

M1 Maths

N1-2 Fraction Meanings

- understanding common fractions, percentages and decimal fractions

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Summary

Common fractions:

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

The top number is called the numerator; the bottom number is the denominator.

Common fractions greater than 1 can be written as mixed numbers or improper fractions. A mixed number is a whole number and a common fraction, e.g. $1\frac{3}{4}$. An improper fraction is a common fraction with the top greater than the bottom, e.g. $\frac{7}{4}$.

Percentages:

14% means 14 hundredths, $\frac{14}{100}$.

Decimal fractions:

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

Decimal fractions can recur. For instance $\frac{1}{3}$ as a decimal is 0.33333333... for ever. We write this as $0.3\dot{}$ and call it 'zero point three recurring'. $4.282828282828...$ is written $4.(28)\dot{}$ or $4.\overline{28}$

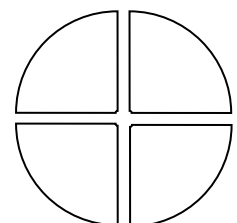
Learn

Common Fractions

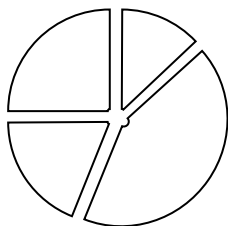
Common Fractions as Equal Pieces

A **common fraction** is a counting number over a counting number, e.g. $\frac{3}{4}$. Sometimes common fractions are just called *fractions*, but we use the full name if we need to distinguish them from decimal fractions or percentages (which are also fractions). An old word for *common fraction* which you might meet is *vulgar fraction*.

One quarter (or $\frac{1}{4}$) of something is what you have if you cut the something into 4 equal pieces and take one of them. If you cut a pizza into 4 equal pieces, each piece will be a quarter.

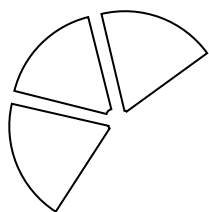
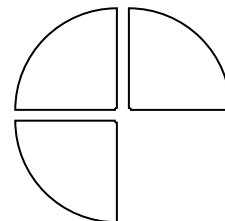


In the same way, $\frac{1}{2}$ is what you have if you cut something into 2 equal pieces and take one of them, $\frac{1}{12}$ is what you have if you cut something into 12 equal pieces and take one of them.



Note that the pieces **must be equal**. Or at least, the pieces must be of the size that they would be if the pizza was cut into equal pieces. In the pizza to the left, the top left piece is a quarter, but the other pieces aren't.

3 quarters (or $\frac{3}{4}$) means the amount of something you get if you cut it into 4 equal pieces and take 3 of them. This picture is $\frac{3}{4}$ of a pizza.



The bottom number in the fraction, the **denominator**, is the number of equal pieces the whole thing is broken into; the top number, the **numerator**, is the number of those pieces that you have. So $\frac{3}{5}$ (three fifths) is what you have if you cut something into 5 equal pieces and take 3 of them. The line between the numerator and the denominator is called the **vinculum**.

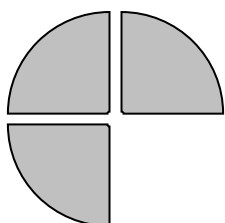
To get a feel for the size of a common fraction, look at the denominator (bottom number). This tells you how many equal parts the thing or number is divided into. Imagine the size of this. Then look at the numerator (top number) to see how many pieces you have. Then imagine that.

For instance with $\frac{4}{5}$, think of the size of 1 fifth, then take 4 of them. As 4 is nearly 5, $\frac{4}{5}$ will be nearly the whole lot.

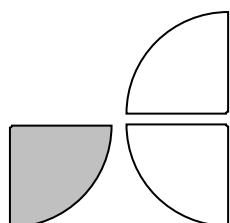


Common Fractions as Division

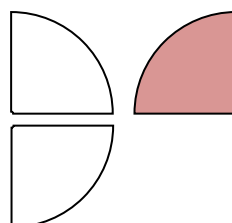
But $\frac{3}{4}$ also means $3 \div 4$. To convince yourself of this, think about sharing 3 pizzas between 4 people. They would get $\frac{3}{4}$ each. This is because 4 lots of $\frac{3}{4}$ is $\frac{12}{4}$ which is 3.



