| Name | Class |
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MATHS TEACHER HUB

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# Circle theorems

## (9 – 1) Topic booklet

# HIGHER

**These questions have been collated from previous years GCSE Mathematics papers.**

| **You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. | Total Marks |
|---|---|

## 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*.
•Diagrams are NOT accurately drawn, unless otherwise indicated.
•You must **show all your working out.**
•If the question is a **1F** question you are not allowed to use a calculator.
•If the question is a **2F** or a **3F** question, you may use a calculator to help you answer.

**Information**

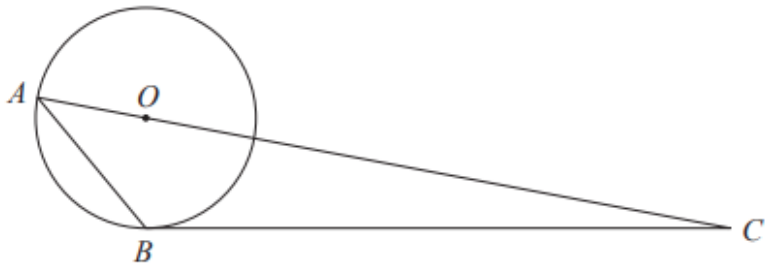
•The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question*.

**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.

**Answer ALL questions**
**Write your answers in the space provided.**
**You must write down all the stages in your working.**

**11**




$A$ and $B$ are points on a circle, centre $O$.

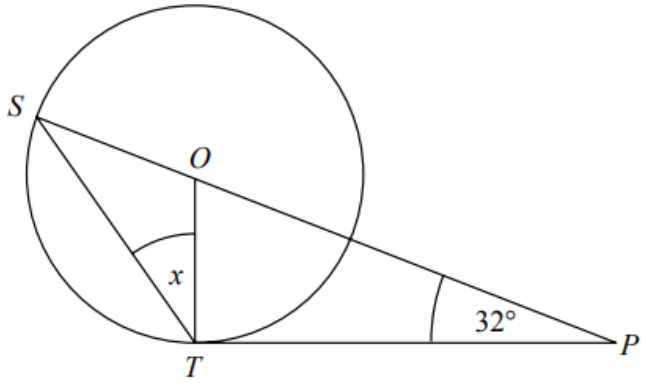
$BC$ is a tangent to the circle.
$AOC$ is a straight line.
Angle $ABO = x°$.

Find the size of angle $ACB$, in terms of $x$.
Give your answer in its simplest form.
Give reasons for each stage of your working.



**(Total for Question 11 is 5 marks)**

**11**



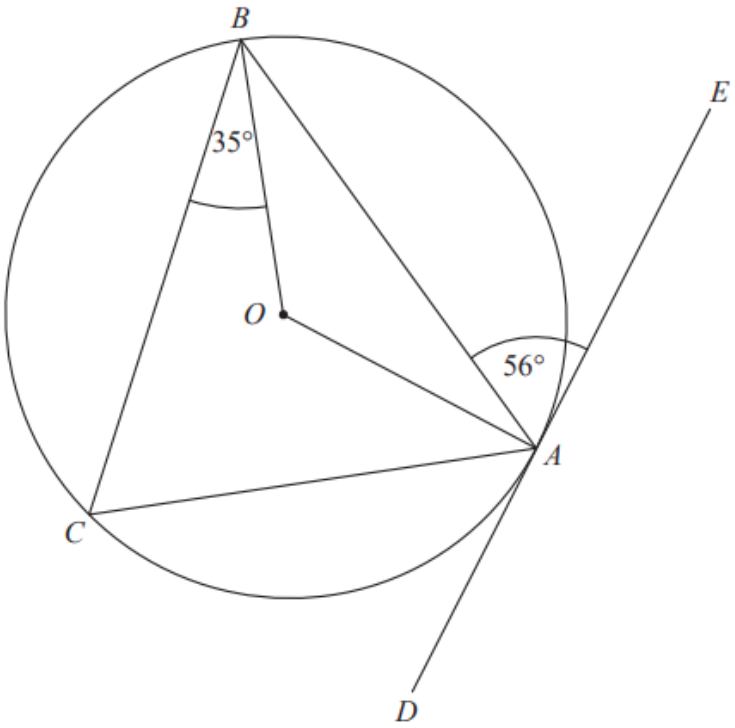

*S* and *T* are points on the circumference of a circle, centre *O*.
*PT* is a tangent to the circle.
*SOP* is a straight line.
Angle *OPT* = 32°

Work out the size of the angle marked *x*.
You must give a reason for each stage of your working.



