

# Properties of Shapes

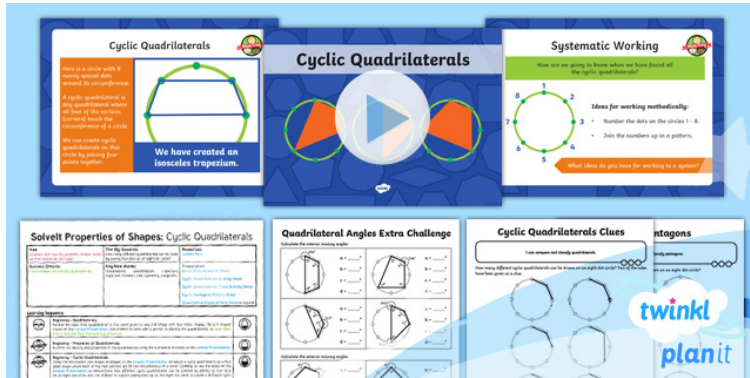
Maths | Year 6 | Area Overview

## Introduction

In this unit, the children will draw 2D shapes to exact measurements, continue to find missing angles by measuring and calculating, and also compare and classify 2D shapes based on their properties. They revisit recognising, describing, comparing and classifying a range of 3D shapes and related shape nets and then further develop their skills by drawing and constructing their own shape nets including tabs. In addition, they consolidate being able to recognise and calculate angles around a point and on a straight line and are introduced to recognising vertically opposite angles. It also includes a brand new objective that has been introduced to KS2 relating to illustrating and naming the parts of a circle and knowing the relationship between radius and diameter.

## Resources

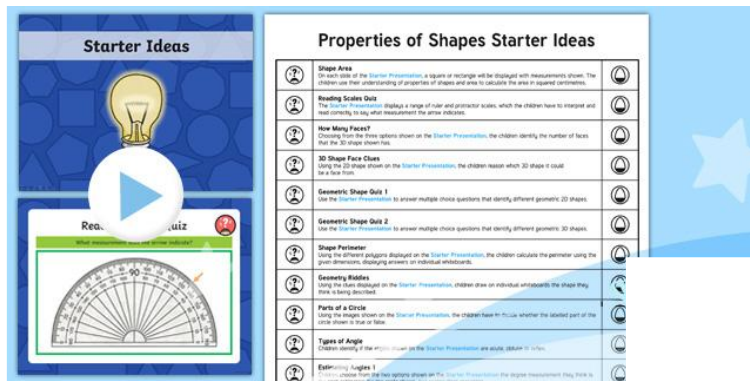
In addition to your standard maths resources, you will need protractors, pairs of compasses, scissors, and glue.



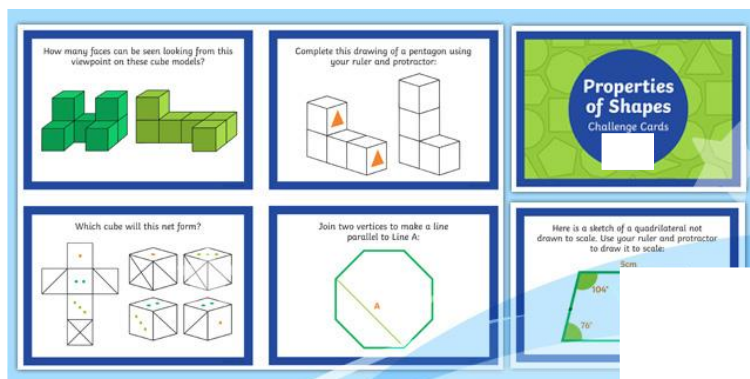
## Solved Lesson Pack: Cyclic Quadrilaterals

### How many different quadrilaterals can be drawn on an eight dot circle?

In this problem-solving lesson, children explore drawing cyclic quadrilaterals (quadrilaterals where each vertex lies on the circumference of a circle), working systematically to find how many different cyclic quadrilaterals are possible (not allowing rotations and reflections.) Supporting and extending differentiated activity sheets are included.



## Starter Ideas



## Challenge Cards

## Assessment Statements

By the end of this unit...

### ...all children should be able to:

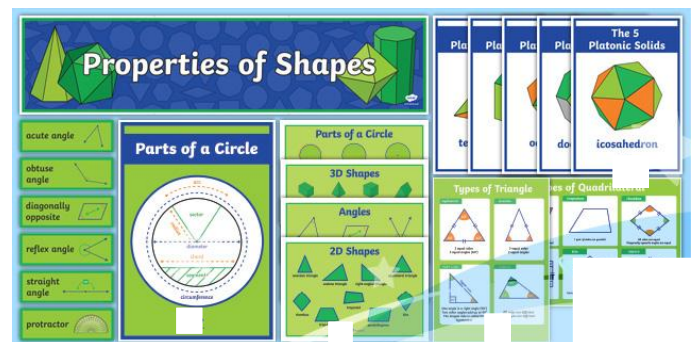
- use a ruler to draw a 2D shape to a given measurement;
- construct a 3D shape from a given shape net;
- compare and classify geometric shapes;
- recognise different types of angle;
- draw circle using a pair of compasses.

### ...most children will be able to:

- draw 2D shapes to given dimensions of length and angle;
- draw their own net of a simple 3D shape including construction tabs;
- measure and calculate unknown angles in 2D shapes and around a point or on a straight line;
- label the parts of a circle including radius and diameter.

### ...some children will be able to:

- confidently use a protractor to accurately draw 2D shapes to within 1° of the given dimension;
- draw their own net of more complex 3D shapes including construction tabs;
- use more complex reasoning to work out missing angles in 2D shapes and around a point or on a straight line;
- understand the relationship between radius and diameter using algebraic representation.



## Display Pack

## Lesson Breakdown

Draw 2D shapes using given dimensions and angles.

### 2D Shape Drawing (1): Expert 2D Shape Drawing

I can accurately draw a range of 2D shapes using the measurements given.

### 2D Shape Drawing (2): Champion 2D Shape Drawing

I can accurately draw a range of 2D shapes using the measurements given.

