

**The University Interscholastic League
Number Sense Test • HS SAC • 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.

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STOP -- WAIT FOR SIGNAL!

- | | |
|--|---|
| <p>(1) $2009 - 2080 =$ _____</p> <p>(2) $2090 + 8002 =$ _____</p> <p>(3) $2008 \div 25 =$ _____ (decimal)</p> <p>(4) $2008 \times 9 =$ _____</p> <p>(5) $7\frac{1}{2}\% =$ _____ (proper fraction)</p> <p>(6) $15^2 =$ _____</p> <p>(7) $2.25 \div (-1.5) =$ _____ (decimal)</p> <p>(8) $2\frac{3}{4} - 3\frac{4}{5} =$ _____ (mixed number)</p> <p>(9) $20 \times 80 + 20 \times 90 =$ _____</p> <p>*(10) $282 - 9292 + 89 =$ _____</p> <p>(11) $20 + 24 \times 16 \div 8 - 12 =$ _____</p> <p>(12) $37 \times 33 =$ _____</p> <p>(13) The sum of the prime divisors of 42 is _____</p> <p>(14) The GCD of 92 and 29 is _____</p> <p>(15) The median of 8, 29, 20, and 9 is _____</p> <p>(16) 25% of 3 pounds 4 ounces = _____ ounces</p> <p>(17) $12\frac{1}{4}$ is 35 % of _____</p> <p>(18) Which is larger, $-\frac{3}{8}$ or $-\frac{5}{13}$? _____</p> | <p>(19) $MMVIII \div IX =$ _____ (Arabic Numeral)</p> <p>*(20) $951 + 842 \times 763 =$ _____</p> <p>(21) $9\frac{1}{3} \times 3\frac{1}{3} =$ _____ (mixed number)</p> <p>(22) $1.08333... - 1.1666... =$ _____</p> <p>(23) Find the simple interest on \$600.00 at 5% for 4 years. \$ _____</p> <p>(24) $(5)^{-1} + (5)^{-2} =$ _____</p> <p>(25) 18 inches is what per cent of a foot? _____ %</p> <p>(26) If $x + 5 = 4$, then $x - 3 =$ _____</p> <p>(27) $12^3 =$ _____</p> <p>(28) $\{p,l,u,s\} \cup \{m,i,n,u,s\}$ has _____ distinct elements</p> <p>(29) If $\frac{5}{8} = \frac{x}{5}$, then $x =$ _____ (decimal)</p> <p>*(30) $109 \times 129 + 21 \times 131 =$ _____</p> <p>(31) $28_9 + 21_9 =$ _____ ₉</p> <p>(32) Which of the following is a pentagonal number, 20, 21, or 22? _____</p> <p>(33) $1^2 + 1^2 + 2^2 + 3^2 + 5^2 =$ _____</p> <p>(34) $(6^3 + 4^2 \times 2^1) \div 8$ has a remainder of _____</p> <p>(35) If $x > 0$ and $2x^2 = \sqrt{4x^3}$ then $x =$ _____</p> |
|--|---|

- (36) $72^2 + 13^2 =$ _____
- (37) $|12 - 9|6 - 3| =$ _____
- (38) $5 \times 4! + 8 \times 3! =$ _____
- (39) If $a = 4$ and $b = 3$, then
 $(a - b)(a^2 + ab + b^2) =$ _____
- *(40) $\sqrt[3]{1329} \times \sqrt{123} \times 11 =$ _____
- (41) If $8^x = 102$ then $8^{(x+1)} =$ _____
- (42) The slope of the line $2x + 3y = 4$ is _____
- (43) If $x + y = 5$ and $xy = 1$ then $x^3 + y^3 =$ _____
- (44) $12_5 + 23_5 + 34_5 =$ _____ $_5$
- (45) $5^4 \times 2^3 =$ _____
- (46) $64 \div .125 =$ _____
- (47) $\frac{3}{4} - \frac{8}{13} =$ _____
- (48) The smallest integer x such that
 $x - 5 > -6$ is _____
- (49) 16% of $333\frac{1}{3}$ is _____ (mixed number)
- *(50) $364 \times 16^3 \div 4^3 =$ _____
- (51) $12 \times 7 + 2 =$ _____
- (52) The integral sides of a triangle are 3, 4, and x .
The least value of x is _____
- (53) $222 \times \frac{2}{37} =$ _____
- (54) The least value of k such that ${}_4P_k = 24$ is _____
- (55) The smaller root of $7x^2 + 15x + 2 = 0$ is _____
- (56) The simplified coefficient of the xy term in the
expansion of $(2x - y)^2$ is _____
- (57) The radius of the circle $x^2 + y^2 = 25$ is _____
- (58) Let $|3x - 2| \leq 5$. The least value of x is _____
- (59) $48 + 24 + 12 + 6 + 3 + \dots =$ _____
- *(60) $32^3 =$ _____
- (61) $52^2 =$ _____
- (62) $34 + 13 + 5 + 2 + 1 =$ _____
- (63) $\det \begin{vmatrix} 1 & 3 \\ 2 & 4 \end{vmatrix} =$ _____
- (64) A square based prism has a base side length of
2' and a height 5'. Its volume is _____ cu. ft
- (65) The greatest integer function $g(x) = [x - 3]$
has a value of _____ for $g(\pi)$
- (66) $3x^2 + 2x + 1$ divided by $x - 4$ has a
remainder of _____
- (67) $\sin \frac{\pi}{4} \div \cos \frac{\pi}{4} =$ _____
- (68) $50^2 - 48^2 + 46^2 - 44^2 =$ _____
- (69) $45^2 + 46^2 =$ _____
- *(70) $31.4 \times 27.2 \times 16.2 =$ _____
- (71) If $f(x) = \frac{2x + 1}{3x + 4}$, then $f'(-1) =$ _____
- (72) Change .12 base 3 to a base 10 fraction. _____
- (73) Find x , $0 \leq x < 5$, if $\frac{(4!)(3!)}{(2!)} \cong x \pmod{5}$. _____
- (74) $\lim_{x \rightarrow 2} \frac{x^2 - 4}{x - 2} =$ _____
- (75) The horizontal asymptote of $y = \frac{x + 1}{x - 3}$ is _____
- (76) $(4, \frac{\pi}{3})$ are polar coordinates for (x, y) . $x =$ _____
- (77) The set $\{a, b, c\}$ has _____ 2-element subsets
- (78) $\int_{-1}^1 x^2 dx =$ _____
- (79) $\frac{1}{3} + \frac{1}{6} + \frac{1}{10} =$ _____
- *(80) $875 \times 62.5 \div \frac{3}{8} =$ _____

University Interscholastic League - Number Sense Answer Key HS • SAC • Fall 2008

*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) - 71 | (19) $223\frac{1}{9}, \frac{2008}{9}$ | (36) 5353 | (59) 96 |
| (2) 10092 | *(20) 611228 - 675566 | (37) 15 | *(60) 31130 - 34406 |
| (3) 80.32 | (21) $31\frac{1}{9}$ | (38) 168 | (61) 2704 |
| (4) 18072 | (22) $-\frac{1}{12}$ | (39) 37 | (62) 55 |
| (5) $\frac{3}{40}$ | (23) \$ 120.00 | *(40) 1275 - 1408 | (63) - 2 |
| (6) 225 | (24) .24, $\frac{6}{25}$ | (41) 816 | (64) 20 |
| (7) - 1.5 | (25) 150 | (42) $-\frac{2}{3}$ | (65) 0 |
| (8) $-1\frac{1}{20}$ | (26) - 4 | (43) 110 | (66) 57 |
| (9) 3400 | (27) 1728 | (44) 124 | (67) 1 |
| *(10) - 9367 - - 8474 | (28) 7 | (45) 5000 | (68) 376 |
| (11) 56 | (29) 3.125 | (46) 512 | (69) 4141 |
| (12) 1221 | *(30) 15972 - 17652 | (47) $\frac{7}{52}$ | *(70) 13145 - 14527 |
| (13) 12 | (31) 50 | (48) 0 | (71) 5 |
| (14) 1 | (32) 22 | (49) $53\frac{1}{3}$ | (72) $\frac{5}{9}$ |
| (15) 14.5, $\frac{29}{2}, 14\frac{1}{2}$ | (33) 40 | *(50) 22132 - 24460 | (73) 2 |
| (16) 13 | (34) 0 | (51) 86 | (74) 4 |
| (17) 35 | (35) 1 | (52) 2 | (75) 1 |
| (18) - .375, $-\frac{3}{8}$ | | (53) 12 | (76) 2 |
| | | (54) 3 | (77) 3 |
| | | (55) - 2 | (78) $\frac{2}{3}$ |
| | | (56) - 4 | (79) .6, $\frac{3}{5}$ |
| | | (57) 5 | *(80) 138542 - 153125 |
| | | (58) - 1 | |

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- | | |
|--|--|
| <p>(1) $2009 + 209 - 29 =$ _____</p> <p>(2) $200.9 + 90.02 =$ _____ (decimal)</p> <p>(3) $29 \times 11 =$ _____</p> <p>(4) $29 \div 9 - 92 \div 9 =$ _____</p> <p>(5) $19^2 =$ _____</p> <p>(6) $\frac{4}{5} \times \frac{15}{16} =$ _____</p> <p>(7) $(9 - 3) \div 12 \times 6 + 1 =$ _____</p> <p>(8) $123\frac{4}{5}\% =$ _____ (decimal)</p> <p>(9) $\\$12.09 \div .3 = \\$ _____</p> <p>*(10) $2009 \times 4 + 2008 =$ _____</p> <p>(11) $(-8) - 9 - (-10) =$ _____</p> <p>(12) What is 8.125% of 800? _____</p> <p>(13) Which is larger, $-\frac{2}{9}$ or $-.29$? _____</p> <p>(14) $MMIX \times XXV =$ _____ (Arabic Numeral)</p> <p>(15) 2 cubic feet = _____ cubic inches</p> <p>(16) The range of 1, 2, 3, 4, 3, 2, 1, 3, & 5 is _____</p> <p>(17) $1\frac{5}{6} \div 11 =$ _____</p> <p>(18) $2 + 6 + 10 + 14 + 18 + 22 + 26 =$ _____</p> | <p>(19) The greatest prime number less than 119 is _____</p> <p>*(20) $\sqrt{839} \times \sqrt{963} =$ _____</p> <p>(21) $7^3 =$ _____</p> <p>(22) The discriminant of $3x^2 - 2x + 1 = 0$ is _____</p> <p>(23) 63 base ten is equivalent to _____ base 4</p> <p>(24) If $4^x - 4 = 252$, then $x =$ _____</p> <p>(25) The fifth hexagonal number is _____</p> <p>(26) $6^7 \div 8$ has a remainder of _____</p> <p>(27) $-3 - 2 1 - 3 + 2 - 1 - 3 =$ _____</p> <p>(28) The set {e,i,g,h,t} has _____ 2-elements subsets</p> <p>(29) $82^2 + 12^2 =$ _____</p> <p>*(30) 2 days - 2 hours - 2 minutes = _____ minutes</p> <p>(31) If $P = -3$, $Q = -2$, and $R = -1$, then $P - Q - R =$ _____</p> <p>(32) If $\frac{1}{2} + \frac{1}{x} = \frac{2}{3}$, then $x =$ _____</p> <p>(33) If $\sqrt{5 + \sqrt{4 + \sqrt{x}}} = 3$ then $x =$ _____</p> <p>(34) If $x - y = 8$ and $2x + y = 4$ then $y =$ _____</p> <p>(35) $20 \times 5! - 40 \times 4! =$ _____</p> |
|--|--|

