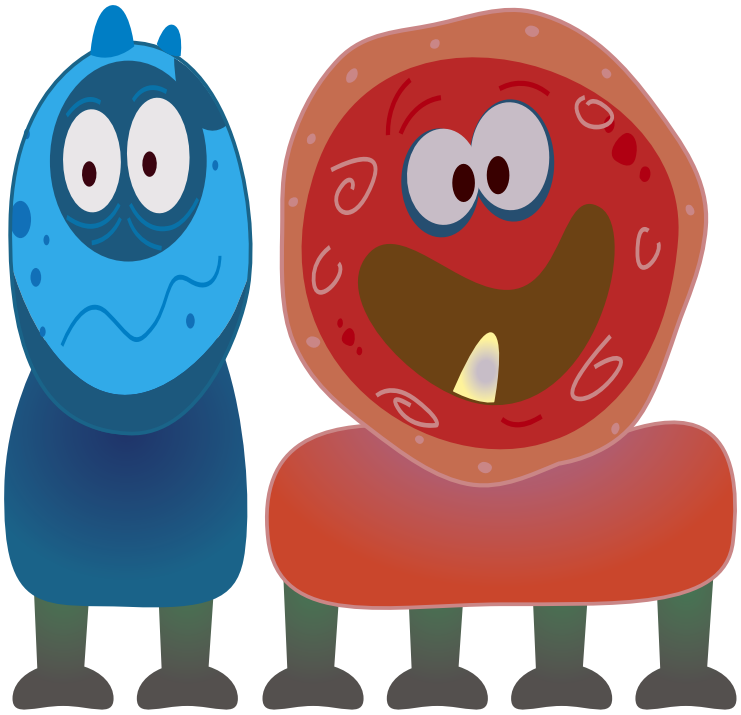
Reasoning in the classroom

Monsters hiding

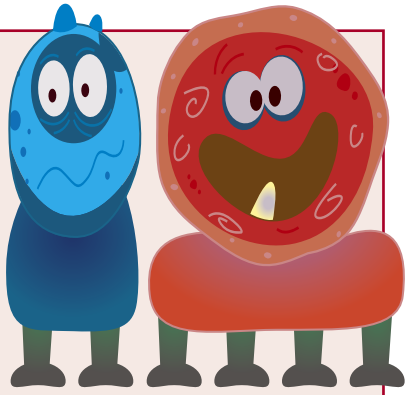


Support materials for teachers

Year 2

Llywodraeth Cymru
Welsh Government

Year 2 Reasoning in the classroom – Monsters hiding



These Year 2 activities are based on things that are hidden. The first activity was included in the 2014 National Numeracy Tests (Reasoning). This is followed by two linked activities.

Activity 1

Monsters hiding

Learners use their reasoning skills to solve problems relating to friendly monsters.

Includes:

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

Activity 2

Shapes hiding

They investigate shapes within shapes.

Includes:

- Explain and question – instructions for teachers
- Whiteboard – Squares, where they are hidden
- Whiteboard – Hidden rectangles
- Whiteboard – Rectangles, where they are hidden
- Whiteboard – Triangle
- Resource sheet – Hidden triangles
- Whiteboard – Triangles, where they are hidden

Activity 3

Cover them up

Learners use simple addition and subtraction then take decisions to try to win a game.

Includes:

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

Reasoning skills required

Identify	Communicate	Review
Learners decide on their methods and their strategies.	They explain their reasoning and their decisions.	They review their work and that of their peers and adapt their methods accordingly.

Procedural skills

- Addition
- Subtraction
- Simple multiplication
- Properties of shapes (square, rectangle, triangle)

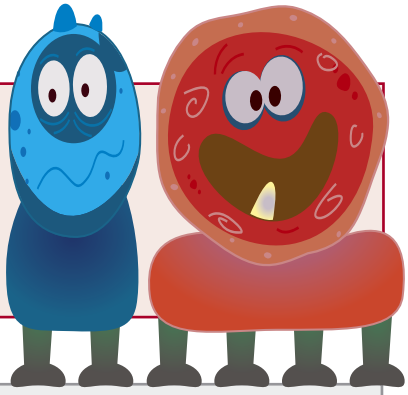
Numerical language

- Altogether
- Square
- Rectangle
- Triangle/equilateral triangle (as appropriate)
- Same/different
- Total
- Highest/lowest (score)
- Row
- Vertical/horizontal/diagonal
- Plan

Activity 1

Monsters hiding

Activity 1 – Monsters hiding



Outline

This Year 2 activity requires learners to work out how many Glubs and how many Fangs are hiding, then to work out why a statement relating to their pets is incorrect.

You will need

Teachers' script

PowerPoint presentation

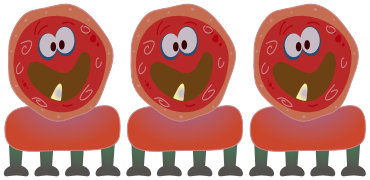
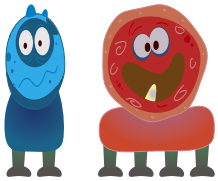
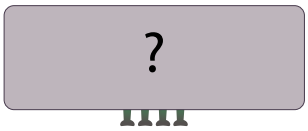
Monsters hiding questions
Three pages for each learner, can be printed double-sided

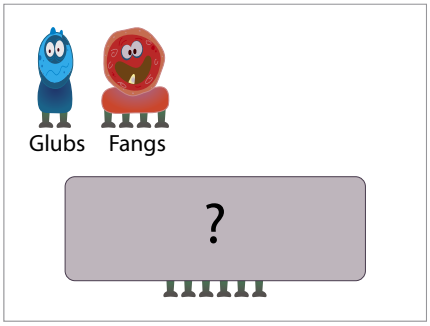
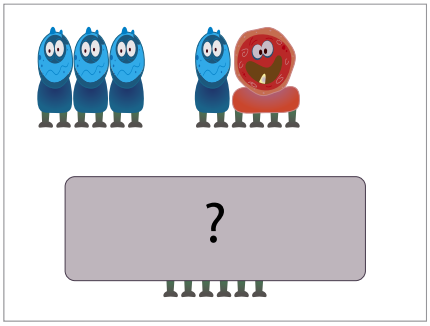
Markscheme

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

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	 Glub	This is a very friendly monster. It is a Glub.
Slide 3	 Glubs	All Glubs look exactly the same. How many legs does each Glub have? That's right, each Glub has **two** legs.

