The University Interscholastic League
Number Sense Test ● HS District ● 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) $2023 - 320 =$ _____

(2) $2021 + 2223 + 2425 =$ _____

(3) $2023 \times 6 =$ _____

(4) $325 \div 9 =$ _____ **(mixed number)**

(5) $16^2 =$ _____

(6) $\frac{17}{25} =$ _____ **%**

(7) $30 + 24 \div 18 \times 12 - 6 =$ _____

(8) $3\frac{2}{5}\% =$ _____ **(fraction)**

(9) **4 square yards =** _____ **square feet**

***(10)** $32020 + 32025 + 2023 =$ _____

(11) $2\frac{1}{3} + 5\frac{1}{6} =$ _____

(12) **MCXI — DLV =** _____ **(Arabic Numeral)**

(13) $4\frac{1}{3}\%$ **of 1500 is** _____

(14) $42 \times 15 =$ _____

(15) $1 + 4 + 7 + 10 + ... + 25 + 28 =$ _____

(16) **1.4 is** _____ **% of 28.**

(17) **The negative reciprocal of 1.125 is** _____

(18) $28^2 - 32^2 = 30 \times$ _____

(19) **1 gram = .04 oz. and 32 oz. =** _____ **grams**

***(20)** $(17 \times 23)^2 =$ _____

(21) **The LCM of 15, 18, and 45 is** _____

(22) $40 + 40\%$ **of 40 is** _____

(23) **The average speed of a car traveling 150 miles in 2.5 hours is** _____**mph**

(24) **The discriminant of** $x^2 - 4x - 12 = 0$ **is** _____

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

(26) **The smallest root of** $x^2 - 4x - 12 = 0$ **is** _____

(27) **59 x 59 =** _____

(28) $\frac{3}{8}\%$ **of 16 is** $\frac{2}{5}\%$ **of** _____

(29) **102 base 10 is written as** _____ **base 7**

***(30)** $\sqrt{32025} =$ _____

(31) $(9^3 - 1) \div (9 - 1) =$ _____

(32) **If** $y - x = 8$ **and** $x + y = 4$**, then** $xy =$ _____

(33) $4\frac{3}{7} \times 7\frac{3}{4} =$ _____ **(mixed number)**

(34) **The slope of the line** $5x - 6y = 7$ **is** _____

(35) $10\frac{1}{8} \times 8\frac{2}{5}$ = _____

(36) 0.05333... = _____ (proper fraction)

(37) How many integers less than 35 are relatively prime to 35? _____

(38) 44_8 = _____ 4

(39) $32^2 \div 16^2 \times 8^2$ = _____

*(40) $1095 \times 905 - 899 \times 901$ = _____

(41) 325_9 = _____ 3

(42) $1591 \times 9 + 81$ = _____

(43) $(36)^{(1.5)}$ = _____

(44) $7^3 - 7$ = _____ 7

(45) 107×109 = _____

(46) 2023×14 = _____

(47) $(6x - 5)^2 = ax^2 + bx + c$ and $a + b + c$ = _____

(48) The set {s,q,u,a,r,e} has _____ 4-elements subsets

(49) $13 \times \frac{15}{19}$ = _____ (mixed number)

*(50) 5714.28×78 = _____

(51) $44^2 + 65^2$ = _____

(52) $123^{19} \div 7$ has a remainder of _____

(53) Let $5\frac{3}{m} \times n\frac{1}{2} = 14$, where m, n are natural numbers. Find $m + n$. _____

(54) The sum of the product of the roots taken two at a time of $x^3 + 6x^2 + 12x + 8 = 0$ is _____

(55) $(4 + 11 + 15 + 26 + 41) + (67 + 108 + 175 + 283 + 458)$ = _____

(56) $\log_5 3 - \log_5 8 = \log_5$ _____

(57) A nonagon has how many distinct diagonals? ____

(58) If $(1 - 3i)(5 + 7i) = (a + bi)$, then $a + b$ = _____

(59) The probability of drawing a prime digit from the set of positive digits is _____

