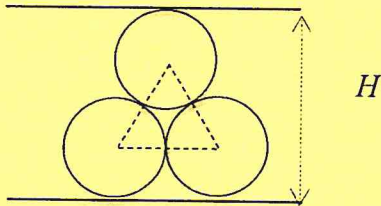


School _____ Team _____

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

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 numerical coefficient of x^2 in the binomial expansion of $\left(x + \frac{1}{\sqrt[3]{x^2}}\right)^7$.

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. 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. Evaluate: $\sin 75^\circ$

Team Member Name _____

Ans: _____

School _____ Team _____

Instructions: Label answers with appropriate units.
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Write fully simplified answers on the lines provided.

1. 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: _____

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. 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: _____

4. Solve for x where $0 \leq x < 2\pi$: $(2 \sin x - 1)(\sin x + 1) = \cos x$

Team Member Name _____ Ans: _____

5. The total number of sides of two convex polygons is 12 and the number of their diagonals is 19. Find the number of sides of each polygon.

Team Member Name _____ Ans: _____

School _____ Team _____

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

1 Arrange the numbers 5^{4444} , 2^{8888} , 7^{3333} , 3^{5555} in order from least to greatest.

Team Member Name _____ Ans: _____

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

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. Let x_1 and x_2 be the real roots of the equation $x^2 - 3^{2017}x + 3^{4032} = 0$.

Find: $\log_3 \frac{(x_1)^3 + (x_2)^3}{2}$

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: _____

School _____ Team _____

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

1. The bases for a trapezoid $ABCD$ are $AB = 9$ and $CD = 3$ and the other two sides are AD and BC . M is a point on side BC and N is a point on side AD such that MN is parallel to AB and CD and $MN = 7$. Find the quotient of the area of $ABMN$ and the area of $NMCD$.

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. Evaluate: $\lim_{n \rightarrow \infty} \frac{5+6+7+\cdots+n}{3n^2 - n + 10}$

Team Member Name _____ Ans: _____

5. The diameter of each wheel of a car is 60 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: _____

School _____ Team _____

Instructions: Label answers with appropriate units.
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Write fully simplified answers on the lines provided.

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

Team Member Name _____ Ans: _____

2. Two numbers x, y are chosen randomly (without replacements) from the set of integers $S = \{1, 2, \dots, 16\}$. What is the probability that the numbers $(x, y, 5)$ form the sides of a right triangle?

Team Member Name _____ Ans: _____

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

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: _____