}$ halves |
| | $\frac{1}{3}$ thirds |
| | $\frac{1}{4}$ quarters |
| | $\frac{1}{5}$ fifths |
| | $\frac{1}{6}$ sixths |
| | $\frac{1}{7}$ sevenths |
| | $\frac{1}{8}$ eighths |
| | $\frac{1}{9}$ ninths |
| | $\frac{1}{10}$ tenths |
| | $\frac{1}{11}$ elevenths |
| | $\frac{1}{12}$ twelfths |

Interactive fraction wall
Have some play with this interactive fraction wall to understand equivalent fractions

Equivalent fractions are found either by multiplying both the numerator and the denominator by the same number, or by dividing both the numerator and the denominator by the same number.

## Worked example

Write pairs of equivalent fractions by copying and completing the following.

(a) $\dfrac{7}{10} = \dfrac{\square}{40}$

(b) $\dfrac{27}{36} = \dfrac{3}{\square}$

| Thinking | Working |
|---|---|
| **(a) 1** Compare the two denominators to determine what you need to multiply the first denominator by to get the second. (To get 40, we multiply 10 by 4.) | (a) $\dfrac{7}{10} \times \dfrac{\phantom{4}}{4} = \dfrac{\phantom{28}}{40}$ |
| **2** Multiply the numerator by the same number to complete the equivalent fraction. | $\dfrac{7}{10} \times \dfrac{4}{4} = \dfrac{28}{40}$ |
| **(b) 1** Compare the two numerators to determine what you need to divide the first numerator by to get the second. (To get 3, we divide 27 by 9.) | (b) $\dfrac{27}{36} \div \dfrac{9}{\phantom{9}} = \dfrac{3}{\phantom{4}}$ |
| **2** We divide the denominator by the same number to complete the equivalent fraction. | $\dfrac{27}{36} \div \dfrac{9}{9} = \dfrac{3}{4}$ |

## Simplifying fractions

$\dfrac{1}{4}$ and $\dfrac{5}{20}$ are equivalent fractions: $\dfrac{1}{4} \times \dfrac{5}{5} = \dfrac{5}{20}$.

Although they both represent the same amount, $\dfrac{1}{4}$ is the **simplest form** of this pair of fractions.

A fraction in simplest form is often the easiest to understand and visualise.

To write a fraction in its simplest form, or to **simplify** it, we divide the numerator and the denominator by their highest common factor (HCF).

Answers to fraction questions should always be written in simplest form.

Write four equivalent fractions for $\dfrac{2}{3}$ by multiplying by $\dfrac{2}{2}, \dfrac{3}{3}, \dfrac{4}{4}$ and $\dfrac{5}{5}$.

**Solution**                                   **Explanation**

$$\frac{2}{3} = \frac{4}{6} = \frac{6}{9} = \frac{8}{12} = \frac{10}{15}$$

$$\overset{\times 2 \quad \times 3 \quad \times 4 \quad \times 5}{\frac{2}{3} = \frac{4}{6} = \frac{6}{9} = \frac{8}{12} = \frac{10}{15}} \quad \times 2 \;\; \times 3 \;\; \times 4 \;\; \times 5$$

---

**1** Copy and complete the following.

a $\dfrac{3}{4} \times \dfrac{2}{2} = \dfrac{\square}{8}$

b $\dfrac{2}{5} \times \dfrac{4}{4} = \dfrac{8}{\square}$

c $\dfrac{1}{3} \times \dfrac{\square}{\square} = \dfrac{3}{9}$

d $\dfrac{1}{2} \times \dfrac{7}{\square} = \dfrac{7}{14}$

e $\dfrac{4}{5} \times \dfrac{\square}{\square} = \dfrac{8}{10}$

f $\dfrac{3}{4} \times \dfrac{5}{5} = \dfrac{15}{\square}$

**2** Write four equivalent fractions for $\dfrac{3}{4}$ by multiplying by $\dfrac{3}{3}, \dfrac{5}{5}, \dfrac{10}{10}$ and $\dfrac{11}{11}$.

> Show the steps each time. For example:
> $\dfrac{3}{4} \times \dfrac{2}{2} = \dfrac{6}{8}$

**3** Fill in the missing numbers to complete the following strings of equivalent fractions.

a $\dfrac{1}{3} = \dfrac{\square}{6} = \dfrac{4}{\square} = \dfrac{\square}{30} = \dfrac{\square}{60} = \dfrac{100}{\square}$

b $\dfrac{2}{8} = \dfrac{\square}{4} = \dfrac{\square}{12} = \dfrac{6}{\square} = \dfrac{\square}{80} = \dfrac{10}{\square}$

Write these fractions in simplest form.

a $\dfrac{12}{20}$

b $\dfrac{7}{42}$

**Solution**                                   **Explanation**

a $\dfrac{12}{20} = \dfrac{3 \times \cancel{4}}{5 \times \cancel{4}} = \dfrac{3}{5}$

The HCF of 12 and 20 is 4.
Both the numerator and the denominator are divided by the HCF of 4.

b $\dfrac{7}{42} = \dfrac{\cancel{7} \times 1}{\cancel{7} \times 6} = \dfrac{1}{6}$

The HCF of 7 and 42 is 7.
The 7 is 'cancelled' from the numerator and the denominator.

