

Unit 3

Working with Percent

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In this unit you will learn to solve three types of percent problems:

- Finding a given percent of a number (**finding the part**).
- Finding what percent one number is of another number (**finding the %**).
- Finding a number when a percent of it is given (**finding the whole**).

Each type of percent problem can be solved using the following proportion:

$$\boxed{\frac{\text{is (part)}}{\text{of (whole)}} = \frac{\%}{100}}$$

Both ratios in this proportion use the same order of comparison because in the ratio $\frac{\%}{100}$ the % represents a part (is) and 100 is the whole (of).

Percent problems involve knowing three pieces of information:

- 1) the part (the “is” part)
- 2) the whole (the “of” part)
- 3) the percent

You will be given two pieces of information and you will find the third. That is, the problems will give two terms of the proportion and you will solve for the missing term. Because these are problems of percent, the **100** is always known to you and will always be in the same position in the proportion.

Remember **Using Cross Multiplication to Solve a Proportion**:

$$\frac{N}{4} = \frac{6}{8} \longrightarrow 4 \times 6 = 8 \times N \longrightarrow 24 = 8N \longrightarrow \frac{24}{8} = \frac{8N}{8} \longrightarrow 3 = N$$

Topic A: Finding a Percent of a Number

$$\frac{\text{is (part)}}{\text{of (whole)}} = \frac{\%}{100}$$

In problems in which you find a percent of a number, the **missing term** is the **part (is)**. You will be given the % and the whole (of), and you know the 100.

Example A:

What is 25% of 40?

$$\begin{aligned}\text{Part (is)} &= N \\ \text{Whole (of)} &= 40 \\ \% &= 25\end{aligned}$$

$$\frac{\text{is}}{\text{of}} = \frac{\%}{100} \longrightarrow \frac{N}{40} = \frac{25}{100}$$

Solve the proportion.

$$\text{Simplify if possible} \quad \frac{N}{40} = \frac{25^1}{100_4}$$

$$\text{Cross multiply} \quad N \times 4 = 40 \times 1$$

$$4N = 40$$

$$\text{Divide} \quad N = 40 \div 4 = 10$$

$$25\% \text{ of } 40 = 10$$

Example B: What is 20% of 18?

$$\begin{aligned}\text{part (is)} &= N \\ \text{whole (of)} &= 18 \\ \% &= 20\end{aligned}$$

$$\frac{\text{is}}{\text{of}} = \frac{\%}{100} \longrightarrow \frac{N}{18} = \frac{20}{100}$$

Solve the proportion:

$$\frac{N}{18} = \frac{20}{100}$$

$$5N = 18$$

$$N = 18 \div 5 = 3 \frac{3}{5} \quad 20\% \text{ of } 18 = 3 \frac{3}{5}$$

The following examples all ask you to find a percent of a number. The missing term is the **part** (the “**is**” part). Look at the examples carefully so you'll recognize the wording.

• What is 14% of 60? $\frac{\text{is}}{\text{of}} = \frac{\%}{100} \longrightarrow \frac{N}{60} = \frac{14}{100}$

• Find 10% of 27. $\frac{\text{is}}{\text{of}} = \frac{\%}{100} \longrightarrow \frac{P}{27} = \frac{10}{100}$

• 5% of 15 is _____. $\frac{\%}{100} = \frac{\text{is}}{\text{of}} \longrightarrow \frac{5}{100} = \frac{X}{15}$

• 75% of 12 = _____. $\frac{\%}{100} = \frac{\text{is}}{\text{of}} \longrightarrow \frac{75}{100} = \frac{K}{12}$



In percent problems, the number after the word **of** usually represents the **whole**.

Exercise One

Solve each problem by setting up the proportion.

$$\frac{\text{is (part)}}{\text{of (whole)}} = \frac{\%}{100}$$

a) 20% of 18 = _____

b) 19% of 200 = _____

c) 25% of 44 = _____

d) 6% of 110 = _____

e) 3% of 33 = _____

f) 30% of 64 = _____

g) 50% of 60 is? _____

h) 30% of 40 is? _____

i) What is 72% of \$425? _____

j) What is 20% of 85? _____

k) 3% of \$72? _____

l) What is 12% of 84? _____

m) What is 25% of \$64? _____

n) 75% of 120 =? _____

Answers to Exercise One

a) $3\frac{3}{5}$ or 3.6

b) 38

c) 11

d) $6\frac{3}{5}$ or 6.6

e) $\frac{99}{100}$ or 0.99

f) $19\frac{1}{5}$ or 19.2

g) 30

h) 12

i) \$306

j) 17

k) \$2.16

l) $10\frac{2}{25}$ or 10.08

m) 16

n) 90

Percents Greater Than or Equal to 100%

Remember that $100\% = 1$.

