

Mathletics

Percentage Calculation Worksheets



Student book

Year 8



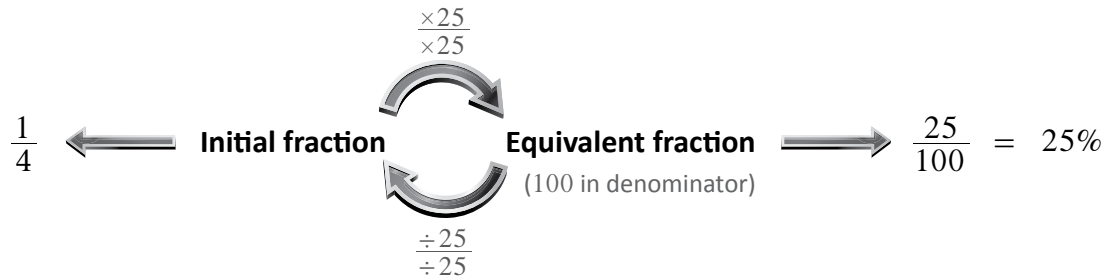
Fractions and percentages

Percent (%) = for every (per) 100 (cent)

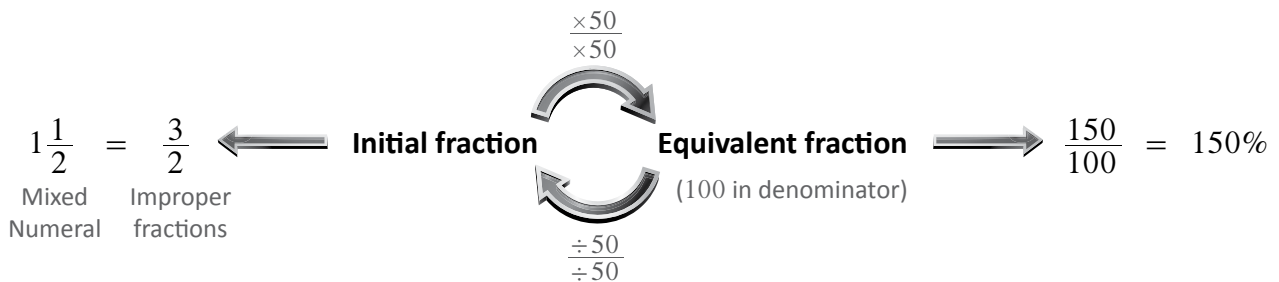
$\therefore 50\%$ means 50 for every 100, which as a fraction = $\frac{50}{100} = \frac{1}{2}$ ← Always write in simplest form

To change fractions to a percentage, write as an **equivalent fraction** with a denominator of 100.

- Proper fractions (for amounts smaller than the whole and percentages $< 100\%$)



- Mixed numerals and improper fractions (for amounts larger than the whole and percentages $> 100\%$)



Another simple way to change fractions to a percentage is by multiplying the fraction by 100.

$$\frac{1}{4} = \left(\frac{1}{4} \times 100\right)\% = 25\%$$

$$\frac{3}{2} = \left(\frac{3}{2} \times 100\right)\% = 150\%$$

Convert these fractions and percentages using the method given

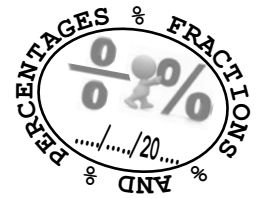
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|---|---|--|
| (i) 75% (Equivalent fraction method) | $75\% = \frac{75}{100}$
$= \frac{3}{4}$ | Percent signs means 'over 100'

Simplify fraction |
| (ii) $\frac{8}{200}$ (Equivalent fraction method) | $\frac{8}{200} = \frac{8 \div 2}{200 \div 2}$
$= \frac{4}{100}$
$= 4\%$ | Divide numerator and denominator by 2

