

2019 - 2020 TH Rogers MS Mathclub Qualifying Test

Name: _____
(first name) (Last name)

Grade: _____

Email: _____

Instructions to the contestants:

1. Answer ALL Questions.
2. Enter your answers inside the box on the right side. You **MUST** put your answer in the box. *(If you circle your answer, but not put in the box, then your answer will be marked as invalid even if you circle the correct answer)*
3. For the multiple choice questions (1-10), choose one of the letters A/B/C/D/E as answer.
4. For questions 11 to 30, write your answer.
5. Each questions carries 1 point.
6. No calculators are allowed.
7. Answers must be fully simplified and, where appropriate, given in the format asked for in the question.
8. Units are not required unless it is asked (Q 25).
9. There are 30 questions and the test duration is 60 minutes.
10. Your answer sheets won't be returned back to you. You will be notified whether you are selected for the mathclub.

I have read and followed the instructions _____
(put your initials here)

(Don't write below this line)

Scorer 1: _____ (initials)		Scorer 2: _____ (initials)	
Total			

1. $(6 ? 3) + 4 - (2 - 1) = 5$. To make this statement true, the question mark between the 6 and the 3 should be replaced by

A) $\div$ B) $\times$ C) $+$ D) $-$ E) *None of these*

2. In July 1861, 372 inches of rain fell in Chirrapunji, India. What was the average rainfall in inches per hour during that month?

A) 0.4 B) 0.3 C) 0.5 D) 0.6 E) *None of these*

3. At 5:00, what is angle between the hour and minute hand on an analog clock?

A) 130° B) 140° C) 150° D) 160° E) *None of these*

4. Which triplet of numbers has a sum NOT equal to 1?

A) $\left(\frac{1}{2}, \frac{1}{3}, \frac{1}{6}\right)$ B) $(2, -2, 1)$ C) $(0.1, 0.3, 0.6)$ D) $(1.1, -2.1, 1.0)$ E) $\left(-\frac{3}{2}, -\frac{5}{2}, 5\right)$

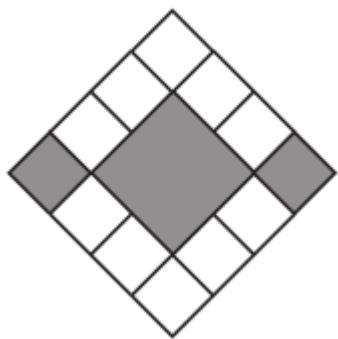
5. How many whole numbers are between $\sqrt{8}$ and $\sqrt{800}$?

A) 24 B) 28 C) 26 D) 25 E) 27

6. Each of two boxes contains three chips numbers 1, 2, 3. A chip is drawn randomly from each box and the numbers on the two chips are multiplied. What is the probability that their product is even?

A) $\frac{1}{9}$ B) $\frac{2}{9}$ C) $\frac{4}{9}$ D) $\frac{1}{2}$ E) $\frac{5}{9}$

- 7.



In this figure, what is the ratio of the area of the gray squares to the area of the white squares?

A) 3:10 B) 3:8 C) 3:7 D) 3:5 E) 1:1

8.

What is the value of $\frac{2}{1 - \frac{2}{3 - \frac{3}{4}}}$?

- A) -18 B) $\frac{2}{34}$ C) $\frac{72}{7}$ D) 0 E) 18

9. If $a = 8^{53}$, $b = 16^{41}$ and $c = 64^{27}$, then which of the following inequalities is true?

- (A) $a > b > c$ (B) $c > b > a$ (C) $b > a > c$ (D) $b > c > a$ (E) $c > a > b$

10. Five ladies were seated around a circular table. Miss Ong was sitting between Miss Lim and Miss Moak. Ellie was sitting between Cindy and Miss. Nal. Miss Lim was between Ellie and Amy. Lastly, Beatrice was seated with Miss Poh on her left and Miss Moak on her right. What is Daisy's surname?

