

# Unit 4

## More Working with Percent

## Topic A: Finding What Percent one Number is of Another

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

In problems where you must find what percent one number is of another, the **missing term** is the **percent**. You will be told the part (is) and the whole (of), you know the 100, and you solve for the missing percent.

**Example A:** 4 is what percent of 5?

4 is the part (is)

5 is the whole (of)

% is unknown (call it  $P$ )

Write the proportion

$$\frac{4}{5} = \frac{P}{100}$$

Cross multiply to solve

$$400 = 5P$$

$$400 \div 5 = P$$

$$P = 80\% \quad \text{Be sure to write the percent sign \%}.$$

In percent problems, the number after "of" usually is the whole.

The number close to "is" usually is the part. You may find it helpful to think "is over of  $\left(\frac{\text{is}}{\text{of}}\right)$ ". An = can substitute for "is".

12 is what percent of 15?

$\frac{\text{is}}{\text{of}}$  will help to find  $\frac{\text{part}}{\text{whole}}$

$$\frac{12 \text{ (is)}}{15 \text{ (of)}} = \frac{N}{100}$$

Example B: What percent of 85 is 60?

60 = the part (close to "is")

85 = the whole (after "of")

% = the unknown

$$\begin{array}{l} \text{proportion } \left( \frac{\text{is}}{\text{of}} \right) \quad \frac{60}{85} = \frac{P}{100} \\ \text{simplify} \quad \frac{\cancel{60}^{12}}{\cancel{85}_{17}} = \frac{P}{100} \end{array}$$

cross multiply and solve

$$1200 = 17P$$

$$1200 \div 17 = P$$

$$P = 70.588\% \quad \text{round to } 70.6\%$$

## Exercise One

The following examples ask you to find what percent one number is of another. The **missing term** is the **percent**. Look carefully at the wording and decide which number is the part (close to "is") and which number is the whole thing (after "of").

Write the proportion but do not solve the problem

- a) 3 is what % of 6?

b) 12 is \_\_\_\_ % of 5?

c) What % of 27 is 9?

d) What % of  $\frac{1}{2}$  is  $\frac{1}{4}$ ?

e) \_\_\_\_ % of 50 is 25?

f) \_\_\_\_ % of 64 = 48

#### Answers to Exercise One

$$\text{a) } \frac{3}{6} = \frac{N}{100}$$

$$\text{b) } \frac{F}{100} = \frac{12}{5}$$

$$\text{c) } \frac{9}{27} = \frac{X}{100}$$

$$\text{d) } \frac{\frac{1}{4}}{\frac{1}{2}} = \frac{P}{100}$$

$$\text{e) } \frac{X}{100} = \frac{25}{50}$$

$$\text{f) } \frac{48}{64} = \frac{N}{100}$$

## Exercise Two

Solve each question by first setting up the proportion

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

$$\text{a) } 25 \text{ is } \underline{125} \% \text{ of } 20. \quad \frac{\cancel{25}^5}{\cancel{20}_4} = \frac{P}{100}$$

$$500 = 4P \quad 500 \div 4 = P \quad P = 125\%$$

- b) 3 is what percent of 60? \_\_\_\_\_
- c) 3 is what percent of 4? \_\_\_\_\_
- d) 1 is what percent of 3? \_\_\_\_\_
- e) What % of 50 is 35? \_\_\_\_\_
- f) What percent of 350 is 42? \_\_\_\_\_
- g) 15 is \_\_\_\_% of 12. \_\_\_\_\_
- h) 14 is \_\_\_\_% of 700. \_\_\_\_\_
- i) What percent of 96 is 12? \_\_\_\_\_
- j) 2 is \_\_\_\_% of 125. \_\_\_\_\_
- k) 7 is what percent of 8? \_\_\_\_\_
- l) 46 is \_\_\_\_% of 40. \_\_\_\_\_

**Answers to Exercise Two**

- |          |           |                        |           |
|----------|-----------|------------------------|-----------|
| b) 5 %   | c) 75 %   | d) $33.\overline{3}$ % | e) 70 %   |
| f) 12 %  | g) 125 %  | h) 2 %                 | i) 12.5 % |
| j) 1.6 % | k) 87.5 % | l) 115 %               |           |

### Exercise Three

Solve the following by setting up the proportion.

