1. Add *this* to *that*, divide by three; the square of *this* of course you'll see.
But *that* to *this* is eight to one; so find what *this* is, and you're done.

A. 3 B. 9 C. $\frac{1}{3}$ D. 0 E. two of the preceding

2. If the point S is the reflection of the point (2,-3) in the x-axis, and the point T is the reflection of the point (2,-3) in the y-axis, the equation of the line determined by S and T is

A. $y = \frac{3}{2}x$ B. $y = \frac{2}{3}x$ C. $y = \frac{3}{2}x - 6$ D. $y = -\frac{3}{2}x$ E. $y = -\frac{2}{3}x$

3. The solution to $|5 - 2x| \le 2001$ is contained in which of the following intervals?

A. $(-\infty,-2001]$ B. $[2001,+\infty)$ C. $[-1001,1001]$ D. $[-2001,1000]$ E. $[-1000,2001]$

4. If the sine of an acute angle is $\frac{2}{3}$, the cotangent of its supplement is

A. $\frac{\sqrt{5}}{2}$ B. $-\frac{\sqrt{5}}{2}$ C. $\frac{3\sqrt{5}}{5}$ D. $-\frac{2\sqrt{5}}{5}$ E. $-\frac{3\sqrt{5}}{5}$

5. For the quadratic function $f(x) = ax^2 + bx + c$, $f(0) = 3$, $f(2) = 0$, and $f(4) = 1$. Then $a + b + c =$

A. -1 B. 0 C. 1 D. 2 E. 3

6. The domain of the rational function $Q(x) = \dfrac{x^2 - 3x + 2}{x^3 + x^2 - 4x - 4}$ is all real numbers EXCEPT

A. -1 B. 2 C. -1 or 2 D. -2 or 2 E. -1, -2, or 2

7. A triangle with sides of length 8, 15, and 17 is inscribed in a circle (that is, the vertices of the triangle all lie on the circle). The radius of the circle is

A. 7.5 B. 8.5 C. 9 D. 17 E. not determined

8. The letters of AMATYC are replaced by distinct digits from 0 to 9 (so that different letters represent different digits). If the 3-digit integer AMA is a perfect cube, and the 3-digit integer TYC is a perfect square divisible by 12, what is A + M + A + T + Y + C?

A. 19 B. 21 C. 25 D. 28 E. 37

9. For how many different integer values of b does $2x^2 - bx - 36 = 0$ have rational solutions?

A. 2 B. 4 C. 6 D. 8 E. 12

10. In parallelogram BCDE, BC = 6 and CD = 9. Let A be a point on the line through B and C with B between A and C such that $\angle A = \angle CDA$. If F is the point where the line through A and D intersects the line through B and E, then EF =

A. 2 B. 3 C. 4 D. 6 E. 8

11. Cassie and Matt are in a boat with water beginning to leak in at 10 gal/min. Thirty gallons of water will sink the boat. If Matt paddles to shore half a mile away at 4 mph, what is the slowest rate Cassie must bail to make it to shore?

A. 2 gal/min B. 3 gal/min C. 5 gal/min D. 6 gal/min E. 8 gal/min

12. A chord of length 12 mm in a circle determines an arc whose midpoint (the point which divides the arc into two equal arcs) is 4 mm from the midpoint of the chord. To the nearest 0.1 mm, the radius of the circle is

A. 6.2 B. 6.3 C. 6.4 D. 6.5 E. 6.6

13. If the expression a + b * c ^ d is parenthesized in every possible way, how many distinct values occur for $a = 3$, $b = 4$, $c = -1$ and $d = 2$?

A. 2 B. 3 C. 4 D. 5 E. 6

14. A farmer has exactly enough trees to plant 8 equal rows. One tree dies, but she finds she can now plant 9 equal rows. Another tree is stolen, but now she can plant 10 equal rows. If she plants the smallest possible number of trees, what other number of equal rows could she have planted originally?

A. 7 B. 11 C. 13 D. 17 E. 19

15. In regular octagon PQRSTUVW, the area of the region bounded by the rectangle PSTW is what fraction of the area bounded by the entire octagon?

A. $\frac{1}{2}$ B. $\frac{7}{12}$ C. $\frac{3}{5}$ D. $\frac{2}{3}$ E. it depends on the octagon

16. The graph of the equation $x + y = x^3 + y^3$ is

A. two oblique lines B. a vertical line and a parabola

C. a vertical line and a hyperbola D. An oblique line and a parabola

E. an oblique line and an ellipse

17. If n positive integers have a sum of 10, what is the maximum possible value of their product?

A. 30 B. 32 C. 36 D. 40 E. 45

18. Sue owns 11 pairs of shoes, 6 identical black pairs, 3 identical brown pairs, and 2 identical gray pairs. If she randomly picks 2 shoes, the probability that she has a matching pair (a right and a left of the same color) is

A. $\frac{2}{11}$ B. $\frac{7}{33}$ C. $\frac{3}{11}$ D. $\frac{1}{3}$ E. $\frac{4}{11}$

19. ΔABC has right angle C, and ΔABE has right angle E. If $AB = 65$, $AE = 25$, $BC = 39$, and $\overline{BE}$ and $\overline{AC}$ intersect at D, the area a of pentagon ABCDE satisfies

A. $a < 1000$ B. $1000 \le a < 1100$ C. $1100 \le a < 1200$ D. $1200 \le a < 1300$ E. $a \ge 1300$

20. Two hikers walking at the same rate leave a camp at the same time, one going due north, the other due east. After each has gone a mile, the northbound camper turns 15° clockwise and the eastbound hiker turns 15° counterclockwise. They repeat these 15° turns after each successive mile until they meet again. To the nearest 0.1 mile, how far from camp are they at that time?

A. 4.3 mi B. 5.0 mi C. 5.5 mi D. 6.1 mi E. 7.1 mi