Reasoning in the classroom

Hat trick

Support materials for teachers

Year 4

Llywodraeth Cymru
Welsh Government

Year 4 Reasoning in the classroom – Hat trick

These Year 4 activities use the fantasy context of a land where the inhabitants love to wear hats which they buy using a currency named lubs. The first activity was included in the 2014 National Numeracy Tests (Reasoning).

Activity 1

Hat trick

Learners work out the cost of hats then find different combinations that can be bought with a fixed amount of money.

Includes:

- Teachers' script
- PowerPoint presentation
- Hat trick questions
- Markscheme

Activity 2

Spending lubs

They use their understanding of money to 'buy' presents using a fictional currency.

Includes:

- Explain and question – instructions for teachers
- Teachers' sheet – Prices
- Whiteboard – Lubs and pounds
- Resource sheet – Shopping list
- Teachers' sheet – Lubs

Activity 3

Number hats

Learners play a game in which they create calculations to match given numbers.

Includes:

- Explain and question – instructions for teachers
- Teachers' sheet – Number hats

Reasoning skills required

Identify	Communicate	Review
Learners decide on their methods, including working within constraints.	They explain their reasoning and their decisions.	They review their work and the outcomes of the activities.

Procedural skills

- **Four rules of number**
- **Combinations (simple)**
- **Money (pounds, pence)**
- **Fractions (quarter, half, three-quarters)**

Numerical language

- **Currency** (optional)
- **Difference**
- **Quarter, half, three-quarters**
- **Total**
- **Change (in relation to money)**
- **Operations**
- **Calculation**
- **Sum/difference**
- **Clockwise/anticlockwise**
- **Odd/even**

Activity 1

Hat trick

Activity 1 – Hat trick

or

Outline

This Year 4 activity focuses on a land in which lubs are the currency, and everyone loves hats!

Learners use their reasoning skills to find the cost of hats. Then they find different combinations of hats that can be bought with 20 lubs.

You will need

Teachers' script

PowerPoint presentation

Hat trick questions
Two pages for each learner, can be printed double-sided

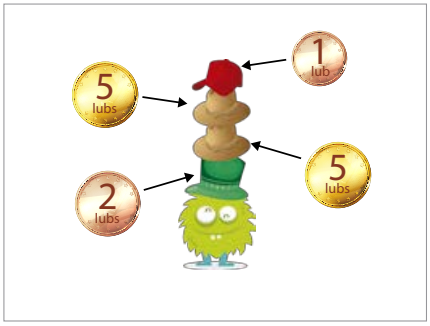
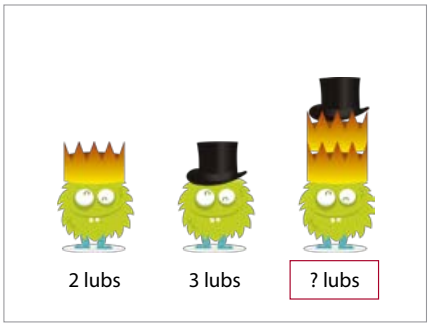
Markscheme

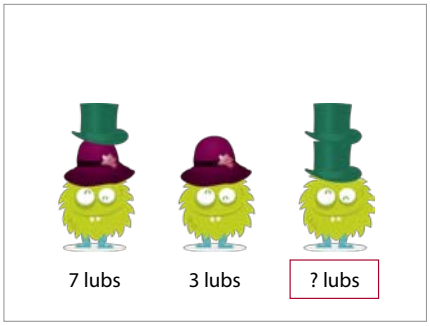
TS

Presentation to be shown to learners before they work on Hat trick

The text in the right-hand boxes (but not italics) should be read to learners. You can use your own words, or provide additional explanation of contexts, if necessary. However, if you are using this as an assessment item, no help must be given with the numeracy that is to be assessed.

