

M1 Maths
Learning by Thinking
N1 - 3 Fraction Conversions

- converting between equivalent common fractions, between mixed numbers and improper fractions and between common fractions, decimal fractions and percentages

[Learn](#) [Answers](#)

This LbT (Learning by Thinking) module is an alternative to the 'Learn' section of the normal module. It is designed to lead the student to work out the maths themselves by solving problems. Thus it contains only minimal explanations. The rationale behind the approach can be read [here](#).

Learn

Converting between equivalent common fractions

Equivalent common fractions are the same amount written in different ways.

The bar below is divided into 5 equal parts. So each part is one fifth. The shaded part is $\frac{1}{5}$ of the bar.

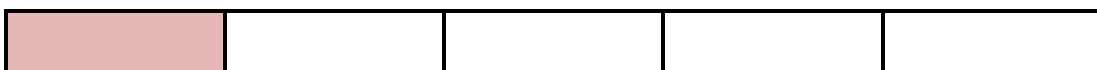


If we divide each fifth into 2 equal parts, then there will be 10 equal parts and each part will be one tenth. The shaded part is now $\frac{2}{10}$ of the bar.



But it is still the same amount, so $\frac{1}{5}$ and $\frac{2}{10}$ are the same amount. We say they are equivalent fractions. If someone gave you $\frac{2}{10}$ of their lottery winnings, that would be the same amount as if they gave you $\frac{1}{5}$ of it. So $\frac{1}{5} = \frac{2}{10}$

Q1 Copy the first bar above that's divided into 5 equal parts.



(a) Then divide each fifth into 3 equal parts.

What pair of equivalent fractions is suggested by your drawing?

(b) Copy the bar again and divide each fifth into 5 equal parts.

What pair of equivalent fractions is suggested by your drawing?

Q2 Draw another bar and, this time, divide it into four equal parts and shade $\frac{1}{4}$.



- (a) Divide each quarter into 6 equal parts.
- (b) What pair of equivalent fractions is suggested by your drawing?
- (c) Now imagine dividing each quarter into 20 equal parts.
- (d) What pair of equivalent fractions would this suggest?
- (e) Now imagine dividing each quarter into 41 equal parts.
- (f) What pair of equivalent fractions would this suggest?

Q3 $\frac{3}{5}$ of this bar is shaded.



- (a) What two equivalent fractions would be shaded if you divided each fifth into 6 equal parts?
- (b) How about if you divided each fifth into 20 equal parts?
- (c) How about 100?
- (d) How about 1000?

Q4 Copy and complete the following pairs of equivalent fractions.

- | | | | |
|---------------------------------------|--|---------------------------------------|--------------------------------------|
| (a) $\frac{3}{5} = \frac{\quad}{100}$ | (b) $\frac{3}{5} = \frac{\quad}{20}$ | (c) $\frac{3}{5} = \frac{\quad}{25}$ | (d) $\frac{3}{5} = \frac{\quad}{45}$ |
| (e) $\frac{3}{5} = \frac{6}{\quad}$ | (f) $\frac{3}{5} = \frac{30}{\quad}$ | (g) $\frac{1}{4} = \frac{\quad}{12}$ | (h) $\frac{1}{4} = \frac{\quad}{20}$ |
| (i) $\frac{1}{4} = \frac{4}{\quad}$ | (j) $\frac{3}{7} = \frac{12}{\quad}$ | (k) $\frac{3}{7} = \frac{\quad}{70}$ | (l) $\frac{9}{4} = \frac{\quad}{12}$ |
| (m) $\frac{9}{4} = \frac{18}{\quad}$ | (n) $\frac{12}{20} = \frac{\quad}{10}$ | (o) $\frac{12}{20} = \frac{3}{\quad}$ | (p) $\frac{20}{6} = \frac{\quad}{3}$ |
| (q) $\frac{40}{15} = \frac{8}{\quad}$ | | | |

Q5 Copy and complete these pairs of equivalent fractions in two (or more) steps.

