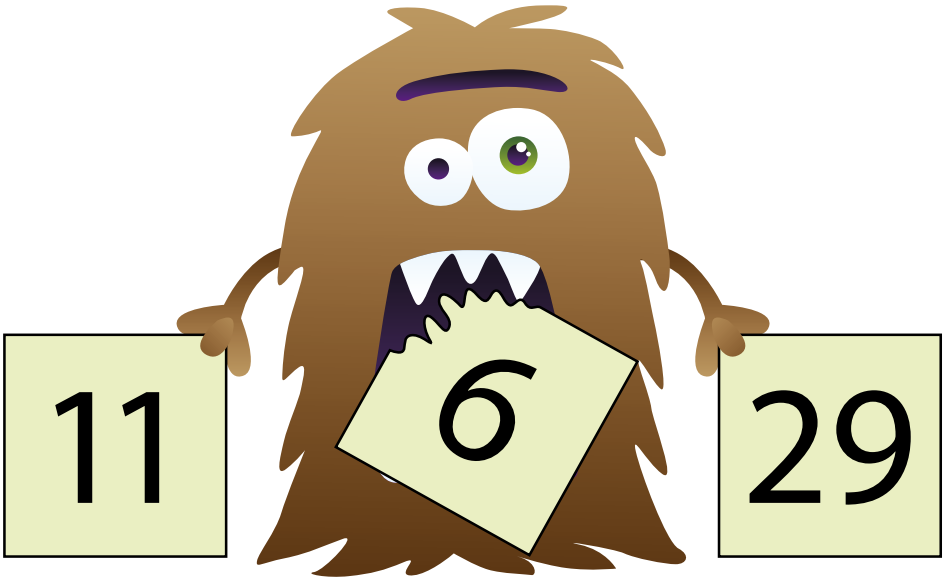
Reasoning in the classroom

Monsters eating



Support materials for teachers

Year 4

Llywodraeth Cymru
Welsh Government

Year 4 Reasoning in the classroom – Monsters eating

This engaging context encourages Year 4 learners to use their knowledge of numbers and number relationships.

Activity 1

Monsters eating

Learners explore a world of monsters that eat numbers.

Includes:

- Teachers' script
- PowerPoint presentation
- Monsters eating questions
- Markscheme

Activity 2

You choose!

They choose their own monster and rule.

Includes:

- Explain and question – instructions for teachers
- Resource sheet – You choose!
- Whiteboard – You choose! What to do (instructions for learners)

Activity 3

Eat them up!

Learners develop their own rules to 'eat' specific numbers.

Includes:

- Explain and question – instructions for teachers
- Whiteboard – Number grid

Reasoning skills required

Identify	Communicate	Review
Learners choose and develop their own rules.	They use clear mathematical language.	They check that all solutions have been found.

Procedural skills

- Addition and subtraction
- Multiplication and division

Numerical language

- Sum to
- Difference
- Multiply
- Identical

Activity 1

Monsters eating

Activity 1 – Monsters eating

or

Outline

Learners engage with the stimulus presentation that explains the context of a world of monsters that only eat numbers.

They then complete questions relating to that context.

You will need

Teachers' script

PowerPoint presentation

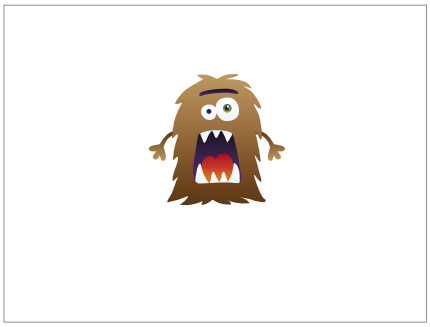
Monsters eating questions
Two pages for each learner, can be printed double-sided