Equivalent fraction with 100 as denominator |
| (iii) $\frac{6}{5}$ (Multiplication method) | $\frac{6}{5} = \left(\frac{6}{5} \times 100\right)\%$
$= 120\%$ | Multiply fraction by 100 |



Fractions and percentages



1 Write these fractions as a percentage.

a $\frac{3}{100} = \boxed{}\%$ b $\frac{41}{100} = \boxed{}\%$ c $\frac{110}{100} = \boxed{}\%$ d $\frac{200}{100} = \boxed{}\%$

2 Write these percentages as a fraction.

a $7\% = \frac{\boxed{}}{\boxed{}}$ b $89\% = \frac{\boxed{}}{\boxed{}}$ c $117\% = \frac{\boxed{}}{\boxed{}}$ d $336\% = \frac{\boxed{}}{\boxed{}}$

3 Write these percentages as a fraction with 100 in the denominator and then simplify.

a $20\% = \frac{\boxed{}}{100} = \frac{\boxed{}}{\boxed{}}$ Simplified b $15\% = \frac{\boxed{}}{100} = \frac{\boxed{}}{\boxed{}}$ Simplified c $80\% = \frac{\boxed{}}{100} = \frac{\boxed{}}{\boxed{}}$ Simplified

d $24\% = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$ Simplified e $42\% = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$ Simplified f $96\% = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$ Simplified

g $125\% = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$ Simplified improper h $180\% = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$ Simplified improper i $350\% = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$ Simplified improper

4 Write these as equivalent fractions with a denominator of 100 and then as a percentage.

a $\frac{24}{300} = \frac{24 \div \boxed{}}{300 \div \boxed{}} = \frac{\boxed{}}{100} = \boxed{}\%$ b $\frac{48}{200} = \frac{48 \div \boxed{}}{200 \div \boxed{}} = \frac{\boxed{}}{\boxed{}} = \boxed{}\%$ c $\frac{175}{500} = \frac{175 \div \boxed{}}{500 \div \boxed{}} = \frac{\boxed{}}{\boxed{}} = \boxed{}\%$



Fractions and percentages

5 Write these as equivalent fractions with a denominator of 100 and then as a percentage.

$$\begin{aligned} \text{a} \quad \frac{3}{10} &= \frac{3 \times \boxed{}}{10 \times \boxed{}} \\ &= \frac{\boxed{}}{\boxed{100}} \\ &= \boxed{}\% \end{aligned}$$

$$\begin{aligned} \text{b} \quad \frac{12}{25} &= \frac{12 \times \boxed{}}{25 \times \boxed{}} \\ &= \frac{\boxed{}}{\boxed{}} \\ &= \boxed{}\% \end{aligned}$$

$$\begin{aligned} \text{c} \quad \frac{6}{5} &= \frac{6 \times \boxed{}}{5 \times \boxed{}} \\ &= \frac{\boxed{}}{\boxed{}} \\ &= \boxed{}\% \end{aligned}$$

6 Write these as equivalent mixed numerals with a denominator of 100 and then as a percentage.

$$\begin{aligned} \text{a} \quad 3\frac{1}{2} &= \frac{\boxed{7} \times \boxed{50}}{2 \times \boxed{50}} \\ &= \frac{\boxed{350}}{\boxed{100}} \\ &= \boxed{350}\% \end{aligned}$$

$$\begin{aligned} \text{b} \quad 2\frac{1}{4} &= \frac{\boxed{} \times \boxed{}}{4 \times \boxed{}} \\ &= \frac{\boxed{}}{\boxed{100}} \\ &= \boxed{}\% \end{aligned}$$

$$\begin{aligned} \text{c} \quad 1\frac{2}{5} &= \frac{\boxed{} \times \boxed{}}{5 \times \boxed{}} \\ &= \frac{\boxed{}}{\boxed{100}} \\ &= \boxed{}\% \end{aligned}$$

