1. In a certain store, all pencils cost the same amount of money. If three pencils can be bought for six dollars, what is the price of two pencils?

   (A) \$3 **(B)** \$3.5 **(C)** \$4 **(D)** \$4.5 **(E)** \$5

2. Let x be a number such that $10000x + 2 = 4$. What is the value of $5000x + 1$?

   (A) -1 **(B)** 0 **(C)** 1 **(D)** 2 **(E)** 3

3. Real numbers w, x, y, and z satisfy $w + x + y = 3$, $x + y + z = 4$, and $w + x + y + z = 5$. What is the value of $x + y$?

   (A) $-\frac{1}{2}$ **(B)** 1 **(C)** $\frac{3}{2}$ **(D)** 2 **(E)** 3

4. There exists a real number n such that $4^n = 5$. What is the value of 8^n?

   (A) $5\sqrt{5}$ **(B)** 10 **(C)** 25 **(D)** 50 **(E)** $25\sqrt{5}$

5. What is the perimeter of the smallest rectangle with integer side length that fits three non-overlapping squares with areas $4, 9$, and 16?

   (A) 20 **(B)** 24 **(C)** 26 **(D)** 28 **(E)** 32

6. A coin is flipped three times. What is the probability that there are no instances of two consecutive heads or two consecutive tails?

   (A) $\frac{1}{8}$ **(B)** $\frac{1}{4}$ **(C)** $\frac{3}{8}$ **(D)** $\frac{5}{8}$ **(E)** $\frac{3}{4}$

7. Alice, Bob, and Charlie are each thinking of a number. Alice's number differs from Bob's number by 2. Bob's number differs from Charlie's number by 6. Charlie's number differs from Alice's number by N. What is the sum of all possible values for N?

   (A) 4 **(B)** 6 **(C)** 7 **(D)** 12 **(E)** 14

8. Let ABC be a triangle and D be a point on segment BC. If $\triangle ABD$ is equilateral and $\angle ACB = 14^\circ$, what is $\angle DAC$?

   (A) 26° **(B)** 34° **(C)** 46° **(D)** 50° **(E)** 54°

9. A circle with area $\frac{36}{\pi}$ has the same perimeter as a square with what side length?

   (A) $\frac{9}{\pi}$ **(B)** 3 **(C)** π **(D)** 6 **(E)** π^2

10. What is the maximum possible value of $5 - |6x - 80|$ over all integers x?

    (A) -1 **(B)** 0 **(C)** 1 **(D)** 3 **(E)** 5

11. If $N = 1000^2 - 950^2$, what is the largest prime factor of N?

    (A) 5 **(B)** 13 **(C)** 17 **(D)** 19 **(E)** 29

12. Out of a sample of 100 people, 24 do not like red or blue, 40 like both red and blue, and 50 people like red. How many people like blue but not red?

    (A) 24 **(B)** 26 **(C)** 48 **(D)** 64 **(E)** 76

13. Sarah is leading a class of 35 students. Initially, all students are standing. Each time Sarah waves her hands, a prime number of standing students sit down. If no one is left standing after Sarah waves her hands 3 times, what is the greatest possible number of students that could have been standing before her third wave?

    (A) 23 **(B)** 27 **(C)** 29 **(D)** 31 **(E)** 33

14. Two truth tellers and two liars are positioned in a line, where every person is distinguishable. How many ways are there to position these four people such that everyone claims that all people directly adjacent to them are liars?

    (A) 4 **(B)** 6 **(C)** 8 **(D)** 12 **(E)** 16

15. There exists a fraction x that satisfies $\sqrt{x^2+5} - x = \frac{1}{3}$. What is the sum of the numerator and denominator of this fraction?

    (A) 8 **(B)** 21 **(C)** 25 **(D)** 32 **(E)** 34

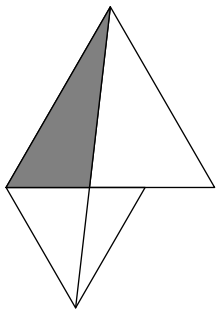
16. An ant climbs either two inches or three inches each day. In how many ways can the ant climb twelve inches, if the order of its climbing sequence matters?