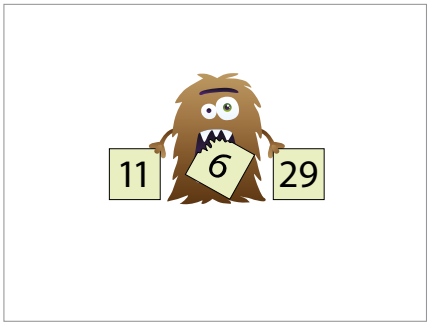
Markscheme

TS

Presentation to be shown to learners before they work on Monsters eating

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 is a monster. Although she looks quite fierce, she is quite gentle really. And she has lots of monster friends.
Slide 3		Here she is with some of her lovely friends. The monsters live together in monster land. But beware! When the monsters get hungry they eat . . .

Slide 4		. . . numbers. Delicious! Of course, they don't just eat any old numbers. That would be silly. They have rules about which numbers they can eat. But the rules change each day. Life is complicated when you are a monster.
Slide 5	three numbers that sum to 10 	The rule for this monster is that he can eat three numbers, but they must sum to 10 *(If needed, remind learners that 'sum to' means 'add up to'.)* What numbers could he eat? Talk with the person next to you: see if you can find different answers. *(Allow discussion and list some possible answers, e.g. 1, 2 and 7; 2, 3 and 5; 3, 3 and 4* *If learners suggest fractions and decimals, praise the response but say that the monsters eat only whole numbers. Similarly, do not allow negative numbers.)* Lucky monster. He has a choice.
Slide 6	two numbers that sum to 16 	For this monster, the rule is different. What is the rule? Yes, he eats two numbers that sum to 16 Can you tell me what the numbers could be? *(Allow discussion, then suddenly announce . . .)* Oh no! The rule for this monster has just been changed . . .
Slide 7	two **identical** numbers that sum to 16 	. . . the numbers must be identical. What does that mean? *(Agree that 'identical' means 'exactly the same' writing this on the whiteboard if necessary.)* So what numbers can he eat? That's right, now he can only eat 8 and 8 because those two numbers are identical and they sum to 16 Let's see one more rule.

Slide 8	 eats **four** numbers that sum to 10 The first two are identical and the second two are identical.	This one is harder. The pink monster eats four numbers that sum to 10 Two are identical. The other two are identical. Talk with the person next to you. Can you work out what the four numbers could be? *(Allow discussion, clarifying that the first two are identical to each other and the second two are identical to each other.* *Using positive whole numbers, the only solutions are 1, 1, 4, 4 or 2, 2, 3, 3)* Now you are going to answer some questions about these monsters and the numbers they eat. 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.)*

eats **three** numbers that sum to **50**

One is **15**

The others could be ☐ and ☐

1m

eats **four** numbers that sum to **60**

One is **13** and one is **18**

The others could be ☐ and ☐

1m

eats **five** numbers that sum to **70**

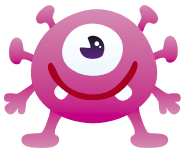
The first **two** are identical and

the **next three** are identical.

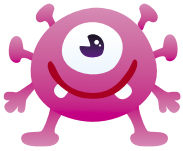
What could the numbers be?

☐ , ☐ , ☐ , ☐ and ☐

1m

 eats numbers that are:

- **less than 20** and
- in the **2-times** table and
- also in the **3-times** table.

So the only numbers that  can eat are

☐ , ☐ and ☐

2m

The only numbers that  can eat are **15** and **30**

He can only eat numbers that are:

- **less than 40** and
- in the ☐ **-times** table and
- also in the ☐ **-times** table.