- a) 16 is \_\_\_\_\_% of 64.
- b) 17 is \_\_\_\_\_% of 85.
- c) What % of 52 is 13? \_\_\_\_\_
- d) What percent of 65 is 39? \_\_\_\_\_
- e) 9 is \_\_\_\_\_% of 54.
- f) 33 is \_\_\_\_\_% of 200.
- g) What percent of 125 is 75? \_\_\_\_\_
- h) 1 is \_\_\_\_\_% of 200.
- i)  $36 =$  \_\_\_\_\_% of 12
- j) \_\_\_\_\_% of 72 = 27

k) 35 is what % of 42? \_\_\_\_\_

l) \_\_\_\_\_% of 48 = 18

m) 125 = \_\_\_\_\_% of 75

n) What % of 18 = 24? \_\_\_\_\_

**Answers to Exercise Three**

a) 25 %

b) 20 %

c) 25 %

d) 60 %

e)  $16.\overline{6}$  %

f) 16.5 %

g) 60 %

h) 0.5 %

i) 300 %

j) 37.5 %

k)  $83.\overline{3}$  % or  $83\frac{1}{3}$  %

l) 37.5 %

m)  $166.\overline{6}$  %

n)  $133.\overline{3}$  % or  $133\frac{1}{3}$  %

## Finding the Percent of an Increase or Decrease

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You learned in to find the amount of an increase (gain) or decrease (loss) when given the percent of the increase or decrease.

Now you are going to find the percent of the increase or decrease when you are given the amounts. This is called the rate of the increase or decrease.

Problems which ask you to find the percent of increase or decrease often involve two steps:

- Step 1 Find the amount of change (either increase or decrease) by finding the difference between the two amounts given. Subtract to find the difference.
- Step 2 Find the percentage of increase/decrease. Always compare the change (amount of increase or decrease) to the amount before the change (the original amount) using this proportion.

$$\frac{\text{amount of increase or decrease}}{\text{original amount}} = \frac{P}{100}$$

Example A: The rent went from \$375 a month to \$427.50 a month. What is the percent of the increase?

- Step 1 Find the change (the amount of increase) by finding the difference between the amounts.

$$\$427.50 - 375 = \$52.50$$

The amount of increase is \$52.50



Step 2 Find the % of increase.

The amount of increase is \$52.50

The original amount (the amount before the increase) is \$375.

What % of \$375 is 52.50?

$$\frac{X}{100} = \frac{52.50}{375} \longrightarrow X \cdot 375 = 5250 \longrightarrow$$

$$X = \frac{5250}{375} \longrightarrow X = 14\%$$

The rent increase is 14%.

Example B:

The hours of operation at the college were reduced from 35 hours a week to 30 hours a week.

What is the percent of this cut in operations?

Step 1 Find the amount change (a decrease) by finding the difference between the amounts.

$$35 \text{ hours} - 30 \text{ hours} = 5 \text{ hours}$$

The amount of decrease is 5 hours.

Step 2 Find the % decrease.

Decrease is 5 hours.

Original amount is 35 hours.

What percent is 5 of 35?

$$\frac{5}{35} = \frac{P}{100} \longrightarrow P \cdot 35 = 500 \longrightarrow \frac{500}{35} = P$$

$$P = 14\frac{2}{7}\%$$

The hours of operation at the college were cut  $14\frac{2}{7}\%$ .

## Exercise Four

Solve the following problems.

a) Ms. Lister's bi-weekly unemployment cheque increased from \$405 to \$435. What percent increase is this?

b) The worker's wage recently went from \$10.00 an hour to \$10.50 an hour. What is the percent of this increase?

c) Joan weighed 72 kg before she went on a programme of strict exercise and careful eating. She now weighs 60 kg. What is the percent of her weight loss?

d) The car dealership gives a special deal if the customer does not have a trade-in and pays cash. The dealers will only charge \$10 650 for a car listed at \$12 000. What is the percent savings in this deal?

e) The enrolment in the afternoon bowling league went from 40 bowlers to 50 bowlers for the spring session. What is the percent of this increase in bowlers?

