

The University Interscholastic League
Number Sense Test • HS Regional • 2021

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) $6528 + 949 =$ _____
- (2) $4692 \div 23 =$ _____
- (3) $4.8 \times 1.5 =$ _____
- (4) $56\% =$ _____ (proper fraction)
- (5) $1 \times 3 - 6 + 10 \div 15 =$ _____
- (6) $18 \times 37 + 43 \times 18 =$ _____
- (7) $\frac{9}{16} =$ _____ (decimal)
- (8) $47^2 =$ _____
- (9) Which is larger, 0.75 or $\frac{5}{7}$? _____
- *(10) $68676 + 67668 + 66867 - 66687 =$ _____
- (11) $\frac{4}{5} \div \frac{15}{16} =$ _____
- (12) $\frac{9}{16} =$ _____ % (mixed number)
- (13) $DCXII \times IX =$ _____ (Arabic Numeral)
- (14) 24 is what percent of 60? _____ %
- (15) 2 gallons — 5 quarts + 3 pints = _____ pints
- (16) $6\frac{1}{5} \times 3\frac{3}{4} =$ _____ (mixed number)
- (17) $41\frac{2}{3}\%$ of 48 = _____
- (18) The cost of driving 180 miles at 18¢ a mile is \$ _____
- (19) $4\frac{1}{2}$ is the square root of _____ (decimal)
- *(20) $639 \times 3024 \div 728 =$ _____
- (21) $(66 \times 82 - 39 - 14) \div 9$ has a remainder of _____
- (22) $231 \times 16 =$ _____
- (23) The sum of the roots of $(5x + 6)(3x - 8)$ is _____
- (24) The arithmetic mean of 31, 42, and x is $33\frac{1}{3}$.
Find x. _____
- (25) $17^2 + 19^2 =$ _____
- (26) The multiplicative inverse of $-2\frac{5}{6}$ is _____
- (27) $203_6 =$ _____ 10
- (28) 36 is what percent less than 240? _____ %
- (29) How many days are there from the end of March 27 to the beginning of April 16? _____
- *(30) $(74 \div 4 \times 32 \div 6)^2 =$ _____
- (31) The sum of the GCD(18, 45) and the LCM(18, 45) is _____
- (32) If $3x - y = 5$ and $5x + y = 3$, then $xy =$ _____
- (33) Given: p, 3, 6, 9, 15, q, r, 63, $p + q + r =$ _____

(34) $27^2 + 68^2 =$ _____

(35) $217 \times 312 =$ _____

(36) $\frac{8^2}{(2^4)(5)} =$ _____ (decimal)

(37) If $(11x + 16)^2 = ax^2 + bx + c$,
then $a + b + c =$ _____

(38) How many subsets containing at least 3 elements does the set {T, E, X, A, S} have? _____

(39) Let P and Q be the roots of $3x^2 + 15x - 42 = 0$.
Find $P + Q - PQ$. _____

*(40) $38\frac{4}{5} \times 49330 \div 16 =$ _____

(41) $0.\overline{1545454\dots} =$ _____ (fraction)

(42) $19 \times 29 + 25 =$ _____

(43) The median to the hypotenuse of a 5-12-13 right triangle is _____ (decimal)

(44) Let $(3, -1)$ be the midpoint of a line segment with endpoints $(0, 2)$ and (x, y) . Find $x + y$. _____

(45) The digits C and D exists, such that $C43 - 47D = 265$. Find $C + D$. _____

(46) Given: 3, 5, 8, 11, 15, ..., k, 75, Find k. _____

(47) $(43_7 - 16_7) \times 4_7 =$ _____ 7

(48) $(204)^3 =$ _____

(49) The diameter of a sphere is 3 feet. The volume is $k\pi$ cubic feet. $k =$ _____

*(50) $(\sqrt{5041})^3 =$ _____

(51) $A^{-k} \times A^{-2} \div A^3 = A^4$ and $A > 1$. Find k. _____

(52) How many integers between 5 and 40 are relatively prime to 40? _____

(53) $31^3 - 30^3 =$ _____

(54) If 61 is in base 8, then its positive square root in base 10 is _____

(55) $(2 - 8i)(3 - 7i) = a + bi$. $a + b =$ _____

(56) The vertex of the parabola $y = -2x^2 + 6x + 1$ is (h, k) and k is _____

(57) If $234_b = 94$, then $123_b =$ _____

(58) $\log_4(x - 2)$ equals 1.5 when x equals _____

(59) $888 \times \frac{2}{37} =$ _____

*(60) $12 \times 24 \times 36 \times 48 =$ _____

(61) ${}_6P_3 + {}_6C_3 =$ _____

(62) $21 \times \frac{19}{23} =$ _____ (mixed number)

