The University Interscholastic League
Number Sense Test • HS State • 2012

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) $52112 + 2012 - 521 =$ _____

(2) $\frac{3}{4} \times \frac{8}{9} =$ _____

(3) $52.1 \div 8 =$ _____ **(decimal)**

(4) $32 \times 18 + 18 \times 18 =$ _____

(5) $521 \times 11 =$ _____

(6) **Which is smaller** $\frac{9}{13}$ **or** $\frac{13}{19}$**?** _____

(7) **DXXI =** _____ **(Arabic Numeral)**

(8) $(34)^2 =$ _____

(9) $1 + 3 \times 6 - 10 \div 15 =$ _____

***(10)** $1123 + 5813 + 2134 + 5589 =$ _____

(11) **45% of 540 =** _____

(12) $\frac{2}{5} - \frac{4}{25} - \frac{6}{75} =$ _____

(13) **4.444... yards =** _____ **inches**

(14) $3 + 7 + 11 + 15 + ... + 35 =$ _____

(15) $\frac{11}{40} =$ _____**% (decimal)**

(16) $531 \times 8 - 6 =$ _____

(17) $\left(\frac{7}{9}\right)^3 =$ _____

(18) **The largest prime factor of 741 is** _____

(19) $24 \times 0.96 =$ _____ **(mixed number)**

***(20)** $5212012 \div 136 =$ _____

(21) $\frac{11}{21} - \frac{21}{43} =$ _____

(22) **If 15 links cost $3.60 then 9 links cost $** _____

(23) **0.44777... =** _____ **(proper fraction)**

(24) $246_8 =$ _____ **10**

(25) **2.375 gallons =** _____ **pints**

(26) $234 \times 532 =$ _____

(27) **Let set A = {a,c,u,t,e}, set T = {t,r,i,a,n,g,l,e}, and set S = {s,h,a,p,e}. How many unique elements are in** $(A \cap S) \cup (T \cap S)$**?** _____

(28) $3\frac{4}{5} - 6\frac{7}{8} =$ _____ **(mixed number)**

(29) **The sum of three consecutive odd integers is 369. The smallest integer is** _____

***(30)** $1\frac{1}{2} \times 3581.3 \div 21 =$ _____

(31) $\sqrt{27 \times 31 + 4} =$ _____

(32) **Truncate** $\sqrt{2} \times \sqrt{3}$ **to the tenths place.** _____

(33) $48 \div 0.1875 =$ _____

(34) If x is to 8 as 12 is to 20 then x = _____ (decimal)

(35) If $2x - 3 = 5$ then $5x + 3$ = _____

(36) $(5)^2 - (3)^0 - (2)^{-1}$ = _____

(37) If x = 6 and y = 3 then $9x^2 - 6xy + y^2$ = _____

(38) A pitcher lost $16\frac{2}{3}\%$ of the 30 games he pitched. How many games did he win? _____

(39) The first 4 digits of the decimal of $\frac{38}{45}$ is 0. _____

*(40) $\sqrt{65748}$ = _____

(41) The slope of the line $4x - ky = 8$ is $-\frac{1}{4}$. Find k. ___

(42) If $A > 1$ and $\left(A^2 \times A^k\right)^{-1} = A^3$ then k = _____

(43) A, B, & C are the roots of $x^3 + 2x^2 - 9x - 18 = 0$. Find ABC — AB — BC — AC. _____

(44) If $33^2 - 39^2 = 3k$, then k = _____

(45) $12 \times 5! + 40 \times 4!$ = _____

(46) $43_7 + 61_7 + 25_7$ = _____ 7

(47) If a triangle has side lengths of x, 12, and 5 then the smallest integral value of x is _____

(48) Which of the following is a triangular number, 136, 148, or 152? _____

(49) $83^2 + 22^2$ = _____

*(50) $31.4 \times \pi + 27.1 \times e + 16.1 \times \Phi$ = _____

(51) ${}_7C_4 + {}_6P_3$ = _____

(52) $1 + 3 + 6 + 10 + 15 + ... + 78$ = _____

(53) The geometric series $5.333... + 4 + 3 + 2.25 + ...$ has a sum of _____

(54) How many ways can the letters in the word 'around' be arranged around a circle? _____

(55) $(235_8 \times 136_8) \div 7$ has a remainder of _____

(56) The harmonic mean of 1, 3, and 6 is _____

(57) $8^{10} \div 12$ has a remainder of _____

(58) $\frac{1}{3} + \frac{1}{6} + \frac{1}{10} + \frac{1}{15} + ... + \frac{1}{78}$ = _____

