

External assessment 2022

Multiple choice question book

Specialist Mathematics

Paper 1 — Technology-free

General instruction

- Work in this book will not be marked.



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Section 1

QUESTION 1

Let $z = a + 3i$ and $w = -3 + bi$, where $a, b \in \mathbb{R}$.

If $z = w$, then

- (A) $a = -3, b = -3$
- (B) $a = -3, b = 3$
- (C) $a = 3, b = -3$
- (D) $a = 3, b = 3$

QUESTION 2

Which statement regarding sample means is true?

- (A) The distribution of X is always normally distributed.
- (B) The distribution of \bar{X} is always normally distributed.
- (C) The value of \bar{x} changes when different samples are selected.
- (D) The value of μ changes when different samples are selected.

QUESTION 3

A particle travels in a straight line over time, t , with a constant acceleration, $a(t)$.

Which function could represent the particle's displacement, $x(t)$?

- (A) $x(t) = t^3$
- (B) $x(t) = t^2$
- (C) $x(t) = \frac{1}{t}$
- (D) $x(t) = \sqrt{t}$

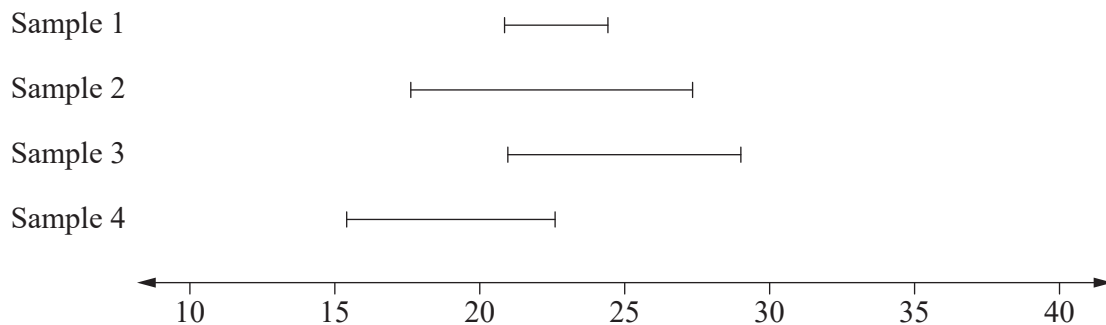
QUESTION 4

When using proof by mathematical induction to prove De Moivre's theorem expressed as $(r\text{cis}(\theta))^n = r^n \text{cis}(n\theta) \forall n \in \mathbb{Z}^+$, which statement would be correct in the proof of the inductive step?

- (A) $(r\text{cis}(\theta))^k = r^k \text{cis}(k\theta)$
- (B) $(r\text{cis}(\theta))^k = r^{k+1} \text{cis}(k+\theta)$
- (C) $(r\text{cis}(\theta))^{k+1} = r^{k+1} \text{cis}(k\theta+1)$
- (D) $(r\text{cis}(\theta))^{k+1} = r^{k+1} \text{cis}((k+1)\theta)$

QUESTION 5

Four random samples of different sizes were taken to estimate a certain population mean, given a known population standard deviation. A 95% confidence interval was calculated for each sample.



Which sample used the largest sample size?

- (A) Sample 1
- (B) Sample 2
- (C) Sample 3
- (D) Sample 4

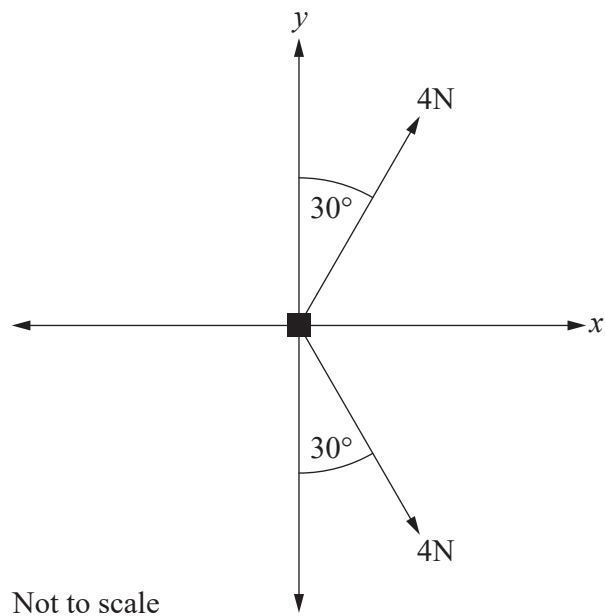
QUESTION 6

The Cartesian equation for a sphere with centre $(-2, 3, -4)$ and radius 9 is

- (A) $(x-2)^2 + (y+3)^2 + (z-4)^2 = 9$
- (B) $(x+2)^2 + (y-3)^2 + (z+4)^2 = 9$
- (C) $(x-2)^2 + (y+3)^2 + (z-4)^2 = 81$
- (D) $(x+2)^2 + (y-3)^2 + (z+4)^2 = 81$

QUESTION 7

Two forces act concurrently on a 2 kg object placed at the origin.



The magnitude of the acceleration of the object is

- (A) 2 m s^{-2}
- (B) $2\sqrt{3} \text{ m s}^{-2}$
- (C) 4 m s^{-2}
- (D) $4\sqrt{3} \text{ m s}^{-2}$

QUESTION 8

Use the substitution $u = \tan(x)$ to determine $\int \tan(x)\sec^2(x)dx$.

- (A) $\frac{1}{2}\tan(x) + c$
- (B) $\frac{1}{2}\tan^2(x) + c$
- (C) $\tan(x) + c$
- (D) $\tan^2(x) + c$

QUESTION 9

A random variable X is normally distributed with a mean of 36 and a standard deviation of 4.

The respective mean and standard deviation of the distribution of \bar{X} from repeated random samples of size 9 are

- (A) 4 and $\frac{4}{9}$
- (B) 4 and $\frac{4}{3}$
- (C) 36 and $\frac{4}{9}$
- (D) 36 and $\frac{4}{3}$

QUESTION 10

A plane is represented by the equation $x - 2z = 5$. A vector normal to this plane is

- (A) $\begin{pmatrix} 1 \\ -2 \\ 5 \end{pmatrix}$
- (B) $\begin{pmatrix} 1 \\ 0 \\ 2 \end{pmatrix}$
- (C) $\begin{pmatrix} 1 \\ 0 \\ -2 \end{pmatrix}$
- (D) $\begin{pmatrix} 1 \\ -2 \\ -5 \end{pmatrix}$

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