

1. Each digit in the number 2001 is placed on a different card. In how many ways can three different cards be selected so that the product of the numbers on those cards is not zero?

1. \_\_\_\_\_

2. Joyce wishes to share six identical pieces of licorice equally among four people. What is the minimum number of pieces that must be cut?

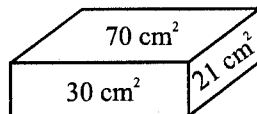
2. \_\_\_\_\_

3. The sum of the squares of two positive integers is 193. The product of the two integers is 84. What is the sum of the two integers?

3. \_\_\_\_\_

4. Three faces of a rectangular prism have the areas shown. What is the number of cubic centimeters in the volume of the rectangular prism?

4. \_\_\_\_\_



5. There are 12 eggs in a carton, 8 cartons in a crate, and 9 crates in a container. How many eggs are in a container?

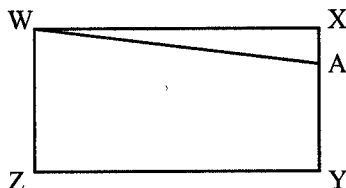
5. \_\_\_\_\_

6. Solve for  $x$ :  $2^{2x} = 256^{\frac{1}{2}}$ .

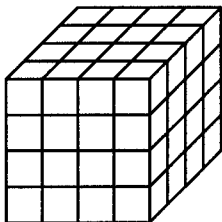
6. \_\_\_\_\_

7.  $\overline{WA}$  divides rectangle  $WXYZ$  into two parts whose areas are in the ratio of 7:1. What is the ratio  $\frac{XA}{AY}$ ? Express your answer as a common fraction.

7. \_\_\_\_\_



8. Sixty-four unit cubes are placed together to create a large cube. How many cubes with integer dimensions are in the  $4 \times 4 \times 4$  cube?



8. \_\_\_\_\_

9. The point  $(2, 3)$  is reflected about the  $x$ -axis to a point P. Then P is reflected about the  $y$ -axis to a point Q. What is the sum of the coordinates of Q?

9. \_\_\_\_\_

10. Each edge of a regular octahedron is colored orange or black. If every face of the octahedron has at least one orange edge, what is the smallest possible number of orange edges?

10. \_\_\_\_\_

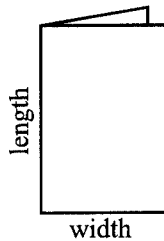
11. The sum of three numbers  $a$ ,  $b$  and  $c$  is 77. If  $a$  decreased by 5 is equal to  $b$  increased by 5 and is also equal to  $c$  multiplied by 5, what is the value of  $b$ ?

11. \_\_\_\_\_

12. While traveling home from school, Alyssa fell asleep halfway through the journey. When she awoke, she still needed to travel one-fourth of the distance that she had traveled while sleeping. For what part of the journey was she awake?  
Express your answer as a common fraction.

12. \_\_\_\_\_

13. What is the ratio of the width to length of a folded sheet of paper if the rectangle formed when the sheet is folded in half as shown is similar to the original rectangular sheet? Express your answer as a common fraction in simplest radical form.



13. \_\_\_\_\_

14. On Monday, 30 girls and 0 boys in the Crescent Valley Band missed practice, resulting in a 2 : 5 ratio of girls to boys. On Tuesday, 30 girls and 48 boys missed practice, resulting in a 2 : 1 ratio of girls to boys. How many students are in the band?

14. \_\_\_\_\_

15. A soccer ball is constructed using 32 regular polygons with equal side lengths. Twelve of the polygons are pentagons, and the rest are hexagons. A seam is sewn wherever two edges meet. What is the number of seams in the soccer ball?

15. \_\_\_\_\_



16. In the following equation,  $\frac{a}{b}$  is a common fraction. What is the value of  $a + b$ ?

16. \_\_\_\_\_

$$\frac{a}{b} = \frac{1}{3 + \frac{1}{1 + \frac{1}{4}}}$$

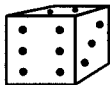
17. How many equilateral triangles in the plane have two vertices in the set  $\{(0,0), (0,1), (1,0), (1,1)\}$ ? 17. \_\_\_\_\_

18. Maria normally spends a half-hour driving to work. When her average speed is ten miles per hour slower than usual, the trip takes ten minutes longer. How many miles does she drive to work? 18. \_\_\_\_\_

19. Two cubes of volumes  $8 \text{ cm}^3$  and  $27 \text{ cm}^3$  are glued together at their faces to form a solid with the smallest possible surface area. What is the number of square centimeters in the surface area of the resulting solid? 19. \_\_\_\_\_

20. There is at least one two-digit number such that when it is added to the two-digit number having the same digits in reverse order, the sum is a perfect square. Find the sum of all such two-digit numbers. 20. \_\_\_\_\_

21. A standard die is tossed twice. What is the probability of obtaining exactly one 5? Express your answer as a common fraction. 21. \_\_\_\_\_



22. The  $n$ th term of a sequence is  $a_n = (-1)^{n+1}(3n + 2)$ . What is the value of  $a_1 + a_2 + \dots + a_{100}$ ? 22. \_\_\_\_\_

23. A regular hexagon and an equilateral triangle have equal perimeters. What is the ratio of the area of the hexagon to the area of the triangle? Express your answer as a common fraction. 23. \_\_\_\_\_

24. The number 4 can be written as a sum of one or more natural numbers in exactly five ways:  $4$ ,  $3 + 1$ ,  $2 + 1 + 1$ ,  $2 + 2$  and  $1 + 1 + 1 + 1$ ; and so 4 is said to have five *partitions*. What is the number of partitions for the number 7? 24. \_\_\_\_\_

25. A number  $x$  is 3 larger than its reciprocal. What is the value of  $(x - \frac{1}{x})^4$ ? 25. \_\_\_\_\_

26. Express the following sum as a common fraction: 26. \_\_\_\_\_  
$$\frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \frac{1}{3 \cdot 4} + \frac{1}{4 \cdot 5} + \dots + \frac{1}{9 \cdot 10}$$

27. What is the least positive integer  $n$  such that  $n^2 - n$  is divisible by some but not all integer values of  $k$  when  $1 \leq k \leq n$ ? 27. \_\_\_\_\_

28. Given that  $m$  and  $n$  are digits, what is the sum of the values for  $m$  and  $n$  which yield the greatest six-digit number  $5m5,62n$  that is divisible by 44? 28. \_\_\_\_\_

29. Janene and Emily plan to go on a marathon training run. Emily arrives late, so Janene starts running 16 minutes before Emily. Janene runs at an average rate of 9 minutes per mile, and Emily runs at an average rate of  $8\frac{1}{4}$  minutes per mile. Assuming that both girls started at the same location and ran the same route, how many minutes will Emily take to catch up to Janene? 29. \_\_\_\_\_

30. What is the number of square feet in the area of a triangle with side lengths shown? 30. \_\_\_\_\_

