External assessment 2024

# Mathematical Methods

Paper 2 — Technology-active

**General instruction**

• Work in this book will not be marked.

Queensland Government | QCAA Queensland Curriculum & Assessment Authority

## Section 1

### Instruction

- Respond to these questions in the question and response book.

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## QUESTION 1

The probability of hitting a target in a particular binomial experiment is 0.72

Determine the mean of the number of hits if this experiment is repeated eight times.

- (A) 1.61
- (B) 2.24
- (C) 5.76
- (D) 7.28

## QUESTION 2

Calculate the expected value of a continuous random variable $X$ with the probability density function

$$p(x) = \begin{cases} \dfrac{1}{4}x^2, & 0 \le x \le \sqrt[3]{12} \\ 0, & \text{otherwise} \end{cases}$$

- (A) 1.72
- (B) 1.15
- (C) 1.00
- (D) 0.11

## QUESTION 3

The derivative of the function $f(x)$ is given by $f'(x) = \sin(2x)$. It is known that $f\left(\dfrac{\pi}{2}\right) = 4$.
Determine $f(x)$.

(A) $-\cos(2x) + 3$

(B) $\cos(2x) + 5$

(C) $-\dfrac{1}{2}\cos(2x) + 3.5$

(D) $\dfrac{1}{2}\cos(2x) + 4.5$

## QUESTION 4

Consider the Bernoulli distribution where the outcomes for rolling a six-sided die are a four and not rolling a four.

Determine the variance of the resulting Bernoulli distribution in this scenario.

(A) $0.02\dot{7}$

(B) $0.13\dot{8}$

(C) $0.1\dot{6}$

(D) $0.8\dot{3}$

## QUESTION 5

The mass (g) of adult kookaburras in a certain region is normally distributed with a mean of 300 g and a standard deviation of 13 g. Select the correct statement about the mass of adult kookaburras.

(A) 34% are between 287 g and 313 g

(B) 68% are between 274 g and 326 g

(C) 95% are between 261 g and 326 g

(D) 99.7% are between 261 g and 339 g

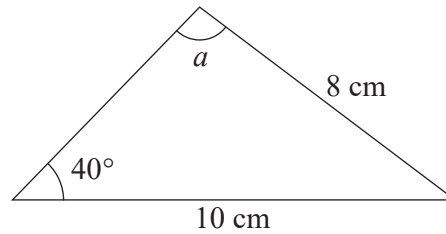## QUESTION 6

Determine the derivative of $y = 2x\cos(3x)$

(A) $2\cos(3x) - 6x\sin(3x)$

(B) $2\cos(3x) + 6x\sin(3x)$

(C) $-6\sin(3x)$

(D) $-2\sin(3x)$

## QUESTION 7

Not to scale



Identify the possible values for $a$ in the triangle.

(A) 13.5° or 126.5°

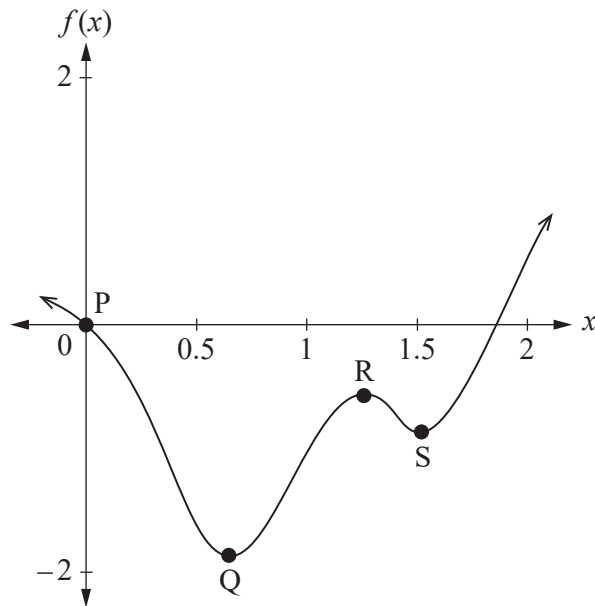(B) 53.5° or 126.5°

(C) 53.5° or 86.5°

(D) 13.5° or 86.5°

## QUESTION 8

Calculate the total enclosed area between the graph of $y = x^2 - x - 6$ and the $x$-axis from $x = 1$ to $x = 5$

(A) 5.33

(B) 7.33

(C) 12.67

(D) 20.00

## QUESTION 9

It is known that $f'(x) = 0$ and $f''(x) < 0$ for one of the labelled points on the graph of $f(x)$.



Which point matches this description?

(A)  P

(B)  Q

(C)  R

(D)  S

## QUESTION 10

The velocity (m s$^{-1}$) at time $t$ (s) of an object is given by $v(t) = 0.4t^2 + 3t$ for $t \geq 0$.

The change in displacement (m) of the object from four to five seconds is

(A)  15.43

(B)  21.63

(C)  32.53

(D)  54.17

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