

## Decimals: Fractions in other forms

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### Overview



### Decimals



This presentation will cover:

- ▶ the link between fractions and decimals;
- ▶ converting between fractions and decimals;
- ▶ percentages; and
- ▶ rates.

- ▶ Decimals are just another way of writing fractions, and some would say a more convenient way, particularly when it comes to calculating.
- ▶ Decimals are special fractions where the denominators are powers of 10 (for example,  $10 = 10^1$ ,  $100 = 10^2$ ,  $1\,000 = 10^3$ ).

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## Decimals and fractions



Convert the following fractions to decimals:

1.  $\frac{1}{8}$
2.  $-\frac{7}{10}$
3.  $\frac{1}{3}$
4.  $-\frac{25}{11}$
5.  $1\frac{3}{4}$

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## Decimals and fractions: Answers



1.  $\frac{1}{8} = 1 \div 8 = 0.125.$
2.  $-\frac{7}{10} = -7 \div 10 = -0.7.$
3.  $\frac{1}{3} = 1 \div 3 = 0.333\dots = 0.\dot{3}.$
4.  $\frac{-25}{11} = -25 \div 11 \approx -2.27272727\dots = -2.\dot{2}\dot{7}.$
5.  $1\frac{3}{4} = \frac{7}{4} = 7 \div 4 = 1.75.$

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## Decimals and fractions



Convert the following decimals to fractions. Express your answer in simplest form.

1. 0.7
2. 0.8
3. 0.35
4. -0.58
5. 0.075
6. -0.625
7. 4.02

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## Decimals and fractions: Answers



1.  $0.7 = \frac{7}{10}.$
2.  $0.8 = \frac{\cancel{8}^4}{\cancel{10}^5} = \frac{4}{5}.$
3.  $0.35 = \frac{\cancel{35}^7}{\cancel{100}^{20}} = \frac{7}{20}.$
4.  $-0.58 = \frac{\cancel{-58}^{-29}}{\cancel{100}^{50}} = \frac{-29}{50}.$
5.  $0.075 = \frac{\cancel{75}^3}{\cancel{1000}^{40}} = \frac{3}{40}.$
6.  $-0.625 = \frac{\cancel{-625}^{-25}}{\cancel{1000}^{40}} = \frac{\cancel{-25}^{-5}}{\cancel{40}^8} = \frac{-5}{8}.$
7.  $4.02 = \frac{\cancel{402}^{201}}{\cancel{100}^{50}} = 4\frac{1}{50}.$

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## Fractions in Other Forms: percentages



In mathematics, a **percentage** is a way of expressing a number as a fraction of 100 (per cent meaning 'per hundred').

For example, 5% means  $\frac{5}{100}$ .

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## Converting a fraction to a percentage



When converting to a percentage, for a fraction and multiply by 100%:

$$\frac{a}{b} \xrightarrow{\times 100} \%.$$

For example: A student receives 15 marks out of a total of 20 for an assignment, what is the percentage of marks they received?

$$\frac{15}{20} \times 100\% = 75\%.$$

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## Converting from a percentage to a fraction or decimal

Divide the percentage by 100:

$$\frac{a}{b} \xleftarrow{\div} \%.$$

For example: Convert 65% to a

1. a fraction; and
2. a decimal.

Solution:

1.  $65\% = \frac{65}{100} = \frac{13}{20}$
2.  $65\% = 65 \div 100 = 0.65$ ,  
note the shift of the decimal place  
two places to the left.

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## Percentages: Exercises

Write each of the following as a percentage.

1. 8 out of 10
2. 250 mL out of 400 mL
3. 800 g out of 2 000 g
4. \$25 out of \$60
5. 50 mL out of 2 L
6.  $2 \times 10^4$  light years out of  $3.5 \times 10^3$  light years

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## Percentages: Answers

1. 8 out of 10 =  $\frac{8}{10} \times 100\% = 80\%$ .
2. 250 mL out of 400 mL =  $\frac{250}{400} \times 100\% = 62.5\%$ .
3. 800 g out of 2000 g =  $\frac{800}{2000} \times 100\% = 40\%$ .
4. \$25 out of \$60 =  $\frac{25}{60} \times 100\% = 41.7\%$ .
5. 50 mL out of 2 L =  $\frac{50}{2000} \times 100\% = 2.5\%$ .
6.  
 $2 \times 10^4$  light years out of  $3.5 \times 10^3$   
 $= \frac{2 \times 10^4}{3.5 \times 10^3} \times 100\%$   
 $\approx (0.5714 \times 10^{4-3}) \times 100\%$   
 $\approx 571.4\%$ .



