

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

Five daily lessons

Primary
National Strategy

Year 3
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 3

- Recognise two-digit and three-digit multiples of 2, 5 or 10 and three-digit multiples of 50 and 100.
- Solve mathematical problems or puzzles, recognise simple patterns and relationships, generalise and predict. Suggest extensions by asking 'What if ...?'
- **Explain methods and reasoning** orally and, where appropriate, in writing.

Page 7

Page 63

Page 65

Link Objectives

Year 2

- Begin to recognise two-digit multiples of 2, 5 or 10.
- 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.

Year 4

- Recognise multiples 2, 3, 4, 5 and 10 up to the tenth multiple.
- Solve mathematical problems or puzzles, recognise and explain patterns and relationships, generalise and predict. Suggest extensions by asking 'What if ...?'.
- Explain methods and reasoning about numbers orally and in writing.

Resources needed to teach this unit:

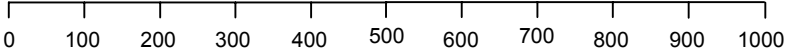
- Activity sheet 8.1
- OHT 8.1 adapted from *Mathematical Challenges for More Able Pupils in Key Stages 1 and 2* (NNS Publication)
- OHT 8.2
- OHT 8.3
- OHT 8.4
- 2p coins, 5p coins
- Digit cards
- Whiteboards

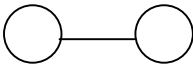
Also see the table of Problem Solving Strategies.

(Key objectives in bold)

Planning sheet	Day One	Unit 8 <i>Counting, properties of numbers and number sequences Reasoning about numbers</i>	Term: <i>Summer</i>	Year Group: 3
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities/Focus Questions
<p>Know by heart multiplication facts for the 2, 5 and 10 times tables.</p> <p>Derive quickly division facts corresponding to the 2, 5 and 10 times tables.</p> <p>VOCABULARY multiplied by multiplication divided by division</p> <p>RESOURCES Whiteboards</p>	<ul style="list-style-type: none"> Say that you are thinking of a number, and have multiplied it by 6 and got the answer 30. <p>Q What's my number?</p> <ul style="list-style-type: none"> Write the numbers 5, 6 and 30 on the board. Ask the children to write on their whiteboards two multiplication and two division facts using these three numbers, i.e. $5 \times 6 = 30$ $6 \times 5 = 30$ $30 \div 6 = 5$ $30 \div 5 = 6$ Think of other single-digit numbers and repeat the activity. 	<p>Recognise 2 and 3 digit multiples of 2, 5 and 10.</p> <p>VOCABULARY multiples totals</p> <p>RESOURCES 2p coins 5p coins Activity sheet 8.1 (half for each child)</p>	<ul style="list-style-type: none"> Show the children a handful of 2p coins. <p>Q How much money might I have in my hand?</p> <ul style="list-style-type: none"> Record the children's suggestions on the board, count out the money to find the total. Show smaller and larger handfuls. Record all the children's contributions on the board (recording all amounts in pence) but do not count the amounts. <p>Q How can we tell if all of these totals are possible?</p> <p>Agree that the amounts of money must all be multiples of 2 and these end in 0, 2, 4, 6, 8, and that they are even. Demonstrate by counting out a handful of 2p coins</p> <ul style="list-style-type: none"> Say that you have no fewer than 10 and no more than 20 2p coins in your hand. Ask the children to write down all the possible totals that you could have. <p>Q Where did you start? Where did you finish?</p> <ul style="list-style-type: none"> Repeat the above demonstration with 5p coins, agreeing that all multiples of 5 end in 5 or zero. Record all the possibilities (remembering that there are no fewer than 10 and no more than 20 coins). <p>Q Will you have the same number of totals as you did when you listed the amounts made by 2p coins?</p> <ul style="list-style-type: none"> Repeat the statements made about recognising multiples of 2 and recognising multiples of 5. Give out Activity sheet 8.1, discuss the table and ask the children to work in pairs to place ticks in the correct boxes. 	<ul style="list-style-type: none"> Go through Activity sheet 8.1. <p>Agree which boxes have ticks.</p> <p>Highlight the numbers that are multiples of both 5 and 2.</p> <p>Q What do you notice about these numbers?</p> <p>Agree that they are multiples of 10 and end in zero.</p> <ul style="list-style-type: none"> Pick up a mixture of 2p and 5p coins and find the total without showing the children the coins. <p>Q I have 21p in my hand, made from 5p and 2p coins. How many of each coin might I have? How could you work it out?</p> <ul style="list-style-type: none"> Agree that writing multiples of 5 and multiples of 2 would be helpful. Do this quickly on the board and look for a pair with a total of 21. <p>By the end of the lesson, children should be able to:</p> <ul style="list-style-type: none"> recognise that multiples of 10 end in 0; 5 end in 0 or 5; 2 end in 0, 2, 4, 6, 8; ring the numbers which are multiples of 5; 15, 35, 52, 55, 59. <p>(Refer to supplement of examples, section 5, page 7.)</p>