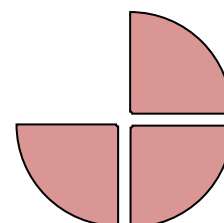
Person 1



Person 2



Person 3

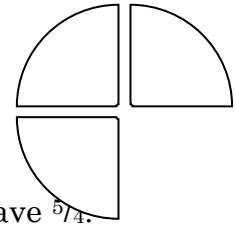
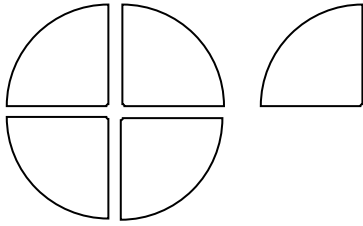


Person 4

Likewise, $\frac{4}{7}$ is the same as $4 \div 7$. The vinculum (/) means the same as \div . In fact, in many computer applications, / is used for \div .

Proper and Improper Fractions

Let's say you have pizzas cut into quarters. If you have 3 of these quarters, then you have $\frac{3}{4}$.



If you have 5 quarters, then you have $\frac{5}{4}$.

$\frac{5}{4}$ is more than a whole pizza, i.e. more than 1. Common fractions can be more than one. If they are, then there will be more pieces than what each whole was cut into. In other words the numerator will be bigger than the denominator. Fractions like this are sometimes called **improper fractions**. Don't ask why. They are quite proper really, but once upon a time, people didn't think so. In the same way, fractions smaller than 1 are sometimes called **proper fractions**.

Mixed Numbers

We can see that the $\frac{5}{4}$ of a pizza above is a whole one plus another quarter. This is another way of writing it – one and a quarter or $1\frac{1}{4}$. Note that we don't put a plus sign between the 1 and the $\frac{1}{4}$. This is understood.

Fractions bigger than one can always be written as a whole number plus a proper fraction. Other examples are $3\frac{3}{4}$, $5\frac{2}{7}$, $32\frac{1}{2}$ etc. Fractions written like this are called **mixed numbers**. This is because they are a mixture of a whole number and a fraction.

Improper fractions can be rewritten as mixed numbers and vice versa. For example

$$\frac{7}{4} = 1\frac{3}{4} = \frac{7}{4}$$

Practice

Q1 $\frac{3}{5}$ means 3 of 5 equal pieces of something, and it also means $3 \div 5$. Write both meanings for each of the following common fractions:

- (a) $\frac{4}{5}$ (b) $\frac{3}{4}$ (c) $\frac{18}{5}$ (d) $\frac{6}{6}$

Q2 Write as a common fraction:

- (a) 6 of 10 equal pieces of something (b) 4 of 9 equal pieces
(c) 7 quarters (d) one fifth
(e) 2 whole ones and 3 quarters (f) 4 wholes plus 7 of 12 equal pieces
(g) $7 \div 10$ (h) $1 \div 8$ (i) $14 \div 5$

Q3 For each of the following, draw a square and shade the given fraction of it:

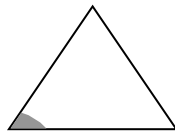
- (a) $\frac{1}{2}$ (b) $\frac{3}{8}$ (c) $\frac{7}{9}$

Q4 For each of the following shapes, write the approximate fraction which is shaded as a common fraction.

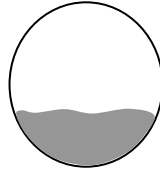
(a)



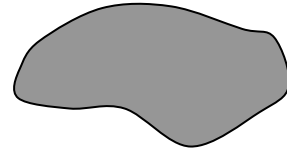
(b)



(c)



(d)



Q5 Draw a number line from 0 to 2 and put the following fractions on it.