7 Use the multiplication method to write these fractions as percentages.

$$\text{a} \quad \frac{1}{2} = \boxed{}\%$$

$$\text{b} \quad \frac{1}{5} = \boxed{}\%$$

$$\text{c} \quad \frac{8}{25} = \boxed{}\%$$

$$\text{d} \quad \frac{13}{50} = \boxed{}\%$$

$$\text{e} \quad \frac{5}{2} = \boxed{}\%$$

$$\text{f} \quad \frac{15}{20} = \boxed{}\%$$

8 Change these to improper fractions and use the multiplication method to change to a percentage.

$$\text{a} \quad 2\frac{2}{5} = \frac{\boxed{}}{\boxed{}} = \boxed{}\%$$

$$\text{b} \quad 3\frac{3}{4} = \frac{\boxed{}}{\boxed{}} = \boxed{}\%$$

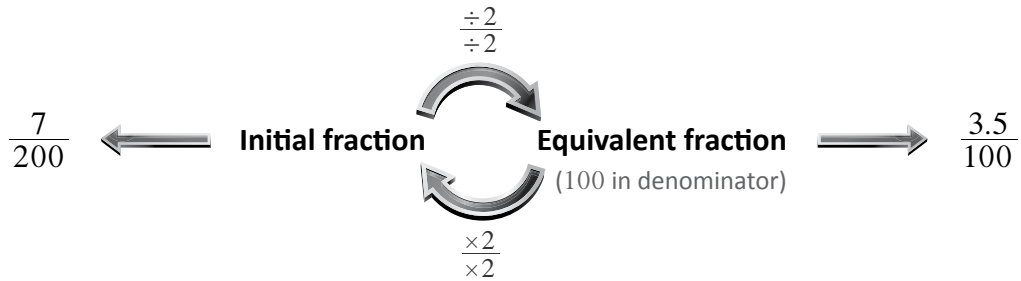
$$\text{c} \quad 1\frac{7}{20} = \frac{\boxed{}}{\boxed{}} = \boxed{}\%$$

$$\text{d} \quad 4\frac{9}{25} = \frac{\boxed{}}{\boxed{}} = \boxed{}\%$$



Fractions and percentages

Sometimes the equivalent fraction with a denominator of 100 has a decimal numerator.



So the equivalent percentages in all forms (decimal, mixed number and improper fraction) are:

$$\therefore \frac{7}{200} = 3.5\% = 3\frac{1}{2}\% = \frac{7}{2}\%$$

Decimal Mixed numeral Improper fraction

9 Write these as a percentage in decimal and mixed numeral form.

a $\frac{13}{500} = \frac{\boxed{}}{100} = \boxed{}\% = \boxed{}\frac{\boxed{}}{\boxed{}}\%$

Decimal Mixed numeral

b $\frac{30}{800} = \frac{\boxed{}}{100} = \boxed{}\% = \boxed{}\frac{\boxed{}}{\boxed{}}\%$

Decimal Mixed numeral

c $\frac{17}{400} = \frac{\boxed{}}{\boxed{}} = \boxed{}\% = \boxed{}\frac{\boxed{}}{\boxed{}}\%$

Decimal Mixed numeral

d $\frac{26}{500} = \frac{\boxed{}}{\boxed{}} = \boxed{}\% = \boxed{}\frac{\boxed{}}{\boxed{}}\%$

Decimal Mixed numeral

e $\frac{47}{500} = \frac{\boxed{}}{\boxed{}} = \boxed{}\% = \boxed{}\frac{\boxed{}}{\boxed{}}\%$

Decimal Mixed numeral

f $\frac{42}{400} = \frac{\boxed{}}{\boxed{}} = \boxed{}\% = \boxed{}\frac{\boxed{}}{\boxed{}}\%$

Decimal Mixed numeral

10 Write these as a percentage in decimal and improper fraction form.

a $\frac{3}{200} = \frac{\boxed{}}{100} = \boxed{}\% = \frac{\boxed{}}{\boxed{}}\%$

Decimal Improper fraction

b $\frac{7}{500} = \frac{\boxed{}}{\boxed{}} = \boxed{}\% = \frac{\boxed{}}{\boxed{}}\%$

