

Snow College Jr. Mathematics Contest

April 5, 2016

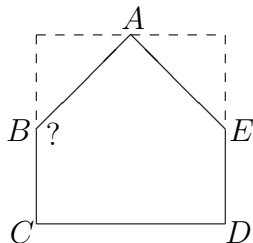
Junior Division: Grades 7–9

Form: **T**

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

1. Home plate on a baseball field has a shape that is a square with two congruent isosceles right triangles removed from adjacent corners. What is the measure of $\angle ABC$?

- (A) 105°
- (B) 110°
- (C) 115°
- (D) 120°
- (E) 135°



2. Using a scale, you find that four tweezers and a bar of soap weigh the same as three combs; a bar of soap weighs the same as two toothbrushes and a comb; and six tweezers weigh the same as one toothbrush and one comb. How many combs are needed to equal the weight of one bar of soap?

- (A) 2
- (B) 4
- (C) 6
- (D) 8
- (E) 10

3. If Gretchen's house is 15 miles due west of Lino's house and 20 miles north of Isaac's house, how far is Lino's house from Isaac's house as the crow flies (direct route)?

- (A) 12 miles
- (B) 25 miles
- (C) 27 miles
- (D) 30 miles
- (E) 32 miles

4. A fountain spouts water from two eyes, a mouth, and a foot. The right eye would fill a specific jar in two days, the left eye in three days, the mouth in six hours, and the foot in four days. To the nearest hour, how long will it take all four of these spouts together to fill the jar?

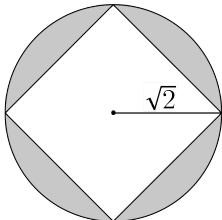
- (A) 2
- (B) 3
- (C) 4
- (D) 5
- (E) 6

5. What is $2^{50} + 2^{50} + 3^{50} + 3^{50} + 3^{50}$?

- (A) 5^{50}
- (B) $2^{51} + 3^{51}$
- (C) 5^{51}
- (D) $2^{100} + 3^{150}$
- (E) 5^{100}

6. Marc owns 7 acres of land. He grows tomatoes on $\frac{5}{6}$ of his land. On how many acres of land does Marc grow tomatoes?

- (A) 5 acres
- (B) $3\frac{1}{2}$ acres
- (C) $4\frac{2}{3}$ acres
- (D) 6 acres
- (E) $5\frac{5}{6}$ acres

7. While cleaning out the garage, Larry found four old single-digit house numbers: one 3, one 4, and two 5s. How many different two-digit house numbers can he create?
- (A) 4
(B) 5
(C) 6
(D) 7
(E) 8
8. What is the measure of an interior angle of a regular heptagon?
- (A) $\frac{900^\circ}{7}$
(B) 140°
(C) $\frac{360^\circ}{7}$
(D) 40°
(E) 120°
9. Consider the equation $x^2 + bx + 2 = 0$. A single, fair, 6-sided die is rolled to determine the value of the middle coefficient b which becomes the number of pips on the upper face of the die. What is the probability that the equation will have real unequal roots?
- (A) $\frac{1}{6}$
(B) $\frac{1}{3}$
(C) $\frac{1}{2}$
(D) $\frac{2}{3}$
(E) $\frac{5}{6}$
10. In 6 years Bill's age will be a perfect square. Six years ago Bill's age was the square root of that perfect square. How old is Bill?
- (A) 6
(B) 8
(C) 10
(D) 12
(E) 14
11. How many ordered triples (x, y, z) of real numbers satisfy the conditions?
- $$xy = z, \quad xz = y, \quad yz = x$$
- (A) 1
(B) 2
(C) 3
(D) 4
(E) 5
12. A square is inscribed in a circle with radius $\sqrt{2}$. Find the area of the region of the circle not included in the square.
- (A) $2\sqrt{2}\pi - 4$
(B) $\pi^2 - 2$
(C) $2\pi - 4$
(D) $2\pi - 2$
(E) $4 - 2\pi$
- 
13. $\frac{68}{77} = \frac{a}{7} + \frac{b}{11}$, $0 < a < 7$, $0 < b < 11$
What is $a + b$?
- (A) 6
(B) 8
(C) 11
(D) 17
(E) $8\sqrt{5}$
14. Find the area, in square units, of the quadrilateral $SNOW$ where $S = (-2, 4)$, $N = (3, 4)$, $O = (0, 0)$, and $W = (-5, 0)$.
- (A) 20
(B) 18
(C) 25
(D) $8\sqrt{5}$
(E) $16\sqrt{2}$

15. The stem and leaf plot shows the scores of the last test in Mr. Newton's math class. Which statement about the scores is true?

stem	leaf
9	2 5 8
8	0 0 1 3 4 7 7 9
7	5 8 8
6	3 6

- (A) More than 50% scored above an 80.
 (B) The highest score was a 92.
 (C) The median score was an 80.
 (D) The range of scores was 50.
 (E) The mode score was 81.
16. Two objects are topologically equivalent if we can stretch, shrink, bend, or twist one, without cutting or gluing, and deform it into the other. Which is equivalent to **F**?
- (A) **G**
 (B) **L**
 (C) **W**
 (D) **X**
 (E) **Y**
17. At the G8 summit, the top leaders of 8 nations meet to discuss crucial political topics. If each of the 8 leaders formally greets the other 7 leaders with a handshake, how many handshakes take place?
- (A) 7
 (B) 8
 (C) 28
 (D) $7! = 5040$
 (E) $8! = 40320$

18. Blims vary inversely as yops squared. If 100 blims go with 2 yops, how many blims go with 10 yops?

- (A) 2
 (B) 4
 (C) 200
 (D) 400
 (E) 2500

19. Evaluate. $(1 + i)^2$

- (A) $-2 - i$
 (B) $-1 + i$
 (C) $2i$
 (D) $1 - 2i$
 (E) $2 + 2i$

20. The lines $2x - y = a$ and $y - a = b$ intersect at the point (p, q) . Find q .

- (A) $a + b$
 (B) $2a + b$
 (C) $a - b$
 (D) $a + 2b$
 (E) $2a - b$