**(Total for Question 11 is 4 marks)**

**12**




$A$, $B$ and $C$ are points on the circumference of a circle, centre $O$.
$DAE$ is the tangent to the circle at $A$.

Angle $BAE = 56°$
Angle $CBO = 35°$

Work out the size of angle $CAO$.
You must show all your working.

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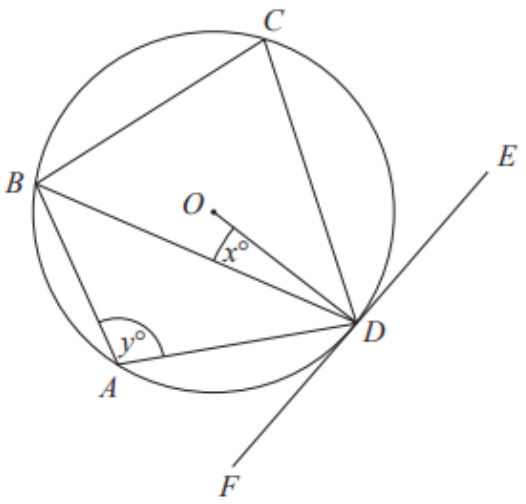
**(Total for Question 12 is 3 marks)**

**13**




$A$, $B$, $C$ and $D$ are points on the circumference of a circle, centre $O$.
$FDE$ is a tangent to the circle.

(a) Show that $y - x = 90$
You must give a reason for each stage of your working.

**(3)**

Dylan was asked to give some possible values for $x$ and $y$.

He said,

"$y$ could be 200 and $x$ could be 110, because $200 - 110 = 90$"

(b) Is Dylan correct?
You must give a reason for your answer.

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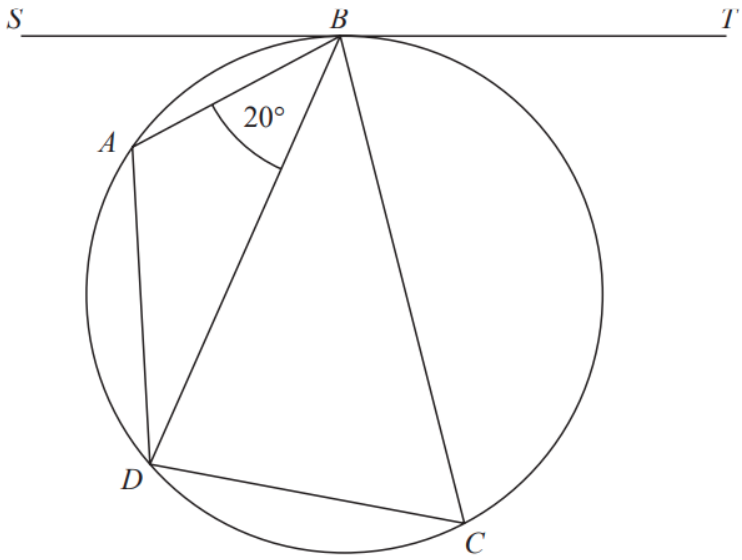
**(1)**

**(Total for Question 13 is 4 marks)**

**14**




$A$, $B$, $C$ and $D$ are four points on a circle.
$SBT$ is a tangent to the circle.
Angle $ABD = 20°$

the size of angle $BAD$ : the size of angle $BCD = 3 : 1$

Find the size of angle $SBA$.
Give a reason for each stage of your working.

