CANDIDATE – PLEASE NOTE:
PRINT your name on the line below return this booklet with the answer sheet. Failure to do so may result in disqualification.

TEST CODE **01254010**

FORM TP 2013036

MAY/JUNE 2013

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE®

EXAMINATION

ADDITIONAL MATHEMATICS

Paper 01 – General Proficiency

1 hour 30 minutes

12 JUNE 2013 (p.m.)

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 answer space (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, omit it and go on to the next one. Your score will be the total number of correct answers.
8. You may use silent non programable calculators to answer the items.

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

LIST OF FORMULAE

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

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

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 $\frac{d}{dx}(ax + b)^n = an(ax + b)^{n-1}$

$\frac{d}{dx}\sin x = \cos x$

$\frac{d}{dx}\cos x = -\sin x$

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

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

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

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. The expression $ab + 3c - 3b - ac$ is equal to

(A) $(a + 3)(c - b)$
(B) $(a + 3)(b - c)$
(C) $(a - 3)(b - c)$
(D) $(a - 3)(b + c)$

3. Given that $x + 2$ is a factor of $f(x) = 2x^3 - 3x^2 - 5x + p$ then p is equal to

(A) -18
(B) -2
(C) 18
(D) 33

4. $2x^3 + x^2 - 7x - 6$ factorizes completely as

(A) $(x + 2)(x - 1)(2x - 3)$
(B) $(x - 2)(x - 1)(2x + 3)$
(C) $(x - 2)(x + 1)(2x - 3)$
(D) $(x - 2)(x + 1)(2x + 3)$

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

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

6. 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 $x > -5$

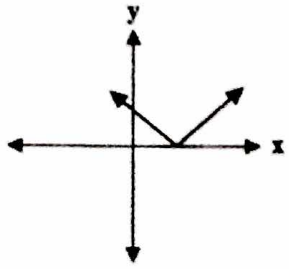
7. The set of values of x for which $3x + 2 > x - 2$ is

(A) $\{x : x > 2\}$
(B) $\{x : x < -2\}$
(C) $\{x : x > 0\}$
(D) $\{x : x > -2\}$

8. If $f(x) = 3x - 4$ and $fg(x) = x$, then $g(x)$ is

(A) $\frac{1}{3x - 4}$
(B) $\frac{x + 4}{3}$
(C) $3 - 4x$
(D) $4x - 3$

9. Which one of the graphs below is a function?

(A)


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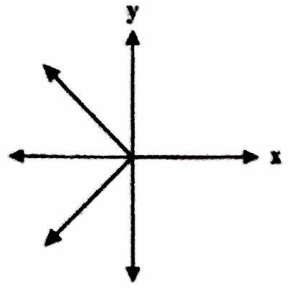
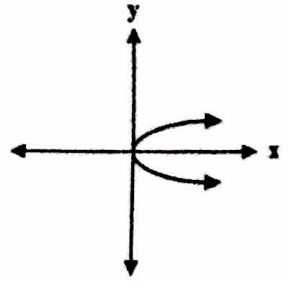


(C)


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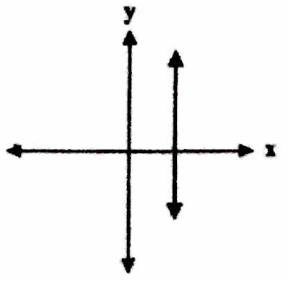

10. A function h is defined by $h : x \to 5x + 2$.
What is $h(2a + 3)$?

(A) $10a + 15$
(B) $2a + 15$
(C) $10a + 17$
(D) $5a + 17$

11. A function is defined by $f : x \to \frac{2}{x-3}$, $x \neq 3$

The value of $f^{-1}(1)$ is

(A) 4
(B) 5
(C) -1
(D) 1

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

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

(B) $\sqrt{2}$

(C) $\frac{1}{4}$

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

13. $(8+\sqrt{5})(2-\sqrt{5})$ can be expressed as

(A) $11-6\sqrt{5}$

(B) $21-6\sqrt{5}$

(C) $11+6\sqrt{5}$

(D) $11+10\sqrt{5}$

14. The value of x for which $4^{x+1} = 2$ is

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

(B) 0

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

(D) 1

15. 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) $\frac{\log_p 6}{\log_p 4}$

(D) 2

16. Given that a and b are the roots of the equation $x^2 + 3x + 4 = 0$, what is the value $(a + b)^2$?

(A) $\frac{9}{16}$

(B) 1

(C) 9

(D) 16

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

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

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

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

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

18. The sum of the ODD integers between 10 and 50 is

(A) 60
(B) 600
(C) 630
(D) 1960

19. For the arithmetic progression $-12, -7, -2, 3, 8$ ... the n^{th} term is given by

(A) $5n - 17$
(B) $5n - 12$
(C) $-12 - 5n$
(D) $5n + 17$

20. A long-distance runner runs the first kilometre of a race in 3 minutes 45 seconds but finds that his speed drops steadily so that each kilometre takes him 12 seconds more than the preceding one. The time taken to cover the first 12 kilometres is

(A) 58 mins 12 secs
(B) 31 mins 48 secs
(C) 9 mins 18 secs
(D) 63 mins 36 secs

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

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

22. The line through the points $P(k, 2)$ and $Q(6, 8)$ is parallel to the line with equation $3x + y - 21 = 0$. The value of k is

(A) 1
(B) 4
(C) 8
(D) 24

23. The points of intersection of the line with equation $x + y = 7$ and the circle with equation $x^2 + y^2 = 25$ are A and B. The coordinates of A and B 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)