Decimal Improper fraction

c $\frac{9}{800} = \frac{\boxed{}}{\boxed{}} = \boxed{}\% = \frac{\boxed{}}{\boxed{}}\%$

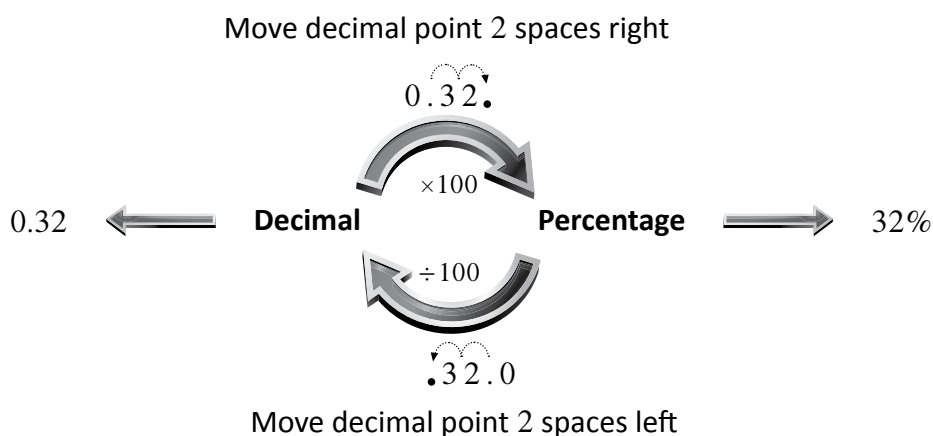
Decimal Improper fraction

d $\frac{9}{750} = \frac{\boxed{}}{\boxed{}} = \boxed{}\% = \frac{\boxed{}}{\boxed{}}\%$

Decimal Improper fraction

Decimals and percentages

Changing between decimals and percentages is all about multiplying and dividing by 100.



Let's look at two more examples moving in opposite directions.

Write these as their equivalent percentage or decimal

(i) 1%	$1\% = 1 \div 100$ $= 0.01$ $= 0.01$	Divide by 100 to get equivalent decimal Move decimal point 2 spaces left Equivalent decimal
(ii) 0.7	$0.7 = (0.7 \times 100)\%$ $= 70\%$ $= 70\%$	Multiply by 100 to get equivalent percentage Move decimal point 2 spaces right Equivalent percentage
(iii) 0.025	$0.025 = (0.025 \times 100)\%$ $= 2.5\%$ or $2\frac{1}{2}\%$ or $\frac{3}{2}\%$	Multiply by 100 to get equivalent percentage Move decimal point 2 spaces right Equivalent percentage in all forms
(iv) 101.5%	$101.5\% = 101.5 \div 100$ $= 1.015$ $= 1.015$ $= 1\frac{15}{1000} \quad (= 1\frac{3}{200})$	Divide by 100 to get equivalent decimal Move decimal point 2 spaces left Equivalent decimal Equivalent mixed numeral



Decimals and percentages

1 Write these percentages as a decimal.

a $15\% =$

b $20\% =$

c $4\% =$

d $9\% =$

e $125\% =$

f $250\% =$

g $110\% =$

h $305\% =$

2 Write these decimals as percentages.

a $0.03 =$ %

b $0.16 =$ %

c $1.12 =$ %

d $2.45 =$ %

e $0.125 =$ %

f $0.253 =$ %

g $0.018 =$ %

h $0.2225 =$ %

3 Write these decimals as decimal percentages and either mixed numeral or improper fractions.

a $0.015 =$ %
Decimal

b $0.185 =$ %
Decimal

c $0.012 =$ %
Decimal

d $0.458 =$ %
Decimal

$= \frac{\text{$ }{} %
Improper fraction

$= \text{$ $\frac{\text{$ }{ %
Mixed numeral

$= \frac{\text{$ }{} %
Improper fraction

$= \text{$ $\frac{\text{$ }{ %
Mixed numeral

4 Write these percentages as decimals, mixed numerals and improper fractions.

a $155\% =$ = $\frac{\text{$ }{ = $\frac{\text{$ }{
Decimal Mixed numeral Improper fraction

