

**The University Interscholastic League
Number Sense Test • HS Regional • 2008**

Contestant's Number _____

Final _____
2nd _____
1st _____
Score _____
Initials _____

Read directions carefully
before beginning test

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

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) $4110 - 4128 + 2008 =$ _____</p> <p>(2) $50 \div 2.5 =$ _____</p> <p>(3) $1\frac{2}{3} \times 3\frac{4}{5} =$ _____ (mixed number)</p> <p>(4) $\frac{8}{25} =$ _____ %</p> <p>(5) $(8 + 12) \div (12 \times 2 - 4) =$ _____</p> <p>(6) $66 \times 54 =$ _____</p> <p>(7) $14 \div 2\frac{2}{3} =$ _____ (decimal)</p> <p>(8) $24^2 =$ _____</p> <p>(9) The median of $-2, -8, 16, \& 4$ is _____</p> <p>*(10) $77 \times 888 + 9999 =$ _____</p> <p>(11) The negative reciprocal of 1.375 is _____</p> <p>(12) $11 \times 747 =$ _____</p> <p>(13) Which is larger, $-1\frac{1}{6}$ or -1.6? _____</p> <p>(14) 45 plus 45% of 45 is _____</p> <p>(15) If 3 pounds of nuts costs \$3.60 then 20 ounces of nuts will cost \$ _____</p> <p>(16) If $\text{GCD}(64, k) = 16$ and $\text{LCM}(64, k) = 64$ then k is _____</p> <p>(17) $\text{CXLIV} \times \text{XII} =$ _____ (Arabic Numeral)</p> | <p>(18) $2 + (-4) - 6 - (-8) =$ _____</p> <p>(19) The sum of the first 5 prime numbers is _____</p> <p>*(20) $\sqrt{322} \times \sqrt{405} \times \sqrt{481} =$ _____</p> <p>(21) 105 has _____ positive prime divisors</p> <p>(22) $235_8 =$ _____ ₂</p> <p>(23) $6.666... - 7.777... + 3.333... =$ _____</p> <p>(24) If $2x + 3 = -5$, then $x - 7 =$ _____</p> <p>(25) Which of the following is a triangular number and a square number, 25, 36, or 81? _____</p> <p>(26) $\{f,i,v,e\} \cup \{e,i,g,h,t\}$ has _____ distinct elements</p> <p>(27) $(2^6 \times 3^5 - 5^4) \div 7$ has a remainder of _____</p> <p>(28) $13 \times 246 =$ _____</p> <p>(29) A convex nonagon has _____ distinct diagonals</p> <p>*(30) 3 days 3 hours 3 minutes = _____ seconds</p> <p>(31) 32 fluid ounces is _____ % of a gallon</p> <p>(32) $12\frac{1}{4} \times 4\frac{1}{4} =$ _____ (mixed number)</p> <p>(33) $1 + 1 + 2 + 3 + 5 + \dots + 34 + 55 =$ _____</p> <p>(34) If $P = -2, Q = -3$, and $R = -5$, then $PQ + R - QR =$ _____</p> |
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- (35) If $a = 4$ and $b = 5$, then $(a - b)(a^2 + ab + b^2) =$ _____
- (36) Find k if $.75$, $-.5$, and k are the roots of $32x^3 - 14x - 3 = 0$. _____
- (37) The diagonals of a rhombus are $15''$ and $18''$. Find the area of the rhombus. _____ sq. in.
- (38) $14^3 =$ _____
- (39) $123456 \times 9 + k = 1,111,111$. $k =$ _____
- *(40) $75 \times 53 + 57 \times 35 =$ _____
- (41) The longest ^{side} of a right triangle with integral sides is 41 cm. The triangle's area is _____ cm^2
- (42) $506^2 =$ _____
- (43) The point (h, k) is reflected across the line $y = x$ to point $(1, 4)$. Find h . _____
- (44) If $(\sqrt[4]{a^5})(\sqrt[3]{a^k}) = \sqrt[12]{a^{23}}$, $a > 1$ and a is not a multiple of 3 , then $k =$ _____
- (45) $412 \times 311 =$ _____
- (46) $1331 \div 1.375 =$ _____
- (47) $44 \times 3! + 11 \times 4! =$ _____
- (48) $456_8 \times 7_8 =$ _____ $_8$
- (49) The smaller root of $7x^2 + 30x + 8 = 0$ is _____
- *(50) $\sqrt{84634221} =$ _____
- (51) $\frac{7}{20} - \frac{55}{161} =$ _____
- (52) If $(3 - 4i)^2 = a + bi$. Find $a + b =$ _____
- (53) $3.5 - 2.1 + 1.26 - 0.756 + \dots =$ _____
- (54) If $\log_4(5x + 4) = 3$ then $x =$ _____
- (55) If y varies directly with x and $x = -2$ when $y = 6$, find x when $y = -9$. _____
- (56) The probability of winning is 75% . The odds of losing is _____ (proper fraction)
- (57) The sum of the coefficients of $(x + y)^6$ is _____
- (58) The 16^{th} term of $2, 7, 12, 17, \dots$ is _____
- (59) ${}_8C_5 \div {}_8C_3 = {}_8C_k$. Find k . _____
- *(60) $777 \times 4545 \div 77 =$ _____
- (61) Vector $u = (-3, -6)$ and vector $v = (-4, 8)$. The dot product for u and v is _____
- (62) If $\log_x 6 = \frac{1}{3}$ then $x =$ _____
- (63) Find x , if $\det \begin{vmatrix} 2 & -3 \\ 4 & -x \end{vmatrix} = 6$. _____
- (64) $\tan \frac{5\pi}{6} \times \cot \frac{4\pi}{3} =$ _____
- (65) $62^2 - 61^2 + 60^2 - 59^2 =$ _____
- (66) The greatest integer function $f(x) = [2 - x]$ has a value of _____ for $f(e)$
- (67) If $\sqrt{15 - \sqrt{12 + \sqrt{6 - x}}} = 3$ then $x =$ _____
- (68) $\sqrt{4444.8889} =$ _____ (decimal)
- (69) $4^9 \div 5$ has a remainder of _____
- *(70) $(e)^\pi \times (\pi)^e \times \frac{\sqrt{5}-1}{2} =$ _____
- (71) The smallest value of x in the domain of $f(x)$ so that $f(x) = \sqrt{12 + 4x}$ has a real valued range is _____
- (72) If $f(x) = 5x^3 - 4x^2 + 2$, then $f''(-1) =$ _____
- (73) $5^3 - 4^3 - 3^3 - 2^3 + 1^3 =$ _____
- (74) Change $.88$ base 9 to a base 10 fraction. _____
- (75) The horizontal asymptote of $y = \frac{3x - 2}{5 - x}$ is _____
- (76) $\int_0^\pi \sin(x) dx =$ _____
- (77) If the initial point of a vector is $(3, -5)$ and the terminal point is $(-2, 7)$, then $\|v\| =$ _____
- (78) $\frac{1}{6} + \frac{1}{10} + \frac{1}{15} =$ _____
- (79) $11^3 \times 121 =$ _____
- *(80) $3333 \div 66\frac{2}{3}\% \times 3.6 =$ _____

