LESSON PLAN III

For learning target 3 - Practicing equivalent (or fair) exchange in coins

A. Manipulatives

To help students understand the concept of equivalent exchange among coins of different values, it may be clearer to refer to ChiMing counters (where cubes are joined into rods, and rods into flats) first than directly to real coins. This is because, e.g. while a 5-dollar (ChiMing) flat can be separated easily into five 1-dollar (ChingMing) rods, a 5-dollar coin cannot be broken physically into five 1-dollar coins. (See diagrams A and B respectively.)

Diagram A
Exchange between ChiMing counters

ONE 5-dollar counter =
(i.e. can be exchanged for)

Broken into →

← Joined into
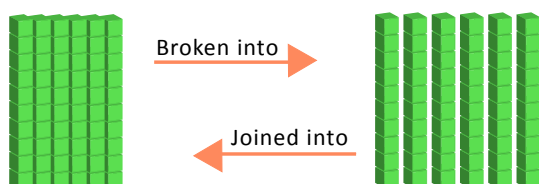
FIVE 1-dollar counters.

Five vertical rods can be made out in the flat of a 5-dollar counter. Furthermore, the 5-dollar flat can physically be broken into FIVE 1-dollar rods.

Diagram B
Exchange between HK coins

ONE 5-dollar counter =
(i.e. can be exchanged for)

a stack of **FIVE** 1-dollar coins.

But **we cannot see** the **FIVE** 1-dollar coins directly from a **5**-dollar coin.

B. Reference Chart

This chart may help students do the exercises concerning coin exchange.

Values	1角	2角	5角	1元	2元	5元	10元
ChiMing Counters							
Hong Kong Coins	10	20	50	1	2	5	10

If stickers of Hong Kong coins are provided by the publisher of the textbook, or available otherwise, the last row of the above chart could be left blank for students to put the corresponding stickers on.

C. Exercises with open-ended problems

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EXERCISE 1	**Count to find the possible equivalent exchange between coins of different values.**

Counting by grouping should be a target method towards which students are led to discover.

Sample Questions:

(a)   一個1元硬幣可以換作多少個其他硬幣呢？

(What and how many other coins can a 1-dollar coin be changed into?)

(b)   還有其他甚麼換法呢？

(What are the other methods to do the exchange?)

(c)   你會用甚麼方法找出下列5角可以換成多少個1元硬幣呢？它們的總值是多少呢？

(Show you methods in finding out how many 1-dollar coins can be exchanged for the pile of 50-cent coins below. What is their total value?)
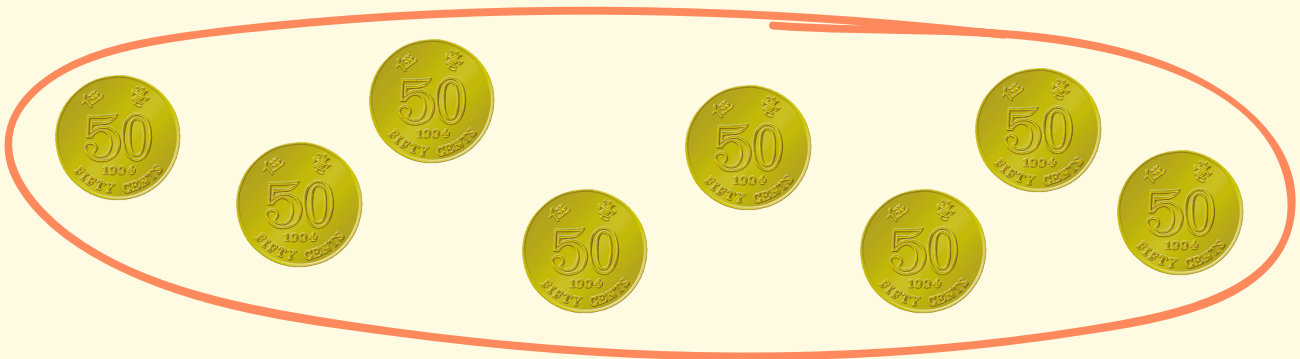
(d)   你會用甚麼方法找出下列1角可以換成多少個5角硬幣呢？它們的總值是多少呢？

