



THIRD SPACE  
LEARNING

# Diagnostic Questions

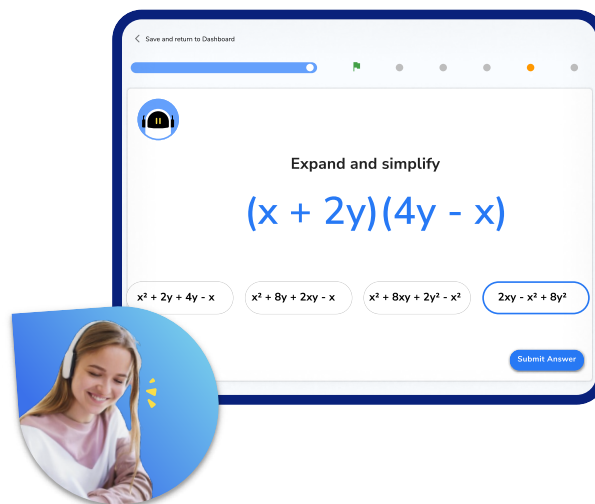
Circle Theorems | Geometry &  
Measure

## This resource in a nutshell

Diagnostic questions are a quick and easy way of assessing your students' knowledge and understanding of a particular topic.

Students may be struggling with **circle theorems** for a number of different reasons. Diagnostic questions can help to identify the particular misconception that the student has and help to determine the specific support they will need in order to improve.

They are low stakes and support students developing metacognition around how their learning is progressing and what they need to do to improve further.



At Third Space Learning, we use diagnostic questions before and after online tutoring sessions to identify gaps and track progress, an example of this is shown above.

## How to use the questions in this resource

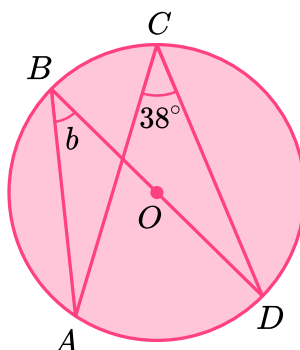
There are 20 multiple choice questions, each designed to assess each of the key skills required to master the given topic. Each question has **one correct answer** and **three carefully chosen incorrect answers** that are designed to identify and highlight fundamental misconceptions, including: **Incorrect theorems**, **Angle facts**, **Incorrect assumptions**, and **Subtraction (non-calc)**.

When answering these questions, students should be **encouraged to explain why they have chosen a particular answer**, and why the other three answers are incorrect. This can be done verbally in small groups, or written down on the worksheet or in their books.

This resource has been designed to be as **flexible** as possible with questions that can be easily chopped up and reordered, and come with a separate answer sheet that details all of the misconceptions highlighted in the answers.

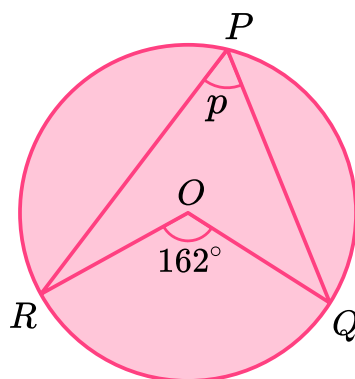
## Diagnostic Questions: Circle Theorems

1. A, B, C and D are points on the circumference of a circle with centre O.  
Determine the size of angle  $b$  :



A) $76^\circ$	B) $52^\circ$
C) $38^\circ$	D) $19^\circ$

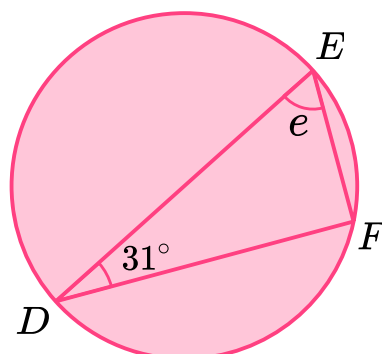
2. P, Q and R are points on the circumference of a circle with centre O.  
Determine the size of angle  $p$  :



A) $324^\circ$	B) $18^\circ$
C) $36^\circ$	D) $81^\circ$

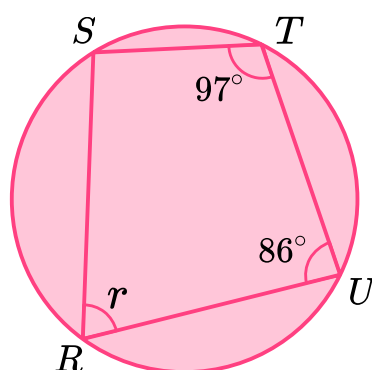
## Diagnostic Questions: Circle Theorems

3. D, E and F are points on the circumference of a circle such that line segment DE passes through the centre of the circle. Determine the size of angle  $e$  :



