

NEWINGTON COLLEGE



2014

Assessment 1

Year 11 Mathematics Extension 1

General Instructions:

- Date of task - Tuesday 8th April (Wk 11A)
- Reading time - 5 mins
- Working time - 90 mins
- Weighting - 35%
- Board-approved calculators may be used.
- Attempt all questions.
- Show all relevant mathematical reasoning and/or calculations.

Total marks - 70

Section I (10 marks)

- Answer questions 1 to 10 on the multiple choice answer sheet provided at the end of this paper.
- Allow about 15 minutes for this section.

Section II (60 marks)

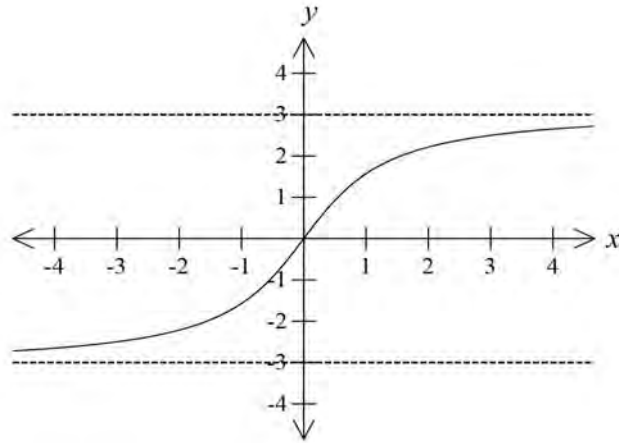
- Answer questions 11 to 15 on the writing paper provided.
- **Start each question on a new page.**
- Each page must show the candidate's computer number.

Outcomes to be assessed:

- P3, PE3** Performs routine arithmetic and algebraic manipulation involving surds, simple rational expressions, trigonometric identities and inequalities.
- P5** Understands the concept of a function and the relationship between a function and its graph.
- P4, PE6** Chooses and applies appropriate arithmetic, algebraic, graphical, trigonometric and geometric techniques in a wide variety of situations.

Section I**10 marks****Attempt Questions 1-10****Allow about 15 minutes for this section.**

- 1 The diagram shows the graph of the function $y = f(x)$.



The equations of the two asymptotes are:

- (A) $y = \pm 3$
(B) $y = 3$ and $y = x$
(C) $x = \pm 3$
(D) There are no asymptotes for this graph.
- 2 Let $f(x) = 3x - 1$ and $g(x) = x^3$. The value of $g(f(2))$ is:
(A) 23
(B) 17
(C) 125
(D) 29791
- 3 If $f(x) = -\sqrt{9 - x^2}$ then $f(x)$ is
(A) neither odd nor even
(B) even
(C) a 1:1 function
(D) odd

4 As a fraction in its simplest form, the recurring decimal $0.\dot{6}3$ may be written as

(A) $\frac{21}{31}$

(B) $\frac{7}{11}$

(C) $\frac{19}{30}$

(D) $\frac{7}{10}$

5 The simultaneous solution to the equations $3x + 2y = 4$ and $7x - 3y = 17$ is:

(A) $x = -3$ and $y = 1$

(B) $x = -2$ and $y = 5$

(C) $x = 4$ and $y = -4$

(D) $x = 2$ and $y = -1$

6 The range of the function $y = 2 + |x - 1|$ may be expressed as:

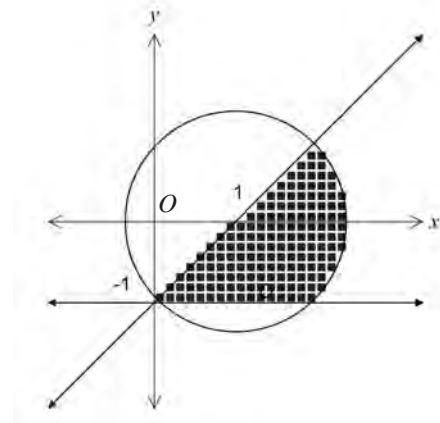
(A) $y > 2$

(B) $y \geq 2$

(C) $0 \leq y \leq 2$

(D) $x \neq 1$

7



Which three inequalities could combine to define the above shaded area?