Planning sheet	Day Two	Unit 8 <i>Counting, properties of numbers and number sequences Reasoning about numbers</i>		Term: Summer	Year Group: 3
Oral and Mental		Main Teaching			Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities		Teaching Activities/Focus Questions
Recognise two-digit (and three-digit) multiples of 2, 5 or 10. Know by heart multiplication facts for the 2, 5 and 10 times table. 					

Planning sheet	Day Three	Unit 8 <i>Counting, properties of numbers and number sequences Reasoning about numbers</i>		Term: <i>Summer</i>	Year Group: 3
Oral and Mental		Main Teaching			Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities		Teaching Activities/Focus Questions
<p>Recognise two-digit and three-digit multiples of 2, 5 or 10.</p> <p>VOCABULARY digit multiple</p> <p>RESOURCES Digit cards</p>	<ul style="list-style-type: none"> Remind the children of the statements about recognising multiples of 2 and 5. <div>Q What about multiples of 10?</div> <p>Agree that multiples of 10 end in 0.</p> <ul style="list-style-type: none"> Ask the children to take 2, 5 and 10 (1 and 0) from a pack of digit cards. Write a three-digit number on the board, ask the children to hold up digit card(s) to show if it is a multiple of 2, 5 or 10. <div>Q What three-digit number can I write that will be a multiple of 2, 5 and 10?</div> <p>Collect answers</p> <ul style="list-style-type: none"> Say but don't write a three-digit number. The children are to show relevant card(s). Say that you are thinking of a multiple of 10 <div>Q Will it be a multiple of 2 or 5?</div> <p>Agree that all multiples of 10 are also multiples of 2 and 5.</p>	<p>Recognise two and three-digit multiples of 50 and 100.</p> <p>VOCABULARY multiple total</p>	<ul style="list-style-type: none"> Starting at 0, count in multiples of 100 to 1500. Record the numbers. Ask the children to make a statement about what they know about multiples of 100 and give examples to match. Agree that multiples of 100 end in at least two zeros. Draw a multiple of a hundred number line on the board.  <ul style="list-style-type: none"> Mark the half-way points between each multiple of 100 and ask the children how you write the numbers that go here. Count in 50s to 1500. Reinforce the point that counting in steps of 50 from zero is the same as saying the multiples of 50. <div>Q What statement can you make about multiples of 50?</div> <ul style="list-style-type: none"> Agree that multiples of 50 end in 50 or 00. Ask the children to count back from 300 to zero in multiples of 100, 50 and 10. Record the numbers. 100 300 200 100 0 50 300 250 200 150 100 50 0 10 300 290 280 270 260 250 240 → 0 Ask the children for the numbers that appear in all three counts. Ring these numbers. <div>Q Would we say 200 if we were counting in multiples of 2 or 5? How do you know?</div> <p>Ensure that children recognise that 200 is a multiple of 10, and therefore a multiple of 2 and 5.</p> <div>Q Could we make £2.50 using only 50p coins? How do you know? What about 10p coins? 2p coins? 5p coins? 20p coins?</div> <p>Collect and discuss children's answers.</p> <ul style="list-style-type: none"> Ask the children to discuss how they could use 10p, 50p and/or £1 coins to make £1.70 and record as many ways as possible in their books. <div>Q How did you record 17 10p coins? Could you use the × sign?</div> <ul style="list-style-type: none"> Repeat with the amounts £2.20, £5, £1.25 and 450p. 		<ul style="list-style-type: none"> Write on the board: 100 200 300 <p>Tell the children that all these numbers appeared in the count of multiples of 100, 50, 10, 5 and 2.</p> <div>Q What do we know about 2, 5, 10 and 50 that would explain why they all have multiples of 100 in their count?</div> <p>Agree that 100 is a multiple of 2, 5, 10 and 50 and so multiples of 100 will also be multiples of 2, 5, 10 and 50.</p> <div>Q Which numbers would we have circled as being a multiple of 2, 5, 10, 50 and 100 if we had counted on from 1500 to 2500?</div> <div>By the end of the lesson, children should be able to:</div> <ul style="list-style-type: none"> recognise that multiples of: 100 end in 00; 50 end in 00 or 50; count in 50s to 1000 then back to zero; write three different multiples of 50. <p>(Refer to supplement of examples, section 5, page 7.)</p>

