11. [Percentages]

- Write the number followed by the percent symbol "**%**"
  Hint: "Percentage" means "per hundred" or "of each hundred".

Q. Write as a percentage:
84 out of 100.

A. *84 out of 100 =*
   = ***84%***

a) Write as a percentage:
60 out of 100.

60%

b) Write as a percentage:
32 out of 100.

c) Write as a percentage:
46 out of 100.

d) Write as a percentage:
12 out of 100.

e) Write as a percentage:
5 out of 100.

f) Write as a percentage:
9 out of 100.

g) Write as a percentage:
61 out of 100.

h) Write as a percentage:
53 out of 100.

i) Write as a percentage:
4 out of 100.

j) Write as a percentage:
7 out of 100.

k) Write as a percentage:
59 out of 100.

l) Write as a percentage:
91 out of 100.

m) Write as a percentage:
28 out of 100.

n) Write as a percentage:
79 out of 100.

- Subtract the given percentages from 100%, to find the remaining percentage.

Q. According to a projection for 2020, 39% of the population of the USA will be aged between 0 - 29 and 35% between 30 - 59. What percentage of the population will be aged 60 or more?

A. *100% – 39% – 35%*
= 100% – 74%
*= **26%***

a) Approximately 59% of the athletes at the 2000 Sydney Olympics were male. What percentage of the athletes were female?

100% – 59%   = **41%**

b) School is approximately 60% of the calendar year in the Russian Federation. What percentage do holidays account for?

100% – 60%   =

c) The green-yellow 18-carat gold is 75% gold and the rest is silver. What percentage is silver?

=

d) If 89% of the West Point military academy graduates are male, what percentage are females?

=

e) If 78% of the Supreme Court justices are male, what percentage are females?

=

f) If the cucumber is 96% water, what percentage do the other components equal?

=

g) In Mali 72% of people earn less than $1 a day. What percentage of people earn more than $1 a day?

=

h) If 37.5% of the adult teeth are incisors and canines, what percentage is formed by molars and pre-molars?

=

i) Approximately 60.5% of the world population lives in Asia and 13.5% lives in North and South America. What percentage of the population lives in the rest of the world?

100% – 60.5% – 13.5%   =

j) Approximately 27.2% of the world population is aged between 0 and 14 years and 65.2% between 15 and 64 years. What percentage of the population is aged 65 years and over?

=

k) If England occupies 57% and Scotland occupies 34% of Great Britain (the main island of the United Kingdom), what percentage is occupied by Wales?

=

l) At the 2012 London Olympics, 20% of the medals won by Australia were gold, and 46% were silver. What percentage of the medals were bronze?

=

EITHER

• Change the percentage to a fraction out of 100.

Example: $40\% = \dfrac{40}{100}$

• Rewrite the question as a multiplication (change "of" to "×").
• Change the whole number to a fraction over 1.

Example: $7 = \dfrac{7}{1}$

• Cross simplify the fractions before multiplying.
(see skill 10.4, page 60)

OR

• First find 10%.
• Then multiply by the amount needed to make the required percentage, i.e. multiply by 3 to get 30%.

To find		
$10\% = \dfrac{1}{10}$	$\Rightarrow$ divide by 10	
5%	$\Rightarrow$ half of 10%	
$20\% = \dfrac{1}{5}$	$\Rightarrow$ divide by 5	
$25\% = \dfrac{1}{4}$	$\Rightarrow$ divide by 4	
$50\% = \dfrac{1}{2}$	$\Rightarrow$ divide by 2	

Q. 40% of $6.00 =

A. 40% of $6.00 =
= 40% of 600   *(Convert $ to cents)*

$= \dfrac{40}{100} \times \dfrac{600}{1}$ *(Simplify: ÷ 100)*

$= 40 \times 6$
= 240 cents
= **$2.40**

OR A. $600 \div 10 =$ *(Find 10%)*
= 60 cents

(Multiply by 4 to get 40%)
60×4
= 240 cents
= **$2.40**

a) 24% of 100 =

$= \dfrac{24}{100} \times \dfrac{100}{1}$ *(Divide by 100)*   **24**

b) 85% of 100 =

=

c) 69% of 100 =

=

d) 9% of $100 =

= $

e) 7% of $100 =

= $

f) 50% of $100 =

= $

g) 75% of $400 =

$= \dfrac{75}{100} \times \dfrac{400}{1}$

$= 75 \times 4$ $=$ $

h) 10% of $300 =

(Divide 300 by 10)

