The University Interscholastic League
Number Sense Test • HS Invitational B • 2009

Final _____ _____
2nd _____ _____
1st _____ _____
Score Initials

Contestant's Number _____

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 percent 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) $2009 - 9002 =$ _____

(2) $2.009 + 20.09 + 200.9 =$ _____ (decimal)

(3) $\frac{5}{6} \times 1\frac{1}{5} =$ _____

(4) $4.8 \div \frac{2}{5} =$ _____

(5) $2\frac{3}{4}\ \% =$ _____ (proper fraction)

(6) $22 \times 38 =$ _____

(7) $10 - 8 + 6 \times 4 \div 2 =$ _____

(8) 30% of 40 minus 50% of 60 is _____

(9) $28^2 =$ _____

*(10) $20.09 \times 200.9 - 2009 =$ _____

(11) $36 \div 75 =$ _____ (decimal)

(12) Which is larger, $3\frac{1}{6}$ or 3.16? _____

(13) $(-2)(-4) - (-6) + (-8) =$ _____

(14) 4.25 feet equals _____ inches

(15) 1 quart plus 2 pints _____ fluid ounces

(16) $6 + 10 + 14 + 18 + 22 + 26 + 30 =$ _____

(17) CDLX + XCVI = _____ (Arabic Numeral)

(18) The mean of 24, 17, 31, & 38 is _____

(19) The sum of the prime numbers less than or equal to 13 is _____

*(20) $\sqrt{1158} \times 34 =$ _____

(21) $9^3 =$ _____

(22) The product of x and 6 gives the same result as the sum of x and 10. Find x. _____

(23) $\left|-5-\left|-3\right|-7\right| =$ _____

(24) $(5^3 + 4^2 \times 3^1) \div 6$ has a remainder of _____

(25) $24^2 + 38^2 =$ _____

(26) 135 base 8 is equivalent to _____ base 10

(27) $(4)^{-1} \div (4)^{-2} \times (4)^{-3} =$ _____

(28) $f(x) = 4x^2 + 12x + 9$. $f(-8) =$ _____

(29) $2 + 1 + 3 + 4 + 7 + \ldots + 29 =$ _____

*(30) $63 \times 55 + 47 \times 55 =$ _____

(31) Let $x = 2y$, $y = 3z$, and $z = -1$. Find xyz. _____

(32) If $x > 1$ and $x^3 = \sqrt{4x^4 + 4x^4 + 4x^4 + 4x^4}$ then $x =$ _____

(33) If $x - 3 = -5$ and $y - 1 = -3$ then $xy =$ _____

(34) $11.090909\ldots + 33.272727\ldots =$ _____

(35) A square has a diagonal of $4\sqrt{2}$ cm. The perimeter of the square is _____ cm

(36) $321 \times 12 =$ _____

(37) $8 \times 4! - 12 \times 3! =$ _____

(38) $1^2 + 1^2 + 2^2 + 3^2 + 5^2 + 8^2 + 13^2 =$ _____

(39) If $8x^3 - 18x^2 - 17x = 3$ and P, Q, & R are the real roots, then PQ + QR + PR is _____

*(40) $\sqrt[3]{1730} \times \sqrt{223} \times 18 =$ _____

(41) $48 \times 0.1875 =$ _____

(42) The slope of the line containing the points $(-3, 4)$ and $(4, -5)$ is _____

(43) If $7^x = 147$ then $7^{(x-2)} =$ _____

(44) $91 \times 98 =$ _____

(45) Let $3x - y = 1$ and $x - 2y = 2$. Find y = _____

(46) The leg opposite the 30° angle in a right triangle is 3.5 cm. The hypotenuse is _____ cm

(47) If $xy = 6$ and $x - y = 5$ then $x^3 - y^3 =$ _____

(48) $\frac{7}{11} - \frac{69}{111} =$ _____

(49) $5^3 \times 2^5 =$ _____

*(50) $12^4 \div 6^3 \times 3^2 =$ _____

(51) $555 \times \frac{5}{37} =$ _____

(52) $246_8 - 57_8 =$ _____ 8

(53) How many 4-element subsets does the set { m, o, n, d, a, y } have? _____

(54) If $\log_5 (x) = -3$ then x = _____

(55) $(1 - 3i)(2 - 4i) = (a + bi)$. Find a + b. _____

(56) The smaller root of $11x^2 + 18x + 7 = 0$ is _____

(57) The area of $(x + 1)^2 + y^2 = 1$ is $k\pi$. k = _____

(58) ${}_7C_3 + {}_7C_4 =$ _____

(59) $80 + 60 + 45 + 33.75 + \ldots =$ _____

*(60) $19^4 =$ _____

(61) $25^3 - 24^3 =$ _____

(62) The Greatest Integer Function is written as $f(x) = [x]$. Find $[1 - 2\pi]$. _____

