



NATIONAL SENIOR CERTIFICATE EXAMINATION
SUPPLEMENTARY EXAMINATION – MARCH 2016

MATHEMATICS: PAPER II

EXAMINATION NUMBER

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Time: 3 hours

150 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 28 pages and an Information Sheet of 2 pages (i – ii). Please check that your paper is complete.
2. Read the questions carefully.
3. **Answer ALL the questions on the question paper and hand it in at the end of the examination. Remember to write your examination number on the paper.**
4. Diagrams are not necessarily drawn to scale.
5. You may use an approved non-programmable and non-graphical calculator, unless stated otherwise.
6. Round off your answers to **one decimal digit** where necessary, unless stated otherwise.
7. All necessary working details must be clearly shown.
8. Ensure that your calculator is in **DEGREE** mode.
9. It is in your own interest to write legibly and to present your work neatly.

FOR OFFICE USE ONLY: MARKER TO ENTER MARKS

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13
18	10	9	18	12	9	13	11	10	10	10	14	6

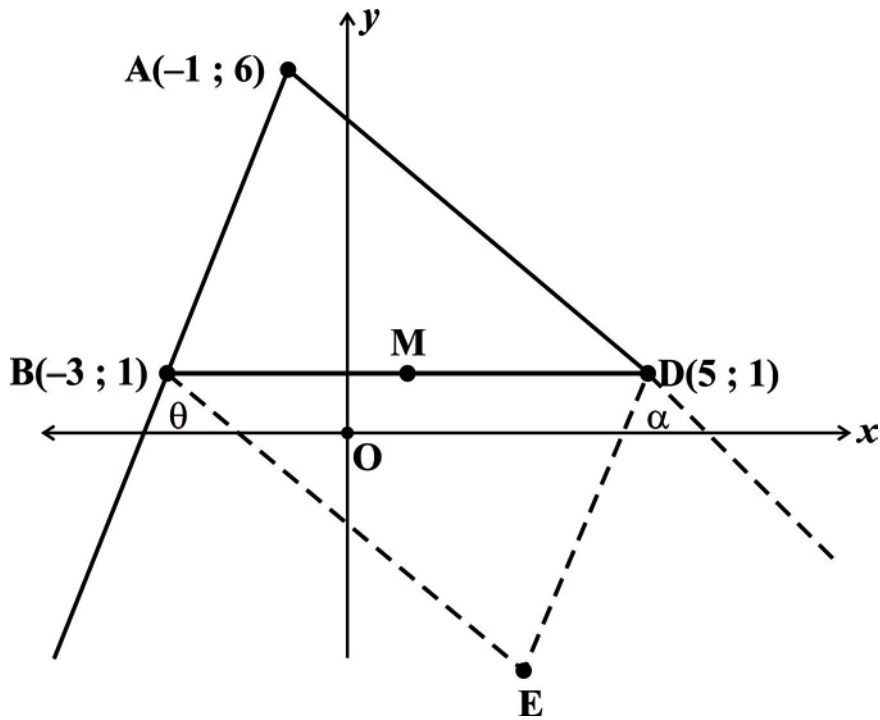
TOTAL	/150
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SECTION A

QUESTION 1

In the diagram, $A(-1;6)$, $B(-3;1)$, and $D(5;1)$ are given.

θ and α are the acute angles that lines AB and AD make respectively with the x -axis.



- (a) Calculate the length of AB to one decimal digit.

(2)

- (b) Determine the coordinates of M , the midpoint of BD .

(2)

(e) If ABED is a parallelogram, determine the co-ordinates of E.

