National Numeracy Strategy

Unit 9
Shape, space and measures

Year 5
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 5

• Recognise positions and directions: read and plot co-ordinates in the first quadrant; **recognise perpendicular and parallel lines.**	Page 109
• **Recognise properties of rectangles.**	Page 103
• Use a protractor to measure and draw acute and obtuse angles to the nearest 5°.	Page 111
• Measure and draw lines to the nearest millimetre.	Pages 93, 95
• Understand, measure and calculate perimeters of rectangles and regular polygons.	Page 97
• Make and investigate a general statement about familiar numbers or shapes by finding examples that satisfy it. Explain a generalised relationship (formula) in words.	Page 81

Link Objectives

Year 4

- Recognise positions and directions: for example, describe and find the position of a point on a grid of squares where the lines are numbered.
- Recognise simple examples of horizontal and vertical lines.
- **Classify polygons using criteria such as number of right angles, whether or not they are regular, symmetry properties.**
- Begin to know that angles are measured in degrees and that: one whole turn is 360° or four right angles; a quarter turn is 90° or one right angle; half a right angle is 45°.
- Make and investigate a general statement about familiar numbers or shapes by finding examples that satisfy it.

Year 6

- **Read and plot co-ordinates in all four quadrants.**
- Classify quadrilaterals using criteria such as parallel sides, equal angles, equal sides.
- **Use a protractor to measure** and draw **acute and obtuse angles to the nearest degree.**
- **Calculate the perimeter and area of simple compound shapes that can be split into rectangles.**
- Make and investigate a general statement about familiar numbers or shapes by finding examples that satisfy it.

(Key objectives in bold)

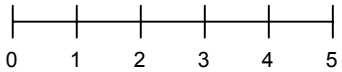
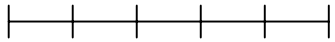
Resources needed to teach this unit:

- Activity sheet 9.1
- Activity sheet 9.2
- Activity sheet 9.3
- OHT 9.1
- OHT 9.2
- OHT 9.3
- Self-assessment sheet 9.1
- Whiteboards
- OHP protractor
- Protractors
- Rulers
- A4 sheets of paper
- Large sheet of paper for display

department for education and skills

Planning sheet	**Day One**	**Unit 9 *Shape, space and measures***	**Term: *Summer***	**Year Group: *5***

Oral and Mental

Objectives and vocabulary	Teaching Activities
Order a set of fractions and position them on a number line. VOCABULARY fraction fifths tenths twentieths	• On the board draw the line:  • Ask the class to count together in halves and then in quarters and halves from 0 to 5 and back. Indicate the positions on the line as they count. • Randomly select different positions on the line and ask children to identify the number represented using $^1/_2$s and $^1/_4$s. • Pick any six fractions/numbers/mixed numbers represented on the line and on the board record them in random order. Ask questions such as: **Q** Which is the smallest? Which is the largest? Which lie between 3 and 4? The class says the answer together on your signal. • Change the line to represent 0 to 1:  Indicate the $^1/_5$ line. **Q** What fraction of the line does this division represent? Indicate different fifths and ask children to identify the fraction. Establish that $^5/_5 = 1$. • Repeat with $^1/_{10}$ and $^1/_{20}$. Establish that $^1/_{10}$ is half $^1/_5$, $^1/_{20}$ is half $^1/_{10}$ and identify the appropriate equivalent fractions. • Randomly select different positions on the line involving fifths, tenths, and twentieths and ask children to identify the number represented. • Pick any six fractions represented on the line and on the board record them in random order. Ask questions such as: **Q** Which is the smallest fraction? Which is the largest? Which lie between $^2/_5$ and $^3/_5$? Children respond orally on your signal.

Main Teaching

Objectives and vocabulary	Teaching Activities
Use a protractor to measure and draw acute and obtuse angles to the nearest 5^o. VOCABULARY angle right angle acute obtuse degrees protractor RESOURCES OHT 9.1 OHP protractor Protractors Rulers Self-assessment sheet 9.1	• Explain that this lesson is about making and measuring angles. Remind the class that they have previously compared angles less than and greater than a right angle. Show the right angle on OHT 9.1. **Q** How many degrees are there in a right angle? Use an OHP protractor to confirm the angle is 90^o and to remind the class how to use a protractor to measure angles. Discuss the scale on the protractor and identify the values of the divisions on the scale. **Q** What do we call angles which are less than 90^o? greater than 90^o? Collect answers and record on the board an acute angle is less than 90^o, and an obtuse angle is between 90^o and 180^o. • Ask the children to each draw an example of an acute angle and an obtuse angle in their books using ruler and pencil. In pairs, ask them to identify which of their partner's angles is acute and which is obtuse, then explain to each other how they know. Ask them to compare their four angles and number them according to size, smallest first. Discuss any examples which were difficult to order. • Show the acute and obtuse angles on OHT 9.1 and using an OHP protractor demonstrate how to measure them to the nearest 5^o. Explain how the protractor can be used from either side, depending on the orientation of the angle and that the angles can be rotated to help with the measuring. Ask the pairs of children to measure their four angles to confirm they ordered them correctly, smallest first. **Q** How can we use a protractor and a ruler to draw an angle of 50^o? Ask the children to discuss and try this in small groups. They are then to write down the step by step instructions. • Take feedback and with the class establish a procedure (e.g. draw a straight line with a ruler. Mark a point at one end of the line. Place the centre of the horizontal line of the protractor on the point. Mark a point at 50^o. Join the two points with a straight line using a ruler.) Use the agreed procedure to demonstrate how to draw angles on the OHP. Emphasise that it helps if the first line drawn is longer than the radius of the protractor for accurate drawing and measurement. • Ask the children to draw angles of 12^o, 55^o, 80^o, 95^o, 155^o using rulers and protractors. Ask them to draw them in different positions, i.e. not all with a horizontal line, and to use both sides of their protractors, i.e. a different side for a different angle. They are to exchange their work with a partner who is to estimate each angle, and they are to explain their reasoning to each other. They then each measure their partner's angles and record the size. They should also record whether the angle is acute or obtuse.

