

## 12. [Percentages]

Skill 12.1 Expressing a number out of 100 as a percentage.

MM7 1 2 2 3 3 4 4  
MM8 1 1 2 2 3 3 4 4

"Percent" means "per - hundred" or "of each hundred". The symbol used is " % "

**Q.** Express 75 out of 100 as a percentage.

**A.**  $\frac{75}{100} = 75\%$

Percent means out of 100.  
75 out of 100 is 75 percent.

**Q.** What percentage is 30 out of 100?

**A.**  $\frac{30}{100} = 30\%$

Percent means out of 100.  
30 out of 100 is 30 percent.

**a)** Express 50 out of 100 as a percentage.

50%

**b)** What percentage is 96 out of 100? .....

**c)** What percentage is 6 out of 100? .....

**d)** Express 100 out of 100 as a percentage. ....

**e)** Express 14 out of 100 as a percentage. ....

**f)** What percentage is 5 out of 100? .....

**g)** What percentage is 25 out of 100? .....

**h)** Express 60 out of 100 as a percentage. ....

**i)** Express 20 out of 100 as a percentage. ....

**j)** What percentage is 15 out of 100? .....

**k)** Express 80 out of 100 as a percentage. ....

**l)** What percentage is 75 out of 100? .....

Q. 17% of 100 =

A. 17% of 100  
= 17

17% means 17 of each 100 parts.  
17% of 100 is equal to 17.

Q. 4% of 300 =

A. 4% of 300  
= 12

4% means 4 of each 100 parts.  
4% of 3 lots of 100 is  
 $4 + 4 + 4 = 12$   
OR  
 $4 \times 3 = 12$ 

Q. 59% of \$1.00 =

A. 59% of \$1.00  
= 59% of 100c  
= 59c

59% means 59 of each 100 parts.  
\$1.00 can be written as 100c.  
59% of 100 cents is equal to 59 cents.

Q. 8% of \$4.00 =

A. 8% of \$4.00  
= 8% of 400c  
= 32c

8% means 8 of each 100 parts.  
\$4.00 can be written as 400c.  
8% of 400 cents is equal to  
8% of 4 lots of 100c or  
 $8c + 8c + 8c + 8c = 32c$   
OR  
 $8c \times 4 = 32c$ 

a) 52% of 100 =  
= 52

b) 25% of 100 =  
= .....

c) 8% of 100 =  
= .....

d) 40% of 100 =  
= .....

e) 30% of 400 =  
=  $30 \times 4$   
= 120

f) 60% of 500 =  
= .....  
= .....

g) 40% of 200 =  
= .....  
= .....

h) 20% of 600 =  
= .....  
= .....

i) 30% of \$1.00 =  
= 30 c

j) 69% of \$1.00 =  
= ..... c

k) 25% of \$1.00 =  
= ..... c

l) 7% of \$1.00 =  
= ..... c

m) 12% of \$4.00 =  
=  $12c \times 4$   
= 48 c

n) 10% of \$8.00 =  
= .....  
= ..... c

o) 6% of \$9.00 =  
= .....  
= \$ .....

p) 75% of \$6.00 =  
= .....  
= \$ .....

Percentage questions can be simplified using fractions.

