

The University Interscholastic League
Number Sense Test • HS Regional • 2024

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) $330 - 2024 =$ _____
- (2) $2024 + 3 \times 2024 =$ _____
- (3) $30.24 \div 3 =$ _____ (decimal)
- (4) $27^2 =$ _____
- (5) $\frac{5}{16} =$ _____ % (decimal)
- (6) $333 \times \frac{1}{37} =$ _____
- (7) $33 \times 24 =$ _____
- (8) The GCD of 20, 24, and 30 is _____
- (9) MMXXX - CCCXX = _____ (Arabic Numeral)
- *(10) $2024 - 330 + 3320 - 324 =$ _____
- (11) The sum of the prime numbers greater than 70 and less than 80 is _____
- (12) How many integers are between -20 and 24? _____
- (13) $33 \times \frac{31}{34} =$ _____ (mixed number)
- (14) $20 \div (2 - 4) \times 3 + 30 =$ _____
- (15) $30 \div \frac{2}{5} =$ _____
- (16) $30 \div 0.8 =$ _____
- (17) $30 \div 1\frac{1}{5} =$ _____
- (18) $33^2 - 29^2 = 31 \times$ _____
- (19) $\frac{1}{64} - \frac{1}{16} - \frac{1}{4} =$ _____
- *(20) $33 \times (\sqrt{20} + \sqrt{24}) =$ _____
- (21) $0.58333\dots \times 72 =$ _____
- (22) 324×14 is _____
- (23) Round $\sqrt{6}$ to the nearest hundredths place. _____
- (24) 23% of 40 is _____ % of 10
- (25) The number of positive integral factors of 30 is _____
- (26) $15\frac{3}{4} \times 8\frac{2}{3} =$ _____ (mixed number)
- (27) Divide 24 into 4 parts such that the ratio of the 4 parts is 1:2:3:4. The largest part is _____
- (28) $2\frac{4}{5} \div 3\frac{7}{10} =$ _____
- (29) How many integers between 3 and 63 are divisible by 8? _____
- *(30) $151222 \div 136 =$ _____
- (31) $1776 \times 24 + 576 =$ _____
- (32) If $x + y = 6$ and $x - y = 4$, then $x^2 + y^2 =$ _____
- (33) If $f(x) = 4x^2 - 12x + 9$, then $f(15) =$ _____
- (34) $41.5 - 7.75 =$ _____

(35) $41\frac{1}{2} - 7\frac{3}{4} - 9\frac{7}{8} =$ _____

(36) $41\frac{1}{2} + 7.75 - 9\frac{7}{8} =$ _____

(37) Given: $0.125, \frac{1}{4}, 0.375, \frac{5}{8}, 1, m, 2.625, n, 6.875, \dots$.
Find $m + n$. _____

(38) The smaller root of $(4x - 1)^2 = 9$ is _____

(39) $[\{a, l, g\} \cup \{g, e, o, m\} \cup \{t, r, i, g\}] \cap \{p, r, e, c, a, l\}$ contains how many distinct elements? _____

*(40) $\sqrt[3]{4202033} =$ _____

(41) 75% of 37.5% of 64 is _____

(42) $(3^5 + 5^5 - 7) \div 8$ has a remainder of _____

(43) $19200 = 144 + 1588 \times$ _____

(44) Which is larger, $-\frac{11}{12}$ or $-\frac{10}{11}$? _____

(45) $83^2 + 22^2 =$ _____

(46) The sum of the measures of the interior angles of a regular heptagon is _____ degrees

(47) Let $8\frac{3}{m} \times n\frac{34}{35} = 26$, where m, n are natural numbers. Find mn . _____

(48) $(3! \times 6!) \div (5! \times 4!) =$ _____

(49) $330_{11} - 42_{11} + A9_{11} =$ _____ 11

*(50) $33^3 =$ _____

(51) If $\frac{1}{3} + \frac{1}{6} + \frac{1}{10} + \frac{1}{15} + \dots + \frac{1}{n} = \frac{11}{13}$, then $n =$ _____

(52) $(708)^2 =$ _____

(53) $8\frac{1}{2}$ is what percent less than $12\frac{1}{2}$? _____ %

(54) $(3 + 7 + 10 + 17 + 27 + 44 + 71) + (115 + 186 + 301) =$ _____

(55) $33024_7 \div 4_7$ has a remainder of _____ 7

(56) The perimeter of a square is decreased from 22 cm to 18 cm. Find the corresponding decrease in its area. _____ cm^2

(57) $21 + 14 + 9\frac{1}{3} + 6\frac{2}{9} + \dots =$ _____

(58) 150 fathoms = _____ inches

(59) The coefficient of the x^3y^2 term in the expansion of $(5x - 2y)^5$ is _____

*(60) A rectangular lot is $\frac{3}{8}$ of a mile by $\frac{7}{16}$ of a mile.
The area of the lot is _____ square feet

