

Unit 8
Counting, properties of numbers and number sequences
Reasoning about numbers or shapes

Five daily lessons

Primary
National Strategy

Year 2
Summer term

This Unit Plan is designed to guide your teaching. You will need to adapt it to meet the needs of your class.

Unit Objectives

Year 2

- Count on in steps of 3, 4 or 5 to at least 30 and back to zero, then from and back to any given small number.
- Solve mathematical problems or puzzles, recognise simple patterns and relationships, generalise and predict. Suggest extensions by asking 'What if...?' or 'What could I try next?'.
- Explain how a problem was solved** orally and, where appropriate, in writing.

Pages 3, 5, 7

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Link Objectives

Year 1

- Count in steps of 5 from zero to 20 or more, then back again; begin to count in steps of 3 from zero.
- Solve simple mathematical problems or puzzles, recognise and predict from simple patterns and relationships. Suggest extensions by asking 'What if...?' or 'What could I try next?'.

Year 3

- Count on in steps of 3, 4 or 5 from any small number to at least 50, then back again.
- Solve mathematical problems or puzzles, recognise simple patterns and relationships, generalise and predict. Suggest extensions by asking 'What if...?' or 'What could I try next?'.
- Explain methods and reasoning** orally and, where appropriate, in writing.

(Key objectives in bold)

Resources needed to teach this unit:

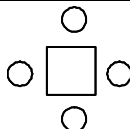
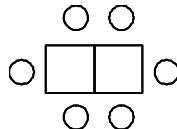
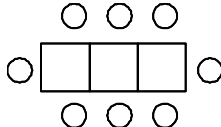
- Resource sheet 8.1
- Resource sheet 8.2
- Resource sheet 8.3
- Resource sheet 8.4
- Resource sheet 8.5
- Resource sheet 8.6
- Resource sheet 8.7
- Resource sheet 8.8 (number 25) taken from *Mathematical Challenges for More Able Pupils in Key Stages 1 and 2* (NNS)
- OHT 8.1 'Gold Bars' (number 7) taken from *Mathematical Challenges for More Able Pupils in Key Stages 1 and 2* (NNS)
- OHT 8.2
- Activity sheet 8.1
- Activity sheet 8.2
- Board (to hide shapes behind)
- ITP 'Number Grid'
- 0-30 number line
- Whiteboards
- Two bead strings
- Building blocks/interlocking bricks

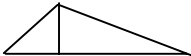
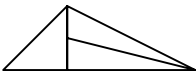
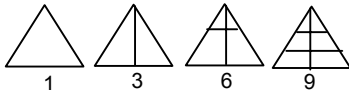
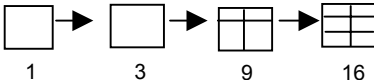

Also see the table of Problem Solving Strategies.

department for
education and skills

Planning sheet	Day One	Unit 8 <i>Counting, properties of numbers and number sequences Reasoning about numbers or shapes</i>		Term: Summer	Year Group: 2
Oral and Mental		Main Teaching			Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities/Focus Questions	
<p>Count on in steps of 3 and 4 to at least 30 and back to zero.</p> <p>VOCABULARY count on count back multiple</p> <p>RESOURCES Bead strings</p>	<ul style="list-style-type: none"> Using the bead string, count in threes, starting at zero. Stop at 30. Count back in threes. <p>Q If we are counting in threes, starting at zero will we get to 7? Why not?</p> <ul style="list-style-type: none"> Draw out that 7 is not made of groups of 3 beads. Say 7 is not a multiple of 3. Repeat, counting in fours. <p>Q When we count in fours from zero, will we get to 9? 21? 16?</p> <ul style="list-style-type: none"> Count in fours to test the children's answers. 	<p>Count in steps of 3 or 4.</p> <p>Recognise simple patterns and relationships, generalise and predict.</p> <p>Suggest extensions by asking 'What if...?' or 'What could I try next?'.</p> <p>VOCABULARY multiple pattern continue predict</p> <p>RESOURCES Two bead strings ITP 'Number Grid'</p>	<p>Q What are the first ten multiples of 3?</p> <ul style="list-style-type: none"> Write a list on the board. Tell the children that when we count in threes, starting at zero, we are saying the multiples of 3. <p>Continue the pattern further until the 20th multiple.</p> <ul style="list-style-type: none"> Ask the children, in pairs, to find out whether there are any multiples of 3 that are also multiples of 4, recording any working in their books. Suggest they count in fours starting at 0 to find the multiples of 4 and write these out. <p>Collect answers and compare working out.</p> <p>Q Why is 12 a multiple of 3 and 4?</p> <ul style="list-style-type: none"> Show the children two bead strings. Count in threes on the first string and stop at 12. <p>Q How many threes in 12?</p> <p>Agree there are four. Count in fours on the second string and stop at 12.</p> <p>Q How many fours in 12?</p> <p>Agree there are three. Record: $3 \times 4 = 12$, $4 \times 3 = 12$</p> <p>Q Which is the next multiple of 3 and 4?</p> <p>Agree that it is 24. Check with the bead strings.</p> <p>Q What do you notice about the first and second of these numbers? (12 and 24)</p> <p>Draw out that 24 is 12 more than 12.</p> <p>Q What will be the next multiple of 3 and 4?</p> <p>Count on in fours until you reach a multiple of 3. Agree that it is 36, 12 more than 24.</p> <p>Q How would you find multiples of 3 that are also multiples of 2?</p> <ul style="list-style-type: none"> Ask the children to work in pairs to do this up to the 20th multiple. If they finish ask them to repeat the problem with 2 and 5. 	<ul style="list-style-type: none"> Launch the ITP 'Number Grid' with grid size 10. <p>Q Where are the multiples of 5 on this grid? What pattern do they make?</p> <p>Q Where are the tens?</p> <p>Highlight both multiples on the grid.</p> <p>Q Which numbers are multiples of 5 and 10?</p> <ul style="list-style-type: none"> Clear the grid. <p>Q What sort of pattern will we get if we count in threes?</p> <ul style="list-style-type: none"> Ask them to predict the pattern and describe it. <p>Collect some answers.</p> <p>Show the multiples of 3 on the ITP.</p> <ul style="list-style-type: none"> Repeat for multiples of 4. Highlight, keep and discuss the pattern they make and the multiples of 3 and 4. <p>By the end of the lesson, children should be able to:</p> <ul style="list-style-type: none"> give examples to match a given statement and ones which don't; describe a rule of a pattern or relationship in words or pictures. <p>(Refer to the table of Problem Solving Strategies.)</p>	

