The University Interscholastic League
Number Sense Test • HS State • 2025

Final _____ _____
2nd _____ _____
1st _____ _____
Score Initials

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) $521 - 202 + 5 =$ _____

(2) $810.45 - 52.125 =$ _____ **(decimal)**

(3) **75% of 21 =** _____

(4) $2125 \div 5 =$ _____

(5) $815 \times 25 - 821 \times 25 =$ _____

(6) **0.5625 =** _____ **(fraction)**

(7) $21 + 36 + 51 + 66 + 81 + 96 + 111 =$ _____

(8) $7 - 2 \times 9 + (1 - 9) \div 4 \times 6 =$ _____

(9) $8\frac{3}{4}\% =$ _____ **(fraction)**

***(10)** $81547 + 82149 + 73052 - 52125 =$ _____

(11) $89 \times 98 =$ _____

(12) $8\frac{4}{5} - 5\frac{1}{7} =$ _____ **(mixed number)**

(13) **5212025 ÷ 11 has a remainder of** _____

(14) **MCMXLVII — DCCCXV =**
_____ **(Arabic Numeral)**

(15) **0.545454... =** _____ **(proper fraction)**

(16) **521 pecks =** _____ **bushels (decimal)**

(17) $47 \times 52 =$ _____

(18) $(5 \times 3^2 \times 2^3) \div (4 \times 6) =$ _____

(19) **In checking 140 houses with ants and/or roaches, they found 105 with roaches and 75 with ants. How many had just roaches?** _____

***(20)** $\sqrt{52125} + 12.5 =$ _____

(21) **If** $A^k \times A^5 \div A^2 = A^{-1}$ **and** $A > 1$**, then k =** _____

(22) **If** $x + (x + 2) + (x + 4) + (x + 6) + (x + 8) = 52$**, then** $(x + 4) =$ _____ **(decimal)**

(23) **Write two and three-fifth million seventy thousand eleven in digits.** _____

(24) $44^2 + 46^2 =$ _____

(25) $7\frac{2}{9} \times 7\frac{7}{9} =$ _____ **(mixed number)**

(26) $(8 + 10 \times 19 - 45) \div 11$ **has a remainder of** _____

(27) $5\frac{1}{4}$ **is to 25 as 7 is to k. Find k.** _____

(28) **Let p, q, r be the roots of** $4x^3 + 2x^2 - 5x - 6 = 0$**. Find** $pq + qr + pr + pqr - p - q - r$**.** _____

(29) **521 base 7 is written as** _____ **base 10**

***(30)** $8151947 \div 521 =$ _____

(31) $5\frac{2}{5} \div 2\frac{1}{2} =$ _____ **(mixed number)**

(32) $7 \times \frac{12}{17} =$ _____ **(mixed number)**

(33) **The quadratic equation,** $4x^2 + 60x + k = 0$**, has two equal roots. Find k.** _____

(34) How many of the first twelve positive triangular numbers are hexagonal numbers? _____

(35) The 10^{th} term of the sequence 1, 8, 27, 64, 125, ... is 1000. The 9^{th} term is _____

(36) If $f(x) = 3x^4 - 12x^3 + 18x^2 - 12x + 3$, then f(4) is _____

(37) Let $5x - y = 9$ and $5x + 2y = 1$. Find y. _____

(38) $22 \times 22 =$ _____

(39) $22 \times 22.5 =$ _____

*(40) 22% of $(22 \times 22 + 22 \times 22.5) =$ _____

(41) Let $(4x - 7)^2 = ax^2 + bx + c$. Find $a - b + c$. ___

(42) The measure of each of the exterior angles of a convex regular nonagon is _____°

(43) The point (5, 2) is reflected across the line $y = 1 - x$ to the point (h, k). Find $h + k$. _____

(44) $1921 \times 14 =$ _____

(45) The sum of the Fibonacci characteristic sequence $5 + a + b + c + d + e + f + g + h + i + 280$ is 731. Find g. _____

(46) $47^2 + 67^2 =$ _____

(47) $37\frac{1}{2}$% of 0.625 divided by $\frac{7}{8}$ is _____

(48) $521_8 - 215_8 + 152_8 =$ _____ 8

(49) $8^{25} \div 47$ has a remainder of _____

*(50) $\sqrt[3]{19202125} =$ _____

(51) $(3^3 + 11^3) \div (3 + 11) =$ _____

(52) A 3" by 5" picture is enlarged to 12" by 20". The original area is increased by a multiple of _____

(53) Let $(5 + 21i) \div (i^3) = a + bi$. Find $a - b$. _____

(54) $21 + 26 + 31 + 36 + ... + 96 =$ _____

(55) $521 \times 125 =$ _____

(56) The sum of the digits of a 3-digit number is 13. How many such numbers exist? _____

