ASHTON
INTERNATIONAL COLLEGE
BALLITO

Mathematics
Paper 2

FORM 4
11 June 2019
Session 1

TIME: 2 hours	TOTAL: 100 marks
Examiner: Mrs A Gunning	**Moderators: Miss A Rohrs; Miss M Eastes**

Name and Surname:

Teacher:

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY BEFORE ANSWERING THE QUESTIONS.

- This question paper consists of 16 pages. Formulae are given on page 17. The formulae page can be detached for ease of use.

- Please check that your question paper is complete.

- Answer all questions on this question paper

- Read and answer all questions carefully.

- It is in your own interest to write legibly and to present your work neatly.

- All necessary working which you have used in determining your answers **must** be clearly shown.

- Approved non-programmable calculators may be used except where otherwise stated. Where necessary give answers correct to **2 decimal places** unless otherwise stated.

- Ensure that your calculator is in DEGREE mode.

- Diagrams have not necessarily been drawn to scale.

- **Give reasons for all statements used in geometry.**

Question	1	2	3	4	5	6	7	8	9	10	Total
Out of	9	9	8	15	13	7	14	6	12	7	100
Mark											

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QUESTION 1

You are given points A(-1;1) and B(5;4) on the Cartesian plane.

(a) Determine the gradient of the line AB. (2)

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(b) Determine the coordinates of M, the midpoint of line AB (2)

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(c) Determine the equation of the line perpendicular to AB, and passing through the point M. (3)

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(d) Determine the length of line AB. Leave your answer in the simplest surd form. (2)

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[9]

QUESTION 2

You are given the coordinates of 3 points: E (4; 3), F (0; − 1) and G (t; 1).

For each of the following, determine the value of t for which:

(a) E, F and G are collinear   (3)

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(b) ΔFEG is right angled at F   (3)

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(c) FG = $2\sqrt{5}$ units   (3)
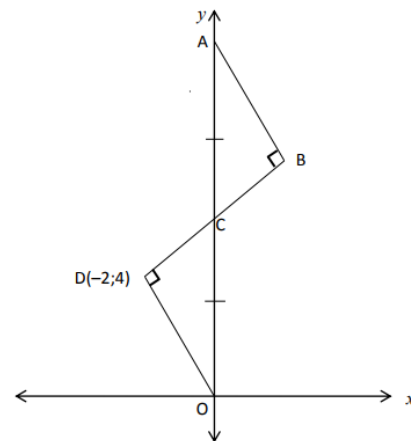
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[9]

QUESTION 3

In the diagram alongside, right-angled triangles ABC and ODC are drawn. O is the origin. A and C lie on the y-axis. C is the midpoint of OA.

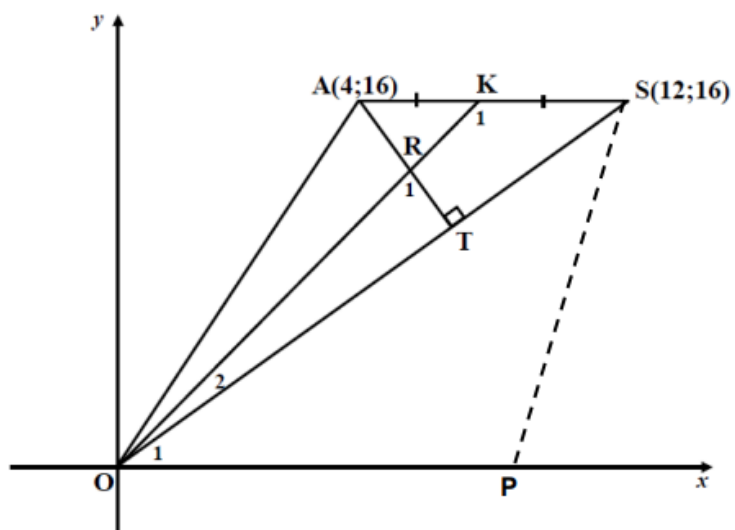D is the point (−2; 4).

(a) Determine the equation of OD. (2)

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(b) Show that the coordinates of Care (0; 5) (3)

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(c) Determine the equation of AB. (3)

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[8]

QUESTION 4

In the diagram K is the midpoint of AS and AT is perpendicular to OS.