- (A) $y \leq x$, $y \geq -1$, $(x-1)^2 + y^2 \leq 2$.
- (B) $y \leq x$, $y \geq -1$, $(x+1)^2 + y^2 \leq 1$.
- (C) $y \geq x$, $y \geq -1$, $(x-1)^2 + y^2 \leq 2$.
- (D) $y \geq x$, $y \geq -1$, $(x+1)^2 + y^2 \leq 1$.

8 When factorised, $a^3 - 8b^3$ becomes

- (A) $(a+2b)(a^2 - 2ab + 4b^2)$
- (B) $(a-2b)(a^2 + 2ab + 4b^2)$
- (C) $(a-2b)(a^2 + ab + 2b^2)$
- (D) $(a-2b)(a^2 - 2ab + 4b^2)$

9 The exact value of $\sin 330^\circ$ is:

- (A) $\frac{\sqrt{3}}{2}$.
- (B) $-\frac{1}{2}$
- (C) $-\frac{1}{\sqrt{2}}$
- (D) $-\frac{\sqrt{3}}{2}$

10 If $\tan \theta = -\frac{3}{4}$ and θ is obtuse, then:

(A) $\sin \theta = \frac{4}{5}$.

(B) $\cos \theta = \frac{4}{5}$.

(C) $\operatorname{cosec} \theta = -\frac{5}{3}$.

(D) $\sec \theta = -\frac{5}{4}$.

Go to Section II

Section II**60 marks****Attempt Questions 11-15****Allow about 1 hour and 15 minutes for this section.*****Question 11 (12 marks)*****Marks**

- (a) State which of the following are rational numbers: **2**
 $\sqrt{3}, -0.012, 67, \pi, 0.\dot{7}, 0$
- (b) Consider the curve $y = \frac{2}{x-4}$.
- (i) Find the y-intercept. **1**
- (ii) Find the equation of the vertical asymptote and the horizontal asymptote. **2**
- (iii) Sketch the curve, labelling all important features. **3**
- (c) (i) Find the point of intersection of the lines $x + 3y + 5 = 0$ and $y = 2x + 3$. **2**
- (ii) Graph the region on the number plane that illustrates the intersection of the following regions: **2**
 $x + 3y + 5 \leq 0$ and $y > 2x + 3$.

Question 12 (11 marks) Start a New Booklet!

- (a) (i) Find the domain and range of the function $y = \sqrt{4-x^2}$ **2**
- (ii) Sketch on a number plane the region indicated by $y \leq \sqrt{4-x^2}$ **2**
- (b) Find the exact value of a and b if $\frac{\sqrt{3}-2}{3+2\sqrt{3}} = a + b\sqrt{3}$. **3**
- (c) Solve $\frac{5x}{2x-1} \geq 3$ and graph the solution on a real number line. **4**

Question 13 (11 marks) Start a New Booklet!

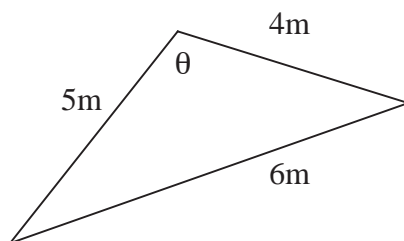
- (a) Solve simultaneously: $3x + y = 9$ and $xy = 6$. **4**
- (b) Solve the following equations simultaneously **4**
 $2^x + 3^y = 5$
 $2^{x+3} - 3^{y+2} = 23$.
- (c) Solve $|x+1| - |2x-1| < 0$. **3**

Marks**Question 14 (12 marks) Start a New Booklet!**

- (a) If $\sin \theta = k$, and θ is acute, find $\cos(180^\circ - \theta)$ in terms of k . **2**
- (b) (i) Find the possible values of θ if $\cos \theta = 0.5$ and $-180^\circ \leq \theta \leq 180^\circ$. **2**
(ii) Find the possible values of θ if $\tan \theta = 3 \cot \theta$ and $0 \leq \theta \leq 360^\circ$. **4**
- (b) A parallelogram has adjacent sides 4.2 cm and 7.8 cm. The obtuse angle between these sides is 105° .
(i) Draw a neat diagram to represent this information. **1**
(ii) Find the length of the shorter diagonal (to 1 decimal place). **3**

Question 15 (14 marks) Start a New Booklet!