f) A regular toilet uses 20 litres of water per flush. By purchasing a new low flow toilet, the water use is 6 litres per flush. What is the percent savings of water per flush if the new tank is used?

g) Garbage has become a major problem all over the world. In Canada, each person produces an average of 2 kilograms of garbage per day! A landfill that takes the garbage of 20 000 people therefore receives an average of 40 000 kg of garbage per day. Although organic household waste like vegetable peelings can be composted at home making new soil, about 7 600 kg of household organic waste goes to that landfill site every day. If all the people using that landfill composted their household organic waste, by what percent would the total amount of garbage be reduced?

h) Sixteen litres of raw strawberries only produced 13.5 litres of cooked strawberries. What is the percent of the shrinkage of these strawberries?

**Answers to Exercise Four**

a) 7.4 % increase

d) 11.25 % savings

g) 19 % reduction

b) 5 % increase

e) 25 % increase

h) 15.625 % shrinkage

c)  $16.\overline{6}$  % decrease

f) 70 % savings

## Other Problems

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Many situations compare one number to another.

- 24 out of 25 on the test
- 6 out of 10 people are overweight
- the government spends 27¢ of every federal tax dollar on the national debt

These numbers are often more easily thought about if written as a percent.

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

The following problems ask you to find what percent one number is of another. Often several steps are involved to calculate the part (as in question d) or to calculate the whole (as in question e) You may be asked to use the % after you find it (as in questions c and g). Remember the whole thing = 100%.

### Exercise Five

Solve the following problems.

- a) The Doal family net income is \$2300 per month. Their mortgage payment is \$750 each month. What percent is the mortgage payment of their monthly income?

b) The town of 20 000 people who use the landfill sight were asked to vote in a referendum concerning a recycling depot. The town had 12 000 eligible voters and 7 500 people voted in the referendum. What percent was the voter turnout? (Voter turnout is the number of people who voted compared to the number of eligible voters. This is usually expressed as a percent.)

c) Jean played on the college volleyball team and missed a lot of classes when she travelled to tournaments. She missed nine of the 42 English classes last semester.

i) What percent of her English classes did she miss?

ii) What percent of her English classes did she attend?

d) If a bank loan including interest totalled \$4 200, and 3 payments of \$210 have been made, what percent of the money owed has been paid back? (2 steps)

e) Four women and six men serve on the Village Council. What percent of the council members are women?

f) Gail bought a \$500 G.I.C. (Guaranteed Investment Certificate) one year ago. She was delighted to receive her annual interest cheque of \$52.50 today. What percent interest did Gail's G.I.C. pay for that year?

g) If a math book had 320 pages and you still had 110 pages left to do, what percent of the book had you finished? (2 steps)

**Answers to Exercise Five**

a) 32.6 % of monthly income

b) 62.5 % voter turnout

c) i) 21.4 % of English classes    ii) 78.6 % of English classes

d) 15 % of money owed

e) 40 % of members are women

f) 10.5 % interest

g) 65.625 % or  $65\frac{5}{8}$  % of the book

## School Grades

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When looking at test results, the mark shows how you did on the test.

- If you get  $\frac{7}{10}$  on a test, you know you got 7 answers right, and 3 answers wrong.

Sometimes it is also helpful to see your mark as a percentage.

### Example A:

$$\begin{array}{lcl} \frac{7}{10} = \frac{N}{100} & \longrightarrow & \text{By solving for } N, \text{ the percentage can be found.} \\ 7 \times 100 = N \times 10 & \longrightarrow & \frac{700}{10} = \frac{N10}{10} \longrightarrow 70 = N \\ & & \text{So, } \frac{7}{10} = 70\% \end{array}$$

Now, you can see that the test mark of  $\frac{7}{10}$  equals 70%.

### Example B:

The test result was  $\frac{15}{43}$ , what was the percent on the test?

$$\frac{15}{43} = \frac{N}{100} \longrightarrow 15 \times 100 = N \times 43 \longrightarrow \frac{1500}{43} = \frac{N43}{43}$$

$$N = 34.88 \%$$

If you round  $N = 35\%$

Not such a great mark!