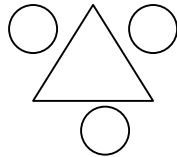
Planning sheet	Day Two	Unit 8 <i>Counting, properties of numbers and number sequences Reasoning about numbers or shapes</i>		Term: <i>Summer</i>	Year Group: 2
Oral and Mental		Main Teaching			Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities/Focus Questions	
<p>Count on in steps of 3 or 4 to at least 30 and back to zero, then from and back to any given small number.</p>	<ul style="list-style-type: none"> Ask the children to give an even number between 1 and 7. Count on in threes from this number. Stop at about 30. Show the steps and number line if necessary. <p>Q If we count on in threes from 4, will we say 10? If we start at an even number will all the numbers we say be even?</p> <ul style="list-style-type: none"> Ask the children to give a multiple of 3 between 1 and 10. Count on in fours from this number to around 30. <p>Q If we start counting on in fours from 6, will we say 15? If we start counting at an even number, will all the numbers we say be even?</p> <ul style="list-style-type: none"> Count back in threes from 20. <p>Q If we start at 21 and count back in 3s, will we say 10?</p> <p>Check with the class by counting on the number line.</p>	<p>Recognise simple patterns and relationships, generalise and predict.</p>	<ul style="list-style-type: none"> Write on the board 3, 12, 21, 30. <p>Q What is the next number in this sequence? How do you know?</p> <p>Ask the children to discuss this with a partner. Discuss with the whole class and agree that 9 is added each time. Ask the children to continue the sequence for another five terms on their whiteboards. Record the answers. Ask if the children notice any patterns.</p> <p>Q What do you notice about the ones digits and the tens digits? Why do you think this is happening?</p> <p>Draw out that we can add 9 by adding 10 and then subtracting 1 so the tens digit will increase by 1 and the units will decrease by 1 each time.</p> <ul style="list-style-type: none"> Write on the board 2, 4. <p>Q Can you predict the next number in this sequence?</p> <p>Draw out that it could be, e.g. 6 or 8, and agree that we need more terms to establish the rule.</p> <ul style="list-style-type: none"> Write on the board 2, 4, 6. <p>Q Can you be sure of the rule now?</p> <p>(Some children may say that the next term is 10 because $2 + 4 = 6$, $4 + 6 = 10$. If so give the next term, 8.)</p> <p>Q What is the rule?</p> <p>Agree that the rule is to add on 2 each time. Ask the children to write 2, 4, 6 and the next five numbers in the sequence in their books.</p> <p>Q What if the rule was the same but the start number was 1, what would the sequence be?</p> <ul style="list-style-type: none"> Ask the children to record the first eight numbers in the sequence in their books. <p>Q What do you notice about the sequence?</p> <p>Q How is it the same as the previous sequence? How is it different?</p> <p>Draw out that both sequences contain alternate numbers, but the numbers in the first sequence are all even, whereas the numbers in the second are all odd.</p> <ul style="list-style-type: none"> Ask each child to think of their own rule for a sequence then write the first few numbers on their whiteboards and ask their partner to guess their rule. <p>Q How many numbers did you need before you could work out the rule?</p>	<ul style="list-style-type: none"> Write on the board 27, 23, 19. <p>Q How can you predict what the fifth number will be?</p> <p>Ask the children to tell their partner how they worked it out.</p> <p>Ask if everyone remembered to check that their rule worked.</p> <p>Q What was different about this sequence to the others we looked at?</p> <p>Say that sequences can go down as well as up.</p> <p>HOMEWORK – Make up a rule and write the first five numbers of the sequence. Then ask someone at home to continue it. Bring it to school for someone else to continue.</p> <p>By the end of the lesson, children should be able to:</p> <ul style="list-style-type: none"> understand, use and begin to read: odd, even, sequence, predict, continue and rule; decide on the information you need to describe and continue the pattern; predict the next few terms in a sequence to test the rule. <p>(Refer to supplement of examples, section 5, page 5 and the table of Problem Solving Strategies.)</p>	
<p>VOCABULARY count in threes count in fours multiple odd even</p> <p>RESOURCES 0-30 number line</p>		<p>VOCABULARY predict continue sequence rule even odd</p> <p>RESOURCES Whiteboards</p>			

Planning sheet	Day Three	Unit 8 <i>Counting, properties of numbers and number sequences Reasoning about numbers or shapes</i>		Term: <i>Summer</i>	Year Group: 2												
Oral and Mental		Main Teaching			Plenary												
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities		Teaching Activities/Focus Questions												
Recognise simple patterns and relationships, generalise and predict.	<ul style="list-style-type: none">Look at the homework. Ask the children to share answers with a partner. Ask them to get into fours and decide on a sequence to share with the class. They should say the sequence one term at a time and see when the other children can predict the rule. <div>Q How many numbers do you need before you can predict the rule?</div>	Solve mathematical problems or puzzles, recognise simple patterns and relationships, generalise and predict.	<ul style="list-style-type: none">Draw a square on the whiteboard and say that this is a table. <div>Q How many children can sit around it if one chair fits on each side?</div> <div>Draw the following:</div> <div></div> <div>Q If we put two tables next to each other how many children can sit around them?</div> <div>Draw the extra table:</div> <div></div> <ul style="list-style-type: none">Ask the children to work in pairs to find out how many children can sit around three tables put together side by side. Ask them to draw the tables on their whiteboards. <div></div> <div>Collect responses and agree the answer.</div> <div>Q How many children could sit around four tables put together?</div> <div>Collect answers and agree the answer.</div> <ul style="list-style-type: none">Point out that drawing the diagrams helped to give us the answer. Ask if anyone noticed a pattern in the numbers. Use the children's responses to draw up the following table: <table><tr><th>Number of tables</th><th>Number of children sitting around</th></tr><tr><td>1</td><td>4</td></tr><tr><td>2</td><td>6</td></tr><tr><td>3</td><td>8</td></tr><tr><td>4</td><td>10</td></tr><tr><td>5</td><td>12</td></tr></table> <div>Q How many children could sit round six tables?</div> <ul style="list-style-type: none">Give out Activity sheet 8.1, read it and ask the children to complete it in pairs.		Number of tables	Number of children sitting around	1	4	2	6	3	8	4	10	5	12	Discuss the children's answers to Activity sheet 8.1.
			Number of tables	Number of children sitting around													
1	4																
2	6																
3	8																
4	10																
5	12																
What did you notice about the numbers in the table?																	
Agree that the numbers of children sitting around the tables are multiples of 3.																	
What happened to the numbers when an extra child sat at each table?																	
Record on a new table:																	
<table><tr><th>Number of tables</th><th>Number of children who can sit around</th></tr><tr><td>1</td><td>4</td></tr><tr><td>2</td><td>8</td></tr><tr><td>3</td><td>12</td></tr><tr><td>4</td><td>16</td></tr><tr><td>5</td><td>20</td></tr></table>		Number of tables	Number of children who can sit around	1	4	2	8	3	12	4	16	5	20				
Number of tables	Number of children who can sit around																
1	4																
2	8																
3	12																
4	16																
5	20																
What did you notice about the numbers in this table?																	
Agree that the numbers of children sitting around the tables are multiples of 4.																	
How many children would sit at ten tables?																	
<p>By the end of the lesson, children should be able to:</p> <ul style="list-style-type: none">use drawings or annotations to help;describe a rule of a pattern or relationship in words or pictures;predict the next few terms in a sequence to test a rule. <p>(Refer to the table of Problem Solving Strategies.)</p>																	
VOCABULARY sequence rule predict		VOCABULARY patterns multiple	RESOURCES Whiteboards Activity sheet 8.1														

