Name:_____

Teacher:_____

GOSFORD HIGH SCHOOL

2015
PRELIMINARY YEARLY EXAMINATION.

Mathematics Extension 1

General Instructions:

- Reading time – 5 minutes
- Working time – 1½ hours
- Write using black or blue pen.
- Board-approved calculators may be used.
- In Questions 6 – 9, show relevant mathematical reasoning and/or calculations

Total Marks – 53

Section I – 5 marks
Answer on the sheet provided

Section II – 48 marks
Attempt Questions 6 – 9
Answer in the booklets provided

	Marks
Multiple Choice	/ 5
Polynomials	/ 10
Question 7	/ 13
Question 8	/ 13
Question 9	/ 12
TOTAL	/ 53

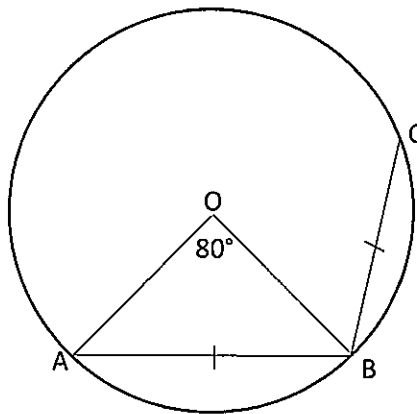This paper MUST NOT be removed from the examination room

Section I

5 multiple choice questions worth 1 mark each.
Attempt Questions 1 – 5.
Answer on the multiple choice answer sheet provided.

1. In the diagram, AB is a chord of a circle with centre O such that $\angle AOB = 80°$.
    C is a point on the circle such that BC = BA. What is the size of $\angle ABC$?

A)	90°	B)	100°	C)	110°	D)	120°

2. A(-2,5) and B(4,-1) are two points. What are the coordinates of the point P(x,y) that divides AB internally in the ratio 2 : 1?

A)	(-5,8)	B)	(0,3)	C)	(2,1)	D)	(7,-4)

3. Which of the following is an expression for $cos(A - B) - cos(A + B)$?

    A) $2sinAsinB$ B) $2cosAcosB$

    C) $-2cosAcosB$ D) $-2sinAsinB$

4. The curves $y = 3x^2$ and $y = 4x - x^2$ meet at the point $(0,0)$. What is the size of the acute angle between the curves at this point?

A) $0°$ B) $38° \, 40'$ C) $68° \, 41'$ D) $75° \, 58'$

5. Which of the following is an expression for $\dfrac{(n+2)! - n!}{(n+1)!}$?

A) $\dfrac{n^2 + 3n + 1}{n+1}$ B) $\dfrac{n^2 + 3n + 2}{n+1}$

C) $\dfrac{n^2 + 2n + 2}{n+1}$ D) $\dfrac{n^2 + 2n + 3}{n+1}$

Section II
48 Marks.
Attempt Questions 6 – 9.
Answer the questions in the writing booklets provided. Start each question in a new booklet.
Your responses should include relevant mathematical reasoning and/or calculations.

Question 6 (10 marks)   **Start a new booklet.**

a) Consider the polynomial $P(x) = 2x^3 - 5x^2 - 4x + 3$

     i)   Show that $(x + 1)$ is a factor of $P(x)$.   1

     ii)   Solve the equation $P(x) = 0$.   3

b) The polynomial $P(x)$ is such that $P(x) = (x - 1)(x - 2)Q(x) + 3x + k$ for some polynomial $Q(x)$ and some constant, k. If the remainder is -1 when $P(x)$ is divided by $(x - 1)$, find the remainder when $P(x)$ is divided by $(x - 2)$.   2

c) Given the polynomial $P(x) = (x-1)(x+2)^2$

    i)   Draw a neat sketch of $y = P(x)$.   **2**

    ii)   Solve $P(x) < 0$.   **2**

Question 7 (13 marks)   **Start a new booklet.**

a) The point $(0, 4)$ divides the interval joining the points (a, b) and (b, a) externally in the ratio $3 : 1$. Find the value of a and b.   **2**

b) Find the value(s) of m, such that the acute angle between the lines $y = 2x$ and $y = mx$ is $45°$.   **2**