(a) Determine the gradient of line OK.   (3)

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(b) Find $\hat{O}_2$ if $\hat{O}_1 = 53,13°$ (4)

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(c) If P is a point on the x-axis such that $S\hat{P}O = 108,4°$, find the equation of SP

   (to 1 decimal place). (4)

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(d) Calculate the area of $\triangle$SPO. (4)

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QUESTION 5

A quadratic number pattern $T_n = an^2 + bn + c$ has a first term equal to 1.

The general term of the **first differences** is given by $4n + 6$

(a) Determine the first three terms of the first differences sequence and **hence find**

   the first three terms of the quadratic number pattern. (4)

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(b) Hence determine the value of a in the quadratic number pattern

   $$T_n = an^2 + bn + c$$ (2)

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(c) Determine the formula of the quadratic number pattern. (3)

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(d) Is 153 a term in this quadratic number pattern? Show working to support your

answer. (4)

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QUESTION 6
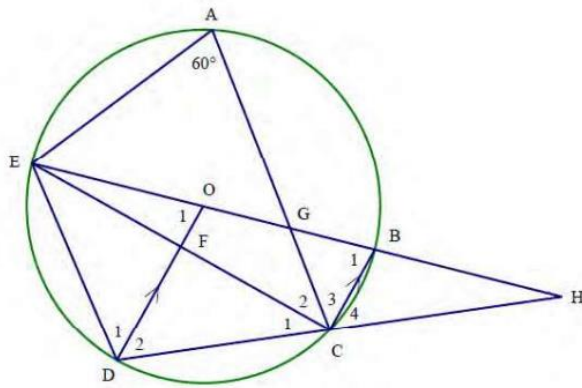
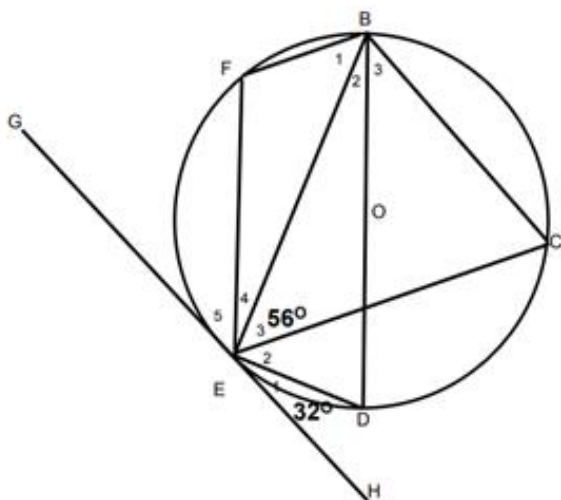In circle ABCDE, centre O, OD // BC and diameter EB is produced to H. $\hat{A}_1 = 60°$.

Find, with reasons, the size of each of the following angles.

Statement	Reasons	
$\hat{B}_1$		(1)
$\hat{O}_1$		(1)
$\hat{C}_1$		(1)
$\hat{D}_1 + \hat{D}_2$		(1)
$\hat{C}_4$		(3)

[7]

QUESTION 7

GEH is a tangent to the circle at E. F and C are two points on the circle and FB, FE, BC, CE and BE are drawn. $\hat{E}_1 = 32°$ and $\hat{E}_3 = 56°$. BOD is the diameter of the circle.

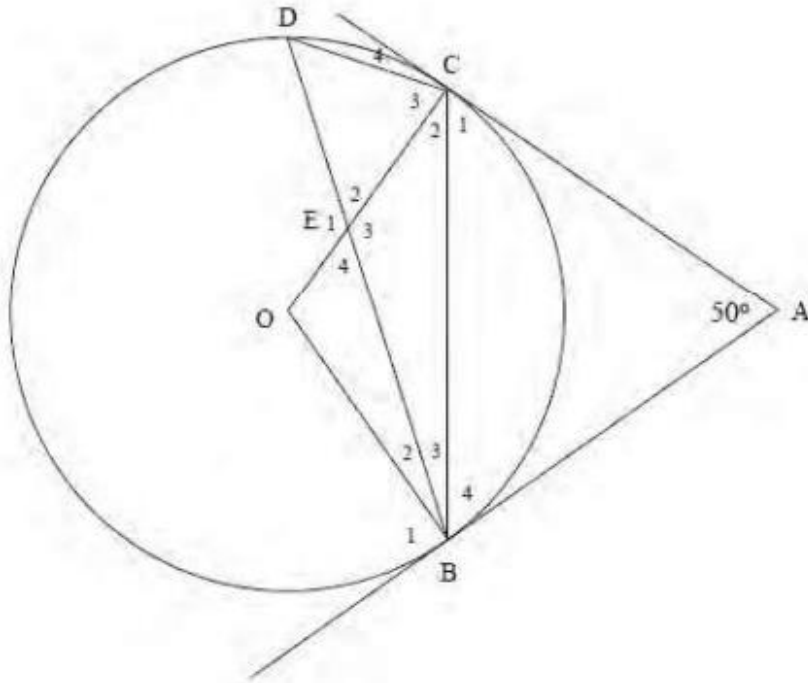(a) Complete the following table, giving full reasoning for each answer.