(a) $\frac{3}{5}$

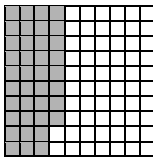
(b) $1\frac{1}{8}$

(c) $\frac{17}{10}$

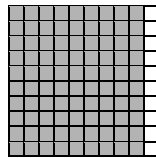
Percentages

It can be hard to compare fractions with different denominators. For example, which is most: $\frac{2}{5}$ of a cake or $\frac{3}{8}$ of the cake? Because of this we often use denominators of 100. It is obvious that $\frac{38}{100}$ is more than $\frac{36}{100}$.

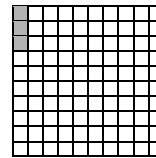
In fact, we use hundredths so much that they are given another name – *percent*, usually written %. **Percent** just means *hundredths*, so 38% is $\frac{38}{100}$, 90% means $\frac{90}{100}$, 3% means $\frac{3}{100}$ and so on.



38% shaded



90% shaded



3% shaded

Remember: **'percent' just means 'hundredths'**

Practice

Q6 (a) What does 34% mean?
 (b) Write it as a common fraction.

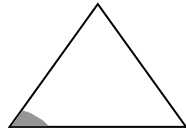
Q7 For each of the following, draw a square and shade the given percentage of it:
 (a) 7% (b) 90% (c) 33%

Q8 For each of the following shapes, write the approximate fraction which is shaded as a percent.

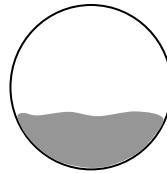
(a)



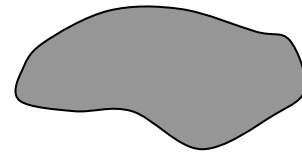
(b)



(c)



(d)



Q9 Draw a number line from 0 to 2 and put the following fractions on it. Just write the letters.

(a) 18%

(b) 100%

(c) 191%

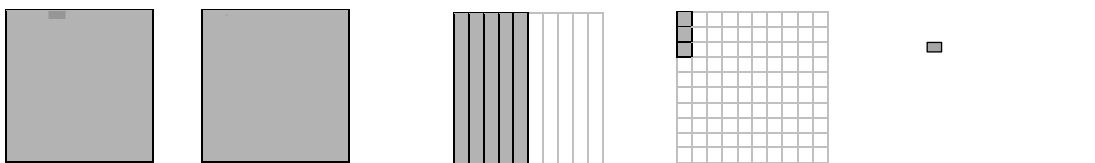
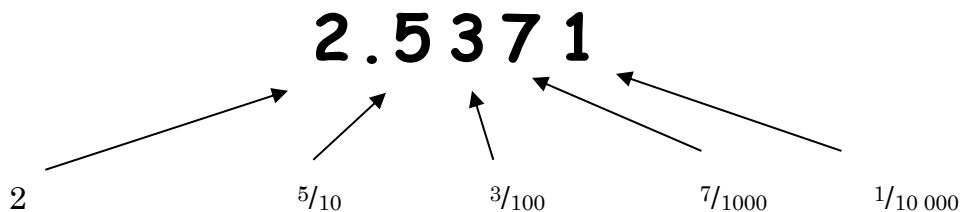
(d) 50%

Decimal Fractions

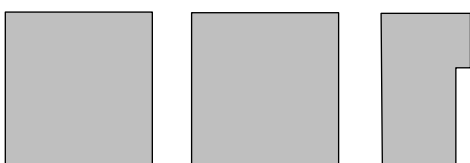
The place-by-place way of thinking about decimal fractions

Think about the number 2.5371. Suppose it is 2.5371 slices of bread. The 2 is the whole slices or the ones, the 5 is the tenths, the 3 is the hundredths, the 7 is the thousandths and the 1 is the ten-thousandths.

So $2.5371 = 2 + \frac{5}{10} + \frac{3}{100} + \frac{7}{1000} + \frac{1}{10\,000}$



Put together, 2.5371 slices looks like this:



Each place contains numbers which are a tenth the size of numbers in the previous place. A tenth is a tenth of a one, a hundredth is a tenth of a tenth and so on. The further to the right of the decimal point a digit is, the smaller is the amount it represents and so the less important it is.

To get a feel for the size of a decimal fraction, just read the first decimal place. If this is say a 4, then the fraction is between 4 tenths and 5 tenths. If you need to be more accurate, then read the next number also.