$

i) 30% of $500 =

(Find 10% first)

$

j) 60% of $200 =

=

=   = $

k) 25% of $800 =

=

=   = $

l) 70% of $600 =

=

=   = $

m) 5% of $300 =

$$= \frac{5}{100} \times \frac{300}{1}$$

$= 5 \times 3$ = $\boxed{\$ \quad}$

n) 5% of $500 =

Find 10%

$500 \div 10 = 50$ =

5% is half of 10%

$50 \div 2$ = $\boxed{\$ \quad}$

o) 5% of $700 =

=

=   = $\boxed{\$ \quad}$

p) 50% of $700 =

=

=   = $\boxed{\$ \quad}$

q) 20% of $200 =

=

=   = $\boxed{\$ \quad}$

r) 40% of $500 =

=

=   = $\boxed{\$ \quad}$

s) 80% of $400 =

=

=   = $\boxed{\$ \quad}$

t) 90% of $300 =

=

=   = $\boxed{\$ \quad}$

u) 15% of $400 =

=

=   = $\boxed{\$ \quad}$

v) 50% of $5.00 =

=

=

=   = $\boxed{\$ \quad}$

w) 20% of $3.00 =

=

=

=   = $\boxed{\$ \quad}$

x) 75% of $6.00 =

=

=

=   = $\boxed{\$ \quad}$

y) 5% of $4.00 =

=   = $\boxed{\quad ¢}$

z) 40% of $3.50 =

=   = $\boxed{\quad ¢}$

A) 30% of $4.50 =

=   = $\boxed{\quad ¢}$

EITHER

- Change the percentage to a fraction out of 100.

  Example: $40\% = \dfrac{40}{100}$

- Rewrite the question as a multiplication (change "of" to "×").
- Change the whole number to a fraction over 1.

  Example: $7 = \dfrac{7}{1}$

- Cross simplify the fractions before multiplying.
  (see skill 10.4, page 60)

OR

- First find 10%.
- Then multiply by the amount needed to make the required percentage, i.e. multiply by 3 to get 30%.

$$
\begin{aligned}
\text{To find}\quad 1\% &= \frac{1}{100} \Rightarrow \text{divide by 100}\\[4pt]
12.5\% &= \frac{1}{8} \Rightarrow \text{divide by 8}\\[4pt]
33\tfrac{1}{3}\% &= \frac{1}{3} \Rightarrow \text{divide by 3}\\[4pt]
66\tfrac{2}{3}\% &= \frac{2}{3} \Rightarrow \text{divide by 3}\\
&\qquad\qquad\ \ \text{multiply by 2}
\end{aligned}
$$

Q. $66\tfrac{2}{3}\%$ of $270 =$

A. $66\tfrac{2}{3}\%$ of $270 =$

$= \dfrac{2}{\cancel{3}_1} \times \dfrac{\cancel{270}^{\,90}}{1}$ — Simplify: ÷ 3

$= 2 \times 90$

$= \boldsymbol{180}$

Substitute $66\tfrac{2}{3}\%$ with $\tfrac{2}{3}$

Change "of" to "×"

Change 270 to $\tfrac{270}{1}$

Multiply $\tfrac{2}{3}$ by $\tfrac{270}{1}$

---

a) 20% of $50 =$

$= \dfrac{\cancel{20}}{\cancel{100}} \times \dfrac{\cancel{50}}{1}$ — Simplify: ÷ 10, twice

