The University Interscholastic League
Number Sense Test • HS State • 2008

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) $5308 - 3085 =$ _____

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

(3) $1.21 \times 1.1 =$ _____ (decimal)

(4) $\frac{8}{25} \div 3.125 =$ _____

(5) $14 + 16 \div 18 \times (20 - 22) =$ _____

(6) $28^2 =$ _____

(7) $37 \times 15 =$ _____

(8) $27.5\% =$ _____ (proper fraction)

(9) $50308 \div 9 =$ _____ (mixed number)

*(10) $41 \times 414 + 4141 =$ _____

(11) $1\frac{1}{5}$ is 42% of _____

(12) $88 \times 82 =$ _____

(13) If 5 gallons of gas costs $14.40 then 5 quarts of gas will cost $ _____

(14) If LCM(k, 48) = 96 and GCD(k, 48) = 16 then k is _____

(15) $(34 \times 56 - 78) \div 12$ has a remainder of _____

(16) If 1 gram = .04 oz., then 600 grams = _____ lbs.

(17) $CCXXV \times XV =$ _____ (Arabic Numeral)

(18) The largest prime divisor of 87 is _____

(19) The additive inverse of $1\frac{2}{3}$ is _____

*(20) $50308 \div 538 =$ _____

(21) $(4)^{-3} \times (4)^2 \div (4)^{-1} =$ _____

(22) The discriminant of $5 - 3x + 8x^2 = 0$ is _____

(23) If $\frac{9}{11x} = \frac{7}{9}$, then $x =$ _____ (mixed number)

(24) $2.222... - 5.555... =$ _____

(25) Harry walked 1 mile in 15 minutes. What was his average speed? _____ mile per hour

(26) $503_8 =$ _____ $_{10}$

(27) $(3^3 + 4^4 \times 5^5) \div 6$ has a remainder of _____

(28) $28\frac{1}{7} \times 7\frac{1}{7} =$ _____ (mixed number)

(29) If $4 - x = 8$, then $x + 4 =$ _____

*(30) $119 \times 45 + 15 \times 143 =$ _____

(31) If A = 5, B = − 3, and C = 8, then $AB \div (AC) \times (C \div B) =$ _____

(32) Find the largest digit k such that 50308k is divisible by 6. k = _____

(33) $1^2 + 1^2 + 2^2 + 3^2 + 5^2 + 8^2 + 13^2 =$ _____

(34) 60% of 75 minus 90 is _____

(35) The sum of the roots divided by the product of the roots of $8x^3 - 18x^2 - 17x = 3$ is _____

(36) $\left|2 - |-3-5|\right| - 7 =$ _____

(37) If $3x + 4y = 5$ and $x - 2y = 3$, then $x =$ _____

(38) $\sqrt[3]{3375} =$ _____

(39) If 8 is to 20 as 14 is to x, then $x =$ _____

*(40) 1 mile + 2 yards + 3 feet = _____ inches

(41) $48 \times 0.1875 =$ _____

(42) $409^2 =$ _____

(43) $80 \times 3! + 16 \times 5! =$ _____

(44) $503_9 - 308_9 =$ _____ $_9$

(45) The x-intercept of the line containing the points (1 , 3) and (5 , 7) is (x , y). $x =$ _____

(46) The measure of an exterior angle of a regular dodecagon is _____ °

(47) If $A \neq 0$ and $A^3 \div A^5 \times A = A^k$ then $k =$ ____

(48) $221 \times 332 =$ _____

(49) The larger root of $5x^2 + 24x - 5 = 0$ is _____

*(50) $24^3 \div 12^2 \times 6^3 =$ _____

(51) $\frac{11}{14} - \frac{109}{141} =$ _____

(52) The sides of a triangle are 8, 11 and x. The least value of x, where x is a natural number, is ____

(53) Point (h, k) is the vertex of the parabola $y = 3(x + 2)^2 + 5$. Find $h + k$. _____

