

Unit 11

Angles, graphs and problem solving

Five daily lessons

National
Numeracy Strategy

Year 6
Summer term

Unit Objectives Year 6

- Use a protractor to measure acute and obtuse angles to the nearest degree.
- Read and plot co-ordinates in all four quadrants.
- Solve a problem by extracting and interpreting information presented in tables, graphs and charts.

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Year 5

Link Objectives

Year 7

- Recognise positions and directions. Read and plot co-ordinates in the first quadrant.
- Understand and use angle measure in degrees. Identify estimate and order acute and obtuse angles. Use a protractor to measure and draw acute and obtuse angles to the nearest 5°.
- Solve a problem by representing and interpreting data in tables, charts, graphs and diagrams.

(Key objectives in bold)

- Use a ruler and protractor to: measure and draw lines to the nearest millimetre and angles, including reflex angles, to the nearest degree.
- Use angle measure; distinguish between and estimate the size of acute, obtuse and reflex angles.
- Use conventions and notation for 2-D co-ordinates in all four quadrants; find co-ordinates of points determined by geometric information.
- Interpret diagrams and graphs and draw simple conclusions.

This Unit Plan is designed to guide your teaching.

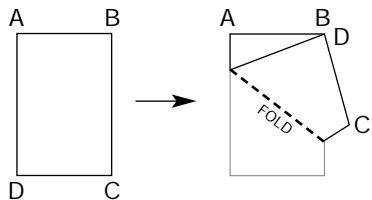
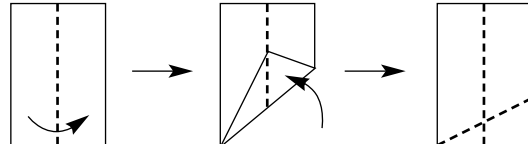
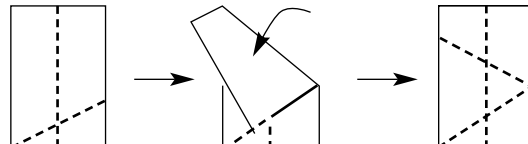
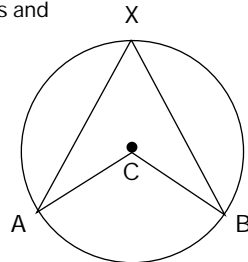
You will need to adapt it to meet the needs of your class.

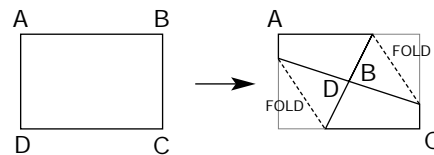
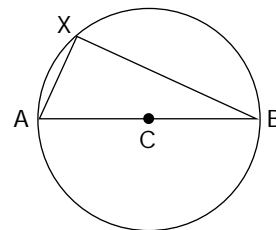
Resources needed to teach this unit:

- Resource sheet 11.1
- Activity sheet 11.1
- Activity sheet 11.2
- Activity sheet 11.3
- OHT 11.1
- OHT 11.2
- OHT 11.3
- OHT 11.4
- OHT 11.5
- OHT 11.6
- OHT 11.7
- OHT 11.8
- OHT 11.9
- OHT 11.10
- Self-assessment sheet 11.1
- Self-assessment sheet 11.2
- Squared and isometric paper
- Rectangular cards or pieces of paper
- Bag with 3-D shapes
- Square sheet of paper
- A4 paper
- Scissors
- Protractors
- Compasses
- Rulers
- Mirrors
- Calculators

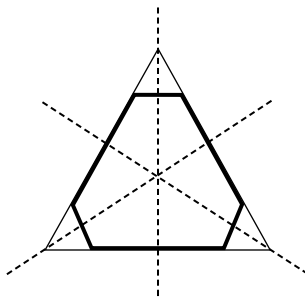
Planning sheet	Day One (page 1 of 2)	Unit 11 <i>Angles, graphs and problem solving</i>	Term: <i>Summer</i>	Year Group: 6
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities/Focus Questions
<p>Use tests of divisibility and short division to find factors of five-digit numbers.</p> <p>VOCABULARY factor divisibility prime</p>	<ul style="list-style-type: none"> Write on the board: 12 330. <div>Q What numbers are factors of 12 330?</div> <p>Establish that the children can use the tests of divisibility for 2, 3, 5 and 10. Write these factors on the board.</p> <div>Q Is 30 a factor of 12 330?</div> <p>Agree that it is, as 3 and 10 are factors and 3 and 10 share no factors. Add 30 to the list on the board.</p> <div>Q Is 50 a factor of 12 330?</div> <p>Agree that 50 is not a factor even though 5 and 10 are factors, as 5 is a factor of 10.</p> <div>Q How can we find other factors of 12 330?</div> <p>Collect responses and add any confirmed factors to the list on the board. Discuss the children's methods. Ask the children to divide 12 330 by 30. Add 411 to the list.</p> <div>Q What factors does 411 have?</div> <p>Agree that 3 is a factor and $411 = 3 \times 137$. Add 3 and 137 to the list.</p> <div>Q What are the factors of 137?</div> <p>Encourage the children to check with division.</p>	<p>Solve a problem by sorting data and interpreting tables and charts.</p> <p>Explain methods and reasoning.</p> <p>VOCABULARY square number rule</p> <p>RESOURCES Rectangular cards or pieces of paper OHT 11.1 OHT 11.2 OHT 11.3 OHT 11.4 OHT 11.5 OHT 11.6</p>	<ul style="list-style-type: none"> Tell the class that the final score in a hockey match is 4 – 3. <div>Q How many different half-time scores could there be?</div> <p>The children work in pairs to write down possible half-time scores on small cards or pieces of paper. Ask the children to sort out all the half-time scores that are draws.</p> <div>Q How many different half-time scores can be draws? What are these scores?</div> <p>Establish that there can be four scores. Tell the children to label this group as draws.</p> <ul style="list-style-type: none"> Tell the children to sort their remaining cards into groups and give each group a name. They can have as many or as few groups as they wish. Invite a pair of children to explain one of their groups and to say how many scores there are in the group. <div>Q How do we know we have all the half-time scores for this group?</div> <p>Get the children to find half-time scores from their sets of scores that fall in this group, and put the scores in order. Repeat this for a number of the groups identified by the children.</p> <ul style="list-style-type: none"> Explain that you are now going to show them how some half-time scores have been sorted. Show OHT 11.1. <div>Q How are these scores grouped?</div> <p>Establish that the children understand the grouping for this sort by asking them to add a half-time score to the empty boxes. Point out that some of the boxes are missing.</p> <div>Q Which half-time scores are missing?</div> <p>Discuss the children's suggestions and reasons. Add missing boxes and scores to demonstrate how this grouping can be used to find missing half-time scores. Show OHT 11.2.</p> <div>Q Can we confirm that for a full-time score of 4 – 3 there are only 20 possible half-time scores?</div> <p>Discuss the children's responses and establish that we need to be sure that, when we sort, our groupings will include all possibilities. Say that you are now going to show how the half-time scores for this problem have been sorted in different ways, for example OHTs 11.3 and 11.4.</p> <ul style="list-style-type: none"> Show OHTs 11.3 and 11.4. <div>Q How have the half-time scores been sorted?</div>	<ul style="list-style-type: none"> Return to the 20 half-time scores the children grouped for the full-time score 4 – 3. <div>Q How can we use our cards to find the number of half-time scores for a final score 4 – 2?</div> <p>Collect responses. Agree which rectangular table of scores shows the 15 possible half-time results. Use OHT 11.5 to confirm the number of scores is 15.</p> <p>Repeat for other full-time scores.</p> <div>Q Can you see any pattern and identify a rule for the number of half-time scores for given full-time scores?</div> <p>Encourage the children to use words and symbols to describe their patterns and rules.</p> <p>Show OHT 11.6 to establish the general rule:</p> <p>If the full-time score is $n - m$, the number of possible half-time scores is $(n + 1) \times (m + 1)$.</p> <p>Confirm this with earlier examples.</p>