### 2D Shape Drawing (3): 2D Shape Reasoning

I can solve reasoning questions about drawing 2D shapes using the measurements given.

### Home Learning: 2D Shape Challenge

A set of differentiated activity sheets that consolidate the skills of drawing 2D shapes to given dimensions.

Recognise, describe and build simple 3D shapes, including making nets.

### 3D Shapes (1): All Things 3D Shape

I can identify and describe the properties of 3D shapes and their nets.

### 3D Shapes (2): Drawing Shape Nets

I can draw shape nets and use them to build 3D shapes.

### 3D Shapes (3): 3D Shape Reasoning

I can solve reasoning questions about recognising, describing and building 3D shapes.

### Home Learning: 3D Shape Challenge

A set of differentiated activity sheets that consolidate the skills of describing the properties of 3D shapes and drawing shape nets.

Compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals and regular polygons.

### Geometric Shapes (1): Triangles

I can compare, classify and find unknown angles in triangles.

### Geometric Shapes (2): Quadrilaterals

I can compare, classify and find unknown angles in quadrilaterals.

### Geometric Shapes (3): Polygons

I can compare, classify and find unknown angles in polygons.

### Geometric Shapes (4): Polygon Reasoning

I can solve reasoning questions about comparing, classifying and finding unknown angles in polygons.

### Home Learning: Polygons

A set of differentiated activity sheets that consolidate the skills of comparing and classifying geometric shapes based on their properties.

## Lesson Breakdown

Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius.

### Parts of Circles (1): Clever Circles

I can draw circles accurately using a pair of compasses and I can identify and label the parts of a circle.

### Parts of Circles (2): Circle Algebra

I know that the diameter of a circle is twice the radius and can express this as algebra.

### Parts of Circles (3): Circle Reasoning

I can solve reasoning questions about knowing that the diameter of a circle is twice the radius.

### Home Learning: Circles

A set of differentiated activity sheets that consolidate the skills of labelling and calculating the radius and diameter of circles.

Recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles.

### Angles (1): Angles at a Point

I can recognise angles where they meet at a point and find missing angles.

### Angles (2): Angles on a Straight Line

I can recognise angles on a straight line and find missing angles.

### Angles (3): Opposite Angles

I can recognise angles that are vertically opposite and find missing angles.

### Angles (4): Angle Reasoning

I can solve reasoning questions about recognising and finding missing angles where they meet at a point, are on a straight line, or are vertically opposite.

### Home Learning: Amazing Angles

A set of differentiated activity sheets that consolidate the skills of recognising and describing angles.

# Angles: Angles at a Point

<b>Aim:</b> Recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles.  I can recognise angles where they meet at a point and find missing angles.	<b>Success Criteria:</b> I know that angles at a point total $360^\circ$ . I can label angles correctly using capital letters. I can find missing angles at a point.	<b>Resources:</b> Lesson Pack
	<b>Key/New Words:</b> Degree, acute, obtuse, reflex.	<b>Preparation:</b> Cut up <a href="#">360° Angle Match Up Cards</a> - 1 per pair  <a href="#">Differentiated Missing Angles at a Point Activity Sheets</a> - 1 per child  <a href="#">Extra Challenge Activity Sheet</a> - as required.

**Prior Learning:** It will be helpful if children have calculated missing angles on a straight line and one whole turn previously.

## Learning Sequence

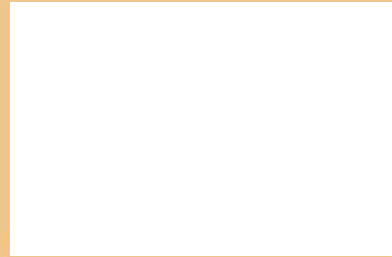
	<b>Types of Angle:</b> Children identify if the angles shown on the <a href="#">Lesson Presentation</a> are acute, obtuse or reflex.	
	<b>Angles at a Point:</b> Using the images and information shown on the <a href="#">Lesson Presentation</a> , ensure children understand that an angle is formed when two lines meet a point, that it is a measure of the rotation from one line to the other and that angles at a point total $360^\circ$ .	
	<b>360° Angles:</b> Using the <a href="#">360° Angle Match Up Cards</a> , the children work in pairs to match two cards together that total $360^\circ$ around a point.	
	<b>Labelling Angles:</b> Using the images and information shown on the <a href="#">Lesson Presentation</a> , ensure children understand how to accurately label an angle using capital letters.	
	<b>Missing Angles at a Point:</b> Children complete the differentiated <a href="#">Missing Angles at a Point Activity Sheets</a> to demonstrate they can find missing angles at a point.  <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">                       Find missing angles at a point (to the nearest <math>10^\circ</math>).                 </div> <div style="text-align: center;">                       Find missing angles at a point (to the nearest <math>5^\circ</math>).                 </div> <div style="text-align: center;">                       Find missing angles at a point (to the nearest <math>1^\circ</math>). An <a href="#">Extra Challenge Activity Sheet</a> is provided as an extension activity if required.                 </div> </div>	
	<b>True or False Angle Calculations:</b> Using the images shown on the <a href="#">Lesson Presentation</a> , the children work as a class to identify whether the angles shown around a point total $360^\circ$ .	

