TRINITY COLLEGE

Year 11 Mathematics Specialist
Test 3 2022

Calculator Assumed

Circle Geometry & Proof

STUDENT'S NAME _____

DATE: Wednesday 11th May **TIME:** 50 minutes **MARKS**: 43

INSTRUCTIONS:

Standard Items: Pens, pencils, drawing templates, eraser.
Special Items: Scientific Calculator

Questions or parts of questions worth more than 2 marks require working to be shown to receive full marks.

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1. (3 marks)

Prove by contradiction the statement "No integers a and b exist for which $24a+12b=1$"

2. (8 marks)

(a) For each of the following statements, state whether they are always true or sometimes false. Support each answer with an example.

(i) If $P \Rightarrow Q$ then it follows that $Q \Rightarrow P$. [2]

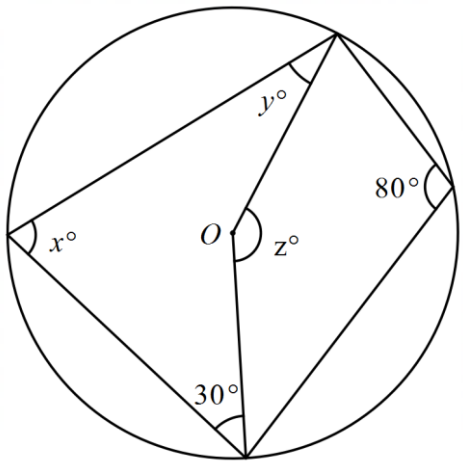
(ii) If $P \Leftrightarrow Q$, then it follows that $Q \Rightarrow P$ and $P \Rightarrow Q$. [2]

(iii) If $P \Rightarrow Q$ then it follows that $\overline{P} \Rightarrow \overline{Q}$. [2]

(b) If $B \Rightarrow A$ is a true statement, write a statement which relates to A and B which will be **always** true. [2]

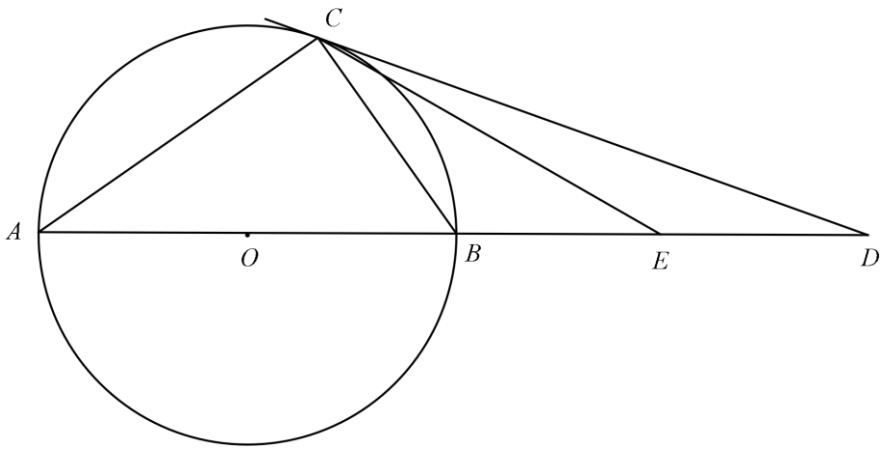
3. (3 marks)

In the diagram below determine the values of x, y and z.



4. (3 marks)

Triangle ABC is inscribed in a circle with AB as a diameter. The tangent at C meets AB produced at D, the point E is on the line BD such that BE = BC.

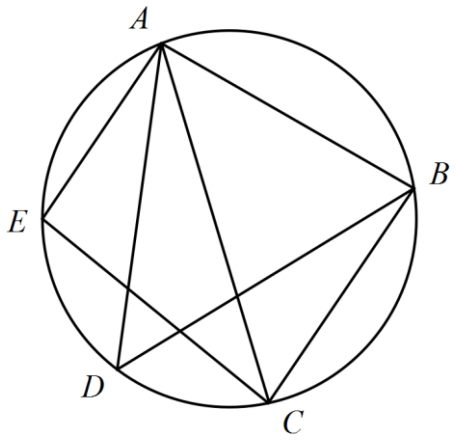


Given that $\angle DCE = x^\circ$ and $\angle BCE = y^\circ$ calculate, in terms of x and y only, the angles CEB, CBA and CAB.

