

Mathematics

Paper 2

FORM 4
11 June 2019
Session 1

TIME: 2 hours

TOTAL: 100 marks

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)

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

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

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

[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)

(b) $\triangle FEG$ is right angled at F (3)

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

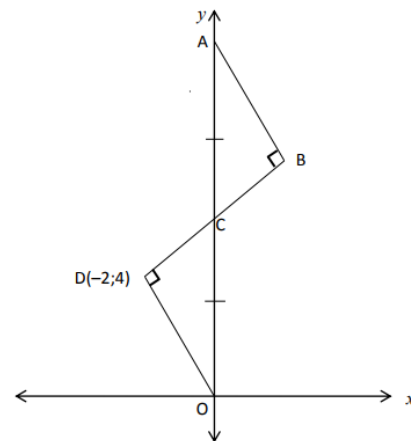
[9]

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)



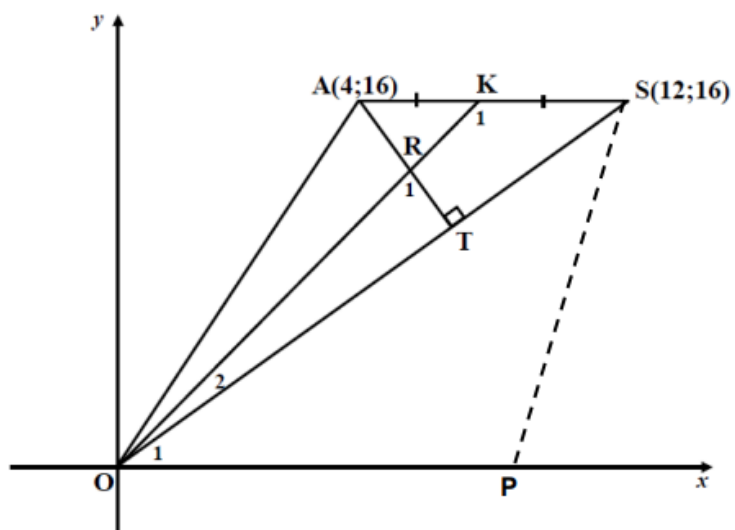
(b) Show that the coordinates of C are $(0; 5)$ (3)

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

[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)

(b) Find $\hat{\theta}_2$ if $\hat{\theta}_1 = 53,13^\circ$ (4)

- (c) If P is a point on the x-axis such that $\widehat{SPO} = 108,4^\circ$, find the equation of SP
(to 1 decimal place). (4)

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

[15]

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)

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

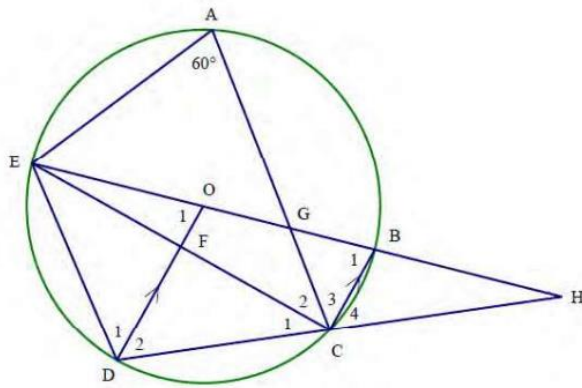
$$T_n = an^2 + bn + c \quad (2)$$

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

(d) Is 153 a term in this quadratic number pattern? Show working to support your answer. (4)

[13]

QUESTION 6



In circle ABCDE, centre O, $OD \parallel BC$ and diameter EB is produced to H. $\hat{A}_1 = 60^\circ$.

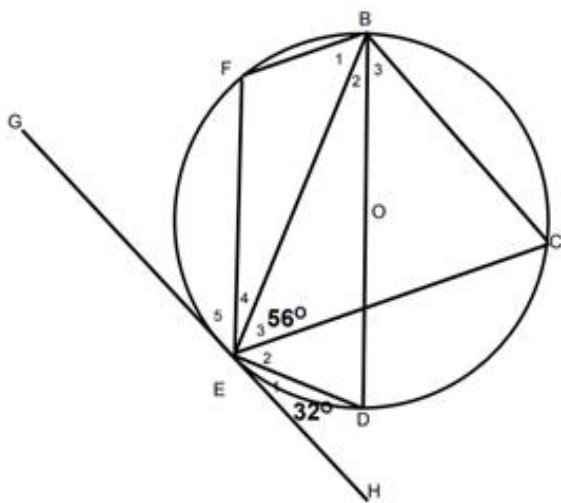
Find, with reasons, the size of each of the following angles.

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. $\hat{E}_1 = 32^\circ$ and $\hat{E}_3 = 56^\circ$. BOD is the diameter of the circle.



