Alabama Statewide Math Contest - Round 3 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

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.

Round 3

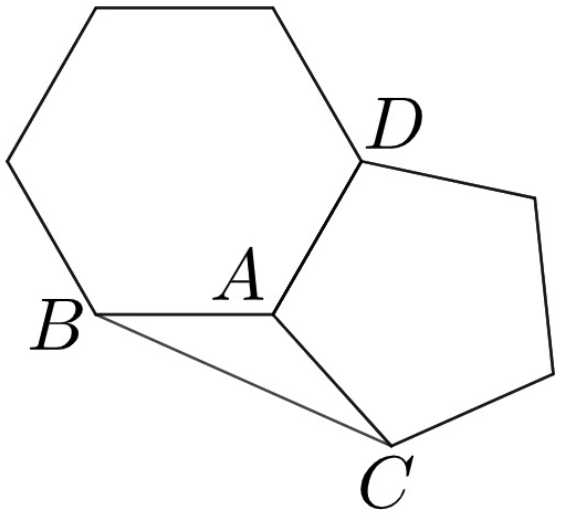
Geometry

Geometry Question # 1

Geometry Question # 1

RESET		

A regular hexagon and a regular pentagon share side $\overline{AD}$ as shown. What is the measure of $\angle ABC$ in degrees?



Geometry Question # 1

Answer:

Geometry Question # 1

Answer: 24

Geometry Question # 2

Geometry Question # 2

RESET

Let A, B, C all lie on a circle of radius 20 with $m\angle ACB = 18^\circ$. What is the length of the intercepted arc $\overset{\frown}{AB}$?

Geometry Question # 2

Answer:

Geometry Question # 2

Answer: 4π

Round 3

Algebra II

Algebra II Question # 3

Algebra II Question # 3

RESET

Find the largest solution to the equation $(x+8)(x-2)=24$.

Algebra II Question # 3

Answer:

Algebra II Question # 3

Answer: 4

Algebra II Question # 4

Algebra II Question # 4

RESET

If (x, y, z) is a solution to the system below, find $x + y + z$.

$$\begin{cases} x + y &= 7 \\ x - 2z &= 8 \\ y + 3z &= 5 \end{cases}$$

Algebra II Question # 4

Answer:

Algebra II Question # 4

Answer: 13

Round 3

Comprehensive Part 1

Comprehensive Part 1
Question # 5

Comprehensive Part 1 Question # 5

RESET

Find the value of x satisfying $\log_7(5x) - \log_7(x-4) = 1$.

Comprehensive Part 1 Question # 5

Answer:

Comprehensive Part 1 Question # 5

Answer: 14

Comprehensive Part 1
Question # 6

Comprehensive Part 1 Question # 6

RESET

A sector of a circle with a central angle of 45° has an area of 50π. What is the radius of the circle?

Comprehensive Part 1 Question # 6

Answer:

Comprehensive Part 1 Question # 6

Answer: 20

Round 3

Comprehensive Part 2

Comprehensive Part 2
Question # 7

Comprehensive Part 2 Question # 7

RESET		

If $g(x) = x + \sqrt{x}$, find the value of $g^{-1}(6)$.

Comprehensive Part 2 Question # 7

Answer:

Comprehensive Part 2 Question # 7

Answer: 4

Comprehensive Part 2
Question # 8

Comprehensive Part 2 Question # 8

RESET

The two endpoints of a diameter of a circle are $(6, 1)$ and $(-2, 3)$. What is the area of the circle?

Comprehensive Part 2 Question # 8

Answer:

Comprehensive Part 2 Question # 8

Answer: 17π

Round 3

Team

Team Question # 9

Team Question # 9

RESET		

An oblong number is a number that is the product of two consecutive integers. For example, 6 is an oblong number because it is 2×3. Find the largest oblong number less than 1000 that is divisible by 12.

Team Question # 9

Answer:

Team Question # 9

Answer: 756

Team Question # 10

Team Question # 10

RESET

Abby, Blake, Connor, Dylan, and Eva line up for a picture. How many ways can they do this if Connor and Eva have to stand next to each other?

Team Question # 10

Answer:

Team Question # 10

Answer: 48

End of Round 3