Reasoning in the classroom

Selling lemonade

Support materials for teachers

Year 5

Llywodraeth Cymru
Welsh Government

Year 5 Reasoning in the classroom – Selling lemonade

These Year 5 activities encourage learners to see the application of numeracy within real-world contexts.

Activity 1

Selling lemonade
Learners work out how many drinks were sold at their school fete.

Includes:
- Selling lemonade question
- Markscheme

Activity 2

Banking coins
They research how banks work out the quantity of coins in bank bags, then use real data to find the total amount raised at a carnival.

Includes:
- Explain and question – instructions for teachers
- Resource sheet – Bridgwater Carnival 2013

Activity 3

Weighing puzzle
They consider how to re-present information to make it clearer for others to understand.

Includes:
- Explain and question – instructions for teachers
- Whiteboard – The eight coins puzzle
- Whiteboard – The eight coins puzzle and solution

Reasoning skills required

Identify	Communicate	Review
Learners choose what to do and how to do it.	They use diagrams and text to show solutions.	They consider how to re-present information.

Procedural skills

- **Working with money, including decimals**
- **Working with weight, including decimals**
- **Use of a calculator**

Numerical language

- **Weight**
- **Balance/balance scales**
- **Equal**

Activity 1

Selling lemonade

Activity 1 – Selling lemonade

or

Outline

Learners use information about coins to work out how many drinks were sold at a school fete.

You will need

Q

Selling lemonade question
One page for each learner

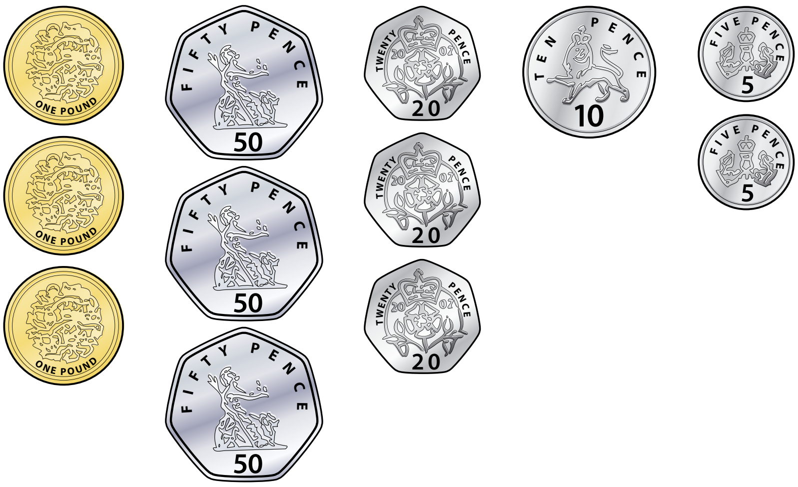
M

Markscheme

Children sell lemonade at their school fete.

When they start they have these coins:

When they finish they have these coins:



Each drink of lemonade costs **10p**.

How many drinks of lemonade did they sell?

drinks

4m

Activity 1 – Selling lemonade – Markscheme

Marks	Answer
4m	**33** drinks
Or 3m	Shows **3.30** or **330**
Or 2m	Shows **2.00** and **5.30** (or **200** and **530**) Or Tries to use an **efficient method**, identifying how the total number of each type of coin has changed, even if there are errors
Or 1m	Shows **2.00** or **200** or answers **20** drinks Or Shows the value **5.30** or **530** or answers **53** drinks Or Shows the number of drinks from any incorrect amount, e.g. • 5.90 or 590 seen, then gives the answer 59 drinks Or Clearly shows the number of drinks that can be bought with all three of the £1, 50p and 20p coins, i.e. Links 10 to £1, 5 to 50p and 2 to 20p

(Total at the finish) – (total at the start)

Totals at the start and at the finish

If their incorrect amount is not a multiple of 10p, the number of drinks must be rounded up or down to the nearest whole number

