VANCOUVER ISLAND UNIVERSITY

Percentages Review

The use of percentage is another way of expressing numbers (usually fractions) in such a way as to make comparisons between them more obvious. For instance, if you get 28 out of 40 in test A and 37 out of 50 in Test B, it may not be clear whether you have improved or not. The use of percentage will allow this comparison, because a percent is part of 100. (i.e. a percent is a fraction with a denominator of 100).

A. CHANGING % TO FRACTIONS / DECIMALS

A percent means a part of 100. For example, if you get 95% on a test, your mark was 95 out of 100. A percent can be changed to a fraction or decimal by simply dividing the percentage number by 100.

1. Changing % to Fractions

Divide by 100.
(i.e. put the % number over 100 and reduce if necessary)

$$93\% = \frac{93}{100}$$

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

$$24\% = \frac{24}{100} = \frac{6}{25}$$

If a decimal appears in the fraction, multiply the fraction by 10, 100, 1000 etc. to produce an equivalent fraction without decimals.

$$26.3\% = \frac{26.3}{100} \times \frac{10}{10} = \frac{263}{1000}$$

$$5.55\% = \frac{5.55}{100} \times \frac{100}{100} = \frac{555}{10000} = \frac{111}{2000}$$

2. Changing % to Decimals

Simply divide by 100. (i.e. move the decimal point 2 places to the left)

$50\% = .50$ or $.5$

$9.23\% = .0923$

$4\% = .04$

$148\% = 1.48$

B. CHANGING FRACTIONS / DECIMALS TO PERCENTS

1. Changing Fractions to Percent

If you get 17 out of 20 on a test, it is convenient to change this mark to a percentage.
This means changing $\frac{17}{20}$ to an equivalent fraction with 100 as denominator (i.e. $\frac{17}{20} = \frac{?}{100}$).

To change fractions to %, simply multiply the fraction by 100%.

$\frac{17}{20} = \frac{17}{20}$ x 100% = $\frac{1700}{20}$ = 85%

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

$\frac{2}{3} = \frac{2}{3}$ x 100% = $66.\dot{6}\,\%$

$\frac{19}{40} = \frac{19}{40}$ x 100% = $47\frac{1}{2}\,\%$ or 47.5%

Note: The mathematical wording for changing a fraction ($\frac{17}{20}$) to a percent would normally be:

17 is what % (out) of 20?
or
What % is 17 (out) of 20?

The word "out" is usually not included.

e.g. 19 is what % of 75?

$\frac{19}{75} = \frac{19}{75}$ x 100% = $25\frac{1}{3}\,\%$

What % is 7 of 5?

$\frac{7}{5} = \frac{7}{5}$ x 100% = 140%

2. Changing Decimals to Percents

To change decimals to percents, simply multiply by 100% (i.e. move the decimal point 2 places to the right.)

.29	=	.29	x	100%	=	29%
.156	=	.156	x	100%	=	15.6%
1.3	=	1.3	x	100%	=	130%

C. USING PERCENTS

When percents are used in calculations, they are first converted to either fractions or decimals. Usually it is more convenient to change % to decimals.

1. Multiplying With Percents

If a test mark was 50% and it was out of 40 total marks, what was the test score?

$$50\% = \frac{\text{test score?}}{40\ (\text{total marks})}$$

$$50\% \times 40 = .5 \times 40 = 20$$

$$\text{So } 50\% = \frac{20 \text{ marks}}{40}$$

50% (out) of 40 is what number?

What number is 50% (out) of 40?

To find the test score, or the part, we multiply the % by the total.

e.g. 85% of 25 is what number? $85\% \times 25 = .85 \times 25 = 21.25$

What number is 30% of 45.37? $30\% \times 45.37 = .3 \times 45.37 = 13.611$

2. Dividing with Percents

If a test mark was 50% and you received a score of 20 marks, what was the test out of?

$$50\% = \frac{20 \text{ marks}}{\text{total?}}$$

$$20 \div 50\% = 20 \div .5 = 40$$

$$\text{or } 20 \div \frac{1}{2} = 20 \times \frac{2}{1} = 40$$

50% (out) of what number is 20?

20 is 50% (out) of what number?

$$\text{So, } 50\% = \frac{20}{40} \text{ total marks}$$

To find the total marks, we divide by the %.

e.g. 40% of what number is 25? $25 \div 40\% = 25 \div .40 = 62.5$

18 is 75% of what number? $18 \div 75\% = 18 \div .75 = 24$

D. **SUMMARY AND EXERCISE**

1. **Three types of Percent Problems**

In summary, there are three things that we can do with percent. We will use the example on the right side of the page to summarize.

$$50\% = \frac{20\ (\text{part})}{40\ \text{total}}$$

1. Finding % **or** what % of 40 is 20? $\frac{20}{40} = \frac{20}{40} \times 100\% = 50\%$
2. Finding the Part **or** 50% of 40 is what number? $50\% \times 40 = .5 \times 40 = 20$
3. Finding the total **or** 50% of what number is 20? $20 \div 50\% = 20 \div .5 = 40$

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2. EXERCISE: PERCENT PROBLEMS

1. **Change to Fractions**

a) 97% b) 82% c) 150% d) 45.3%

e) 9.25% f) 40% g) $5\frac{1}{2}\%$

2. **Change to Decimals**

a) 42% b) 9.37% c) 2% d) 243.9%

e) 0.95%

3. **Change to %**

a) $\frac{19}{20}$ b) $\frac{2}{3}$ c) $\frac{18}{75}$ d) $\frac{1}{12}$

e) $\frac{5}{9}$ f) $\frac{38}{40}$ g) 0.865 h) 2.37

i) .0092 j) $\frac{7}{4}$

4. **Finding %**

   a) What % of 72 is 18?

   b) 16 is what % of 80?

   c) What % of 30 is 18.5?

5. **Finding the Part**

   a) 40% of 18 is what number?

   b) What number is 16.5% of 30.2?

   c) 65% of 15 is what?

6. **Finding the Total**

   a) 40% of what number is 12?

   b) 18 is 55% of what number?

   c) 120 is 150% of what number?

7. **Percent Problems Combined**

   a) What % of 25 is 5?

   b) 70% of 15 is what number?

   c) 85 is 20% of what number?

   d) 90 is what % of 55?

   e) 30% of what number is 80?

   f) What number is 42% of 50?

ANSWERS

1. a) $\frac{97}{100}$ b) $\frac{41}{50}$ c) $1\frac{1}{2}$ d) $\frac{453}{1000}$ e) $\frac{37}{400}$ f) $\frac{2}{5}$ g) $\frac{11}{200}$

2. a) .42 b) .0937 c) .02 d) 2.439 e) .0095

3. a) 95% b) $66.\dot{6}\%$ or $66\frac{2}{3}\%$ c) 24% d) $8.\dot{3}\%$ e) $55.\dot{5}\%$ f) 95%
   g) 86.5% h) 237% i) .92% j) 175%

4. a) 25% b) 20% c) $61.\dot{6}\%$

5. a) 7.2 b) 4.983 c) 9.75

6. a) 30 b) $32.\overline{72}$ c) 80

7. a) 20% b) 10.5 c) 425 d) $163.\overline{63}\%$ e) $266.\dot{6}$ f) 21