2m

Activity 1 – Monsters eating – Markscheme

Q	Marks	Answer
i	1m	Any two numbers that sum to **35**
ii	1m	Any two numbers that sum to **29**
iii	1m	Any five numbers that sum to **70** provided two are identical and the other three are identical, e.g. • 20, 20, 10, 10, 10
iv	2m	**6**, **12** and **18** in any order
	Or 1m	Any two of **6**, **12** and **18** even if the other is incorrect or omitted Or Lists multiples of 6, e.g. • 6, 12, 18, 24, 30
v	2m	**3**-times table and **5**-times table, in either order Or **15**-times table and one of **3**-times table, **5**-times table or **1**-times table, in either order
	Or 1m	Any **one** of **3**-times, **5**-times or **15**-times table identified, even if the other is incorrect or omitted

Accept in any order, e.g.
- **22, 2, 22, 22, 2**

Activity 1 – Monsters eating – Exemplars

Part iv

• **less than 20** and • in the **2-times** table and • also in the **3-times** table. 2 4 6 8 10 12 14 16 18 20 / 3 6 9 12 15 18 So the only numbers that  can eat are 6, 12 and 18	Correct; **2 marks** • This learner works systematically, listing multiples of 2 and then 3 to find numbers that are common to both.
• **less than 20** and 19, 18, 17, 16, 15, 14 • in the **2-times** table and 13, 12, 11, 10, 9, 8, 7, • also in the **3-times** table. 6, 5, 4, 3, 2, 1 So the only numbers that  can eat are , , and	Correct; **2 marks** • The answers are clearly indicated within the working.
• **less than 20** and 6, 12, 18 • in the **2-times** table and 2 x 3; 2 6; 4 • also in the **3-times** table. 2 3 So the only numbers that  can eat are 6, 12 and 18	Correct; **2 marks** • This learner has used factor pairs to check that 6 and 12 are multiples of both 2 and 3, but has struggled to apply this understanding to 18.
• **less than 20** and 6 12 18 24 30 36 • in the **2-times** table and 42 48 54 • also in the **3-times** table. 60 66 72 So the only numbers that  can eat are , , and	Lists multiples of 6; **1 mark** • Understanding of two of the constraints is shown, but this learner has ignored that the numbers must be less than 20.
• **less than 20** and 2 4 6 8 10 12 • in the **2-times** table and 14 16 18 20 • also in the **3-times** table. 3 6 9 12 16 19 So the only numbers that  can eat are 6, 12 and 16	Two correct with one incorrect; **1 mark** • This learner has made an error when working out 5 × 3 (or adding 3 to 12).
• **less than 20** and • in the **2-times** table and • also in the **3-times** table. So the only numbers that  can eat are , 12 and 16	Incorrect; **0 marks** • Only one correct value is shown.

Activity 2

You choose!

Activity 2 – You choose!

Outline

This activity is designed to carry on from **Activity 1 – Monsters eating**.

From their resource sheet, learners choose a monster and a rule, working out all the pairs of numbers that their monster can eat.

Learners present their work to other pairs/groups.

Rules, together with solutions, can then be displayed in the classroom.

You will need

Resource sheet – You choose!
One for each group/pair

Whiteboard – You choose! What to do
Instructions for learners

Scissors

Glue

Activity 2 – You choose!

Explain

Give learners a copy of the resource sheet, **You choose!**

Tell them that they are going to cut out their chosen rule and monster and stick them on the top part of a piece of paper or card.

They will then insert a number for their rule, e.g.

Rule:
2 numbers that multiply to 20

They will need to work out and record the pairs of numbers their monster can eat, writing them on the bottom part of the sheet and folding it so that no one can see their answers.

Show **You choose! What to do** on the whiteboard to remind learners of the task.

Learners then challenge other pairs/groups to see if they can identify all the numbers that can be eaten.

Or

Prepare a range of cards in advance. Learners choose one or more at random and then find all the pairs.

