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.

Agape Learning Hub

FORM TP 2021041

TEST CODE **01254010**

MAY/JUNE 2021

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE®

EXAMINATION

ADDITIONAL MATHEMATICS

Paper 01 – General Proficiency

1 hour 30 minutes

02 JUNE 2021 (a.m.)

471

1041

A000

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. 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.
4. A list of formulae is provided on page 2 of this booklet.
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 fill 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.

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

Copyright © 2020 Caribbean Examinations Council
All rights reserved.

28/6/2021 Pm
27/7/ am ×2

Agape Learning Hub - http://linktr.ee/agapelearninghub - FREE CSEC CLASSES

LIST OF FORMULAE

Arithmetic Series $T_n = a + (n-1)d \qquad S_2 = \frac{n}{2}[2a + (n-1)d]$

Geometric Series $T_n = ar^{n-1} \qquad S_n = \frac{a(r^n - 1)}{r-1} \qquad S_\infty = \frac{a}{1-r}, -1 < r < 1 \text{ or } |r| < 1$

Circle $x^2 + y^2 + 2fx + 2gy + c = 0 \qquad (x+f)^2 + (y+g)^2 = r^2$

Vectors $\hat{\mathbf{v}} = \frac{\mathbf{v}}{|\mathbf{v}|} \qquad \cos\theta = \frac{\mathbf{a} \bullet \mathbf{b}}{|\mathbf{a}| \times |\mathbf{b}|} \qquad |\mathbf{v}| = \sqrt{(x^2 + y^2)}$ where $\mathbf{v} = x\mathbf{i} + y\mathbf{j}$

Trigonometry $\sin(A \pm B) \equiv \sin A \cos B \pm \cos A \sin B$

$\cos(A \pm B) \equiv \cos A \cos B \mp \sin A \sin B$

$\tan(A \pm B) \equiv \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$

Differentiation $\frac{\mathrm{d}}{\mathrm{d}x}(ax+b)^n = an(ax+b)^{n-1} \qquad \frac{\mathrm{d}}{\mathrm{d}x}\sin x = \cos x \qquad \frac{\mathrm{d}}{\mathrm{d}x}\cos x = -\sin x$

Statistics $\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n} = \frac{\sum_{i=1}^{n} f_i x_i}{\sum_{i=1}^{n} f_i}, \qquad S^2 = \frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n} = \frac{\sum_{i=1}^{n} f_i x_i^2}{\sum_{i=1}^{n} f_i} - (\bar{x})^2$

Probability $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

Kinematics $v = u + at \qquad v^2 = u^2 + 2as \qquad s = ut + \frac{1}{2}at^2 \qquad v = \frac{dx}{dt} = \dot{x}$

$a = \frac{d^2x}{dt^2} = \frac{dv}{dt} = \ddot{x}$

Calculus $\frac{d}{dx}(ax+b)^n = an(ax+b)^{n-1} \qquad \frac{d}{dx}\sin ax = a\cos ax$

$\frac{d}{dx}\cos ax = -a\sin ax \qquad s = \int v\,dt \qquad v = \int a\,dt$

GO ON TO THE NEXT PAGE

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. When $x^3 - 7x^2 + 2x - 1$ is divided by $x + 2$, the quotient is

(A) -17

(B) -39

(C) $x^2 - 5x - 8$

(D) $x^2 - 9x + 20$

3. Given that $f(x) = ax^2 + bx + c$, then $f(x)$ can be expressed in the form

(A) $a\left(x + \frac{b}{a}\right)^2 + \frac{ac - b^2}{a^2}$

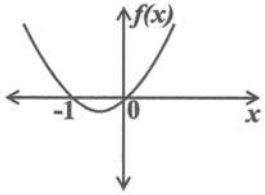
(B) $a\left(x + \frac{b}{2a}\right)^2 + \frac{ac - b^2}{a^2}$