Plenary

Teaching Activities/Focus Questions

- Discuss the activity and address any common difficulties children had.

Q Which angles were the easiest/ hardest to estimate? Why? How did you decide?

Encourage children to explain any methods they found helpful.

- Ask the children to draw these angles in their books, without a protractor: 100^o, 45^o, 135^o, 15^o. Each time ask them to check their sketch with a protractor.

ASSESSMENT – Give out Self-assessment sheet 9.1.
Ask the children to complete the first cloud question on the sheet.

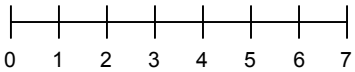
By the end of the lesson the children should be able to:

- **Identify and estimate obtuse and right angles;**
- **Use a protractor to measure and draw angles to the nearest 5^o.**

(Refer to supplement of examples, section 6, page 111.)

Planning sheet	Day Two (page 1 of 2)	Unit 9 *Shape, space and measures*	Term: *Summer*	Year Group: *5*

Oral and Mental

Objectives and vocabulary	Teaching Activities
Order a set of numbers with the same number of decimal places. VOCABULARY decimal numbers decimal place	• Write 6.2 on the board. **Q** How many decimal places has this decimal number? Agree it has one, and the digit 2 in 6.2 represents tenths. Next to 6.2 write 4.9. **Q** Which number is the larger? Establish 6.2 is the larger and why. Next to 4.9 write 5.1 and 3.7. **Q** Which number is the smallest? Establish 3.7 is the smallest and why. Add 1.4, 2.1, 0.8 to the list. With the class arrange the 7 numbers in order, smallest first. • Point to 5.1 and 6.2. **Q** Can you give me a whole number between these two numbers? Establish it is 6 and that it can be written 6.0. Repeat asking for other whole and decimal numbers with one decimal place. • On the board draw the number line from 0 to 7:  Identify a number from the list of seven numbers, e.g. 4.9. **Q** Where does this number appear on the number line? Agree that it is just to the left of 5, and draw a line from the number to the correct position on the line. Repeat with the other six decimal numbers. • Identify various positions on the number line and ask children to say what number with one decimal place it represents.

Main Teaching

Objectives and vocabulary	Teaching Activities
Recognise properties of rectangles. Recognise perpendicular and parallel lines. Make and investigate a general statement about familiar shapes by finding examples that satisfy it. VOCABULARY square rectangle oblong parallel perpendicular bisect right angle diagonal properties RESOURCES OHT 9.2 Rulers OHT protractor Protractors A4 sheets of paper	• Ask a volunteer to draw two parallel lines on the board and another to draw two perpendicular lines. Ask the children to comment on the accuracy of the drawings. **Q** What is special about parallel lines and perpendicular lines? Discuss and establish that: parallel lines are exactly the same distance apart at all points and will therefore never meet; perpendicular lines touch or cross each other at right angles. • Ask children to identify examples of parallel and of perpendicular lines in the classroom. • Show OHT 9.2. **Q** Which of these pairs of line is perpendicular? Agree that the first pair looks perpendicular. **Q** How could we check whether these lines are perpendicular to each other? Establish that the angles between them need to be measured as right angles. Demonstrate by using an OHP protractor. Measure the lines with a ruler and show that each crosses the other at the middle point. Explain that the lines bisect each other, which means they divide each other into two equal parts. **Q** Do perpendicular lines always bisect each other? Refer to the lines on the board or in the classroom and agree they do not. • Join the ends of the lines to make a square. **Q** What shape do you think I have made? How could we be sure? Discuss suggestions. Use an OHP protractor to check that all angles measure 90^{o} and a ruler to show that all sides are equal in length. Establish that the two original lines are now diagonals of the square. Remind children that diagonals join opposite vertices of a shape. • Ask the children to work in pairs and compile a list of all the properties of the square, including information about the diagonals. Take feedback and record the properties on the board, e.g. all four angles are right angles; all sides are equal; opposite sides are parallel; touching sides are perpendicular; diagonals are equal; diagonals bisect each other; diagonals are perpendicular to each other; diagonals bisect angles at the corners.

Plenary

Teaching Activities/Focus Questions

• Take feedback about the properties of rectangles the children have agreed and record them on the board. Suggest any that are missing and ask the children to check whether they agree, then add them to the list on the board.

Q Can we be sure that these properties apply to any rectangle?

Ask children to justify their answers. Discuss results and confirm those that are general properties.

• Compare the list of the properties of a rectangle with those of a square.

Q What properties do rectangles and squares share? Which extra properties hold just for a square?

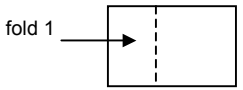
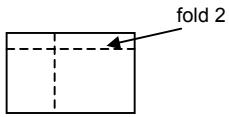
Establish that the properties of rectangles apply to squares, but that squares have additional properties. Also explain that a square is a regular rectangle, rectangles which are not squares can be called oblongs.

By the end of the lesson the children should be able to:

- **Recognise properties of rectangles;**
- **Understand that parallel lines are the same distance apart;**
- **Understand that perpendicular lines are at right angles to each other;**
- **Recognise and identify parallel and perpendicular lines in the environment and in rectangles;**
- **Make investments and general statements.**

(Refer to supplement of examples, section 6, pages 81, 103, 109.)

Planning sheet	Day Two (page 2 of 2)	Unit 9 *Shape, space and measures*	Term: *Summer*	Year Group: *5*

Oral and Mental		Main Teaching		Plenary
Objectives and vocabulary	**Teaching Activities**	**Objectives and vocabulary**	**Teaching Activities**	**Teaching Activities/Focus Questions**
			• Discuss the second pair of lines on OHP 9.2. **Q** What can you tell me about this pair of lines? Collect suggestions. Agree that the lines are not perpendicular but may bisect each other. Use a ruler to confirm they do. **Q** If we joined up the ends of the lines, what shape would we make? Collect suggestions and discuss whether it could be a rectangle. Write this on the board. Say it is a general statement to be tested. Give each child a sheet of A4 paper. Ask them to make a fold that is parallel to the short side but not in the middle of the page, then unfold the sheet.  **Q** How many rectangles can you see? Establish that there are three rectangles: the original sheet plus two. Ask the children to make a fold that is parallel to the long side but not on the middle of the page, then unfold the sheet.  **Q** How many rectangles can you see now? Establish that there are nine rectangles. Ask the children to use a ruler to draw over the two fold lines. They are to use the four small rectangles they have made and in each rectangle draw the two diagonals of these rectangles. They are to work in groups of four and use the rectangles to explore the properties of rectangles. • Say that each child is to explore the four rectangles and record all the properties which they know or can discover by measuring. Ask them to check properties with other children in their group and to add any properties to their list if these are found to be correct and to remove any they decide are incorrect.	