- (36) $3.111\dots - 3.0555\dots =$ _____
- (37) $2 + 5 + 7 + 12 + \dots + 31 + 50 =$ _____
- (38) The sum of the roots of $3x^2 - 2x = -1$ is _____
- (39) The perimeter of an equilateral triangle is 18".
The area of the triangle is $k\sqrt{3}$ in.². $k =$ _____
- *(40) $(363 \times 59)^2 \div (31 \times 119) =$ _____
- (41) Let $a^3 \div a^4 \div a^5 = a^k$, where $a > 1$. $k =$ _____
- (42) If P is 40% of Q and Q is 60% of R, then P is what percent of R? _____ %
- (43) If $3x - 4 < 5$, then $2x <$ _____
- (44) $\frac{7}{12} - \frac{27}{49} =$ _____
- (45) The distance between the points (1, 3) and (4, 7) is _____
- (46) $5^2 \times 4^3 =$ _____
- (47) The hypotenuse of a 30-60-90° triangle is $2\frac{1}{2}$ inches. The smaller leg is _____ inches
- (48) $124 \times 142 =$ _____
- (49) If $x + y = 4$ and $xy = 5$ then $x^3 + y^3 =$ _____
- *(50) $428.571 \times 76 =$ _____
- (51) The probability of winning is 60%. The odds of losing is _____
- (52) $123_6 - 45_6 =$ _____₆
- (53) ${}_7C_3 + {}_7C_4 =$ _____
- (54) If y varies inversely with x and $y = 3$ when $x = 2$, find x when $y = 4$. _____
- (55) $555 \times \frac{6}{37} =$ _____
- (56) The smaller root of $2x^2 - 27x + 13 = 0$ is _____
- (57) The simplified coefficient of the x^2y^2 term in the expansion of $(x - y)^4$ is _____
- (58) $(1 + 2i)(3 + 4i) = (a + bi)$. Find b. _____
- (59) The line of symmetry of the parabola $y = x^2 + 2x - 3$ is $x =$ _____
- *(60) $2357 \times 111 =$ _____
- (61) $58^2 =$ _____
- (62) $89 + 34 + 13 + 5 + 2 + 1 =$ _____
- (63) The volume of a right circular cylinder 5 cm high with a diameter of 2 cm is _____ π cm³
- (64) $2 \sin 165^\circ \cos 165^\circ =$ _____
- (65) $(42 + 63 - 84) \div 4$ has a remainder of _____
- (66) 88 feet per second = _____ miles per hour
- (67) The slope of the line $6x + 2y = 4$ is _____
- (68) The set {a,b,c,d} has _____ 2-element subsets
- (69) If $f(x) = \frac{3x-1}{2x+5}$, then $f'(-2) =$ _____
- *(70) $(3e)^2 \times (2\pi)^3 =$ _____
- (71) $f(x) = x^2 + 2x - 3$. Find $f(f(-2))$. _____
- (72) $35^2 + 36^2 =$ _____
- (73) Change .12 base 5 to a base 10 decimal. _____
- (74) Find the slope of the line tangent to $y = x^2 - 1$ at (2, 3). _____
- (75) The sum of the first ten terms of the sequence 4, 6, 10, 16, 26, 42, ... is _____
- (76) The horizontal asymptote of $y = \frac{2x^2-1}{3x^2+2}$ is $y =$ _____
- (77) $\frac{1}{3} + \frac{1}{6} + \frac{1}{10} + \frac{1}{15} =$ _____
- (78) $\int_0^2 x^2 dx =$ _____
- (79) $\sum_{k=1}^3 (k)^k =$ _____
- *(80) $399 \div 62.5\% \times \frac{7}{8} =$ _____

University Interscholastic League - Number Sense Answer Key HS • Invitation A • 2009

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- | | | | |
|------------------------|-------------------|--|----------------------------------|
| (1) 2189 | (19) 113 | (36) $\frac{1}{18}$ | (59) -1 |
| (2) 290.92 | *(20) 854 — 943 | (37) 126 | *(60) 248546 — 274708 |
| (3) 319 | (21) 343 | (38) $\frac{2}{3}$ | (61) 3364 |
| (4) -7 | (22) -8 | (39) 9 | (62) 144 |
| (5) 361 | (23) 333 | *(40) 118123 — 130556 | (63) 5 |
| (6) .75, $\frac{3}{4}$ | (24) 4 | (41) -6 | (64) $-.5, -\frac{1}{2}$ |
| (7) 4 | (25) 45 | (42) 24 | (65) 1 |
| (8) 1.238 | (26) 0 | (43) 6 | (66) 60 |
| (9) \$ 40.30 | (27) 1 | (44) $\frac{19}{588}$ | (67) -3 |
| *(10) 9542 — 10546 | (28) 10 | (45) 5 | (68) 6 |
| (11) -7 | (29) 6868 | (46) 1600 | (69) 17 |
| (12) 65 | *(30) 2621 — 2895 | (47) 1.25, $\frac{5}{4}, 1\frac{1}{4}$ | *(70) 15671 — 17320 |
| (13) $-\frac{2}{9}$ | (31) 0 | (48) 17608 | (71) 0 |
| (14) 50225 | (32) 6 | (49) 4 | (72) 2521 |
| (15) 3456 | (33) 144 | *(50) 30943 — 34199 | (73) .28 |
| (16) 4 | (34) -4 | (51) $\frac{2}{3}$ | (74) 4 |
| (17) $\frac{1}{6}$ | (35) 1440 | (52) 34 | (75) 748 |
| (18) 98 | | (53) 70 | (76) $\frac{2}{3}$ |
| | | (54) 1.5, $\frac{3}{2}, 1\frac{1}{2}$ | (77) $\frac{2}{3}$ |
| | | (55) 90 | (78) $\frac{8}{3}, 2\frac{2}{3}$ |
| | | (56) $.5, \frac{1}{2}$ | (79) 32 |
| | | (57) 6 | *(80) 531 — 586 |
| | | (58) 10 | |

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- | | |
|---|---|
| <p>(1) $2009 - 9002 =$ _____</p> <p>(2) $2.009 + 20.09 + 200.9 =$ _____ (decimal)</p> <p>(3) $\frac{5}{6} \times 1\frac{1}{5} =$ _____</p> <p>(4) $4.8 \div \frac{2}{5} =$ _____</p> <p>(5) $2\frac{3}{4}\% =$ _____ (proper fraction)</p> <p>(6) $22 \times 38 =$ _____</p> <p>(7) $10 - 8 + 6 \times 4 \div 2 =$ _____</p> <p>(8) 30% of 40 minus 50% of 60 is _____</p> <p>(9) $28^2 =$ _____</p> <p>*(10) $20.09 \times 200.9 - 2009 =$ _____</p> <p>(11) $36 \div 75 =$ _____ (decimal)</p> <p>(12) Which is larger, $3\frac{1}{6}$ or 3.16? _____</p> <p>(13) $(-2)(-4) - (-6) + (-8) =$ _____</p> <p>(14) 4.25 feet equals _____ inches</p> <p>(15) 1 quart plus 2 pints _____ fluid ounces</p> <p>(16) $6 + 10 + 14 + 18 + 22 + 26 + 30 =$ _____</p> <p>(17) $CDLX + XCVI =$ _____ (Arabic Numeral)</p> <p>(18) The mean of 24, 17, 31, & 38 is _____</p> | <p>(19) The sum of the prime numbers less than or equal to 13 is _____</p> <p>*(20) $\sqrt{1158} \times 34 =$ _____</p> <p>(21) $9^3 =$ _____</p> <p>(22) The product of x and 6 gives the same result as the sum of x and 10. Find x. _____</p> <p>(23) $-5 - -3 - 7 =$ _____</p> <p>(24) $(5^3 + 4^2 \times 3^1) \div 6$ has a remainder of _____</p> <p>(25) $24^2 + 38^2 =$ _____</p> <p>(26) 135 base 8 is equivalent to _____ base 10</p> <p>(27) $(4)^{-1} \div (4)^{-2} \times (4)^{-3} =$ _____</p> <p>(28) $f(x) = 4x^2 + 12x + 9$. $f(-8) =$ _____</p> <p>(29) $2 + 1 + 3 + 4 + 7 + \dots + 29 =$ _____</p> <p>*(30) $63 \times 55 + 47 \times 55 =$ _____</p> <p>(31) Let $x = 2y$, $y = 3z$, and $z = -1$. Find xyz. _____</p> <p>(32) If $x > 1$ and $x^3 = \sqrt{4x^4 + 4x^4 + 4x^4 + 4x^4}$ then $x =$ _____</p> <p>(33) If $x - 3 = -5$ and $y - 1 = -3$ then $xy =$ _____</p> <p>(34) $11.090909\dots + 33.272727\dots =$ _____</p> |
|---|---|

