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### Add and subtract fractions.

Add and subtract more complex fractions.  
For example:

- $\frac{11}{18} + \frac{7}{24} = \frac{44+21}{72} = \frac{65}{72}$
- A photograph is  $6\frac{1}{4}$  inches tall and  $8\frac{5}{8}$  inches wide. Calculate its perimeter.
- *Investigate  $1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots$  and similar series.*
- *Begin to add and subtract algebraic fractions (pages 118–19), linking to number examples.*

[Link to finding lowest common multiples \(pages 54–5\).](#)

- This fraction sum is made from four different digits, 1, 2, 4 and 8. The fraction sum is 1.

$$\frac{1}{2} + \frac{4}{8}$$

Eight other fraction sums are made from four different

### Calculate fractions of numbers, quantities or measurements.

Develop written methods to answer short questions with fraction answers, such as:

- Find: three fifths of 17;  
two thirds of 140 g;  
 $\frac{6}{25}$  of 34.

[Link to multiplying and dividing fractions \(pages 68–9\).](#)

### Calculate fractions of numbers, quantities or measurements.

Understand the multiplicative nature of fractions as operators. For example:

- Which is the greater:  $\frac{3}{4}$  of 24 or  $\frac{2}{3}$  of 21?  
34% of 75 or  $\frac{5}{7}$  of 85?  
5 out of 16 or 8 out of 25?
- In a survey of 24 pupils,  $\frac{1}{3}$  liked football best,  $\frac{1}{4}$  liked basketball,  $\frac{3}{8}$  liked athletics and the rest liked swimming. How many liked swimming?
- Brian used  $\frac{1}{3}$  of a 750 g bag of flour to make scones. Claire used  $\frac{2}{5}$  of the flour that remained to make a cake. How many grams of flour were left in the bag?
- In a bag of 20 coloured beads,  $\frac{2}{5}$  are red,  $\frac{1}{4}$  are blue,  $\frac{1}{10}$  are yellow and 3 are green. The rest are black. What fraction are black?

[Link to mutually exclusive events in probability \(pages 278–81\).](#)

**NUMBER**

**Fractions, decimals, percentages, ratio and proportion**

**Pupils should learn to:**

**As outcomes, Year 7 pupils should, for example:**

**Calculate fractions of quantities; add, subtract, multiply and divide fractions (continued)**

**Multiply a fraction by an integer or an integer by a fraction.**

Know that  $\frac{1}{4}$  of 12,  $\frac{1}{4} \times 12$ ,  $12 \times \frac{1}{4}$  and  $12 \div 4$  are all equivalent.

Multiply a simple fraction by an integer. For example:

$$\frac{1}{5} \times 3 = \frac{3}{5} \qquad \frac{2}{5} \times 4 = \frac{8}{5}$$

Simplify the product of a simple fraction and an integer.

For example:

$$\frac{1}{5} \times 15 = 3$$

$$\frac{2}{5} \times 15 = 2 \times \frac{1}{5} \times 15 = 2 \times 3 = 6$$

$$12 \times \frac{5}{6} = \frac{5}{6} \times 12 = 5 \times \frac{1}{6} \times 12 = 5 \times 2 = 10$$

Answer questions such as:

- Find:  $\frac{1}{9} \times 63$        $\frac{7}{9} \times 90$        $1\frac{1}{4} \times 10$
- Find:  $0.25 \times 24$        $0.2 \times 50$        $3.3 \times 40$

**NUMBER**

**Fractions, decimals, percentages, ratio and proportion**

As outcomes, Year 8 pupils should, for example:

As outcomes, Year 9 pupils should, for example:

**Multiply an integer by a fraction.**

Know that  $\frac{2}{3}$  of 12,  $\frac{2}{3} \times 12$  and  $12 \times \frac{2}{3}$  are all equivalent.

Connect ordinary multiplication tables with patterns in fraction multiplication tables:

$$\begin{array}{lll} \frac{1}{5} \times 1 = \frac{1}{5} & \frac{2}{5} \times 1 = \frac{2}{5} & \frac{3}{5} \times 1 = \frac{3}{5} \\ \frac{1}{5} \times 2 = \frac{2}{5} & \frac{2}{5} \times 2 = \frac{4}{5} & \frac{3}{5} \times 2 = \frac{6}{5} \\ \frac{1}{5} \times 3 = \frac{3}{5} & \frac{2}{5} \times 3 = \frac{6}{5} & \frac{3}{5} \times 3 = \frac{9}{5} \\ \frac{1}{5} \times 4 = \frac{4}{5} & \frac{2}{5} \times 4 = \frac{8}{5} & \frac{3}{5} \times 4 = \frac{12}{5} \end{array}$$

Think of multiplication by  $\frac{1}{8}$  as division by 8, so  $6 \times \frac{1}{8} = 6 \div 8$ , and  $6 \times \frac{3}{8} = 6 \times 3 \times \frac{1}{8} = 18 \div 8$ .