b $218\% =$ = $\frac{\text{$ }{ = $\frac{\text{$ }{
Decimal Mixed numeral Improper fraction

c $100.5\% =$ = $\frac{\text{$ }{ = $\frac{\text{$ }{
Decimal Mixed numeral Improper fraction

d $220.4\% =$ = $\frac{\text{$ }{ = $\frac{\text{$ }{
Decimal Mixed numeral Improper fraction

e $375.20\% =$ = $\frac{\text{$ }{ = $\frac{\text{$ }{
Decimal Mixed numeral Improper fraction

f $125.8\% =$ = $\frac{\text{$ }{ = $\frac{\text{$ }{
Decimal Mixed numeral Improper fraction

**Decimals and percentages**

5 Write each of these percentages in all their equivalent forms:

a 25%

b 5.5%

c $4\frac{3}{4}\%$

d $2\frac{1}{8}\%$

e 112.5%

f 237.2%

g 17.25%

h $7\frac{3}{16}\%$

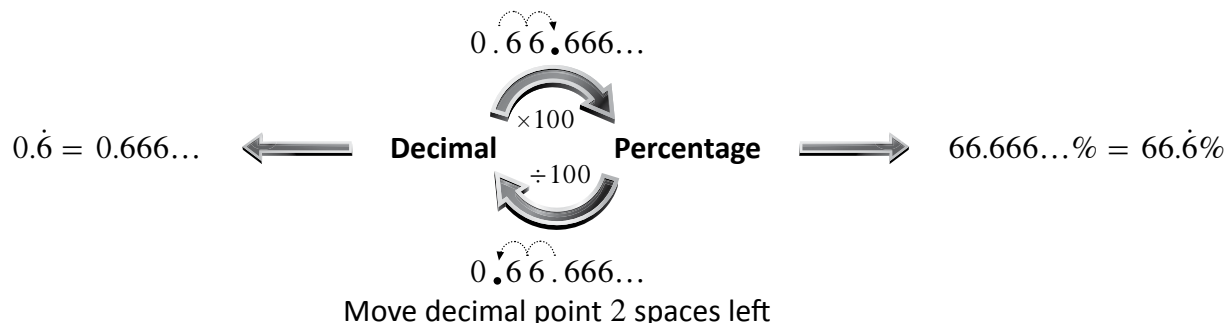
i 2.375%

j $100\frac{5}{8}\%$

Recurring decimals and percentages

Recurring decimals are treated just like terminating decimals when changing to percentages.

Move decimal point 2 spaces right



It is usually nicer to write recurring decimals as a mixed numeral percentage where possible.

$$\therefore 66.\dot{6}\% = 66\frac{6}{9}\% = 66\frac{2}{3}\%$$

Always simplify



These tables show that there are patterns for writing simple recurring decimals as fractions:

$0.\dot{1} = \frac{1}{9}$	$0.\dot{2} = \frac{2}{9}$	$0.\dot{3} = \frac{1}{3}$	$0.\dot{4} = \frac{4}{9}$	$0.\dot{5} = \frac{5}{9}$	$0.\dot{6} = \frac{2}{3}$	$0.\dot{7} = \frac{7}{9}$	$0.\dot{8} = \frac{8}{9}$	$0.\dot{9} = \frac{9}{9} = 1$
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$0.0\dot{1} = \frac{1}{90}$	$0.0\dot{2} = \frac{2}{90} = \frac{1}{45}$	and so on...	$0.2\dot{1} = \frac{2}{10} + \frac{1}{90} = \frac{19}{90}$	$0.03\dot{5} = \frac{3}{100} + \frac{5}{900} = \frac{8}{225}$	and so on...
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Here are some more examples with slight differences involving recurring decimals

(i) Convert $0.00\dot{4}$ to its equivalent percentage value.