Activity 1 – Selling lemonade – Exemplars

Start with £2.00 end with £5.30 10p a drink difference between the 2 £3.30 so 33 drinks 33 drinks	Correct; **4 marks** • This numerical communication is very clear, explaining the approach and findings without writing a 'mini-essay'.
~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ ||| 33 drinks	Correct; **4 marks** • Although this response gains 4 marks because the answer is correct, the method (tally chart) would be insufficiently clear to gain partial credit had there been a slip.
10 10 10 5 5 5 2 2 2 d d d d d d d d d 1 1 d d 53 drinks	53 drinks; **2 marks** • This learner is working with just the final illustration. They have listed the number of drinks (d) that can be bought with each coin.
When they start they have these coins:  When they finish they have these coins:  Each drink of lemonade costs **10**p. How many drinks of lemonade did they sell? £3.60 drinks	Efficient method; **2 marks** Efficient method The circles on the coins identify the changes in the number of coins: this shows good insight into the problem. However, the coins circled have then been added. The answer '£3.60 drinks' suggests that this learner needs encouragement to review their work.
£1 10 50 5 20 2 10 1 £1 10 50 5 20 2 5 .5 £1 10 50 5 20 2 57 drinks	Shows drinks that can be bought; **1 mark** • 10 is clearly linked to £1, 5 is clearly linked to 50p, and 2 is clearly linked to 20p.
10 + 10 + 10 + 10 + 10 + 10 + 10 + 10 + 10 + 10 + 10+10+10+ 10 + 10 + 10 + 10 + 10 + 10 + 10+10+10+10+ 10 + 10 + 10 + 10 + 10 + 10 + 10+10+10+10+ 10 + 10 + 10 + 10 + 10 49 drinks	Incorrect; **0 marks** • There is a lot of (inefficient) work here but what this learner is doing and why is unclear. Sadly, they gain no marks.

Activity 2

Banking coins

Activity 2 – Banking coins

or

Outline

This home-based research activity is designed to carry on from **Activity 1 – Selling lemonade**.

Learners research how banks work efficiently to be sure, for example, that a bag of twenty £1 coins does contain the correct amount of money.

Then they use real data to find the total amount raised at a carnival.

You will need

Empty plastic bank bags (optional)

R

Resource sheet – Bridgwater Carnival 2013

Activity 2 – Banking coins

Explain

If possible, introduce this task by referring to a local fund-raising activity: something where a large number of coins would have been collected.

Tell the learners that when people have a large number of coins they usually take them to the bank, but first they put them into bags that banks give especially for each different coin. For example, twenty £1 coins are always put together in one bag.

When these bags are taken to the bank the people who work in the bank don't empty them and count the coins inside. So how can they be sure that the number of coins in the bag is correct? Ask learners to find out as much as they can about how banks solve this problem.

(The Royal Mint publishes information about the weight of each coin at www.royalmint.com/discover/uk-coins/coin-design-and-specifications

So, for example, as one £1 coin weighs 9.5g, a bag of twenty £1 coins would be expected to weigh 190g. This creates a good opportunity to discuss variation: as there will be some variation in weight for each coin a small tolerance will be needed.)

Now give each pair or group a copy of the Resource sheet – **Bridgwater Carnival 2013**.

(Data from www.bridgwatercarnival.org.uk/useful-info/collection/
Alternatively, use real data from a local fund-raising activity.)

Explain that Bridgwater Carnival is one of the largest carnivals in the UK. It takes place over several days and raises a lot of money for charity.

Ask learners to work out how much money was raised. *(£34 018.23)* Remind them of the importance of using a calculator, and suggest that the work can be shared among different members of the group.

Question

- Can you read this number *(e.g. 27 029)* in words?
- What calculation did you do to find the total for the 50p coins? How could you get an answer that is in £ not in pence? What about other coins?
- Which amounts are easy to work out without a calculator? Which are harder? Why?
- What does it mean when you are working in £ and a calculator shows 0.5? What about 0.2 or 0.1?
- How are you checking your work? What might you notice if you, or someone else, have made a mistake?

Extension

- How much would these coins weigh altogether? Would they fit in an ordinary size of car?