Use cancellation to simplify the product of a fraction and an integer. For example:

$$\frac{7}{24} \times \frac{15}{1} = \frac{7}{\cancel{24}^8} \times \frac{\cancel{15}^5}{1} = \frac{35}{8}$$

Answer questions such as:

- Find:  $\frac{3}{12} \times 30$      $\frac{5}{9} \times 24$      $2\frac{1}{8} \times 10$

Understand that when multiplying a positive number by a fraction less than one, the result will be a smaller number. For example:

$$24 \times \frac{1}{4} = 6$$

**Divide an integer by a fraction.**

Know that a statement such as  $24 \div \frac{1}{4}$  can be interpreted as:

- How many quarters are there in 24?  
 $24 = \square \times \frac{1}{4}$  or  $24 = \frac{1}{4} \times \square$ .

For example:

- Look at one whole circle (or rectangle, prism...). How many sevenths can you see? (Seven.)
- Look at 1. How many fifths can you see? (Five.)
- Look at 4. How many fifths can you see? (Twenty.)
- Look at 4. How many two fifths can you see? (Ten.)

Use patterns. For example:

$$\begin{array}{ll} 60 \times \frac{1}{6} = 10 & \text{and} & 10 \div \frac{1}{6} = 60 \\ 30 \times \frac{2}{6} = 10 & \text{and} & 10 \div \frac{2}{6} = 30 \\ 20 \times \frac{3}{6} = 10 & \text{and} & 10 \div \frac{3}{6} = 20 \\ 15 \times \frac{4}{6} = 10 & \text{and} & 10 \div \frac{4}{6} = 15 \\ 12 \times \frac{5}{6} = 10 & \text{and} & 10 \div \frac{5}{6} = 12 \end{array}$$

Understand that when dividing a positive number by a fraction less than one, the result will be a larger number.

For example:

$$24 \div \frac{1}{4} = 96$$

**Multiply a fraction by a fraction.**

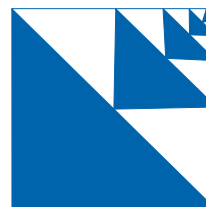
Multiply fractions, using cancelling to simplify:

$$\frac{3}{4} \times \frac{2}{9} = \frac{\cancel{3}^1 \times \cancel{2}^1}{\cancel{4}^2 \times \cancel{9}^3} = \frac{1}{6}$$

For example:

- Calculate:
  - a.  $\frac{3}{5} \times \frac{20}{33} \times \frac{22}{14}$
  - b.  $\frac{22}{7} \times 14 \times 14$
  - c.  $4\frac{2}{3} \times 1\frac{3}{4}$
  - d.  $\frac{1}{2}(2 - \frac{1}{4})$
  - e.  $(2\frac{1}{2})^3$
- A photograph is  $6\frac{1}{4}$  inches tall and  $8\frac{5}{8}$  inches wide. Calculate its area.

- Imagine a square with sides of 1 metre. The area of the largest shaded triangle is  $\frac{1}{2} \text{ m}^2$ .



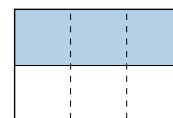
- Write the areas of the next two largest shaded triangles.
- Use the diagram to help you find the sum of the infinite series:  
 $\frac{1}{2} + \frac{1}{8} + \frac{1}{32} + \frac{1}{128} + \dots$   
Explain how you arrived at your solution.

**Divide a fraction by a fraction.**

Use the inverse rule to divide fractions, first converting mixed numbers to improper fractions.

For example:

- Look at one half of a shape.



How many sixths of the shape can you see? (Six.)  
So, how many sixths in one half? (Three.)  
So  $\frac{1}{2} \div \frac{1}{6} = \frac{1}{2} \times \frac{6}{1} = \frac{6}{2} = 3$

- $\frac{2}{3} \div \frac{4}{7} = \frac{2}{3} \times \frac{7}{4} = \frac{14}{12}$  or  $\frac{7}{6}$
- $2\frac{1}{3} \div \frac{4}{5} = \frac{7}{3} \times \frac{5}{4} = \frac{35}{12}$  or  $2\frac{11}{12}$

Answer questions such as:

- Calculate:  $(1 - \frac{1}{3}) / (1 - \frac{5}{6})$
- The area of a circle is  $154 \text{ cm}^2$ . Taking  $\pi$  as  $\frac{22}{7}$ , find the radius of the circle.