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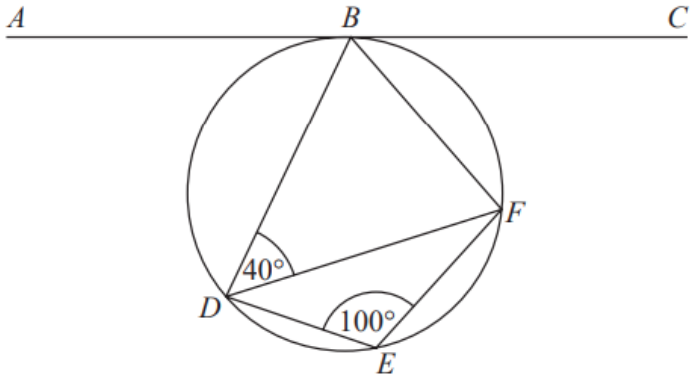
**(Total for Question 14 is 4 marks)**

**14**

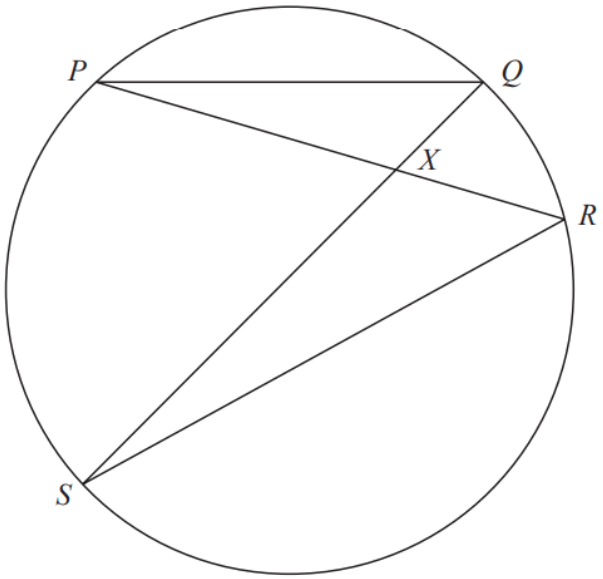



Points $B$, $D$, $E$ and $F$ lie on a circle.
$ABC$ is the tangent to the circle at $B$.

Find the size of angle $ABD$.
You must give a reason for each stage of your working.

**(Total for Question 14 is 4 marks)**

**15** $P$, $Q$, $R$ and $S$ are four points on a circle.

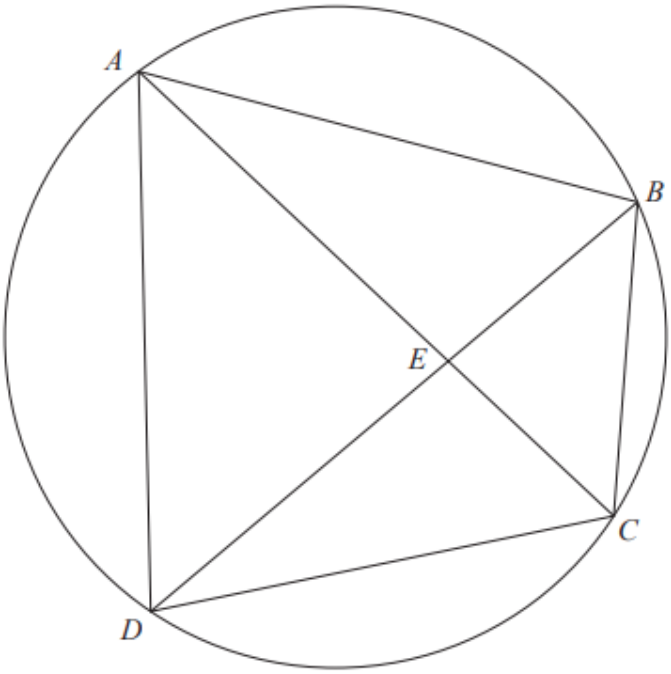



$PXR$ and $SXQ$ are straight lines.

Prove that triangle $PQX$ and triangle $SRX$ are similar.