Remember:
Change so the
recurring pattern
starts from the
decimal point.



$$0.00\dot{4} = 0.00444...$$

$$= (0.00444... \times 100)\% \text{ Multiply the decimal by 100}$$

$$= 0.444...\%$$

$$= 0.\dot{4}\%$$

Recurring decimal percentage

$$= \frac{4}{9}\%$$

Percentage form from the table

(ii) Convert $2\frac{2}{3}\%$ to its equivalent decimal and fraction values.

$$2\frac{2}{3}\% = 2.\dot{6}\%$$

$$= 2.\dot{6} \div 100$$

Divide by 100

$$= 0.\dot{0}2.\dot{6}66...$$

Decimal point moves two spaces to the left

$$= 0.02\dot{6}$$

Equivalent recurring decimal

$$0.02\dot{6} = \frac{2}{100} + \frac{6}{900}$$

$$= \frac{2}{75}$$

Equivalent fraction



Recurring decimals and percentages

$$0.0\dot{1} = \frac{1}{90} \quad 0.0\dot{2} = \frac{2}{90} = \frac{1}{45} \quad \text{and so on...} \quad 0.2\dot{1} = \frac{2}{10} + \frac{1}{90} = \frac{19}{90} \quad 0.03\dot{5} = \frac{3}{100} + \frac{5}{900} = \frac{8}{225} \quad \text{and so on...}$$

- 1 Use the tables above to help write these percentages as fractions.

a $0.\dot{1}\% = \frac{\boxed{}}{\boxed{}}\%$ **b** $0.\dot{5}\% = \frac{\boxed{}}{\boxed{}}\%$ **c** $0.0\dot{7}\% = \frac{\boxed{}}{\boxed{}}\%$ **d** $0.0\dot{6}\% = \frac{\boxed{}}{\boxed{}}\%$

- 2 Use the tables above to help write these percentages as the sum of two fractions then simplify.

a $0.1\dot{3}\% = \frac{\boxed{}}{\boxed{}} + \frac{\boxed{}}{\boxed{}}\% = \frac{\boxed{}}{\boxed{}}\%$

c $0.08\dot{3} = \frac{\boxed{}}{\boxed{}} + \frac{\boxed{}}{\boxed{}}\% = \frac{\boxed{}}{\boxed{}}\%$

b $0.3\dot{8}\% = \frac{\boxed{}}{\boxed{}} + \frac{\boxed{}}{\boxed{}}\% = \frac{\boxed{}}{\boxed{}}\%$

d $0.05\dot{7}\% = \frac{\boxed{}}{\boxed{}} + \frac{\boxed{}}{\boxed{}}\% = \frac{\boxed{}}{\boxed{}}\%$

- 3** Convert these mixed numeral percentages into their equivalent decimals and fractions.

<p>a $23\frac{1}{3}\%$ = % = </p> <p style="text-align: center; margin-top: 10px;">Decimal form Equivalent decimal</p> <div style="text-align: center; margin-top: 20px;"> = </div> <p style="text-align: center; margin-top: 10px;">Fraction</p>	<p>b $14\frac{4}{9}\%$ = % = </p> <p style="text-align: center; margin-top: 10px;">Decimal form Equivalent decimal</p> <div style="text-align: center; margin-top: 20px;"> = </div> <p style="text-align: center; margin-top: 10px;">Fraction</p>
<p>c $5\frac{1}{9}\%$ = % = </p> <p style="text-align: center; margin-top: 10px;">Decimal form Equivalent decimal</p> <div style="text-align: center; margin-top: 20px;"> = </div> <p style="text-align: center; margin-top: 10px;">Fraction</p>	<p>d $9\frac{2}{3}\%$ = % = </p> <p style="text-align: center; margin-top: 10px;">Decimal form Equivalent decimal</p> <div style="text-align: center; margin-top: 20px;"> = </div> <p style="text-align: center; margin-top: 10px;">Fraction</p>



Recurring decimals and percentages

- 4 Join each equivalent percentage, decimal and fraction with straight lines to create symmetrical triangle art.

