

The University Interscholastic League

Number Sense Test • HS A • 2018

Contestant's Number _____

Final _____

2nd _____

1st _____

Read directions carefully
before beginning test

**DO NOT UNFOLD THIS SHEET
UNTIL TOLD TO BEGIN**

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!

- | | |
|---|--|
| <p>(1) $118 + 811 - 181 =$ _____</p> <p>(2) $40 \times 125 =$ _____</p> <p>(3) $\frac{5}{8} + \frac{3}{16} =$ _____ (proper fraction)</p> <p>(4) $123 \times 9 + 4 =$ _____</p> <p>(5) $17^2 =$ _____</p> <p>(6) $\frac{3}{40} =$ _____ % (decimal)</p> <p>(7) $16 \times 28 + 16 \times 22 =$ _____</p> <p>(8) $11 \div 2.5 =$ _____ (decimal)</p> <p>(9) The largest prime divisor 76 is _____</p> <p>*(10) $158 \times 262 =$ _____</p> <p>(11) $430 \div 9 =$ _____ (mixed number)</p> <p>(12) 6 is _____ % less than 25</p> <p>(13) 80% of 80 minus 80 = _____</p> <p>(14) $1\frac{2}{5} + 1\frac{5}{7} =$ _____ (mixed number)</p> <p>(15) MCXLVI = _____ (Arabic Numeral)</p> <p>(16) If 1 gram = .04 oz, then 120 grams = _____ oz</p> <p>(17) The GCD 24, 36, and 48 is _____</p> <p>(18) $1994 \times 6 + 36 =$ _____</p> | <p>(19) The smallest prime number greater than 89 is _____</p> <p>*(20) $810210 \div 159 =$ _____</p> <p>(21) 25 base 10 is written as _____ base 7</p> <p>(22) $(44 \times 19) - (36 \times 11) =$ _____</p> <p>(23) $0.189189189\dots =$ _____ (fraction)</p> <p>(24) $(37 \times 9 + 11) \div 5$ has a remainder of _____</p> <p>(25) The sum of the roots $2x^2 - 4x - 3$ is _____</p> <p>(26) $F(x) = 9x^2 - 6x + 1$, evaluate $F(4)$. _____</p> <p>(27) $64 \times 66 =$ _____</p> <p>(28) $2500 = [2(15 + k)]^2$. Find $k \geq 0$. _____</p> <p>(29) Given the set $\{1,3,6,10,15,p,28,36,q,\dots\}$. $q - p =$ _____</p> <p>*(30) 7 days = _____ minutes</p> <p>(31) Let $x + y = 23$ and $xy = 76$, where x, y are integers and $y \geq x$. Find x. _____</p> <p>(32) Let $(4x + 3)^2 = ax^2 + bx + c$. Find $b - c$. _____</p> <p>(33) The LCM 24, 36, and 48 is _____</p> <p>(34) How many positive integers between 4 and 28 are relatively prime to 28? _____</p> <p>(35) $7^3 - 5^3 =$ _____</p> |
|---|--|