(54) $(3 - ki)^2 = -16 - 30i$. Find k. _____

(55) If $6\log_x 2 = 2$ then $x =$ _____

(56) ${}_6P_6 \div {}_6P_3 = {}_6P_k$. Find k. _____

(57) If $\sqrt{108} + \sqrt{75} = \sqrt{x}$ then $x =$ _____

(58) $(4 + 9 \times 123) \div 11 =$ _____

(59) The area of $3x^2 + 12y^2 = 4$ is $k\pi$. $k =$ _____

*(60) $(16)^4 =$ _____

(61) $6x^3 + x^2 - 18x + 8$ divided by $x + 2$ has a remainder of _____

(62) If $\det \begin{vmatrix} x & -2 \\ 3 & -4 \end{vmatrix} + 5 = -6$, then $x =$ _____

(63) $\sin[\cos^{-1}(-\frac{\sqrt{3}}{2})] =$ _____

(64) Let $n^2 = \sqrt{n^5 + n^5 + n^5 + n^5 + n^5}$, where $n > 0$. Find n. _____

(65) $9876 \times 9 + 4 =$ _____

(66) The volume of a rectangular based prism with side lengths 4" and 6" is 120 cubic inches. The height of the prism is _____ inches

(67) $7^8 \div 9$ has a remainder of _____

(68) The probability of not rolling a 7 using two fair dice is _____

(69) The greatest integer less than $\sqrt{1100}$ is _____

*(70) $1.6\pi \times 3.1e \times 2.7\phi =$ _____

(71) The polar coordinates of the rectangular coordinates $(\sqrt{3}, 1)$ are $(r, \frac{\pi}{k})$. $k =$ _____

(72) If $f(x) = 6x^2 - 11x + 4$, then $f'(2) =$ _____

(73) Change $\frac{11}{36}$ to a base 6 decimal. _____ $_6$

(74) Find x, $0 \leq x < 7$, if $\frac{(5!)(3!)}{(2!)} \cong x \pmod 7$. ____

(75) $\frac{7}{110} + \frac{7}{132} + \frac{7}{156} =$ _____

(76) $\lim_{x \to 1} \frac{9x^2 - 6x + 1}{3x - 1} =$ _____

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

(78) $5 - 4^2 + 3^3 - 2^4 + 1^5 =$ _____

(79) $161051 \div 121 =$ _____

*(80) $2828 \times 28\frac{4}{7}\% \times 2.8 =$ _____

University Interscholastic League - Number Sense Answer Key HS • State • 2008

*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) 2223

(2) $13\frac{39}{40}$

(3) 1.331

(4) .1024, $\frac{64}{625}$

(5) $\frac{110}{9}$, $12\frac{2}{9}$

(6) 784

(7) 555

(8) $\frac{11}{40}$

(9) $5589\frac{7}{9}$

*(10) 20060 - 22170

(11) $\frac{20}{7}$, $2\frac{6}{7}$

(12) 7216

(13) $3.60

(14) 32

(15) 2

(16) 1.5, $\frac{3}{2}$, $1\frac{1}{2}$

(17) 3375

(18) 29

(19) $-\frac{5}{3}$, $-1\frac{2}{3}$

*(20) 89 – 98

(21) 1

(22) – 151

(23) $1\frac{4}{77}$

(24) $-\frac{10}{3}$, $-3\frac{1}{3}$

(25) 4

(26) 323

(27) 5

(28) $201\frac{1}{49}$

(29) 0

*(30) 7125 – 7875

(31) 1

(32) 8

(33) 273

(34) – 45

(35) 6

(36) – 1

(37) 2.2, $\frac{11}{5}$, $2\frac{1}{5}$

(38) 15

(39) 35

*(40) 60295 – 66641

(41) 9

(42) 167281

(43) 2400

(44) 184

(45) – 2

(46) 30

(47) – 1

(48) 73372

(49) .2, $\frac{1}{5}$

*(50) 19700 – 21772

(51) $\frac{25}{1974}$

(52) 4

(53) 3

(54) 5

(55) 8

(56) 1

(57) 363

(58) 101

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

*(60) 62260 – 68812

(61) 0

(62) 4.25, $\frac{17}{4}$, $4\frac{1}{4}$

(63) .5, $\frac{1}{2}$

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

(65) 88888

(66) 5

(67) 4

(68) $\frac{5}{6}$

(69) 33

*(70) 176 – 194

(71) 6

(72) 13

(73) .15

(74) 3

(75) $\frac{21}{130}$

(76) 2

(77) 2

(78) 1

(79) 1331

*(80) 2150 – 2375