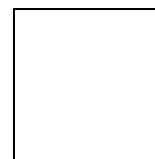
Normally we don't bother to name the places after the decimal point separately. We would read the number above as 'two point five three seven one'.

The all-together way of thinking about decimal fractions

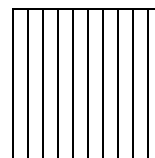
Now think about the number 0.37. Reading it place by place, this is 3 tenths and 7 hundredths. But it can also be read all together as 37 hundredths, i.e. $\frac{37}{100}$.

To see why, let us imagine that it is 0.37 of a square slice of bread.

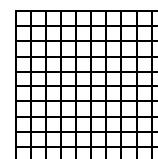
The slice of bread might look like this:



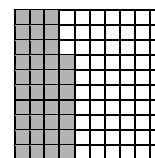
We could divide the slice into 10 strips like this:
Each strip would be a tenth of the slice.



Then we could divide each strip into 10 squares like this:
Each square would be a hundredth of the slice.



0.37 of the slice would be three tenths and seven hundredths.
This is three strips and 7 small squares.



But we can see that this is also 37 small squares,
i.e. 37 hundredths.

Any decimal fraction can be thought of place by place and all together. For example, take 0.374.

Place by place, this is 3 tenths, 7 hundredths and 4 thousandths.

All together it is 374 thousandths or $\frac{374}{1000}$.

The all-together way of reading it is really just reading it as a common fraction. To read a decimal fraction as a common fraction, just find what decimal place the last digit is in. This is the denominator. Then read the number ignoring the decimal point. This is the numerator.

So, 0.28 is $\frac{28}{100}$
 0.395 is $\frac{395}{1000}$
 0.045 is $\frac{45}{1000}$
 0.0036 is $\frac{36}{10\ 000}$
 2.97 is $\frac{297}{100}$
 12.5 is $\frac{125}{10}$ and so on.

Practice

Q10 0.51 means 5 tenths and 1 hundredth and it means 51 hundredths. Write both meanings of the following decimal fractions:

- | | | | |
|-------------|------------|-----------|-----------|
| (a) 0.29 | (b) 0.348 | (c) 0.106 | (d) 0.088 |
| (e) 0.00215 | (f) 3.75 | (g) 14.1 | (h) 4.006 |
| (i) 20.73 | (j) 1.4107 | | |

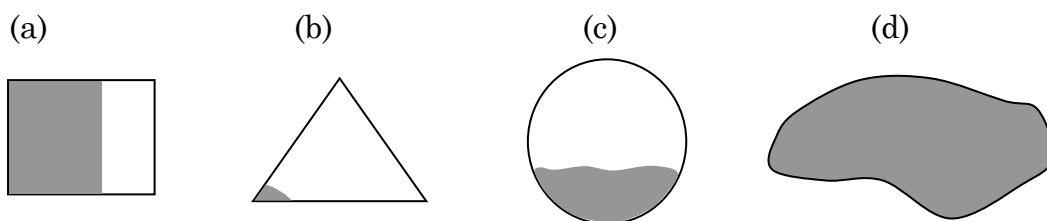
Q11 Write the following numbers as decimal fractions:

- | | |
|--------------------------------------|------------------------|
| (a) 3 and 7 tenths and 2 thousandths | (b) 49 hundredths |
| (c) 51 thousandths | (d) 87 tenths |
| (e) 2405 hundredths | (f) 37 ten-thousandths |

Q12 For each of the following, draw a square and shade the given fraction of it:

- | | | | |
|---------|----------|----------|----------|
| (a) 0.2 | (b) 0.65 | (c) 0.01 | (d) 0.40 |
|---------|----------|----------|----------|

Q13 For each of the following shapes, write the approximate fraction which is shaded as a decimal fraction.



Q14 Draw a number line from 0 to 2 and put the following fractions on it. Just write the letters.

