The University Interscholastic League
Number Sense Test • HS Regional • 2014

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) $41914 + 13 + 50314 =$ _____

(2) $25 \times 41 =$ _____

(3) $531.4 - 41.35 =$ _____ (decimal)

(4) $2014 \div 5 =$ _____ (decimal)

(5) $\frac{5}{8} =$ _____ % (mixed number)

(6) 51232014 ÷ 11 has a remainder of _____

(7) $5\frac{1}{4} + 2\frac{2}{3} =$ _____ (mixed number)

(8) $18 \times 15 + 15 \times 32 =$ _____

(9) $5 \times (3 - 20 + 1) \div 4 =$ _____

*(10) $5314 + 531 + 53 + 5 =$ _____

(11) 2 gallons + 3 quarts + 1 pint = _____ cups

(12) 31% of 31 = _____

(13) $7 \times \frac{7}{11} =$ _____ (mixed number)

(14) $8\frac{3}{5} - 5\frac{3}{8} =$ _____ (mixed number)

(15) $63 \times 44 =$ _____

(16) MMCDXV = _____ (Arabic Numeral)

(17) $\left(\frac{9}{11}\right)^3 =$ _____

(18) $18.00 is 40% of $ _____

(19) The multiplicative inverse of $-1\frac{5}{7}$ is _____

*(20) 532014 ÷ 415 = _____

(21) Set A has 5 elements and set B has 6 elements. If $A \cup B$ has 8 elements, then $A \cap B$ has ___ elements

(22) $(43 + 61 \times 8) \div 7$ has a remainder of _____

(23) $532 \times 14 =$ _____

(24) 0.1666... + 0.08333... = _____

(25) If 8 As cost $16.40 then 12 As cost $ _____

(26) If $f(x) = x^3 + 3x^2 + 3x + 1$ then f(11) is _____

(27) The sum of three consecutive even integers is 732. The largest of the three is _____

(28) $2\frac{3}{4} \times 2\frac{7}{11} =$ _____ (mixed number)

(29) Truncate $\sqrt{6}$ to the nearest thousandth. _____

*(30) $\sqrt{5180} \times 68 =$ _____

(31) 5.3222... = _____ (improper fraction)

(32) $214_5 \times 4_5 =$ _____ 5

(33) $1 + 5 + 6 + 11 + 17 + ... + 118 + 191 =$ _____

(34) $(5! \div 3!) - (4! \div 2!) =$ _____

(35) The number of positive integral divisors of 54 is ___

(36) $\frac{1}{4}(35^2 - 15^2) =$ _____

(37) Find k if $72^2 - 76^2 = 8k$. k = _____

(38) $4\frac{1}{3} \div 3\frac{1}{4} =$ _____ (mixed number)

(39) 214 base 10 = _____ base 5

*(40) $3195 \times 18.75 \div 6 =$ _____

(41) If $x + 3y = 2$ and $3x - y = 1$ then x = _____

(42) The sum of the roots of $3x^2 + 5x - 2 = 0$ is _____

(43) $36 \times 0.41666... =$ _____

(44) If $8^{(x-1)} = 2$ then $8^{(x+1)} =$ _____

(45) The number of sides of a regular polygon with an exterior angle measure of 36° is _____

(46) $\frac{17}{22} - \frac{35}{43} =$ _____

(47) $5^2 \times 2^5 =$ _____

(48) $(6 + 7i)(3 - 2i) = a + bi$. Find $a + b$. _____

(49) $\left(\frac{x^2 + 10x + 25}{x - 5}\right)\left(\frac{x^2 - 10x + 25}{x^2 - 25}\right) = x +$ _____

*(50) $\frac{\sqrt{5} - 1}{2} \times e \times 10^3 =$ _____

(51) The first 4 digits of the decimal of $\frac{313}{333}$ is 0._____

(52) If $\log_4(x) = 2.5$ then x = _____

(53) The sum of the coefficients of $(5x + 4y)^3$ is _____

(54) ${}_8P_2 =$ _____

(55) $\frac{1}{5} + \frac{1}{10} + \frac{1}{15} + \frac{1}{20} =$ _____

(56) The larger root of $2x^2 + 7x - 15 = 0$ is _____

(57) If $\frac{2x}{5}$ has a remainder of 3 and $\frac{3y}{5}$ has a remainder of 2 then $\frac{xy}{5}$ has a remainder of _____