(C) $a\left(x + \frac{b}{2a}\right)^2 + \frac{4ac - b^2}{4a}$

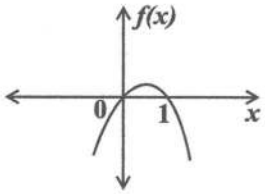
(D) $a\left(x + \frac{b}{2a}\right)^2 + \frac{4ac - b^2}{4a^2}$

4. Which of the following graphs BEST represents $f(x) = x(1 - x)$?

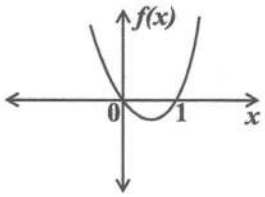
(A)



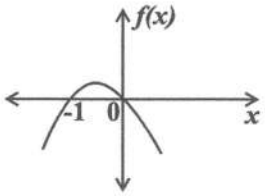
(B)



(C)



(D)



5. A quadratic equation is such that the sum of its roots is $-\frac{2}{3}$ and the product of its roots is $\frac{3}{4}$. The quadratic equation is

(A) $12x^2 + 8x + 9 = 0$

(B) $12x^2 - 8x - 9 = 0$

(C) $12x^2 - 8x + 9 = 0$

(D) $12x^2 + 8x - 9 = 0$

GO ON TO THE NEXT PAGE

Agape Learning Hub - http://linktr.ee/agapelearninghub - FREE CSEC CLASSES

6. Given that $f(x) = 1 - 4x - 2x^2$, then $f(x)$ can be expressed in the form

(A) $2(x + 1)^2 - 3$

(B) $3 - 2(x - 1)^2$

(C) $3 - 2(x + 1)^2$

(D) $3 - (2x + 1)^2$

7. The set of values of x for which $3x + 2 > x - 2$ is

(A) $\{x : x > 2\}$

(B) $\{x : x < -2\}$

(C) $\{x : x > -2\}$

(D) $\{x : x > 0\}$

8. The range of values for which $x^2 - 7x + 10 < 0$ is

(A) $2 > x > 5$

(B) $2 < x < 5$

(C) $x < 2$ and $x > 5$

(D) $x < -5$ and $x > -5$

9. $\dfrac{2^{-1}}{8^{\frac{1}{3}}}$ simplifies to

(A) $\dfrac{1}{4}$

(B) $\dfrac{1}{2}$

(C) $\sqrt{2}$

(D) $\dfrac{1}{\sqrt{2}}$

10. Given that $\log_p X = 6$ and $\log_p Y = 4$, the value of $\log_p \left(\frac{X}{Y}\right)$ is

(A) 10

(B) $\log_p 2$

(C) $\dfrac{\log_p 6}{\log_p 4}$

(D) 2

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. The value of x such that $\log_2 (5x + 1) - \log_2 (3x - 5) = 2$ is

(A) 2

(B) 3

(C) 5

(D) 11

13. The common ratio of the geometric sequence 8, 12, 18, . . . is

(A) $\dfrac{3}{4}$

(B) $\dfrac{2}{3}$

(C) $\dfrac{3}{2}$

(D) $\dfrac{1}{2}$

GO ON TO THE NEXT PAGE

Agape Learning Hub - http://linktr.ee/agapelearninghub - FREE CSEC CLASSES

14. 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) –170
(B) –125
(C) –115
(D) –85

15. The sum of $\sum_{k=1}^{3}\frac{1}{k}$ is

(A) $\frac{1}{3}$
(B) $\frac{1}{2}$
(C) $\frac{3}{5}$
(D) $\frac{11}{6}$

16. The point (2, 3) is at one end of a diameter of the circle whose equation is

$x^2 + y^2 - 10x + 2y + 1 = 0.$

The coordinates of the point on the other end of the diameter are

(A) (8, –1)
(B) (8, –5)
(C) (–12, –1)
(D) (–12, –5)

17. 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)

18. The points of intersection of the line with equation $x + y = 7$ and the circle with equation $x^2 + y^2 = 25$ are P and Q. The coordinates of P and Q respectively are

(A) (–3, –4) and (–4, –3)
(B) (–3, 4) and (–4, 3)
(C) (3, –4) and (4, –3)
(D) (3, 4) and (4, 3)

