The University Interscholastic League
Number Sense Test • HS B • 2016

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) $2312 - 2016 =$ _____

(2) $212 + 316 =$ _____

(3) $2016 \div 3 =$ _____

(4) $231 \times 6 =$ _____

(5) $\frac{3}{5} =$ _____ %

(6) $23 \times 11 =$ _____

(7) $0.375 - \frac{1}{4} =$ _____

(8) $2 - 1 - 2 \div 3 \times (1 + 2) =$ _____

(9) $3\frac{1}{2} - 2\frac{1}{6} =$ _____ (mixed number)

***(10)** $136 + 1015 - 2128 + 3645 =$ _____

(11) $23^2 =$ _____

(12) 14% of 16 = _____ (decimal)

(13) $1 + 2 + 3 + 4 + 5 + ... + 19 + 20 =$ _____

(14) $17 \times 23 =$ _____

(15) $12^3 =$ _____

(16) $3\frac{1}{5} + 2\frac{3}{4} =$ _____ (mixed number)

(17) 3 gallons — 2 quarts = _____ pints

(18) MMXVI × IV = _____ (Arabic numeral)

(19) 21231216 ÷ 8 has a remainder of _____

***(20)** $31216 \div 396 =$ _____

(21) $2^4 + 3^3 + 4^2 =$ _____

(22) $2 + |1 - 2| - |3 - 1| + 2 =$ _____

(23) The multiplicative inverse of — 1.25 is _____

(24) $7^3 =$ _____

(25) Let x = — 2. Find 3 — 4x. _____

(26) If 15 ★s cost $18.45 then 10 ★s cost $ _____

(27) $11 \times \frac{14}{17} =$ _____ (mixed number)

(28) $3\frac{3}{5} \times 1\frac{2}{9} =$ _____ (mixed number)

(29) Set E = {e,l,p,a,s,o} and A = {a,u,s,t,i,n}. E ∪ A contains how many distinct elements? _____

***(30)** $4\frac{2}{7} \times 6390 \div 15 =$ _____

(31) 0.515151... = _____ (proper fraction)

(32) $12^2 + 36^2 =$ _____

(33) $(37 + 27 \times 17) \div 8$ has a remainder of _____

(34) 27% of $211\frac{1}{9} =$ _____

(35) If a = 12 and b = 11, then $9a^2 - 6ab + b^2 =$ _____

(36) 15% of 30 minus 45 is _____

(37) 312 base 5 in base 10 is _____

(38) $73 \times 23 =$ _____

(39) The perimeter of a square is 14". The area of the square is _____ sq. in.

*(40) $\sqrt{44044} =$ _____

(41) $22 \times 28 + 9 =$ _____

(42) If $9^{-1} - x^{-1} = 10^{-1}$ then x = _____

(43) 75% of 80 = 30% of _____

(44) A face of a Platonic dodecahedron has ____vertices

(45) Let $21^7 \times 21^{-3} \div 21^5 = 21^k$. Find k. _____

(46) The area of a right triangle with a base of 7 cm and a hypotenuse of 25 cm is _____ sq. cm

(47) $(\frac{3}{4})^2 \div (\frac{3}{8})^2 \times (\frac{3}{16})^2 =$ _____

(48) How many subsets containing only 3 elements does the set {p,r,i,m,e} have? _____

(49) $312_4 \times 3_4 =$ _____ 4

*(50) $12^3 \times 21^2 =$ _____

(51) Find the units digit of 17^6. _____

(52) The midpoint of the segment with endpoints (x, y) and (1, — 7) is (— 3, 5). Find $x + y$. _____

(53) $7 + 9 + 16 + 25 + 41 + 66 + 107 + 173 =$ _____

(54) ${}_5C_3 + {}_5C_2 =$ _____

(55) The probability of selecting a multiple of three from the set of positive digits is _____

(56) The sum of the roots of $(x + 5)^3 = 0$ is _____

(57) The sum of coeficients of the x^2y^2 term and the xy^3 term of $(x + y)^4$ is _____

