

Alabama Statewide Math Contest - Round 1

Division Two

University of North Alabama

April 9, 2022

Scoring

Scoring

0:00 - 0:30 10 points

0:31 - 1:00 8 points

1:01 - 1:30 6 points

1:31 - 2:00 4 points

If the first person to answer is correct, they receive
2 Bonus Points.

Rules

Rules

1. Answers must be in answer box provided to be counted. Units such as cm, in, etc. are **not** necessary.
2. Fractions must be reduced. Improper fractions are acceptable.
3. The numbers π and e must be left as such.
4. Complex numbers must be put into $a + bi$ form.

Rules

Rules

5. Answers with radicals must be simplified. Denominators must be rationalized.
6. Exponents should be positive.
7. Answers involving trigonometric functions should be simplified as much as possible.
8. $\log(x)$ means $\log_{10}(x)$ and $\ln(x)$ means $\log_e(x)$.
9. The time limit for **all** problems is 2 minutes.

Sample Problem # 1

Sample Problem

RESET : 

Solve for x in the equation

$$x^2 - 6x - 3 = 0$$

Sample Problem

Answer:

Sample Problem

Answer: $3 + 2\sqrt{3}$ and $3 - 2\sqrt{3}$.

Round 1

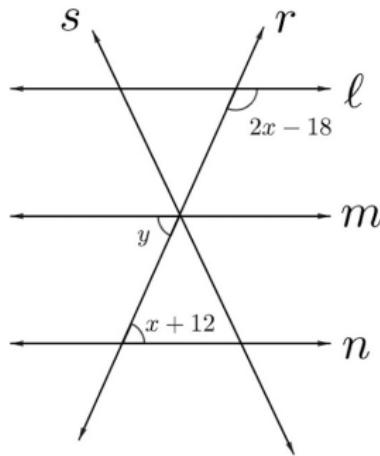
Geometry

Geometry Question # 1

Geometry Question # 1

RESET

In the figure shown, lines ℓ , m , and n are all parallel, and transversals s and r meet at a point on line m . If ℓ and r meet at an angle of $2x - 18$, n and r meet at an angle of $x + 12$, and m and r meet at angle of y , find the value of y , in degrees.



Geometry Question # 1

Answer:

Geometry Question # 1

Answer: 74

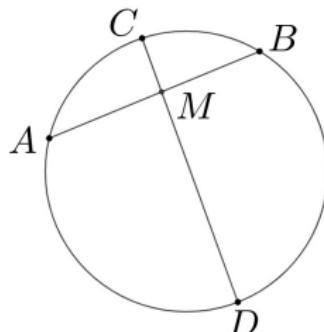
Geometry Question # 2

Geometry Question # 2

RESET

:

Let A, C, B, D be four points on a circle with \overline{CD} the perpendicular bisector of \overline{AB} . Suppose M is the point of intersection of \overline{AB} and \overline{CD} . If $CM = 6$ and $AB = 24$, what is the area of $\triangle BMD$?



Geometry Question # 2

Answer:

Geometry Question # 2

Answer: 144

Round 1

Algebra II

Algebra II Question # 3

Algebra II Question # 3

RESET

:

Find the midpoint between the intersection points of the graphs of $y = 5x - 3$ and $y = 2x^2 + 3x - 7$.

Algebra II Question # 3

Answer:

Algebra II Question # 3

Answer: $\left(\frac{1}{2}, -\frac{1}{2}\right)$

Algebra II Question # 4

Algebra II Question # 4

RESET

:

Put $\frac{\sqrt{6} - i\sqrt{2}}{\sqrt{6} + i\sqrt{2}}$ into $a + bi$ form.

Algebra II Question # 4

Answer:

Algebra II Question # 4

Answer: $\frac{1}{2} - \frac{\sqrt{3}}{2}i$

Round 1

Comprehensive Part 1

Comprehensive Part 1

Question # 5

Comprehensive Part 1 Question # 5

RESET

:

Find the solution to $\log_{x+1}(x^2 - 3x + 5) = 2$.

Comprehensive Part 1 Question # 5

Answer:

Comprehensive Part 1 Question # 5

Answer: $\frac{4}{5}$

Comprehensive Part 1

Question # 6

Comprehensive Part 1 Question # 6

RESET

:

In the binomial expression of $(x + y)^9$, what is the coefficient on the x^4y^5 term?

Comprehensive Part 1 Question # 6

Answer:

Comprehensive Part 1 Question # 6

Answer: 126

Round 1

Comprehensive Part 2

Comprehensive Part 2

Question # 7

Comprehensive Part 2 Question # 7

RESET

:

What is the center of the ellipse $4x^2 + 3y^2 - 8x + 12y + 4 = 0$?

Comprehensive Part 2 Question # 7

Answer:

Comprehensive Part 2 Question # 7

Answer: $(1, -2)$

Comprehensive Part 2

Question # 8

Comprehensive Part 2 Question # 8

RESET

:

Seven blue and four green socks are in a basket. Two socks are drawn at random, without replacement. What is the probability they are the same color?

Comprehensive Part 2 Question # 8

Answer:

Comprehensive Part 2 Question # 8

Answer: $\frac{27}{55}$

Round 1

Team

Team Question # 9

Team Question # 9

RESET

:

Find the sum of the three numbers:

the measure of an interior angle of a regular 15-sided polygon

+

solution to $\sqrt{30x - 25} = 3x$

+

probability of choosing a prime number when selecting
one number at random between 3 and 32, inclusive.

Team Question # 9

Answer:

Team Question # 9

Answer: 158

Team Question # 10

Team Question # 10

RESET

:

Find the largest solution (in radians) to $\sec(2x) = 2$ on the interval $[0, 2\pi)$.

Team Question # 10

Answer:

Team Question # 10

Answer: $\frac{11\pi}{6}$

End of Round 1