



الجامعة الإسلامية العالمية ماليزيا

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

IIUM Mathematics Competition (IMC 2013)

FIRST ROUND

Preliminary Stage

MULTIPLE CHOICE QUESTIONS

2 HOURS

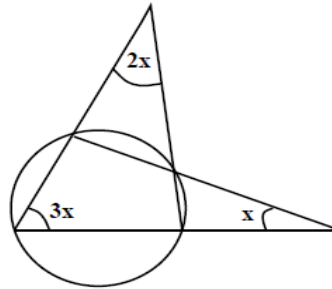
This Question Paper Consists of 5 Printed Pages with 20 Questions

**Department of Computational and Theoretical Sciences
Kulliyah of Science**

1. The “Berjaya Megamall” shopping is selling Baju Melayu for RM200 during the Ramadhan. After Hari Raya Aidilfitri, the Baju Melayu goes on sale at 10% off. After Hari Raya Aidiladha, the sale is extended by a further 20% off the first discounted price. What is the price of Baju Melayu after the second reduction?

- (A) RM140 (B) RM144 (C) RM150 (D) RM168 (E) RM170

2. What is the angle x in the picture below?

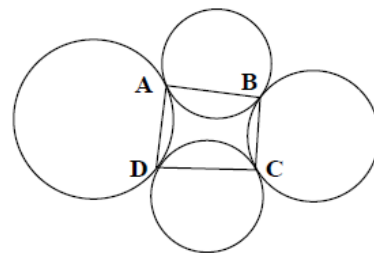


- (A) 10° (B) 15° (C) 18° (D) 20° (E) 25°

3. How many divisors does 2013^3 have?

- (A) 8 (B) 16 (C) 25 (D) 27 (E) 64

4. Four circles are tangent to each other at the points A, B, C, D as shown in the figure. Which of the following statements is true about the quadrilateral ABCD?



- (A) There is a circle passing through all four vertices of ABCD
 (B) There is a circle tangent to all four sides of ABCD
 (C) The diagonals of ABCD bisect each other
 (D) The diagonals of ABCD are perpendicular to each other
 (E) The diagonals of ABCD intersect at the center of mass of ABCD

5. A function f has the property that $f(xy) = f(x) + f(y)$ for any two numbers x and y .

If $f(10) = 6$ and $f(20) = 10$ then compute the value of $f(25)$.

- (A) 8 (B) 6 (C) 4 (D) 10 (E) 12

6. Let $m = \underbrace{11111111 \cdots 11}_{2013 \text{ times}}$ and $n = \underbrace{1111 \cdots 11}_{183 \text{ times}}$. What is the greatest common divisor of m and n ?

- (A) $\frac{n}{61}$ (B) $\frac{n}{33}$ (C) $\frac{n}{11}$ (D) $\frac{n}{3}$ (E) n

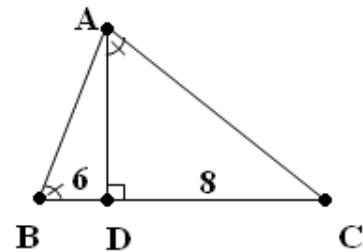
7. Find the perimeter of a triangle whose altitudes (heights) are 3, 4, and 6.

- (A) $12\sqrt{\frac{3}{5}}$ (B) $16\sqrt{\frac{3}{5}}$ (C) $20\sqrt{\frac{3}{5}}$ (D) $24\sqrt{\frac{3}{5}}$ (E) None

8. Which one satisfies the equation $\sqrt[3]{6+\sqrt{x}} + \sqrt[3]{6-\sqrt{x}} = \sqrt[3]{3}$

- (A) 27 (B) 32 (C) 45 (D) 52 (E) 63

9. Let $AD \perp BC$, $\angle ABC = \angle DAC$, $BD = 6$ and $DC = 8$ for given triangle $\triangle ABC$. Find $AD = ?$.



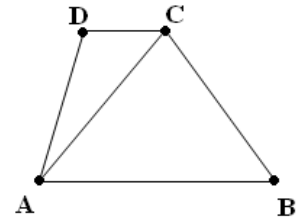
- (A) $4\sqrt{2}$ (B) $4\sqrt{3}$ (C) $5\sqrt{2}$ (D) $5\sqrt{3}$ (E) 7

10. Suppose that x , y , and z are positive integers such that $x + \frac{1}{y + \frac{1}{z}} = \frac{8}{3}$. Find the value z ?

