# The University Interscholastic League
# Number Sense Test • HS Invitational A • 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) $2012 - 2102 =$ _____

(2) $3.1 \times 3.9 =$ _____ (decimal)

(3) $\frac{4}{5} + \frac{5}{12} =$ _____ (mixed number)

(4) $538 \div 9$ has a remainder of _____

(5) $22^2 =$ _____

(6) $11 \times 246 =$ _____

(7) $1648 \div 8 =$ _____

(8) XCIX = _____ (Arabic Numeral)

(9) $\frac{5}{6} - \frac{5}{12} - \frac{5}{18} =$ _____

*(10) $32 + 322 + 3222 + 32222 =$ _____

(11) $753 + 357 =$ _____

(12) $12.5 \times 15 =$ _____

(13) 35% of 210 = k% of 420. Find k. _____ (decimal)

(14) $14 \times \frac{14}{17} =$ _____ (mixed number)

(15) $\frac{1}{12} =$ _____% (mixed number)

(16) $1 + 35 \div 7 \times 9 - 11 =$ _____

(17) $13 \times 313 =$ _____

(18) $37 \times 36 + 38 \times 36 =$ _____

(19) If 12 pencils cost \$1.11 then 8 pencils cost \$_____

*(20) $594 \times 248 =$ _____

(21) $(45 \times 30 + 15) \div 7$ has a remainder of _____

(22) 36 base 9 = _____ base 10

(23) $\frac{1}{3}$ of a gallon = _____ cubic inches

(24) $19^2 - 21^2 =$ _____

(25) The largest prime number less than 37 is _____

(26) If $k^3 = 729$, then $k^2 =$ _____

(27) 4 cups = _____ fluid ounces

(28) $2\frac{3}{5} + 6\frac{1}{4} =$ _____ (mixed number)

(29) The sum of three consecutive even integers is 132. The largest integer is _____

*(30) $\sqrt{167} + \sqrt{2345} =$ _____

(31) .242424... = _____ (proper fraction)

(32) If $3x - 6 = 9$ then $2x + 4 =$ _____

(33) Let set D = {d,e,c,i,m,a,l} and set P = {p,o,i,n,t}. How many unique elements are in $D \cap P$? _____

(34) $4^{-2} + 3^0 + 2^2 =$ _____

(35) A bowler won 37.5% of the 40 games he bowled. How many games did he lose? _____

(36) $12 \div 0.08333... =$ _____

(37) If $x = 13$ and $y = 19$ then $x^2 + 2xy + y^2 =$ _____

(38) Round $10\sqrt{5}$ to the tenths place. _____

(39) The simple interest on \$400 at 6% for 8 months is \$ _____

*(40) $\frac{1}{6} \times 35.79 \times 216 =$ _____

(41) $24_6 + 15_6 + 33_6 =$ _____ $_6$

(42) If $A > 1$ and $A^k \div A^2 \times A = A^4$ then $k =$ _____

(43) $(20 \times 5!) \div (80 \times 3!) =$ _____

(44) Find k, so that 917k is the largest 4-digit number divisible by 6. _____

(45) If $31^2 - 37^2 = 34k$, then $k =$ _____

(46) $\sqrt{44 \times 56 + 36} =$ _____

(47) If $3^{(x)} = 6561$ then $3^{(x-2)} =$ _____

(48) The slope of the line $6x - ky = 9$ is 12. Find k. ____

(49) Which of the following is a triangular number, 66, 76, or 86? _____

*(50) $(10 \times \pi \times e)^2 =$ _____

(51) The sum of the first 10 triangular numbers is ____

(52) A triangle has sides of 7, 11, and k. How many integral values of k will form a triangle? _____

(53) $\frac{1}{3} + \frac{1}{6} + \frac{1}{10} + \frac{1}{15} + ... + \frac{1}{55} =$ _____

(54) Let $(3 - 6i)(6 - 3i) = a + bi$. Find $a + b$. _____

(55) $54^2 + 35^2 =$ _____

(56) If $\log_x 32 + \log_x 2 = 3$ then $x =$ _____

(57) How many different groups of 5 songs can be made from 7 different songs? _____