$= 2 \times 5 \qquad = \boxed{10}$

b) 70% of $240 =$ — Find 10% first

$240 \div 10 = 24$

Multiply by 7 to get 70%

$24 \times 7 \qquad = \boxed{}$

c) 80% of $20 =$

$=$

$= \qquad = \boxed{}$

d) 40% of $80 =$

$=$

$= \qquad = \boxed{}$

e) 60% of $250 =$

$=$

$= \qquad = \boxed{}$

f) 30% of $140 =$

$=$

$= \qquad = \boxed{}$

g) 70% of $120 =$

$=$

$= \qquad = \boxed{}$

h) 5% of $40 =$

$=$

$= \qquad = \boxed{}$

i) 5% of $120 =$

$=$

$= \qquad = \boxed{}$

j) 15% of $60 =$

10% $60 \div 10 = 6$ — Find 10% first

5% $6 \div 2 = 3$ — 5% is half of 10%

15% $6 + 3 \qquad = \boxed{}$

k) 35% of $80 =$

10%

5%

35% $\qquad = \boxed{}$

l) 45% of $120 =$

10%

5%

45% $\qquad = \boxed{}$

m) 25% of 180 =

Simplify: ÷ 5

$$= \frac{\overset{5}{\cancel{25}}}{\underset{2}{\cancel{100}}} \times \frac{\cancel{180}}{1}$$

Divide by 10

$$= \frac{90}{2}$$

= ☐

n) 75% of 40 =

=

= ☐

o) 75% of 120 =

=

= ☐

p) 15% of 40 =

$$= \frac{15}{\cancel{100}} \times \frac{\cancel{40}}{1}$$

Simplify: ÷ 10

$$= \frac{\overset{6}{\cancel{60}}}{\underset{1}{\cancel{10}}}$$

= ☐

q) 6% of 30 =

=

= ☐

r) 8% of 80 =

=

= ☐

s) 1% of 300 =

$$= \frac{1}{100} \times \frac{300}{1}$$

=

= ☐

t) 1% of 150 =

=

= ☐

u) 2% of 50 =

=

= ☐

v) 12.5% of 560 =

$$= \frac{1}{\underset{1}{\cancel{8}}} \times \frac{\overset{70}{\cancel{560}}}{1}$$

Simplify: ÷ 8

=

= ☐

w) 12.5% of 80 =

=

= ☐

x) 12.5% of 160 =

=

= ☐

y) $33\frac{1}{3}$% of 150 =

$$\frac{1}{\cancel{3}} \times \frac{\cancel{150}}{1}$$

Simplify: ÷ 3

=

= ☐

z) $33\frac{1}{3}$% of 180 =

=

= ☐

A) $33\frac{1}{3}$% of 60 =

=

= ☐

B) $66\frac{2}{3}$% of 90 =

$$= \frac{2}{\cancel{3}} \times \frac{\cancel{90}}{1}$$

=

= ☐

C) $66\frac{2}{3}$% of 150 =

=

= ☐

D) $66\frac{2}{3}$% of 210 =

=

= ☐

To find the discount on an item

- Calculate the percentage of the given amount.   (see skill 11.3, page 69 and skill 11.4, page 71)

  Discount is associated with words like: *discounted, reduced, off, save, cash back*

To find the sale price if a discount is applied

- Calculate the percentage of the given amount.
- Subtract this result from the given amount.

Q. In a store a $300 jacket is marked '20% off'. What is the sale price of the jacket?

A. *Discount:*   *20% of 300 =*

$$= \frac{20}{100} \times \frac{300}{1} \quad \text{(Divide by 100)}$$

$$= 20 \times 3 = 60$$

Sale price: $300 - 60 =$ **$240**

---

a) If a $30 T-shirt is reduced by 15%, what is the discount?

discount: *15% of 30 =*

$$= \frac{15}{100} \times \frac{30}{1} = \frac{45}{10} \qquad = \boxed{\$\,4.50}$$

b) If a $120 bike is reduced by 25%, what is the discount?

discount:

$$= \qquad\qquad = \boxed{\$}$$

c) If a $500 computer is reduced by 25%, what is the discount?

discount: *25% of 500 =*

$$= \qquad\qquad = \boxed{\$}$$

d) If an $80 game is reduced by 40%, what is the discount?

discount:

$$= \qquad\qquad = \boxed{\$}$$

e) If a $3000 laptop is reduced by 20%, what is the sale price?

discount: *20% of 3000 =*

$$= \frac{20}{100} \times \frac{3000}{1} = 600 \quad \text{(Divide by 100)}$$

sale price: $3000 - $600 $= \boxed{\$}$

f) If a $500 dress is discounted by 40%, what is the sale price?

discount:

$$=$$

sale price: $= \boxed{\$}$

g) In a store a $125 skirt is marked '50% off'. What is the sale price of the skirt?

discount:

$$=$$

sale price: $= \boxed{\$}$

h) In a store a $240 suitcase is marked '10% off'. What is the sale price of the suitcase?

discount:

$$=$$

sale price: $= \boxed{\$}$

---

i) If a $400 gold bracelet is discounted by 30%, what is the sale price?

discount: ....

