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

Final _____ _____

Contestant's Number _____ 2nd _____ _____

1st _____ _____

Score Initials

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) $2009 + 209 - 29 =$ _____

(2) $200.9 + 90.02 =$ _____ (decimal)

(3) $29 \times 11 =$ _____

(4) $29 \div 9 - 92 \div 9 =$ _____

(5) $19^2 =$ _____

(6) $\frac{4}{5} \times \frac{15}{16} =$ _____

(7) $(9 - 3) \div 12 \times 6 + 1 =$ _____

(8) $123\frac{4}{5}\% =$ _____ (decimal)

(9) $\$12.09 \div .3 = \$$ _____

*(10) $2009 \times 4 + 2008 =$ _____

(11) $(-8) - 9 - (-10) =$ _____

(12) What is 8.125% of 800? _____

(13) Which is larger, $-\frac{2}{9}$ or $-.29$? _____

(14) MMIX × XXV = _____ (Arabic Numeral)

(15) 2 cubic feet = _____ cubic inches

(16) The range of 1, 2, 3, 4, 3, 2, 1, 3, & 5 is _____

(17) $1\frac{5}{6} \div 11 =$ _____

(18) $2 + 6 + 10 + 14 + 18 + 22 + 26 =$ _____

(19) The greatest prime number less than 119 is ___

*(20) $\sqrt{839} \times \sqrt{963} =$ _____

(21) $7^3 =$ _____

(22) The discriminant of $3x^2 - 2x + 1 = 0$ is _____

(23) 63 base ten is equivalent to _____ base 4

(24) If $4^x - 4 = 252$, then x = _____

(25) The fifth hexagonal number is _____

(26) $6^7 \div 8$ has a remainder of _____

(27) $-3 - 2|1 - 3| + 2|-1 - 3| =$ _____

(28) The set {e,i,g,h,t} has _____ 2-elements subsets

(29) $82^2 + 12^2 =$ _____

*(30) 2 days — 2 hours — 2 minutes = _____ minutes

(31) If P = — 3, Q = — 2, and R = — 1, then P — Q — R = _____

(32) If $\frac{1}{2} + \frac{1}{x} = \frac{2}{3}$, then x = _____

(33) If $\sqrt{5 + \sqrt{4 + \sqrt{x}}} = 3$ then x = _____

(34) If $x - y = 8$ and $2x + y = 4$ then y = _____

(35) $20 \times 5! - 40 \times 4! =$ _____

(36) $3.111... - 3.0555... =$ _____

(37) $2 + 5 + 7 + 12 + ... + 31 + 50 =$ _____

(38) The sum of the roots of $3x^2 - 2x = -1$ is ____

(39) The perimeter of an equilateral triangle is 18". The area of the triangle is $k\sqrt{3}$ in.^{2}. $k =$ _____

*(40) $(363 \times 59)^2 \div (31 \times 119) =$ _____

(41) Let $a^3 \div a^4 \div a^5 = a^k$, where $a > 1$. $k =$ _____

(42) If P is 40% of Q and Q is 60% of R, then P is what percent of R? _____%

(43) If $3x - 4 < 5$, then $2x <$ _____

(44) $\frac{7}{12} - \frac{27}{49} =$ _____

(45) The distance between the points (1 , 3) and (4 , 7) is _____

(46) $5^2 \times 4^3 =$ _____

(47) The hypotenuse of a 30-60-90° triangle is $2\frac{1}{2}$ inches. The smaller leg is _____ inches

(48) $124 \times 142 =$ _____

(49) If $x + y = 4$ and $xy = 5$ then $x^3 + y^3 =$ _____

*(50) $428.571 \times 76 =$ _____

(51) The probability of winning is 60%. The odds of losing is _____

(52) $123_6 - 45_6 =$ _____ $_6$

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

(54) If y varies inversely with x and y = 3 when x = 2, find x when y = 4. _____

(55) $555 \times \frac{6}{37} =$ _____

(56) The smaller root of $2x^2 - 27x + 13 = 0$ is ____

(57) The simplified coefficient of the x^2y^2 term in the expansion of $(x - y)^4$ is _____

(58) $(1 + 2i)(3 + 4i) = (a + bi)$. Find b. _____

(59) The line of symmetry of the parabola $y = x^2 + 2x - 3$ is $x =$ _____

*(60) $2357 \times 111 =$ _____

(61) $58^2 =$ _____

(62) $89 + 34 + 13 + 5 + 2 + 1 =$ _____

(63) The volume of a right circular cylinder 5 cm high with a diameter of 2 cm is _____π cm^3

(64) $2 \sin 165° \cos 165° =$ _____

(65) $(42 + 63 - 84) \div 4$ has a remainder of _____

(66) 88 feet per second = _____ miles per hour

(67) The slope of the line $6x + 2y = 4$ is _____

(68) The set {a,b,c,d} has _____ 2–element subsets

(69) If $f(x) = \frac{3x-1}{2x+5}$, then $f'(-2) =$ _____

*(70) $(3e)^2 \times (2\pi)^3 =$ _____

(71) $f(x) = x^2 + 2x - 3$. Find $f(f(-2))$. _____

(72) $35^2 + 36^2 =$ _____

(73) Change .12 base 5 to a base 10 decimal. _____

(74) Find the slope of the line tangent to $y = x^2 - 1$ at (2, 3). _____

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

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

(77) $\frac{1}{3} + \frac{1}{6} + \frac{1}{10} + \frac{1}{15} =$ _____

(78) $\int_0^2 x^2 \, dx =$ _____

(79) $\sum_{k=1}^{3} (k)^k =$ _____

*(80) $399 \div 62.5\% \times \frac{7}{8} =$ _____

University Interscholastic League - Number Sense Answer Key HS • Invitation A • 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) 2189

(2) 290.92

(3) 319

(4) — 7

(5) 361

(6) .75, $\frac{3}{4}$

(7) 4

(8) 1.238

(9) $ 40.30

*(10) 9542 — 10546

(11) — 7

(12) 65

(13) $-\frac{2}{9}$

(14) 50225

(15) 3456

(16) 4

(17) $\frac{1}{6}$

(18) 98

(19) 113

*(20) 854 — 943

(21) 343

(22) — 8

(23) 333

(24) 4

(25) 45

(26) 0

(27) 1

(28) 10

(29) 6868

*(30) 2621 — 2895

(31) 0

(32) 6

(33) 144

(34) — 4

(35) 1440

(36) $\frac{1}{18}$

(37) 126

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

(39) 9

*(40) 118123 – 130556

(41) — 6

(42) 24

(43) 6

(44) $\frac{19}{588}$

(45) 5

(46) 1600

(47) 1.25, $\frac{5}{4}$, $1\frac{1}{4}$

(48) 17608

(49) 4

*(50) 30943 — 34199

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

(52) 34

(53) 70

(54) 1.5, $\frac{3}{2}$, $1\frac{1}{2}$

(55) 90

(56) .5, $\frac{1}{2}$

(57) 6

(58) 10

(59) — 1

*(60) 248546 – 274708

(61) 3364

(62) 144

(63) 5

(64) — .5, $-\frac{1}{2}$

(65) 1

(66) 60

(67) — 3

(68) 6

(69) 17

*(70) 15671 — 17320

(71) 0

(72) 2521

(73) .28

(74) 4

(75) 748

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

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

(78) $\frac{8}{3}$, $2\frac{2}{3}$

(79) 32

*(80) 531 — 586