Slide 1		*(Keep this slide on the screen until you are ready to start the presentation.)*
Slide 2		This handsome young creature is called Hatty. She is standing next to her wardrobe. She is smiling because she really, really likes the things that are in her wardrobe. I wonder what could be in there? Let's open the wardrobe . . . what might be in there? It's . . .
Slide 3		. . . hats! She loves hats. Any shape, any colour, any size. She thinks they are wonderful.
Slide 4		Here is Hatty wearing one of her hats. But she loves hats so much that sometimes . . .

Slide 5		. . . she wears more than one hat at the same time! She saves all her pocket money to pay for all these hats. Now, where she lives they pay for things in money called lubs.
Slide 6		How many lovely hats is she wearing here? *(4)* How much is the green hat? *(2 lubs)* How much is the red hat on the top? *(1 lub)* And what about the brown hats? That's right, this brown hat *(point)* is 5 lubs, and this brown hat *(point)* is 5 lubs. So how much did she pay altogether for these lovely hats? *(13 lubs)*
Slide 7		Here is Hatty again. These numbers *(point)* show how much she paid for the hats she is wearing in each picture. So here *(point to the far left image)* she is wearing an orange hat. How much is the orange hat? Yes, 2 lubs. How much is the black hat? That's right, 3 lubs. But here *(point to the far right image)* she is wearing two of the orange hats and one black hat. How much is that altogether? That's right, it is 7 lubs, because she paid 2 for this one *(point to the lowest hat)*, 2 for this one *(point)* and 3 for this one *(point)*, and 2 + 2 + 3 = 7 Let's look at one more example . . .

Slide 8		This one is harder. Talk with the person next to you. Can you work out how much she pays for these two green hats? *(point)* *(Discuss, helping learners to realise that one green hat costs 4 lubs (because 7 – 3 = 4) so two green hats cost 8 lubs.)* Now you are going to work out the costs of some of her lovely hats. Remember to show your working so that someone else can understand what you are doing and why. *(If you are using this item for assessment purposes, you may wish to limit the time available, e.g. 10 minutes.)*

7 lubs

9 lubs

lubs

1m

2 lubs

6 lubs

lubs

1m

15 lubs

10 lubs

lubs

1m

Hat shop

5 lubs each

2 lubs each

3 lubs each

Hatty has **20** lubs to buy hats.

Here is one way she can buy hats costing **20** lubs.

1  and 0  and 5 

Give four **different** ways she can buy hats costing 20 lubs.

 and  and 

 and  and 

 and  and 

 and  and 

4m

Activity 1 – Hat trick – Markscheme

Q	Marks	Answer
i	1m	**16** lubs
ii	1m	**10** lubs
iii	1m	**5** lubs
iv	4m	Gives any **four** correct answers. The only possible answers are shown below, grouped for marker convenience: • **4, 0, 0** • **3, 1, 1** • **2, 2, 2** • **2, 5, 0** • **1, 6, 1** • **1, 3, 3** • **0, 10, 0** • **0, 7, 2** • **0, 4, 4** • **0, 1, 6**
	Or 3m	Any **three** correct answers
	Or 2m	Any **two** correct answers
	Or 1m	Any **one** correct answer

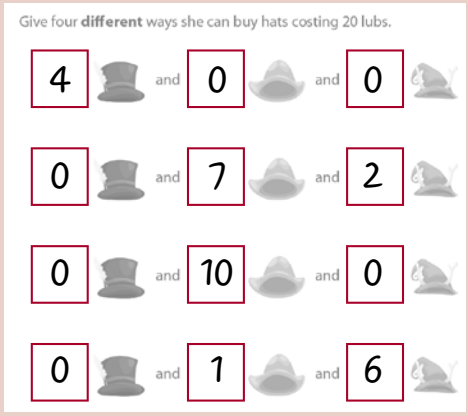
◀ **For any 0, accept the box left blank**

Do not accept repetition of 1, 0, 5 and/or duplications, e.g. the following scores 2m