Planning sheet	**Day Three**	**Unit 9 *Shape, space and measures***	**Term: *Summer***	**Year Group: *5***

Oral and Mental

Objectives and vocabulary	Teaching Activities
Express simple fractions as decimals. VOCABULARY fraction decimal percentages equivalent	• On the board draw the number line:  Identify the point halfway between 2 and 3. **Q** What number is represented by this point? Confirm it is $2^{1}/_{2}$ or 2.5. Remind children that 2.5 also represents $2^{5}/_{10}$. **Q** Where on the number line are $1^{5}/_{10}$, $3^{1}/_{2}$, 5.5? At each point ask the children to give the equivalents to $1^{5}/_{10}$, i.e. 1.5, $1^{1}/_{2}$, etc. • Identify the point one quarter of the way between 2 and 3. **Q** What number is represented by this point? Confirm it is $2^{1}/_{4}$ or 2.25. Remind the children that 2.25 also represents $2^{25}/_{100}$. Establish that this number has two decimal places and the second decimal place represents hundredths. Ask children to identify points on the line representing $3^{1}/_{4}$, 5.25, $7^{25}/_{100}$. **Q** How else can we express these numbers? Ensure the children can identify the equivalences $3^{1}/_{4}$, 3.25, $3^{25}/_{100}$, etc. • Repeat using numbers with three quarters, e.g. $2^{3}/_{4}$ and, the equivalents, e.g. 2.75 and $2^{75}/_{100}$. • Identify a point on the line and give the number represented as a number in hundredths, e.g. $4^{63}/_{100}$. **Q** How do we represent this number as a decimal? Collect answers and agree it is 4.63. Repeat with other numbers in fractional form for the children to represent as decimals.

Main Teaching

Objectives and vocabulary	Teaching Activities
Recognise properties of rectangles. Measure and draw lines to the nearest millimetre. Use a protractor to measure acute and obtuse angles to the nearest 5^{o}. Investigate a general statement by testing examples. VOCABULARY diagonal bisect quadrilateral polygon vertex vertices RESOURCES Activity sheet 9.1 Activity sheet 9.2 Rulers Protractors	• Remind the children that they explored properties of rectangles on the previous day. **Q** What do we know about the diagonals of a rectangle? Collect answers and correct any misunderstandings. Establish that the diagonals bisect each other. **Q** Do the diagonals of a square bisect each other? Agree that they do, and at right angles. **Q** Do the diagonals of all quadrilaterals bisect each other? Collect suggestions and pose as an agreed general statement. **Q** How can we check if our statement might be true or not? Establish the need to test different examples. • Give out Activity sheet 9.1. Remind the children how to use a protractor to measure an angle to the nearest 5^{o}, and a ruler to measure length to the nearest millimetre. Ask them to measure the sides of each quadrilateral with a ruler, and the size of each angle with a protractor. Say they are to record the information on the sheet and use this to decide if any of the shapes has equal sides or angles and if any could be a square or rectangle. Take feedback and establish that none is a square or rectangle. Ask them whether there are any parallel or perpendicular sides. Discuss answers and the children's reasons. • Ask the children to draw carefully the diagonals in each quadrilateral on the sheet and measure the lengths from the vertex to the points where the diagonals cross, to determine whether they bisect each other.

Plenary

Teaching Activities/Focus Questions

• Write on the board: The diagonals of all quadrilaterals bisect each other.

Q Is this statement true? How do you know?

Agree that the statement is untrue.

Q Are there any quadrilaterals for which the statement is true?

Agree that for squares, rectangles and any examples which children found to satisfy the statement, that the diagonals bisect each other.

• Write on the board: The diagonals of any quadrilateral divide it into four triangles.

Q Is this statement true? How do you know?

Agree that the examples used in the main activity satisfy the statement, and that to show it is untrue, a counter example has to be found.

HOMEWORK – Ask the children to draw all the diagonals on each of the polygons on Activity sheet 9.2. Remind them that diagonals join non-adjacent vertices. Explain that two diagonals are drawn to help them. They should record the number of diagonals for each shape in the box provided.

By the end of the lesson the children should be able to:

- **Measure and draw lines to the nearest millimetre;**
- **Test a general statement by exploring appropriate examples;**
- **Recognise properties of rectangles;**
- **Use a protractor to measure angles to the nearest 5^{o}.**

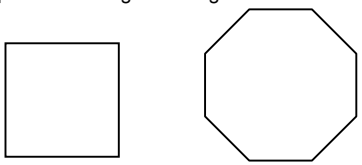
(Refer to supplement of examples, section 6, pages 81, 95, 103 and 111.)

Planning sheet	Day Four (page 1 of 2)	Unit 9 *Shape, space and measures*	Term: *Summer*	Year Group: *5*

Oral and Mental

Objectives and vocabulary	Teaching Activities
Express simple percentages as fractions and decimals, and find simple percentages of small quantities. VOCABULARY percentage fraction equivalent	• Remind the children that in the first lesson they converted fractions in hundredths to decimals. **Q** What is $^{4}/_{100}$ as a decimal? Establish it is 0.04. Repeat with other decimals. Remind the children that fractions and decimals can also be expressed as percentages. **Q** What does per cent mean? Confirm it means per 100. **Q** What fraction is equivalent to 50% Establish that 50% = $^{50}/_{100}$ = 0.5 = $^{1}/_{2}$. Repeat with other simple percentages, e.g. 25%, 5%, 75%, etc. **Q** What is 1% as a fraction and a decimal? Establish that 1% is $^{1}/_{100}$ or 0.01. Use this to convert 2%, 3%, etc and identify the pattern. Ensure that the children recognise that 10% is $^{10}/_{100}$ = 0.10 = 0.1 = $^{1}/_{10}$, etc. • Say that you now want the children to find percentages of small quantities of money. **Q** What is 50% of £1.00? Of £4.00? Of £7.00? How did you work it out? Establish that 50% can be calculated by halving as 50% can be represented as $^{1}/_{2}$. **Q** What is 25% of £8.00? Establish that as 25% represents $^{1}/_{4}$, 25% can be found by quartering or halving twice. **Q** What is 10% of £20.00? Establish that 10% = $^{1}/_{10}$ so we divide by 10.