- | | |
|---|---|
| (a) $\frac{12}{16} = \frac{\quad}{\quad} = \frac{\quad}{20}$ | (b) $\frac{15}{10} = \frac{\quad}{\quad} = \frac{18}{\quad}$ |
| (c) $\frac{40}{16} = \frac{\quad}{\quad} = \frac{\quad}{6}$ | (d) $\frac{18}{60} = \frac{\quad}{\quad} = \frac{12}{\quad}$ |
| (e) $\frac{24}{10} = \frac{\quad}{\quad} = \frac{\quad}{15}$ | (f) $\frac{60}{100} = \frac{\quad}{\quad} = \frac{24}{\quad}$ |
| (g) $\frac{60}{100} = \frac{\quad}{\quad} = \frac{\quad}{60}$ | (h) $60\% = \frac{\quad}{\quad} = \frac{\quad}{\quad} = \frac{\quad}{15}$ |

Q6 Explain why multiplying or dividing the top and bottom of a fraction by the same number makes an equivalent fraction.

Q7 Write four equivalent fractions for each of the following, two using larger numbers, two using smaller numbers.

- (a) $\frac{8}{12}$ (b) $\frac{4}{20}$ (c) $\frac{16}{80}$ (d) $\frac{20}{12}$ (e) $\frac{32}{32}$ (f) $\frac{96}{36}$

Simplest form

We sometimes like to write common fractions in their **simplest form**, i.e. with the smallest possible whole numbers for the numerator and denominator.

For example, the simplest form of $\frac{30}{48}$ is $\frac{5}{8}$.

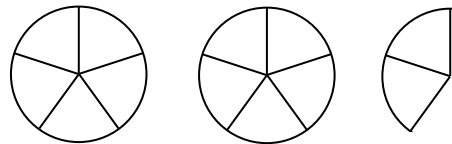
Q8 Write the following in simplest form (i.e. as equivalent fractions with the smallest possible numbers).

- (a) $\frac{5}{10}$ (b) $\frac{14}{21}$ (c) $\frac{64}{24}$ (d) $\frac{14}{35}$ (e) $\frac{32}{15}$ (f) $\frac{120}{200}$

Converting between mixed numbers and improper fractions

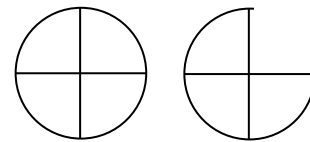
Fractions bigger than 1 can be written as mixed numbers or as improper fractions. A mixed number is a whole number with a fraction, e.g. $1\frac{1}{2}$. An improper fraction is a common fraction with the numerator bigger than the denominator. As an improper fraction, $1\frac{1}{2}$ would be $\frac{3}{2}$.

A mixed number like $2\frac{2}{5}$ can be drawn as pizzas like this:



It is then fairly easy to see how many fifths there are.

An improper fraction like $\frac{7}{4}$ can be drawn as:



Q9 Draw pizzas to convert the following to improper fractions.

- (a) $\frac{13}{5}$ (b) $2\frac{3}{4}$ (c) $2\frac{1}{3}$ (d) $4\frac{1}{2}$ (e) $5\frac{3}{4}$ (f) $\frac{67}{8}$

Q10 Imagine the pizzas to convert the following to improper fractions.

- (a) $\frac{53}{8}$ (b) $14\frac{1}{4}$ (c) $8\frac{7}{10}$ (d) $10\frac{7}{8}$ (e) $21\frac{3}{4}$ (f) $142\frac{2}{5}$

Q11 Draw pizzas to convert the following to mixed numbers.

- (a) $\frac{13}{5}$ (b) $\frac{9}{4}$ (c) $\frac{11}{3}$ (d) $\frac{7}{2}$ (e) $\frac{15}{4}$ (f) $\frac{17}{8}$

Q12 Imagine the pizzas to convert the following to mixed numbers.

- (a) $\frac{25}{8}$ (b) $6\frac{1}{4}$ (c) $\frac{112}{10}$ (d) $\frac{87}{8}$ (e) $\frac{33}{4}$ (f) $\frac{48}{5}$

Q13 Convert the following mixed numbers to improper fractions.