A) $31^\circ$	B) $59^\circ$
C) $69^\circ$	D) $62^\circ$

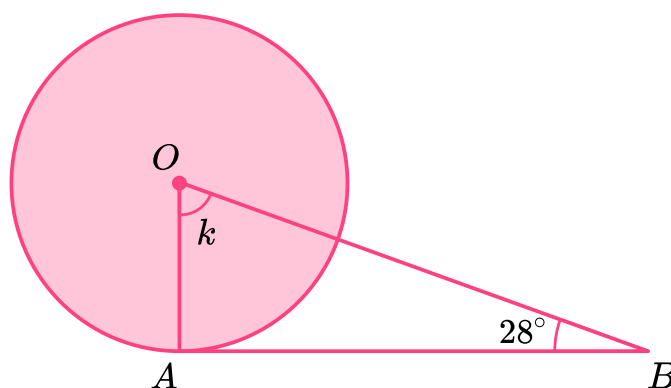
4. A polygon is formed using points R, S, T and U which lie on the circumference of a circle. Determine the size of angle  $r$  :



A) $83^\circ$	B) $86^\circ$
C) $97^\circ$	D) $94^\circ$

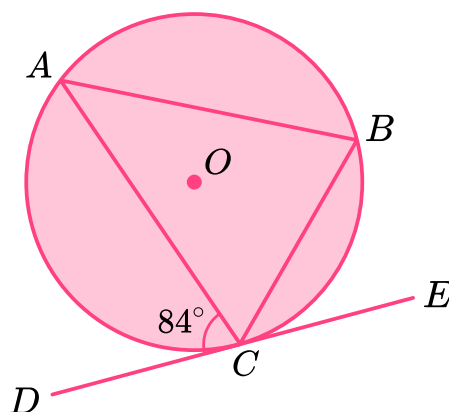
## Diagnostic Questions: Circle Theorems

5. Triangle AOB intersects a circle with centre O, such that AB is tangent to the circle. Determine the size of angle  $k$  :



A) $56^\circ$	B) $90^\circ$
C) $62^\circ$	D) $28^\circ$

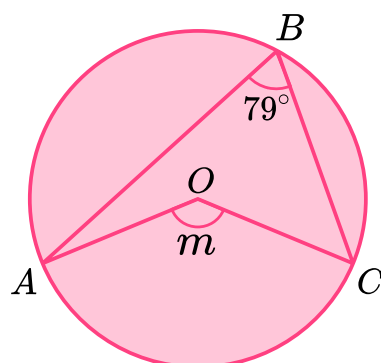
6. A, B and C are points on the circumference of a circle with centre O. Line DE is tangent to the circle at point C. Determine the size of angle ABC:



A) $96^\circ$	B) $84^\circ$
C) $42^\circ$	D) $69^\circ$

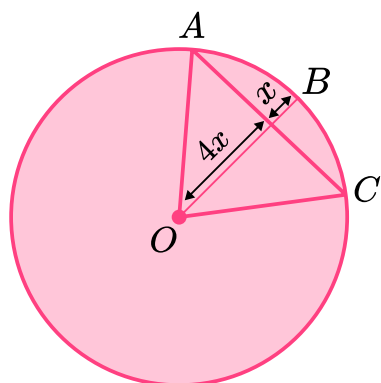
## Diagnostic Questions: Circle Theorems

7. A, B and C are points on the circumference of a circle with centre O.  
Determine the size of angle  $m$  :



A) $158^\circ$	B) $101^\circ$
C) $148^\circ$	D) $281^\circ$

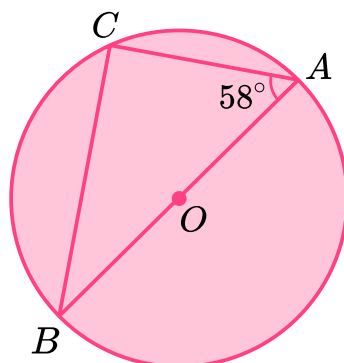
8. A, B and C are points on the circumference of a circle with centre O and radius  $10\text{ cm}$ . Chord AC is perpendicular to OB. Calculate the length of AC:



A) $18.3\text{ cm}$	B) $6\text{ cm}$
C) $4\text{ cm}$	D) $12\text{ cm}$

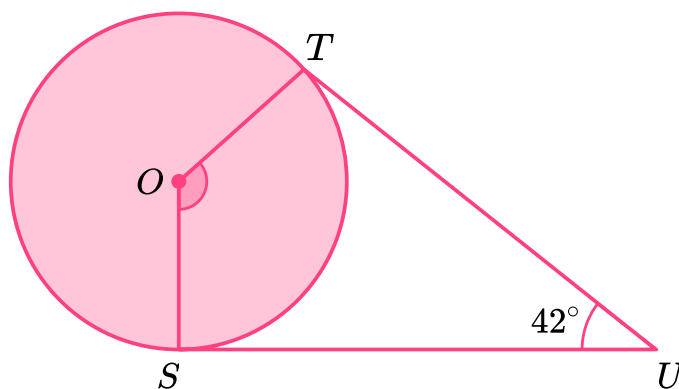
## Diagnostic Questions: Circle Theorems