Planning sheet	Day One (page 2 of 2)	Unit 11 <i>Angles, graphs and problem solving</i>	Term: <i>Summer</i>	Year Group: 6
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities/Focus Questions
	<p>Collect answers. Establish that only numbers to 11 need be tested as: 11×11 is 121 and $12 \times 12 = 144$. 137 is odd so only odd numbers need be tested. As 3 and 5 are not factors, only 7 and 11 need be used and they are not factors.</p> <p>Q What type of number is 137?</p> <p>Agree it is a prime number. Return to the list of factors.</p> <p>Q Have we got all the factors of 12 330?</p> <p>Establish that there are others but we can get all these from the key factors: 2, 3, 3, 5, 137. Add other factors to the list using these numbers, e.g. 9, 15, 45, 274.</p> <ul style="list-style-type: none"> Repeat with other five-digit numbers such as 12 660, 19 320. 		<p>Discuss the different sorts. Establish that the total scores for each of the sorts is 20. Ask the children to sort their half-time scores using any of the three sorts demonstrated and using the patterns in the sort, ensure that they have got all 20 half-time scores.</p> <ul style="list-style-type: none"> Show OHT 11.5 and ask the children to sort their cards in the same way. <p>Q How have the half-time scores been sorted?</p> <p>Discuss the patterns in the sort and the way in which the cards have been sorted.</p> <p>Q How many more half-time scores would there be if the final score was 4 – 4?</p> <p>Establish that there would be another five half-time scores. Demonstrate this by adding another row with scores 0 – 4 to 4 – 4.</p> <p>Q What do you notice about the pattern for the 4 – 4 half-time scores?</p> <p>Establish that the table forms a square and the diagonal contains all the half-time draws.</p> <p>Q How many half-time scores would there be if the final score was 2 – 2 or 3 – 3?</p> <p>Collect answers and point out that the number of half-time scores is a square number in each case.</p> <p>Q How many half-time scores would there be if the full-time score was 9 – 9?</p> <p>Take responses and establish that this is the square number of 100.</p>	<p>ASSESSMENT – Explain to the children that during the week they will be completing 'My Mathematics' Self-assessment sheets which they will take to their secondary school.</p>

Planning sheet	Day Two (page 1 of 2)	Unit 11 <i>Angles, graphs and problem solving</i>	Term: <i>Summer</i>	Year Group: 6
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities/ Focus Questions
<p>Describe and visualise properties of 2-D shapes.</p> <p>VOCABULARY right angle obtuse symmetry regular irregular pentagon hexagon</p> <p>RESOURCES A4 paper A square sheet of paper</p>	<ul style="list-style-type: none"> Ask the children to close their eyes and tell them to imagine a square sheet of paper. Say that they are to fold the paper so the bottom left-hand corner of the square meets the top right-hand corner of the square. <p>Q What shape have you made?</p> <p>Collect answers. Use a square piece of paper to confirm that the shape is a right-angled triangle.</p> <ul style="list-style-type: none"> Tell the children to imagine a rectangular sheet of A4 paper with the short side horizontal. Say that they are to fold the rectangle so that the bottom left hand corner meets the top right-hand corner. <p>Q What shape have you made?</p> <p>Collect answers and discuss the shape the children think they have made. Confirm it is a pentagon as shown:</p>  <p>Q What types of angles make up this pentagon?</p> <p>Agree there are two right angles and three obtuse angles.</p> <p>Q How many lines of symmetry does it have?</p> <p>Establish it has one.</p> <p>Q Are any of the sides equal?</p> <p>Establish it has two pairs of equal sides.</p> <p>Q Is the pentagon regular?</p> <p>Confirm it is not as it does not have five equal sides and five equal angles.</p>	<p>Use a protractor to measure acute and obtuse angles to the nearest degree.</p> <p>VOCABULARY equilateral trapezium trapezia circle circumference radius radii semi-circle</p> <p>RESOURCES Protractors Compasses A4 paper Self-assessment sheet 11.1</p>	<ul style="list-style-type: none"> Give the children a blank sheet of A4 paper. Demonstrate how to fold and unfold the paper as follows:  <p>Identify the shapes made by the two folds.</p> <p>Q What are the names of these shapes?</p> <p>Establish that these are right-angled triangles, rectangles and trapezia.</p> <ul style="list-style-type: none"> Make another fold as follows:  <p>Discuss the different shapes made by the three folds. Identify the trapezia and the triangles.</p> <p>Q Is the large triangle equilateral?</p> <p>Ask the children to measure the angles with protractors. Remind them that measuring accurately helps to support the view that the triangle is equilateral, but it does not prove that it is equilateral. Explain that in this case, the triangle should be equilateral but there will be 'folding' errors.</p> <ul style="list-style-type: none"> With the children, draw a circle with the centre and the lines clearly marked. Tell the children to draw similar lines and add the letters in this circle. <p>Explain the notation, C is the centre, AC and BC are radii of the circle. Angle ACB is at the centre; angle AXB is on the circumference of the circle. Ask the children to measure angles ACB and AXB to the nearest degree. Collect answers in a table:</p> 	<ul style="list-style-type: none"> Draw together some of the properties the children have found about angles in a circle. <p>Q How could we use the properties to help us draw a right-angled triangle?</p> <p>Establish that drawing a semi-circle with the angle at the circumference will give a right-angled triangle.</p>

