Q1. Find m if $P(x) = x^4 + 3x^3 + mx^2 + 7x + 10$ is divisible by $x + 2$.

A. 3
B. 5
C. 7
D. -4

Q2. Factorize $x^4 - x^2 + 1$

A. $(x^2 + 1)(x^2 - 1)$
B. $x^2(x^2 - 1) + 1$
C. $(x^2 + \sqrt{3}x + 1)(x^2 - \sqrt{3}x + 1)$
D. $(x^2 - x + 1)^2$

Q3. Solve the equation $x^3 - 2x^2 - x + 2 = 0$.

A. $x_1 = 2, x_2 = -2, x_3 = -1$
B. $x_1 = 2, x_2 = -2, x_3 = 1$
C. $x_1 = 1, x_2 = -1, x_3 = 2$
D. $x_1 = 1, x_2 = -1, x_3 = -2$

Q4. The 12th term of an arithmetic progression is 18, and the sum of the first 12 terms is 288. Find N such that the sum of the first N terms is 0.

A. 43
B. 56
C. 64
D. 72

Q5. The sum of the first two terms of a geometric progression is 21, and the sum to infinity is 28. Find the two possible values of the common ratio, r.

A. ± 1
B. $\pm \frac{1}{2}$
C. $\pm \frac{1}{4}$
D. $\pm \frac{2}{3}$

Q6. Let B be a number that is divisible by both 3 and 16 and has exactly 21 positive divisors. Find the remainder when B is divided by 7.

A. 2
B. 3
C. 4
D. 5

Q7. You have 3 groups of beads: 4 different black beads, 2 different white beads, and 3 different gold beads. Beads of the same color must be kept together. How many different necklaces can you make?

A. 144
B. 172
C. 288
D. 344

Q8. What is the remainder when $555^{555} + 999^{99}$ is divided by 8?

A. 7
B. 5
C. 2
D. 0

Q9. What is the coefficient of the term containing x^4y^6 in the expansion of $(3x^2 - 2y^3)^5$?

A. 0
B. 64
C. 124
D. 164

Q18. What is the remainder when $n\left(n^2-1\right)\left(5n+2\right)$ divide by 24 for all natural values of n.

(Answer: 0)

Q19. ABCD is a trapezoid with bases AB and DC. AB = 14, BC = 4, CD = 10 and AD = 12 are given. Find the area of the trapezoid.

Q10. Find $\lim_{x\to 3} \frac{(x-3)(4x+7)}{4-\sqrt{x+13}}$.

A. 0
B. ∞
C. 76
D. -76

Q11. Cup A is 40% filled with water. Cup B, which is identical to Cup A, is completely filled with a mixed solution containing 70% water and 30% hydrochloric acid. 60% of the content in Cup B is then poured into Cup A. After mixing, 60% of the mixed solution in Cup A is poured back into Cup B. Find the percentage of water in Cup A now.

A. 46%
B. 58%
C. 82%
D. 94%

Q12. Amirah has 2 bottles of jellybeans, A and B. Bottle A has 400 jellybeans while bottle B has 300 jellybeans. 75% of the jellybeans in bottle A are red while the rest are yellow;50% of the jellybeans in bottle B are red while the rest are yellow. If Amirah moves some jellybeans from bottle A to bottle B such that 80% of the jellybeans in bottle A are now red and 40% of those in bottle B are yellow, find the number of jellybeans Amirah moves from bottle A to bottle B.

A. 250
B. 200
C. 156
D. 142

Q13. An arrow is shot upward on a planet. Its height (in meters) after t seconds is given by

$h(t) = 80t - t^2$.

What will be the velocity of the arrow when it strikes the ground?

A. 20
B. 40

C. 80
D. 160

Q14. If $x + \frac{1}{x} = 3$, what is the value of $x^4 + \frac{1}{x^4}$?

A. 43
B. 47
C. 52
D. 56

Q15. The Australian 50 cent coin has the shape of a regular dodecagon, which is a polygon with 12 sides.

Eight of these 50 cent coins will fit exactly on an Australian $10 note as shown. What fraction of the $10 note is not covered?

A. $\frac{1}{2}$
B. $\frac{1}{3}$
C. $\frac{1}{4}$
D. $\frac{2}{3}$

Q16. Solve $\begin{cases} \sqrt{\frac{x+5}{2x-1}} > 2 \\ \frac{4-3x}{\sqrt{40-3x}} < \sqrt{5} \end{cases}$

(Answer: $x \in (\frac{1}{3}, \frac{3}{2})$)

Q17. Find the value of x.

$$\frac{3 - \log_{16} 4}{\log_{16}(x+2)} - 1 = \frac{\log_4(10-x)}{\log_4(x+2)}$$

(Answer: No real solution)

Q18. What is the remainder when $n(n^2-1)(5n+2)$ divide by 24 for all natural values of n.

(Answer: 0)

Q19. A board has 5 permanent and 5 elected members (total 10). A policy is approved if:

1. At least 7 people vote “Yes,”
2. All 5 permanent members vote “Yes.”

Assuming every member votes, how many ways can the policy be approved?

(Answer: 26)

Q20. Find the value of the expression below.

$$\sqrt[3]{26+15\sqrt{3}}+\sqrt[3]{26-15\sqrt{3}}$$

(Answer: 4)