

Equivalent Fractions

- Equivalent fractions can be created by multiplying/dividing the numerator and denominator by the same number.

Examples:

$$\begin{aligned} \frac{1}{2} & \\ &= \frac{1 \times 3}{2 \times 3} \leftarrow \text{Multiply by 3} \\ &= \frac{3}{6} \leftarrow \text{Multiply by 3} \\ &= \frac{3}{6} \leftarrow \frac{1}{2} = \frac{3}{6} \end{aligned}$$

$$\begin{aligned} \frac{3}{7} & \\ &= \frac{3 \times 5}{7 \times 5} \leftarrow \text{Multiply by 5} \\ &= \frac{15}{35} \leftarrow \text{Multiply by 5} \\ &= \frac{15}{35} \leftarrow \frac{3}{7} = \frac{15}{35} \end{aligned}$$

Practice: Fill in the blank

a) $\frac{1}{2} = \frac{\quad}{12}$

b) $\frac{2}{3} = \frac{\quad}{24}$

c) $\frac{4}{9} = \frac{16}{\quad}$

d) $\frac{3}{5} = \frac{\quad}{60}$

e) $\frac{1}{4} = \frac{7}{\quad}$

f) $\frac{5}{6} = \frac{\quad}{42}$

g) $\frac{7}{8} = \frac{49}{\quad}$

h) $\frac{2}{9} = \frac{\quad}{108}$

i) $\frac{7}{15} = \frac{\quad}{135}$

j) $\frac{1}{5} = \frac{\quad}{245}$

Answers:

a) $\frac{1 \times 6}{2 \times 6} = \frac{6}{12}$

b) $\frac{2 \times 8}{3 \times 8} = \frac{16}{24}$

c) $\frac{4 \times 4}{9 \times 4} = \frac{16}{36}$

d) $\frac{3 \times 12}{5 \times 12} = \frac{36}{60}$

e) $\frac{1 \times 7}{4 \times 7} = \frac{7}{28}$

f) $\frac{5 \times 7}{6 \times 7} = \frac{35}{42}$

g) $\frac{7 \times 7}{8 \times 7} = \frac{49}{56}$

h) $\frac{2 \times 12}{9 \times 12} = \frac{24}{108}$

i) $\frac{7 \times 9}{15 \times 9} = \frac{63}{135}$

j) $\frac{1 \times 49}{5 \times 49} = \frac{49}{245}$

$$\text{numerator} \rightarrow \frac{2}{5}$$

$$\text{denominator} \rightarrow \frac{5}{5}$$

Simplifying Fractions

- To simplify a fraction, divide the numerator and denominator by the same number until the numerator and denominator can be simplified no further.

Examples:

$$\begin{aligned} & \frac{40}{56} \\ &= \frac{40 \div 8}{56 \div 8} \quad \leftarrow \text{Divide by 8} \\ &= \frac{5}{7} \quad \leftarrow \text{Divide by 8} \\ & \quad \uparrow \\ & \text{Cannot be} \\ & \text{simplified further} \end{aligned}$$

$$\begin{aligned} & \frac{42}{54} \\ &= \frac{42 \div 2}{54 \div 2} \quad \leftarrow \text{Divide by 2} \\ &= \frac{21}{27} \quad \leftarrow \text{Divide by 2} \\ &= \frac{21}{27} \quad \leftarrow \text{Can be simplified further} \\ &= \frac{21 \div 3}{27 \div 3} \quad \leftarrow \text{Divide by 3} \\ &= \frac{7}{9} \quad \leftarrow \text{Divide by 3} \\ &= \frac{7}{9} \quad \leftarrow \text{Cannot be simplified further} \end{aligned}$$

