The University Interscholastic League
Number Sense Test, Series XX-B

Contestant's Number _____ Contestant's Score _____

Read Directions Carefully Before Beginning Test

Do Not Unfold This Sheet Until Told To Begin

DIRECTIONS: Do not turn this page until the person conducting this test gives the signal to begin. This is a ten-minute test. There are 80 problems. Solve accurately and quickly as many as you can in the order in which they appear. ALL PROBLEMS ARE TO BE SOLVED MENTALLY. Make no calculations with paper and pencil. Write only the answer in the space provided at the end of each problem. Problems marked with a (*) require approximate integral answers; any answer to a starred problem that is within five per cent of the exact answer will be scored correct; all other problems require exact answers.

The person conducting this contest should explain these directions to the contestants.

Stop - Wait for Signal!

(1) $1991 - 981 + 17 =$ _____.

(2) $12 \times 23 =$ _____.

(3) $25 \times 52 =$ _____.

(4) $73^2 =$ _____.

(5) $14 \div 2 \times 14 + 14 =$ _____.

(6) $3\frac{1}{4} - 1\frac{5}{8} =$ _____ (mixed number).

(7) $1122 \div 11 =$ _____.

(8) The largest prime divisor of 42 is _____.

(9) $75 \times 52 =$ _____.

*(10) $401 \times 799 =$ _____.

(11) Which is larger $\frac{-2}{7}$ or $\frac{3}{-8}$? _____.

(12) $\frac{9}{2(5^3)} =$ _____ (decimal).

(13) $28\frac{3}{4}\% =$ _____ (fraction).

(14) $(7 + 8)(37 + 8) =$ _____.

(15) How far do you travel in 2 hours 20 minutes at a constant speed of 45 mph? _____ miles.

(16) $19\frac{1}{2} \div 2\frac{1}{2} =$ _____ (improper fraction).

(17) The average of 58, 73, 64, 81 and 54 is _____.

(18) $5\frac{3}{5}$ is what percent less than 8? _____ %.

(19) Which is smaller, .27 or $\frac{7}{26}$? _____.

*(20) $31017 \div 147 =$ _____.

(21) How many seconds in a day (24 hours)? _____.

(22) $(45 \times 70) - (13 \times 30) =$ _____.

(23) 15 + 15% of 30 is _____.

(24) $345_6 =$ _____ 10.

(25) The sum of the roots of $x^2 + 2x - 1 = 0$ is _____.

(26) .3484848... = _____ (fraction).

(27) If a car can travel 20 miles on a gallon of gasoline and if gas costs $.90 a gallon, how much will the gas cost to travel 840 miles? $ _____.

(28) $f(x) = x^4 + 2x^2 + 1$, evaluate f (-3). _____.

(29) If x = 12 and y = 3, then $(y \cdot x)^3 =$ _____.

*(30) A ranch consists of 62,500 acres. How many square miles does it contain? (640 acres = 1 square mile) _____.

(31) $53 \times 57 =$ _____.

(32) $(34_5)(10_5) =$ _____ 5.

(33) Find the smaller of two integers whose product is 65 and whose sum is 18. _____.

(34) $8^4 - 6^4 =$ _____.

(35) Of 241 girls in a school, 158 play tennis and 166 play basketball. If 28 play neither, how many play both? _____.

(36) $5\frac{1}{4} \times 5\frac{3}{4} =$ _____ (mixed number).

(37) Find the smallest number greater than 4 that 968 is divisible by. _____.

(38) If $2^{2x} = 16$, then x = _____.

(39) The side of an equilateral triangle is 8, its altitude is _____.

*(40) $(299 \times 98)^2 \div (98 \times 150)$ = _____.

(41) If $3^{x+y} = 81$ and $3^{x-y} = 1$, then x = _____.

(42) The legs of a right triangle are $2\frac{1}{2}$ and 6. Find the hypotenuse. _____ (decimal).

(43) If $x^2 + 12x + b$ is a trinomial square, then b = _____.

(44) If a circle with radius 2 is inscribed in a square, the perimeter of the square is _____.

(45) $\frac{1}{5}$ mile = _____ feet.

(46) 101×102 = _____.

(47) A 5 tooth gear meshes with a 7 tooth gear. How many revolutions does the 7 tooth one turn when the 5 tooth one revolves 21 times? _____.

(48) 24×84 = _____.

(49) The y coordinate of the midpoint of the line segment with endpoints (2,2) and (4,-11) is _____.

*(50) 142857×13 = _____.

(51) A pair of dice is rolled. Find the probability that the sum is not 2, 12 or 7. _____.

(52) If $2^x = 9.19$, then 2^{x+1} = _____.

(53) If $\sqrt{2x - 5} = 3$, then x = _____.

(54) 98×103 = _____.

(55) $2\cos^2 40^0 - 1 = \cos$ _____ ^{0}.

(56) $\sec(\text{Cos}^{-1}\frac{2}{5})$ = _____.

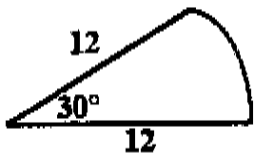
(57) $462_8 \div 22_8$ = _____ $_8$.

(58) If two cards are drawn from a standard deck, without replacement, what is the probability that neither card is a face card? _____.

(59) $|2 + 5i|$ = _____.

*(60) The volume of a sphere whose diameter is 30 is $k\pi$ and k = _____.

(61) In the drawing the arc length is $k\pi$.



k = _____.

(62) $\frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \ldots$ = _____.

(63) A die is rolled. The top face shows a 2. The bottom face shows a _____.

(64) $2 + 7 + 12 + 17 + \ldots + 42$ = _____.

(65) If $\log_7 x^2 = 4$ and $x > 0$, then x = _____.

(66) $(2 - i)^2$ = _____.

(67) $\det \begin{vmatrix} 3 & 7 \\ 5 & 9 \end{vmatrix}$ = _____.

(68) If $f(x) = 3x + 1$, then $f[f(3)]$ = _____.

(69) If the surface area of a cube is multiplied by 2, its volume is multiplied by _____.

*(70) $[2 \times 3 \times 5 \times 7 \times 9]^2$ = _____.

(71) Find the slope of the line tangent to $y = 4x^2 + 3x^3 + 2$ at $x = -2$. x = _____.

(72) Change $\frac{9}{16}$ to a base 4 decimal. _____.

(73) $\lim_{x \to 1} (4x - 2)$ = _____.

(74) The horizontal asymptote of $y = \frac{2x + 1}{x - 3}$ is y = _____.

(75) $\lim_{x \to \infty} \frac{3x}{x - 1}$ = _____.

(76) The largest possible value of $f(x) = 3x - 6x^2$ is _____.

(77) $\lim_{x \to 1} \frac{\sqrt{x} - 1}{x - 1}$ = _____.

(78) $\int_0^1 (-x)^3 \, dx$ = _____.

(79) $f'(x) = 2$, $f(0) = 1$, find $f(x)$. _____.

*(80) The perimeter of the ellipse $16x^2 + 25y^2 = 400$ is _____.