The University Interscholastic League
Number Sense Test • HS Regional • 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) $422 + 423 - 2022 =$ _____

(2) $\frac{4}{5} \times \frac{6}{7} \div \frac{8}{9} =$ _____

(3) $0.555... =$ _____ **(fraction)**

(4) $37 \times 15 =$ _____

(5) $22 \times 45 + 23 \times 45 =$ _____

(6) $28^2 =$ _____

(7) $22\% =$ _____ **(fraction)**

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

(9) 22.5 is 5% of _____

***(10)** $4224 + 2320 - 2250 + 3422 =$ _____

(11) The number of prime numbers less than 86 and greater that 68 is _____

(12) The GCD of 56 and 98 is _____

(13) $73 \times 87 =$ _____

(14) $1\frac{9}{11} + \frac{11}{20} =$ _____ **(mixed number)**

(15) A 15% tip on a $64.00 lunch bill is $ _____

(16) 25% of $20\frac{2}{3}$ is _____

(17) CDXXII — MMXXIII = _____ **(Arabic Number)**

(18) 423k2 is divisible by 6. The largest value of k is ___

(19) 60% of 55 less 50 is _____

***(20)** $422 \times 423 =$ _____

(21) $64 \times 44 =$ _____

(22) $\sqrt[3]{2744} + \sqrt{196} =$ _____

(23) The additive inverse of $\frac{4}{23}$ is _____

(24) $123456 \times 9 + 8 =$ _____

(25) $\frac{14}{33} = 0.ababab...$ and $a + b =$ _____

(26) 27% of $333\frac{1}{3}$ is _____

(27) Given, 7:8 = 5:x. Find 7x. _____

(28) The product of the coefficients of $(x + 2y)^3$ is ____

(29) How long is it between the end of April 23, 2022 and the beginning of Aug. 22, 2022? _____days

***(30)** $4222022 \div 423 =$ _____

(31) $6\frac{2}{3} \times 6\frac{1}{3} =$ _____ **(mixed number)**

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

(33) $12D_{15} =$ _____

(34) The sum of the coefficients of $(4x - 2y)^3$ is _____

(35) Given: 1, 5, p, 22, 35, q, 70, 92, ... $p + q$ = _____

(36) $\frac{1}{3}$ square yard = _____ square inches

(37) $64\frac{2}{7}\%$ = _____ (proper fraction)

(38) If $A^4 \times A^{-3} \div A^2 \times A^k = A^5$ and $A > 1$, then k = _____

(39) $63^2 + 24^2$ = _____

*(40) $\sqrt{535825}$ = _____

(41) $56^2 - 57^2$ = _____

(42) If $x + 2y < 8$ and $x > 3$, then $y <$ _____

(43) The length of the median to the hypotenuse of a 10-24-x right triangle is _____

(44) $48^2 + 48$ = _____

(45) The abscissa of the x-intercept of the line $4x - 3y = 5$ is _____

(46) $(6_7)^2 + 5_7 - 43_7$ = _____ 7

(47) Let $12\frac{4}{m} \times n\frac{1}{2} = 32$, where m, n are natural numbers. Find $m + n$. _____

(48) $\frac{8!}{5!\,2!\,1!}$ = _____

(49) The measures of an inscribed angle and its intercepted arc are $\frac{\pi}{8}$ radians and $k\pi$ radians. The measure of the arc is _____ degrees

*(50) $0.08333... \div 0.0625 \times 4795$ = _____

(51) The fourth octagonal number is _____

(52) $2\log_4(2) - 3\log_4(16)$ = _____

(53) 0.625 is _____ % more than 0.5?

