# Money Charts

Task 239 ... Years 2 - 8

Summary

Text book exercises on adding and subtracting money come to life in this hands-on logic challenge that is most effectively completed by patient application of if-then reasoning and working backwards. In effect there is a little equation solving going on too. Using the coins to complete the chart is important because doing so either builds, or builds on to, the children's familiarity with coins. The task is a necessary bridge into tackling, and even making your own, similar charts using symbols and mental arithmetic only.

Content

- arithmetic, addition / subtraction
- equations, creating
- equations, solution
- mental arithmetic
- money
- reasoning
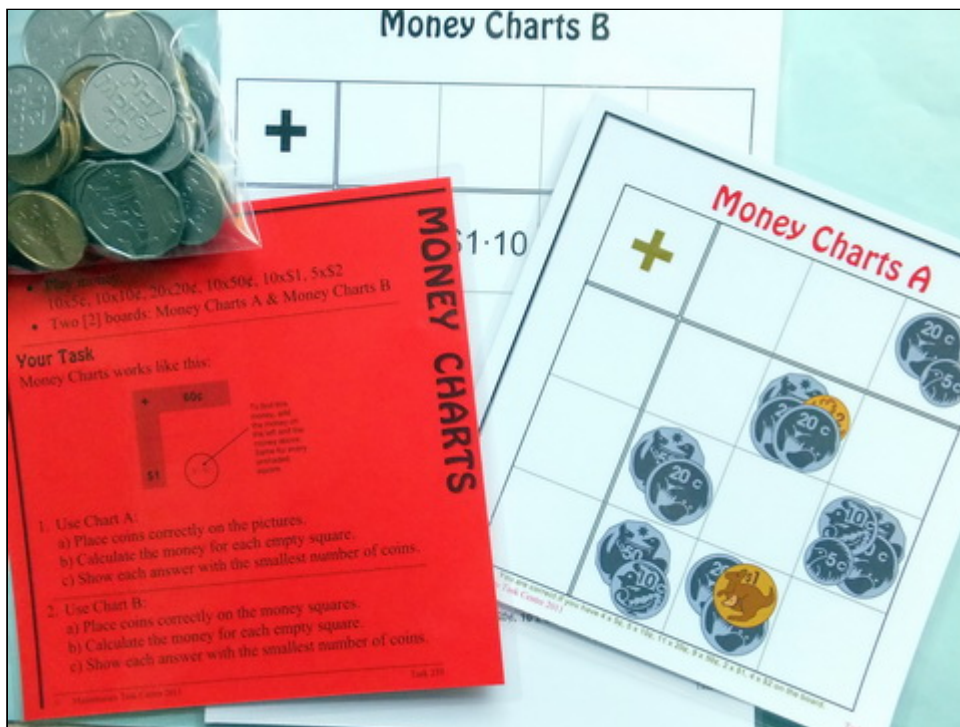
Iceberg

A task is the tip of a learning iceberg. There is always more to a task than is recorded on the card.

We would like to suggest that you try this task yourself to discover some of its subtleties. As teachers we would tend to tackle the challenges on the two boards symbolically and hence might miss the support given by using the coins. For example, in the third column of Chart A a student could know that the missing coins at the head of the row must be a 50¢ and a 10¢ because the other two coins in that cell are used as the head of the column.

This means that even a student with weaker arithmetic skills could still demonstrate their reasoning skills and hence that they are working like a mathematician. It is possible to use guess and check as a strategy for solving these charts, but this strategy is not efficient. Since the answer for each cell is made up of three parts (row head + column head = answer cell), the efficient approach is to look for a start where two pieces of information are available (such as the third column cell above) and work out the missing piece of information. This then provides the next equation with two pieces of information and solving that leads to the next and so on. When all the row and column heads have been found, any empty cells can easily be completed.

You will notice in the image above that the answer is (almost) provided on the card. On the assumption that coins are put in every cell, including the headers and the ones with pictures, the total number of each coin on the board is given. However, even this is not quite enough. An unwritten assumption is that the *least number of coins* are used in each cell. For example the 75¢ in the bottom right would be shown with 50¢, 20¢ and 5¢. It could also be shown with 3x20¢, 10¢ and 5¢, but then the totals on the board wouldn't match the totals given. Symbolically the answers are:

+	10¢	90¢	25¢
$2	$2·10	$2·90	$2·25

60¢	70¢	$1·50	85¢
50¢	60¢	$1·40	75¢

In Chart B the answer given also assumes that coins have been placed on every cell of the board. It is not necessary to solve the problem that way, but the given amounts do have to be converted to minimum coins in order to obtain the stated result.

+	$1·60	45¢	30¢	40¢
65¢	$2·25	$1·10	95¢	$1·05
70¢	$2·30	$1·15	$1	$1·10
60¢	$2·20	$1·05	90¢	$1
50¢	$2·10	95¢	80¢	90¢

This board offers opportunity to highlight the mathematician's question: *Can I check it another way?*. For example:

- *How do you know that 60¢ plus $1·60 equals $2·20?*
- Students answer...
- *Can you check it another way?*
- Students answer differently...
- *How many different ways could think of to check that one?*

This could lead to answer such as:

- I know 60 + 60 = 120, so that's $1·20 and the other dollar makes $2·20.
- 40 out of the 60¢ makes the $1·60 up to $2 and there's another 20¢.
- 50 out of each of the 60s makes another dollar and there's 2 more 10¢ which is $2·20.
- ...