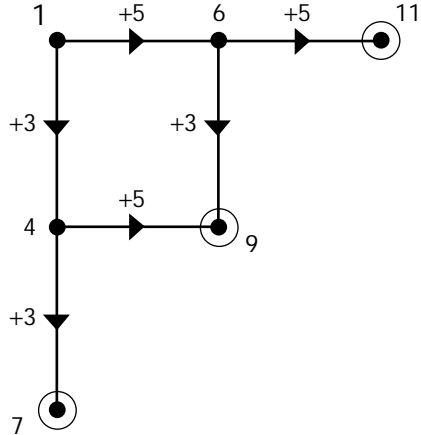
Planning sheet	Day Two (page 2 of 2)	Unit 11 <i>Angles, graphs and problem solving</i>	Term: <i>Summer</i>	Year Group: 6				
Oral and Mental		Main Teaching		Plenary				
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities/ Focus Questions				
	<ul style="list-style-type: none">Tell the children to imagine a rectangular sheet of A4 paper with the short side vertical and with the centre of the rectangle clearly identified. Say they are to fold the rectangle so they have the bottom left-hand corner at the centre and the top right-hand corner meeting at the centre. <div>Q What shape have you made?</div> <p>Collect answers and fold an A4 sheet to confirm that the shape is a hexagon as shown:</p> <div></div> <div>Q What types of angles are in this hexagon?</div> <p>Agree there are two right angles and four obtuse angles.</p> <div>Q How many lines of symmetry does it have?</div> <p>Establish there are none.</p> <div>Q Is the hexagon regular?</div> <p>Agree it is irregular.</p> <div>Q Are any of the sides equal?</div> <p>Establish it has three pairs of equal sides.</p>		<table><tr><td>Angle ACB</td><td>Angle AXB</td></tr><tr><td></td><td></td></tr></table> <div>Q What do you notice about these angles?</div> <p>Collect responses and establish that the angle at the centre ACB appears to be twice the size of the angle at the circumference AXB. Tell the children to draw other angles at the circumference and measure them.</p> <div>Q Are your angles at the circumference the same size as AXB?</div> <p>Collect views and set up conjectures about the angles at the circumference based on the children's beliefs.</p> <div>Q If we made ACB a straight line, what size could we expect angles ACB and AXB to be?</div> <p>Tell the children to draw another circle with ACB a straight (or diameter) and measure the angles ACB and AXB.</p> <div></div> <div>Q What is the name for half a circle?</div> <p>Establish that it is a semi-circle and that angle AXB is in the semi-circle. Collect the children's measurements of angles ACB and AXB.</p> <div>Q What do we think we might say about angle AXB?</div> <p>Establish that it looks as though the angle in the semi-circle is a right angle. Emphasise that the accurate measuring of angles helps us identify possible properties but it does not prove they are true. In these cases they are true and children will learn how to prove they are true in their mathematics lessons in secondary school.</p>	Angle ACB	Angle AXB			<p>ASSESSMENT –</p> <ul style="list-style-type: none">Give out 'My Mathematics' Self-assessment sheet 11.1. Explain that the sheet is to help children to identify what mathematics they have been able to do during the week. There will be some time each lesson for them to complete the sheet.Ask the children to answer the first two 'cloud' questions on the sheet. Say that you want them to write their calculations and solutions in the middle loop. When they have done this they should show their work to a partner. Some of the children may need help.Tell the children that they should tick the box to say if they required any help.Give the children a few minutes to complete this task and ask them to put this sheet away ready for their next mathematics lesson.
Angle ACB	Angle AXB							

Planning sheet	Day Three	Unit 11 <i>Angles, graphs and problem solving</i>	Term: <i>Summer</i>	Year Group: 6
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities/ Focus Questions
<p>Solve simple problems involving ratio and proportion.</p> <p>VOCABULARY gallon mile litre kilometre round convert</p> <p>RESOURCES Calculators</p>	<ul style="list-style-type: none"> Remind the children that we often want to express proportions and rates using different units. Give examples such as: rainfall; sunshine; speed; charges per minute; fat content in food. <p>Q What units are used in each of these?</p> <p>Discuss the units, e.g. cm per day; hours of sunshine per week; mph; km/h; etc.</p> <ul style="list-style-type: none"> Tell the children that on average a large car travels 25 miles on a gallon of petrol; a small car can travel 40 miles on one gallon. <p>Q On a journey of 200 miles, how many gallons of petrol would each car use?</p> <p>Collect and discuss answers.</p> <ul style="list-style-type: none"> Remind the children that fuel consumption of cars is also expressed as km per litre. <p>Q How do we convert miles to km? Q How do we convert gallons to litres?</p> <p>Discuss conversions using 5 miles = 8 km and 1 gallon = 4.5 litres</p> <p>Write on the board: Large car: 25 miles per gallon Small car: 40 miles per gallon</p> <p>Ask the children to convert the miles to km. Add the answers to the board: 40 km per 4.5 litres. 64 km per 4.5 litres.</p> <p>Q What distances will the cars travel on 1 litre of petrol?</p> <p>Establish that to find out we divide by 4.5. Using calculators convert to km/litre, rounding answers to the nearest km and record: 9 km per litre 14 km per litre</p> <ul style="list-style-type: none"> Give children other miles per gallon rates to convert to km per litre. 	<p>Read and plot co-ordinates in all four quadrants.</p> <p>Solve a problem by extracting and interpreting information presented in tables and charts.</p> <p>VOCABULARY quadrant axis axes x-axis y-axis origin co-ordinates vertex vertices scale</p> <p>RESOURCES Squared paper Rulers Activity sheet 11.1 Activity sheet 11.2 OHT 11.7 OHT 11.8 Self-assessment sheet 11.1</p>	<ul style="list-style-type: none"> Give out Activity sheet 11.1 and display OHT 11.7. Remind the children of the co-ordinate system in four quadrants. <p>Q Are (4, -3) and (-4, 3) in the same quadrant?</p> <p>Establish they are not.</p> <p>Q Can you give me four points that are 6 units away from (-1, -4)?</p> <p>Collect answers. Ask the children to work in pairs and set each other similar questions.</p> <ul style="list-style-type: none"> Show OHT 11.8, give out Activity sheet 11.2 and ask children to read through the problem. Discuss the problem with the children. <p>Q How should we start to solve this problem?</p> <p>Establish that plotting the positions of the different space stations would help to give a picture of the data in the table.</p> <ul style="list-style-type: none"> Discuss the scale on the sheet. <p>Q How can we use this scale to find the approximate distances of each station from Earth?</p> <p>Establish that the children need to measure the distance using the units represented by the grid. Discuss different ways of doing this, e.g. using a metric ruler, or making a 'grid' ruler. Tell the children to work in pairs to find the approximate distances of the space stations from Earth. Collect and record the children's answers on OHT 11.8. Discuss their methods and answers.</p> <ul style="list-style-type: none"> Tell the children to work in pairs to find a route from Earth to each space station and back to earth. Remind them about the fuel they have on board and the rate of fuel consumption. Remind them they can use calculators. Discuss the routes the children chose and compare the distances their space ship travelled. Ensure they were able to complete the journey on the amount of fuel they had available. 	<p>ASSESSMENT –</p> <ul style="list-style-type: none"> Ask the children to complete the third 'cloud' question on the 'My Mathematics' Self-assessment sheet 11.1. They should discuss it with a partner as before and tick the appropriate box. Help those children who need it. Give the children a few minutes to complete the task. Ask them to put the sheet away carefully for the next lesson.

