

External assessment 2021

Multiple choice question book

# Specialist Mathematics

Paper 2 — Technology-active

## General instruction

- Work in this book will not be marked.

## Section 1

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### QUESTION 1

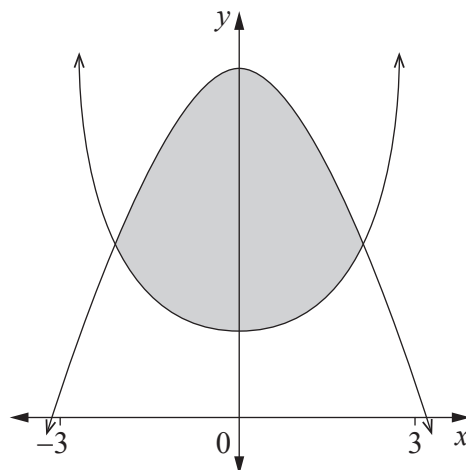
The time taken to complete orders at a pizza store is normally distributed with a mean time ( $\mu$ ) of 10 minutes. The owner of the pizza store records the time taken to complete orders for a random sample of 20 pizzas each day over a 30-day period. From this data, an approximate 90% confidence interval for  $\mu$  is calculated at the end of each day.

How many of these confidence intervals would be expected to contain  $\mu$ ?

- (A) 3
- (B) 18
- (C) 27
- (D) 30

### QUESTION 2

Determine the area of the shaded region between the graphs of the functions  $y = \frac{1}{3}\sec\left(\frac{x}{3}\right)$  and  $y = 2\cos\left(\frac{x}{2}\right)$ , as shown.



Not to scale

- (A) 5.29 units<sup>2</sup>
- (B) 5.51 units<sup>2</sup>
- (C) 5.65 units<sup>2</sup>
- (D) 5.71 units<sup>2</sup>

### QUESTION 3

Given  $n \in \mathbb{Z}^+$ , for which proposition can the initial statement for mathematical induction be proven?

(A)  $x^{2n} - y^{2n}$  is divisible by  $(x + y) \forall (x + y) \neq 0$

(B)  $1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{1}{6}n(2n^2 + 3n - 1)$

(C)  $(n+1)^3 + (n+2)^3$  is divisible by 3

(D)  $\sum_{r=1}^n \frac{1}{(2r-1)(2r+1)} = \frac{n}{n+1}$

### QUESTION 4

The mean time that visitors spend at an art exhibition is 39 minutes and the standard deviation is 6 minutes.

Determine the approximate probability that the mean time spent at the exhibition by a random sample of 35 visitors is between 38 and 40 minutes.

(A) 0.13

(B) 0.16

(C) 0.68

(D) 0.84

### QUESTION 5

A vector normal to the plane that contains the vectors  $\begin{pmatrix} 1 \\ 3 \\ 0 \end{pmatrix}$  and  $\begin{pmatrix} 1 \\ 0 \\ 2 \end{pmatrix}$  is

(A)  $6\hat{i} + 2\hat{j} + 3\hat{k}$

(B)  $6\hat{i} + 2\hat{j} - 3\hat{k}$

(C)  $6\hat{i} - 2\hat{j} + 3\hat{k}$

(D)  $6\hat{i} - 2\hat{j} - 3\hat{k}$

### QUESTION 6

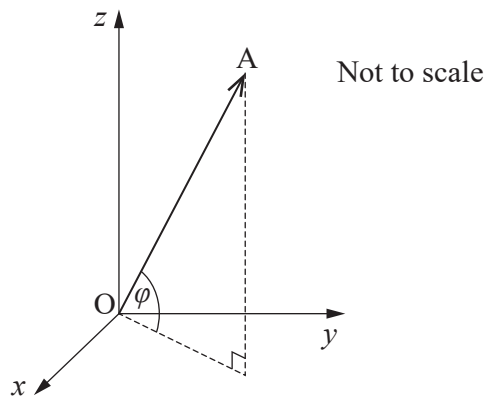
The Cartesian equation of a sphere is given by  $x^2 + y^2 + z^2 + 2x - 2y = 7$ .

The centre and radius of the sphere are

- (A)  $(-1, 1, 0)$  and 3 respectively.
- (B)  $(-1, 1, 0)$  and 9 respectively.
- (C)  $(1, -1, 0)$  and 3 respectively.
- (D)  $(1, -1, 0)$  and 9 respectively.

### QUESTION 7

The altitude angle of  $\vec{OA}$  is represented as  $\varphi$ .



Given the coordinates of A are  $(3, 4, 6)$ , the altitude angle of  $\vec{OA}$  in radians is

- (A) 0.93
- (B) 0.88
- (C) 0.69
- (D) 0.66

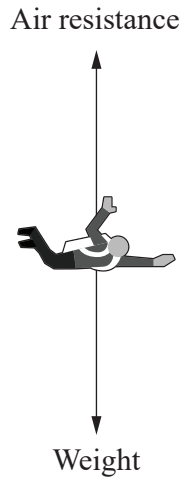
### QUESTION 8

The imaginary part of  $\left(\operatorname{cis}\left(\frac{\pi}{8}\right)\right)^{-2}$  is

- (A) -6.83
- (B) -0.71
- (C) 0.71
- (D) 1.17

### QUESTION 9

Two vertical forces act on a skydiver with a mass of 85 kg, as shown.



When the magnitude of the air resistance is 62 N, the magnitude of the acceleration of the skydiver is

- (A)  $0.73 \text{ m s}^{-2}$
- (B)  $2.65 \text{ m s}^{-2}$
- (C)  $9.07 \text{ m s}^{-2}$
- (D)  $12.44 \text{ m s}^{-2}$

### QUESTION 10

A random variable is normally distributed with a mean  $\mu$ . An approximate 95% confidence interval for  $\mu$  from a sample from this distribution is (209.7, 221.9).

An approximate confidence interval for  $\mu$  based on the same sample, using a confidence level greater than 95%, could be

- (A) (206.5, 223.3)
- (B) (208.5, 223.1)
- (C) (210.6, 221.0)
- (D) (215.8, 228.0)

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