<p><b>Q.</b> 12% of 50 =</p>	<p><b>A.</b> 12% of 50  <math>= \frac{12}{100} \times \frac{50}{1}</math>  <math>= \frac{600}{100}</math>  <math>= 6</math></p>	<p>Since: • 12% is <math>\frac{12}{100}</math>                  • “of” means <math>\times</math> rewrite the question as a multiplication.                  • 50 is <math>\frac{50}{1}</math></p> <p>Multiply the numerators together and denominators together.                  Simplify, if possible.                  OR                  We know 12% of 100 is 12. So, 12% of 50 would be half that.</p>
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<p><b>Q.</b> 30% of 80 =</p>	<p><b>A.</b> 30% of 80  <math>= \frac{30}{100} \times \frac{80}{1}</math>  <math>= \frac{2400}{100}</math>  <math>= 24</math></p>	<p>Since: • 30% is <math>\frac{30}{100}</math>                  • “of” means <math>\times</math> rewrite the question as a multiplication.                  • 80 is <math>\frac{80}{1}</math></p> <p>Multiply the numerators together and denominators together.                  Simplify, if possible.</p>
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- |   |  |   |   |
|---|--|---|---|
| <p><b>a)</b> 20% of 50 =<br/> <math>= \frac{20}{100} \times \frac{50}{1}</math><br/> <math>= \frac{1000}{100} = 10</math></p> | <p><b>b)</b> 10% of 60 =<br/>                 = .....<br/>                 = .....</p> | <p><b>c)</b> 30% of 20 =<br/>                 = .....<br/>                 = .....</p>  | <p><b>d)</b> 60% of 200 =<br/>                 = .....<br/>                 = .....</p> |
| <p><b>e)</b> 70% of 60 =<br/>                 = .....<br/>                 = .....</p>  | <p><b>f)</b> 50% of 40 =<br/>                 = .....<br/>                 = .....</p> | <p><b>g)</b> 80% of 90 =<br/>                 = .....<br/>                 = .....</p>  | <p><b>h)</b> 40% of 80 =<br/>                 = .....<br/>                 = .....</p>  |
| <p><b>i)</b> 75% of 200 =<br/>                 = .....<br/>                 = .....</p>                                       | <p><b>j)</b> 15% of 60 =<br/>                 = .....<br/>                 = .....</p> | <p><b>k)</b> 25% of 120 =<br/>                 = .....<br/>                 = .....</p> | <p><b>l)</b> 10% of 35 =<br/>                 = .....<br/>                 = .....</p>  |
| <p><b>m)</b> 12% of 1000 =<br/>                 = .....<br/>                 = .....</p>                                      | <p><b>n)</b> 5% of 12 =<br/>                 = .....<br/>                 = .....</p>  | <p><b>o)</b> 15% of 300 =<br/>                 = .....<br/>                 = .....</p> | <p><b>p)</b> 35% of 20 =<br/>                 = .....<br/>                 = .....</p>  |

**Skill 12.4** Finding 12.5%,  $33\frac{1}{3}\%$  or  $66\frac{2}{3}\%$  of a number.

For the following percentages it is worth remembering their equivalent fractions.

$$12.5\% = \frac{12.5}{100} = \frac{12.5 \times 2}{100 \times 2} = \frac{25}{200} = \frac{25 \div 25}{200 \div 25} = \frac{1}{8}$$

$$25\% = \frac{25}{100} = \frac{25 \div 25}{100 \div 25} = \frac{1}{4}$$

$$33\frac{1}{3}\% = \frac{33\frac{1}{3}}{100} = \frac{100}{3} \div 100 = \frac{1}{3}$$

$$33\frac{1}{3}\% = \frac{(33 \times 3) + 1}{3} = \frac{100}{3}$$

$$50\% = \frac{50}{100} = \frac{50 \div 50}{100 \div 50} = \frac{1}{2}$$

$$66\frac{2}{3}\% = \frac{66\frac{2}{3}}{100} = \frac{200}{3} \div 100 = \frac{2}{3}$$

$$75\% = \frac{75}{100} = \frac{75 \div 25}{100 \div 25} = \frac{3}{4}$$

$$66\frac{2}{3}\% = \frac{(66 \times 3) + 2}{3} = \frac{200}{3}$$

**Q.** 12.5% of 400 =

**A.** 12.5% of 400

Since  $12.5\% = \frac{1}{8}$ , substitute 12.5% with  $\frac{1}{8}$ .

$$= \frac{1}{8} \times \frac{400}{1}$$

Multiply the numerators together and denominators together.

$$= \frac{400}{8}$$

Simplify, if possible.