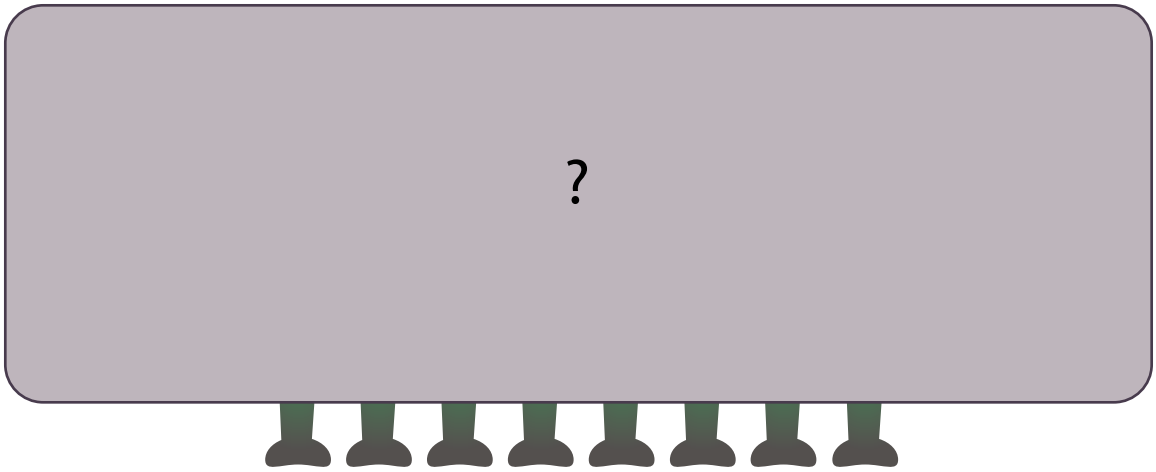
Slide 4	 Fang	This is a different type of friendly monster. It is a Fang.
Slide 5	 Fangs	All Fangs look exactly the same. How many legs does each Fang have? That's right, each Fang has **four** legs.
Slide 6	 1 Glub, 1 Fang	Here is one Glub with one Fang. Their legs are the same shape and size. But a Glub has two legs and a Fang has four legs.
Slide 7	 Glubs Fangs  ?	Glubs and Fangs are very shy. They hide behind things so they can't be seen. Who could be hiding here? *(Encourage discussion but do not refer to the 2 times table. Help learners to understand that there could be 1 Fang and 0 Glubs or 2 Glubs and 0 Fangs. You may wish to use the whiteboard to help show why.)*

Slide 8		Now who might be hiding? *(Encourage the children to discuss together, then agree that there could be 3 Glubs and 0 Fangs or there could be 1 Glub with 1 Fang.)* Let's have a look at the next slide to check.
Slide 9		Yes, 3 Glubs and 0 Fangs *(point)* have 6 legs altogether. And 1 Glub and 1 Fang *(point)* have 6 legs altogether. So, 3 Glubs and 0 Fangs could be hiding, or 1 Glub and 1 Fang could be hiding. Now you are going to answer some questions about Glubs and Fangs. 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. 15 minutes.)*

1

Glubs

Fangs



Who could be hiding?

☐ Glubs and ☐ Fangs

or

☐ Glubs and ☐ Fangs

or

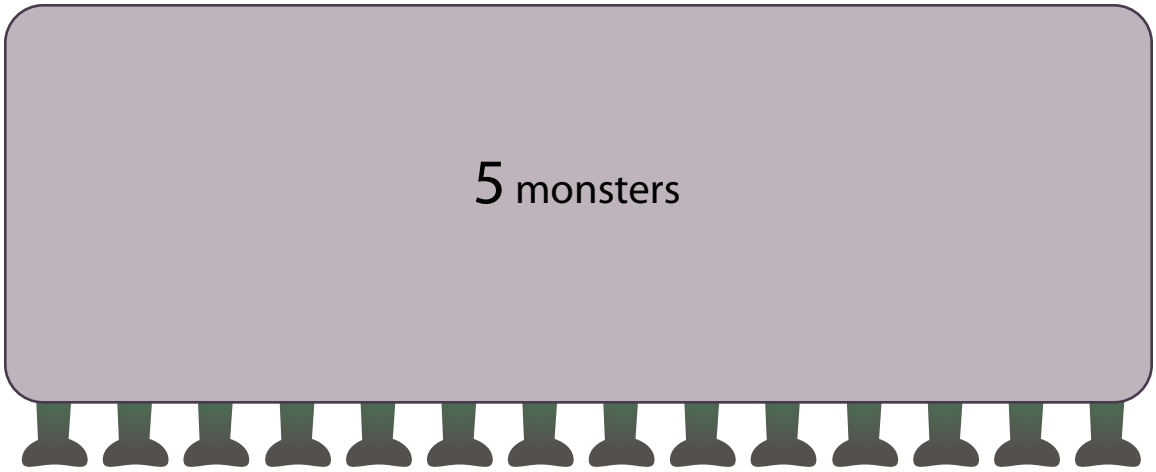
☐ Glubs and ☐ Fangs

3m

2

Glubs

Fangs



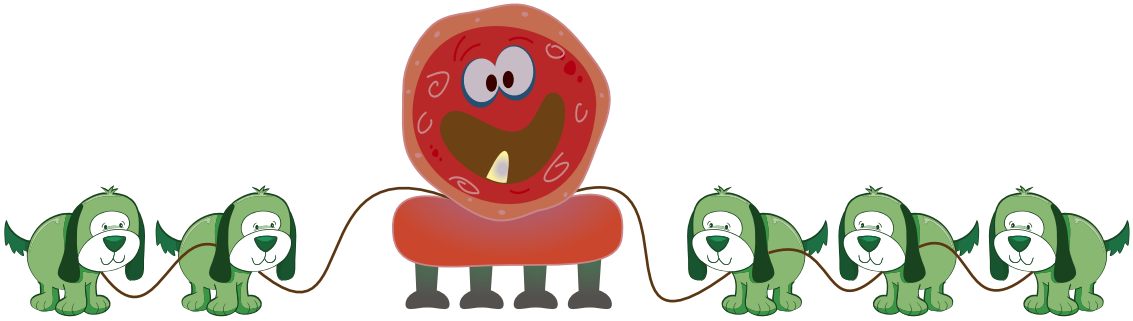
5 monsters are hiding.

Work out how many are Glubs and how many are Fangs.

