The University Interscholastic League
Number Sense Test • HS District 2 • 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) $923 - 324 =$ _____

(2) $28 \times 15 =$ _____

(3) $324 \div 8 =$ _____ (mixed number)

(4) $32.4 + 3.29 =$ _____ (decimal)

(5) $24\% =$ _____ (proper fraction)

(6) 32432 ÷ 9 has a remainder of _____

(7) $31^2 =$ _____

(8) $3 - 2 \times 9 \div 3 \times (2 - 9) =$ _____

(9) 11 feet = _____ inches

*(10) $923 + 4102 + 410 + 232 + 4 =$ _____

(11) $3\frac{2}{9} - 4\frac{2}{3} =$ _____ (mixed number)

(12) $24 \times 29 =$ _____

(13) Which is larger 3.24 or $3\frac{2}{9}$? _____

(14) $4 + 9 + 14 + 19 + \ldots + 54 + 59 =$ _____

(15) GCD of 52 and 91 is _____

(16) The mean of 2,1,3,4,7, and 11 is _____

(17) $\frac{5}{9} + \frac{5}{18} + \frac{5}{27} =$ _____

(18) $324 \times 14 =$ _____

(19) $13^3 =$ _____

*(20) 3292014 ÷ 324 = _____

(21) $5\frac{4}{9} \times 5\frac{5}{9} =$ _____

(22) $(12 + 24 \times 48) \div 7$ has a remainder of _____

(23) 3.242424... = _____ (mixed number)

(24) 423 base 5 = _____ base 10

(25) If $f(x) = 4x^2 - 20x + 25$ then f(19) is _____

(26) The multiplicative inverse of 2.2 is _____

(27) If 14 ∇s cost $8.00 then 35 ∇s cost $ _____

(28) 45 has _____ positive integral divisors

(29) Round $\sqrt{8}$ to the nearest tenth. _____

*(30) $\sqrt{324329} =$ _____

(31) If $2x + 3y = 5$ and $5x - 3y = 2$ then $xy =$ _____

(32) $11 - \left|10 - \left|9 + 8\right|\right| =$ _____

(33) $4\frac{2}{3} + 2\frac{1}{4} =$ _____ (mixed number)

(34) How far will a car travel in 2 hours 45 minutes at a rate of 72 mph? _____ miles

(35) $\frac{1}{4}(32^2 - 48^2) =$ _____

(36) $\sqrt[3]{2197} =$ _____

(37) A rectangle has a length of 14 cm and a width of 7 cm. The ratio of its area to its perimeter is _____

(38) $4! \times 3 + 5! \times 4 =$ _____

(39) $324_6 + 423_6 =$ _____ 6

*(40) $58 \times 65 \times 72 =$ _____

(41) The slope of the line containing the points $(-2, 0)$ and $(-1, -4)$ is _____

(42) $48 \times 0.1875 =$ _____

(43) $4\frac{3}{5} + 5\frac{3}{4} =$ _____ (mixed number)

(44) $103 \times 109 =$ _____

(45) $2^6 \times 5^9 =$ _____

(46) The number of distinct diagonals in a regular decagon is _____

(47) Given 5, 10, 26, 50, 122, k, 290, ... Find k. _____

(48) 12 miles per hour = _____ feet per second

(49) The first 4 digits of the decimal of $\frac{221}{900}$ is 0._____

*(50) $27^4 \div 9^3 \times 3^2 =$ _____

(51) Find the 12th term of the arithmetic sequence 5, 13, 21, 29, 37, ... _____

(52) $\left(\frac{x^2 + 14x + 49}{x - 7}\right)\left(\frac{x^2 - 14x + 49}{x^2 - 49}\right) = x +$ _____

(53) The larger root of $3x^2 + 5x - 2 = 0$ is _____

(54) $(2 - 3i)(5 + 3i) = (a + bi)$. Find $a + b$. _____

(55) If $\frac{x}{8}$ has a remainder of 7 and $\frac{3y}{8}$ has a remainder of 3 then $\frac{xy}{8}$ has a remainder of _____