Planning sheet	Day Four	Unit 8 <i>Counting, properties of numbers and number sequences Reasoning about numbers</i>		Term: <i>Summer</i>	Year Group: 3
Oral and Mental		Main Teaching			Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities/Focus Questions	
<p>Use the relationship between addition and subtraction.</p> <p>VOCABULARY how many more? multiple of 10</p> <p>RESOURCES OHT 8.2 Whiteboards</p>	<ul style="list-style-type: none"> Show the first number line on OHT 8.2. <p>Q What's missing?</p> <p>Agree that the numbers after the two steps are missing.</p> <p>Q How will you calculate the missing numbers?</p> <p>Agree the missing numbers from the first line are 50 and 70.</p> <p>Q What calculation might this be showing?</p> <p>Ask the children to respond using their whiteboards.</p> <p>Agree that it could be $41 + 29 = 70$ or $70 - 29 = 41$</p> <ul style="list-style-type: none"> Repeat with the other number lines asking similar questions about the missing numbers. 	<p>Solve mathematical problems or puzzles, recognise simple patterns and relationships, generalise and predict.</p> <p>Suggest extensions by asking 'What if ...?'.</p> <p>VOCABULARY difference joined horizontal vertical</p> <p>RESOURCES OHT 8.3</p>	<ul style="list-style-type: none"> Write the numbers 1–10 on the board and draw:  <p>Say that you want to put a number in each circle but that you want the difference between the numbers to be even. Collect suggestions.</p> <p>Q What do you notice about the numbers that I should use?</p> <p>Agree that they must both be even or both be odd.</p> <p>Q What if I wanted the difference to be odd?</p> <p>Collect suggestions and agree that one number must be even and one must be odd.</p> <ul style="list-style-type: none"> Show OHT 8.3 but cover up the instructions. <p>Q What do you see?</p> <p>Establish that there are nine circles that are joined horizontally and vertically.</p> <p>Say that an important skill of problem solving is taking time to look at all the information presented. Reveal the instructions.</p> <p>Q What information do we still need?</p> <p>Agree that you need the set of numbers to use. Write in 2 to 10 (so that the OHT reads 'Put the numbers 2 to 10 in the circles...').</p> <ul style="list-style-type: none"> Illustrate that a random approach to this type of problem is unhelpful. Show this by randomly putting numbers in circles. <p>Q What do we know about the numbers that are joined?</p> <ul style="list-style-type: none"> Agree that one must be odd and one must be even. Point to the top left-hand circle. Agree that all odd numbers or all even numbers will have to be placed in the corners. <p>Q If this is an even number, what can you tell me about the other numbers?</p> <ul style="list-style-type: none"> Emphasise that taking time to consider the information and our knowledge of numbers will reduce the time needed to solve the problem. Illustrate how to jot down possible solutions without wasting time drawing the elaborate grid, and the importance of keeping these jottings for reference, e.g. $2 - 3 - 8$ $9 - 10 - 7$ $4 - 5 - 6$ Emphasise that there is more than one answer but you can only place even numbers in the corners. Complete the task together finding one solution. Change the numbers on the OHT to 1 to 9 and ask the children to complete the problem. 	<p>Q What difference did it make when the numbers were changed to 1 to 9?</p> <p>Agree that there were more odd numbers (five) than even numbers (four), so these odd numbers had to be placed in the corners and the middle.</p> <p>Q Did you get the same or a different arrangement to others at your table? Why?</p> <p>Draw out that as long as the odd numbers were in the corners and centre, the solution would be correct.</p> <p>HOMEWORK – Ask the children to spend 10 minutes at home finding a different solution to the problem.</p> <p>By the end of the lesson, children should be able to:</p> <ul style="list-style-type: none"> solve puzzles such as: put the numbers 1–9 in the circles so that the difference between each pair of joined numbers is odd; use a systematic approach to solve a problem and a way of recording it. <p>(Refer to the table of Problem Solving Strategies and supplement of examples, section 6, page 63.)</p>	