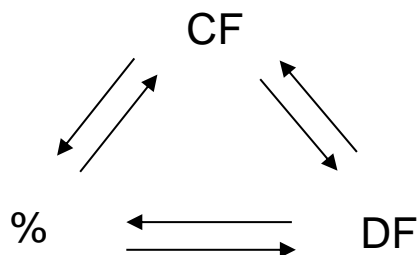
- (a) $2\frac{1}{2}$ (b) $1\frac{3}{8}$ (c) $3\frac{3}{4}$ (d) $7\frac{1}{3}$ (e) $20\frac{4}{5}$ (f) $63\frac{1}{2}$

Q14 Convert the following improper fractions to mixed numbers.

- (a) $\frac{6}{5}$ (b) $\frac{13}{4}$ (c) $\frac{20}{3}$ (d) $\frac{19}{7}$ (e) $\frac{53}{5}$ (f) $\frac{187}{6}$

Converting between common fractions, decimal fractions and percentages

There are six conversions as shown in this diagram:



Feel free to use your calculator for any of these.

Common fractions to decimal fractions

From Module N1-2, you should remember the two ways of thinking about common fractions:

$\frac{3}{5}$ or $3/5$ means 3 of 5 equal pieces. It also means $3 \div 5$.

Q15 Use one of these to convert the following common fractions to decimal fractions.

- (a) $3/5$ (b) $4/10$ (c) $7/8$ (d) $11/20$ (e) $13/81$ (f) $1/137$
(g) $13/5$ (h) $23/4$ (i) $22/10$ (j) $45/8$ (k) $72/9$ (l) $6^{13}/22$

Decimal fractions to common fractions

From Module N1-2, you should remember the two ways of thinking about decimal fractions:

3.27 means 3 ones, 2 tenths and 7 hundredths. It also means 327 hundredths.

Q16 Use one of these to convert the following decimal fractions to common fractions.

Change them to simplest form. For numbers greater than 1, give the answers as improper fractions and as mixed numbers.

- (a) 0.3 (b) 2.7 (c) 1.4 (d) 0.024 (e) 8.15 (f) 0.11
(g) 0.95 (h) 4.17 (i) 4.08 (j) 2.35 (k) 13.5 (l) 3.01

Percentages to common fractions

From Module N1-2, you should remember the meaning of percentages:

14% means 14 hundredths or $\frac{14}{100}$

Q17 Use this idea to convert the following percentages to common fractions. Change them to simplest form. For numbers greater than 1, give the answers as improper fractions and as mixed numbers.

- (a) 23% (b) 10% (c) 95% (d) 120% (e) 215% (f) 78%
(g) 11.7% (h) 17.5% (i) 4.75% (j) 0.04% (k) 112.8% (l) 64.32%

Common fractions to percentages

$\frac{3}{5}$ means $\frac{3}{5}$ of a whole or $\frac{3}{5}$ of 100%. So work out $\frac{1}{5}$ of 100% by dividing by 5, then work out $\frac{3}{5}$ by multiplying the result by 3.

Q18 Use this idea to convert the following common fractions to percentages.

- (a) $\frac{3}{5}$ (b) $\frac{7}{10}$ (c) $\frac{5}{8}$ (d) $\frac{19}{20}$ (e) $\frac{13}{17}$ (f) $\frac{21}{4}$
(g) $\frac{14}{5}$ (h) $2\frac{3}{4}$ (i) $\frac{3}{10}$ (j) $\frac{45}{8}$ (k) $\frac{12}{9}$ (l) $\frac{15}{22}$

Percentages to decimal fractions

42.5% means $\frac{42.5}{100}$ which is $42.5 \div 100$.

Q19 Use this idea to convert the following percentages to decimal fractions.

- (a) 21% (b) 30% (c) 95% (d) 150% (e) 214% (f) 72%
(g) 11.9% (h) 12.25% (i) 0.75% (j) 0.06% (k) 112.2% (l) 41.35%

Decimal fractions to percentages

This is the reverse of changing a percentage to a decimal fraction. So, instead of dividing by 100, we multiply by 100.

Q20 Use this idea to convert the following decimal fractions to percentages.

- (a) 0.35 (b) 0.7 (c) 1.4 (d) 0.024 (e) 8.15 (f) 0.117
(g) 0.955 (h) 4.17 (i) 4.085 (j) 2.356 (k) 13.5 (l) 3.01

Q21 If you would like some more practice, copy and complete the following table.

