The University Interscholastic League
Number Sense Test • HS B • 2015

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) $21315 - 31415 =$ _____

(2) $2015 \div 3 =$ _____ **(mixed number)**

(3) $31.4 + 201.5 =$ _____ **(decimal)**

(4) $2\frac{1}{3} \times 3\frac{1}{4} =$ _____ **(mixed number)**

(5) $\frac{11}{400} =$ _____ **% (decimal)**

(6) $0.3125 =$ _____ **(proper fraction)**

(7) $68 \times 75 =$ _____

(8) The largest prime factor of 111 is _____

(9) $15^2 =$ _____

***(10)** $21320 + 1531 + 420 + 15 =$ _____

(11) The GCD of 76 and 95 is _____

(12) 3 gallons — 2quarts — 1 pint = _____ pints

(13) $2 + 6 + 10 + 14 + ... + 38 + 42 =$ _____

(14) $2\frac{1}{3} - 3\frac{1}{4} =$ _____

(15) MMXCV = _____ (Arabic Numeral)

(16) $15 \times 112 + 113 \times 15 =$ _____

(17) Which is smaller, $-\frac{4}{9}$ or $-.49$? _____

(18) $31 - 4 \div 20 \times 15 + 5 \times 2 - 13 =$ _____

(19) Which of the following is divisible by 3: 213, 314, or 2015? _____

***(20)** $314 \times 213 \times 15 =$ _____

(21) $3\frac{1}{4} + 20\frac{1}{5} =$ _____

(22) 337.5 is 15% of _____

(23) If $x + (x + 4) + (x + 8) + (x + 12) + (x + 16) + (x + 20) = 72$, then $(x + 10) =$ _____

(24) Change 84 base 10 to base 5. _____ 5

(25) If $21 - 3x = 15$ then $3x - 14 =$ _____

(26) $\frac{22}{25} - \frac{45}{49} =$ _____

(27) .1505050... = _____ **(proper fraction)**

(28) If $x = 15$ and $y = 16$ then $x^2 + 2xy + y^2 =$ _____

(29) $54^2 + 18^2 =$ _____

***(30)** $\sqrt{192} \times \sqrt[3]{4100} =$ _____

(31) 88 has n positive integral divisors. n = _____

(32) $(312 + 413 - 15) \div 20$ has a remainder of _____

(33) Find the area of a rhombus with diagonals of $11\sqrt{2}$ dm and $22\sqrt{2}$ dm. _____ dm^2

(34) $88 \times 0.090909... =$ _____

(35) If 7 Cs cost \$21.14 then 10 Cs cost \$ _____

(36) $(4)^{-2} + (2)^{-1} + (2)^{0}$ = _____

(37) How many 3 element subsets and 2 element subsets does the set {e,i,g,h,t} have? _____

(38) $15 \times \frac{17}{19}$ = _____(mixed number)

(39) The product of the primes less than 10 is _____

*(40) $28 \times 30 \times 32$ = _____

(41) If $A^2 \div A^4 \times A^k = A^8$, then k = _____

(42) $(1 - 4i)^2 = a + bi$. Find a. _____

(43) Round $(\sqrt{3})(\sqrt{2})$ to the tenths place. _____

(44) $7 + 11 + 18 + 29 + 47 + 76 + 123 + 199$ = _____

(45) The point (— 3, — 4) is reflected across the line y = — 1 to the point (h, k). Find h + k. _____

(46) The product of the roots of $3x^2 + 4x = 5$ is _____

(47) If x + y = 2 and x — y = 5 then y = _____

(48) 6% of $833\frac{1}{3}$ = _____

(49) The coefficient of the xy^2 term when $(5x + 4y)^3$ is expanded is _____

*(50) The surface area of a sphere with a diameter of 10 inches is = _____ sq. inches

(51) The hypotenuse of a right triangle is $4\sqrt{5}$ and one leg is 4. Find the other leg. _____