(58) Change $0.313131..._4$ to a base 4 fraction. _____ 4

(59) $514 \times 415 =$ _____

*(60) $25^3 \div 5^4 \times 5^5 =$ _____

(61) $53^2 - 50^2 + 47^2 - 44^2 =$ _____

(62) $f(x) = 1 - x^2$ and $g(x) = 2x - 1$. $f(g(2)) =$ _____

(63) $444 \times \frac{4}{37} =$ _____

(64) The frequency of $y = 1 - 2\sin(\frac{3\pi}{4}\theta + 5)$ is _____

(65) There are 8 different colors of beads in a box. How many different linear strings of 5 beads can be created? _____

(66) $\csc(30°) \times \sec(60°) \times \cot(45°) =$ _____

(67) GCD(k, 35) = 7. LCM(k, 35) = 70. k = _____

(68) Find C if $\det\begin{bmatrix} C & -3 \\ 1 & 6 \end{bmatrix} = -9$. C = _____

(69) If $x^3 - 3x^2 + 3x - 1 = 0$, then the harmonic mean of the roots is _____

*(70) $\sqrt{5032014} =$ _____

(71) $F(x) = (2x + 1)^4$. Find $F'(-1) =$ _____

(72) If $x > 0$ and $x^3 = \sqrt{3x^4 + 3x^4 + 3x^4}$ then x = _____

(73) If $f(x) = \frac{2x + 1}{3}$, then $f^{-1}(4) =$ _____

(74) What is the first *abundant* number? _____

(75) $\int_0^{\frac{\pi}{3}} \cos(\frac{x}{2})\, dx =$ _____

(76) The Greatest Integer Function is written as $f(x) = [x]$. Find $\left[\frac{\sqrt{7} + \sqrt{6}}{5}\right]$. _____

(77) The 33rd triangular number is _____

(78) $\frac{11}{16} =$ _____ % (decimal)

(79) $77 \times 44 = k \times 22$. k = _____

*(80) $11^5 \div 5 =$ _____

University Interscholastic League - Number Sense Answer Key HS • Regional • 2014

*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) 92,241

(2) 1,025

(3) 490.05

(4) 402.8

(5) $62\frac{1}{2}$

(6) 9

(7) $7\frac{11}{12}$

(8) 750

(9) — 20

*(10) 5,608 — 6,198

(11) 46

(12) 9.61, $\frac{961}{100}$, $9\frac{61}{100}$

(13) $4\frac{5}{11}$

(14) $3\frac{9}{40}$

(15) 2,772

(16) 2,415

(17) $\frac{729}{1331}$

(18) $45.00

(19) $-\frac{7}{12}$

*(20) 1,218 — 1,346

(21) 3

(22) 6

(23) 7,448

(24) .25, $\frac{1}{4}$

(25) $24.60

(26) 1,728

(27) 246

(28) $7\frac{1}{4}$

(29) 2.449

*(30) 4,650 — 5,138

(31) $\frac{479}{90}$

(32) 1,421

(33) 495

(34) 8

(35) 8

(36) 250

(37) — 74

(38) $1\frac{1}{3}$

(39) 1324

*(40) 9,486 — 10,483

(41) .5, $\frac{1}{2}$

(42) $-\frac{5}{3}, -1\frac{2}{3}$

(43) 15

(44) 128

(45) 10

(46) $-\frac{39}{946}$

(47) 800

(48) 41

(49) 5

*(50) 1,596 — 1,763

(51) 9399

(52) 32

(53) 729

(54) 56

(55) $\frac{5}{12}$

(56) 1.5, $\frac{3}{2}$, $1\frac{1}{2}$

(57) 1

(58) $\frac{31}{33}$

(59) 213,310

*(60) 74,219 — 82,031

(61) 582

(62) — 8

(63) 48

(64) $\frac{3}{8}$

(65) 792

(66) 4

(67) 14

(68) — 2

(69) 1

*(70) 2,132 — 2,355

(71) — 8

(72) 3

(73) 5.5, $\frac{11}{2}$, $5\frac{1}{2}$

(74) 12

(75) 1

(76) 1

(77) 561

(78) 68.75

(79) 154

*(80) 30,600 — 33,820