◀
- **2, 2, 2** ✓
  1, 0, 5 **repetition**
  4, 0, 0 ✓
  2, 2, 2 **duplication**

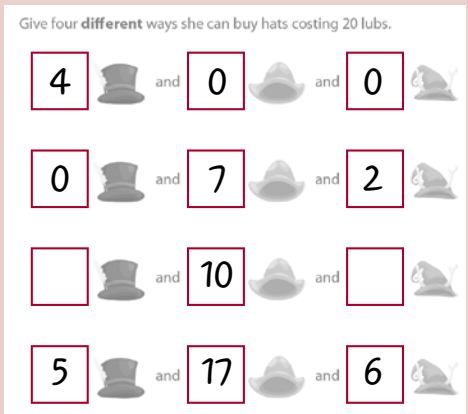
Activity 1 – Hat trick – Exemplars

Part iv



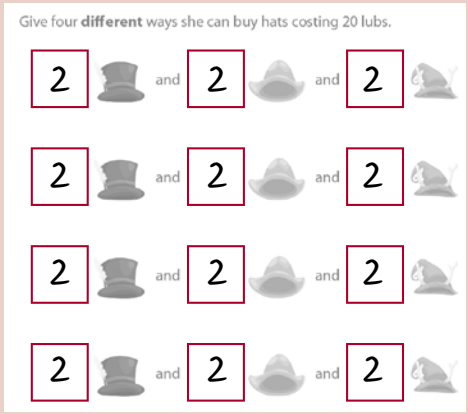
✓, ✓, ✓, ✓; 4 marks

- This learner has chosen an efficient strategy, choosing 0 as the first number for three of the answers. This allows the focus to be on two, rather than three, costs.



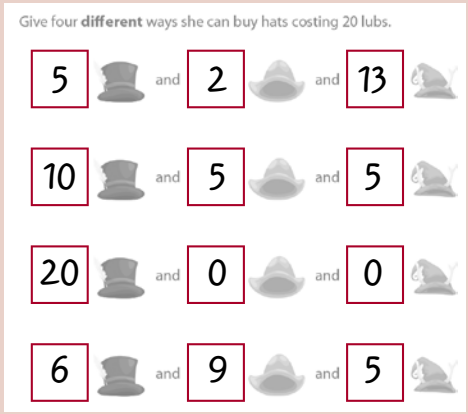
✓, ✓, ✓, ✗; 3 marks

- In the third row, the empty boxes can be taken to represent 0



✓, ✗, ✗, ✗; 1 mark

- This learner has found one correct solution, but has then duplicated it.



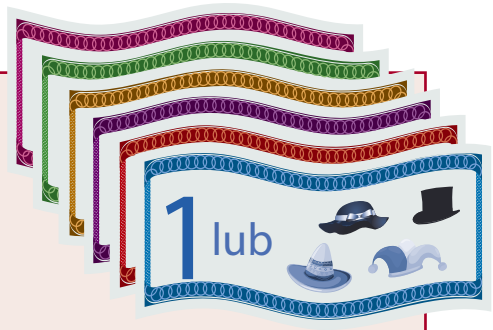
✗, ✗, ✗, ✗; 0 marks

Common error This is a common error. The learner has ignored the cost of the hats and given sets of numbers that sum to 20

Activity 2

Spending lubs

Activity 2 – Spending lubs



Outline

This Year 4 activity follows on from **Activity 1 – Hat trick**, using the same context of lubs as a fictional currency.

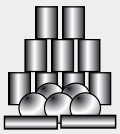
Learners are given £10 *(in pretend money)* which they exchange for lubs then spend on presents to take home from their visit to Hatty's land.

Activity 2 – Spending lubs extends learners' understanding of money and also provides practice in using fractions in a practical context. Given the nature of the task and the role of the teacher as banker, this activity may be better delivered in small groups, or with support from other adults.

This activity could readily be extended into a broader piece of work through asking learners to write about their 'visit' to Hatty's land and their shopping trip, and to draw/paint their version of Hatty's world.

