National Numeracy Strategy

# Unit 5b
# Angle

**Year 5**
**Spring 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

- 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 $5^o$.
- Calculate angles in a straight line.

**Supplement of Examples:**

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## Link Objectives

### Year 4

- Make and measure clockwise and anti-clockwise turns: for example, from SW to N, or from 4 to 10 on the clock face.
- Begin to know that angles are measured in degrees and that: one whole turn is $360^o$ or 4 right angles; a quarter turn is $90^o$ or one right angle; half a right angle is $45^o$.
- Start to order a set of angles less than $180^o$.

### Year 6

- Recognise and estimate angles.
- **Use a protractor to measure** and draw **acute and obtuse angles to the nearest degree.**
  Check that the sum of the angles in a triangle is $180^o$: for example by measuring or paper folding.
  Calculate angles in a triangle or around a point.

(Key objectives in bold)

**Resources needed to teach this unit:**

- OHT 5b.1
- OHT 5b.2
- OHT 5b.3
- Activity sheet 5b.1
- Three strips of card joined at one end by a split pin
- Four strips of card joined at one end by a split pin
- Regular and irregular 2-D shapes
- Three large triangles, one right-angled, one isosceles, one scalene with an obtuse angle
- Rulers
- Pencils
- OHP calculator
- OHP protractor
- Protractors
- Whiteboards

department for education and skills

| Planning sheet | Day One (page 1 of 2) | Unit 5b *Angle* | Term: *Spring* | Year Group: *5* |
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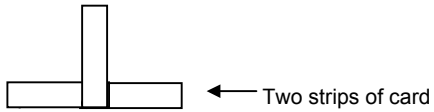
## Oral and Mental

| Objectives and Vocabulary | Teaching Activities |
|---|---|
| Recall the 9 times table and use it to derive associated number facts.<br><br>VOCABULARY<br>multiple | • On the board write: 9. Get the class to recite the 9 times table, saying each number fact twice. Repeat saying each number fact only once.<br><br>• On the board write: 9 90.<br><br>**Q** Can we use our knowledge of the 9 times table to say the 90 times table?<br><br>Ask one half of the class to recite the 90 times table while the other half listens. Reverse their roles. Then have the whole class recite the table.<br><br>• On the board write: 9 90 900.<br><br>Tell the children that by reciting the 9 and 90 times tables they have listed the multiples of 9 to 90 and the multiples of 90 to 900.<br><br>• On the board draw a circle with numbers 1 to 9 equally spaced inside the circumference. Tell children to recite the 9 times table. As they do record the multiples of 9 on the outside of the circle. |

## Main Teaching

| Objectives and Vocabulary | Teaching Activities |
|---|---|
| Understand and use angle measure in degrees.<br><br>Identify and estimate acute and obtuse angles.<br><br>Calculate angles in a straight line.<br><br>VOCABULARY<br>angle<br>degree<br>right angle<br>acute<br>obtuse<br><br>RESOURCES<br>Regular and irregular 2-D shapes<br>Three strips of card joined at one end by a split pin | • Remind children that an angle is the amount of turn.<br><br>**Q** What units do we measure angles in?<br><br>Establish the units are degrees.<br><br>**Q** How many degrees in a right angle?<br><br>Agree there are 90 degrees in a right angle. Record on the board:<br><br>1 right angle = $90^{o}$ (degrees).<br><br>• Hold up a sheet of A4 paper; point to a corner.<br><br>**Q** What is the size of this angle?<br><br>Establish it is a right angle or $90^{o}$.<br><br>**Q** What is the name of an angle smaller than $90^{o}$?<br><br>Remind children it is an acute angle. Record on the board: Angles < $90^{o}$ are called acute angles.<br><br>• Take three strips of card, joined at the ends by a split pin and attach to the board to form a right angle:<br><br>  <br><br><br>Slowly rotate one of the two horizontal strips anticlockwise to sit on top of the vertical strip. Remind the children the strip has turned through 1 right angle or $90^{o}$.<br><br>• Return the strip to the horizontal position and rotate again but stopping at various positions and asking:<br><br>**Q** What size is this angle?<br><br>Remind children they are estimating. Point to the complementary angle and ask:<br><br>**Q** What size must this angle be? Why?<br><br>Ensure children recognise and check that the two angles sum to $90^{o}$. Repeat varying the angles.<br><br>• Rotate the angle past the vertical strip. |

## Plenary

**Teaching Activities/Focus questions**

• Hold up a 2D shape. Point to one of the angles.

