TRINITY · COLLEGE

Year 11 Mathematics Specialist
Test 3   2016

Calculator Assumed
Geometric proofs, vector proofs, relative motion

STUDENT'S NAME _____

DATE: **TIME:** 50 minutes   **MARKS**: 50

INSTRUCTIONS:
Standard Items: Pens, pencils, ruler, eraser.
Special Items: Three calculators, drawing instruments, notes on one side of a single A4 page (these
                       notes to be handed in with this assessment)

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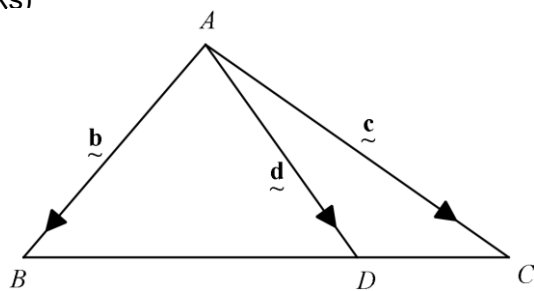
_____

1.   (4 marks)

Ship A is sailing north-east at 15 km per hour. To an observer on ship A, ship B appears to be
moving east at 7 km per hour. Calculate the actual magnitude and direction of ship B.

2. (4 marks)

Given $_A r_B = \begin{pmatrix} 2 \\ 10 \end{pmatrix}$, $_B r_C = \begin{pmatrix} -11 \\ 9 \end{pmatrix}$ and $r_C = \begin{pmatrix} 8 \\ 2 \end{pmatrix}$. Determine r_A
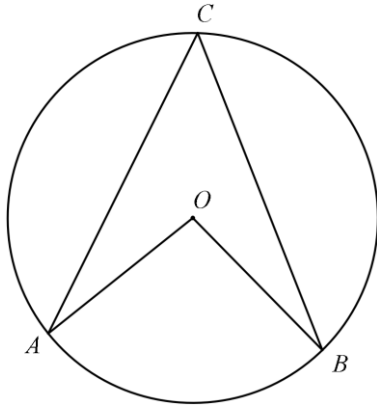
3. (4 marks)

Given that $\overrightarrow{BD} = 2\overrightarrow{DC}$, show that $\underset{\sim}{b} + 2\underset{\sim}{c} = 3\underset{\sim}{d}$.

4.   (4 marks)

The diagram shows a circle with centre O. Given that ∠CAO = 18° and ∠CBO = 18°.
Determine the size of ∠AOB.

5.   (4 marks)

In the diagram below PT is a tangent at T. TB = TA and ∠DCA = 80°.
Determine the size of ∠PTA.
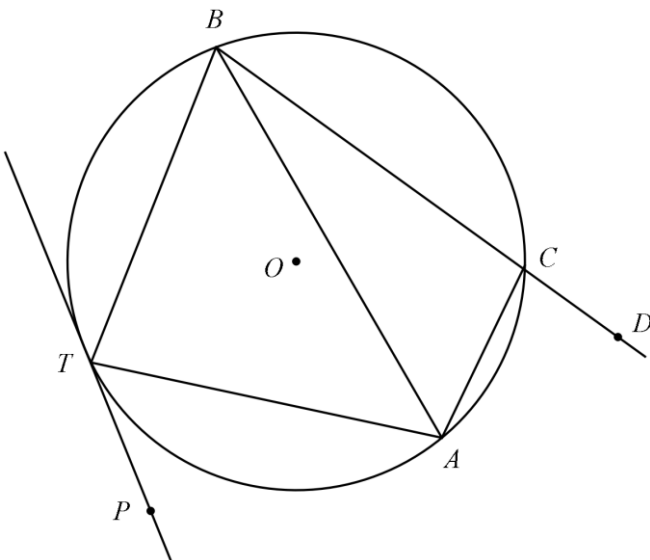
6.   (7 marks)

$\overrightarrow{OA} = \underset{\sim}{a}$ and $\overrightarrow{OB} = \underset{\sim}{b}$. E is the point on OA such that OE : EA = 1 : 2. F is the point such that $\overrightarrow{BF} = 2\underset{\sim}{b}$.

