11. [Percents]

Skill 11.1 Writing a number out of 100 as a percent.

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

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

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

a) Write as a percent:
60 out of 100. 60%

b) Write as a percent:
32 out of 100. ____

c) Write as a percent:
46 out of 100. ____

d) Write as a percent:
12 out of 100. ____

e) Write as a percent:
5 out of 100. ____

f) Write as a percent:
9 out of 100. ____

g) Write as a percent:
61 out of 100. ____

h) Write as a percent:
53 out of 100. ____

i) Write as a percent:
4 out of 100. ____

j) Write as a percent:
7 out of 100. ____

k) Write as a percent:
59 out of 100. ____

l) Write as a percent:
91 out of 100. ____

m) Write as a percent:
28 out of 100. ____

n) Write as a percent:
79 out of 100. ____

Skill 11.2 Finding the remaining percent.

- Subtract the given percents from 100%, to find the remaining percent.

Q. According to a projection for 2020, 39% of the U.S. population will be aged between 0 - 29 and 35% between 30 - 59. What percent 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 percent of the athletes were female?

100% – 59% = 41%

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

100% – 60% = ☐

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

= ☐

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

= ☐

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

= ☐

f) If the cucumber is 96% water, what percent do the other components make?

= ☐

g) In 2007, 25% of employed women in the U.S. worked in part-time jobs. What percent of women worked in full-time jobs?

= ☐

h) If 37.5% of the adult teeth are incisors and canines, what percent 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 percent 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 percent 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 percent is occupied by Wales?

= ☐

l) At the 2008 Beijing Olympics, 39% of the medals won by Germany were gold and 24% were silver. What percent of the medals were bronze?

= ☐

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Skill 11.3 Finding a percent of multiples of 100 (1).

- Change the percent to a fraction out of 100.

  Example: $40\% = \frac{40}{100}$
- Rewrite the question as a multiplication (change "of" to "×").
- Change the whole number to a fraction over 1.

  Example: $7 = \frac{7}{1}$
- Cross simplify the fractions before multiplying.
  (see skill 10.4, page 58)

OR

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

Hint:

To find $10\% = \frac{1}{10}$ *⇒ divide by 10*

5% = *half of* 10%

$20\% = \frac{1}{5}$ *⇒ divide by 5*

$25\% = \frac{1}{4}$ *⇒ divide by 4*

$50\% = \frac{1}{2}$ *⇒ divide by 2*

Q. 40% of $6.00 =

A. *40% of $6.00 =* (Convert $ to cents)
$= 40\%$ *of* 600
$= \frac{40}{1\cancel{00}} \times \frac{6\cancel{00}}{1}$ (Simplify: ÷ 100)
$= 40 \times 6$
$= 240$ *cents*
$=$ ***$2.40***

OR

A. $600 \div 10 =$ (Find 10%)
$= 60$ *cents*
60×4 (Multiply by 4 to get 40%)
$= 240$ *cents*
$=$ ***$2.40***

a) 24% of 100 =

$= \frac{24}{1\cancel{00}} \times \frac{1\cancel{00}}{1}$ (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 =

$= \frac{75}{1\cancel{00}} \times \frac{4\cancel{00}}{1}$

$= 75 \times 4$ =

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 =

=

.....

= =

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Skill 11.3 Finding a percent of multiples of 100 (2).

m) 5% of 300 =

$= \frac{5}{1ØØ} \times \frac{3ØØ}{1}$

$= 5 \times 3$ = ☐

n) 5% of 500 =

Find 10%

$500 \div 10 = 50$

5% is half of 10%

$50 \div 2$ = ☐

o) 5% of 700 =

= .....

= ..... = ☐

p) 50% of 700 =

= .....

= ..... = ☐

q) 20% of 200 =

= .....

= ..... = ☐

r) 40% of 500 =

= .....

= ..... = ☐

s) 80% of 400 =

= .....

= ..... = ☐

t) 90% of 300 =

= .....

= ..... = ☐

u) 15% of 400 =

= .....

= ..... = ☐

v) 50% of $5.00 =

= .....

= .....

= ..... = $ ☐

w) 20% of $3.00 =

= .....

= .....

= ..... = $ ☐

x) 75% of $6.00 =

= .....

= .....

= ..... = $ ☐

y) 5% of $4.00 =

.....

.....

= ☐ ¢

z) 40% of $3.50 =

.....

.....

= ☐ ¢

zz) 30% of $4.50 =

.....

.....

= ☐ ¢

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Skill 11.4 Finding a percent of any number (1).