● $0.02\dot{1}$

● $0.20\dot{9}$

● $30\frac{1}{3}\%$

● $2\frac{1}{9}\%$

● $\frac{1}{900}$

● $0.00\dot{1}$

● $\frac{91}{300}$

● $\frac{11}{300}$

● $0.20\dot{7}$

● $\frac{187}{900}$

● $7.\dot{6}\%$

● $20\frac{1}{9}\%$

● $0.05\dot{4}$

● $\frac{91}{300}$

● $0.0\dot{5}$

● $\frac{49}{900}$

● $5\frac{4}{9}\%$

● $\frac{4}{75}$

● $3\frac{2}{3}\%$

● $0.03\dot{6}$

● $\frac{23}{300}$

● $5.\dot{5}\%$

● $0.07\dot{6}$

● $\frac{5}{90}$

● $\frac{1}{9}\%$

● $5\frac{1}{3}\%$

● $0.05\dot{3}$

● $0.30\dot{3}$

● $20\frac{7}{9}\%$

● $\frac{19}{900}$



Recurring decimals and percentages

Here are some examples of the many other recurring decimals along with their equivalent fractions.

$$0.\dot{0}9 = 0.0909... = \frac{1}{11}$$

$$0.0\dot{4}5 = 0.04545... = \frac{1}{22}$$

$$0.0\dot{3}0 = 0.03030... = \frac{1}{33}$$

$$0.1\dot{6} = 0.1666... = \frac{1}{6}$$

$$0.08\dot{3} = 0.08383... = \frac{1}{12}$$

$$0.0\dot{5} = 0.0555... = \frac{1}{18}$$



Remember:
A dot is placed
above the first
and last digit of
the recurring
pattern.



To change the fraction into the recurring decimal, just divide the numerator (top) by the denominator (bottom) on your calculator.

5 Write these fractions as recurring decimals and then as equivalent percentages rounded to 1 d.p.

a $\frac{8}{11} = \boxed{} \div \boxed{}$
 $= \boxed{}$ Recurring decimal
 $= \boxed{} \times \boxed{}\%$
 $= \boxed{}\%$
 Equivalent percentage to 1 d.p.

b $\frac{19}{12} = \boxed{} \div \boxed{}$
 $= \boxed{}$ Recurring decimal
 $= \boxed{} \times \boxed{}\%$
 $= \boxed{}\%$
 Equivalent percentage to 1 d.p.

c $\frac{5}{6} = \boxed{}$
 Recurring decimal
 $= \boxed{}\%$
 Percentage to 1 d.p.

d $\frac{2}{15} = \boxed{}$
 Recurring decimal
 $= \boxed{}\%$
 Percentage to 1 d.p.

e $\frac{5}{18} = \boxed{}$
 Recurring decimal
 $= \boxed{}\%$
 Percentage to 1 d.p.

f $\frac{9}{22} = \boxed{}$
 Recurring decimal
 $= \boxed{}\%$
 Percentage to 1 d.p.

g $\frac{7}{12} = \boxed{}$
 Recurring decimal
 $= \boxed{}\%$
 Percentage to 1 d.p.

h $\frac{13}{33} = \boxed{}$
 Recurring decimal
 $= \boxed{}\%$
 Percentage to 1 d.p.

i $\frac{12}{11} = \boxed{}$
 Recurring decimal
 $= \boxed{}\%$
 Percentage to 1 d.p.

j $\frac{17}{15} = \boxed{}$
 Recurring decimal
 $= \boxed{}\%$
 Percentage to 1 d.p.

k $\frac{16}{12} = \boxed{}$
 Recurring decimal
 $= \boxed{}\%$
 Percentage to 1 d.p.

Mathletics



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