The University Interscholastic League
Number Sense Test • HS District • 2022

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) $322 + 2126 =$ _____

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

(3) $32.1 - 262.2 =$ _____ **(decimal)**

(4) $1\frac{2}{3} \times 3\frac{1}{2} =$ _____

(5) $1.75 =$ _____ **(improper fraction)**

(6) $15^3 =$ _____

(7) $\frac{3}{16} =$ _____ **(decimal)**

(8) $2! - 3 \times 4 + 5 \div 6 =$ _____

(9) $2126 \div 4$ **has a remainder of** _____

***(10)** $2202 + 123 + 623 =$ _____

(11) $58 \times 62 =$ _____

(12) $6^3 + 12^2 =$ _____

(13) **CMXLVI =** _____ **(Arabic Number)**

(14) $\frac{8}{13} + \frac{13}{8} =$ _____ **(mixed number)**

(15) **The arithmetic mean of 3, 21, 26, and 22 is** _____

(16) **Which is smaller,** $2\frac{7}{8}$ **or 2.87** _____

(17) **The number of odd integral divisors greater than 0 of 30 is** _____

(18) **25% of** $7\frac{1}{3}$ **is** _____ **(mixed number)**

(19) **40% of 45 less 50 is** _____

***(20)** $321 \times 2622 =$ _____

(21) **If** $5 - 2x = 7$, **then** $5x - 7 =$ _____

(22) **Set A ={a, u, s, t, i, n}. How many distinct 4-element subsets of set A exist?** _____

(23) **A dozen orbs cost $16.40 and 9 orbs cost $** _____

(24) $\left[\{m,a,r,c,h\} \cap \{a,p,r,i,l\}\right] \cup \{m,a,y\}$ **contains how many elements?** _____

(25) $2\left|3 - 5\right| - 7 + 11\left|13 - 17\right| =$ _____

(26) **Let** $8^{(x)} = 4\frac{3}{4}$, **then** $8^{(x-1)} =$ _____

(27) $28 \times 88 =$ _____

(28) $0.5777... =$ _____ **(proper fraction)**

(29) **97 is written as** _____ **in base 6**

***(30)** $2202123 \div 326 =$ _____

(31) $84^2 + 32^2 =$ _____

(32) **Let** $2.090909... \times k = 1$. **Find k.** _____

(33) $[21 + 26 \times 20 - 22] \div 3$ **has a remainder of** _____

(34) **If** $\sqrt{256} - \sqrt{529} = k$, **then** $k^2 =$ _____

(35) Given: 1, 6, 15, 28, p, q, r, 120, ... $p + r =$ _____

(36) The product of the roots $4x^2 + x - 14 = 0$ is _____

(37) $\frac{6}{14} =$ _____% (mixed number)

(38) The area of a square is 7.29 sq. inches. The perimeter of the square is _____ inches

(39) The sum of the coefficients of $(5x - y)^3$ is _____

*(40) $\sqrt{6221223} =$ _____

(41) $69^2 + 69 =$ _____

(42) $3212622 \div 11$ has a remainder of _____

(43) Let $(-2, 5)$ be the midpoint of a segment with endpoints $(3, -7)$ and (x, y). Find $x + y$. _____

(44) $({}_6C_2)({}_6C_4) =$ _____

(45) If y varies inversely with x^2, and $y = 2$ when $x = 3$, then $y =$ _____ when $x = 6$.

(46) $3_7 \times (21_7 + 26_7 - 20_7 + 22_7) =$ _____ 7

(47) The sum of the coefficients of the x^3y term and the xy^3 term in the expansion of $(x + y)^4$ is _____

(48) $36^2 - 37^2 =$ _____

(49) Let $6\frac{2}{m} \times n\frac{1}{2} = 16$, where m, n are natural numbers. Find $m + n$. _____

*(50) (2.41666...)(3579) = _____

(51) A box of pens contains 6 black ones, 5 red, 4 blue, and 3 green. The probability of randomly selecting a black pen or a blue pen is _____%

(52) $\log_4(8) + \log_4(32) =$ _____

(53) $37^{34} \div 17$ has a remainder of _____

(54) Let $(2 + i)(2 - 6i) = a + bi$. Find $a + b$. _____

(55) $\sum_{1}^{13} (-1)^k(k^2) =$ _____

(56) The focus of $x^2 = 24(y - 3)$ is at (0, _____)

(57) $\frac{3}{8} - \frac{1}{4} + \frac{1}{6} - \frac{1}{9} + ... =$ _____

(58) $\frac{1}{5} + 2 + 2.2 + 4\frac{1}{5} + 6.4 + 10\frac{3}{5} + 17 + 27.6 =$ ____

