The University Interscholastic League
Number Sense Test ● HS B ● 2018

Contestant's Number _____

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) $2018 - 201 - 20 =$ _____

(2) $8(10) + 8(12) + 8(2) =$ _____

(3) $37 \times 25 =$ _____

(4) $2018 \div 9$ has a remainder of _____

(5) $1234 \times 9 + 5 =$ _____

(6) $87.5\% =$ _____ (proper fraction)

(7) $\frac{2}{7} - \frac{2}{5} =$ _____

(8) $27^2 =$ _____

(9) MCCXLI = _____ (Arabic Numeral)

*(10) $20 + 81 \times 218 =$ _____

(11) If 1 gram = .04 oz, then 800 grams = _____ lbs

(12) The largest prime divisor of 253 is _____

(13) $4.8 \times 75 =$ _____

(14) The LCM of 63 and 28 is _____

(15) $48 \div 8 - 4 \times 12 =$ _____

(16) $1992 \times 8 + 64 =$ _____

(17) $\frac{18}{(5^3)(2)} =$ _____

(18) $5\frac{1}{4} - 2\frac{2}{3} =$ _____

(19) $11 \times 369 =$ _____

*(20) $\sqrt{224} \times \sqrt{325} =$ _____

(21) Find the simple interest on $600.00 at a rate of 4% for 5 months. $_____

(22) The GCD of 21, 49, and 42 is _____

(23) $72 \times 78 =$ _____

(24) The sum of 3 consecutive integers is 84. The largest of these integers is _____

(25) $6\frac{1}{3} \times 9\frac{1}{3} =$ _____

(26) $1 + 3 + 5 + 7 + ... + 47 + 49 =$ _____

(27) $(4 \times 9 + 6) \div 7$ has a remainder of = _____

(28) The number of positive integer divisors of 24 is ___

(29) The largest root of $15x^2 + 2x - 1 = 0$ is _____

*(30) $\sqrt{291} + \sqrt{359} + \sqrt{440} =$ _____

(31) A square has a perimeter of 48" and a diagonal length of $k\sqrt{2}$ ". Find k. _____

(32) Let $(5x - 1)^2 = ax^2 + bx + c$. Find $a + b + c$. ___

(33) $0.1373737...$ _____ (proper fraction)

(34) Change 37 base 8 to base 10. _____

(35) The smallest root of $(x-1)^2 = \frac{1}{4}$ is _____

(36) The measure of a central angle of a regular septagon is _____ °

(37) Find x if $3x - y = 8$ and $x + y = 6$. x = _____

(38) Given: 547B6 is divisible by 6. Find B > 5. _____

(39) $(\sqrt{256} - \sqrt{484})^3 =$ _____

(40) $42 \times 37 + 1500 =$ _____

(41) If $f(x) = 2x^2 - x - 4$ then $f(-3) =$ _____

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

(43) 5.6 is _____ % less than 8

(44) $\frac{1}{4}$ mile = _____ yards

(45) If $3^{(x+y)} = 81$ then $(x+y)^3 =$ _____

(46) $121_5 \div 4_5 =$ _____

(47) $32^2 - 37^2 =$ _____

(48) Given the sequence 2, 6, 14, 30, 62, k, 254, ...
k = _____

(49) The sum of the reciprocals of all of the positive integral divisors of R is 1.444... . R = _____

(50) $\sqrt[3]{531441} =$ _____

(51) If a triangle has integral sides of 6, 10, and x then
x + 3 > _____

(52) $11101_2 =$ _____ 4

(53) $60 + 30 + 15 + 7.5 + ... =$ _____

(54) The vertex of $y = 3x^2 + 6x + 1$ is (h, k). k = _____

(55) The 12th triangular number is _____

(56) $(259)(39)(k) = 121,212$. k = _____

(57) $\ln e^{10} =$ _____

(58) The probability of randomly selecting an ace from a standard deck of cards is _____ (fraction)

(59) If $x^2 + y^2 = 53$, x > y and both x and y are positive integers, then y = _____

(60) $11 \times 22 \times 33 \times 44 =$ _____

(61) Find the sum of all positive integers x such that $3x - 1 \le 8$. _____

(62) $241 \times 246 =$ _____

(63) 0.1333... base 5 = _____ base 10 (fraction)

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

(65) $\begin{bmatrix} 2 & 5 \\ 3 & 7 \end{bmatrix} + \begin{bmatrix} 1 & -1 \\ 1 & -1 \end{bmatrix} = \begin{bmatrix} a & c \\ b & d \end{bmatrix}$. ab - cd = _____

(66) $\tan(135°) =$ _____

(67) $\cot(\frac{5\pi}{4}) =$ _____

(68) $(x^2 + 5) \div (x + 2)$ has a remainder of _____

(69) The surface area of a cube is 96 cm^2. The perimeter of a single face of the cube is _____ cm

(70) $\pi^2 \times e^3 \times \phi^4 =$ _____

(71) Find x, $4 \le x \le 8$, if $3x - 4 \equiv 5(\bmod 9)$. x = _____

(72) The first four digits of the decimal for $\frac{3}{10}$ base 5 is
0._____ base 5

(73) $f'(x) = 2$, $f(1) = 3$, find f(4). _____

(74) The minimum value of $y = 3x^2 - 2$ is _____

(75) $\lim_{x \to 2} \frac{2x^2 - 8}{x - 2} =$ _____

(76) The length of the tangent from (5, 0) to the circle $x^2 + y^2 = 9$ is _____

(77) $\int_0^2 (4 - x)\, dx =$ _____

(78) $8^7 \div 6$ has a remainder of _____

(79) 4 bushels + 3 pecks - 1 quart = _____ pints

(80) $3\frac{1}{4} \times 13413 \div 26 =$ _____

University Interscholastic League - Number Sense Answer Key HS ● Invitation B ● 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) 1,797

(2) 192

(3) 925

(4) 2

(5) 11,111

(6) $\frac{7}{8}$

(7) $-\frac{4}{35}$

(8) 729

(9) 1,241

*(10) 16,795 — 18,561

(11) 2

(12) 23

(13) 360

(14) 252

(15) — 42

(16) 16,000

(17) .072, $\frac{9}{125}$

(18) $\frac{31}{12}$, $2\frac{7}{12}$

(19) 4,059

*(20) 257 — 283

(21) $10.00

(22) 7

(23) 5,616

(24) 29

(25) $\frac{532}{9}$, $59\frac{1}{9}$

(26) 625

(27) 0

(28) 8

(29) .2, $\frac{1}{5}$

*(30) 55 — 59

(31) 12

(32) 16

(33) $\frac{68}{495}$

(34) 31

(35) .5, $\frac{1}{2}$

(36) $\frac{360}{7}$, $51\frac{3}{7}$

(37) 3.5, $\frac{7}{2}$, $3\frac{1}{2}$

(38) 8

(39) — 216

*(40) 2,902 — 3,206

(41) 17

(42) 12

(43) 30

(44) 440

(45) 64

(46) 14

(47) — 345

(48) 126

(49) 9

*(50) 77 — 85

(51) 7

(52) 131

(53) 120

(54) — 2

(55) 78

(56) 12

(57) 10

(58) $\frac{1}{13}$

(59) 2

*(60) 333,815 — 368,953

(61) 6

(62) 59,286

(63) $\frac{7}{20}$

(64) 1

(65) — 12

(66) — 1

(67) 1

(68) 9

(69) 16

*(70) 1,291 — 1,426

(71) 6

(72) 2444

(73) 9

(74) — 2

(75) 8

(76) 4

(77) 6

(78) 2

(79) 302

*(80) 1,593 — 1,760