The University Interscholastic League
Number Sense Test • HS B • 2020

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) $20720 + 31420 =$ _____

(2) $31420 - 20720 =$ _____

(3) $\frac{3}{14} \div \frac{3}{8} =$ _____

(4) $4.3 \times 2.5 =$ _____

(5) $42\% =$ _____ **(proper fraction)**

(6) $4\frac{1}{8} + 3\frac{3}{4} =$ _____ **(mixed number)**

(7) $31^2 =$ _____

(8) $4 + 5 \times (6 - 7) \div (8 - 9) =$ _____

(9) Which is larger, $\frac{3}{8}$ or .38 = _____

***(10)** $1947 + 1875 + 1779 + 1648 =$ _____

(11) $9 \times 45 + 9 \times 36 =$ _____

(12) The mode of {1, 9, 4, 7, 1, 8, 7, 5, 1, 7, 7, 5} is _____

(13) $49^2 =$ _____

(14) $13 \times \frac{13}{15} =$ _____ **(mixed number)**

(15) $26052 \div 13 =$ _____

(16) $1892 \times 8 + 64 =$ _____

(17) $34 + 51 + 68 + 12 + 29 + 46 =$ _____

(18) The GCD of 18, 36, and 81 is _____

(19) $3\frac{1}{2}$ is the square root of _____ **(decimal)**

***(20)** $314 \times 207 =$ _____

(21) $1 - |1 - 2| - |3 - 5| - 8 =$ _____

(22) 33% of 2.666... = _____

(23) $\frac{2}{3}$ of a gallon = _____ cubic inches

(24) The slope of the line $4x + 5y = 6$ is _____

(25) How many subsets containing 3 elements or 4 elements does the set {l,e,n,g,t,h} have? _____

(26) $(37)(13)(7)(5)(3) =$ _____

(27) 1A1 base 16 is _____ in base 10

(28) The ratio of the width to the length of a rectangle is 3:5. The perimeter is 64". The width is _____"

(29) Let $(56x - 41)^2 = ax^2 + bx + c$. $a + b + c =$ ____

***(30)** $(\sqrt{1088} + \sqrt{728})(\sqrt{3598}) =$ _____

(31) 0.38555... = _____ **(proper fraction)**

(32) The number of prime divisors of 112 is _____

(33) If $2.555... \times k = 1$, then $k =$ _____

(34) Divide 83 into two parts such that the larger number is 25 more than the smaller number. The smaller number is _____

(35) 2.5 is _____ % greater than $\frac{4}{5}$

(36) $(39)^2 - (36)^2$ = _____

(37) $9\frac{1}{3} \times 12\frac{2}{3}$ = _____

(38) The smallest root of $(2x - 1)^2 = \frac{1}{16}$ is _____

(39) $(11^5 - 1) \div 5$ has a remainder of _____

*(40) $24^4 \times 12^2 \div 12^4$ = _____

(41) $(i)^{56} = a\sqrt{b}$, where $a,b \in \{-1,1\}$. Find $a + b$. ___

(42) The sum of the prime divisors of 96 is _____

(43) $77^2 - 63^2$ = _____

(44) $.125 + .25 + .375 + .5 + .625 + .75 + .875$ = _____

(45) $(201)^3$ = _____

(46) The eighth triangular number is _____

(47) 12% of $266\frac{2}{3}$ = _____

(48) ${}_8C_6 + {}_8P_2$ = _____

(49) $(51)^3 - (52)^3$ = _____

*(50) $\sqrt{207314}$ = _____

(51) The length of the altitude to the hypotenuse of a 6', 8', 10' triangle is _____ ft

(52) Find the modulus of $(7 + 24i)^2$. _____

(53) The simplified coefficient of the third term of the expansion of $(x + 2y)^4$ is _____

(54) A triangle has sides of 12, 8 and x. $x >$ _____

(55) $356_9 \div 6_9$ = _____ 9

(56) If $201_b = 129$, then 301_b = _____

(57) The probability of randomly selecting a 2, 3, 5, or 7 from a standard deck of cards is _____ (fraction)

