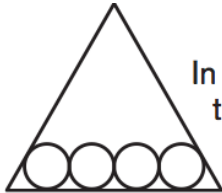


1.

A Ferris wheel has the same height as a building with 60 floors of identical height. After boarding at the bottom of the Ferris wheel, Courtney used a stopwatch to find that it took 8 minutes 26 seconds to rise to the top of the 45th floor of the building. How many seconds will it take from there for the Ferris wheel to bring her back around to where she started, assuming the wheel rotates at a constant rate?

Ⓒ Ⓓ

2.



In an equilateral triangle with edge length 12 cm, four congruent circles are tangent to each other and at least one side of the triangle as shown. What is the radius of each circle? Express your answer in simplest radical form.

Ⓒ Ⓓ Ⓔ

3.

Given the following facts about the integers a , b , c , d , e and f , what is the value of a if $0 \leq a \leq 60$?

a is odd.

$c = \frac{b}{2}$ is even.

$e = \frac{d-1}{2}$ is odd.

$b = \frac{a-1}{2}$ is even.

$d = \frac{c}{2}$ is odd.

$f = \frac{e-1}{2}$ is even.

4.

When $a > 5$ and $b \leq 5$, $a @ b = (a + b)(a - b)$, and when $a \leq 5$ and $b > 5$, $a @ b = (b + a)(b - a)$. What is the value of $2 \times ((2 @ 6) @ -4) - 1$?

5.

If $\frac{1}{n} + \frac{1}{2n} + \frac{1}{3n} = k$, what is the value of nk ? Express your answer as a common fraction.

6.

What positive four-digit integer has its thousands and hundreds digits add up to the tens digit, its hundreds and tens digits add up to its ones digit and its tens and ones digits add up to the two-digit number formed by the thousands and hundreds digits?

7.

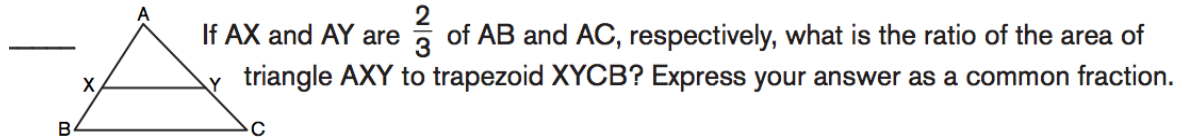
What is the smallest positive integer value of x for which $54x$ is a perfect square?

8.

Twenty-seven unit cubes are arranged to form a $3 \times 3 \times 3$ cube. The center unit cube from each face is then removed. What is the surface area of the resulting solid?

9. If a and b are positive integers such that $ab = 48$ and $a - b = 8$, what is the value of $a + b$?

10.



11.

A bug is walking on the ticking second hand of a clock, starting from the center and walking outward. Every second, the bug walks 1 mm along the stationary second hand, and then the hand ticks while the bug stands still. If the bug starts at the very center of the clock and proceeds for exactly 60 seconds, what is the total distance that the bug will travel? Express your answer as a decimal to the nearest tenth.

12.

The *digital sum* of a number is the sum of its digits. How many positive three-digit integers have a digital sum of 5?

13.

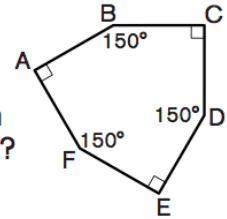
The sum of two numbers is 1, and the absolute difference of the two numbers is 2. What is the product of the two numbers? Express your answer as a common fraction.

14.

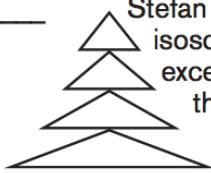
What is the decimal difference between 1111_3 and 1111_2 ?

15.

As shown, convex hexagon ABCDEF has right angles at A, C and E, and 150-degree angles at B, D and F. If each side is $\underline{2}$ inches long, its area can be expressed in simplest radical form as $p + q\sqrt{3}$. What is the value of pq ?



16.



Stefan created this tree design in his computer drawing class. It consists of four isosceles triangles of the same height arranged vertically as shown. With the exception of the top triangle, the apex of each triangle is the midpoint of the base of the triangle above it, and the base of each triangle is 50% larger than the base of the triangle above it. What is the ratio of the area of the smallest triangle to the area of the largest? Express your answer as a common fraction.