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

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) $857 - 758 =$ _____

(2) $64 \times 25 =$ _____

(3) $323 \div 9 =$ _____ (mixed number)

(4) $964 + 469 =$ _____

(5) $11 \times 412 =$ _____

(6) Which is larger $\frac{5}{8}$ or .624? _____

(7) $16^2 =$ _____

(8) $35 \times 66 - 24 \times 66 =$ _____

(9) $24 \times 6 \div 8 + 10 =$ _____

*(10) $24242 + 2424 + 242 + 24 + 2 =$ _____

(11) $12 \div 1.5 =$ _____

(12) $\frac{1}{4} - \frac{3}{8} - \frac{5}{24} =$ _____

(13) $321 \times 8 - 1 =$ _____

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

(15) $\frac{1}{16} =$ _____ % (decimal)

(16) 15% of $24.00 is $_____

(17) $13 \times 221 =$ _____

(18) $1 + 2 + 3 + 4 + \ldots + 15 =$ _____

(19) The mean of 20, 34, 22, and 36 is _____

*(20) $78563 \div 492 =$ _____

(21) $3\frac{1}{3} \times 6\frac{1}{3} =$ _____ (mixed number)

(22) If 4 pens cost $1.20 then 6 pens cost $ _____

(23) $1 + 9 + 17 + 25 + 33 + 41 =$ _____

(24) $34 \times 46 =$ _____

(25) $(32 \times 4 - 9) \div 6$ has a remainder of _____

(26) If $k^2 = 49$, then $k^3 =$ _____

(27) .252525... = _____ (proper fraction)

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

(29) $123_4 =$ _____ 10

*(30) $2\frac{9}{10} \times 1511.5 \div 11 =$ _____

(31) 3 quarts = _____ pints

(32) 2.2 is what % of 20 ? _____

(33) $16 \div 0.0625 =$ _____

(34) Round $2\sqrt{2}$ to the tenths place. _____

(35) If x is to 6 as 8 is to 12 then x = _____

(36) $4^2 + 3^3 - 2^4 =$ _____

(37) If x = 9 and y = 11 then $x^2 + 2xy + y^2 =$ _____

(38) Let set A = {m,e,n,t,a,l} and set B = {m,a,t,h}. How many unique elements are in A ∪ B? _____

(39) If the perimeter of a square is 24 cm then the area of the square is _____ sq. cm.

*(40) $\sqrt{75863} =$ _____

(41) If $48^2 - 42^2 = 12k$, then k = _____

(42) Which of the following is a triangular number, 18, 21, or 24? _____

(43) $214 \times 421 =$ _____

(44) The slope of the line $kx + 4y = 3$ is 2. Find k. _____

(45) $15 \times 4! + 60 \times 3! =$ _____

(46) $\sqrt{32 \times 38 + 9} =$ _____

(47) The sum of the roots of $2x^2 - 5x - 3 = 0$ is _____

(48) If $A > 1$ and $A^2 \div A^3 \times A^4 = A^k$ then k = _____

(49) $246_8 + 135_8 =$ _____ 8

*(50) $(10\pi)^3 =$ _____

(51) If $(3 + 4i)(3 + 4i) = a + bi$, then a = _____

(52) $1 + 3 + 6 + 10 + 15 + \ldots + 28 =$ _____

(53) $54^2 + 35^2 =$ _____

(54) ${}_5P_2 =$ _____

(55) $\log_8(x) = 2$ then $\sqrt{x} =$ _____

(56) A triangle has sides of 3, 5, and k. How many integral values of k will form a triangle? _____

(57) $6^7 \div 8$ has a remainder of _____

(58) $\frac{1}{3} + \frac{1}{6} + \frac{1}{10} + \frac{1}{15} + \ldots + \frac{1}{28} =$ _____

(59) How many ways can the letters in the word 'white' be arranged in a row? _____

*(60) $4^3 \times 8^2 \div 2^2 =$ _____

(61) If $f(x) = x^2 + x - 2$ then $f(f(-2)) =$ _____

(62) $(135_7 + 246_7) \div 6$ has a remainder of _____

(63) The harmonic mean of 1, 2, and 4 is _____

(64) $A = \begin{bmatrix} 1 & 2 \\ 3 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & 2 \\ 3 & 1 \end{bmatrix}$. Find $|A + B|$. _____

(65) A bag contains golf balls, 5 white, 3 yellow, and 2 pink. The probability of reaching in the bag and randomly selecting a pink golf ball is _____%

(66) $104 \times 108 =$ _____

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

(68) 77° Fahrenheit = _____ ° Celsius

(69) The Greatest Integer Function is written as $f(x) = [x]$. Find $\left[\sqrt{2} + \sqrt{3}\right]$. _____

*(70) 55 miles per hour = _____ feet per second

(71) The function $\frac{x+3}{x^2+9}$ has _____ asymptotes

(72) $F(x) = x^3 + 3x^2 - 6x - 10$. Find $f'(1) =$ _____

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

(74) The polar coordinates of the rectangular coordinates $(2, -2)$ are $(r, k\pi)$. If $r > 0$, then the least value of k is _____

(75) $\sin\left(\arccos\left(\frac{\sqrt{3}}{2}\right)\right) =$ _____

(76) Find k, $0 \leq k \leq 7$, if $3k + 2 \cong 1 \pmod 8$. _____

(77) $\int_0^1 (3 - 2x)\, dx =$ _____

(78) Change $\frac{7}{16}$ to a base 4 decimal. _____

(79) The 8th term of the arithmetic sequence $-9, -3, 3, 9, \ldots$ is _____

*(80) $(1 + 2 + 3 + 4 + 5 + \ldots + 10)^2 =$ _____

University Interscholastic League - Number Sense Answer Key HS • SAC • Fall 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) 99

(2) 1,600

(3) $35\frac{8}{9}$

(4) 1,433

(5) 4,532

(6) .625, $\frac{5}{8}$

(7) 256

(8) 726

(9) 28

*(10) 25,588 — 28,280

(11) 8

(12) $-\frac{1}{3}$

(13) 2,567

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

(15) 6,25

(16) $3.60

(17) 2,873

(18) 120

(19) 28

*(20) 152 — 167

(21) $21\frac{1}{9}$

(22) $1.80

(23) 126

(24) 1,564

(25) 5

(26) 343 or -343

(27) $\frac{25}{99}$

(28) $1\frac{1}{12}$

(29) 27

*(30) 379 — 418

(31) 6

(32) 11

(33) 256

(34) 2.8

(35) 4

(36) 27

(37) 400

(38) 7

(39) 36

*(40) 262 — 289

(41) 45

(42) 21

(43) 90,094

(44) — 8

(45) 720

(46) 35

(47) 2.5, $\frac{5}{2}$, $2\frac{1}{2}$

(48) 3

(49) 403

*(50) 29,456 — 32,556

(51) — 7

(52) 84

(53) 4,141

(54) 20

(55) 8

(56) 5

(57) 0

(58) .75, $\frac{3}{4}$

(59) 120

*(60) 973 — 1,075

(61) — 2

(62) 3

(63) $\frac{12}{7}$, $1\frac{5}{7}$

(64) 12

(65) 20

(66) 11,232

(67) .75, $\frac{3}{4}$

(68) 25

(69) 3

*(70) 77 — 84

(71) 1

(72) 3

(73) 2

(74) 1.75, $\frac{7}{4}$, $1\frac{3}{4}$

(75) .5, $\frac{1}{2}$

(76) 5

(77) 2

(78) .13

(79) 33

*(80) 2,874 — 3,176