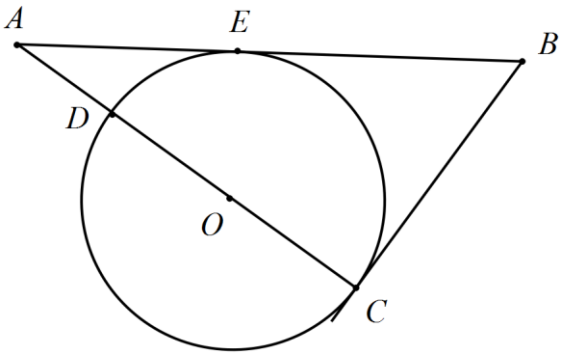
5. (7 marks)

(a) In the diagram below $\angle AEC = 85°$ and $\angle BAC = 38°$. Determine the size of $\angle ADB$.

(Show all relevant angles on the diagram below) [3]

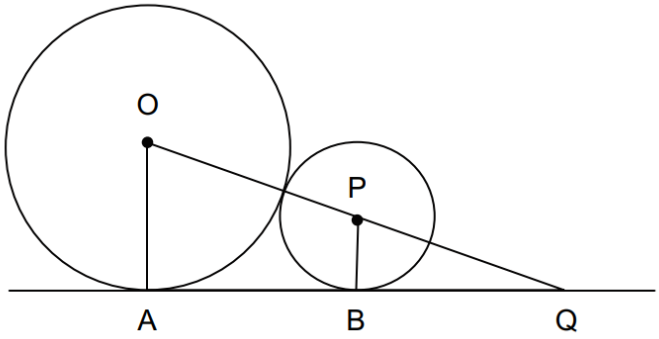


(b) In the diagram shown below, not drawn to scale, a circle with centre *O* has tangents at *E* and *C* that meet at *B*. If the length of *BC* is 8 cm and the length of *AE* is 9 cm, determine the length of *DC*. [4]



6. (6 marks)

Two circles are tangent to a line and to each other, as shown in the diagram below. The radius of the larger circle is twice the radius of the smaller circle.



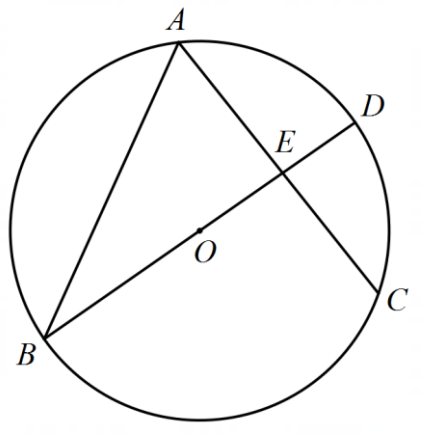
(a) Prove that the triangles AOQ and BPQ are similar. [2]

(b) Show that $PQ = 3r$ where r is the radius of the smaller circle. [2]

(c) Determine the exact radius of the smaller circle given that AB = 20 cm. [2]

7. (7 marks)

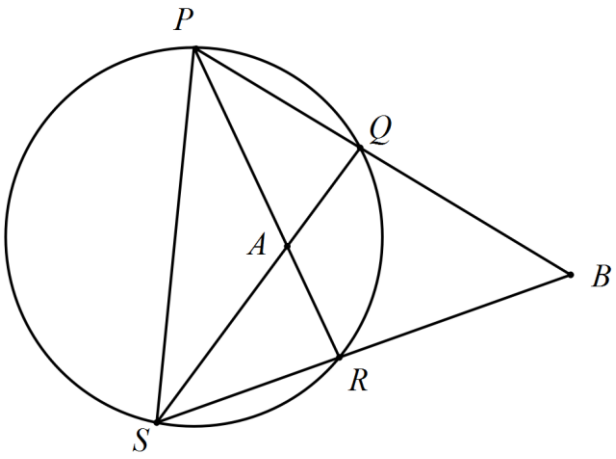
Consider the diagram below. ΔABC is isosceles with $AB = AC$ and BOD is a diameter where O is the centre of the circle.



Prove $\angle AED = 3 \times \angle ABD$

8. (6 marks)

The points *P*, *Q*, *R* and *S* lie on a circle of radius *r*. *PR* and *QS* meet at *A*. *PQ* and *SR* are produced to meet at *B*, and *AQBR* is a cyclic quadrilateral.



Prove that *BS* is perpendicular to *PR*.