$$= 50$$

**Q.**  $33\frac{1}{3}\%$  of 60 =

**A.**  $33\frac{1}{3}\%$  of 60

Since  $33\frac{1}{3}\% = \frac{1}{3}$ , substitute  $33\frac{1}{3}\%$  with  $\frac{1}{3}$ .

$$= \frac{1}{3} \times \frac{60}{1}$$

Multiply the numerators together and denominators together.

$$= \frac{60}{3}$$

Simplify, if possible.

$$= 20$$

**a)**  $66\frac{2}{3}\%$  of 60 =

$$= \frac{2}{3} \times \frac{60}{1}$$

$$= \frac{120}{3} = 40$$

**b)**  $33\frac{1}{3}\%$  of 30 =

$$= \dots\dots\dots$$

$$= \dots\dots\dots$$

**c)** 12.5% of 800 =

$$= \dots\dots\dots$$

$$= \dots\dots\dots$$

**d)**  $33\frac{1}{3}\%$  of 540 =

$$= \dots\dots\dots$$

$$= \dots\dots\dots$$

**e)**  $66\frac{2}{3}\%$  of 450 =

$$= \dots\dots\dots$$

$$= \dots\dots\dots$$

**f)** 12.5% of 344 =

$$= \dots\dots\dots$$

$$= \dots\dots\dots$$

**g)** 25% of 800 =

$$= \dots\dots\dots$$

$$= \dots\dots\dots$$

**h)** 75% of 400 =

$$= \dots\dots\dots$$

$$= \dots\dots\dots$$

**i)** 50% of 170 =

$$= \dots\dots\dots$$

$$= \dots\dots\dots$$

**Q.** Express 48 out of 50 as a percentage.

**A.**  $\frac{48}{50} = \frac{?}{100}$   
 $\frac{48 \times 2}{50 \times 2} = \frac{96}{100}$   
 $\frac{96}{100} = 96\%$

Complete the equivalent fractions.  
 To get from 50 to 100 you must multiply by 2.  
 Do the same operation to the numerator.  $48 \times 2 = 96$   
 96 out of 100 is 96%.  
 OR  
 Divide 48 by 50 to get 0.96, which can be written as 96%.

**Q.** Express 45 out of 60 as a percentage.

**A.**  $\frac{45}{60} \div 5$   
 $= \frac{9}{12} \div 3 = \frac{3}{4}$   
 $\frac{3 \times 25}{4 \times 25} = \frac{?}{100}$   
 $\frac{75}{100} = 75\%$

Simplify by dividing 45 and 60 by a common factor till you reach the simplest form.  
 5 goes into 45 and 60.  
 3 goes into 9 and 12.  
 Complete the equivalent fractions. To get from 4 to 100 you must multiply by 25.  
 Do the same operation to the numerator.  $3 \times 25 = 75$

**a)** Express 30 out of 50 as a percentage.

$= \frac{30}{50} \times 2$   
 $= \frac{60}{100} = 60\%$

**b)** Express 20 out of 80 as a percentage.

$= \frac{20}{80} \div 20$   
 $= \frac{1}{4} \times 25 = \frac{25}{100} = 25\%$

**c)** Express 6 out of 10 as a percentage.

$=$   
 $=$

**d)** Express 40 out of 80 as a percentage.

$=$   
 $=$

**e)** Express 24 out of 30 as a percentage.

$=$   
 $=$

**f)** Express 6 out of 300 as a percentage.

$=$   
 $=$

**g)** What percentage is 12 out of 48?

$=$   
 $=$

**h)** What percentage is 12 out of 30?

$=$   
 $=$

**i)** What percentage is 14 out of 200?

$=$   
 $=$

To write a decimal as a percentage multiply by 100 and add the % sign.  
To multiply by 100 move the decimal point two places to the right.

**Q.** Express 0.68 as a percentage.

**A.**  $0.\widehat{68} = 68\%$

To write 0.68 as a percentage move the decimal point two places to the right and add the % sign.