### Example C:

Find the percent of the following grade:  $\frac{89}{97}$

$$\frac{89}{97} = \frac{P}{100} \longrightarrow 89 \times 100 = P \times 97 \longrightarrow \frac{8900}{97} = \frac{P97}{97}$$

$$P = 91.75 \% \text{ or } 92\%$$

## Exercise Six

Find the percents for the following test grades. Round your answer to the nearest percent.

a)  $\frac{33}{42}$

\_\_\_\_\_

b)  $\frac{24}{40}$

\_\_\_\_\_

c)  $\frac{13}{21}$

\_\_\_\_\_

d)  $\frac{5}{10}$

\_\_\_\_\_

e)  $\frac{90}{120}$

\_\_\_\_\_

f)  $\frac{100}{110}$

\_\_\_\_\_

g)  $\frac{7}{11}$

\_\_\_\_\_

h)  $\frac{10}{20}$

\_\_\_\_\_

### Answers to Exercise Six

a) 79%  
f) 91%

b) 60%  
g) 64%

c) 62%  
h) 50%

d) 50%

e) 75%



A. Solve to find the missing percents.

7 marks

a) 12 is \_\_\_\_\_% of 60.

b) \_\_\_\_\_% of 32 = 8.

c) \_\_\_\_\_% of 50 = 70.

d) 15 is \_\_\_\_\_% of 75.

e)  $3\frac{1}{2}$  is \_\_\_\_\_% of 70.

f) 8.2 = \_\_\_\_\_% of 32.8

g) What percent of 64 is 48? \_\_\_\_\_

**B. Problems**

6 marks

- a) The \$140 jacket was on sale for \$126. What percent is the savings?
- b) The rent on the apartment went from \$320 a month to \$400 dollars a month. What percent is this rent increase?
- c) The grocery bills were \$87.50, \$22.50 and \$30.25 last week. The net weekly income for that family is \$530. What percent of the income was spent on groceries?

**C. School Grades**

10 marks

Find the percents for the following grades on tests. Round your answer to the nearest whole percent.

a)  $\frac{3}{15}$

b)  $\frac{7}{15}$

c)  $\frac{12}{15}$

d)  $\frac{10}{19}$

e)  $\frac{71}{92}$

f)  $\frac{132}{140}$

g)  $\frac{13}{20}$

h)  $\frac{19}{20}$

i)  $\frac{5}{7}$

j)  $\frac{35}{40}$

### Answers to Topic A Self-Test

#### Part A

- |         |         |          |         |
|---------|---------|----------|---------|
| a) 20 % | b) 25 % | c) 140 % | d) 20 % |
| e) 5 %  | f) 25 % | g) 75 %  |         |

#### Part B

- |                 |                  |                            |
|-----------------|------------------|----------------------------|
| a) 10 % savings | b) 25 % increase | c) 26.5 % of weekly income |
|-----------------|------------------|----------------------------|

#### Part C

- |        |          |        |        |
|--------|----------|--------|--------|
| a) 20% | b) 47%   | c) 80% | d) 53% |
| e) 77% | f) 94%   | g) 65% | h) 95% |
| i) 71% | j) 87.5% |        |        |

## Topic B: Finding a Number when a Percent of it is Given

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

In problems when a certain percentage of a number is given, the **missing term is the whole**. You will be told the % and the part (is), and asked to find the whole (of), which is 100%.

**Example A:** 20% of what number is 14?

The part = 14.

The whole ("what number") = unknown (call it  $N$ ).

The percent = 20%.

Write the proportion

$$\frac{14}{N} = \frac{20}{100}$$

Solve the proportion

$$\text{simplify } \frac{14}{N} = \frac{20^1}{100_5}$$

cross multiply

$$14 \times 5 = N \times 1$$

$$70 = N$$

$$20\% \text{ of } \underline{70} = 14$$

Check by finding 20% of 70. The answer should be 14.

$$\frac{20}{100} = \frac{N}{70} \longrightarrow N100 = 140 \longrightarrow N = 14$$

Example B:  $33\frac{1}{3}\%$  of \_\_\_\_ is 60.

part = 60

whole =  $N$

percent =  $33\frac{1}{3}\% = \frac{1}{3}$

proportion

$$\frac{60}{N} = \frac{1}{3} \longrightarrow 3 \times 60 = 1N \longrightarrow N = 180$$

$33\frac{1}{3}\%$  of 180 is 60.