19. The vectors **i** and **j** represent 1 km/h east and 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 there is a current of $3\mathbf{i}$, then the resultant velocity, v, is given by

(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 triangle OAB has vertices given by $\begin{pmatrix}0\\0\end{pmatrix}, \begin{pmatrix}-3\\a\end{pmatrix}, \begin{pmatrix}6\\2\end{pmatrix}$ respectively. Given that the angle AÔB is $\frac{\pi}{2}$, then $a =$

(A) 18
(B) 9
(C) –9
(D) 0

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

GO ON TO THE NEXT PAGE

Agape Learning Hub - http://linktr.ee/agapelearninghub - FREE CSEC CLASSES

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

23. If $\sin\theta = \frac{5}{13}$ and θ is **obtuse**, then $\tan\theta =$

(A) $-\frac{12}{13}$

(B) $-\frac{5}{12}$

(C) $\frac{5}{12}$

(D) $\frac{12}{13}$

24. The trigonometrical expression

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

(A) $2\sin x$

(B) $2\tan x$

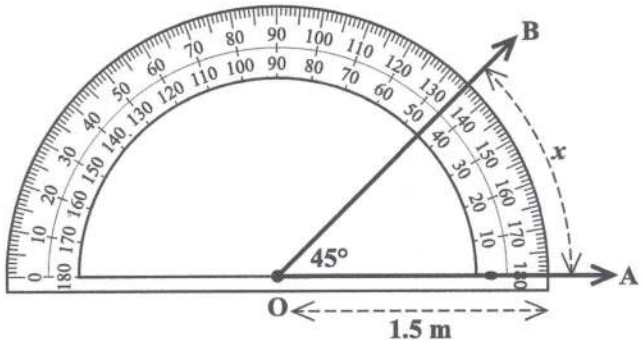
(C) $\tan^2 x$

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

25. $\sin\left(\frac{\pi}{2}-x\right) + \cos\left(x+\frac{\pi}{2}\right) =$

(A) $\tan\pi$
(B) $\sin x - \cos x$
(C) $\cos x - \sin x$
(D) $1 - \sin x - \cos x$

Item **26** refers to the following protractor which represents half of a circle. The protractor has a radius of 1.5 metres and the angle AOB measures 45°.



26. What is the arc length, x, in metres, along the outer edge of the protractor?

(A) $\frac{\pi}{4}$

(B) $\frac{3\pi}{8}$

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

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

Agape Learning Hub - http://linktr.ee/agapelearninghub - FREE CSEC CLASSES

27. If $\sin(x + 20°) = \cos x$, then the value of x is

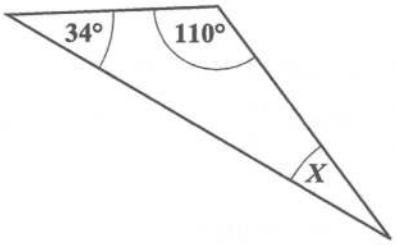
(A) 35°

(B) 45°

(C) 55°

(D) 70°

Item **28** refers to the following triangle (**not drawn to scale**).



28. The size of the missing angle, ***X***, measured in radians, is

(A) $\frac{\pi}{5}$

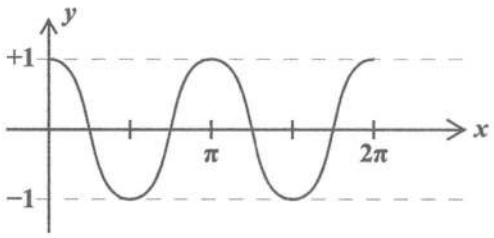
(B) $\frac{\pi}{10}$

(C) $\frac{\pi}{20}$

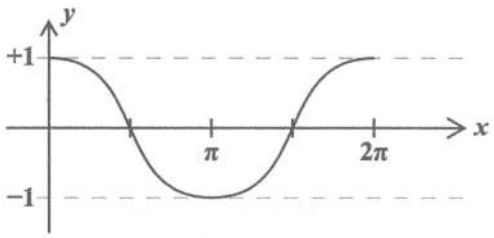
(D) $\frac{\pi}{25}$

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

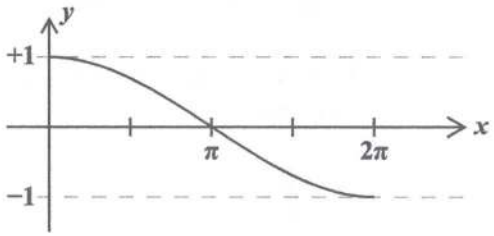
(A)