## Masterit

**Controlit:** Using a computer control program, rehearse drawing angles at a point.

**Directionit:** Link the teaching of angles with the teaching of direction to write instructions.

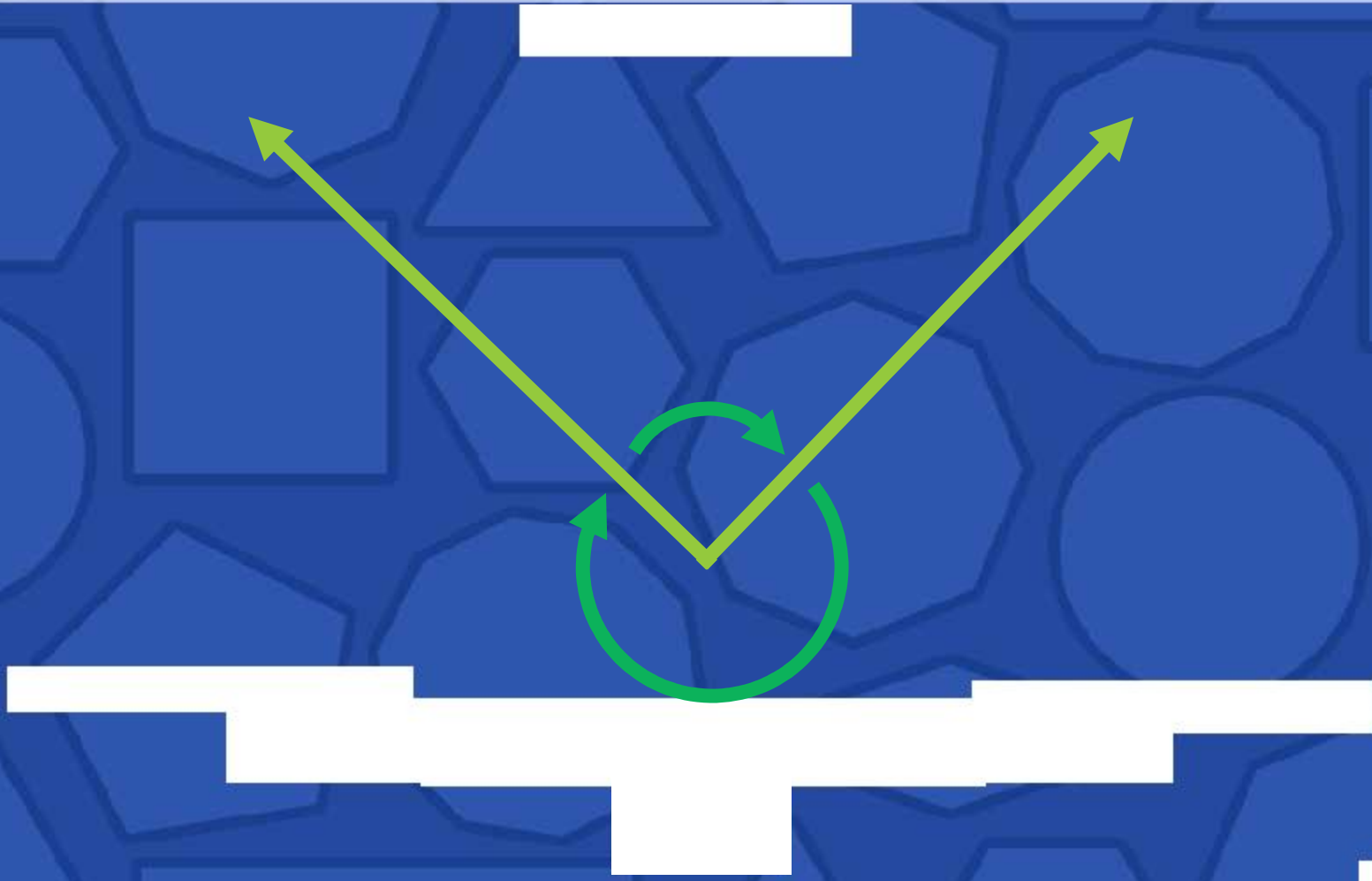
**Artit:** Explore the work of famous abstract painters such as Picasso or Kandinsky for their use of angles around a point.



# Maths

## Properties of Shapes

# Angles at a Point



# Aim

- I can recognise angles where they meet at a point and find missing angles.

# Success Criteria

- I know that angles at a point total  $360^\circ$ .
- I can label angles correctly using capital letters.
- I can find missing angles at a point.

# Types of Angle

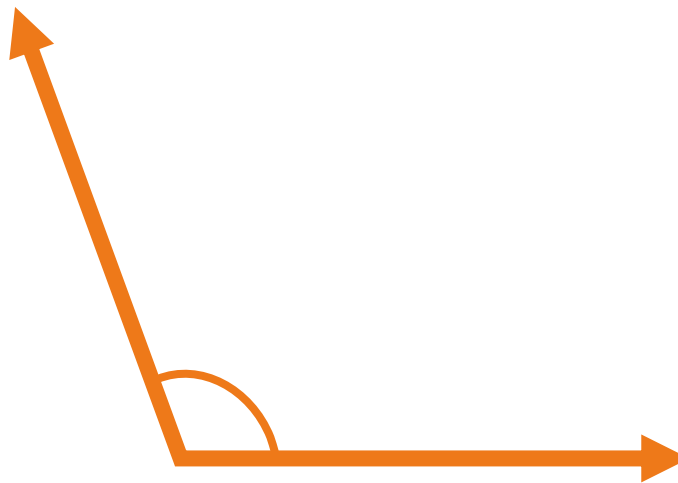


Is the angle shown acute, obtuse or reflex?

**Acute**

**Obtuse**

**Reflex**





# Types of Angle



Is the angle shown acute, obtuse or reflex?

Acute

Obtuse

Reflex



# Types of Angle

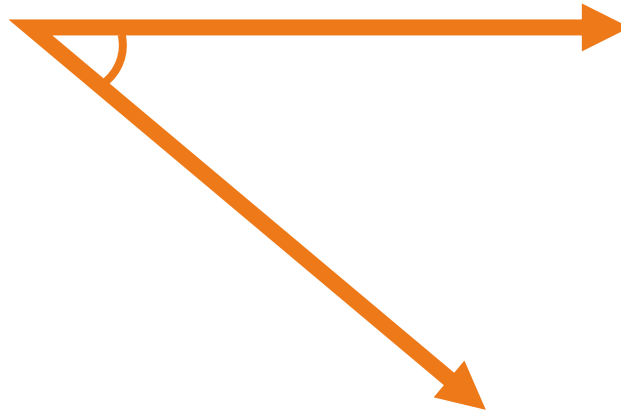


Is the angle shown acute, obtuse or reflex?