Planning sheet	Day Four	Unit 8 <i>Counting, properties of numbers and number sequences Reasoning about numbers or shapes</i>		Term: <i>Summer</i>	Year Group: 2
Oral and Mental		Main Teaching			Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities/Focus Questions	
<p>Describe and classify common 2-D shapes according to their properties.</p> <p>VOCABULARY triangle sides angles length equal</p> <p>RESOURCES Resource sheet 8.1 Resource sheet 8.2 Resource sheet 8.3 Resource sheet 8.4 Board to hide the shapes Whiteboards</p>	<ul style="list-style-type: none"> Hide the shape from Resource sheet 8.1 behind a board. Gradually reveal the shape. <p>As you do, ask the children to identify the shape and draw the whole shape on their whiteboards.</p> <p>Q Why do you think it is a ...?</p> <p>Draw out the properties of the shape, e.g. it has three sides.</p> <ul style="list-style-type: none"> Repeat with Resource sheets 8.2, 8.3, 8.4. <p>Q How is this triangle different from the previous one?</p> <p>Discuss the lengths of sides, for example whether three sides, two sides or no sides are equal in length.</p>	<p>Solve mathematical problems or puzzles, recognise simple patterns and relationships, generalise and predict.</p> <p>Suggest extensions by asking 'What if ...?' or 'What could I try next?'.</p> <p>VOCABULARY pattern method</p> <p>RESOURCES Resource sheet 8.5 Resource sheet 8.6 Resource sheet 8.7 Resource sheet 8.8 (copy for each pair) Whiteboards</p>	<ul style="list-style-type: none"> Draw a triangle on the board. Then draw one line to make it into two triangles. For example:  <p>Q How many triangles are there now altogether?</p> <p>Draw out that there are three triangles altogether, because there is still the original triangle.</p> <ul style="list-style-type: none"> Draw a second line to create another triangle. For example:  <p>Q How many triangles are there?</p> <p>Ask the children to draw this picture on their whiteboards and to discuss this with their partners. Take feedback and agree that there are five.</p> <p>Use Resource sheets 8.5, 8.6 and 8.7 to show the triangles cut up and put on top of each other to convince them that there are five triangles altogether.</p> <ul style="list-style-type: none"> Give out Resource sheet 8.8. Ask the children, in pairs, to solve the problem. Ask each pair to join with another pair to discuss their methods of working this out. Collect the answers. Discuss setting about the problem systematically. Encourage the children to draw the shape on their whiteboards in the same way as you did above. <p>Q Where would you start to count the triangles?</p> <p>Q Is there a pattern?</p> <p>Draw out that there are 9 triangles.</p>  <p>Ask the children to complete question 2 on the Resource sheet 8.8 in pairs.</p> <ul style="list-style-type: none"> Ask each pair to join with another pair to discuss their methods of working this out. Collect answers. <p>Point out the steps</p> 	<ul style="list-style-type: none"> Ask the children to shut their eyes and visualise the shapes you describe. They are to draw their visualisation on their whiteboards when you have finished describing it. <p>Imagine a triangle in front of you. All its sides are the same length. Now imagine a smaller triangle whose sides are the same length. It slides over the larger triangle so that one of its corners fits into one of the corners of the larger triangle. Draw what you see.</p> <p>Compare their drawings, e.g.</p>  <p>By the end of the lesson, children should be able to:</p> <ul style="list-style-type: none"> use a systematic approach to solve the problem and a way of recording if necessary. <p>(Refer to the table of Problem Solving Strategies.)</p>	

Planning sheet	Day Five	Unit 8 <i>Counting, properties of numbers and number sequences Reasoning about numbers or shapes</i>		Term: <i>Summer</i>	Year Group: 2
Oral and Mental		Main Teaching			Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities		Teaching Activities/Focus Questions
<p>Recognise simple patterns and relationships.</p> <p>VOCABULARY sequence predict</p> <p>RESOURCES ITP 'Number Grid' Whiteboards</p>	<ul style="list-style-type: none"> Launch the ITP 'Number Grid' with 10 columns, highlight numbers in a sequence, e.g. 12, 15, 18, 21, and ask the children to describe the pattern on whiteboards, e.g. adding on 3. Ask children to come to the computer or whiteboard and highlight further terms in the sequence. Ask a child to think of a sequence and highlight it. Ask the children to describe the pattern on their whiteboards. Ask children to come to the computer or whiteboard and highlight further terms in the sequence. Repeat with other sequences. 	<p>Solve mathematical problems or puzzles.</p> <p>VOCABULARY investigate explain</p> <p>RESOURCES OHT 8.1 OHT 8.2 Activity sheet 8.2 Whiteboards Building blocks/ interlocking bricks</p>	<ul style="list-style-type: none"> Show OHT 8.1. Ask the children to discuss in pairs how they would start to solve it. Agree that you could: <ul style="list-style-type: none"> use blocks for gold bars and do it practically; draw diagrams; visualise it. <p>Ask the children to solve the problem with their partner.</p> Discuss the different methods used. Ask the children to explain how they solved the problem. Ask if anyone worked out how many bars had to be in each pile. (There are 16 bars and four piles so each pile must have four bars.) Give out and read Activity sheet 8.2 and ask the children to work on it in pairs. (They can use blocks/bricks to help if necessary.) After the children have been working on the problem for about five minutes or so, bring them back together. <div> <p>Q How have you started? How many bars will be in the piles when they are the same height?</p> <p>Ask them to continue with the problem.</p> </div>		<ul style="list-style-type: none"> Show the children OHT 8.2. Ask them to find as many ways as possible to solve the problem and draw them on their whiteboards. <p>Share answers and methods.</p> <div> <p>By the end of the lesson, children should be able to:</p> <ul style="list-style-type: none"> visualise the problem using familiar shapes or patterns; use drawings or annotations to help. <p>(Refer to the table of Problem Solving Strategies.)</p> </div>

In Class 2 the tables are triangular. Three children usually sit around each. The tables are not put together.



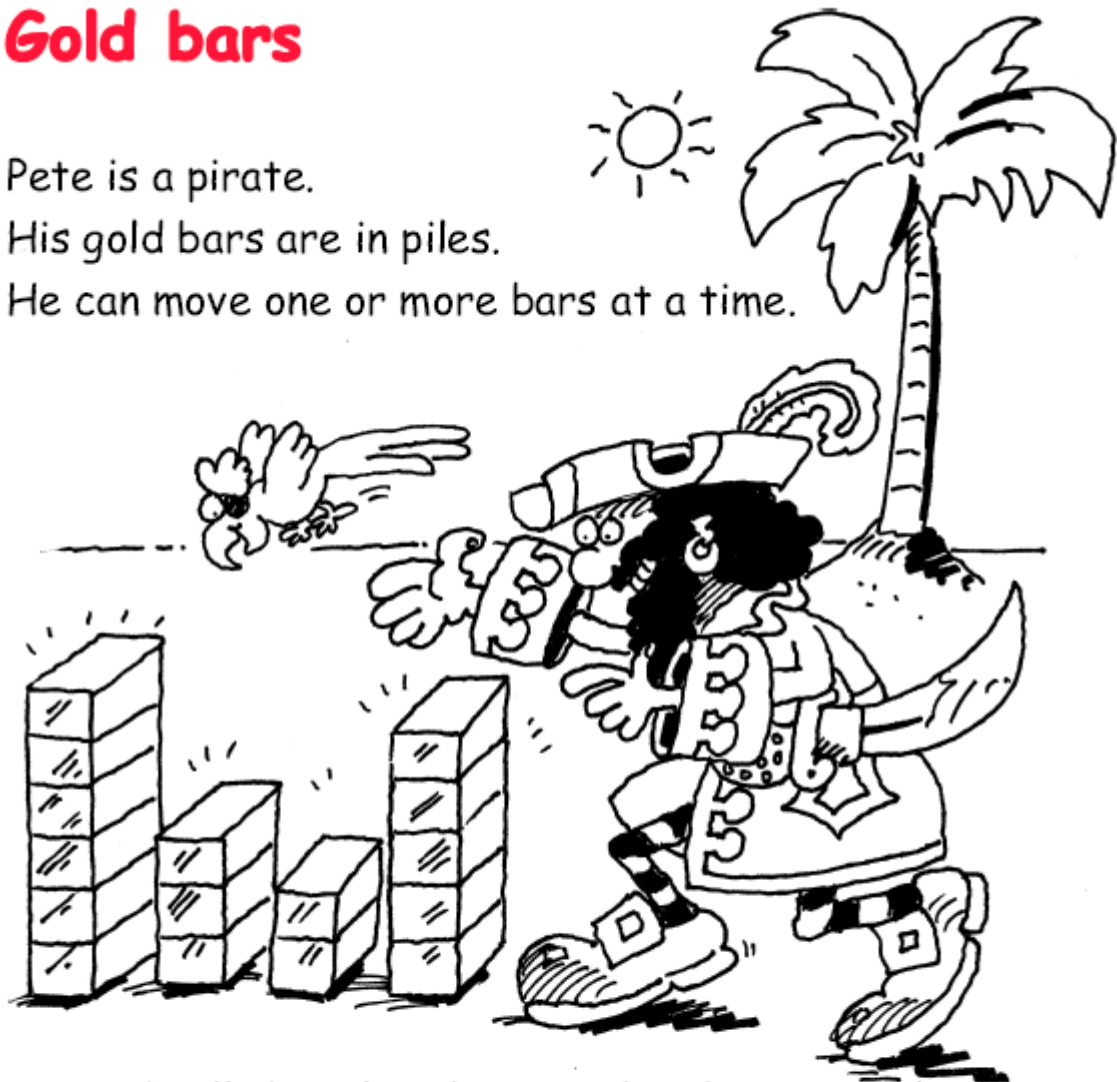
Complete the table.

