Snow College Jr. Mathematics Contest

April 3, 2018 **Junior Division: Grades 7–9** **Form: T**

Bubble in the single best choice for each question you choose to answer.

1. If $a + b = 3$ and $a^2 + b^2 = 89$, then what is $a^3 + b^3$?
   (A) 307
   (B) 347
   (C) 387
   (D) 507
   (E) Not possible to determine

2. Today €1.00 = \$1.25. If the value of the euro in dollars increases by 10% tomorrow, how many euros will 2.20 dollars be worth?
   (A) €1.50
   (B) €1.58
   (C) €1.60
   (D) €1.76
   (E) €1.94

3. The scale on an architectural floor plan is 1 in : 12 ft. The length of a hallway in the floor plan is 1.75 in. What is the actual length of the hallway?
   (A) 15 ft
   (B) 18 ft
   (C) 21 ft
   (D) 24 ft
   (E) 27 ft

4. A party-length sandwich that is 59 in long is cut into three pieces. The middle piece is 5 in longer than the shortest piece, and the shortest piece is 9 in shorter than the longest piece. How long is the longest piece?
   (A) 24 in
   (B) 20 in
   (C) 15 in
   (D) 59 in
   (E) 29 in

5. If $a \natural b = 2b - a$, then what is $(3 \natural 2) \natural 4$?
   (A) 3
   (B) 5
   (C) 7
   (D) 9
   (E) 11

6. A circle and a square have the same perimeter. Then
   (A) their areas are equal.
   (B) the area of the circle is the greater.
   (C) the area of the square is the greater.
   (D) the area of the circle is π times the area of the square.
   (E) None of these

7. Find the measure of an angle that is both the complement of $\angle A$ and the supplement of $\angle B$ if $m\angle A + m\angle B = 236°$.

   (A) $17°$
   (B) $34°$
   (C) $45°$
   (D) $59°$
   (E) $67.5°$

8. Tau, who loves eating 2 pieces of pi, discovered that when the digits of a three-digit natural number are rearranged to form a second number, the difference between the two numbers is usually divisible by ____.

   (A) 2
   (B) 4
   (C) 5
   (D) 6
   (E) 9

9. KSNO gives traffic reports every 10 minutes, 24 hours a day, but advertises "1000 reports each week." What is the difference between the exact number of reports and the advertised number?

   (A) 8
   (B) 12
   (C) 16
   (D) 20
   (E) 24

10. Convert the repeating decimal into a fraction. After reducing to lowest terms, find the difference between the denominator and the numerator. $0.60\overline{60}$

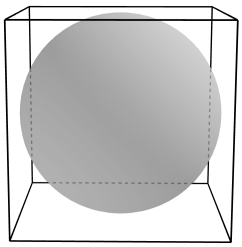
    (A) 13
    (B) 33
    (C) 39
    (D) 47
    (E) 60

11. Laura loves leftovers. On Monday she ate $\frac{1}{4}$ of the leftover lasagna; on Tuesday, $\frac{1}{3}$ of what remained then; on Wednesday, $\frac{1}{2}$ of what remained then; and on Thursday she finishes it off. On what day did she eat more than on any other day?

    (A) Monday
    (B) Tuesday
    (C) Wednesday
    (D) Thursday
    (E) She eats the same amount each day

12. A sphere is inscribed in a cube. What is the ratio of the volume of the sphere to the volume of the cube?

    (A) $\frac{\pi}{6}$
    (B) $\frac{2\pi}{3}$
    (C) $\frac{\pi}{8}$
    (D) $\frac{6}{\pi}$
    (E) $\frac{\pi}{2}$



13. Al and Bob are walking together at the same pace. Al stops to talk to Carl while Bob continues on at the same pace. After conversing with Carl, Al continues on at the same pace as before. He later passes Bob, who stopped to sit on a bench. How long has Bob been sitting on the bench when Al passes by?

    (A) half as long as Al talked to Carl
    (B) exactly as long as Al talked to Carl
    (C) twice as long as Al talked to Carl
    (D) four times as long as Al talked to Carl
    (E) undeterminable

14. The ages of 4 family members are represented by the positive integers a, b, c, and d, where $a < b < c < d$. Their mean age is 34, the median is 33, and the range of ages is 32. What is the value of a?

(A) 12
(B) 14
(C) 16
(D) 17
(E) 19

15. You have an account into which you place S dollars. At the end of each **even** year, you notice that your account has gained 50% in value compared to the previous year. And every **odd** year, your account loses 50% relative to the previous year. You first invest at the start of 2018. What is the value of your investment at the end of 2025?

(A) $\frac{1}{2}S$
(B) S
(C) $\frac{27}{64}S$
(D) $\frac{3}{2}S$
(E) $\frac{81}{256}S$

16. A train traveling at a constant speed takes 25 s from the time that it enters a tunnel 100 m long until the last car exits the tunnel on the other side. The last car is completely in the tunnel 5 s after the first car entered. How long is the train?

(A) 15 m
(B) 20 m
(C) 25 m
(D) 35 m
(E) 50 m

17. How many whole numbers lie between $\sqrt{\pi}$ and π^2?

(A) 4
(B) 5
(C) 6
(D) 7
(E) 8

18. Towns A, B, and C are at the corners of a triangle with equal sides. A car travels at constant speed from A to B at 30 mph, from B to C at 40 mph, and from C back to A at 60 mph. What is the average speed for the round trip?

(A) 40 mph
(B) 43 mph
(C) 45 mph
(D) 48 mph
(E) 50 mph

19. Car A is 2 mi ahead of car B, which is going in the same direction. 8 min later car A is only 1 mi ahead of car B. On average, how much faster is car B traveling?

(A) 5 mph
(B) 7.5 mph
(C) 10 mph
(D) 15 mph
(E) not enough info

20. During shooting practice, a basketball player takes one step closer if she misses a shot, and one step farther away if she makes a shot. After a while, she notices she is two steps farther away than when she began. What is the most we can say about her shooting percentage P (i.e., shots made $\div$ shots taken)?

(A) $25\% < P \leq 50\%$
(B) $P > 50\%$
(C) $P > 67\%$
(D) $P > 75\%$
(E) not enough info