University Interscholastic League - Number Sense Answer Key HS • Regional • 2008

*number) $x \rightarrow y$ 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) 1990 | (18) 0 | (35) — 61 | (59) 8, 0 |
| (2) 20 | (19) 28 | (36) — .25, — $\frac{1}{4}$ | *(60) 43571 — 48156 |
| (3) $6\frac{1}{3}$ | *(20) 7525 — 8316 | (37) 135 | (61) — 36 |
| (4) 32 | (21) 3 | (38) 2744 | (62) 216 |
| (5) 1 | (22) 10011101 | (39) 7 | (63) 3 |
| (6) 3564 | (23) $\frac{20}{9}, 2\frac{2}{9}$ | *(40) 5672 — 6268 | (64) — $\frac{1}{3}$ |
| (7) 5.25 | (24) — 11 | (41) 180 | (65) 242 |
| (8) 576 | (25) 36 | (42) 256036 | (66) — 1 |
| (9) 1 | (26) 7 | (43) 4 | (67) — 570 |
| *(10) 74457 — 82293 | (27) 3 | (44) 2 | (68) 66.67 |
| (11) — $\frac{8}{11}$ | (28) 3198 | (45) 128132 | (69) 4 |
| (12) 8217 | (29) 27 | (46) 968 | *(70) 306 — 337 |
| (13) — $\frac{7}{6}, -1\frac{1}{6}$ | *(30) 256,671 —
283,689 | (47) 528 | (71) — 3 |
| (14) 65.25, $\frac{261}{4}, 65\frac{1}{4}$ | (31) 25 | (48) 4102 | (72) — 38 |
| (15) \$1.50 | (32) $52\frac{1}{16}$ | (49) — 4 | (73) 27 |
| (16) 16 | (33) 143 | *(50) 8740 — 9659 | (74) $\frac{80}{81}$ |
| (17) 1728 | (34) — 14 | (51) $\frac{27}{3220}$ | (75) — 3 |
| | | (52) — 31 | (76) 2 |
| | | (53) 2.1875, $\frac{35}{16}, 2\frac{3}{16}$ | (77) 13 |
| | | (54) 12 | (78) $\frac{1}{3}$ |
| | | (55) 3 | (79) 161051 |
| | | (56) $\frac{1}{3}$ | *(80) 17099 — 18898 |
| | | (57) 64 | |
| | | (58) 77 | |