CANDIDATE – PLEASE NOTE!

PRINT your name on the line below and return this booklet with your answer sheet. Failure to do so may result in disqualification.

TEST CODE **01254010**

FORM TP 2022041

MAY/JUNE 2022

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE®

EXAMINATION

ADDITIONAL MATHEMATICS

Paper 01 – General Proficiency

1 hour 30 minutes

01 JUNE 2022 (a.m.)

475

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This test consists of 45 items. You will have 1 hour and 30 minutes to answer them.
2. In addition to this test booklet, you should have an answer sheet.
3. A list of formulae is provided on page 2 of this booklet.
4. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
5. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

Sample Item

$(4^{-2})^2 \div \left(\frac{1}{16}\right)^2 =$

(A) 4^{-2}
(B) 4^{-1}
(C) 4^{0}
(D) 4^{2}

Sample Answer

(A) (B) ● (D)

The best answer to this item is "4^0", so (C) has been shaded.

6. If you want to change your answer, erase it completely before you shade in your new choice.
7. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, go on to the next one. You may return to that item later.
8. You may use silent, non-programmable calculators to answer items.

A005

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

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1. The expression $x - 2$ is a factor of

(A) $4x^4 - 2x^2 - 56$
(B) $4x^3 + 2x^2 - 16$
(C) $2x^3 + 2x^2 - 4x - 8$
(D) $3x^4 - 10x^3 - 5x^2 + 4$

2. $\frac{1}{x+3} + \frac{3}{x^2-9}$ expressed as a single fraction is

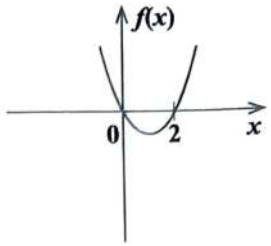
(A) $\frac{4}{x+3}$

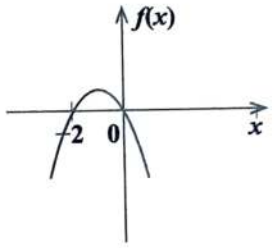
(B) $\frac{x}{x^2-9}$

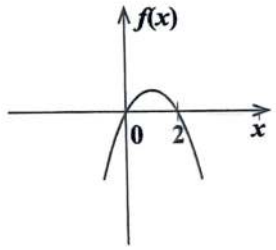
(C) $\frac{x+6}{x^2-9}$

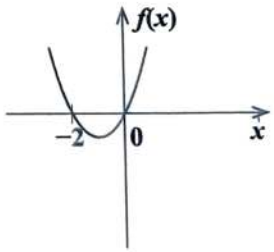
(D) $\frac{x^2-6}{(x^2-9)(x+3)}$

3. Which of the following graphs represents $f(x) = x(2 + x)$?

(A)


(B)


(C)


(D)


4. If $x^2 - 6x + 13 = a(x + h)^2 + k$, then

(A) $a = 1 \quad h = -3 \quad k = 4$
(B) $a = 1 \quad h = 3 \quad k = 4$
(C) $a = 1 \quad h = -4 \quad k = 3$
(D) $a = -1 \quad h = 4 \quad k = 3$

5. The number of visas, V(x), issued by an embassy annually is given by $V(x) = 7x^2 - 42x + 72$. The LEAST number of visas issued in a particular year, x, is

(A) 6
(B) 9
(C) 42
(D) 72

6. The roots of the equation $5x^2 + 6x - 2 = 0$ are

(A) real and equal
(B) real and distinct
(C) not real and not equal
(D) not real and not distinct