Number of tables	Number of children who can sit around the table
1	3
2	6
	9
4	

How would the number of children who sit around the tables change if an extra child sat at each table?

Gold bars

Pete is a pirate.
His gold bars are in piles.
He can move one or more bars at a time.



He made all the piles the same height.
He made just two moves.
How did he do it?

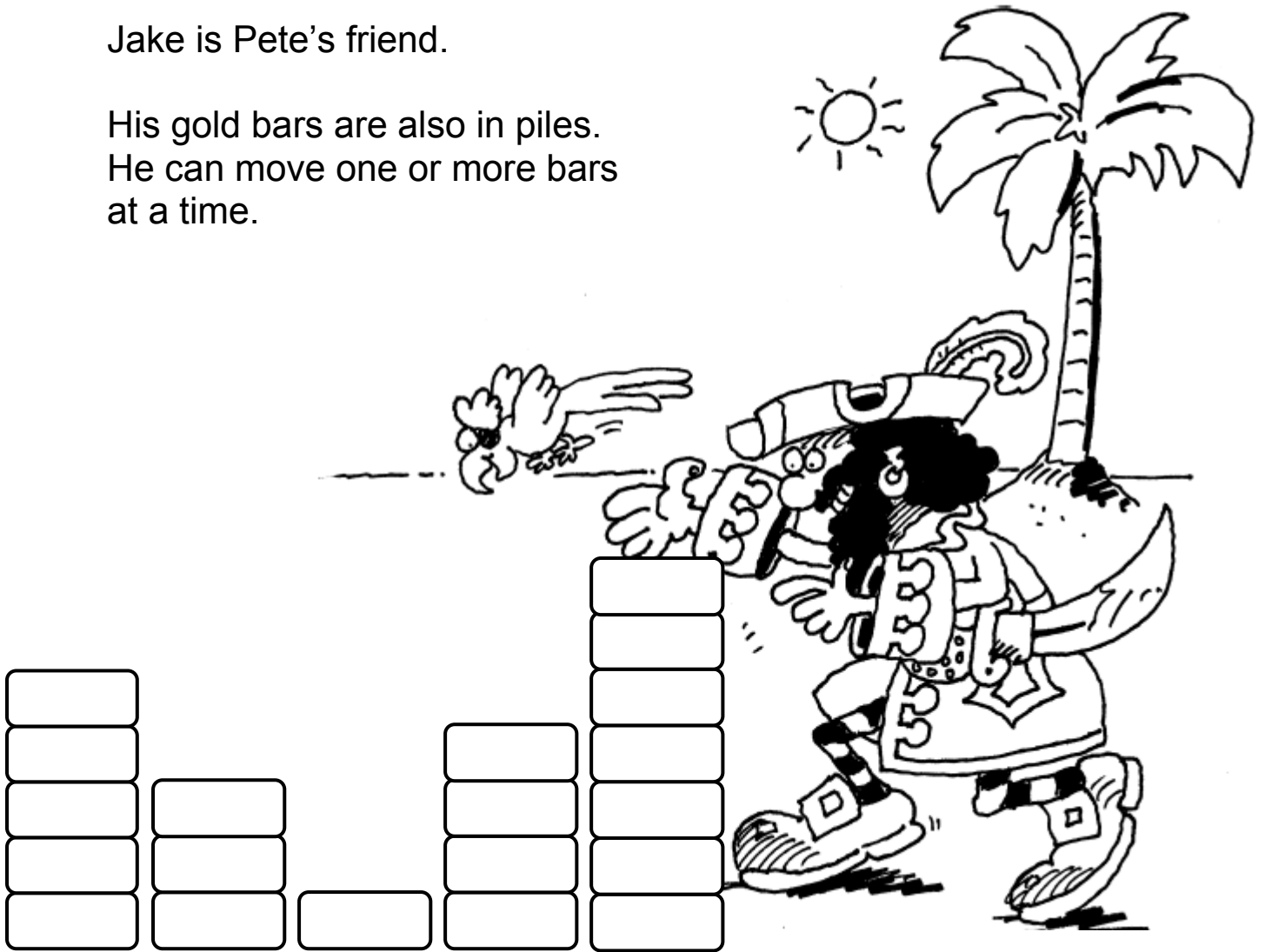


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Taken from *Mathematical Challenges for More Able Pupils in Key Stages 1 and 2* (NNS publication).

Jake is Pete's friend.

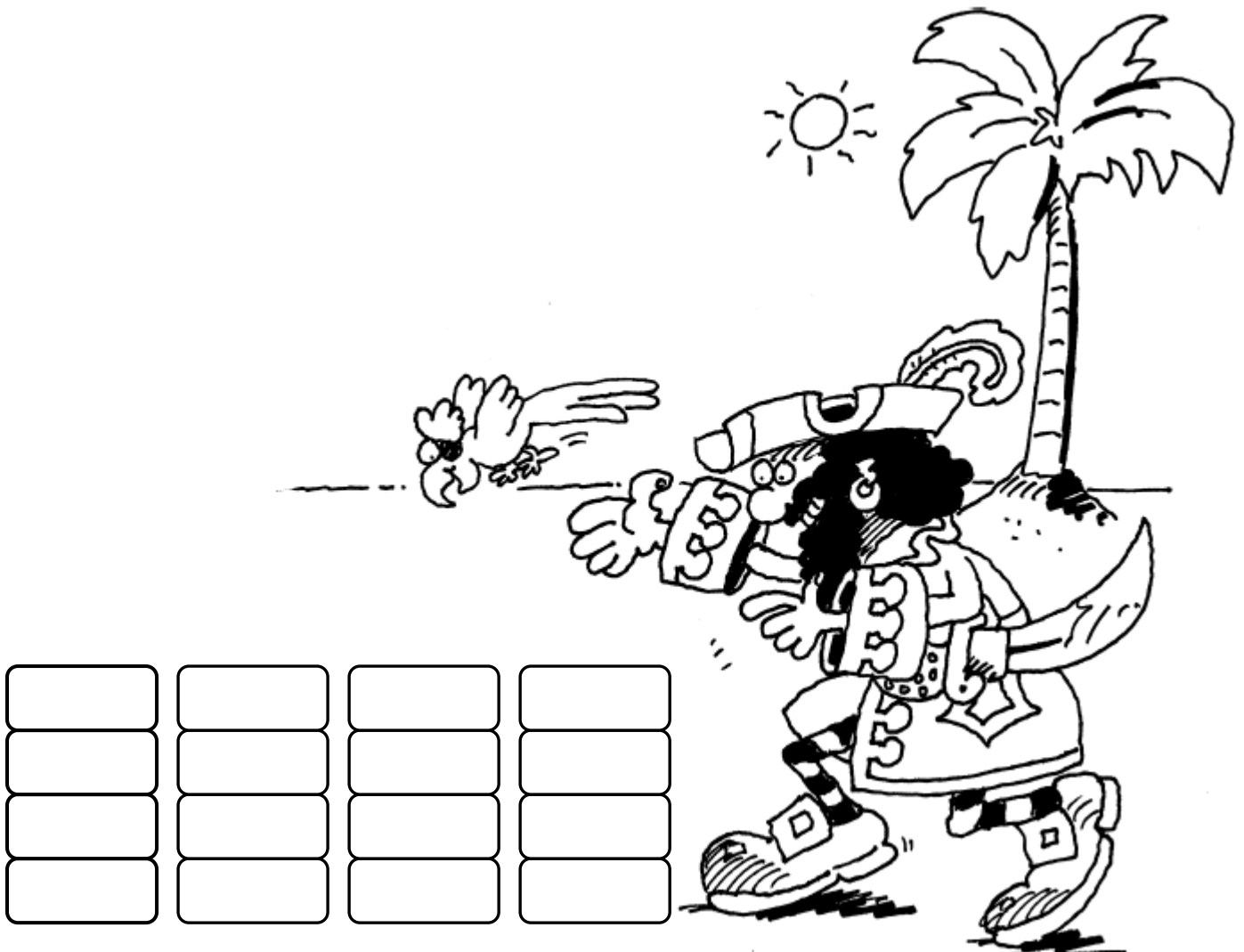
His gold bars are also in piles.
He can move one or more bars
at a time.



