KING EDWARD VI
HANDSWORTH GRAMMAR
SCHOOL FOR BOYS

KING EDWARD VI
ACADEMY TRUST
BIRMINGHAM

Year 11

2026 Mathematics 2027

Unit 25 Booklet

HGS Maths

Tasks

Dr Frost Course

Name: _____

Class: _____

Contents

1 Graph Transformations

Worked Example	Your Turn
The point $A(2, 5)$ is on the graph of $y = f(x)$. Write the new coordinates of A after the transformation: a) $y = f(x) + 3$ b) $y = f(x + 3)$ c) $y = -f(x)$ d) $y = f(-x)$ e) $y = -f(x) + 3$ f) $y = f(-x) + 3$	The point $A(3, 4)$ is on the graph of $y = f(x)$. Write the new coordinates of A after the transformation: a) $y = f(x) - 4$ b) $y = f(x - 4)$ c) $y = f(-x)$ d) $y = -f(x)$ e) $y = -f(x) - 6$ f) $y = -f(-x) - 6$

Dr Frost 448d, 448c, 449c and 449d

Worked Example	Your Turn
Sketch $y = \cos(x) + 1, 0 \leq x \leq 360°$	Sketch $y = \sin(x) - 2, 0 \leq x \leq 360°$

Worked Example	Your Turn
Sketch $y = \sin(x - 45°)$, $0 \leq x \leq 360°$	Sketch $y = \cos(x + 45°)$, $0 \leq x \leq 360°$

Worked Example	Your Turn
Sketch $y = -\sin(x)$, $0 \leq x \leq 360°$	Sketch $y = -\tan(x)$, $0 \leq x \leq 360°$

Worked Example	Your Turn
Sketch $y = \cos(-x)$, $0 \leq x \leq 360°$	Sketch $y = \tan(-x)$, $0 \leq x \leq 360°$

Worked Example

The graph of $y = f(x)$ is shown in Figure 1.

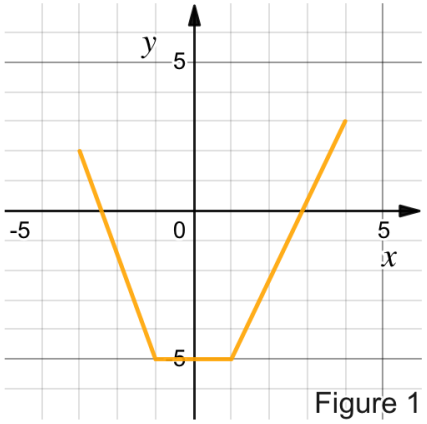


Figure 1

The graph of $y = f(x) + a$ is shown in Figure 2.

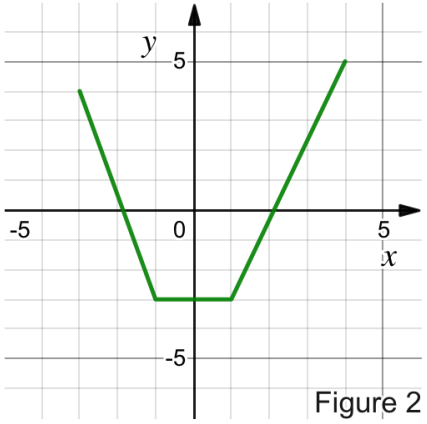


Figure 2

Determine the value of a.

Your Turn

The graph of $y = f(x)$ is shown in Figure 1.

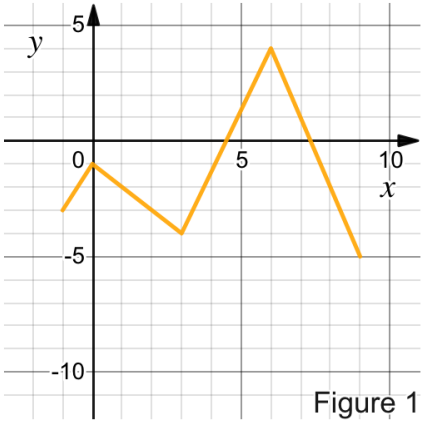


Figure 1

The graph of $y = f(x) + a$ is shown in Figure 2.

