

Sample Final Exam in 5th Year HL Maths

Instructions

This sample final exam contains multiple choice questions on the topics studied during 5th Year in HL Maths.

There are **TWENTY QUESTIONS** in total. Each question is worth **ONE MARK**.

This sample final exam is worth **0%** of your end-of-year mark.

It can be attempted **ONCE** only.

There is an overall time limit of **25 MINUTES** for the entire sample final exam.

THE ORDER IN WHICH ANSWER OPTIONS APPEAR ON THIS QUESTION SHEET MAY NOT BE THE SAME AS THE ORDER IN WHICH THEY APPEAR ON THE ANSWER SHEET (IN MS FORMS).

Don't forget to click **SUBMIT** at the end.

Good luck!

Question 1

The expression $(2\sqrt{11} - 17\sqrt{41})^2$ is expanded and simplified.

The result is $a + b\sqrt{c}$.

What is the value of $a + b + c$?

Select the correct option

12276

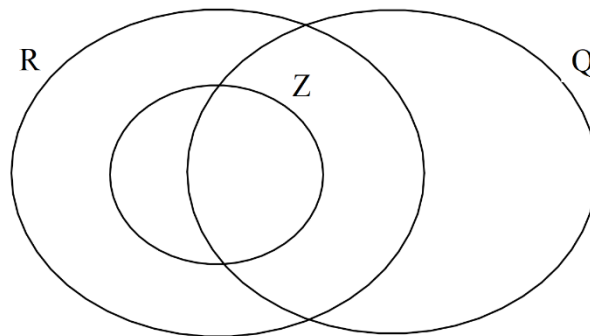
12412

10449

11893

Question 2

Consider the Venn diagram below showing the real set, the rational set and the integer set.



There are two empty regions in this Venn diagram.

Select the correct option.

- $Q \setminus R$ and $Z \setminus Q$
- $R \setminus Q$ and $Q \setminus Z$
- $Q \setminus R$ and $Z \cap Q$
- $Z \setminus Q$ and $R \setminus Q$

Question 3

You wish to prove the truth of a statement $P(n)$, using induction, for all natural numbers n greater than or equal to 3.

The first case that you need to prove the truth of is ...

Select the correct option.

- $P(1)$
- $P(2)$
- $P(3)$
- $P(4)$

Question 4

An incomplete conclusion to a proof by induction is given as follows:

$P(2)$ true.

If _____ .

Therefore, by induction, $P(n)$ true for all natural numbers n which are greater than or equal to 2.

Select the correct option to correctly complete the above conclusion.

$P(k)$ true, k is natural, then $P(k+1)$ true

$P(k)$ true, then $P(k+1)$ true

$P(k+1)$ true, then $P(k)$ true

none of the other three options is correct

Question 5

The horizontal line test for injectivity of a function can be stated as ...

Select the correct option.

As it is not possible to draw a horizontal line intersecting the graph of the function more than once, the function is injective.

As it is possible to draw a horizontal line intersecting the graph of the function more than once, the function is injective.

As every horizontal line of the form $y = b$, where b is in the codomain, intersects the graph of the function as least once, the function is injective.

As no vertical line intersects the graph more than once, the function is injective.

Question 6

Consider the two functions f and g defined below.

$$\begin{aligned}f(x) &= x^2 - x \\g(x) &= -x(1 - x)(x + 2)\end{aligned}$$

$f(x) = g(x)$ at $x = a, b, c$.

What is the value of $a + b + c$?

Select the correct option.

-3

-1

1

3

Question 7

Solve for $x \in R$ in the equation below.

$$\log_2(x - 2) + \log_2(x + 5) = 3$$

Select the correct option.

$x = 3$

$x = 6$

$x = -3$ or 6

$x = 3$ or -6

Question 8

Consider the equation below.

$$(2^x)^2 - 5(2^x) = 0$$

Select the statement below which correctly describes the solution set for this equation.

This equation has 0 real solutions.

This equation has 1 real solution.

This equation has 2 real solutions.

none of the other three options is correct.

Question 9

What is the argument of the number $10 - 10i$?

Select the correct option.

- 45 degrees
- 135 degrees
- 45 degrees
- 135 degrees

Question 10

The complex number $z = \sqrt{2} \left(\cos \frac{\pi}{7} + i \sin \frac{\pi}{7} \right)$.

What is the value of z^7 ?

Select the correct option.

- $8\sqrt{2}$
- $8\sqrt{2}i$
- $-8\sqrt{2}$
- $-8\sqrt{2}i$

Question 11

The function f is such that $f(x) = 2x^3 + 5x^2 - 4x - 3$, where $x \in \mathbb{R}$.
Given that $x = -3$ is a root of $f(x)$ what are the other two roots?

Select the correct option.

- $x = -3$ or $x = 1$
- $x = -\frac{1}{2}$ or $x = 1$
- $x = \frac{1}{2}$ or $x = -1$
- $x = -3$ or $x = -\frac{1}{2}$

Question 12

Find the range of values of x for which $|x - 4| \geq 2$, where $x \in \mathbb{R}$.

Select the correct option.

$$x \geq 6 \cup x \leq 2$$

$$x \geq 2 \cup x \leq 6$$

$$x \geq 2 \cup x \leq \frac{1}{2}$$

$$x \geq 2 \cup x \leq -6$$

Question 13

What is the coefficient of x^4 in the binomial expansion of $(1 - 3x)^8$?