**4** Fill in the gaps to reduce these fractions to their simplest form.

a $\dfrac{10}{30}$  **i** HCF = ☐  **ii** $\dfrac{10}{30} = \dfrac{1\times☐}{3\times☐}$ . Therefore, simplest form is $\dfrac{☐}{3}$ .

b $\dfrac{4}{18}$  **i** HCF = ☐  **ii** $\dfrac{4}{18} = \dfrac{2\times☐}{9\times☐}$ . Therefore, simplest form is $\dfrac{☐}{9}$ .

c $\dfrac{4}{28}$  **i** HCF = ☐  **ii** $\dfrac{4}{28} = \dfrac{1\times☐}{7\times☐}$ . Therefore, simplest form is $\dfrac{1}{☐}$ .

d $\dfrac{9}{15}$  **i** HCF = ☐  **ii** $\dfrac{9}{15} = \dfrac{3\times☐}{5\times☐}$ . Therefore, simplest form is $\dfrac{☐}{☐}$ .
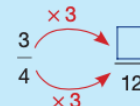
> **HCF** means **H**ighest **C**ommon **F**actor.

**5** Copy and complete these equivalent fractions.

a $\dfrac{3}{4} = \dfrac{☐}{12}$   b $\dfrac{5}{8} = \dfrac{☐}{80}$   c $\dfrac{6}{11} = \dfrac{18}{☐}$

d $\dfrac{2}{7} = \dfrac{16}{☐}$   e $\dfrac{3}{☐} = \dfrac{15}{40}$   f $\dfrac{☐}{1} = \dfrac{14}{7}$

g $\dfrac{☐}{10} = \dfrac{24}{20}$   h $\dfrac{13}{14} = \dfrac{☐}{42}$   i $\dfrac{2}{7} = \dfrac{10}{☐}$

j $\dfrac{19}{20} = \dfrac{190}{☐}$   k $\dfrac{11}{21} = \dfrac{55}{☐}$   l $\dfrac{11}{☐} = \dfrac{44}{8}$

> Always multiply the **nu**merator (**up**) and **d**enominator (**down**) by the same number.
> $\times 3$
> $\dfrac{3}{4} \qquad \dfrac{☐}{12}$
> $\times 3$

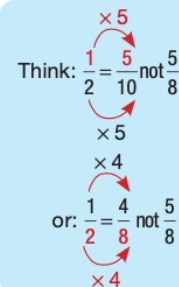**6** By writing either = or ≠ in the box, state whether each pair of fractions is equivalent or not equivalent. The first one has been done for you.

a $\dfrac{1}{2} \boxed{\ne} \dfrac{5}{8}$   b $\dfrac{4}{8} \boxed{\phantom{=}} \dfrac{2}{4}$   c $\dfrac{3}{7} \boxed{\phantom{=}} \dfrac{30}{60}$

d $\dfrac{5}{9} \boxed{\phantom{=}} \dfrac{15}{18}$   e $\dfrac{11}{15} \boxed{\phantom{=}} \dfrac{33}{45}$   f $\dfrac{1}{2} \boxed{\phantom{=}} \dfrac{402}{804}$

g $\dfrac{12}{36} \boxed{\phantom{=}} \dfrac{1}{3}$   h $\dfrac{18}{24} \boxed{\phantom{=}} \dfrac{21}{28}$   i $\dfrac{6}{18} \boxed{\phantom{=}} \dfrac{11}{33}$

> $\times 5$
> Think: $\dfrac{1}{2} = \dfrac{5}{10}$ not $\dfrac{5}{8}$
> $\times 5$
> $\times 4$
> or: $\dfrac{1}{2} = \dfrac{4}{8}$ not $\dfrac{5}{8}$
> $\times 4$

**7** Simplify the following fractions.

a $\dfrac{5\times1}{5\times2}$   b $\dfrac{6\times1}{6\times3}$   c $\dfrac{4\times3}{4\times4}$   d $\dfrac{7\times2}{7\times3}$

e $\dfrac{4\times5}{4\times6}$   f $\dfrac{10\times1}{10\times3}$   g $\dfrac{5\times3}{5\times5}$   h $\dfrac{8\times2}{8\times5}$
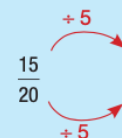
> Remember, $\dfrac{5}{5} = 5 \div 5 = 1$

