The University Interscholastic League
Number Sense Test • HS A • 2024

Final _____ _____

Contestant's Number _____ 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!

(1) $4261 - 1624 =$ _____

(2) $\frac{5}{8} + \frac{3}{5} =$ _____

(3) $1.62 \div 4 =$ _____ **(decimal)**

(4) $1624 \div 9 =$ _____ **(mixed number)**

(5) $1.0625 =$ _____ **(improper fraction)**

(6) $24^2 =$ _____

(7) $75 \times 56 =$ _____

(8) The GCD of 12, 24, and 64 is _____

(9) 2024 ÷ 6 has a remainder of _____

***(10)** $(1624 + 2324) \times 30 =$ _____

(11) $326.00 at 5% simple interest for 6 months will have a balance of $ _____

(12) CVI + MMXXIV = _____ **(Arabic Numeral)**

(13) $10 \div 6 - 20 \times 2 + 4 =$ _____

(14) $23 \times \frac{23}{25} =$ _____ **(mixed number)**

(15) The average of 10, 6, 20, and 24 is _____

(16) The average of 20, 12, 40, and 48 is _____

(17) The average of 2.5, 1.5, 5, and 6 is _____

(18) $34^2 - 31^2 = 6 \times$ _____

(19) The number of positive integral factors of 24 is ___

***(20)** $106203 \div 24 =$ _____

(21) $52 \times 58 =$ _____

(22) 0.2141414... = _____ **(fraction)**

(23) Write one million sixty-two thousand twenty-four in digits. _____

(24) $[10 + 6 \times 20 + 24] \div 7$ has a remainder of _____

(25) $9\frac{1}{4} \times 9\frac{3}{4} =$ _____ **(mixed number)**

(26) 15 pens at 34¢ a pen is $ _____

(27) 15 pens at 37¢ a pen is $ _____

(28) 15 pens at 35.2¢ a pen is $ _____

(29) 2024 base 6 is written as _____ base 10

***(30)** $\sqrt{162324} =$ _____

(31) $2394 \times 6 + 36 =$ _____

(32) $102B = [2(12 + B)]^2$. Find B, $B > 0$. _____

(33) If $f(x) = 4x^2 - 20x + 25$, then $f(-9.5) =$ _____

(34) Given: 1, 7, 21, m, 35, 21, n, 1. Find m + n. _____

(35) The sum of three consecutive integers is 633. The smallest integer is _____

(36) $7\frac{5}{11} \times 11\frac{5}{7}$ = _____

(37) How many integers between 8 and 82 are divisible by 8? _____

(38) $\{p, r, i, m, e\} \cap \left[\{e, v, i, l\} \cap \{p, r, i, m, e, v, a, l\}\right]$ contains how many elements? _____

(39) Let $\frac{x+7}{x-3} + \frac{x-3}{x+7} = 2\frac{B}{C}$. Find B. _____

***(40)** $\sqrt[3]{60130224}$ = _____

(41) $1 \div 2\frac{1}{2}$ = _____ (decimal)

(42) $(502)^2$ = _____

(43) $\frac{1}{3} + \frac{1}{6} + \frac{1}{10} + \frac{1}{15} + \ldots + \frac{1}{36}$ = _____

(44) 13×153 = _____

(45) $33^2 + 74^2$ = _____

(46) The sum of the measures of the interior angles of a regular octagon is _____ degrees

(47) Two dice are rolled one at a time. Find the odds that the first number is even and the second is odd? _____

(48) 17 is what percent less than 20? _____ %

(49) $(7^3 - 5^3) \div (7 - 5)$ = _____

***(50)** $106203 \div 42$ = _____

(51) The 11^{th} term of 1, 3, 6, 11, 18, 29, ... is 130. The 10^{th} term is _____

(52) If $(1 + 6i)(2 - 3i) = a + bi$, then a — b = _____

(53) $(6^5 + 4^5 + 1) \div 10$ has a remainder of _____

(54) $(1.2 + 3.4 + 4.6 + 8 + 12.6 + 20.6 + 33.2 + 53.8) + (87 + 140.8 + 227.8)$ = _____

(55) If $\left(\sqrt[3]{a^2}\right)\left(\sqrt[6]{a^{10}}\right) = \left(\sqrt[n]{a^k}\right)$, where n and k are relatively prime, then n + k = _____

(56) $2024_8 - 106_8 - 203_8$ = _____ 8

(57) Let $6\frac{2}{m} \times n\frac{3}{8} = 28$, where m, n are natural numbers. Find mn. _____

(58) The coefficient of the x^3y^3 term of $(x + 2y)^6$ is ___

(59) $10624_9 \div 3_9$ has a remainder of _____

***(60)** $8^3 \div 4^6 \times 2^{10}$ = _____

(61) $\sin\left(\frac{\pi}{3}\right)\cos\left(\frac{\pi}{6}\right)$ = _____

(62) If $\sqrt{1 + 6\sqrt{2\sqrt{4 + x}}} = 5$, then x = _____

(63) The third hexagonal number is _____

(64) $\begin{bmatrix} 1 & 6 \\ 2 & 4 \end{bmatrix} \times \begin{bmatrix} 2 & 3 \\ 2 & 4 \end{bmatrix} = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$. Find b — c. _____

(65) $f(x) = x^2 - x$, $g(x) = 2x + 1$, and $f(g(3))$ = _____

(66) 16 feet = _____ fathoms

(67) Let $x - 6y = 24$ and $2x + 6y = 24$. Find 3x. _____

(68) 0.45 base 6 = _____ base 10 (fraction)