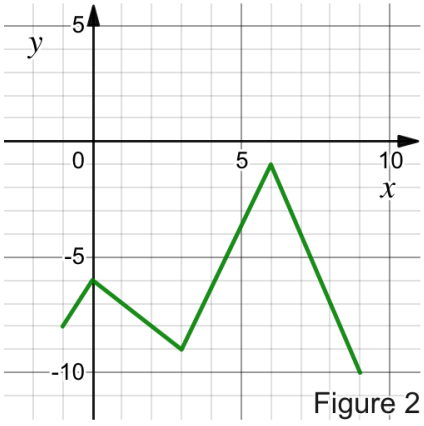


Figure 2

Determine the value of a.

Worked Example

The graph of $y = f(x)$ is shown in Figure 1.

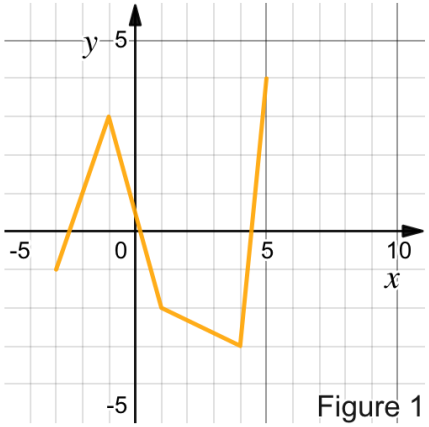


Figure 1

The graph of $y = f(x + a)$ is shown in Figure 2.

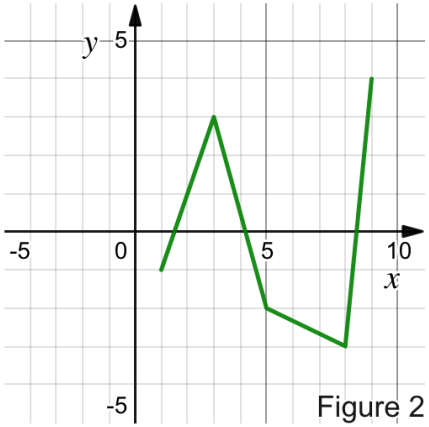


Figure 2

Determine the value of a.

Your Turn

The graph of $y = f(x)$ is shown in Figure 1.

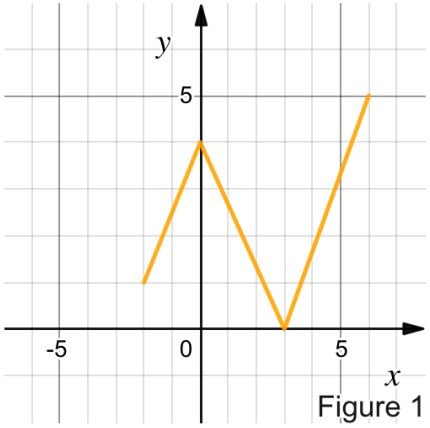


Figure 1

The graph of $y = f(x + a)$ is shown in Figure 2.

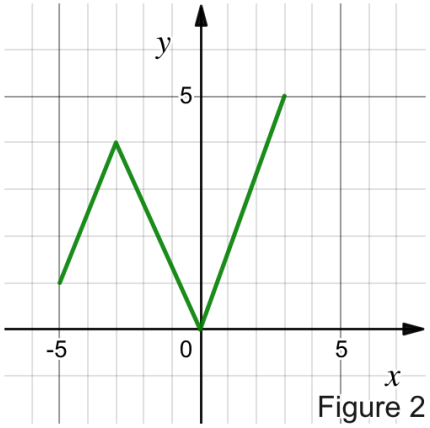


Figure 2

Determine the value of a.