- (35) A square has a diagonal of $4\sqrt{2}$ cm. The perimeter of the square is _____ cm
- (36) $321 \times 12 =$ _____
- (37) $8 \times 4! - 12 \times 3! =$ _____
- (38) $1^2 + 1^2 + 2^2 + 3^2 + 5^2 + 8^2 + 13^2 =$ _____
- (39) If $8x^3 - 18x^2 - 17x = 3$ and P, Q, & R are the real roots, then $PQ + QR + PR$ is _____
- *(40) $\sqrt[3]{1730} \times \sqrt{223} \times 18 =$ _____
- (41) $48 \times 0.1875 =$ _____
- (42) The slope of the line containing the points $(-3, 4)$ and $(4, -5)$ is _____
- (43) If $7^x = 147$ then $7^{(x-2)} =$ _____
- (44) $91 \times 98 =$ _____
- (45) Let $3x - y = 1$ and $x - 2y = 2$. Find $y =$ _____
- (46) The leg opposite the 30° angle in a right triangle is 3.5 cm. The hypotenuse is _____ cm
- (47) If $xy = 6$ and $x - y = 5$ then $x^3 - y^3 =$ _____
- (48) $\frac{7}{11} - \frac{69}{111} =$ _____
- (49) $5^3 \times 2^5 =$ _____
- *(50) $12^4 \div 6^3 \times 3^2 =$ _____
- (51) $555 \times \frac{5}{37} =$ _____
- (52) $246_8 - 57_8 =$ _____ $_8$
- (53) How many 4-element subsets does the set $\{m, o, n, d, a, y\}$ have? _____
- (54) If $\log_5(x) = -3$ then $x =$ _____
- (55) $(1 - 3i)(2 - 4i) = (a + bi)$. Find $a + b$. _____
- (56) The smaller root of $11x^2 + 18x + 7 = 0$ is _____
- (57) The area of $(x + 1)^2 + y^2 = 1$ is $k\pi$. $k =$ _____
- (58) ${}^7C_3 + {}^7C_4 =$ _____
- (59) $80 + 60 + 45 + 33.75 + \dots =$ _____
- *(60) $19^4 =$ _____
- (61) $25^3 - 24^3 =$ _____
- (62) The Greatest Integer Function is written as $f(x) = [x]$. Find $[1 - 2\pi]$. _____
- (63) $56^2 =$ _____
- (64) If $\log_x 4 + \log_x 4 = 4$ then $x =$ _____
- (65) $\sqrt{14641} =$ _____
- (66) $[2 \ -3] \times \begin{bmatrix} 3 \\ -2 \end{bmatrix} = [\quad]$
- (67) $1 + 3 + 8 + 21 + \dots + 144 =$ _____
- (68) $(x^3 - 2x^2 + 4x - 6) \div (x - 2)$ has a remainder of _____
- (69) $(\tan \frac{4\pi}{3})^2 =$ _____
- *(70) $(\pi)^3 \times (e)^3 =$ _____
- (71) If $f(x) = \frac{2x+1}{3x-8}$, then $f'(3) =$ _____
- (72) If the initial point of a vector is $(1, 3)$ and the terminal point is $(1, -4)$, then $\|v\| =$ _____
- (73) $\lim_{x \rightarrow \infty} \frac{2x-3}{1-x} =$ _____
- (74) The slope of the line tangent to $f(x) = x^3 - 2x + 3$ at the point $(1, 2)$ is _____
- (75) If $f(x) = x^3 - 2x^2 + 3x - 4$, then $f''(5) =$ _____
- (76) The rectangular coordinates of the polar coordinates $(5\sqrt{2}, \frac{\pi}{4})$ are (x, y) . $y =$ _____
- (77) The sum of the first nine terms of the sequence 4, 6, 10, 16, 26, 42, ... is _____
- (78) $\int_0^1 \sqrt{x} \, dx =$ _____
- (79) $\frac{1}{56} + \frac{1}{72} + \frac{1}{90} + \frac{1}{110} =$ _____
- *(80) $889 \div 88\frac{8}{9}\% \times .125 =$ _____

University Interscholastic League - Number Sense Answer Key HS • Invitation B • 2009

*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) — 6993 | (19) 41 | (35) 16 | *(60) 123805 — 136837 |
| (2) 222.999 | *(20) 1100 — 1214 | (36) 3852 | (61) 1801 |
| (3) 1 | (21) 729 | (37) 120 | (62) — 6 |
| (4) 12 | (22) 2 | (38) 273 | (63) 3136 |
| (5) $\frac{11}{400}$ | (23) 15 | (39) — 2.125, — $\frac{17}{8}$, | (64) 2 |
| (6) 836 | (24) 5 | — $2\frac{1}{8}$ | (65) 121 |
| (7) 14 | (25) 2020 | *(40) 3066 — 3388 | (66) 12 |
| (8) — 18 | (26) 93 | (41) 9 | (67) 232 |
| (9) 784 | (27) .0625, $\frac{1}{16}$ | (42) — $\frac{9}{7}$, — $1\frac{2}{7}$ | (68) 2 |
| *(10) 1926 — 2128 | (28) 169 | (43) 3 | (69) 3 |
| (11) .48 | (29) 75 | (44) 8918 | *(70) 592 — 653 |
| (12) $\frac{19}{6}$, $3\frac{1}{6}$ | *(30) 5748 — 6352 | (45) — 1 | (71) — 19 |
| (13) 6 | (31) — 18 | (46) 7 | (72) 7 |
| (14) 51 | (32) 4 | (47) 215 | (73) — 2 |
| (15) 64 | (33) 4 | (48) $\frac{6}{407}$ | (74) 1 |
| (16) 126 | (34) $44\frac{4}{11}$ | (49) 4000 | (75) 26 |
| (17) 556 | | *(50) 821 — 907 | (76) 5 |
| (18) 27.5, $\frac{54}{2}$, $27\frac{1}{2}$ | | (51) 75 | (77) 460 |
| | | (52) 167 | (78) $\frac{2}{3}$ |
| | | (53) 15 | (79) $\frac{4}{77}$ |
| | | (54) .008, $\frac{1}{125}$ | *(80) 119 — 131 |
| | | (55) — 20 | |
| | | (56) — 1 | |
| | | (57) 1 | |
| | | (58) 70 | |
| | | (59) 320 | |

2008-09 TMSCA High School Number Sense Test 6

- (1) $2008 + 2009 =$ _____
- (2) $8002 - 2009 =$ _____
- (3) $20.09 + 90.02 =$ _____ (decimal)
- (4) $2009 \div 9 =$ _____ (mixed number)
- (5) $25 \times 2008 =$ _____
- (6) $\frac{5}{8} \div \frac{2}{5} =$ _____
- (7) $5 + 30 \div 15 \times 10 - 25 =$ _____
- (8) $56\% =$ _____ (proper fraction)
- (9) $1\frac{3}{5} \times 2\frac{1}{2} =$ _____
- * (10) $92 + 292 + 9292 =$ _____
- (11) $54 \times 46 =$ _____
- (12) $15 \text{ ft.} \times 9 \text{ ft.} \times 3 \text{ ft.} =$ _____ cubic yards
- (13) $1\frac{2}{5} - 3\frac{4}{7} =$ _____ (mixed number)
- (14) $23^2 =$ _____
- (15) $\text{MCDV} + \text{DCIV} =$ _____ (Arabic Numeral)
- (16) The LCM of 12, 15, and 60 is _____
- (17) Which is smaller, $\frac{8}{11}$ or $\frac{10}{13}$? _____
- (18) The mean of 17, 31 and 25 is _____
- (19) 4.5 is what % of 30? _____ %
- * (20) $200809 \div 289 =$ _____
- (21) $235 \times 14 =$ _____
- (22) The set {f,i,v,e} has _____ proper subsets
- (23) $0.3111\dots =$ _____ (fraction)
- (24) $1 + 1 + 2 + 3 + 5 + \dots + 21 + 34 =$ _____
- (25) A rhombus has _____ distinct diagonals
- (26) If $x + 2y = 3$ and $2y - x = -9$ then $y =$ _____
- (27) The sum of the positive integral divisors of 32 is _____
- (28) The additive inverse of $-\frac{3}{5}$ is _____
- (29) $|1 - 2| - |3 - 4| + |5 - 6| =$ _____
- * (30) $18^4 =$ _____
- (31) 60% of 65 minus 70 is _____
- (32) If a dozen ♥'s cost \$8.76 then 4 ♥'s cost \$ _____
- (33) $987 \times 9 + 5 =$ _____
- (34) If $f(x) = 9x^2 - 6x + 1$ then $f(7)$ is _____
- (35) $63^2 + 24^2 =$ _____
- (36) $6 \times 6! - 18 \times 5! =$ _____

- (37) $1.25 \times 1.75 =$ _____
- (38) If $\sqrt{125} - \sqrt{45} = \sqrt{x}$ then $x =$ _____
- (39) 30 base 6 is equivalent to _____ base 8
- *(40) $2009 \times 2008 \div 289 =$ _____
- (41) If $x - y = 3$ and $xy = 2$ then $x^3 - y^3 =$ _____
- (42) $101 \times 101 =$ _____
- (43) The measure of each of the interior angles of a regular hexagon is $k\pi$ radians. $k =$ _____
- (44) $45 \times 55 =$ _____
- (45) Let $k^4 \times k^{-3} \div k^2 = k^x$, where $k > 1$. $x =$ _____
- (46) $\frac{4}{25} - \frac{11}{76} =$ _____
- (47) The point $(-2, -3)$ is reflected across the x-axis to point (h, k) . Find k . _____
- (48) $333 \times \frac{3}{37} =$ _____
- (49) If $7^2 + b^2 = 25^2$, then $|b| =$ _____
- *(50) $14.2857 \times 348 =$ _____
- (51) The vertex of the parabola $y = x^2 - 2x - 3$ is (c, d) and $c =$ _____
- (52) $123 \times 8 + 3 =$ _____
- (53) $\frac{3}{4} + \frac{1}{2} + \frac{1}{3} + \dots =$ _____
- (54) The set $\{a, b, c, d\}$ has _____ 3-element subsets
- (55) The larger root of $18x^2 + 11x + 1 = 0$ is _____
- (56) If $\log_5(3x - 2) = 0$ then $x =$ _____
- (57) If ${}_4C_k = 6$, then $k =$ _____
- (58) Y varies directly with X and $Y = 2$ when $X = 6$. Find Y when $X = 1$. _____
- (59) $5^5 \times 2^2 =$ _____
- *(60) The circumference of $x^2 + y^2 = 961$ is _____
- (61) $54^2 =$ _____
- (62) $55 + 21 + 8 + 3 + 1 =$ _____
- (63) $\sin \frac{\pi}{3} \times \cos \frac{\pi}{6} =$ _____
- (64) The surface area of a cube is 54 sq. cm. The edge of the cube is _____ cm
- (65) $(3 - 4i)(4 - 3i) = a + bi$. Find a . _____
- (66) If $f(x) = x - 5$ and $g(x) = 5 + x$, then $g(f(1)) =$ _____
- (67) The greatest integer less than $\sqrt{60}$ is _____
- (68) The dot product for $u = (2, -1)$ and $v = (-1, 2)$ is _____
- (69) $31^3 - 30^3 =$ _____
- *(70) $(e + \pi)^\pi \times (e + \pi)^e =$ _____
- (71) If $f(x) = \frac{3x-1}{x+2}$, then $f'(-1) =$ _____
- (72) Change .23 base 4 to a base 10 fraction. _____
- (73) The polar coordinates of the rectangular coordinates $(9, 40)$ are (r, θ) . $r =$ _____
- (74) Find k , $0 \leq k \leq 6$, if $(6!)(3!) \cong k \pmod{7}$. _____
- (75) If $f(x) = x^4 - x^3 + x^2 - x + 1$, then $f''(1) =$ _____
- (76) The sum of the first ten terms of the sequence 1, 4, 5, 9, 14, 23, 37, ... is _____
- (77) If $\sin \theta = 0.1$ then $\csc \theta =$ _____
- (78) $\int_0^4 (4 - x) dx =$ _____
- (79) $1125 \div 25 =$ _____ 5
- *(80) $888.8 \div 55\frac{5}{9}\% \times \frac{2}{9} =$ _____