9. A, B and C are points on the circumference of a circle with centre O. AB is a diameter of length 9 cm. Calculate the length of chord AC:



A) 4.8 cm	B) 7.6 cm
C) 5.6 cm	D) 4.5 cm

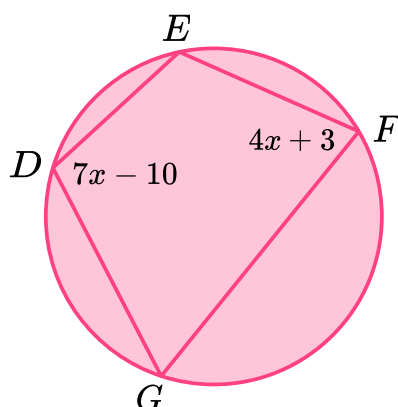
10. Lines SU and TU are tangent to the circle, with centre O, at the points S and U respectively. Determine the size of angle SOT (indicated):



A) 96°	B) 84°
C) 148°	D) 138°

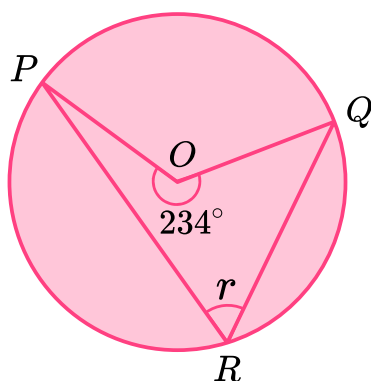
## Diagnostic Questions: Circle Theorems

11. Given that the corners of quadrilateral DEFG lie on the circumference of a circle, determine the value of  $x$  :



A) $x = 15.7$	B) $x = 17$
C) $x = 4.3$	D) $x = 14.3$

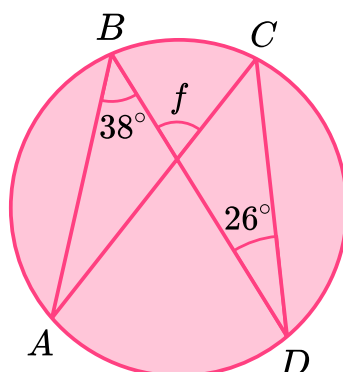
12. P, Q and R are points on the circumference of a circle with centre O. Determine the size of angle  $r$  :



A) $63^\circ$	B) $117^\circ$
C) $54^\circ$	D) $68^\circ$

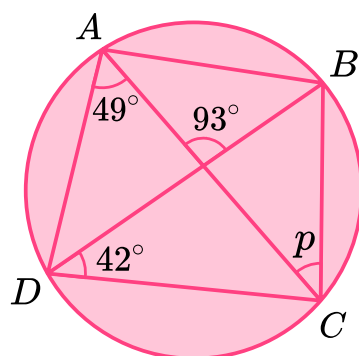
## Diagnostic Questions: Circle Theorems

13. Given that A, B, C and D are points on the circumference of a circle, find the size of angle  $f$  :



A) $76^\circ$	B) $116^\circ$
C) $64^\circ$	D) $52^\circ$

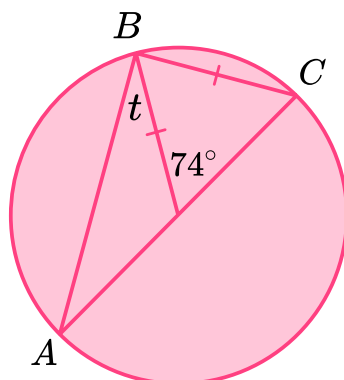
14. A, B, C and D are points on the circumference of a circle. Determine the size of angle  $p$  :



A) $44^\circ$	B) $49^\circ$
C) $42^\circ$	D) $38^\circ$

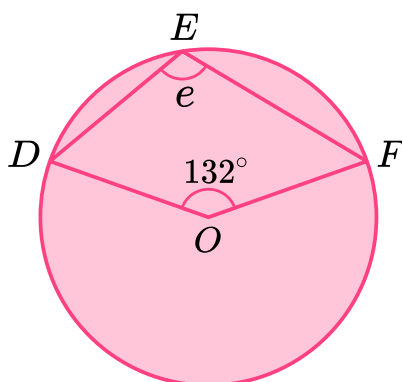
## Diagnostic Questions: Circle Theorems