**Q** Is it an acute or obtuse angle?

Establish which and ask:

**Q** What size is the angle?

Emphasise that while the children's answers are only estimates, they have some well established reference points, such as $90^{o}$ and $180^{o}$.

Repeat for other angles in other shapes. Include $90^{o}$ and $180^{o}$ angles. Emphasise these are called a right angle and a straight line, and are neither acute nor obtuse.

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

- **Know that an angle less than $90^{o}$ is acute; an angle between $90^{o}$ and $180^{o}$ is obtuse;**
- **Begin to identify and estimate, acute, obtuse and right angles;**
- **Identify acute, obtuse and right angles in 2D shapes;**
- **Calculate angles in a straight line.**

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

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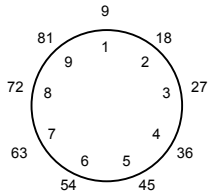
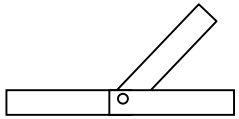
## Oral and Mental

| Objectives and Vocabulary | Teaching Activities |
|---|---|
| |  <br>Write in the circle: x9 clock.<br><br>**Q** How can we use our x9 clock to work out 40 x 9?<br><br>Collect answers. Establish that 4 x 9 = 36 and 40 x 9 = 360.<br><br>• Emphasise that the outer number divided by the inside circle number is always 9.<br><br>**Q** How can we use our x9 clock to work out 540 ÷ 9?<br><br>Collect answers. Agree that 54 ÷ 9 = 6 and 540 ÷ 9 = 60.<br><br>• Ask a range of similar questions that use the number facts on the x9 clock. |

## Main Teaching

| Objectives and Vocabulary | Teaching Activities |
|---|---|
| | **Q** What is the size of this angle?<br><br>Establish it is greater than 90°.<br><br>Rotate anticlockwise around to the horizontal, stopping and asking for the size of the angle. At the point when the two horizontal strips form a straight line stop.<br><br>**Q** What is the size of the angle now?<br><br>Establish it is 180° and that this forms a straight line made up of 2 right angles. Record on the board:<br><br>Straight line = 2 right angles = 180°.<br><br>• Now attach the two horizontal strip to the board and move the vertical strip e.g.:<br><br>  <br><br>Stop at various points and ask children to estimate the size of the two adjacent angles.<br><br>**Q** What should these two angles sum to?<br><br>Establish they should sum to 180° as they lie on a straight line.<br><br>**Q** What is the name of the two angles?<br><br>Confirm one is acute, one is obtuse. Record on the board:<br><br>90° < Angles < 180° are called obtuse angles.<br><br>• Rotate the strip to form two supplementary angles on the straight line and identify one angle.<br><br>**Q** What is the size of the other angle?<br><br>Ensure children understand and can calculate angles in a straight line. |

## Plenary

| Teaching Activities/Focus questions |
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| Planning sheet | Day Two (page 1 of 2) | Unit 5b *Angle* | Term: *Spring* | Year Group: *5* |
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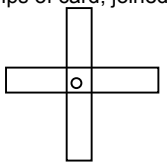
## Oral and Mental

| Objectives and Vocabulary | Teaching Activities |
|---|---|
| Say whether angles are acute, obtuse or right angles.<br><br>Estimate and order angles.<br><br>VOCABULARY<br>acute<br>obtuse<br>right angle<br><br>RESOURCES<br>Three large triangles, one right-angled, one isosceles, one scalene with an obtuse angle<br>Whiteboards | • With two rulers form an angle and show it to the class.<br><br>**Q** Is this angle acute, obtuse or right-angled?<br><br>Say that the children are to write A, O or R on their whiteboards as you count to 5 then show their answers.<br><br>• Repeat showing a mix of acute and obtuse angles in different orientations. Include a right angle and ask:<br><br>**Q** How can we check this is a right angle?<br><br>Encourage children to identify right angles in the classroom that can be used to check the angle.<br><br>• Show the right-angled triangle.<br><br>**Q** How many angles has this triangle?<br><br>Point to an angle e.g. $50^o$ and mark it with the letter A. Ask:<br><br>**Q** What is the name of this angle?<br><br>Collect answers using whiteboards. |