Planning sheet	Day Four (page 1 of 2)	Unit 11 <i>Angles, graphs and problem solving</i>	Term: <i>Summer</i>	Year Group: 6
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities/ Focus Questions
<p>Recognise the names of 2-D and 3-D shapes and reflective symmetry in 2-D shapes.</p> <p>VOCABULARY face cube cuboid prism pyramid symmetry</p> <p>RESOURCES Bag with 3-D shapes</p>	<ul style="list-style-type: none"> Place some 3-D shapes in a bag. Draw one out and ask the children to name the shape and to say how many faces it has. <div>Q What is the name of each face?</div> <div>Q How many lines of symmetry does it have?</div> <p>Invite the children to think of possible faces on the shapes in the bag that have;</p> <ul style="list-style-type: none"> – four sides and one line of symmetry; – four sides and two lines of symmetry etc. <div>Q What is the name of the 3-D shape with these faces?</div> <p>Discuss the faces on various 3-D shapes.</p>	<p>Solve a problem by sorting and classifying data and interpreting information presented in tables.</p> <p>VOCABULARY polygon</p> <p>RESOURCES Squared and isometric paper Rulers Mirrors OHT 11.9 Activity sheet 11.3 OHT 11.10 Self-assessment sheet 11.1</p>	<ul style="list-style-type: none"> Explain that the children are going to draw some polygons with different numbers of lines of symmetry. The children are to find out if it is possible to draw polygons with a particular number of lines of symmetry. <div>Q What polygons can you draw that have three lines of symmetry?</div> <p>Take the children's responses and explanations. Say that they will return to this question later in the lesson.</p> <p>Ask the children to work in pairs to draw as many different polygons (up to eight sides) with different numbers of lines of symmetry. Tell the children that they can use plain, square or isometric paper, rulers and mirrors.</p> <p>Collect the polygons the children have drawn and ask them to sort out all the polygons that have two lines of symmetry.</p> <div>Q What do you notice about all the shapes that have two lines of symmetry?</div> <p>Establish that all the shapes drawn have an even number of sides.</p> <ul style="list-style-type: none"> Explain that by sorting the polygons that had two lines of symmetry helped to show that all the polygons drawn with two lines of symmetry have an even number of sides. <div>Q Is it possible to draw a polygon with an even number of sides that has three lines of symmetry?</div> <p>Take responses and establish that it is possible (hexagon).</p>  <ul style="list-style-type: none"> Explain that the children are now going to explore the relationship between the polygons drawn and the number of lines of symmetry they have. Show OHT 11.9 and explain that the headings on the two-way table allow the polygons to be classified by the number of sides and the number of lines of symmetry. 	<ul style="list-style-type: none"> Discuss the lesson with the children and ask them how the two tables helped them learn about the relationship between the number of sides of a polygon and the number of lines of symmetry it can have. <p>Collect answers. Ask the class the question posed earlier.</p> <div>Q What polygons can you draw that have three lines of symmetry?</div> <p>Establish that the answer is:</p> <p>Any polygon with a number of sides that is a multiple of three.</p>

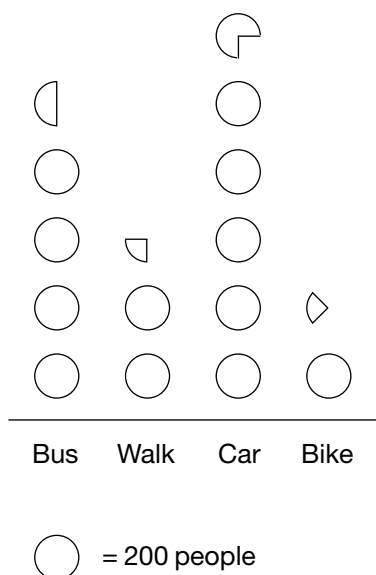
Planning sheet	Day Four (page 2 of 2)	Unit 11 <i>Angles, graphs and problem solving</i>	Term: <i>Summer</i>	Year Group: 6
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities/ Focus Questions
			<ul style="list-style-type: none"> Give out Activity sheet 11.3. Set the children to work in pairs to decide whether polygons can or cannot be drawn to meet the requirements on their two-way table. Give them a few minutes to search for polygons that are missing. Collect the children's results on OHT 11.9 and explore the empty cells in the table. Point to some empty cells. Ask the following questions: <div> Q Is it possible to draw a triangle with two lines of symmetry? Q Is it possible to draw a quadrilateral with three lines of symmetry? Q Is it possible to draw a pentagon with four lines of symmetry? </div> <p>Collect responses and discuss the children's reasons.</p> Show OHT 11.10. Say that this is another way of representing the information in the table on OHT 11.9. <p>Explain that the children are now going to use this table to see if they can find a connection between the number of sides and the number of lines of symmetry.</p> <div> Q Can you draw a polygon with 9, 10, 11 or 12 sides that has no lines of symmetry? </div> <p>Establish that the table on OHT 11.9 shows that polygons with up to eight sides can be drawn with no lines of symmetry. Discuss the children's explanations and confirm that a polygon with any number of sides can be drawn with no lines of symmetry.</p> <div> Q Can you see a connection between the number of lines of symmetry and the number of sides? </div> <p>Discuss previous strategies such as using difference, multiples, etc. and establish that the number of lines of symmetry a polygon can have are the factors of the number of sides.</p> Ask children to complete the table for 9-, 10-, 11- and 12-sided polygons. <div> Q How many different numbers of lines of symmetry can a 20-sided polygon have? </div> <p>Establish that you can draw 20-sided polygons that have 0, 1, 2, 4, 5, 10 and 20 lines of symmetry.</p> 	<p>ASSESSMENT –</p> <ul style="list-style-type: none"> Ask the children to complete the last 'cloud' question on the 'My Mathematics' Self-assessment sheet 11.1. They should discuss it with a partner and tick the appropriate box. Help any children who need it. Give the children a few minutes to complete the table. Discuss the work with the children then ask them to put their sheets away for next lesson.

