

1. A circular cookie, 8 cm in diameter, is cut from a square piece of dough, 8 cm on a side and 1 cm deep. How many cubic cm of dough is left over? Give your answer to the nearest cubic cm. 1. _____ cubic cm

2. How many right triangles with integer sides (in centimeters) have perimeters less than 50 centimeters? 2. _____

3. A piece of wire 72 inches long is cut into two pieces of equal length. One piece is formed into a circle and the other into a square. What is the sum, in square inches, of the areas of the circle and the square? Use 3.14 for π . Give your answer to the nearest square inch. 3. _____ sq. in.

4. Find the distance between the points $(-5, -5)$ and $(5, 5)$. Leave answer in simplified exact form. 4. _____

5. By how much does the sum of the two largest two-digit primes exceed the sum of the two smallest two-digit primes? 5. _____

6. The total resistance in a certain circuit wired in parallel is a function, g , of the resistances, a and b , where

$$g(a,b) = \frac{1}{\frac{1}{a} + \frac{1}{b}}$$

6. _____

Evaluate $g(4,5)$ and give your answer as a mixed number.

7. The planet Polynum is inhabited by the Quadtris which have 4 legs and 3 heads, and the Pentabis, which have 5 legs and 2 heads. If 106 legs and 55 heads were counted at a recent gathering of both species, how many Quadtris were present?

7. _____

8. A mathematician specified in his will that his children were to receive a total of x dollars. His eldest son was to receive \$100 plus a quarter of what remained. The eldest daughter would then receive \$200 plus a quarter of what remained. The rest of the children would divide equally what was left. If the eldest son and eldest daughter each received the same amount, then how much did the eldest son and eldest daughter each receive?

8. _____

9. A number is chosen at random from the first 100 positive integers. What is the probability that the number selected has an odd number of positive integral factors?

9. _____

10. Each side of a cube is increased by 1%. By what percent is the volume of the cube increased? Express your answer to the nearest one-hundredth of a percent.

10. _____ %

11. A cube n units on each side is painted red and sliced into n^3 smaller cubes of equal size. Find the general formula for the number of smaller cubes that have exactly one red face. 11. _____

12. Substitute digits for letters in the following cryptarithm to produce a valid equation. A given letter always represents the same digit, and no two different letters ever represent the same digit.

$$\begin{array}{r} A B C D E \\ \times 4 \\ \hline E D C B A \end{array}$$

12. _____

13. The Greek algebraist Diophantus was a boy for one-sixth of his life. After one-twelfth more he grew a beard; after one-seventh more he married; and after 5 years of marriage a son was born. The son lived half as long as his father, and Diophantus died 4 years after his son's death. How old was Diophantus when his son died? 13. _____

14. Find the largest integer less than 1000 which leaves remainders of 1 when divided by 2, 3, 5, and 7. 14. _____

15. If \otimes is defined by $x \otimes \frac{1}{x}$, find the value of $\textcircled{5} \otimes \frac{1}{\textcircled{5}}$. 15. _____