- | | | |
|---------|----------|-----------|
| (a) 0.8 | (b) 0.05 | (c) 1.305 |
|---------|----------|-----------|

4 out of 3 people have trouble with fractions

Solve

Q51 By estimation, arrange these common fractions from smallest to biggest:

$\frac{3}{4}$ $1\frac{1}{3}$ $\frac{5}{3}$ $\frac{9}{10}$ $\frac{3}{5}$ $\frac{1}{2}$ $\frac{5}{8}$ $2\frac{1}{10}$ $\frac{4}{25}$ $\frac{1}{6}$ $\frac{9}{4}$

Q52 Arrange these decimal fractions from smallest to biggest:

0.6 0.12 0.2 1.03 1.1 0.659 0.6510 0.65 0.66 0.65^{*}

Revise

Revision Set 1

Q61 (a) Write $\frac{3}{10}$ in terms of division

(b) Write $2 \div 5$ as a common fraction

Q62 (a) Draw a square and shade $\frac{3}{7}$ of it

(b) As a common fraction, write the approximate fraction of this rectangle which is shaded



Q63 (a) What does 79% mean

(b) Write 7% as a common fraction

Q64 (a) Draw a square and shade 60% of it

(b) Roughly what percentage of this rectangle is shaded?



Q65 0.51 means 5 tenths and 1 hundredth and it means 51 hundredths. Write both meanings of the following decimal fractions:

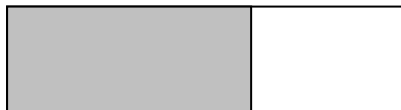
(a) 0.316 (b) 7.2

Q66 Write the following numbers as decimal fractions:

(a) 5 and 7 tenths and 9 thousandths (b) 368 hundredths

Q67 (a) Draw a square and shade roughly 0.712 of it.

(b) Approximately what decimal fraction of this rectangle is shaded?



Q68 Draw a number line from 0 to 2 and put the following fractions on it.

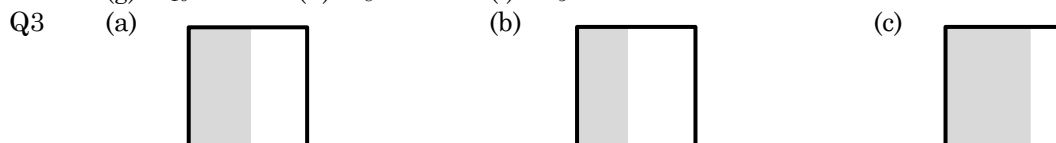
(a) $\frac{5}{8}$ (b) $\frac{8}{5}$ (c) $1\frac{1}{20}$
(d) 62% (e) 8% (f) 175%
(g) 0.32 (h) 1.055 (i) 1.7

Answers

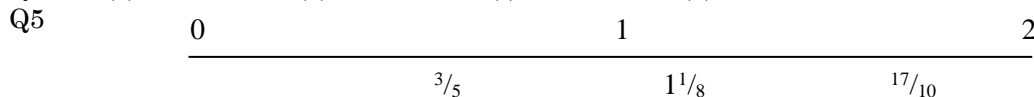
Your answers to the approximation questions may be a bit different from those given.

- Q1 (a) 4 of 5 equal pieces, $4 \div 5$ (b) 3 of 4 equal pieces, $3 \div 4$
 (c) 18 pieces each one fifth, $18 \div 5$ (d) 6 of 6 equal pieces, $6 \div 6$

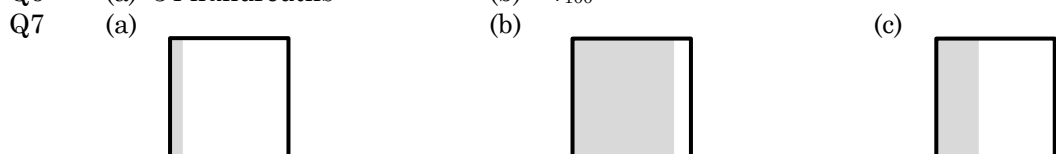
- Q2 (a) $\frac{6}{10}$ (b) $\frac{4}{9}$ (c) $\frac{7}{4}$ (d) $\frac{1}{5}$ (e) $2\frac{3}{4}$ (f) $\frac{47}{12}$
 (g) $\frac{7}{10}$ (h) $\frac{1}{8}$ (i) $\frac{14}{5}$