(69) $24^{10} \div 19$ has a remainder of _____

***(70)** $(16 + 4 + 1 + \frac{1}{4} + \ldots)^3$ = _____

(71) Find x, $6 \leq x \leq 10$, if $2x + 3 \cong 4 \pmod 5$. _____

(72) The smallest posssible value of $g(x) = x^2 - 2x - 4$ is _____

(73) $f(x) = \frac{3x-4}{2x+5}$ and $f^{-1}(-1)$ = _____

(74) Given: $f(x) = x^2 + 2x + 5$ has a minimum point at (a, b). Find a + b. _____

(75) $x^2 + y^2 = 6x$ has area of $k\pi$ sq. units and k = ____

(76) The y-intercept of the line tangent to the curve $y = x^2 + 3x - 1$ at x = 1 is y = _____

(77) $\int_0^2 (3 - x)\,dx$ = _____

(78) Given: 2, 6, 15, 28, k, 78, 119,... . Find k. _____

(79) 1624×15 = _____

***(80)** 107×428.571 = _____

University Interscholastic League - Number Sense Answer Key HS ● Invitation A ● 2024

***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) 2,637

(2) 1.225, $\frac{49}{40}$, $1\frac{9}{40}$

(3) .405

(4) $180\frac{4}{9}$

(5) $\frac{17}{16}$

(6) 576

(7) 4,200

(8) 4

(9) 2

***(10) 112,518 — 124,362**

(11) 334.15

(12) 2,130

(13) $-\frac{103}{3}$, $-34\frac{1}{3}$

(14) $21\frac{4}{25}$

(15) 15

(16) 30

(17) 3.75, $\frac{15}{4}$, $3\frac{3}{4}$

(18) 32.5, $\frac{65}{2}$, $32\frac{1}{2}$

(19) 8

***(20) 4,204 — 4,646**

(21) 3,016

(22) $\frac{106}{495}$

(23) 1,062,024

(24) 0

(25) $90\frac{3}{16}$

(26) 5.10

(27) 5.55

(28) 5.28

(29) 448

***(30) 383 — 423**

(31) 14,400

(32) 4

(33) 576

(34) 42

(35) 210

(36) $\frac{6724}{77}$, $87\frac{25}{77}$

(37) 9

(38) 2

(39) 100

***(40) 373 — 411**

(41) .4

(42) 252,004

(43) $\frac{7}{9}$

(44) 1,989

(45) 6,565

(46) 1,080

(47) $\frac{1}{3}$

(48) 15

(49) 109

***(50) 2,403 — 2,655**

(51) 101

(52) 11

(53) 1

(54) 593

(55) 10

(56) 1513

(57) 20

(58) 160

(59) 1

***(60) 122 — 134**

(61) .75, $\frac{3}{4}$

(62) 60

(63) 15

(64) 15

(65) 42

(66) $\frac{8}{3}$, $2\frac{2}{3}$

(67) 48

(68) $\frac{29}{36}$

(69) 5

***(70) 9,224 — 10,194**

(71) 8

(72) — 5

(73) — .2, $-\frac{1}{5}$

(74) 3

(75) 9

(76) — 2

(77) 4

(78) 55

(79) 24,360

***(80) 43,565 — 48,149**

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Number Sense Test • HS B • 2024

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(1) $210 - 309 + 2024 =$ _____

(2) $2024 \div 4 =$ _____

(3) $(5.6)(5 + 6) =$ _____ **(decimal)**

(4) $3.09 + 2\frac{1}{10} =$ _____

(5) $32 \times 35 =$ _____

(6) $13^3 =$ _____

(7) **The LCM of 28 and 64 is** _____

(8) $\frac{3}{8} =$ _____ **% (decimal)**

(9) **10620324 ÷ 11 has a remainder of** _____

***(10)** **2 hours 15 minutes =** _____ **seconds**

(11) **MMCCCXXIV — DL =** _____ **(Arabic Numeral)**

(12) $31 \times \frac{31}{34} =$ _____ **(mixed number)**

(13) **$22.50 plus 8% tax is $** _____

(14) $2 \div (10 - 30) \times 9 + (20 - 24) =$ _____

(15) $53 \times 53 =$ _____

(16) $52 \times 52 =$ _____

(17) $(53 \times 53) - (52 \times 52) =$ _____

(18) $54^2 - 48^2 = 51 \times$ _____

(19) **The number of integers between 1 and 15 which are relatively prime to 15 is** _____

***(20)** $1623 + 2024 \times 28 =$ _____

(21) **Round** $\sqrt{2}$ **to the nearest hundredths place.** _____

(22) **If** $\frac{19}{33} =$ **ababab... , then** $a + b =$ _____

(23) **Twenty-one thousand twenty-four plus thirty thousand nine hundred twenty-four is** _____

(24) $[2 + 10 \times 30 - k] \div 7$ **has remainder 6, where** $0 < k < 9$. $k =$ _____

(25) **210 base 8 is written as** _____ **base 10**

(26) $104 \times 107 =$ _____

(27) **Let P = {p, r, i, m, e, s}. How many three member subsets of P are there?** _____

(28) **Find x if** $\frac{1}{x} + \frac{1}{5} = \frac{1}{2}$. _____

(29) **How many integers between 17 and 85 are divisible by 9?** _____

***(30)** $\sqrt{309210} =$ _____

(31) $3092 \times 8 + 64 =$ _____

(32) $5B6 = [3(15 - B)]^2$. **Find B, B > 0.** _____

(33) **If** $f(x) = x^3 + 6x^2 + 12x + 8$, **then** $f(8) =$ _____

(34) Given: 1, 1, 3, 5, 6, 12, p, q, 15, ... Find pq. _____

(35) Three numbers are in the ratio of 2:3:4. If their sum is 63, then the smaller number is _____