15. Triangle ABC is inscribed in a circle with diameter AC. Determine the size of angle  $t$  :



A) $16^\circ$	B) $37^\circ$
C) $58^\circ$	D) $90^\circ$

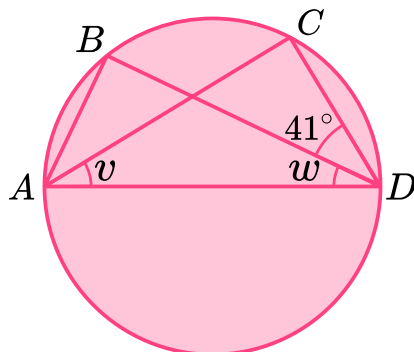
16. Given that points D, E and F are points on the circumference with centre O, determine the size of angle  $e$  :



A) $66^\circ$	B) $48^\circ$
C) $132^\circ$	D) $114^\circ$

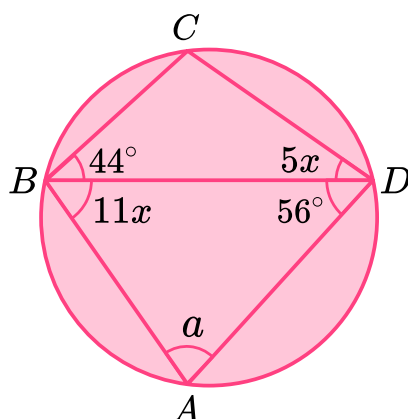
## Diagnostic Questions: Circle Theorems

17. A, B, C and D are points on the circumference of a circle with a diameter AD. Find a formula for the size of angle  $w$ , in terms of angle  $v$  :



A) $w = 41 - v$	B) $w = 49 - v$
C) $w = 131 - v$	D) $w = 90 - v$

18. Given that A, B, C and D are points on the circumference of a circle, find the size of angle  $a$  :

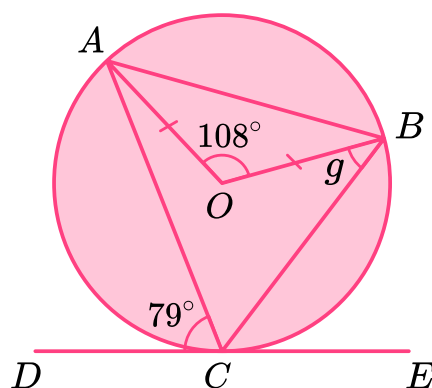


A) $69^\circ$	B) $5^\circ$
C) $100^\circ$	D) $111^\circ$

## Diagnostic Questions: Circle Theorems

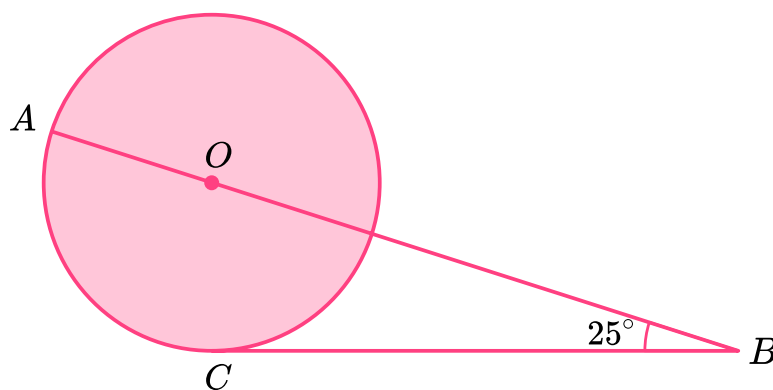
19. A, B and C are points on a circle with centre O.

DE is tangent to the circle at point C. Calculate the size of angle  $g$  :



A) $79^\circ$	B) $43^\circ$
C) $7^\circ$	D) $36^\circ$

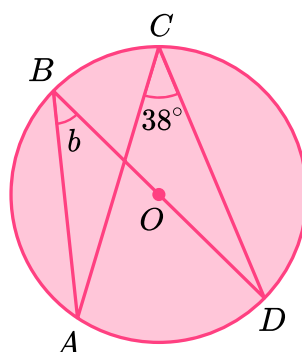
20. Line BC is tangent to a circle with centre O at point C. Line AB passes through the centre of the circle. The circle has radius  $5\text{ cm}$ . Find the length of AB:



A) $11.8\text{ cm}$	B) $10.5\text{ cm}$
C) $16.8\text{ cm}$	D) $15\text{ cm}$

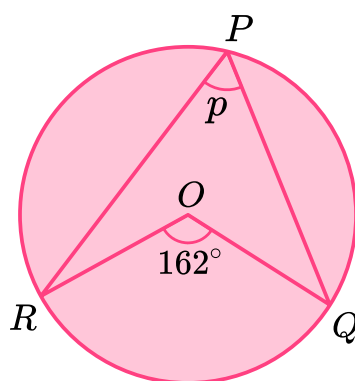
## Diagnostic Questions: Circle Theorems Answers