(59) If $(3 - 4i) \div (3 + 4i) = a + bi$, then $a + b$ = _____

*(60) 321 miles per hour = _____ feet per second

(61) $\sin(240°) \times \cos(330°) - \tan(135°)$ = _____

(62) $A = \begin{bmatrix} 2 & 4 \\ 1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 3 \\ 1 & 2 \end{bmatrix}$. Find $|A + B|$. _____

(63) If $f(x) = x^4 + 4x^3 + 6x^2 + 4x + 1$, then f(4) = ____

(64) Given the sequence 0, 5, 8, 17, 24, 37, 48,..., 145, k, 197,..., find k. _____

(65) 1003×1007 = _____

(66) A golfer has 8 brown tees, 5 red tees, 9 white tees, and 2 pink tees. The probability that the golfer randomly selects a red or pink tee is _____%

(67) If $f(x) = 5x - 2$, then $f^{-1}(8)$ = _____

(68) If $\log_b(9) = 0.5$ and $\log_b(x) = 0.25$ then x = _____

(69) $(805)^2$ = _____

*(70) A pyramid has a 33 cm by 55 cm rectangular base and a height of 22 cm. The volume of the pyramid is _____ cm^3

(71) $\frac{7}{8} + \frac{7}{24} + \frac{7}{48} + \frac{7}{80} + \frac{7}{120}$ = _____

(72) Change $\frac{14}{25}$ to a base 5 decimal. _____

(73) $F(x) = (x - 3)^{-2}$ has _____ horizontal asymptotes

(74) The rectangular coordinates of the polar coordinates $(-2, -\frac{\pi}{2})$ are (x, y). $x + y$ = _____

(75) $\int_{-2}^{2} (x^3 + 1)\ dx$ = _____

(76) Find k, $0 \leq k \leq 8$, if $3! + k \cong 2 \pmod 9$. _____

(77) $F(x) = x^3 + 3x^2 + 3x + 1$. Find $f''(3)$ = _____

(78) $\lim_{x \to 1} \left(\frac{x^3 - 1}{x - 1}\right)$ = _____

(79) $1^2 - 2^2 + 3^2 - 4^2 + 5^2 - ... + 15^2$ = _____

*(80) 714.285 x 857.142 = _____

University Interscholastic League - Number Sense Answer Key HS ● State ● 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) 53,603

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

(3) 6.5125

(4) 900

(5) 5,731

(6) $\frac{13}{19}$

(7) 521

(8) 1,156

(9) $\frac{55}{3}$, $18\frac{1}{3}$

***(10) 13,927 — 15,391**

(11) 243

(12) .16, $\frac{4}{25}$

(13) 160

(14) 171

(15) 27.5

(16) 4,242

(17) $\frac{343}{729}$

(18) 19

(19) $23\frac{1}{25}$

***(20) 36,408 — 40,239**

(21) $\frac{32}{903}$

(22) $2.16

(23) $\frac{403}{900}$

(24) 166

(25) 19

(26) 124,488

(27) 2

(28) $-3\frac{3}{40}$

(29) 121

***(30) 244 — 268**

(31) 29

(32) 2.4

(33) 256

(34) 4.8

(35) 23

(36) 23.5, $\frac{47}{2}$, $23\frac{1}{2}$

(37) 225

(38) 25

(39) 8444

***(40) 244 — 269**

(41) — 16

(42) — 5

(43) 27

(44) — 144

(45) 2,400

(46) 162

(47) 8

(48) 136

(49) 7,373

***(50) 189 — 208**

(51) 155

(52) 364

(53) $\frac{64}{3}$, $21\frac{1}{3}$

(54) 120

(55) 2

(56) 2

(57) 4

(58) $\frac{11}{13}$

(59) — 1.24, $-\frac{31}{25}$, $-1\frac{6}{25}$

***(60) 448 — 494**

(61) .25, $\frac{1}{4}$

(62) 1

(63) 625

(64) 168

(65) 1,010,021

(66) $\frac{175}{6}$, $29\frac{1}{6}$

(67) 2

(68) 3

(69) 648,025

***(70) 12,645 — 13,975**

(71) $\frac{35}{24}$, $1\frac{11}{24}$

(72) .24

(73) 1

(74) 2

(75) 4

(76) 5

(77) 24

(78) 3

(79) 120

***(80) 581,632 — 642,855**