    (A) 8 **(B)** 9 **(C)** 10 **(D)** 12 **(E)** 14

17. What is the value of
$$(\sqrt{2}-1)^4 + \frac{1}{(\sqrt{2}-1)^4}?$$

    (A) $32 - 16\sqrt{2}$ **(B)** 30 **(C)** 34 **(D)** $15 + 15\sqrt{2}$ **(E)** $16 + 16\sqrt{2}$

18. Two equilateral triangles are glued, and their opposite vertices are connected. If the larger equilateral triangle has an area of 225 and the smaller equilateral triangle has an area of 100, what is the area of the shaded region?



(A) 60 **(B)** 90 **(C)** 96 **(D)** 108 **(E)** 120

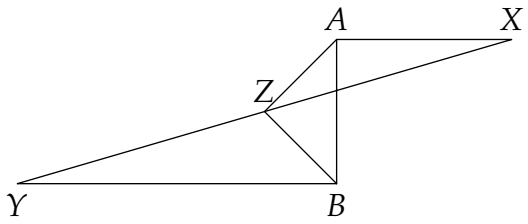
19. Cozi makes a two-way table on chalkboard describing the right or left hand usage of students and teachers in her school. However, when she returns to the chalkboard from lunch, she is dismayed to find that most of the numbers on her table have been erased, leaving behind:

5	?	?	Total
?	?	6	Total
?	11	?	
Total	Total		

Fortunately, Cozi remembers that the difference between two of the missing numbers is equal to 12. Which of the following could be the total number of students and teachers on the table?

(A) 14 **(B)** 15 **(C)** 16 **(D)** 17 **(E)** 18

20. In the diagram below, AX is parallel to BY, AB is perpendicular to BY, and AZB is an isosceles right triangle. If $AB = 7$ and $XY = 25$, what is the length of AX?



(A) $\frac{17}{3}$ **(B)** $\frac{17}{2}$ **(C)** 9 **(D)** $\frac{51}{4}$ **(E)** 12

21. A herder has forgotten the number of cows she has, and does not want to count them all of them. She remembers these four facts about the number of cows:

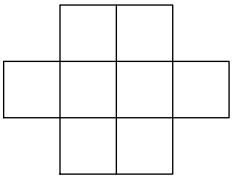
- It has 3 digits.

- It is a palindrome.
- The middle digit is a multiple of 4.
- It is divisible by 11.

What is the sum of all possible numbers of cows that the herder has?

(A) 343 **(B)** 494 **(C)** 615 **(D)** 635 **(E)** 726

22. How many ways are there to color each of the 8 cells below red or blue such that no two blue cells are adjacent?



(A) 48 **(B)** 50 **(C)** 52 **(D)** 54 **(E)** 56

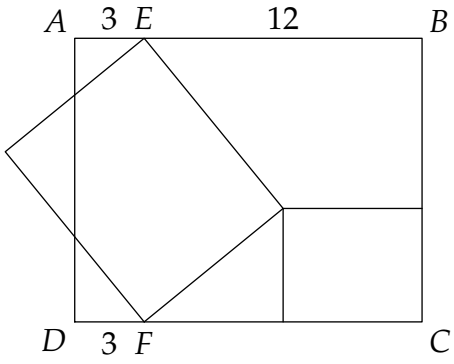
23. Friends Alice, Betty, and Cathy are playing a game. Betty and Cathy are each given a square number, such that Betty knows Cathy's number and Cathy knows Betty's, but neither of them know their own. Alice then says: "The sum of the numbers is less than 100." Betty says: "If Cathy knew the number of possibilities for my number, she would know her own." Cathy then says: "Now I know my number." What is Cathy's number?

(A) 16 **(B)** 25 **(C)** 36 **(D)** 49 **(E)** 64

24. Jenn draws a scalene triangle, and measures the heights from each of the vertices to its opposite side. She discovers that the three height lengths are all roots of the polynomial $x^3 - 3.9x^2 + 4.4x - 1.2$. What is the length of the inradius of the triangle?

(A) $\frac{3}{13}$ **(B)** $\frac{3}{11}$ **(C)** $\frac{2}{7}$ **(D)** $\frac{8}{15}$ **(E)** $\frac{9}{14}$

25. In the below diagram, the three rectangles are similar. Find the area of rectangle $ABCD$.



(A) $75\sqrt{3}$ **(B)** $120\sqrt{2}$ **(C)** $100\sqrt{3}$ **(D)** 180 **(E)** $75\sqrt{6}$