Glubs and Fangs

3m

3 Every Fang has 5 pets.



One day, 3 Fangs took ☐ pets for a walk.

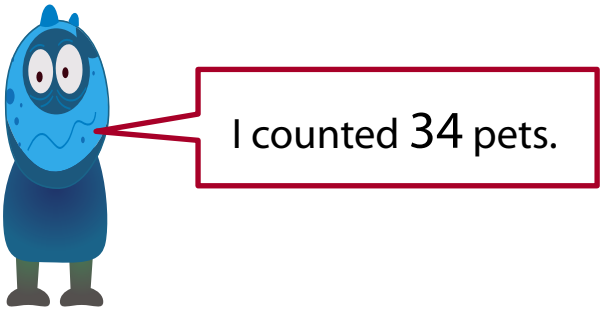
1m

The next day, ☐ Fangs took 20 pets for a walk.

1m

Another day, a Glub saw some Fangs with their pets.

He says:



How do you know that 34 pets must be **wrong**?

2m

Activity 1 – Monsters hiding – Markscheme

Q	Marks	Answer
1	3m	Gives all three correct answers below, in any order: **4** Glubs and **0** Fangs **2** Glubs and **1** Fang **0** Glubs and **2** Fangs
	Or 2m	Gives any **two** of the correct answers
	Or 1m	Gives any **one** of the correct answers

◀ **Throughout, accept 0 left blank**

2	3m	**3** Glubs and **2** Fangs
	Or 2m	Gives any one of the following answers: **5** Glubs and **1** Fang **1** Glub and **3** Fangs Or Shows one or more of the following: **4** Glubs and **1** Fang, with the value **12** **2** Glubs and **3** Fangs, with the value **16** **1** Glub and **4** Fangs, with the value **18**
	Or 1m	Gives the answer **7** Glubs and **0** Fangs Or Shows one or both of the following: **5** Glubs and **0** Fangs, with the value **10** **0** Glubs and **5** Fangs, with the value **20**

Common error

◀ **Groups containing both Glubs and Fangs which have 14 legs**

◀ **Groups containing five Glubs and Fangs, with their total number of legs**

◀ **Group of Glubs which has 14 legs**

◀ **Groups containing five Glubs or five Fangs, with their total number of legs**

Activity 1 – Monsters hiding – Markscheme (continued)

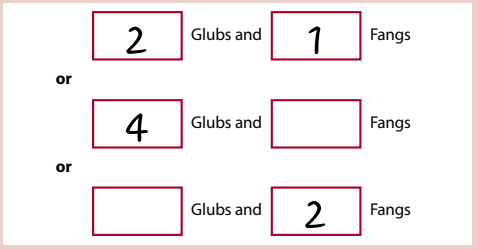
Q	Marks	Answer
3i	1m	**15**

3ii	1m	**4**

3iii	2m	Makes a **correct and relevant statement** that links to the **5-times table** (accept counting in fives to 30 or 35, or more, as indication of the 5-times table), e.g. • 34 isn't in the 5-times table • It must end in 5 or 0 • $6 \times 5 = 30$ so 4 pets left over • If you keep adding 5, you get 35 not 34 • 20, 25, 30, 35 so it should be 35
	Or 1m	Makes a **correct and relevant statement** but doesn't link to the 5-times table, e.g. • There would be 4 left over • He needs another pet Or States or implies that the number of Fangs should be 35 (accept 30) but does not explain why Or Links, even if implicitly, to the **5-times table** (accept counting in fives to 30 or 35, or more, as indication of the 5-times table), e.g. • It must end in 5 • It doesn't end in 0 • 20, 25, 30, 35

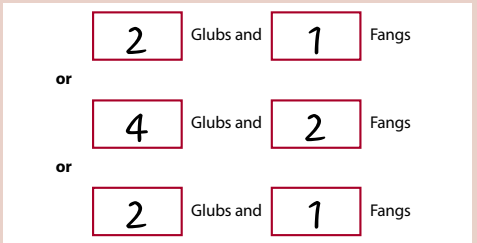
Activity 1 – Monsters hiding – Exemplars

Question 1



All three correct; **3 marks**

- The empty boxes imply 0 so are acceptable.

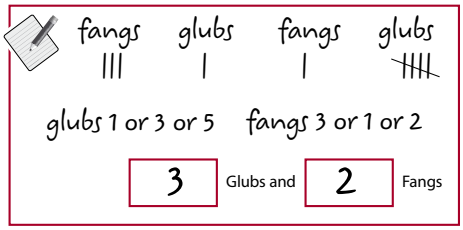


One correct; **1 mark**

- 2 Glubs and 1 Fang is repeated.

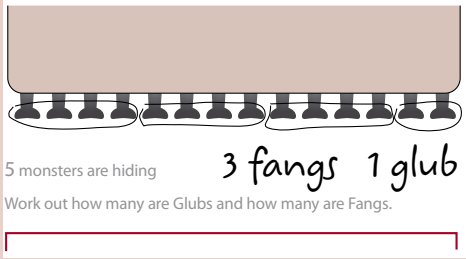
Common error 4 Glubs and 2 Fangs may represent two different answers (4, 0 and 0, 2) shown on one line. However, it is incorrect so cannot be credited.

Question 2



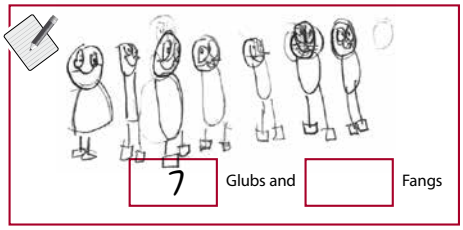
Correct; **3 marks**

- This learner shows numerical insight by considering different options then selecting the correct answer.



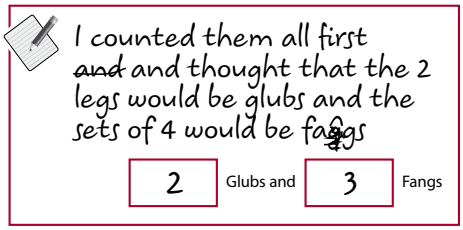
1 Glub and 3 Fangs; **2 marks**

Common error This solution uses all the legs but with four monsters not five.



7 Glubs and 0 Fangs; **1 mark**

Common error This solution also uses all the legs but with seven monsters not five, and with Glubs only.