Main Teaching

Objectives and vocabulary	Teaching Activities
Understand and calculate perimeters of rectangles and regular polygons. Explain a generalised relationship in words. VOCABULARY rectangle regular polygon perimeter formula RESOURCES Activity sheet 9.2 Large sheet of paper for display	• Discuss the homework from day 3. Agree the numbers of diagonals for the shapes are 5, 9, 14, 20. **Q** Can we see any pattern in the number of diagonals? Discuss suggestions; agree the gaps in the numbers 5, 9, 14, 20 increase by 1 each time. Draw an irregular hexagon on the board and point to a vertex. **Q** How many diagonals will join up at this vertex? Establish it is three. Repeat the question for each vertex. **Q** If there are three diagonals at each vertex, and there are six vertices, how many diagonals is that? Agree it suggests 3 diagonals x 6 vertices, i.e. 18 diagonals. Remind the children the answer was 9. **Q** Why is the answer only 9? Establish that each diagonal joins two vertices so we have counted them twice and must divide by 2. Use this argument for the pentagon, heptagon and octagon to confirm the answers. Say that you want the children to see if they can tell you the number of diagonals in a decagon, a 10-sided polygon, for next lesson. Remind them they don't have to draw all the diagonals but use the same argument to reason out the answer. • Refer back to Activity sheet 9.2 that the children used for homework. **Q** How could we find the perimeters of these polygons? Establish the children remember that the perimeter is the total distance around the edges of the shape and if we know the lengths of the sides we could add them together. **Q** What properties does a regular polygon have? Agree that all its angles are equal, and all its sides are equal. On the board draw a square and a regular octagon:  Say that the side of the square is 6 cm and the side of the octagon is 4 cm. **Q** Which shape has the bigger perimeter? Ask the children to work in pairs to answer the question and explain their answers.

Plenary

Teaching Activities/Focus Questions
• On the board draw a rectangle. **Q** Is this a regular polygon? Agree it is not as the sides are not all equal. Say the length of the rectangle is 5 cm and the breadth is 3 cm. **Q** How would you find the perimeter of this rectangle? Collect answers and agree it is 3 + 5 + 3 + 5. **Q** Can we express this another way? Establish that: perimeter of rectangle = double length + double breadth = double (length + breadth) = (length + breadth) x 2 Set questions for pairs of children to find the perimeters of the rectangle using one of the general relationships. • Collect answers and discuss the methods the children preferred to use. • Remind the children that they have found two general relationships. Record on a large sheet of paper: Perimeter of regular polygon = length of side x number of sides Perimeter of rectangle = (length + breadth) x 2. **Q** Can we express these in shorthand?

Planning sheet	Day Four (page 2 of 2)	Unit 9 *Shape, space and measures*	Term: *Summer*	Year Group: *5*

Oral and Mental

Objectives and vocabulary	Teaching Activities
	Q What is 1% of £5.00? Establish that this time we divide by 100. • Ask questions involving finding simple percentages of whole pounds for the children to answer. Each time encourage the children to use the simplest methods of calculation and explain their methods. Help the children to build on the landmarks 50%, 25%, 10%, 1% to calculate other percentages.

Main Teaching

Objectives and vocabulary	Teaching Activities
	• Collect answers. Establish that the perimeter of the square is 24 cm and of the octagon is 32 cm so the octagon's perimeter is bigger. **Q** If the square had sides of 10 cm what would be the side of the octagon if the perimeters were equal? Children work in pairs to find the answer and give reasons. • Discuss answers. Establish that the perimeter of the square is 4 x 10 = 40 cm. The perimeter of the regular octagon is 8 times the length of the side so the side must be 5 cm if the perimeter is 40 cm. • Repeat asking similar questions about the perimeters of two regular polygons, e.g. with 3 and 6 sides, 5 and 10 sides. **Q** Can we make a general statement about how to find the perimeter of a regular polygon if we know the length of the sides? Establish that: perimeter = length of one side x number of sides. **Q** How could we find the length of a side if we know the perimeter of a regular polygon? Establish that: length of side = perimeter ÷ number of sides. Ask the children questions so they can use these two general relationships to find the perimeters and sides of regular polygons.

Plenary

Teaching Activities/Focus Questions

Collect suggestions. On the sheet record the shortest suggestions and lead the children to the formulae.

Perimeter of regular polygon = L x N

Perimeter of rectangle = (l + b) x 2

Ensure the children understand the use of the letters by setting them questions. Display the sheet on the wall.

By the end of the lesson the children should be able to:

- **Express the formula for the perimeter of a rectangle in words and in letters.**
- **Work out and express in words a formula for finding the perimeter of a regular polygon.**

(Refer to supplement of examples, section 6, pages 95 and 97.)

Planning sheet	Day Five (page 1 of 2)	Unit 9 *Shape, space and measures*	Term: *Summer*	Year Group: *5*

Oral and Mental

Objectives and vocabulary	Teaching Activities
Apply knowledge of multiplication facts to 10 x 10 and related division facts in the context of perimeter. VOCABULARY perimeter	• On the board draw a square: □ **Q** If the side of the square is 8 cm, how long is the perimeter? Collect answers on whiteboards and establish the calculation was 8 x 4. **Q** If the perimeter of the square is 24 cm, how long is each side? Collect answers and establish the calculation was 24 ÷ 4. Repeat with other dimensions. • On the board draw another square: □ □. Explain that these are identical squares. **Q** If the sides are 6 cm, what is the total perimeter of the two squares? Collect answers and establish the calculation was 6 x 8. **Q** If the perimeter of the two squares totals 32 cm, how long are the sides of each square? Collect answers and establish the calculation was 32 ÷ 8. Repeat with other dimensions. • Combine the two squares to make a rectangle: □□ **Q** If the rectangle's shorter side is 5 cm, what is its perimeter? Collect answers and establish the calculation was 5 x 6. **Q** If the perimeter of the rectangle is 42 cm, what are the lengths of the sides? Collect answers and establish that to find the short side the calculation is 42 ÷ 6. Repeat with other dimensions.

