The University Interscholastic League
Number Sense Test • HS Regional • 2011

Final _____ _____

Contestant's Number _____ 2nd _____ _____

1st _____ _____

Score **Initials**

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) $1123 - 2134$ = _____

(2) $\frac{1}{8} - 4 + \frac{1}{2}$ = _____ **(mixed number)**

(3) $4.15 \div 2.5$ = _____

(4) 416×15 = _____

(5) 1.0625% = _____ **(proper fraction)**

(6) 13×57 = _____

(7) $112358 \div 9$ **has a remainder of** _____

(8) 17^2 = _____

(9) $2 + 1 \times 3 - 4 \div 7$ = _____

***(10)** $41611 - 2011 + 415$ = _____

(11) $(13)^3$ = _____

(12) The GCD of 90, 54, and 36 is _____

(13) The number of positive integral divisors of 108 is _____

(14) $1\frac{2}{3} - \frac{3}{5}$ = _____

(15) 248×75 = _____

(16) $DCVI + DV + CM$ = _____ **(Arabic Numeral)**

(17) $2\frac{4}{5} \times 1\frac{3}{7}$ = _____

(18) $79 + 68 + 57 + 46 + 44 + 33 + 22 + 11$ = ____

(19) 1.125 times 4 feet 7 inches = _____ feet

***(20)** 235×146 = _____

(21) The set {e,i,g,h,t} has _____ subsets

(22) 1331×11 = _____

(23) $(17 \times 27 - 37) \div 7$ has a remainder of _____

(24) $0.41666... + 0.8333...$ = _____

(25) The simple interest on \$500.00 at k% for 6 months is \$12.50. Find k. _____

(26) $1.928 \div 0.08$ = _____ **(decimal)**

(27) Find k if $54^2 - 59^2 = 5k$. k = _____

(28) $0.5333...$ = _____ **(fraction)**

(29) Which of the following is not an evil number, 56, 129, or 384? _____

***(30)** $4567 \times 8\frac{9}{10} \div 11$ = _____

(31) If 44% of 33 is k% of 88 then k is _____

(32) $65_7 + 43_7 - 21_7$ = _____ $_7$

(33) How many positive integers less than 42 are relatively prime to 42? _____

(34) Round $\sqrt{5}+\sqrt{8}$ to a whole number _____

(35) $3\frac{5}{11} \times 3\frac{6}{11}$ = _____ (mixed number)

(36) $(42)^2 + (14)^2$ = _____

(37) If four chocolate bunnies cost $1.40 then two and a half dozen chocolate bunnies cost $ _____

(38) $(5)^{-1} + (5)^{-2} + (5)^{-3}$ = _____

(39) If $2x + 3 = 5x - 7$, then $9x$ = _____

*(40) $\sqrt{112358}$ = _____

(41) 20 ° C = _____ ° F

(42) $5! - 4! \div 3! + 2!$ = _____

(43) $A^4 \times A^{2k} \div A^3 = A^5$, where $A > 1$. k = _____

(44) $4x^3 - 8x^2 - 15x = -9$ has real roots P, Q, and R. Find $P + Q + R + PQR$. _____

(45) $424_5 \div 3_5$ = _____ 5

(46) Find the largest value for k, so that the 4-digit number 538k is divisible by 6. _____

(47) If $27^{(x+1)} = 9^{(x-1)}$, then $3^{(x)}$ = _____

(48) A triangle has sides of 9, 14, and x. What is the greatest integral value of x? _____

(49) The slope of a line perpendicular to a line going through the points (— 2, 3) and (3, —1) is ____

*(50) $\left(\frac{\sqrt{5}+1}{2}\right)^2 (\pi)^2 (e)^2$ = _____

(51) A regular polygon with a central angle of 24° has a perimeter of 90". Each side is _____"

(52) 141×232 = _____

(53) If $\frac{x}{11}$ has a remainder of 4 and $\frac{y}{11}$ has a remainder of 7 then $\frac{xy}{11}$ has a remainder of ____

(54) $1 + 8 + 27 + 64 + ... + 512 + 729$ = _____

(55) The geometric series $\frac{8}{9} + \frac{2}{3} + \frac{1}{2} + \frac{3}{8} + ...$ has a sum of _____