1. A, B, C and D are points on the circumference of a circle with centre O.  
Determine the size of angle  $b$  :



- A)  $76^\circ$  Student used wrong theorem and doubled known angle size  
 B)  $52^\circ$  Student subtracted known angle size from  $90^\circ$   
 C)  $38^\circ$  Correct answer  
 D)  $19^\circ$  Student used wrong theorem and halved known angle size

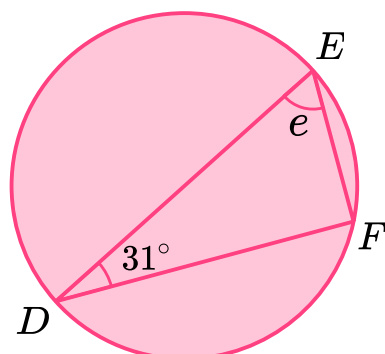
2. P, Q and R are points on the circumference of a circle with centre O.  
Determine the size of angle  $p$  :



- A)  $324^\circ$  Student doubled (rather than halved) the known angle  
 B)  $18^\circ$  Student assumed angle ROQ and RPQ to be supplementary  
 C)  $36^\circ$  Student doubled the known angle and subtracted the result from  $360^\circ$   
 D)  $81^\circ$  Correct answer

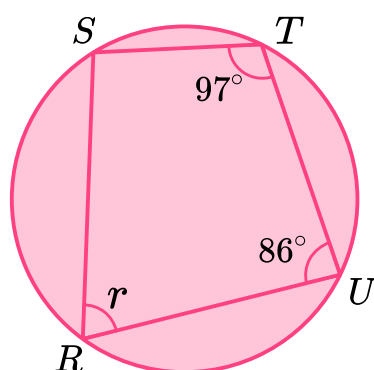
## Diagnostic Questions: Circle Theorems Answers

3. D, E and F are points on the circumference of a circle such that line segment DE passes through the centre of the circle. Determine the size of angle  $e$  :



- A)  $31^\circ$  Student made assumption angles EDF and DEF are equal  
 B)  $59^\circ$  Correct answer  
 C)  $69^\circ$  Student made an error subtracting 31 from 90  
 D)  $62^\circ$  Student used wrong theorem and doubled known angle size

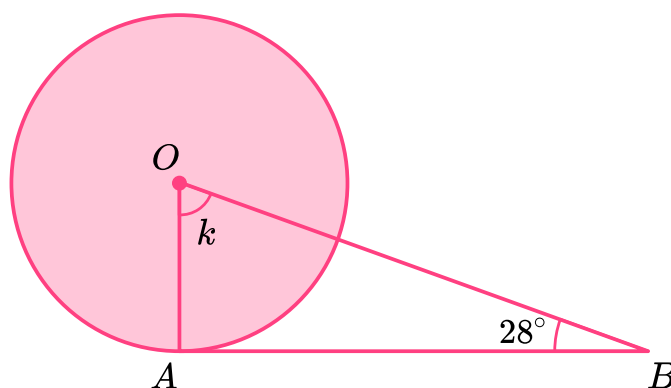
4. A polygon is formed using points R, S, T and U which lie on the circumference of a circle. Determine the size of angle  $r$  :



- A)  $83^\circ$  Correct answer  
 B)  $86^\circ$  Student made assumption angles SRU and RUT are equal  
 C)  $97^\circ$  Student made assumption that opposite angles of a cyclic quadrilateral are equal  
 D)  $94^\circ$  Student subtracted the wrong angle from  $180^\circ$

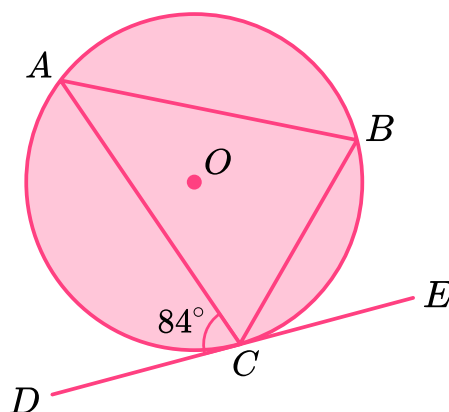
## Diagnostic Questions: Circle Theorems Answers

5. Triangle AOB intersects a circle with centre O, such that AB is tangent to the circle. Determine the size of angle  $k$  :



- A)  $56^\circ$  Student used wrong theorem and doubled known angle size  
 B)  $90^\circ$  Student identified angle AOB as  $90^\circ$  instead of angle OAB  
 C)  $62^\circ$  Correct answer  
 D)  $28^\circ$  Student made assumption angles AOB and ABO are equal