(58) $7^9 \div 11$ has a remainder of _____

(59) $235 \times 112 =$ _____

*(60) $18^4 =$ _____

(61) The harmonic mean of 2, 3, and 5 is _____

(62) 95° Fahrenheit = _____ ° Celsius

(63) $(\sin \frac{4\pi}{3})(\cos \frac{5\pi}{6}) - (\tan \frac{\pi}{4}) =$ _____

(64) The $\det\left(\begin{bmatrix} 2 & -2 \\ 3 & -5 \end{bmatrix} \times \begin{bmatrix} 2 & 3 \\ -2 & -5 \end{bmatrix}\right)$ is = _____

(65) A single die is rolled. The odds that the top face is a composite number is _____

(66) If $f(x) = x^3 + 3x^2 + 3x + 1$, then $f(8) =$ _____

(67) $103 \times 98 =$ _____

(68) $(112_9 + 358_9) \div 8$ has a remainder of _____

(69) If $\log 4 = .8$ and $\log x = .4$ then $x =$ _____

*(70) 70 miles per hour = _____ feet per minute

(71) The radius of the base of a right cylinder is 5 cm and its height is 4 cm. If the volume of the cylinder is $k\pi$ cm$^3$ then k is _____

(72) The function $\frac{x^3 + 3x + 9}{-20x^2 - 8x}$ has _____ asymptotes

(73) $111 \times 505 =$ _____

(74) The polar coordinates of the rectangular coordinates $(1, \sqrt{3})$ are $(r, k\pi)$. The smallest positive value of k is _____

(75) Find k, $0 \leq k \leq 6$, if $5k - 3 \cong 2 \pmod 7$. _____

(76) The y-intercept of the line tangent to $f(x) = x^3 + 2x$ (1, 3) is (0, y). $y =$ _____

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

(78) Given the sequence 5,6,7,9,12,17,k,38, ... . $k =$ ____

(79) The first 4 digits of the decimal of $\frac{23}{99}$ is 0. _____

*(80) $(1 + 2 + 3 + 4 + 5 + ... + 15)^2 =$ _____

**University Interscholastic League - Number Sense Answer Key HS • Invitation A • 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) — 90

(2) 12.09

(3) $1\frac{13}{60}$

(4) 7

(5) 484

(6) 2,706

(7) 206

(8) 99

(9) $\frac{5}{36}$

*(10) 34,009 – 37,587

(11) 1,110

(12) 187.5, $\frac{375}{2}$, $187\frac{1}{2}$

(13) 17.5

(14) $11\frac{9}{17}$

(15) $8\frac{1}{3}$

(16) 35

(17) 4,069

(18) 2,700

(19) $.74

*(20) 139,947 – 154,677

(21) 0

(22) 33

(23) 77

(24) — 80

(25) 31

(26) 81

(27) 32

(28) $8\frac{17}{20}$

(29) 46

*(30) 59 – 64

(31) $\frac{8}{33}$

(32) 14

(33) 1

(34) 5.0625, $\frac{81}{16}$, $5\frac{1}{16}$

(35) 25

(36) 144

(37) 1,024

(38) 22.4

(39) $16.00

*(40) 1,225 – 1,352

(41) 120

(42) 5

(43) 5

(44) 4

(45) — 12

(46) 50

(47) 729

(48) .5, $\frac{1}{2}$

(49) 66

*(50) 6,929 – 7,657

(51) 220

(52) 13

(53) $\frac{9}{11}$

(54) — 45

(55) 4,141

(56) 4

(57) 21

(58) 8

(59) 26,320

*(60) 99,728 – 110,224

(61) $\frac{90}{31}$, $2\frac{28}{31}$

(62) 35

(63) — .25, — $\frac{1}{4}$

(64) 16

(65) .5, $\frac{1}{2}$

(66) 729

(67) 10,094

(68) 4

(69) 2

*(70) 5,852 – 6,468

(71) 100

(72) 3

(73) 56,055

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

(75) 1

(76) — 2

(77) 2

(78) 25

(79) 2323

*(80) 13,680 – 15,120