Planning sheet	Day Five	Unit 8 <i>Counting, properties of numbers and number sequences Reasoning about numbers</i>		Term: Summer	Year Group: 3																																																
Oral and Mental		Main Teaching			Plenary																																																
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<p>Use known number facts and place value to add and subtract mentally.</p>	<ul style="list-style-type: none"> Write on the board: $32 + 41 = 73$ Remind the children that adding the tens will gives us 70 and adding the ones will give us 3. Write on the board: $27 + 3\square = 59$ <div>Q What is the missing digit?</div> <div>Q How did you work it out?</div> Write on the board: $\square 5 + 42 = 67$ and $\square 8 - 22 = 50$ Ask similar questions. Write on the board: $1\square + \square 2 = 35$ and $3\square - \square 2 = 16$ <div>Q What do we know about the missing digits?</div> Repeat with similar calculations not crossing the tens boundary. 	<p>Solve mathematical problems or puzzles, recognise simple patterns and relationships, generalise and predict. Suggest extensions by asking 'What if ...?'.</p>	<ul style="list-style-type: none"> Remind the children that when they were given yesterday's puzzle they had to look at all the information and consider what they knew about the numbers involved. Discuss how the children found a different solution to the homework puzzle. Show OHT 8.4. <div>Q What do we need to work out before we start the puzzle?</div> <p>Agree that we need to work out combinations of three numbers from the range 1–6 that total 9.</p> Demonstrate a systematic approach on the board. <table border="1"> <tr> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td>1</td> <td>2</td> <td></td> <td></td> <td></td> <td>6</td> </tr> <tr> <td>1</td> <td></td> <td>3</td> <td></td> <td>5</td> <td></td> </tr> <tr> <td></td> <td>2</td> <td>3</td> <td>4</td> <td></td> <td></td> </tr> </table> <div>Q What do you notice about the use of 4, 5, 6 compared to 1, 2, 3?</div> <p>Agree that 1, 2 and 3 are used twice.</p> Look again at OHT 8.4. <div>Q I am going to place 1, 2 and 3 in the corners. Why?</div> <p>Agree that this way they will be used twice.</p> <p>Look at the combinations of numbers totalling 9 to quickly establish which number should be placed between 1 and 2, 2 and 3, 1 and 3.</p> <div>Q How can I show a different arrangement and still solve the problem?</div> <p>Agree that the numbers could be rotated.</p> Ask the children to find the different solutions to the puzzle with each side of the triangle totalling 10. <div>Q How might you start?</div> <p>Agree that finding three numbers with a total of 10 might be helpful.</p> 		1	2	3	4	5	6	1	2				6	1		3		5			2	3	4			<ul style="list-style-type: none"> Quickly run through the problems to allow children to mark their work. <table border="1"> <tr> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td>1</td> <td></td> <td>3</td> <td></td> <td></td> <td>6</td> </tr> <tr> <td>1</td> <td></td> <td></td> <td>4</td> <td>5</td> <td></td> </tr> <tr> <td></td> <td>2</td> <td>3</td> <td></td> <td>5</td> <td></td> </tr> </table> <p>Agree that 1, 3 and 5 should be in the corners. 6 should be between 1 and 3, 4 between 1 and 5, 2 between 3 and 5.</p> Show OHT 8.4 again and ask the children how confident they would feel in tackling this problem if the sides had totals of 11 or 12. (Thumb up is very confident ranging to thumb down, not very confident.) 	1	2	3	4	5	6	1		3			6	1			4	5			2	3		5	
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VOCABULARY digits		VOCABULARY rotate total RESOURCES OHT 8.4			<p>By the end of the lesson, children should be able to:</p> <ul style="list-style-type: none"> solve puzzles such as: put the numbers 1–6 in the circles so that each side of the triangle totals 9. Now try 10, 11 or 12. <p>(Refer to supplement of examples, section 5, page 63.)</p>																																																

Spaceship



Some pentapods and bipods flew from planet Zeno.

Pentapods have five legs.
Bipods have two legs.