**Acute**

**Obtuse**

**Reflex**



# Types of Angle

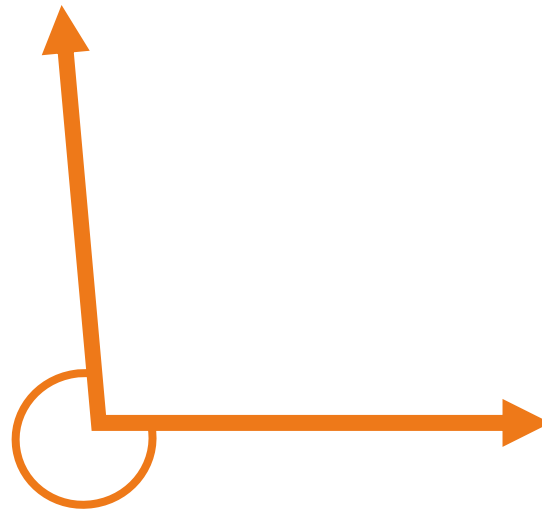


Is the angle shown acute, obtuse or reflex?

**Acute**

**Obtuse**

**Reflex**



# Types of Angle

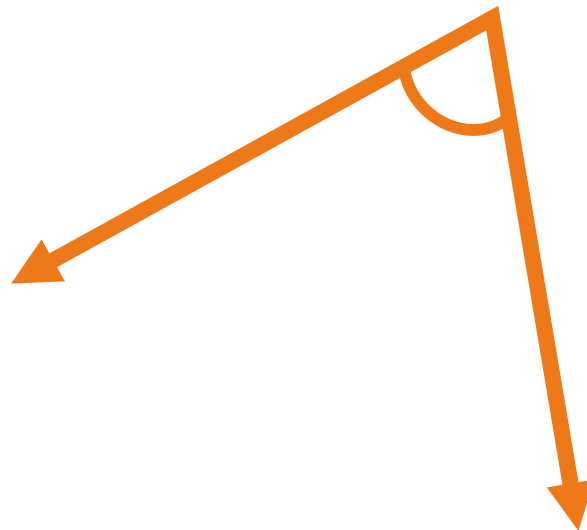


Is the angle shown acute, obtuse or reflex?

**Acute**

**Obtuse**

**Reflex**



# Types of Angle

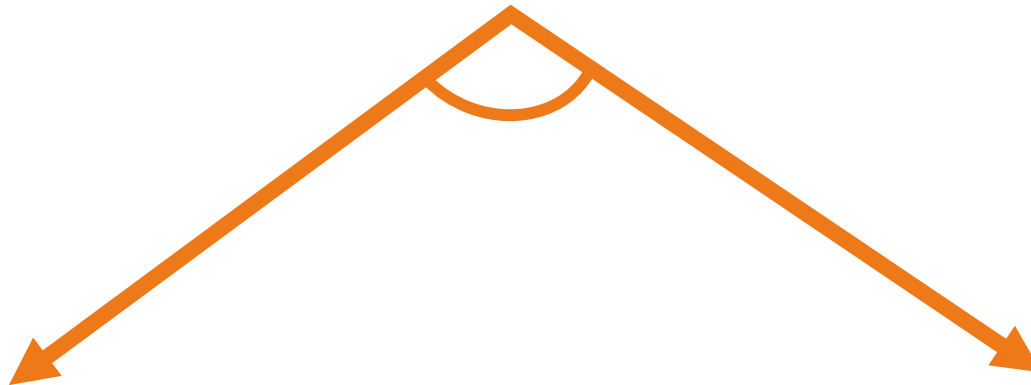


Is the angle shown acute, obtuse or reflex?

**Acute**

**Obtuse**

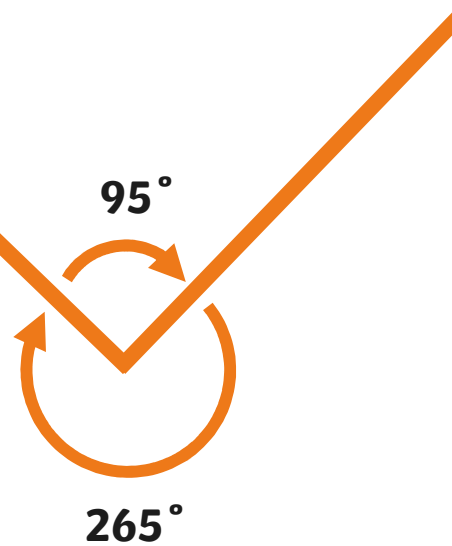
**Reflex**



# Angles at a Point

An angle is created when two straight lines meet at a point.

Angles at a point  
total  $360^\circ$ .



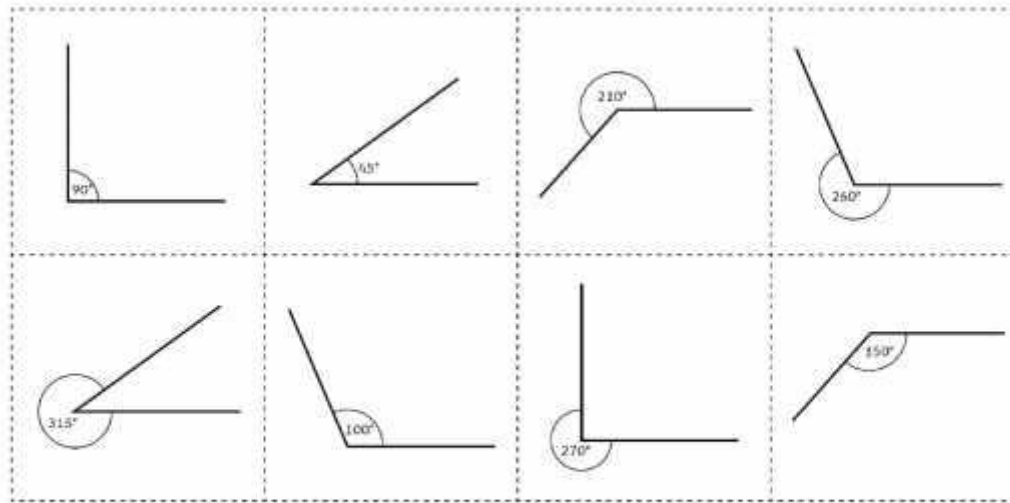
An angle is the measure of rotation from one line to the other either clockwise or anticlockwise.

# 360° Angles



Work with your partner to match angle pairs which total 360° around a point.

