1. Find the next number in the sequence

$$1, 5, 12, 22, 35, \ldots$$

2. Twenty percent less than 60 is one-third more than what number?

3. What is the lowest common multiple of 18 and 35?

4. Find the cube root of 3^{3^3}. Note that $a^{b^c} = a^{(b^c)}$.

5. A triangle is inscribed in a circle of radius 3. Find the area of the triangle if its sides are in the ratio $3 : 4 : 5$.

6. In the plane, a lattice point is a point where both the x and y coordinates are whole numbers. The line $y = 55x/12$ is sketched for $0 < x < 12$. How many lattice points are there on the line?

7. Which number is the first number greater than 1 that is the cube of the sum of its digits?

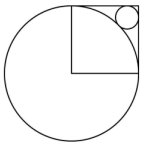
8. Evaluate

$$\sqrt{(2023 + 2023) + (2023 - 2023) + (2023 \times 2023) + (2023 \div 2023)}.$$

9. How many digits does $(2^22)^5 \times (5^55)^2$ have?

10. In how many ways can 10 objects be put into 3 bins such that one of the bins gets 5 objects, another gets 3 objects, and the third bin gets 2 objects?

11. In the diagram below the side length of the square is 1. What is the radius of the smaller circle?



12. Josh writes the numbers $1, 2, 3, \ldots, 99, 100$. He marks out 1, skips the next number (2), marks out 3, and continues skipping and marking out the next number to the end of the list. Then he goes back to the start of his list, marks out the first remaining number (2), skips the next number (4), marks out 6, skips 8, marks out 10, and so on to the end. Josh continues in this manner until only one number remains. What is that number?

13. Solve the equation
$$7\sqrt{x} - 22 = \frac{24\sqrt{x}}{x}.$$

14. Five points are randomly placed in a square with side length 2. The distance between every pair of points is measured, and the smallest distance between a pair of points is called the *minimum* distance. What is the largest possible minimum distance?

15. For how many integer values of n (positive or negative) is the value of
$$4000 \cdot \left(\frac{2}{5}\right)^n$$
an integer?

16. If $\sin a + \sin b = \sqrt{5/3}$ and $\cos a + \cos b = 1$ what is $\cos(a - b)$?

17. How many ways are there to write 6 as the sum of any number of positive integers?

18. The number
$$1 + \cfrac{1}{2 + \cfrac{1}{2 + \cfrac{1}{2 + \cdots}}}$$
is the root of a quadratic. Find the sum of the roots of this quadratic.

19. We have 5 disks of distinct sizes, and 3 pegs in a line. Let the left peg be A and the right-most peg be B. The disks start off on A in descending order of size; the largest disk is at the bottom. What is the minimum number of moves required to transfer the entire stack of disks from A to B if a larger disk is not allowed to be placed on top of a smaller disk and *direct transfers from A to B are not allowed?* This means every move must be made to or from the middle peg.

20. Find
$$1^3 + 2^3 + 3^3 + \cdots + 50^3$$
given the following four equations.
$$1 = 0 + 1$$
$$2 + 3 + 4 = 1 + 8$$
$$5 + 6 + 7 + 8 + 9 = 8 + 27$$
$$10 + 11 + 12 + 13 + 14 + 15 + 16 = 27 + 64$$

1. 51
2. 36
3. 3^{3^2}
4. 630
5. 8.64
6. 0
7. 512
8. 2024
9. 111
10. 2520
11. $(\sqrt{2}-1)^2$
12. 64
13. 16
14. $\sqrt{2}$
15. 9
16. $1/3$
17. 11
18. 0
19. 242
20. 1625625