

External assessment 2024

Multiple choice question book

# Specialist Mathematics

Paper 2 — Technology-active

## General instruction

- Work in this book will not be marked.

## Section 1

### Instruction

- Respond to these questions in the question and response book.
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### QUESTION 1

Given that  $z = -2 + 3i$  is a root of  $z^3 + az + b = 0$ , where  $a, b \in R$ , another root is

- (A)  $-2 - 3i$
- (B)  $-2 + 3i$
- (C)  $2 - 3i$
- (D)  $2 + 3i$

### QUESTION 2

Rounded to two decimal places, the  $z$ -value used in the calculation of an approximate 95% confidence interval for  $\mu$  is

- (A) 0.95
- (B) 1.64
- (C) 1.96
- (D) 2.58

### QUESTION 3

Given  $\mathbf{a} = \hat{j} + \hat{k}$  and  $\mathbf{b} = 2\hat{i} + \hat{k}$ , determine  $\mathbf{a} \times \mathbf{b}$ .

- (A)  $\hat{i} - 2\hat{j} - 2\hat{k}$
- (B)  $\hat{i} - 2\hat{j} + 2\hat{k}$
- (C)  $\hat{i} + 2\hat{j} - 2\hat{k}$
- (D)  $\hat{i} + 2\hat{j} + 2\hat{k}$

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**QUESTION 4**

The mass of biscuit packets produced by a company is normally distributed with a mean of 250 g and a standard deviation of 1.5 g. The distribution of the sample mean mass of these biscuit packets is formed using repeated random sampling of size 5.

The mean and standard deviation of this distribution of sample means are

- (A) 50 g and 0.3 g
- (B) 50 g and 0.67 g
- (C) 250 g and 0.3 g
- (D) 250 g and 0.67 g

**QUESTION 5**

The equation of a plane is  $2x - 4z - 8 = 0$ .

Determine the point where the plane intersects the  $z$ -axis.

- (A) (0, 0, -4)
- (B) (0, 0, -2)
- (C) (0, 0, 2)
- (D) (0, 0, 4)

**QUESTION 6**

Two concurrent forces represented in the polar form of  $F_1 = (1.21 \text{ N}, 120^\circ)$  and  $F_2 = (1.30 \text{ N}, -160^\circ)$  act on an object.

Determine the magnitude of the resultant force.

- (A) 0.50 N
- (B) 1.92 N
- (C) 2.51 N
- (D) 3.70 N

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**QUESTION 7**

Determine the number of roots of  $w^8 = 1$  that can be expressed in the form  $a + bi$ , where  $a, b \in \mathbb{R}^+$ .

- (A) 0
- (B) 1
- (C) 2
- (D) 3

**QUESTION 8**

$T$  is a random variable. A random sample of four values of  $T$  is collected and used to produce an approximate confidence interval for the population mean of (3.3, 4.1).

Given that three of the sample values are 3.4, 3.6 and 3.9, the remaining sample value is

- (A) 3.6
- (B) 3.7
- (C) 3.8
- (D) 3.9

**QUESTION 9**

Random variable  $X$  has an exponential distribution with the probability density function

$$f(x) = \begin{cases} \frac{1}{5}e^{-\frac{x}{5}}, & x \geq 0 \\ 0, & \text{otherwise} \end{cases}$$

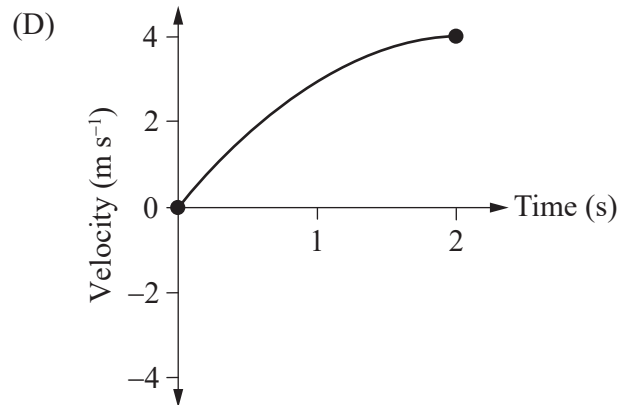
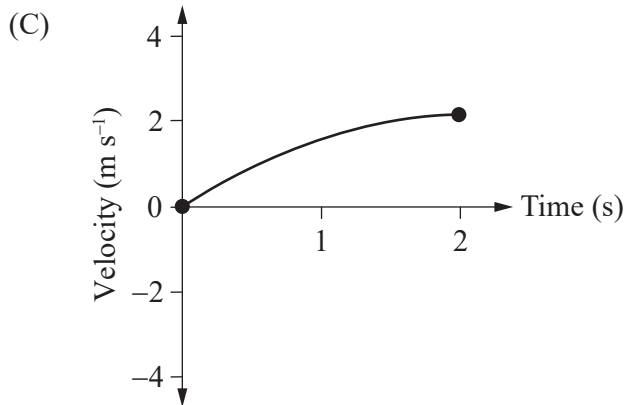
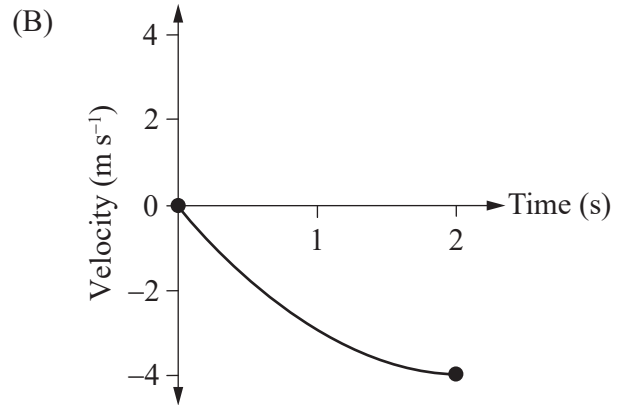
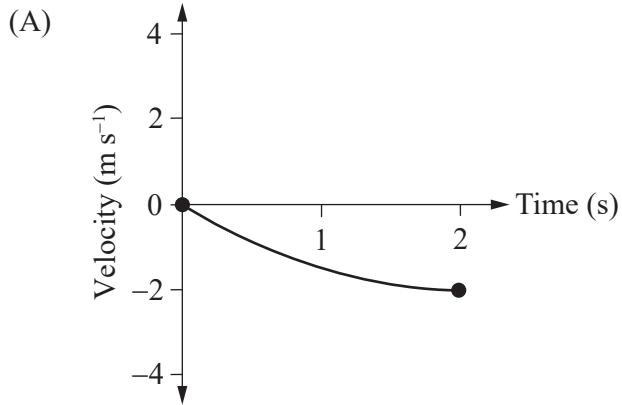
Given that  $P(0 \leq X \leq k) = 0.5$ , determine  $k$ .

- (A) 0.10
- (B) 0.69
- (C) 2.03
- (D) 3.47

QUESTION 10

The acceleration ( $\text{m s}^{-2}$ ) of an object at time,  $t$ , for  $0 \leq t \leq 2$  seconds is given by  $a = \frac{2}{t+1}$ .

Given that the object is initially at rest, its velocity–time graph is



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