= ....

sale price: = $ [　　]

j) If a $25 000 car is reduced by 10%, what is the sale price?

discount: ....

= ....

sale price: = $ [　　]

k) In a store a $900 canoe is labelled 'Save 60%'. What is the sale price of the canoe?

discount: ....

= ....

sale price: = $ [　　]

l) In a store a $300 pram is labelled 'Save 15%'. What is the sale price of the pram?

discount: ....

= ....

sale price: = $ [　　]

m) A printer is priced at $200. Which is the better deal?
   A) 20% off
   B) $50 cash back

sale price A: ....

= ....

sale price B: ....

= ....   ⇒ [　　]

n) A watch is priced at $450. Which is the better deal?
   A) Save 30%
   B) Take $100 off

sale price A: ....

= ....

sale price B: ....

= ....   ⇒ [　　]

o) A utility is priced at $15 000. Which is the better deal?
   A) 10% discount
   B) Reduce by $\frac{1}{5}$

sale price A: ....

= ....

sale price B: ....

= ....   ⇒ [　　]

p) A lounge suite is priced at $6000. Which is the better deal?
   A) Save 25%
   B) Reduce by $\frac{1}{3}$

sale price A: ....

= ....

sale price B: ....

= ....   ⇒ [　　]

EITHER
- Change the percentage to a fraction out of 100.

  Example: $150\% = \dfrac{150}{100}$

- Rewrite the question as a multiplication (change "of" to "×").
- Change the whole number to a fraction over 1.

  Example: $7 = \dfrac{7}{1}$

- Cross simplify the fractions before multiplying.
  (see skill 10.4, page 60)

OR
- First find 100% or other multiples of 100%.
- Then find the remaining percentage.
- Add the results.

> To find $200\% = \dfrac{2}{1} \Rightarrow$ multiply by 2
>
> $300\% = \dfrac{3}{1} \Rightarrow$ multiply by 3

Q. 350% of $40 =$

A. 350% of $40 =$

$= \dfrac{35\emptyset}{10\emptyset} \times \dfrac{4\emptyset}{1}$ _Simplify: ÷ 10, twice_

$= 35 \times 4$

$= \mathbf{140}$

OR

A. *100% of 40 is 40*

So 300% is triple that, or 120

50% of 40 is 20

So 350% of 40 is

*120 + 20 = **140***

---

a) 200% of $60 =$

$= \dfrac{20\emptyset}{10\emptyset} \times \dfrac{6\emptyset}{1}$ _Simplify: ÷ 10, twice_

$= 20 \times 6$ $= \boxed{120}$

b) 300% of $50 =$

$=$ ....

$=$ $= \boxed{}$

c) 400% of $70 =$

$=$ ....

$=$ $= \boxed{}$

d) 120% of $80 =$ _Find 100%_

100% of $80 = 80$

Find 20%

20% of $80 = 16$

Add the results

$80 + 16$ $= \boxed{}$

e) 110% of $90 =$

$=$ $= \boxed{}$

f) 250% of $30 =$

$=$ $= \boxed{}$

g) 250% of $40 =$

$= \dfrac{25\emptyset}{10\emptyset} \times \dfrac{4\emptyset}{1}$

$= 25 \times 4$ $= \boxed{}$

h) 140% of $50 =$

$=$ $= \boxed{}$

i) 220% of $80 =$

$=$ $= \boxed{}$

j) 130% of $60 =$

$=$ $= \boxed{}$

k) 120% of $70 =$

$=$ $= \boxed{}$

l) 350% of $40 =$

$=$ $= \boxed{}$

- Form a fraction using the two numbers.

