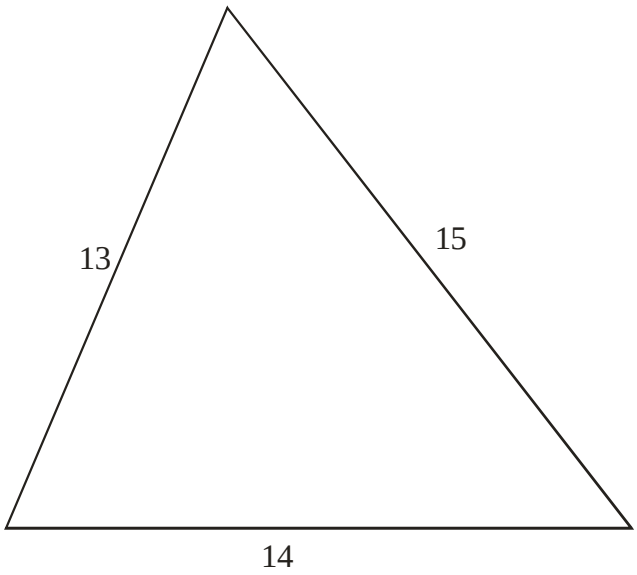
1. What is the remainder when we divide $3^{2004} + 2$ by 11?

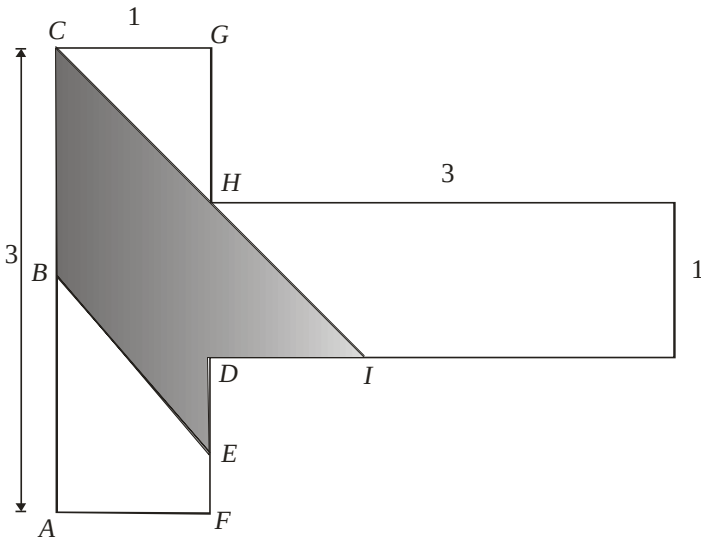
2. Find the area of the following triangle



3. Find the missing digits in the following multiplication

		4	[ ]
	×	[ ]	[ ]
	[ ]	8	[ ]
	8	[ ]	
[ ]	[ ]	4	[ ]

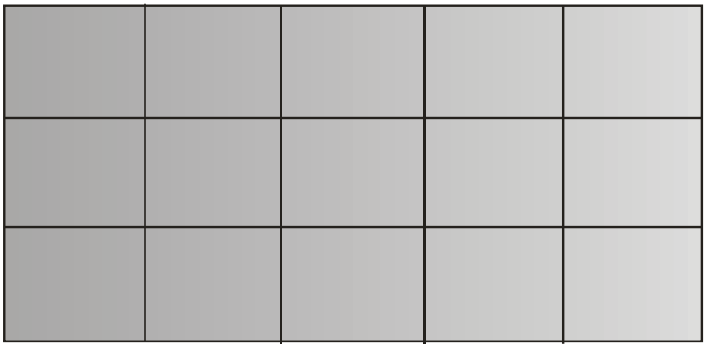
4. Find the area of the shaded region. Note that B and E are the midpoints of $\overline{AC}$ and $\overline{FD}$, respectively, and that $GH = DF$.



5. The positive integer 4 can be represented as a sum of 1's and 2's in several ways, such as 1 + 2 + 1, 1 + 1 + 2, and 1 + 1 + 1 + 1. In how many ways can 5 be represented as a sum of 1's and 2's?

6. 25 workers finished (1/5) of a task in 8 days. Then, because of an emergency, it became necessary to complete the task in the next 20 days. How many additional workers are needed to be added to the present 25 to accomplish this in time?

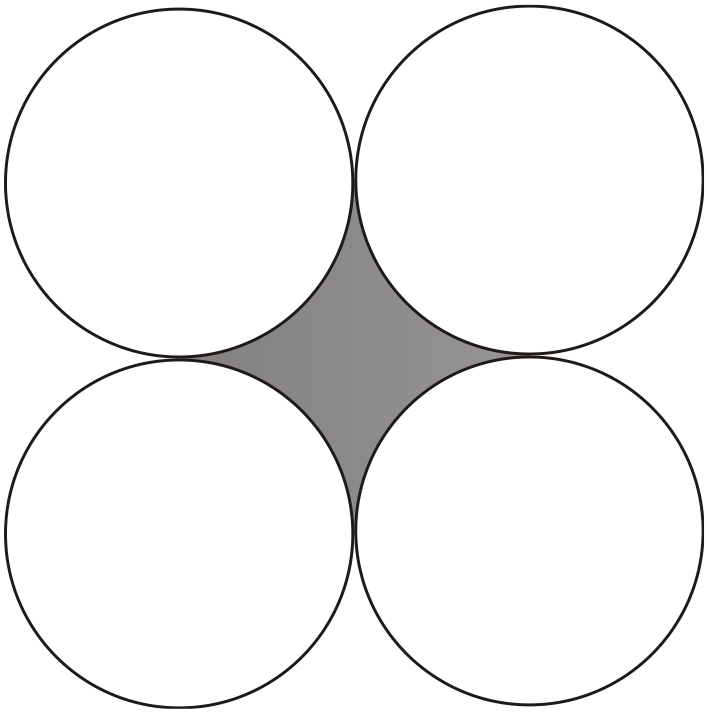
7. How many rectangles are in the figure?



