# The University Interscholastic League
## Number Sense Test ● HS B ● 2021

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) $41720 - 18420 =$ _____

(2) $417 + 1820 =$ _____

(3) $3.5 \times 1.1 =$ _____ **(decimal)**

(4) $\frac{3}{16} =$ _____**% (decimal)**

(5) $\frac{3}{4} + \frac{7}{8} =$ _____ **(improper fraction)**

(6) $4\frac{1}{7} + 4\frac{1}{8} =$ _____ **(mixed number)**

(7) $4.18 - 17.4 =$ _____ **(decimal)**

(8) MDCCXVIII = _____ **(Arabic Numeral)**

(9) The GCD of 56 and 84 is _____

*(10) $4182 + 4170 + 1817 + 2020 =$ _____

(11) $17 \times 71 =$ _____

(12) The mode of {1, 1, 2, 3, 5, 2, 1, 3, 4, 7} is _____

(13) $23^2 =$ _____

(14) DCCXIV — CDXVIII = _____ **(Arabic Numeral)**

(15) 17 is what percent of 85? _____%

(16) $41718 \div 6$ has a remainder of _____

(17) $8\frac{3}{5} \times 5\frac{1}{4} =$ _____ **(mixed number)**

(18) $53^2 \div 4$ has a remainder of _____

(19) 18% of $277\frac{7}{9} =$ _____

*(20) $417 \times 2041 \div 820 =$ _____

(21) $3\frac{1}{5}$ is the square root of _____ **(decimal)**

(22) $(14 + 15 \times 16 - 17) \div 6$ has a remainder of ____

(23) $74_8 =$ _____

(24) The arithmetic mean of 32, 37, and 48 is _____

(25) $555 \times \frac{3}{37} =$ _____

(26) Let $97 = p + q$, where $p = q + 17$. Find q. _____

(27) 265 base 10 equals kAx base 12. Find k + x. _____

(28) 50 is what percent greater than 40? _____%

(29) Find the value of k so that the slope of the line
$8x + ky = 2$ is — 4.  k = _____

*(30) $(59 \div 3 \times 24 \div 4)^2 =$ _____

(31) $0.11222... =$ _____ **(proper fraction)**

(32) If $(12)(63) = 21k$, then k = _____

(33) $7\frac{3}{5} \times 7\frac{2}{5} =$ _____ **(mixed number)**

(34) $6^6 \div 7$ has a remainder of _____

(35) Given: 3, 9, 12, 21, 33, m, 87, n, ... . $m + n =$ _____

(36) $\dfrac{4^3}{(2^3)(5^2)} =$ _____ (decimal)

(37) The number of positive integral divisors of 84 greater than 4 is _____

(38) If $4\sqrt{3} + \sqrt{75} = \sqrt{k}$, then $k =$ _____

(39) Find the smallest integer k, where $k > 3$, such that $7k + 4$ is a perfect square. _____

*(40) $3\frac{1}{17} \times 47820 \div 13 =$ _____

(41) $352 \times 358 =$ _____

(42) If $9 \times 3^3 \div 27^2 = 3^k$, then $k =$ _____

(43) Let $x + y = 16$ and $x - y = 21$. Find $x^2 - y^2$. _____

(44) $630_8 - 415_8 + 72_8 =$ _____ 8

(45) The cube root of 39,304 is _____

(46) If $\sqrt{a^5} \times \sqrt[3]{a^2} = \sqrt[n]{a^k}$, then $k =$ _____

(47) The product of the roots of $(5x - 2)^3 = 0$ is _____

(48) $(105)^3 =$ _____

(49) Given: 3, 4, 6, 8, 12, k, 18, ... . $k =$ _____

*(50) $\sqrt{325} \times \sqrt{253} \times \sqrt{532} =$ _____

(51) The sides of a right triangle are integers. If one leg is 13, then the hypotenuse is _____

(52) $\dfrac{1 + 4 + 9 + 16 + ... + 49}{1 + 3 + 6 + 10 + ... + 28} =$ _____

(53) Let $f(x) = 2x + \log_3(x)$. Find $f(9)$. _____

(54) The first 4 digits of the decimal of $\frac{5}{66}$ is 0._____

(55) $(4 + 7i)(3 - 5i) = a + bi$. $a + b =$ _____

(56) 0.125 mile = _____ yards

(57) The number of positive proper fractions in lowest terms with a denominator of 26 is _____