To check the answer, find  $33\frac{1}{3}\%$  of 180. The answer should be 60.

Example C:  $12 = 15\%$  of what number?

$$\frac{12}{N} = \frac{15}{100} \longrightarrow \frac{12}{N} = \frac{\cancel{15}^3}{\cancel{100}_{20}} \longrightarrow 12 \times 20 = 3N$$

$$240 = 3N \longrightarrow 240 \div 3 = N \longrightarrow 80 = N$$

$12 = 15\%$  of 80

To check, find  $15\%$  of 80. The answer should be 12.

Example D: 24 is  $40\%$  of what number?

$$\frac{24}{N} = \frac{40}{100} \longrightarrow \frac{24}{N} = \frac{\cancel{40}^2}{\cancel{100}_5} \longrightarrow 24 \times 5 = N \times 2$$

$$120 = 2N \longrightarrow 120 \div 2 = N \longrightarrow N = 60$$

24 is  $40\%$  of 60.

## Exercise One

Set up the proportion. Do Not solve the question.

a) 18 is 50% of what number? \_\_\_\_\_

b) 24 is 15% of what number? \_\_\_\_\_

c) 90 is 4% of what number? \_\_\_\_\_

d) 15 = 60% of what number? \_\_\_\_\_

e)  $12\frac{1}{2}\%$  of what number is 2? \_\_\_\_\_

f) 200% of what number is 86? \_\_\_\_\_

g) 75% of what number = 10? \_\_\_\_\_

h)  $66\frac{2}{3}\%$  of what number = 500? \_\_\_\_\_

i) 37.5% of \_\_\_\_\_ = 240. \_\_\_\_\_

j) 10% of \_\_\_\_\_ is \$25. \_\_\_\_\_

### Answers to Exercise One

$$\begin{array}{lllll} \text{a) } \frac{18}{P} = \frac{50}{100} & \text{b) } \frac{24}{N} = \frac{15}{100} & \text{c) } \frac{90}{X} = \frac{4}{100} & \text{d) } \frac{15}{N} = \frac{60}{100} & \text{e) } \frac{2}{F} = \frac{12\frac{1}{2}}{100} \\ \text{f) } \frac{86}{P} = \frac{200}{100} & \text{g) } \frac{10}{Y} = \frac{75}{100} & \text{h) } \frac{500}{P} = \frac{66\frac{2}{3}}{100} \text{ or } \frac{2}{3} & \text{i) } \frac{240}{L} = \frac{37.5}{100} & \text{j) } \frac{25}{N} = \frac{10}{100} \end{array}$$

## Exercise Two

Solve the following. Check your answers to see if your proportion was set up correctly.

a) 60 is 75% of what number? \_\_\_\_\_

b) 950 is 95% of \_\_\_\_\_

c)  $125 = 33\frac{1}{3}\%$  of what number? \_\_\_\_\_

d)  $87\frac{1}{2}\%$  of what number is 280? \_\_\_\_\_

e) 50% of \_\_\_\_\_ = 95. \_\_\_\_\_

f) 25% of \_\_\_\_\_ is 800. \_\_\_\_\_

g) 12.5% of what number is 64? \_\_\_\_\_

h) 120% of \_\_\_\_\_ is 6. \_\_\_\_\_

i) 270 is 100% of what number? \_\_\_\_\_

j)  $3\frac{1}{2}\%$  of what number is 21? \_\_\_\_\_

### Answers to Exercise Two

a)  $\frac{60}{x} = \frac{75}{100}$ , 80

b)  $\frac{950}{p} = \frac{95}{100}$ , 1 000

c)  $\frac{125}{N} = \frac{33\frac{1}{3}}{100}$ , 375

d)  $\frac{280}{L} = \frac{87\frac{1}{2}}{100}$ , 320

e)  $\frac{50}{100} = \frac{95}{x}$ , 190

f)  $\frac{25}{100} = \frac{800}{p}$ , 3 200

g)  $\frac{12.5}{100} = \frac{64}{N}$ , 512

h)  $\frac{120}{100} = \frac{6}{j}$ , 5

i)  $\frac{100}{100} = \frac{270}{N}$ , 270

j)  $\frac{3\frac{1}{2}}{100} = \frac{21}{p}$ , 600

## Exercise Three

Solve the questions.

