Reasoning in the classroom

Medals

Support materials for teachers

Year 6

Llywodraeth Cymru
Welsh Government

Year 6 Reasoning in the classroom – Medals

These Year 6 activities focus on the medals for the 2012 Olympic Games that were made in Wales. They start with an item that was included in the 2014 National Numeracy Tests (Reasoning) and continue with one linked activity.

Activity 1

Medals
Learners compare the costs of a gold and silver medal.
Includes:
- Medals question
- Markscheme

Activity 2

Pure gold
They review a newspaper headline claiming the cost of pure-gold medals would have been £66 million and work out whether or not this is correct.
Includes:
- Explain and question – instructions for teachers
- Whiteboard – Cost of gold
- Resource sheet – Gold medals

Reasoning skills required

Identify	Communicate	Review
Learners choose for themselves the steps needed to find solutions.	They use mathematical language to explain their strategy and findings.	They consider their strategy and find ways to improve.

Procedural skills

- **Multiplication and division**
- **Interpreting graphs**
- **Reading and writing large numbers**

Numerical language

- **Cost per gram**
- **Accurate**

Medals

Activity 1 – Medals

Outline

In this Year 6 activity, learners compare the costs of a gold and silver medal from the Olympic Games held in 2012.

You will need

Q

Medals question
One page for each learner

M

Markscheme

The medals for the 2012 Olympics were made in Wales.

Gold medal

Made from:

- 6 grams of gold
- 370 grams of silver
- 24 grams of copper.

Silver medal

Made from:
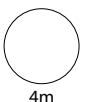
- 370 grams of silver
- 30 grams of copper.

	Gold	Silver	Copper
Cost of one gram	£36.50	£0.63	£0.01

A gold medal cost **more** to make than a silver medal.

How much more?

£ _____ more

4m

Activity 1 – Medals – Markscheme

Marks	Answer	
4m	**£218.94**	
Or 3m	Shows **219 – 0.06**	◄ Cost of 6g of gold – 6g of copper *Efficient method*
	Or	
	Shows **219.24 – 0.30** (accept 0.3)	◄ Cost of (6g of gold + 24g of copper) – 30g of copper *Efficient method*
	Or	
	Shows both **452.34** and **233.40** (accept 233.4)	◄ Total costs of both medals
Or 2m	Shows **219** and **0.06** (accept 6)	
	Or	
	Shows **219.24** and **0.30** (accept 0.3 or 30)	
	Or	
	Shows **452.34**	◄ Total cost of a gold medal
	Or	
	Shows **233.40** (accept 233.4)	◄ Total cost of a silver medal
Or 1m	Shows **219**	◄ Cost of 6g of gold
	Or	
	Shows **233.10** (accept 233.1)	◄ Cost of 370g of silver

Activity 1 – Medals – Exemplars

6 × 36.50 = 219
370 × 0.63 = 233.1
24 × 0.01 = 0.24
219 + 233.1 + 0.24 = 452.34

370 × 0.63 = 233.1
30 × 0.01 = 0.3
233.1 + 0.3 = 233.4

452.34 + 233.4 = £685.74

Shows 452.34 and 233.4; **3 marks**

- The only error is that this learner has added rather than subtracted the costs.
- The mathematical communication is good – the learner's working is easy to follow.

£36.50 × 6 = 219   219 – 6 = 213

£ 213 more

Shows 219 and 6; **2 marks**

- This learner shows numerical insight by using an efficient method. However, they have subtracted £6 rather than 6p – an unfortunate slip that shows the importance of checking calculations.

Gold medal
Made from:
- 6 grams of gold   £219
- 370 grams of silver £23,310
- 24 grams of copper. 20p

Silver medal
Made from:
- 370 grams of silver £23,310
- 30 grams of copper. 26p

£ 35.10 more

Shows 219; **1 mark**

- £23310 (from 370 × 0.63) shows confusion about £ and pence.
- No working is shown to explain the answer. This lack of effective communication is something that could usefully be discussed after the test.

24p copper   6 copper
370 × 63 = 6,300   6 grams of gold
silver £6,300
                gold £221.00
£36.50 × 6   £63.00
£73.00   146.00   24p
£73.00   £75.00   ─────
£73.00   ─────   284.24
─────   121
146.00   2 + 1
           1 2   221.000   £ 284.24 more

Incorrect; **0 marks**

- By not using a calculator, this learner has scored zero and has also incurred a time penalty. Knowing when to use a calculator is important.

Pure gold

Activity 2 – Pure gold

Outline

Learners interpret an unfamiliar graph then provide reasons why a newspaper headline, showing the cost of making Olympic medals in pure gold, is incorrect.

You will need

WB   **Whiteboard – Cost of gold**

R   **Resource sheet – Gold medals**

Activity 2 – Pure gold

Explain

Remind learners that a gold medal for the 2012 Olympic Games contained 6 grams of gold. Ask why they think the medals were not pure gold *(cost – the last time that pure-gold medals were presented was the Olympic Games in 1912)*.

Say that they are going to work out how much a pure-gold Olympic medal would cost. Show **Cost of gold** on the whiteboard and ask learners to discuss in their groups/pairs – what information is the graph showing? Bring the class back together and ask why the graph lines are jagged *(the price of gold varies considerably over time)* and why that might be. *(When lots of people want to buy gold, perhaps because the financial situation in a country is worrying, e.g. war, the price rises. At times of lower demand the price falls.)*

Now give each group/pair a copy of the resource sheet **Gold medals**. Ask them to work out if the cost of £66 million is correct – remind them to show their calculations so that other people can understand what they are doing and why.

(Values will depend on readings from the graphs. Using a cost of £36.50 per gram – the cost shown in the first activity – one gold medal would cost 412 × £36.50 = £15 038. So 302 gold medals would cost 302 × £15 038 = £4 541 476. The newspaper is unclear as to whether the cost of making is included, but even allowing for this – and additional spare medals – £66 million seems unlikely.

As 66 million ÷ 15 038 = 4388.88..., almost 4400 gold medals could have been produced.)

Question

- Have you seen jagged graphs like this before? Are they harder to understand than straight line graphs? Why?

- When was the cost of gold the highest? *(In summer 2011, when gold was almost £38 per gram)*

- How many zeroes are there in one million? *(6)* So how do you write 66 million?

- How can you work out the cost of one gold medal? So how can you work out the cost of 302 gold medals?

- When calculations involve large numbers, do they seem more difficult than calculations involving small numbers? Why/why not? Why should you use a calculator rather than doing long multiplication? *(Understanding when to use technology is an important part of becoming numerate.)*

- How accurate do you need to be? *(We can't read the graph accurately so rounding is a good idea.)*

- What if the gold medals had been made at the beginning of 2014? How many gold medals could have been made with £66 million? *(Gold cost about £24 per gram – this would give 6674 gold medals in total.)*

Gold medals made in Wales!

The gold medals for the 2012 Olympic Games were the biggest and heaviest summer Olympic medals ever made. If the London 2012 Games medals were made of solid gold, it would have cost nearly £66 million!

Facts

- 302 gold medals were given out at the Games.
- Each weighed 412 grams.

Your task

Use the graph. Check the cost of £66 million in the newspaper article. Is it correct? If not, about how many gold medals could have been made with that amount of money?

Cost of gold