(36) 7 is what per cent of 28? _____ %

(37) 7.84 is what per cent of 28? _____ %

(38) 53% of 28 is _____

(39) Let $\frac{x+7}{x-3} + \frac{x-3}{x+7} = 2\frac{B}{C}$. Find B. _____

*(40) $\sqrt[3]{210309} \times \sqrt{309210}$ = _____

(41) $(405)^2$ = _____

(42) The positive geometric mean of 4 and 9 is _____

(43) The coefficient of the x^2y^3 term of $(2x - y)^5$ is ____

(44) Find the sum of the reciprocals of the first seven triangular numbers. _____

(45) $7^4 - 1$ = _____ 7

(46) $210_4 + 23_4$ = _____ 2

(47) If $\sqrt{9\sqrt{8\sqrt{x+7}}} = 6$, then x = _____

(48) The product of the roots of $2x^2 + 3x = 5$ is _____

(49) $(10^3 - 4^3) \div (6)$ = _____

*(50) 17^3 = _____

(51) Let x — y = 9 and 2x + y = 30. Find y. _____

(52) $2311_4 \div 11_4$ has a remainder of _____

(53) If f(x) = 2x — $\log_4(x)$, then f(16) = _____

(54) 16 + 4 + 1 + 0.25 + ... = _____

(55) $(5^7 + 6^7 + 8) \div 11$ has a remainder of _____

(56) Three pennies are tossed in the air. The probability all three pennies land showing tails is _____ %

(57) The 11^{th} term of 1, 3, 6, 11, 18, 29, ... is 130. The 10^{th} term is _____

(58) If the sides of an equilateral triangle are $2\sqrt{3}$ inches long, then its altitude length is _____ "

(59) Let $11\frac{3}{m} \times n\frac{4}{5} = 32$, where m, n are natural numbers. Find mn. _____

*(60) $27^3 \div 9^6 \times 3^{10}$ = _____

(61) $32^{11} \div 23$ has a remainder of _____

(62) $\sqrt{41_6}$ = _____ 6

(63) 2 rods = _____ feet

(64) $\sec^2(60°) - \tan^2(60°)$ = _____

(65) 12° = kπ radians. k = _____

(66) The fifth pentagonal number is _____

(67) If $\left(\sqrt[n]{a^4}\right)\left(\sqrt[5]{a^6}\right) = \left(\sqrt[15]{a^k}\right)$, where n and k are relatively prime, then k = _____

(68) Let B = $\begin{bmatrix} 1 & 3 \\ 6 & 10 \end{bmatrix}$. Find $|B|$. _____

(69) Find g(f(— $\frac{1}{2}$)) when f(x) = 2x — 3 and g(x) = 3x — 1. _____

*(70) $(75 \times 75) \div (25 \times 25 \times 25) \times (75 \times 25)$ = _____

(71) If f(x) = $\frac{5}{8} - \frac{2x}{5}$ and $f^{-1}(x) = ax + b$, then b = ___

(72) Let g(x) = $2x^2 - \frac{x}{2} - 2$. Find g′(— 2). _____

(73) Find x, $11 \leq x \leq 19$, if $3x + 6 \cong 8 \pmod{10}$. ____

(74) $h(x) = -x^3 - 3x^2 + 2$ has a local minimum at (a, b). a + b = _____

(75) Let (x, y) be the focus of $y - 2 = 3(x - 5)^2$. y = ___

(76) $\int_{\frac{\pi}{4}}^{\frac{3\pi}{4}} \left(2\sin(x)\cos(x)\right) dx$ = _____

(77) The line tangent to f(x) = $\frac{x^2}{2} + 3x - 1$ at point (— 6, — 1) has y-intercept at y = _____

(78) Given: 4, 9, 25, 49, k, 169, 289,... . Find k. _____

(79) 309 × 16 = _____

*(80) $797 \div (87.5\% \times \frac{7}{10})$ = _____

University Interscholastic League - Number Sense Answer Key HS ● Invitation B ● 2024

***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) 1,925

(2) 506

(3) 61.6

(4) 5.19, $\frac{519}{100}$, $5\frac{19}{100}$

(5) 1,120

(6) 2,197

(7) 448

(8) 37.5

(9) 0

***(10) 7,695 — 8,505**

(11) 1,774

(12) $28\frac{9}{34}$

(13) 24.30

(14) $-4.9, -\frac{49}{10}, -4\frac{9}{10}$

(15) 2,809

(16) 2,704

(17) 105

(18) 12

(19) 7

***(20) 55,381 — 61,209**

(21) 1.41

(22) 12

(23) 51,948

(24) 2

(25) 136

(26) 11,128

(27) 20

(28) $\frac{10}{3}$, $3\frac{1}{3}$

(29) 8

***(30) 529 — 583**

(31) 24,800

(32) 7

(33) 1,000

(34) 220

(35) 14

(36) 25

(37) 28

(38) 14.84, $\frac{371}{25}$, $14\frac{21}{25}$

(39) 100

***(40) 31,415 — 34,721**

(41) 164,025

(42) 6

(43) — 40

(44) 1.75, $\frac{7}{4}$, $1\frac{3}{4}$

(45) 6666

(46) 101111

(47) — 3

(48) $-2.5, -\frac{5}{2}, -2\frac{1}{2}$

(49) 156

***(50) 4,668 — 5,158**

(51) 4

(52) 1

(53) 30

(54) $\frac{64}{3}$, $21\frac{1}{3}$

(55) 8

(56) 12.5, $\frac{25}{2}$, $12\frac{1}{2}$

(57) 101

(58) 3

(59) 14

***(60) 2,078 — 2,296**

(61) 1

(62) 5

(63) 33

(64) 1

(65) $\frac{1}{15}$

(66) 35

(67) 38

(68) — 8

(69) — 13

***(70) 642 — 708**

(71) 1.5625, $\frac{25}{16}$, $1\frac{9}{16}$

(72) $-8.5, -\frac{17}{2}, -8\frac{1}{2}$

(73) 14

(74) — 4

(75) $\frac{25}{12}$, $2\frac{1}{12}$

(76) 0

(77) — 19

(78) 121

(79) 4,944

***(80) 1,237 — 1,366**

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Number Sense Test ● HS District ● 2024