- Change the percent to a fraction out of 100.
  Example: $40\% = \frac{40}{100}$
- Rewrite the question as a multiplication (change "of" to "×").
- Change the whole number to a fraction over 1.
  Example: $7 = \frac{7}{1}$
- Cross simplify the fractions before multiplying.
  (see skill 10.4, page 58)

Hint:
To find 1% = $\frac{1}{100}$ ⇒ divide by 100
12.5% = $\frac{1}{8}$ ⇒ divide by 8
$33\frac{1}{3}\% = \frac{1}{3}$ ⇒ divide by 3
$66\frac{2}{3}\% = \frac{2}{3}$ ⇒ divide by 3, multiply by 2

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

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

A. $66\frac{2}{3}\%$ *of* $270 =$
$= \frac{2}{\cancel{3}_1} \times \frac{\cancel{270}^{90}}{1}$ *Simplify: ÷ 3*
$= 2 \times 90$
$= \mathbf{180}$

Substitute $66\frac{2}{3}\%$ with $\frac{2}{3}$
Change "of" to "×"
Change 270 to $\frac{270}{1}$
Multiply $\frac{2}{3}$ by $\frac{270}{1}$

a) 20% of $50 =$
$= \frac{2\cancel{0}}{1\cancel{0}\cancel{0}} \times \frac{5\cancel{0}}{1}$ *Simplify: ÷ 10, twice*
$= 2 \times 5 = 10$

b) 70% of $240 =$ *Find 10% first*
$240 \div 10 = 24$
$24 \times 7 =$ ☐ *Multiply by 7 to get 70%*

c) 80% of $20 =$
$=$ ……
$=$ …… $=$ ☐

d) 40% of $80 =$
$=$ ……
$=$ …… $=$ ☐

e) 60% of $250 =$
$=$ ……
$=$ …… $=$ ☐

f) 30% of $140 =$
$=$ ……
$=$ …… $=$ ☐

g) 70% of $120 =$
$=$ ……
$=$ …… $=$ ☐

h) 5% of $40 =$
$=$ ……
$=$ …… $=$ ☐

i) 5% of $120 =$
$=$ ……
$=$ …… $=$ ☐

j) 15% of $60 =$
10% $60 \div 10 = 6$ *Find 10% first*
5% $6 \div 2 = 3$ *5% is half of 10%*
15% $6 + 3 =$ ☐

k) 35% of $80 =$
10% ……
5% ……
35% …… $=$ ☐

l) 45% of $120 =$
10% ……
5% ……
45% …… $=$ ☐

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Skill 11.4 Finding a percent of any number (2).

m) 25% of 180 =

$= \frac{\cancel{25}^{5}}{\cancel{100}_{2}} \times \frac{180}{1}$ (Simplify: ÷ 5; Divide by 10)

$= \frac{90}{2}$ = ☐

n) 75% of 40 =

= .....

= ..... = ☐

o) 75% of 120 =

= .....

= ..... = ☐

p) 15% of 40 =

$= \frac{15}{100} \times \frac{40}{1}$ (Simplify: ÷ 10)

$= \frac{\cancel{60}^{6}}{\cancel{10}_{1}}$ = ☐

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 =

$= \frac{1}{\cancel{8}_{1}} \times \frac{\cancel{560}^{70}}{1}$ (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 =

= .....

= ..... = ☐

Skill 11.5 Working with percents greater than 100%.

- Change the percent to a fraction out of 100.
  Example: $150\% = \frac{150}{100}$
- Rewrite the question as a multiplication (change "of" to "×").
- Change the whole number to a fraction over 1.
  Example: $7 = \frac{7}{1}$
- Cross simplify the fractions before multiplying.
  (see skill 10.4, page 58)

OR

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

Hint:

To find 10% = $\frac{1}{10}$ ⇒ divide by 10

20% = $\frac{1}{5}$ ⇒ divide by 5

200% = $\frac{2}{1}$ ⇒ multiply by 2

300% = $\frac{3}{1}$ ⇒ multiply by 3

Q. 350% of 40 =

A. *350% of 40 =*

$= \frac{35\cancel{0}}{1\cancel{00}} \times \frac{4\cancel{0}}{1}$ (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 =

$= \frac{20\cancel{0}}{1\cancel{00}} \times \frac{6\cancel{0}}{1}$ (Simplify: ÷ 10, twice)

$= 20 \times 6$ = 120

b) 300% of 50 =

= ..... = ... = ☐

c) 400% of 70 =

= ..... = ... = ☐

d) 120% of 80 =

100% of 80 = 80 (Find 100%)

20% of 80 = 16 (Find 20%)

80 + 16 = ☐ (Add the results)

e) 110% of 90 =

..... = ☐

f) 250% of 30 =

..... = ☐

g) 250% of 40 =

$= \frac{25\cancel{0}}{1\cancel{00}} \times \frac{4\cancel{0}}{1}$

$= 25 \times 4$ = ☐

h) 140% of 50 =

..... = ☐

i) 220% of 80 =

..... = ☐

j) 130% of 60 =

..... = ☐

k) 120% of 70 =

..... = ☐

l) 350% of 40 =

..... = ☐

Skill 11.6 Working with percents to find discounts and sale prices.