- (36) A regular septagon has how many sides? _____
- (37) Find the simple interest on \$300.00 at a rate of 4% for 2 years. \$ _____
- (38) $\frac{x-8}{x+9} + \frac{x+9}{x-8} = A\frac{B}{C}$, a simplified mixed number. Find B. _____
- (39) $5\frac{1}{4}$ is _____ % less than 7
- *(40) $(376 \times 49)^2 \div (51 \times 124) =$ _____
- (41) The sum of the prime divisors of 30 is _____
- (42) Find x if $4^x = 32$. x = _____
- (43) 1,320 feet = _____ mile
- (44) If $\sqrt{4k} = 6$ then k = _____
- (45) $35^2 - 40^2 =$ _____
- (46) $5^6 \div 7$ has a remainder of _____
- (47) If $2^{(2x+2y)} = 16$ then $(x+y)^2 =$ _____
- (48) The sum of the reciprocals of all of the positive integral divisors of 20 is _____
- (49) The 6th hexagonal number is _____
- *(50) $\sqrt{12018} =$ _____
- (51) The vertex of the parabola, $y = 2x^2 - 4x - 5$ is at (h, k). $h + k =$ _____
- (52) $(3 - i)^2 + 6i =$ _____
- (53) $(135_6)(4_6) =$ _____ 6
- (54) $\log_3(9) + \log_3(27) =$ _____
- (55) Two dice are rolled. What are the odds that a 4 was rolled? _____
- (56) In Petville, 35 families have cats, 24 have dogs, and 12 have both. How many families are there? _____
- (57) $2^{-1} + 2^{-2} + 2^{-3} + 2^{-4} + \dots =$ _____
- (58) The area of a $30^\circ - 60^\circ - 90^\circ$ triangle with a hypotenuse length of 16 is $k\sqrt{3}$. k = _____
- (59) If $x^2 + y^2 = 89$, $x > y$ and both x and y are positive integers, then y = _____
- *(60) $14 \times 42 \times 70 \times 98 =$ _____
- (61) Find the sum of all positive integers x such that $3x - 6 < 9$. _____
- (62) If $\left| \frac{2}{3} \frac{5}{x} \right| = 7$ then x = _____
- (63) $\cos^{-1}(\sin \frac{\pi}{6}) =$ _____ °
- (64) The volume of a right circular cylinder is $32\pi \text{ cm}^3$. Find the height if the radius is twice the the height. _____ cm
- (65) $\sin^{-1}(\cos \frac{\pi}{3}) =$ _____ °
- (66) 0.0202... base 5 = _____ base 10 (fraction)
- (67) If $14^4 \div 4 = (2^x)(7^y)$, then $x + y =$ _____
- (68) $(2x^3 + x^2 + 3x + 4) \div (x + 1)$ has a remainder of _____
- (69) Let $f(x) = 4x^2 - 1$. Find $f(f(-1))$. _____
- *(70) $\left(\frac{\sqrt{5}+1}{2} \right)^{10} =$ _____
- (71) Change $\frac{3}{5}$ to a base 5 decimal. _____ 5
- (72) Find x, $0 \leq x \leq 4$, if $16 + x \equiv 4 \pmod{5}$. x = _____
- (73) $f'(x) = 3$, $f(2) = 5$, find $f(1)$. _____
- (74) $y = \log_3(x)$ has a vertical asymptote at x = _____
- (75) $\lim_{x \rightarrow 3} \frac{2x+2}{x^2+1} =$ _____
- (76) $f(x) = \cos(x)$, $f''(60^\circ) =$ _____
- (77) $\int_0^3 (3+x) dx =$ _____
- (78) $7^9 \div 11$ has a remainder of _____
- (79) 1 gallon + 2 quarts + 3 pints = _____ cups
- *(80) $1428.57 \times 69 =$ _____

University Interscholastic League - Number Sense Answer Key HS • Invitation A • Fall 2018

*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

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|---|----------------------|---|---|
| (1) 748 | (19) 97 | (36) 7 | (59) 5 |
| (2) 5,000 | *(20) 4,841 — 5,350 | (37) \$24.00 | *(60) 3,831,996 — 4,235,364 |
| (3) .8125, $\frac{13}{16}$ | (21) 34 | (38) 289 | (61) 10 |
| (4) 1,111 | (22) 440 | (39) 25 | (62) 11 |
| (5) 289 | (23) $\frac{7}{37}$ | *(40) 50,992 — 56,359 | (63) 60 |
| (6) 7.5 | (24) 4 | (41) 10 | (64) 2 |
| (7) 800 | (25) 2 | (42) 2.5, $\frac{5}{2}$, $2\frac{1}{2}$ | (65) 30 |
| (8) 4.4 | (26) 121 | (43) .25, $\frac{1}{4}$ | (66) $\frac{1}{12}$ |
| (9) 19 | (27) 4,224 | (44) 9 | (67) 6 |
| *(10) 39,327 — 43,465 | (28) 10 | (45) — 375 | (68) 0 |
| (11) $47\frac{7}{9}$ | (29) 24 | (46) 1 | (69) 35 |
| (12) 76 | *(30) 9,576 — 10,584 | (47) 4 | *(70) 117 — 129 |
| (13) — 16 | (31) 4 | (48) 2.1, $\frac{21}{10}$, $2\frac{1}{10}$ | (71) .03 |
| (14) $3\frac{4}{35}$ | (32) 15 | (49) 66 | (72) 3 |
| (15) 1,146 | (33) 144 | *(50) 105 — 115 | (73) 2 |
| (16) 4.8, $\frac{24}{5}$, $4\frac{4}{5}$ | (34) 10 | (51) — 6 | (74) 0 |
| (17) 12 | (35) 218 | (52) 8 | (75) .8, $\frac{4}{5}$ |
| (18) 12,000 | | (53) 1032 | (76) — .5, — $\frac{1}{2}$ |
| | | (54) 5 | (77) 13.5, $\frac{27}{2}$, $13\frac{1}{2}$ |
| | | (55) $\frac{1}{11}$ | (78) 8 |
| | | (56) 47 | (79) 30 |
| | | (57) 1 | |
| | | (58) 32 | *(80) 93,643 — 103,499 |