

# 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!

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| <p>(1) <math>5622 - 1247 + 525 =</math> _____</p> <p>(2) <math>1\frac{2}{3} \times 45.6 =</math> _____</p> <p>(3) <math>3672 \div 12 =</math> _____</p> <p>(4) <math>0.428571428571428571\dots =</math> _____ (fraction)</p> <p>(5) <math>2 - 1 \times (3 + 4) \div 7 - 11 =</math> _____</p> <p>(6) <math>35 \times 28 - 23 \times 35 =</math> _____</p> <p>(7) <math>\frac{11}{25} =</math> _____ (decimal)</p> <p>(8) <math>4\frac{1}{5} + 5\frac{1}{6} =</math> _____ (mixed number)</p> <p>(9) <math>72 \times 88 =</math> _____</p> <p>*(10) <math>50622 - 62250 + 25062 =</math> _____</p> <p>(11) Which is greater, <math>\frac{11}{16}</math> or <math>\frac{16}{21}</math>? _____</p> <p>(12) The GCD of 72, 54, and 90 is _____</p> <p>(13) The median of 2, 5, 1, 5, 2, 1, 3, 4, 1 is _____</p> <p>(14) <math>2\frac{25}{84} - \frac{7}{12} =</math> _____ (mixed number)</p> <p>(15) The number of prime numbers less than 35 and greater than 5 is _____</p> <p>(16) The number of composite numbers greater than 5 and less than 35 is _____</p> | <p>(17) <math>DCV + MCCII =</math> _____ (Arabic Numeral)</p> <p>(18) How long is it between the beginning of May 6, 2022 and the end of Aug. 15, 2022? _____ days</p> <p>(19) <math>50622 \div 9</math> has a remainder of _____</p> <p>*(20) <math>650 \times 2220 =</math> _____</p> <p>(21) <math>73 \times 33 =</math> _____</p> <p>(22) If 9 pips cost \$45.18, then 11 pips cost \$ _____</p> <p>(23) <math>74^2 + 33^2 =</math> _____</p> <p>(24) <math>\frac{41}{333} = 0.\text{abcabcabc}\dots</math> and <math>a + b + c =</math> _____</p> <p>(25) If <math>\frac{2x+3}{5} + 7 = 11</math>, then <math>x - 4 =</math> _____</p> <p>(26) <math>\sqrt{196} - \sqrt{289} = d</math> and <math>d^3 =</math> _____</p> <p>(27) 50 base 10 = _____ base 6</p> <p>(28) The product of the coefficients of <math>(2x + y)^3</math> is _____</p> <p>(29) <math>7\frac{3}{8} \times 7\frac{5}{8} =</math> _____ (mixed number)</p> <p>*(30) <math>5062022 \div 1247 =</math> _____</p> <p>(31) The sum of the coefficients of <math>(2x - 3y)^5</math> is _____</p> <p>(32) <math>2401 = k^4</math> and <math>k =</math> _____</p> <p>(33) Given: 1, 7, 18, 34, 55, p, q, 148, ... . <math>p - q =</math> _____</p> |
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- (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)  $0.41666... \div 0.3125 \times 506 =$  \_\_\_\_\_
- (51) The Greatest Integer Function is written as  $f(x) = [x]$ . Find  $\left[\sqrt{2} + \sqrt{5} + \sqrt{7}\right]$ . \_\_\_\_\_
- (52)  $\log_3(2) - \log_3(18) =$  \_\_\_\_\_
- (53)  $\sqrt[3]{85184} =$  \_\_\_\_\_
- (54) The focus of  $(y - 2)^2 = 12(x - 5)$  is at ( \_\_\_\_\_, 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)  $(4_7)^3 - (4_7)^2 - 4_7 =$  \_\_\_\_\_ <sub>7</sub>
- \*(60)  $333 \times (0.1666... \div \frac{1}{9}) =$  \_\_\_\_\_
- (61) If  $\tan(\theta) = \frac{\sin(30^\circ)}{1 + \cos(30^\circ)}$ , then  $\theta =$  \_\_\_\_\_<sup>o</sup>
- (62)  $235_8 =$  \_\_\_\_\_ <sub>2</sub>
- (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)  $(0.41666...)^{-3} =$  \_\_\_\_\_ (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)  $(1.444...)^{-2} =$  \_\_\_\_\_
- (75) Find  $x$ ,  $0 \leq x \leq 4$ , if  $3x - 4 \cong 7(\text{mod}5)$ . \_\_\_\_\_
- (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) $-5.6, -\frac{28}{5},$<br>$-5\frac{3}{5}$ | (59) 62                                   |
| (4) $\frac{3}{7}$     | *(20) 1,370,850 —<br>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 —<br>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                       |