S1 Topic 15

Percentages

Level: Key Stage 3

Dimension: Number and Algebra
Module: Comparing Quantities
Unit: Using Percentages

Student ability: Average

Content Objectives:

After completing the activity, students will be more familiar with fractions, decimals & percentages, percentage change, discount, profit and loss.

Language Objectives:

After completing the activity, students should be able to

- understand English key words related to the topic (e.g., *fraction, numerator, denominator, decimals, percent, percentage, new value, original value, increase, decrease, marked price, discount, discount percent, saved, selling price, profit, loss, cost price*);
- understand the English expressions for explaining key concepts related to percentages, e.g.,
  - *A percentage is a fraction whose denominator is 100.*
  - *To change a fraction or a decimal to a percentage, we just multiply the fraction (or decimal) by 100%.*
  - *To change a percentage to a fraction or a decimal, we can replace % by* $\frac{x}{100}$ *and simplify the answer.*
- use English to discuss problems related to percentages, e.g.,

  A: What is the marked price of this bicycle?
  B: The marked price of this bicycle is $300.
  A: What is the discount percent?
  B: The discount percent is 30%
  A: How much will Cathy save if she buys this bicycle?
  B: Cathy will save $90 ($_300 x 30% _ = $_90).
  A: How much will Cathy pay?
  B: She will pay $210.
- follow English instructions on solving problems concerning this topic and work on related problems written in English.

Prerequisite knowledge:

Students should have learned about the concept of percentage through the medium of Chinese and had some experience of calculating percentages.

Time: 4 lessons (4 x 40 minutes)

Procedure:

Lesson 1:

1. Based on the knowledge of percentages students have acquired in Chinese, the teacher should present the meanings of the mathematical terms shown at the top of the worksheet, demonstrating the pronunciation of the terms clearly.

2. Then the teacher should ask the students to read and answer the questions in the worksheet themselves.

3. The teacher should then discuss the answers with the students.

Lesson 2:

1. The teacher should introduce the pronunciation and meaning of the vocabulary related to percentage change.

2. Using the vocabulary learnt in the list, the teacher should then ask students to complete the formula for percentage change.

3. Using the supermarket situation, the teacher should then ask the students to answer the questions related to changes in price of goods.

Lesson 3:

1. The teacher should introduce the pronunciation and meaning of the key words related to discount.

2. The teacher should then review the formulae for discount with the students.

3. Using the situation of buying a bicycle, students practise the calculation of discount by answering the questions in the worksheet.

4. Students pair-up and gain oral practice of the English vocabulary items by asking and answering questions in English.

Lesson 4:

1. Students practise the calculation of discount by completing the table about buying dresses in a department store. Students have to calculate the value of the selling price and discount per cent.

2. The teacher should first introduce the pronunciation and meaning of the key words. The teacher should also discuss the meanings of profit and loss. Then students then complete

the profit and loss exercise on the worksheet.

3. The teacher should then review the formulae for profit and loss.

4. Students then fill in the missing information in the table for dress A. Then they have to practise the oral presentation in pairs.

5. The teacher then divides the class into 3 groups and asks the students to fill in the missing information in the table for dresses B/C/D (e.g. students from rows 1-2 are responsible for dress B, students from rows 3-4 for dress C)

6. Students work in pairs and take parts in the dialogue discussing the dresses B/C/D.

Explanatory Notes for Teachers:

1. The aim of this teaching material is to give students the opportunity to practise presentation skills and the skill of reading and answering questions in English on the topic of percentages. It is therefore expected that the teacher will use English as the medium of instruction to complete the topic.
2. Apart from learning the meanings of the English terms, students are expected to learn how to pronounce them correctly.
3. Teachers are expected to provide more examples of decimals, percentages and fractions if students are not familiar with the conversion in Lesson 1.
4. In Lesson 2, students learn to calculate the new values or percentage change using the goods in a supermarket. The teacher can use the enlarged diagram in the Appendix to show the prices during the lesson.
5. In Lesson 3, students will gain oral practice with similar simple examples (such as buying a bicycle). The teacher should ensure that students know the meaning of “saved” (not the new price).
6. In Lesson 4, students have to calculate the unknown values (selling price, discount percent and cost price) by themselves first. Otherwise, they cannot do the pair-work speaking activity smoothly.
7. In Lesson 4, the teacher can demonstrate how to do the speaking activity with partners for

dress A. Then students will do the oral practice for dress A with their partners. After that, the teacher can ask some students (e.g. rows 1-2) to practise for dress B, while other students (e.g. rows 3-4) are practising for dress C and some students (e.g. rows 5-6) are practising for dress D.

Percentages

Name: _____ Class: _____ ( )

Lesson 1: Fraction, decimal and percentage

Vocabulary:

Fraction 分數	Numerator 分子	Percentage 百分數
Decimal 小數	Denominator 分母	Per cent 百分率

Read the following passage.

