

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

Contestant's Number _____

Read directions carefully
before beginning test

**DO NOT UNFOLD THIS SHEET
UNTIL TOLD TO BEGIN**

Final _____

2nd _____

1st _____

Score _____

Initials _____

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) $11030 + 2025 =$ _____
- (2) $\frac{1}{10} \div 0.4 =$ _____
- (3) $\frac{2}{5} \times 130 =$ _____
- (4) $2025 - 130 - 110 =$ _____
- (5) $10\frac{1}{4}\%$ = _____ (decimal)
- (6) $110 \div 25 + 130 \div 25 =$ _____
- (7) $1030 \times 15 =$ _____
- (8) $(2 \div 1 + 3 \times 4 - 7) \times 11 =$ _____
- (9) $26^2 =$ _____
- *(10) $520 + 20111 + 13020 + 25 =$ _____
- (11) $84 + 72 + 60 + 48 + 36 =$ _____
- (12) $\frac{4}{7}$ of 6 feet 5 inches = _____ inches
- (13) $13025 \div 9$ has a remainder of _____
- (14) $93 \times 98 =$ _____
- (15) The number of positive integral divisors of $2 \times 3 \times 5 \times 7$ is _____
- (16) 24% of $\frac{3}{4}$ of 18 is _____
- (17) $\text{MXXX} - \text{DXX} - \text{CX} =$ _____ (Arabic Numeral)
- (18) The sum of the median and the mode of the set of numbers $\{1, 1, 0, 2, 5, 1, 3, 0, 2, 5\}$ is _____
- (19) $1211 \times 11 - 121 =$ _____
- *(20) $11030 \div 25 =$ _____
- (21) If $A^6 \times A^{-2} \div A^3 = A^k$ and $A > 1$, then $k =$ _____
- (22) $\sqrt[3]{2197} =$ _____
- (23) A trapezoid has bases of 5 dm and 8 dm. If the altitude is 16 dm, then the area is _____ dm²
- (24) $(7^5 + 5^5 - 3) \div 12$ has a remainder of _____
- (25) $6\frac{5}{7} \times 6\frac{2}{7} =$ _____ (mixed number)
- (26) $[\{p, o, l, i, t, e\} \cap \{p, r, i, m, e\}] \cup \{n, u, m, b, e, r\}$ contains how many distinct elements? _____
- (27) 6 gallons at \$2.95 a gallon costs \$ _____
- (28) 6 gallons at \$2.89 a gallon costs \$ _____
- (29) 6 gallons at \$3.13 a gallon costs \$ _____
- *(30) $\sqrt{1103025} =$ _____
- (31) 1030 base 4 is written as _____ base 10
- (32) $5\frac{3}{7} \times 7\frac{3}{5} =$ _____
- (33) Find k, so that the roots of $4x^2 - 5x + k = 0$ are equal. _____