- Calculate the percent of the given amount. (see skill 11.3, page 67 and skill 11.4, page 69)

To find the **sale price** if a **discount** is applied:

- Subtract this result from the given amount.

To find the **total amount** if a **sales tax** is applied:

- Add this result to the given amount.

Q. If a sales tax of 6% is applied on a purchase of $200, what is the total amount that must be paid?

A. *Sales tax: 6% of 200 =*

$$= \frac{6}{1\text{Ø}\text{Ø}} \times \frac{2\text{Ø}\text{Ø}}{1}$$

$$= 6 \times 2 = 12$$

Total: $200 + 12 =$ ***$212***

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

discount: 15% of 30 =

$= \frac{15}{10\text{Ø}} \times \frac{3\text{Ø}}{1} = \frac{45}{10}$ = $ 4.50

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

discount:

= = $

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

discount: 20% of 3000 =

$= \frac{20}{1\text{Ø}\text{Ø}} \times \frac{30\text{Ø}\text{Ø}}{1}$ (Divide by 100) $= 600$

sale price: $3000 – $600 = $

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

discount:

=

sale price: = $

e) If a sales tax of 4% is applied on a purchase of $500, what is the total amount that must be paid?

sales tax: 4% of 500 =

=

total: $500 + = $

f) If a sales tax of 5% is applied on a purchase of $120, what is the total amount that must be paid?

sales tax:

=

total: = $

g) If a sales tax of 6% is applied on a restaurant bill of $80, what is the total amount that must be paid?

sales tax:

=

total: = $

h) If a sales tax of 4% is applied on a purchase of $60, what is the total amount that must be paid?

sales tax:

=

total: = $

Skill 11.7 Writing one number as a percent of another number.

- Form a fraction using the two numbers.

EITHER

- Multiply this fraction by 100%: fraction = fraction × 100%

Hint: 100% equals 1 and does not change the value of the fraction.

- Simplify the resulting fraction and/or change it to a mixed number if necessary. (see skill 9.1, page 39)

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 percent. (see skill 12.9, page 84)

Hint: Both numbers must represent the same unit of measurement.

Q. Write as a percent:
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)

$= 23 \times 2$

$= \mathbf{46\%}$

OR

A. *23 out of 50 =*

$= \frac{23}{50} \overset{\times 2}{}$

$= \frac{46}{100}$

$= \mathbf{46\%}$

a) Write as a percent:
10 out of 40.

$= \frac{10}{40} \times \frac{10\cancel{0}}{1}\%$ (Simplify: ÷ 10)

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

b) Write as a percent:
15 out of 20.

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

= =

c) Write as a percent:
45 out of 50.

=

d) Write as a percent:
12 out of 60.

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

(Find equivalent fraction)

$= \frac{1}{5} \overset{\times 20}{} = \frac{20}{100} =$

e) Write as a percent:
9 out of 90.

=

f) Write as a percent:
300 out of 1500.

=

g) Write as a percent:
20 cents out of $2.00.

$2.00 = 200 cents (Change $ to cents)

$\frac{20}{200} \overset{\div 2}{}$

$= \frac{10}{100}$ =

h) Write as a percent:
45 min out of 3 hours.

=

i) Write as a percent:
15 min out of 2 hours.

=

Skill 11.8 Calculating profit or loss as a percent of the cost price.

- Calculate the profit or the loss, as the difference between the selling and the cost price.
- Express the profit or the loss as a percent of the cost price. (see skill 11.7, page 73)

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

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

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

$= \frac{45}{5\cancel{0}} \times \frac{10\cancel{0}}{1}\% = \frac{450}{5}\%$

$= \mathbf{90\%}$

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

loss: $\$40$

loss out of cost: $\$40 \text{ out of } \$400 =$

$= \frac{40}{4\cancel{0}\cancel{0}} \times \frac{1\cancel{0}\cancel{0}}{1}\% = \frac{40}{4}\%$ $= \boxed{10\%}$

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

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

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

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

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

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

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

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