A percentage is a fraction whose denominator is 100. For example, $\frac{28}{100}$ is a percentage.

Usually, we use the symbol % to represent $\frac{}{100}$. Therefore, $\frac{28}{100}$ is also written as 28%.

To change a fraction or a decimal to a percentage, we just multiply the fraction (or decimal) by 100%.

e.g. $\frac{1}{4} = \frac{1}{4} \times 100\% = 25\%$

$1.275 = 1.275 \times 100\% = 127.5\%$

Change the following fraction into a percentage:

i) $\frac{1}{50} =$ _____

ii) $\frac{1}{20} =$ _____

To change a percentage to a fraction or a decimal, we can replace % by $\frac{}{100}$ and simplify the answer.

e.g. $36\% = \frac{36}{100} = \frac{9}{25}$

$17\% = \frac{17}{100} = 0.17$

iii) change the following percentage into a fraction:

60% =_____

iv) change the following percentage into a decimal:

75% = _____

v) Fill in the missing information in the table:

Percentage	Decimal	Fraction
25%		
	0.3	
		$\frac{1}{8}$

Percentages

Name: _____ **Class: _____ ( )**

Lesson 2: Percentage change

Vocabulary

New value 新值	Original value 原值	Increase 增加
Decrease 减少		

Use the above vocabulary to complete the formula:

$$\text{Percentage change} = \frac{(\qquad\qquad)}{(\qquad\qquad)} \times (\qquad)$$

Last week in a supermarket, the food prices were as follows:

Milk
$6.5 each

Soy sauce
$12 each

Lemon Tea
$3 each

Salad dressing
$30 each

This week, the new prices are as follows:

Questions:

1) 

In the case of milk, what was the original value? _____

What is the new value? _____

What is the percentage change?

Steps:

The percentage change is _____

The price has <u>increased / decreased</u>.

2) 

In the case of soy sauce, what is the percentage change?

Steps:

_____

The price is _____

3) 

In the case of lemon tea, what is the percentage change?

Steps:

_____

The price is _____

4)  In the case of salad dressing, what is the original price of 3 bottles?

_____

What is the new price of 3 bottles?

_____

What is the percentage change of 3 bottles of salad dressing?

Steps:

_____

_____

Percentages

Name: _____ **Class: _____ ( )**

Lesson 3: Discount

Vocabulary

Marked price 標價	Discount 折扣	Discount per cent 折扣百分率
Saved 節省	Selling price 售價	

Alfred, Betty, Cathy and David want to buy new bikes. Read each advertisement and answer the questions below to show how much money will be **saved** when buying the bikes in the sale.

i) Fill in the blanks in the following dialogues.

ii) Practise the following dialogues with your partner. Take turns to play the roles of A and B.

a)

A: What is the marked price of this bicycle?

B: The marked price of this bicycle is _____

A: What is the discount percentage?

B: The discount per cent is _____

A: How much will Alfred save if he buys this bike?

B: Alfred will save $_____

($400 x 25% = $_____)

A: How much will Alfred pay?

B: Alfred will pay_____

B: What is the marked price of this bicycle?

A: The marked price _____

B: What is the discount percentage?

A: The discount _____

B: How much will Betty save if she buys this bike?

A: Betty will save $_____

($_____ × _____= $_____)

B: How much will Betty pay?

A: Betty _____

b)

30% saving

Rocket R1 $300

15% saving

All Terrain bike $700

A:	What is the marked price of this bicycle?	B:	What is the marked price of this bicycle?
B:	The _____	A:	_____
A:	What is the discount percentage?	B:	What is the discount percentage?
B:	The_____	A:	_____
A:	How much will Cathy save if she buys this bike?	B:	How much will David save if he buys this bike?
B:	Cathy_____ $_____ ($_____ = $_____)	A:	David _____ ($_____ _____)
A:	How much will Cathy pay?	B:	How much will David pay?
B:	_____	A:	_____

Discount = Marked price – Selling price

$$\text{Discount rate} = \frac{\text{Discount}}{\text{Marked price}} \times 100\%$$

Discount = Marked price × Discount rate

Selling price = Marked price – Discount

= Marked price × (1-Discount rate)

Percentages

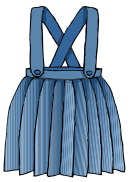
Name: _____ **Class: _____ ( )**

Lesson 4: Profit and Loss

Vocabulary

Profit 盈利	Loss 虧蝕	Cost price 成本

In a department store, the following items are being sold at a discount.