2008-09 TMSCA High School Number Sense Test 6 - Answer Key

*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) 4017 | (19) 15 | (37) $2.1875, \frac{35}{16}, 2\frac{3}{16}$ | (59) 12500 |
| (2) 5993 | *(20) $661 - 729$ | (38) 20 | *(60) $186 - 204$ |
| (3) 110.11 | (21) 3290 | (39) 22 | (61) 2916 |
| (4) $223\frac{2}{9}$ | (22) 15 | *(40) $13261 - 14656$ | (62) 88 |
| (5) 50200 | (23) $\frac{14}{45}$ | (41) 45 | (63) $.75, \frac{3}{4}$ |
| (6) $1.5625, \frac{25}{16}, 1\frac{9}{16}$ | (24) 88 | (42) 10701 | (64) 3 |
| (7) 0 | (25) 2 | (43) $\frac{2}{3}$ | (65) 0 |
| (8) $\frac{14}{25}$ | (26) $-1.5, -\frac{3}{2}, -1\frac{1}{2}$ | (44) 2475 | (66) 1 |
| (9) 4 | (27) 63 | (45) -1 | (67) 7 |
| *(10) $9193 - 10159$ | (28) $.6, \frac{3}{5}$ | (46) $\frac{29}{1900}$ | (68) -4 |
| (11) 2484 | (29) 1 | (47) 3 | (69) 2791 |
| (12) 15 | *(30) $99728 - 110224$ | (48) 27 | *(70) $30023 - 33183$ |
| (13) $-2\frac{6}{35}$ | (31) -31 | (49) 24 | (71) 7 |
| (14) 529 | (32) \$ 2.92 | *(50) $4723 - 5219$ | (72) $\frac{11}{16}$ |
| (15) 2009 | (33) 8888 | (51) 1 | (73) 41 |
| (16) 60 | (34) 400 | (52) 987 | (74) 1 |
| (17) $\frac{8}{11}$ | (35) 4545 | (53) $2.25, \frac{9}{4}, 2\frac{1}{4}$ | (75) 8 |
| (18) $\frac{73}{3}, 24\frac{1}{3}$ | (36) 2160 | (54) 4 | (76) 407 |
| | | (55) $-\frac{1}{9}$ | (77) 10 |
| | | (56) 1 | (78) 8 |
| | | (57) 2 | (79) 31 |
| | | (58) $\frac{1}{3}$ | *(80) $338 - 373$ |

2008-09 TMSCA High School Number Sense Test 13

- (1) $2009 - 209 - 29 =$ _____
- (2) $\frac{3}{5} \times \frac{5}{12} \div \frac{3}{4} =$ _____
- (3) $2468 \div 9$ has a remainder of _____
- (4) $64 \times 44 =$ _____
- (5) $3 \times 6 - 9 + 4 \div 2 =$ _____
- (6) $6.25\% =$ _____ (proper fraction)
- (7) $27 \times 27 =$ _____
- (8) Which is smaller, $-\frac{11}{15}$ or $-\frac{9}{13}$? _____
- (9) $92 \div 9 - 29 \div 9 =$ _____
- * (10) $45 + 55 \times 65 =$ _____
- (11) The GCD of 57 and 76 is _____
- (12) 17 is what % of 68? _____ %
- (13) The median of 2, 8, 4, 3, 7, 5, & 9 is _____
- (14) $(23 + 45 \times 67) \div 8$ has a remainder of _____
- (15) If 3 ★'s cost 88¢ then a dozen ★'s cost \$ _____
- (16) The sum of the first 4 composite numbers is _____
- (17) $14641 \div 11 =$ _____
- (18) The sum of the positive integral divisors of 64 is _____
- (19) $DCLX \times IX =$ _____ (Arabic Numeral)
- * (20) $\sqrt{780} \times \sqrt{1080} =$ _____
- (21) If $\frac{3}{4x} = \frac{2}{5}$, then $x =$ _____ (mixed number)
- (22) $44^2 + 36^2 =$ _____
- (23) What number taken away from 12 and divided by 5, gives the same results? _____
- (24) $0.222... - 0.444... - 0.666... =$ _____
- (25) The additive inverse of 5.2 is _____
- (26) $111000_2 =$ _____ ₄
- (27) If $6x - 5 = 4$, then $3x - 2 =$ _____
- (28) $(2^4 \times 3^3 - 4^2) \div 5$ has a remainder of _____
- (29) Let $A = -1$, $B = -A$, and $C = AB$, then $A - B - C =$ _____
- * (30) $64^3 \div 16^3 \times 4^3 =$ _____
- (31) A 6-element set has _____ proper subsets
- (32) The roots of $x^3 + kx^2 - 13x + 12 = 0$ are -4, 1, and 3. Find k. _____
- (33) $5 \times 5! + 30 \times 4! =$ _____
- (34) The area of an equilateral triangle is $3\sqrt{3} \text{ cm}^2$. The height of the triangle is _____ cm

(35) If $\sqrt{15 + \sqrt{10 + \sqrt{x}}} = 5$ then $x =$ _____

(36) $1 + 1 + 2 + 3 + 5 + 8 + \dots + 89 + 144 =$ _____

(37) Let $x - 2y = 3$ and $x + y = 6$. $xy =$ _____

(38) $1 - |2 + |-3 + 4|| =$ _____

(39) If $h > 1$ and $h^6 \div h^4 \times h^3 = h^k$, then $k =$ _____

*(40) $43 \times 22 - 1800 =$ _____

(41) $66 \div 0.1666\dots =$ _____

(42) The y-intercept of the line $6x - 8y = 10$ is (h, k). Find k. _____

(43) $507^2 =$ _____

(44) $5 \times 10^3 \div 5^4 =$ _____

(45) If $4^{(x-1)} = 160$ then $4^{(x+1)} =$ _____

(46) $122 \times 131 =$ _____

(47) $\frac{11}{12} - \frac{10}{13} =$ _____

(48) The smallest leg of a right triangle with integral sides is 13". The hypotenuse is _____"

(49) $777 \times \frac{3}{37} =$ _____

*(50) $118 \times 159 + 42 \times 161 =$ _____

(51) 36% of $166\frac{2}{3}$ is _____

(52) $(2 - i) \div (0 + i) = (a + bi)$. Find $a + b$. _____

(53) If $xy = 1$ and $x + y = -2$ then $x^3 + y^3 =$ _____

(54) $24_5 \times 4_5 =$ _____₅

(55) If $\log_4(8) = x$ then $x =$ _____

(56) The set $\{f, o, u, r\}$ has _____ 2-elements subsets

(57) If $k + 24 + 16 + 10\frac{2}{3} + \dots = 108$ then $k =$ _____

(58) The smaller root of $3x^2 - 14x + 11 = 0$ is _____

(59) ${}_5P_3 \div {}_5C_4 =$ _____

*(60) $875 \times 890 \div 777 =$ _____

(61) $51 \times 51 - 101 =$ _____

(62) $(\tan \frac{\pi}{3})(\cot \frac{\pi}{6}) =$ _____

(63) Two cards are drawn from a standard deck of cards without replacement. What is the probability that both cards are Jacks? _____

(64) $f(x) = x^3 + 5x^2 - 17x - 21$ divided by $x - 3$ has a remainder of _____

(65) $2^2 + 1^2 + 3^2 + 4^2 + 7^2 + 11^2 =$ _____

(66) The slope of a line perpendicular to the line $2x - 4y = 3$ is _____

(67) $55^2 + 56^2 =$ _____

(68) Let $A = \begin{bmatrix} 3 & 1 \\ -2 & 2 \end{bmatrix}$. The determinant of A is _____

(69) $16^3 - 15^3 =$ _____

*(70) $346578 \div 9201 =$ _____

(71) The sum of the first ten terms of the Fibonacci sequence 3, 6, 9, 15, 24, 39, ... is _____

(72) If $f(x) = \frac{2x+5}{2x-7}$, then $f'(4) =$ _____

(73) The slope of the line tangent to $f(x) = \sqrt{x+1}$ at the point (3, 2) is _____

(74) The 18th triangular number is _____

(75) If $f(x) = 2x - 1$ then $f(f(-3)) =$ _____

(76) $7 \times 11 \times 13 \times 17 =$ _____

(77) Change .231 base 4 to a base 10 fraction. _____

(78) $\int_0^1 (-x)^3 dx =$ _____

(79) The vertical asymptote of $y = \log_3 x$ is $x =$ _____

*(80) $18 \times 36 \times 54 \div 72 =$ _____

2008-09 TMSCA High School Number Sense Test 13 - Answer Key

*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) 1771 | (19) 5940 | (35) 8100 | (59) 12 |
| (2) $\frac{1}{3}$ | *(20) 872 — 963 | (36) 376 | *(60) 953 — 1052 |
| (3) 2 | (21) $1\frac{7}{8}$ | (37) 5 | (61) 2500 |
| (4) 2816 | (22) 3232 | (38) — 2 | (62) 3 |
| (5) 11 | (23) 10 | (39) 5 | (63) $\frac{1}{221}$ |
| (6) $\frac{1}{16}$ | (24) — $\frac{8}{9}$ | *(40) — 896 — — 811 | (64) 0 |
| (7) 729 | (25) — 5.2, — $\frac{26}{5}$,
— $5\frac{1}{5}$ | (41) 396 | (65) 200 |
| (8) — $\frac{11}{15}$ | (26) 320 | (42) — 1.25, — $\frac{5}{4}$,
— $1\frac{1}{4}$ | (66) — 2 |
| (9) 7 | (27) 2.5, $\frac{5}{2}$, $2\frac{1}{2}$ | (43) 257049 | (67) 6161 |
| *(10) 3439 — 3801 | (28) 1 | (44) 8 | (68) 8 |
| (11) 19 | (29) — 1 | (45) 2560 | (69) 721 |
| (12) 25 | *(30) 3892 — 4300 | (46) 15982 | *(70) 36 — 39 |
| (13) 5 | (31) 63 | (47) $\frac{23}{156}$ | (71) 693 |
| (14) 6 | (32) 0 | (48) 85 | (72) — 24 |
| (15) 53.52 | (33) 1320 | (49) 63 | (73) .25, $\frac{1}{4}$ |
| (16) 27 | (34) 3 | *(50) 24248 — 26800 | (74) 171 |
| (17) 1331 | | (51) 60 | (75) — 15 |
| (18) 127 | | (52) — 3 | (76) 17017 |
| | | (53) — 2 | (77) .703125, $\frac{45}{64}$ |
| | | (54) 211 | (78) — $\frac{1}{4}$ |
| | | (55) 1.5, $\frac{3}{2}$, $1\frac{1}{2}$ | (79) 0 |
| | | (56) 6 | *(80) 462 — 510 |
| | | (57) 36 | |
| | | (58) 1 | |