- (A) 2 (B) 3 (C) 8 (D) 4 (E) 6

11. Let $AB \parallel DC$ and $AB = 5DC$ for the given trapezoid $ABCD$.

Find following ratio $\frac{Area(\triangle CAB)}{Area(ABCD)}$.

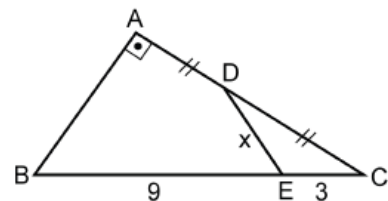


- (A) $\frac{1}{5}$ (B) $\frac{2}{5}$ (C) $\frac{1}{6}$ (D) $\frac{3}{5}$ (E) $\frac{5}{6}$

12. If $2012! + 2013! + 2014! = a! \cdot b^2$ then find the ordered pair (a, b) , where $n! = 1 \cdot 2 \cdot 3 \cdot \dots \cdot n$ and a, b are positive integer numbers.

- (A) (2012, 2013) (B) (2012, 2014) (C) (2013, 2014) (D) (2013, 2015) (E) (2011, 2012)

13. Let ABC be a triangle in which $BA \perp AC$. If $AD = DC$, $EC = 3$, $BE = 9$ then find $DE = x$



- (A) $\frac{7}{3}$ (B) $\frac{10}{3}$ (C) 2 (D) 3 (E) 4

14. Find all real solutions of the following equation

$$(x^2 - 3x + 3)^{2013} + \frac{1}{(x^2 - 3x + 3)^{2013}} = 2$$

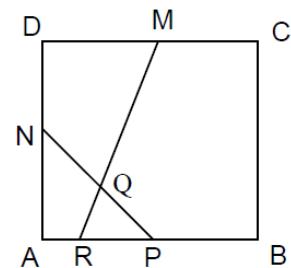
- (A) {1,-2} (B) {-1, 2} (C) {1,2} (D) {-1,-2} (E) 1

15. Suppose $f(x) = ax + b$ and $g(x) = bx + a$ with a and b are positive integers.

If $f(g(50)) - g(f(50)) = 28$ then find the product ab .

- (A) 12 (B) 11 (C) 10 (D) 13 (E) 14

16. In the figure M, N , and P are midpoints of three sides of square $ABCD$, and Q is the midpoint of NP . If $\angle MRP = \alpha$ then find $\tan \alpha = ?$



- (A) 1 (B) 1.5 (C) 2 (D) 2.5 (E) 3

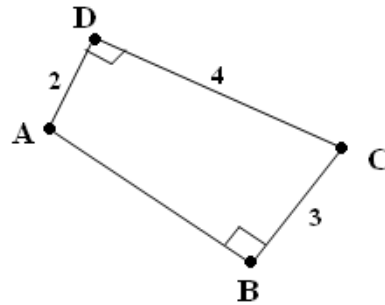
17. Find solution of the following inequality $\frac{1}{x} > x$

- (A) (0, 1) (B) (-1, 1) (C) $(-\infty, -1) \cup (0, 1)$ (D) $(-1, 0) \cup (1, +\infty)$ (E) (-1, 0)

18. An integer p is prime if $p > 1$ and the only positive divisors of p are 1 and p . How many 2-digit prime numbers p are there such that each digit of p is also a prime?

- (A) 3 (B) 4 (C) 5 (D) 6 (E) 7

19. Let $AD \perp CD$, $CB \perp AB$, $DC = 4$, $BC = 3$, $AD = 2$ of the quadrangle $ABCD$. Find $AB = ?$



- (A) $\sqrt{11}$ (B) $2\sqrt{2}$ (C) 3 (D) 2 (E) 4

20. For given positive integers a and b , their sum $a + b$ and product ab are even numbers. What can we say about the given numbers a and b ?

- (A) a -odd
 b -even (B) a -odd
 b -odd (C) a -even
 b -odd (D) a -even
 b -even (E) There are
no such
numbers

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