**(Total for Question 15 is 3 marks)**

**15** $A$, $B$, $C$ and $D$ are four points on the circumference of a circle.

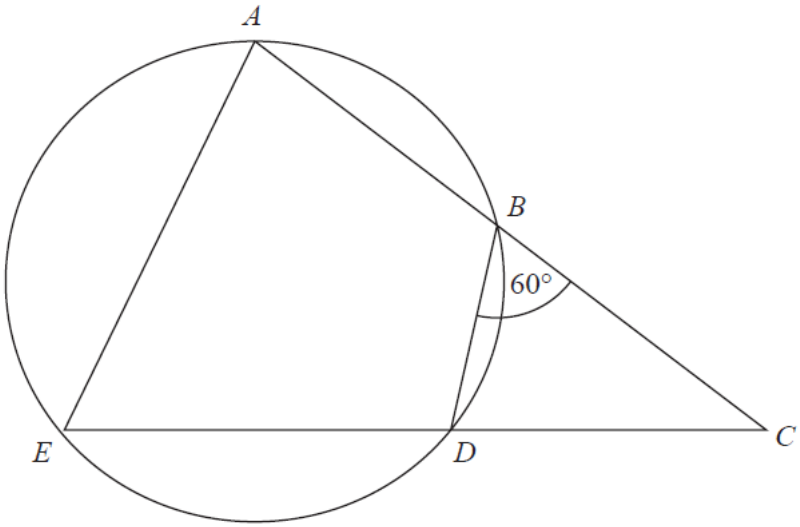



$AEC$ and $BED$ are straight lines.

Prove that triangle $ABE$ and triangle $DCE$ are similar.
You must give reasons for each stage of your working.

**(Total for Question 15 is 3 marks)**

**16**




*ABDE* is a cyclic quadrilateral.
*ABC* and *EDC* are straight lines.
Angle *DBC* = 60°

Given that

size of angle *EAB* : size of angle *BCD* = 2 : 1

work out the size of angle *BCD*.
You must show all your working.

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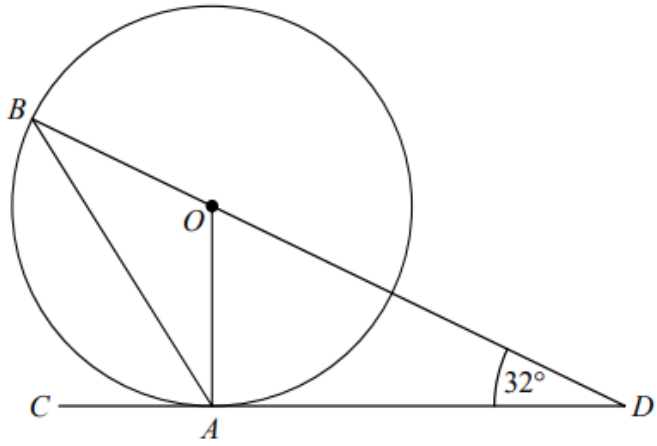
**(Total for Question 16 is 4 marks)**

**17**




*A* and *B* are points on a circle with centre *O*.
*CAD* is the tangent to the circle at *A*.
*BOD* is a straight line.

Angle *ODA* = 32°

Work out the size of angle *CAB*.
You must show all your working.

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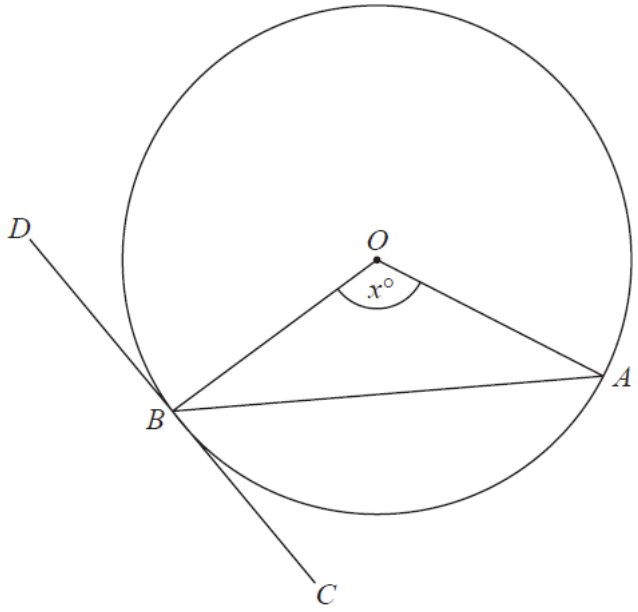
**(Total for Question 17 is 3 marks)**