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(1) $322 + 327 + 2024 =$ _____

(2) $3\frac{2}{7} - 2\frac{2}{3} =$ _____

(3) $(5.6)(7 + 8) =$ _____

(4) $\frac{5}{8} \div \frac{4}{5} =$ _____

(5) $31^2 =$ _____

(6) $3.58333... =$ _____ (improper fraction)

(7) The LCM of 98 and 56 is _____

(8) $\frac{4}{5} =$ _____%

(9) 322327 ÷ 9 has a remainder of _____

***(10)** $(2024 - 327) \times 22 =$ _____

(11) If CDs cost $4.75 each or a 3-pack for $12.95, then how much is saved by buying a 3-pack? $ _____

(12) $\sqrt[3]{2744} =$ _____

(13) 8% tax on $322.00 is $ _____

(14) $3 \div (2 - 7) \times 2 + 2 - 3 =$ _____

(15) 12.5% of 96 is _____

(16) $\frac{5}{8}$ of 96 is _____

(17) 0.75 times 96 is _____

(18) There are _____ positive integral factors of 36

(19) $33\frac{1}{3}\%$ of 20% of 15 is _____

***(20)** $300\left(\sqrt{2} + \sqrt{7}\right) =$ _____

(21) Find digit $B > 0$, such that $B32 - 32B = 405$. ____

(22) If $\frac{29}{33} = .ababab...$, then $a + b =$ _____

(23) Write thirty-two and two-fifths million two thousand twenty-four in digits. _____

(24) $[3 + 22 \times 3 - 27] \div 4$ has a remainder of _____

(25) $8\frac{3}{7} \times 8\frac{4}{7} =$ _____ (mixed number)

(26) $[\{t,r,i\} \cup \{q,u,a,d\}] \cap [\{b,i\} \cup \{p,e,n,t\}]$ contains how many distinct elements? _____

(27) 322 base 7 is written as _____ base 10

(28) If $\frac{1}{7} + \frac{1}{x} = \frac{1}{3}$, then x = _____

(29) $0.727272... =$ _____ (fraction)

***(30)** $\sqrt{3222724} =$ _____

(31) $5993 \times 7 + 49 =$ _____

(32) If $f(x) = 4x^2 + 20x + 25$, then $f(15) =$ _____

(33) The multiplicative inverse of 0.24 is _____

(34) Given: 2, 0, 3, 2, 5, 4, 7, p, q, 8, 13, ... Find pq. ____

(35) 202 base 10 is written as _____ base 4

(36) The cost of 15 pints at 32¢ each is $ _____

(37) The cost of 17 pints at 32¢ each is $ _____

(38) The cost of 8.5 pints at 32¢ each is $ _____

(39) Let $\frac{x+11}{x-8} + \frac{x-8}{x+11} = 2\frac{B}{C}$. Find B. _____

***(40)** $\sqrt[3]{322272024}$ = _____

(41) $(309)^2$ = _____

(42) The positive geometric mean of 4 and 16 is _____

(43) The simple interest on $322.00 at 7% for two years is $ _____

(44) The arithmetic mean of 22, 27, and 24 is _____

(45) $54^2 + 66^2$ = _____

(46) $(2^5 + 7^5 - 2) \div 9$ has a remainder of _____

(47) $(4x - 3y)^2 = ax^2 + bxy + cy^2$ and a + b — c = ___

(48) The product of the roots of $3x^2 - 4x = 7$ is _____

(49) $327_8 + 322_8 - 24_8$ = _____ 8

***(50)** 3272024 ÷ 322 = _____

(51) The 11^{th} term of 1, 1, 2, 3, 5, 8, ... is 89. The 12^{th} term is _____

(52) $(11^3 - 13^3) \div (11 - 13)$ = _____

(53) $\frac{1}{28} + \frac{1}{70} + \frac{1}{130}$ = _____

(54) $25 + 10 + 4 + 1.6 + \ ...$ = _____

(55) If $\sqrt{12 + \sqrt{8 + \sqrt{x - 8}}} = 4$, then x = _____

(56) Two dice are rolled. Find the odds that the sum of the numbers is less than 4. _____

(57) Let $3\frac{2}{m} \times n\frac{2}{23} = 20$, where m, n are natural numbers. Find n — m. _____

(58) $2024_6 \div 3_6$ has a remainder of _____

(59) Let $4^5 \times 8^3 \div 128 = 2^k$. Find k. _____

***(60)** $125^2 \div 25^3 \times 5^5$ = _____

(61) $\sin\left(\frac{17\pi}{6}\right)$ = _____

(62) If $\left(\sqrt[3]{a^{22}}\right)\left(\sqrt[3]{a^{27}}\right) = \left(\sqrt[n]{a^k}\right)$, where n and k are relatively prime, then k = _____