## Main Teaching

| Objectives and Vocabulary | Teaching Activities |
|---|---|
| Calculate angles in a straight line.<br><br>Use a protractor to measure and draw acute and obtuse angles to $5^o$.<br><br>VOCABULARY<br>whole turn<br>rotate<br>protractor<br>radius<br>regular<br>interior<br>nonagon<br>decagon<br>concave<br>polygon<br><br>RESOURCES<br>Four strips of card joined at one end by split pin<br>OHP protractor<br>OHT 5b.1<br>OHT 5b.2<br>Activity sheet 5b.1<br>Rulers<br>Pencils | • Take four strips of card, joined together by a split pin, and attach to the board to show four right angles:<br><br>  <br><br>Establish that each is a right angle. Rotate one strip through $90^o$, then $180^o$, $270^o$ and $360^o$, each time ask:<br><br>**Q** How many degrees has the strip turned?<br><br>Record on the board:<br><br>A whole turn = 4 right angles = $360^o$.<br><br>• Remind children that it is possible to turn through more than $360^o$. Turn the strip a whole turn and another $90^o$.<br><br>**Q** How many degrees has the strip turned now?<br><br>Establish it is $360^o + 90^o = 450^o$.<br><br>• Show OHT 5b.1. Explain that there are 10 points equally spaced around the circle. Rotate a pencil through one revolution about the centre.<br><br>**Q** How many degrees did the pencil turn?<br><br>Agree it was $360^o$. Rotate the pencil about the centre between two adjacent points.<br><br>**Q** How many degrees did the pencil turn this time?<br><br>Establish it was $36^o$. Rotate the pencil through different combinations of $36^o$ starting from different points, moving clockwise as well as anticlockwise. Ask:<br><br>**Q** What is this angle of turn?<br><br>Collect answers and correct any errors or mistakes.<br><br>• On the circle draw a radius. Explain that you join the centre of the large circle to the point in the middle of the small circle.<br><br>**Q** Where should I draw the other radius to make an angle of $72^o$? |

## Plenary

**Teaching Activities/Focus questions**

• Give out Activity sheet 5b.1, rulers and pencils.

Discuss the circles drawn on the sheet and identify the number of points around each circle.

• Ask children to label the points as on the OHT. Say they are to join the points up carefully with a ruler and pencil. Remind them that they are to join the points in the middle of the small circles very carefully. In one circle they join up the points in order. On the second circle they join up 1 to 3, 3 to 5 etc. as on the OHT example.

Discuss the shapes that are formed on the circles.

HOMEWORK – Ask children to copy and complete this table ready for the next lesson.

| Number of points and name of shape | Angle at centre of circle |
|---|---|
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |

Fill in the last 2 rows with the class, referring back to the work on the OHT e.g.

| | |
|---|---|
| 9 nonagon | $360^o \div 9 = 40^o$ |
| 10 decagon | $360^o \div 10 = 36^o$ |

| Planning sheet | Day Two (page 2 of 2) | Unit 5b *Angle* | Term: *Spring* | Year Group: *5* |
|---|---|---|---|---|