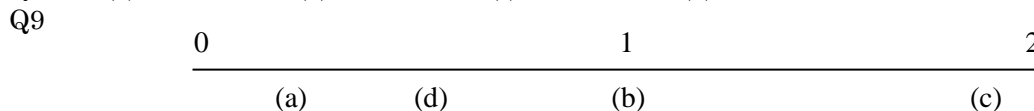
- Q4 (a) $\frac{6}{10}$ (b) $\frac{1}{40}$ (c) $\frac{1}{3}$ (d) 1



- Q6 (a) 34 hundredths (b) $\frac{34}{100}$

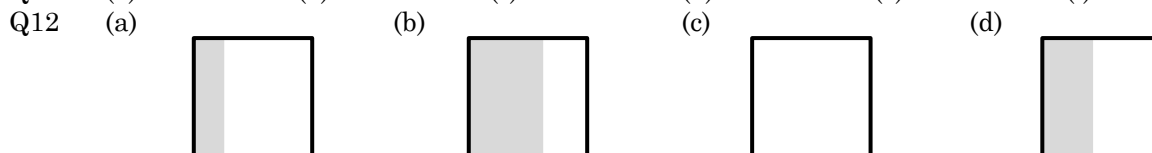


- Q8 (a) 60% (b) 2% (c) 30% (d) 100%

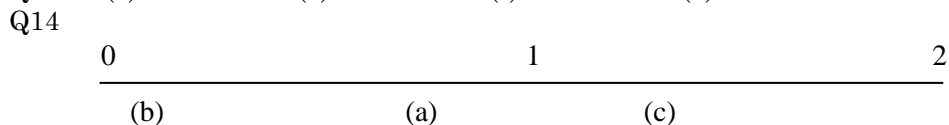


- Q10 (a) 2 tenths and 9 hundredths, 29 hundredths
 (b) 3 tenths, 4 hundredths and 8 thousandths, 348 thousandths
 (c) 1 tenth, and 6 thousandths, 106 thousandths
 (d) 8 hundredths and 8 thousandths, 88 thousandths
 (e) 2 thousandths, one ten-thousandth and 5 hundred-thousandths, 215 hundred-thousandths
 (f) 3, 7 tenths and 5 hundredths, 375 hundredths
 (g) 14 and 1 tenth, 141 tenths
 (h) 4 and 6 thousandths, 4006 thousandths
 (i) 2 tens, 7 tenths and 3 hundredths, 2073 hundredths
 (j) 1, 4 tenths, 1 hundredth and 7 ten-thousandths, 14 107 ten-thousandths

- Q11 (a) 3.702 (b) 0.49 (c) 0.051 (d) 8.7 (e) 24.05 (f) 0.0037



- Q13 (a) 0.6 (b) 0.02 (c) 0.3 (d) 1.0



- Q51 $\frac{4}{25}$ $\frac{1}{6}$ $\frac{1}{2}$ $\frac{3}{5}$ $\frac{5}{8}$ $\frac{3}{4}$ $\frac{9}{10}$ $1\frac{1}{3}$ $\frac{5}{3}$ $2\frac{1}{10}$ $\frac{9}{4}$

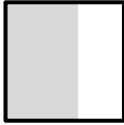
- Q52 0.12 0.2 0.6 0.65 0.6510 0.65̇ 0.659 0.66 1.03 1.1

- Q61 (a) $3 \div 10$ (b) $\frac{2}{5}$

Q62 (a) (b) $\frac{5}{6}$

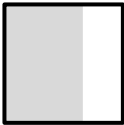


Q63 (a) 79 hundredths (b) $\frac{7}{100}$
Q64 (a) (b) 20%



Q65 (a) 3 tenths and one hundredth and 6 thousandths, 316 thousandths
(b) 7 and 2 tenths, 72 tenths

Q66 (a) 5.709 (b) 3.68
Q67 (a) (b) 0.6



Q68 0 1 2

(e) (g) (a) (c) (b) (i)(f)
(d) (d)