Dress		Marked price	Selling price	Discount per cent	Cost price	Profit / loss
A		$ 100	$ 80		$60	
B		$ 300	$ 285		$280	
C		$400		30% off	$320	
D		$ 175		10% off	$ 160	

Rough work:

In business, when the selling price is greater than the cost price, we are making a

_____.

When the selling price is less than the cost price, we are making a _____.

$$\text{Profit rate} = \frac{\text{profit}}{\text{cost price}} \times 100\%$$

Selling price = Cost price + profit
= Cost price × (1+ profit rate)

$$\text{Loss rate} = \frac{\text{loss}}{\text{cost price}} \times 100\%$$

Selling price = Cost price – loss
= Cost price × (1- loss rate)

i) Fill in the missing information in the following dialogues.

ii) Practise the following dialogues with your partner. Take turns to play the role of A and B.

For Dress A

Student A: What is the selling price of dress A?

Student B: The selling price of dress A is _____.

Student A: What is the discount per cent of dress A?

Student B: The discount per cent of dress A is _____.

Student A: Comparing with the cost price, could you tell me whether the department store is having a profit or a loss?

Student B: The department store is making _____.

The profit / loss is $_____ and the profit / loss percentage is _____.

For Dress B/C/D

Student A: What is the selling price of dress _____?

Student B: The selling price of dress _____ is _____.

Student A: What is the discount per cent of dress _____?

Student B: The discount per cent of dress _____ is _____.

Student A: Comparing with the cost price, could you tell me

whether the department store is having a profit or a loss?

Student B: The department store is _____.

The profit / loss is $_____ and the profit / loss percentage is _____.

Suggested answers:

Lesson 1:

i) $\frac{1}{50}$ = 2%

ii) $\frac{1}{20}$ = 5%

iii) 60% = $\frac{3}{5}$

iv) 75% = $\frac{3}{4}$

v)

Percentage	Decimal	Fraction
25%	0.25	$\frac{1}{4}$
30%	0.3	$\frac{3}{10}$
12.5%	0.125	$\frac{1}{8}$

Lesson 2:

$$\text{Percentage change} = \frac{(\text{New value} - \text{original value})}{(\text{original value})} \times (100\%)$$

Questions:

1. \$6.5

   \$6

   $\frac{\$6 - \$6.5}{\$6.5} \times 100\% = -7.69\%$

   The percentage change is -7.69%.

   The price has increased / decreased.

2. $\frac{\$12.5 - \$12}{\$12} \times 100\% = 4.17\%$

   The percentage change is 4.17%.

   The price is increased.

3. $\frac{\$21 - \$18}{\$18} \times 100\% = 16.7\%$

   The percentage change is 16.7%.

   The price is increased.

4. $3 \times \$30 = \$90$

   $2 \times \$30 = \$60$

   $\frac{\$60 - \$90}{\$90} \times 100\% = -33.3\%$

   The percentage change is -33.3%

   The price is decreased.

Lesson 3:

a)

A: What is the marked price of this bicycle?

B: The marked price of this bicycle is $400.

A: What is the discount per cent?

B: The discount per cent is 25% .

A: How much will Alfred save if he buys this bike?

B: Alfred will save $ 100 .
($400 x 25% = $100)

A: How much will Alfred pay?

B: Alfred will pay $300.

B: What is the marked price of this bicycle?

A: The marked price of this bicycle is $250.

B: What is the discount per cent?

A: The discount per cent is 20%.

B: How much will Betty save if she buys this bike?

A: Betty will save $50.
($250 × 20%= $50)

B: How much will Betty pay?

A: Betty will pay$200.

b)

A: What is the marked price of this bicycle?

B: The marked price of this bicycle is $300.

A: What is the discount per cent?

B: The discount per cent is 30%.

A: How much will Cathy save if she buys this bike?

B: Cathy will save $ 90
($ 300 x 30% = $ 90)

A: How much will Cathy pay?

B: Cathy will pay $210.

B: What is the marked price of this bicycle?

A: The marked price of this bicycle is $700.

B: What is the discount per cent?

A: The discount per cent is 15%.

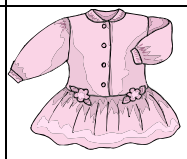
B: How much will David save if he buys this bike?

A: David will save $105.
($ 700 x 15% =$105)

B: How much will David pay?

A: David will pay $595.

Lesson 4:

Dress		Marked price	Selling price	Discount per cent	Cost price	Profit / loss
A		$ 100	$ 80	20% off	$60	Profit
B		$ 300	$ 285	5% off	$280	Profit
C		$400	$280	30% off	$320	Loss
D		$ 175	$157.5	10% off	$ 160	Loss

profit

loss

For Dress A:

$80

20% off

profit

(profit) $20 (profit) 33.3%

For Dress B:

$285

5% off

profit

(profit) $5 (profit) 1.79%

For Dress C:

$280

30% off

loss

loss $40 loss 12.5%

For Dress D:

$157.5

10% off

loss

loss $2.5 loss 1.565