(58) $\frac{6!}{3!3!} =$ _____

(59) $271 \times 314 =$ _____

*(60) $212312 \div 201.6 =$ _____

(61) The Greatest Integer Function is written as $f(x) = [x]$. Find $\left[\sin(\frac{\pi}{4}) + \cos(\frac{\pi}{4}) + \tan(\frac{\pi}{4})\right]$. ____

(62) How many positive integers less than 30 are relatively prime to 30? _____

(63) If $\begin{vmatrix} 1 & -5 \\ 12 & 22 \end{vmatrix} = 35 - k$ then k = _____

(64) If $2\log_4(3x - 1) = 3$ and $x > 0$ then x = _____

(65) The smallest integral value of x such that $|2x - 3| \leq 4$ is _____

(66) Change 0.2111... base 5 to a base 10 fraction. _____

(67) $F(x) = 2x^3 - 4$. $G(x) = 1 - x$. $F(G(-2)) =$ _____

(68) $\sec(\frac{\pi}{3}) + \csc(\frac{\pi}{6}) =$ _____

(69) The volume of a rectangular based pyramid with a base width 5", a base length 12", and a height 13" is _____ in^3

*(70) $(2 + 4 + 6 + 8 + ... + 18 + 20)^2 =$ _____

(71) The first four digits of the decimal for $\frac{31}{111}$ is 0.___

(72) Truncate $(2\sqrt{3} - \sqrt{5})$ to the nearest whole. ____

(73) If $f(x) = 1 - \frac{x+3}{4}$, then $f^{-1}(2) =$ _____

(74) $f(x) = 2x^3 + 6x^2 + 6x + 2$. Find $f''(3) =$ _____

(75) The minimum value of $f(x) = 4(x - 3)^2 + 1$ is ____

(76) If $x + 6 \equiv 2 \pmod 7$, $0 \leq x \leq 6$, then x = _____

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

(78) The sum of the first 3 hexagonal numbers is _____

(79) The range of the function $y = \sqrt{3 - x}$ is $y \geq$ ____

*(80) The compound interest on $2000 for 4 years at 8% compounded annually is _____ dollars (integer)

University Interscholastic League - Number Sense Answer Key HS ● Invitation B ● 2016
***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) 296

(2) 528

(3) 672

(4) 1,386

(5) 60

(6) 253

(7) .125, $\frac{1}{8}$

(8) — 1

(9) $1\frac{1}{3}$

***(10) 2,535 — 2,801**

(11) 529

(12) 2.24

(13) 210

(14) 391

(15) 1,728

(16) $5\frac{19}{20}$

(17) 20

(18) 8,064

(19) 0

***(20) 75 — 82**

(21) 59

(22) 3

(23) — .8, $-\frac{4}{5}$

(24) 343

(25) 11

(26) $12.30

(27) $9\frac{1}{17}$

(28) $4\frac{2}{5}$

(29) 10

***(30) 1,735 — 1,917**

(31) $\frac{17}{33}$

(32) 1,440

(33) 0

(34) 57

(35) 625

(36) — 40.5, $-\frac{81}{2}$, $-40\frac{1}{2}$

(37) 82

(38) 1,679

(39) 12.25, $\frac{49}{4}$, $12\frac{1}{4}$

***(40) 200 — 220**

(41) 625

(42) 90

(43) 200

(44) 5

(45) — 1

(46) 84

(47) .140625, $\frac{9}{64}$

(48) 10

(49) 2202

***(50) 723,946 — 800,150**

(51) 9

(52) 10

(53) 444

(54) 20

(55) $\frac{1}{3}$

(56) — 15

(57) 10

(58) 20

(59) 85,094

***(60) 1,001 — 1,105**

(61) 2

(62) 8

(63) — 47

(64) 3

(65) 0

(66) $\frac{9}{20}$

(67) 50

(68) 4

(69) 260

***(70) 11,495 — 12,705**

(71) 2792

(72) 1

(73) — 7

(74) 48

(75) 1

(76) 3

(77) .5, $\frac{1}{2}$

(78) 22

(79) 0

***(80) 685 — 757**