Worked Example	Your Turn
a) The curve $y = \cos(4x + 90)$ is translated by $\begin{pmatrix} 30 \\ 0 \end{pmatrix}$ State the equation of the new curve after this transformation.	a) The curve $y = \tan(3x - 30)$ is translated by $\begin{pmatrix} 0 \\ -3 \end{pmatrix}$ State the equation of the new curve after this transformation.
b) The curve $y = \frac{4}{2x-5}$ is translated by $\begin{pmatrix} 0 \\ 3 \end{pmatrix}$ State the equation of the new curve after this transformation.	b) The curve $y = \frac{1}{3x-3}$ is translated by $\begin{pmatrix} -4 \\ 0 \end{pmatrix}$ State the equation of the new curve after this transformation.

Worked Example	Your Turn
The curve $y = 2x^2 + 3x$ is translated by $\begin{pmatrix} -4 \\ 5 \end{pmatrix}$ State the equation of the new curve after this transformation.	The curve $y = 2x^3 - x^2$ is translated by $\begin{pmatrix} 3 \\ -4 \end{pmatrix}$ State the equation of the new curve after this transformation.

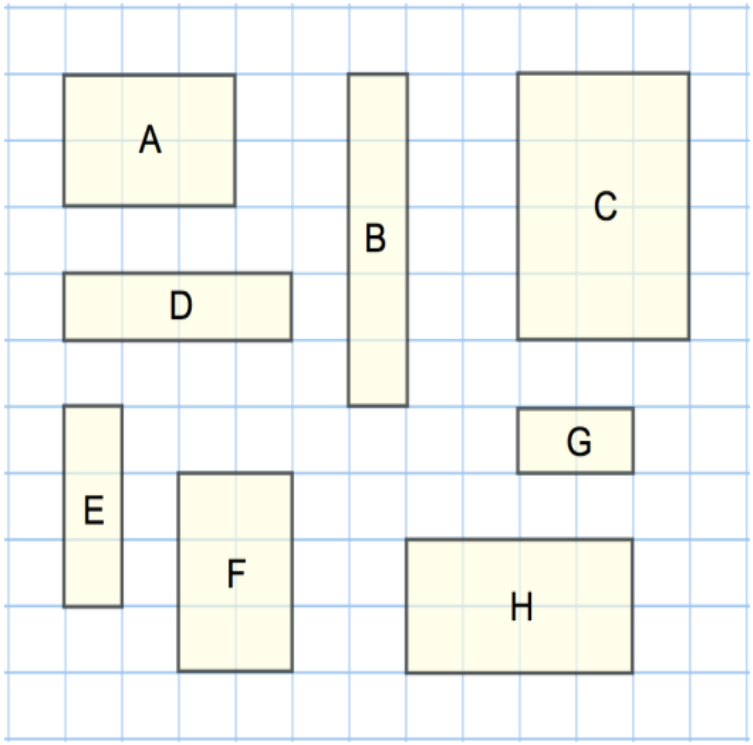
Fill in the Gaps

$f(x)$	Function notation	Description of translation	Vector of translation	New function
$2x+1$	$f(x-3)$	3 places right	$\begin{pmatrix}3\\0\end{pmatrix}$	$f(x-3) = 2(x-3)+1$ $= 2x-6+1$ $= 2x-5$
$3x+1$	$f(x-2)$			
x^2	$f(x-1)$			
x^2		2 places left		
x^2+5			$\begin{pmatrix}-3\\0\end{pmatrix}$	
				$4(x+5)+2$
x^2+2x-1		1 place left		
	$f(x-4)$			

