The University Interscholastic League
Number Sense Test • HS Regional • 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) $413 + 414 + 2018 =$ _____

(2) $4.8 \times 1.25 =$ _____

(3) $414 \div 5 =$ _____ **(mixed number)**

(4) $18.75\% =$ _____ **(proper fraction)**

(5) $34^2 =$ _____

(6) $413414 \div 9$ **has a remainder of** _____

(7) $4\frac{1}{3} - 2\frac{1}{8} =$ _____ **(mixed number)**

(8) Which is larger, $-\frac{3}{5}$ **or** $-.59 =$ _____

(9) $CCCXIV + CDXIV =$ _____ **(Arabic Numeral)**

***(10)** $247 \times 352 =$ _____

(11) Simplify to lowest terms: $\frac{314}{414}$. _____

(12) 20 plus 30% of 40 = _____

(13) $2\frac{3}{5} + 5\frac{2}{3} =$ _____ **(mixed number)**

(14) $6 \times 12 \div 18 - 24 + 30 =$ _____

(15) $1995 \times 6 + 30 =$ _____

(16) The arithmetic mean of 15, 22, 37 and 41 = _____

(17) The largest prime number less than 79 is _____

(18) $63 \times 36 =$ _____

(19) $413 \times 11 =$ _____

***(20)** $41314 - 4131 + 413 - 41 + 4 =$ _____

(21) The number 70 has _____ **positive prime divisors**

(22) The simple interest on $800.00 at 9% for 8 months is $ _____

(23) $0.2353535... =$ _____ **(proper fraction)**

(24) $(41 \times 34 - 14) \div 8$ **has a remainder of** _____

(25) $8\frac{3}{4} \times 4\frac{1}{2} =$ _____

(26) Find the slope of the line $2x - 3y = 1$. _____

(27) $2 + 5 + 8 + 11 + ... + 32 + 35 =$ _____

(28) $\sqrt[3]{2197} =$ _____

(29) If $(2x - 5)^2 = ax^2 + bx + c$ **then** $a + b - c$ **is** ____

***(30)** $8102414 \div 314 =$ _____

(31) $468_{10} =$ _____ $_8$

(32) $414 \times 13 =$ _____

(33) The LCM 28, 56, and 14 is _____

(34) The larger root of $(x - 1)^2 = \frac{4}{9}$ **is** _____

(35) Given the set {4,6,8,9,p,q,14,15,... }. $p + q =$ _____

(36) $5\frac{1}{3}$ is _____ % more than 4

(37) The measure of a central angle of a regular nonagon is _____°

(38) 2 miles = _____ yards

(39) Find y if $2x - y = -6$ and $3x + y = 1$. $y =$ _____

*(40) $21^4 \div 7^3 \times 3^2 =$ _____

(41) $991^2 =$ _____

(42) The sum of the prime divisors of 70 is _____

(43) The 4-digit number 41k8 is divisible by 9. k = ____

(44) $31^2 - 41^2 =$ _____

(45) ${}_7P_3 =$ _____

(46) $5^{(-2)} =$ _____ (decimal)

(47) $124_8 \div 6_8 =$ _____ 8

(48) The sum of the reciprocals of all of the positive integral divisors of 15 is _____

(49) The 9th pentagonal number is _____

*(50) $\sqrt[3]{413414} =$ _____

(51) The vertex of $y = 3x^2 - 2x - 5$ is (h, k). h = _____

(52) If (111)(65)(k) = 404,040 then k = _____

(53) If 4, 11, and x are the integral sides of a triangle, then the greatest value of x is _____

(54) Let $5x - 7 < 12$. The largest integer x is _____

(55) The probability of randomly selecting a composite number from the set of positive digits is _____%

(56) $127 \times 413 =$ _____

(57) $\log 10^2 =$ _____

(58) If $x^2 + y^2 = 169$, $x > y$ and both x and y are positive integers, then $x - y =$ _____

