50th Lee Webb Math Field Day

California State University, Bakersfield
Department of Mathematics

March 11, 2019

Varsity Math Bowl

Varsity Math Bowl Round 1 Sample Question

2023 is not a prime. What is the next number that is also not prime?

Varsity Math Bowl Round 1 Question 1

Feidi runs at a pace of 12 minutes per mile. How many hours will it take her to run 10 miles?

Varsity Math Bowl Round 1 Question 2

Suppose $f(x) = x^2$.
Evaluate $f(5 + 12)$.

Varsity Math Bowl Round 1 Question 3

Simplify

$$|||3-4|-4|+|6-7|-2|$$

Varsity Math Bowl Round 1 Question 4

At 4 o'clock, on an old-fashioned clock, the round kind with two hands, what is the angle, in degrees, between the minute and hour hands?

Varsity Math Bowl Round 1 Question 5

On the same clock, at 4:00, what is the rate of change of the angle between the two hands, in degrees per hour?

Varsity Math Bowl Round 1 Question 6

Evaluate:

$$(10101)^2$$

Varsity Math Bowl Round 1 Question 7

What is the volume of a sphere that has radius equal to

$$15^{2/3}(20\pi)^{-1/3}$$

Varsity Math Bowl Round 1 Question 8

Suppose $\frac{1}{3}$ of 3^{2023} equals 3^j. What is the value of j?

Varsity Math Bowl Round 1 Question 9

Simplify:

$$\lim_{n \to \infty} \frac{(n+2)!(3n)!}{(n-1)!(3(n+1))!}$$

Varsity Math Bowl Round 1 Question 10

What are the first two digits of 202^3, after expanding?

Round 2

Varsity Math Bowl Round 2 Sample Question

If $\frac{20}{23}$ is written in decimal form, what is the first digit after the decimal point?

Varsity Math Bowl Round 2 Question 1

Solve for n:

$$(n-1)^{n+1} - (n+1)^{(n-1)} = 118$$

Varsity Math Bowl Round 2 Question 2

Given that $x + xy + y = 76$, what is $x + y$?

Varsity Math Bowl Round 2 Question 3

What is the remainder when $15! + 16!$ is divided by 17?

Varsity Math Bowl Round 2 Question 4

How many 3 digit numbers are there that have their digits in increasing order?

Varsity Math Bowl Round 2 Question 5

Simplify

$$\frac{log_9 2023}{log_3 2023}$$

Varsity Math Bowl Round 2 Question 6

What is the area of the largest rectangle that has vertices on an ellipse with semi-major and semi-minor axes of length a and b?

Varsity Math Bowl Round 2 Question 7

Suppose $f(x) = (-1)^x$ and $g(x) = 1 - x$. What is

$$f(g(f(g(1))))?$$

Varsity Math Bowl Round 2 Question 8

Find the smallest positive integer n such that

$$n! > 1000.$$

Varsity Math Bowl Round 2 Question 9

Estimate to the nearest degree, the value of

$$Arccos(\frac{20}{23}) + Arcsin(\frac{20}{23})$$

Varsity Math Bowl Round 2 Question 10

How many primes less than 100 have 3 as their units digit?

Round 3

Varsity Math Bowl Round 3 Sample Question

What is $\frac{2023}{202}$, rounded to the nearest whole number?

Varsity Math Bowl Round 3 Question 1

In base 2, what is 111000 doubled?

Varsity Math Bowl Round 3 Question 2

Let

$$f(x) = \sum_{n=1}^{4} (5 - n)x^{2n-1}$$

What is $f(10)$?

Varsity Math Bowl Round 3 Question 3

The infinite sum, $486 + 324 + 216 + \ldots$ converges to what number?

Varsity Math Bowl Round 3 Question 4

Solve for x:

$$\frac{5^{12x}}{5^{12x^2}} = 125$$

Varsity Math Bowl Round 3 Question 5

What is the largest value of

$$6n^2 - n^3 - 4n,$$

where n is a positive integer?

Varsity Math Bowl Round 3 Question 6

Simplify

$$cos(sin^{-1}(\frac{\sqrt{33}}{7}))$$

Varsity Math Bowl Round 3 Question 7

Substitute $x = 1/2$ and $y = 1/3$ into the following expression and evaluate.

$$x+xy+y+x^2+(xy)^2+y^2+x^3+(xy)^3+y^3+\ldots$$

Varsity Math Bowl Round 3 Question 8

For distinct primes p and q, $2023 = pq^2$.
What is p^2q?

Varsity Math Bowl Round 3 Question 9

Simplify

$$\sum_{n=3}^{101} n - \sum_{m=5}^{101} m$$

Varsity Math Bowl Round 3 Question 10

In the complex plane, there are two solutions to the equation $z^2 = 2i$. Which is the one in the first quadrant?

Round 4

Varsity Math Bowl Round 4 Sample Question

There are 104 musicians in the Queen's County Honor Orchestra. It takes them 40 minutes to perform Beethoven's 9th Symphony. If the orchestra were halved in size, how long would it take them to play Beethoven's 18th Symphony?

Varsity Math Bowl Round 4 Question 1

How many three digit numbers are there that have at least one 7 and no 5's?

Varsity Math Bowl Round 4 Question 2

For a triangular prism, what is the sum of the number of vertices, edges, and faces?

Varsity Math Bowl Round 4 Question 3

Assume A is an acute angle and $\sin A = 2/3$. Determine $\cos 2A$.

Varsity Math Bowl Round 4 Question 4

How many multiples of 2023 are between 100,000 and 1,000,000?

Varsity Math Bowl Round 4 Question 5

Simplify

$$\cos 28^o \sin 107^o + \cos 107^o \sin 28^o$$

Varsity Math Bowl Round 4 Question 6

Evaluate

$$(\log_6 2 + \log_6 3)(6^2 + 6^3)$$

Varsity Math Bowl Round 4 Question 7

Simplify

$$\sec(\frac{4}{\pi})\csc(\frac{\pi}{4})tan(\frac{3}{\pi})\cot(\frac{\pi}{3})\sin(\frac{2}{\pi})\cos(\frac{\pi}{2})$$

Varsity Math Bowl Round 4 Question 8

A differentiable function f has y-intercept equal to 5 and is equal to $1/2$ of its derivative. Evaluate

$$f(ln3)$$

Varsity Math Bowl Round 4 Question 9

Simplify:

$$\frac{d}{dx}\left(\pi^x + x^e + e^\pi\right)$$

Varsity Math Bowl Round 4 Question 10

Evaluate

$$\int_{\pi/5}^{\pi/3} \cos^2\left(\ln(\tan(\sqrt{x})) + \ln(\cot(\sqrt{x}))\right) dx$$

The End

Please be patient while we calculate the scores.

Closing Ceremony to commence shortly