Planning sheet	Day Five (page 1 of 2)	Unit 11 <i>Angles, graphs and problem solving</i>	Term: <i>Summer</i>	Year Group: 6
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities/Focus Questions
<p>Interpret information presented in graphs.</p> <p>RESOURCES Resource sheet 11.1</p>	<ul style="list-style-type: none"> Give out Resource sheet 11.1. Ask the children to work in pairs and identify two facts about each of the graphs on the sheet. <p>Collect their ideas and discuss the features of the graphs.</p> <div>Q How has the data in the age profile graph been grouped?</div> <p>Establish that the groups are of unequal size.</p>	<p>Solve a problem by sorting data and interpreting tables and charts.</p> <p>Explain methods and reasoning.</p> <p>VOCABULARY systematic</p> <p>RESOURCES A4 paper Scissors Self-assessment sheet 11.2</p>	<ul style="list-style-type: none"> Hold up a large sheet of paper. Explain that you can choose to cut it into four or six pieces. Cut it into four pieces and say that this represents Cut 1. Say that now you will take one of the four pieces and cut that into four or six pieces. <div>Q If I cut it into four pieces how many pieces of paper will I have altogether?</div> <ul style="list-style-type: none"> Establish the answer is seven pieces of paper. <div>Q If I cut it into six pieces how many pieces will I have altogether?</div> <p>Establish the answer is nine pieces of paper.</p> <div>Q Suppose my Cut 1 gave me six pieces of paper, and my Cut 2 was into six pieces of paper, how many pieces will I have altogether?</div> <p>Establish the answer is 11 pieces of paper.</p> <div>Q Which type of cuts gave us nine pieces of paper?</div> <p>Encourage the children to explain how to make nine pieces of paper in two different ways.</p> <ul style="list-style-type: none"> Say that Cut 1 is into four, Cut 2 is into six and Cut 3 is into four. <div>Q How many pieces of paper would I have after my three cuts?</div> <div>Q What other choices could I have made for Cuts 1, 2, 3 and how many pieces of paper would I have had?</div> <p>Have available paper and scissors for the children to use if they wish. Explain that you want the children to work in small groups and find ways to record what they find out in a systematic way.</p> <p>Collect response for the third cut and discuss the recording methods the children have produced, demonstrating a systematic approach.</p> <div>Q How has your recording helped you to sort and record the number of pieces of paper?</div> <p>Encourage the children to move onto four and five cuts.</p> <ul style="list-style-type: none"> Discuss the answers the children have agreed so far. Encourage them to go back to the first cut. Hold up a sheet of paper and say that you have one piece of paper before any cuts are made. <div>Q When I cut this piece, how many extra pieces do I make?</div>	<ul style="list-style-type: none"> Discuss with the children the work they have been engaged in during the week. Emphasise that they have been collecting and sorting data in different ways to look for patterns and explanations. Remind them that sorting is an important strategy when solving problems and is part of being systematic. <p>ASSESSMENT –</p> <ul style="list-style-type: none"> Give out 'My Mathematics' Self-assessment sheet 11.2. Allow time for the children to read and complete the problem on the sheet and describe their strategies. Discuss the solutions to the problems with the class. Explain that the table on the bottom half of the sheet is for the children to summarise how well they have been able to answer each question. Ask the children to look at the statements in the left-hand column. The questions alongside each statement are intended to remind the children what each statement means. Ask the children to look back on their work to help them fill in the table. Encourage the children to complete each statement by putting a tick in one box. Ask the children to complete the target statement by indicating where they think they need to improve. For those children who were able to answer all the questions without help, discuss the learning objectives for Year 7 shown on the front page of the unit. Get the children to stick 'My Mathematics' Self-assessment sheets 1 and 2 in their books under their work.

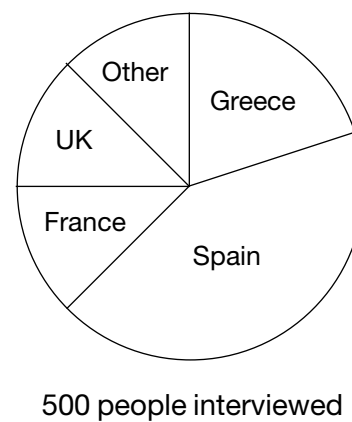
Planning sheet	Day Five (page 2 of 2)	Unit 11 <i>Angles, graphs and problem solving</i>	Term: <i>Summer</i>	Year Group: 6
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities/Focus Questions
			<p>Agree that it is three extra pieces when the piece is cut into four pieces and five extra pieces when cut into six pieces.</p> <p>Q When I make my second cut, how many extra pieces do I make?</p> <p>Collect answers and establish that with each cut, three or five extra pieces are added. On the board draw:</p>  <p>Explain that the diagram represents the two cuts. The downward arrows represent the cut into four, when three pieces are added. The horizontal arrows represent the cut into six, when five pieces are added. After Cuts 1 and 2, the answers are 7, 9 and 11, those that we agreed earlier.</p> <p>Q Can you add Cut 3 to the diagram, how many pieces of paper could we make?</p> <p>Ensure the children understand how the diagram helps to represent and to solve the problem. Agree the answers are 10, 12, 14, 16. Compare these with the children's answers and their methods of recording.</p> <p>Q Which combinations of Cuts 1, 2 and 3 give us 12 pieces, 14 pieces?</p> <p>Collect answers and establish that for 12 pieces and 14 pieces, three different types of cut could have been used. With the children extend the diagram to Cuts 4 and 5. Discuss the types of cuts that lead to different numbers of pieces of paper, and compare the methods of recording the children have used.</p>	