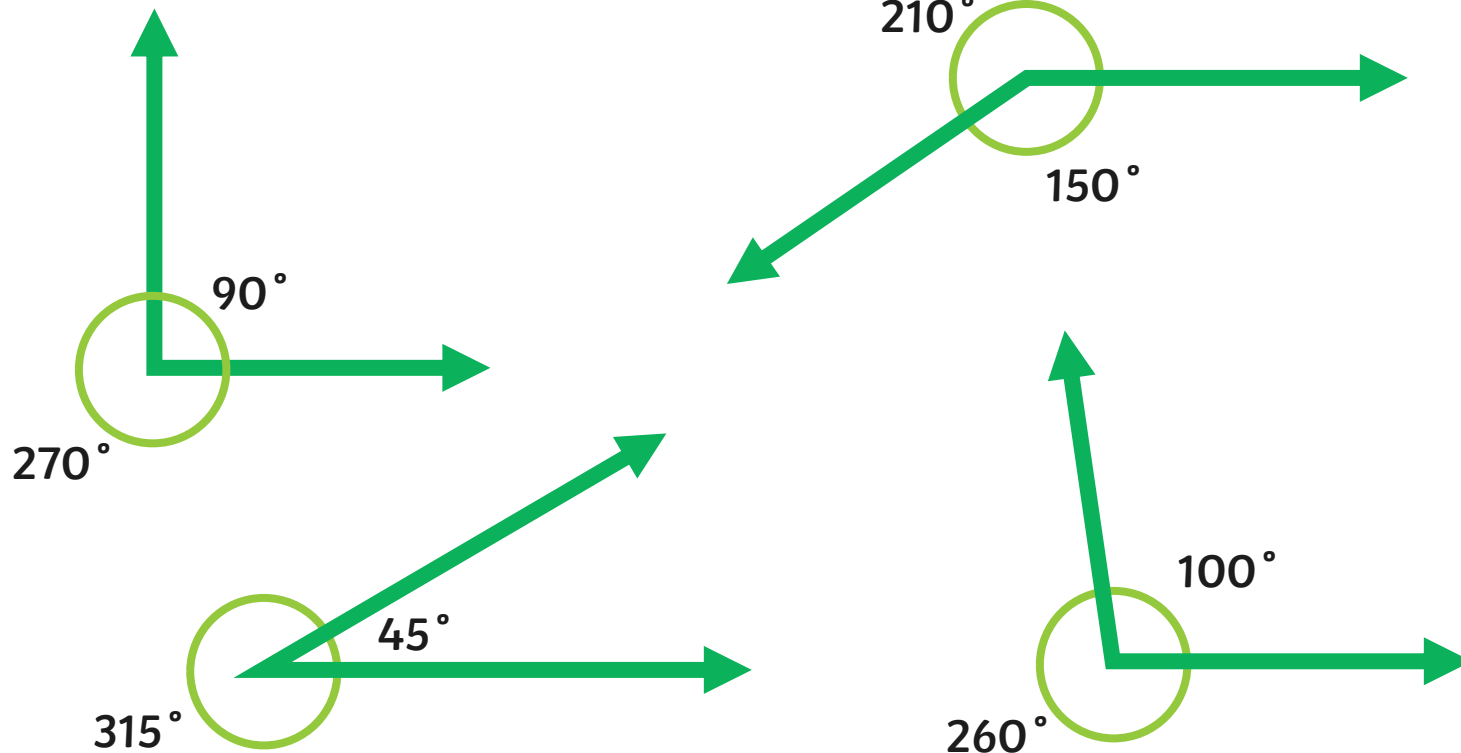
## 360° Angle Match Up Cards



# 360° Angles



Did you find the pairs of angles that total 360° around a point?

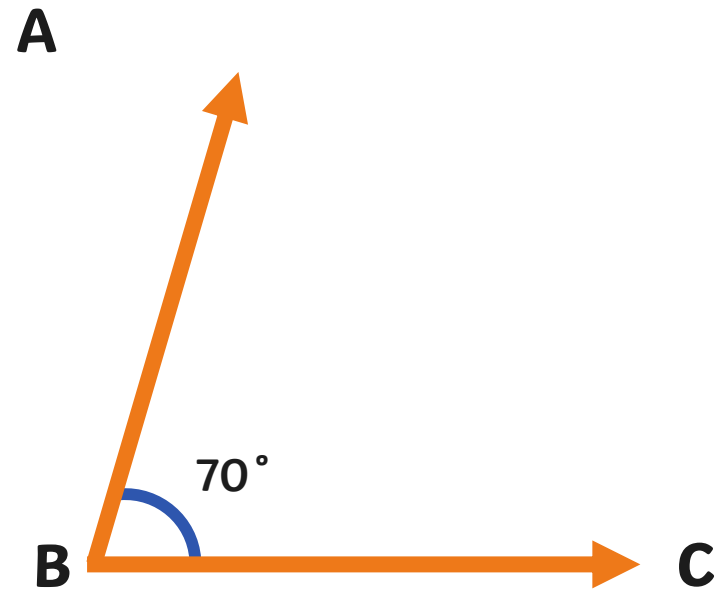




# Labelling Angles

Label an angle using three uppercase, consecutive letters. The first and third letters indicate the two lines (arms) of the angle, and the middle letter indicates the point (vertex).

To refer to an angle we use the symbol  $\angle$  and the letter of the vertex, or the three letters with the vertex letter in the middle.



$$\angle B = 70^\circ$$

or

$$\angle ABC = 70^\circ$$

# Missing Angles at a Point



### ★ Missing Angles at a Point

Find the unknown angles around a point.

Calculate the missing angles.

