Team # _____

Question #1

2 minutes, 2 points

A bouncy ball is dropped from the top of a 200 foot tall building. The ball bounces to 75% of its previous height on each successive bounce. Find the total distance the ball travels.

Team # _____

Question #2

2 minutes, 2 points

The probability that Bob makes a free throw is 82%. Assuming that Bob's free throws are all independent of each other, find the probability that Bob makes at least three out of five free throws in a given game. Express your answer as a percent, rounded to the nearest tenth.

Team # _____

Question #3

2 minutes, 2 points

An airplane flies due northeast at a speed of 400 miles per hour. The wind is blowing directly out of the south at a speed of 30 miles per hour. Find the actual speed of the plane, rounded to the nearest whole number.

Team # _____

Question #4

2 minutes, 2 points

**Solve for *x*:**

$$\begin{bmatrix} x & 2 \\ 4 & x \end{bmatrix}\begin{bmatrix} x & 5 \\ x & 7 \end{bmatrix}=\begin{bmatrix} 3 & 5x+14 \\ -3 & 20+7x \end{bmatrix}$$

Team # _____

Question #5

1 minute, 1 point

For what non-zero value of the radius, r, does the volume of a sphere equal its surface area?

Team # _____

Question #6

1 minute, 1 point

Suppose $f(x) = \dfrac{ax^2 + bx + 5}{2x^2 + 3}$, where *a* and *b* are constants. If f(*x*) has a horizontal asymptote at $y = 3$, and passes through the point (1, 9), find the value of *b*.

Team # _____

Question #7

2 minutes, 2 points

A computer randomly generates six character passwords. Each character may be any letter of the alphabet (A-Z) or any number (0-9) and characters can be repeated. Find the probability that the computer generates a password with all letters. Round your answer to the nearest percent.

Team # _____

Question #8

2 minutes, 2 points

Suppose $\sin\theta = \frac{6}{w}$ and $\tan\theta = \frac{3}{11}$. Find the value of $w^2$.

Team # _____

Question #9

3 minutes, 3 points

Consider the equation $e^{y}+e^{-y}=5.$ The largest solution of the equation can be written in the form $y=\ln\left(\frac{A+\sqrt{B}}{C}\right).$ Find the value of A + B + C.

Team # _____

Question #10

3 minutes, 3 points

The domain of the relation $xy^2 - 16xy = 7$ can be expressed as $\left(-\infty, -\frac{A}{B}\right] \cup (0, \infty)$ where $\frac{A}{B}$ is in simplest form and A and B are positive integers. Find the value of A + B.

Team # _____

Question #11

1 minute, 1 point

**Evaluate:** $\displaystyle\sum_{k=0}^{20} \tan\left(\frac{k\pi}{2}+\frac{\pi}{4}\right)$

Team # _____

Question #12

2 minutes, 2 points

The decimal $.2543434343...$ (a.k.a. $25\overline{43}$) can be expressed as a fraction, $\frac{A}{B}$ in lowest terms. Find the value of A + B.

Team # _____

Question #13

1 minute, 1 point

The expression $\ln 300 - (\ln 7)(\log_7 4)$ can be written as $\ln A$. Find the value of A.

Team # _____

Question #14

2 minutes, 2 points

An airplane can fly 2200 miles in 4 hours with the wind and 2200 miles in 5 hours against the wind.  Find the speed of the wind.

Team # _____

Question #15

2 minutes, 2 points

Suppose $f(x) = \sum_{n=0}^{2} \frac{n! x^{n+1}}{x^n (n+1)!}$. Find $f(30)$.

Team # _____

Question #16

3 minutes, 3 points

What is the **minimum value** of the relation $x^2 + y^2 - 8x + 6y + 47$?

Team # _____

Question #17

2 minutes, 2 points

A function $h(n)$ is defined for all nonnegative integers *n* and satisfies the following criteria:

(a) $h(0) = 5$

(b) $h(n) = n^3 + nh(n-1)$ for all $n \geq 1$.

Find $h(3)$.

Team # _____

Question #18

1 minute, 1 point

**Choose the correct answer to fill in the blank from the choices below.**

The graph of $(2x+5y)(2x-5y)=-7$ is the graph of

a(n) _____.

(A) Line
(B) Union of a pair of intersecting lines and a circle
(C) Hyperbola
(D) Parabola
(E) A pair of perpendicular lines
(F) Ellipse
(G) Circle
(H) None of these

**HIGH SCHOOL MATHLETICS ANSWERS 2014**

1) **1400 ft**
2) **95.6%**
3) **379 mph**
4) **x = -3**
5) **r = 3**
6) **34**
7) **14%**
8) **520**
9) **27**
10) **71**
11) **1**
12) **6209**
13) **75**
14) **55 mph**
15) **55**
16) **22**
17) **87**
18) **C**