Incorrect; **0 marks**

- 2 Glubs and 3 Fangs (rather than 3 Glubs and 2 Fangs) may indicate that the learner has transposed their answers. However, as no relevant working is shown we cannot be sure so no marks can be given.

Activity 1 – Monsters hiding – Exemplars (continued)

Question 3iii

Because 34 is not in the 5 times tabel because if 5 pets	Correct; **2 marks**
𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 if there was 34 pets together one fang has 4 pets	Correct; **2 marks** • The tally chart clearly links to the 5-times table, and 'one fang has 4 pets' is a correct and relevant statement.
because he didunts no how to count in 5 and he the answer wrong it is 35 pets	Correct; **2 marks** • 'Count in 5' links to the 5-times table, and 'it is 35 pets' is a correct and relevant statement that assumes that the nearest 5 is the correct total.
Because in sted of a four it needs to be a five	Implies 35; **1 mark** • This learner does not explain why it should be 35 rather than 34
he counted to many 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸	Counts in fives; **1 mark** • The tally chart clearly links to the 5-times table but 'he counted to many' is not enough without reference to 30 or 35
there isnt enuf pets	Incomplete; **0 marks**
Becos every Fang had 5 pets	Incomplete; **0 marks** Common error Restating information given is a common error.
you add the 15 and the 5 you get 20	Incomplete; **0 marks**

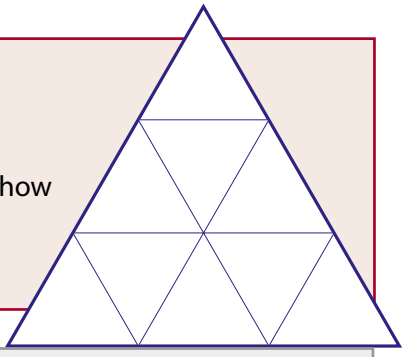
Activity 2

Shapes hiding

Activity 2 – Shapes hiding

Outline

This Year 2 activity continues the theme of things being hidden in **Activity 1 – Monsters hiding**, with learners exploring shapes within shapes. They work out how many smaller squares there are in a large square, then extend this to rectangles and triangles.



You will need

- WB **Whiteboard – Squares, where they are hidden**
- WB **Whiteboard – Hidden rectangles**
- WB **Whiteboard – Rectangles, where they are hidden**
- WB **Whiteboard – Triangle**
- R **Resource sheet – Hidden triangles**
- WB **Whiteboard – Triangles, where they are hidden**
- **Each pair will need paper, colouring pens and a ruler**

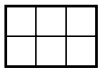
Activity 2 – Shapes hiding

Explain

Use a ruler to draw a large square on the whiteboard and ask learners what shape they see. Ask them to explain why it is a square *(sides all the same length, four right angles)* and why you used a ruler. Then draw a vertical and horizontal line to divide the large square into four equal squares, and ask how many squares they can see *(five, including the outline one)*. Show **Squares, where they are hidden** on the whiteboard to explain.

Discuss the properties of a rectangle, drawing one on the whiteboard, then show **Hidden rectangles** on the whiteboard and ask pairs of learners how many rectangles they can find. Is it the same number as with the square, or different? Let them investigate, drawing their own diagrams, then bring them back together and check how many each pair has identified. Show all nine possibilities on **Rectangles, where they are hidden**, and make sure learners understand the process and can see all the rectangles.

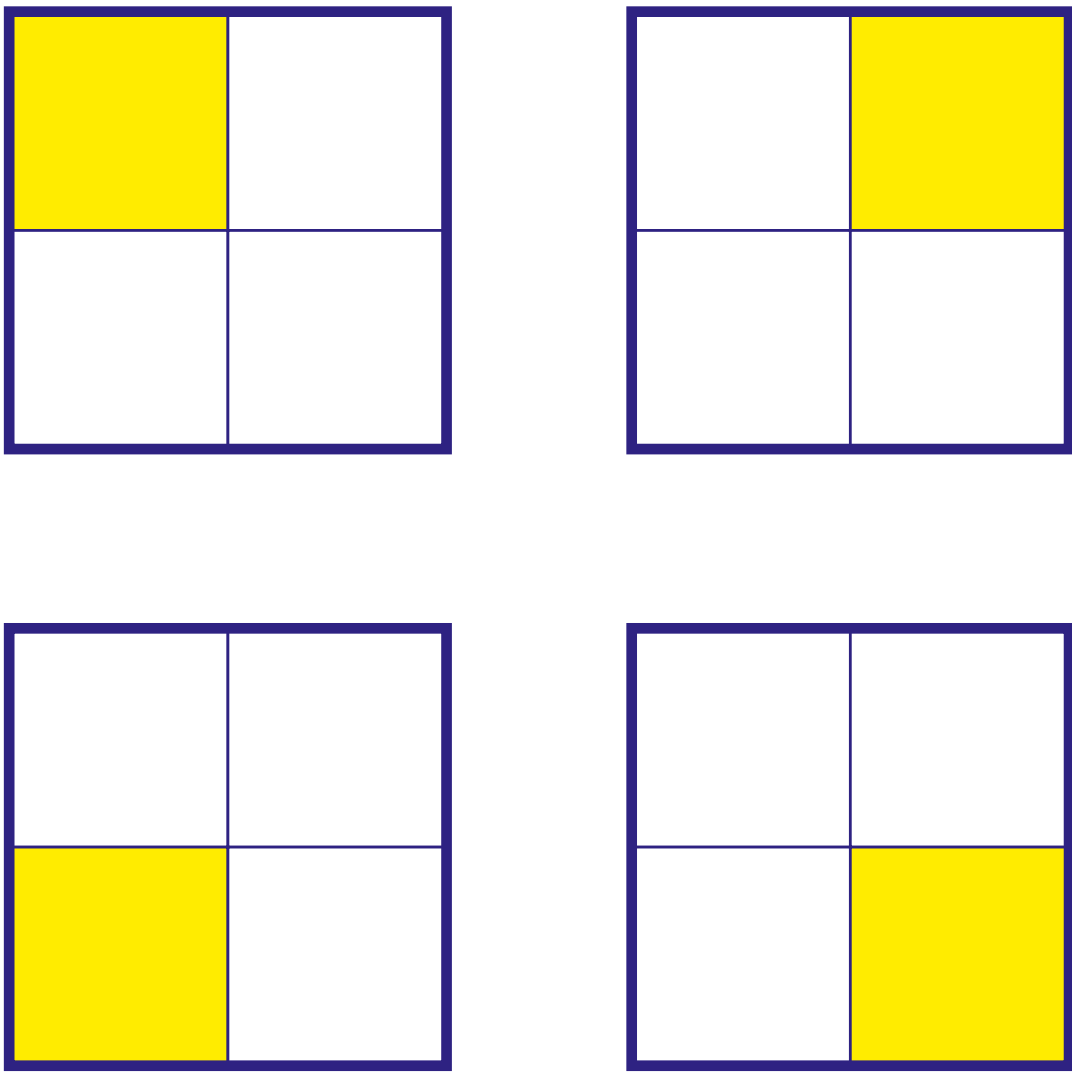
Do they think as many triangles could be hidden in one big triangle? Show **Triangle** on the whiteboard and ask first how they know it is a triangle/equilateral triangle *(as appropriate)*. Then point out that this triangle has hidden triangles within it – but how many? Give each pair a copy of the resource sheet **Hidden triangles** and ask them to find as many different triangles as possible. As they find a triangle, they should colour it in on one of the outlines given on their page. Support the process, then let learners check with another pair before discussing as a whole class and seeing who found all 13 possibilities shown in **Triangles, where they are hidden**.

