53th Lee Webb Math Field Day

California State University, Bakersfield
Department of Mathematics

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Varsity Math Bowl

Varsity Math Bowl Round 1 Sample Question

Simplify: $\frac{1}{4} - \frac{1}{12} + \frac{1}{18}$

Varsity Math Bowl Round 1 Question 1

How many distinct sums can be formed by adding two different elements of 2,4,6,8,10,12?

Varsity Math Bowl Round 1 Question 2

A standard dice is rolled twice. What is the probability that the second roll is larger than the first? Leave your answer as a fraction.

Varsity Math Bowl Round 1 Question 3

Suppose there is a diagnostic blood test to detect use of drug. Among drug users, 98% had a positive test. Among individuals not using the drug, 5% had a positive test. Assume that 1% of athletes actually use the drug. What is the probability of a randomly chosen athlete getting a positive test result? Keep your answer in 4 decimal places.

Varsity Math Bowl Round 1 Question 4

How many integers between 1 and 100, inclusive, are divisible by 8 or 12, but not both?

Varsity Math Bowl Round 1 Question 5

Evaluate:

$$|||6 - 11| - |3 - 7|| - 2|$$

Varsity Math Bowl Round 1 Question 6

Evaluate

$$\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\frac{1}{2}}}}$$

Varsity Math Bowl Round 1 Question 7

A fair coin is flipped four times. What is the probability that exactly two heads occur, and the first flip is a head?

Varsity Math Bowl Round 1 Question 8

Find the unit digit of:

$$9^{2026} + 6^{2026}$$

Varsity Math Bowl Round 1 Question 9

The average of six numbers is 20. If one number is removed, the average of the remaining five numbers is 18. What was the removed number?

Varsity Math Bowl Round 1 Question 10

A newspaper publishes three special columns entitled "Art" (A), "Books" (B), and "Cinema" (C). Suppose that

- 18% read column A, 23% read column B, and 37% read column C.
- 10% read both A and B, 11% read both A and C, and 15% read both B and C
- 5% read all three

What is the probability that a randomly chosen subscriber reads exactly one of the three columns?

Round 2

Varsity Math Bowl Round 2 Sample Question

Simplify:

$$\frac{10!}{8!2!}$$

Varsity Math Bowl Round 2 Question 1

A triangle has side lengths 7, 9, x, where x is an integer. How many possible values of x are there?

Varsity Math Bowl Round 2 Question 2

A computer password consists of eight characters. A special security system requires that passwords contain at least one digit. If eight characters are generated at random, and each is equally likely to be any of lowercase letters or digits, How many different valid passwords are possible? Leave your answer in exact form. Do not simplify or evaluate numerically.

Varsity Math Bowl Round 2 Question 3

What is the sum of all integers n such that $|n - 4| < 7$

Varsity Math Bowl Round 2 Question 4

How many solutions does the equation

$$x^4 - 5x^2 + 4 = 0$$

have?

Varsity Math Bowl Round 2 Question 5

How many positive divisors does 360 have?

Varsity Math Bowl Round 2 Question 6

Find the sum of all integers n such that:

$$|2n - 5| \leq 9$$

Varsity Math Bowl Round 2 Question 7

Evaluate

$$\cos\left(\sin^{-1}\left(\frac{5}{13}\right)\right)$$

Varsity Math Bowl Round 2 Question 8

Evaluate

$$\log_2(128) - \log_4(16) + \log_3(27)$$

Varsity Math Bowl Round 2 Question 9

A regular octagon has side length 1.
What is the area of this octagon?

Varsity Math Bowl Round 2 Question 10

Solve for the positive integer n:

$$n^{n+1} - (n+1)^n = 399$$

Round 3

Varsity Math Bowl Round 3 Sample Question

What is the minimum value of

$$x^2 - 8x + 20$$

Varsity Math Bowl Round 3 Question 1

Evaluate

$$\sum_{k=1}^{20}(2k-1)$$

Varsity Math Bowl Round 3 Question 2

Solve for x

$$\log_3(x-1)+\log_3(x-3)=2$$

Varsity Math Bowl Round 3 Question 3

Evaluate the limit:

$$\lim_{x \to 0} \frac{\sin(5x)}{\sin(2\sin(3x))}$$

Varsity Math Bowl Round 3 Question 4

How many seven-digit numbers consist only of odd digits and do not begin with 5?

Varsity Math Bowl Round 3 Question 5

In how many ways can 4 distinct books be arranged on a shelf if two specific books must not be next to each other?

Varsity Math Bowl Round 3 Question 6

In the complex plane, what is the distance between the roots of

$$x^2 - 6x + 13 = 0$$

Varsity Math Bowl Round 3 Question 7

Find the positive integer n such that

$$10^4 < (n+1)^{2^n} < 10^7 - 1$$

Varsity Math Bowl Round 3 Question 8

For positive integers a and b, we have

$$\int_2^6 \frac{2x}{x^2+4}\,dx = \frac{1}{a}\ln b$$

Determine $a+b$.

Varsity Math Bowl Round 3 Question 9

What is the coefficient of x^5 when

$$\frac{x^{15} - 125}{x^5 - 5}$$

is simplified?

Varsity Math Bowl Round 3 Question 10

In $(0, \frac{\pi}{2})$, the equation

$$\sin x + 2\tan x + 2\sec x = \cos x + 2\cot x + 2\csc x$$

has one solution. The solution can be written in the form $r\pi$ for some rational number r. What is the value of r?

Round 4

Varsity Math Bowl Round 4 Sample Question

Let

$$z^2 = -16$$

What is the product of all solutions?

Varsity Math Bowl Round 4 Question 1

Evaluate

$$\sum_{n=1}^{10} \frac{1}{n(n+1)}$$

Varsity Math Bowl Round 4 Question 2

A function satisfies $f'(x) = 3f(x)$ and $f(0) = 4$. What is $f(\ln 2)$?

Varsity Math Bowl Round 4 Question 3

If two fair dice are rolled, what is the probability that the sum is prime?

Varsity Math Bowl Round 4 Question 4

Let

$$f(x) = \sum_{n=0}^{\infty} \frac{(2x)^n}{n!}$$

Evaluate $f(\ln 2)$

Varsity Math Bowl Round 4 Question 5

Evaluate

$$\lim_{x \to 0} \frac{\sin(5x) - 5\sin x}{x^3}$$

Varsity Math Bowl Round 4 Question 6

Evaluate

$$\sin\left(\cos^{-1}\left(\frac{5}{13}\right)+\tan^{-1}\left(\frac{12}{5}\right)\right)$$

Varsity Math Bowl Round 4 Question 7

A family has 3 children. Given that at least 2 of the children are boys, what is the probability that all three are boys?

Varsity Math Bowl Round 4 Question 8

The number 20266202 is a palindrome which reads the same forwards and backwards. How many 8-digit palindrome numbers (without leading $0's$) are divisible by 5?

Varsity Math Bowl Round 4 Question 9

Evaluate

$$\int_{0.20}^{0.26} 2026^{\sec^2 x - \tan^2 x + \cot^2 x - \csc^2 x}\, dx$$

Answer with 2 decimal places accuracy.

Varsity Math Bowl Round 4 Question 10

Evaluate

$$\log_{\int_{2021}^{2026} dx}\left(5^{\int_{2024}^{2026} 2dt}\right) - \log_{\tan(\tan^{-1} 5)}\left(\int_{2021}^{2026} dx\right)$$

The End

Please be patient while we calculate the scores.

Closing Ceremony to commence shortly