Common fraction	Decimal fraction	Percent
		27%
	0.56	
$\frac{3}{5}$		
		4.2%
	0.295	
$\frac{4}{7}$		
		120%
	3.4	
$\frac{8}{5}$		
		11.98%
	0.0045	
$2\frac{3}{4}$		

Answers

- Q1 (a) $\frac{1}{5} = \frac{3}{15}$ (b) $\frac{1}{5} = \frac{5}{25}$
- Q2 (b) $\frac{1}{4} = \frac{6}{24}$ (d) $\frac{1}{4} = \frac{20}{80}$ (f) $\frac{41}{164}$
- Q3 (a) $\frac{3}{5} = \frac{18}{30}$ (b) $\frac{60}{100}$ (c) $\frac{300}{500}$ (d) $\frac{3000}{5000}$
- Q4 (a) $\frac{3}{5} = \frac{60}{100}$ (b) $\frac{3}{5} = \frac{12}{20}$ (c) $\frac{3}{5} = \frac{15}{25}$ (d) $\frac{3}{5} = \frac{27}{45}$
 (e) $\frac{3}{5} = \frac{6}{10}$ (f) $\frac{3}{5} = \frac{30}{50}$ (g) $\frac{1}{4} = \frac{3}{12}$ (h) $\frac{1}{4} = \frac{5}{20}$
 (i) $\frac{1}{4} = \frac{4}{16}$ (j) $\frac{3}{7} = \frac{12}{28}$ (k) $\frac{3}{7} = \frac{30}{70}$ (l) $\frac{9}{4} = \frac{27}{12}$
 (m) $\frac{9}{4} = \frac{18}{8}$ (n) $\frac{12}{20} = \frac{6}{10}$ (o) $\frac{12}{20} = \frac{3}{5}$ (p) $\frac{20}{6} = \frac{10}{3}$
 (q) $\frac{40}{15} = \frac{8}{3}$
- Q5 (a) $\frac{12}{16} = \frac{3}{4} = \frac{15}{20}$ (b) $\frac{15}{10} = \frac{3}{2} = \frac{18}{12}$
 (c) $\frac{40}{16} = \frac{5}{2} = \frac{15}{6}$ (d) $\frac{18}{60} = \frac{6}{20} = \frac{12}{40}$
 (e) $\frac{24}{10} = \frac{12}{5} = \frac{36}{15}$ (f) $\frac{60}{100} = \frac{12}{20} = \frac{24}{40}$
 (g) $\frac{60}{100} = \frac{12}{20} = \frac{36}{60}$ (h) $60\% = \frac{60}{100} = \frac{3}{5} = \frac{9}{15}$
- Q6 If you multiply top and bottom by say 3, then you make the pieces a third the size, but you take three times as many, so you end up with the same amount.
- Q7 (a) e.g. $\frac{2}{3}, \frac{4}{6}, \frac{16}{24}, \frac{24}{36}$
 (b) e.g. $\frac{1}{5}, \frac{2}{10}, \frac{8}{40}, \frac{12}{60}$
 (c) e.g. $\frac{1}{5}, \frac{2}{10}, \frac{32}{160}, \frac{48}{240}$
 (d) e.g. $\frac{5}{3}, \frac{10}{6}, \frac{40}{24}, \frac{200}{120}$
 (e) e.g. $\frac{1}{1}, \frac{2}{2}, \frac{64}{64}, \frac{41}{41}$
 (f) e.g. $\frac{16}{6}, \frac{8}{3}, \frac{192}{72}, \frac{960}{360}$
- Q8 (a) $\frac{1}{2}$ (b) $\frac{2}{3}$ (c) $\frac{8}{3}$ (d) $\frac{2}{5}$ (e) $\frac{32}{15}$ (f) $\frac{3}{5}$
- Q9 (a) $\frac{8}{5}$ (b) $\frac{11}{4}$ (c) $\frac{7}{3}$ (d) $\frac{9}{2}$ (e) $\frac{23}{4}$ (f) $\frac{55}{8}$
- Q10 (a) $\frac{43}{8}$ (b) $\frac{57}{4}$ (c) $\frac{87}{10}$ (d) $\frac{87}{8}$ (e) $\frac{87}{4}$ (f) $\frac{712}{5}$
- Q11 (a) $2\frac{3}{5}$ (b) $2\frac{1}{4}$ (c) $3\frac{2}{3}$ (d) $3\frac{1}{2}$ (e) $3\frac{3}{4}$ (f) $2\frac{1}{8}$
- Q12 (a) $3\frac{1}{8}$ (b) $15\frac{1}{4}$ (c) $11\frac{2}{10}$ (d) $10\frac{7}{8}$ (e) $8\frac{1}{4}$ (f) $9\frac{3}{5}$
- Q13 (a) $\frac{5}{2}$ (b) $\frac{11}{8}$ (c) $\frac{15}{4}$ (d) $\frac{22}{3}$ (e) $\frac{104}{5}$ (f) $\frac{127}{2}$
- Q14 (a) $1\frac{1}{5}$ (b) $3\frac{1}{4}$ (c) $6\frac{2}{3}$ (d) $2\frac{5}{7}$ (e) $10\frac{3}{5}$ (f) $31\frac{1}{6}$
- Q15 (a) 0.6 (b) 0.4 (c) 0.875 (d) 0.55 (e) 0.1605 (f) 0.0073
 (g) 1.6 (h) 2.75 (i) 2.2 (j) 4.625 (k) 7.222 (l) 6.5856
- Q16 (a) $\frac{3}{10}$ (b) $\frac{27}{10} = \frac{27}{10}$ (c) $1\frac{2}{5} = \frac{7}{5}$ (d) $\frac{3}{125}$ (e) $\frac{8^3}{20} = \frac{163}{20}$ (f) $\frac{11}{100}$
 (g) $\frac{19}{20}$ (h) $\frac{4^{17}}{100} = \frac{4^{17}}{100}$ (i) $4\frac{2}{25} = \frac{102}{25}$ (j) $\frac{27}{20} = \frac{47}{20}$ (k) $13\frac{1}{2} = \frac{27}{2}$ (l) $3\frac{1}{100} = \frac{301}{100}$