2008-09 TMSCA High School State Meet

- (1) $2009 - 314 =$ _____
- (2) $\$29.29 + \$90.02 = \$$ _____
- (3) $31 \times 29 =$ _____
- (4) $\frac{2}{9} \div 3\frac{1}{4} =$ _____
- (5) $92\% =$ _____ (proper fraction)
- (6) $34^2 =$ _____
- (7) $1\frac{1}{8} - 1.6 =$ _____ (decimal)
- (8) $(5 + 10) \times 15 \div (20 - 25) =$ _____
- (9) $135720 \div 6$ has a remainder of _____
- *(10) $2009 \times 6 - 2009 =$ _____
- (11) $-2 - (-3) - (-4)(-5) =$ _____
- (12) $\text{CCCXIV} + \text{MMIX} =$ _____ (Arabic Numeral)
- (13) $10 \div 1\frac{1}{7} =$ _____ (decimal)
- (14) $\text{LCM}(12, 20) \times \text{GCD}(12, 20) =$ _____
- (15) The range of 3, 14, 20, & 9 is _____
- (16) The sum of the positive integral divisors of 95 is _____
- (17) 64 is what % more than 48? _____ %
- (18) If 11 ♦'s cost \$13.31 then 5 ♦'s cost \$ _____
- (19) $57 \times 57 =$ _____
- *(20) $235689 \div 111 =$ _____
- (21) $1.111... + 3.333... + 6.666... =$ _____
- (22) The perimeter of a regular octagon is 44 cm.
The side length the octagon is _____ cm
- (23) $6^3 =$ _____
- (24) The largest root of $x^2 + x - 30 = 0$ is _____
- (25) How many positive integers divide 45? _____
- (26) $234 \text{ s}_t =$ _____ 10
- (27) $86^2 + 52^2 =$ _____
- (28) How many 3-element subsets does the set $\{p, r, e, c, a, l\}$ have? _____
- (29) $1.5 \times 1.6 \times 2.4 =$ _____ (decimal)
- *(30) $41 \times 42 + 43 \times 40 =$ _____
- (31) If $f(x) = 16x^2 - 8x + 1$ then $f(9)$ is _____
- (32) $212 \times 16 =$ _____
- (33) 12.5 plus 12.5% of 36 is _____
- (34) $7^8 \div 9$ has a remainder of _____
- (35) $(\frac{4}{9})^{\frac{3}{2}} =$ _____

(36) $15 \times 5! + 25 \times 4! =$ _____

(37) If $\frac{4}{7x} = -\frac{2}{7}$, then $x =$ _____

(38) If $x^3 = \sqrt{5x^5 + 5x^5 + 5x^5 + 5x^5 + 5x^5}$,
where $x > 1$ then $x =$ _____

(39) $1234 \times 8 + 4 =$ _____

*(40) $\sqrt{784356} =$ _____

(41) $102 \times 112 =$ _____

(42) $\frac{5}{8} - \frac{54}{89} =$ _____

(43) The slope of the line $3x - ky = 5$ is .75. $k =$ _____

(44) $5^4 \times 4^4 =$ _____

(45) If $7^x = 51$ then $7^{(x+2)} =$ _____

(46) The largest integer x such that
 $5x - 7 \leq -9$ is _____

(47) If $xy = -1$ and $x - y = 3$ then $x^3 - y^3 =$ _____

(48) $390 \div 1.625 =$ _____

(49) $110 \times \frac{11}{27} =$ _____ (mixed number)

*(50) $714.285 \times 348 =$ _____

(51) The integral sides of a triangle are 7, 9, and x .
The greatest value of x is _____

(52) ${}_8C_5 + {}_8C_3 =$ _____

(53) $31_6 + 22_6 - 35_6 =$ _____ ₆

(54) The circumference of the circle
 $(x - 2)^2 + (y + 4)^2 = 16$ is $k\pi$. Find k . _____

(55) 63% of $777\frac{7}{9}$ is _____

(56) $81 + 54 + 36 + 24 + 16 + \dots =$ _____

(57) The simplified coefficient of the xy^3 term in
the expansion of $(x - 2y)^4$ is _____

(58) $444 \times \frac{k}{37} = 48$. Find k . _____

(59) If the odds of winning a game is 1.5, then the
probability of losing that game is _____ %

*(60) $36 \times 41 \times 44 =$ _____

(61) $12345 \times 7 + 5 =$ _____

(62) When two dice are rolled, what is the
probability that the sum is a factor of 9? _____

(63) The tenth term of 6, 11, 16, 21, ... is _____

(64) $74^2 + 75^2 =$ _____

(65) The Greatest Integer Function is written as
 $f(x) = [x]$. Find $[\frac{9 - \sqrt{6}}{3}]$. _____

(66) $11\frac{1}{10} \times 11\frac{1}{10} =$ _____ (decimal)

(67) 15 miles per hour = _____ feet per second

(68) $\sum_{k=1}^4 (k)^2 =$ _____

(69) $\sec^2(\frac{2\pi}{3}) - 1 =$ _____

*(70) $3142009 \div 5678 =$ _____

(71) If $f(x) = \frac{3x+5}{6x+4}$, then $f'(-\frac{1}{2}) =$ _____

(72) Find x , if $\det \begin{vmatrix} -3 & 6 \\ x & 9 \end{vmatrix} = 12$. _____

(73) If $f(x) = \frac{2}{3x} - 1$ then $f^{-1}(1) =$ _____

(74) The horizontal asymptote of $y = 4^x + 4$
is $y =$ _____

(75) The polar coordinate of the rectangular
coordinate $(3, \sqrt{7})$ is (r, θ) . Find $r > 0$. _____

(76) Change .52 to a base 5 decimal. _____ ₅

(77) $\lim_{x \rightarrow 0} \frac{\sin(x)}{x} =$ _____

(78) $\int_0^5 (5 - x) dx =$ _____

(79) $\frac{7}{6} + \frac{7}{12} + \frac{7}{20} =$ _____

*(80) $658 \div 16\frac{2}{3}\% \times .333\dots =$ _____

2008-09 TMSCA High School State Meet Number Sense - Answer Key

*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) 1695 | (19) 3249 | (36) 2400 | *(60) 61697 — 68191 |
| (2) \$119.31 | *(20) 2018 — 2229 | (37) — 2 | (61) 86420 |
| (3) 899 | (21) $11\frac{1}{9}$ | (38) 25 | (62) $\frac{1}{6}$ |
| (4) $\frac{8}{117}$ | (22) 5.5, $\frac{11}{2}$, $5\frac{1}{2}$ | (39) 9876 | (63) 51 |
| (5) $\frac{23}{25}$ | (23) 216 | *(40) 842 — 929 | (64) 11101 |
| (6) 1156 | (24) 5 | (41) 11424 | (65) 2 |
| (7) — .475 | (25) 6 | (42) $\frac{13}{712}$ | (66) 123.21 |
| (8) — 45 | (26) 69 | (43) 4 | (67) 22 |
| (9) 0 | (27) 10100 | (44) 160000 | (68) 30 |
| *(10) 9543 — 10547 | (28) 20 | (45) 2499 | (69) 3 |
| (11) — 19 | (29) 5.76 | (46) — 1 | *(70) 526 — 581 |
| (12) 2323 | *(30) 3270 — 3614 | (47) 18 | (71) — 18 |
| (13) 8.75 | (31) 1225 | (48) 240 | (72) — 6.5, — $\frac{13}{2}$,
— $6\frac{1}{2}$ |
| (14) 240 | (32) 3392 | (49) $44\frac{22}{27}$ | (73) $\frac{1}{3}$ |
| (15) 17 | (33) 17 | *(50) 236143 — 260999 | (74) 4 |
| (16) 120 | (34) 4 | (51) 15 | (75) 4 |
| (17) $33\frac{1}{3}$ | (35) $\frac{8}{27}$ | (52) 112 | (76) .23 |
| (18) \$6.05 | | (53) 14 | (77) 1 |
| | | (54) 8 | (78) 12.5, $\frac{25}{2}$, $12\frac{1}{2}$ |
| | | (55) 490 | (79) 2.1, $\frac{21}{10}$, $2\frac{1}{10}$ |
| | | (56) 243 | *(80) 1251 — 1381 |
| | | (57) — 32 | |
| | | (58) 4 | |
| | | (59) 40 | |

**The University Interscholastic League
Number Sense Test • HS District 1 • 2009**

Contestant's Number _____

Final	_____
2nd	_____
1st	_____
Score	Initials

Read directions carefully
before beginning test

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UNTIL TOLD TO BEGIN**

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STOP -- WAIT FOR SIGNAL!

- | | |
|--|--|
| <p>(1) $2008 - 2009 =$ _____</p> <p>(2) $2.09 + 80.02 =$ _____</p> <p>(3) $17^2 =$ _____</p> <p>(4) $12 - 10 + 8 \times 6 \div 4 =$ _____</p> <p>(5) $25 \times 70 + 25 \times 50 =$ _____</p> <p>(6) $2\frac{3}{4} \times 5 =$ _____ (mixed number)</p> <p>(7) $3\frac{1}{5}\% =$ _____ (decimal)</p> <p>(8) $2090 \div 9 =$ _____ (mixed number)</p> <p>(9) $92 \times 11 =$ _____</p> <p>*(10) $2090 - 209 + 29 - 9 =$ _____</p> <p>(11) $27 \times 33 =$ _____</p> <p>(12) $18'' \times 24'' \times 30'' =$ _____ cubic feet</p> <p>(13) $MDC \div XXV =$ _____ (Arabic Numeral)</p> <p>(14) $5 + 11 + 17 + 23 + 29 + 35 + 41 + 47 =$ _____</p> <p>(15) The sum of the first 4 odd prime numbers is _____</p> <p>(16) If 6 \triangle's cost \$1.86 then 8 \triangle's cost \$ _____</p> <p>(17) 45% of 45 is _____</p> <p>(18) The mean of 27, 16, 42, and 31 is _____</p> | <p>(19) $(-11) - 12 - (-13) =$ _____</p> <p>*(20) $\sqrt{3846} \times 68 =$ _____</p> <p>(21) $3.222... - 2.333... =$ _____</p> <p>(22) $1 + 1 + 2 + 3 + 5 + 8 + \dots + 34 =$ _____</p> <p>(23) 1123 base 5 is equivalent to _____ base 10</p> <p>(24) $\{p,l,u,s\} \cap \{m,i,n,u,s\}$ has _____ distinct elements</p> <p>(25) If $\frac{3}{4} + \frac{1}{x} = \frac{7}{8}$, then $x =$ _____</p> <p>(26) A 10-element set has _____ subsets</p> <p>(27) $7^3 =$ _____</p> <p>(28) $2 - 3 - 5 - 7 + 11 =$ _____</p> <p>(29) $123 \times 14 =$ _____</p> <p>*(30) $108 \times 119 + 12 \times 121 =$ _____</p> <p>(31) $12g + 34g + 56g =$ _____ 8</p> <p>(32) The multiplicative inverse of 2.5 is _____</p> <p>(33) $9876 \times 9 + 4 =$ _____</p> <p>(34) The product of the roots of $3x^2 + 4x - 5 = 0$ is _____</p> <p>(35) The length of a diagonal of a square is $\sqrt{18}$ cm. The perimeter of the square is _____ cm</p> |
|--|--|