1. $\angle BAC = \dots^\circ$	2. $\angle BAC = \dots^\circ$
3. $\angle BAC = \dots^\circ$	4. $\angle BAC = \dots^\circ$
5. $\angle BAC = \dots^\circ$	6. $\angle BAC = \dots^\circ$
7. $\angle BAC = \dots^\circ$	8. $\angle BAC = \dots^\circ$

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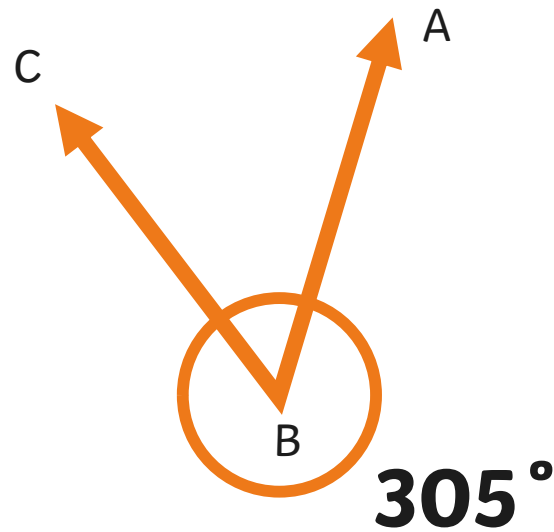
### Missing Angles at a Point

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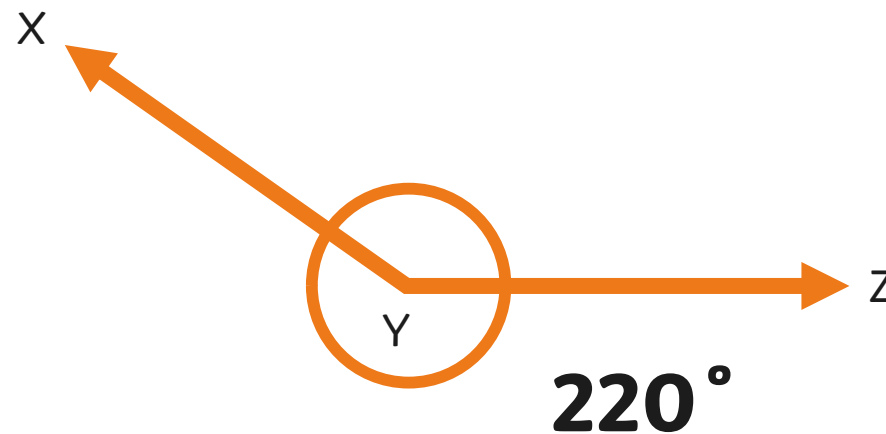
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7. $\angle BAC = \dots^\circ$	8. $\angle BAC = \dots^\circ$

# True or False Angle Calculations



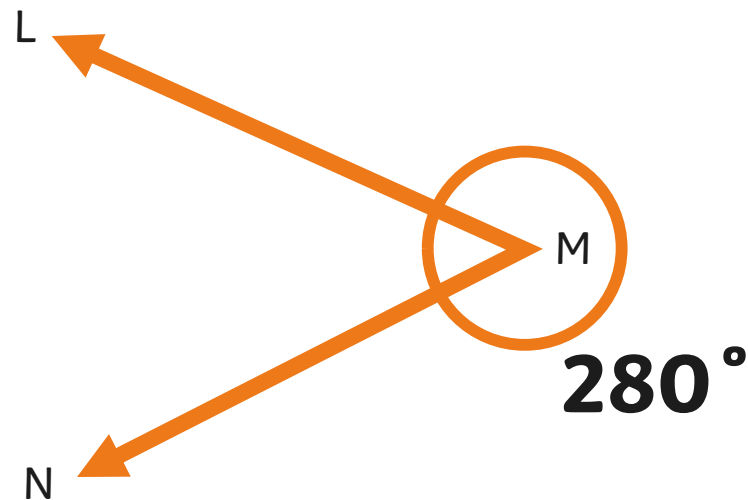
**True**       $\angle ABC = 55^\circ$       **False**

# True or False Angle Calculations



**True**      $\angle XYZ = 145^\circ$      **False**

# True or False Angle Calculations



**True**  $\angle NML = 145^\circ$  **False**

# Aim



- I can recognise angles where they meet at a point and find missing angles.

# Success Criteria

- I know that angles at a point total  $360^\circ$ .
- I can label angles correctly using capital letters.
- I can find missing angles at a point.



**Maths | Angles at a Point**

I can recognise angles where they meet at a point and find missing angles.		
I know that angles at a point total 360°.		
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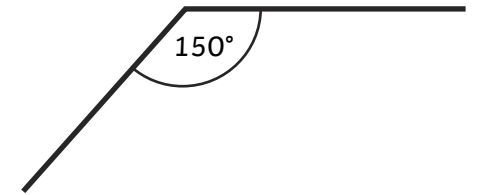
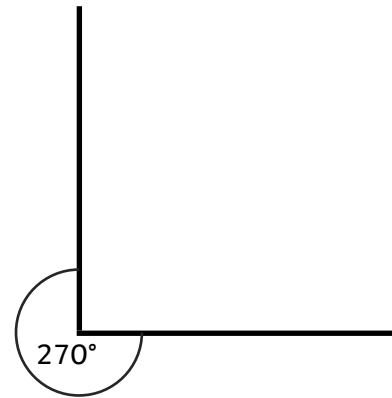
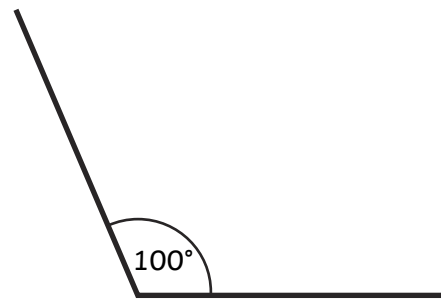
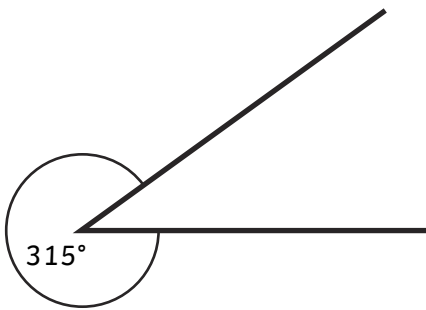
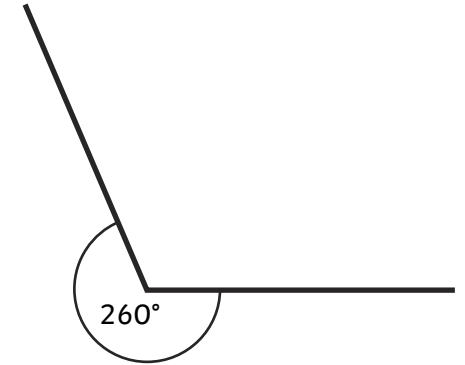
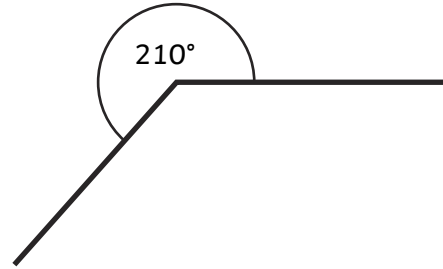
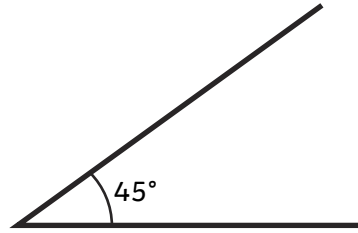
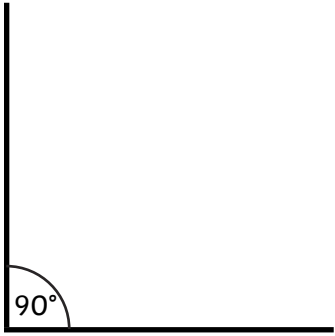
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# 360° Angle Match Up Cards