He made all the piles the same height.

What is the least number of moves he could have made to do this?

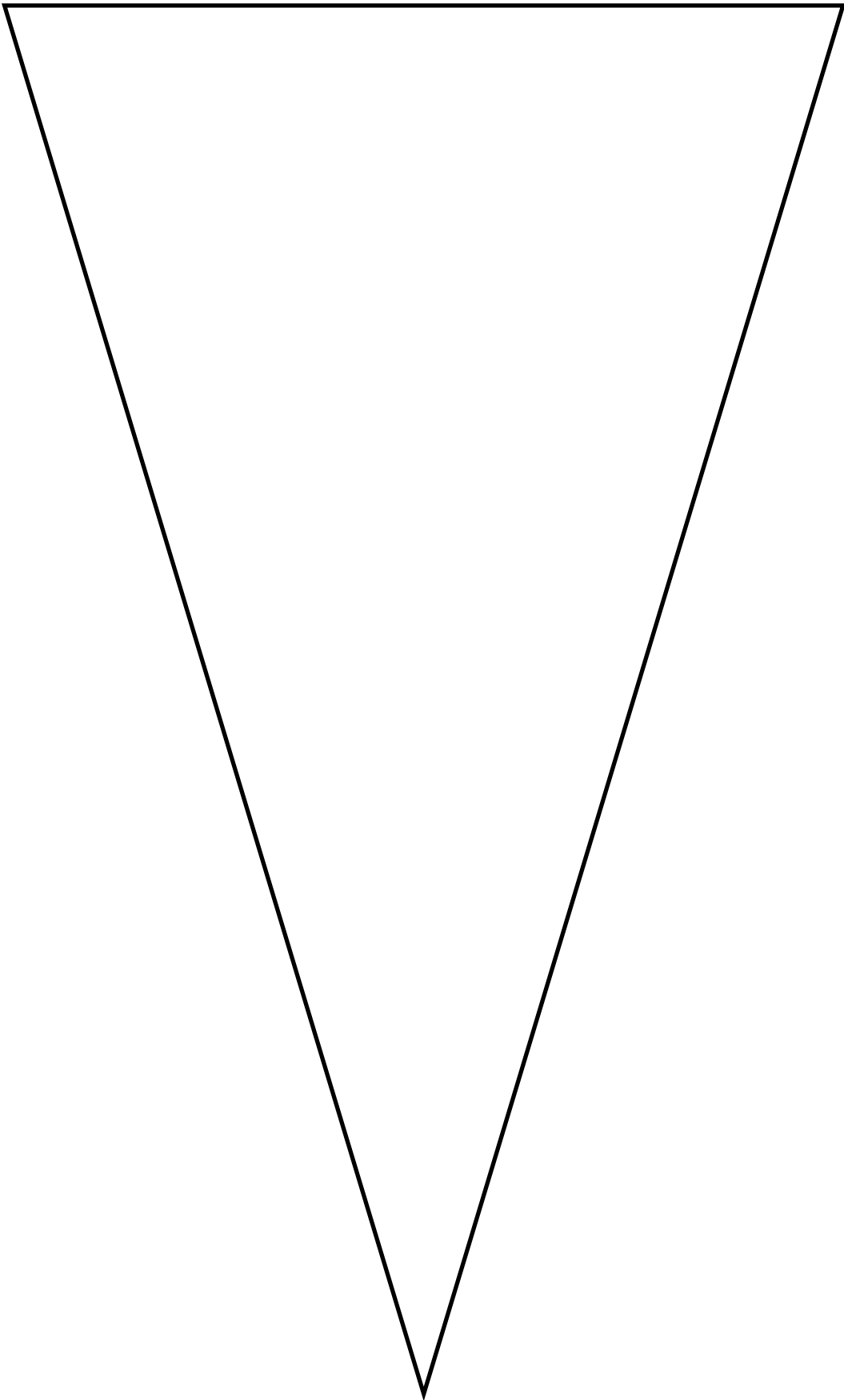
Make up a problem with another pirate with piles of gold which have to be put into piles of the same height. Make sure it works, then ask another pair of children to solve your problem.

