Alabama Statewide Math Contest - Round 3 Division 2

University of North Alabama

April 8, 2017

Round 3

Geometry

Geometry Question # 1

Geometry Question # 1

RESET

Hexagon $ABCDEF$ is equiangular, with $BC = EF = 12$ and $AB = CD = DE = FA = 4$. Find the area of hexagon $ABCDEF$.

Geometry Question # 1

Answer:

Geometry Question # 1

Answer: $56\sqrt{3}$

Geometry Question # 2

Geometry Question # 2

RESET

Find the measure of the angle in degrees satisfying: six times the complement of the angle is five less than the supplement.

Geometry Question # 2

Answer:

Geometry Question # 2

Answer: 73°

Round 3

Algebra II & Trig

Algebra II & Trig Question # 3

Algebra II & Trig Question # 3

RESET		

How many vertical asymptotes does the graph of

$$y = \frac{3x^2 + x}{x^3 + 5x^2 - 7x}$$

have?

Algebra II & Trig Question # 3

Answer:

Algebra II & Trig Question # 3

Answer: 2

Algebra II & Trig Question # 4

Algebra II & Trig Question # 4

RESET		

Recall that $i = \sqrt{-1}$. Write the complex number $\left(\frac{2i}{1-i}\right)^2$ in $a + bi$ form.

Algebra II & Trig Question # 4

Answer:

Algebra II & Trig Question # 4

Answer: $-2i$

Round 3

Comprehensive Part 1

Comprehensive Part 1
Question # 5

Comprehensive Part 1 Question # 5

RESET

Find the value of $\sqrt[4]{1.6 \times 10^{21}}$.

Comprehensive Part 1 Question # 5

Answer:

Comprehensive Part 1 Question # 5

Answer: $200,000$

Comprehensive Part 1
Question # 6

Comprehensive Part 1 Question # 6

RESET

Two people are on an elliptical track whose outer edge is given by the equation

$$\frac{(x-5)^2}{25} + \frac{(y+3)^2}{4} = 1$$

What is the maximum distance that can be between them?

Comprehensive Part 1 Question # 6

Answer:

Comprehensive Part 1 Question # 6

Answer: 10

Round 3

Comprehensive Part 2

Comprehensive Part 2
Question # 7

Comprehensive Part 2 Question # 7

RESET		

Find the value of x which satisfies $-2x^{-1/3} + 1 = 0$.

Comprehensive Part 2 Question # 7

Answer:

Comprehensive Part 2 Question # 7

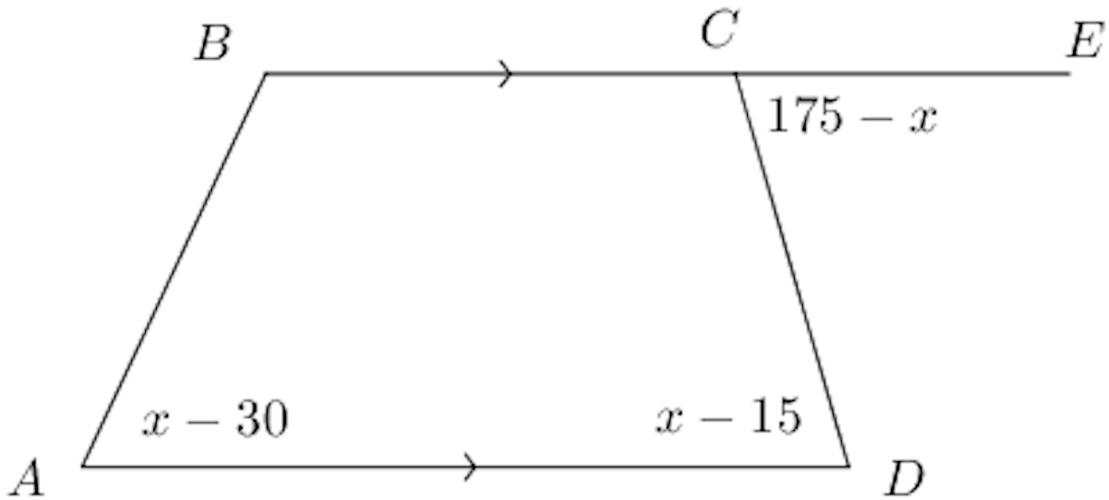
Answer: 8

Comprehensive Part 2
Question # 8

Comprehensive Part 2 Question # 8

RESET

In trapezoid $ABCD$, $\overleftrightarrow{BC} \parallel \overleftrightarrow{AD}$, E is on $\overleftrightarrow{BC}$, $m\angle DAB = x - 30$, $m\angle ECD = 175 - x$ and $m\angle ADC = x - 15$. Find $m\angle ABC$ in degrees.



Comprehensive Part 2 Question # 8

Answer:

Comprehensive Part 2 Question # 8

Answer: 115°

Round 3

Team

Team Question # 9

Team Question # 9

RESET		

In a particular dorm at Harvard, 20 students are from in-state and 43 are from out-of-state. A total of 23 of the students in this dorm are majoring in math, and 14 are both from in-state and majoring in math. How many are both from out-of-state and not majoring in math?

Team Question # 9

Answer:

Team Question # 9

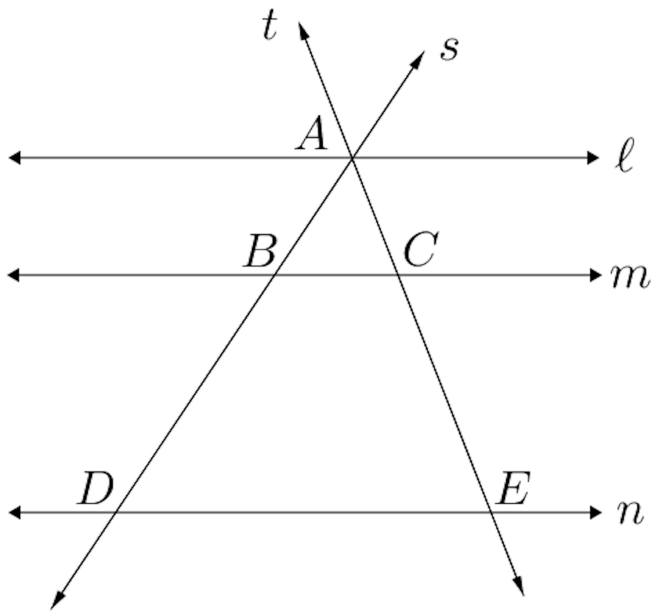
Answer: 34

Team Question # 10

Team Question # 10

RESET

Find the perimeter of $\triangle ABC$ if $AB = 3$, $CE = 6$, $DE = 16$, and the area of $\triangle ABC$ is one-sixteenth of the area of $\triangle ADE$ where lines ℓ, m, n are parallel to each other, t crosses ℓ, m and n at points A, C and E, respectively, and s crosses ℓ, m and n at A, B and D, respectively.



Team Question # 10

Answer:

Team Question # 10

Answer: 9

End of Round 3