100% of anything is the whole thing. If you spend 100% of your pay cheque, you spend the whole thing. If you get 100% on a test, you have the whole thing correct.

If you have **more than 100%** you have **more than the whole thing**. If you spend 110% of your paycheque, you spent more than you earned, and you may be in trouble! It is hard to get more than 100% on a test unless the instructor has given bonus marks for extra questions. You may hear of percents more than 100% in increases, such as costs of housing or inflation. For example, "The Browns just sold their house and made a 200% profit." This means they got back what they paid and two times more!

If a percent is less than ($<$) 100, it is less than the whole thing.

$$90\% \text{ of } 50 = 45$$

If a percent is 100, it equals the whole thing.

$$100\% \text{ of } 50 = 50$$

If a percent is more than ($>$) 100, it is more than the whole thing.

$$120\% \text{ of } 50 = 60$$

Exercise Two

Look at the percent. Is it < 100 , $= 100$, or > 100 ? Circle the correct answer for each question. Do not solve the problems.

- a) 200% of 10 is
i) equal to 10
ii) less than 10
iii) greater than 10
- b) 50% of 0.25 is
i) equal to 0.25
ii) less than 0.25
iii) greater than 0.25
- c) 90% of 75 is
i) equal to 75
ii) less than 75
iii) greater than 75
- d) $33\frac{1}{3}\%$ of 15 is
i) equal to 15
ii) less than 15
iii) greater than 15
- e) 100% of 100 is
i) equal to 100
ii) less than 100
iii) greater than 100
- f) 127% of 936 is
i) equal to 936
ii) less than 936
iii) greater than 936

Answers to Exercise Two

- | | | |
|-------------------------|-----------------------|--------------------------|
| a) iii) greater than 10 | b) ii) less than 0.25 | c) ii) less than 75 |
| d) ii) less than 15 | e) i) equal to 100 | f) iii) greater than 936 |

Exercise Three

Use the proportion method to solve these questions.

a) $16\frac{2}{3}\%$ of 12 = _____

b) What is 60% of 15? _____

c) 75% of 144 is? _____

d) 30% of 90 = _____

e) What is $37\frac{1}{2}\%$ of 80? _____

f) 25% of 52 is? _____

g) Find 8.2% of 300. _____

h) 260% of 45 is? _____

i) What is 109% of 200? _____

j) 98.75% of 50 = _____

k) Find 2% of 720. _____

l) 5% of 180 is? _____

m) 90% of 700 = _____

n) What is 85% of 600? _____

o) Find 46% of 90. _____

p) What is 12.5% of 90? _____

q) $37\frac{1}{2}\%$ of 80 is? _____

r) 115% of 250 = _____

s) 2.5% of 300 = _____

t) Find $33\frac{1}{3}\%$ of 252. _____

u) What is $66\frac{2}{3}\%$ of 324? _____

v) $3\frac{1}{4}\%$ of 200 is? _____

w) $62\frac{1}{2}\%$ of 872 = _____

x) Find $16\frac{2}{3}\%$ of 264. _____

Answers to Exercise Three

a) 2

b) 9

c) 108

d) 27

e) 30

f) 13

g) 24.6

h) 117

i) 218

j) 49.375

k) 14.4

l) 9

m) 630

n) 510

o) 41.4

p) 11.25

q) 30

r) 287.5

s) 7.5

t) 84

u) 216

v) 6.5

w) 545

x) 44

Taxes

The amount of tax to be paid is calculated by finding a percent of a number. The tax rate is usually given as a percent. The basic proportion for these problems is:

$$\frac{\text{tax (part)}}{\text{taxable amount (whole)}} = \frac{\% \text{ tax}}{100}$$

Please note that the tax rates used in the questions in this book are for the year 2010 and are subject to change.

The British Columbia Harmonized Sales Tax (HST) is 12%. In B.C., the provincial portion of the harmonized sales tax does not have to be paid on children's clothes, food, books, gasoline, diesel fuel and other special items.

Example A: How much HST (12%) will be charged on a new kitchen table that cost \$125?

use proportion:

$$\frac{H.S.T}{\$125} = \frac{12}{100}$$

$$100 \text{ HST} = \$1500$$

$$\text{HST} = \$1500 \div 100 = \$15.00$$

HST on a \$125 table is \$15.00.