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

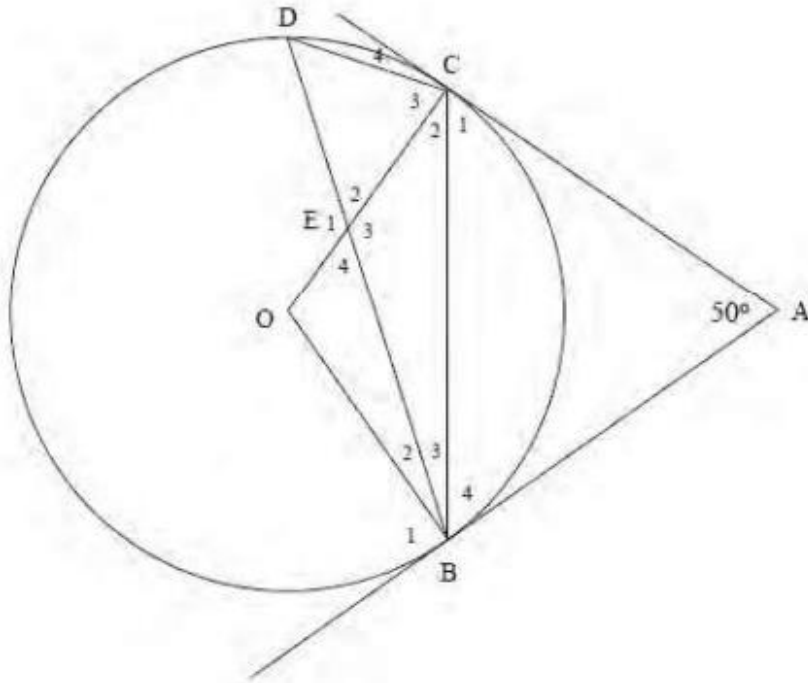
Statement	Reasons	
\hat{E}_2		(2)
\hat{B}_2		(2)
\hat{B}_3		(2)
\hat{F}		(2)
\hat{C}		(2)
\hat{D}		(2)

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

[14]

QUESTION 8

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

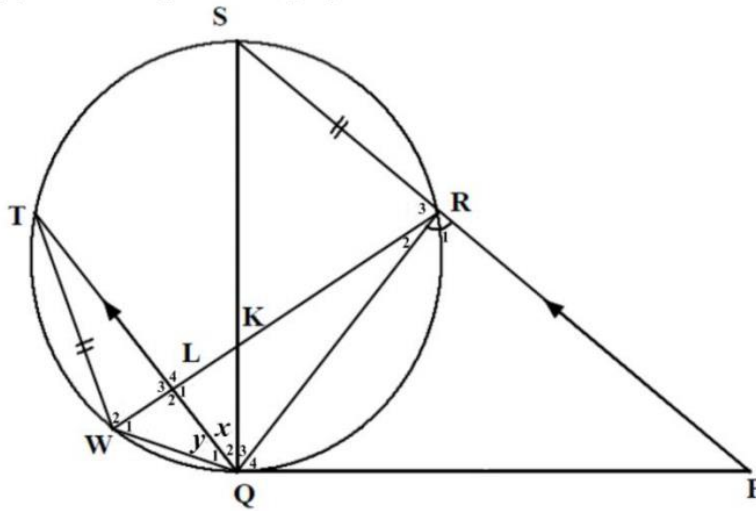


Statements	Reasons	
(a) Determine, with reasons, \widehat{BDC}		(4)
(b) Determine, with reasons, \widehat{BOC}		(2)

[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 $\hat{Q}_1 = y$



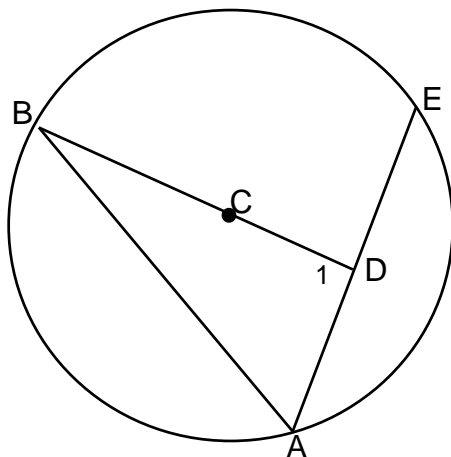
(a) State the reason(s) why each of the following angles is equal to x		
$\hat{S} = x$		(1)
$\hat{Q}_4 = x$		(1)
$\hat{W}_1 = x$		(1)
(b) State the reason(s) why the following angle is equal to y		
$\hat{Q}_3 = y$		(1)
(c) Hence, prove that $\hat{R}_1 = \hat{L}_3$		(4)

(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:

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

$$y = mx + c$$

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

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

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

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

$$m = \tan \theta$$