

The University Interscholastic League
Number Sense Test • HS State • 2022

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) $5622 - 1247 + 525 =$ _____

(17) $DCV + MCCII =$ _____ (Arabic Numeral)

(2) $1\frac{2}{3} \times 45.6 =$ _____

(18) How long is it between the beginning of May 6, 2022 and the end of Aug. 15, 2022? _____ days

(3) $3672 \div 12 =$ _____

(19) $50622 \div 9$ has a remainder of _____

(4) $0.\overline{428571428571428571\dots} =$ _____ (fraction)

(20) $650 \times 2220 =$ _____

(5) $2 - 1 \times (3 + 4) \div 7 - 11 =$ _____

(21) $73 \times 33 =$ _____

(6) $35 \times 28 - 23 \times 35 =$ _____

(22) If 9 pips cost \$45.18, then 11 pips cost \$ _____

(7) $\frac{11}{25} =$ _____ (decimal)

(23) $74^2 + 33^2 =$ _____

(8) $4\frac{1}{5} + 5\frac{1}{6} =$ _____ (mixed number)

(24) $\frac{41}{333} = 0.\overline{abcabcabc\dots}$ and $a + b + c =$ _____

(9) $72 \times 88 =$ _____

(25) If $\frac{2x+3}{5} + 7 = 11$, then $x - 4 =$ _____

*(10) $50622 - 62250 + 25062 =$ _____

(26) $\sqrt{196} - \sqrt{289} = d$ and $d^3 =$ _____

(11) Which is greater, $\frac{11}{16}$ or $\frac{16}{21}$? _____

(27) 50 base 10 = _____ base 6

(12) The GCD of 72, 54, and 90 is _____

(28) The product of the coefficients of $(2x + y)^3$ is _____

(13) The median of 2, 5, 1, 5, 2, 1, 3, 4, 1 is _____

(29) $7\frac{3}{8} \times 7\frac{5}{8} =$ _____ (mixed number)

(14) $2\frac{25}{84} - \frac{7}{12} =$ _____ (mixed number)

*(30) $5062022 \div 1247 =$ _____

(15) The number of prime numbers less than 35 and greater than 5 is _____

(31) The sum of the coefficients of $(2x - 3y)^5$ is _____

(16) The number of composite numbers greater than 5 and less than 35 is _____

(32) $2401 = k^4$ and $k =$ _____

(33) Given: 1, 7, 18, 34, 55, p, q, 148, $p - q =$ _____

- (34) $[20 + 22 \times 50 - 6] \div 4$ has a remainder of _____
- (35) If $4x - 7y = -3$ and $3x + 7y = 10$, then $x =$ _____
- (36) The smaller solution for $|5x + 6| = 22$ is _____
- (37) If $\frac{11}{14} = 78\frac{k}{7}\%$, then $k =$ _____
- (38) The perimeter of a face of a cube is 16". The cube's lateral surface area is _____ sq. in
- (39) Set $N = \{n, u, m, b, e, r\}$. How many distinct subsets of N contain at least 4 elements? _____
- *(40) $\sqrt{6052202} =$ _____
- (41) $70^2 - 69^2 =$ _____
- (42) If $A^k \div A^{-3} \times A^2 = A^5$ and $A > 1$, then $k =$ _____
- (43) Let $3x - 8y = 24$. The abscissa of the x-intercept plus the ordinate of the y-intercept is _____
- (44) $49^2 + 49 =$ _____
- (45) $6! \div 8! \times 2! =$ _____
- (46) Let $(1 + 3i)(6 - 10i) = a + bi$. Find $b - a$. _____
- (47) Let $6\frac{9}{m} \times n\frac{1}{3} = 23$, where m, n are natural numbers. Find $m \times n$. _____
- (48) The sum of the coefficients of the x^3y^2 term and the x^2y^3 term in the expansion of $(x + y)^5$ is _____
- (49) $135^9 \div 7$ has a remainder of _____
- *(50) $0.41666\dots \div 0.3125 \times 506 =$ _____
- (51) The Greatest Integer Function is written as $f(x) = [x]$. Find $[\sqrt{2} + \sqrt{5} + \sqrt{7}]$. _____
- (52) $\log_3(2) - \log_3(18) =$ _____
- (53) $\sqrt[3]{85184} =$ _____
- (54) The focus of $(y - 2)^2 = 12(x - 5)$ is at $(\underline{\hspace{2cm}}, 2)$.
- (55) The probability of picking a prime number from the set of factors of 45 is _____
- (56) $\sum_{k=1}^{12} (-1)^k(k^2) =$ _____
- (57) The roots of $6x^2 - 5x = 4$ are P and $-\frac{1}{2}$. $P =$ _____
- (58) $34 \times 46 + 36 =$ _____
- (59) $(4_7)^3 - (4_7)^2 - 4_7 =$ _____ 7
- *(60) $333 \times (0.1666\dots \div \frac{1}{9}) =$ _____
- (61) If $\tan(\theta) = \frac{\sin(30^\circ)}{1 + \cos(30^\circ)}$, then $\theta =$ _____ °
- (62) $235_8 =$ _____ 2
- (63) Let $f(x) = x^2 - 4$. Find $f(f(2))$. _____
- (64) A cylinder has a volume of $64\pi \text{ cm}^3$ and its height equals its radius. Find its height? _____ cm
- (65) $222 \times \frac{5}{27} =$ _____ (mixed number)
- (66) $\frac{1}{3} + \frac{3}{5} + \frac{14}{15} + \frac{23}{15} + \frac{37}{15} + 4 + \frac{97}{15} + \frac{157}{15} =$ _____
- (67) $(0.41666\dots)^{-3} =$ _____ (improper fraction)
- (68) If $x + 4 > 6$, then $4x >$ _____
- (69) Let (x, y) be the rectangular coordinate for the polar coordinate $(6, \frac{\pi}{3})$. $x =$ _____
- *(70) $142857 \times 43 =$ _____
- (71) $8^3 - 6^3 + 4^3 - 2^3 =$ _____
- (72) Let $f(x) = x^3 - x - 5$. Find $f'(3)$. _____
- (73) $\lim_{x \rightarrow 0} \frac{\sin(x)}{x} =$ _____
- (74) $(1.444\dots)^{-2} =$ _____
- (75) Find x , $0 \leq x \leq 4$, if $3x - 4 \cong 7 \pmod{5}$. _____
- (76) The vertical asymptote farthest to the left on the graph of $y = \frac{x+5}{(x+3)(x-3)}$ is $x =$ _____
- (77) $\int_0^3 (3-x) dx =$ _____
- (78) $\frac{5}{63} + \frac{5}{99} + \frac{5}{143} =$ _____
- (79) $5622 \times 13 =$ _____
- *(80) Crawling 6 miles at 6 in/sec takes _____ minutes