Extra Notes

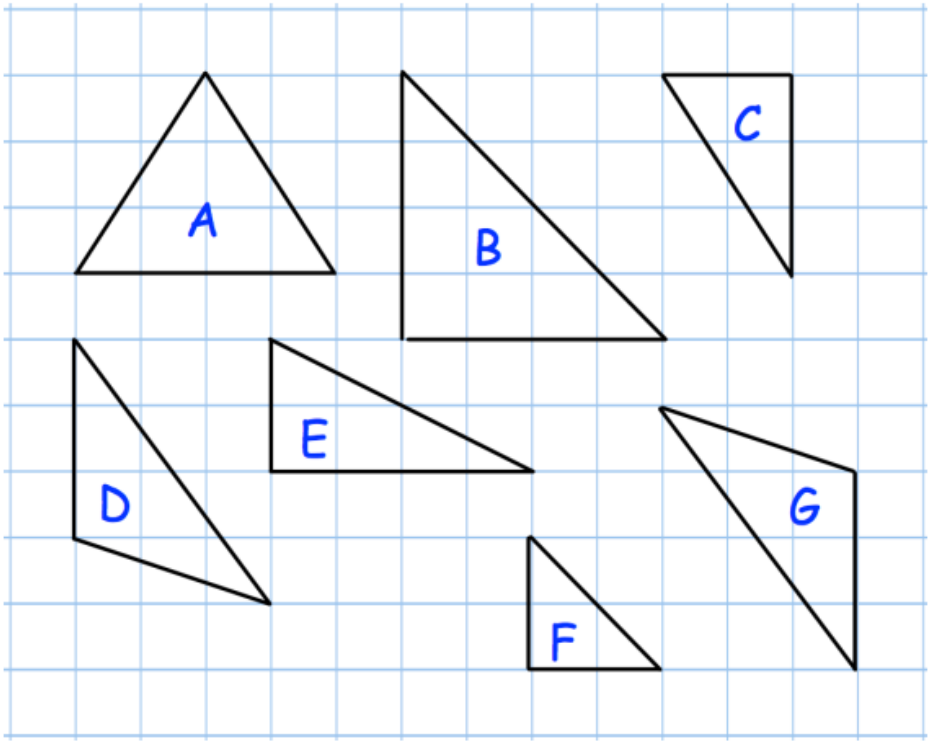
2 Congruence and Similarity Proofs

Worked Example



a) Which two shapes are congruent?
b) Which two shapes are similar?

Your Turn

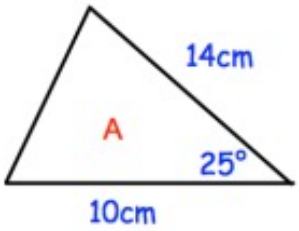


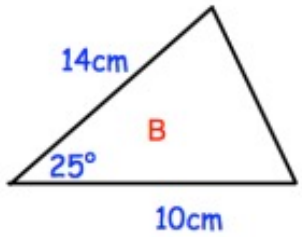
a) Which two shapes are congruent?
b) Which two shapes are similar?

Dr Frost 290a and 291d

Worked Example

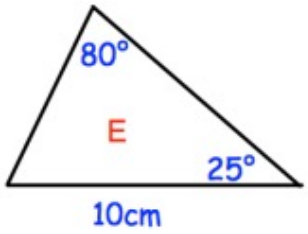
State the condition why these two triangles are congruent.

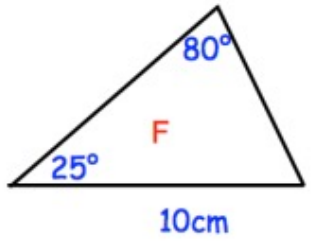




Your Turn

State the condition why these two triangles are congruent.

