THE UNIVERSITY OF THE WEST INDIES, MONA

Presents

The 2014 Jamaican Mathematical Olympiad

Test for Grades 7 and 8

NAME: _____

GRADE: _____

SCHOOL: _____

PRINCIPAL: _____

YEAR OF BIRTH: _____

STUDENT PHONE: _____

CONTACT TEACHER: _____

EXAMINATION QUESTIONS

1) What is the value of $(2000 + 14) + (2000 - 14)$?

   (a) 0   (b) 28   (c) 4000   (d) 3988   (e) 4028

2) Two of the puzzle pieces below have the same area. Which ones are they?

   (a) 2 and 4   (b) 1 and 5   (c) 1 and 3   (d) 4 and 5   (e) 3 and 5

3) Luis has 1000 pesos' worth of 10-peso notes, 1000 pesos' worth of 20-peso notes, and 1000 pesos' worth of 50-peso notes. How many notes does Luis have?

   (a) 80   (b) 650   (c) 90   (d) 200   (e) 170

4) In a magic square, the sum of the cells in any row, column, or along any diagonal is the same. In the magic square below, two numbers were removed and three others were covered by the letters A, B, and C. What is $A + B + C$?

16	3	A
C	10	
B		4

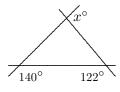(a) 30   (b) 41   (c) 14   (d) 25   (e) 40

5) In the figure below, what is the value of x?

(a) 98   (b) 122   (c) 80   (d) 140   (e) 90

6) In a certain classroom, the number of boys is equal to 80% of the number of girls. What is the number of girls equal to, as a percentage of the number of boys?

(a) 80%   (b) 100%   (c) 120%   (d) 125%   (e) 160%

7) Sherice bought some copy books and pens. Each copy book cost $90 and each pen cost $40. She spent $350 in all. How many pens did she buy?
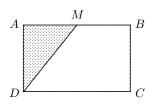
(a) 1   (b) 2   (c) 3   (d) 4   (e) 5

8) In the figure below, $ABCD$ is a rectangle and M is the midpoint of AB. The area of the shaded triangle is $7\,\text{cm}^2$. What is the area, in cm^2, of $ABCD$?

(a) 14   (b) 21   (c) 25   (d) 28   (e) 36

9) Suppose Janielle writes down all the numbers from 1 to 1000, including 1 and 1000. How many digits will she write in all?

(a) 1000   (b) 3001   (c) 2891   (d) 2888   (e) 2893

10) Marcia's dog is 9 times heavier than her cat, her gerbil is 20 times lighter than her cat, and her prize-winning turnip is 6 times heavier than her gerbil. The weight of her dog is how many times the weight of her turnip?

    (a) 30   (b) 2.7   (c) 1080   (d) 15   (e) 0.9

11) In Miss Brown's class, each student swims or plays football. Half of her students do both. Overall, the same number of students swim as play football. If 24 students swim, how many students are in Miss Brown's class?

    (a) 24   (b) 32   (c) 48   (d) 28   (e) 36

12) The figure below shows two concentric circles. The larger circle has radius 7 cm and the smaller one has radius 5 cm. What is the area of the shaded region?

    (a) 4π (b) 5π (c) 7π (d) 12π (e) 24π

13) Peter, Paul, and their grandfather went fishing. During the time that grandfather caught 8 fish, Paul caught 4 fish and Peter caught 7 fish. In one hour, Peter caught 42 fish. How many fish did the three of them catch during that hour?

    (a) 58   (b) 94   (c) 114   (d) 125   (e) 132

14) What is the value of $(1900 + 1901 + 1902 + \cdots + 1999) - (100 + 101 + 102 + \cdots + 199)$?

    (a) 180,000   (b) 178,200   (c) 1.800,000   (d) 1,801,800   (e) 1,900,000

15) In $\triangle ABC$ below, D is the point such that DB bisects $\angle ABC$ and DC bisects $\angle ACB$. If $\angle BDC = 150°$, what is the measure of $\angle BAC$?