7. The values of x for which $\frac{3x-2}{2x+1} \leq 0$ are

(A) $x \leq \frac{2}{3}$

(B) $x > -\frac{1}{2}$

(C) $-\frac{1}{2} < x \leq \frac{2}{3}$

(D) $x \leq -\frac{1}{2}$ or $x \geq \frac{2}{3}$

8. The range of values of x for which $4x - 3x^2 > 0$ is

(A) $-\frac{4}{3} < x < 0$

(B) $x < 0, x > \frac{4}{3}$

(C) $0 < x < \frac{4}{3}$

(D) $x > 0, x > \frac{4}{3}$

9. The expression $\frac{\sqrt{5}-1}{1+\sqrt{5}}$ when simplified is equal to

(A) $\frac{1}{3}(3 - \sqrt{5})$

(B) $\frac{1}{2}(\sqrt{5} - 3)$

(C) $\frac{1}{3}(\sqrt{5} - 3)$

(D) $\frac{1}{2}(3 - \sqrt{5})$

10. $\sqrt[n]{3 \times 27^m}$ is equal to

(A) $3^{\frac{4m}{n}}$

(B) 3^{n+3m}

(C) $\sqrt[n]{81^{3m}}$

(D) $3^{\frac{3m+1}{n}}$

11. The value of 2^z where $z = 5 + \log_2 3$ is

(A) $\log_2 96$

(B) 2^5

(C) 96

(D) 2^{96}

12. Which of the following mathematical statements are true?

I. $\log_a PQ = \log_a P \times \log_a Q$

II. $\log_a \frac{P}{Q} = \log_a P - \log_a Q$

III. $\log_a P^b = b \log_a P$

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

13. The sum of the first n terms of a series is given by $\sum_{r=1}^{n} (5 - 3r)$. The sum of the first 10 terms is

(A) −85
(B) −115
(C) −125
(D) −170

14. The sum of the first n terms of a geometric series is $S_n = 4^n - 1$. For this series,

I. the common ratio is −1

II. the first 3 terms are 3, 12 and 48

III. $S_{2n} = 2^{4n} - 1$

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

15. A sequence of positive integers, $\{U_n\}$, is defined by $U_n = 3\left(\frac{1}{2}\right)^{n-1}$. The 10th term of the sequence is given by

(A) $-\frac{19\,683}{512}$

(B) $\frac{3}{512}$

(C) $\frac{3}{256}$

(D) $\frac{3}{1000}$

16. The lines $7x - 4y + 25 = 0$ and $3x - y - 5 = 0$ intersect at the point **P**. The coordinates of **P** are

(A) (5, 10)
(B) (−1, 8)
(C) (9, 22)
(D) (−9, −32)

17. The coordinates of the centre of a circle with equation $(x - 1)^2 + (y + 3)^2 = 36$ is

(A) (−1, 3)
(B) (−3, 1)
(C) (1, −3)
(D) (3, −1)

18. The points of intersection of the line with equation $y - x - 2 = 0$ and the circle with equation $x^2 + y^2 = 10$ are

(A) (3, 1) and (−1, −3)
(B) (3, −1) and (1, −3)
(C) (−3, −1) and (−1, −3)
(D) (−3, −1) and (1, 3)

19. The vectors **i** and **j** represent 1 km/h east and 1 km/h north respectively. A man sails a boat on a lake such that the velocity is $-\mathbf{i} + 2\mathbf{j}$ when there is no current. If a current of $3\mathbf{i}$ is encountered, then the resulting velocity, v, is

(A) $2\mathbf{i} + 2\mathbf{j}$ km/h
(B) $4\mathbf{i} - 2\mathbf{j}$ km/h
(C) $-4\mathbf{i} + 2\mathbf{j}$ km/h
(D) $-4\mathbf{i} - 2\mathbf{j}$ km/h

20. The vector **a** is given as $5\mathbf{i} + 12\mathbf{j}$. A unit vector parallel to **a** is

(A) $15\mathbf{i} + 36\mathbf{j}$

(B) $195\mathbf{i} + 468\mathbf{j}$

(C) $\frac{1}{13}(5\mathbf{i} + 12\mathbf{j})$

(D) $\frac{3}{13}(5\mathbf{i} + 12\mathbf{j})$

21. The position vectors of A and B relative to an origin O are $\begin{pmatrix} 2 \\ 5 \end{pmatrix}$ and $\begin{pmatrix} 3 \\ -1 \end{pmatrix}$ respectively.

