The University Interscholastic League
Number Sense Test • HS Invitational B • 2010

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) $3141 - 2718 + 1618 =$ _____

(2) $\frac{3}{5} \div \frac{21}{25} =$ _____

(3) $\$15.15 \times 4 = \$$ _____

(4) $\frac{22}{25} =$ _____ %

(5) $1\frac{1}{6} \div .08333... =$ _____

(6) $3.4 + 2\frac{3}{10} - 1 =$ _____ (decimal)

(7) $77 \div 25 + 123 \div 25 =$ _____

(8) $54 \times 45 =$ _____

(9) $8 \div 4 - 2 + 4 \times 8 =$ _____

*(10) $2468 + 3579 + 1001 =$ _____

(11) $14^2 =$ _____

(12) $14^3 =$ _____

(13) The LCM of 48 and 57 is _____

(14) $(34 \times 56 - 78) \div 9$ has a remainder of _____

(15) 1 acre is equivalent to _____ square feet

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

(17) DLV × CXI = _____ (Arabic Numeral)

(18) How many elements are in $\{x \mid 30 < x < 40, \text{where } x \in \{\text{Primes}\}\}$? ____

(19) If a 6-pack of 12 oz. cans of soda costs $4.50 then one 12 oz. can will cost $ _____

*(20) $\sqrt{678} \times \sqrt{1154} =$ _____

(21) 115% of 15 is _____

(22) If $x - 4 = 2$, then $4x + 2 =$ _____

(23) $122 \times 16 =$ _____

(24) Round $\sqrt{8} - \sqrt{2}$ to the tenths place. _____

(25) What number multiplied by 12 and added to 33 gives the same results? _____

(26) $8\frac{3}{11} \times 8\frac{8}{11} =$ _____ (mixed number)

(27) $1.777... - 1.555... + 1.333... =$ _____

(28) $2 + 1 + 3 + 4 + 7 + ... + 47 + 76 =$ _____

(29) 25836k is divisible by 8. Find $k > 0$. _____

*(30) $783209 \div 247 =$ _____

(31) $5! \times 6 + 6! \times 4 =$ _____

(32) $|-8| - 1 + |4| - 3|-2-5| =$ _____

(33) Which of the following numbers is both abundant and unlucky, 24, 25, or 28? _____

(34) $\sqrt{192} - \sqrt{75} = \sqrt{x}$. Find x. _____

(35) The discriminant of $4x^2 + 19x - 2 = 0$ is ____

(36) Set A has 8 elements, set B has 12, $A \cap B$ has 5, and $A \cup B$ has k. Find k. _____

(37) Find k if $74^2 - 66^2 = 8k$. k = _____

(38) 12 is to 18 as 15 is to _____ (decimal)

(39) The sum of the positive integral divisors of 108 is _____

*(40) $16 \times 16 \times 16 \times 16$ = _____

(41) The slope of the line $6x + 2y = 8$ is _____

(42) $28 \times 45 - 15 \times 34$ = _____

(43) 40 °C = _____ °F

(44) $(34)^2 - (21)(55)$ = _____

(45) The sum of the product of the roots taken two at a time of $x^4 - 2x^3 - 13x^2 + 14x = -24$ is ____

(46) $\frac{3}{5} - \frac{25}{39}$ = _____

(47) The geometric mean of 8, 25, and 40 is _____

(48) Given $1190 \div 34 = 35$. Find $1190 \div 4.25$. _____

(49) If $x - y = 3$ and $xy = 3$ then $x^3 - y^3$ = _____

*(50) $798 \times 1.0625 \div \frac{17}{20}$ = _____

(51) The probability of randomly selecting a vowel from the elements of {p, r, o, d, u, c, t} is _____

(52) The legs of a right △ are 5 and 12. The length of the altitude to the hypotenuse is _____

(53) Find the next term of the geometric sequence $-1\frac{2}{3}, \frac{2}{3}, -\frac{4}{15}, \cdots$. _____

(54) $222_4 - 33_4$ = _____ 4

(55) $(4 - 7i)(4 + 7i) = (a + bi)$. Find $a + b$. _____

(56) If $\log_{16}(4x) = \frac{3}{4}$ then x = _____

(57) The complex conjugate of $3 + 4i$ is $3 +$ _____ i.