(63) The fifth hexagonal number is _____

(64) $f(x) = \frac{x+1}{2-3x} - 4$ and $f^{-1}(5)$ = _____

(65) If x = 7 and y = — 6, then $(x + y)(x^2 - xy + y^2)$ = _____

(66) The 2^{nd} pentagonal number minus the 4^{th} pentagonal number is _____

(67) If $h(x) = x^2 - 3$ and g(x) = x — 1, then h(g(0)) = _____

(68) Change $\frac{12}{25}$ to a base 5 decimal. _____ 5

(69) $24^9 \div 17$ has a remainder of _____

***(70)** A Jedi rocket traveling at a rate of 5280 miles per hour is traveling _____ feet per second

(71) Find k, $0 \leq x \leq 22$, if $11^4 + 2^6 \cong k \pmod{22}$. ___

(72) Let $h(x) = 3x^2 + 2x + 1$. Find $h'(-4)$. _____

(73) $2\frac{2}{3}$ fathoms = _____ inches

(74) Let (a, b) be an inflection point for $h(x) = 2x^3 - 3x + 5$. Find a + b. _____

(75) $x^2 + y^2 = 4y$ has area of $k\pi$ sq. units and k = ____

(76) $\int_{-1}^{2} (x - 3)\,dx$ = _____

(77) The domain of $f(x) = \frac{\sqrt{3x-5}}{\sqrt{7-2x}}$ is $w \leq x < y$ and $x \in$ Reals. Find w + y. _____

(78) Given: 8, 12, 20, 28, k, 52, 68, ... Find k. _____

(79) 322 × 327 = _____

***(80)** 322 × 571.428 = _____

DO NOT DISTRIBUTE TO STUDENTS BEFORE OR DURING THE CONTEST

University Interscholastic League - Number Sense Answer Key HS ● District ● 2024

***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) 2,673

(2) $\frac{13}{21}$

(3) 84

(4) .78125, $\frac{25}{32}$

(5) 961

(6) $\frac{43}{12}$

(7) 392

(8) 80

(9) 1

***(10) 35,468 — 39,200**

(11) 1.30

(12) 14

(13) 25.76

(14) $-2.2, -\frac{11}{5}, -2\frac{1}{5}$

(15) 12

(16) 60

(17) 72

(18) 9

(19) 1

***(20) 1,158 — 1,278**

(21) 7

(22) 15

(23) 32,402,024

(24) 2

(25) $72\frac{12}{49}$

(26) 2

(27) 163

(28) 5.25, $\frac{21}{4}$, $5\frac{1}{4}$

(29) $\frac{8}{11}$

***(30) 1,706 — 1,884**

(31) 42,000

(32) 1,225

(33) $\frac{25}{6}$, $4\frac{1}{6}$

(34) 66

(35) 3022

(36) 4.80

(37) 5.44

(38) 2.72

(39) 361

***(40) 652 — 719**

(41) 95,481

(42) 8

(43) 45.08

(44) $\frac{73}{3}$, $24\frac{1}{3}$

(45) 7,272

(46) 7

(47) — 17

(48) $-\frac{7}{3}, -2\frac{1}{3}$

(49) 625

***(50) 9,654 — 10,669**

(51) 144

(52) 433

(53) $\frac{3}{52}$

(54) $\frac{125}{3}$, $41\frac{2}{3}$

(55) 72

(56) $\frac{1}{11}$

(57) — 1

(58) 1

(59) 12

***(60) 2,969 — 3,281**

(61) .5, $\frac{1}{2}$

(62) 49

(63) 45

(64) $\frac{17}{28}$

(65) 127

(66) — 17

(67) — 2

(68) .22

(69) 10

***(70) 7,357 — 8,131**

(71) 9

(72) — 22

(73) 192

(74) 5

(75) 4

(76) $-7.5, -\frac{15}{2}, -7\frac{1}{2}$

(77) $\frac{31}{6}$, $5\frac{1}{6}$

(78) 44

(79) 105,294

***(80) 174,800 — 193,199**

The University Interscholastic League
Number Sense Test • HS Regional • 2024

Final _____ _____

Contestant's Number _____ 2nd _____ _____

1st _____ _____

Score **Initials**

Read directions carefully before beginning test

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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!

(1) $330 - 2024 =$ _____

(2) $2024 + 3 \times 2024 =$ _____

(3) $30.24 \div 3 =$ _____ **(decimal)**

(4) $27^2 =$ _____

(5) $\frac{5}{16} =$ _____**% (decimal)**

(6) $333 \times \frac{1}{37} =$ _____

(7) $33 \times 24 =$ _____

(8) **The GCD of 20, 24, and 30 is** _____

(9) **MMXXX — CCCXX=** _____ **(Arabic Numeral)**

***(10)** $2024 - 330 + 3320 - 324 =$ _____

(11) **The sum of the prime numbers greater than 70 and less than 80 is** _____

(12) **How many integers are between — 20 and 24?** ___

(13) $33 \times \frac{31}{34} =$ _____ **(mixed number)**

(14) $20 \div (2 - 4) \times 3 + 30 =$ _____

(15) $30 \div \frac{2}{5} =$ _____

(16) $30 \div 0.8 =$ _____

(17) $30 \div 1\frac{1}{5} =$ _____

(18) $33^2 - 29^2 = 31 \times$ _____

(19) $\frac{1}{64} - \frac{1}{16} - \frac{1}{4} =$ _____

***(20)** $33 \times \left(\sqrt{20} + \sqrt{24}\right) =$ _____

(21) $0.58333... \times 72 =$ _____

(22) 324×14 **is** _____

(23) **Round** $\sqrt{6}$ **to the nearest hundredths place.** _____

(24) **23% of 40 is** _____**% of 10**

(25) **The number of positive integral factors of 30 is** ___

(26) $15\frac{3}{4} \times 8\frac{2}{3} =$ _____ **(mixed number)**

(27) **Divide 24 into 4 parts such that the ratio of the 4 parts is 1:2:3:4. The largest part is** _____