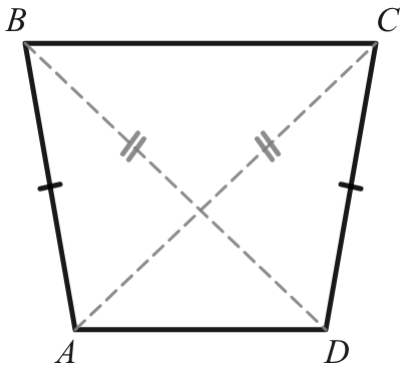




Dr Frost 290c and 290b

Worked Example

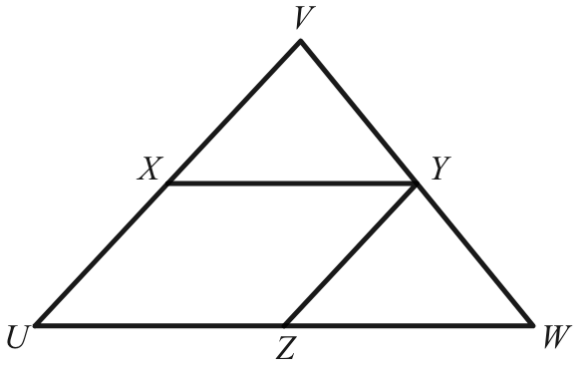
Below is a quadrilateral $ABCD$.



Prove that triangle ABD is congruent to triangle ACD.

Your Turn

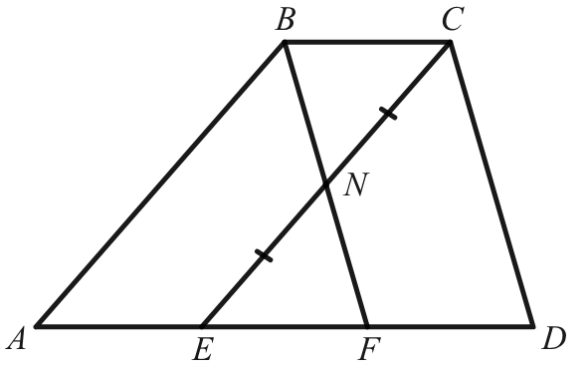
The diagram shows triangle UVW.



$UXYZ$ is a parallelogram where
X is the midpoint of UV,
Y is the midpoint of VW,
and Z is the midpoint of UW.
Prove that triangle XVY and triangle ZYW are congruent.

Worked Example

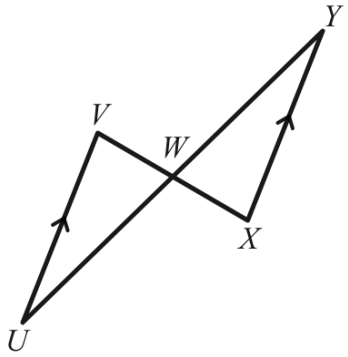
In the diagram below, $ABCE$ and $BCDF$ are parallelograms and N is the midpoint of CE.



Prove that triangle BCN and triangle EFN are congruent.

Your Turn

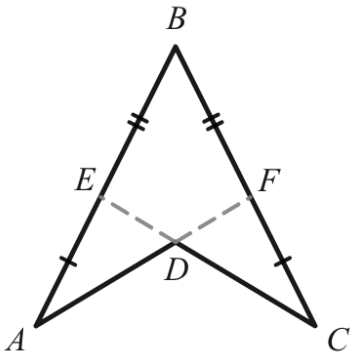
In the diagram below, UWY and VWX are straight lines.



UV and XY are parallel.
W is the midpoint of UWY.
Prove that triangle UVW and triangle WXY are congruent.

Worked Example

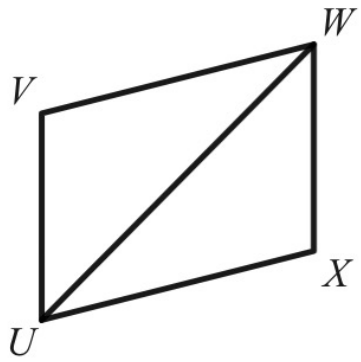
Below is a quadrilateral $ABCD$.



Prove that triangle ABF and triangle BCE are congruent.

Your Turn

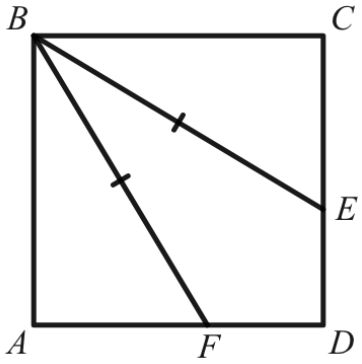
The diagram below shows a parallelogram $UVWX$.