| Oral and Mental | | Main Teaching | | Plenary |
|---|---|---|---|---|
| **Objectives and Vocabulary** | **Teaching Activities** | **Objectives and Vocabulary** | **Teaching Activities** | **Teaching Activities/Focus questions** |
| | **Q** What size is this angle?<br><br>Take answers and agree an estimate. Write: A is about 50°.<br><br>• Repeat with other angles and triangles until all 9 angles are recorded on the board referred to by the letters A, B to I. With the children, order the angles using the letters. Stop and ask questions such as:<br><br>**Q** How can we check C is bigger than D?<br><br>Use the triangles to compare the angles.<br><br>• Write the children's estimates under the letters.<br><br>**Q** Are our estimates in order?<br><br>Select two estimates e.g. 40° and 90°. Compare the two angles on the triangles. Ask:<br><br>**Q** Does this angle look about half the size of this angle?<br><br>Review and confirm estimates. | | Collect responses and agree there are two possibilities. Choose one and draw the radius. Explain that you are going to measure the angle using a protractor to check that it is 72°. Demonstrate how to measure the angles with an OHP protractor. Emphasise that measuring angles needs care and it is useful to estimate the angle before-hand as measuring can be inaccurate. Draw, estimate and measure other angles about the centre. Invite children to demonstrate the process of measuring the angle.<br><br>• Show the top circle on OHT 5b.2. Explain there are nine points equally spaced about the circle.<br><br>**Q** What angle would the pencil rotate through from point to point?<br><br>Establish that the calculation is 360 ÷ 9 and the answer is 40°. Check this by measuring. Rotate a pencil through different multiples of 40°, each time asking:<br><br>**Q** What is this angle of turn?<br><br>• Say that you want to join up the points in order. To help you are going to label the points, from 1 to 9 clockwise. Join up the points in order and join 9 to 1 to close the shape.<br><br>**Q** How many sides has this shape?<br><br>Confirm it has nine sides and is called a nonagon. Agree all the sides are the same length, and all the angles are the same size so it is regular.<br>Using the OHP protractor measure some of the interior angles to confirm that they are 140°.<br><br>• Show the second circle on OHT 5b.2.<br><br>Label the points 1 to 9 as before. Say that this time you are going to join 1 to 3, 3 to 5 and so on until you get back to the start. Join the points and ask:<br><br>**Q** What is this shape?<br><br>Establish it has 18 straight edges, so it is called a polygon. As some of the edges turn inwards. It is called a concave polygon.<br><br>Identify the regular nonagon inside the circles with triangles on each edge.<br><br>Look at the angles at the points on the circle, ask:<br><br>**Q** What size are these angles?<br><br>Using the corner of a sheet of paper show they are greater than 90°. Agree they are about 100°. Measure angles to confirm they are about 100°.<br><br>Ask children to estimate the size of other angles. Measure them to compare against the estimates. | **By the end of the lesson children should be able to:**<br><br>• **Begin to identify, estimate and calculate acute, obtuse and right angles.**<br>• **Identify acute, obtuse and right angles in 2-D shapes.**<br>• **Estimate the size of angles and begin to use a protractor to measure angles.**<br><br>(Refer to supplement of examples, section 6, page 111.) |

| Planning sheet | Day Three (page 1 of 2) | Unit 5b *Angle* | Term: *Spring* | Year Group: *5* |
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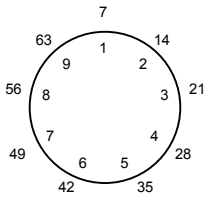
## Oral and Mental

| Objectives and Vocabulary | Teaching Activities |
|---|---|
| Recall the 7 times table and use it to derive associated number facts. | • On the board write: 7. Get the class to recite the 7 times table, saying each number fact twice. Repeat saying each number fact only once.<br><br>• On the board write: 7 70. Ask the class to use the 7 times table to recite the 70 times table.<br><br>• On the board draw a circle with 1 to 9 equally spaced inside the circumference. Ask the children to recite the 7 times table and record the multiples of 7 on the outside of the circle.<br><br>  <br><br><br>Write in the circle: x7 clock.<br><br>• Ask questions such as:<br><br>**Q** What is 40 x 7, 6 x 70, 3 x 0.7?<br><br>Collect answers and ensure children can use the x7 clock to derive the answers. |