(28) $2\frac{4}{5} \div 3\frac{7}{10} =$ _____

(29) **How many integers between 3 and 63 are divisible by 8?** _____

***(30)** $151222 \div 136 =$ _____

(31) $1776 \times 24 + 576 =$ _____

(32) **If** $x + y = 6$ **and** $x - y = 4$**, then** $x^2 + y^2 =$ _____

(33) **If** $f(x) = 4x^2 - 12x + 9$**, then** $f(15) =$ _____

(34) $41.5 - 7.75 =$ _____

(35) $41\frac{1}{2} - 7\frac{3}{4} - 9\frac{7}{8} =$ _____

(36) $41\frac{1}{2} + 7.75 - 9\frac{7}{8} =$ _____

(37) Given: 0.125, $\frac{1}{4}$, 0.375, $\frac{5}{8}$, 1, m, 2.625, n, 6.875, ... Find m + n. _____

(38) The smaller root of $(4x - 1)^2 = 9$ is _____

(39) $[\{a, l, g\} \cup \{g, e, o, m\} \cup \{t, r, i, g\}] \cap \{p, r, e, c, a, l\}$ contains how many distinct elements? _____

*(40) $\sqrt[3]{4202033} =$ _____

(41) 75% of 37.5% of 64 is _____

(42) $(3^5 + 5^5 - 7) \div 8$ has a remainder of _____

(43) $19200 = 144 + 1588 \times$ _____

(44) Which is larger, $-\frac{11}{12}$ or $-\frac{10}{11}$? _____

(45) $83^2 + 22^2 =$ _____

(46) The sum of the measures of the interior angles of a regular heptagon is _____ degrees

(47) Let $8\frac{3}{m} \times n\frac{34}{35} = 26$, where m, n are natural numbers. Find mn. _____

(48) $(3! \times 6!) \div (5! \times 4!) =$ _____

(49) $330_{11} - 42_{11} + A9_{11} =$ _____ 11

*(50) $33^3 =$ _____

(51) If $\frac{1}{3} + \frac{1}{6} + \frac{1}{10} + \frac{1}{15} + ... + \frac{1}{n} = \frac{11}{13}$, then n = _____

(52) $(708)^2 =$ _____

(53) $8\frac{1}{2}$ is what percent less than $12\frac{1}{2}$? _____ %

(54) $(3 + 7 + 10 + 17 + 27 + 44 + 71) + (115 + 186 + 301) =$ _____

(55) $33024_7 \div 4_7$ has a remainder of _____ 7

(56) The perimeter of a square is decreased from 22 cm to 18 cm. Find the corresponding decrease in its area. _____ cm^2

(57) $21 + 14 + 9\frac{1}{3} + 6\frac{2}{9} + ... =$ _____

(58) 150 fathoms = _____ inches

(59) The coefficient of the x^3y^2 term in the expansion of $(5x - 2y)^5$ is _____

*(60) A rectangular lot is $\frac{3}{8}$ of a mile by $\frac{7}{16}$ of a mile. The area of the lot is _____ square feet

(61) Write in figures: three hundred and four-fifths million three thousand thirty. _____

(62) Given: y varies inversely with x and y = 12 when x = 7. Find y when x = 11. _____

(63) $\begin{bmatrix} 1 & 3 \\ 6 & 10 \end{bmatrix} \times \begin{bmatrix} 0 & -2 \\ k & 5 \end{bmatrix} = \begin{bmatrix} 12 & 13 \\ 40 & 38 \end{bmatrix}$. k = _____

(64) $47^{15} \div 29$ has a remainder of _____

(65) The first 4 digits after the decimal point in the decimal representation of $\frac{13}{45}$ are _____

(66) A coin is tossed 3 times. What is the probability of getting 2 heads and 1 tail? _____%

(67) Let $(6 + 4i) \div 2i = a + bi$. Find b. _____

(68) $\text{Arcsin}\left(\cos\left(\frac{\pi}{6}\right)\right) =$ _____ degrees

(69) 0.77 base 8 = _____ base 10 (fraction)

*(70) $5^3 \div 4! \times 3^5 \div 2! =$ _____

(71) $f(x) = \frac{5x-7}{3} + 2$ and $f^{-1}(11) =$ _____

(72) Find $f(g(-\frac{2}{3}))$ when $f(x) = 3x + 5$ and $g(x) = 5x - 3$. _____

(73) Let $f(x) = \cos(2x)$. Find $f''(\frac{2\pi}{3})$. _____

(74) Given: $f(x) = -x^2 + 4x + 1$ has a maximum point at (a, b). Find a + b. _____

(75) Find the slope of the line tangent to $f(x) = x^3 + 2x$ at the origin. _____