c)
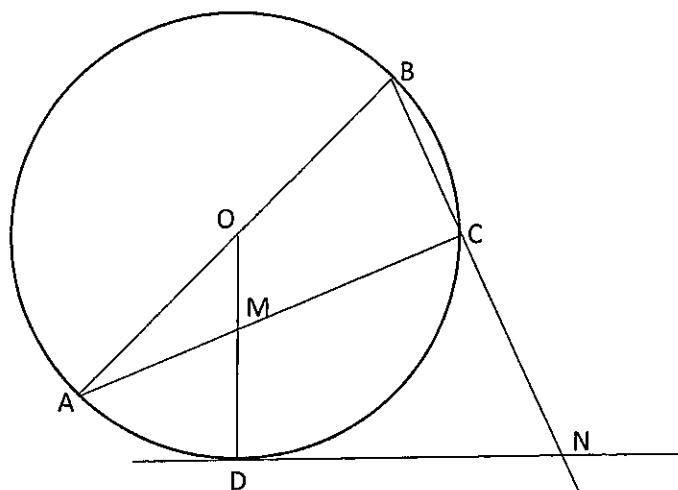
In the diagram, AB is a diameter of a circle with centre O. C and D are points on the Circle. OD cuts AC at M. The tangent to the circle at D cuts BC produced at N. Show That MCND is a cyclic quadrilateral.   **2**

d) Find the number of ways in which the letters of the word FORMULA can be arranged in a line:

    i)   without restriction   **1**

    ii)   so that the 4 consonants are all next to each other and the 3 vowels are all next to each other.   **2**
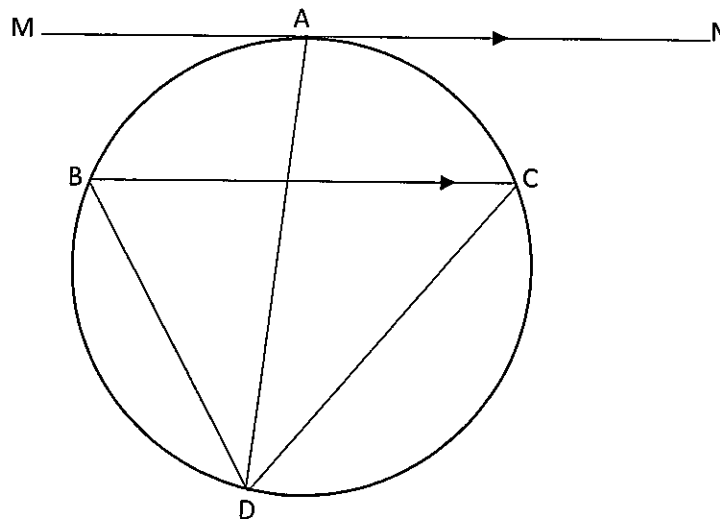
e) Draw a neat sketch of $y = f(x)$, where $f(x) = \dfrac{2x^2}{x^2-9}$, showing any asymptotes and intercepts.   **4**

Question 8 (13 marks)   **Start a new booklet.**

a) Solve the inequality $\dfrac{x^2-4}{x} > 0.$ **3**

b) Express $sinx + \sqrt{3}cosx$ in the form $Rsin(x + \alpha)$, where α is acute and $R > 0$. Hence solve $sinx + \sqrt{3}cosx = 1$ for $0° \leq x \leq 360°$.   **4**

c) Use the substitution $t = tan\dfrac{x}{2}$, to solve $cosx + 2sinx = -1$, for $0° \leq x \leq 360°$. Give your answer(s) correct to the nearest minute.   **3**

d)

In the diagram, MAN is a tangent to the circle at A. BC is a chord of the circle such that $BC \parallel MN$. D is a point on the circle.
Show that AD bisects $\angle BDC$.   **3**

Question 9 (12 marks)   **Start a new booklet.**

a)   Prove that $\dfrac{sinA}{cosA+sinA} + \dfrac{sinA}{cosA-sinA} = tan2A$ **3**

b)   6 boys and 5 girls are available for selection in a mixed team of seven players. Find the number of ways that the team can be chosen if it has to contain at least 3 girls and at least 3 boys.   **2**

c)   Solve the equation $tan2x + tanx = 0$, for $0° \leq x \leq 180°$.   **3**

d)   From a point A due south of a tower, the angle of elevation of the top of the tower T, is 23°. From another point B, on a bearing of 120° from the tower, the angle of elevation of T is 32°. The distance AB is 200 metres.
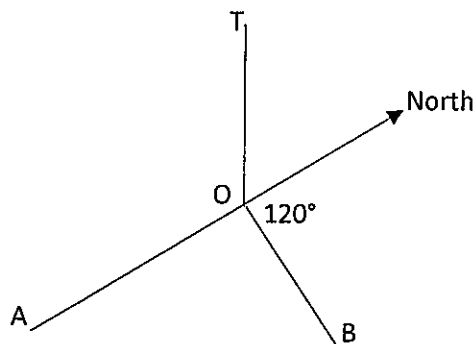
i)   Copy the diagram into your writing booklet, adding the given information to your diagram.   **1**

ii)   Find the height of the tower, to the nearest metre.   **3**

End of Examination