Finally, ask learners to draw their own shape *(square, rectangle, triangle)* containing a different number of lines within it, for example 

They then work out how many hidden shapes there are before giving their challenge to another pair.

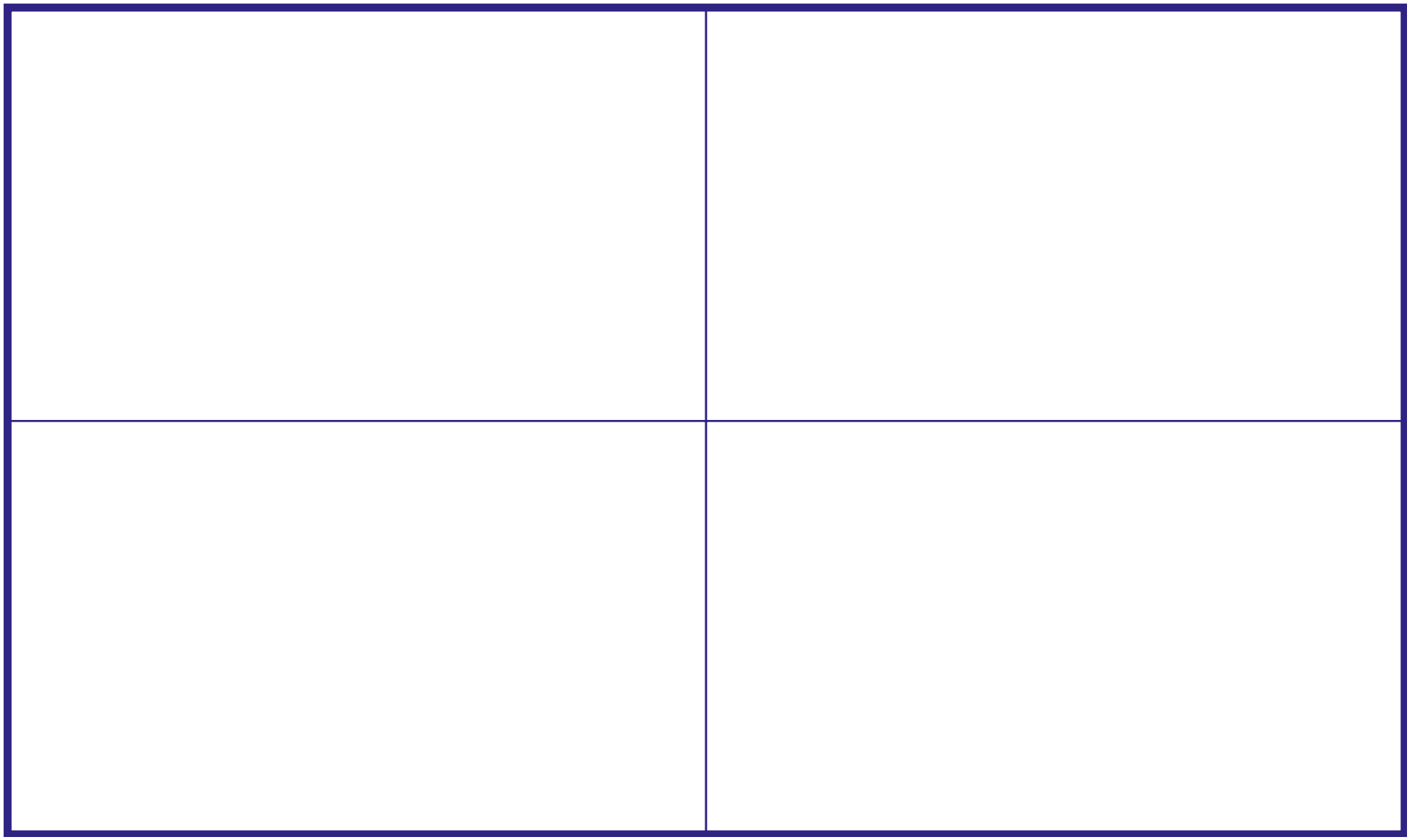
Question

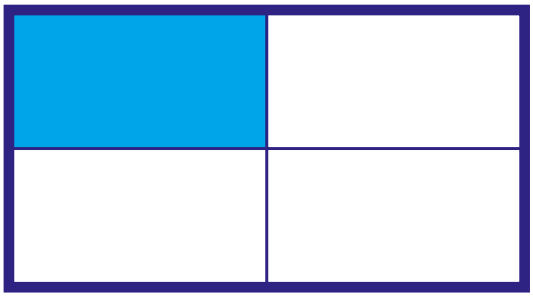
- What is the same and what is different about a square and a rectangle?
- What is the same and what is different about a rectangle and a triangle?
- How are you going to record all the different rectangles/triangles? Do you have a plan? What is your starting point? Why?
- Are you working together? Do you agree? If you don't, what are you doing about it?
- Do you have the same number of triangles as the pair you are now working with? If not, how are you going to decide which one of you is right? Have you checked together that you haven't missed any/done one of the shapes twice?
- What shape are you going to choose to give to another pair? Why that shape? How many lines are you going to use to break it down into smaller shapes? Why?
- Have you checked the number of hidden shapes within it? Are you sure?
- *(If appropriate for the pair)* Can you see any other shapes in your triangle/your challenge shape? What shapes?