(61) Write in figures: three hundred and four-fifths million three thousand thirty. _____

(62) Given: y varies inversely with x and $y = 12$ when $x = 7$. Find y when $x = 11$. _____

(63) $\begin{bmatrix} 1 & 3 \\ 6 & 10 \end{bmatrix} \times \begin{bmatrix} 0 & -2 \\ k & 5 \end{bmatrix} = \begin{bmatrix} 12 & 13 \\ 40 & 38 \end{bmatrix}$. $k =$ _____

(64) $47^{15} \div 29$ has a remainder of _____

(65) The first 4 digits after the decimal point in the decimal representation of $\frac{13}{45}$ are _____

(66) A coin is tossed 3 times. What is the probability of getting 2 heads and 1 tail? _____ %

(67) Let $(6 + 4i) \div 2i = a + bi$. Find b . _____

(68) $\text{Arcsin}(\cos(\frac{\pi}{6})) =$ _____ degrees

(69) 0.77 base 8 = _____ base 10 (fraction)

*(70) $5^3 \div 4! \times 3^5 \div 2! =$ _____

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

(72) Find $f(g(-\frac{2}{3}))$ when $f(x) = 3x + 5$ and $g(x) = 5x - 3$. _____

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

(74) Given: $f(x) = -x^2 + 4x + 1$ has a maximum point at (a, b) . Find $a + b$. _____

(75) Find the slope of the line tangent to $f(x) = x^3 + 2x$ at the origin. _____

(76) $\int_1^2 \int_2^3 xy \, dy \, dx =$ _____

(77) Let (x, y) be the focus of $x = y^2 - 1$. $x =$ _____

(78) $330 \div 0.6875 =$ _____

(79) Given: 1, 1, 3, 5, 6, 12, 10, 22, T, P, $T - P =$ _____

*(80) $(\ln 100000)^3 =$ _____

DO NOT DISTRIBUTE TO STUDENTS BEFORE OR DURING THE CONTEST

University Interscholastic League - Number Sense Answer Key HS • Regional • 2024

*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) — 1,694 | (18) 8 | (35) $23.875, \frac{191}{8}, 23\frac{7}{8}$ | (59) 5,000 |
| (2) 8,096 | (19) $-\frac{19}{64}$ | (36) $39.375, \frac{315}{8}, 39\frac{3}{8}$ | *(60) $4,345,110 - 4,802,490$ |
| (3) 10.08 | *(20) $294 - 324$ | (37) $5.875, \frac{47}{8}, 5\frac{7}{8}$ | (61) 300,803,030 |
| (4) 729 | (21) 42 | (38) $- .5, - \frac{1}{2}$ | (62) $\frac{84}{11}, 7\frac{7}{11}$ |
| (5) 31.25 | (22) 4,536 | (39) 4 | (63) 4 |
| (6) 9 | (23) 2.45 | *(40) $154 - 169$ | (64) 11 |
| (7) 792 | (24) 92 | (41) 18 | (65) 2888 |
| (8) 2 | (25) 8 | (42) 1 | (66) $37.5, \frac{75}{2}, 37\frac{1}{2}$ |
| (9) 1,710 | (26) $136\frac{1}{2}$ | (43) 12 | (67) — 3 |
| *(10) $4,456 - 4,924$ | (27) $9.6, \frac{48}{5}, 9\frac{3}{5}$ | (44) $-\frac{10}{11}$ | (68) 60 |
| (11) 223 | (28) $\frac{28}{37}$ | (45) 7,373 | (69) $\frac{63}{64}$ |
| (12) 43 | (29) 7 | (46) 900 | *(70) $602 - 664$ |
| (13) $30\frac{3}{34}$ | *(30) $1,057 - 1,167$ | (47) 8 | (71) $6.8, \frac{34}{5}, 6\frac{4}{5}$ |
| (14) 0 | (31) 43,200 | (48) $1.5, \frac{3}{2}, 1\frac{1}{2}$ | (72) — 14 |
| (15) 75 | (32) 26 | (49) 397 | (73) 2 |
| (16) $37.5, \frac{75}{2}, 37\frac{1}{2}$ | (33) 729 | *(50) $34,141 - 37,733$ | (74) 7 |
| (17) 25 | (34) $33.75, \frac{135}{4}, 33\frac{3}{4}$ | (51) 78 | (75) 2 |
| | | (52) 501,264 | (76) $3.75, \frac{15}{4}, 3\frac{3}{4}$ |
| | | (53) 32 | (77) $-.75, -\frac{3}{4}$ |
| | | (54) 781 | (78) 480 |
| | | (55) 2 | (79) — 20 |
| | | (56) 10 | *(80) $1,450 - 1,602$ |
| | | (57) 63 | |
| | | (58) 10,800 | |