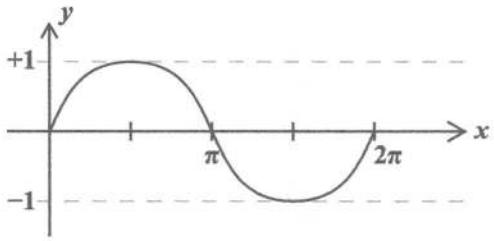
(B)



(C)



(D)



30. 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) $\cos x = -\frac{1}{3}$

GO ON TO THE NEXT PAGE

Agape Learning Hub - http://linktr.ee/agapelearninghub - FREE CSEC CLASSES

31. The gradient at $x = \frac{\pi}{6}$ on the curve $y = \cos x$ is

(A) $-\frac{\sqrt{3}}{2}$

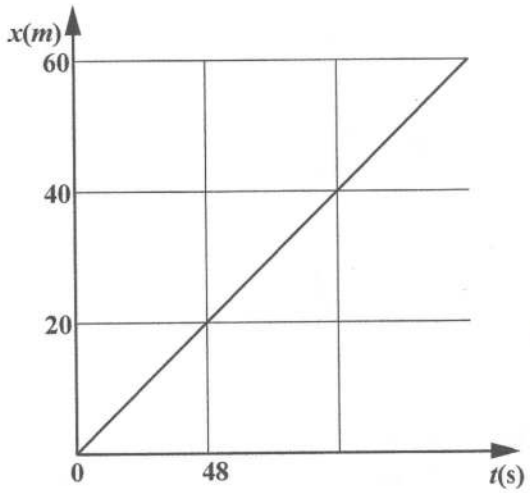
(B) $-\frac{1}{2}$

(C) $\frac{1}{2}$

(D) $\frac{\sqrt{3}}{2}$

Item **32** refers to the following graph which represents the position, as a function of time, for a moving object.

Use this graph to answer the following question.



32. Which of the following statements is true?

(A) The object stays at rest.
(B) The object increases its velocity.
(C) The object decreases its velocity.
(D) The object's velocity stays unchanged.

33. $\frac{d}{dx}\left(\frac{2x-1}{5-x}\right) =$

(A) $\frac{9}{(5-x)^2}$

(B) $\frac{-9-4x}{(5-x)^2}$

(C) $-\frac{9}{(5-x)^2}$

(D) $\frac{9-4x}{(5-x)^2}$

34. At the point (7, 4) on the curve $y = f(x)$, $\frac{dy}{dx} = 0$ and $\frac{d^2y}{dx^2} = -5$. The point (7, 4) is

(A) an optimum point
(B) a point of inflexion
(C) a minimum turning point
(D) a maximum turning point

35. $\frac{d}{dx}\sqrt{7x^2 + 4} =$

(A) $\frac{14x}{\sqrt{7x^2 + 4}}$

(B) $\frac{7x}{\sqrt{7x^2 + 4}}$

(C) $\frac{7x}{2\sqrt{7x^2 + 4}}$

(D) $\frac{7}{\sqrt{7x^2 + 4}}$

GO ON TO THE NEXT PAGE

Agape Learning Hub - http://linktr.ee/agapelearninghub - FREE CSEC CLASSES

36. If $y = 3x^2 + \cos x$ then $\int y\,dx =$

(A) $x^3 - \sin x + c$
(B) $x^3 + \sin x + c$
(C) $6x - \sin x + c$
(D) $3x^3 - \sin x + c$

37. $\int_0^2 (3x + 4)^3\,dx =$

(A) 812 units^2
(B) 821 units^2
(C) 830 units^2
(D) 854⅔ units^2

38. A car and a delivery truck both start from rest and accelerate at the same rate. However, the car accelerates for twice the amount of time as the truck. What is the travelled distance of the car compared to the truck?