(4)

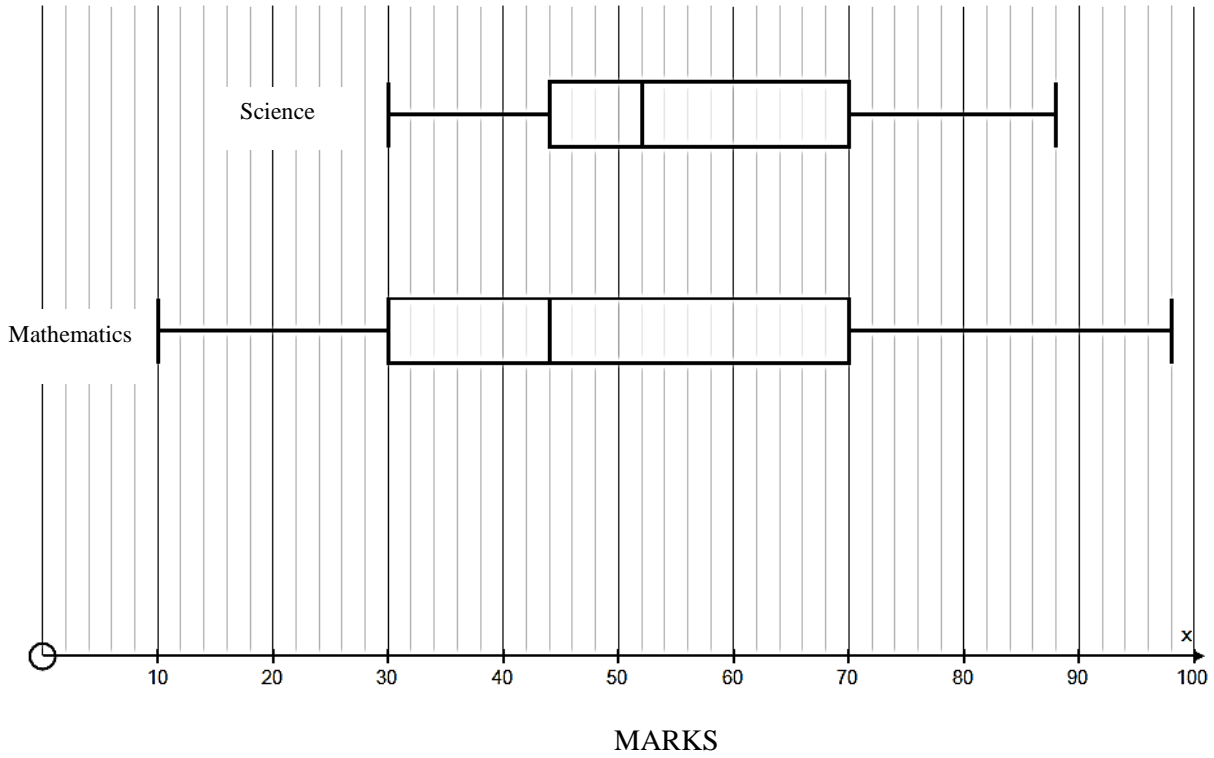
(f) If C is the point $(-5; -4)$, show that A, B and C lie on the same straight line.

(2)

[18]

QUESTION 2

The box and whisker plots below show the distribution of test scores obtained by a sample of students in Science and Mathematics.



(a) Use the diagram to determine:

(1) The range for Mathematics.

(2)

(2) The median for Science.

(1)

(3) The interquartile range for Science.

(2)

(b) Which examination was easier for the students? Justify giving two reasons.

(2)

(c) Which examination has a wider spread of scores? Justify giving two reasons.

(2)

(d) If a learner from the Science sample is selected at random, find the probability that they achieved a mark greater than 70%.

(1)
[10]

QUESTION 3

The table shows the number of practice examples (x) completed by learners A to J and the scores (as percentages) obtained (y) in the test.

Learner	A	B	C	D	E	F	G	H	I	J
x	18	5	21	33	60	4	45	28	11	38
y	70	45	90	75	95	60	89	70	49	78

- (a) Determine the least squares regression line in the form $y = a + bx$. Give your values for a and b to 4 decimal places.

(3)

- (b) Use your answer to (a) to extrapolate the score that a learner would obtain if they practised 100 examples. Give your answer to the nearest whole number.

(2)

- (c) Comment on the answer in (b).

