

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

- Answers with radicals must be simplified. Denominators must be rationalized.
- Exponents should be positive.
- Answers involving trigonometric functions should be simplified as much as possible.
- $\log(x)$ means $\log_{10}(x)$ and $\ln(x)$ means $\log_e(x)$.
- 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

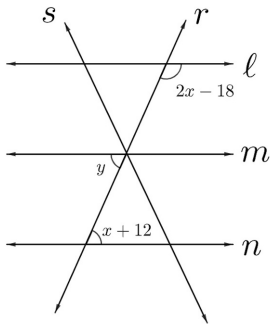
Geometry

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

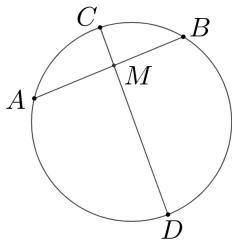
Answer: 74

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

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

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

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

End of Round 1