(A) The same
(B) Half as much
(C) Twice as much
(D) Four times as much

39. 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) $\frac{7}{3}$

40. The region bounded by the curve $y = x^2$, the x-axis and the lines $x = 0$ and $x = 1$ is rotated 360° about the x-axis. The volume of the solid generated can be found from

(A) $\pi\int_0^1 x^2 dx$
(B) $\int_0^1 x^2 dx$
(C) $\int_0^1 x^4 dx$
(D) $\pi\int_0^1 x^4 dx$

Item **41** refers to the following probability table which shows the probability of a biased spinner landing on 3 of the 5 possible prizes.

Prize	Car	Cruise vacation	Television	Jewellery	Blender
Probability			0.15	0.25	0.5

41. If winning the car or the cruise vacation are equally likely, what is the probability of winning the car?

(A) 1
(B) 0.9
(C) 0.1
(D) 0.05

GO ON TO THE NEXT PAGE

Agape Learning Hub - http://linktr.ee/agapelearninghub - FREE CSEC CLASSES

42. In a regular deck of 52 cards where there are 26 red and 26 black cards, if a single card is selected at random, what is the probability of getting a red card?

(A) 1
(B) 1.5
(C) 0.5
(D) 0.25

43. A fair 6-sided die is rolled. Given that an odd number has turned up, what is the probability that it is a prime number?

(A) $\frac{1}{3}$
(B) $\frac{1}{2}$
(C) $\frac{2}{3}$
(D) 1

Item **44** refers to the following stem and leaf plot which shows the mass, to the nearest kg, of a Grade 6 class.

Boys		Girls
9	2	
9 9 8 8 8 8 3	3	1 1 6 7 7 8 8 8 9
4 3 2 1 1 0 0	4	0 1 1 4
0	5	3
Key 8|3 means 38 kg		**Key 3|8 means 38 kg**

44. Which of the following statements is true regarding the shape of the distribution of the weights of the girls compared to the boys?

(A) The weights of both boys and girls are positively skewed.
(B) The weights of both boys and girls are relatively symmetrical.
(C) The weights of the girls are negatively skewed and the weights of the boys are positively skewed.
(D) The weights of the girls are positively skewed and the weights of the boys are relatively symmetrical.

45. Joseph collects data on the colour of cars passing his yard. The data can be described as

(A) qualitative and discrete
(B) quantitative and discrete
(C) qualitative and continuous
(D) quantitative and continuous

END OF TEST

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

Agape Learning Hub - http://linktr.ee/agapelearninghub - FREE CSEC CLASSES

CANDIDATE'S RECEIPT

INSTRUCTIONS TO CANDIDATE:

1. **Fill in all the information requested clearly in capital letters.**

TEST CODE: | 0 | 1 | 2 | 5 | 4 | 0 | 1 | 0 |

SUBJECT: ADDITIONAL MATHEMATICS – Paper 01

PROFICIENCY: GENERAL

REGISTRATION NUMBER: | | | | | | | | | | |

FULL NAME: _____

(BLOCK LETTERS)

Signature: _____

Date: _____

2. **Ensure that this slip is detached by the Supervisor or Invigilator and given to you when you hand in this booklet.**

3. **Keep it in a safe place until you have received your results.**

INSTRUCTION TO SUPERVISOR/INVIGILATOR:

Sign the declaration below, detach this slip and hand it to the candidate as his/her receipt for this booklet collected by you.

I hereby acknowledge receipt of the candidate's booklet for the examination stated above.

Signature: _____
Supervisor/Invigilator

Date: _____

Agape Learning Hub - http://linktr.ee/agapelearninghub - FREE CSEC CLASSES