- (36) $42^2 + 85^2 =$ _____
- (37) If $\sqrt{48} + \sqrt{75} = \sqrt{x}$, then $x =$ _____
- (38) $9 \times 6! - 18 \times 5! =$ _____
- (39) If $a = -7$ and $b = 2$, then
 $(a + b)(a^2 - ab + b^2) =$ _____
- *(40) $21^4 =$ _____
- (41) If $6^{(x-1)} = 123$ then $6^x =$ _____
- (42) $5^5 \times 2^2 =$ _____
- (43) $\frac{4}{5} - \frac{19}{26} =$ _____
- (44) If $6 - 5x < 4$, then $10x >$ _____
- (45) The smaller leg of a 30-60-90° triangle is $3\frac{1}{2}$ cm. The hypotenuse is _____ cm
- (46) $131 \times 212 =$ _____
- (47) The slope of the line $3x - 5y = 7$ is _____
- (48) If $xy = 1$ and $x + y = 2$ then $x^3 + y^3 =$ _____
- (49) $89 \times 98 =$ _____
- *(50) $85.7142 \times 1492 =$ _____
- (51) If $444 \times \frac{k}{37} = 96$, then $k =$ _____
- (52) $123_7 - 45_7 =$ _____ $_7$
- (53) The integral sides of a triangle are 7, 2, and x .
The least value of x is _____
- (54) $2.3 + 4.8 + 7.3 + 9.8 + \dots + 19.8 =$ _____
- (55) The larger root of $11x^2 - 8x - 3 = 0$ is _____
- (56) $12345 \times 8 + 5 =$ _____
- (57) ${}_6P_4 \div {}_6C_2 =$ _____
- (58) Let $|2 + 3x| \leq 4$. The greatest value of x is _____
- (59) The simplified coefficient of the xy^2 term in the expansion of $(x - 2y)^3$ is _____
- *(60) $67 \times 71 \times 73 =$ _____
- (61) $53^2 =$ _____
- (62) 132 feet per second = _____ miles per hour
- (63) $(2x^3 + 3x^2 - 4x - 5) \div (x + 1)$ has a remainder of _____
- (64) The volume of a right circular cylinder 11 cm high with a diameter of 22 cm is _____ π cm^3
- (65) $1 + 2 + 5 + 13 + \dots + 89 + 233 =$ _____
- (66) $\det \begin{vmatrix} -4 & 8 \\ -6 & 9 \end{vmatrix} =$ _____
- (67) $\sin \frac{5\pi}{6} \div \cos \frac{2\pi}{3} =$ _____
- (68) The Greatest Integer Function is written as $f(x) = [x]$. Find $[3\pi + 2e]$. _____
- (69) $41^3 - 40^3 =$ _____
- *(70) $314 \times 27.2 \times 1.62 =$ _____
- (71) If $f(x) = \frac{5x-3}{2x+5}$, then $f'(-2) =$ _____
- (72) Find the slope of the line tangent to $y = x^3 + x^2 + x + 1$ at $(-1, 0)$. _____
- (73) $\frac{1}{6} + \frac{1}{10} + \frac{1}{15} + \frac{1}{21} =$ _____
- (74) $\lim_{x \rightarrow -1} \frac{x^3 + 1}{x^2 - 2} =$ _____
- (75) $124_5 \div 3_5 =$ _____ $_5$
- (76) $\sum_{k=1}^3 (-k)^k =$ _____
- (77) The 21st triangular number is _____
- (78) $\int_0^3 (2x + 1) dx =$ _____
- (79) $5 + 7 + 12 + 19 + 31 + \dots + 131 + 212 =$ _____
- *(80) $833 \times \frac{2}{9} \times 67\% =$ _____

University Interscholastic League - Number Sense Answer Key HS • District 1 • 2009

*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 | (19) — 10 | (36) 8989 | *(60) 329898 — 364624 |
| (2) 82.11 | *(20) 4007 — 4427 | (37) 243 | (61) 2809 |
| (3) 289 | (21) $\frac{8}{9}$ | (38) 4320 | (62) 90 |
| (4) 14 | (22) 88 | (39) — 335 | (63) 0 |
| (5) 3000 | (23) 163 | *(40) 184757 — 204205 | (64) 1331 |
| (6) $13\frac{3}{4}$ | (24) 2 | (41) 738 | (65) 377 |
| (7) .032 | (25) 8 | (42) 12500 | (66) 12 |
| (8) $232\frac{2}{9}$ | (26) 1024 | (43) $\frac{9}{130}$ | (67) — 1 |
| (9) 1012 | (27) 243 | (44) 4 | (68) 14 |
| *(10) 1806 — 1996 | (28) 8 | (45) 7 | (69) 4921 |
| (11) 891 | (29) 1722 | (46) 27772 | *(70) 13145 — 14527 |
| (12) 7.5, $\frac{15}{2}$, $7\frac{1}{2}$ | *(30) 13589 — 15019 | (47) $6\frac{3}{5}$ | (71) 31 |
| (13) 64 | (31) 124 | (48) 2 | (72) 2 |
| (14) 208 | (32) $1\frac{2}{5}$ | (49) 8722 | (73) $\frac{8}{21}$ |
| (15) 26 | (33) 8888 | *(50) 121492 — 134279 | (74) 0 |
| (16) \$ 2.48 | (34) $-\frac{5}{3}$, $-1\frac{2}{3}$ | (51) 8 | (75) 23 |
| (17) 20.25, $\frac{81}{4}$, $20\frac{1}{4}$ | (35) 12 | (52) 45 | (76) — 24 |
| (18) 29 | | (53) 6 | (77) 231 |
| | | (54) 88.4, $\frac{442}{5}$, $88\frac{2}{5}$ | (78) 12 |
| | | (55) 1 | (79) 548 |
| | | (56) 98765 | *(80) 118 — 130 |
| | | (57) 24 | |
| | | (58) $\frac{2}{3}$ | |
| | | (59) 12 | |

**The University Interscholastic League
Number Sense Test • HS District 2 • 2009**

Contestant's Number _____

Final _____

2nd _____

1st _____

Score _____ Initials _____

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STOP -- WAIT FOR SIGNAL!

- | | |
|---|--|
| <p>(1) $2909 + 2090 =$ _____</p> <p>(2) $824 \div 8 =$ _____</p> <p>(3) $\frac{3}{4} \times \frac{14}{15} =$ _____</p> <p>(4) 20% of 30 plus 40% of 50 is _____</p> <p>(5) The GCD of 68 and 85 is _____</p> <p>(6) $22 \times \overset{\cdot}{2}2 =$ _____</p> <p>(7) $4\frac{1}{4}\%$ = _____ (proper fraction)</p> <p>(8) $15 + 10 \div 5 \times 10 - 15 =$ _____</p> <p>(9) $2012 \times 25 =$ _____</p> <p>* (10) $45 \times 55 - 65 =$ _____</p> <p>(11) The sum of the prime divisors 105 is _____</p> <p>(12) $44 \times 46 =$ _____</p> <p>(13) 3 cubic yards = _____ cubic feet</p> <p>(14) $CXLIV \times XII =$ _____ (Arabic Numeral)</p> <p>(15) $(44 + 55 \times 66) \div 7$ has a remainder of _____</p> <p>(16) 22 is what % less than 88? _____ %</p> <p>(17) Which is smaller $\frac{5}{11}$ or $\frac{11}{23}$? _____</p> <p>(18) $23 \times 45 =$ _____</p> | <p>(19) The median of 17, 22, 19, 12, & 25 is _____</p> <p>* (20) $2134711 \div 111 =$ _____</p> <p>(21) $8\frac{1}{4} \times 4\frac{1}{4} =$ _____ (mixed number)</p> <p>(22) $0.8111\dots =$ _____ (proper fraction)</p> <p>(23) The 3rd triangular number is _____</p> <p>(24) $(5)^{-2} \times (5)^0 \div 5^2 =$ _____</p> <p>(25) 21 inches is what per cent of a foot? _____ %</p> <p>(26) If $x + 5 = 4$, then $x - 3 =$ _____</p> <p>(27) If $A=1$, $B=-A$, and $C=A-B$, then $ABC =$ _____</p> <p>(28) Let $f(x) = 4x^2 - 12x + 9$. Find $f(17)$. _____</p> <p>(29) $1^2 + 2^2 + 3^2 + 5^2 + 8^2 =$ _____</p> <p>* (30) 3 gals — 3 qts — 3 pts — 3 fl.oz. = _____ fl. oz.</p> <p>(31) Find the simple interest on \$400.00 at 4% for 4 years. \$ _____</p> <p>(32) $44^2 + 36^2 =$ _____</p> <p>(33) $3 + 7 + 10 + 17 + \dots + 44 + 71 =$ _____</p> <p>(34) If $\sqrt{4 + \sqrt{4 + 4\sqrt{x}}} = 4$ then $x =$ _____</p> <p>(35) $10 \times 4! + 8 \times 5! =$ _____</p> |
|---|--|

- (36) $8^3 =$ _____
- (37) 44 base 10 is equivalent to _____ base 4
- (38) The set {m,i,n,u,t,e} has _____ 3-element subsets
- (39) $|- (2 - 4) - |6 - 8|| =$ _____
- *(40) $\sqrt[3]{1332} \times \sqrt{141} \times 13 =$ _____
- (41) $120 \div 8.333\dots =$ _____
- (42) The point $(-4, 5)$ is reflected across the origin to point (h,k) . Find k. _____
- (43) If $x - y = 1$ and $xy = 2$ then $x^3 - y^3 =$ _____
- (44) 19% of $666\frac{2}{3}$ is _____ (mixed number)
- (45) $5^3 \times 2^5 =$ _____
- (46) Let $a^2 \div a^{-4} \div a^6 = a^k$, where $a > 1$. $k =$ _____
- (47) $\frac{9}{11} - \frac{71}{89} =$ _____
- (48) The distance between the points $(1, -5)$ and $(-4, 7)$ is _____
- (49) $40_5 - 12_5 - 11_5 =$ _____ 5
- *(50) $3^9 \div 6^6 \times 9^3 =$ _____
- (51) $1234 \times 7 + 4 =$ _____
- (52) If the odds of losing the game is 35%, then the probability of winning the game is _____
- (53) $333 \times \frac{9}{37} =$ _____
- (54) $(3 + 5i)(5 - 3i) = (a + bi)$. Find $a + b$. _____
- (55) The smaller root of $5x^2 - 7x - 6 = 0$ is _____
- (56) If $\log_3 \left(\frac{1}{27}\right) = x$ then $x =$ _____
- (57) $54 + 18 + 6 + 2 + \dots =$ _____
- (58) The area of $x^2 + (y - 2)^2 = 2$ is $k\pi$. $k =$ _____
- (59) ${}_6P_4 + {}_6P_2 =$ _____
- *(60) $11235 \times 111 =$ _____
- (61) $57^2 =$ _____
- (62) $1^2 + 1^2 + 2^2 + 3^2 + 5^2 + 8^2 + 13^2 =$ _____
- (63) $\begin{vmatrix} 1 & 2 \\ 3 & 4 \end{vmatrix} \times \begin{vmatrix} 4 & 3 \\ 2 & 1 \end{vmatrix} = \begin{vmatrix} a & c \\ b & d \end{vmatrix}$. Find d. _____
- (64) $\sqrt[6]{1771561} =$ _____
- (65) The greatest integer function $f(x) = [2x + 3]$ has a value of _____ for $f(e)$
- (66) The line of symmetry of the parabola $y = x^2 - 4x + 5$ is $x =$ _____
- (67) $(\tan \frac{5\pi}{6})^2 =$ _____
- (68) $44^2 - 47^2 + 50^2 - 53^2 =$ _____
- (69) $\sum_{k=1}^4 (k)^2 - k =$ _____
- *(70) $2718281 \div 3141 =$ _____
- (71) If $f(x) = \frac{2 + 5x}{3 + 4x}$, then $f'(2) =$ _____
- (72) If the initial point of a vector is $(2, 5)$ and the terminal point is $(-1, 1)$, then $\|v\| =$ _____
- (73) Find x , $0 \leq x < 7$, if $\frac{(5!)(3!)}{(4!)} \cong x \pmod{7}$. _____
- (74) If $f(x) = x^3 - x^2 - x - 1$, then $f''(-1) =$ _____
- (75) How many asymptotes does the function $f(x) = \frac{2x^2 - 3x}{x + 1}$ have? _____
- (76) $(3, \frac{\pi}{6})$ are polar coordinates for (x,y) . $y =$ _____
- (77) $\frac{1}{6} + \frac{1}{12} + \frac{1}{20} + \frac{1}{30} =$ _____
- (78) $\int_2^4 (3x) dx =$ _____
- (79) If $f(x) = \frac{3x}{4} + 2$ then $f^{-1}(1) =$ _____
- *(80) $106\frac{1}{4}\% \times 799 \times .125 =$ _____