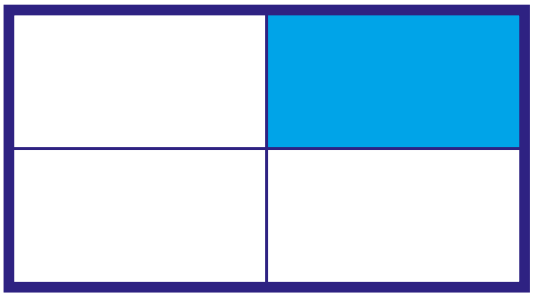


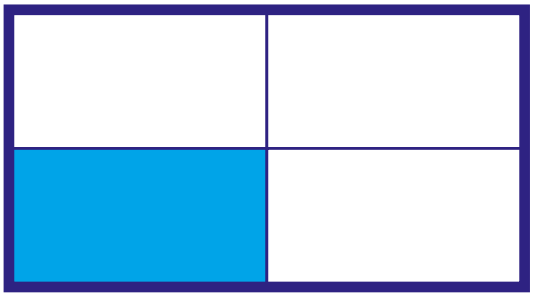
How many squares altogether?

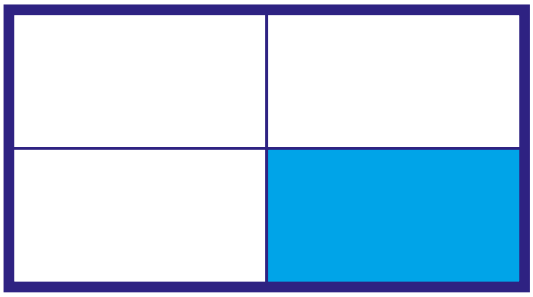
WB

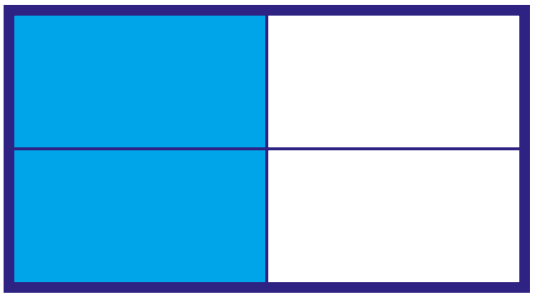


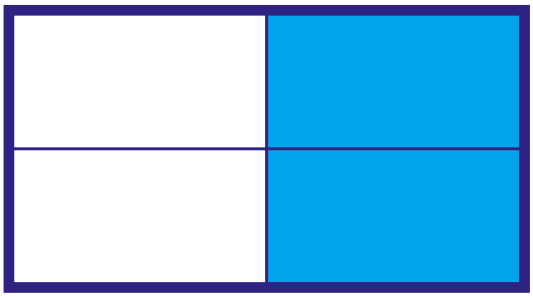


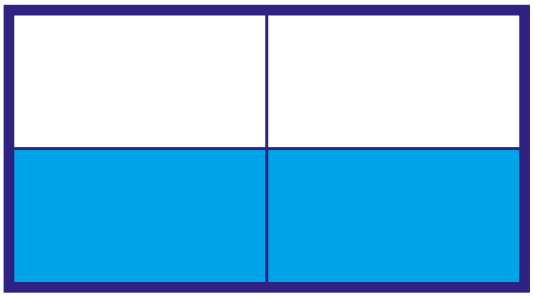


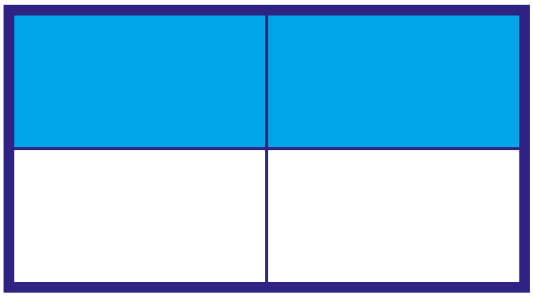


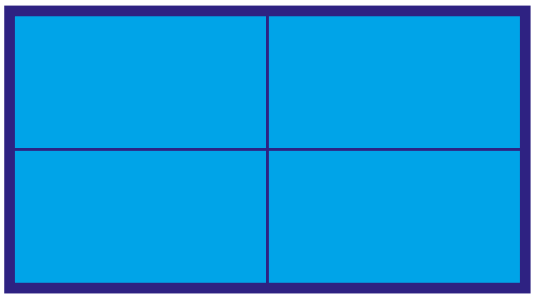




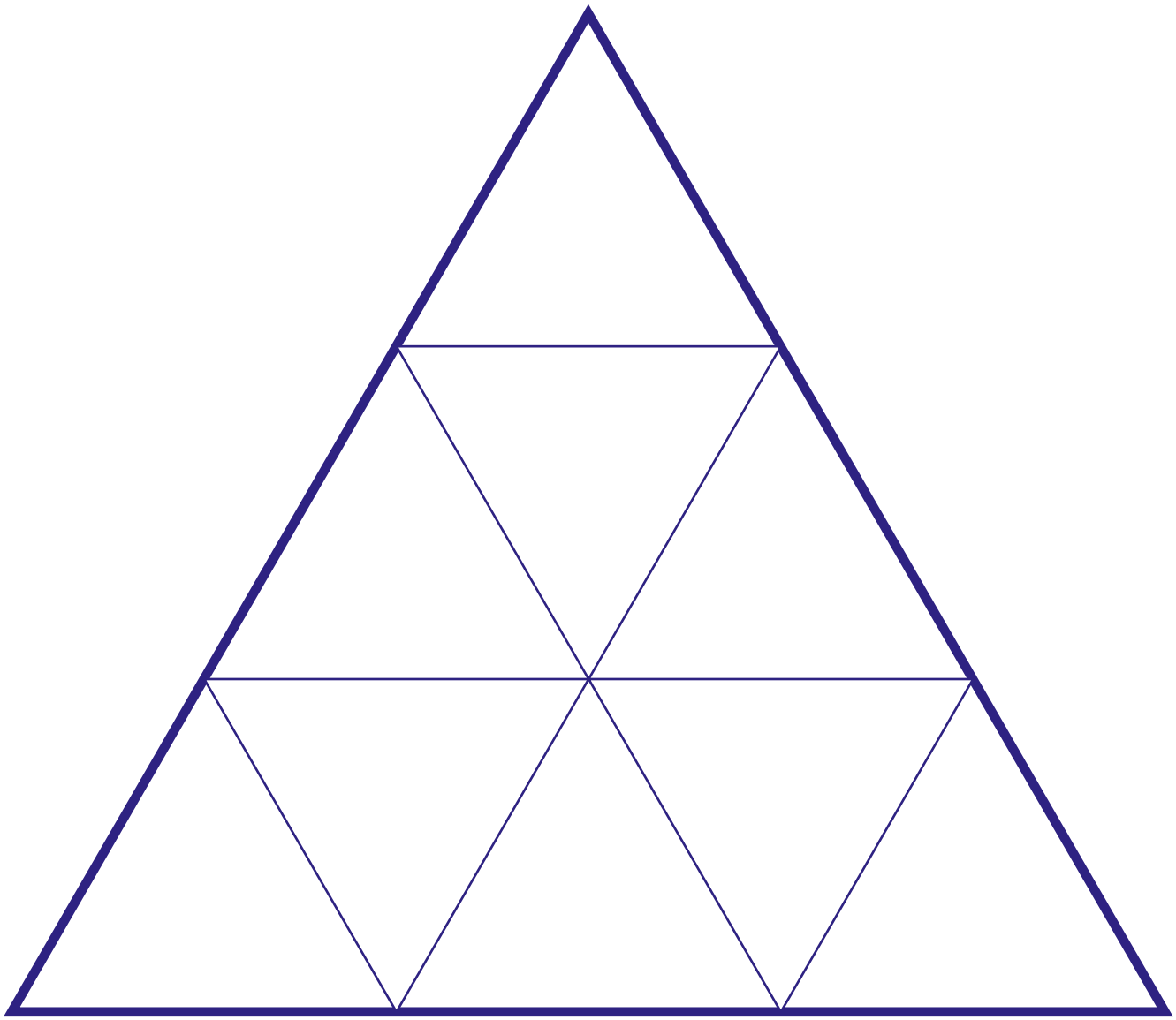


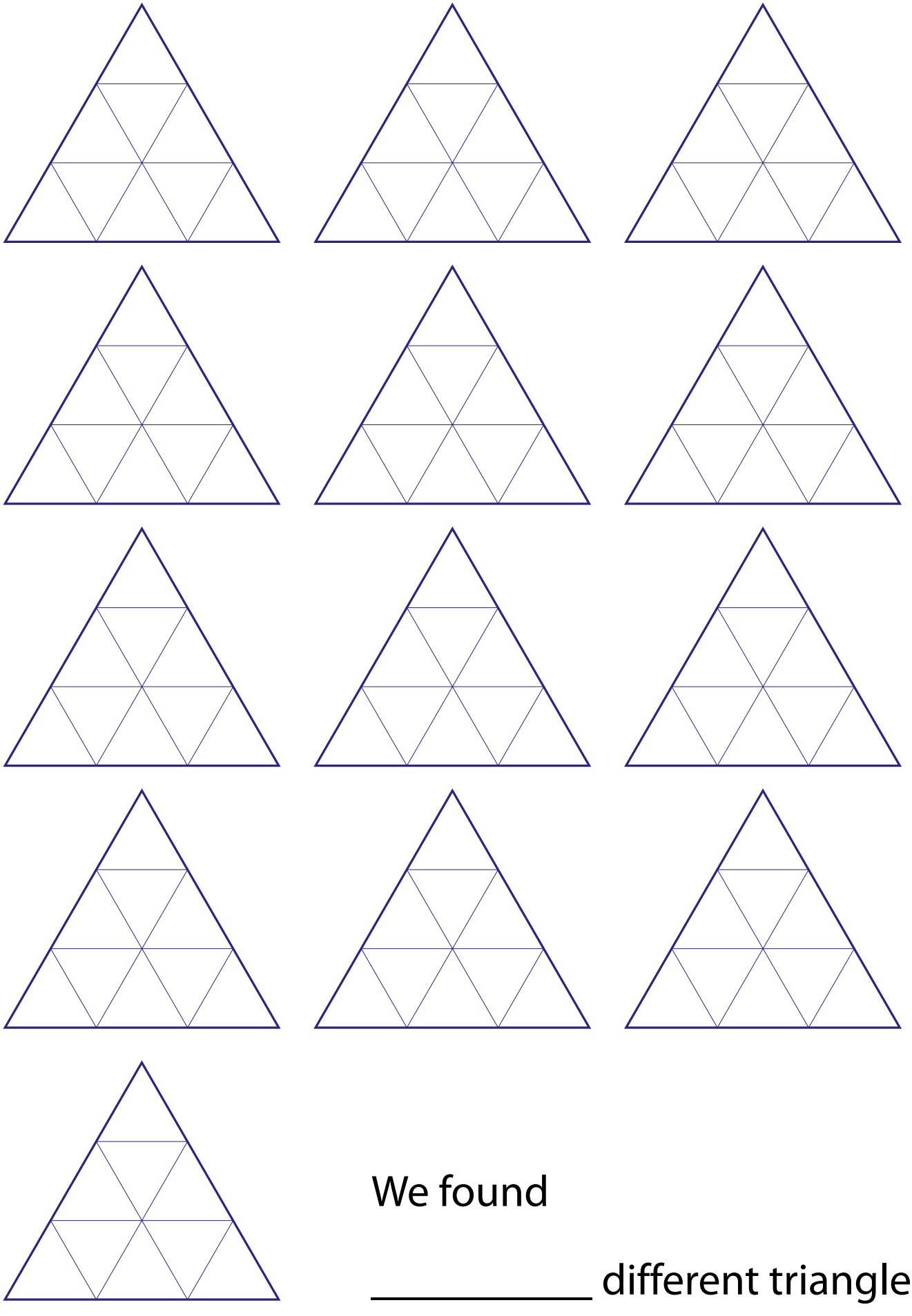






WB

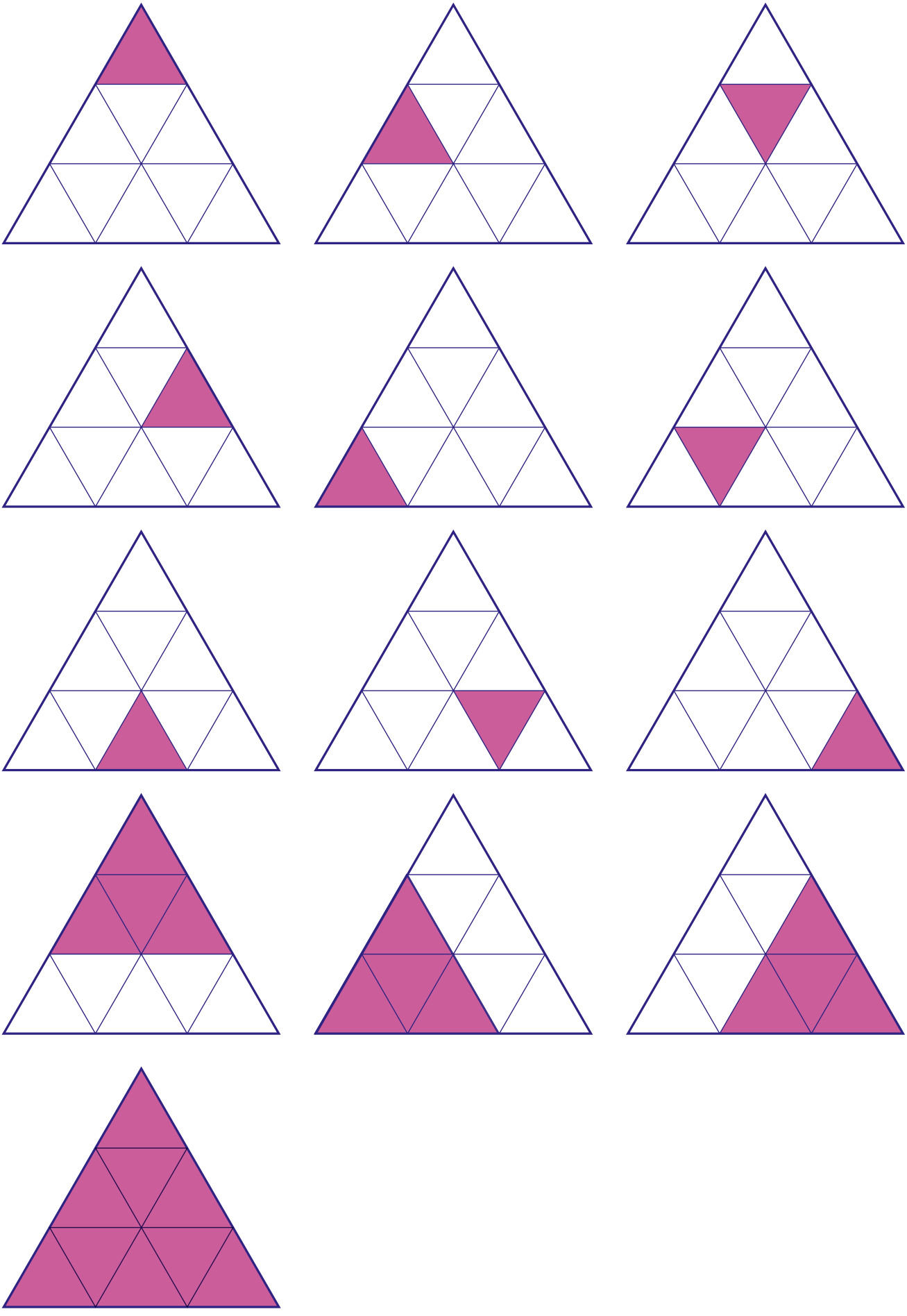




We found

_____ different triangles.

WB



Activity 3

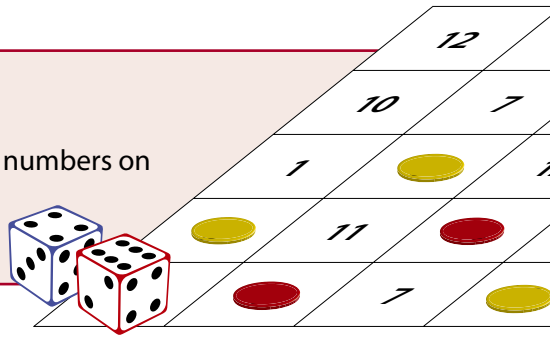
Cover them up

Activity 3 – Cover them up

or

Outline

This Year 2 activity continues the theme of hiding, with learners covering numbers on a grid in order to get three of their counters in a row and win the game.



You will need

WB **Whiteboard – Number grid**

R **Resource sheet – Number grid**
One copy for each pair or set of two pairs

Each pair or set of two pairs will need:

- **Two dice**
- **Two sets of counters (15 of one colour, and 15 of a different colour)**

Activity 3 – Cover them up

Explain