(76) $\int_1^2 \int_2^3 xy \, dydx =$ _____

(77) Let (x, y) be the focus of $x = y^2 - 1$. x = _____

(78) $330 \div 0.6875 =$ _____

(79) Given: 1, 1, 3, 5, 6, 12, 10, 22, T, P, ... T − P = ___

*(80) $(\ln 100000)^3 =$ _____

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(1) — 1,694

(2) 8,096

(3) 10.08

(4) 729

(5) 31.25

(6) 9

(7) 792

(8) 2

(9) 1,710

***(10) 4,456 — 4,924**

(11) 223

(12) 43

(13) $30\frac{3}{34}$

(14) 0

(15) 75

(16) 37.5, $\frac{75}{2}$, $37\frac{1}{2}$

(17) 25

(18) 8

(19) — $\frac{19}{64}$

***(20) 294 — 324**

(21) 42

(22) 4,536

(23) 2.45

(24) 92

(25) 8

(26) $136\frac{1}{2}$

(27) 9.6, $\frac{48}{5}$, $9\frac{3}{5}$

(28) $\frac{28}{37}$

(29) 7

***(30) 1,057 — 1,167**

(31) 43,200

(32) 26

(33) 729

(34) 33.75, $\frac{135}{4}$, $33\frac{3}{4}$

(35) 23.875, $\frac{191}{8}$, $23\frac{7}{8}$

(36) 39.375, $\frac{315}{8}$, $39\frac{3}{8}$

(37) 5.875, $\frac{47}{8}$, $5\frac{7}{8}$

(38) — .5, — $\frac{1}{2}$

(39) 4

***(40) 154 — 169**

(41) 18

(42) 1

(43) 12

(44) — $\frac{10}{11}$

(45) 7,373

(46) 900

(47) 8

(48) 1.5, $\frac{3}{2}$, $1\frac{1}{2}$

(49) 397

***(50) 34,141 — 37,733**

(51) 78

(52) 501,264

(53) 32

(54) 781

(55) 2

(56) 10

(57) 63

(58) 10,800

(59) 5,000

***(60) 4,345,110 — 4,802,490**

(61) 300,803,030

(62) $\frac{84}{11}$, $7\frac{7}{11}$

(63) 4

(64) 11

(65) 2888

(66) 37.5, $\frac{75}{2}$, $37\frac{1}{2}$

(67) — 3

(68) 60

(69) $\frac{63}{64}$

***(70) 602 — 664**

(71) 6.8, $\frac{34}{5}$, $6\frac{4}{5}$

(72) — 14

(73) 2

(74) 7

(75) 2

(76) 3.75, $\frac{15}{4}$, $3\frac{3}{4}$

(77) — .75, — $\frac{3}{4}$

(78) 480

(79) — 20

***(80) 1,450 — 1,602**

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Number Sense Test • HS State • 2024

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(1) $5 \times 15 + 2024 =$ _____

(2) $24 \div \frac{2}{3} - 15.5 =$ _____

(3) $\frac{7}{9} \div \frac{2}{3} =$ _____

(4) $\frac{7}{8} =$ _____ **(decimal)**

(5) $5^3 - 15^2 + 24 =$ _____

(6) 0.8333... = _____ **(proper fraction)**

(7) $666 \times \frac{2}{37} =$ _____

(8) MMXXIV + XV × V = _____ **(Arabic Numeral)**

(9) Which is larger, $\frac{7}{12}$ or 0.58? _____

***(10)** $4202 \times 51 - 5 =$ _____

(11) If hankies cost $1.50 each or a dozen for $15.75, then how much is saved by buying a dozen? $ _____

(12) $24 \div (20 - 16) + 12 - 8 \times 4 =$ _____

(13) $155 \times 14 =$ _____

(14) $54 \times 54 =$ _____

(15) $\frac{1}{27} - \frac{1}{9} - \frac{1}{3} =$ _____

(16) $3 + 5 + 7 + 9 + ... + 19 + 21 =$ _____

(17) $25 \times 64 =$ _____

(18) $26.25 \times 64 =$ _____

(19) $102\frac{1}{2} \times 64 =$ _____

***(20)** $2024 \times \left(\sqrt{15} + \sqrt{5}\right) =$ _____

(21) $39 \times 31 =$ _____

(22) $4\frac{2}{3} \div 2\frac{4}{9} =$ _____

(23) 40 — 60% of 80 is _____

(24) 0.5151515... = _____ **(fraction)**

(25) If $f(x) = 16x^2 - 40x + 25$, then f(15) = _____

(26) $63 \times 24 =$ _____

(27) Write five and three-fifths million two thousand twenty-four in digits. _____

(28) $10\frac{5}{7} \times 10\frac{2}{7} =$ _____ **(mixed number)**

(29) 515 base 10 is written as _____ base 5

***(30)** $\sqrt{5504122} =$ _____

(31) 51.5 — 20.24 = _____ **(decimal)**

(32) If $x + y = 15$ and $x - y = 5$, then $x^2 + y^2 =$ _____

(33) The reciprocal of $-6\frac{2}{3}$ is _____ **(decimal)**

(34) $[51 + 5 \times 20 - 24] \div 7$ has a remainder of _____

(35) $\sqrt[3]{13824}$ = _____

(36) $3906 \times 6 - 36$ = _____

(37) How many integers greater than 12 and less than or equal to 72 are divisible by 8? _____

(38) Given: 2, 3, 5, 4, 6, 10, 6, 9, 15, p, q, r, 10, 15, 25, ... Find $p + q + r$. _____

(39) Find the digit $B > 0$, such that $39B9 = [9(13 - B)]^2$. B = _____

*(40) $\sqrt[3]{515} \times \sqrt{515} \times 515$ = _____

(41) $\frac{2}{45}$ = _____% (mixed number)

(42) $(7^5 + 3^5 - 2) \div 10$ has a remainder of _____

(43) 2401 has how many positive integral divisors? ____

(44) The arithmetic mean of the set {5, 15, 24, k} is 16. Find k. _____

(45) If $3x + y = 5$ and $x - 2y = 5$, then x = _____

(46) $123_4 \times 2_4$ = _____ 2

(47) $(2! \times 3! \times 5!) \div (4! \times 6!)$ = _____

(48) Two dice are rolled. The probability that the sum of the top faces is greater than 10 is _____%