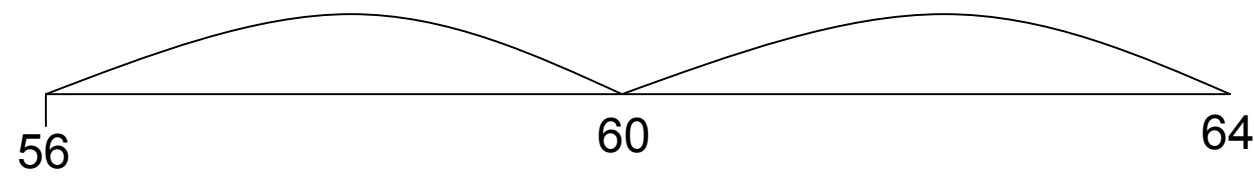
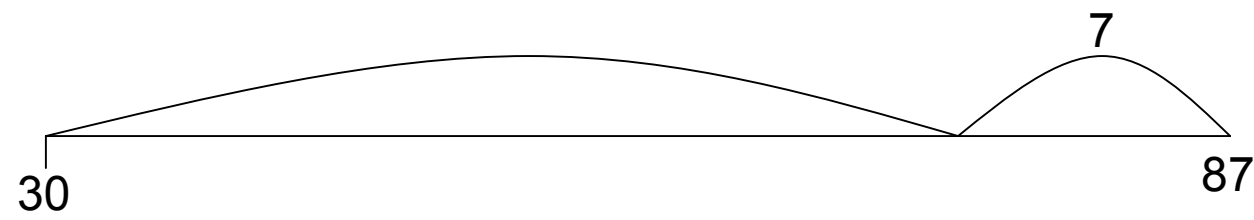
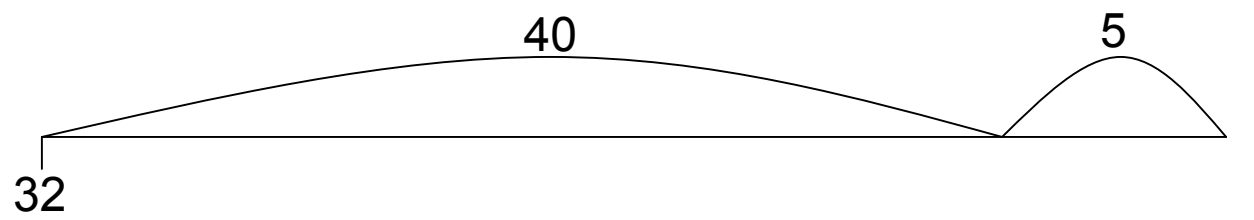
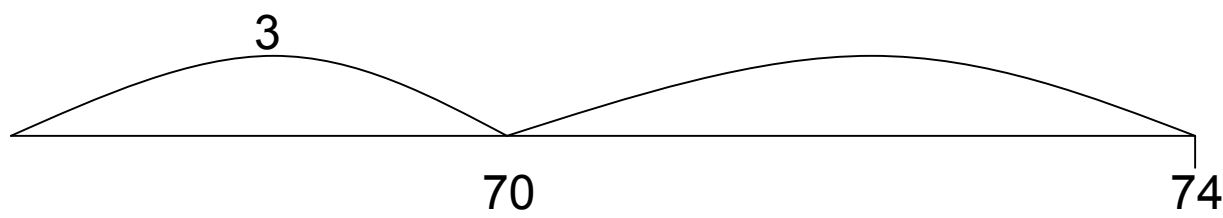
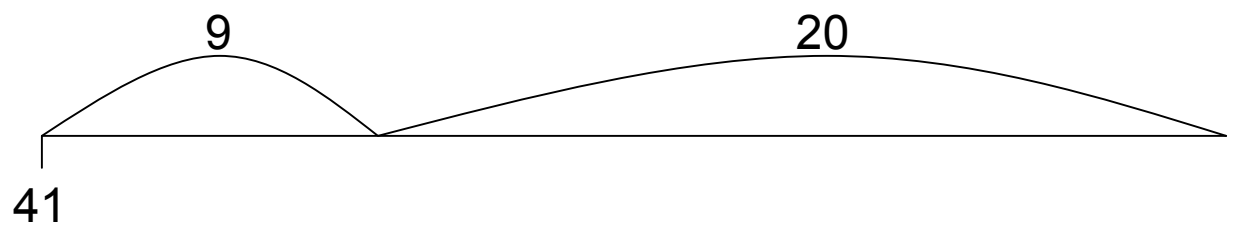
There were 17 legs altogether.