The acute angle AOB is given by

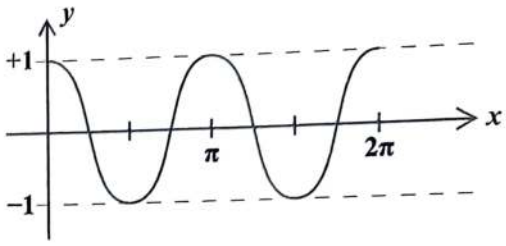
(A) $\cos^{-1}\left(\frac{1}{\sqrt{290}}\right)$

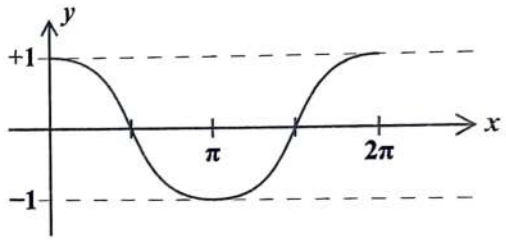
(B) $\cos^{-1}\left(\frac{11}{\sqrt{290}}\right)$

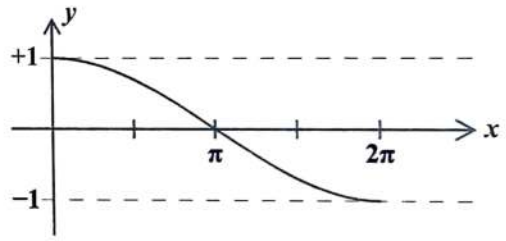
(C) $\cos^{-1}\left(\frac{\sqrt{11}}{\sqrt{290}}\right)$

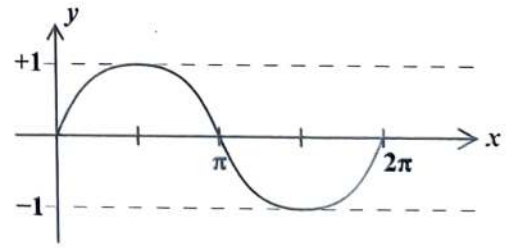
(D) $\cos^{-1}\left(\frac{-1}{290}\right)$

22. Which of the following graphs represents $y = \sin x$?

(A)


(B)


(C)


(D)


23. The EXACT value of $\cos\left(\frac{5\pi}{12}\right)$ =

(A) $\frac{1}{4}\left(\sqrt{6} - \sqrt{2}\right)$

(B) $\frac{1}{4}\left(\sqrt{6} + \sqrt{2}\right)$

(C) $\frac{1}{2}\left(\sqrt{6} + \sqrt{2}\right)$

(D) $\frac{1}{2}\left(\sqrt{6} - \sqrt{2}\right)$

GO ON TO THE NEXT PAGE

24. For $0° < x < 360°$, the equation $3 \sin^2 x = 8 \cos x$ has only one real solution given by

(A) $\sin x = \frac{1}{3}$

(B) $\cos x = \frac{1}{3}$

(C) $\sin x = -\frac{1}{3}$

(D) $\cos x = -\frac{1}{3}$

25. If $\sin (x + 20°) = \cos x$, then a possible value of x is

(A) 35°
(B) 45°
(C) 55°
(D) 70°

26. $\cos (A + B) + \cos (A - B) \equiv$

(A) $2 \cos A$
(B) $\cos^2 A \cos^2 B$
(C) $2 \cos A \cos B$
(D) $2 \cos A + 2 \cos B$

27. The trigonometrical expression

$\frac{\sin x}{1 - \cos x} + \frac{\sin x}{1 + \cos x}$ is identical to

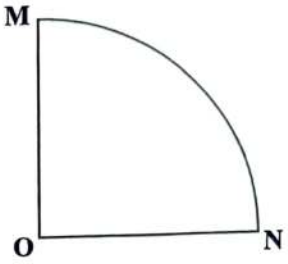
(A) $2 \sin x$

(B) $2 \tan x$

(C) $\tan^2 x$

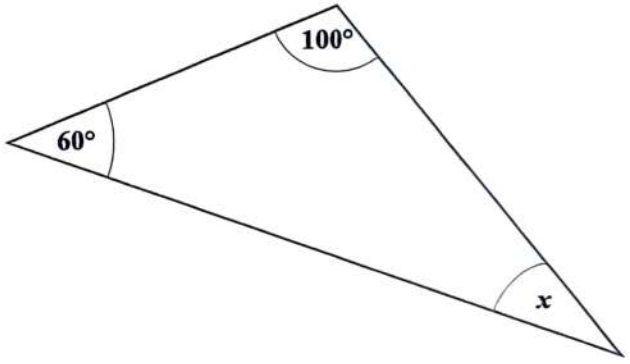
(D) $\frac{2}{\sin x}$

28. The figure MON below shows a quarter circle with radius 4 cm. The perimeter of the figure, in cm, is



(A) 2π
(B) 4π
(C) $\pi + 8$
(D) $2(\pi + 4)$

Item **29** refers to the figure below.