## Main Teaching

| Objectives and Vocabulary | Teaching Activities |
|---|---|
| Calculate angles in a straight line.<br><br>Use a protractor to measure and draw acute and obtuse angles to $5^{o}$.<br><br>VOCABULARY<br>interior angle<br>regular<br>pentagon<br>hexagon<br>heptagon<br>octagon<br>polygon<br>equilateral triangle<br>square<br><br>RESOURCES<br>Protractors<br>Rulers<br>Pencils<br>OHP protractor<br>OHP calculator<br>Activity sheet 5b.1<br>OHT 5b.3 | • Discuss the homework. Go through the names of each polygon and record in a table on a large sheet of paper which can be displayed during the lesson. Collect from the children those calculations needed to find the angles at the centre of the circle, record these on the sheet, together with the answer e.g. $360^{o} \div 3 = 120^{o}$. For the heptagon, record the calculation $360^{o} \div 7$ and ask:<br><br>**Q** What is different about this calculation?<br><br>Establish the answer is not a whole number of degrees. With an OHP calculator, work out 360 ÷ 7 and discuss the displayed answer.<br><br>**Q** What is the answer rounded to the nearest whole degree?<br><br>Confirm and record the answer as $51^{o}$. Look at the table of angles and agree that as the number of points increases, the angles get smaller.<br><br>• Return to the Activity sheet 5b.1 that children had been completing in the previous lesson. Tell children to look at the regular polygon they drew using the 5 points. Using rulers and pencils, ask them to draw an angle between two points to the centre of the circle.<br><br>**Q** What did we calculate this angle to be?<br><br>Refer to the table and agree the angle should be $72^{o}$.<br><br>• Show OHT 5b.3 and draw an angle to the centre of the circle. Remind children how to measure the angle at the centre with a protractor and ask children to confirm the angle is $72^{o}$. Discuss the accuracy and ensure that they can read the angle on the protractor to the nearest $5^{o}$.<br><br>**Q** What type of angle is this angle?<br><br>Agree it is acute and close to $70^{o}$. Ask children to draw an angle at the centre of the circle for the other 3 regular polygons they have drawn on Activity sheet 5b.1. Get them to measure the angles. Collect answers and compare with those in the table.<br><br>• On OHT 5b.3 identify the 5 angles in the regular pentagon. Remind children that each of these angles is called an interior angle of the regular pentagon.<br><br>**Q** What type of angles are these angles?<br><br>Agree they are obtuse. Remind children how to measure an obtuse angle with a protractor, and ask them to measure the interior angles of the pentagon on their sheets.<br><br>**Q** What size is the angle?<br><br>Establish it is between $105^{o}$ and $110^{o}$ and record this on the board.<br><br>• Ask children to look at the interior angles of the other regular polygons they have drawn. |

## Plenary

**Teaching Activities/Focus questions**

- Draw on the board:

**Q** What size do you think these two angles are?

Take estimates.

**Q** What must the two angles sum to?

Confirm they should sum to $180^{o}$.

- Ask each child to draw two such diagrams, measure the two angles they have drawn, and note them down, checking the angles sum to $180^{o}$. They are to swap their diagrams with a partner and measure their partner's pair of angles then compare results.

- Remind children of the vocabulary they have been using during these lessons. Emphasise that measuring angles with a protractor is helped if the children first estimate the size of the angle, then have a way of checking.

