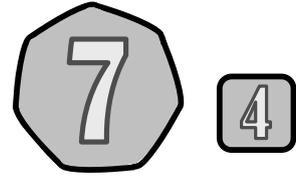
**intro**

There are plenty of problems and investigations which ask children to look at which totals can or can't be made up from combinations of certain given numbers. This investigation is similar but it takes things further – and it requires a bit more thinking . . .

**first steps**

Long, long before the Romans came to Britain, there were some people using coins. These early traders were actually 'buying' and 'selling' rather than just trading one thing for another . . .

A group of tribes living in one valley, for example, had a currency system using just two kinds of coin, the 4p coin and the 7p coin. The 'p' stands for potato, by the way, the idea being that 1p was about the value of 1 large potato.

**the investigation**

With this system of currency, it's pretty obvious how you're going to pay for something which costs 4p or 7p or 11p – but what about something costing 3p? Or, even harder, 5p? The answer is that you'll have to pay some coins over and then the person selling will have to give you some coins back – your 'change' in other words. As you can see, these people knew all about change . . .

Now for our investigation: If we look at any of the transactions above we can add up how many coins have changed hands; for example, to buy something costing 5p, you'd have to give three 4p coins and get back one 7p coin, so altogether four coins will have changed hands. The aim of our investigation is to look at a range of prices – say from 1p to 30p – and to work out for each price what's the 'neatest' way of using the coins ie what's the smallest number of coins which can be used to make the payment.

**practical**

Children can do this using just pencil and paper but if you – or they – have time, it's worth cutting out some 7p and 4p coins (see photocopy masters). This is definitely an exercise to do in pairs or in small groups! You can let pupils decide for themselves how they want to record their findings or you can give them copies of the results tables (see photocopy provided) and show them how to use it.

**results** It's worth going through the results with the whole class to make sure that everyone really has found the most efficient ways of paying for the different amounts.

---

**notes** With an agreed set of results established, you can ask :

- What's the largest number of coins you needed for amounts up to 30p in value? That's to say, which were the amounts which needed most coins?
- To pay 9p you could give four 4p coins and get one 7p coin change, which uses five coins altogether, or you could give three 7p coins and get four 4p coins change, which obviously uses seven coins altogether. What other amounts did you come across which can be done in different ways using different numbers of coins?
- Are there any amounts where you could have two different ways of paying, each using the same number of coins?
- How would you describe the amounts which you can make up exactly (the ones where change isn't needed)?

---

**extension** You can leave things here but the full version of this investigation is really in two parts. If you – and the class – have the stamina it's well worth going on to the second part (though probably not on the same day).

In part 2 we carry out essentially the same exercise but with a different currency system. In a valley not too far away from the one we've already mentioned, the tribes who live there have developed their own system. The unit of currency is still based on the potato – but instead of the 7p and 4p coins used by the others, we find these tribes using 2p and 5p coins. Apparently these people felt they had made a big improvement on the original idea.

Once again, pupils can look at amounts from 1p to 30p and work out the 'neatest' ways of making the payments, this time using just 2p and 5p coins. Once the results are in, the interesting thing is to compare the two systems . . .

Look first at the amounts from 1p to 10p. If you add up the 'number of coins needed' column, you get a total of 30 coins used for the 4p / 7p system but just 22 coins used for the 2p / 5p system – which suggests the men's system might indeed be better. However, if you look at the amounts from 21p to 30p, you might form a different impression . . .

---