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.

The person conducting this contest should explain these directions to the contestants.

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**