Sample assessment 2020

Multiple choice question book

Specialist Mathematics

Paper 1 — Technology-free





Queensland Curriculum & Assessment Authority

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Section 1

Instructions

- Answer all questions in the question and response book.
- This book will not be marked.

QUESTION 1

Determine the value of $y = \arccos\left(\sin\left(\frac{4\pi}{3}\right)\right)$ in the domain $y \in [0, \pi]$.

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{3}$ (C) $\frac{3\pi}{4}$ (D) $\frac{5\pi}{6}$

QUESTION 2

The time taken for customers to assemble a particular piece of furniture is normally distributed with a mean of 4 hours and a standard deviation of 36 minutes.

A random sample of 9 customers is selected. Each customer assembles the piece of furniture.

The mean and standard deviation of the distribution of the mean time taken to assemble the piece of furniture for this sample is

- (A) $\frac{4}{9}$ hours, 4 minutes.
- (B) $\frac{4}{9}$ hours, 12 minutes.
- (C) 4 hours, 4 minutes.
- (D) 4 hours, 12 minutes.

QUESTION 3

Which of the following equations describes circular motion?

- (A) $\mathbf{r}(t) = \sin(t)\,\hat{\mathbf{i}} + \cos(2t)\,\hat{\mathbf{j}}$
- (B) $\mathbf{r}(t) = 2\cos(t)\,\hat{\mathbf{i}} + \sin(t)\,\hat{\mathbf{j}}$
- (C) $\mathbf{r}(t) = 2\cos(t)\,\mathbf{\hat{i}} + \sin(2t)\,\mathbf{\hat{j}}$
- (D) $r(t) = 2\cos(2t)\hat{i} + 2\sin(2t)\hat{j}$

QUESTION 4

The following diagram shows a vector \overrightarrow{OA} in three dimensions and its projection \overrightarrow{OB} in the xy plane. Point C lies on the z-axis.



The angle that represents the altitude of the vector \overrightarrow{OA} is

- (A) ∠AOB
- (B) ∠A0C
- (C) ∠BAO
- (D) ∠BOC

QUESTION 5

A matchbox company advertises that the mean number of matches in their boxes is 50.

Peter takes samples of the number of matches in 350 boxes. Based on his sample mean and corresponding sample standard deviation results, he calculates a 95% confidence interval for the mean of (45.2, 49.6) matches.

Which of the following statements **best** describes a statistical inference from this confidence interval?

- (A) The company is using false advertising.
- (B) 95% of the company's matchboxes do not contain 50 matches.
- (C) There is a statistical basis for being suspicious of the company's advertising.
- (D) The sample size is too small to draw a conclusion about the company's advertising.

QUESTION 6

The slope field that represents the differential equation $\frac{dy}{dx} = \frac{x}{2y}$ is



QUESTION 7

Which of the following **best** describes an interval estimate of a population parameter?

- (A) the degree of uncertainty associated with an interval
- (B) the proportion of values expected to lie within an interval
- (C) an interval that is calculated using the population parameter
- (D) an interval that is likely to include the unknown value of the population parameter

QUESTION 8

Given z = a + bi where $a, b \in R$, a < 0 and b > 0, the Argand plane that represents a possible position of *w* where $w = i\overline{z}$ is



QUESTION 9

An antiderivative of $\frac{1}{\sqrt{4 - x^2} \cos^{-1}\left(\frac{x}{2}\right)}$ is (A) $-\ln\left|\cos^{-1}\left(\frac{x}{2}\right)\right| + c$ (B) $\ln\left|\cos^{-1}\left(\frac{x}{2}\right)\right| + c$ (C) $-2\ln\left|\cos^{-1}\left(\frac{x}{2}\right)\right| + c$ (D) $-2\ln\left|\sin^{-1}\left(\frac{x}{2}\right)\right| + c$

QUESTION 10

The value of $\int_{0}^{2} \frac{4}{x^{2} + 16} dx$ is (A) $\frac{1}{2} \tan^{-1} \left(\frac{1}{2}\right)$ (B) $\tan^{-1} \left(\frac{1}{2}\right)$ (C) $2 \tan^{-1} \left(\frac{1}{2}\right)$ (D) $\tan^{-1}(2)$

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