**18**



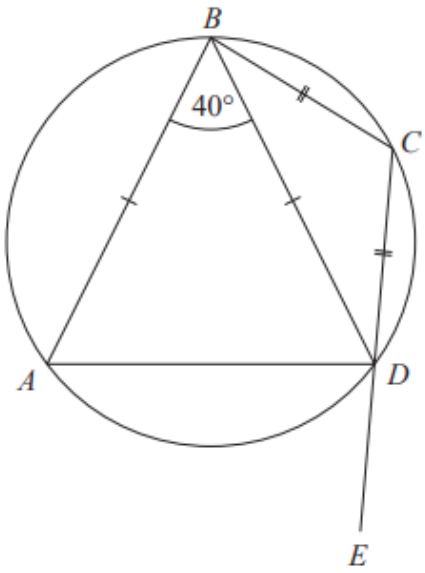

$A$ and $B$ are points on a circle, centre $O$.
$DBC$ is the tangent to the circle at $B$.
Angle $AOB = x°$

Show that angle $ABC = \frac{1}{2}x°$

You must give a reason for each stage of your working.

**(Total for Question 18 is 3 marks)**

**18** The points $A$, $B$, $C$ and $D$ lie on a circle.
$CDE$ is a straight line.



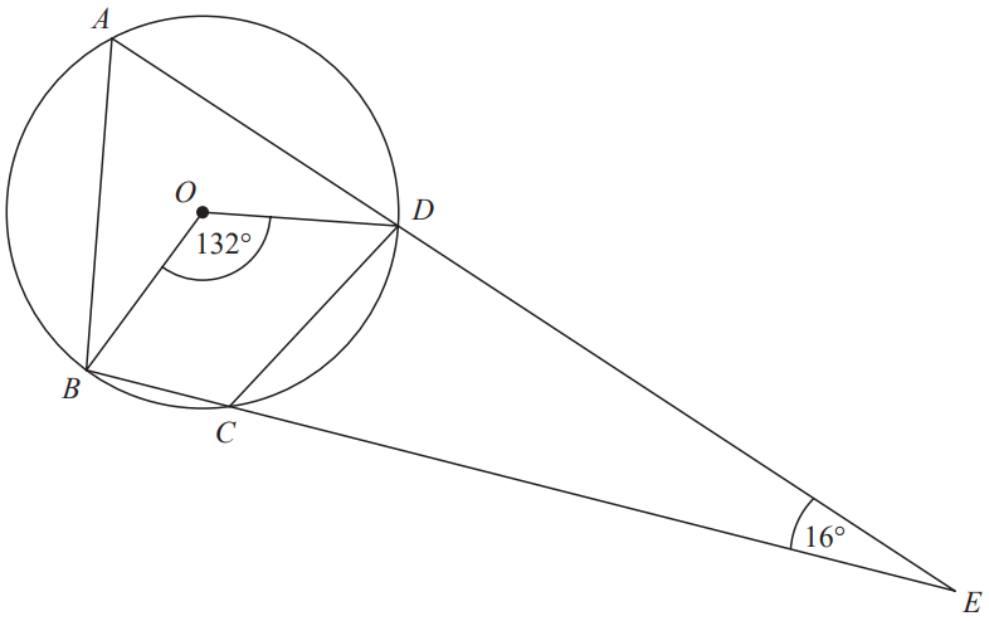

$BA = BD$
$CB = CD$
Angle $ABD = 40°$

Work out the size of angle $ADE$.
You must give a reason for each stage of your working.