(a)   Express in terms of $\underset{\sim}{a}$ and $\underset{\sim}{b}$, $\overrightarrow{OE}, \overrightarrow{EB}, \overrightarrow{OF}$ and $\overrightarrow{AF}$.   [4]

(b)   Show that EB is parallel to AF.   [2]

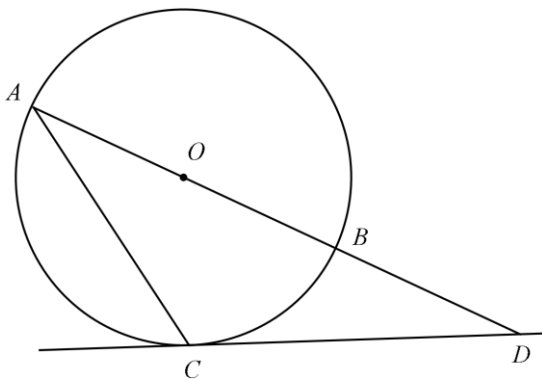(c)   Determine the ratio of the lengths EB : AF   [1]

7.   (3 marks)

The circle in the diagram touches the triangle ABC at P, Q and R. and $\angle PRQ = 65°$.
Determine the size of $\angle ACB$.
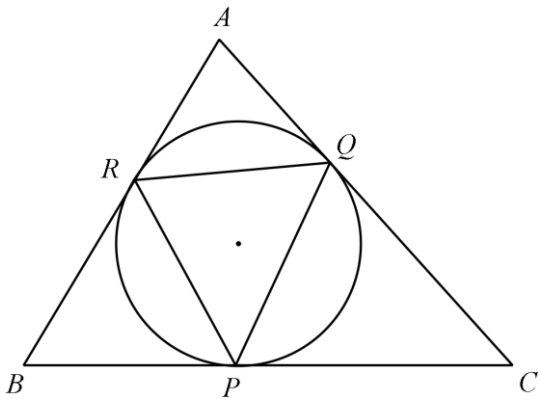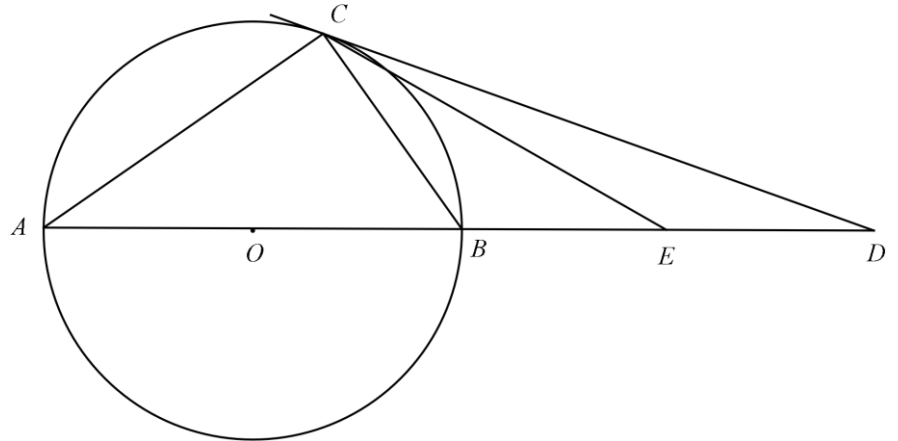

8.   (3 marks)

The diameter AOB of the circle below is produced to meet the tangent CD at D. Given that
$\angle ADC = 36°$. Calculate the size of $\angle DAC$.

8.   (9 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
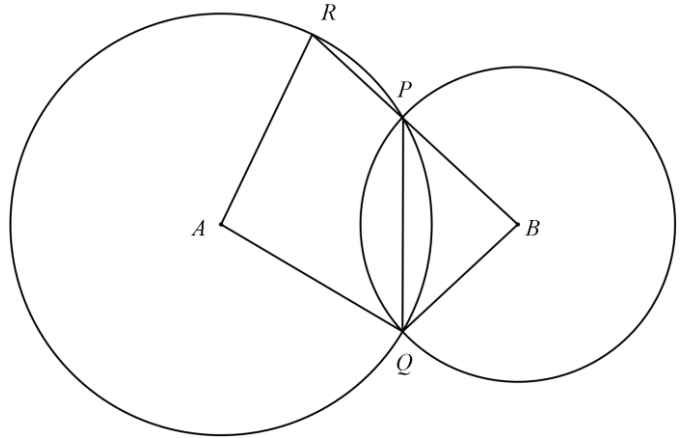$\angle DCE = x°$ and $\angle BCE = y°$.

(a)   Calculate, in terms of x and y only, the angles CEB, CBA and CAB.   [3]

(b)   Write an equation for y in terms of x.   [3]

(c)   If the length of DC = 7 cm and the radius of the circle is 2 cm, show that DB (z) is given by
$z^2 + 4z - 49 = 0$.   [3]

9.   (8 marks)

In the given diagram, two unequal circles, centres A and B, intersect at P and Q. The line BP produced meets the circle whose centre is A, at the point R

(a)   If $\angle RPQ = x°$, prove that $\angle PBQ = (2x - 180)°$ [4]

(b)   Deduce, or prove otherwise, that BQAR is a cyclic quadrilateral   [4]