29. The size of angle x, measured in radians, is

(A) $\frac{\pi}{12}$

(B) $\frac{\pi}{9}$

(C) $\frac{\pi}{6}$

(D) $\frac{\pi}{3}$

30. The **smallest** positive angle in radians, within the range $0 \leq \theta \leq 2\pi$ that satisfies the equation $(2\cos\theta - 1)(\cos\theta - 2) = 0$, is

(A) $\frac{\pi}{3}$

(B) $\frac{2\pi}{3}$

(C) $\frac{4\pi}{3}$

(D) $\frac{5\pi}{3}$

31. Given that $y = \sqrt{5-x}$, then $\frac{dy}{dx}$ is

(A) $-\frac{1}{\sqrt{5-x}}$

(B) $\frac{1}{\sqrt{5-x}}$

(C) $\frac{1}{2\sqrt{5-x}}$

(D) $-\frac{1}{2\sqrt{5-x}}$

32. At the 10 m stopping point on a runway, an airplane is stationary before takeoff. If the plane travels 120 m from this point in 4 seconds, what is its speed at the point of takeoff?

(A) 32 m/s
(B) 27 m/s
(C) 30 m/s
(D) 50 m/s

33. The curve C is given by the equation $y = 2x^3 - 3x^2 - 12x + 6$. The values of x at which stationary points occur are

(A) 1 and 2
(B) –1 and 2
(C) 1 and –2
(D) –1 and –2

34. The curve C has the equation $y = f(x)$. C has a stationary point at (–2, 5). If $f''(x) = x^4 - 15$, then (–2, 5) is

(A) a vertex
(B) an intercept
(C) a minimum turning point
(D) a maximum turning point

35. If $f(x) = \sin 3x - \cos 4x$, then $f''(x) =$

(A) $3\cos 3x + 4\sin 4x$
(B) $9\sin 3x - 16\cos 4x$
(C) $9\sin 3x + 16\cos 4x$
(D) $-9\sin 3x + 16\cos 4x$

36. Given an expression for the acceleration of a moving object, the velocity of the object can be found by

(A) squaring the expression
(B) integrating the expression
(C) differentiating the expression
(D) square rooting the expression

37. If $X = \int_a^b f(x)dx$ and $a < c < b$, then $X =$

(A) $\int_0^a f(x)dx + \int_0^b f(x)dx$

(B) $\int_a^c f(x)dx + \int_b^c f(x)dx$

(C) $\int_a^c f(x)dx + \int_c^b f(x)dx$

(D) $\int_0^a f(x)dx + \int_0^c f(x)dx - \int_0^b f(x)dx$

38. If c is a constant, then $\int (2x-5)^3\, dx =$

(A) $\frac{(2x-5)^4}{4} + c$

(B) $\frac{(2x-5)^2}{8} + c$

(C) $\frac{(2x-5)^4}{8} + c$

(D) $\frac{2(2x-5)}{4} + c$

39. If c is a constant, then $\int (\sin x + 2\cos x)\, dx =$

(A) $2 \sin x - \cos x + c$
(B) $\cos x + 2 \sin x + c$
(C) $\cos x - 2 \sin x + c$
(D) $2 \sin x + \cos x + c$

40. The region **R** is enclosed by the x-axis, the curve $y = -x^2 + 2$ and the lines $x = 0$ and $x = 1$. The area of **R** is

(A) 1

(B) $\frac{5}{3}$

(C) 2

(D) $\frac{7}{3}$

41. There are 108 cards in a deck of UNO playing cards. There are four "Wild", four "Wild Draw Four" and 25 each of four colours (red, yellow, green, blue).

If a player needs to select 1 card, what is the probability of NOT drawing a "Wild Draw Four"?