You will need

Teachers' sheet – Prices



Items for a 'shop'

Whiteboard – Lubs and pounds

Resource sheet – Shopping list
One sheet for each group

Pretend money (a mix of £1 notes and coins)

Teachers' sheet – Lubs
Each group will need 20 lubs in total – a mix of notes.
Also remember to keep notes for the 'bank' as you will need to give change

Activity 2 – Spending lubs

Explain

Before starting the activity, create a 'shop' taking items from the classroom and labelling them with the price tags from the teachers' sheet **Prices** *(amend if necessary)*.

Ask learners if anyone has ever been to a country where they use money that is different from ours. Give examples, e.g. euros, then ask what money is used in the land where Hatty from **Activity 1 – Hat trick** comes from. *(Lubs. Make sure they realise this is fantasy!)* Say that if Hatty visited Wales she would have to change her lubs to pounds. Show **Lubs and pounds** on the whiteboard, and together agree the answers.

Explain to learners that they are going to visit Hatty's land. Before they go, you will give each group £10 for them to spend on presents to take home – but they must change their pounds to lubs. Say that they can't take any lubs home with them, so they should spend as much as possible.

Give each group £10 in pretend money, plus a copy of the resource sheet **Shopping list** to record what they are going to buy. You are the banker, so they come to you to change their pounds to lubs, but they need to check to make sure you don't make any mistakes. When they tell you how many lubs they should have, change their pounds to lubs *(using the currency from the teachers' sheet* **Lubs***)*.

Make sure learners have paper for their working, and support as appropriate. Once they have completed their shopping list, groups come to you to order and pay for their goods. Check their work and take their money, handing out change as appropriate. Bring the class together to see who has the least change, and therefore was closest to the total amount of 20 lubs.

Learners can then make their own shop, pricing their goods *(give squares of paper)*. They then 'sell' to other groups, working out the costs and giving the correct change.

Question

- When we visit a country with different money, why is it important to work out how much something would cost in pounds? *(We can compare and see if it is worth buying.)*
- How are you deciding what to buy? What is the most expensive item? Can you buy more than one of these? What about three of them? Why/why not?
- What is the cost of two of these? *(Indicate an item that has a cost that includes a fraction.)* What about the cost of three of them?
- How can you make sure you don't overspend? *(Keep a running total.)* And that you spend as much as you can of your lubs? *(Subtract your running total from the 20 lubs and see what you can get for your money.)*
- If you have change at the end, and could change it for pounds, would you have less than 50p, or more than 50p, or . . . ? How do you know? *(If you have less or more than 1 lub left)*

Create a 'shop' using items that are readily named by learners. Prices can be adapted according to ability levels.

1 lub	$1\frac{1}{4}$ lubs	$1\frac{1}{2}$ lubs	$1\frac{3}{4}$ lubs	2 lubs
$2\frac{1}{4}$ lubs	$2\frac{1}{2}$ lubs	$2\frac{3}{4}$ lubs	3 lubs	$3\frac{1}{4}$ lubs
$3\frac{1}{2}$ lubs	4 lubs	$4\frac{3}{4}$ lubs	5 lubs	$7\frac{1}{2}$ lubs

WB

1 lub is worth 50p

so

2 lubs are worth _____

5 lubs are worth _____

____ lubs are worth £3.00

Our shopping order

Item	How many lubs one of these items costs	How many of these items we want	How many lubs these items cost altogether
Total cost of our shopping order			**lubs**

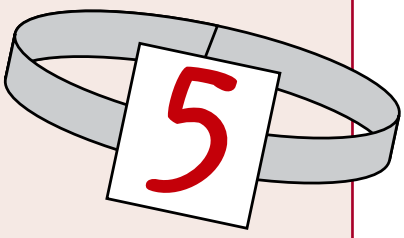
10 lubs 	10 lubs 	1 lub 	1 lub 
5 lubs 	5 lubs 	1 lub 	1 lub 
$\frac{1}{4}$ lub 	$\frac{1}{4}$ lub 	1 lub 	1 lub 
$\frac{1}{2}$ lub 	$\frac{1}{2}$ lub 	1 lub 	1 lub 
$\frac{3}{4}$ lub 	$\frac{3}{4}$ lub 	1 lub 	1 lub 

Activity 3

Number hats

Activity 3 – Number hats

Outline



In this Year 4 activity, learners create calculations to match given numbers. They use numbers written on their hats and each time a hat number is included in a correct solution, it is marked with a star. At the end of the activity, learners explore which numbers achieved the most stars and why that might be.