Main Teaching

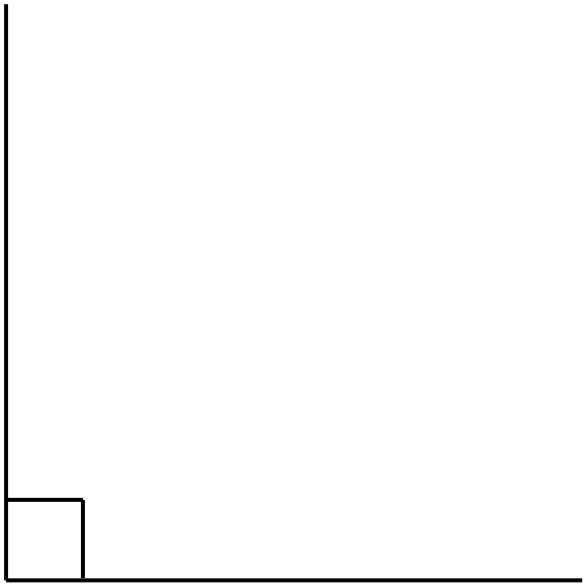
Objectives and vocabulary	Teaching Activities
Recognise positions and directions: read and plot co-ordinates in the first quadrant. Use understanding of calculating perimeters of rectangles. VOCABULARY co-ordinates perimeter properties right-hand left-hand vertex, corner, etc. RESOURCES OHT 9.3 Whiteboards Activity sheet 9.3 Self-assessment sheet 9.1	• Show OHT 9.3. Remind the children that each point can be represented by a co-ordinate, a pair of numbers in brackets. Identify a point on the grid, e.g. (4, 7). **Q** What is the co-ordinate of this point? Collect answers and ensure the children remember the first number is the distance along and the second number the distance up. Repeat with other points and give co-ordinates for the children to identify the points. • Write on the board (6, 10). Say this represents the bottom left-hand vertex of a square with sides of 3 units. **Q** What are the co-ordinates of the other three vertices? The children work in pairs and display their answers on whiteboards. • Discuss the children's answers and reasons. Confirm the answers and ask other questions such as: **Q** What if the point (6, 10) had been the top right-hand vertex of the square? Discuss these other cases. **Q** What is the perimeter of the square? Does it matter if (6, 10) is where the bottom left-hand or top right-hand vertex sits? Agree the perimeter is 3 x 4 = 12 units and the position does not matter. • Give out Activity sheet 9.3. Say that this represents the same grid as that on the OHT. Say that this time the bottom left-hand corner of the rectangle is the point (1, 2), and the perimeter of the rectangle is 10 cm. Record these two properties on the board. **Q** What rectangles can you draw on the grid that have these two properties? Set the children to work in small groups to find as many rectangles as they can. • Collect and discuss answers. Ask different groups for the co-ordinate of their rectangles, and draw examples on the OHT to check answers. Ask children to explain their methods. • Say that this time the top right-hand corner of the rectangle is the point (10, 5), and the co-ordinates of the bottom left-hand corner are (7, 3). **Q** What is the perimeter of this rectangle? The children work in pairs to find the perimeter and write the two other co-ordinates and the perimeter on their whiteboards.

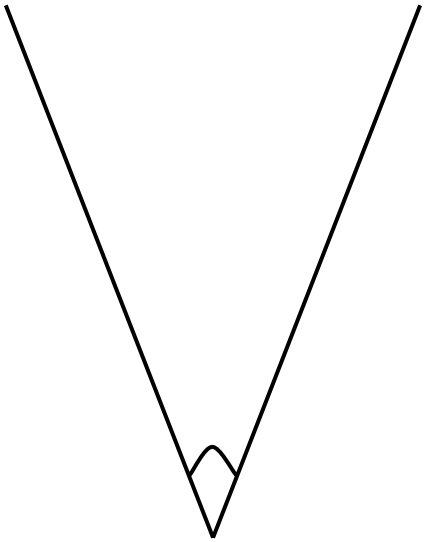
Plenary

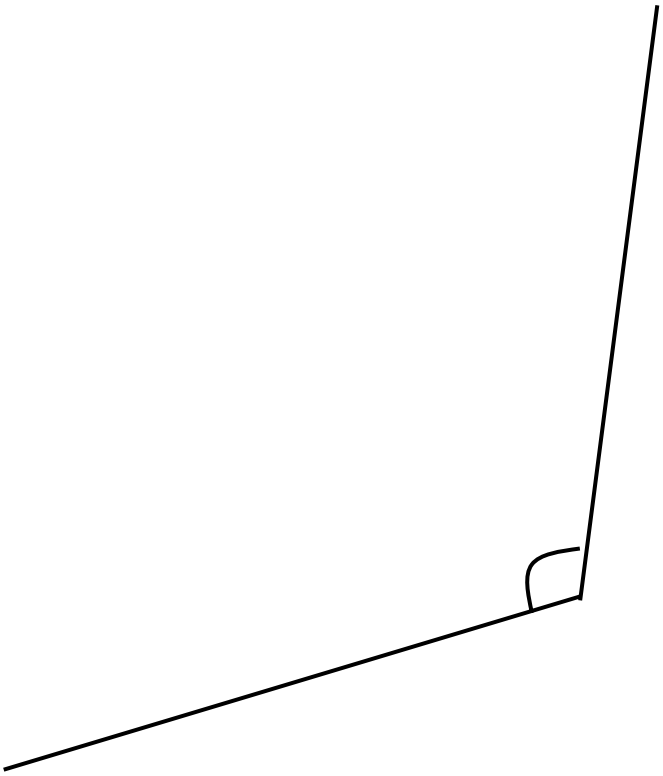
Teaching Activities/Focus Questions
• Ask if any children were able to work out the number of diagonals in a decagon. Establish that the answer is 7 diagonals at each vertex (7 x 10 = 70) divided by 2 (70 ÷ 2 = 35). Repeat the argument used on day 4. • Remind the children of the work covered during the week and the formulae they developed to find the perimeters of regular polygons and rectangles. ASSESSMENT – • Give out Self-assessment sheet 9.1. Ask the children to complete the second and third cloud questions, and indicate whether they needed help or not. Ask them to think about the mathematics they have been doing during the week and record on the sheet which bit of mathematics they want to improve upon. **By the end of the lesson the children should be able to:** • **Read and plot points using co-ordinates in the first quadrant, using the convention that co-ordinates are recorded in ordered pairs with the value on the x-axis first;** • **Use a formula for finding the perimeter of a rectangle.** (Refer to supplement of examples, section 6, pages 97 and 109.)

