CANDIDATE – PLEASE NOTE!

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

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FORM TP TEST CODE

MAY/JUNE 2017

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE®

EXAMINATION

ADDITIONAL MATHEMATICS

Paper 01 – General Proficiency

1 hour 30 minutes

07 JUNE 2017 (a.m.)

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

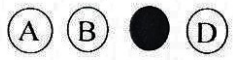
1. This test consists of 45 items. You will have 1 hour and 30 minutes to answer them.
2. In addition to this test booklet, you should have an answer sheet.
3. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice 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



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 can 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.

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

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1. The function $f(x) = 2x^3 - x^2 + hx - 6$ can be expressed as $f(x) = (2x + 1)(x + 2)(x - 3)$. What is the value of h?

(A) -13
(B) -12
(C) 7
(D) 13

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

(A) $\frac{x}{x^2-9}$
(B) $\frac{4}{x+3}$
(C) $\frac{x+6}{x^2-9}$
(D) $\frac{x^2-6}{(x^2-9)(x+3)}$

3. 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) $a = -1 \quad h = 4 \quad k = 3$

4. The roots of the equation $3x^2 - 6x - 5 = 0$ are

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

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

6. The set of values of x for which $\frac{5x-2}{2-3x} \geq 0$ is given by

(A) $\left\{x : x \geq \frac{2}{5} \cup x > \frac{2}{3}\right\}$
(B) $\left\{x : x \leq \frac{2}{5} \cup x > \frac{2}{3}\right\}$
(C) $\left\{x : \frac{2}{3} < x \leq \frac{2}{5}\right\}$
(D) $\left\{x : \frac{2}{5} \leq x < \frac{2}{3}\right\}$

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 $f(x) = -\frac{2}{9}x^3$, $-3 \leq x \leq 3$, $x \in R$, then

(A) $0 \leq f(x) \leq 6$
(B) $-6 \leq f(x) \leq 0$
(C) $-6 \leq f(x) \leq 6$
(D) $6 \leq f(x) \leq -6$

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9. The functions f and g are defined as follows:

$f: x \to \frac{x+1}{x-1},\ x \neq 1,\ x \in R$

$g: x \to 2x+1,\ x \neq \frac{1}{2},\ x \in R$

The function $fg(x)$ is given by

(A) $\frac{x+1}{x},\ x \neq 0,\ x \in R$

(B) $\frac{x-2}{x+1},\ x \neq -1,\ x \in R$

(C) $\frac{x+1}{x+2},\ x \neq -2,\ x \in R$

(D) $\frac{x-1}{2x+1},\ x \neq -\frac{1}{2},\ x \in R$

10. If function $m: x \to 5+2x$, then $m(4-2a)$ is

(A) $4-4a$
(B) $9-2a$
(C) $8-4a$
(D) $13-4a$

11. If $f^{-1}: x \to x^2-1,\ x \geq 0$, then

(A) $f: x \to 1-x^2,\ x \in R$

(B) $f: x \to \sqrt{(x+1)},\ x \geq -1$

(C) $f: x \to \sqrt{(x-1)},\ x \geq 1$

(D) $f: x \to \frac{2}{x^2-1},\ x \neq \pm 1$

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

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

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

(C) $\sqrt{2}$

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

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

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

(B) 3^{n+3m}

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

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

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

(A) $\log_2 96$

(B) 2^5

(C) 96

(D) 2^{96}

15. Given that $\log_2 x^3 = 6$, then the value of x is

(A) 2
(B) 4
(C) 8
(D) 64

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

(A) $\frac{\log_p 6}{\log_p 4}$

(B) $\log_p 2$

(C) 10

(D) 2

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 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

19. The expression $\sum_{r=1}^{5}(-1)^r(3)^{r+1} =$

(A) 1089
(B) 549
(C) –183
(D) –549

20. The sum of the **odd** integers between 10 and 50 is

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

21. A line **L** passes through the point (6, 5) and is perpendicular to a line whose equation is $3x + 4y - 7 = 0$. The equation of **L** is

(A) $3x - 4y - 30 = 0$
(B) $3x + 4y - 11 = 0$
(C) $4x + 3y - 7 = 9$
(D) $4x - 3y - 9 = 0$

22. 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)

23. A circle **C** has centre (3, –2) and radius 4. The equation of **C** is

(A) $x^2 + y^2 - 3 = 0$
(B) $x^2 + y^2 + 6x - 4y + 3 = 0$
(C) $x^2 + y^2 - 6x + 4y - 3 = 0$
(D) $x^2 + y^2 + 3x - 2y - 3 = 0$

24. Two vectors are equal if they

(A) have the same magnitude and different directions
(B) have the same magnitude and same direction
(C) are parallel and are in different directions
(D) have different magnitudes and are in the same direction

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

26. Given that $\overrightarrow{OA} = \begin{pmatrix} -17 \\ 25 \end{pmatrix}$ and $\overrightarrow{OB} = \begin{pmatrix} 4 \\ 5 \end{pmatrix}$, then the vector $\overrightarrow{AB} =$

(A) $\begin{pmatrix} -13 \\ 30 \end{pmatrix}$

(B) $\begin{pmatrix} -13 \\ -20 \end{pmatrix}$

(C) $\begin{pmatrix} -21 \\ 20 \end{pmatrix}$

(D) $\begin{pmatrix} 21 \\ -20 \end{pmatrix}$

27. The exact value of $\frac{\sin 150^\circ}{\cos 150^\circ}$ is given as

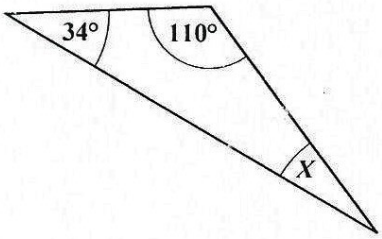
(A) $-\frac{1}{\sqrt{3}}$

(B) $\frac{1}{\sqrt{3}}$

(C) $-\sqrt{3}$

(D) $\sqrt{3}$

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

(A) 72°
(B) 144°
(C) 180°
(D) 288°

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. $\sin(\alpha + 45°)$ 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. 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) $\frac{12}{13}$

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

(A) 35°
(B) 45°
(C) 55°
(D) 70°

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

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

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

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

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

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

37. 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) $\frac{\sqrt{3}}{2}$

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38. Given $y = 2x^2 + 3\cos x$, then $\frac{dy}{dx} =$

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

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

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

40. If $\int_1^4 f(x)dx = 6$, then $\int_1^4 4f(x)dx + 5 =$

(A) 9
(B) 11
(C) 29
(D) 44

41. $\int(\cos x - 2\sin x)\,dx =$

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

42. The region bounded by the curve $y = 2x^2$, 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 calculated by

(A) $\int_0^1 2x^2\,dx$

(B) $\int_0^1 4x^4 dx$

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

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

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. $\int_1^2 (1 + x + x^2)dx =$

(A) 2

(B) 4

(C) $4\frac{5}{6}$

(D) $8\frac{1}{2}$

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

END OF TEST

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