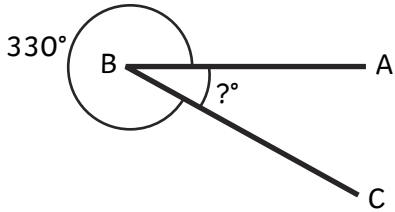
# Missing Angles at a Point

I can find unknown angles around a point.



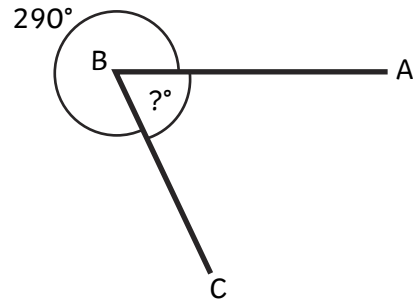
Calculate the missing angles:

1.



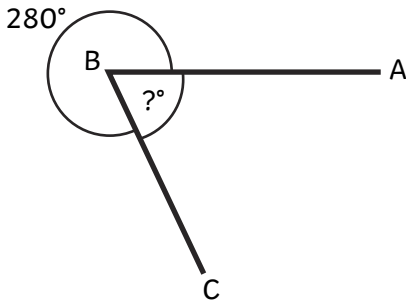
$$\angle ABC = \text{-----}^\circ$$

2.



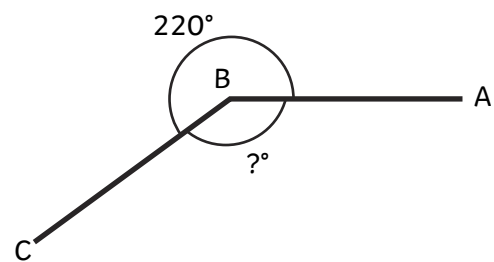
$$\angle ABC = \text{-----}^\circ$$

3.



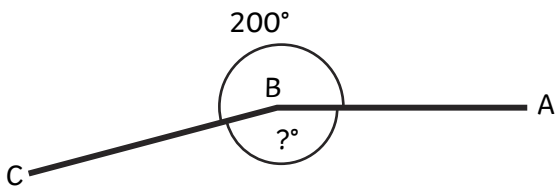
$$\angle ABC = \text{-----}^\circ$$

4.



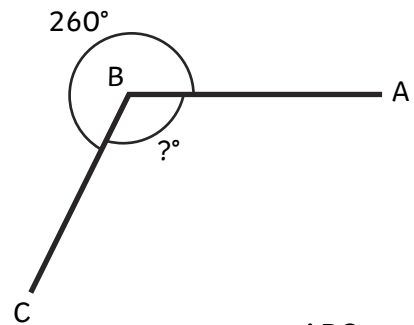
$$\angle ABC = \text{-----}^\circ$$

5.



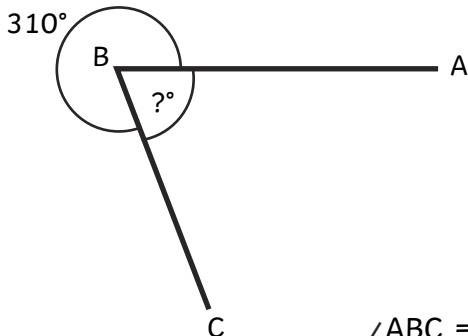
$$\angle ABC = \text{-----}^\circ$$

6.



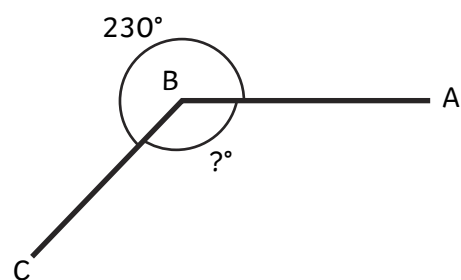
$$\angle ABC = \text{-----}^\circ$$

7.



$$\angle ABC = \text{-----}^\circ$$

8.



$$\angle ABC = \text{-----}^\circ$$



# Missing Angles at a Point

I can find unknown angles around a point.



Calculate the missing angles:

<p>1.</p> <p><math>\angle ABC = \text{-----}^\circ</math></p>	<p>2.</p> <p><math>\angle ABC = \text{-----}^\circ</math></p>
<p>3.</p> <p><math>\angle ABC = \text{-----}^\circ</math></p>	<p>4.</p> <p><math>\angle ABC = \text{-----}^\circ</math></p>
<p>5.</p> <p><math>\angle ABC = \text{-----}^\circ</math></p>	<p>6.</p> <p><math>\angle ABC = \text{-----}^\circ</math></p>
<p>7.</p> <p><math>\angle ABC = \text{-----}^\circ</math></p>	<p>8.</p> <p><math>\angle ABC = \text{-----}^\circ</math></p>



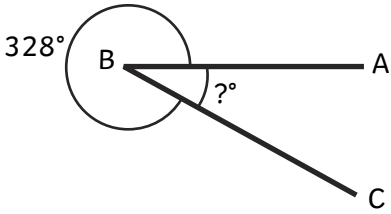
# Missing Angles at a Point

I can find unknown angles around a point.



