

2018 BOMB – Page 1

School \_\_\_\_\_ Team \_\_\_\_\_

Instructions: Label answers with appropriate units.  
Do not round or approximate answers.  
Write fully simplified answers on the lines provided.

1. Amy goes to a bank to get \$10 worth of change. She requests twice as many quarters as half-dollars, twice as many dimes as quarters, three times as many nickels as dimes, and no pennies or dollars. How many dimes did she get?

Team Member Name \_\_\_\_\_ Ans: \_\_\_\_\_

2. The area of a right triangle is  $2,400 \text{ cm}^2$ . Find the dimensions of the triangle, given that the lengths of its sides form an arithmetic sequence.

Team Member Name \_\_\_\_\_ Ans: \_\_\_\_\_

3. Evaluate  $\lim_{x \rightarrow 0} \frac{|2x-1| - |2x+1|}{x}$

Team Member Name \_\_\_\_\_ Ans: \_\_\_\_\_

4. Write as an algebraic expression:  $\sin^{-1} v + \cos^{-1} v$ .

Team Member Name \_\_\_\_\_ Ans: \_\_\_\_\_

5. Find the hypotenuse of a right triangle with area  $25 \text{ m}^2$  and perimeter 20 m.

Team Member Name \_\_\_\_\_ Ans: \_\_\_\_\_

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School \_\_\_\_\_ Team \_\_\_\_\_

Instructions: Label answers with appropriate units.  
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1. Arrange the numbers  $5^{4444}$ ,  $2^{8888}$ ,  $7^{3333}$ ,  $3^{5555}$  in order from least to greatest.

Team Member Name \_\_\_\_\_ Ans: \_\_\_\_\_

2. Evaluate  $\int_0^3 (x - \sqrt{9 - x^2}) dx$

Team Member Name \_\_\_\_\_ Ans: \_\_\_\_\_

3. The radius of a cylinder is  $r$  and its height is  $h$ . It is found that by increasing either its radius or its height by  $x$ , its volume is increased by the same amount. Find  $x$ .

Team Member Name \_\_\_\_\_ Ans: \_\_\_\_\_

4. Find the term in the expansion of  $\left(\frac{3x^2}{2} - \frac{1}{3x}\right)^{12}$  that does not contain an  $x$ .

Team Member Name \_\_\_\_\_ Ans: \_\_\_\_\_

5. Find all values of  $x$  that are solutions of the equation  $\sum_{k=1}^x i^k = -1$ , where  $i = \sqrt{-1}$

Team Member Name \_\_\_\_\_ Ans: \_\_\_\_\_

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School \_\_\_\_\_ Team \_\_\_\_\_

Instructions: Label answers with appropriate units.  
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1. A diagonal of a square connect the vertices  $(-3, -1)$  and  $(2, 4)$ . Find the area.

Team Member Name \_\_\_\_\_ Ans: \_\_\_\_\_

2. Draw a number from the set  $\{1, 2, 3, 4, 5, 6, 7, 8, 9\}$ , record it, then draw again from the remaining numbers and record it. What is the probability that this 2-digit number is divisible by 5?

Team Member Name \_\_\_\_\_ Ans: \_\_\_\_\_

3. One solution of the equation  $kx^2 + 4x + k = 0$  is  $x = -2$ . What is the other solution?

Team Member Name \_\_\_\_\_ Ans: \_\_\_\_\_

4. Find the limit (if it exists):  $\lim_{n \rightarrow \infty} \frac{5+10+15+\dots+5n}{n^2-1}$

Team Member Name \_\_\_\_\_ Ans: \_\_\_\_\_

5. Let  $\tan \alpha = \frac{1}{2}$ ,  $\tan \beta = \frac{1}{5}$ ,  $\tan \gamma = \frac{1}{8}$ , for some acute angles  $\alpha, \beta$ , and  $\gamma$ . Find  $\alpha + \beta + \gamma$ .

Team Member Name \_\_\_\_\_ Ans: \_\_\_\_\_

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School \_\_\_\_\_ Team \_\_\_\_\_

Instructions: Label answers with appropriate units.  
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1. The measure of a central angle of one regular polygon is  $\frac{4}{5}$  of the measure of a central angle of a second regular polygon. If the first polygon has three more sides than the second, how many sides does each polygon have?

Team Member Name \_\_\_\_\_ Ans: \_\_\_\_\_

2. The capacity of a ferry boat is either 48 children or 36 adults. If 20 children are on the ferry boat, how many adults can still get on?

Team Member Name \_\_\_\_\_ Ans: \_\_\_\_\_

3. Angenita drives to work at 50 mph and arrives 1 min late. She drives to work at 60 mph and arrives 5 min early. How far does Angenita live from work?

Team Member Name \_\_\_\_\_ Ans: \_\_\_\_\_

4. One of the bases of a trapezoid has length  $a$ . Each of the sides of the trapezoid also has length  $a$ . Find the length of the other base of the trapezoid so that the area of the trapezoid is maximal.

Team Member Name \_\_\_\_\_ Ans: \_\_\_\_\_

5. If a polynomial  $P(x)$  is divided by  $(x+2)$ , the remainder is 1. If  $P(x)$  is divided by  $(x-3)$ , the remainder is 6. Find the remainder when  $P(x)$  is divided by  $(x^2 - x - 6)$ .

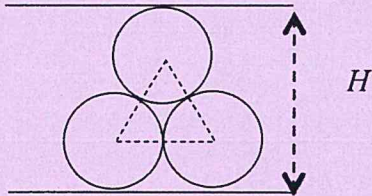
Team Member Name \_\_\_\_\_ Ans: \_\_\_\_\_

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School \_\_\_\_\_ Team \_\_\_\_\_

Instructions: Label answers with appropriate units.  
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1. Three pipes, each of radius 4 in., are stacked as shown. What is the height of the stack?



Team Member Name \_\_\_\_\_

Ans: \_\_\_\_\_

2. If  $\left(x + \frac{1}{x}\right)^2 = 3$ , evaluate  $x^3 + \frac{1}{x^3}$ .

Team Member Name \_\_\_\_\_

Ans: \_\_\_\_\_

3. In the numbers 1 through 10,000 (inclusive), how many times does the digit “1” occur?

Team Member Name \_\_\_\_\_

Ans: \_\_\_\_\_

4. Find the area of the region bounded by the parabola  $y^2 = 4x$  and the line  $x - 2y + 3 = 0$ .

Team Member Name \_\_\_\_\_

Ans: \_\_\_\_\_

5. Find all solutions in the interval  $[0, 2\pi)$ :  $\cos(2x) + 5\sin x = 3$

Team Member Name \_\_\_\_\_

Ans: \_\_\_\_\_