Question 1. A piece of string is 40 centimeters long. It is cut into three pieces. The longest piece is 3 times as long as the middle-sized piece and the shortest piece is 23 centimeters shorter than the longest piece. Find the length of the longest piece in centimeters.
Answer: 27

Question 2. If (x, y) is a solution of $3^2 + 4^2 + 6^2 + 8^2 = x^2 + y^2$, where x and y are positive integers, find $x + y$.
Answer: 13 or 15

Question 3. If $\sin(\theta) = \dfrac{1}{3}$, find $\tan^2(\theta)$.
Answer: $\dfrac{1}{8}$

Question 4. What is the sum of the solutions of the equations
$x^3 + x^2 - 4x - 4 = 0$ and $|x^2 + 2x| = 3$?
Answer: -5

Question 5. If $x + y = -6$ and $x^3 + y^3 = -60$, what is xy?
Answer: $\dfrac{26}{3}$

Question 6. Evaluate $(\log_3 27)^{\log_9 64}$.
Answer: 8

Question 7. Suppose $f(x) = ax + b$, where a and b are real numbers and
$f(f(f(x))) = 27x + 39$. Find the value of $a + b$.
Answer: 6

Question 8. Find the volume of a cube whose surface area is four times the number of its faces.
Answer: 8

Question 9. The average of 5 numbers is 28. What would a 6th number have to be to bring the average up to 30?
Answer: 40

Question 10. Which is the smaller of these four: $\left(2^4\right)^8$ or $\left(8^2\right)^4$ or $\left(4^8\right)^2$ or $\left(2^8\right)^4$?
Answer: $\left(8^2\right)^4$

Question 11. If $\sec\theta = \frac{3}{2}, \pi \leq \theta \leq 2\pi$, then what is $\tan\theta + \cot\theta$? Rationalize the denominator.
Answer: $-\frac{9\sqrt{5}}{10}$

Question 12. What is the sum: $\frac{1}{1-\frac{1}{1-\frac{1}{x}}} + \frac{1}{1-\frac{1}{1+\frac{1}{x}}}$?
Answer: 2

Question 13. Find the sum: $i - i^2 + i^3 - i^4 + ... + i^{2011} - i^{2012}$, where $i = \sqrt{-1}$.
Answer: 0

Question 14. The average grade of a class on a 100-point exam is 89. The teacher gives an extra 10 points to one of the students and 3 extra points to each of the other students. The new average is now 92.5. How many students are in the class?
Answer: 14

Question 15. Suppose $f(n) = f(n+1) - f(n-1)$ for $n = 0, 1, 2, ...$ and $f(1) = 0, f(3) = 1$. Find the value of $f(2) + f(4)$.
Answer: 3

Question 16. Given a bag with 4 pairs of white gloves, 5 pairs of red gloves and 6 pairs of blue gloves, find the number of gloves one needs to pull out of the bag one glove at a time to ensure a pair of matching gloves, where there are both right-handed and left-handed gloves.
Answer: 16