

2016 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. The height of an isosceles right triangle is 6 inches. Find the area of the triangle.

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

2. Solve:  $\log_{\frac{1}{2}} \left[ \log_8 \frac{x^2 - 2x}{x - 3} \right] = 0$

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

3. A cat is at the bottom of a 15-foot well. Each day it climbs up 3 feet, and each night it slides back 2 feet. How long will it take the cat to get out of the well?

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

4. The radius of a sphere is increasing at a rate of 4 mm/s. How fast is the volume increasing when the diameter is 80 mm?

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. During an electric blackout on August 10, 2015, the residents of Modesto lost power at 3:00 pm. One resident returned from vacation at 2:00 pm the following day to find the clocks in his house reading 8 am. At what time, and on what day, was power restored?

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

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

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

3. Evaluate:  $\lim_{x \rightarrow 5^+} \frac{5x - x^2}{|5 - x|}$

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

4. Evaluate:  $\left(3 \sin \frac{\pi}{6}\right) \left(2 \tan \frac{\pi}{12}\right)$

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

5. Find the area of the triangle whose sides have lengths 5, 6, and 7.

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

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

Instructions: Label answers with appropriate units.  
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1. Fresh cherries contain 99% water. You start with 100 pounds of fresh cherries. After a few hours in the sun, some of the water evaporates and the percentage of water in the cherries becomes 90%. What is the new weight of the cherries?

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

2. Find the values of  $a$  for which the function  $f(x) = a \sin x + \frac{1}{3} \sin 3x$  has an extreme value at  $x = \frac{\pi}{3}$  and determine whether it is a maximum or a minimum.

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

3. Two concentric circles have radii 3 cm and 6 cm. Find the area of the smaller region determined by a chord of the larger circle that is also tangent to the smaller circle.

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

4. Solve: 
$$\begin{cases} a + b = \frac{5}{6} \\ \frac{a}{b} + \frac{b}{a} = \frac{13}{6} \end{cases}$$

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

5. The diameter of each wheel of a car is 30 inches. If the wheels are turning at the rate of 3 revolutions per second, how fast is the car moving in miles per hour?

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

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

Instructions: Label answers with appropriate units.  
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1. Find the radius of a circle inscribed in a rhombus with diagonals of 30 inches and 40 inches.

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

2. The following message is a correct addition sum in which  $D = 7$ ,  $E = 5$  and  $R = 8$ . If each different letter represents a different digit, what is the sum?

SEND  
MORE  
MONEY

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

3. Write an equation of the line which is perpendicular to the line  $2x + 3y = 7$  and has the same  $x$ -intercept as the line  $5x + 2y = 10$ .

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

4. Evaluate:  $\lim_{n \rightarrow \infty} \sum_{i=1}^n \left( \frac{3i}{n} - 2 \right)^2 \left( \frac{3}{n} \right)$

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

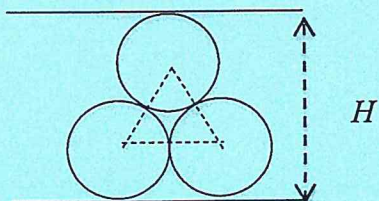
5. Find the range of  $f(x) = \frac{x^2 + x + 2}{x^2 + x + 1}$ .

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

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. Find the maximum value of the quotient  $\frac{a}{b} \div \frac{c}{d}$  that can be obtained by replacing  $a, b, c, d$  with different numbers from the set  $\{2, 3, 7, 9\}$ .

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

3. The polynomial  $x^2 - 9x + 3$  has roots  $r$  and  $s$ . The polynomial  $x^2 + bx + c$  has roots  $r^2$  and  $s^2$ . What is  $(b, c)$ ?

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

4. Find  $f'(\frac{\pi}{6})$  if  $f(x) = \frac{\tan x}{1 - \tan^2 x}$ .

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

5. Write as an algebraic expression in simplified form and with rationalized denominator:

$$\sin\left(\arccos\frac{x^2}{4-x^2}\right)$$

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