- Q17 (a) $\frac{23}{100}$ (b) $\frac{1}{10}$ (c) $\frac{19}{20}$ (d) $1\frac{1}{5}$ $\frac{6}{5}$ (e) $2\frac{3}{20}$ $\frac{43}{20}$ (f) $\frac{39}{50}$
 (g) $\frac{117}{1000}$ (h) $\frac{7}{40}$ (i) $\frac{19}{400}$ (j) $\frac{1}{2500}$ (k) $\frac{169}{500}$ (l) $\frac{804}{1250}$
- Q18 (a) 60% (b) 70% (c) 62.5% (d) 145% (e) 76.47% (f) 525%
 (g) 180% (h) 275% (i) 30% (j) 562.5% (k) 122.2% (l) 68.18%
- Q19 (a) 0.21 (b) 0.3 (c) 0.95 (d) 1.5 (e) 2.14 (f) 0.72
 (g) 0.119 (h) 0.1225 (i) 0.75 (j) 0.0006 (k) 1.122 (l) 0.4135
- Q20 (a) 35% (b) 70% (c) 140% (d) 2.4% (e) 815% (f) 11.7%
 (g) 95.5% (h) 417% (i) 408.5% (j) 235.6% (k) 1350% (l) 301%
- Q21

Common fraction	Decimal fraction	Percent
$\frac{27}{100}$	0.27	27%
$\frac{14}{25}$	0.56	56%
$\frac{3}{5}$	0.6	60%
$\frac{21}{500}$	0.042	4.2%
$\frac{59}{200}$	0.295	29.5%
$\frac{4}{7}$	0.5714	57.14%
$\frac{6}{5}$	1.2	120%
$\frac{17}{5}$	3.4	340%
$\frac{8}{5}$	1.6	160%
$\frac{599}{5000}$	0.1198	11.98%
$\frac{9}{2000}$	0.0045	0.45%
$2\frac{3}{4}$	2.75	275%