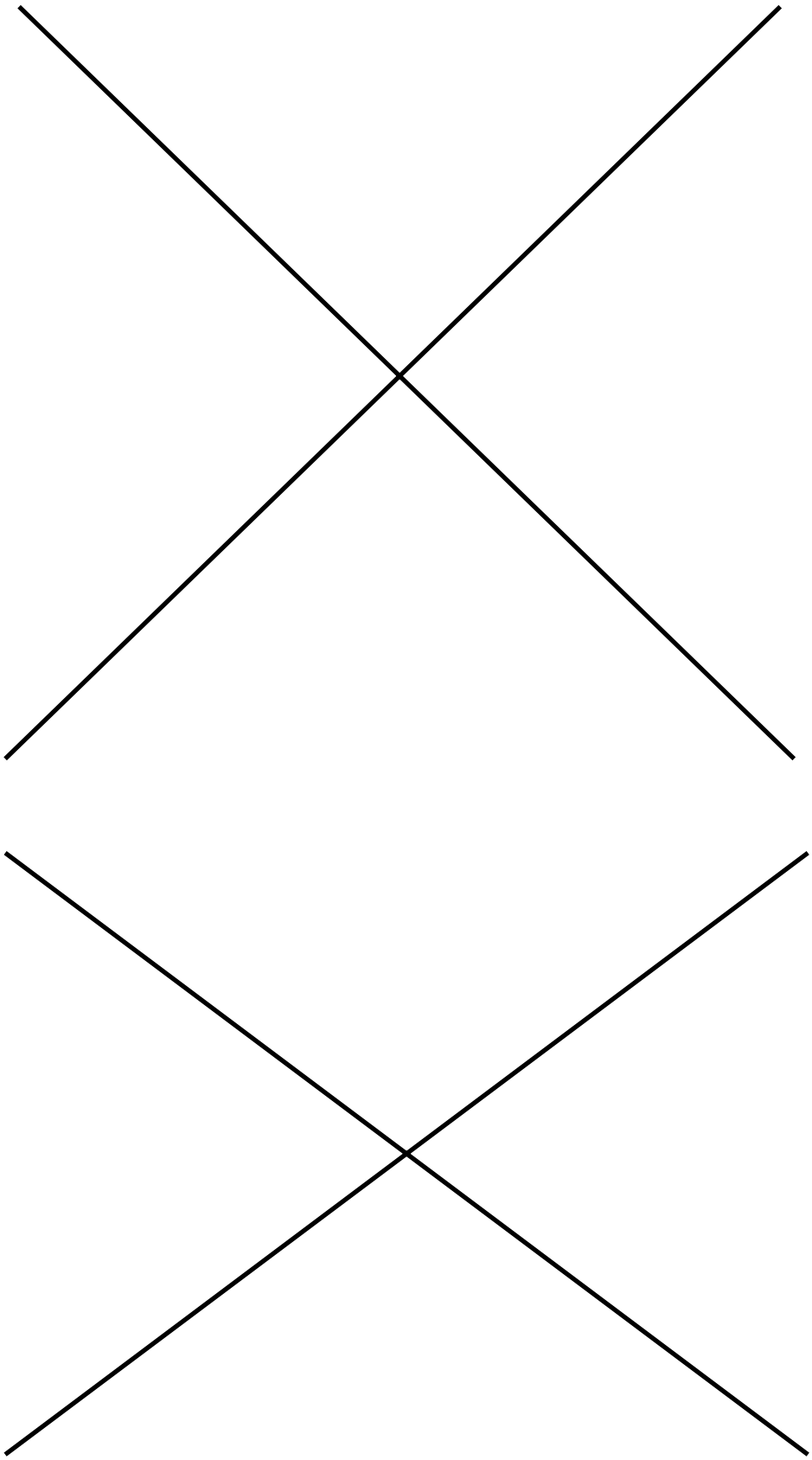
Planning sheet	Day Five (page 2 of 2)	Unit 9 *Shape, space and measures*	Term: *Summer*	Year Group: *5*