- (34) The 11th term of 2, 4, 7, 11, 16, 22, ... is 67. The 10th term is _____
- (35) $0.\overline{2888} = \underline{\hspace{2cm}}$ (proper fraction)
- (36) $(12)^{0.5} = a\sqrt{b}$ in simplified form and $b = \underline{\hspace{2cm}}$
- (37) Let $2x + y = 5$ and $3x + y = 7$. Find $x = \underline{\hspace{2cm}}$
- (38) 18% of $144\frac{4}{9} = \underline{\hspace{2cm}}$
- (39) If $f(x) = x^4 + 4x^3 + 6x^2 + 4x + 1$, then $f(3)$ is _____
- *(40) $34^2 + 2(26)(34) + 26^2 = \underline{\hspace{2cm}}$
- (41) $29^2 + 30^2 = \underline{\hspace{2cm}}$
- (42) A regular dodecahedron has how many congruent pentagonal regions? _____
- (43) $3^B + 3B = 93$ and $B^3 = \underline{\hspace{2cm}}$
- (44) $12 \times 11030 = \underline{\hspace{2cm}}$
- (45) Let $2^x \times 7^x = \frac{1}{196}$. Find $x = \underline{\hspace{2cm}}$
- (46) The point (5, -1) is reflected across the origin to the point (h, k). Find $h + k = \underline{\hspace{2cm}}$
- (47) $77^2 + 37^2 = \underline{\hspace{2cm}}$
- (48) $5C_3 \div 5P_2 = \underline{\hspace{2cm}}$
- (49) $(8^3 - 2^3) \div (8 - 2) = \underline{\hspace{2cm}}$
- *(50) $\sqrt[3]{520203011} = \underline{\hspace{2cm}}$
- (51) $2 + 7 + 9 + 16 + 25 + 41 + 66 + 107 + 173 + 280 = \underline{\hspace{2cm}}$
- (52) If urn A holds 10% more than urn B and urn C holds 54% more than urn B, then urn C holds what percent more than urn A? _____ %
- (53) $(7^7 + 3^7 + 4) \div 10$ has a remainder of _____
- (54) The average of 22_8 , 31_8 , and 35_8 is _____ 8
- (55) The average of 24_8 , 33_8 , and 37_8 is _____ 8
- (56) The average of 32_8 , 41_8 , and 45_8 is _____ 8
- (57) The sum of the digits of a 3-digit number is 5. How many such numbers exist? _____
- (58) The coefficient of the 3rd term of $(2x + 3y)^5$ is _____
- (59) $24^{10} \div 17$ has a remainder of _____
- *(60) $[0.121212\dots \times 3295]^2 = \underline{\hspace{2cm}}$
- (61) $2\cos^2(\frac{\pi}{4}) - 1 = \underline{\hspace{2cm}}$
- (62) Let $i^{(22)} = a\sqrt{b}$. Find $a + b = \underline{\hspace{2cm}}$
- (63) Change $0.1333\dots_6$ to a base 6 fraction. _____ 6
- (64) If $1^3 + k^3 = 28$, then $k = \underline{\hspace{2cm}}$
- (65) $f(x) = 2x^2 - 3x + 5$ and $f(f(1)) = \underline{\hspace{2cm}}$
- (66) 75 miles per hour = _____ feet per second
- (67) $9 + 6.75 + 5.0625 + 3.796875 + \dots = \underline{\hspace{2cm}}$
- (68) 0.45 base 6 = _____ base 10 (fraction)
- (69) Find k , if $\begin{vmatrix} 1 & 5k \\ 5 & 12 \end{vmatrix} = 22$. _____
- *(70) A pipe with a diameter of 8 feet is 76 feet long. The volume of the pipe is _____ cu. ft
- (71) The horizontal asymptote for $y = 2^x + 1$ is $y = \underline{\hspace{2cm}}$
- (72) Find x , $0 \leq x < 6$, if $4x \cong 22 \pmod{5}$. _____
- (73) $g(x) = \frac{x}{10} + \frac{1}{30}$ and $g^{-1}(-1) = \underline{\hspace{2cm}}$
- (74) The domain of $f(q) = \sqrt{\frac{1-q}{3q-2}}$ is $p < q \leq r$ and $q \in \text{Reals}$. Find $r = \underline{\hspace{2cm}}$
- (75) The rectangular coordinates of the polar coordinates $(2, \frac{3\pi}{2})$ are (x, y) and $y = \underline{\hspace{2cm}}$
- (76) $1030_5 \div 4_5 = \underline{\hspace{2cm}} 5$
- (77) $\int_0^1 (2x - 3) dx + \int_1^2 (2x - 3) dx = \underline{\hspace{2cm}}$
- (78) $453 \times 457 = \underline{\hspace{2cm}}$
- (79) Given: $\{3, 4, 7, 10, m, 21, n, \dots\}$. Find $m + n = \underline{\hspace{2cm}}$
- *(80) 5000 varas in Texas = _____ yards

University Interscholastic League - Number Sense Answer Key HS • Invitation A • 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) 13,055 | (18) $2.5, \frac{5}{2}, 2\frac{1}{2}$ | (34) 56 | (58) 720 |
| (2) .25, $\frac{1}{4}$ | (19) 13,200 | (35) $\frac{13}{45}$ | (59) 2 |
| (3) 52 | *(20) 420 — 463 | (36) 3 | *(60) $151,540 - 167,491$ |
| (4) 1,785 | (21) 1 | (37) 2 | (61) 0 |
| (5) .1025 | (22) 13 | (38) 26 | (62) 0 |
| (6) $9.6, \frac{48}{5}, 9\frac{3}{5}$ | (23) 104 | (39) 256 | (63) $\frac{4}{23}$ |
| (7) 15,450 | (24) 9 | *(40) 3,420 — 3,780 | (64) 3 |
| (8) 77 | (25) $42\frac{10}{49}$ | (41) 1,741 | (65) 25 |
| (9) 676 | (26) 8 | (42) 12 | (66) 110 |
| *(10) $31,993 - 35,359$ | (27) 17.70 | (43) 64 | (67) 36 |
| (11) 300 | (28) 17.34 | (44) 132,360 | (68) $\frac{29}{36}$ |
| (12) 44 | (29) 18.78 | (45) — 2 | (69) $-.4, -\frac{2}{5}$ |
| (13) 2 | *(30) 998 — 1,102 | (46) — 4 | *(70) $3,630 - 4,011$ |
| (14) 9,114 | (31) 76 | (47) 7,298 | (71) 1 |
| (15) 16 | (32) $\frac{1444}{35}, 41\frac{9}{35}$ | (48) $.5, \frac{1}{2}$ | (72) 3 |
| (16) $3.24, \frac{81}{25}, 3\frac{6}{25}$ | (33) $1.5625, \frac{25}{16}, 1\frac{9}{16}$ | (49) 84 | (73) $-\frac{31}{3}, -3\frac{1}{3}$ |
| (17) 400 | | *(50) 765 — 844 | |
| | | (51) 726 | (74) 1 |
| | | (52) 40 | (75) — 2 |
| | | (53) 4 | (76) 120 |
| | | (54) 30 | (77) — 2 |
| | | (55) 32 | (78) 207,021 |
| | | (56) 40 | (79) 46 |
| | | (57) 15 | *(80) $4,399 - 4,861$ |