(1)

- (d) Calculate the correlation coefficient of the data to the nearest whole number and describe it.

(3)

[9]

QUESTION 4

(a) Given $\tan \theta = \frac{\sqrt{3}}{2}$ and $\cos \theta < 0$. Without the use of a calculator, express each of the following in its simplest form:

(1) $\sin \theta$ and $\cos \theta$

(2)

(2) $\sin 2\theta$

(2)

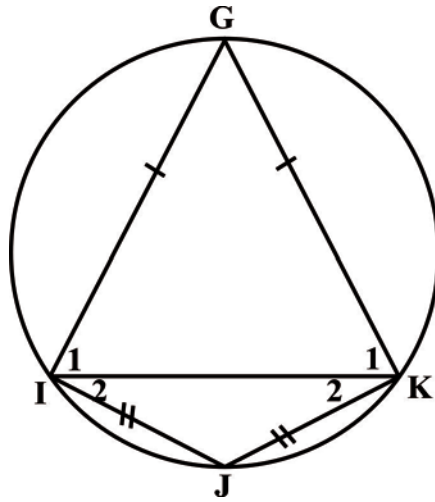
(3) $\cos^2(90^\circ + \theta)$

(2)

(2) $1 + \sin 2A$

(3)
[18]

- (b) In the diagram G, I, J and K lie on the circumference of the circle. $GI = GK$ and $IJ = JK$.



Let $\hat{I}_1 = x$ and $\hat{I}_2 = y$.

Prove that GJ is a diameter of the circle.

(6)
[12]

(9)
[9]

76 marks

SECTION B

QUESTION 7

Given the equation of a circle: $x^2 + y^2 - 4x + 2y + 4 = 0$.

- (a) (1) Show that $\left(\frac{7}{5}; -\frac{9}{5}\right)$ is a point on this circle.

(2)

- (2) Find the equation of the tangent to the circle at the point $\left(\frac{7}{5}; -\frac{9}{5}\right)$.

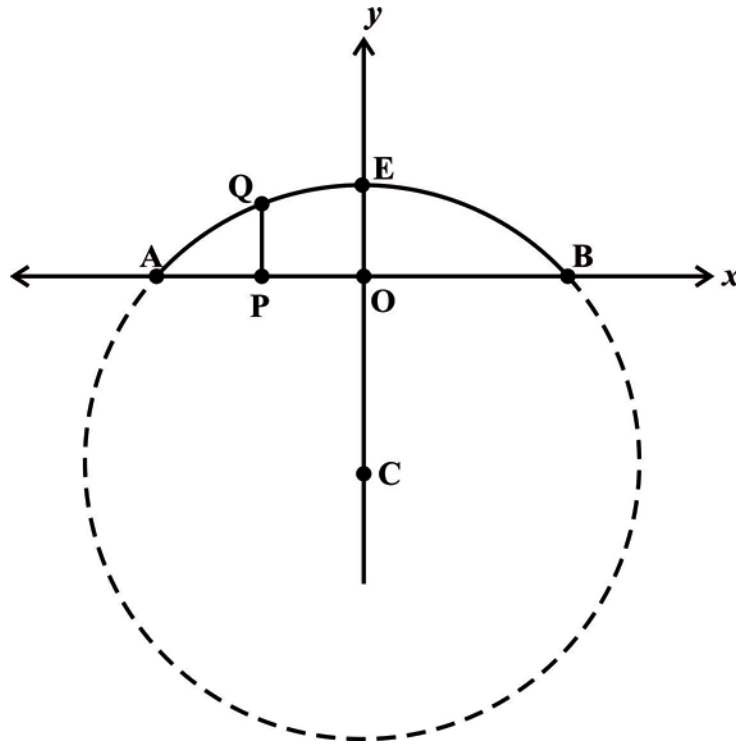
(8)

QUESTION 8

The diagram represents a model of a steel arch which is an arc of a circle centre C. The width, AB, of the arch is 16 metres and its maximum height, EO, is 2 metres.