Exercise Four

Find the total cost of each item. All are to be taxed with HST.

	Purchase Price	HST 12%	Total Cost
a)	clothes \$130		
b)	washing machine \$589		
c)	compact disc \$18.99		
d)	garden tools \$48.50		
e)	lumber \$250		
f)	new car \$10 000		
g)	shoes \$59.99		
h)	television \$489		

Answers to Exercise Four

	Purchase Price	HST 12%	Total Cost
a)	clothes \$130	\$15.60	\$145.60
b)	washing machine \$589	\$70.68	\$659.68
c)	compact disc \$18.99	\$2.28	\$21.27
d)	garden tools \$48.50	\$5.82	\$54.32
e)	lumber \$250	\$30.00	\$280.00
f)	new car \$10 000	\$1200	\$11 200
g)	shoes \$59.99	\$7.20	\$67.19
h)	television \$489	\$58.68	\$547.68

Income Tax is charged at different percentages according to the amount of a person's taxable income. The first \$28 000 of taxable income is taxed at 17%. Note that other tax rules and charges may apply in real situations.

Example A: If a person's taxable income for the year is \$23 400, what amount of income tax will that person pay?

To use the proportion method, do this:

$$\frac{\text{tax}}{\text{income}} \rightarrow \frac{T}{\$23\,400} = \frac{17}{100}$$

$$100T = 17 \times \$23\,400$$

$$100T = 397\,800$$

$$T = \$397\,800 \div 100 = \$3\,978$$

The income tax on \$23 400 is \$3 978.

Exercise Five

Calculate the income tax for the annual taxable earnings listed. These amounts are all under \$28 000, so the tax rate is 17%.

- a) \$18 500 _____ b) \$27 620 _____
- c) \$15 365 _____ d) \$25 900 _____

Answers to Exercise Five

- a) \$3 145 b) \$4 695.40 c) \$2 612.05 d) \$4 403



If you are interested in the tax rates and the basic calculation of income tax for taxable incomes higher than \$28 000, talk to your instructor. Your instructor will help you to find out various rates and will show you how to do the calculations.

Cross-Border Shopping

The Canadian (CAN) and American (US) dollars are not equal in value. The **exchange rate** (the value of one Canadian dollar compared to a dollar from another country) changes often; the current rate is usually available from banks, on the news, in the newspapers and on a web site. In the winter of 2010, the Canadian dollar was around \$0.92 of an American dollar (ratio is \$1.00 CAN: \$0.92 US), so CAN money was valued at 92% of US money.

⇒ To find the value of one US dollar in Canadian funds, use this proportion:

$$\frac{\$1 \text{ CAN}}{\$0.92 \text{ US}} = \frac{N \text{ CAN}}{\$1 \text{ US}}$$

$N = \$1 \div \$0.92 = \$1.086$, so US money was valued at 109% of CAN money.

Note that the proportion changes as the exchange rate changes.

What if you buy in the United States?

- Change the US cost to the Canadian equivalent (multiply by 109% [varies]).
- If you have more than the purchases allowed (call the **Canada Border Service Agency** for information), the Canadian Customs charge **duty** on the Canadian value of your purchases. The percent of the duty (the rate) varies according to what the item is, where it was made and the duty rates of the day. For example, duty on poultry is 12.5%, on non-US cotton 25%, and on liquor 110%!

Duty is gradually being eliminated under the Canada-US Free Trade Agreement. If an item is made in North America, there is no duty charged because of NAFTA (North American Free Trade Agreement)

- HST (12%) is charged on the duty and on the Canadian value of the purchases (which includes any US sales taxes).

Look at this example (assume \$1.00 CAN = \$0.92 US).

Men's leather shoes, US price **\$64.80**

$$\text{US sales tax 6\%} \left(\frac{N}{64.80} = \frac{6}{100} \right) \quad 3.89$$

US total cost **68.69**

Equivalent cost in CAN funds (US\$ × 109%)

$$\left(\frac{N}{68.69} = \frac{109}{100} \right) \quad \$74.87$$

Duty on leather shoes is 22.8%

$$\left(\frac{N}{74.87} = \frac{22.8}{100} \right) \quad \$17.07$$

HST (12%) on CAN value plus duty

$$12\% \text{ of } (\$74.87 + \$17.07) \text{ is } \left(\frac{N}{91.94} = \frac{12}{100} \right) \quad \$11.03$$