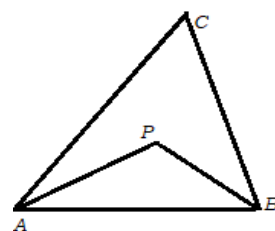
- A) Lim B) Moak C) Nal D) Ong E) Poh

11. What is the absolute difference between the two values of x for which, $|x - 9| = 8$?

12. Convex quadrilateral WXYZ is inscribed in a circle. If $\angle XYZ = 54^\circ$, what is the degree measure of $\angle XWZ$?

13. What is the sum of the distinct prime factors of 156?

14. In $\triangle ABC$, $\angle ACB = 36^\circ$, and the interior angle bisectors of $\angle CAB$ and $\angle ABC$ intersect at P. Find $\angle APB$.



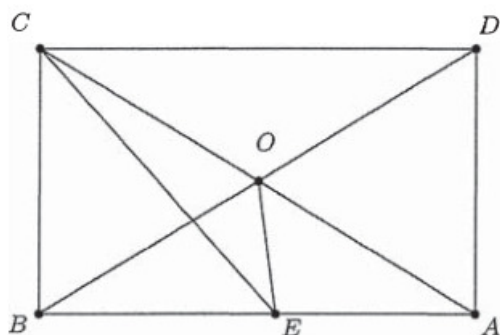
15. An equilateral triangle having a height of 3 inches is placed above a square creating a regular pentagon. What is the absolute difference between the area and perimeter of this pentagon?

28. In the following equation, what is the sum of positive integers a and b ?

$$\frac{7}{22} = \frac{1}{a + \frac{1}{b}}$$

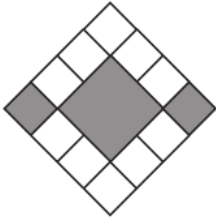
29. On a 12-hour clock, an elapsed time of four hours looks the same as an elapsed time of 16 hours. Because of this, we can say that four hours is “clock equivalent” to its square number of hours. What is the least whole number of hours that is greater than 4 hours and is “clock equivalent” to its square number of hours?

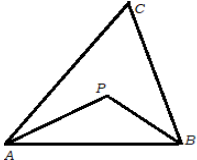
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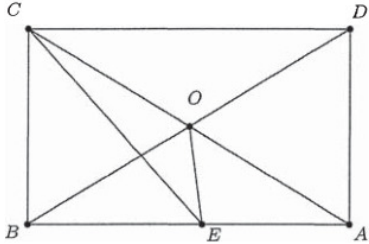


ABCD is a rectangle whose diagonals intersect at point O. E is a point on AB such that CE bisects $\angle BCD$. If $\angle ACE = 15^\circ$, find $\angle BOE$.

Answer Keys:

1.	$(6 ? 3) + 4 - (2 - 1) = 5$. To make this statement true, the question mark between the 6 and the 3 should be replaced by A) $\div$ B) $\times$ C) $+$ D) $-$ E) <i>None of these</i>	A
2.	In July 1861, 372 inches of rain fell in Chirrapunji, India. What was the average rainfall in inches per hour during that month? A) 0.4 B) 0.3 C) 0.5 D) 0.6 E) <i>None of these</i>	C
3.	At 5:00, what is angle between the hour and minute hand on an analog clock? A) 130° B) 140° C) 150° D) 160° E) <i>None of these</i>	C
4.	Which triplet of numbers has a sum NOT equal to 1? A) $\left(\frac{1}{2}, \frac{1}{3}, \frac{1}{6}\right)$ B) $(2, -2, 1)$ C) $(0.1, 0.3, 0.6)$ D) $(1.1, -2.1, 1.0)$ E) $\left(-\frac{3}{2}, -\frac{5}{2}, 5\right)$	D
5.	How many whole numbers are between $\sqrt{8}$ and $\sqrt{800}$? A) 24 B) 28 C) 26 D) 25 E) 27	C
6.	Each of two boxes contains three chips numbers 1, 2, 3. A chip is drawn randomly from each box and the numbers on the two chips are multiplied. What is the probability that their product is even? A) $\frac{1}{9}$ B) $\frac{2}{9}$ C) $\frac{4}{9}$ D) $\frac{1}{2}$ E) $\frac{5}{9}$	E
7.	 In this figure, what is the ratio of the area of the gray squares to the area of the white squares? A) 3:10 B) 3:8 C) 3:7 D) 3:5 E) 1:1	D
8.	What is the value of $\frac{2}{1 - \frac{2}{3 - \frac{3}{4}}}$? A) -18 B) $\frac{2}{34}$ C) $\frac{72}{7}$ D) 0 E) 18	E
9.	If $a = 8^{53}$, $b = 16^{41}$ and $c = 64^{27}$, then which of the following inequalities is true?	D