Notes

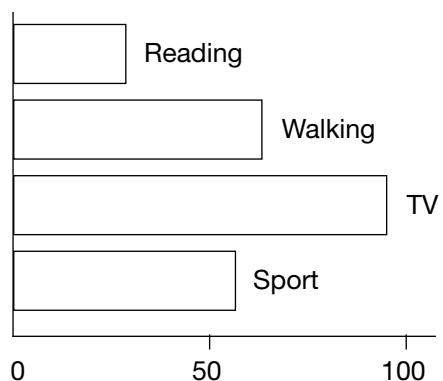
How I travel when I shop



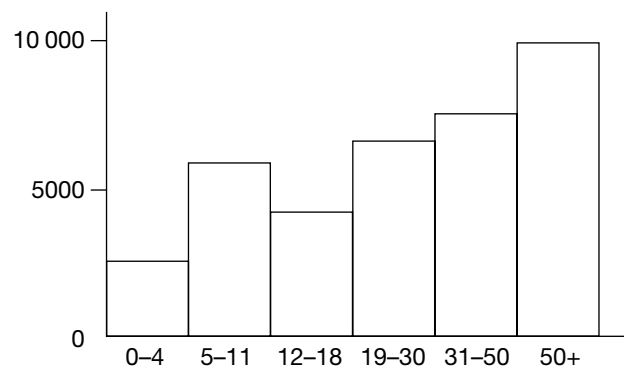
Where I holiday



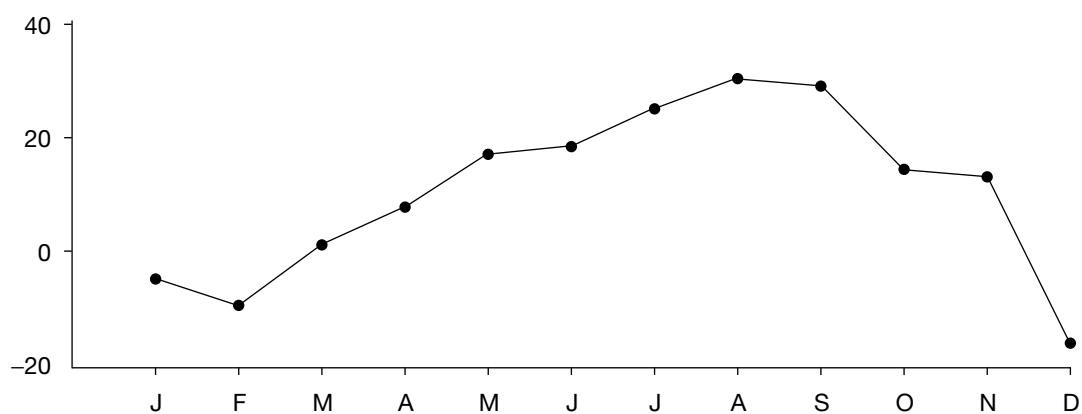
My entertainment

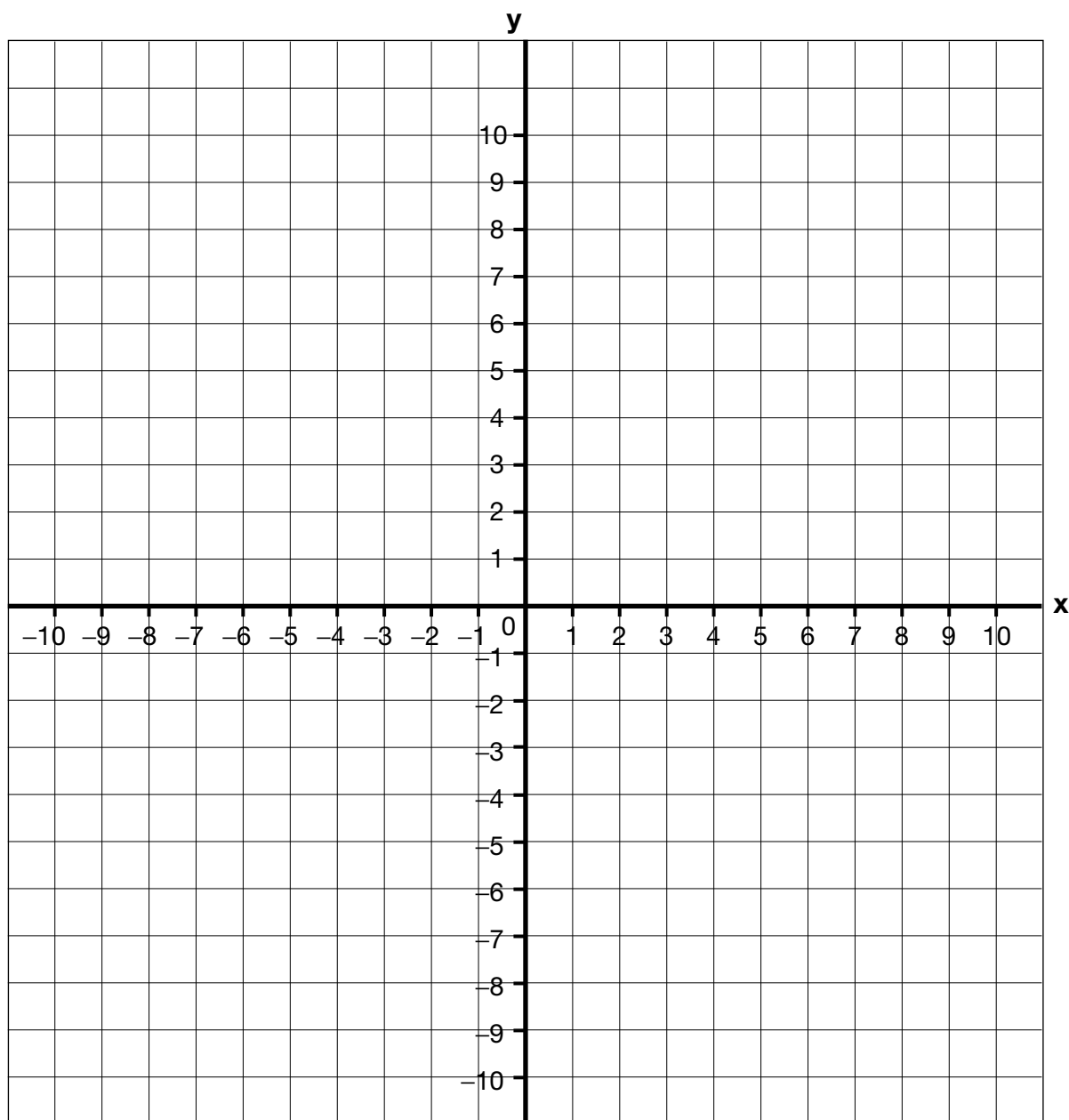


Age profile in my town



Average monthly temperature in my town





Steve is the GASSA Space centre trouble-shooter. He has had an emergency call. There are seven space stations that are in danger of running out of food. They need help and fast! Can Steve save the day? His boss says that he should be able to visit all the space stations in one trip and that will save fuel. Find the best route for Steve to take. Your journey should start from Earth.