The total cost of a pair of leather shoes priced at \$64.80 in the United States will be the American price in Canadian funds + duty + HST = **\$102.97 CAN**

Exercise Six

For each item, do the calculations using the duty and tax rates given. Assume \$1.00 US is \$1.09 CAN.

a) Groceries, US price \$75.

i) 3% US sales tax

ii) US total cost

iii) Equivalent value in CAN funds

iv) Duty at 10.2% (No HST on food)

v) Total cost in Canadian funds

b) Cotton Clothing, made in Romania, US price **\$98**.

i) 5% US sales tax

ii) US total cost

iii) Equivalent value in CAN \$

iv) Duty at 25%

v) HST at 12% (on Canadian Value + Duty)

vi) Total cost in Canadian funds

Answers to Exercise Six

a) i) \$2.25	ii) \$77.25	iii) \$84.20	iv) \$8.59	v) \$92.79	
b) i) \$4.90	ii) \$102.90	iii) \$112.16	iv) \$28.04	v) \$16.82	vi) \$157.02

Increases and Decreases, Discounts and Mark-ups

Increases (amount changing to more) and decreases (amount changing to less) are often given as a percent. For example,

- The Insurance Corporation of B.C. increased car insurance rates by 3.3% in March 2007.
- The number of acute care beds at the local hospital has decreased by 28% in the last year.
- The new work contract provides a 4% wage increase in the first year and a $2\frac{1}{2}\%$ increase in the second year.

The amount of an increase or decrease is calculated by **finding a percent of a number**.

When the percent of an increase or decrease is given, the proportion is:

$$\frac{\text{amount of increase or decrease}}{\text{whole amount}} = \frac{\text{increase or decrease \%}}{100}$$

Discounts are a form of decrease. The discount is the amount taken off a price; it is the price reduction.

Sale prices (discounted prices) may be advertised as

"All items 20% off."

"Everything in stock reduced by 25% to 50%."

" $33\frac{1}{3}\%$ savings!"

"2% discount for cash."

Decrease and discount problems may need to be solved in several steps. Sometimes the problems ask for:

- the amount of the decrease (may be called the "saving") (1 step).
- the amount left **after** the decrease (2 steps).

Example A: The sign says, "All winter coats 40% off." How much money will you **save** on a coat originally priced at \$128.99?

One step problem

use proportion $\frac{\text{decrease}}{\text{original price}} \rightarrow \frac{D}{\$128.99} = \frac{40}{100}$

$$100D = 40 \times \$128.99$$

$$D = \$5159.60 \div 100 = \$51.596 \text{ round to nearest cent} = \$51.60$$

You will save \$51.60

Example B: The couch and chair are advertised in a $33\frac{1}{3}\%$ price reduction sale. How much will you **pay** for a couch and chair originally priced at \$798?

Two step problem

First: Find the amount of savings (the decrease).

$$\frac{\text{saving}}{\text{full cost}} \rightarrow \frac{S}{798} = \frac{33\frac{1}{3}}{100}$$

Second: **Subtract** the savings from the original amount.
original amount - savings = sale price

Step 1 Find the amount of savings.

$$\begin{aligned} \frac{S}{798} &= \frac{33\frac{1}{3}}{100} & \longrightarrow & \quad 798 \times 33\frac{1}{3} = S100 & \longrightarrow & \quad \frac{798}{1} \times \frac{100}{3} = S100 \\ 26600 &= S100 & \longrightarrow & \quad \frac{26600}{100} = \frac{S100}{100} & \longrightarrow & \quad S = \$266 \end{aligned}$$

Step 2 Find the sale price.

original amount - savings (decrease) = sale price

$$\$798 - \$266 = \$532$$

The couch and chair will cost \$532 on sale (plus HST of course, but you do not have to calculate tax for this problem).

Exercise Seven

Solve these problems. Round all answers to the nearest cent.

a) The employees agreed to take a 5% pay cut (reduction) so no-one will be laid off. If the pay rate was \$15.50 per hour, how much less per hour will the workers earn?

b) "All shoes 25% off," says the sign. What will be the sale price of a pair of dress shoes originally priced at \$69.98?

c) The work force at the factory has to be reduced by $16\frac{2}{3}\%$ over the next two years. Early retirements, attrition (not replacing people who leave) and some lay-offs will be used. The work force is 3000 people right now. What is the planned size of the work force in two years?

d) 28% of the acute care beds in the hospital are going to be closed. The hospital has 175 acute care beds now.

i) How many beds will be closed?

ii) How many beds will the hospital have open for use after the bed closure?

