N4.2 Equivalence of fractions

objectives

- Recall multiplication facts to 10 × 10 and derive associated division facts.
- Find simple equivalent fractions.
- Change mixed numbers to improper fractions and vice versa.

starter

Vocabulary
multiplied by
divided by
product
quarters
fifths
numerator
denominator
mixed number
improper fraction

Resources
mini-whiteboards

Chant the four times table, forwards and backwards: one four is four, two fours are eight, three fours are twelve, and so on. Ask a few questions, varying the wording. Ask pupils to write answers on their whiteboards.

Q What is 8 multiplied by 3? What is 32 divided by 4? 6 times 4? Seven fours? 8 shared between 2? The product of 3 and 4? How many fours make 28?

Remind pupils that the numerator is the 'top number' and the denominator is the 'bottom number' of a fraction. The line that separates the numerator from the denominator represents division. The fraction $^1/_4$ means one whole divided into four equal parts.

Q How many quarters are equivalent to one whole? (four)

Write $1 = {}^4/_4$ on the board.

Q How many quarters are equivalent to one and one quarter? (five)

Write $1\,^1/_4 = {}^5/_4$ on the board.

Q How many quarters are equivalent to one and a half? (six)

Write $1\,^1/_2 = {}^6/_4$ on the board.

Explain that numbers like $1\,^1/_4$ and $1\,^1/_2$ are called *mixed numbers*. A mixed number is the sum of a whole number and a fraction: $2\,^1/_2$ and $3\,^2/_5$ are examples of mixed numbers. A fraction whose numerator is greater than its denominator is called an *improper fraction*: $^8/_3$ and $^9/_4$ are examples of improper fractions.

Demonstrate how to change a mixed number to an improper fraction. Write $3\,^2/_5$ on the board. Explain that in each of the three wholes there are five fifths. Altogether, in the three wholes there are 3×5 fifths. So in $3\,^2/_5$ there are $(3 \times 5) + 2$ fifths or 17 fifths. Write $3\,^2/_5 = {}^{17}/_5$ on the board.

Ask pupils to change the following mixed numbers to improper fractions, and to write the answers on their whiteboards: $4\,^1/_4$ and $2\,^5/_8$.

Q How could we change an improper fraction to a mixed number?

Remind the class that the line that separates the numerator from the denominator represents division. To change $^{17}/_5$, or 17 fifths, back to a mixed number, 17 is divided by 5. Since $17 \div 5 = 3$ r 2, the answer will be three whole ones and two fifths, or $3\,^2/_5$.

Ask pupils to change these improper fractions to mixed numbers, and to write the answers on their whiteboards: $^{13}/_4$ and $^{73}/_{10}$.

main activity

Vocabulary
equivalent
multiple
simplify
cancelling

Resources
OHT or poster of multiplication square
OHP calculator
ITP *Fractions* (optional)

Draw on the board two circles, marked in quarters, side by side. Write $\frac{1}{4}$ on one of the quarters on the circle on the left. Point to the other circle and invite a pupil to mark one eighth of it. Establish that one eighth can be found by halving each quarter, making eight eighths altogether.

Q How many eighths are equivalent to one quarter? (two)

Draw a third circle, marked in quarters. Invite a pupil to mark one twelfth of the circle. Establish that one twelfth can be found by finding one third of each quarter, making twelve twelfths altogether.

Q How many twelfths are equivalent to one quarter? (three)

Write on the board $\frac{1}{4} = \frac{2}{8} = \frac{3}{12}$. Remind the class that these are equivalent fractions. Repeat for $\frac{3}{4} = \frac{6}{8} = \frac{9}{12}$.

You may wish to support the main activity of this lesson by using the ITP *Fractions* downloaded from www.standards.dfes.gov.uk/numeracy. Select options and ask questions to consolidate pupils' understanding.

Ask the class:

Q Which fractions are equivalent to one half?

Take pupils' suggestions, then write on the board:

$$\frac{1}{2} \quad \frac{2}{4} \quad \frac{3}{6} \quad \frac{4}{8} \quad \frac{\square}{10} \quad \frac{6}{\square} \quad \frac{\square}{14} \quad \frac{8}{\square}$$

Q What are the missing numbers?