8. Two athletes starting at the same point on a circular 1-kilometer track walk in opposite directions with uniform speeds and meet in 6 minutes. If they walk in the same direction, it requires one hour for the faster athlete to gain a lap. What is the speed (in kph) of the slower athlete?

9. All the even numbers from 2 to 98 inclusive, except those ending in 0, are multiplied together. What is the units digit of the product?

10. Four coins of radius 2 cm each are arranged as shown below. What is the area of the shaded region?

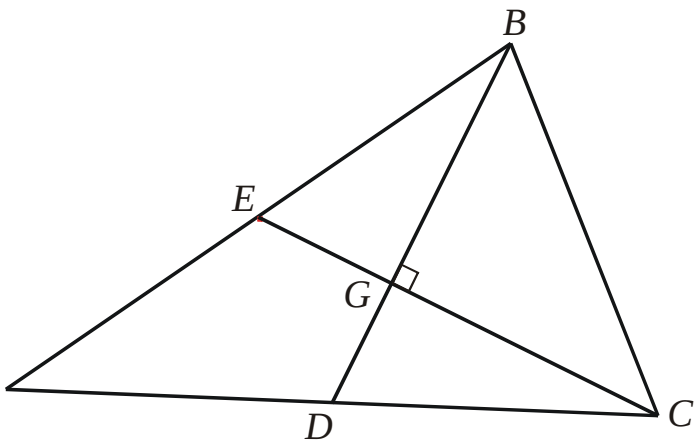


11. Find all the 2-digit positive integers *N* that have the property that the sum of *N* and the number obtained by reversing the order of the digits of *N* is a perfect square.

12. If this triangle were continued, what number would lie directly below 169?

			1			
		2	3	4		
	5	6	7	8	9	
10	11	12	13	14	15	16
			M			

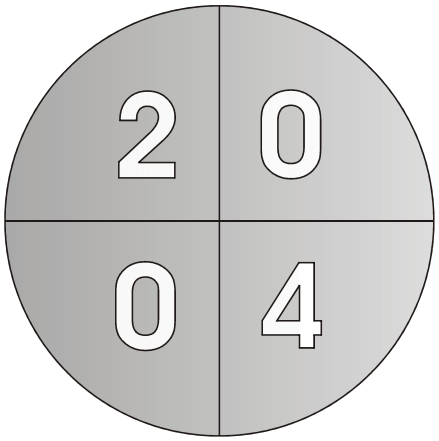
13. Medians $\overline{BD}$ and $\overline{CE}$ of triangle *ABC* are perpendicular to each other, *BD* = 8, and *CE* = 12. Find the area of triangle *ABC*.



14. If $P = 64! = 64 \times 63 \times \Lambda \times 3 \times 2 \times 1$, find the largest positive integer *n*, such that *P* is divisible by 12^n.

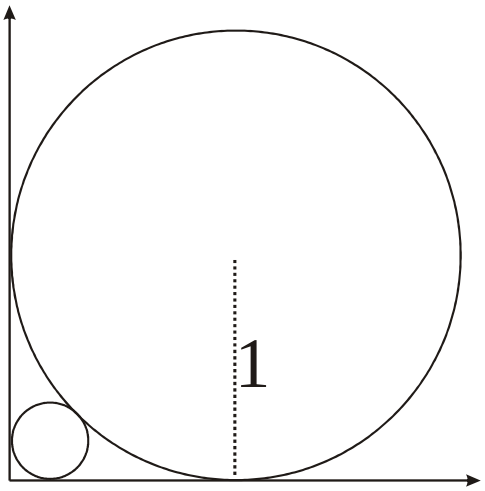
15. The number $2^{48} - 1$ has two divisors between 50 and 75. Find them.

16. The circular target below is divided into four congruent quadrants with point values 2, 0, 0, and 4, as shown. Four darts are thrown that hit the target randomly (one outcome could be 2,2,2,2). What is the probability that the digits obtained could be arranged to form 2004?



17. The digits 1, 2, 3, 4, and 5 are each used once to compose a five-digit number *abcde*, such that the 3-digit number *abc* is divisible by 4, *bcd* is divisible by 5, and *cde* is divisible by 3. What is the number *abcde*?

18. Place a smaller circle in the space left by a larger circle of radius 1, as shown in the diagram. What is the radius of the smaller circle?



19. Evaluate the following
$200^2 - 199^2 + 198^2 - 197^2 + \cdots + 4^2 - 3^2 + 2^2 - 1^2$

20. If m and n are each chosen at random from the set {0, 1, 2, 3, 4, 5, 6, 7, 8, 9}, what is the probability that
$$x^2 + mx + n^2 = 0$$
will have at least one real solution?

Answers

1. 6
2. 84
3. $\begin{array}{r} 43 \\ \times \quad 29 \\ \hline 387 \\ 86 \\ \hline 1247 \end{array}$
4. 2 sq. units
5. 8
6. 15
7. 90
8. 4.5 kph
9. 6
10. $4(4-\pi)$ or $16 - 4\pi$
11. 29, 38, 47, 56, 65, 74, 83, 92
12. 195
13. 64
14. 30
15. 63, 65
16. $\frac{3}{16}$
17. 12453
18. $3-2\sqrt{2}$
19. 20100
20. $\frac{30}{100}=\frac{3}{10}$