

1. If the side of one square is the diagonal of a second square, what is the ratio of the area of the first square to the area of the second?
 - (a) $\sqrt{2}$
 - (b) $2\sqrt{2}$
 - (c) $\frac{1}{2}$
 - (d) 2
 - (e) 4

2. If $y = x^2$ and $x^y \cdot y^x = x^w$ for $x > 0$, then, in terms of x , $w =$
 - (a) $x^2 + 2x$
 - (b) $x^2 + x + 2$
 - (c) $x^2 + 2^x$
 - (d) $2x^2$
 - (e) $2x^3$

3. How many integers greater than ten and less than one hundred, written in base ten notation, are increased by nine when their digits are reversed?
 - (a) 0
 - (b) 1
 - (c) 8
 - (d) 9
 - (e) 10

4. If two factors of $2x^3 - hx + k$ are $x + 2$ and $x - 1$, then the value of $|2h - 3k|$ is
 - (a) 4
 - (b) 3
 - (c) 2
 - (d) 1
 - (e) 0

5. Which statement is correct?
 - (a) If $x < 0$, then $x^2 > x$
 - (b) If $x^2 > 0$, then $x > 0$
 - (c) If $x^2 > x$, then $x > 0$
 - (d) If $x^2 > x$, then $x < 0$
 - (e) If $x < 1$, then $x^2 < x$

6. The sum of the first eighty positive odd integers subtracted from the sum of the first eighty positive even integers is
- (a) 0 (b) 20 (c) 40 (d) 60 (e) 80
7. Let x_1 and x_2 be such that $x_1 \neq x_2$ and $3x_i^2 - hx_i = b, i = 1, 2$. Then $x_1 + x_2$ equals
- (a) $-h/3$
(b) $h/3$
(c) $b/3$
(d) $2b$
(e) $-b/3$
8. Let $f(t) = \frac{t}{1-t}, t \neq 1$. If $y = f(x)$, then x can be expressed as:
- (a) $f(\frac{1}{y})$
(b) $-f(y)$
(c) $-f(-y)$
(d) $f(-y)$
(e) $f(y)$
9. If N , written in base 2, is 11000, the integer immediately preceding N , written in base 2, is:
- (a) 10001
(b) 10010
(c) 10011
(d) 10110
(e) 10111
10. In the figure shown to the right, if the degree measures of the angles are shown, then $x + y =$
- (a) 190 (b) 170 (c) 80 (d) 50 (e) 30

11. The arithmetic mean of the fifty-two successive positive integers beginning with 2 is:
- (a) 27 (b) $27\frac{1}{4}$ (c) $27\frac{1}{2}$ (d) 28 (e) $28\frac{1}{2}$
12. In a class of 15 students, there are 7 girls, 6 honor students, and 11 students who are either boys or honor students. How many girls are honor students?
- (a) 1
(b) 2
(c) 3
(d) 4
(e) 5
13. The unit digit in the number 2^{356} is
- (a) 0 (b) 2 (c) 4 (d) 6 (e) 8
14. If $x < -2$, then $|1 - |1 + x||$ equals
- (a) $2 + x$
(b) $-2 - x$
(c) x
(d) $-x$
(e) -2
15. A solution to the equation $2^{2x} - 8 \cdot 2^x + 12 = 0$ is $x =$ (note: $\log = \log_{10}$).
- (a) $\log 3$
(b) $\frac{1}{2} \log 6$
(c) $1 + \log \frac{3}{2}$
(d) $1 + \frac{\log 3}{\log 2}$
(e) None of these.

16. If s varies inversely as the square of t and if $s = 9$ when $t = 4$, then when $t = 3$, $s =$
- (a) 12
 - (b) 16
 - (c) 6
 - (d) $25/4$
 - (e) None of the above.
17. The number of distinct ordered pairs (x, y) , where x and y have positive integral values satisfying the equation $x^4y^4 - 10x^2y^2 + 9 = 0$, is:
- (a) 0
 - (b) 3
 - (c) 4
 - (d) 12
 - (e) infinite.
18. An urn contains 12 red and 16 blue marbles. Two marbles are drawn in succession, without replacing the first marble. What is the probability that both drawn are red?
- (a) $\frac{33}{196}$
 - (b) $\frac{16}{49}$
 - (c) $\frac{9}{16}$
 - (d) $\frac{11}{63}$
 - (e) None of the above.
19. AB is a diameter of a circle centered at O. Let C be a point on the circle such that angle BOC is 60° . If the diameter of the circle is 5 inches, then the length of the chord AC in inches is:
- (a) 3
 - (b) $\frac{5\sqrt{2}}{2}$
 - (c) $\frac{5\sqrt{3}}{2}$
 - (d) $\frac{3}{\sqrt{3}}$
 - (e) None of these.

20. A rope 13 feet long is fastened to the top of a pole 12 feet high. If a cow is tied to the other end of the rope, over how much ground can she graze?
- (a) 25π sq. ft.
 - (b) 12π sq. ft.
 - (c) 9π sq. ft.
 - (d) $\frac{25}{9}\pi$ sq. ft.
 - (e) None of the above.
21. If $\tan x = \frac{2ab}{a^2-b^2}$, where $a > b > 0$ and $0 < x < 90^\circ$, then $\sin x$ is equal to
- (a) $\frac{a}{b}$
 - (b) $\frac{b}{a}$
 - (c) $\frac{\sqrt{a^2-b^2}}{2a}$
 - (d) $\frac{\sqrt{a^2-b^2}}{2ab}$
 - (e) $\frac{2ab}{a^2+b^2}$
22. If $x = 1 + 2^p$ and $y = 1 + 2^{-p}$, then y in terms of x is:
- (a) $\frac{x+1}{x-1}$
 - (b) $\frac{x+2}{x-1}$
 - (c) $\frac{x}{x-1}$
 - (d) $2 - x$
 - (e) $\frac{x-1}{x}$

23. If a number N , $N \neq 0$, decreased by four times its reciprocal, equals a given real constant R , then, for this given R , the sum of all such possible values of N is:
- (a) $\frac{1}{R}$
 - (b) R
 - (c) 4
 - (d) $\frac{1}{4}$
 - (e) $-R$
24. The bases of an isosceles trapezoid are 7 and 15. Each base angle is 45° . Find the area of the trapezoid.
- (a) 44
 - (b) 88
 - (c) 420
 - (d) 105
 - (e) None of the above.
25. The shaded region of the xy -plane shown here is the graph of the solution set for:
- (a) $|x + y| > 1$
 - (b) $|x| + 1 > y$
 - (c) $1 - |x| < y$
 - (d) $y > |x - 1|$
 - (e) none of the above