**Q.** Express 0.3 as a percentage.

**A.**  $0.3$   
 $= 0.\widehat{30}$   
 $= 30\%$

For decimals with one digit after the decimal point, add a 0 in the hundredths column to fill the gap.

**a)** Express 1.60 as a percentage.

$1.\widehat{60} = 160\%$

**b)** Express 0.08 as a percentage.

$0.\widehat{08} = 8\%$

**c)** Express 0.65 as a percentage.

.....

**d)** Express 0.5 as a percentage.

.....

**e)** Express 0.32 as a percentage.

.....

**f)** Express 0.75 as a percentage.

.....

**g)** Express 1.4 as a percentage.

.....

**h)** Express 0.24 as a percentage.

.....

**i)** Express 0.05 as a percentage.

.....

**j)** Express 0.02 as a percentage.

.....

**k)** Express 0.15 as a percentage.

.....

**l)** Express 0.6 as a percentage.

.....

**m)** Express 0.25 as a percentage.

.....

**n)** Express 0.4 as a percentage.

.....

**o)** Express 1.2 as a percentage.

.....

Percent means out of one hundred, so any percentage can be written as a fraction with a denominator of 100.

<p><b>Q.</b> Write 60% as a fraction in its simplest form.</p>	<p><b>A.</b> <math>60\%</math>  <math>= \frac{60 \div 20}{100 \div 20}</math>  <math>= \frac{3}{5}</math></p>	<p>Sixty percent means 60 out of 100.                  Simplify the top and bottom of the fraction by dividing both 60 and 100 by their HCF, which is 20.</p>
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<p><b>Q.</b> Write 2% as a fraction in its simplest form.</p>	<p><b>A.</b> <math>2\%</math>  <math>= \frac{2 \div 2}{100 \div 2}</math>  <math>= \frac{1}{50}</math></p>	<p>Two percent means 2 out of 100.                  Simplify top and bottom of the fraction by dividing both 2 and 100 by their HCF, which is 2.</p>
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**a)** Write 55% as a fraction in its simplest form.

$$55\% = \frac{55 \div 5}{100 \div 5} = \frac{11}{20}$$

.....

**b)** Write 6% as a fraction in its simplest form.

$$6\% = \frac{6 \div 2}{100 \div 2} =$$

.....

**c)** Write 30% as a fraction in its simplest form.

.....

**d)** Write 25% as a fraction in its simplest form.

.....

**e)** Write 40% as a fraction in its simplest form.

.....

**f)** Write 15% as a fraction in its simplest form.

.....

**g)** Write 4% as a fraction in its simplest form.

.....

**h)** Write 24% as a fraction in its simplest form.

.....

**i)** Write 50% as a fraction in its simplest form.

.....

**j)** Write 72% as a fraction in its simplest form.

.....

**k)** Write 60% as a fraction in its simplest form.

.....

**l)** Write 32% as a fraction in its simplest form.

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**Skill 12.8** Writing a fraction as a percentage.Percent means: fraction of one hundred OR fraction  $\times 100\%$ 

(See Skill Builder 12.5 for an alternative method.)

**Q.** Write  $\frac{3}{5}$  as a percentage.

$$\begin{aligned} \mathbf{A.} \quad \frac{3}{5} &= \frac{3}{5} \times 100\% \\ &= \frac{3}{5} \times \frac{100}{1} \% \\ &= \frac{300}{5} \% \\ &= \mathbf{60\%} \end{aligned}$$

**Q.** Write  $\frac{4}{25}$  as a percentage.

$$\begin{aligned} \mathbf{A.} \quad \frac{4}{25} &= \frac{4}{25} \times 100\% \\ &= \frac{4}{25} \times \frac{100}{1} \% \\ &= \frac{400}{25} \% \\ &= \mathbf{16\%} \end{aligned}$$

**a)** Write  $\frac{3}{20}$  as a percentage.

$$\frac{3}{20} = \frac{3}{20} \times \frac{100}{1} \% = \frac{300}{20} \% = \mathbf{15\%}$$

**b)** Write  $\frac{16}{40}$  as a percentage.

$$\frac{16}{40} = \frac{16}{40} \times \frac{100}{1} \% = \frac{1600}{40} \% =$$

**c)** Write  $\frac{1}{4}$  as a percentage.

.....