Extensions

1. Set up the following for the students. It doesn't have a '2 known out of 3' starting point. However, the answer under the chart does provide additional

information. The problem can be solved, but remember minimum coins have to be used.

You are correct if you have 4 x 10¢, 5 x 20¢, 2 x 50¢ on the board.
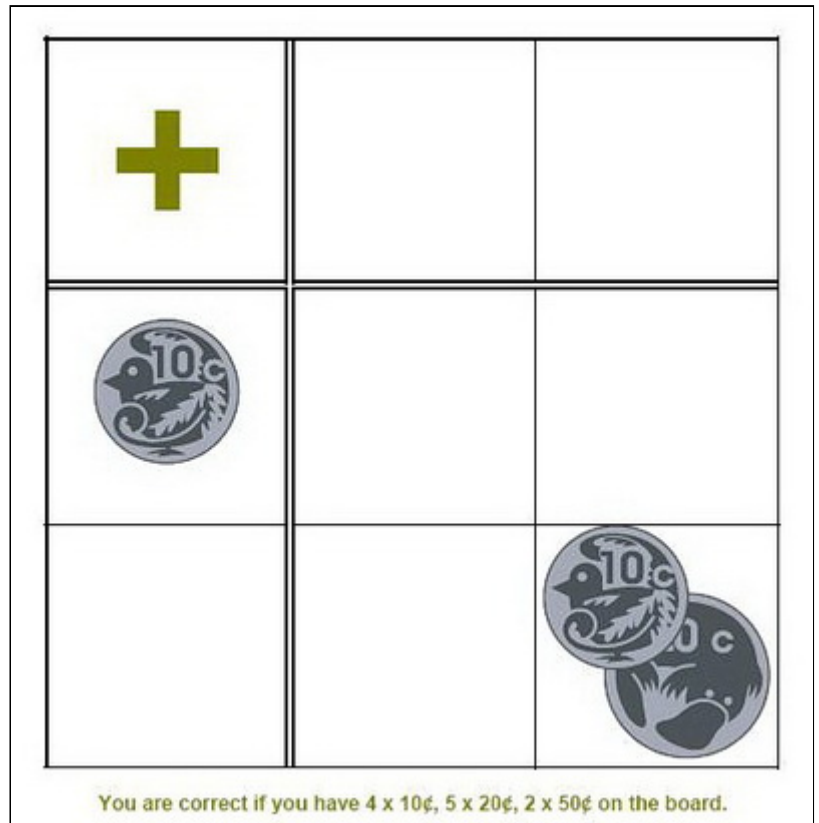
2. Encourage students to create their own money chart problem, starting with a 2 x 2 if they wish. Over time student examples can be made into a class set of additional puzzles.

Whole Class Investigation

Tasks are an invitation for two students to work like a mathematician. Tasks can also be modified to become whole class investigations which model how a mathematician works.

It is unlikely that a school would have sufficient play money to turn this task into a whole class lesson where each group was using the investigation at the same time. However, if *Chart Strategies* or *Number Charts* from Maths300 was the whole class investigation, then Money Charts would be an appropriate 'Maths Corner' activity to include when the students were working on the software challenges in pairs, as would Task 80, A Dollar To Spend. The Task Cameo Content Finder will help you find more tasks in your collection which have a money component. Just scroll down until you find 'Money' in the alphabetical list in the left column.

Equally, when the money topic is being explored there are many activities - a classroom shop for one - which could be used to create several work stations investigating various aspects. Money Charts is perfect as one of those stations. Calculating Changes has a great idea for a class shop in its Win/Lose A Flat activity and if your school is a Calculating Changes member, Two

[Dollar Shop](#) is a great starting point for a classroom shop activity focussing on whole numbers of dollars.

At this stage, *Money Charts* does not have a matching lesson on Maths300. However Maths300 does contain several lessons which use the chart strategy to involve students in the particular content of the lesson. Those lessons are:

- Lesson 156, *Chart Strategies*
  - single digit addition and multiplication (and their inverses)
- Lesson 84, *Number Charts*
  - more difficult addition and multiplication and fraction addition
- Lesson 160, *Algebra Charts*
  - addition and multiplication of binomial expressions, factorisation
- Lesson 76, *Protons & Anti-Protons*
  - addition and subtraction of integers represented by protons and anti-protons
- Lesson 191, *Fractions & Fractions Charts*
  - problems involving the 'of' operation

Each of these lessons includes charts as software support and each piece of software offers several levels of difficulty to allow for the range of students in your classroom.

Is it in Maths With Attitude?

Maths With Attitude is a set of hands-on learning kits available from Years 3-10 which structure the use of tasks and whole class investigations into a week by week planner.

Money Charts is not in any MWA kit. However it can be used to enrich the *Number & Computation* kit at Years 3/4 and the *Number & Computation* kit at Years 7/8.