Space station	Co-ordinates	Number of astronauts	Approximate distance from earth	Boxes of food
Ark	(-3, -4)	5		100
Bear	(8, -9)	3		60
Cat	(-4, 6)	2		40
Dog	(5, 8)	3		80
Elk	(-7, -6)	4		60
Frog	(-8, 10)	3		80
Goat	(4, -10)	4		40
Earth	(0, 0)	0	0 km	0

The rocket ship that Steve flies can carry 7500 litres of fuel.
The average fuel consumption of the rocket ship is 1 litre of fuel per 10 km.

On the graph use the scale: 1 unit represents 1000 km.

Number of sides	Number of lines of symmetry								
	0	1	2	3	4	5	6	7	8
3									
4									
5									
6									
7									
8									

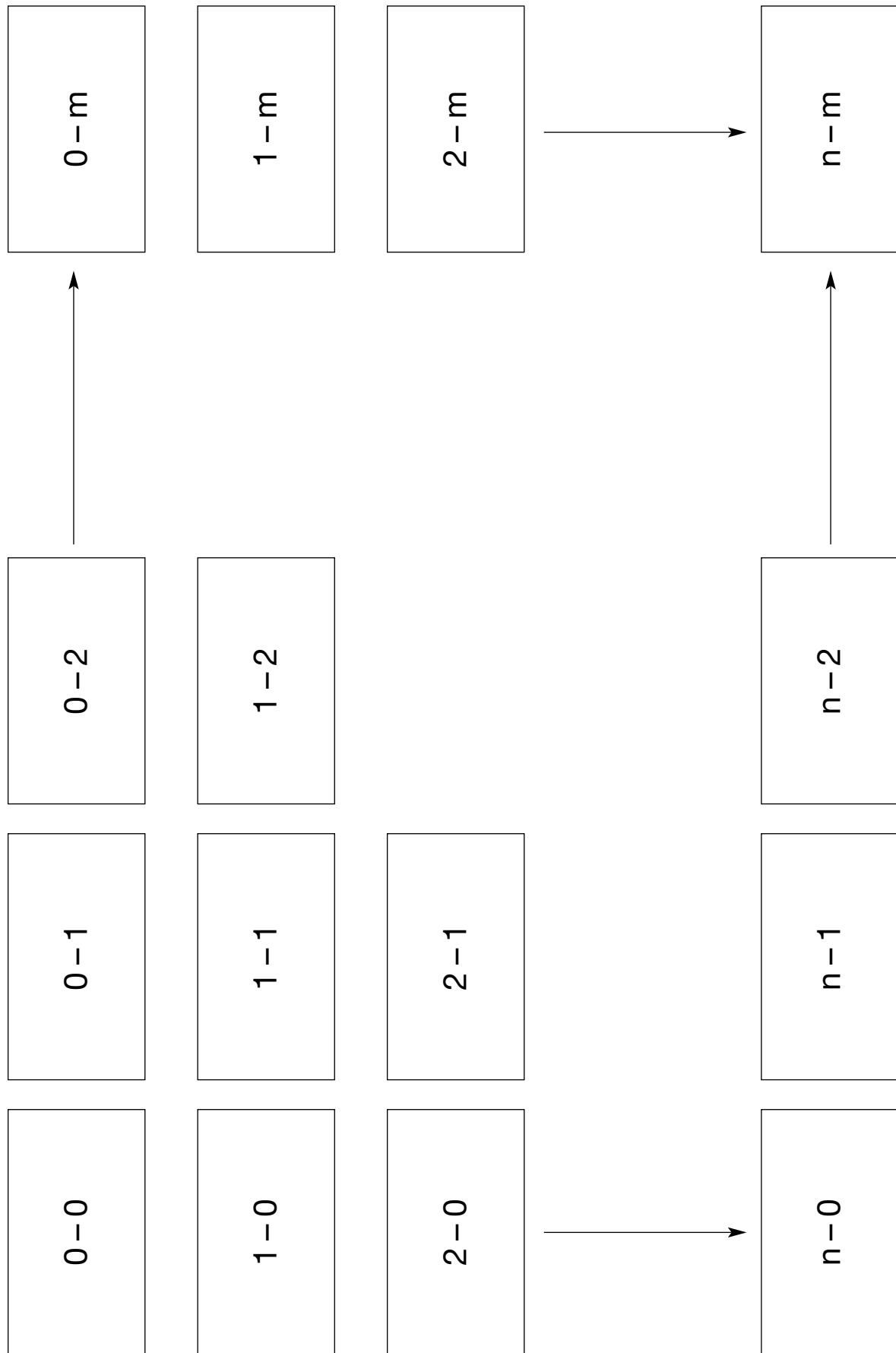
	4-0			
	3-0			
	2-0		2-3	
	1-0		1-3	
	0-1	0-2		
DRAWS	0-0	1-1	2-2	

 $4-0$ $4-1$ $4-2$ $4-3$  $3-0$ $3-1$ $3-2$  $2-0$ $2-1$ $2-3$  $1-0$ $1-2$ $1-3$  $0-1$ $0-2$ $0-3$  $0-0$ $1-1$ $2-2$ $3-3$

[illegible]

0 – 0	1 – 0	2 – 0	3 – 0	4 – 0
1 – 1	0 – 1	0 – 2	0 – 3	
2 – 2	1 – 2	1 – 3	4 – 1	
3 – 3	2 – 1	3 – 1		
	2 – 3	4 – 2		
	3 – 2			
	4 – 3			

0-0	1-0	2-0	3-0	4-0
0-1	1-1	2-1	3-1	4-1
0-2	1-2	2-2	3-2	4-2
0-3	1-3	2-3	3-3	4-3

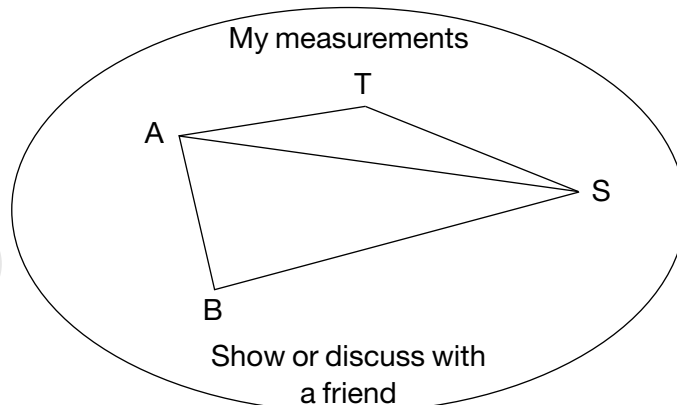


Number of half-time scores is $(n + 1) \times (m + 1)$

Number of sides	Lines of symmetry
3	0, 1, 3
4	0, 1, 2, 4
5	0, 1, 5
6	0, 1, 2, 3, 6
7	0, 1, 7
8	0, 1, 2, 4, 8
9	
10	
11	
12	