Hats are exchanged so the focus remains on the numbers, not on the wearers of the hats.

Activity 3 – Number hats requires learners to create their calculations without pen or paper, so provides an opportunity for them to practise their mental mathematics. It is a physical activity which is likely to benefit from more than one adult's support.

You will need

A large space (e.g. gym/hall or the playground)

One simple hat for each learner
made from stapled strips of card, each with a number written on (numbers 0–15, with duplicates of the smaller numbers)

Teachers' sheet – Number hats

Activity 3 – Number hats

Explain

Create 'hats' using stapled strips of card, wide enough to include a large number written in bold on the front – where possible, use the numbers 0 to 15, with duplicates of the smaller numbers if needed. Randomly allocate a hat to each learner.

Explain that you are going to call out some instructions – they will use the numbers on their hats to try to match each instruction. If they can't they should sit on the floor. If they can they will get a star on their hat *(using bright marker pen, or stickers)*. Tell them that they will need to listen carefully and think creatively about whether or not they will be able to do as you ask. They need to work together – speed is not important.

Then ask learners to move around the hall/gym, until you call an instruction from the teachers' sheet **Number hats** *(these can be amended to suit the ability level of the class)*.

After each instruction, check the calculations of the pairs or groups who believe they can make the number – but remember to quickly check the seated ones to make sure they are correct, too. Discuss as appropriate, e.g. after the first instruction *(Find one other person so that your hat numbers sum to 20)* how did some learners know it was not possible for them to find a partner?

At the end, ask learners to place all their hats in the middle of the room, or in a line on a bench, etc. Discuss the outcome in terms of the numbers that received the most stars, using the questions below as a guide.

Question

During the game

- What operations can you use to try to make the number? Have you tried addition . . . subtraction . . . ? What other operations are there?
- Are you certain that you can/can't make the number? How do you know?

After the game

- Which number did you like having most? Why?
- Which number has the most stars? Why do you think that is?
- Which has least? Why?
- *(Show them one hat.)* Imagine you had this hat. If I told you to work with another person in a pair, and I called nine, which number hat would you look for if you could choose? Why? What other number could you use? Why?
- Imagine you are in a pair. Both of you have odd numbers on your hats. If I called an odd number, could you make that number? How/why not? *(You cannot make it using addition or subtraction, as the sum of or difference between two odd numbers is always even; but you may be able to make it using division or multiplication, e.g. 3×5 or $9 \div 3$.)*

Learners who don't think they can make the number sit down. Go through the calculations of the pairs who believe they can make the number – but remember to quickly check the seated ones to make sure they are correct, too.

For those who can make the number, draw a star on their hats *(in bright marker pen, or use stickers)*.

Instruction	Comment
Find one other person so that your hat numbers sum to 20.	Smaller numbers are disadvantaged.
Find one other person so that your hat numbers sum to 8.	Larger numbers are disadvantaged.
Find someone so that your hat numbers have a difference of 5.	
All change! Swap an even-numbered hat for an odd-numbered hat.	This prevents learners from 'owning' a particular hat.
Get into pairs. *(Once they are in pairs)* Can you use your numbers to make a calculation that has the answer 2?	Remind learners that they can use addition, subtraction, multiplication or division.
Odd numbers go round the room clockwise, even numbers anticlockwise.	Mixes learners up
Get into threes or fours. *(Once they are in their groups)* Can you use your numbers to make a calculation that has the answer 10?	
All change! Change hats with the person next to you.	
Can you find people so that your numbers make a calculation that has the answer 1?	The number of learners in a group can be variable.
Can you find people so that your numbers make a calculation that has the answer 12?	

And so on, but note that the instructions can be changed to suit the ability level of the group.