

The University Interscholastic League
Number Sense Test • HS A • 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) $2050 - 202 =$ _____
- (2) $6834 \div 17 =$ _____
- (3) $\frac{7}{15} \times \frac{10}{21} =$ _____
- (4) $50220 \div 9$ has a remainder of _____
- (5) The LCM of 52 and 24 is _____
- (6) $3\frac{2}{5} + 6\frac{4}{9} =$ _____ (mixed number)
- (7) $0.\overline{1875} =$ _____ (proper fraction)
- (8) $|8 - 1| - 5 - |1 - 9| + |4 - 7| =$ _____
- (9) $5 + 10 \div 15 \times (20 - 25) =$ _____
- *(10) $5220 + 522 + 2052 - 2205 =$ _____
- (11) $7 \times 23 + 26 \times 7 =$ _____
- (12) Which is larger, 0.6 or $\frac{7}{12}$? _____
- (13) $MMXXI \times V =$ _____ (Arabic Numeral)
- (14) 24 is what percent of 20? _____ %
- (15) 170 less 30% of 170 is _____
- (16) $58^2 =$ _____
- (17) $2020 \div 6$ has a remainder of _____
- (18) $42^2 =$ _____
- (19) $2\frac{2}{5}$ is the square root of _____ (decimal)
- *(20) $518 \times 7491 =$ _____
- (21) $\sqrt[3]{2744} =$ _____
- (22) 48% of 1.333... = _____ (proper fraction)
- (23) 30 pints = _____ gallons
- (24) How many days are there from the beginning of 01/09/21 to the end of 03/22/21? _____ days
- (25) $24^2 + 25^2 =$ _____
- (26) The sum of the solutions of $|2x + 1| = 3$ is _____
- (27) 1A1 base 11 is _____ in base 10
- (28) $|2 - 3| - 5 + |7 - 11 + 13| =$ _____
- (29) Find the value of k so that the slope of the line $6x - ky = 2$ is 2. $k =$ _____
- *(30) $(48 \div 7 \times 24 \div 3)^2 =$ _____
- (31) $24^2 - 25^2 =$ _____
- (32) $111 \times 502 =$ _____
- (33) If $3.666\dots \times k = 1$, then $k =$ _____

- (34) If $f(x) = x^2 + 18x + 81$, then $f(21) =$ _____
- (35) $451 \times 459 =$ _____
- (36) $10\frac{2}{5} \times 10\frac{3}{5} =$ _____
- (37) $2 + 6 + 8 + 14 + 22 + \dots + 152 + 246 =$ _____
- (38) The largest root of $(3x - 2)^2 = \frac{1}{25}$ is _____
- (39) $1\frac{1}{2}$ is k % less than 4. k = _____% (decimal)
- *(40) $20\frac{2}{5} \times 50220 \div 17 =$ _____
- (41) If $4^{-1} + x^{-1} = 2^{-1}$, then $x =$ _____
- (42) If $\sqrt{72} + \sqrt{18} = \sqrt{k}$, then $k =$ _____
- (43) $(201)^3 =$ _____
- (44) Let $35^2 - 22^2 = 13k$. Find k. _____
- (45) The seventh pentagonal number is _____
- (46) Given: 2, 5, 11, 23, ..., k, 383 Find k. _____
- (47) The length of the median to the hypotenuse of a 3-4-5 right triangle is _____ (decimal)
- (48) $63^2 + 24^2 =$ _____
- (49) ${}_7C_4 + {}_7P_3 =$ _____
- *(50) $\sqrt{50220} \times \sqrt{626} =$ _____
- (51) If $x - y = 6$ and $3x + y = 4$ then $5y =$ _____
- (52) Let $(7 + 4i)(7 - 4i) = (a + bi)$. $a + b =$ _____
- (53) $21^3 - 20^3 =$ _____
- (54) If (x, y) is the midpoint of the segment with endpoints $(-1, 9)$ and $(7, -5)$, then $x + y =$ _____
- (55) $352_6 \div 5_6 =$ _____ 6
- (56) The perimeter of a triangle with side lengths 9, 6, and x units must be greater than _____ units
- (57) If $\log_2(8x) = 6$, then $x =$ _____
- (58) If $202_b = 100$, then $303_b =$ _____
- (59) $666 \times \frac{3}{37} =$ _____
- *(60) $14 \times 28 \times 42 \times 56 =$ _____
- (61) The determinant of $\begin{bmatrix} 1 & 3k \\ 4 & 12 \end{bmatrix} = 6$. k = _____
- (62) The radius of the inscribed circle of a 3, 4, 5 right triangle is _____ units
- (63) Truncate $(\sqrt{2} + \sqrt{5})$ to the hundredth. _____
- (64) Round $\sin(\frac{11\pi}{3})$ to the nearest tenth. _____
- (65) $12 \times \frac{14}{17} =$ _____ (mixed number)
- (66) Two dice are rolled. The odds that the sum of the pips showing on top is less than 5 is _____
- (67) $3 + 1.5 + 0.75 + 0.375 + \dots =$ _____
- (68) $(245)^2 =$ _____
- (69) $(52_6 \times 43_6 - 20_6) \div 5$ has a remainder of _____
- *(70) 2,640 feet at 6 in/sec takes _____ minutes
- (71) $f'(x) = -2$, $f(1) = 3$, find $f(-2)$. _____
- (72) The Greatest Integer Function is written as $f(x) = [x]$. Find $[4(\frac{\sqrt{5}-1}{2})]$. _____
- (73) $\sin^3(\frac{\pi}{6}) =$ _____
- (74) The first four digits of the decimal for $\frac{14}{40}$ base 5 is 0._____ base 5
- (75) 95° Fahrenheit = _____ $^\circ$ Celsius
- (76) Find the sum of the squares of the roots of $5x^2 + x - 4 = 0$.
- (77) $\int_0^3 (x - 6) dx =$ _____
- (78) The sixth pentagonal number is _____
- (79) If $2 < x < 5$, then $x^2 - 1 <$ _____
- *(80) The length of the height of an equilateral triangle with a perimeter of 423 cm is _____ cm