One of the vertical pillars that supports the arch is at a point P, the midpoint of AO.

O (0; 0).



- (a) Determine the equation of the circle with centre C in the form:
 $x^2 + y^2 + cx + dy + e = 0$.

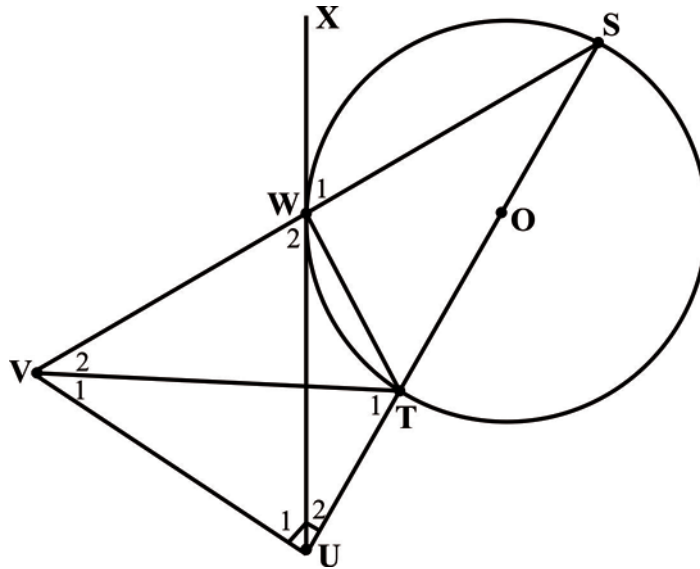
(8)

- (b) Determine the height of the vertical pillar PQ to one decimal digit given that Q is a point on the arc.

(3)
[11]

QUESTION 11

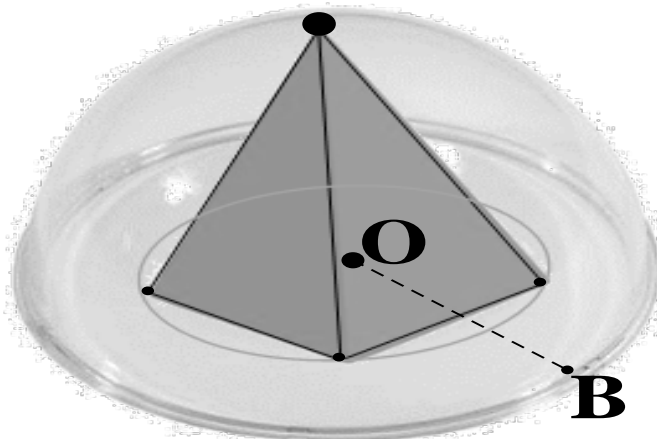
In the diagram, O is the centre of the circle with diameter ST produced to U. XU is a tangent to the circle at point W and chord SW is produced to V. $VU \perp US$.



(a) Prove that WVUT is a cyclic quadrilateral.

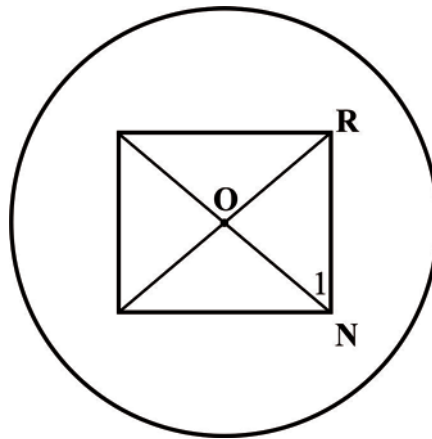
(4)

QUESTION 13



The diagram represents an aquarium in the shape of a hemispherical dome having radius 25 metres. Within the dome is a solid right pyramid with a rectangular base. The centre O of the rectangle is also the centre of the hemisphere.

- (a) The top view of the hemispherical dome is represented in the diagram below.
 $ON = p$ units and $\hat{N}_1 = \alpha$.



Show that $RN = 2p \cos \alpha$.

(3)