**d)** Write  $\frac{1}{2}$  as a percentage.

.....

**e)** Write  $\frac{9}{10}$  as a percentage.

.....

**f)** Write  $\frac{7}{50}$  as a percentage.

.....

**g)** Write  $\frac{6}{10}$  as a percentage.

.....

**h)** Write  $\frac{8}{50}$  as a percentage.

.....

<p><b>Q.</b> Decrease \$60 by 4%</p>	<p><b>A.</b> 4% of 60</p> $= \frac{4}{100} \times \frac{60}{1}$ $= \frac{240}{100}$ $= 240 \div 100$ $= \underline{240} \div 100$ $= 2.40$ $\$60 - \$2.40$ $= \mathbf{\$57.60}$	<p><i>First find 4% of 60.</i></p>       <p><i>Then decrease or subtract the result from \$60.</i></p>
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<p><b>Q.</b> Increase \$200 by 30%</p>	<p><b>A.</b> 30% of 200</p> $= \frac{30}{100} \times \frac{200}{1}$ $= \frac{6000}{100}$ $= 60$ $\$200 + \$60$ $= \mathbf{\$260}$	<p><i>First find 30% of 200.</i></p>       <p><i>Simplify by dividing by 100 and crossing off the respective zeros.</i></p>    <p><i>Then increase or add the result to \$200.</i></p>
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**a)** Increase \$40 by 15%

$$= \frac{15}{100} \times \frac{40}{1} = \frac{600}{100} = 6$$

$$\underline{\$40 + \$6 = \$46}$$

**b)** Decrease \$90 by 20%

.....  
.....

**c)** Increase \$1000 by 18%

.....  
.....

**d)** Decrease \$75 by 10%

.....  
.....

**e)** Increase \$1000 by 24%

.....  
.....

**f)** Decrease \$60 by 20%

.....  
.....

**Q.** If 10% GST is to be added to a \$25 book, find the selling price.

**A.**  $GST = 10\% \text{ of } 25$   
 $= \frac{10}{100} \times 25$   
 $= \frac{250}{100}$   
 $= 250 \div 100$   
 $= \frac{250}{100}$   
 $= 2.5$

$Selling \text{ price} = Wholesale \text{ price} + GST$   
 $= \$25 + \$2.50 = \mathbf{\$27.50}$

First find the amount of GST, 10% of \$25.

Then add the GST to the wholesale price.

**Q.** If 10% GST is to be added to a \$8.00 calendar, find the selling price.

**A.**  $GST = 10\% \text{ of } 8$   
 $= \frac{10}{100} \times 8$   
 $= \frac{80}{100}$   
 $= 80 \div 100$   
 $= \frac{80}{100}$   
 $= 0.8$

$Selling \text{ price} = Wholesale \text{ price} + GST$   
 $= \$8.00 + \$0.80 = \mathbf{\$8.80}$

First find the amount of GST, 10% of \$8.

Then add the GST to the wholesale price.

**a)** If 10% GST is to be added to a \$160 software package, find the selling price.

$$GST = \frac{10}{100} \times \frac{160}{1} = \frac{1600}{100} = 16$$

$$SP = \$160 + \$16 = \mathbf{\$176}$$

**b)** If 10% GST is to be added to a \$225 bike, find the selling price.

**c)** If 10% GST is to be added to a \$320 tennis racket, find the selling price.

**d)** If 10% GST is to be added to a \$49 game, find the selling price.

**e)** If 10% GST is to be added to a \$1900 computer, find the selling price.

**f)** If 10% GST is to be added to a \$4.00 card, find the selling price.