- a) 480 is  $66\frac{2}{3}\%$  of \_\_\_\_.
- b) 40% of \_\_\_\_ is 50.
- c) 25% of what number is 8? \_\_\_\_
- d) 12 is 75% of what number? \_\_\_\_
- e)  $33\frac{1}{3}\%$  of what number is 99? \_\_\_\_
- f) 2800 is  $87\frac{1}{2}\%$  of what number. \_\_\_\_
- g) 97% of what number is 970? \_\_\_\_
- h) 3 is 150% of what number? \_\_\_\_
- i) 122 is 80% of \_\_\_\_.
- j) \$8.75 is  $10\frac{1}{2}\%$  of what number? \_\_\_\_

### Answers to Exercise Three

- |          |            |          |       |
|----------|------------|----------|-------|
| a) 720   | b) 125     | c) 32    | d) 16 |
| e) 297   | f) 3 200   | g) 1 000 | h) 2  |
| i) 152.5 | j) \$83.33 |          |       |



# Solving Problems when the Percent of a Number is Given

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Read the problems carefully. More than one step may be needed. Look at the wording so you will recognize problems missing the whole and be able to tell them from problems missing the part.

## Exercise Four

Solve the problems. Round money to the nearest cent.

- a) When the business was declared bankrupt, all the creditors (people owed money by the business) were paid 55% of the money owed them.
- i) If a creditor received \$8 000 from the bankrupt business, how much money had he really been owed?
  - ii) How much money did the creditor lose on this business?
- b) In telethons and other fund-raising events, records show that about 80% of the money pledged is actually collected. The local telethon organizers need to raise \$12 000. To actually raise \$12 000, their goal for pledges should be what amount?

c) Statistics suggest that only about 46% of victims of sexual assault report the assault to the police. If a police department received 920 reports of sexual assault in a year, how many cases of sexual assault may really have occurred?

d) The shoe store sold all merchandise at 25% off in a huge clearance sale. They took in \$3 500 in the first day of the sale. If the same shoes had been sold at the regular price, how much money would they have taken in? (Note—this problem has 2 steps. The merchandise was 25% off, so it sold for  $100\% - 25\% = 75\%$  of the original price.)

e) Marie paid \$4 500 for a second hand car in the Bonanza Summer Sale when all cars were  $33\frac{1}{3}\%$  cheaper than their list price. What had been the listed price of Marie's car? (Watch for the extra step!)

f) A 15% down payment is required on clothes before any alterations will be done for you by the store tailor. If someone had to make a down payment of \$30 before his suit would be altered, what was the price of the suit?

g) The quorum (number of people who must be present so official business can be decided) set in a particular club's bylaws is 30% of the members. They had exactly a quorum at their last meeting when 12 people came. How many members are in this club?

h) A common rate of commission earned by real estate agents is  $3\frac{1}{2}\%$ . If an agent had a gross income of \$63 000 from commissions in one year, what was the value of the houses sold?

i) The distance from Vancouver to Osoyoos is 420 km. This is 60% of the total distance of the trip from Vancouver to Nelson. What is the distance from Vancouver to Nelson?

**Answers to Exercise Four**

- |                   |                   |                |                |
|-------------------|-------------------|----------------|----------------|
| a) i) \$14 545.45 | a) ii) \$6 545.45 | b) \$15 000.00 | c) 2 000 cases |
| d) \$4 666.67     | e) \$6 750        | f) \$200       | g) 40 members  |
| h) \$1 800 000    | i) 700 km         |                |                |

## Topic B: Self-Test

Mark /10 Aim 8/10

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A. Solve these questions:

6 marks

a) 2.5% of what number is 160? \_\_\_\_\_

b)  $37\frac{1}{2}\%$  of what number is 24? \_\_\_\_\_

c) 5 is  $\frac{4}{5}\%$  of \_\_\_\_\_.

d) 20 is  $12\frac{1}{2}\%$  of what number? \_\_\_\_\_

e) 180 is 90% of what number? \_\_\_\_\_

f) 28 is 35% of what number? \_\_\_\_\_

**B. Problems.**

**4 marks**

a) If a bank insists that new house buyers have a cash down payment of 12%, what house price can a couple afford if they have saved a \$15 000 down payment?

b) Jim has really cut down on his smoking. He now smokes 7 cigarettes a day, which he says is only 20% of what he used to smoke. How many cigarettes a day did Jim smoke before he started cutting down?