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

25. If $\pi < \theta < 2\pi$ and $2\cos\theta = \sqrt{3}$, then θ is

(A) $\frac{11\pi}{6}$

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

(C) $\frac{7\pi}{4}$

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

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

27. Given that $\cos x = \frac{3}{5}$, the value of $\sin 2x$ is

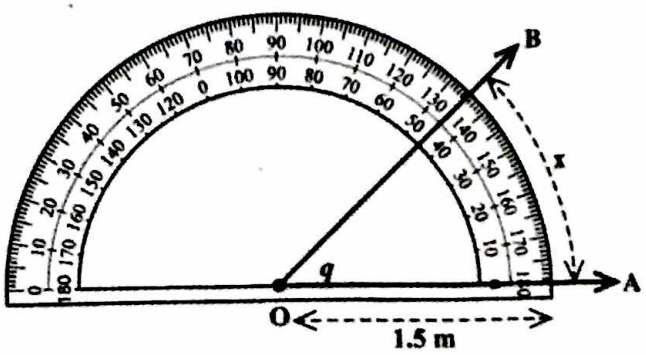
(A) $\frac{3}{5}$

(B) $\frac{4}{5}$

(C) $\frac{12}{25}$

(D) $\frac{24}{25}$

Item 28 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°.



28. What is the arc length, x, in metres, along the outer edge of the protractor in the region of angle AOB?

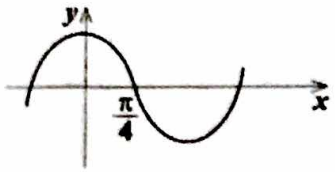
(A) $\frac{\pi}{4}$

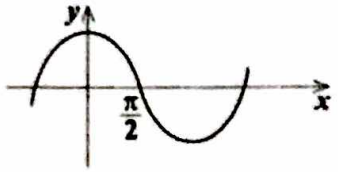
(B) $\frac{3\pi}{8}$

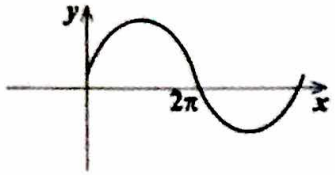
(C) $\frac{3\pi}{4}$

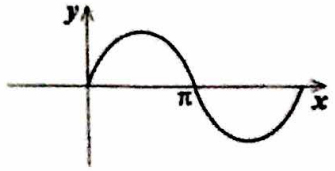
(D) $\frac{\pi}{6}$

29. The graph of $y = \sin x$ is

(A) 

(B) 

(C) 

(D) 

30. If $\sin (x^\circ + 20^\circ) = \cos x$, then the value of x is

(A) 35
(B) 45
(C) 55
(D) 70

31. $\sin (\alpha + 45^\circ)$ is equal to

(A) $\frac{1}{\sqrt{2}} (\sin \alpha + \cos \alpha)$

(B) $\frac{1}{\sqrt{2}} (\cos \alpha - \sin \alpha)$

(C) $\frac{1}{2} (\sin \alpha - \cos \alpha)$

(D) $\frac{1}{2} (\cos \alpha - \sin \alpha)$

32. $\frac{4\pi}{5}$ radians converted to degrees is

(A) 72
(B) 144
(C) 180
(D) 288

33. 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) $\frac{12}{13}$

34. 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) $\frac{2}{\sin x}$

(D) $\tan^2 x$

35. If $y = \sqrt{(1+x^3)}$, then $\frac{dy}{dx} =$

(A) $\frac{x^2}{2\sqrt{(1+x^3)}}$

(B) $\frac{3x^2}{2\sqrt{(1+x^3)}}$

(C) $\frac{1}{2\sqrt{(1+x^3)}}$

(D) $\frac{x^3}{2\sqrt{(1+x^3)}}$

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

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

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

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

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

37. The equation of a curve is given by $y = (x^2 + 2)(x - 1)^3$.

The gradient function, $\frac{dy}{dx}$, is given by

(A) $(x - 1)(5x^2 - 2x + 6)$

(B) $(x - 1)^2(-x^2 - 2x - 6)$

(C) $(x - 1)^2(5x^2 - 2x + 6)$

(D) $(x - 1)^2(5x^2 + 2x + 6)$

38. If $y = \frac{x^2}{x+3}$ then $\frac{dy}{dx}$ is

(A) $\frac{-3x(x+2)}{(x+3)^2}$

(B) $\frac{3x(x+2)}{(x+3)^2}$

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

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

39. The curve C is given by the equation $y = x^2 + \frac{16}{x}$. The second derivative, $\frac{d^2y}{dx^2}$ is given by

(A) $2 - \frac{16}{x^2}$

(B) $2 + \frac{32}{x^3}$

(C) $2 + \frac{32}{x^2}$

(D) $2 + \frac{16}{x^3}$

40. The value of a for which $\int_0^a (x^2 - 5)\,dx = \frac{50}{3}$ is

(A) 5
(B) 6
(C) 8
(D) 10

41. 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) $\int_0^1 x^4 dx$

(C) $\int_0^1 x^2 dx$

(D) $\pi\int_0^1 x^4 dx$

42. $\int(2x-5)^3\,dx =$

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

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

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

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

43. 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) $3x^3 - \sin x + c$

44. $\int(\sin x + 2\cos x)\,dx =$

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

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

(A) 1

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

(C) 2

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

END OF TEST