Answers to Exercise Seven

a) \$0.78

b) \$52.48

c) 2 500 people

d) i) 49 beds

ii) 126 beds

Increases and mark-ups are calculated in the same way as decreases and discounts. However, an increase or mark-up is **added** to the original amount.

Example A: The auto insurance rate increased 19%. The basic insurance rate for Don's car was \$550 before the increase. What is the basic insurance after the increase?

Step 1 Calculate the amount of the increase

$$\frac{\text{amount of increase}}{\text{present cost}} \rightarrow \frac{N}{550} = \frac{19}{100}$$

$$N \cdot 100 = 550 \times 19 \quad \longrightarrow \quad N = 104.5$$

Step 2 **Add** the amount of increase to the original amount.

original amount + increase = new insurance cost

$$\$550 + \$104.50 = \$654.50$$

Don's new basic insurance is \$654.50.

Mark-ups are the amount added to the cost price before an item is resold. Many factors must be considered when businesses decide on the percent of the mark-up:

- all costs of operating a business
- the profit wanted
- the community the business is in
- the competition the business has

For example, the mark-up on leather shoes may be 45%, but on running shoes it may be 60%. Kitchen appliances might have a 42% mark-up, while lawn mowers might have a 55% mark-up.

Example A:

A shoe seller pays \$40.00 per pair of running shoes from the factory. The shoe seller makes the mark up 75%. What is the selling price of the shoes?

$$\frac{\text{mark up cost}}{\text{original cost}} \rightarrow \frac{N}{40} = \frac{75}{100} \longrightarrow 3000 = N100 \longrightarrow N = 30$$

Add the mark up to the original cost to get the selling price of the shoes:

$$\$75 + \$30 = \$105.00$$

Wage Increase

Having a wage increase at work is always a good thing! Often the raise will be given as a percentage. That means that everyone will see more money on their pay cheque, but they will each have a different amount because they all get paid a different amount to start with.

Example B:

The boss at A-1 House Painting will give a 1.5% wage increase to the 10 employees.

- a) 3 staff are paid the minimum wage of \$8.00 an hour.
- b) the other 7 staff are paid \$12.00 an hour.

$$\text{a) } \frac{\text{increase}}{\text{present wage}} \rightarrow \frac{I}{8} = \frac{1.5}{100} \longrightarrow \frac{\text{increase}}{\text{present wage}} \rightarrow \frac{I}{8} = \frac{1.5}{100}$$

$$8 \times 1.5 = I100 \longrightarrow I = \$0.12$$

The new wage will be the old wage plus the increase:

$$\$8.00 + \$0.12 = \$8.12 \text{ per hour}$$

$$\text{b) } \frac{\text{increase}}{\text{present wage}} \rightarrow \frac{I}{12} = \frac{1.5}{100} \longrightarrow 12 \times 1.5 = I100 \longrightarrow I = \$0.18$$

The new wage will be the old wage plus the increase:

$$\$12.00 + \$0.18 = \$12.18 \text{ per hour}$$

Exercise Eight

Solve the problems. Round money to the nearest cent.

- a) If the mark-up on the craft supplies was set at 75%, calculate the selling price for these items and complete the chart.

Cost Price to Business	Mark-up (75%)	Selling Price
silk flowers \$1.48	$\frac{N}{1.48} = \frac{75}{100} = \1.11	$\$1.48 + \$1.11 = \$2.59$
styrofoam cones \$0.40		
lace \$1.40 metre		
stuffing \$4.50 bag		
beads \$3.20 dozen		

- b) The population of the town has increased 30% since the pulp mill was built. The population before the pulp mill was 8 436 people. What is the population now? (Round to the nearest person.)

c) The wage contract gave the workers a 4% increase in the first year and a $2\frac{1}{2}\%$ increase in the second year. If the hourly rate of pay was \$12.45 before the new contract, calculate the following:

i) The amount of the increase per hour in the first year.

ii) The hourly pay rate in the first year. (old pay + increase = first year rate)

iii) The amount of pay increase in the second year. (Note—use the new hourly pay rate from the first year to calculate the increase for the second year.)

iv) The hourly pay rate in the second year. (first year rate + increase = second year rate)

d) Everyone in the apartment building received a notice that the rent would be increased 8% on September 1.

i) If the one bedroom apartment rents for \$375 a month, how much will the increase be?

ii) What is the rent for the one bedroom apartment after September 1?

iii) The two bedroom apartment is \$425 a month. How much is the increase per month?

iv) What is the rent for a two bedroom apartment after September 1?

v) If you rent a two bedroom apartment, how much more will you have to pay per year **after** the increase than you paid per year before the increase?

e) Joao's wage at his new job was \$15 an hour. He loves his job and his boss promised him an increase of pay of 10% after his first 500 hours of work. What will his new pay be?

