

1. Hiromi buys a TV in Oregon (where there is no sales tax) and receives a 13% discount on the list price. Later she sees an ad offering a 19% discount. If the store agrees to refund the difference and Hiromi gets \$21 back, what is the TV's list price?
- A. \$300      B. \$320      C. \$325      D. \$330      E. \$350
2. What is the coefficient of  $x^2$  in the expansion of  $(x^2 + 3x - 1)^2$ ?
- A. -2      B. -1      C. 2      D. 7      E. 9
3. Find the sum of the values of  $x$  for which  $\frac{x-2}{x^2-4x+3}$  is undefined.
- A. 3      B. 4      C. 5      D. 6      E. 7
4. The lines with equations  $ax + by = c$  and  $dx + ey = f$  are perpendicular ( $a, b, c, d, e, f$  constants). Which of the following must be true?
- A.  $ad - be = 0$       B.  $ad + be = -1$       C.  $ae + bd = -1$       D.  $ae + bd = 0$       E.  $ad + be = 0$
5. A palindrome is a word or a number (like RADAR or 1221) which reads the same forwards and backwards. If dates are written in the format MMDDYY, how many dates in the 21<sup>st</sup> century are palindromes?
- A. 1      B. 12      C. 24      D. 36      E. 144
6. In square ABCD, E is the midpoint of CD. Suppose AE intersects BD at F and the extension of side BC at G. If  $AF = 2005$  and  $EF = 1000$ , find EG.
- A. 1000      B. 2000      C. 2005      D. 3005      E. 4010
7. For positive values of  $x$  for which  $\text{Sec}^{-1}(x)$  is in the first quadrant,  $\text{Sec}^{-1}(x) =$
- A.  $\frac{1}{\text{Cos}^{-1}(x)}$       B.  $\sec\left(\frac{1}{x}\right)$       C.  $\cos(x)$       D.  $\cos\left(\frac{1}{x}\right)$       E.  $\text{Cos}^{-1}\left(\frac{1}{x}\right)$
8. Mrs. Abbott finds that the number of possible groups of 3 students in her class is exactly five times the number of possible groups of 2 students. How many students are in her class?
- A. 15      B. 17      C. 20      D. 22      E. 25
9. In how many ways can slashes be placed among the letters AMATYCSML to separate them into four groups with each group including at least one letter?
- A. 28      B. 56      C. 70      D. 84      E. 112
10. Two motorists set out at the same time to go from Danbury to Norwich, 100 miles apart. They follow the same route and travel at different but constant speeds of an integral number of miles per hour. The difference in their speeds is a prime number of miles per hour, and after driving for two hours, the distance of the slower car from Danbury is five times that of the faster car from Norwich. What is the faster car's speed?
- A. 40 mph      B. 42 mph      C. 44 mph      D. 46 mph      E. 48 mph

11. The sum  $\cos 1^\circ + \cos 2^\circ + \cos 3^\circ + \dots + \cos 357^\circ + \cos 358^\circ + \cos 359^\circ$  is equal to
- A.  $\frac{p}{2}$       B.  $p$       C.  $0$       D.  $1$       E.  $-1$
12. If  $M = \begin{bmatrix} 0 & 2 \\ 5 & 0 \end{bmatrix}$  and  $N = \begin{bmatrix} 0 & 5 \\ 2 & 0 \end{bmatrix}$ , find  $M^{2005}$ .
- A.  $10^{1002} M$       B.  $10^{1002} N$       C.  $10^{2004} M$       D.  $10^{2004} N$       E.  $10^{2005} M$
13. A basketball team scores 78 points on 41 baskets (field goals count 2 points, free throws 1 point, and 3-point shots 3 points). If the number of each type of basket is different, and the number of baskets of any two types differs by no more than 4, how many field goals are scored?
- A. 11      B. 12      C. 13      D. 14      E. 15
14. Which of the following is a factor of  $(10^{2005} + 1)^2 + (10^{2005} + 2)^2 - (10^{2005})^2$ ?
- A.  $10^{2005} - 1$       B.  $10^{2005} + 3$       C.  $10^{2005} + 4$       D.  $10^{2005} + 5$       E.  $10^{2005} + 6$
15. The volume of cylinder A is  $108p$ , which is twice the volume of cylinder B. If the radius and height of A are the height and radius respectively of B, find the height of cylinder B.
- A. 3      B. 4      C. 6      D. 9      E. 12
16. In how many ways can nine identical dominos ( $2 \times 1$  rectangles) be used to exactly cover a  $3 \times 6$  rectangle with no overlap? Assume two coverings are different if the nine dominos are not in exactly the same positions.
- A. 27      B. 31      C. 35      D. 41      E. 47
17. Two triangular regions are formed in the first quadrant, one with vertices  $(0,0)$ ,  $(5,0)$ , and  $(0,12)$ , the other with vertices  $(0,0)$ ,  $(8,0)$ , and  $(0,6)$ . Find the area to the nearest integer of the region they have in common.
- A. 15      B. 17      C. 19      D. 21      E. 23
18. A triangle has sides of length  $a$ ,  $b$ , and  $c$ , which are consecutive integers in increasing order, and  $\cos C = \frac{5}{16}$ . Find  $\cos A$ .
- A.  $\frac{5}{8}$       B.  $\frac{7}{11}$       C.  $\frac{13}{20}$       D.  $\frac{2}{3}$       E.  $\frac{11}{16}$
19. If  $p > 5$  is a prime number, what is the largest integer which must be a factor of  $p^4 - 1$ ?
- A. 120      B. 150      C. 180      D. 240      E. 400
20. The circumference of a triangle is the radius of the circle which contains all three of the triangle's vertices. The length of the circumference of the triangle with sides of length 193, 194, and 195 is a rational number. Find this length to the nearest tenth.
- A. 112.0      B. 112.1      C. 112.2      D. 112.3      E. 112.4