**8** Write the following fractions in simplest form.

a $\dfrac{15}{20}$   b $\dfrac{12}{18}$   c $\dfrac{10}{30}$   d $\dfrac{8}{22}$

e $\dfrac{14}{35}$   f $\dfrac{2}{22}$   g $\dfrac{8}{56}$   h $\dfrac{9}{27}$

i $\dfrac{35}{45}$   j $\dfrac{36}{96}$   k $\dfrac{120}{144}$   l $\dfrac{700}{140}$

> HCF of 15 and 20 is 5.
> $\div 5$
> $\dfrac{15}{20}$
> $\div 5$

**9** In each group, choose the fraction that is not in its simplest form. What should it be?

a $\dfrac{1}{3}, \dfrac{3}{8}, \dfrac{5}{9}, \dfrac{7}{14}$

b $\dfrac{2}{5}, \dfrac{12}{16}, \dfrac{15}{19}, \dfrac{13}{37}$

c $\dfrac{12}{19}, \dfrac{4}{42}, \dfrac{5}{24}, \dfrac{6}{61}$

d $\dfrac{7}{63}, \dfrac{9}{62}, \dfrac{11}{81}, \dfrac{13}{72}$

**10** Which of the following fractions are equivalent to $\dfrac{8}{20}$?

$\dfrac{4}{10}, \dfrac{1}{5}, \dfrac{6}{20}, \dfrac{8}{10}, \dfrac{16}{40}, \dfrac{2}{5}, \dfrac{4}{12}, \dfrac{12}{40}, \dfrac{80}{200}, \dfrac{1}{4}$

**11** A family block of chocolate consists of 6 rows of 6 individual squares. Tania eats 16 individual squares. What fraction of the block, in simplest terms, has Tania eaten?

**12** Jameel, Joanna and Jack are sharing a large pizza for dinner. The pizza has been cut into 12 equal pieces. Jameel would like $\dfrac{1}{3}$ of the pizza, Joanna would like $\dfrac{1}{4}$ of the pizza and Jack will eat whatever is remaining. How much does Jack eat?
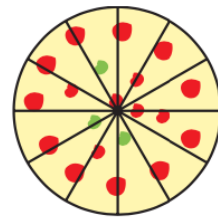
⭐ **Mystery fraction**

**13** A fraction when simplified is written as $\dfrac{3}{5}$.

What could the fraction have been before it was simplified?
Show your fraction on a diagram. Is your fraction the same as the student's sitting next to you?

Check your Answers

**1 a** 6    **b** 20    **c** $\dfrac{3}{3}$

  **d** 7    **e** $\dfrac{2}{2}$    **f** 20

**2** $\dfrac{9}{12}, \dfrac{15}{20}, \dfrac{30}{40}, \dfrac{33}{44}$

**3 a** 2, 12, 10, 20, 300    **b** 1, 3, 24, 20, 40

**4 a** 10, 10, 10, 1    **b** 2, 2, 2, 2

  **c** 4, 4, 4, 7    **d** 3, 3, 3, 3, 5

**5 a** 9    **b** 50    **c** 33    **d** 56

  **e** 8    **f** 2    **g** 12    **h** 39

  **i** 35    **j** 200    **k** 105    **l** 2

**6 a** $\neq$    **b** $=$    **c** $\neq$    **d** $\neq$

  **e** $=$    **f** $=$    **g** $=$    **h** $=$

  **i** $=$

**7 a** $\dfrac{1}{2}$    **b** $\dfrac{1}{3}$    **c** $\dfrac{3}{4}$    **d** $\dfrac{2}{3}$

  **e** $\dfrac{5}{6}$    **f** $\dfrac{1}{3}$    **g** $\dfrac{3}{5}$    **h** $\dfrac{2}{5}$

**8 a** $\dfrac{3}{4}$    **b** $\dfrac{2}{3}$    **c** $\dfrac{1}{3}$    **d** $\dfrac{4}{11}$

  **e** $\dfrac{2}{5}$    **f** $\dfrac{1}{11}$    **g** $\dfrac{1}{7}$    **h** $\dfrac{1}{3}$

  **i** $\dfrac{7}{9}$    **j** $\dfrac{3}{8}$    **k** $\dfrac{5}{6}$    **l** $\dfrac{5}{1} = 5$

**9 a** $\dfrac{7}{14} = \dfrac{1}{2}$    **b** $\dfrac{12}{16} = \dfrac{3}{4}$

  **c** $\dfrac{4}{42} = \dfrac{2}{21}$    **d** $\dfrac{7}{63} = \dfrac{1}{9}$

**10** $\dfrac{4}{10}, \dfrac{16}{40}, \dfrac{2}{5}, \dfrac{80}{200}$

**11** $\dfrac{4}{9}$

**12** Jameel 4, Joanna 3, Jack 5

**13** Answers may vary; $\dfrac{6}{10}$