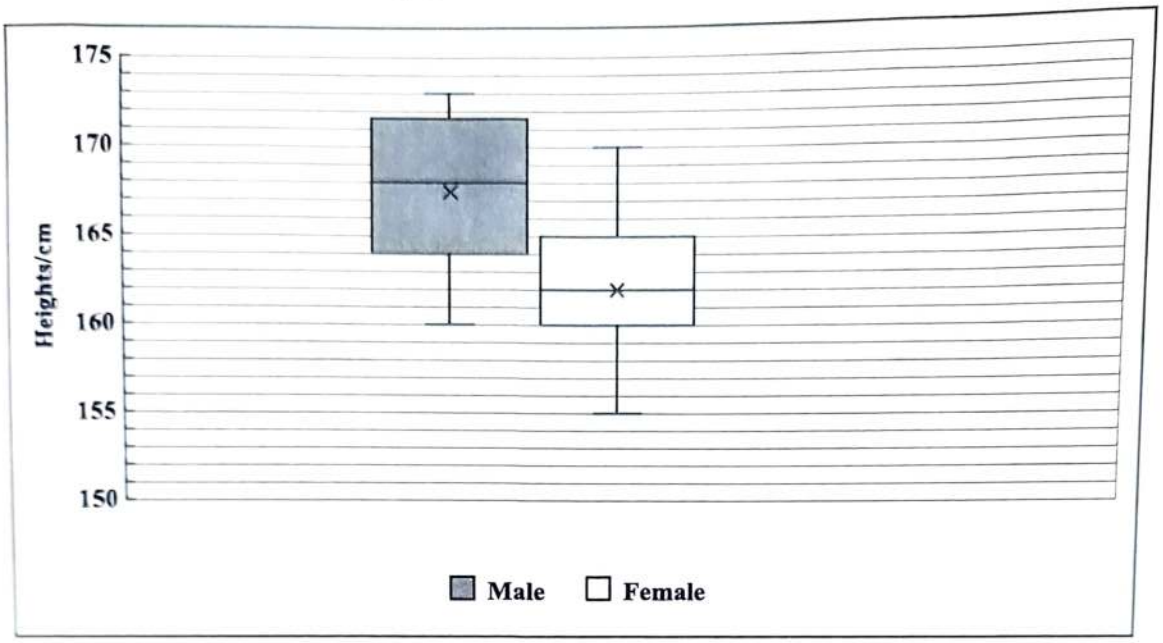
(A) $\frac{26}{27}$

(B) $\frac{25}{108}$

(C) $\frac{2}{27}$

(D) $\frac{1}{108}$

Item **42** refers to the following diagram which shows a box-and-whisker plot of the heights of male and female students in a physics class.



42. Which of the following values describes the range of heights in the class?

(A) 18.0 cm
(B) 15.0 cm
(C) 13.0 cm
(D) 11.5 cm

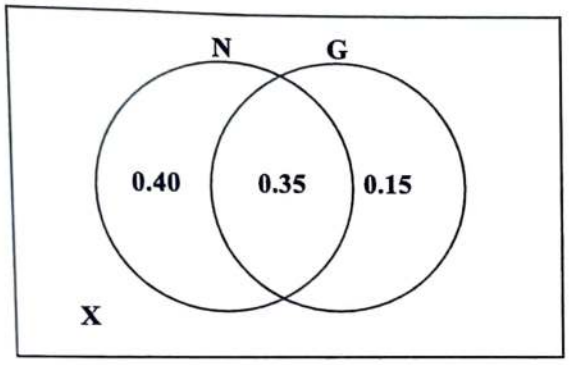
Item **43** refers to the following table which shows the performance of final-year university students, majoring in social work or psychology, on a research project.

	Passed	Failed	TOTAL
Social Work	200	15	
Psychology	300	25	
TOTAL			

43. The probability, expressed to two decimal places, of selecting a student who failed is

(A) 0.03
(B) 0.07
(C) 0.08
(D) 0.60

Items **44** and **45** refer to the following Venn diagram. There are 120 students in a school's music club. The Venn diagram shows the probabilities that a randomly selected student plays the piano (N) or guitar (G).



44. What is the value of X?

(A) 0.10
(B) 0.35
(C) 0.90
(D) 1.00

45. What is $P(N \mid G)$?

(A) 0.10
(B) 0.40
(C) 0.47
(D) 0.70

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.