DO NOT DISTRIBUTE TO STUDENTS BEFORE OR DURING THE CONTEST

University Interscholastic League - Number Sense Answer Key HS • Invitation A • 2021

*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) 1,848 | (18) 1,764 | (34) 900 | (59) 54 |
| (2) 402 | (19) 5.76 | (35) 207,009 | (60) 875,885 —
968,083 |
| (3) $\frac{2}{9}$ | (20) 3,686,322 —
4,074,354 | (36) $110.24, \frac{2756}{25},$
$110\frac{6}{25}$ | (61) .5, $\frac{1}{2}$ |
| (4) 0 | (21) 14 | (37) 638 | (62) 1 |
| (5) 312 | (22) $\frac{16}{25}$ | (38) $\frac{11}{15}$ | (63) $3.65, \frac{73}{20}, 3\frac{13}{20}$ |
| (6) $9\frac{38}{45}$ | (23) $3.75, \frac{15}{4}, 3\frac{3}{4}$ | (39) 62.5 | (64) —.9, — $\frac{9}{10}$ |
| (7) $\frac{3}{16}$ | (24) 73 | (40) 57,251 — 63,277 | (65) $9\frac{15}{17}$ |
| (8) —3 | (25) 1,201 | (41) 4 | (66) .2, $\frac{1}{5}$ |
| (9) $\frac{5}{3}, 1\frac{2}{3}$ | (26) —1 | (42) 162 | (67) 6 |
| (10) 5,310 — 5,868 | (27) 232 | (43) 8,120,601 | (68) 60,025 |
| (11) 343 | (28) 5 | (44) 57 | (69) 2 |
| (12) .6, $\frac{3}{5}$ | (29) 3 | (45) 70 | (70) 84 — 92 |
| (13) 10,105 | (30) 2,859 — 3,159 | (46) 191 | (71) 9 |
| (14) 120 | (31) —49 | (47) 2.5 | (72) 2 |
| (15) 119 | (32) 55,722 | (48) 4,545 | (73) $.125, \frac{1}{8}$ |
| (16) 3,364 | (33) $\frac{3}{11}$ | (49) 245 | (74) 2111 |
| (17) 4 | | (50) 5,327 — 5,887 | |
| | | (51) —17.5, — $\frac{35}{2},$
— $17\frac{1}{2}$ | (75) 35 |
| | | (52) 65 | (77) —13.5, — $\frac{27}{2},$
— $13\frac{1}{2}$ |
| | | (53) 1,261 | |
| | | (54) 5 | (78) 51 |
| | | (55) 44 | (79) 24 |
| | | (56) 18 | (80) 117 — 128 |
| | | (57) 8 | |
| | | (58) 150 | |