| Planning sheet | Day Three (page 2 of 2) | Unit 5b *Angle* | Term: *Spring* | Year Group: *5* |
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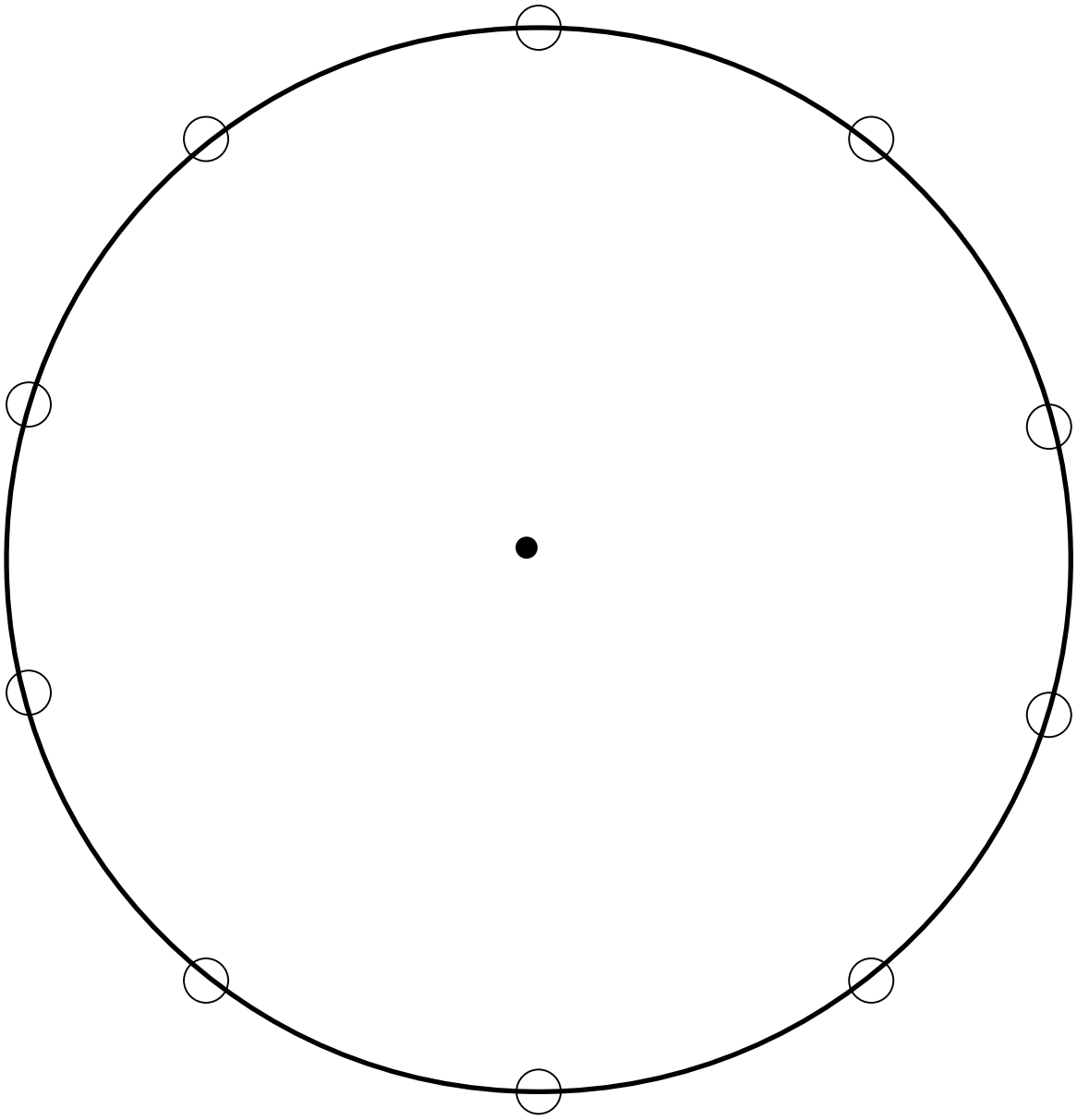
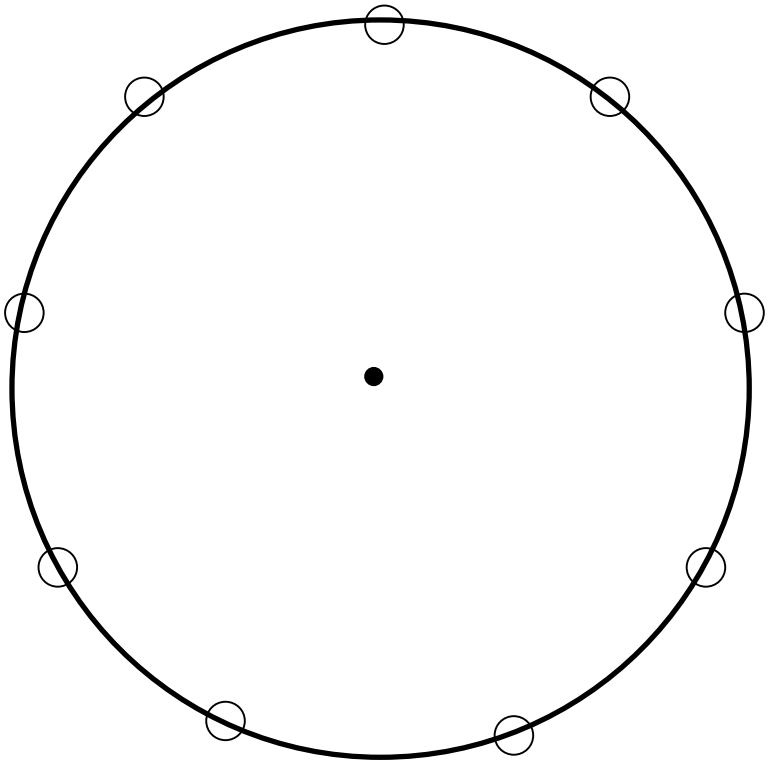
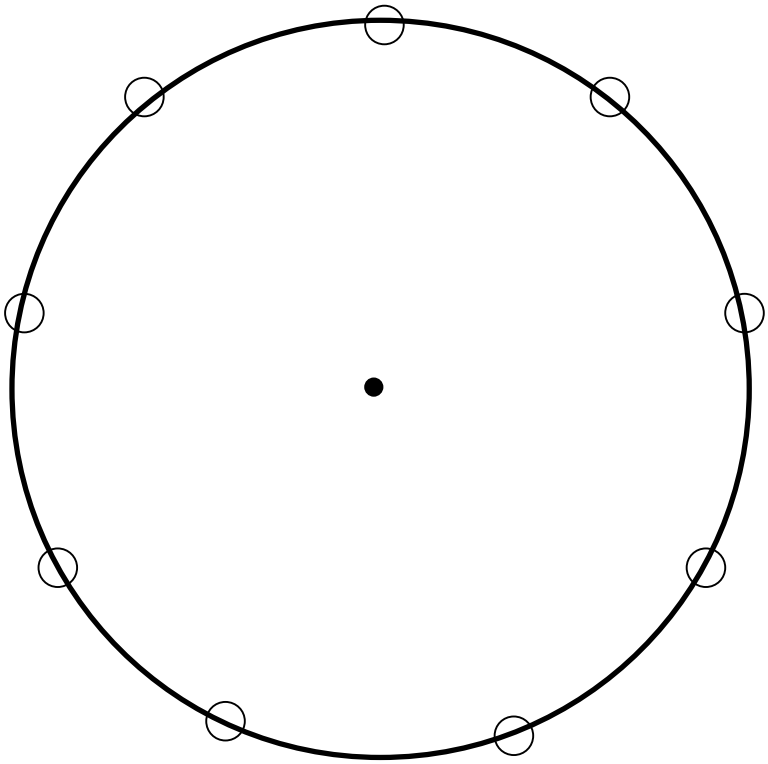
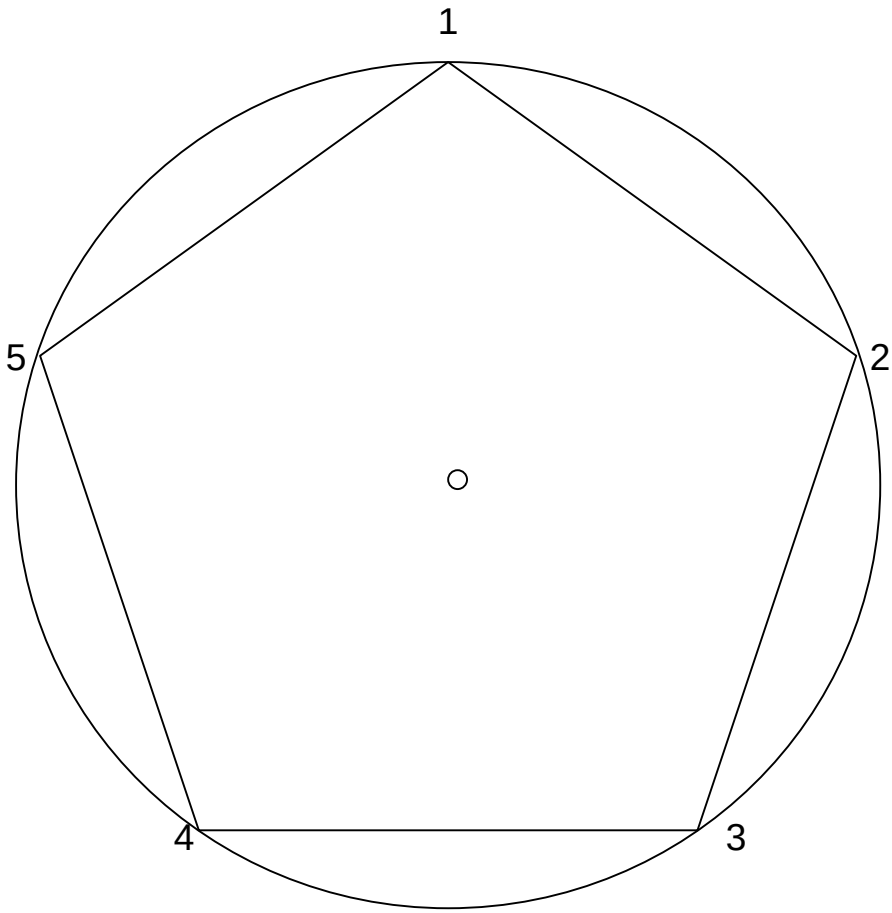
| Oral and Mental | | Main Teaching | | Plenary |
|---|---|---|---|---|
| **Objectives and Vocabulary** | **Teaching Activities** | **Objectives and Vocabulary** | **Teaching Activities** | **Teaching Activities/Focus questions** |
| | **Q** What is the outer number divided by the inner number?<br><br>Confirm it is always 7.<br><br>• Ask questions such as:<br><br>**Q** What is 280 ÷ 7, 6.3 ÷ 7, 490 ÷ 70?<br><br>Collect answers and correct any errors or misunderstandings. | | **Q** Are all these interior angles obtuse?<br><br>Agree they are and that they appear to be getting larger as the number of sides increases. Ask children to measure these interior angles, discuss their answers with a partner and record their answers. Collect and discuss answers and record them on the board.<br><br>• Show the second diagram on OHT 5b.3. Remind children that the shape looks like a regular pentagon at the centre with triangles on each edge. Trace the outside shape and say it is a concave polygon.<br><br>**Q** How many sides has this concave polygon?<br><br>Establish it has ten sides.<br><br>Ask children to measure the angles at the points on the circle. Collect and discuss answers.<br><br>• Look at each of the other three concave polygons. Ask children to measure the angles. Point out the different shapes the children have drawn e.g. the two equilateral triangles with the six points and the two squares with the eight points. | **By the end of the lesson children should be able to:**<br><br>• **Begin to identify, estimate, order, measure and calculate acute, obtuse and right angles;**<br>• **Calculate angles on a straight line.**<br><br>(Refer to supplement of examples, section 6, page 111.) |