(59) If $(2x^3 + 7x^2 - 3x + k) \div (x + 1)$ has a remainder of 1, then $k =$ _____

*(60) $\sqrt[3]{321262022} =$ _____

(61) $2\cos^2\left(\frac{7\pi}{6}\right) - 1 =$ _____

(62) The Greatest Integer Function is written as $f(x) = [x]$. Find $\left[\sqrt{8} + \sqrt{6}\right]$. _____

(63) $42 \times 48 + 9 =$ _____

(64) $\begin{bmatrix} 1 & 1 \\ 2 & 3 \end{bmatrix}\begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix} = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ and $b + c =$ _____

(65) $888 \times \frac{1}{27} =$ _____ (mixed number)

(66) The first four digits of the decimal for $\frac{2}{11}$ base 4 is 0._____ base 4

(67) $101110011_2 =$ _____ 8

(68) Let $f(x) = 2x^2 + x - 1$ and $g(x) = 3x + 2$. Find $f(g(\frac{2}{3}))$. _____

(69) Let (p, q) be the polar coordinate for the rectangular coordinate $(\frac{1}{2}, -\frac{\sqrt{3}}{2})$. $p =$ _____

*(70) 75% of 5 miles = _____ feet

(71) $\lim_{x \to 3} \frac{x - 3}{x^2 - 7x + 12} =$ _____

(72) Let $f'(x) = 1$ and $f(2) = 3$. Find $f(4)$. _____

(73) Let $f(x) = 2x^4 + 7x^2 - 9 +$. Find $f''(-1)$. _____

(74) The slope of the line tangent to $y = 2x^2 - 5x - 3$ at $x = 3$ is _____

(75) $(.444...)^{-3} =$ _____ (improper fraction)

(76) If $f(x) = \frac{1 - 3x}{6} + 10$, then $f^{-1}(15) =$ _____

(77) $\int_0^{\frac{3\pi}{2}} \cos(2x)\,dx =$ _____

(78) $4^4 \times 5^4 =$ _____

(79) $\frac{2}{11} - \frac{5}{34} =$ _____

*(80) $375 \times (.875 \div \frac{5}{8}) =$ _____

DO NOT DISTRIBUTE TO STUDENTS BEFORE OR DURING THE CONTEST

University Interscholastic League - Number Sense Answer Key HS ● District ● 2022

***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) 2,448

(2) $\frac{14}{15}$

(3) — 230.1

(4) $\frac{35}{6}$, $5\frac{5}{6}$

(5) $\frac{7}{4}$

(6) 3,375

(7) .1875

(8) $-\frac{55}{6}$, $-9\frac{1}{6}$

(9) 2

***(10) 2,801 — 3,095**

(11) 3,596

(12) 360

(13) 946

(14) $2\frac{25}{104}$

(15) 18

(16) 2.87, $\frac{23}{8}$, $2\frac{87}{100}$

(17) 4

(18) $1\frac{5}{6}$

(19) — 32

***(20) 799,579 — 883,745**

(21) — 12

(22) 15

(23) 12.30

(24) 4

(25) 41

(26) .59375, $\frac{19}{32}$

(27) 2,464

(28) $\frac{26}{45}$

(29) 241

***(30) 6,418 — 7,092**

(31) 8,080

(32) $\frac{11}{23}$

(33) 0

(34) 49

(35) 136

(36) — 3.5, $-\frac{7}{2}$, $-3\frac{1}{2}$

(37) $42\frac{6}{7}$

(38) 10.8, $\frac{54}{5}$, $10\frac{4}{5}$

(39) 64

***(40) 2,370 — 2,618**

(41) 4,830

(42) 6

(43) 10

(44) 225

(45) .5, $\frac{1}{2}$

(46) 216

(47) 8

(48) — 73

(49) 7

***(50) 8,217 — 9,081**

(51) $\frac{500}{9}$, $55\frac{5}{9}$

(52) 4

(53) 9

(54) 0

(55) — 91

(56) 9

(57) .225, $\frac{9}{40}$

(58) 70.2, $\frac{351}{5}$, $70\frac{1}{5}$

(59) — 7

***(60) 651 — 719**

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

(62) 5

(63) 2,025

(64) 18

(65) $32\frac{8}{9}$

(66) 1212

(67) 563

(68) 35

(69) 1

***(70) 18,810 — 20,790**

(71) — 1

(72) 5

(73) 38

(74) 7

(75) $\frac{729}{64}$

(76) $-\frac{29}{3}$, $-9\frac{2}{3}$

(77) 0

(78) 160,000

(79) $\frac{13}{374}$

***(80) 499 — 551**