(49) Let R_1 and R_2 be the roots of $(2x - 3)^2 = 5$. Find $R_1 + R_2 - R_1 \times R_2$. _____

*(50) 13141524 ÷ 515 = _____

(51) $114 - 17\frac{1}{2} - 22.25$ = _____

(52) $114 + 17.5 - 22\frac{1}{4}$ = _____

(53) $114.25 + 17\frac{1}{2} + 22$ = _____

(54) $2 + 7 + 9 + 16 + 25 + 41 + 66 + m + 173 + n + 453$ = _____

(55) If $f(x) = 3x + \log_4(x)$, then f(8) = _____

(56) $4\frac{1}{5}$ is what percent more than $3\frac{1}{2}$? _____%

(57) $513_6 - 1415_6 + 2024_6$ = _____ 6

(58) $48 + 32 + 21.333... + 14.222... + ...$ = _____

(59) $37^{12} \div 23$ has a remainder of _____

*(60) $(10\pi^2 - 1)^2$ = _____

(61) $\begin{bmatrix} 2 & 5 \\ 3 & -7 \end{bmatrix} \times \begin{bmatrix} 1 & -6 \\ 3 & 10 \end{bmatrix} = \begin{bmatrix} a & c \\ b & d \end{bmatrix}$. b + c = ____

(62) $\tan(\frac{\pi}{3}) \times \tan(\frac{5\pi}{3})$ = _____

(63) 2.5 fathoms = _____ inches

(64) If 300° = $k\pi$ radians, then k = _____

(65) 0.43 base 5 = _____ base 10 (decimal)

(66) Which element of {21, 35, 45} is both a triangular number and a hexagonal number? _____

(67) $\log_2(32) - \log_5(25) = \log_3(x)$ and x = _____

(68) If x = 5 and y = 15, then $(x - y)(x^2 + xy + y^2)$ = _____

(69) $\sqrt{1000_4}$ = _____ 4

*(70) $(4 + 5 + 6 + ... + 11 + 12 + 13)^2$ = _____

(71) If $f(x) = \frac{5x}{6} + \frac{3}{4}$ and $f^{-1}(x) = ax + b$, then a + b = _____

(72) Let f(x) = sin(2x). Find $f''(\frac{\pi}{12})$. _____

(73) Find the sum of the squares of the diagonals of a parallelogram with side lengths 7 and 11. _____

(74) $h(x) = (x + 3)^{\frac{1}{2}}$ has a relative minimum at x = ____

(75) $\int_1^2 \int_3^4 xy \, dydx$ = _____

(76) The axis of symmetry of the graph of $f(x) = 5x^2 + 15x - 24$ is x = _____

(77) Given: 5, 1, 4, — 3, 7, — 10, 17, k, 44, ... k = _____

(78) $(402)^3$ = _____

(79) 28146×111 = _____

*(80) 93.75% of 51524 = _____

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(1) 2,099

(2) 20.5, $\frac{41}{2}$, $20\frac{1}{2}$

(3) $\frac{7}{6}$, $1\frac{1}{6}$

(4) .875

(5) — 76

(6) $\frac{5}{6}$

(7) 36

(8) 2,099

(9) $\frac{7}{12}$

***(10) 203,583 — 225,011**

(11) 2.25

(12) — 14

(13) 2,170

(14) 2,916

(15) — $\frac{11}{27}$

(16) 120

(17) 1,600

(18) 1,680

(19) 6,560

***(20) 11,747 — 12,982**

(21) 1,209

(22) $\frac{21}{11}$, $1\frac{10}{11}$

(23) — 8

(24) $\frac{17}{33}$

(25) 3,025

(26) 1,512

(27) 5,602,024

(28) $110\frac{10}{49}$

(29) 4030

***(30) 2,229 — 2,463**

(31) 31.26

(32) 125

(33) — .15

(34) 1

(35) 24

(36) 23,400

(37) 8

(38) 40

(39) 6

***(40) 88,996 — 98,363**

(41) $4\frac{4}{9}$

(42) 8

(43) 5

(44) 20

(45) $\frac{15}{7}$, $2\frac{1}{7}$

(46) 110110

(47) $\frac{1}{12}$

(48) $\frac{25}{3}$, $8\frac{1}{3}$

(49) 2

***(50) 24,242 — 26,793**

(51) 74.25, $\frac{297}{4}$, $74\frac{1}{4}$

(52) 109.25, $\frac{437}{4}$, $109\frac{1}{4}$

(53) 153.75, $\frac{615}{4}$, $153\frac{3}{4}$

(54) 1,179

(55) 25.5, $\frac{51}{2}$, $25\frac{1}{2}$

(56) 20

(57) 1122

(58) 144

(59) 9

***(60) 9,068 — 10,021**

(61) 20

(62) — 3

(63) 180

(64) $\frac{5}{3}$, $1\frac{2}{3}$

(65) .92

(66) 45

(67) 27

(68) — 3,250

(69) 20

***(70) 6,864 — 7,586**

(71) .3, $\frac{3}{10}$

(72) — 2

(73) 340

(74) — 3

(75) 5.25, $\frac{21}{4}$, $5\frac{1}{4}$

(76) — 1.5, $-\frac{3}{2}$, $-1\frac{1}{2}$

(77) — 27

(78) 64,964,808

(79) 3,124,206

***(80) 45,889 — 50,718**