Select the correct option.

$$5670$$

$$-4536$$

$$10206$$

$$4536$$

Question 14

Solve the simultaneous equations:

$$\begin{aligned} x &= 2y \\ x^2 + y^2 - 2xy - 9 &= 0 \end{aligned}$$

Select the correct option.

$$(9, 4.5) \text{ or } (-9, -4.5)$$

$$(2, 1) \text{ or } (-2, -1)$$

$$(6, 3) \text{ or } (-6, -3)$$

$$(4.5, 9) \text{ or } (-4.5, -9)$$

Question 15

Simplify fully the expression below:

$$\frac{x^2 - 9}{2x^2 - 11x + 15} \div \frac{x^2 + 3x}{4x^3 - 10x^2}$$

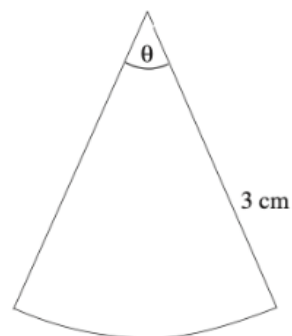
Select the correct option.

$$\frac{2x^2}{x - 3}$$
$$\frac{x}{x - 3}$$
$$2x$$

Question 16

A pendant (shown below), of area 6cm^2 , is made in the form of a sector of a circle as shown.

If the radius of the sector is 3cm, what is the value of the angle θ , in radians?



Select the correct option.

$$\frac{2}{3}$$

$$\frac{4}{3}$$

$$\frac{2\pi}{3}$$

$$\frac{4\pi}{3}$$

Question 17

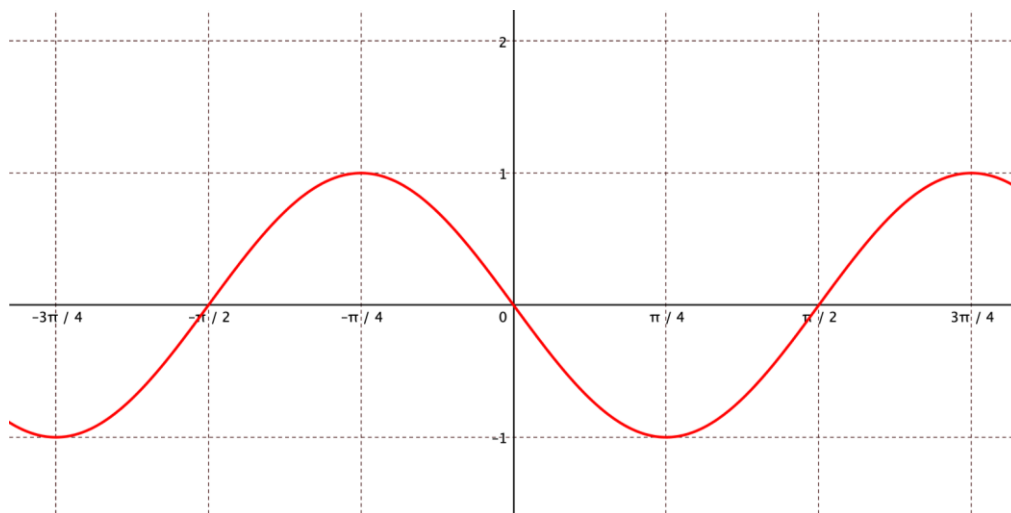
Which of the following values are the solutions to $\tan A = -3.4$, $0^\circ \leq A \leq 360^\circ$?

Select the correct option.

- 73.6°, 106.4°
- 106.4°, 286.4°
- 106.4°, 253.6°
- 163.6°, 286.4°

Question 18

Which of the functions below correspond to the given graph?

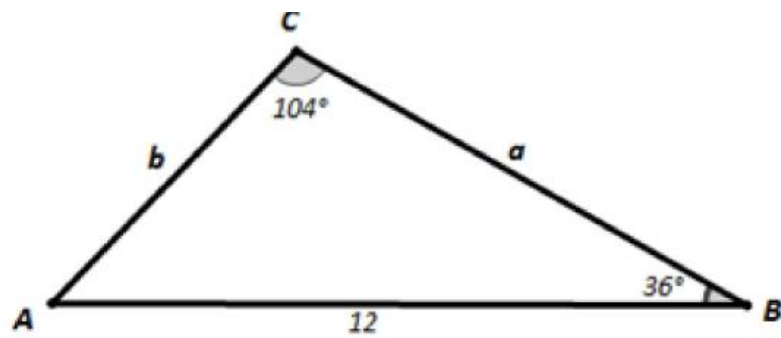


Select the correct option.

- $y = \sin(2x)$
- $y = \sin(x)$
- $y = -\sin(x)$
- $y = -\sin(2x)$

Question 19

Find the value of the side b (to two decimal places) in the given triangle.

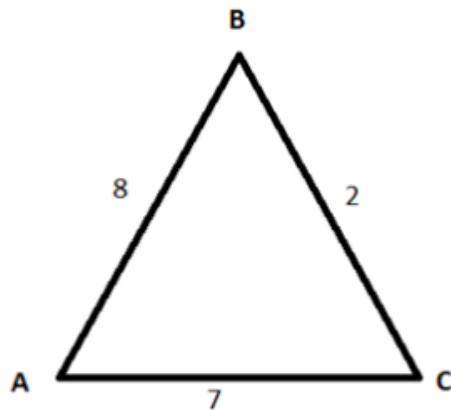


Select the correct option.

- 8.01
- 7.27
- 7.95
- 7.71

Question 20

Find the value of angle A (to one decimal place) in the given triangle.



Select the correct option.

- 53.6
- 113.1
- 13.3
- 136.4