**(Total for Question 18 is 5 marks)**

**20** $A$, $B$, $C$ and $D$ are points on the circumference of a circle, centre $O$.
$ADE$ and $BCE$ are straight lines.




Work out the size of angle $CDE$.
Give a reason for each stage of your working.

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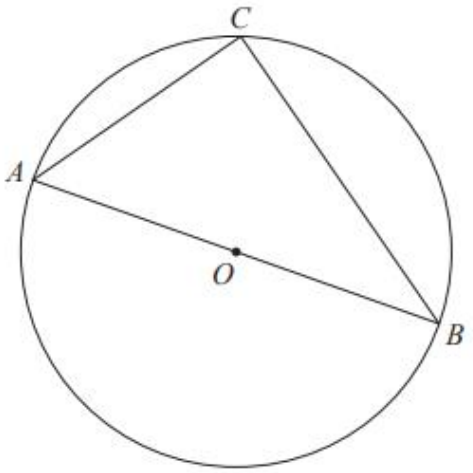
**(Total for Question 20 is 4 marks)**

**20**



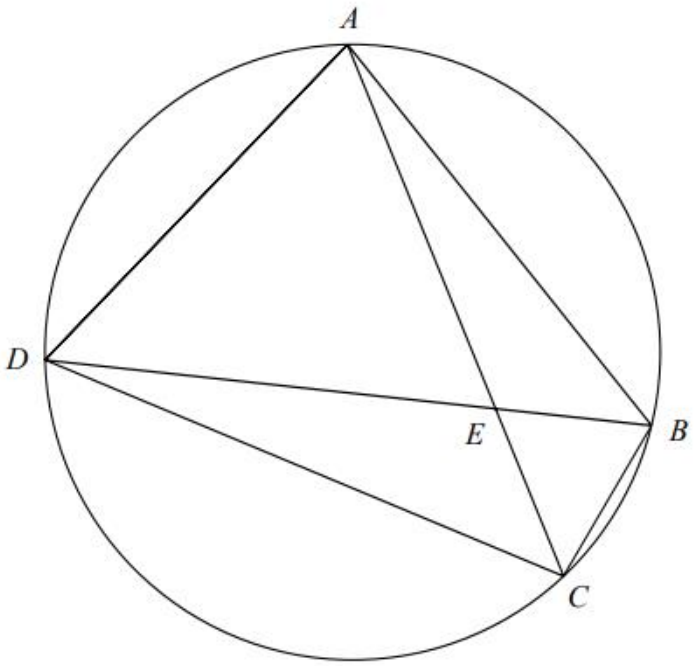

$A$, $B$ and $C$ are points on the circumference of a circle, centre $O$.
$AOB$ is a diameter of the circle.

Prove that angle $ACB$ is 90°
You must **not** use any circle theorems in your proof.



**(Total for Question 20 is 4 marks)**

**22** $A$, $B$, $C$ and $D$ are four points on a circle.



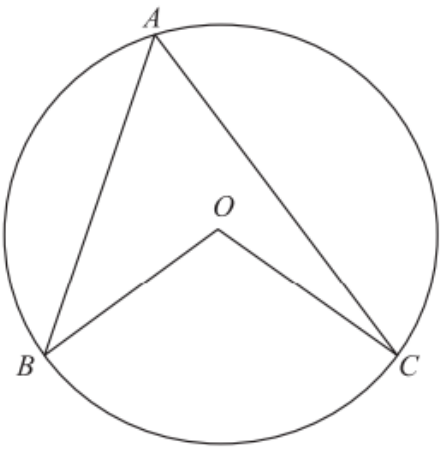

$AEC$ and $DEB$ are straight lines.

Triangle $AED$ is an equilateral triangle.

Prove that triangle $ABC$ is congruent to triangle $DCB$.

**(Total for Question 22 is 4 marks)**

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




Prove that angle $BOC$ is twice the size of angle $BAC$.

**(Total for Question 24 is 4 marks)**