**Topic B: Self-Test**

**Part A**

a) 6 400

b) 64

c) 625

d) 160

e) 200

f) 80

**Part B**

a) \$125 000

b) 35 cigarettes per day

## Unit 4 Review

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You have been practising three types of percent problems. You have learned that one proportion can be used to solve all the problems:

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

### A: Finding a Percent of a Number

- You are given the percent and the whole.
- The missing term is the part (call it  $N$ ).

$$\frac{N}{\text{whole}} = \frac{\%}{100}$$

### B: Finding What Percent One Number is of Another

- You are told the part and the whole.
- The missing term is the percent (call it  $P$ ).

$$\frac{\text{part}}{\text{whole}} = \frac{P}{100}$$

### C: Finding a Number When a Percent of It Is Given

- You are given the part and the percent.
- The missing term is the whole (call it  $W$ ).

$$\frac{\text{part}}{W} = \frac{\%}{100}$$

Real-life situations and real math problems often require several steps to collect and organize all the information. Look for those extra steps in the problems that follow. When you read the problems look for the part, the whole and the percent. Decide which term is missing. Once you know which term is missing, the problem can be solved by using the proportion  $\frac{\text{part}}{\text{whole}} = \frac{\%}{100}$ , or the appropriate short method.

Solve these problems using proportion. **Show your work under each problem so your instructor can help if you have any difficulty.** Remember to check that the answer makes sense. Round your answers as follows:

- money to the nearest cent
- all other answers to the nearest tenth

a) Derek is driving home from college, a distance of 240 km. He has stopped for a quick lunch after driving 180 km. What percent of his trip home does he have left to drive?

b) You need a minimum of 80% on the test which means you must get at least 36 marks. What are the total possible marks on the test?



c) Canadian residents pay a 5% surtax on their federal income tax. The 5% surtax is an extra tax on federal income tax. If a person has to pay \$2250 federal income tax in a year, how much will the surtax be?

d) The Lings are buying a \$130 000 home and have made a \$19 500 down payment. What percent of the purchase price is their down payment?

e) Ann and Joe bought their home twelve years ago and have paid 45% of the principle amount of their mortgage. They have paid \$18 000 towards the principle of the mortgage. What was the principle amount of the mortgage to start with?

f) The waiters at the restaurant must contribute money to be shared among the cocktail servers and kitchen staff. Each waiter contributes 4% of his or her total food and drink sales. Craig's total sales were \$645 in his 5 hour shift.

i) How much money must he contribute to the kitchen and cocktail servers?

ii) Craig made 12% in tips on his sales tonight. What amount were his tips?

iii) Craig is paid \$9.50 an hour. Calculate how much money he will receive for his evening's work. Include wages and tips. Remember to subtract the money he had to pay to the kitchen and cocktail staff.

g) The college employs 432 people. Administrators make up 12% of the staff. All other employees belong to unions. How many employees belong to unions?

h) The cost of hydroelectric power for our home last year was 210% of what it was six years ago. Last year our power bill totalled \$960. How much was it six years ago?

i) The graduating class had 68 women and 80 men. What percent of the class were men?

j)  $16\frac{2}{3}\%$  of the tickets for the rock concert were sold in the first hour the telephone order lines were open. In that hour, 2 500 tickets were sold. What was the total number of tickets available for the concert?

k) Mrs. Brown went shopping for her daughter. At one store, she bought her daughter a purse for \$39.99, a pair of shorts on sale for \$18.50, a great looking shirt for \$29.95 and some shampoo for \$4.25.

i) Calculate the Harmonized Sales Tax (12%) on these purchases.

ii) Calculate the total cost, including taxes, for all these items.

l) The total student enrolment in the school district has increased from 18 506 students to 19 724 students in the last year. What is the percent of this increase in student enrolment?