Answers to Exercise Eight

Cost Price to Business	Mark-up (75%)	Selling Price
silk flowers \$1.48	<i>\$1.11</i>	<i>\$1.48+\$1.11=\$2.59</i>
styrofoam cones \$.40	\$0.30	\$0.70
lace \$1.40 metre	\$1.05	\$2.45
stuffing \$4.50 bag	\$3.38	\$7.88
beads \$3.20 dozen	\$2.40	\$5.60

- b) 10 967 people c) i) \$0.50 c) ii) \$12.95 c) iii) \$0.32
 c) iv) \$13.27 d) i) \$30 d) ii) \$405 d) iii) \$34
 d) iv) \$459 d) v) \$408 e) \$16.50

Commission and Tips

Salespeople may receive a **commission** as part or all of their pay. The business owner pays the salesperson an agreed-upon percent of the selling price of the product.

- Real estate agents are paid by commission on their sales.
- Car and truck salespeople may be paid a small salary per month, but their main income is the commission on the vehicles they sell.

Tips are appreciation payments for service. The customer gives tips directly to the worker. Taxi drivers, waiters, bellhops and chambermaids in hotels often receive a minimal hourly wage. A large part of their earnings is from **tips**. In restaurants, expect to leave at least a 15% tip for adequate service.

To calculate the amount of a commission (or a tip), find the percentage of the total amount using the proportion

$$\frac{\text{commission (part)}}{\text{total amount (whole)}} = \frac{\text{commission \%}}{100}$$

Commission problems often have several steps. You may have to

- add together several items to find the total of sales.
- subtract a base amount for which salespeople do not receive a commission.
- add the amount of commission to the basic wage to find out how much the person earned.

Example A:

The bill for the excellent dinner at the restaurant was \$56.40. The service had been good and the waiter very pleasant so Bill and Diane wanted to leave at least a 15% tip.

i) How much is the tip?

$$\frac{\text{tip}}{\text{bill}} \rightarrow \frac{N}{56.40} = \frac{15}{100} \longrightarrow 56.40 \times 15 = N100 \longrightarrow N = \$8.46$$

Bill will round this amount to \$8.50

ii) How much will he pay for the meal and the tip?

$$\begin{array}{r} \text{cost of dinner } \$56.40 \\ + \text{ tip } \underline{8.50} \\ \$64.90 \end{array}$$



In a **real** situation, we would probably round the amount of the bill to the nearest dollar and then calculate the tip.

Example B:

The salespeople at XW Ford receive a monthly salary of \$1 000. They also receive a 12% commission on any sales over \$35 000 in a month. This means they are expected to sell \$35 000 worth of vehicles every month to earn the \$1000 salary. If a saleswoman made \$54 000 in sales one month, what would her gross earning be?

You are asked to find the gross monthly earnings. What do you know?

- She earns \$1 000 per month.
- She earns 12% commission on sales over \$35 000.
- She had \$54 000 in sales.

Step 1 Subtract the base amount for which she will not earn a commission from her total sales.

total sales - base amount = amount of sales for which commission
will be paid

$$\$54\,000 - \$35\,000 = \$19\,000 \text{ in commissionable sales}$$

Step 2 Calculate the commission.

$$\frac{\text{commission}}{\text{commissionable sales}} \rightarrow \frac{X}{19000} = \frac{12}{100}$$

$$19\,000 \times 12 = X100 \rightarrow 228\,000 = X100 \rightarrow X = \$2\,280$$

Step 3 Add the salary and commission to find gross earnings

$$\$1000 + \$2\,280 = \$3\,280.$$

The saleswoman earned \$3 280.

Exercise Nine

Solve these problems.

a) A real estate agent sells a home for \$128 500. How much is the commission at 7% of the selling price? (Note that some of the commission goes to the real estate company and some to the salesperson.)

b) A clerk sold \$18 000 worth of clothes last year. He was paid a 15% commission. How much was his commission?

c) Mr. Green receives a weekly salary of \$325 plus a commission of 10% on all sales he makes over \$1 500. Last week Mr. Green sold \$3 500 worth of merchandise. How much money did he earn last week?

d) George sells used cars. He gets a 9% commission on all his sales. If he sold a total of 5 cars priced at \$2 295, \$3 450, \$8 600, \$1 049, and \$5 299 last month, how much money did he earn?

e) The final bill at the restaurant is \$160 and you want to leave a 15% tip.

i) What amount of tip should you leave?

ii) What is the total cost (bill and tip)?

iii) The total cost is to be shared amongst eight people. How much will each person pay?