(Show you methods in finding out how many 50-cent coins can be exchanged for the pile of 10-cent coins below. What is their total value?)
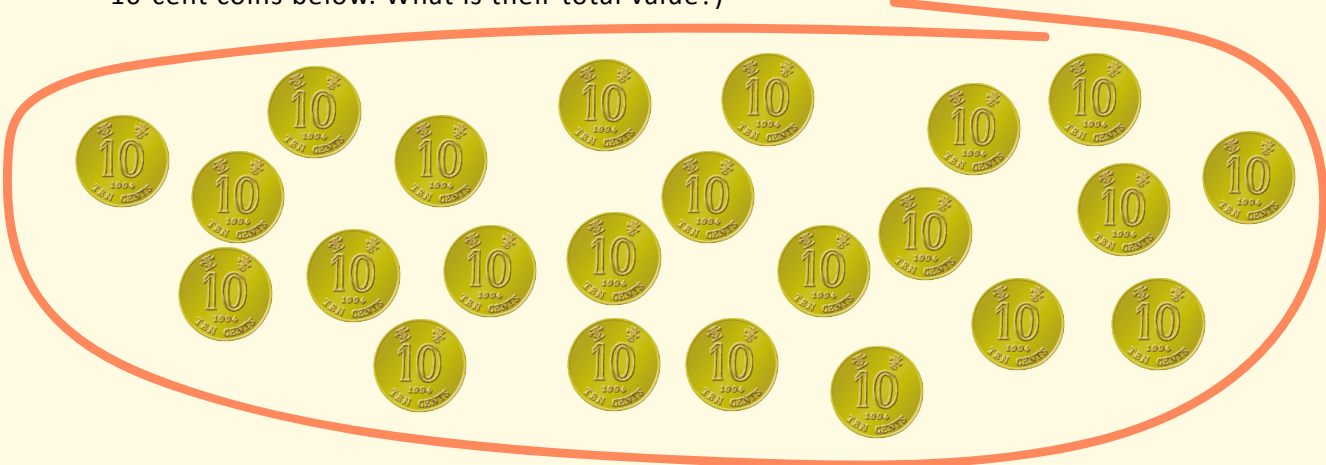
Remark: If toy coins or real coins are available, it might be easier for students to discover more methods.

EXERCISE 2　　Create coin combinations according to a given value.

Since the working methods and answers are again not unique for this exercise, pair work is recommended for students to practice dialogue.

Sample Questions:

(a)　SiuLing has 11 dollars in her pocket. What and how many coins do you think she has? Record your ideas in the chart below.（小玲袋裏有11元。試猜猜她有些甚麼硬幣，分別是多少個。在下面的圖表列出你的各種想法。）

		10	5	2	1
11 dollar (11元) =	(i)	1個	0個	0個	1個
	(ii)	☐個	☐個	☐個	☐個
		☐個	☐個	☐個	☐個

Sample Questions:

(b)　SiuLing has 160 cents. What and how many coins could she have? Record your ideas in the chart below.（小玲有16角。試猜猜她有些甚麼硬幣，分別是多少個。在下面的圖表列出你的各種想法。）

This question can also be set as:

SiuLing has 160 cents and one of them is a 1-dollar coin. What and how many coins could she have?（小玲說她有16角，其中一個是1元硬幣。試猜猜她有些甚麼硬幣，分別是多少個？）

		1	50	20	10
160 cent (16角) =	(i)	0個	0個	0個	16個
	(ii)	☐個	☐個	☐個	☐個
		☐個	☐個	☐個	☐個

For this type of questions, teachers may also ask students to mark the answer which has the least number of coins.

EXERCISE 3   Open-ended Exercise with story problems[1]

Miss Wong went to a toy shop and found special offers there.