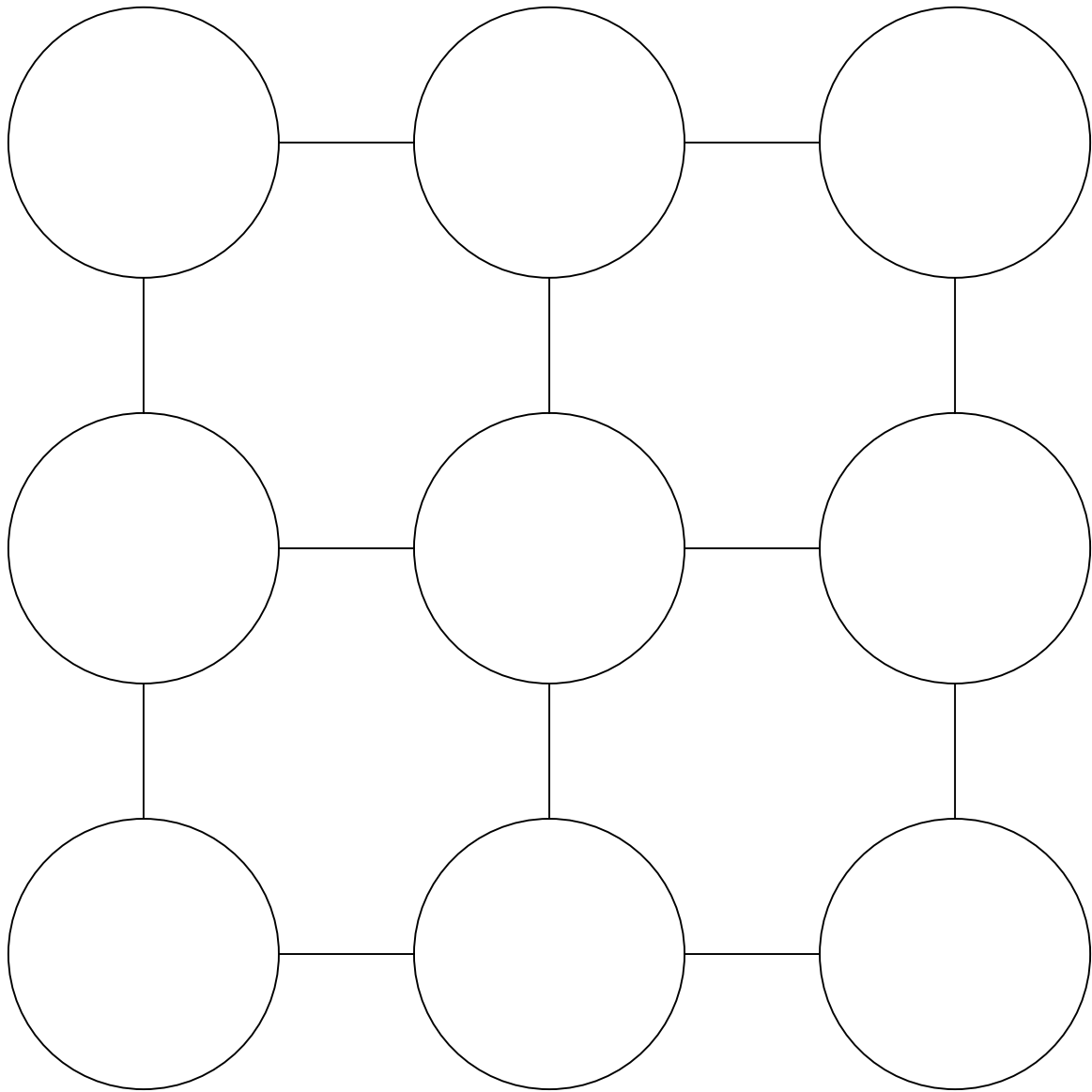
How many pentapods were there?
How many bipods?

What if there were 27 legs?
What if there were 30 legs?

