The University Interscholastic League
Number Sense Test • HS Invitational A • 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) $2011 - 2110 =$ _____

(2) $1102 + 112 =$ _____

(3) $20.11 \div 5 =$ _____ (decimal)

(4) $\frac{4}{5} \times .75 =$ _____

(5) $\frac{7}{8} =$ _____% (mixed number)

(6) $2011 \times 11 - 11 =$ _____

(7) $1\frac{1}{4}\% =$ _____ (proper fraction)

(8) XC — LIX = _____ (Arabic Numeral)

(9) $\frac{6}{7} + \frac{8}{9} =$ _____ (mixed number)

*(10) $369 - 2468 + 510 =$ _____

(11) The sum of the positive prime divisors of 20 is _____

(12) $31 \times 27 - 19 \times 27 =$ _____

(13) 24% of 24 is _____

(14) Which is smaller, $\frac{4}{7}$ or $\frac{8}{13}$? _____

(15) $43 \times 57 =$ _____

(16) The LCM of 6, 9, and 12 is _____

(17) The arithmetic mean of 33, 18, and 21 is _____

(18) 25% of a peck is equivalent to _____ quarts

(19) $34 \times 43 =$ _____

*(20) $144441 \div 441 =$ _____

(21) $42 \div 7 + 8 \times 21 - 15 =$ _____

(22) Which of the following is not an odious number, 7, 15, or 31? _____

(23) $(32 - 43 + 54) \div 7$ has a remainder of _____

(24) $(5)^{-1} + (5)^{-2} =$ _____

(25) $4\frac{3}{7} \times 4\frac{4}{7} =$ _____

(26) $2.222... - 6.666... =$ _____

(27) If there are 10 elements in set A, 18 in set B, and 20 in $A \cup B$, then $A \cap B$ has _____ elements

(28) 21 feet/second = _____ yards/minute

(29) Find k if $34^2 - 28^2 = 6k$. k = _____

*(30) $6\frac{2}{5} \times 3972 \div 16 =$ _____

(31) 123 base 7 = _____ base 10

(32) $-\left|3 - \left|2 - 7\right|\right| =$ _____

(33) The 6% sales tax on an item is 39¢. The price of the item before the sales tax is $_____

(34) $4 \times 4! + 16 \times 3! =$ _____

(35) Truncate $\sqrt{2} + \sqrt{3}$ to the $\frac{1}{100}$ place. _____

(36) The cube root of 10,648 is _____

(37) If $a = 8$ and $b = 9$, then $a^3 - 3a^2b + 3ab^2 - b^3 =$ _____

(38) If $2x - 3 = 4$, then $4x + 1 =$ _____

(39) $\sqrt{108} - \sqrt{48} = \sqrt{x}$. Find x. _____

*(40) 39 x 59 x 79 = _____

(41) If $8^5 \times 8^4 \div 8^k = 8^3$ then k = _____

(42) The distance between the points (— 6, 5) and (3, — 7) is _____

(43) 3101 ÷ 9 = _____ (mixed number)

(44) $103 \times 107 =$ _____

(45) The product of the roots of the equation $10x^3 + 9x^2 - 19x + 6 = 0$ is _____

(46) If $x + y = -1$ and $xy = -2$ then $x^3 + y^3 =$ ____

(47) The measure of an interior angle of a regular n-gon is 135°. The n-gon has _____ sides

(48) Find the area of a triangle with side lengths of 7", 24" and 25". _____ square inches

(49) A set containing k elements has 7 proper subsets. Find k. _____

*(50) $314 \times (\pi)^3 =$ _____

(51) A regular polygon with a central angle of 20° has a perimeter of 54". Each side is ____ inches

(52) $222 \times 333 =$ _____

(53) ${}_6P_4 =$ _____

(54) The geometric series $4 + 2 + 1 + \frac{1}{2} + \ldots$ has a sum of _____

(55) $(2 + 5i)(3 - 7i) = a + bi$. Find a. _____

(56) $\sqrt{4489} =$ _____

(57) If $\frac{x}{9}$ has a remainder of 5 and $\frac{y}{9}$ has a remainder of 4 then $\frac{xy}{9}$ has a remainder of ____