Refer to a poster of a multiplication square, or show one on an OHT.

1	2	3	4	5	6	7	
2	4	6	8	10	12	14	
3	6	9	12	15	18	21	
4	8	12	16	20	24	28	
5	10	15	20	25	30	35	
6	12	18	24	30	36	42	
7	14	21	28	35	42	49	

Explain that the rows are multiples. Show how to use the square to find fractions equivalent to one half by looking at the first and the second rows of the square.

Now find fractions equivalent to one quarter, using the first and fourth rows of multiples. Write on the board:

$$\frac{1}{4} \quad \frac{2}{8} \quad \frac{\square}{\square} \quad \frac{4}{\square} \quad \frac{\square}{20} \quad \frac{6}{\square} \quad \frac{\square}{28} \quad \frac{\square}{\square}$$

Find fractions equivalent to one third by looking at the first and third rows. Explain that the fractions are produced by multiplying the numerator and the denominator of the first fraction by 2, then by 3, then by 4, and so on.

Write $\frac{4}{20}$ on the board.

Q What is the simplest fraction equivalent to this?

Demonstrate how to show that the simplest equivalent fraction is one fifth. Point to 4 in the first row, and move down the column to find 20 in the fifth row. Look back to the beginning of the two rows, to point at 1 and 5. Write on the board: $^{4}/_{20} = {}^{1}/_{5}$. Repeat for $^{6}/_{36}$ and $^{7}/_{21}$, showing that the simplest equivalent fractions are $^{1}/_{6}$ and $^{1}/_{3}$ respectively.

Explain that a simpler equivalent fraction is produced by dividing the numerator and the denominator by the same number, and that this process is known as *cancelling*.

other tasks

Springboard 7
Units 5 and 13

Unit 5 section 2: Fractions and whole numbers

Unit 5 section 6: Equivalent fractions

Unit 13 section 1: Fractions of quantities

plenary

Resources
OHT N4.2a
mini-whiteboards

Write on the board:

$$\frac{\square\square}{\square}$$

Explain that this improper fraction has a two-digit numerator and a one-digit denominator. Ask pupils to work in pairs and to use their whiteboards. They should make improper fractions of this form that are whole numbers. For each fraction, they should use each of the digits 2, 3 and 4 once and only once.

Give the pairs a few minutes to work on the problem, then take feedback. The complete set of fractions is $^{34}/_{2}$, $^{24}/_{3}$, $^{42}/_{3}$ and $^{32}/_{4}$.

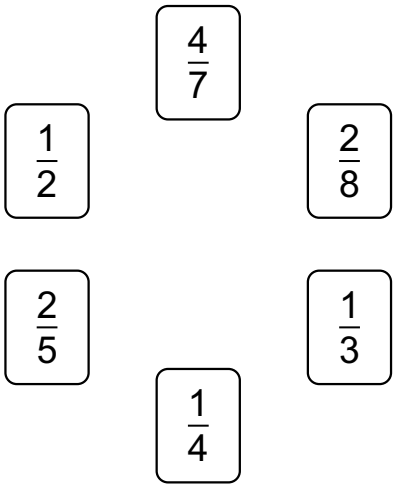
Finish by working through the problems on **OHT N4.2a** with the class.

Remember

- Fractions in which the numerator is greater than the denominator are called ‘improper fractions’. They can be changed into mixed numbers so that they have a whole-number part and a fraction part.
- You can convert any fraction into another equivalent fraction by multiplying the numerator and the denominator by the same number.
- You can simplify a fraction by dividing the numerator and the denominator by the same number. This process is known as ‘cancelling’.

OHT N4.2a

Draw a line to join two fractions with the same value.



Fill in the missing numbers in the boxes.

$$\frac{2}{12} = \frac{\square}{6}$$

$$\frac{1}{2} = \frac{12}{\square} \qquad \frac{1}{\square} = \frac{6}{24}$$

Make each fraction equivalent to $\frac{3}{5}$.

$$\frac{\square}{10} \qquad \frac{\square}{15} \qquad \frac{12}{\square}$$