DO NOT DISTRIBUTE TO STUDENTS BEFORE OR DURING THE CONTEST

University Interscholastic League - Number Sense Answer Key HS • State • 2022

*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) 4,900 | (17) 1,807 | (34) 2 | (57) $\frac{4}{3}, 1\frac{1}{3}$ |
| (2) 76 | (18) 102 | (35) 1 | (58) 1,600 |
| (3) 306 | (19) 6 | (36) $-5.6, -\frac{28}{5}, -5\frac{3}{5}$ | (59) 62 |
| (4) $\frac{3}{7}$ | (20) $1,370,850 - 1,515,150$ | (37) 4 | (60) $475 - 524$ |
| (5) -10 | (21) 2,409 | (38) 64 | (61) 15 |
| (6) 175 | (22) 55.22 | (39) 22 | (62) 10011101 |
| (7) .44 | (23) 6,565 | (40) $2,338 - 2,583$ | (63) -4 |
| (8) $9\frac{11}{30}$ | (24) 6 | (41) 139 | (64) 4 |
| (9) 6,336 | (25) $4.5, \frac{9}{2}, 4\frac{1}{2}$ | (42) 0 | (65) $41\frac{1}{9}$ |
| (10) $12,763 - 14,105$ | (26) -27 | (43) 5 | (66) $26.8, \frac{134}{5}, 26\frac{4}{5}$ |
| (11) $\frac{16}{21}$ | (27) 122 | (44) 2,450 | (67) $\frac{1728}{125}$ |
| (12) 18 | (28) 576 | (45) $\frac{1}{28}$ | (68) 8 |
| (13) 2 | (29) $56\frac{15}{64}$ | (46) -28 | (69) 3 |
| (14) $1\frac{5}{7}$ | (30) $3,857 - 4,262$ | (47) 30 | (70) $5,835,709 - 6,449,993$ |
| (15) 8 | (31) -1 | (48) 20 | (71) 352 |
| (16) 21 | (32) 7 | (49) 1 | (72) 26 |
| | (33) -31 | (50) $641 - 708$ | (73) 1 |
| | | (51) 6 | (74) $\frac{81}{169}$ |
| | | (52) -2 | (75) 2 |
| | | (53) 44 | (76) -3 |
| | | (54) 8 | (77) $4.5, \frac{9}{2}, 4\frac{1}{2}$ |
| | | (55) $\frac{1}{3}$ | (78) $\frac{15}{91}$ |
| | | (56) 78 | (79) 73,086 |
| | | | (80) $1,004 - 1,108$ |