	(A) $a > b > c$ (B) $c > b > a$ (C) $b > a > c$ (D) $b > c > a$ (E) $c > a > b$	
10	Five ladies were seated around a circular table. Miss Ong was sitting between Miss Lim and Miss Moak. Ellie was sitting between Cindy and Miss. Nal. Miss Lim was between Ellie and Amy. Lastly, Beatrice was seated with Miss Poh on her left and Miss Moak on her right. What is Daisy's surname? A) Lim B) Moak C) Nal D) Ong E) Poh	B
11	What is the absolute difference between the two values of x for which $ x - 9 = 8$?	16
12	Convex quadrilateral WXYZ is inscribed in a circle. If $\angle XYZ = 54^\circ$, what is the degree measure of $\angle XWZ$?	126°
13	What is the sum of the distinct prime factors of 156?	18
14	In $\triangle ABC$, $\angle ACB = 36^\circ$, and the interior angle bisectors of $\angle CAB$ and $\angle ABC$ intersect at P. Find $\angle APB$. 	108°
15	An equilateral triangle having a height of 3 inches is placed above a square creating a regular pentagon. What is the absolute difference between the area and perimeter of this pentagon?	$12 - 7\sqrt{3}$
16	What is the value of the expression $\frac{8! - 7 \times 7! + 6 \times 6!}{7! - 6 \times 6! + 5 \times 5!}$? Express your answer as a common fraction.	$\frac{78}{11}$
17	A complete cycle of a traffic light takes 60 seconds. During each cycle the light is green for 25 seconds, yellow for 5 seconds and red for 30 seconds. At a randomly chosen time, what is the probability that light will NOT be green?	$\frac{7}{12}$
18	For what value of x does $\frac{0.\overline{09}}{x} = 11^{-1}$?	1
19	Jan is as old now as Gary was 15 years ago. Six years from now, Gary will be twice as old as Jan will be then. How old is Gary now?	24

20	The sum of the first 20 positive even integers is also the sum of four consecutive even integers. What is the largest of these four integers?	108
21	How many integers between 1000 and 9999 have four distinct digits?	4536
22	Define $a@b = ab - b^2$ and $a\#b = a + b - ab^2$. What is $\frac{6@2}{6\#2}$?	$-\frac{1}{2}$
23	The five-digit integer RS,TUV is divisible by 5, $S = R^2$ and $10 \times T + U = 5$. If $R, S, T, U, \text{ and } V$ are not necessarily distinct, how many positive five-digit integers satisfy these conditions?	6
24	What value of n satisfies $(n + 1)! - n! = 4320$?	6
25	Jones is chasing a car 800 meters ahead of him. He is on a horse moving at 50 km/h. If Jones catches up to the car in 4 minutes, how fast was the car moving? (<i>express your answer in km/h</i>)	38 km/h
26	Find the value of $\sqrt{9999^2 + 19999}$.	10000
27	What is the remainder of $222^{333} + 333^{222}$ if divided by 7?	0
28	In the following equation, what is the sum of positive integers a and b ? $\frac{7}{22} = \frac{1}{a + \frac{1}{b}}$	10 $a = 3;$ $b = 7$
29	On a 12-hour clock, an elapsed time of four hours looks the same as an elapsed time of 16 hours. Because of this, we can say that four hours is "clock equivalent" to its square number of hours. What is the least whole number of hours that is greater than 4 hours and is "clock equivalent" to its square number of hours?	9
30	 ABCD is a rectangle whose diagonals intersect at point O. E is a point on AB such that CE bisects $\angle BCD$. If $\angle ACE = 15^\circ$, find $\angle BOE$.	75°