My Mathematics by

Use a protractor to
measure angles:
SAT, ABS, ATS

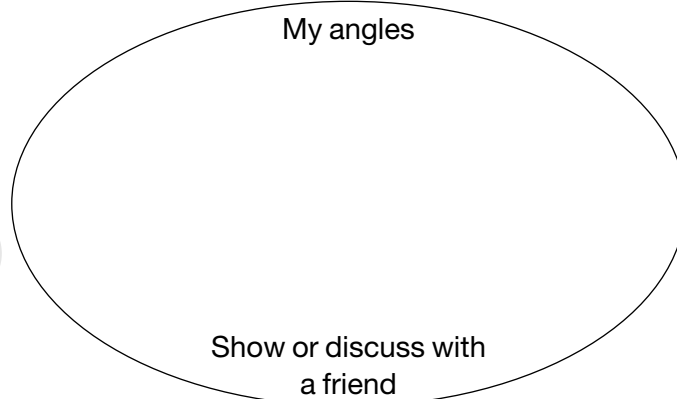


I measured these
angles:

on my own

with some help

Use a protractor and
draw angles of:
 33° , 118° , 176°



I drew these angles:

on my own

with some help

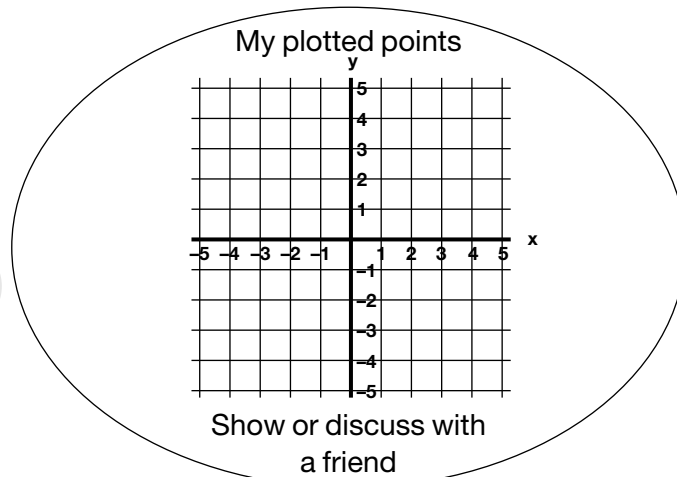
Plot the points:

A (3,-5);

B (-2,4);

C (3,5);

D (-4,-4)



I plotted these points:

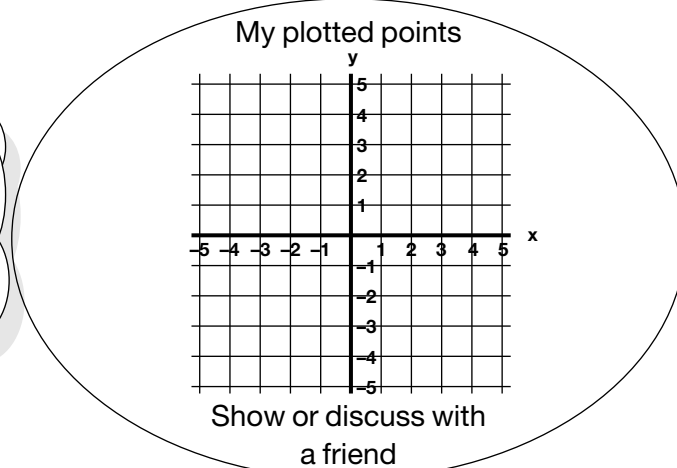
on my own

with some help

Plot these points in
order and join up the
points with a straight
line. Name the shape:

$(-5,3)$, $(-3,0)$, $(-5,-3)$,

$(4,-5)$, $(1,0)$, $(4,5)$, $(-5,3)$



My shape is:

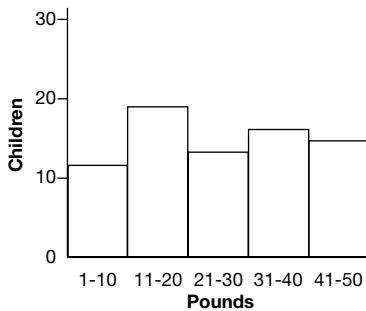
I plotted the points and
named the shape:

on my own

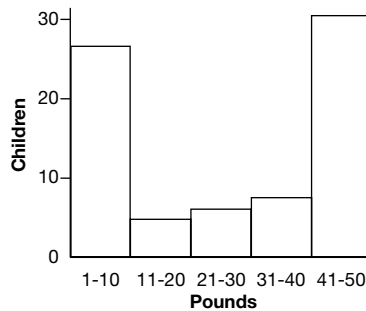
with some help

My Mathematics by

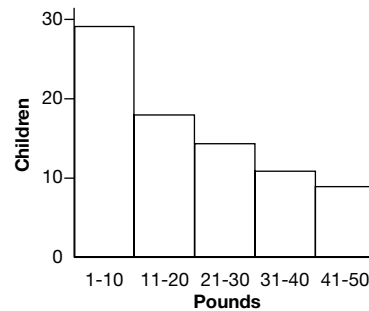
Money Collected



School A



School B



School C

The children in three schools collect money for a charity. Which school do you think collected the most money?

I think School collected the most.

Explain why you chose the school.

I explained my strategy:

on my own

with some help

<input type="text"/>
<input type="text"/>

Name:	School:
What I can do	
I can use a protractor to measure acute and obtuse angles to the nearest degree: on my own <input type="text"/> with some help <input type="text"/>	Use a protractor to measure given angles.
	Use a protractor to draw given angles.
I can read and plot co-ordinates in all four quadrants: on my own <input type="text"/> with some help <input type="text"/>	Plot the points: A (3, -5); B (-2, 4); C (3, 5); D (-4, 4).
	Plot the points in order and name the shape.
I can solve a problem by extracting and interpreting information presented in tables, graphs and charts: on my own <input type="text"/> with some help <input type="text"/>	Money collected

My next target:

I want to get better at _____
