The University Interscholastic League
Number Sense Test • HS A • 2018

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) $118 + 811 - 181 =$ _____

(2) $40 \times 125 =$ _____

(3) $\frac{5}{8} + \frac{3}{16} =$ _____ **(proper fraction)**

(4) $123 \times 9 + 4 =$ _____

(5) $17^2 =$ _____

(6) $\frac{3}{40} =$ _____ **% (decimal)**

(7) $16 \times 28 + 16 \times 22 =$ _____

(8) $11 \div 2.5 =$ _____ **(decimal)**

(9) The largest prime divisor 76 is _____

***(10)** $158 \times 262 =$ _____

(11) $430 \div 9 =$ _____ **(mixed number)**

(12) 6 is _____ **% less than 25**

(13) 80% of 80 minus 80 = _____

(14) $1\frac{2}{5} + 1\frac{5}{7} =$ _____ **(mixed number)**

(15) MCXLVI = _____ **(Arabic Numeral)**

(16) If 1 gram = .04 oz, then 120 grams = _____ oz

(17) The GCD 24, 36, and 48 is _____

(18) $1994 \times 6 + 36 =$ _____

(19) The smallest prime number greater than 89 is ____

***(20)** $810210 \div 159 =$ _____

(21) 25 base 10 is written as _____base 7

(22) $(44 \times 19) - (36 \times 11) =$ _____

(23) 0.189189189... = _____ **(fraction)**

(24) $(37 \times 9 + 11) \div 5$ has a remainder of _____

(25) The sum of the roots $2x^2 - 4x - 3$ is _____

(26) $F(x) = 9x^2 - 6x + 1$, evaluate F(4). _____

(27) $64 \times 66 =$ _____

(28) $2500 = [2(15 + k)]^2$. Find $k \geq 0$. _____

(29) Given the set {1,3,6,10,15,p,28,36,q...}. q — p = ___

***(30)** 7 days = _____ **minutes**

(31) Let $x + y = 23$ and $xy = 76$, where x, y are integers and $y \geq x$. Find x. _____

(32) Let $(4x + 3)^2 = ax^2 + bx + c$. Find b — c. _____

(33) The LCM 24, 36, and 48 is _____

(34) How many positive integers between 4 and 28 are relatively prime to 28? _____

(35) $7^3 - 5^3 =$ _____

(36) A regular septagon has how many sides? _____

(37) Find the simple interest on \$300.00 at a rate of 4% for 2 years. \$_____

(38) $\frac{x-8}{x+9} + \frac{x+9}{x-8} = A\frac{B}{C}$, a simplified mixed number. Find B. _____

(39) $5\frac{1}{4}$ is _____ % less than 7

*(40) $(376 \times 49)^2 \div (51 \times 124)$ = _____

(41) The sum of the prime divisors of 30 is _____

(42) Find x if $4^x = 32$. x = _____

(43) 1,320 feet = _____ mile

(44) If $\sqrt{4k} = 6$ then k = _____

(45) $35^2 - 40^2$ = _____

(46) $5^6 \div 7$ has a remainder of _____

(47) If $2^{(2x+2y)} = 16$ then $(x+y)^2$ = _____

(48) The sum of the reciprocals of all of the positive integral divisors of 20 is _____

(49) The 6th hexagonal number is _____

*(50) $\sqrt{12018}$ = _____

(51) The vertex of the parabola, $y = 2x^2 - 4x - 5$ is at (h, k). h + k = _____

(52) $(3 - i)^2 + 6i$ = _____

(53) $(135_6)(4_6)$ = _____ 6

(54) $\log_3(9) + \log_3(27)$ = _____

(55) Two dice are rolled. What are the odds that a 4 was rolled? _____

(56) In Petville, 35 families have cats, 24 have dogs, and 12 have both. How many families are there? _____

(57) $2^{-1} + 2^{-2} + 2^{-3} + 2^{-4} + ...$ = _____

(58) The area of a 30° - 60° - 90° triangle with a hypotenuse length of 16 is $k\sqrt{3}$. k = _____