Practice: Simplify each fraction

a) $\frac{15}{20} =$

b) $\frac{18}{27} =$

c) $\frac{40}{48} =$

d) $\frac{7}{13} =$

e) $\frac{60}{150} =$

f) $\frac{39}{52} =$

g) $\frac{135}{215} =$

h) $\frac{121}{154} =$

i) $\frac{72}{108} =$

Answers:

a) $\frac{15 \div 5}{20 \div 5} = \frac{3}{4}$

b) $\frac{18 \div 9}{27 \div 9} = \frac{2}{3}$

c) $\frac{40 \div 8}{48 \div 8} = \frac{5}{6}$

d) $\frac{7}{13}$ (already simplified)

e) $\frac{60 \div 30}{150 \div 30} = \frac{2}{5}$

f) $\frac{39 \div 13}{52 \div 13} = \frac{3}{4}$

g) $\frac{135 \div 5}{215 \div 5} = \frac{27}{43}$

h) $\frac{121 \div 11}{154 \div 11} = \frac{11}{14}$

i) $\frac{72 \div 36}{108 \div 36} = \frac{2}{3}$

Converting Fractions

- Let's look at converting entire fractions to mixed fractions and converting mixed fractions to entire fractions

<u>Entire fractions</u>		<u>Mixed fractions</u>
$\frac{7}{2}$	←————→	$3\frac{1}{2}$
$\frac{20}{3}$	←————→	$6\frac{2}{3}$
$\frac{40}{17}$	←————→	$2\frac{6}{17}$

Converting an entire fraction to a mixed fraction:

- Determine how many times the denominator divides into the numerator (this becomes the whole number)
- The remainder becomes the numerator of the new fraction
- The denominator remains the same

Examples: $\frac{7}{2} = 3\frac{1}{2}$ The denominator (2) divides into the numerator (7) **three** times, with a remainder of **one**

$\frac{32}{5} = 6\frac{2}{5}$ The denominator (5) divides into the numerator (32) **six** times, with a remainder of **two**

Converting a mixed fraction to an entire fraction:

- Multiply the whole number by the denominator and add the product to the numerator
- The result becomes the new numerator and the denominator remains the same

Examples: $5\frac{1}{4} = \frac{21}{4}$ The whole number (5) multiplied by the denominator (4) equals 21. The denominator (4) remains the same

$3\frac{2}{7} = \frac{23}{7}$ The whole number (3) multiplied by the denominator (7) equals 22. The denominator (7) remains the same

Practice questions
on the next page

Practice: Convert each entire fraction to a mixed fraction

a) $\frac{9}{4} =$

b) $\frac{19}{5} =$

c) $\frac{35}{2} =$

d) $\frac{40}{7} =$

e) $\frac{68}{11} =$

f) $\frac{59}{6} =$

Answers:

a) $2\frac{1}{4}$

b) $3\frac{4}{5}$

c) $17\frac{1}{2}$

d) $5\frac{5}{7}$

e) $6\frac{2}{11}$

f) $9\frac{5}{6}$

Practice: Convert each mixed fraction to an entire fraction

a) $3\frac{1}{4} =$

b) $8\frac{3}{5} =$

c) $2\frac{4}{9} =$

d) $1\frac{11}{15} =$

e) $3\frac{9}{20} =$

f) $30\frac{1}{3} =$

Answers:

a) $\frac{13}{4}$

b) $\frac{43}{5}$

c) $\frac{22}{9}$

d) $\frac{26}{15}$

e) $\frac{69}{20}$

f) $\frac{91}{3}$

Adding and subtracting fractions

(1) Create equivalent fractions with the same denominator (a.k.a. common denominator)

(2) Add/subtract the numerators, and keep the denominator the same

Examples:

$$\frac{3}{4} + \frac{1}{6}$$

$$= \frac{3 \times 3}{4 \times 3} + \frac{1 \times 2}{6 \times 2}$$

$$= \frac{9}{12} + \frac{2}{12}$$

$$= \frac{11}{12}$$

← Create equivalent fractions with the same denominator (12)