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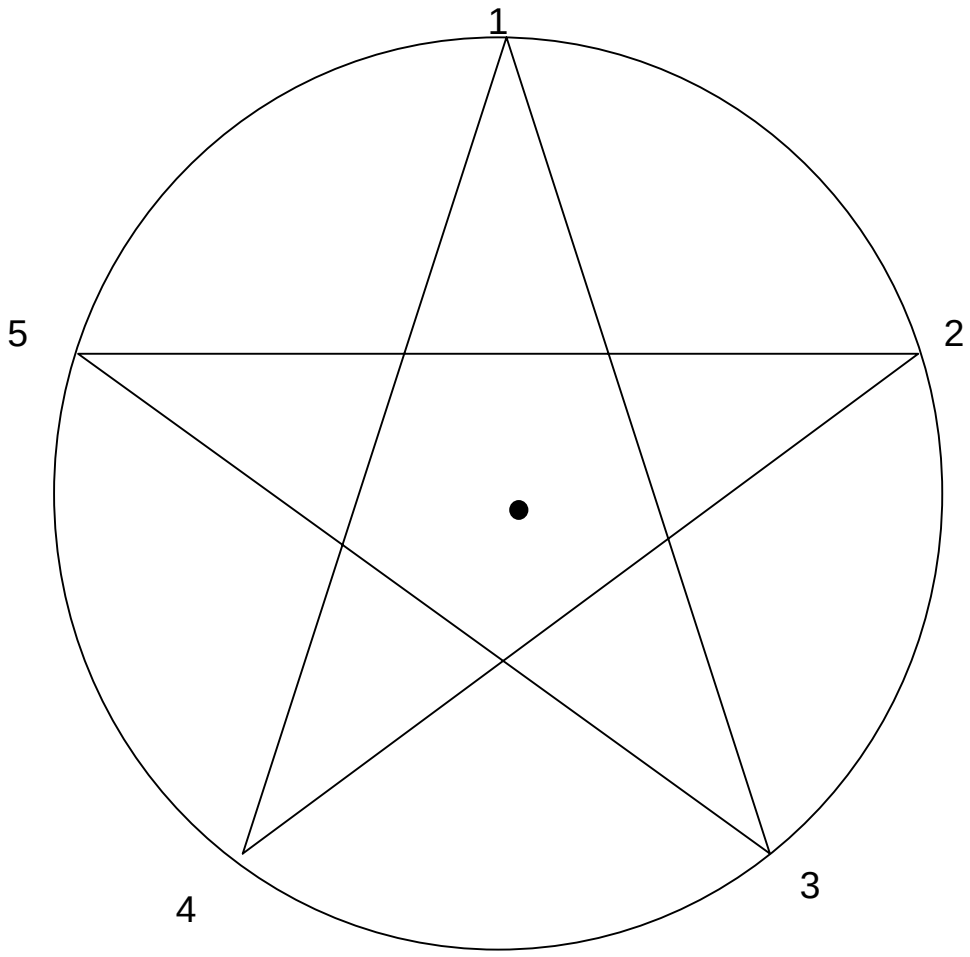
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