The University Interscholastic League
Number Sense Test • HS Regional • 2023

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) $2122 \times 20 =$ _____

(2) $815 - 729 =$ _____

(3) $2021.22 + 202.3 =$ _____ **(decimal)**

(4) $23 \div 3\frac{1}{2} =$ _____ **(mixed number)**

(5) $20 \times 21 + 20 \times 22 + 20 \times 23 =$ _____

(6) $22^2 =$ _____

(7) $5 - 10 \times 15 \div 20 + 25 =$ _____

(8) $21.22 \times 10^2 - 2 =$ _____

(9) $5.555... =$ _____ **(improper fraction)**

***(10)** $20 + 2122 \times 23 =$ _____

(11) The GCD of 28, 35, and 63 is _____

(12) 202121 ÷ 9 has a remainder of _____

(13) Which is smaller $\frac{-3}{4}$ or $\frac{5}{-6}$? _____

(14) $124 \times 15 =$ _____

(15) $(420 + 421 + 422) \div 4$ has a remainder of _____

(16) $\frac{1}{4} + \frac{1}{6} + \frac{1}{8} =$ _____

(17) $(3^2 \times 6^2 \times 9) \div (6 \times 3) =$ _____

(18) If 9 dits cost \$12.00, then 6 dits will cost \$ _____

(19) $23 \times 32 =$ _____

***(20)** $892 \times 213 =$ _____

(21) The cost of filling up a 22 gallon tank at \$3.49 a gallon is \$_____

(22) $124 \div 25 =$ _____ **(decimal)**

(23) How many prime numbers divide 180? _____

(24) If $x = 22$, then $x^2 - 4x + 4 =$ _____

(25) $2122_4 =$ _____ **10**

(26) $10\frac{4}{7} \times 10\frac{3}{7} =$ _____ **(mixed number)**

(27) $0.41666... + 0.8333... =$ _____

(28) $\frac{4}{7}$% of 14 is $\frac{2}{3}$% of _____

(29) $1492 \times 8 + 8^2 =$ _____

***(30)** $420212 \div 223 =$ _____

(31) $43 \times 47 =$ _____

(32) $6\frac{2}{3} \times 9\frac{2}{3} =$ _____ **(mixed number)**

(33) $[17 + 4 \times 7 + 8] \div 6$ has a remainder of _____

(34) Given: 1, 1, 3, 5, 6, 12, p, r, 15, 35,... . p — r = ____

(35) How many integers less than or equal to 21 are relatively prime to 21? _____

(36) 40 cars use gas, 18 cars use electricity, and 12 cars use both. How many cars are there? _____

(37) $8\frac{3}{5} \times 5\frac{3}{8}$ = _____

(38) Given: $4 + 7 + 10 + 13 + ... + 43 + 46$ = _____

(39) $3x^2 + kx + 4 = 0$ and the sum of its roots is 5. Find k. _____

*(40) $\sqrt{4222023}$ = _____

(41) The median of an isoceles trapezoid is 2'. If the longer base is 2.5', then the shorter base is _____"

(42) $(4^7 + 2^7) \div 6$ has a remainder of _____

(43) 422_9 = _____ 3

(44) Let $y = 3 - x$ and $x = y - 3$. Find x. _____

(45) 3^6 has how many positive integral divisors? _____

(46) $5^4 - 3$ = _____ 5

(47) ${}_8P_4 \div {}_8P_1$ = _____

(48) 2122×13 = _____

(49) Let $4\frac{1}{m} \times n\frac{1}{13} = 22$, where m, n are natural numbers. Find $m + n$. _____

*(50) $636.363636... \times 765$ = _____

(51) $\frac{1}{6} + \frac{1}{36} + \frac{1}{216} + ...$ = _____

(52) $22_6 \times 4_6 - 23_6$ = _____ 6

(53) $73^2 - 74^2$ = _____

(54) Let $4^{(6x)} = 4096$. Find $4^{(2x)}$. _____

(55) $36^2 + 44^2$ = _____

(56) The measure of an exterior angle of a regular n-gon is 60° and its number of sides is _____

(57) Two dice are rolled. What is the probability that the sum of the faces is 2, 3, or 12? _____