m) Al bought his second hand off-road motorcycle for \$1500 and sold it three years later for \$1175. By what percent did his motorcycle depreciate (decrease in value)?

n) Pat operates a street-vendor's cart selling hot dogs, sausages on a bun and soft drinks. The basic pay is \$100 per week and 28% commission on all sales over \$450 in a week. Pat sold \$1244 of food and soft drinks last week. Calculate Pat's earnings from the street-vending cart for the week.

o) The 1500 blouses purchased by the large retail chain of ladies' clothing stores cost the company a total of \$24 000. The blouses were then priced to sell at \$45 each. What is the percent of the mark-up on these blouses? (Hint-First calculate the company's cost price for each blouse.)

p) 92% of the members of the union voted to strike; that is, 320 union members voted to strike. How many members are in the union?

q) Maureen was happy to see that she got 27 out of 30 on her English essay. What percent did she get?

r) The ski jackets were on the summer clearance rack marked "45% off".

i) What is the sale price of a jacket priced regularly at \$229.95?

ii) What is the total cost of this jacket with H.S.T (12%)?

s) Tuition fees at the university have increased from \$49 per credit hour to \$62 per credit hour in the last three years. What is the percent of the tuition increase?

t) Jill bought 3 bottles of liquor in the US. The bill, including US sales tax, was \$28.50. Assume the American dollar was \$1.08 Canadian. Calculate

i) The value of the liquor in Canadian funds.

ii) Duty at 110%

iii) HST. at 12% (on Canadian value + duty)

iv) Total cost in Canadian funds.

u) The consignment store will sell your good used women's clothing for you. The store owners take a percentage of the selling price as their fee for service. The consignment charges (the % the store owners keep) are as follows:

coats	45%
dressess and skirts	$33\frac{1}{3}\%$
bridal and evening gowns	50%
blouses, jeans, and slacks	25%

Lisa and her daughters did a huge closet clean-out and had the following items sold at the consignment store. For each category, calculate the amount for the store fee and the amount Lisa and the girls received.

	Items	Selling Price	Store Fee	Amount for Lisa & her daughters
i)	Wedding dress	\$275		
ii)	2 lovely "prom" dresses at \$90 each	2 @ \$90 = \$180		
iii)	3 dresses at \$40 each	3 @ \$40 = \$120		
iv)	Lisa's winter coat at \$120	\$120		
v)	4 pairs of outgrown jeans at \$10 each	4 @ \$10 = \$40		
vi)	1 silk blouse for \$15	\$15		
vii)	6 cotton/polyester blouses for \$9 each	6 @ \$9 = \$54		

v) You have just completed four units of the five units in this book. What percent of the book have you completed?!?!?



**Answers to Review**

- a) 25 % of trip left      b) 45 marks      c) \$112.50
- d) 15 % of purchase price      e) \$40 000      f) i) \$25.80
- f) ii) \$77.40      f) iii) \$99.10      g) 380 employees
- h) \$457.14      i) 54.1 % men      j) 15 000 tickets
- k) i) \$11.12      k) iii) \$103.81
- l) 6.6 % increase      m) 21.7 % depreciation      n) \$322.32
- o) 181.3 % mark-up      p) 348 members      q) 90 % correct
- r) i) \$126.47      r) ii) \$141.65      s) 26.5 % increase
- t) i) \$30.78      t) ii) \$33.86      t) iii) \$7.76
- t) iv) \$72.40
- u)

	Items	Selling Price	Store Fee	Amount for Lisa & her daughters
i)	Wedding dress	\$275.	\$137.50	\$137.50
ii)	2 lovely "prom" dresses at \$90 each	2 @ \$90 = \$180	\$90.00	\$90.00
iii)	3 dresses at \$40 each	3 @ \$40 = \$120	\$40.00	\$80.00
iv)	Lisa's winter coat at \$120	\$120	\$54.00	\$66.00
v)	4 pairs of outgrown jeans at \$10 each	4 @ \$10 = \$40	\$10.00	\$30.00
vi)	1 silk blouse for \$15	\$15	\$3.75	\$11.25
vii)	6 cotton/polyester blouses for \$9 each	6 @ \$9 = \$54	\$13.50	\$40.50

- v) 80 % Well done!

## **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!**