Answers to Exercise Nine

a) \$8995

b) \$2 700

c) \$525

d) \$1 862.37

e) i) \$24.00

e) ii) \$184.00

e) iii) \$23.00

More Problems for Finding a Percent of a Number

- a) Joe was having trouble at school because he was absent 40% of the last 35 days of school. How many days did he miss?
- b) To successfully pass the course, the student must get at least 80% on the test. The test is out of 125. What mark will give the student 80%?
- c) The Masons invited 275 people to their daughter's wedding. They were happy when 90% of the people invited were able to attend. How many people came to the wedding? (round to the nearest person)
- d) George made a $12\frac{1}{2}\%$ down payment on a new car which cost \$3 200. How much was the down payment?

e) In B.C., employers are required to pay 6% holiday pay to all employees. Holiday pay is added to regular salary if a paid vacation is not taken. The young grocery clerk who earns \$8.00 an hour worked 25 hours last week.

i) What amount of holiday pay is he eligible for?

ii) His employer pays holiday pay on each cheque to part-time employees. What are his total earnings for the week? (salary + holiday pay)

f) Nutrition experts recommend that no more than 30% of the food calories a person consumes should be from fats. Foods such as fatty meat, dairy products with lots of butter fat, cooking oils, margarine, some salad dressings, and nuts contain a high percentage of fat. If a person's daily intake of calories is 2 560, what is the most number of calories that should be from fat?

g) 40% to 60% of a person's body weight is water. Good health depends on keeping the body's fluid (water) level balanced. Excessive sweating, illness such as diarrhea and some "crash" diets can upset this fluid balance.

i) Dave is a distance runner who weighs 70.5 kg. If his body weight is 60% water, what is the weight of the water contained throughout his body?

ii) Jack weighs 103 kg. He has a lot of body fat which contains less water, so only about 43% of his body weight is water. What is the weight of the water contained in Jack's body?

Answers to More Problems for Finding a Percent of a Number

a) 14 days

b) 100 marks

c) 248 people

d) \$400

e) i) \$12.00

e) ii) \$212.00

f) 768 calories

g) i) 42.3 kg

g) ii) 44.29 kg

Topic A: Self-Test

Mark /18 Aim 15/18

A. Answer the following.

7 marks

a) 6% of 30 = _____

b) $\frac{1}{4}$ % of 48 is? _____

c) What is 75% of 200? _____

d) $12\frac{1}{2}$ % of 8 = _____

e) Find 131% of 400. _____

f) 1.5% of 21 is? _____

g) Write the general proportion that can be used to solve percent problems.

B. Solve the problems. (2 marks each, except c)

11 marks

a) The \$125 000 house is insured for 85% of its value against fire damage. How much money should the owner receive if the house is destroyed by fire?

b) Charlotte sells leisure clothes in her small town for a large national company. She receives \$500 a month, and a 20% commission on all monthly sales over \$1 000. What are her monthly earnings if her total sales are \$2300?

c) The barbeque was originally priced at \$599 but Jack bought it during a 35% off, end-of-season sale.

i) What was the sale price? (1 mark)

ii) Calculate the harmonized sales tax (12%). (1 mark)

iv) Give the total cost of Jack's barbeque. (1 mark)

d) The contract to deliver phone books was split between two people. Jeff was given 60% of the books to deliver. The total number of books was 3 600. How many books did Jeff have to deliver?

e) This test is scored out of 19. On self-tests you should aim to get 80% to 85%. On this test your aim is 84%. Calculate, to the nearest whole number, the aim for this test.