    (a) 100°   (b) 110°   (c) 120°   (d) 130°   (e) 150°

16) How many positive integers less than 1,000,000 are there whose last four digits are 2014?

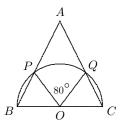   (a) 100   (b) 99   (c) 101   (d) 1001   (e) 999

17) In the figure below, each letter represents a digit and different letters represent different digits. None of the letters represents 0. What is the largest possible value of the sum $DREI$?
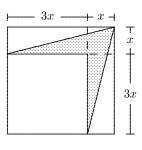
$$
\begin{array}{r}
\text{O N E} \\
+ \text{ D E U X} \\
\hline
\text{D R E I}
\end{array}
$$

  (a) 9863   (b) 9873   (c) 9874   (d) 9875   (e) 9876

18) In the figure below, BC is both the diameter of the semicircle with centre O and the base of the isosceles triangle ABC. The segments AB and AC intersect the circle at P and Q, respectively. If $\angle POQ = 80°$, what is the measure of $\angle APO$?

  (a) 90°   (b) 95°   (c) 105°   (d) 115°   (e) 120°

19) A certain father is 52 years old and his sons are 24 and 18 years old. In how many years will the age of the father be the same as the sum of the ages of his two sons?

  (a) 6   (b) 10   (c) 5   (d) 4   (e) 11

20) How many pairs a and b of positive integers are there that solve the equation $a^2 b - 1 = 1999$?

  (a) 6   (b) 5   (c) 4   (d) 3   (e) 7

21) In the figure below, what is the shaded area?

  (a) x^2 (b) $3x^2$ (c) $6x^2$ (d) $7x^2$ (e) $9x^2$

22) There are 20 jars of jam in a cupboard. They consist of 8 jars of strawberry jam, 7 jars of raspberry jam, and 5 jars of grape jam. What is the greatest number of jars we could take out in the dark and still be sure that at least 4 jars of one kind and 3 jars of another kind of jam would be left?

  (a) 9   (b) 6   (c) 8   (d) 5   (e) 7

23) Suppose w, x, and y are positive real numbers, all different, such that

$$\frac{y}{x-w} = \frac{x+y}{w} = \frac{x}{y}.$$

What is the value of x/y?

(a) $\dfrac{1}{2}$ (b) $\dfrac{3}{5}$ (c) 2 (d) $\dfrac{5}{3}$ (e) $\dfrac{2}{3}$

24) In the figure below, a square is inscribed in a circle. If S is the area of the shaded region and C is the area of the circle, what is S/C?

(a) $\dfrac{\pi - 2\sqrt{2}}{\pi}$ (b) $\dfrac{2\sqrt{2}}{\pi}$ (c) $\dfrac{\pi - \sqrt{2}}{\pi}$ (d) $\dfrac{\sqrt{2}}{\pi}$ (e) $\dfrac{\pi - 2}{\pi}$

25) A child has a set of 96 distinct blocks. Each block is one of 2 materials (*plastic* or *wood*), one of 3 sizes (*small*, *medium*, or *large*), one of 4 colours (*blue*, *green*, *red*, or *yellow*), and one of 4 shapes (*circle*, *hexagon*, *square*, or *triangle*). How many blocks in the set are different from the "*plastic medium red circle*" in exactly two ways? (The "*wood medium red square*" is such a block.)

(a) 29 (b) 39 (c) 48 (d) 56 (e) 62

END OF QUESTIONS

You may mail your completed question paper to:

Mathematical Olympiad
P.O. Box 94
Mona Post Office
Kingston 7

You may also deliver your entry by hand or by courier directly to the Department of Mathematics at the UWI, Mona Campus. In all cases, an entry must be received by December 2, 2013 in order to be considered.

For more information, a copy of this question paper, or the latest updates, please visit http://myspot.mona.uwi.edu/mathematics/ (see the link to the Olympiad Resource Centre).