The University Interscholastic League
Number Sense Test • HS SAC • 2012

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) $2012 + 2013 =$ _____

(2) $2012 \times 6 =$ _____

(3) $2102 - 2012 =$ _____

(4) $2012 \div 5 =$ _____ (decimal)

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

(6) $16^2 =$ _____

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

(8) $20 \times 12 + 20 \times 13 =$ _____

(9) $5.6 \div (-1.25) =$ _____ (decimal)

*(10) $136 - 1015 + 2128 =$ _____

(11) 48 is 16 % of _____

(12) $42 \times 48 =$ _____

(13) The GCD of 51 and 85 is _____

(14) $35 + 30 \times 25 \div 15 - 10 =$ _____

(15) MCII = _____ (Arabic Number)

(16) 20 pounds 12 ounces = _____ ounces

(17) Which is larger, $\frac{11}{15}$ or $\frac{9}{13}$? _____

(18) The sum of the prime divisors of 110 is _____

(19) The mean of 1, 3, 6, 10, and 15 is _____

*(20) $2012 + 201 \times 210 =$ _____

(21) $0.656565... =$ _____ (proper fraction)

(22) $|2-1| + |3-4| + |7-8| =$ _____

(23) Truncate $\sqrt{2}$ to the $\frac{1}{1000}$ place. _____ (decimal)

(24) If 12 WEEs cost $9.60 then 8 WEEs cost $_____

(25) If $f(x) = x^2 - 10x + 25$ then f(35) is _____

(26) The seven digit number 112358k is divisible by 8. Find k. _____

(27) How many prime numbers, P, exist such that $40 < P < 50$? _____

(28) $5! + 4! =$ _____

(29) 112 base 3 equals _____ base 10

*(30) $1369 \times 248 =$ _____

(31) The perimeter of a square is 10 inches. The area of this square is _____ square inches

(32) Find k if $29^2 - 23^2 = 12k$. k = _____

(33) $0.111... + 0.222... + 0.333... =$ _____

(34) $(9 + 18 \times 27) \div 4$ has a remainder of _____

(35) Set A has 3 elements, B has 4 elements, and $A \cup B$ has 5 elements. $A \cap B$ has _____ elements

(36) The sum of the roots of $3x^2 + 8x - 3 = 0$ is _____

(37) $17^2 + 51^2 =$ _____

(38) $\sqrt{48} - \sqrt{12} = \sqrt{x}$. Find x. _____

(39) $8\frac{3}{5} \times 8\frac{2}{5} =$ _____ (mixed number)

*(40) $\sqrt{15100} =$ _____

(41) Let $A^7 \div A^5 \times A^3 = A^k$. If $A > 1$, then $k =$ _____

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

(43) $123_6 + 45_6 =$ _____ 6

(44) $123 \times 231 =$ _____

(45) A triangle has sides of 5, 7, and x. What is the least integral value of x? _____

(46) If $\frac{x-2}{x+3} + \frac{x+3}{x-2}$ is written as the mixed number $A\frac{B}{C}$ then $B =$ _____

(47) If $3x - 5 > 8$ then $x >$ _____

(48) $\frac{1}{4}(35^2 - 5^2) =$ _____

(49) If $4^{(5)} = 2^{(3x)}$ then $x =$ _____

*(50) $(\pi + e)^4 =$ _____

(51) How many distinct 7 letter words, real or imaginary, can be made using the letters from the word "average"? _____

(52) $10^2 - 9^2 + 8^2 - 7^2 + \ldots + 2^2 - 1^2 =$ _____

(53) If $66^2 + 54^2 =$ _____

(54) The simplified coefficient of the x^2y term in the expansion of $(x - 2y)^3$ is _____

(55) 60 miles per hour = _____ feet per second

(56) The number of positive integral divisors of $4 \times 5 \times 9$ is _____

(57) If $\log_8(4x) = 2$ then $x =$ _____

(58) $(1 - 2i)(2 - i) = a + bi$. Find a. _____

(59) ${}_5C_3 =$ _____

*(60) 57 radians = _____ degrees

(61) Given the sequence 8, 11, 16, 19, 24, 27, k, 35,..., find k. _____

(62) A box contains 12 red chips, 5 white chips, and 8 blue chips. The probability of randomly selecting a blue chip is _____%

(63) $(603)^2 =$ _____

(64) $\sin(45°) \times \cos(45°) \times \tan(45°) =$ _____

(65) If $f(x) = x^3 + 3x^2 + 3x + 1$, then $f(3) =$ _____

(66) $4! \div 6! =$ _____

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

(68) $992 \times 996 =$ _____

(69) If $A = \begin{bmatrix} 1 & 3 \\ 6 & 10 \end{bmatrix}$, then $|A| =$ _____

*(70) The perimeter of $16x^2 + 9y^2 = 144$ is P. $P^2 =$ _____

(71) Find k, $2 \leq k \leq 6$, if $6k \cong 2 \pmod 8$. _____

(72) $F(x) = x^3 + 3x^2 + 3x + 1$. Find $f'(-1) =$ _____

(73) The horizontal asymptote of $f(x) = \frac{x}{1-2x}$ is _____

(74) Change 0.56 to a base 5 decimal. _____

(75) $\lim_{x \to \infty} \left(\frac{3x-2}{x}\right) =$ _____

(76) The radius of the circumscribed circle around a 6,8,10-right triangle is _____

(77) $\frac{4}{7} + \frac{7}{4} - 2 =$ _____

(78) $\int_1^2 (2x)\, dx =$ _____

(79) $\frac{1}{6} + \frac{1}{12} + \frac{1}{20} + \frac{1}{30} + \frac{1}{42} =$ _____

*(80) $13^{(4)} =$ _____

University Interscholastic League - Number Sense Answer Key HS • SAC • Fall 2012

*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) 4,025

(2) 12,072

(3) 90

(4) 402.4

(5) 380

(6) 256

(7) $4\frac{7}{20}$

(8) 500

(9) — 4.48

*(10) 1,187 — 1,311

(11) 300

(12) 2,016

(13) 17

(14) 75

(15) 1,102

(16) 332

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

(18) 18

(19) 7

*(20) 42,011 — 46,433

(21) $\frac{65}{99}$

(22) 3

(23) 1.414

(24) $6.40

(25) 900

(26) 4

(27) 3

(28) 144

(29) 14

*(30) 322,537 — 356,487

(31) 6.25, $\frac{25}{4}$, $6\frac{1}{4}$

(32) 26

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

(34) 3

(35) 2

(36) $-\frac{8}{3}, -2\frac{2}{3}$

(37) 2,890

(38) 12

(39) $72\frac{6}{25}$

*(40) 117 — 129

(41) 5

(42) $-\frac{1}{3}$

(43) 212

(44) 28,413

(45) 3

(46) 25

(47) $\frac{13}{3}, 4\frac{1}{3}$

(48) 300

(49) $\frac{10}{3}, 3\frac{1}{3}$

*(50) 1,121 — 1,238

(51) 1,260

(52) 55

(53) 7,272

(54) — 6

(55) 88

(56) 18

(57) 16

(58) 0

(59) 10

*(60) 3,103 — 3,429

(61) 32

(62) 32

(63) 363,609

(64) .5, $\frac{1}{2}$

(65) 64

(66) $\frac{1}{30}$

(67) 14

(68) 988,032

(69) — 8

*(70) 460 — 507

(71) 3

(72) 0

(73) $-.5, -\frac{1}{2}$

(74) .24

(75) 3

(76) 5

(77) $\frac{9}{28}$

(78) 3

(79) $\frac{5}{14}$

*(80) 27,133 — 29,989