← Add the numerators; keep the denominator the same

$$\frac{8}{9} - \frac{5}{12}$$

$$= \frac{8 \times 4}{9 \times 4} - \frac{5 \times 3}{12 \times 3}$$

$$= \frac{32}{36} - \frac{15}{36}$$

$$= \frac{17}{36}$$

← Create equivalent fractions with the same denominator (36)

← Subtract the numerators; keep the denominator the same

Practice:

a) $\frac{3}{8} + \frac{1}{12} =$

b) $\frac{14}{15} - \frac{7}{10} =$

c) $\frac{7}{16} - \frac{3}{8} =$

d) $\frac{1}{8} + \frac{2}{3} =$

e) $1\frac{1}{2} - \frac{5}{6} =$

f) $\frac{5}{6} + \frac{9}{10} =$

Answers:

a) $\frac{11}{24}$

b) $\frac{7}{30}$

c) $\frac{1}{16}$

d) $\frac{19}{24}$

e) $\frac{2}{3}$

f) $\frac{26}{15}$ or $1\frac{11}{15}$

Multiplying fractions

numerator → $\frac{2}{\quad}$

denominator → $\frac{\quad}{5}$

- Multiply numerator by numerator, and denominator by denominator.

Examples:

$$\frac{2}{11} \times \frac{5}{7} = \frac{10}{77}$$

$$\frac{5}{6} \times \frac{1}{7} = \frac{5}{42}$$

- Whenever possible, “cross simplify” beforehand.

Cross simplifying

Method 1: $\frac{9}{16} \times \frac{4}{15} = \frac{36}{240} = \frac{36 \div 12}{240 \div 12} = \frac{3}{20}$

Cross simplify: $\frac{9}{16} \times \frac{4}{15} = \frac{9 \div 3}{16 \div 4} \times \frac{4 \div 4}{15 \div 3} = \frac{3}{4} \times \frac{1}{5} = \frac{3}{20}$

Practice: Find each product and write answer in simplest terms

Answers:

a) $\frac{3}{5} \times \frac{7}{9} =$

a) $\frac{7}{15}$

b) $\frac{21}{32} \times \frac{16}{35} =$

b) $\frac{3}{10}$

c) $\frac{7}{24} \times \frac{9}{14} =$

c) $\frac{3}{16}$

d) $\frac{8}{15} \times \frac{3}{4} =$

d) $\frac{2}{5}$

e) $\frac{11}{16} \times \frac{4}{33} =$

e) $\frac{1}{12}$

f) $\frac{72}{125} \times \frac{25}{96} =$

f) $\frac{3}{20}$

Dividing fractions

- Multiply by the reciprocal of the divisor.

Examples:

$$\begin{aligned} & \frac{4}{9} \div \frac{11}{20} \\ & = \frac{4}{9} \times \frac{20}{11} \quad \rightarrow \text{"flip"} \frac{11}{20} \text{ to become } \frac{20}{11} \text{ and multiply} \\ & = \frac{80}{99} \end{aligned}$$

$$\begin{aligned} & \frac{3}{7} \div \frac{5}{8} \\ & = \frac{3}{7} \times \frac{8}{5} \quad \rightarrow \text{"flip"} \frac{5}{8} \text{ to become } \frac{8}{5} \text{ and multiply} \\ & = \frac{24}{35} \end{aligned}$$

Practice: Find each quotient and write answer in simplest terms

Answers:

a) $\frac{2}{7} \div \frac{3}{4} =$

a) $\frac{8}{21}$

b) $\frac{5}{6} \div \frac{1}{5} =$

b) $\frac{25}{6}$ or $4\frac{1}{6}$

c) $\frac{9}{16} \div \frac{15}{16} =$

c) $\frac{3}{5}$

d) $\frac{21}{40} \div \frac{14}{25} =$

d) $\frac{15}{16}$

e) $\frac{8}{15} \div \frac{1}{20} =$

e) $\frac{32}{3}$ or $10\frac{2}{3}$

f) $\frac{27}{32} \div 1\frac{1}{8} =$

f) $\frac{3}{4}$