(58) $417 \times 131 =$ _____

(59) How many days are there from the end of 02/07/21 to the beginning of 03/14/21? _____ days

*(60) $(41)^4 = 38 \times$ _____

(61) Find the sum of all negative integers x such that $2x + 8 \ge 1$. _____

(62) $(185)^2 =$ _____

(63) $\sin(105°)\cos(105°) =$ _____

(64) $39 \times 111 =$ _____

(65) Round $(\sqrt{6} + \sqrt{7})$ to the nearest tenth. _____

(66) $21 \times \frac{22}{25} =$ _____ (mixed number)

(67) The sum of the reciprocals of all of the positive divisors of 30 is _____

(68) How many different 6-letter code words can be constructed using the letters ELEVEN? _____

(69) The determinant of $\begin{bmatrix} 2 & 3 \\ -k & 1.5 \end{bmatrix}$ is 4. $k =$ _____

*(70) 1,380 miles per hour = _____ feet per second

(71) Change .36, base 7, to a base 10 fraction. _____

(72) 30° Celsius = _____° Fahrenheit

(73) Let $f'(x) = 6x$ and $f(-1) = 3$. Find $f(-3)$. _____

(74) If $f(x) = 2x - 3$ then $f^{-1}[f(4)] =$ _____

(75) If $f(x) = 4 + \dfrac{3 - 2x}{5}$, then $f^{-1}(1) =$ _____

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

(77) $1718 \times 101 =$ _____

(78) $\int_1^3 x^2\, dx =$ _____

(79) The sum of the product of the roots taken two at a time of $2x^4 - 13x^3 + 28x^2 - 23x + 6 = 0$ is ____

*(80) The length of the altitude of an equilateral triangle with a perimeter of 510 cm is _____ cm

**DO NOT DISTRIBUTE TO STUDENTS BEFORE OR DURING THE CONTEST**

**University Interscholastic League - Number Sense Answer Key HS ● Invitation B ● 2021**
**\*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) 23,300

(2) 2,237

(3) 3.85

(4) 18.75

(5) $\frac{13}{8}$

(6) $8\frac{15}{56}$

(7) $-13.22$

(8) 1,718

(9) 28

\*(10) 11,580 — 12,798

(11) 1,207

(12) 1

(13) 529

(14) 296

(15) 20

(16) 0

(17) $45\frac{3}{20}$

(18) 1

(19) 50

\*(20) 987 — 1,089

(21) 10.24

(22) 3

(23) 60

(24) 39

(25) 45

(26) 40

(27) 2

(28) 25

(29) 2

\*(30) 13,228 — 14,620

(31) $\frac{101}{900}$

(32) 36

(33) $56\frac{6}{25}$

(34) 1

(35) 195

(36) .32

(37) 8

(38) 243

(39) 11

\*(40) 10,690 — 11,814

(41) 126,016

(42) $-1$

(43) 336

(44) 305

(45) 34

(46) 19

(47) .064, $\frac{8}{125}$,

(48) 1,157,625

(49) 14

\*(50) 6,284 — 6,944

(51) 85

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

(53) 20

(54) 0757

(55) 48

(56) 220

(57) 12

(58) 54,627

(59) 34

\*(60) 70,645 — 78,080

(61) $-6$

(62) 34,225

(63) $-.25$ , $-\frac{1}{4}$

(64) 4,329

(65) 5.1, $\frac{51}{10}$, $5\frac{1}{10}$

(66) $18\frac{12}{25}$

(67) 2.4, $\frac{12}{5}$, $2\frac{2}{5}$

(68) 120

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

\*(70) 1,923 — 2,125

(71) $\frac{27}{49}$

(72) 86

(73) 27

(74) 4

(75) 9

(76) $-2$

(77) 173,518

(78) $\frac{26}{3}$, $8\frac{2}{3}$

(79) 14

\*(80) 140 — 154