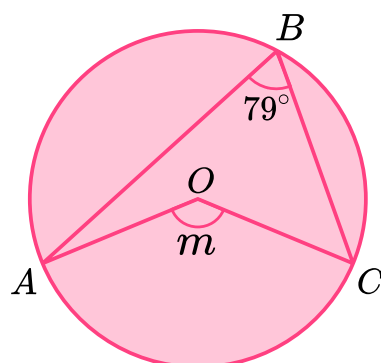
6. A, B and C are points on the circumference of a circle with centre O. Line DE is tangent to the circle at point C. Determine the size of angle ABC:



- A)  $96^\circ$  Student subtracted angle ACD from  $180^\circ$   
 B)  $84^\circ$  Correct answer  
 C)  $42^\circ$  Student used wrong theorem and halved known angle size  
 D)  $69^\circ$  Student made several incorrect assumptions

## Diagnostic Questions: Circle Theorems Answers

7. A, B and C are points on the circumference of a circle with centre O.  
Determine the size of angle  $m$  :



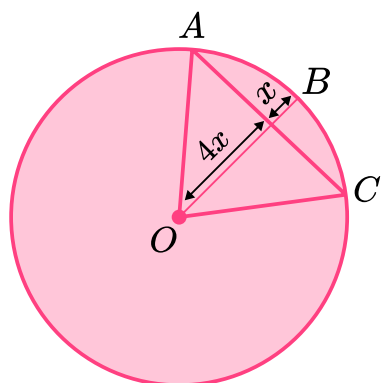
A)  $158^\circ$  Correct answer

B)  $101^\circ$  Student subtracted angle ABC from  $180^\circ$

C)  $148^\circ$  Student made a calculation error doubling 79

D)  $281^\circ$  Student subtracted angle ABC from  $360^\circ$

8. A, B and C are points on the circumference of a circle with centre O and radius  $10\text{ cm}$ . Chord AC is perpendicular to OB. Calculate the length of AC:



A)  $18.3\text{ cm}$  Student applied Pythagoras' Theorem incorrectly (using  $4\text{ cm}$  instead of  $8\text{ cm}$ )

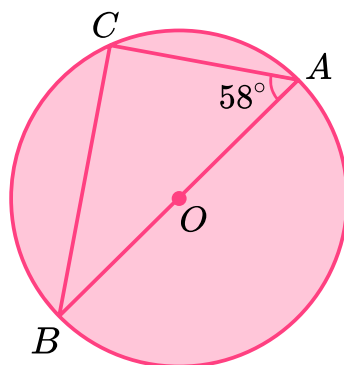
B)  $6\text{ cm}$  Student found only half the chord length

C)  $4\text{ cm}$  Student forgot to square the lengths in Pythagoras' Theorem

D)  $12\text{ cm}$  Correct answer

## Diagnostic Questions: Circle Theorems Answers

9. A, B and C are points on the circumference of a circle with centre O. AB is a diameter of length 9 cm. Calculate the length of chord AC:



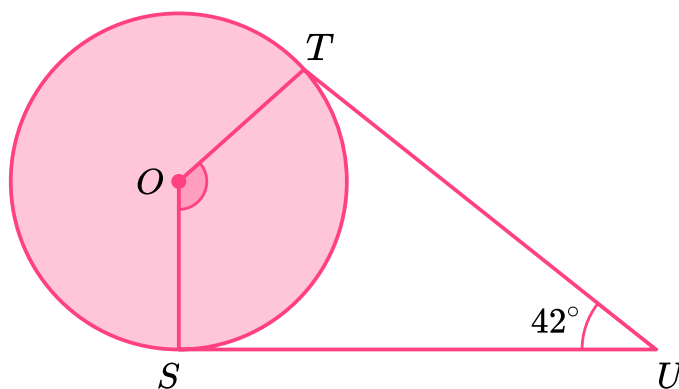
A) 4.8 cm **Correct answer**

B) 7.6 cm Student applied trigonometry rules incorrectly (used  $\sin 58$ )

C) 5.6 cm Student applied trigonometry rules incorrectly (used  $\tan 32$ )

D) 4.5 cm Student halved the diameter

10. Lines SU and TU are tangent to the circle, with centre O, at the points S and U respectively. Determine the size of angle SOT (indicated):



A) 96° Student forgot to halve 42 before applying rules for angles in triangles

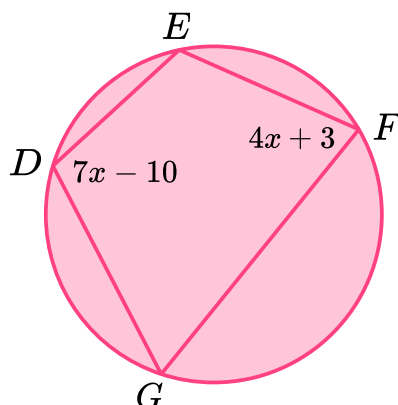
B) 84° Student used wrong theorem and doubled angle SUT