Answers to Topic A Self-Test

Part A

a) 1.8

b) 0.12

c) 150

d) 1

e) 524

f) 0.315

g) $\frac{\textit{part}}{\textit{whole}} = \frac{\%}{100}$ or $\frac{\textit{is}}{\textit{of}} = \frac{\%}{100}$

Part B

a) \$106250

b) \$760.00

c) i) \$389.35

c) ii) \$46.72

c) iii) \$436.07

d) 2 160 books

e) 16 marks

Unit 3 Review

1) Solve each problem by setting up a proportion

a) 50% of 22

b) 25% of 36

c) 150% of 7

d) 12.5% of 48

e) 20% of 16

f) 18% of 40

g) 30% of 4

h) 5% of 45

i) what is 13% of 50?

j) 85% of \$165.00

k) $\frac{1}{4}$ % of 20

l) 0.5% of 122

m) 2% of \$7 800.00

n) 3.5% of 60

2) Use the proportion method to solve these questions

a) 75% of 12

b) $3\frac{1}{4}\%$ of 200 is?

c) what is 16% of 34?

d) 90% of 75 is

e) what is 14% of 60?

f) find 10% of 27

g) 5% of 15 is

h) $16\frac{2}{3}\%$ of 163

3) Find the total cost of each item, using 12% HST

	Item	Cost	HST (12%)	Total Cost
a)	t-shirt	\$14.99	$\frac{X}{14.99} = \frac{12}{100} \rightarrow X = \1.80	\$1.80 + \$14.99 = \$16.79
b)	New car	\$7 890.00		
c)	40" flat screen tv	\$699.00		
d)	Tent	\$168.79		
e)	Couch	\$348.00		
f)	Dehumidifier	\$78.99		
g)	Drill and bit set	\$248.99		
h)	Shoes	\$79.98		

- f) Kelowna's population in 2001 was 147 739, it grew 9.8% in 5 years. What was its population in 2006?
- g) Rent will increase 10% on Oliver's apartment on January 1. His rent was \$460.00 per month. What will his new rent be?
- h) The French Bread Bakery staff will get a one-time 15% pay increase on their Christmas pay check. If Manon works 63 hours at \$12.78/hour for that pay check, how much will she get paid? (figure out the regular pay first and then add on the 15% increase)
- i) A real estate agent sells a home for \$239 000.00. How much is the commission at 7%?
- j) Sylvia receives a weekly salary of \$280.00 plus a commission of 8% on all sales she makes over \$2000. Last week she sold \$5 600.00 worth of merchandise. How much money did she make?

- k) The bill at the restaurant was \$38.00. Add a 20% tip. What did the customer pay in total?
- l) Mica's wage increase in 15% after her first year of training. She made \$10.90 per hour for her first year. What will her wage be after the increase? (round to the nearest cent)
- m) The mark up on a pair of fancy running shoes is 45%. The shoes cost the buyer \$38.00. How much will they be sold for after mark-up?
- n) A house is insured for 90% of its value against damage. How much money will the owner get back on a destroyed house that is worth \$370 000.00?

o) Julie and Frank both work at the local restaurant. Julie is a cook's assistant and Frank is the cook. Julie makes \$9.00 an hour, Frank makes \$12.25 an hour. The boss is giving them both a raise of 8%. What will their new wages be? (remember to round to the nearest cent)

p) 15 employees work at the local day care. There are 4 pay categories. The board of directors has managed to find enough money to give each employee a 9% raise. Use the chart to figure out the following new pay rates.

Category	Pay rate	9% increase	New pay rate
1	\$12.15		
2	\$13.50		
3	\$14.00		
4	\$15.50		

Answers to Review**1.**

- a) 11 b) 9 c) 10.5 d) 6 e) 3.2 f) 7.2
g) 1.2 h) 2.25 i) 6.5 j) \$140.25 k) 0.05 l) 0.61
m) \$156.00 n) 2.1

2.

- a) 9 b) 6.5 c) 5.44 d) 67.5 e) 8.4 f) 2.7
g) 0.75 h) 27.16

3.

- b) \$946.80, \$8 836.80 c) \$83.88, \$782.88 d) \$20.25, \$189.04
e) \$41.76, \$389.76 f) \$9.48, \$88.47 g) \$29.88, \$278.87
h) \$9.60, \$89.58

4.

- a) \$44.83 b) 45 acres c) \$2.70 d) 27 people e) 2 116 139 f) 162 217
g) \$506.00 h) \$925.91 i) 16 730 j) \$568.00 k) \$45.60 l) \$12.54
m) \$55.10 n) \$333 000.00 o) Julie \$9.72 Frank \$13.23

p)

Category	Pay rate	9% increase	New pay rate
1	\$12.15	\$1.09	\$13.24
2	\$13.50	\$1.22	\$14.72
3	\$14.00	\$1.26	\$15.26
4	\$15.50	\$1.40	\$16.90

TEST TIME!

Ask your instructor for the Practice Test
for this unit.

Once you've done the practice test,
you need to do the unit 4 test.

Again, ask your instructor for this.

Good luck!