External assessment

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

The indefinite integral $\int \frac{3x-A}{1-x^2}\,dx$ can be determined using the partial fractions $\frac{-1}{1+x}+\frac{2}{1-x}$

The value of A is

(A) –3

(B) –1

(C) 1

(D) 3

QUESTION 2

When using proof by mathematical induction to show that $n(2n-1)(2n+1)$ is divisible by $3\ \forall\ n \in Z^+$, the inductive step requires proving

(A) $(k+1)(2k)(2k+2)$ is divisible by 3.

(B) $(k+1)(2k)(2k+3)$ is divisible by 3.

(C) $(k+1)(2k+1)(2k+2)$ is divisible by 3.

(D) $(k+1)(2k+1)(2k+3)$ is divisible by 3.

QUESTION 3

According to a recent census, the mean hours worked per week by all Australian workers is 35.6 hours.

A mean of 36.1 hours worked per week is calculated from a random selection of 500 Australian workers.

Based on this data, which of the following is correct?

(A) $\bar{x} = 35.6, \mu = 36.1$

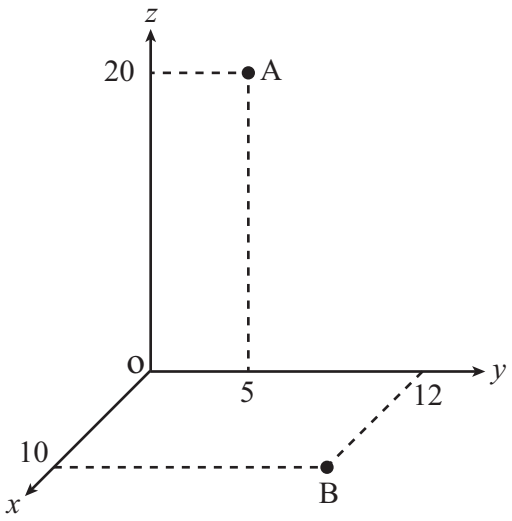
(B) $\bar{x} = 35.6, \bar{X} = 36.1$

(C) $\bar{x} = 36.1, \mu = 35.6$

(D) $\bar{x} = 36.1, \bar{X} = 35.6$

QUESTION 4

Consider points A and B as shown.



The position vector representing the midpoint of AB is

(A) $\begin{pmatrix} 5 \\ 8.5 \\ 10 \end{pmatrix}$

(B) $\begin{pmatrix} 5 \\ 10 \\ 8.5 \end{pmatrix}$

(C) $\begin{pmatrix} 10 \\ 8.5 \\ 5 \end{pmatrix}$

(D) $\begin{pmatrix} 10 \\ 5 \\ 8.5 \end{pmatrix}$

QUESTION 5

Determine $\int 4x(3x^2+5)^3\,dx$

(A) $\frac{1}{6}\left(3x^2+5\right)^4+c$

(B) $\frac{2}{3}\left(3x^2+5\right)^4+c$

(C) $2\left(3x^2+5\right)^2+c$

(D) $72x^2\left(3x^2+5\right)^2+c$

QUESTION 6

Given $z = 2 - 2i$ and $w = -3 + i$, calculate $z^2 - \overline{w}$

(A) $3 - 9i$

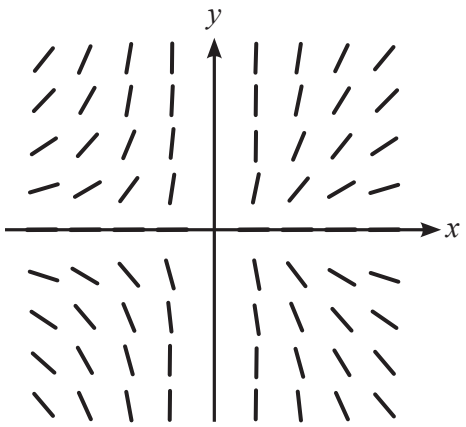
(B) $3 - 7i$

(C) $11 - 9i$

(D) $11 - 7i$

QUESTION 7

The diagram shows a slope field.