Duckies were 2 dollars each. Piggies were 5 dollars each. Teddy bears were 10 dollars each.
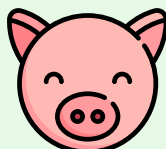
（黃老師在玩具店大減價時，看見小鴨只賣2元，小豬賣5元，小熊賣10元。）

Duckie (小鴨)   Piggy (小豬)   Teddy Bear (小熊)

2 dollars (2 元)   5 dollars (5 元)   10 dollars (10 元)

In solving the following problems, students are required to show their methods in finding the answers.

They can show their thinking with drawings or listing of their counting methods. Doing addition with arithmetic expression can also be an option.

(Manipulatives such as tokens, counters or toy coins are also available.)

Sample Problems:

Level 1   Dealing with one type of dollar coins only.

1.   Miss Wong bought 6 duckies with some 2-dollar coins. How many were used?

2.   Miss Wong bought 4 piggies with some 5-dollar coins. How many were used?

> 1.   黃老師用了一些2元的硬幣買了6隻小鴨。她用了多少個2元硬幣呢？
> 2.   黃老師用了一些5元的硬幣買了4隻小豬。她用了多少個5元硬幣呢？

Level 2   Dealing with two type of dollar coins only.

3.   Miss Wong bought 3 piggies and 4 duckies with some 5-dollar and 2-dollar coins. How many of each type were used?

4.   Miss Wong bought 4 teddy bears and 3 piggies with some 10-dollar and 5-dollar coins. How many of each type were used?

> 3.   黃老師用了一些5元和2元的硬幣買了3隻小豬和4隻小鴨。她分別用了多少個2元和5元硬幣呢？
> 4.   黃老師用了一些10元和5元的硬幣買了4隻小熊和3隻小豬。她分別用了多少個5元和10元硬幣呢？

Level 3   Letting students choose from 2-dollar, 5-dollar and 10-dollar coins.

5.   Miss Wong bought 5 duckies and 4 teddy bears. How much did she spend? With what coins did she pay?

6.   Miss Wong bought 3 piggies and 2 duckies. How much did she spend? With what coins did she pay?

> 5.   黃老師買了5隻小鴨和4隻小熊。她共用了多少錢？她用了哪些硬幣付款？每種硬幣用了多少個？
>
> 6.   黃老師買了3隻小豬和2隻小鴨。她共用了多少錢？她用了哪些硬幣付款？每種硬幣用了多少個？

Level 4   Letting students decide what to buy.

7.   Miss Wong came into the toy store with 17 dollars. What could she buy?

> 7.   黃老師只帶了17元去玩具店。她可以買到些甚麼呢？

Students may learn better if they work together in a group, especially for the problems in the higher levels, where there can be multiple solutions[2] , which, in turn, provide an opportunity for students to experience the wider horizon[3] of open-endedness.

Level 5   Letting students create their own story problems.

For example,

    (i)   changing the toy shop into a flower shop or candy shop, etc., and

    (ii)   setting the goods at different prices.

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[2] Multiple solutions – For example, in question 7, a solution is to spend all the 17 dollars, and another is have some money left afterwards. Both carry more than one sub-solution.

[3] Wider horizon – Having an interest and perspective in alternative solutions is an important generic skills in mathematics learning of any specific topics. For example, when one group has decided to buy 1 duckie, 1 piggy and 1 teddy bear in question 7, they can be encouraged to think about other combinations, including those with some money left. The teacher tabulating on the blackboard all the solutions from the students is yet a wider horizon.

EXERCISE 4   A story for dialogic learning

An animated story concerning values of coins – 認識各種錢幣

https://www.youtube.com/watch?v=r0CRWNIu5Ec&app=desktop

Teachers can watch this video for inspiration of designing a learning session involving storytelling, question raising, group discussion and problem solving.

In the story, four children needed to buy some stationery. They had 9 coins. One little girl thought it meant they had 9 dollars, and was worried that they were short of money. Then they went into a conversation, finally realising they actually had the money they needed.

This is an illustration of how the two different concepts of number and value of coins can be learnt by children from some daily life situations probably interesting to them.