(63) $56^2 =$ _____

(64) If $\log_x 4 + \log_x 4 = 4$ then x = _____

(65) $\sqrt{14641} =$ _____

(66) $\begin{bmatrix} 2 & -3 \end{bmatrix} \times \begin{bmatrix} 3 \\ -2 \end{bmatrix} = [$ _____ $]$

(67) $1 + 3 + 8 + 21 + \ldots + 144 =$ _____

(68) $(x^3 - 2x^2 + 4x - 6) \div (x - 2)$ has a remainder of _____

(69) $\left(\tan \frac{4\pi}{3}\right)^2 =$ _____

*(70) $(\pi)^3 \times (e)^3 =$ _____

(71) If $f(x) = \frac{2x + 1}{3x - 8}$, then $f'(3) =$ _____

(72) If the initial point of a vector is (1, 3) and the terminal point is (1,— 4), then $\|v\| =$ _____

(73) $\lim_{x \to \infty} \frac{2x - 3}{1 - x} =$ _____

(74) The slope of the line tangent to $f(x) = x^3 - 2x + 3$ at the point (1,2) is _____

(75) If $f(x) = x^3 - 2x^2 + 3x - 4$, then $f''(5) =$ _____

(76) The rectangular coordinates of the polar coordinates $(5\sqrt{2}, \frac{\pi}{4})$ are (x,y). y = _____

(77) The sum of the first nine terms of the sequence 4, 6, 10, 16, 26, 42, ... is _____

(78) $\int_0^1 \sqrt{x}\, dx =$ _____

(79) $\frac{1}{56} + \frac{1}{72} + \frac{1}{90} + \frac{1}{110} =$ _____

*(80) $889 \div 88\frac{8}{9}\% \times .125 =$ _____

University Interscholastic League - Number Sense Answer Key HS • Invitation B • 2009

*number) x — y means an integer between x and y inclusive

NOTE: If an answer is of the type like $\frac{2}{3}$ it cannot be written as a repeating decimal

(1) — 6993

(2) 222.999

(3) 1

(4) 12

(5) $\frac{11}{400}$

(6) 836

(7) 14

(8) — 18

(9) 784

*(10) 1926 — 2128

(11) .48

(12) $\frac{19}{6}$, $3\frac{1}{6}$

(13) 6

(14) 51

(15) 64

(16) 126

(17) 556

(18) 27.5, $\frac{54}{2}$, $27\frac{1}{2}$

(19) 41

*(20) 1100 — 1214

(21) 729

(22) 2

(23) 15

(24) 5

(25) 2020

(26) 93

(27) .0625, $\frac{1}{16}$

(28) 169

(29) 75

*(30) 5748 — 6352

(31) — 18

(32) 4

(33) 4

(34) $44\frac{4}{11}$

(35) 16

(36) 3852

(37) 120

(38) 273

(39) $-2.125, -\frac{17}{8}, -2\frac{1}{8}$

*(40) 3066 — 3388

(41) 9

(42) $-\frac{9}{7}$, $-1\frac{2}{7}$

(43) 3

(44) 8918

(45) — 1

(46) 7

(47) 215

(48) $\frac{6}{407}$

(49) 4000

*(50) 821 — 907

(51) 75

(52) 167

(53) 15

(54) .008, $\frac{1}{125}$

(55) — 20

(56) — 1

(57) 1

(58) 70

(59) 320

*(60) 123805 – 136837

(61) 1801

(62) — 6

(63) 3136

(64) 2

(65) 121

(66) 12

(67) 232

(68) 2

(69) 3

*(70) 592 — 653

(71) — 19

(72) 7

(73) — 2

(74) 1

(75) 26

(76) 5

(77) 460

(78) $\frac{2}{3}$

(79) $\frac{4}{77}$

*(80) 119 — 131