Statement	Reasons	
$\hat{E}_2$		(2)
$\hat{B}_2$		(2)
$\hat{B}_3$		(2)
$\hat{F}$		(2)
$\hat{C}$		(2)
$\hat{D}$		(2)

(b) Is BD a tangent to the circle BFE? Give a reason for your answer. (2)

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QUESTION 8

In the diagram below, $\hat{A} = 50°$. AC and AB are tangents to the circle at C and B respectively. O is the centre of the circle.
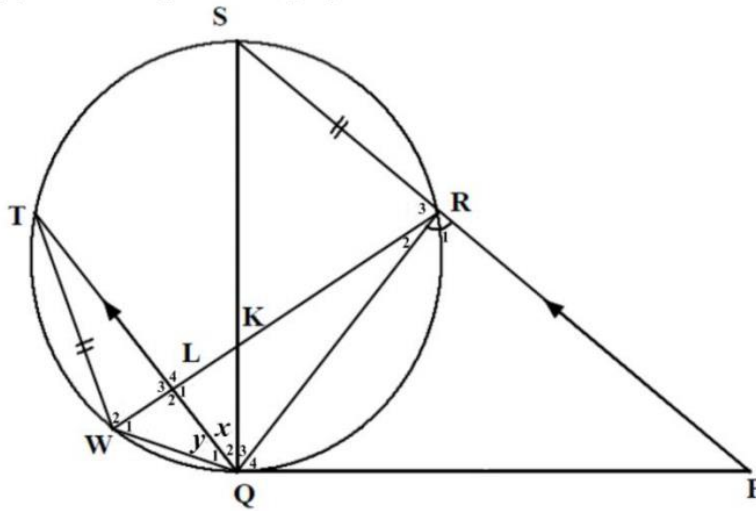

Statements	Reasons	
(a) Determine, with reasons, $B\hat{D}C$		(4)
(b) Determine, with reasons, $B\hat{O}C$		(2)

[6]

QUESTION 9

In the diagram below, PQ is a tangent to circle SRQWT at Q. PRS is a straight line.
RW cuts SQ and QT at K and L respectively. PS//QT, RS = TW, $\hat{Q}_2 = x$ and $\hat{Q}_1 = y$

(a) State the reason(s) why each of the following angles is equal to x		
$\hat{S} = x$		(1)
$\hat{Q}_4 = x$		(1)
$\hat{W}_1 = x$		(1)
(b) State the reason(s) why the following angle is equal to y		
$\hat{Q}_3 = y$		(1)
(c) Hence, prove that $\hat{R}_1 = \hat{L}_3$		(4)

(d) Hence, or otherwise, prove that PRKQ is a cyclic quadrilateral.	(4)

QUESTION 10

Consider the diagram below in which it is given that right angled triangle ABD is drawn with A and B on the circumference of the circle with centre C and D on the chord AE.

AE = 10 units and CE = 13 units.
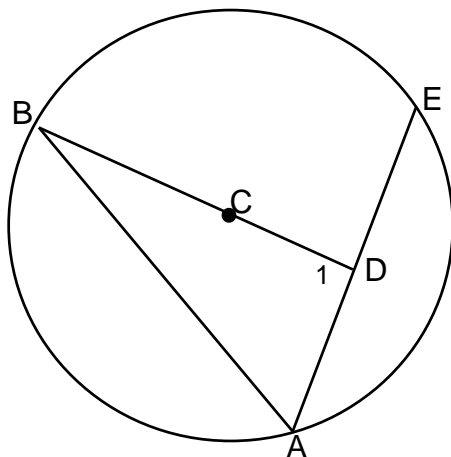
Calculate, showing full reasoning, the length of AB, leaving your answer in the simplest surd form.
(7)

[7]

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FORMULAE:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$M\left(\frac{x_1 + x_2}{2} ; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan\theta$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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