(57) $2125_6 \div 5_6$ has a remainder of _____

(58) How many ways can 5 people be seated in a circle with 6 chairs? _____

(59) Let t and n be consecutive triangular numbers such that $t + n = 196$. Find t, $t < n$. _____

*(60) $(0.252525... \times 1250)^2 =$ _____

(61) Let $A = \begin{bmatrix} 1 & 1 \\ 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 3 \\ 3 & 4 \end{bmatrix}$. Find $|AB|$. ____

(62) $\cos^2(\tan^{-1}(1)) =$ _____

(63) $f(x) = 2x - 1$, $g(x) = 2x + 5$, and $f(g(-5)) =$ _____

(64) Change $0.5212121..._7$ to a base 7 fraction. _____ 7

(65) Ed's weekly salary of $780 was increased 5%. How much is Ed's weekly salary now? $ _____

(66) Jo's weekly salary of $780 was decreased 5%. How much is Jo's weekly salary now? $ _____

(67) Tim's weekly salary of $780 was increased 5%. After the increase his new salary was raised 2%. How much is Tim's weekly salary now? $ _____

(68) If $\frac{3}{20}$ base 5 = 0.abbb... base 5, then $a + b =$ _____

(69) $(1, \frac{5\pi}{6})$ are polar coordinates for (x, y). y = _____

*(70) The total surface area of a hemisphere with a radius of 5.2 cm is _____ square cm

(71) 8128 written in base 2 is _____ 2

(72) Let $f(x) = \frac{\cos(x)}{2}$. Find $f''(\frac{3\pi}{2})$. _____

(73) The directrix of $x^2 - 2x - 4y = 7$ is y = _____

(74) The domain of $f(q) = \sqrt{\frac{5q + 21}{2 - 5q}}$ is $p \leq q < r$ and $q \in$ Reals. Find $p + r$. _____

(75) $(-1, \frac{5\pi}{2})$ are polar coordinates for (x, y). y = ____

(76) $\int_0^5 \int_1^2 xy \, dxdy =$ _____

(77) $3^{76} \div 35$ has a remainder of _____

(78) Given: 1, 2, 3, 4, 6, 5, k, — 2, — 9... . Find k. _____

(79) $\sqrt[3]{140608} =$ _____

*(80) 5 *leagues* of land plus 21 *labors* of land plus 2025 square *varas* of land in Texas is _____ acres

DO NOT DISTRIBUTE TO STUDENTS BEFORE OR DURING THE CONTEST

University Interscholastic League - Number Sense Answer Key HS ● State ● 2025

***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) 324

(2) 758.325

(3) 15.75, $\frac{63}{4}$, $15\frac{3}{4}$

(4) 425

(5) — 150

(6) $\frac{9}{16}$

(7) 462

(8) — 23

(9) $\frac{7}{80}$

***(10) 175,392 — 193,854**

(11) 8,722

(12) $3\frac{23}{35}$

(13) 5

(14) 1,132

(15) $\frac{6}{11}$

(16) 130.25

(17) 2,444

(18) 15

(19) 65

***(20) 229 — 252**

(21) — 4

(22) 10.4

(23) 2,670,011

(24) 4,052

(25) $56\frac{14}{81}$

(26) 10

(27) $\frac{100}{3}$, $33\frac{1}{3}$

(28) .75, $\frac{3}{4}$

(29) 260

***(30) 14,865 — 16,429**

(31) $2\frac{4}{25}$

(32) $4\frac{16}{17}$

(33) 225

(34) 6

(35) 729

(36) 243

(37) — $\frac{8}{3}$, — $2\frac{2}{3}$

(38) 484

(39) 495

***(40) 205 — 226**

(41) 121

(42) 40

(43) — 5

(44) 26,894

(45) 66

(46) 6,698

(47) $\frac{15}{56}$

(48) 456

(49) 17

***(50) 255 — 281**

(51) 97

(52) 16

(53) — 26

(54) 936

(55) 65,125

(56) 69

(57) 0

(58) 120

(59) 91

***(60) 94,658 — 104,621**

(61) 1

(62) .5, $\frac{1}{2}$

(63) — 11

(64) $\frac{151}{220}$

(65) 819.00

(66) 741.00

(67) 835.38

(68) 3

(69) .5, $\frac{1}{2}$

***(70) 243 — 267**

(71) 1111111000000

(72) 0

(73) — 3

(74) — 3.8, — $\frac{19}{5}$, — $3\frac{4}{5}$

(75) — 1

(76) 18.75, $\frac{75}{4}$, $18\frac{3}{4}$

(77) 11

(78) 4

(79) 52

***(80) 24,570 — 27,155**