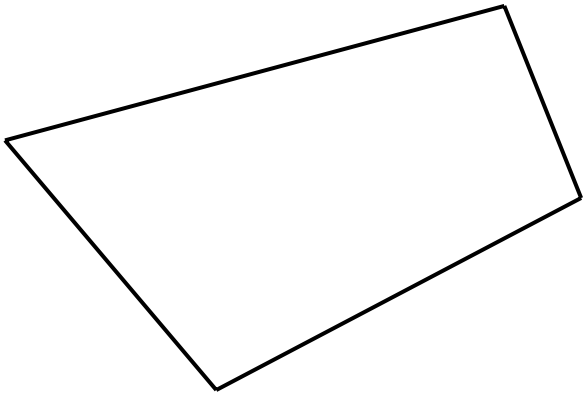
Oral and Mental		Main Teaching		Plenary
Objectives and vocabulary	**Teaching Activities**	**Objectives and vocabulary**	**Teaching Activities**	**Teaching Activities/Focus Questions**
	• On the board draw another square. Say that the three squares are identical. □□ □ **Q** If the perimeter of the rectangle and the square together total 60 cm what are the dimensions of the square and rectangle? Collect answers and discuss the children's strategies. Ask other questions involving the perimeters of the two shapes. • Combine the rectangle and square to make one larger rectangle. □□□ **Q** What is the relationship between the sides of this rectangle? Agree one side is 3 times the length of the other. Ask questions about its perimeter and lengths of sides.		• Say that this time, the rectangle has its bottom right-hand corner at (6, 4) and the long side is twice as long as the short side. The short side is horizontal. Ask the children to draw on the grid rectangles that meet these properties. **Q** What are the perimeters of these rectangles? Collect answers. Record on a table the co-ordinates of the bottom left-hand vertex and the perimeter. Bottom LH Vertex | Perimeter (5, 4) | 6 (4, 4) | 12 (3, 4) | 18 Ask children to describe the pattern in the table. Establish that the perimeters form the 6 times table. As the short side is increased by 1 the perimeter is increased by 6, because the short side fits into the perimeter 6 times. Repeat with the rectangles in other positions on the grid and the sides in ratio 1 to 3. Collect and discuss answers and patterns.	

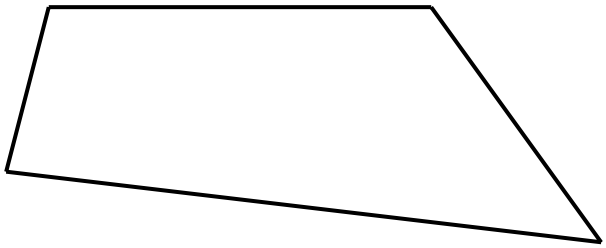


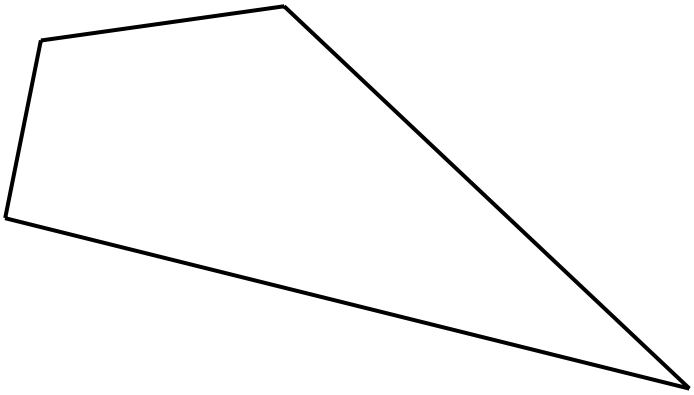


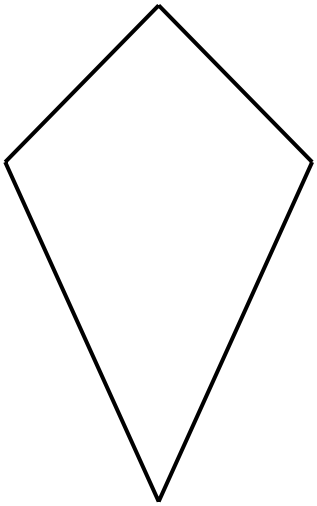


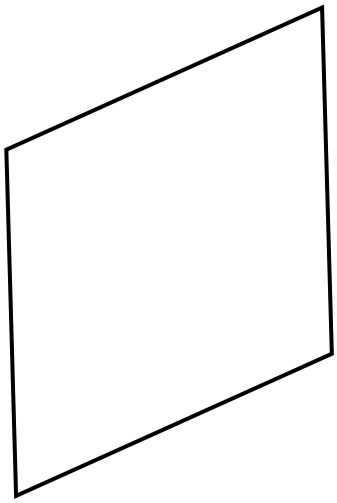


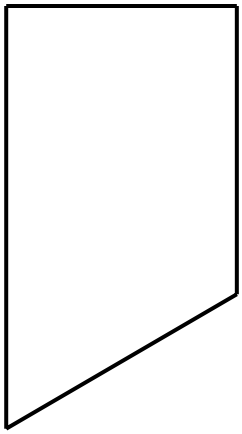






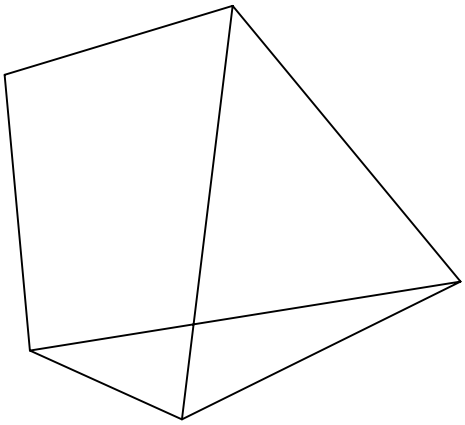




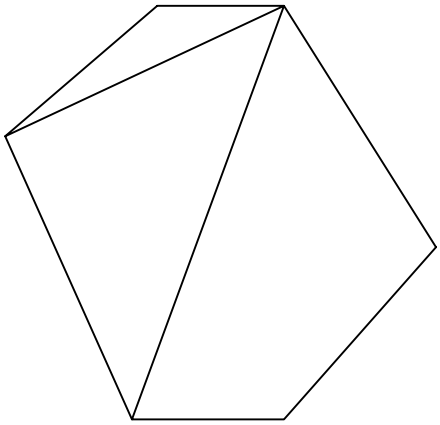


Join the vertices of each shape to make diagonals (two diagonals are already drawn in each polygon to help you).

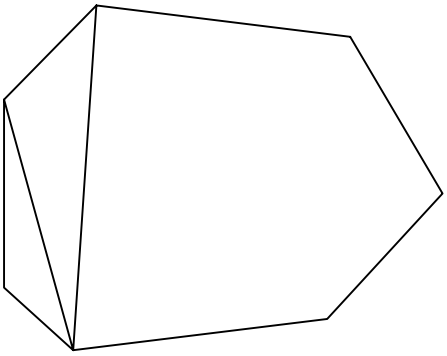
Write the number of diagonals in the box for each shape.