(52) $2\log_4(8)$ = _____

(53) ${}_6C_2$ = _____

(54) Let $\frac{8!}{6!} = \frac{(x-1)!}{(x-2)!}$. Find x. _____

(55) $233_5 \div 4_5$ = _____ 5

(56) The first 4 digits of the decimal of $\frac{29}{90}$ is 0._____

(57) How much time has passed from 2:13 a.m. to 3:14 p.m. the same day? _____ minutes

(58) The odds of randomly selecting a prime number from $\{x \mid 0 < x \leq 15\}$ is _____

(59) 314×213 = _____

*(60) $21^3 \times 31^4 \div 15^6$ = _____

(61) If csc θ = 1.25 then sin θ = _____

(62) Change $0.2131313..._4$ to a base 4 fraction. _____4

(63) f(x) = 2x — 13 and g(x) = 3x + 14. g(f(5)) = _____

(64) How many positive integers less than or equal to 16 are relatively prime to 16? _____

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

(66) If ln(9) = kln(3) — ln(9), then k = _____

(67) The first two digits of the decimal of $\frac{41}{55_6}$ is 0.___ 6

(68) If k ÷ 101 = 323, then k = _____

(69) M varies inversely with 3N and M = 7 when N = 1. If N = 5 then M = _____

*(70) 142857 × 36 = _____

(71) $\sqrt{5929}$ = _____

(72) The greatest value of k such that ${}_{10}C_k = 45$ is _____

(73) The perimeter of a square is increased from 18" to 26". Find the corresponding increase in the area is _____ sq. in.

(74) $f(x) = \frac{x^2 + 3x + 2}{x - 2}$ has how many asymptotes? ____

(75) The sum of the first two *perfect* numbers is _____

(76) If $f(x) = 2x^3 + x - 5$, then $f''(-\frac{1}{2})$ = _____

(77) $\int_1^2 (x^{-2})\ dx$ = _____

(78) Write using numbers:
twenty and three-eighths billion. _____

(79) $15^3 - 11^3$ = _____

*(80) 314 rods is equivalent to _____ feet

University Interscholastic League - Number Sense Answer Key HS ● Invitation B ● 2015

***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) — 10,100

(2) $671\frac{2}{3}$

(3) 232.9

(4) $7\frac{7}{12}$

(5) 2.75

(6) $\frac{5}{16}$

(7) 5,100

(8) 37

(9) 225

***(10) 22,122 — 24,450**

(11) 19

(12) 19

(13) 242

(14) $-\frac{11}{12}$

(15) 2,095

(16) 3,375

(17) — .49, $-\frac{49}{100}$

(18) 25

(19) 213

***(20) 953,069 — 1,053,391**

(21) 23.45, $\frac{469}{20}$, $23\frac{9}{20}$

(22) 2,250

(23) 12

(24) 314

(25) — 8

(26) $-\frac{47}{1225}$

(27) $\frac{149}{990}$

(28) 961

(29) 3,240

***(30) 211 — 232**

(31) 8

(32) 10

(33) 242

(34) 8

(35) $30.20

(36) 1.5625, $\frac{25}{16}$, $1\frac{9}{16}$

(37) 20

(38) $13\frac{8}{19}$

(39) 210

***(40) 25,536 — 28,224**

(41) 10

(42) — 15

(43) 2.4

(44) 510

(45) — 1

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

(47) — 1.5, $-\frac{3}{2}$, $-1\frac{1}{2}$

(48) 50

(49) 240

***(50) 299 — 329**

(51) 8

(52) 3

(53) 15

(54) 57

(55) 32

(56) 3222

(57) 781

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

(59) 66,882

***(60) 713 — 788**

(61) .8, $\frac{4}{5}$

(62) $\frac{211}{330}$

(63) 5

(64) 8

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

(66) 4

(67) 41

(68) 32,623

(69) 1.4, $\frac{7}{5}$, $1\frac{2}{5}$

***(70) 4,885,710 — 5,399,994**

(71) 77

(72) 8

(73) 22

(74) 2

(75) 34

(76) — 6

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

(78) 20,375,000,000

(79) 2,044

***(80) 4,922 — 5,440**