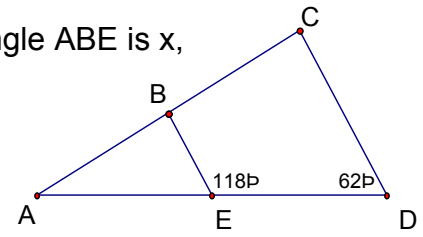
Mu Alpha Theta National Convention 2004
Theta State Bowl

Round 1

1. Simplify for all x: $2^x + 2^x + 2^x + 2^x$.

2. In the given triangle, AB = BC. If the area of triangle ABE is x, what is the area of triangle ACD?



Round 2

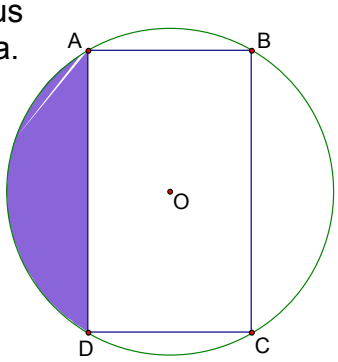
3. The sides of a triangle are in an arithmetic progression with the middle term = 2 and the angle opposite the side of 2 is 60°. Find the area of the triangle.

4. The perimeter of trapezoid ABCD is 50. If the two bases BC = 9 and AD = 21, what is the length of the diagonal AC?

Round 3

5. A square and a hexagon have the same perimeter. If the area of the square is 2.25, what is the area of the hexagon?

6. In the figure, rectangle ABCD is inscribed in a circle. If the radius of the circle is 1 and AB = 1, what is the area of the shaded area.



Round 4

7. A regular pyramid is composed of a square base of area 12 and four equilateral triangles. What is the volume of the pyramid?

8. What is the sum of the infinite geometric series $2+\left(-\frac{1}{2}\right)+\left(\frac{1}{8}\right)+\left(-\frac{1}{32}\right)+...$

Round 5

9. If $4^{2x+2}=64,$ then $x=$

10. Consider the ellipse with the equation $9x^2+4y^2-36x+32y+64=0$. Find the equation of the circle, in graphing form, with its center at the center of the ellipse and its area the same as the ellipse.

Round 6

11. Change 3.2513513513513… to a fraction. At lowest terms

12. Solve over the real numbers: $x-\sqrt{x}-20=0$

Round 7

13. A goat is tethered by a 100 ft. rope attached to an outside corner of an 80 ft. by 80 ft. square barn. How much grazing area outside the barn can the goat reach?

14. A triangle has sides of lengths 1, 2, and $\sqrt{3}$. Find the radius of a circle inscribed in the triangle.

Round 8

15. Evaluate $\log\frac{7}{8} + \log\frac{9}{14} - 2\log\frac{3}{4}$ where logs are to base 2.

16. A snowman is made using three balls of snow with diameters of 20 cm, 30 cm, and 40 cm. If the head of the snowman weighs 1 kg, what is the total weight of the snowman? (the head is the 20 cm snowball)

Round 9

17. Find the positive integer x for which $\frac{2^{x^2}}{4^{5x}} = 8^8$.

18. Find the equations of the asymptotes for $16x^2 - 9y^2 - 32x - 54y - 209 = 0$ in slope intercept form.

Round 10

19. Simplify: $i^{44776389827563405877634}$

20. In an arithmetic progression of positive numbers, the common difference is three times the first term, and the sum of the first five terms is equal to the square of the first term. Find the first term.