Prove that triangle UVW and triangle UWX are congruent.

Worked Example

Below is a square $ABCD$.

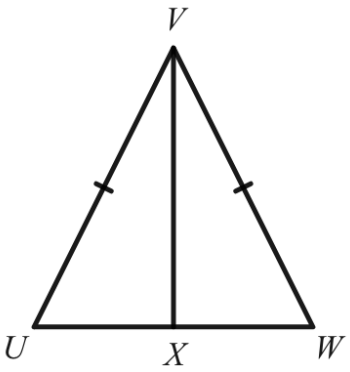


$BE = BF$

Prove that triangle ABF and triangle BCE are congruent.

Your Turn

Below is an isosceles triangle UVW.



VX is the perpendicular bisector of UW.

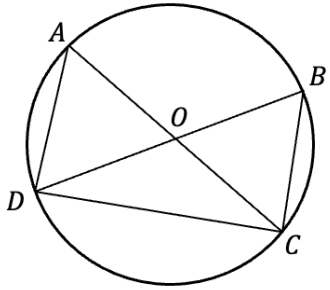
Prove that triangle UVX and triangle VWX are congruent.

Worked Example

AOC and BOD are diameters of the circle with centre O.

a) Prove that triangle ABD and triangle BCD are congruent.

b) Show that $AD = BC$



Your Turn

ABC is an equilateral triangle.

D lies on BC

AD is perpendicular to BC

a) Prove that triangle ADC is congruent to triangle ADB

b) Hence prove that $BD = \frac{1}{2}AB$

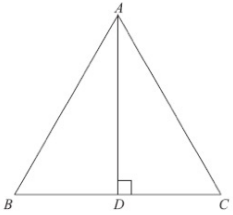
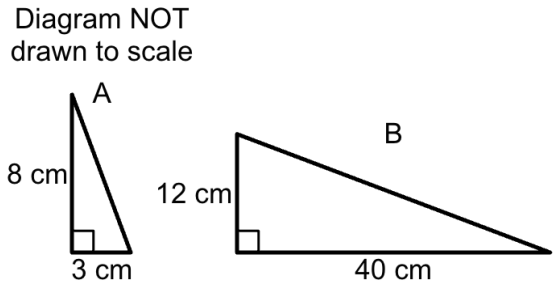


Diagram **NOT** accurately drawn

Worked Example

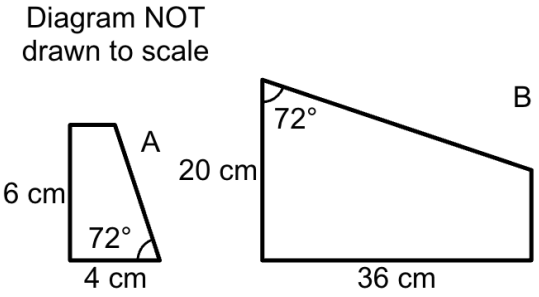
The diagram below shows two triangles A and B



By considering the ratio of the corresponding lengths for triangle A and triangle B, determine if triangle A and triangle B are similar shapes.

Your Turn

The diagram below shows two shapes A and B

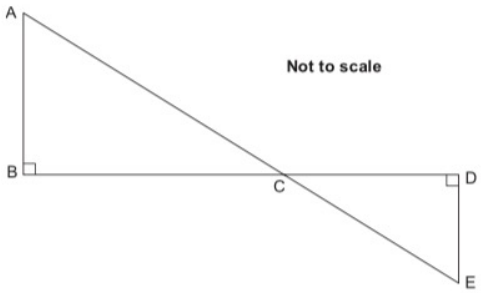


By considering the ratio of the corresponding lengths for shape A and shape B, determine if shape A and shape B are similar shapes.