(58) $1 - 2^2 + 3^2 - 4^2 + 5^2 - \ldots - 10^2 =$ _____

(59) If A is 12 more than B and C is 8 less than A, then C is how much more than B? _____

*(60) $7^4 \times 5^2 \div 12 =$ _____

(61) If $f(x) = 6x^3 - 8x^2 + 3x - 9$, then $f(3) =$ _____

(62) $(321_8)(456_8) \div 7$ has a remainder of _____

(63) If $f(x) = 4 - 5x$, then $f(f(3)) =$ _____

(64) If $9^{(x-1)} = 27^{(x+2)}$ then x = _____

(65) $3 + 6 + 9 + 12 + \ldots + 57 =$ _____

(66) $15 \times \frac{16}{17} =$ _____ mixed number

(67) $\sin(\arccos(0.8)) =$ _____

(68) A bag contains 10 blue and k white socks. Find k if the probability of a white sock is k/24. ____

(69) Let $A = \begin{bmatrix} 2 & 3 \\ 5 & 8 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 5 \\ 3 & 8 \end{bmatrix}$. $|AB| =$ _____

*(70) $400\sin(\frac{29\pi}{180}) =$ _____

(71) If $f(x) = 2x^3 - 3x^2 + x - 1$, then $f'(-1) =$ ____

(72) $5! \div 3! - 4! \times 2! =$ _____

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

(74) The 8th term of 6, 9, 14, 21, 30,... is _____

(75) The rectangular coordinates of the polar coordinates $(3\sqrt{3}, \frac{\pi}{3})$ are (x,y). y = _____

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

(77) If $f(x) = \sqrt{4x - 3}$ and $f(x) \in \{\text{Reals}\}$ then the range of f(x) is $\{f(x) | f(x) \geq$ _____ $\}$

(78) Change $\frac{13}{16}$ to a base 4 decimal. _____

(79) $111 \times 38 =$ _____

*(80) 1428.57 x 211 = _____

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*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) — 99

(2) 1214

(3) 4.022

(4) .6, $\frac{3}{5}$

(5) $87\frac{1}{2}$

(6) 22110

(7) $\frac{1}{80}$

(8) 31

(9) $1\frac{47}{63}$

*(10) — 1668 – — 1510

(11) 7

(12) 324

(13) 5.76, $\frac{144}{25}$, $5\frac{19}{25}$

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

(15) 2451

(16) 36

(17) 24

(18) 2

(19) 1462

*(20) 312 — 343

(21) 159

(22) 15

(23) 1

(24) .24, $\frac{6}{25}$

(25) $20\frac{12}{49}$

(26) $-4\frac{4}{9}$

(27) 8

(28) 420

(29) 62

*(30) 1510 — 1668

(31) 66

(32) — 2

(33) $ 6.50

(34) 192

(35) 3.14

(36) 22

(37) — 1

(38) 15

(39) 12

*(40) 172691 – 190867

(41) 6

(42) 15

(43) $344\frac{5}{9}$

(44) 11021

(45) — .6, $-\frac{3}{5}$

(46) — 7

(47) 8

(48) 84

(49) 3

*(50) 9250 — 10222

(51) 3

(52) 73926

(53) 360

(54) 8

(55) 41

(56) 67

(57) 2

(58) — 55

(59) 4

*(60) 4752 — 5252

(61) 90

(62) 6

(63) 59

(64) — 8

(65) 570

(66) $14\frac{2}{17}$

(67) .6, $\frac{3}{5}$

(68) 14

(69) 1

*(70) 185 — 203

(71) 13

(72) — 28

(73) 2

(74) 69

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

(76) 2

(77) 0

(78) .31

(79) 4218

*(80) 286357 – 316499