University Interscholastic League - Number Sense Answer Key HS • District 2 • 2009

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NOTE: If an answer is of the type like $\frac{2}{3}$ it cannot be written as a repeating decimal

- | | | | |
|------------------------|-----------------------|--|---------------------------------------|
| (1) 4999 | (19) 19 | (36) 512 | * (60) 1184731 – 1309439 |
| (2) 103 | * (20) 18271 – 20193 | (37) 230 | (61) 3249 |
| (3) $.7, \frac{7}{10}$ | (21) $35\frac{1}{16}$ | (38) 20 | (62) 273 |
| (4) 26 | (22) $\frac{73}{90}$ | (39) 0 | (63) 13 |
| (5) 17 | (23) 6 | * (40) 1614 – 1783 | (64) 11 |
| (6) 484 | (24) $\frac{1}{625}$ | (41) $14.4, \frac{72}{5}, 14\frac{2}{5}$ | (65) 8 |
| (7) $\frac{17}{400}$ | (25) 175 | (42) – 5 | (66) 2 |
| (8) 20 | (26) – 4 | (43) 7 | (67) $\frac{1}{3}$ |
| (9) 50300 | (27) – 2 | (44) $126\frac{2}{3}$ | (68) – 582 |
| * (10) 2290 – 2530 | (28) 961 | (45) 4000 | (69) 20 |
| (11) 15 | (29) 103 | (46) 0 | * (70) 823 – 908 |
| (12) 2024 | * (30) 226 – 248 | (47) $\frac{20}{979}$ | (71) $\frac{7}{121}$ |
| (13) 81 | (31) \$ 64.00 | (48) 13 | (72) 5 |
| (14) 1728 | (32) 3232 | (49) 12 | (73) 2 |
| (15) 6 | (33) 179 | * (50) 293 – 322 | (74) – 8 |
| (16) 75 | (34) 1225 | (51) 8642 | (75) 2 |
| (17) $\frac{5}{11}$ | (35) 1200 | (52) $\frac{20}{27}$ | (76) $1.5, \frac{3}{2}, 1\frac{1}{2}$ |
| (18) 1035 | | (53) 81 | (77) $\frac{1}{3}$ |
| | | (54) 46 | (78) 18 |
| | | (55) $-.6, -\frac{3}{5}$ | (79) $-\frac{4}{3}, -1\frac{1}{3}$ |
| | | (56) – 3 | * (80) 101 – 111 |
| | | (57) 81 | |
| | | (58) 2 | |
| | | (59) 390 | |

**The University Interscholastic League
Number Sense Test • HS Regional • 2009**

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- | | |
|---|--|
| <p>(1) $2009 - 209 + 29 =$ _____</p> <p>(2) $2.3 \times 3.2 =$ _____ (decimal)</p> <p>(3) $\frac{5}{9} \div \frac{2}{3} =$ _____</p> <p>(4) $29^2 =$ _____</p> <p>(5) $1\frac{2}{3}\% =$ _____ (proper fraction)</p> <p>(6) $15 - 12 + 9 \times 6 \div 3 =$ _____</p> <p>(7) The GCD of 171 and 57 is _____</p> <p>(8) $112358 \div 6$ has a remainder of _____</p> <p>(9) 15% of \$18.20 is \$ _____</p> <p>*(10) $55 \times 65 - 75 =$ _____</p> <p>(11) $5 - (-4) - 3(-2) =$ _____</p> <p>(12) $64 \times 66 =$ _____</p> <p>(13) $MCCCXXXI \div CXXI =$ _____ (Arabic Numeral)</p> <p>(14) The mean of 72, 65, 73, and 66 is _____</p> <p>(15) Which is smaller .45 or $\frac{4}{9}$? _____</p> <p>(16) 30 is what % less than 45? _____ %</p> <p>(17) The sum of the proper divisors 115 is _____</p> <p>(18) 12 square feet = _____ square inches</p> | <p>(19) If 9 □'s cost \$1.89 then 12 □'s cost \$ _____</p> <p>*(20) $\sqrt{4444} \times 59 =$ _____</p> <p>(21) $2.111... + 3.222... - 4.333... =$ _____</p> <p>(22) $2 + 1 + 3 + 4 + 7 + 11 + ... + 47 =$ _____</p> <p>(23) The 9th triangular number is _____</p> <p>(24) The smallest root of $x^2 - 4x - 12 = 0$ is _____</p> <p>(25) If $\frac{2}{5} - \frac{1}{x} = \frac{3}{10}$, then $x =$ _____</p> <p>(26) Let $x - 3 = -5$. Find $x + 7$. _____</p> <p>(27) $13^3 =$ _____</p> <p>(28) If $g(x) = 9x^2 + 6x + 1$, then $g(13) =$ _____</p> <p>(29) $2.4 \times 1.1 \times 2.5 =$ _____ (decimal)</p> <p>*(30) $51 \times 49 + 62 \times 58 =$ _____</p> <p>(31) $77^2 + 63^2 =$ _____</p> <p>(32) $321 \times 18 =$ _____</p> <p>(33) $12345 \times 8 + 5 =$ _____</p> <p>(34) $8^7 \div 9$ has a remainder of _____</p> <p>(35) The perimeter of a square is 20 cm. The diagonal of the square is \sqrt{x} cm. $x =$ _____</p> |
|---|--|

(36) $15 \times 4! + 5! \times 4 =$ _____

(37) 66 base 10 is equivalent to _____ base 6

(38) If $\sqrt{5 - \sqrt{4 - 3\sqrt{x}}} = 2$ then $x =$ _____

(39) How many 2-element or 3-element subsets does the set $\{e, m, p, t, y\}$ have? _____

*(40) $\sqrt[3]{1860867} =$ _____

(41) If $xy = -1$ and $x + y = -2$ then $x^3 + y^3 =$ _____

(42) $104 \times 93 =$ _____

(43) $\frac{8}{11} - \frac{31}{45} =$ _____

(44) The slope of the line perpendicular to the line $5x - 3y = 4$ is _____

(45) $5^4 \times 2^3 =$ _____

(46) Let $a^3 \div a^{-2} \times a^4 = a^k$, where $a > 1$. $k =$ _____

(47) If $7^{(x+1)} = 140$ then $7^{(x-1)} =$ _____

(48) $450 \div 1.875 =$ _____

(49) The point $(-4, 0)$ is rotated clockwise 270° about the origin to point (h, k) . Find k . _____

*(50) $2^7 \div 4^5 \times 8^3 =$ _____

(51) The integral sides of a triangle are 7, 11, and x . The greatest value of x is _____

(52) $8C_3 \div 8C_5 =$ _____

(53) $2\frac{1}{2} + 3\frac{3}{4} + 5 + \dots + 8\frac{3}{4} =$ _____

(54) $4321_9 - 1234_9 =$ _____ $_9$

(55) If $777 \times \frac{k}{37} = 147$, then $k =$ _____

(56) If $\log_4(\frac{1}{8}) = x$ then $x =$ _____

(57) $5.6 + 1.12 + 0.224 + 0.0448 + \dots =$ _____

(58) The probability of losing game X is 37.5%. The odds of winning game X is _____

(59) The larger root of $12x^2 + 17x - 5 = 0$ is _____

*(60) $55 \times 51 \times 59 =$ _____

(61) $25^3 - 24^3 =$ _____

(62) $\sin \frac{2\pi}{3} \times \cos \frac{5\pi}{6} =$ _____

(63) The Greatest Integer Function is written as $f(x) = [x]$. Find $[\frac{5 + \sqrt{6}}{7}]$. _____

(64) $\sum_{k=1}^4 k - (k)^2 =$ _____

(65) $1 + 3 + 8 + 21 + \dots + 377 =$ _____

(66) The 11th term of 11, 16, 21, 26, ... is _____

(67) The lateral surface area of a right circular cylinder 11 inches high with a diameter of 22 inches is $k\pi$ square inches. $k =$ _____

(68) $\det \begin{vmatrix} 2 & -4 \\ -3 & 5 \end{vmatrix} =$ _____

(69) $56^2 =$ _____

*(70) $10\pi \times 10e \times 10\phi =$ _____

(71) If $f(x) = \frac{7x+4}{3x-5}$, then $f'(2) =$ _____

(72) Find x , $0 \leq x < 8$, if $\frac{(6!)(2!)}{(5!)} \cong x \pmod{8}$. _____

(73) $\lim_{x \rightarrow 3} \frac{x^2 - 3x + 1}{x - 2} =$ _____

(74) Change .44 base 6 to a base 10 fraction. _____

(75) If $f(x) = x^3 + x^2 + 1$, then $f''(4) =$ _____

(76) $\int_2^4 (3x) dx =$ _____

(77) Find the slope of the line tangent to $y = x^3 + x^2 + 1$ at $x = -2$. _____

(78) $\frac{1}{15} + \frac{1}{35} + \frac{1}{63} =$ _____

(79) 75 miles per hour = _____ feet per second

*(80) $654 \times \frac{2}{3} \times 16.7\% =$ _____

University Interscholastic League - Number Sense Answer Key HS • Regional • 2009

*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) 1829 | (19) \$ 2.52 | (36) 840 | (59) .25, $\frac{1}{4}$ |
| (2) 7.36 | *(20) 3739 — 4129 | (37) 150 | *(60) 157221 — 173769 |
| (3) $\frac{5}{6}$ | (21) 1 | (38) 1 | (61) 1801 |
| (4) 841 | (22) 122 | (39) 20 | (62) — .75, — $\frac{3}{4}$ |
| (5) $\frac{1}{60}$ | (23) 45 | *(40) 117 — 129 | (63) 1 |
| (6) 21 | (24) — 2 | (41) — 14 | (64) — 20 |
| (7) 57 | (25) 10 | (42) 9672 | (65) 609 |
| (8) 2 | (26) 5 | (43) $\frac{19}{495}$ | (66) 61 |
| (9) \$ 2.73 | (27) 2197 | (44) — .6, — $\frac{3}{5}$ | (67) 242 |
| *(10) 3325 — 3675 | (28) 1600 | (45) 5000 | (68) — 2 |
| (11) 15 | (29) 6.6 | (46) 9 | (69) 3136 |
| (12) 4224 | *(30) 5791 — 6399 | (47) $\frac{20}{7}, 2\frac{6}{7}$ | *(70) 13127 — 14508 |
| (13) 11 | (31) 9898 | (48) 240 | (71) — 47 |
| (14) 69 | (32) 5778 | (49) — 4 | (72) 4 |
| (15) $\frac{4}{9}$ | (33) 98765 | *(50) 61 — 67 | (73) 1 |
| (16) $33\frac{1}{3}$ | (34) 8 | (51) 17 | (74) $\frac{7}{9}$ |
| (17) 29 | (35) 50 | (52) 1 | (75) 26 |
| (18) 1728 | | (53) 33.75, $\frac{135}{4}, 33\frac{3}{4}$ | (76) 18 |
| | | (54) 3076 | (77) 8 |
| | | (55) 7 | (78) $\frac{1}{9}$ |
| | | (56) — 1.5, — $\frac{3}{2}, -1\frac{1}{2}$ | (79) 110 |
| | | (57) 7 | *(80) 70 — 76 |
| | | (58) $\frac{5}{3}, 1\frac{2}{3}$ | |

**The University Interscholastic League
Number Sense Test • HS State • 2009**

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!