(56) ${}_6C_3 \div {}_6C_4 =$ _____

(57) $324 \times 423 =$ _____

(58) $\frac{4\pi}{5}$ radians = _____ degrees

(59) Change 0.1333... base 5 to a base 5 fraction. _____ 5

*(60) $42 \times 55 \times 68 =$ _____

(61) Let $f(x) = 2x + 1$, $g(x) = x^2 - 1$ and $h(x) = 2 - x^2$. Find $f(g(h(3)))$. _____

(62) If $(4!) + (3!) + (2!) \cong x \pmod 5$, where $0 \leq x \leq 4$, then $x =$ _____

(63) The slope of the line perpendicular to the line $5x - 3y = 1$ is _____

(64) $41^2 - 46^2 + 51^2 - 56^2 =$ _____

(65) The sum of the first ten terms of the Fibonacci type sequence 0,4,4,8,12,20,... is _____

(66) $4\frac{3}{5} \div 5\frac{3}{4} =$ _____

(67) $69^2 + 69 =$ _____

(68) GCD(15, x) = 3. LCM(15, x) = 165. x = _____

(69) The harmonic mean of the roots of $x^3 + Bx^2 + 6x + D = 0$ is 5. Find D. _____

*(70) $(314\pi - 271e)^2 =$ _____

(71) How many different 3-scoop ice cream cones can be made if there are 6 flavors to choose from? _____

(72) $12(\sin \frac{5\pi}{12})(\cos \frac{5\pi}{12}) =$ _____

(73) $f(x) = 3x^3 + 9x^2 + 9x + 3$. Find $f'(2) =$ _____

(74) Which of the following is an evil number, 73, 43, 13? _____

(75) $\frac{2}{3} + \frac{2}{15} + \frac{2}{35} + \frac{2}{63} =$ _____

(76) $\int_{-2}^{2} (4x - 1)\, dx =$ _____

(77) The odds of winning is $\frac{5}{8}$. The probability of losing is _____%

(78) $32_9 \times 4_9 =$ _____ 9

(79) Round $(\sqrt{5} + \sqrt{8})$ to the nearest tenth. _____

*(80) 5.5 rods + 3 yards + 12 feet = _____ inches

University Interscholastic League - Number Sense Answer Key HS • District 2 • 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) 599

(2) 420

(3) $40\frac{1}{2}$

(4) 35.69

(5) $\frac{6}{25}$

(6) 5

(7) 961

(8) 45

(9) 132

*(10) 5,388 — 5,954

(11) $-1\frac{4}{9}$

(12) 696

(13) 3.24, $\frac{81}{25}$, $3\frac{6}{25}$

(14) 378

(15) 13

(16) $\frac{14}{3}$, $4\frac{2}{3}$

(17) $\frac{55}{54}$, $1\frac{1}{54}$

(18) 4,536

(19) 2,197

*(20) 9,653 — 10,668

(21) $\frac{2450}{81}$, $30\frac{20}{81}$

(22) 2

(23) $3\frac{8}{33}$

(24) 113

(25) 1,089

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

(27) $20.00

(28) 6

(29) 2.8

*(30) 542 — 597

(31) 1

(32) 4

(33) $6\frac{11}{12}$

(34) 198

(35) —320

(36) 13

(37) $\frac{7}{3}$, $2\frac{1}{3}$

(38) 552

(39) 1151

*(40) 257,868 — 285,012

(41) —4

(42) 9

(43) $10\frac{7}{20}$

(44) 11,227

(45) 125,000,000

(46) 35

(47) 170

(48) 17.6, $\frac{88}{5}$, $17\frac{3}{5}$

(49) 2,455

*(50) 6,233 — 6,889

(51) 93

(52) 7

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

(54) 10

(55) 7

(56) $\frac{4}{3}$, $1\frac{1}{3}$

(57) 137,052

(58) 144

(59) $\frac{12}{40}$ (not reducible base 5)

*(60) 149,226 — 164,934

(61) 97

(62) 2

(63) —.6, $-\frac{3}{5}$

(64) —970

(65) 352

(66) .8, $\frac{4}{5}$

(67) 4,830

(68) 33

(69) —10

*(70) 59,283 — 65,523

(71) 56

(72) 3

(73) 81

(74) 43

(75) $\frac{8}{9}$

(76) —4

(77) $\frac{800}{13}$, $61\frac{7}{13}$

(78) 138

(79) 5.1

*(80) 1,274 — 1,408