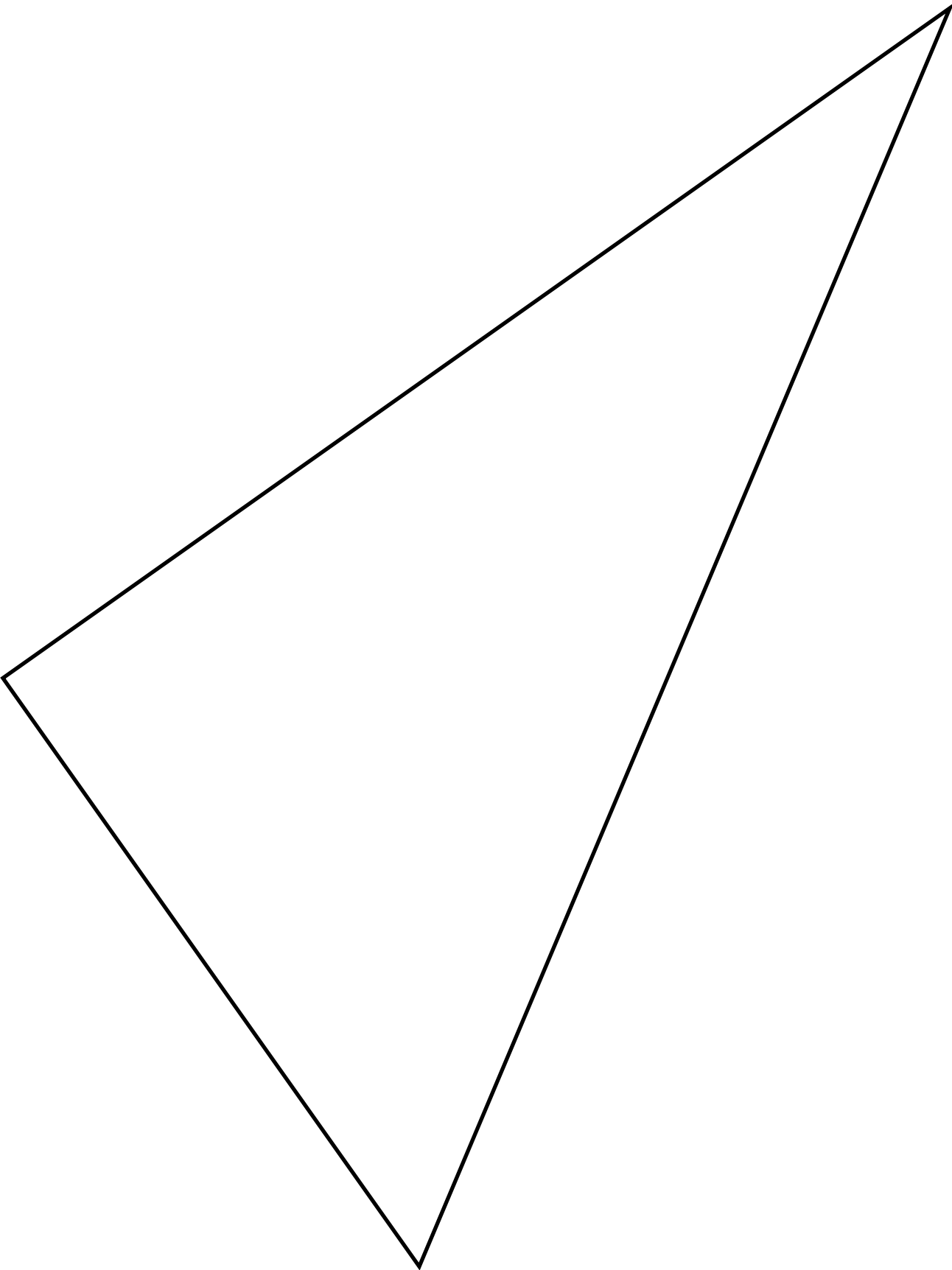


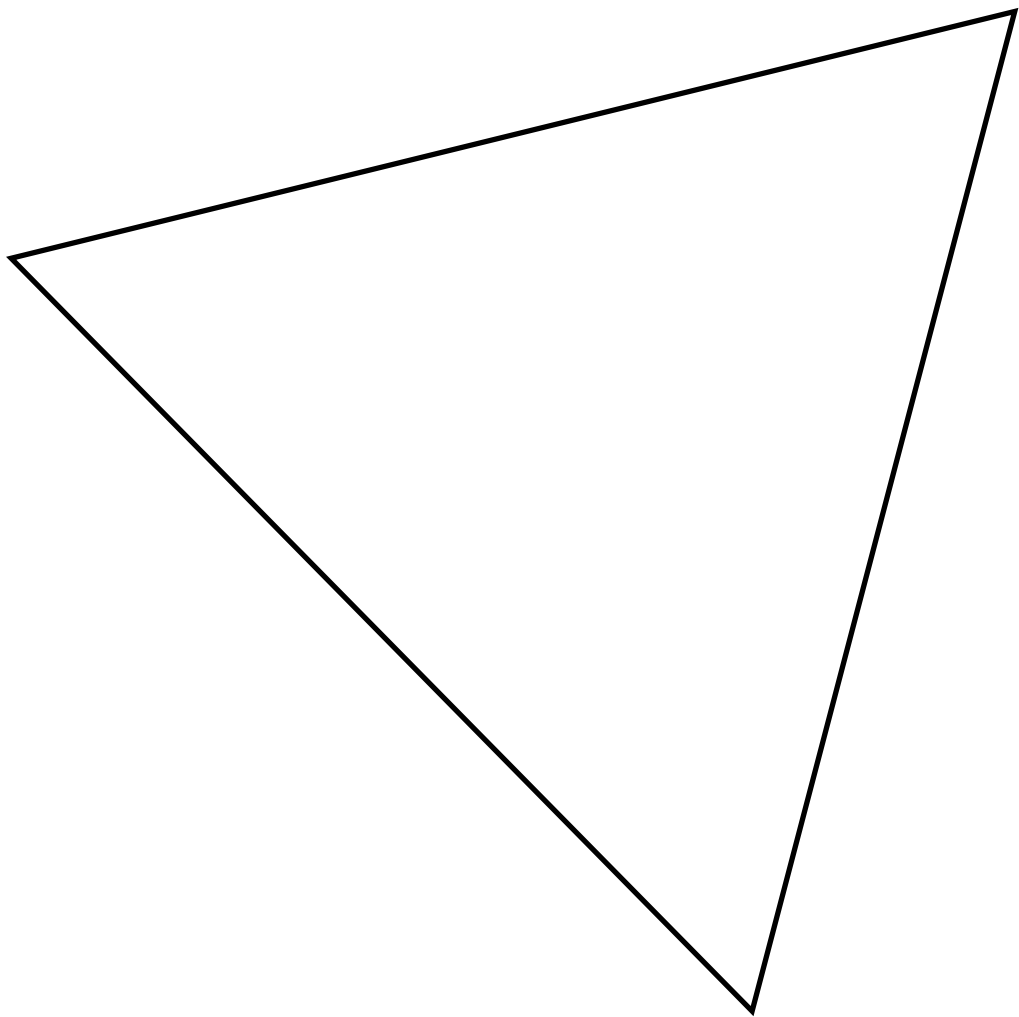
Pete is a pirate, his gold bars are in piles of four.