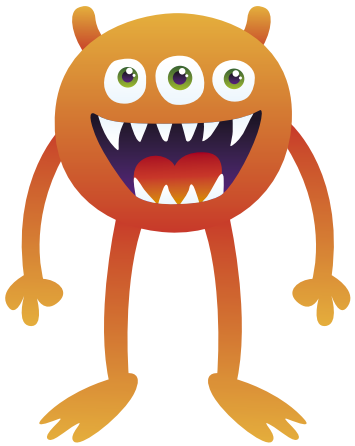
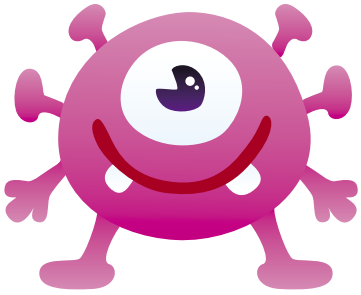
Question

- How are you working out the numbers that your monster can eat?
- Is it possible to use two identical numbers for your rule? If not, why not?
- How can you be sure that you have found all the pairs?
- Can you give me an example of a rule that has lots of pairs of numbers?
- Can you give me an example of a rule that has only a few pairs of numbers?
- Is it true that rules with addition usually have more pairs of numbers than rules with multiplication? Why?

Extension

- Can you find a rule where there is only one pair of numbers? *(One solution is to use 1 with a prime number, such as 17.)*
- What if we allow monsters to eat decimals (or fractions, or negatives)? *(There is an infinite number of solutions.)*



Rule: two numbers that sum to ☐	Rule: two numbers that sum to ☐
Rule: two numbers that multiply to ☐	Rule: two numbers that multiply to ☐
Rule: two numbers that have a difference of ☐	Rule: two numbers that have a difference of ☐

You choose!

What to do

1. Choose a monster. Cut it out.
2. Choose a rule. Cut it out.
3. Stick the monster and the rule onto the top of your paper.
4. Choose a number for your rule.
5. Work out **all** the pairs for your rule.
   Write them on the bottom of your paper.
6. Keep your answers out of sight!

Check

Have we found **all** the pairs for our rule?

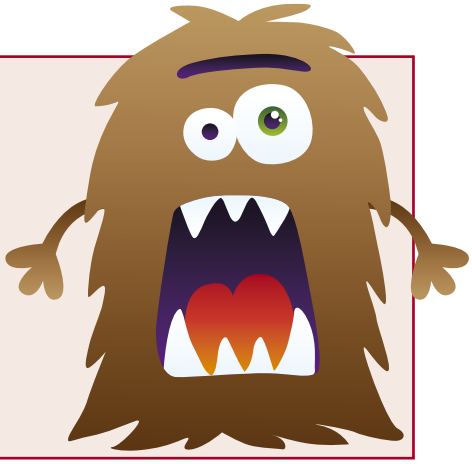
Have we written them all down?

Activity 3

Eat them up!

Activity 3 – Eat them up!

Outline



Learners identify rules that allow the monsters to eat specific numbers.

Eat them up! has been designed to follow on from **Activity 2 – You choose!**

However, it can be presented as a stand-alone activity, following on from **Activity 1 – Monsters eating**.

Eat them up! is presented as a whole-class activity, but can easily be amended to allow for working in small groups or pairs.

You will need

WB **Whiteboard – Number grid**

Activity 3 – Eat them up!

Explain

Introduce by explaining that the monsters can now only eat the numbers 1 to 20.

Show **Number grid** on the whiteboard, and explain that this monster can only eat two numbers that multiply to 12.

Ask which numbers on the grid this monster can eat. Discuss as a group and cross off the numbers as learners identify them.

When they have identified all the pairs of numbers that the monster can eat, ask them to work out a rule for the next monster (e.g. two numbers that sum to 17) . . . and the next . . . and the next, until all the numbers have been eaten.

Decide in advance whether it is acceptable for the new rule to eat a number that has already been crossed off – this is likely to emerge during the activity.

Then encourage learners to compare and check their rules.

Question

- Which numbers are easy to find rules for?
- Which are harder? Why are they harder?
- Can you find different rules that allow monsters to eat the same numbers?
- Can you find some really challenging rules?
- Can you find a rule that allows a monster to eat all the numbers? *(For example, two numbers that sum to 21.)*

WB

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

I eat
two numbers
that multiply to 12