1. If $y = 2x$ and $z = 2y$, then $x + y + z$ equals:
   A) x B) $3x$ C) $5x$ D) $7x$ E) $9x$

2. The diagonal of square I is $a + b$. The perimeter of square II with twice the area of square I is:
   A) $(a+b)^2$ B) $\sqrt{2}\,(a+b)^2$ C) $2\,(a+b)$ D) $\sqrt{8}\,(a+b)$ E) $4\,(a+b)$

3. What is the $y-$intercept of the line passing through $\left(\sqrt{2}, 1\right)$ and $(-2, 2)$?
   A) 1 B) 1.5 C) $\sqrt{2}$ D) $\sqrt{3}$ E) $5 - 1$

4. For $x > 0$, $y > 0$, and $b > 0$ where $b \neq 1$ and $y \neq 1$, let $\log_b x = m$ and $\log_b y = n$. Three of the following statements are true. Which one is, in general, not true?
   A) $\log_b xy = nm$ B) $\log_b x^p = pm$ C) $\log_y x = \dfrac{m}{n}$ D) $\log_b \dfrac{x}{y} = m - n$

5. How many real solutions has the equation $\left|x^2 - 6x\right| = 9$?
   A) 0 B) 1 C) 2 D) 3 E) 4

6. Find the area of the triangle with vertices $(-3, 1)$, $(1, 2)$, and $(2, -1)$.
   A) 6 B) $\dfrac{13}{2}$ C) 7 D) $\dfrac{15}{2}$ E) 8

7. Find the positive number x for which $\sqrt{x} = \sqrt[3]{y}$ and $\sqrt{y} = 8$.
   A) 2 B) $2\sqrt{2}$ C) 4 D) 16 E) 64

8. When the three-digit numbers $6a3$ and $2b5$ are added together, the answer is a number divisible by 9. The largest value of $a + b$ is:
   A) 2 B) 9 C) 11 D) 17 E) 20

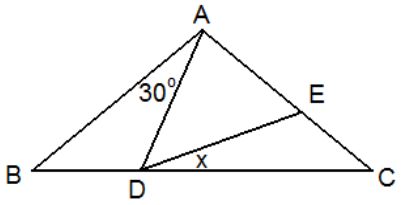
9. Find the real part of $\dfrac{i}{1 + \dfrac{i}{1 + \dfrac{i}{1+i}}}$
   A) $-\dfrac{1}{4}$ B) $\dfrac{1}{3}$ C) $\dfrac{4}{5}$ D) $\dfrac{2}{3}$ E) none of these

10. The solution of the equation $\dfrac{\sqrt{x+1} + \sqrt{x-1}}{\sqrt{x+1} - \sqrt{x-1}} = 3$ is:
    A) 3 B) $\dfrac{3}{5}$ C) $\dfrac{4}{5}$ D) $\dfrac{5}{4}$ E) $\dfrac{5}{3}$

11. Which of the following describes the asymptotes for the hyperbola $\dfrac{(x-8)^2}{16} - \dfrac{(y-3)^2}{4} = 1$
    A) $y - 3 = \pm\dfrac{1}{2}(x-8)$ B) $y - 1 = \pm\dfrac{3}{8}(x-2)$ C) $y + 2 = \pm\dfrac{3}{8}(x-4)$
    D) $y - 1 = \pm\dfrac{1}{2}(x-2)$ E) $y + 2 = \pm\dfrac{1}{4}(x-4)$

12. $\sin y + \sin(x - y) = \sin x$ for all y provided that x is:
    A) $60°$ B) $90°$ C) $180°$ D) $270°$ E) $360°$

13. In the figure $\overline{AB} = \overline{AC}$, angle $BAD = 30°$, and $\overline{AE} = \overline{AD}$. Then x equals:



A) $7\frac{1}{2}^\circ$ B) $10°$ C) $12\frac{1}{2}^\circ$ D) $15°$ E) $20°$

14. Of the following, which fraction is an integer multiple of each of the fractions $\frac{6}{7}$, $\frac{5}{14}$, $\frac{10}{21}$?

A) $\frac{7}{30}$ B) $\frac{7}{15}$ C) $\frac{15}{7}$ D) $\frac{30}{7}$ E) $\frac{80}{21}$

15. Fifteen billiard balls are lying on a table in such a way that they are just squeezed inside an equilateral triangular frame whose inside perimeter is 876. The radius of a billiard ball is:

A) $\frac{73}{2}$ B) $\frac{146}{4+\sqrt{3}}$ C) $\frac{146}{2+\sqrt{3}}$ D) $\frac{146}{3+\sqrt{3}}$ E) none of these

16. The least positive integer which has reminders 1, 1, and 5 when divided by 3, 5, and 7 respectively, is:

A) 166 B) 151 C) 145 D) 131 E) none of these

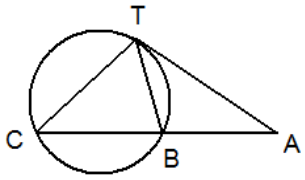
17. Each valve A, B, and C, when open, releases water into a tank at its own constant rate. With all three valves open, the tank fills in one hour, with only valves A and C open it takes 1 hour and 20 minutes, and with only valves B and C open it takes 2 hours. The time it takes to fill the tank with only valves A and B open is:

A) $\frac{2}{3}$ hr B) $\frac{4}{3}$ hr C) $\frac{3}{2}$ hr D) 2 hr E) $\frac{9}{4}$ hr

18. In how many different arrangements can a careless office boy place 5 letters into 5 mailboxes so that no one gets the right letter?

A) 32 B) 44 C) 60 D) 120 E) 225

19. In the given diagram, points B, C, and T are on the circle, and AT is tangent to the circle at T If $AB = 3$ and $BC = 4$, find $\frac{AB + AT}{AT + AC}$.



20. Find the limiting value of $\frac{1}{9} + \frac{3}{27} + \frac{5}{81} + \frac{7}{243} + ... + \frac{2k-1}{3^{k+1}}$