(59) If $x^2 + y^2 = 89$, $x > y$ and both x and y are positive integers, then y = _____

*(60) $14 \times 42 \times 70 \times 98$ = _____

(61) Find the sum of all positive integers x such that $3x - 6 < 9$. _____

(62) If $\begin{vmatrix} 2 & 5 \\ 3 & x \end{vmatrix} = 7$ then x = _____

(63) $\cos^{-1}(\sin \frac{\pi}{6})$ = _____°

(64) The volume of a right circular cylinder is 32π cm^3. Find the height if the radius is twice the the height. _____ cm

(65) $\sin^{-1}(\cos \frac{\pi}{3})$ = _____°

(66) 0.0202... base 5 = _____ base 10 (fraction)

(67) If $14^4 \div 4 = (2^x)(7^y)$, then x + y = _____

(68) $(2x^3 + x^2 + 3x + 4) \div (x + 1)$ has a remainder of _____

(69) Let $f(x) = 4x^2 - 1$. Find f(f(— 1)). _____

*(70) $\left(\frac{\sqrt{5}+1}{2}\right)^{10}$ = _____

(71) Change $\frac{3}{25}$ to a base 5 decimal. _____ 5

(72) Find x, $0 \le x \le 4$, if $16 + x \equiv 4 \pmod 5$. x = _____

(73) $f'(x) = 3$, $f(2) = 5$, find f(1). _____

(74) $y = \log_3(x)$ has a vertical asymptote at x = _____

(75) $\lim_{x \to 3} \frac{2x+2}{x^2+1}$ = _____

(76) $f(x) = \cos(x)$, $f''(60°)$ = _____

(77) $\int_0^3 (3 + x)\, dx$ = _____

(78) $7^9 \div 11$ has a remainder of _____

(79) 1 gallon + 2 quarts + 3 pints = _____ cups

*(80) 1428.57×69 = _____

University Interscholastic League - Number Sense Answer Key HS ● Invitation A ● Fall 2018
***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) 748

(2) 5,000

(3) .8125, $\frac{13}{16}$

(4) 1,111

(5) 289

(6) 7.5

(7) 800

(8) 4.4

(9) 19

***(10) 39,327 — 43,465**

(11) $47\frac{7}{9}$

(12) 76

(13) — 16

(14) $3\frac{4}{35}$

(15) 1,146

(16) 4.8, $\frac{24}{5}$, $4\frac{4}{5}$

(17) 12

(18) 12,000

(19) 97

***(20) 4,841 — 5,350**

(21) 34

(22) 440

(23) $\frac{7}{37}$

(24) 4

(25) 2

(26) 121

(27) 4,224

(28) 10

(29) 24

***(30) 9,576 — 10,584**

(31) 4

(32) 15

(33) 144

(34) 10

(35) 218

(36) 7

(37) $24.00

(38) 289

(39) 25

***(40) 50,992 — 56,359**

(41) 10

(42) 2.5, $\frac{5}{2}$, $2\frac{1}{2}$

(43) .25, $\frac{1}{4}$

(44) 9

(45) — 375

(46) 1

(47) 4

(48) 2.1, $\frac{21}{10}$, $2\frac{1}{10}$

(49) 66

***(50) 105 — 115**

(51) — 6

(52) 8

(53) 1032

(54) 5

(55) $\frac{1}{11}$

(56) 47

(57) 1

(58) 32

(59) 5

***(60) 3,831,996 — 4,235,364**

(61) 10

(62) 11

(63) 60

(64) 2

(65) 30

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

(67) 6

(68) 0

(69) 35

***(70) 117 — 129**

(71) .03

(72) 3

(73) 2

(74) 0

(75) .8, $\frac{4}{5}$

(76) — .5, — $\frac{1}{2}$

(77) 13.5, $\frac{27}{2}$, $13\frac{1}{2}$

(78) 8

(79) 30

***(80) 93,643 — 103,499**