(63) A 5-digit number $17k18$ is divisible by 6. How many positive digits, k, exist? _____

(64) $\frac{5}{8}$ mile = _____ yards

(65) $\cos(\frac{5\pi}{6}) \times \cos(\frac{7\pi}{6}) =$ _____

(66) $\frac{4}{7} - \frac{23}{43} =$ _____

(67) The shortest distance between $(1, -1)$ and $8x + 15y = 17$ is _____

(68) A bag contains 5 green chips and x pink chips. The probability of drawing a pink chip is 80%. $x =$ _____

(69) $(44_8 \times 53_8 - 62_8) \div 7_8$ has a remainder of _____

*(70) 2000 feet per second = _____ miles per hour

(71) $f'(x) = 2x - 1$, $f(1) = -2$, find $f(2)$. _____

(72) The first four digits of the decimal for $\frac{12}{220}$ base 3 is 0._____ base 3

(73) $8 + 2x \equiv 4 \pmod{6}$, where $2 \leq x \leq 6$. $x =$ _____

(74) If $f(x) = 1 - \frac{2x+3}{4}$, then $f^{-1}(5) =$ _____

(75) The sum of the 7th triangular number and the 4th hexagonal number is _____

(76) $\int_1^2 (x^3) dx =$ _____

(77) Find the sum of the squares of the roots of $4x^2 + 7x - 11 = 0$. _____

(78) The intersection of the horizontal and vertical asymptotes of $y = (x - 3)^{-1} + 5$ is (x, y) . $x =$ _____

(79) Given: 1, 1, 4, 9, 25, ..., 441, k, 3025, $k =$ _____

*(80) $\frac{5}{9} \times 2.22 \times 33.3 \times 444 =$ _____

DO NOT DISTRIBUTE TO STUDENTS BEFORE OR DURING THE CONTEST**University Interscholastic League - Number Sense Answer Key HS • Regional • 2021***number) $x - y$ means an integer between x and y inclusiveNOTE: If an answer is of the type like $\frac{2}{3}$ it cannot be written as a repeating decimal

- | | | | |
|---------------------------------------|-------------------------------------|--|--|
| (1) 7,477 | (18) \$32.40 | (34) 5,353 | (57) 51 |
| (2) 204 | (19) 20.25 | (35) 67,704 | (58) 10 |
| (3) $7.2, \frac{36}{5}, 7\frac{1}{5}$ | *(20) $2,522 - 2,787$ | (36) .8 | (59) 48 |
| (4) $\frac{14}{25}$ | (21) 4 | (37) 729 | *(60) $472,781 - 522,547$ |
| (5) $-\frac{7}{3}, -2\frac{1}{3}$ | (22) 3,696 | (38) 16 | (61) 140 |
| (6) 1,440 | (23) $\frac{22}{15}, 1\frac{7}{15}$ | (39) 9 | (62) $17\frac{8}{23}$ |
| (7) .5625 | (24) 27 | *(40) $113,644 - 125,606$ | (63) 3 |
| (8) 2,209 | (25) 650 | (41) $\frac{17}{110}$ | (64) 1,100 |
| (9) .75, $\frac{3}{4}$ | (26) $-\frac{6}{17}$ | (42) 576 | (65) $.75, \frac{3}{4}$ |
| *(10) $129,698 - 143,350$ | (27) 75 | (43) 6.5 | (66) $\frac{11}{301}$ |
| (11) $\frac{64}{75}$ | (28) 85 | (44) 2 | (67) $\frac{24}{17}, 1\frac{7}{17}$ |
| (12) $56\frac{1}{4}$ | (29) 19 | (45) 15 | (68) 20 |
| (13) 5,508 | *(30) $9,249 - 10,221$ | (46) 52 | (69) 0 |
| (14) 40 | (31) 99 | (47) 132 | *(70) $1,296 - 1,431$ |
| (15) 9 | (32) -2 | (48) 8,489,664 | (71) 0 |
| (16) $23\frac{1}{4}$ | (33) 66 | (49) $4.5, \frac{9}{2}, 4\frac{1}{2}$ | (72) 0121 |
| (17) 20 | | *(50) $340,016 - 375,806$ | (73) 4 |
| | | (51) -9 | (74) $-9.5, -\frac{19}{2}, -9\frac{1}{2}$ |
| | | (52) 14 | (75) 56 |
| | | (53) 2,791 | (76) $3.75, \frac{15}{4}, 3\frac{3}{4}$ |
| | | (54) 7 | (77) $8.5625, \frac{137}{16}, 8\frac{9}{16}$ |
| | | (55) -88 | (78) 3 |
| | | (56) $5.5, \frac{11}{2}, 5\frac{1}{2}$ | (79) 1,156 |
| | | | *(80) $17,324 - 19,146$ |