(59) $321_4 =$ _____ 2

*(60) $8 \times 16 \times 24 \times 32 =$ _____

(61) Find the sum of all positive integers x such that $2x - 4 \leq 6$. _____

(62) 0.3111... base 5 = _____ base 5 (fraction)

(63) The simplified coefficient of the x^3y^3 term in the expansion of $(2x + y)^6$ is _____

(64) Let $\frac{2-3i}{i} = a + bi$. Find a + b. _____

(65) $\sin(\frac{5\pi}{6}) =$ _____

(66) $\cos(300°) =$ _____

(67) If $21^4 \div 3 = (3^x)(7^y)$, then xy = _____

(68) $f(x) = 2x^2 - 1$. $g(x) = 2 + x^2$. $g(f(1)) =$ _____

(69) $9^8 \div 7$ has a remainder of _____

*(70) $\left((\sqrt{5} + 1) \div 2 + \pi + e\right)^3 =$ _____

(71) Let $f'(x) = 4$ and $f(2) = 3$. Find $f(-1)$. _____

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

(73) The length of the tangent from (13, 0) to the circle $x^2 + y^2 = 25$ is _____

(74) If $\begin{vmatrix} -4 & 6 \\ 8 & x \end{vmatrix} = 9$ then x = _____ (decimal)

(75) $\lim_{x \to -2} \left(\frac{x+2}{x^2-4}\right) =$ _____

(76) $3^{-1} + 3^{-2} + 3^{-3} + 3^{-4} + ... =$ _____

(77) Find x, $1 \leq x \leq 6$, if $2x - 1 \equiv 4 \pmod 7$. _____

(78) Truncate $6\sqrt{6}$ to a whole number. _____

(79) 2 cups + 4 pints + 6 quarts = _____ gallons

*(80) How many seconds are in April, 2018? _____

DO NOT DISTRIBUTE TO STUDENTS BEFORE OR DURING THE CONTEST

University Interscholastic League - Number Sense Answer Key HS • Regional • 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) 2,845

(2) 6

(3) $82\frac{4}{5}$

(4) $\frac{3}{16}$

(5) 1,156

(6) 8

(7) $2\frac{5}{24}$

(8) $-.59, -\frac{59}{100}$

(9) 728

***(10) 82,597 — 91,291**

(11) $\frac{157}{207}$

(12) 32

(13) $8\frac{4}{15}$

(14) 10

(15) 12,000

(16) 28.75, $\frac{115}{4}$, $28\frac{3}{4}$

(17) 73

(18) 2,268

(19) 4,543

***(20) 35,682 — 39,436**

(21) 3

(22) $48.00

(23) $\frac{233}{990}$

(24) 4

(25) 39.375, $\frac{315}{8}$, $39\frac{3}{8}$

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

(27) 222

(28) 13

(29) — 41

***(30) 24,514 — 27,094**

(31) 724

(32) 5,382

(33) 56

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

(35) 22

(36) $\frac{100}{3}$, $33\frac{1}{3}$

(37) 40

(38) 3,520

(39) 4

***(40) 4,848 — 5,358**

(41) 982,081

(42) 14

(43) 5

(44) — 720

(45) 210

(46) .04

(47) 16

(48) 1.6, $\frac{8}{5}$, $1\frac{3}{5}$

(49) 117

***(50) 71 — 78**

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

(52) 56

(53) 14

(54) 3

(55) $\frac{400}{9}$, $44\frac{4}{9}$

(56) 52,451

(57) 2

(58) 7

(59) 111001

***(60) 93,389 — 103,219**

(61) 15

(62) $\frac{23}{40}$

(63) 160

(64) — 5

(65) .5, $\frac{1}{2}$

(66) .5, $\frac{1}{2}$

(67) 12

(68) 3

(69) 4

***(70) 398 — 439**

(71) — 9

(72) 6

(73) 12

(74) — 14.25

(75) $-.25, -\frac{1}{4}$

(76) .5, $\frac{1}{2}$

(77) 6

(78) 14

(79) 2.125, $\frac{17}{8}$, $2\frac{1}{8}$

***(80) 2,462,400 — 2,721,600**