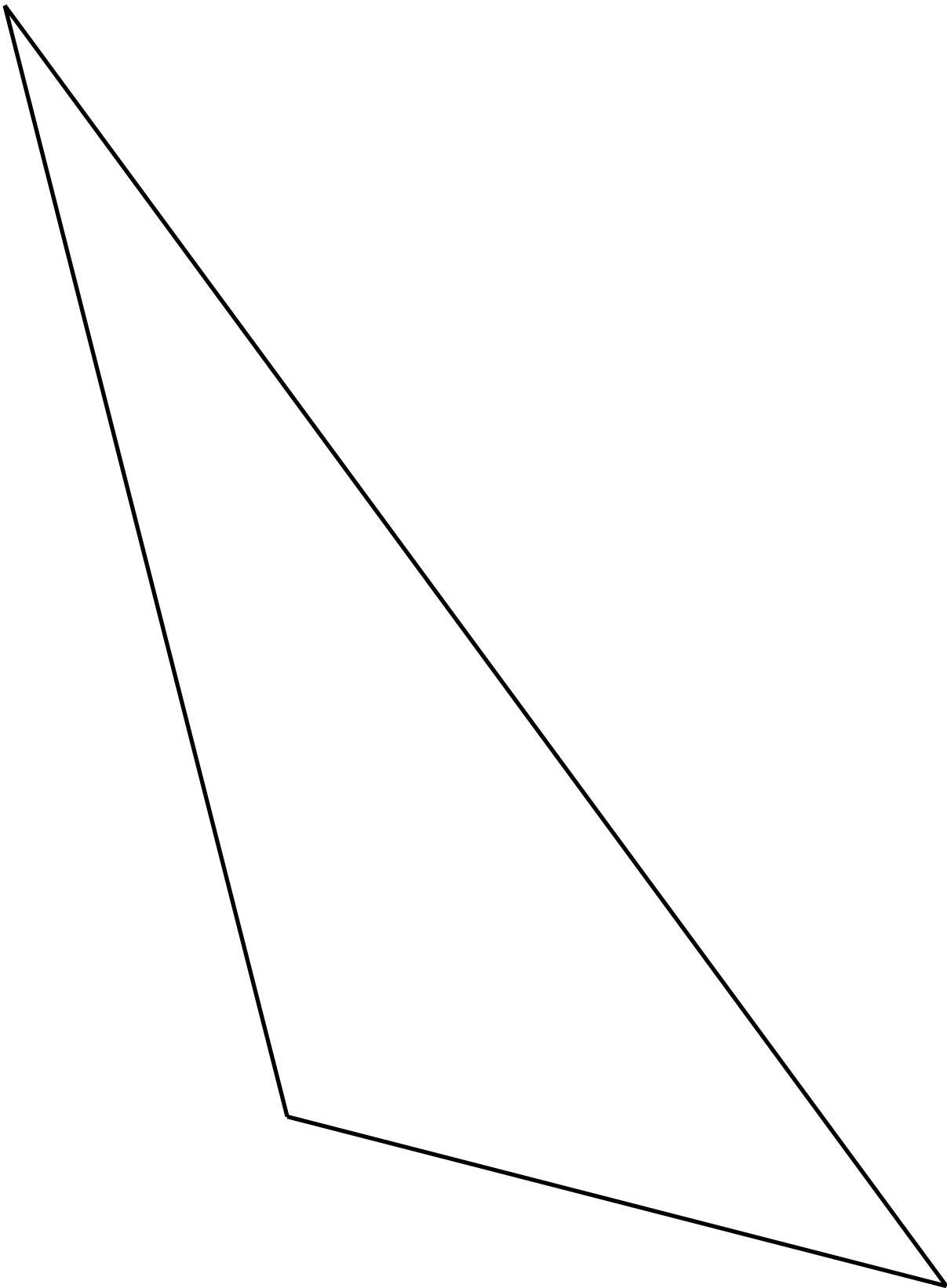
Can you make four piles with a different number in each?
Every pile must have at least one bar. No pile can be
higher than six bars. All the bars must be used.

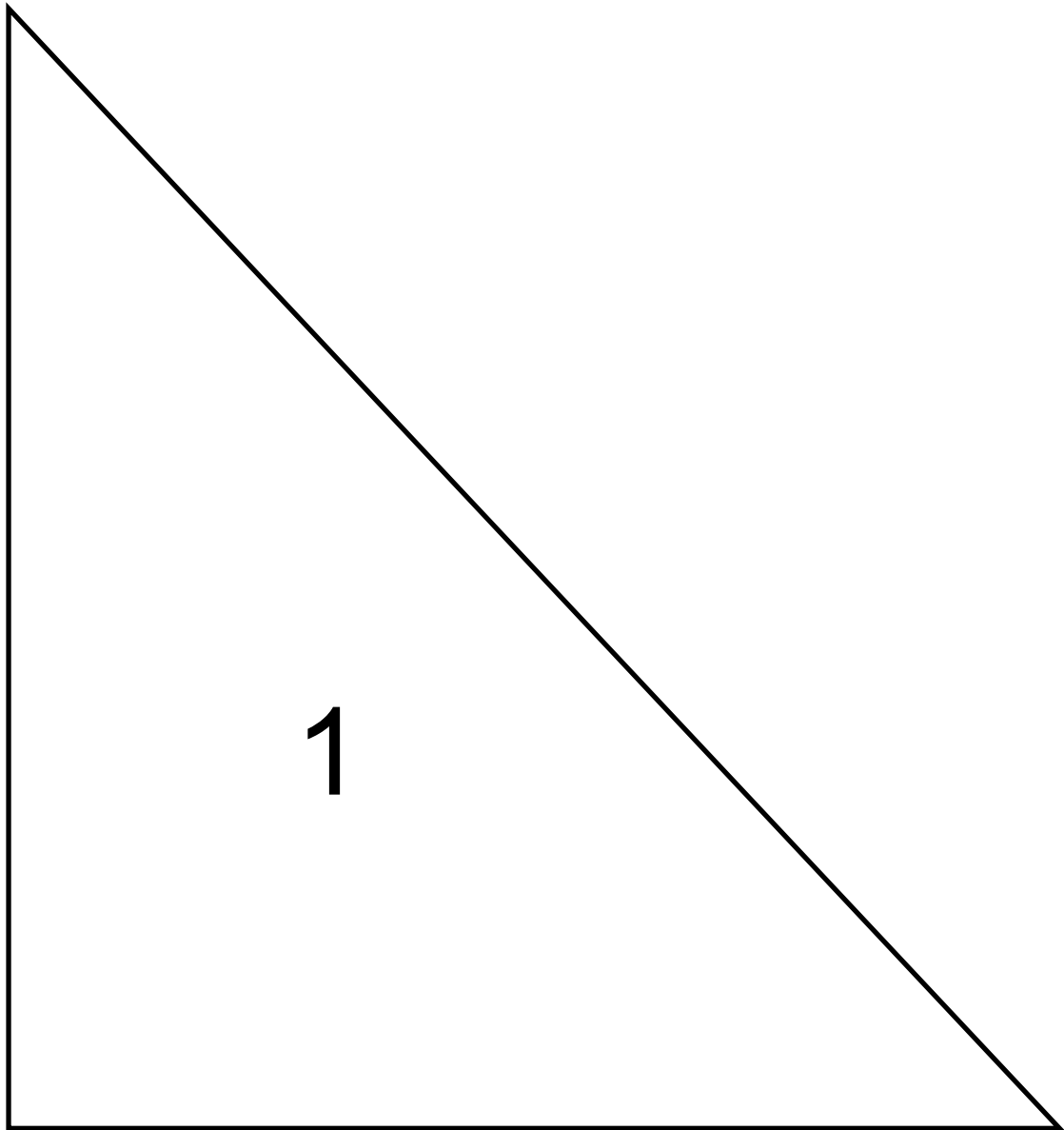
How many different ways can you find?