(54) The sum of the roots of $(3x - 8)(4x + 5)$ is _____

(55) The odds of picking a prime number from the set of base 10 digits is _____

(56) $\sum_{1}^{7} (-1)^k(k^2)$ = _____

(57) $25^k \div 23$ has a remainder of 1, where $k < 25$ and k = _____

(58) $\frac{1}{4} + \frac{3}{2} + \frac{7}{4} + \frac{13}{4} + 5 + \frac{33}{4} + \frac{53}{4} + 21\frac{1}{2}$ = _____

(59) The vertex of $y = 3x^2 - 2x - 1$ is at x = _____

*(60) $\sqrt[3]{422232022}$ = _____

(61) If x = 5 and y = — 1, then $9x^2 - 5xy + y^2$ = _____

(62) 111001101_2 = _____ 8

(63) Two dice are tossed. What is the probability that the sum of the faces is 13? _____%

(64) If the initial point of a vector is (2, — 2) and the terminal point is (— 2,1), then $||v||$ = _____

(65) $444 \times \frac{4}{27}$ = _____ (mixed number)

(66) $28 \times 34 + 9$ = _____

(67) 22.5 miles/hour = _____ feet/second

(68) If $(2x^2 - 3x + k) \div (x + 5)$ has a remainder of 4, then k = _____

(69) The area of an isosceles trapezoid with slant height 5" and base lengths 11" and 19" is _____ in^2

*(70) $8\frac{1}{4}\%$ of 100 gallons = _____ fluid ounces

(71) The vertical asymptote for $y = \frac{x + 2}{x^2 + 2x - 8}$, where $x \leq 0$, is x = _____

(72) Let $f(x) = 6x^3 - 9x + 3$. Find $f'(-2)$. _____

(73) $\int_0^{\pi/2} \cos(-x)\,dx$ = _____

(74) A critical value of $f(x) = \frac{x^2 - 3x}{4}$ is _____

(75) $(0.1875)^{-3}$ = _____ (improper fraction)

(76) $\frac{1}{15} + \frac{1}{35} + \frac{1}{63}$ = _____ (proper fraction)

(77) Let $f(x) = x + \frac{1}{x}$. The maximum value of f(x) minus the minimum value f(x) over [1, 3] is _____

(78) Let s(x) be the slant asymptote of $g(x) = \frac{x^2 + 1}{x - 4}$. Find s(— 5). _____

(79) $1^3 - 3^3 + 6^3 - 10^3$ = _____

*(80) $666 \div 0.888... \times \frac{5}{6}$ = _____

DO NOT DISTRIBUTE TO STUDENTS BEFORE OR DURING THE CONTEST

University Interscholastic League - Number Sense Answer Key HS ● Regional ● 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) — 1,177

(2) $\frac{27}{35}$

(3) $\frac{5}{9}$

(4) 555

(5) 2,025

(6) 784

(7) $\frac{11}{50}$

(8) $7\frac{5}{12}$

(9) 450

***(10) 7,331 — 8,101**

(11) 4

(12) 14

(13) 6,351

(14) $2\frac{81}{220}$

(15) 9.60

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

(17) — 1,601

(18) 7

(19) — 17

***(20) 169,581 — 187,431**

(21) 2,816

(22) 28

(23) — $\frac{4}{23}$

(24) 1,111,112

(25) 6

(26) 90

(27) 40

(28) 576

(29) 120

***(30) 9,483 — 10,480**

(31) $42\frac{2}{9}$

(32) .8, $\frac{4}{5}$

(33) 268

(34) 8

(35) 63

(36) 432

(37) $\frac{9}{14}$

(38) 6

(39) 4,545

***(40) 696 — 768**

(41) — 113

(42) 2.5, $\frac{5}{2}$, $2\frac{1}{2}$

(43) 13

(44) 2,352

(45) 1.25, $\frac{5}{4}$, $1\frac{1}{4}$

(46) 13

(47) 7

(48) 168

(49) 45

***(50) 6,074 — 6,713**

(51) 40

(52) — 5

(53) 25

(54) $\frac{17}{12}$, $1\frac{5}{12}$

(55) $\frac{2}{3}$

(56) — 28

(57) 22

(58) 54.75, $\frac{219}{4}$, $54\frac{3}{4}$

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

***(60) 713 — 787**

(61) 251

(62) 715

(63) 0

(64) 5

(65) $65\frac{7}{9}$

(66) 961

(67) 33

(68) — 61

(69) 45

***(70) 1,004 — 1,108**

(71) — 4

(72) 63

(73) 1

(74) 1.5, $\frac{3}{2}$, $1\frac{1}{2}$

(75) $\frac{4096}{27}$

(76) $\frac{1}{9}$

(77) $\frac{4}{3}$, $1\frac{1}{3}$

(78) — 1

(79) — 810

***(80) 594 — 655**