(58) $888 \times \frac{4}{37}$ = _____

(59) Given P coplanar points such that no three points are collinear, only 15 lines exist. P = _____

*(60) $17 \times 28 + 16 \times 34$ = _____

(61) 1618×14 = _____

(62) Given: 5, 8, 14, 23, 35, k, 68, ... k = _____

(63) $2\sin\frac{\pi}{12}\cos\frac{\pi}{12}$ = _____

(64) How many positive integers less than 26 are relatively prime to 26? _____

(65) The sum of the reciprocals of all of the positive divisors of 24 is _____

(66) $14 \times \frac{16}{19}$ = _____ (mixed number)

(67) The shortest distance between (5, 5) and $24x + 7y = 25$ is _____

(68) How many different 5-letter code words can be constructed using the letters STATE? _____

(69) How many triangles can be formed using any three vertices of a regular pentagon? _____

*(70) $(\pi + e)^5$ = _____

(71) The first four digits of the decimal for $\frac{5}{23}$ base 6 is 0._____ base 6

(72) $f'(x) = -4$, $f(1) = 5$, find $f(-3)$. _____

(73) $43 \times 47 + 4$ = _____

(74) The minimum value of $y = 2(x - 3)^2 + 1$ is _____

(75) The graph of $y = \frac{x + 3}{x^2 + 9}$ has _____ asymptote(s)

(76) Find the sum of the squares of the roots of $6x^2 + x - 5 = 0$._____

(77) $\int_0^{10} (9 - x)\,dx$ = _____

(78) The tenth pentagonal number is _____

(79) $(\log_4 5)(\log_5 16)$ = _____

*(80) 340% of $(7.1 \times 8\frac{4}{5})$ = _____

DO NOT DISTRIBUTE TO STUDENTS BEFORE OR DURING THE CONTEST

University Interscholastic League - Number Sense Answer Key HS • Invitation B • 2020

***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) 52,140

(2) 10,700

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

(4) 10.75, $\frac{43}{4}$, $10\frac{3}{4}$

(5) $\frac{21}{50}$

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

(7) 961

(8) 9

(9) .38, $\frac{19}{50}$

***(10) 6,887 — 7,611**

(11) 729

(12) 7

(13) 2,401

(14) $11\frac{4}{15}$

(15) 2,004

(16) 15,200

(17) 240

(18) 9

(19) 12.25

***(20) 61,749 — 68,247**

(21) — 10

(22) .88, $\frac{22}{25}$

(23) 154

(24) — .8, — $\frac{4}{5}$

(25) 35

(26) 50,505

(27) 417

(28) 12

(29) 225

***(30) 3,418 — 3,776**

(31) $\frac{347}{900}$

(32) 2

(33) $\frac{9}{23}$

(34) 29

(35) 212.5, $\frac{425}{2}$, $212\frac{1}{2}$

(36) 225

(37) $\frac{1064}{9}$, $118\frac{2}{9}$

(38) .375, $\frac{3}{8}$

(39) 0

***(40) 2,189 — 2,419**

(41) 2

(42) 5

(43) 1,960

(44) 3.5, $\frac{7}{2}$, $3\frac{1}{2}$

(45) 8,120,601

(46) 36

(47) 32

(48) 84

(49) — 7,957

***(50) 433 — 478**

(51) 4.8, $\frac{24}{5}$, $4\frac{4}{5}$

(52) 625

(53) 24

(54) 4

(55) 54

(56) 193

(57) $\frac{4}{13}$

(58) 96

(59) 6

***(60) 969 — 1,071**

(61) 22,652

(62) 50

(63) .5, $\frac{1}{2}$

(64) 12

(65) 2.5, $\frac{5}{2}$, $2\frac{1}{2}$

(66) $11\frac{15}{19}$

(67) 5.2, $\frac{26}{5}$, $5\frac{1}{5}$

(68) 60

(69) 10

***(70) 6,564 — 7,254**

(71) 1555

(72) 21

(73) 2,025

(74) 1

(75) 1

(76) $\frac{61}{36}$, $1\frac{25}{36}$

(77) 40

(78) 145

(79) 2

***(80) 202 — 223**