Learners can either play this game individually with one learner playing against another, or pairs could play against other pairs.

Show **Number grid** on the whiteboard and explain that they are going to play a game. Each person/pair will take it in turns to throw two dice. They use the two numbers – either adding or subtracting – to make a number on the grid which they cover using one of their counters. The aim of the game is to get three of their counters in a row – vertically, horizontally or diagonally *(explain these terms as necessary)*. But . . . some numbers appear on the board in more than one place, so learners need to choose wisely where to place their counter.

Give each pair/set of two pairs a copy of the resource sheet **Number grid**, two dice and their counters. They throw one dice to start – nearest to six starts.

Support them playing the game, then bring the class back together to discuss, using the questions below as a guide. Repeat the game, but ask them to think about their approach and whether they think they should change anything. *(Be aware that they may fill the board without anyone winning – discuss why this is, and what they might do to improve their chances of winning next time.)*

Question

- What does vertical/horizontal/diagonal mean? Show me on the board. When you go to sleep, what position are you in? What about when you are walking?
- How did you decide whether to add the two numbers on your dice, or subtract? *(A good strategy is to decide on the number on the board you want to cover, then see if you can make it using the two numbers you throw.)*
- Is it important to have a plan? Why? Is it important to try to work out your opponent's plan? Why? *(To try to block it, and to adapt your own plan)*
- What is the highest total score you can get with the two dice? *(12, using addition)* What is the lowest? *(0, using subtraction)*
- If you didn't get a winner in your game, why was that? (*Each player blocked the other.)* Is it possible for it to happen again next time you play? *(Yes, if you continue to play competitively)*
- Now you have played the game once, is there anything you would change in the way you approached it? What? Why?

WB

12	8	6	9	11	1
10	7	5	10	4	5
1	3	12	7	8	10
3	11	10	6	1	3
2	9	7	4	2	7

12	8	6	9	11	1
10	7	5	10	4	5
1	3	12	7	8	10
3	11	10	6	1	3
2	9	7	4	2	7