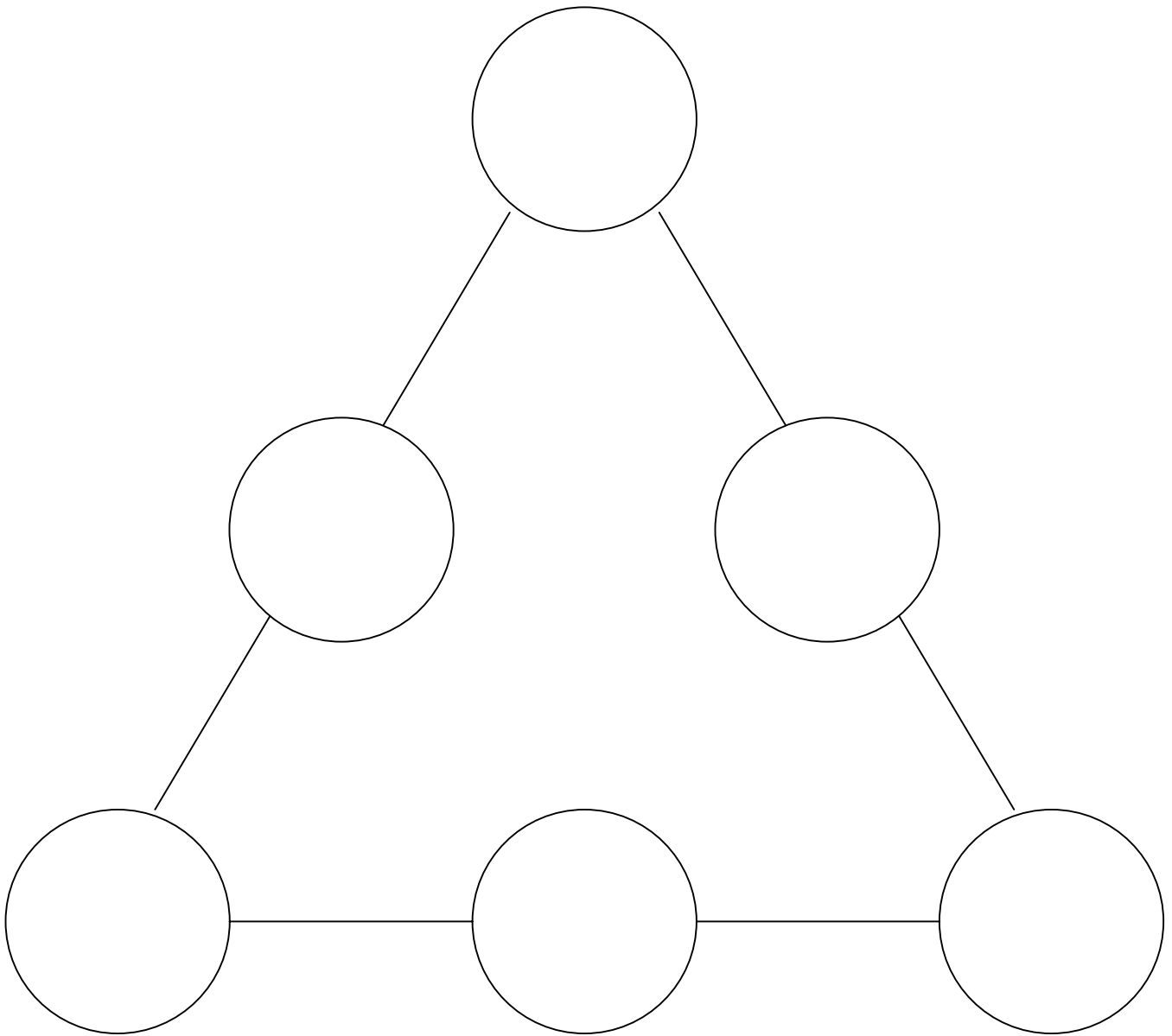


Adapted from *Mathematical Challenges for More Able Pupils in Key Stages 1 and 2* (NNS publication).





Put the numbers ____ to ____ in the circles so that the difference between each pair of joined numbers is odd.



Put the numbers 1 to 6 in the circles so that each of the sides totals 9.

Year 3 Unit 8 (Summer term)



Activity sheet 8.1

Totals	Possible to make with just 2p coins	Possible to make with just 5p coins
185p		✓
118p		
62p		
50p		
120p		
10p		
135p		
200p		
312p		
501p		
246p		
9p		
90p		
725p		
604p		

Totals	Possible to make with just 2p coins	Possible to make with just 5p coins
185p		
118p		
62p		
50p		
120p		
10p		
135p		
200p		
312p		
501p		
246p		
9p		
90p		
725p		
604p		