The University Interscholastic League
Number Sense Test • HS State • 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) $579 - 57 + 9 =$ _____

(2) $4.1 \times 1.4 =$ _____ (decimal)

(3) $\frac{5}{8} \div \frac{15}{16} =$ _____

(4) $1\frac{3}{8}\% =$ _____ (decimal)

(5) $5 - 10 \times 15 \div 20 + 25 =$ _____

(6) $\frac{11}{40} =$ _____ % (decimal)

(7) $125 \times 77 =$ _____

(8) $2134711 \div 8$ has a remainder of _____

(9) 11% of 75 minus 11% of 50 is _____

*(10) $96 \times 85 - 74 =$ _____

(11) $13 \times 321 =$ _____

(12) Which is larger $\frac{7}{9}$ or .76? _____

(13) $\frac{1}{3}$ square yard = _____ square inches

(14) LCM(25, 45) × GCD(25, 45) = _____

(15) If 16 ♦'s cost $25.60 then 12 ♦'s cost $ _____

(16) How many positive integers divide 42? _____

(17) $(-1) - |-2| - (-3) - |4| =$ _____

(18) DCCXXIX ÷ LXXXI = _____ (Arabic Numeral)

(19) $6 + 11 + 16 + 21 + \ldots + 61 + 66 =$ _____

*(20) $\sqrt{11223344} \div 11 =$ _____

(21) $24_8 =$ _____ $_2$

(22) $14^3 =$ _____

(23) $5.444\ldots - 6.555\ldots =$ _____

(24) $63^2 + 24^2 =$ _____

(25) If $\frac{3}{4} - \frac{3}{x} = \frac{3}{16}$, then x = _____

(26) $(2)^{-2} \div (2)^{-1} \times 2^0 + 2 =$ _____

(27) How many 1-element or 8-element subsets does the set { u, n, i, v, e, r, s, a, l } have? _____

(28) If $f(x) = 4x^2 - 20x + 25$, then f(11) = _____

(29) The 6th triangular number is _____

*(30) 1 gal + 2 qts + 3 pts + 4 fl.oz. = _____ fl.oz.

(31) $12_3 + 22_3 + 21_3 =$ _____ $_3$

(32) $7^6 \div 5$ has a remainder of _____

(33) The ratio of the perimeter to its area of a rectangle with length 6 and width 5 is _____

(34) If $P = 3$, $Q = 1$, and $R = -1$, then $PQ - QR + PR =$ _____

(35) If $h > 1$ and $h^{-3} \times h^4 \div h^5 = h^k$, then $k =$ ____

(36) $32 \times 6! + 5! \times 48 =$ _____

(37) The product of the roots of $10x^3 + 21x^2 + x - 6 = 0$ is _____

(38) $(\frac{8}{125})^{\frac{2}{3}} =$ _____

(39) If $\sqrt{80} + \sqrt{45} = \sqrt{x}$, then $x =$ _____

*(40) $\sqrt[3]{1730} \times \sqrt{167} \times 11 =$ _____

(41) $\frac{12}{25} - \frac{37}{76} =$ _____

(42) The slope of the line $2x - 3y = 4$ is _____

(43) $5^8 \times 2^5 =$ _____

(44) The point $(-4, 2)$ is reflected across the line $y = -x$ to the point (h, k). Find k. _____

(45) If $xy = 3$ and $x - y = -3$ then $x^3 - y^3 =$ ____

(46) $51 \div 1.0625 =$ _____

(47) 26% of $333\frac{1}{3}$ is _____(mixed number)

(48) $305 \times 305 =$ _____

(49) The smaller leg of a 30-60-90° triangle is $2\sqrt{3}$ cm. The length of the larger leg that is not the hypotenuse is _____ cm

*(50) $428.571 \times 282 =$ _____

(51) ${}_7C_4 - {}_7C_3 =$ _____

(52) The odds of winning game X is $\frac{3}{5}$. The probability of losing the game is _____%

(53) $2.25 + 3.5 + 4.75 + \ldots + 9.75 =$ _____

(54) $4321_8 - 567_8 =$ _____$_8$

(55) $666 \times \frac{18}{37} =$ _____

(56) The area of the circle $(x - 4)^2 + (y + 2)^2 = 14$ is $k\pi$. Find k. _____