(56) $(7 + 5i)(3 - 2i) = a + bi$. Find $a + b$. _____

(57) ${}_8C_4$ = _____

(58) The simplified coefficient of the x^3y^2 term in the expansion of $(4x + 5y)^5$ is _____

(59) If P is 5 less than Q and R is 10 more than P, then Q is how much less than R? _____

*(60) $2^6 \times 4^4 \div 8^2$ = _____

(61) The sum of the positive integral divisors of $2 \times 2 \times 2 \times 3 \times 3$ is _____

(62) $(112_6 + 213_6) \div 5$ has a remainder of _____

(63) Let $h(x) = 5x^2 - 3x + 2$, then $h(h(-1))$ = ____

(64) The Greatest Integer Function is written as $f(x) = [x]$. Find $\left[\sin \frac{6\pi}{5}\right]$. _____

(65) $1 + 3 + 8 + 21 + ... + 377$ = _____

(66) $\sin(135°) + \cos(225°) - \tan(315°)$ = _____

(67) 603×111 = _____

(68) A bag has 8 red and k blue pens. There is a 60% probability of picking a blue pen. k = ____

(69) The first triangular number greater than one that is also a pentagonal number is _____

*(70) $13 \times 33 \times 53 \times 73$ = _____

(71) $A = \begin{bmatrix} 3 & 5 \\ -4 & 6 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & -4 \\ 5 & 6 \end{bmatrix}$. $|AB|$ = _____

(72) Change .53, base 6, to a base 10 fraction. _____

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

(74) $\cos(\arcsin(\frac{13}{85}))$ = _____

(75) If $f(x) = x^3 - 6x^2 + 11x - 6$, then $f''(2)$ = ____

(76) $f(x) = \frac{x^2}{x^3+1}$ has _____ asymptotes

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

(78) The next term of 7, 8, 11, 17, 27, ... is _____

(79) $\frac{1}{56} + \frac{1}{42} + \frac{1}{30} + \frac{1}{20} + \frac{1}{12}$ = _____

*(80) 25% of 1 acre is _____ square feet

University Interscholastic League - Number Sense Answer Key HS ● Regional ● 2011

***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) — 1,011

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

(3) 1.66, $\frac{83}{50}$, $1\frac{33}{50}$

(4) 6,240

(5) $\frac{17}{1600}$

(6) 741

(7) 2

(8) 289

(9) $\frac{31}{7}$, $4\frac{3}{7}$

***(10) 38,015 — 42,015**

(11) 2,197

(12) 18

(13) 12

(14) $\frac{16}{15}$, $1\frac{1}{15}$

(15) 18,600

(16) 2,011

(17) 4

(18) 360

(19) 5.15625, $\frac{165}{32}$, $5\frac{5}{32}$

***(20) 32,595 — 36,025**

(21) 32

(22) 14,641

(23) 2

(24) 1.25, $\frac{5}{4}$, $1\frac{1}{4}$

(25) 5

(26) 24.1

(27) — 113

(28) $\frac{8}{15}$

(29) 56

***(30) 3,511 — 3,879**

(31) 16.5, $\frac{33}{2}$, $16\frac{1}{2}$

(32) 120

(33) 12

(34) 5

(35) $12\frac{30}{121}$

(36) 1,960

(37) $10.50

(38) .248, $\frac{31}{125}$

(39) 30

***(40) 319 — 351**

(41) 68

(42) 118

(43) 2

(44) — .25, $-\frac{1}{4}$

(45) 123

(46) 8

(47) $\frac{1}{243}$

(48) 22

(49) 1.25, $\frac{5}{4}$, $1\frac{1}{4}$

***(50) 182 — 200**

(51) 6

(52) 32,712

(53) 6

(54) 2,025

(55) $\frac{32}{9}$, $3\frac{5}{9}$

(56) 32

(57) 70

(58) 16,000

(59) 5

***(60) 244 — 268**

(61) 195

(62) 0

(63) 472

(64) — 1

(65) 609

(66) 1

(67) 66,933

(68) 12

(69) 210

***(70) 1,576,811 — 1,742,791**

(71) 1,444

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

(73) — 3

(74) $\frac{84}{85}$

(75) 0

(76) 2

(77) 1.6, $\frac{8}{5}$, $1\frac{3}{5}$

(78) 42

(79) $\frac{5}{24}$

***(80) 10,346 — 11,434**