Materials required for examination
Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser.
Tracing paper may be used.

Instructions
Use black ink or ball-point pen.
Fill in the boxes at the top of this page with your name, centre number and candidate number.
Answer all questions.
Answer the questions in the spaces provided – there may be more space than you need.
Calculators may be used.

Information
The marks for each question are shown in brackets – use this as a guide as to how much time to spend on each question.
Questions labelled with an asterisk (*) are ones where the quality of your written communication will be assessed – you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.

Advice
Read each question carefully before you start to answer it.
Keep an eye on the time.
Try to answer every question.
Check your answers if you have time at the end.
1. A, B, C and D are points on the circumference of a circle. 
Angle $ABD = 54^\circ$. 
Angle $BAC = 28^\circ$. 

(i) Find the size of angle $ACD$. 

(ii) Give a reason for your answer.

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(3 marks)

2. A, B, C and D are points on the circumference of a circle, centre $O$.

Angle $AOC = 168^\circ$

Work out the size of angle $ADC$. 
You must give reasons for your working.

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(4 marks)
3. A, B and D are points on the circumference of a circle, centre O. 
BOD is a diameter of the circle. 
BC and AC are tangents to the circle. 
Angle OCB = 34°.

Work out the size of angle DOA.

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(4 marks)

4. B and C are points on a circle, centre O. 
AB and AC are tangents to the circle. 
Angle BOC = 130°.

Work out the size of angle BAO.

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(4 marks)
5.

A and B are points on the circumference of a circle, centre O.
PA and PB are tangents to the circle.
Angle APB is 86°.

Work out the size of the angle marked x.

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(3 marks)

6.

R and S are two points on a circle, centre O.
TS is a tangent to the circle.
Angle RST = x.

Prove that angle ROS = 2x.
You must give reasons for each stage of your working.

(4 marks)
In the diagram, $O$ is the centre of the circle. 
$A$ and $C$ are points on the circumference of the circle. 
$BCO$ is a straight line. 
$BA$ is a tangent to the circle.

$AB = 8 \text{ cm}$. 
$OA = 6 \text{ cm}$.

(a) Explain why angle $OAB$ is a right angle.

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   (1)

(b) Work out the length of $BC$.

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   (3)
A, B, C and D are points on a circle, centre O.
BC = CD.
Angle BCD = 130°.

(a) Write down the size of angle BAD.
Give a reason for your answer.

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(2)

(b) Work out the size of angle ODC.
Give reasons for your answer.

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(4)

(6 marks)
In the diagram, $A$, $B$, $C$ and $D$ are points on the circumference of a circle, centre $O$.
Angle $BAD = 70^\circ$.
Angle $BOD = x^\circ$.
Angle $BCD = y^\circ$.

(a) (i) Work out the value of $x$.

$x = ..................................$

(ii) Give a reason for your answer.
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(2)

(b) (i) Work out the value of $y$.

$y = ..................................$

(ii) Give a reason for your answer.
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(2)

(4 marks)
The diagram shows a circle centre $O$. 
$A, B$ and $C$ are points on the circumference.

$DCO$ is a straight line. 
$DA$ is a tangent to the circle.

Angle $ADO = 36^\circ$

(a) Work out the size of angle $AOD$.

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(2)

(b) (i) Work out the size of angle $ABC$.

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(ii) Give a reason for your answer.

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B, D and E are points on a circle centre O. 
ABC is a tangent to the circle. 
BE is a diameter of the circle. 
Angle DBE = 35°.

(a) Find the size of angle ABD.

Give a reason for your answer.

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(2)

(b) Find the size of angle DEB.

Give a reason for your answer.

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(2)

(4 marks)
P, Q and T are points on the circumference of a circle, centre O. The line ATB is the tangent at T to the circle.

\( PQ = TQ \).
Angle \( ATP = 58^\circ \).

Calculate the size of angle \( OTQ \).
Give a reason for each stage in your working.

\[ \text{..........................} \,^\circ \]

\( (4 \text{ marks}) \)
13. (a)

\[ D, \, E \, \text{and} \, F \, \text{are points on the circumference of a circle, centre} \, O. \]
\[ \text{Angle} \, DOF = 130^\circ. \]

(i) Work out the size of angle \( DEF \).

\[ \text{.................................................}^\circ \]

(ii) Give a reason for your answer.

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\[ \text{.............................................................................................................................} \]

(2)

(b)

\[ \text{In the diagram,} \, A, \, B \, \text{and} \, C \, \text{are points on the circumference of a circle, centre} \, O. \]
\[ \text{Angle} \, ABC = 85^\circ. \]

(i) Work out the size of the angle marked \( x^\circ \).

\[ \text{.................................................}^\circ \]

(ii) Give a reason for your answer.

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(2)

(4 marks)
*14.

$S$ and $T$ are points on the circumference of a circle, centre $O$.
$PT$ is a tangent to the circle.
$SOP$ is a straight line.

Angle $OPT = 32^\circ$.

Work out the size of the angle marked $x$.
Give reasons for your answer.