R

The collection at Bridgwater Carnival

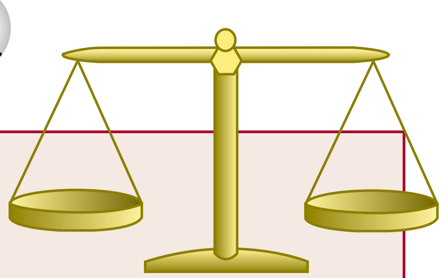
Coin	Number of coins collected
£2	726
£1	11 009
50p	7 821
20p	25 341
10p	27 029
5p	58 699
2p	205 415
1p	283 238

Activity 3

Weighing puzzle

Activity 3 – Weighing puzzle

or



Outline

This activity is designed to carry on from **Activity 2 – Banking coins**.

Learners are given a word puzzle and its solution.
(The puzzle is a well-known one which is freely available from many places on the web.)

Their task is to re-present the solution using diagrams to make it clearer for others to understand.

You will need

WB **Whiteboard – The eight coins puzzle**

WB **Whiteboard – The eight coins puzzle and solution**

Activity 3 – Weighing puzzle

Explain

Show **The eight coins puzzle** on the whiteboard. Make sure that learners understand what is being asked, including the meaning of a fake coin.

You may wish to allow them time to try to solve the puzzle (and could give them eight such coins and a balance), but unless they have seen this or a similar puzzle before they may find it overly demanding. As the aim of the activity is to re-present information, we suggest you show **The eight coins puzzle and solution** and ask learners to discuss.

Say that you don't find the solution very 'friendly' and that you would like them to work in groups to change the solution to one that others would find easier to understand. They can use diagrams . . . or any other form of presentation.

Groups can then compare their responses, voting for the one that is most accessible.

Question

- What have you decided to do, and why?
- Why is it important that someone else can understand a method?
- How do diagrams help show information quickly and clearly? Do you use diagrams when working on problems in numeracy or other subjects?

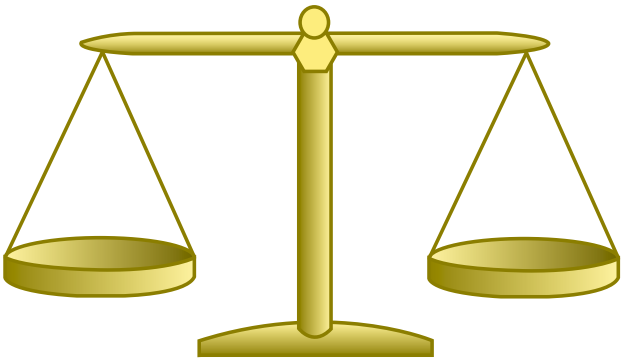
Extension

- What if the number of coins changes? Investigate!

You have eight coins that look exactly the same, but one of them is a fake.

It is slightly heavier than the other seven.

How can you use a balance scale to work out which coin is the heavier one?



Challenge! You can only use the scales twice.

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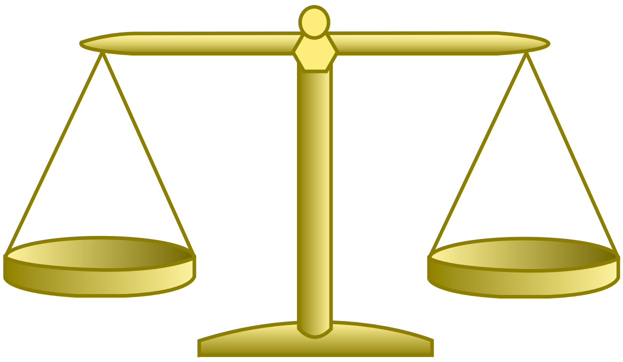

Challenge! You can only use the scales twice.

Solution

Start off by weighing three of the coins against three others. If the weights are equal, weigh the remaining two against each other. The heavier one is the fake coin. If one of the groups of three is heavier, weigh two of those coins against each other. If one is heavier, it's the fake coin. If they're equal weight, the third coin is the fake coin.