- | | |
|---|--|
| <p>(1) $579 - 57 + 9 =$ _____</p> <p>(2) $4.1 \times 1.4 =$ _____ (decimal)</p> <p>(3) $\frac{5}{8} \div \frac{15}{16} =$ _____</p> <p>(4) $1\frac{3}{8}\% =$ _____ (decimal)</p> <p>(5) $5 - 10 \times 15 \div 20 + 25 =$ _____</p> <p>(6) $\frac{11}{40} =$ _____ % (decimal)</p> <p>(7) $125 \times 77 =$ _____</p> <p>(8) $2134711 \div 8$ has a remainder of _____</p> <p>(9) 11% of 75 minus 11% of 50 is _____</p> <p>*(10) $96 \times 85 - 74 =$ _____</p> <p>(11) $13 \times 321 =$ _____</p> <p>(12) Which is larger $\frac{7}{9}$ or .76? _____</p> <p>(13) $\frac{1}{3}$ square yard = _____ square inches</p> <p>(14) $\text{LCM}(25, 45) \times \text{GCD}(25, 45) =$ _____</p> <p>(15) If 16 ♦'s cost \$25.60 then 12 ♦'s cost \$ _____</p> <p>(16) How many positive integers divide 42? _____</p> <p>(17) $(-1) - -2 - (-3) - 4 =$ _____</p> | <p>(18) $\text{DCCXXIX} \div \text{LXXXI} =$ _____ (Arabic Numeral)</p> <p>(19) $6 + 11 + 16 + 21 + \dots + 61 + 66 =$ _____</p> <p>*(20) $\sqrt{11223344} \div 11 =$ _____</p> <p>(21) $24_8 =$ _____ 2</p> <p>(22) $14^3 =$ _____</p> <p>(23) $5.444\dots - 6.555\dots =$ _____</p> <p>(24) $63^2 + 24^2 =$ _____</p> <p>(25) If $\frac{3}{4} - \frac{3}{x} = \frac{3}{16}$, then $x =$ _____</p> <p>(26) $(2)^{-2} \div (2)^{-1} \times 2^0 + 2 =$ _____</p> <p>(27) How many 1-element or 8-element subsets does the set { u, n, i, v, e, r, s, a, l } have? _____</p> <p>(28) If $f(x) = 4x^2 - 20x + 25$, then $f(11) =$ _____</p> <p>(29) The 6th triangular number is _____</p> <p>*(30) 1 gal + 2 qts + 3 pts + 4 fl.oz. = _____ fl.oz.</p> <p>(31) $12_3 + 22_3 + 21_3 =$ _____ 3</p> <p>(32) $7^6 \div 5$ has a remainder of _____</p> <p>(33) The ratio of the perimeter to its area of a rectangle with length 6 and width 5 is _____</p> |
|---|--|

- (34) If $P = 3$, $Q = 1$, and $R = -1$, then
 $PQ - QR + PR =$ _____
- (35) If $h > 1$ and $h^{-3} \times h^4 \div h^5 = h^k$, then $k =$ _____
- (36) $32 \times 6! + 5! \times 48 =$ _____
- (37) The product of the roots of
 $10x^3 + 21x^2 + x - 6 = 0$ is _____
- (38) $(\frac{8}{125})^{\frac{2}{3}} =$ _____
- (39) If $\sqrt{80} + \sqrt{45} = \sqrt{x}$, then $x =$ _____
- *(40) $\sqrt[3]{1730} \times \sqrt{167} \times 11 =$ _____
- (41) $\frac{12}{25} - \frac{37}{76} =$ _____
- (42) The slope of the line $2x - 3y = 4$ is _____
- (43) $5^8 \times 2^5 =$ _____
- (44) The point $(-4, 2)$ is reflected across the line
 $y = -x$ to the point (h, k) . Find k . _____
- (45) If $xy = 3$ and $x - y = -3$ then $x^3 - y^3 =$ _____
- (46) $51 \div 1.0625 =$ _____
- (47) 26% of $333\frac{1}{3}$ is _____ (mixed number)
- (48) $305 \times 305 =$ _____
- (49) The smaller leg of a 30-60-90° triangle is
 $2\sqrt{3}$ cm. The length of the larger leg that is
not the hypotenuse is _____ cm
- *(50) $428.571 \times 282 =$ _____
- (51) ${}^7C_4 - {}^7C_3 =$ _____
- (52) The odds of winning game X is $\frac{3}{5}$. The
probability of losing the game is _____ %
- (53) $2.25 + 3.5 + 4.75 + \dots + 9.75 =$ _____
- (54) $4321_8 - 567_8 =$ _____ $_8$
- (55) $666 \times \frac{18}{37} =$ _____
- (56) The area of the circle $(x - 4)^2 + (y + 2)^2 = 14$
is $k\pi$. Find k . _____
- (57) If $(4 + 3i)(2 - i) = a + bi$, the $a + b =$ _____
- (58) If $\log_4 x = -3$ then $x =$ _____
- (59) The smaller root of $6x^2 + 15x + 9 = 0$ is _____
- *(60) $6765 \times 898 \div 66 =$ _____
- (61) $\sin^2(\frac{7\pi}{24}) + \sin^2(\frac{5\pi}{24}) =$ _____
- (62) $\begin{vmatrix} -1 & 3 \\ 2 & 4 \end{vmatrix} \times \begin{vmatrix} 4 & 3 \\ -2 & 1 \end{vmatrix} = \begin{vmatrix} a & c \\ b & d \end{vmatrix}$. Find b . _____
- (63) 105 miles per hour = _____ feet per second
- (64) The line of symmetry of the parabola
 $y = 6x^2 + 5x - 6$ is $x =$ _____
- (65) $2 + 5 + 7 + 12 + 19 + \dots + 81 + 131 =$ _____
- (66) The Greatest Integer Function is written as
 $f(x) = [x]$. Find $[\frac{\sqrt{3}-5}{2}]$. _____
- (67) $\sum_{k=1}^4 (k)^k =$ _____
- (68) The 11th term of 12, 17, 22, 27, ... is _____
- (69) $52^2 =$ _____
- *(70) $31.4 \times 27.18 \times \frac{10 + 10\sqrt{5}}{2} =$ _____
- (71) $61^3 - 60^3 =$ _____
- (72) If $f(x) = \frac{4x-7}{2x+3}$, then $f'(-2) =$ _____
- (73) $2424 \times 1001 =$ _____
- (74) If $f(x) = x^3 + 2x^2 - x + 2$, then $f''(2) =$ _____
- (75) The polar coordinate of the rectangular
coordinate $(5, \sqrt{11})$ is (r, θ) . Find $r > 0$. _____
- (76) $\int_1^3 (2x + 1) dx =$ _____
- (77) $60^2 - 57^2 + 54^2 - 51^2 =$ _____
- (78) $\frac{1}{21} + \frac{1}{28} + \frac{1}{36} + \frac{1}{45} =$ _____
- (79) $11.1 \times 11.1 =$ _____ (mixed number)
- *(80) $8\frac{1}{3}\%$ of $(251 \times 11.1) =$ _____

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*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) 531 | (18) 9 | (34) 1 | (57) 13 |
| (2) 5.74 | (19) 468 | (35) -4 | (58) $.015625, \frac{1}{64}$ |
| (3) $\frac{2}{3}$ | *(20) 290 — 319 | (36) 28800 | (59) $-1.5, -\frac{3}{2}, -1\frac{1}{2}$ |
| (4) .01375 | (21) 10100 | (37) $.6, \frac{3}{5}$ | *(60) 87443 — 96647 |
| (5) 22.5, $\frac{45}{2}, 22\frac{1}{2}$ | (22) 2744 | (38) $.16, \frac{4}{25}$ | (61) 1 |
| (6) 27.5 | (23) $-\frac{10}{9}, -1\frac{1}{9}$ | (39) 245 | (62) 0 |
| (7) 9625 | (24) 4545 | *(40) 1622 — 1791 | (63) 154 |
| (8) 7 | (25) $\frac{16}{3}, 5\frac{1}{3}$ | (41) $-\frac{13}{1900}$ | (64) $-\frac{5}{12}$ |
| (9) 2.75, $\frac{11}{4}, 2\frac{3}{4}$ | (26) 2.5, $\frac{5}{2}, 2\frac{1}{2}$ | (42) $\frac{2}{3}$ | (65) 338 |
| *(10) 7682 — 8490 | (27) 18 | (43) 12500000 | (66) -2 |
| (11) 4173 | (28) 289 | (44) 4 | (67) 288 |
| (12) $\frac{7}{9}$ | (29) 21 | (45) -54 | (68) 62 |
| (13) 432 | *(30) 232 — 256 | (46) 48 | (69) 2704 |
| (14) 1125 | (31) 202 | (47) $86\frac{2}{3}$ | *(70) 13119 — 14499 |
| (15) \$19.20 | (32) 4 | (48) 93025 | (71) 10981 |
| (16) 8 | (33) $\frac{11}{15}$ | (49) 6 | (72) 26 |
| (17) -4 | | *(50) 114815 — 126899 | (73) 2426424 |
| | | (51) 0 | (74) 16 |
| | | (52) 62.5, $\frac{125}{2}, 62\frac{1}{2}$ | (75) 6 |
| | | (53) 42 | (76) 10 |
| | | (54) 3532 | (77) 666 |
| | | (55) 324 | (78) $\frac{2}{15}$ |
| | | (56) 14 | (79) $123\frac{21}{100}$ |
| | | | *(80) 221 — 243 |