Dr Frost 291e and 291c

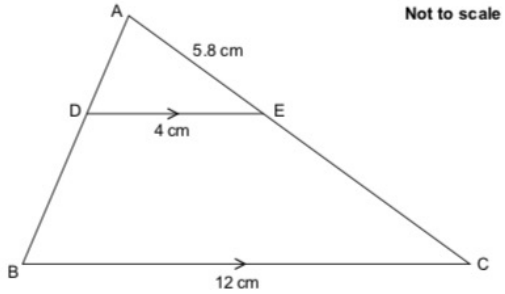
Worked Example

In the diagram below, AE and BD are straight lines.
Show that triangles ABC and EDC are similar.



Your Turn

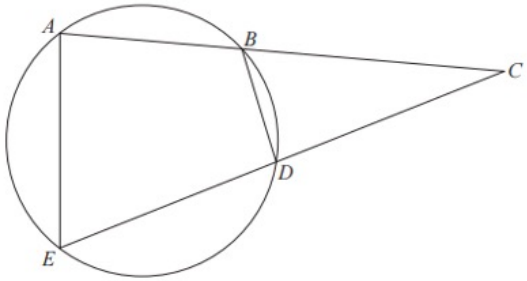
In the diagram BC is parallel to DE.
Prove that triangle ABC is similar to triangle ADE.



Worked Example

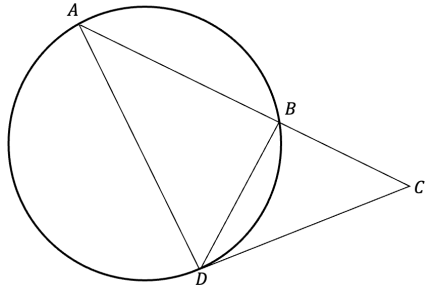
A, B, D and E are points on a circle.
ABC and EDC are straight lines.

Prove that triangle BCD is similar to triangle ECA
You must give reasons for your working.



Your Turn

The line CD is tangent to the circle. Prove that BCD is similar to ACD

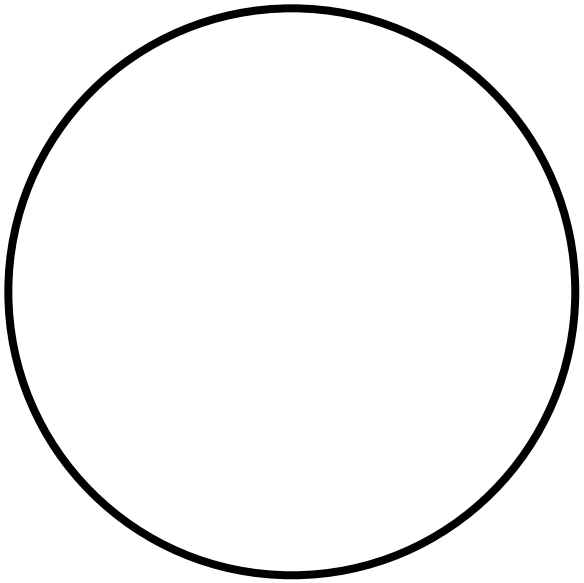


Extra Notes

3 Circle Theorem Proofs

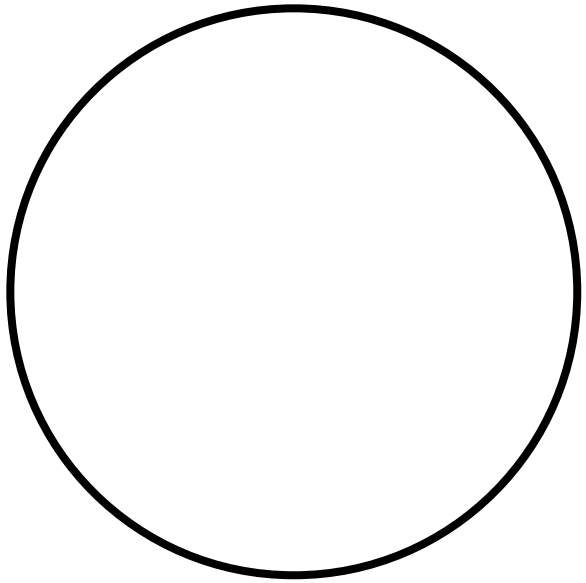
Worked Example

Prove angles in a semicircle are 90°.