EITHER
- Multiply this fraction by 100%.
- Simplify the resulting fraction and/or change it to a mixed number if necessary. (see skill 9.1, page 41)

OR
- Find an equivalent fraction with the denominator 100, by multiplying or dividing both the numerator and denominator by the same number.
- Write this fraction as a percentage. (see skill 12.11, page 92)
  Hint: Both numbers must represent the same unit of measurement.

Multiplying by 100%

$100\% = 1$

Multiplying by 1 or 100% does not change the value.

Q. Write as a percentage: 23 out of 50.

A. *23 out of 50 =*

$$= \frac{23}{50} \times 100\%$$

$$= \frac{23}{\cancel{50}_1} \times \frac{\cancel{100}^2}{1}\%$$ (Simplify: ÷ 50)

$$= 23 \times 2$$

$$= 46\%$$

OR   **A.** *23 out of 50 =*

$$= \frac{23}{50} \begin{smallmatrix} \times 2 \\ \\ \times 2 \end{smallmatrix}$$

$$= \frac{46}{100}$$

$$= 46\%$$

---

a) Write as a percentage: 12 out of 60.

$$\frac{12}{60} \begin{smallmatrix} \div 12 \\ \\ \div 12 \end{smallmatrix} = \frac{1}{5}$$ (Simplify: ÷ 12)

(Find equivalent fraction)

$$\frac{1}{5} \begin{smallmatrix} \times 20 \\ \\ \times 20 \end{smallmatrix} = \frac{20}{100}$$

$$\boxed{20\%}$$

b) In Australia 88 out of every 100 people live in an urban area. What percentage is this?

....

.... $\boxed{}$

c) At the 2010 Delhi Commonwealth Games, 3 out of the 4 medals won by Samoa were gold. What percentage is this?

....

= $\boxed{}$

....

d) For every 20 Skype calls made, 8 calls are video to video. What percentage is this?

....

.... $\boxed{}$

e) A male lion weighs 225 kg. It eats 9 kg of food each day. What percentage of its own weight does a lion eat each day?

....

.... $\boxed{}$

f) Of the 1 billion cattle in the world, 200 million are in India. What percentage of the world's cattle are in India?

....

.... $\boxed{}$

- Calculate the profit or the loss, as the difference between the selling and the cost price.
- Express the profit or the loss as a percentage of the cost price. (see skill 11.7, page 76)

Q. A shop buys jackets in bulk for $50 each, then sells them for $95 each. Calculate the profit on each jacket as a percentage of the cost price.

A. *profit:* $95 - $50 = $45

profit out of cost price: $45 out of $50 $= \dfrac{45}{50}$

$= \dfrac{45}{5\emptyset} \times \dfrac{10\emptyset}{1}\% = \dfrac{450}{5}\%$

$= \boldsymbol{90\%}$

a) Lorien lost $40 on a ring costing $400. What was her loss as a percentage of the cost price?

loss: $40

loss out of cost: $40 out of $400 =

$= \dfrac{40}{4\emptyset\emptyset} \times \dfrac{10\emptyset}{1}\% = \dfrac{40}{4}\%$ $= \boxed{10\%}$

b) The Cycle Centre made $30 profit on a bicycle costing $150. What was the profit as a percentage of the cost price?

profit:

profit out of cost:

$=$ $= \boxed{}$

c) John made $20 profit on a tool box costing $100. What was his profit as a percentage of the cost price?

profit:

profit out of cost:

$=$ $= \boxed{}$

d) Jason lost $15 on a book costing $30. What was his loss as a percentage of the cost price?

loss:

loss out of cost:

$=$ $= \boxed{}$

e) Serena bought a car for $5000. If she later sold it for $3500, find the loss as a percentage of the cost price.

$=$ $= \boxed{}$

f) A shop buys school uniforms in bulk for $75 each, then sells them for $100 each. Find the profit as a percentage of the cost price.

$=$ $= \boxed{}$

g) Amelia bought a table for $400. If she later sold it for $350, find the loss as a percentage of the cost price.

$=$ $= \boxed{}$

h) A painting was bought for $6000. If it was later sold for $7500, find the profit as a percentage of the cost price.

$=$ $= \boxed{}$