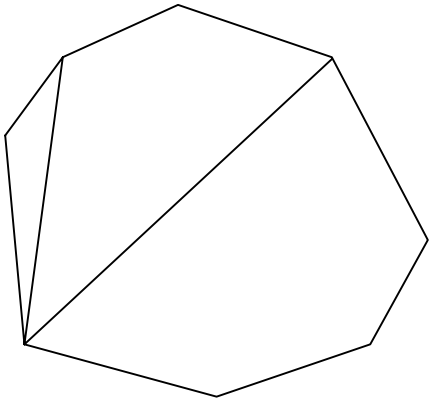
A pentagon has ☐ diagonals.



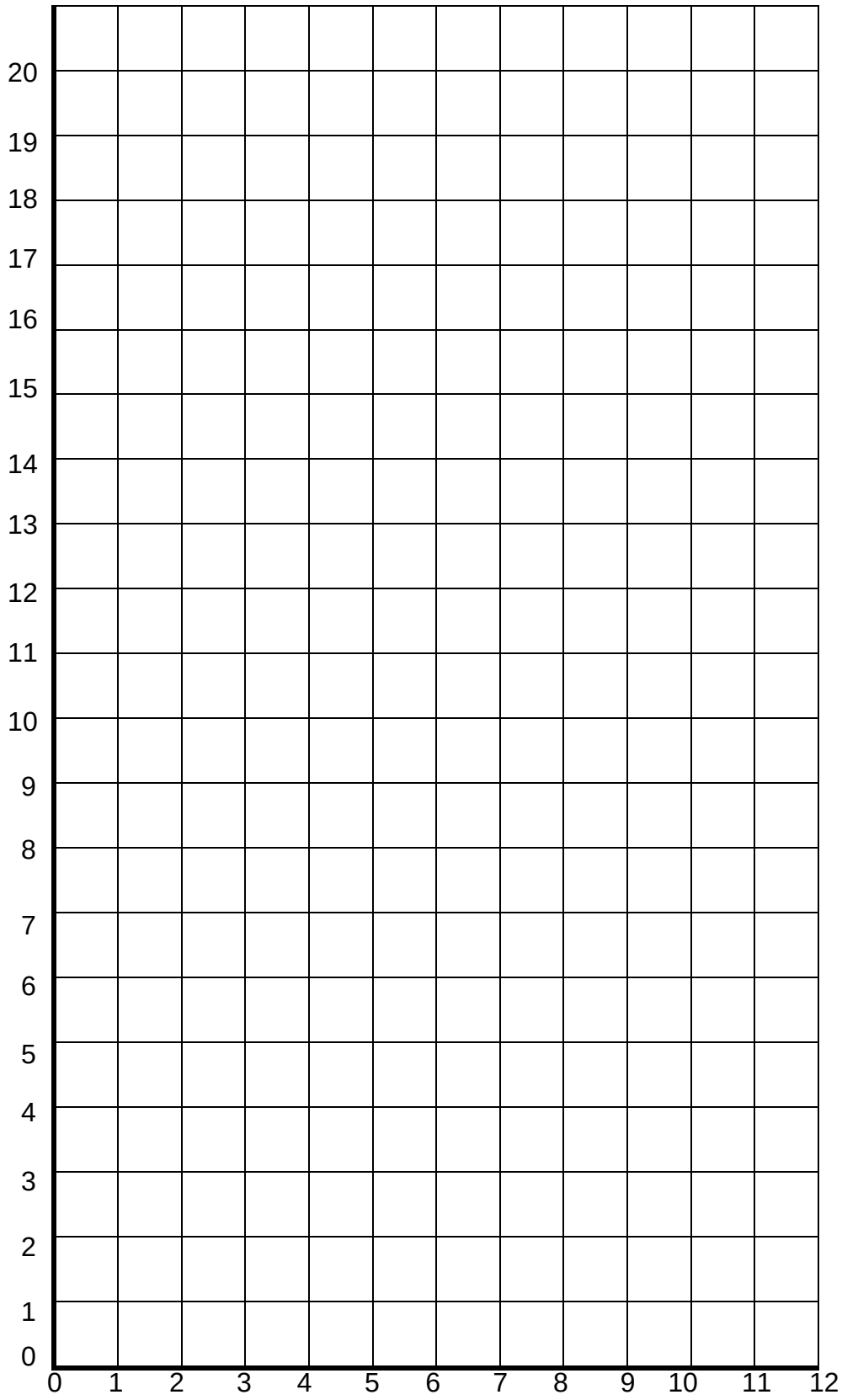
A hexagon has ☐ diagonals.



A heptagon has ☐ diagonals.



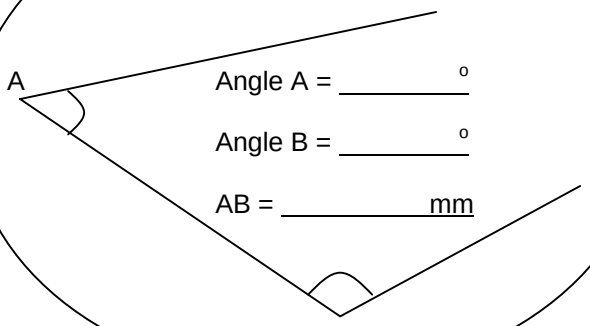
An octagon has ☐ diagonals.


20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
0 1 2 3 4 5 6 7 8 9 10 11 12

My Mathematics

Use a protractor to measure the angles at A and B. Use a ruler to measure the length of the line from A to B.

My measurements



Angle A = _____ o

Angle B = _____ o

AB = _____ mm

I did this:
on my own ☐
with some help ☐

What is the perimeter of the regular heptagon?
The length of the rectangle is four times the breadth. Its perimeter is 80 cm, what is the length and breadth?

My calculations
Regular heptagon has sides of 9 cm

Perimeter = _____ cm

Length = _____ cm

Breadth = _____ cm

I did this:
on my own ☐
with some help ☐

Write down four statements about the properties of a rectangle.

My statements

1. _____
2. _____
3. _____
4. _____

I did this:
on my own ☐
with some help ☐

Name: _____

I want to get better at _____

_____