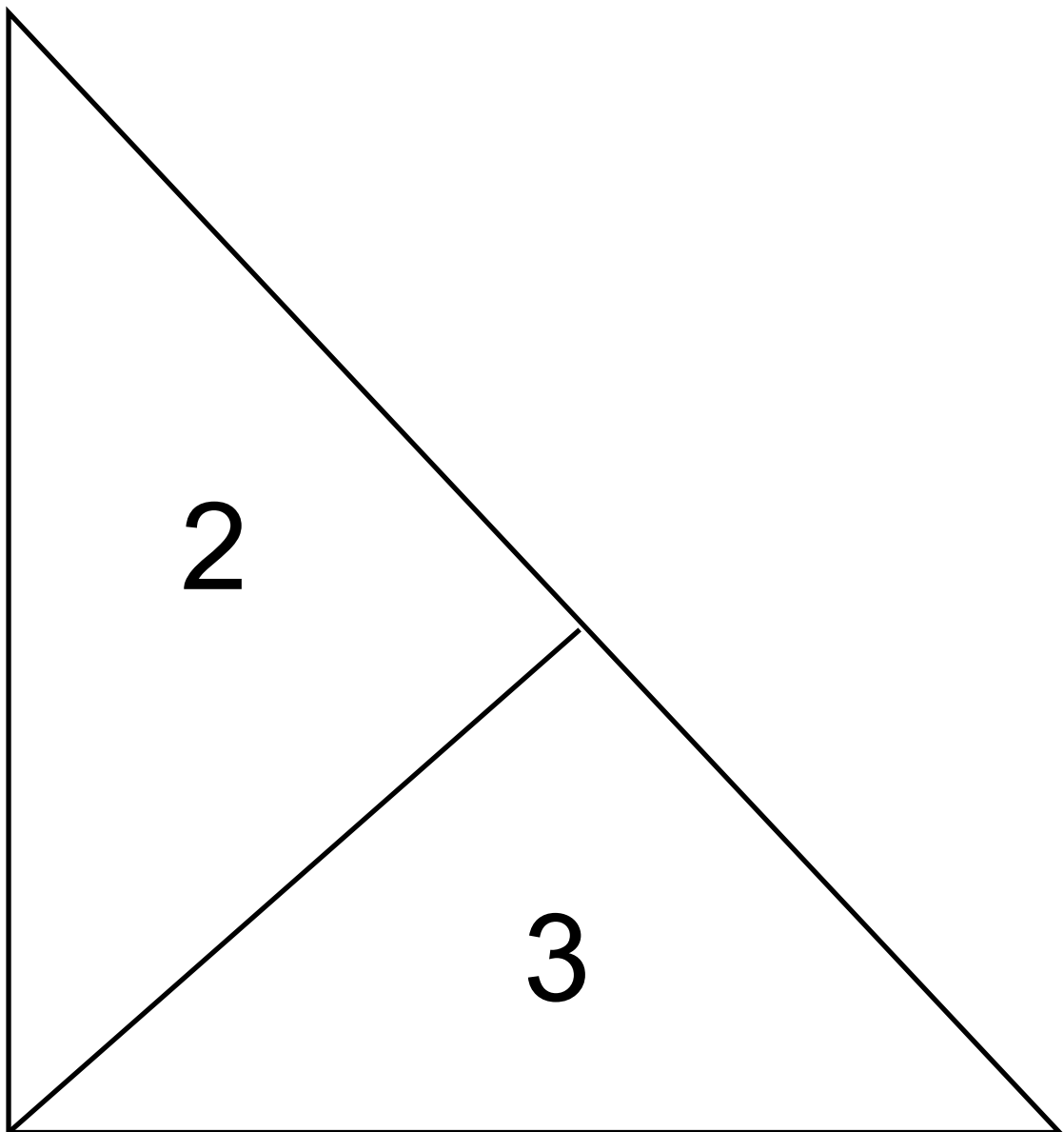




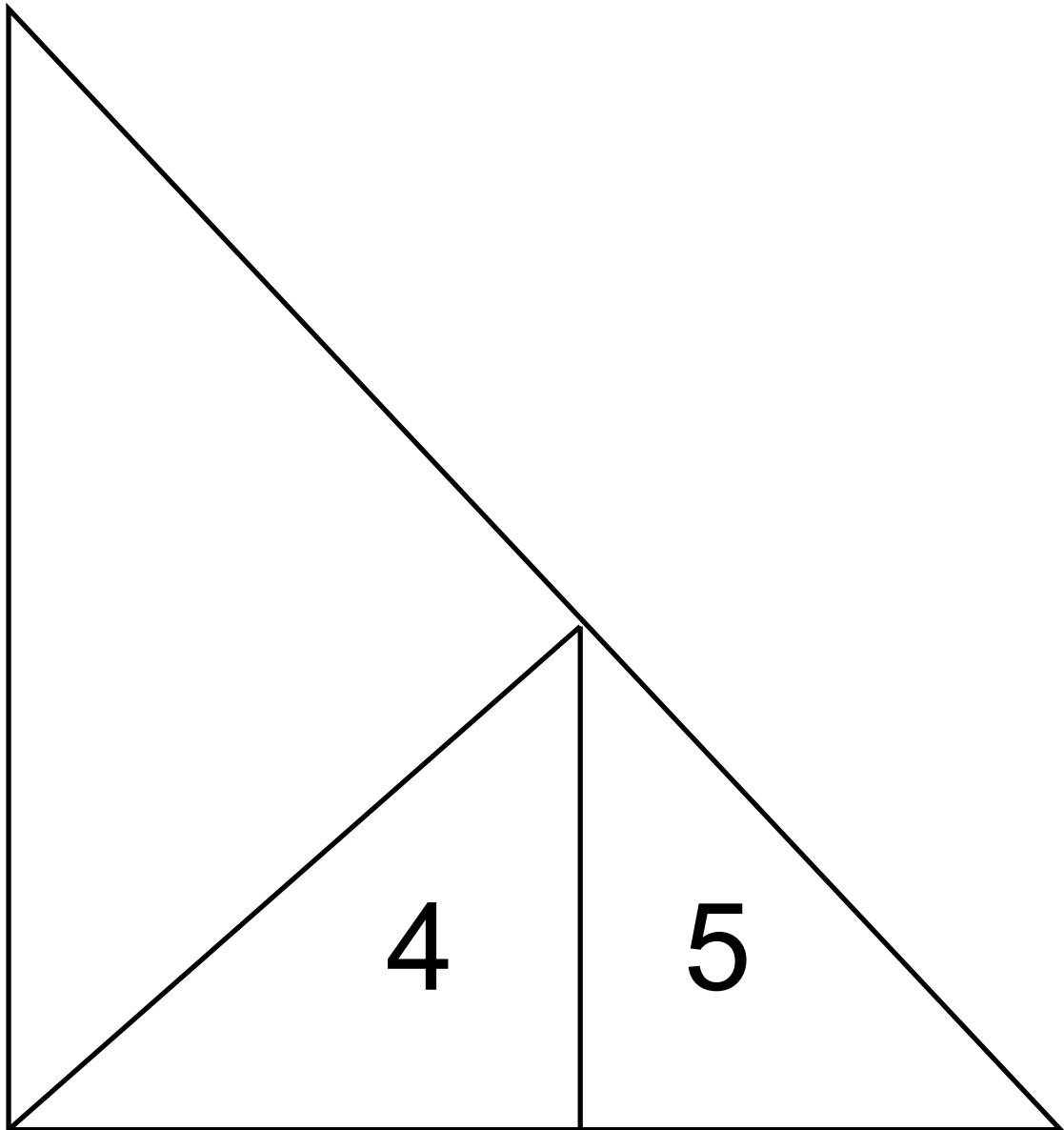




Triangles 2 and 3. Cut these out to lay on Triangle 1.

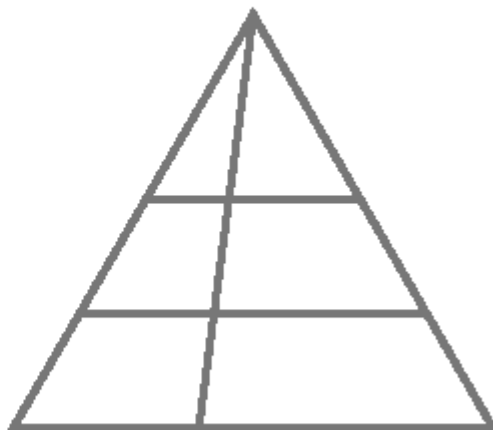


Cut triangles out to lay on Triangle 3.

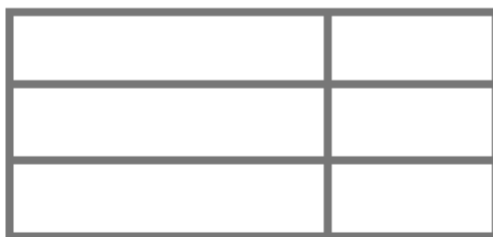


Spot the shapes 1

1. How many triangles can you count?



2. How many rectangles can you count?



3. Draw your own diagram to count triangles.
How many can a friend find?
Can you find more?