*(60) $\sqrt[3]{202325203}$ = _____

(61) $12 \times 6! - 32 \times 5!$ = _____

(62) $(\cos\frac{\pi}{6})(\cos\frac{\pi}{3}) - (\sin\frac{\pi}{6})(\sin\frac{\pi}{3})$ = _____

(63) The harmonic mean of the roots of $x^3 - 6x^2 + 11x - 6 = 0$ is _____

(64) Let $\det\begin{vmatrix} 1 & 3 \\ x & -5 \end{vmatrix} = \det\begin{vmatrix} 2 & x \\ -4 & 6 \end{vmatrix}$. Find x. _____

(65) If the fourth term in the expansion of $(2x + 3y)^5$ is $cx^a y^b$, then $a + b + c$ = _____

(66) If $xy = -4$ and $x + y = -3$ then $x^3 + y^3$ = _____

(67) $(0 + i)^{26}$ = _____

(68) A triangle has sides of 3, 6, and x. $x + 1 >$ _____

(69) Given: 1, 5, 7, 9, 10, d, f , 15, ... Find $d + f$. _____

*(70) 62.5% of 24 yards = _____ inches

(71) If $f(x) = x^3 + 6x^2 + 12x + 8$, then $f'(1)$ = _____

(72) $999 \times \frac{14}{37} \times \frac{16}{27}$ = _____

(73) Find x, $7 \leq x \leq 13$, if $3x + 1 \cong 35 \pmod 7$. _____

(74) The graph of $y = \frac{x + 2}{5x^2 - 1}$ has _____ asymptotes

(75) $f(x) = \frac{2x + 3}{5} + 7$ and $f^{-1}(11)$ = _____

(76) $\lim_{x \to \infty} \frac{\sin(x)}{x}$ = _____

(77) $\int_0^{\pi} \sin(x)\, dx$ = _____

(78) $\sum_{x=1}^{3} (-x)^x$ = _____

(79) Round $(\sqrt{3} + \sqrt{5} + \sqrt{7})$ to the tenths place. ___

*(80) 75 miles/hour = _____ feet/second

DO NOT DISTRIBUTE TO STUDENTS BEFORE OR DURING THE CONTEST

University Interscholastic League - Number Sense Answer Key HS ● District ● 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) 1,703

(2) 6,669

(3) 12,138

(4) $36\frac{1}{9}$

(5) 256

(6) 68

(7) 40

(8) $\frac{17}{500}$

(9) 36

***(10) 62,765 — 69,371**

(11) 7.5, $\frac{15}{2}$, $7\frac{1}{2}$

(12) 556

(13) 65

(14) 630

(15) 145

(16) 5

(17) $-\frac{8}{9}$

(18) — 8

(19) 800

***(20) 145,237 — 160,525**

(21) 90

(22) 56

(23) 60

(24) 64

(25) $\frac{650}{9}$, $72\frac{2}{9}$

(26) — 2

(27) 3,481

(28) 15

(29) 204

***(30) 171 — 187**

(31) 91

(32) — 12

(33) $34\frac{9}{28}$

(34) $\frac{5}{6}$

(35) 85.05, $\frac{1701}{20}$, $85\frac{1}{20}$

(36) $\frac{4}{75}$

(37) 24

(38) 210

(39) 256

***(40) 171,928 — 190,024**

(41) 100212

(42) 14,400

(43) 216

(44) 660

(45) 11,663

(46) 28,322

(47) 1

(48) 15

(49) $10\frac{5}{19}$

***(50) 423,429 — 467,999**

(51) 6,161

(52) 4

(53) 7

(54) 12

(55) 1,188

(56) .375, $\frac{3}{8}$

(57) 27

(58) 18

(59) $\frac{4}{9}$

***(60) 558 — 616**

(61) 4,800

(62) 0

(63) $\frac{18}{11}$, $1\frac{7}{11}$

(64) $-\frac{17}{7}$, $-2\frac{3}{7}$

(65) 1,085

(66) — 63

(67) — 1

(68) 4

(69) 24

***(70) 513 — 567**

(71) 27

(72) 224

(73) 9

(74) 3

(75) 8.5, $\frac{17}{2}$, $8\frac{1}{2}$

(76) 0

(77) 2

(78) — 24

(79) 6.6

***(80) 105 — 115**