



Glen Waverley Secondary College
2016 Semester 2: Technology Free exam

UNIT 2 Specialist Maths

Teachers:

Please circle

		
CAL	GMN	JLS

Student Name:

Student Code: **Form Group:**

Instructions:

Reading Time:	15 minutes
Writing Time:	60 minutes

Total Marks	50 marks
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This examination consists of 12 short answer questions.

For each question correct working must be shown to gain full marks

Neither calculators nor summary notes of any type are permitted.

A formula sheet is provided

Question 1

Express $\frac{2x+3}{(x-3)^2}$ as partial fractions

(3 marks)

Question 2

From a point on a cliff x m above sea level, the angle of depression to a boat is 30° . The distance from the foot of the cliff to the boat is 180 metres. Find the height of the cliff.

(2 marks)

Question 3

If $\cos \theta = -\frac{1}{3}$ and $\pi < \theta < \frac{3\pi}{2}$ calculate the exact value of $\operatorname{cosec} 2\theta$

(3 marks)

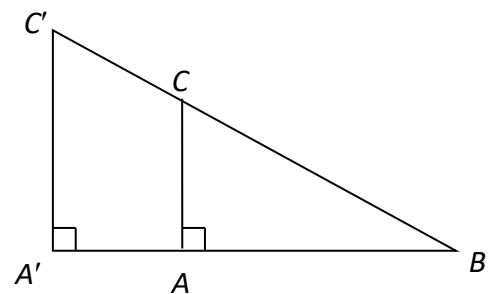
Question 4

The lengths of the sides of a triangle form a geometric sequence and the largest side has a length of 36 cm. Given that the perimeter is 76 cm, find the length of the shortest side.

(4 marks)

Question 5

Find the value of x if $AC = 6$ cm, $A'C' = 10$ cm, $A'A = 2$ cm and $AB = (x + 1)$ cm.



(2 marks)

Question 6

Find the Cartesian equation of the curve whose parametric equations are $x = 3\cos(\theta)$ and $y = 2\sin(\theta)$

(2 marks)

Question 7

Express $\frac{2\sqrt{3} + 2i}{1 - \sqrt{3}i}$ in polar form.

(4 marks)

Question 8

Prove that $\sin \theta + \sin\left(\theta + \frac{2\pi}{3}\right) + \sin\left(\theta + \frac{4\pi}{3}\right) = 0$

(3 marks)

Question 9

$\underline{u}$ and $\underline{v}$ are vectors defined by $\underline{u} = \cos(\theta)\underline{i} + \sin(\theta)\underline{j}$ and $\underline{v} = \sin(\theta)\underline{i} + \cos(\theta)\underline{j}$ where $0 < \theta < \frac{\pi}{2}$

- a) Show that $\underline{u}$ and $\underline{v}$ are unit vectors
- b) Let α be the angle between the vectors $\underline{u}$ and $\underline{v}$. Show, using an appropriate double angle formula that $\alpha = \cos^{-1}(\sin(2\theta))$
- c) Find α when $\theta = \frac{\pi}{6}$
- d) If $\theta = \frac{\pi}{3}$, find the vector resolute of $\underline{v}$ in the direction of $\underline{u}$.

(2+3+2+3=10 marks)

Question 10

The straight line with equation $2x + 4y = 3$ is transformed by the rule $(x, y) \rightarrow (x - y, x)$. Find the equation of its image.

(4 marks)

Question 11

In the entire college, a total of 100 students are studying year 11 Specialist Maths course. On a recent exam, the mean score was 73.4 with a standard deviation of 20.

- a) If there are 41 female and 59 male students taking the subject, what is the proportion of female students?
- b) A group of 15 students selected from this class and 3 of them were female. What is the sample proportion, $\hat{p}$?
- c) The top 5 students comprise of 3 male and 2 female. If 3 students were selected from the top 5, what is the probability that only 1 female was selected?
- d) Samples of 4 students are selected from the year level. Find the mean and standard deviation of the distribution of $\bar{x}$.

(1+1+2+2=6 marks)

Question 12

A particle moving in a straight line has acceleration of $(3 - 2t) \text{ m/s}^2$ at time t seconds ($t \geq 0$). If the particle starts at the origin O with a velocity of 4 m/s , find:

- a) the time when the particle comes to rest
- b) the position of the particle at the instant it comes to rest
- c) the acceleration at this instant
- d) the time when the acceleration is zero
- e) the velocity at this time.

(2+2+1+1+1=7 marks)

End of Exam