C) 148° Student made an error performing subtraction

D) 138° **Correct answer**

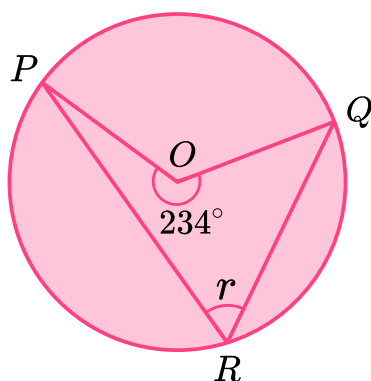
## Diagnostic Questions: Circle Theorems Answers

11. Given that the corners of quadrilateral DEFG lie on the circumference of a circle, determine the value of  $x$  :



- A)  $x = 15.7$  Student formed correct equation but inverted operation incorrectly  
 B)  $x = 17$  Correct answer  
 C)  $x = 4.3$  Student equated angles to each other  
 D)  $x = 14.3$  Student equated angle EDG to  $90^\circ$

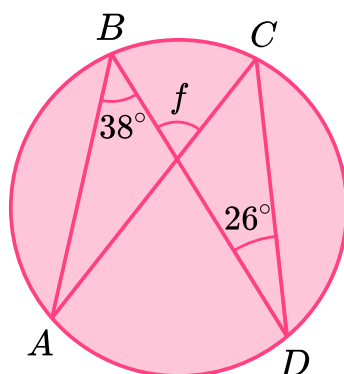
12. P, Q and R are points on the circumference of a circle with centre O. Determine the size of angle  $r$  :



- A)  $63^\circ$  Correct answer  
 B)  $117^\circ$  Student halved  $234^\circ$ , rather than subtracting from  $360^\circ$  and halving  
 C)  $54^\circ$  Student subtracted  $180^\circ$  from  $234^\circ$   
 D)  $68^\circ$  Student made errors subtracting  $234^\circ$  from  $360^\circ$  before halving

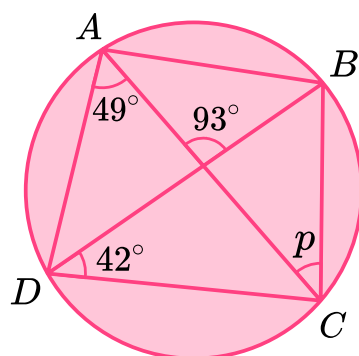
## Diagnostic Questions: Circle Theorems Answers

13. Given that A, B, C and D are points on the circumference of a circle, find the size of angle  $f$  :



- A)  $76^\circ$  Student doubled the size of angle ABD  
 B)  $116^\circ$  Student gave the supplementary angle to  $f$   
 C)  $64^\circ$  Correct answer  
 D)  $52^\circ$  Student doubled the size of angle BDC

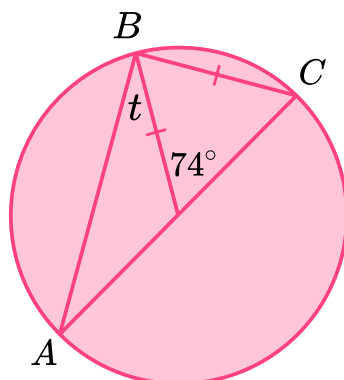
14. A, B, C and D are points on the circumference of a circle. Determine the size of angle  $p$  :



- A)  $44^\circ$  Correct answer  
 B)  $49^\circ$  Student confused rule for alternate angles in parallel lines  
 C)  $42^\circ$  Student rotated angle BDC to “correspond” with angle ACB  
 D)  $38^\circ$  Student subtracted  $(93+49)$  from 180

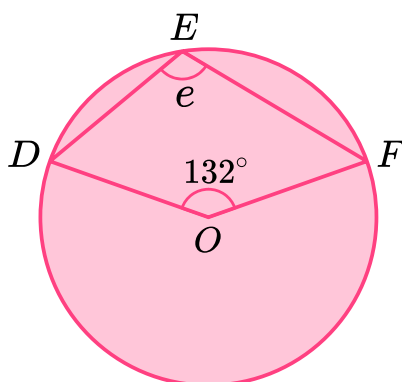
## Diagnostic Questions: Circle Theorems Answers

15. Triangle ABC is inscribed in a circle with diameter AC. Determine the size of angle  $t$  :



- A)  $16^\circ$  Student subtracted  $74^\circ$  from  $90^\circ$   
 B)  $37^\circ$  Student halved the known angle ( $74^\circ$ )  
 C)  $58^\circ$  Correct answer  
 D)  $90^\circ$  Student stated the size of angle ABC