(57) If $(4 + 3i)(2 - i) = a + bi$, the $a + b =$ _____

(58) If $\log_4 x = -3$ then $x =$ _____

(59) The smaller root of $6x^2 + 15x + 9 = 0$ is _____

*(60) $6765 \times 898 \div 66 =$ _____

(61) $\sin^2(\frac{7\pi}{24}) + \sin^2(\frac{5\pi}{24}) =$ _____

(62) $\begin{vmatrix} -1 & 3 \\ 2 & 4 \end{vmatrix} \times \begin{vmatrix} 4 & 3 \\ -2 & 1 \end{vmatrix} = \begin{vmatrix} a & c \\ b & d \end{vmatrix}$. Find b. _____

(63) 105 miles per hour = _____ feet per second

(64) The line of symmetry of the parabola $y = 6x^2 + 5x - 6$ is $x =$ _____

(65) $2 + 5 + 7 + 12 + 19 + \ldots + 81 + 131 =$ _____

(66) The Greatest Integer Function is written as $f(x) = [x]$. Find $[\frac{\sqrt{3} - 5}{2}]$. _____

(67) $\sum_{k=1}^{4} (k)^k =$ _____

(68) The 11th term of 12, 17, 22, 27, ... is _____

(69) $52^2 =$ _____

*(70) $31.4 \times 27.18 \times \frac{10 + 10\sqrt{5}}{2} =$ _____

(71) $61^3 - 60^3 =$ _____

(72) If $f(x) = \frac{4x - 7}{2x + 3}$, then $f'(-2) =$ _____

(73) $2424 \times 1001 =$ _____

(74) If $f(x) = x^3 + 2x^2 - x + 2$, then $f''(2) =$ ____

(75) The polar coordinate of the rectangular coordinate $(5, \sqrt{11})$ is (r, θ). Find $r > 0$. ____

(76) $\int_1^3 (2x + 1)\,dx =$ _____

(77) $60^2 - 57^2 + 54^2 - 51^2 =$ _____

(78) $\frac{1}{21} + \frac{1}{28} + \frac{1}{36} + \frac{1}{45} =$ _____

(79) $11.1 \times 11.1 =$ _____ (mixed number)

*(80) $8\frac{1}{3}\%$ of $(251 \times 11.1) =$ _____

University Interscholastic League - Number Sense Answer Key HS • State • 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) 531

(2) 5.74

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

(4) .01375

(5) 22.5, $\frac{45}{2}$, $22\frac{1}{2}$

(6) 27.5

(7) 9625

(8) 7

(9) 2.75, $\frac{11}{4}$, $2\frac{3}{4}$

*(10) 7682 — 8490

(11) 4173

(12) $\frac{7}{9}$

(13) 432

(14) 1125

(15) $19.20

(16) 8

(17) — 4

(18) 9

(19) 468

*(20) 290 — 319

(21) 10100

(22) 2744

(23) $-\frac{10}{9}$, $-1\frac{1}{9}$

(24) 4545

(25) $\frac{16}{3}$, $5\frac{1}{3}$

(26) 2.5, $\frac{5}{2}$, $2\frac{1}{2}$

(27) 18

(28) 289

(29) 21

*(30) 232 — 256

(31) 202

(32) 4

(33) $\frac{11}{15}$

(34) 1

(35) — 4

(36) 28800

(37) .6, $\frac{3}{5}$

(38) .16, $\frac{4}{25}$

(39) 245

*(40) 1622 — 1791

(41) $-\frac{13}{1900}$

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

(43) 12500000

(44) 4

(45) — 54

(46) 48

(47) $86\frac{2}{3}$

(48) 93025

(49) 6

*(50) 114815 – 126899

(51) 0

(52) 62.5, $\frac{125}{2}$, $62\frac{1}{2}$

(53) 42

(54) 3532

(55) 324

(56) 14

(57) 13

(58) .015625, $\frac{1}{64}$

(59) $-1.5, -\frac{3}{2}, -1\frac{1}{2}$

*(60) 87443 — 96647

(61) 1

(62) 0

(63) 154

(64) $-\frac{5}{12}$

(65) 338

(66) — 2

(67) 288

(68) 62

(69) 2704

*(70) 13119 — 14499

(71) 10981

(72) 26

(73) 2426424

(74) 16

(75) 6

(76) 10

(77) 666

(78) $\frac{2}{15}$

(79) $123\frac{21}{100}$

*(80) 221 — 243