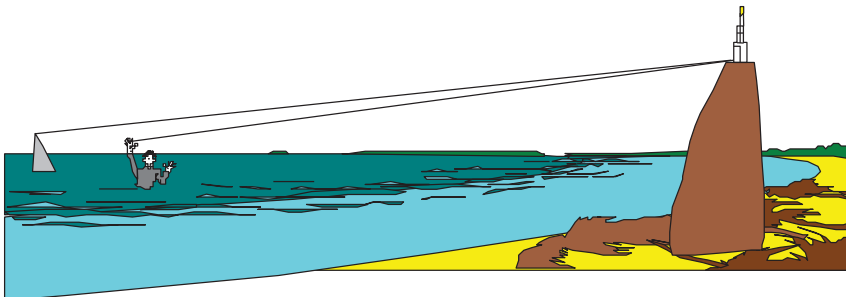
- (a) Simplify $\frac{\cos^2 \theta - 1}{\sin \theta}$ **2**
- (b) Prove that $\frac{2 \cot^2 \theta - \operatorname{cosec}^2 \theta}{1 - \cot \theta} = -\cot \theta - 1$ **3**
- (c) (i) Find $\sin \theta$ for the triangle below **3**
(ii) Find the exact area of the triangle. **1**



Question 15 continued next page.

Question 15 (14 marks) Continued**Marks**

- (d) From the top of a rock 30 m above sea level, a lifeguard observes the angle of depression of a stationary swimmer to be $2^{\circ}30'$. The angle of depression of a shark heading towards the swimmer was observed to be 2° . At this moment a rescue boat was directed to sail from its position at the base of the rock at maximum speed to rescue the swimmer.
- (i) Calculate the distance from:
- (α) the base of the rock to the swimmer. **1**
- (β) the base of the rock to the shark. **1**
- (ii) After 15 seconds had elapsed the angle of depression of the shark and the boat were $2^{\circ}16'$ and 5° respectively. The boat, the swimmer and the shark all lay on a straight line from the base of the rock. Assuming that the shark will not change its speed or direction and the swimmer remains stationary, which of the two will reach the swimmer first and by how many seconds? Answer to one decimal place. **3**

**End of Paper**

Student Number :

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SECTION I – Multiple Choice Answer Sheet

Use the multiple choice answer sheet below to record your answers to Question 1 – 10.

Select the alternative: A, B, C or D that best answers the question.

Colour in the response oval completely.

Sample:

$2 + 4 = ?$ (A) 2 (B) 6 (C) 8 (D) 9

A B C D

If you think you have made a mistake, draw a cross through the incorrect answer and colour in the new answer

ie A B C D

If you change your mind and have crossed out what you consider to be the correct answer, then indicate this by writing the word “correct” and draw an arrow as follows:

A B C D

Year 11 Extension 1 Mathematics

Question 1	A <input type="radio"/>	B <input type="radio"/>	C <input type="radio"/>	D <input type="radio"/>
Question 2	A <input type="radio"/>	B <input type="radio"/>	C <input type="radio"/>	D <input type="radio"/>
Question 3	A <input type="radio"/>	B <input type="radio"/>	C <input type="radio"/>	D <input type="radio"/>
Question 4	A <input type="radio"/>	B <input type="radio"/>	C <input type="radio"/>	D <input type="radio"/>
Question 5	A <input type="radio"/>	B <input type="radio"/>	C <input type="radio"/>	D <input type="radio"/>
Question 6	A <input type="radio"/>	B <input type="radio"/>	C <input type="radio"/>	D <input type="radio"/>
Question 7	A <input type="radio"/>	B <input type="radio"/>	C <input type="radio"/>	D <input type="radio"/>
Question 8	A <input type="radio"/>	B <input type="radio"/>	C <input type="radio"/>	D <input type="radio"/>
Question 9	A <input type="radio"/>	B <input type="radio"/>	C <input type="radio"/>	D <input type="radio"/>
Question 10	A <input type="radio"/>	B <input type="radio"/>	C <input type="radio"/>	D <input type="radio"/>

Appendix - Marking and mapping grid

Outcome	Arithmetic & Algebra (P3, PE3)	Real functions of a variable (P5)	Trigonometric ratios (P4, PE6)
Q1		/1	
Q2		/1	
Q3		/1	
Q4	/1		
Q5	/1		
Q6		/1	
Q7		/1	
Q8	/1		
Q9			/1
Q10			/1
Q11	a(2)	b(6), c(4)	
Q12	b(3), c(4)	a(4)	
Q13	/11		
Q14			/12
Q15			/14
Total	/23	/19	/28

Overall	/70
Comment	