The differential equation represented by the slope field is

(A) $\frac{dy}{dx} = \frac{5y}{x}$

(B) $\frac{dy}{dx} = \frac{5y^2}{x}$

(C) $\frac{dy}{dx} = \frac{5y}{x^2}$

(D) $\frac{dy}{dx} = \frac{5y^2}{x^2}$

QUESTION 8

An equation of the line passing through the points A(2, 4, 5) and B(3, –2, 1) is

(A) $2\hat{\boldsymbol{i}} + 4\hat{\boldsymbol{j}} + 5\hat{\boldsymbol{k}} + t\left(3\hat{\boldsymbol{i}} - 2\hat{\boldsymbol{j}} + \hat{\boldsymbol{k}}\right), t \in R$

(B) $-3\hat{\boldsymbol{i}} + 2\hat{\boldsymbol{j}} - \hat{\boldsymbol{k}} + t\left(\hat{\boldsymbol{i}} - 6\hat{\boldsymbol{j}} - 4\hat{\boldsymbol{k}}\right), t \in R$

(C) $\frac{x-1}{2} = \frac{y+6}{4} = \frac{z+4}{5}$

(D) $\frac{x-3}{-1} = \frac{y+2}{6} = \frac{z-1}{4}$

QUESTION 9

The scores on a test are assumed to be normally distributed.

Researchers use the results from a random sample of scores to calculate a confidence interval for the population mean. However, a shorter confidence interval width is required so the researchers decide to use a second sample for their calculations.

Assuming that the standard deviations for both samples are the same, the researchers can ensure that a shorter confidence interval width is produced by

(A) decreasing the sample size and decreasing the confidence level.

(B) decreasing the sample size and increasing the confidence level.

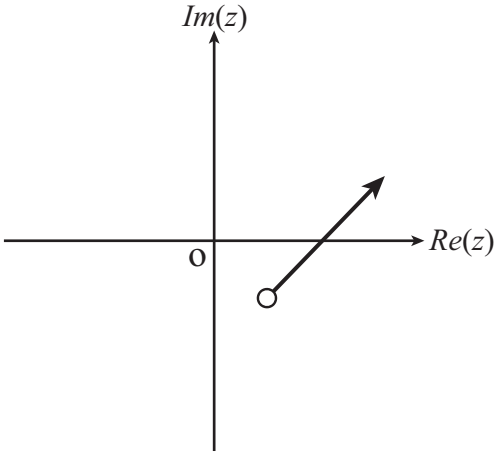
(C) increasing the sample size and decreasing the confidence level.

(D) increasing the sample size and increasing the confidence level.

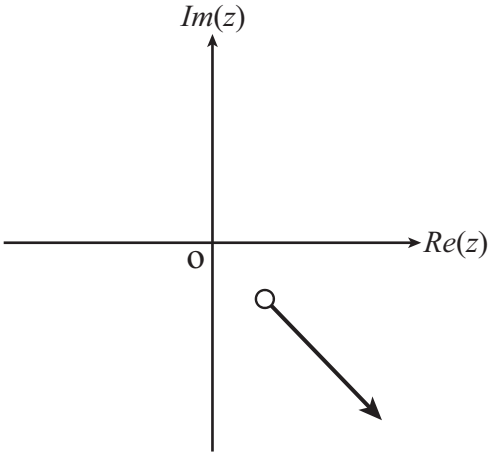
QUESTION 10

The subset of the complex plane that represents $\arg[z+i-1]+\frac{\pi}{4}=0$ for $z \in C$ is

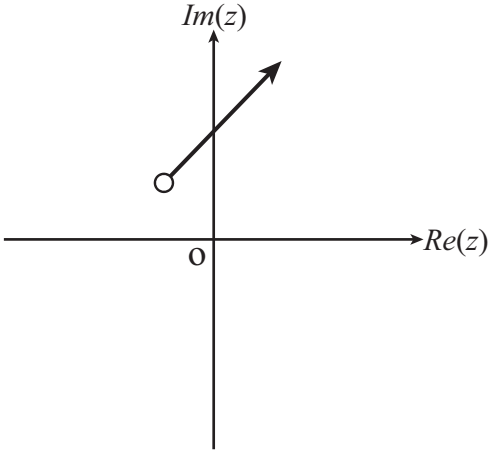
(A)



(B)



(C)



(D)