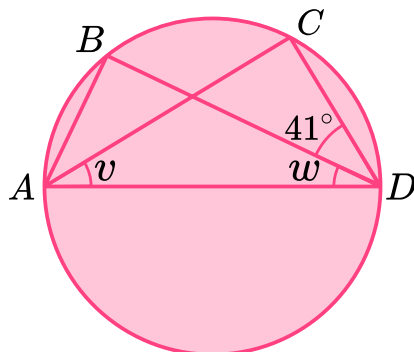
16. Given that points D, E and F are points on the circumference with centre O, determine the size of angle  $e$  :



- A)  $66^\circ$  Student did not use the given angle at the centre correctly  
 B)  $48^\circ$  Student attempted to use the theorem for cyclic quadrilaterals  
 C)  $132^\circ$  Student assumed angles DOF and DEF were equal  
 D)  $114^\circ$  Correct answer

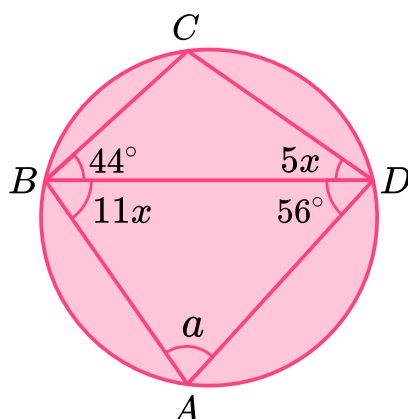
## Diagnostic Questions: Circle Theorems Answers

17. A, B, C and D are points on the circumference of a circle with a diameter AD. Find a formula for the size of angle  $w$ , in terms of angle  $v$  :



- A)  $w = 41 - v$  Student equated  $v$  and  $w$  to  $41^\circ$   
 B)  $w = 49 - v$  **Correct answer**  
 C)  $w = 131 - v$  Student did not apply angle sum of a triangle correctly  
 D)  $w = 90 - v$  Student forgot to account for the known angle BDC

18. Given that A, B, C and D are points on the circumference of a circle, find the size of angle  $a$  :

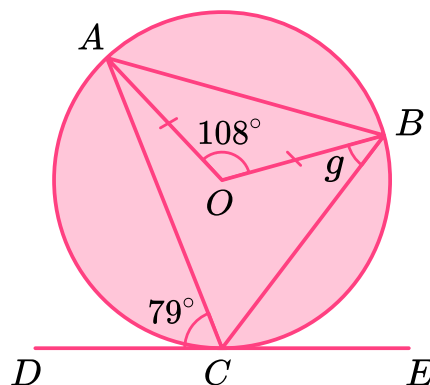


- A)  $69^\circ$  **Correct answer**  
 B)  $5^\circ$  Student stated the value of  $x$   
 C)  $100^\circ$  Student found the sum of the two known angles  
 D)  $111^\circ$  Student found the size of angle BCD

## Diagnostic Questions: Circle Theorems Answers

19. A, B and C are points on a circle with centre O.

DE is tangent to the circle at point C. Calculate the size of angle  $g$  :



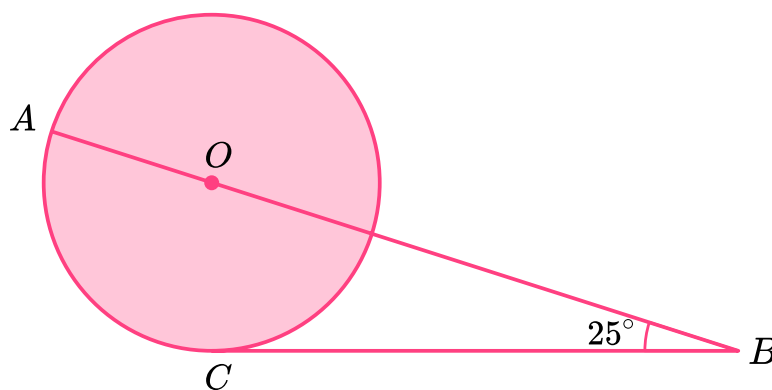
A)  $79^\circ$  Student stated the size of angle ABC

B)  $43^\circ$  Correct answer

C)  $7^\circ$  Student found angle OBA to be  $72^\circ$  (mistake with isosceles triangle)

D)  $36^\circ$  Student gave the size of angle OBA

20. Line BC is tangent to a circle with centre O at point C. Line AB passes through the centre of the circle. The circle has radius  $5\text{ cm}$ . Find the length of AB:



A)  $11.8\text{ cm}$  Student forgot to add length AO to the length of OB

B)  $10.5\text{ cm}$  Student used incorrect trig function to determine length OB

C)  $16.8\text{ cm}$  Correct answer

D)  $15\text{ cm}$  Student found the sum of diameter and radius

# Where to go next?

For more <sup>x</sup> diagnostic questions, and GCSE maths revision resources and worksheets to support students in fixing any misconceptions take a look at the free Third Space Learning [GCSE maths revision](#) pages.

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