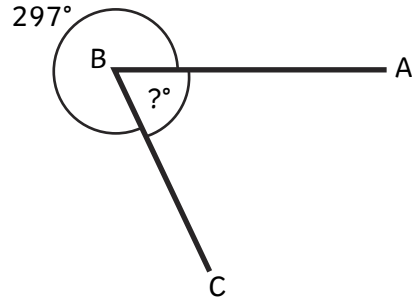
Calculate the missing angles:

1.



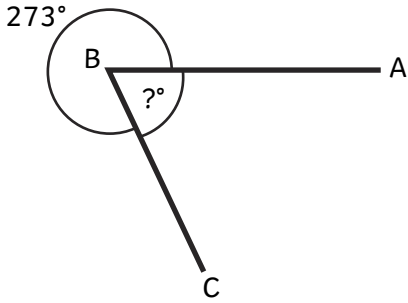
$$\angle ABC = \text{-----}^\circ$$

2.



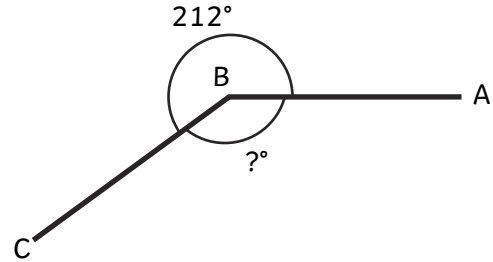
$$\angle ABC = \text{-----}^\circ$$

3.



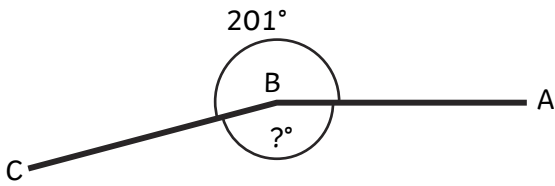
$$\angle ABC = \text{-----}^\circ$$

4.



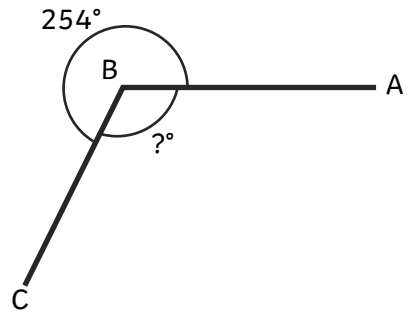
$$\angle ABC = \text{-----}^\circ$$

5.



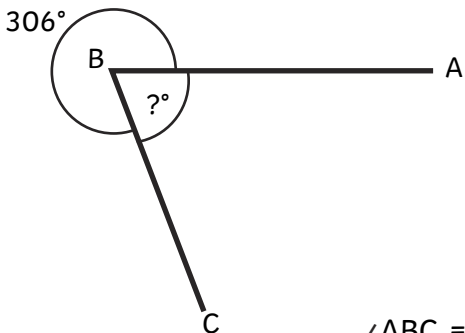
$$\angle ABC = \text{-----}^\circ$$

6.



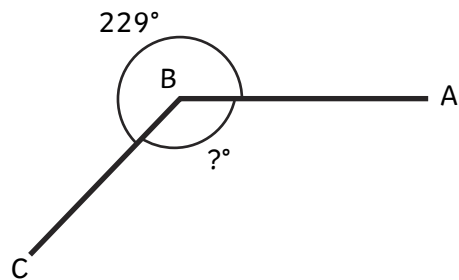
$$\angle ABC = \text{-----}^\circ$$

7.




$$\angle ABC = \text{-----}^\circ$$


8.




$$\angle ABC = \text{-----}^\circ$$

# Missing Angles at a Point **Answers**

 Question	Answer	Question	Answer
1.	$\angle ABC = 30^\circ$	2.	$\angle ABC = 70^\circ$
3.	$\angle ABC = 80^\circ$	4.	$\angle ABC = 140^\circ$
5.	$\angle ABC = 160^\circ$	6.	$\angle ABC = 100^\circ$
7.	$\angle ABC = 50^\circ$	8.	$\angle ABC = 130^\circ$

 Question	Answer	Question	Answer
1.	$\angle ABC = 35^\circ$	2.	$\angle ABC = 65^\circ$
3.	$\angle ABC = 85^\circ$	4.	$\angle ABC = 145^\circ$
5.	$\angle ABC = 155^\circ$	6.	$\angle ABC = 105^\circ$
7.	$\angle ABC = 55^\circ$	8.	$\angle ABC = 135^\circ$

 Question	Answer	Question	Answer
1.	$\angle ABC = 32^\circ$	2.	$\angle ABC = 63^\circ$
3.	$\angle ABC = 87^\circ$	4.	$\angle ABC = 148^\circ$
5.	$\angle ABC = 159^\circ$	6.	$\angle ABC = 106^\circ$
7.	$\angle ABC = 54^\circ$	8.	$\angle ABC = 131^\circ$

# Missing Angles at a Point Extra Challenge

I can find unknown angles around a point.



<p>63° ? 67° 127°</p>	<p>? 100° 120°</p>	<p>62° ? 75° 124°</p>	<p>? 106° 118°</p>
<p>81° ? 45°</p>	<p>? 19° 45°</p>	<p>113° ? 45°</p>	<p>52° ? 90°</p>

# Missing Angles at a Point Extra Challenge **Answers**

I can find unknown angles around a point.



<p>63° 103° 67° 127°</p>	<p>50° 100° 120°</p>	<p>62° 99° 75° 124°</p>	<p>46° 106° 118°</p>
<p>81° 45° 234°</p>	<p>19° 45° 296°</p>	<p>113° 45° 202°</p>	<p>52° 218°</p>