(58) $888 \times \frac{24}{37}$ = _____

(59) $2^2 + 1^2 + 3^2 + 4^2 + 7^2$ = _____

*(60) $(3.1\pi)(2.7e)\left(\frac{1+\sqrt{5}}{2}\right)$ = _____

(61) $(65_8) + (54_8) \div 7$ has a remainder of _____

(62) If $\log_4 2x + \log_4 3 = 2$ then x = _____

(63) $1.5P = \frac{1}{5}Q$ and 40% of Q = R. R is ____% of P.

(64) How many ways can Snow White and the seven dwarfs be seated at the round table? _____

(65) The greatest integer function $g(x) = [1 - x]$ has a value of _____ for $g(\sqrt{3})$

(66) $\frac{5!}{2! + 3!} \cong x \pmod 7$ & $0 \leq x \leq 6$. x = _____

(67) $\sqrt{42436}$ = _____

(68) $\cos^2(150°) - \sin^2(150°)$ = _____

(69) $2 + 5 + 8 + 11 + 14 + \ldots + 44$ = _____

*(70) The volume of a sphere with a diameter of 12 cm is _____ cu. cm

(71) If $f(x) = \frac{2x+3}{x-4}$, then $f'(5)$ = _____

(72) $4(4!) - 3(3!) - 2(2!) - 1(1!)$ = _____

(73) The slope of the line tangent to $y = 3x^2 - x + 2$ at (1, 4) is _____

(74) $\int_{-1}^{1} (x + 1)\,dx$ = _____

(75) If h(x) is the slant asymptote of $f(x) = \frac{4x^2+5x+6}{2x+1}$, then h(— 3) = _____

(76) $\sum_{0}^{3} (2x - 1)$ = _____

(77) $f(x) = 7 - 3x$ and $g(x) = 6 + 2x$. $f(g(-1))$ = ____

(78) 4141×1001 = _____

(79) Change .33 base 6 to a base ten decimal. _____

*(80) 5300 inches/second = _____ miles/hour

University Interscholastic League - Number Sense Answer Key HS • Invitation B • 2010

*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) 2041

(2) $\frac{5}{7}$

(3) $60.60

(4) 88

(5) 14

(6) 4.7

(7) 8

(8) 2430

(9) 32

*(10) 6696 — 7400

(11) 196

(12) 2744

(13) 912

(14) 8

(15) 43560

(16) 3

(17) 61605

(18) 2

(19) $ .75

*(20) 841 — 928

(21) 17.25, $\frac{69}{4}$, $17\frac{1}{4}$

(22) 26

(23) 1952

(24) 1.4, $\frac{7}{5}$, $1\frac{2}{5}$

(25) 3

(26) $72\frac{24}{121}$

(27) $\frac{14}{9}$, $1\frac{5}{9}$

(28) 198

(29) 8

*(30) 3013 — 3329

(31) 3600

(32) — 10

(33) 24

(34) 27

(35) 393

(36) 15

(37) 140

(38) 22.5

(39) 280

*(40) 62260 — 68812

(41) — 3

(42) 750

(43) 104

(44) 1

(45) — 13

(46) $-\frac{8}{195}$

(47) 20

(48) 280

(49) 54

*(50) 948 — 1047

(51) $\frac{2}{7}$

(52) $\frac{60}{13}$, $4\frac{8}{13}$

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

(54) 123

(55) 65

(56) 2

(57) — 4

(58) 576

(59) 79

*(60) 110 — 121

(61) 6

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

(63) 300

(64) 5040

(65) — 1

(66) 3

(67) 206

(68) .5, $\frac{1}{2}$

(69) 345

*(70) 860 — 950

(71) — 11

(72) 73

(73) 5

(74) 2

(75) — 4.5, $-\frac{9}{2}$, $-4\frac{1}{2}$

(76) 8

(77) — 5

(78) 4145141

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

*(80) 287 — 316