External assessment 2022

Multiple choice question book

Specialist Mathematics

Paper 1 — Technology-free

General instruction

- Work in this book will not be marked.

Queensland Government | QCAA Queensland Curriculum & Assessment Authority

Section 1

QUESTION 1

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

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 $\overline{X}$ is always normally distributed.

(C) The value of $\overline{x}$ 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 $\left(r\text{cis}\left(\theta\right)\right)^n = r^n\text{cis}\left(n\theta\right)\forall n \in Z^+$, which statement would be correct in the proof of the inductive step?

(A) $\left(r\text{cis}\left(\theta\right)\right)^k = r^k\text{cis}\left(k\theta\right)$

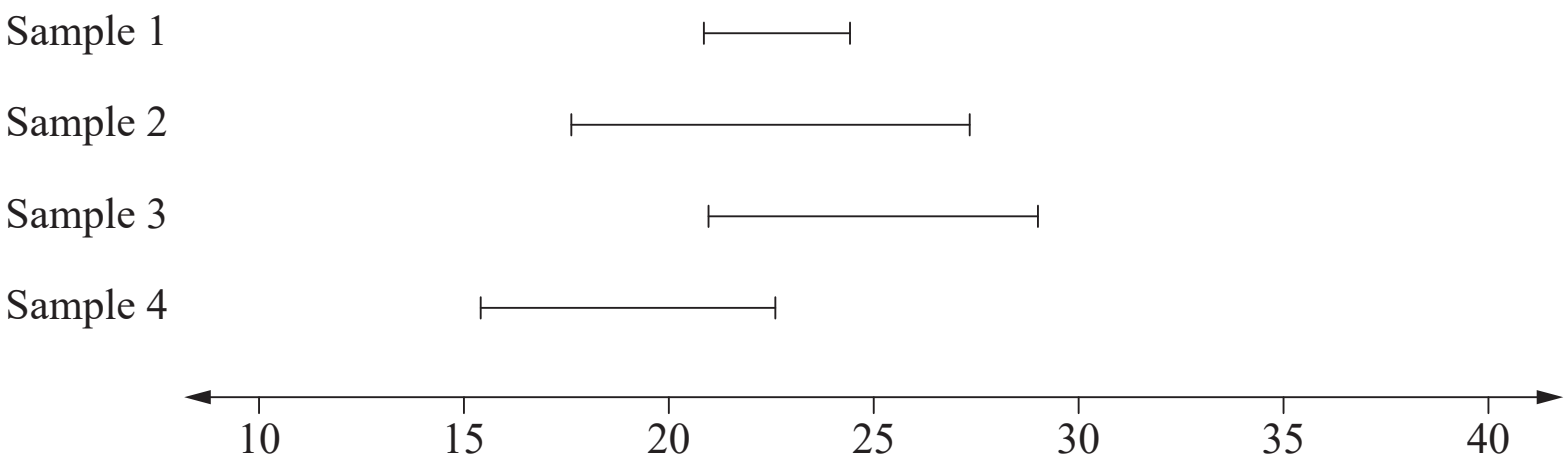
(B) $\left(r\text{cis}\left(\theta\right)\right)^k = r^{k+1}\text{cis}\left(k+\theta\right)$

(C) $\left(r\text{cis}\left(\theta\right)\right)^{k+1} = r^{k+1}\text{cis}\left(k\theta+1\right)$

(D) $\left(r\text{cis}\left(\theta\right)\right)^{k+1} = r^{k+1}\text{cis}\left(\left(k+1\right)\theta\right)$

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) $(x-2)^2+(y+3)^2+(z-4)^2=9$

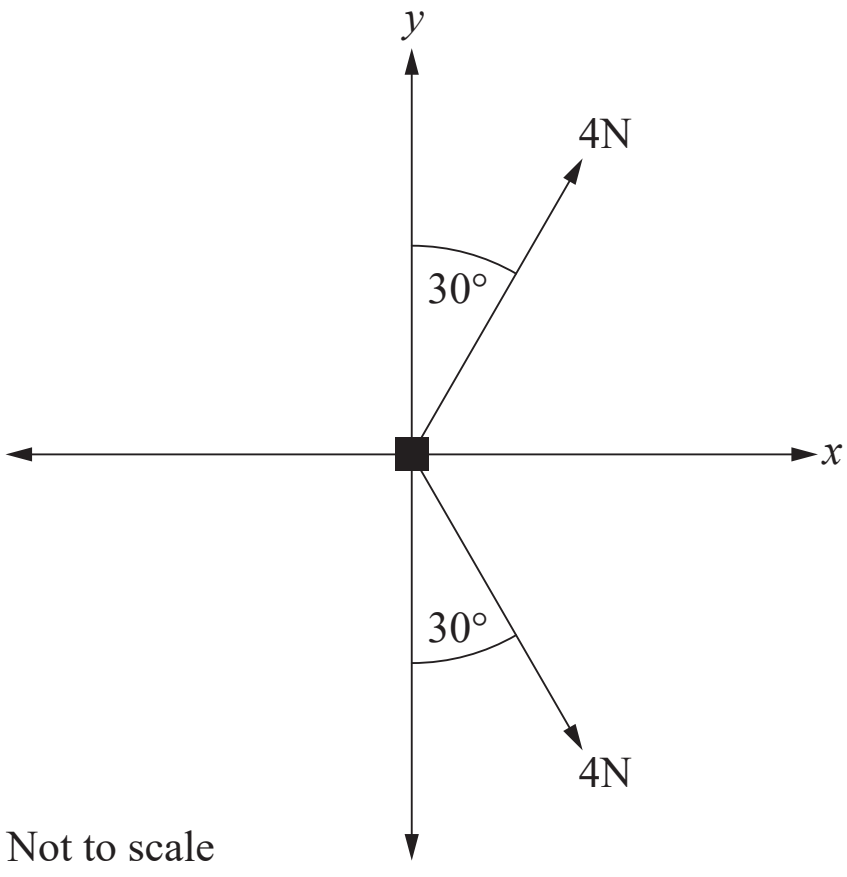
(B) $(x+2)^2+(y-3)^2+(z+4)^2=9$

(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.



Not to scale

The magnitude of the acceleration of the object is

(A) $2\ \text{m s}^{-2}$

(B) $2\sqrt{3}\ \text{m s}^{-2}$

(C) $4\ \text{m s}^{-2}$

(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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