(58) $50^{13} \div 13$ has a remainder of _____

(59) $\sum_{k=1}^{20} (-1)^k(k^2)$ = _____

*(60) 422 laps around a circle is _____ radians

(61) The area of the ellipse $16x^2 + 25y^2 = 400$ is $k\pi$. Find k. _____

(62) If $xy = 5$ and $x + y = -5$ then $x^3 + y^3$ = _____

(63) If $2\sqrt{50} + \sqrt{32} = \sqrt{x}$, then x = _____

(64) $2122_4 \div 3_4$ has a remainder of _____ 4

(65) $\sec(\cos^{-1}(-\frac{1}{2}))$ = _____

(66) The total surface area of a right circular cylinder with height 10' and diameter 4' is _____ π sq. ft.

(67) $\frac{5\times7! - 7\times5!}{5!}$ = _____

(68) $(6 - bi)^2 = 11 - 60i$ and b = _____

(69) $666 \times \frac{11}{37} \times \frac{4}{9}$ = _____

*(70) $\sqrt[3]{20212223}$ = _____

(71) The remainder when $x^3 + 6x^2 + 12x + 8 = 0$ is divided by $x + 2$ is _____

(72) Change .14 base 5 to a base 10 decimal. _____

(73) The smallest value in the domain of $y = \sqrt{4 - x^2}$, where $y \in \{Reals\}$, is _____

(74) Let $f'(x) = 4x$ and $f(1) = 0$. Find $f(-1)$. _____

(75) $\int_0^{\pi} \sin^2(x)\,dx = k\pi$ and k = _____

(76) Given: 0, 2, 4, 7, 10, d, e , f, 11 ... . Find $e + f$. ____

(77) $(501)^3$ = _____

(78) $7^{-1} + 7^{-2} + 7^{-3}$ = _____

(79) Round $(\sqrt{10} - \sqrt{8} + \sqrt{2})$ to the tenths place. ___

*(80) $0.08333... \times 7.111 \times 10^4$ = _____

DO NOT DISTRIBUTE TO STUDENTS BEFORE OR DURING THE CONTEST

University Interscholastic League - Number Sense Answer Key HS ● Regional ● 2023

***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) 42,440

(2) 86

(3) 2,223.52

(4) $6\frac{4}{7}$

(5) 1,320

(6) 484

(7) 22.5, $\frac{45}{2}$, $22\frac{1}{2}$

(8) 2,120

(9) $\frac{50}{9}$

***(10) 46,385 — 51,267**

(11) 7

(12) 8

(13) $-\frac{5}{6}$

(14) 1,860

(15) 3

(16) $\frac{13}{24}$

(17) 162

(18) 8.00

(19) 736

***(20) 180,497 — 199,495**

(21) 76.78

(22) 4.96

(23) 3

(24) 400

(25) 154

(26) $110\frac{12}{49}$

(27) 1.25, $\frac{5}{4}$, $1\frac{1}{4}$

(28) 12

(29) 12,000

***(30) 1,791 — 1,978**

(31) 2,021

(32) $64\frac{4}{9}$

(33) 5

(34) — 12

(35) 12

(36) 46

(37) $46\frac{9}{40}$

(38) 375

(39) — 15

***(40) 1,953 — 2,157**

(41) 18

(42) 0

(43) 110202

(44) 0

(45) 7

(46) 4442

(47) 210

(48) 27,586

(49) 8

***(50) 462,478 — 511,159**

(51) .2, $\frac{1}{5}$

(52) 105

(53) — 147

(54) 16

(55) 3,232

(56) 6

(57) $\frac{1}{9}$

(58) 11

(59) 210

***(60) 2,519 — 2,784**

(61) 20

(62) — 50

(63) 392

(64) 1

(65) — 2

(66) 48

(67) 203

(68) 5

(69) 88

***(70) 259 — 286**

(71) 0

(72) .36

(73) — 2

(74) 0

(75) .5, $\frac{1}{2}$

(76) 30

(77) 125,751,501

(78) $\frac{57}{343}$

(79) 1.7

***(80) 5,630 — 6,222**