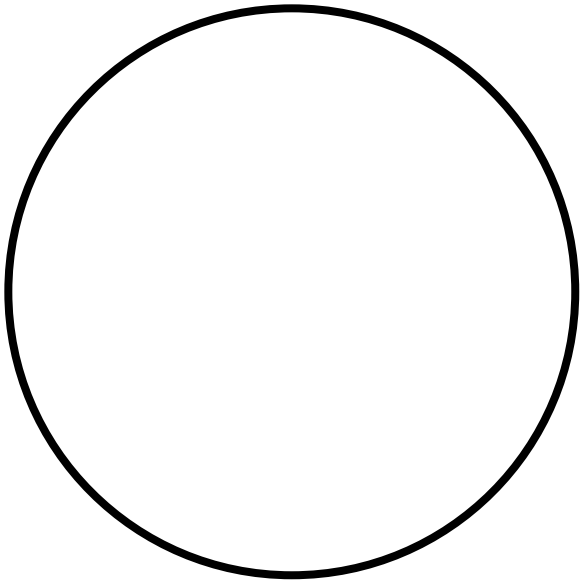
Worked Example

Prove the angle at the centre of a circle is twice the angle at the circumference.



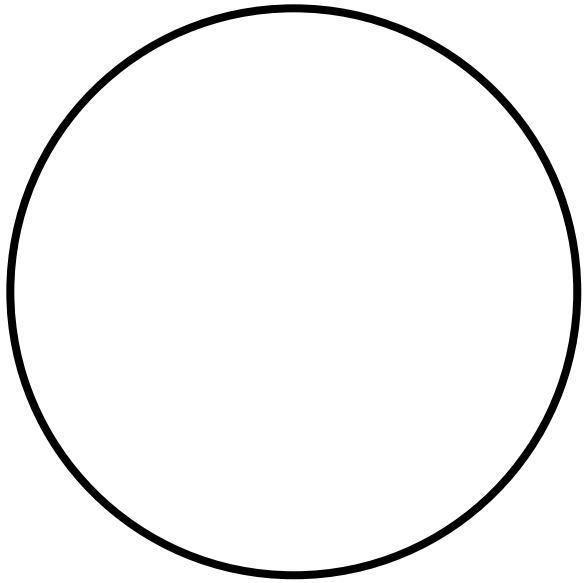
Worked Example

Prove angles in the same segment are equal.



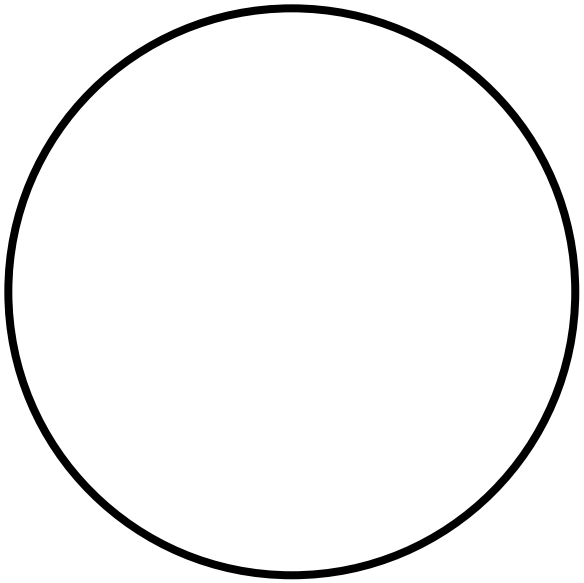
Worked Example

Prove opposite angles of a cyclic quadrilateral add to 180°.



Worked Example

Prove the alternate segment theorem.



Extra Notes