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## Calculating a percentage increase or decrease



Percentage increase and percentage decrease are used in many different contexts.

To calculate the percentage change:

1. calculate the actual increase or decrease;
2. divide the increase or decrease by the original amount;
3. multiply by 100 to convert to a percentage.

$$\text{Percentage change} = \frac{\text{change amount}}{\text{original amount}} \times 100\%.$$

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## Percentage decrease example



The value of a car decreased from \$20 000 to \$16 000. Find the percentage decrease.

$$\begin{aligned} \text{The percentage decrease} &= \frac{\text{amount of decrease}}{\text{original amount}} \times 100\% \\ &= \frac{\$20\,000 - \$16\,000}{\$20\,000} \times 100\% \\ &= \frac{\$4\,000}{\$20\,000} \times 100\% \\ &= 20\%. \end{aligned}$$

Therefore the percentage decrease is 20%.

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## Percentage increase example



An item of jewellery increased in value from \$16 000 to \$20 000.

$$\begin{aligned} \text{The percentage increase} &= \frac{\text{amount of increase}}{\text{original amount}} \times 100\% \\ &= \frac{\$20\,000 - \$16\,000}{\$16\,000} \times 100\% \\ &= \frac{\$4\,000}{\$16\,000} \times 100\% \\ &= 25\%. \end{aligned}$$

Therefore the percentage increase is 25%.

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## Percentage change: Exercise



Calculate the percentage change (round any answer to 1 decimal place):

1. A product increases from \$15 to \$40.
2. Something increases from 75 to 135.
3. A product is reduced from \$250 to \$210.
4. A car depreciates from \$26 000 to \$19 000.

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## Percentage change: Answers



1.

$$\begin{aligned} & \text{Percentage increase} \\ &= \frac{\text{increase amount}}{\text{original amount}} \times 100\% \\ &= \frac{40 - 15}{15} \times 100\% \\ &= 166\frac{2}{3}\% \approx 166.7\% . \end{aligned}$$

2.

$$\begin{aligned} & \text{Percentage increase} \\ &= \frac{\text{increase amount}}{\text{original amount}} \times 100\% \\ &= \frac{135 - 75}{75} \times 100\% \\ &= 80\% . \end{aligned}$$

3.

$$\begin{aligned} & \text{Percentage decrease} \\ &= \frac{\text{decrease amount}}{\text{original amount}} \times 100\% \\ &= \frac{250 - 210}{250} \times 100\% \\ &= 16\% . \end{aligned}$$

4.

$$\begin{aligned} & \text{Percentage increase} \\ &= \frac{\text{increase amount}}{\text{original amount}} \times 100\% \\ &= \frac{26\,000 - 19\,000}{26\,000} \times 100\% \\ &\approx 19.2\% . \end{aligned}$$

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## Fractions in other forms: Rates



Complete the following.

1. 300 kilometres in 6 hours is a rate of  kilometres per hour.
2. \$27 for 9 metres is a rate of  dollars per metre.
3. 42 hectares in 7 days is a rate of  hectares per day.
4. 120 runs for 4 wickets is a rate of  runs per wicket.
5. \$320 for 40 hours work is a rate of  dollars per hour.

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## Rates: Answers



1. 300 kilometres in 6 hours is a rate of 50 kilometres per hour.
2. \$27 for 9 metres is a rate of 3 dollars per metre.
3. 42 hectares in 7 days is a rate of 6 hectares per day.
4. 120 runs for 4 wickets is a rate of 30 runs per wicket.
5. \$320 for 40 hours work is a rate of 8 dollars per hour.

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