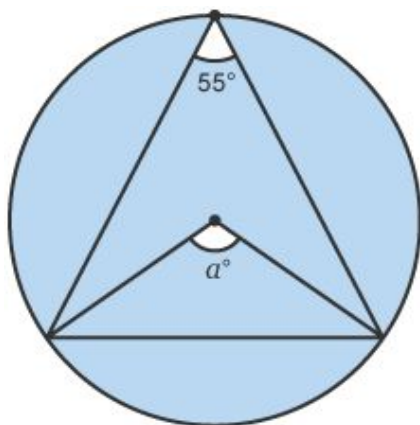


## Geometry

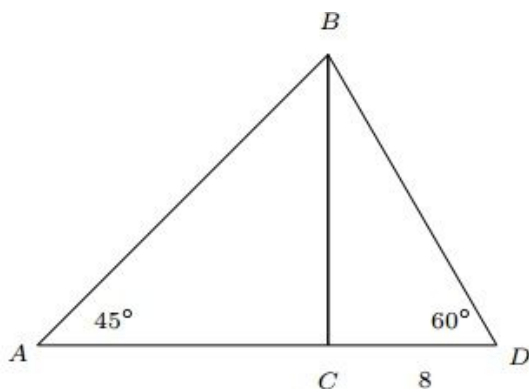
1. Find the measure of angle  $a$  in radians.

Express your answer as an improper fraction in terms of  $\pi$ .



**Answer:**  $11\pi/18$

2. Solve for the area of triangle  $ABD$ , given that angle  $BCD$  is a right angle.



**Answer:**  $32\sqrt{3} + 96$

3. The perimeter of a rhombus is 104 units. Find the length of the smaller diagonal of the rhombus given that the larger diagonal is 2.4 times the length of the smaller diagonal.

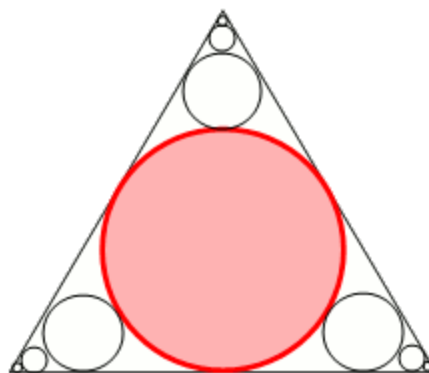
**Answer:** 20 units

4.  $\log_9 p = \log_{12} q = \log_{16} (p+q)$ . Find  $q/p$  and express your answer in the form  $(a+\sqrt{b})/c$ , where  $a$ ,  $b$ , and  $c$  are constants.

**Answer:**  $(1+\sqrt{5})/2$

5. A circle is inscribed inside an equilateral triangle and an infinite set of circles are nested inside such that each circle touches the previous circle and the edges of the triangle act as tangents.

What is the ratio of the total area of all of the smaller circles to the area of the largest circle? Express your answer in the form of  $p:q$ , where  $p$  and  $q$  are integers.



**Answer:** 3:8

$$6. 2x+5y+2z=-38$$

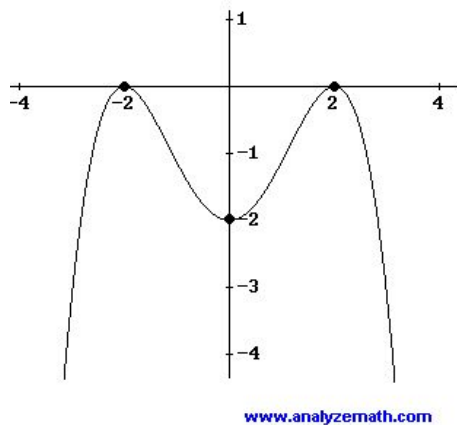
$$3x-2y+4z=17$$

$$-6x+y-7z=-12$$

Solve for the value of  $y$  that satisfies this system of equations.

**Answer:**  $y=-8$

7. Given the graph below that corresponds to the equation  $y = ax^4 + bx^3 + cx^2 + dx + e$ , find the sum  $a+e$ . Express your answer as a simplified, improper fraction.



**Answer:**  $-17/8$

8. Find the product of the imaginary roots of  $y=x^2+x+1$ .

**Answer:** **1**

9. Solve for  $x$ .

$$3^{x-2} + 3^{x-3} + 3^{x-4} = 13$$

**$x=4$**

10. An amount of money  $P$  is compounded annually, and grows to \$5100 in 33 years & to \$5800 in 34 years. Find the interest rate,

expressed as a percent with a decimal rounded to the nearest tenth.

**Answer:** **12.5%**

**Tiebreakers:**

11. If the 101st term of an arithmetic sequence is 1234 and the 65th term is 874, find the 10th term of the sequence.

**Answer:** 324

12. What is the probability of rolling four six-sided dice and getting a different number on each die? Express your answer as a fraction.

**Answer:**  $5/18$