The University Interscholastic League
Number Sense Test ● HS B ● 2022

Contestant's Number _____

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) $20520 \div 5 =$ _____

(2) $\frac{7}{8} + \frac{4}{5} =$ _____ (improper fraction)

(3) $2.05 - 20.22 =$ _____ (decimal)

(4) $1\frac{2}{5} \times 1\frac{4}{7} =$ _____ (mixed number)

(5) $0.8333... =$ _____ (fraction)

(6) $13 \times 24 =$ _____

(7) 30.5 is 5% of _____

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

(9) $44 \div 18 + 64 \div 18 =$ _____

*(10) $729 + 731 + 810 + 814 - 821 =$ _____

(11) $46 \times 34 =$ _____

(12) $\frac{9}{10} + 1\frac{1}{9} =$ _____ (mixed number)

(13) 4 bushels = _____ pints

(14) MCDLI + DXLIX = _____ (Arabic Numeral)

(15) LCM(15, 21, 30) = _____

(16) The range of {1, 0, 7, 2, 0, 5, 2, 0, 2, 1} is _____

(17) The number of positive prime divisors of 66 is _____

(18) 10720k is divisible by 6. Find k < 7. _____

(19) How long is it between the beginning of March 14, 2022 and the end of June 19, 2022? _____days

*(20) $107 \times 502 \div 22 =$ _____

(21) The additive inverse of 1.3 is _____

(22) Set G ={g, r, o, u, p}. How many distinct 3-element subsets of set G exist? _____

(23) $\sqrt[3]{1331} + \sqrt{169} =$ _____

(24) $|k - 1| - |3 - 6| = 10$, k > 0, and k = _____

(25) $[17 + 13 \times 11 + 7] \div 5$ has a remainder of _____

(26) 12 is to 5 as 30 is to _____

(27) If $\frac{3x - 2}{4} = 1$, then $\frac{2x - 4}{3} =$ _____

(28) $0.2161616... =$ _____ (proper fraction)

(29) 175 written in base 5 is _____ $_5$

*(30) $1072021 \div 205 =$ _____

(31) If $x - 3y = 5$ and $2x + 3y = 1$, then $x + y =$ _____

(32) $33 \times 37 =$ _____

(33) $17^2 + 69^2 =$ _____

(34) The sum of the coefficients of $(3x + 5)^3$ is _____

(35) Given: 2, 3, 5, 7, p, q, r, 19, ... Find $p + q + r$. ___

(36) The product of the roots $3x^2 - 13x + 12 = 0$ is ___

(37) Let $7^{(x + 1)} = \frac{21}{25}$, then $7^{(x)} = $ _____

(38) If 6 Bips cost \$2.30, then 15 Bips cost \$ _____

(39) $21\frac{3}{7}\% = $ _____ (proper fraction)

*(40) $\sqrt{10631} = $ _____

(41) The length of the altitude to the hypotenuse of a 8-15-17 right triangle _____

(42) The ordinate of the y-intercept of the line $2x - 5y = 10$ is _____

(43) A side of a regular dodecagon is 11 inches. The perimeter is _____ inches

(44) If $x + y < 7$ and $x > 3$, then $y < $ _____

(45) If y varies inversely with x, and $y = 5$ when $x = 2$, then $x = $ _____ when $y = 4$.

(46) $30 + 27 + 24 + ... + 6 + 3 = $ _____

(47) Let $(1 + 2i)(3 - 4i) = a + bi$. Find b. _____

(48) The vertex of $y = 2(x + 3)^2 - 8$ is (h, k). $h = $ ____

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

*(50) $992 \div 0.268 = $ _____

(51) $210_7 \div 6_7$ has a remainder of _____$_7$

(52) $\log_3(2) - \log_3(18) = $ _____

(53) The product of the roots of $y = 2(x + 3)^2 - 8$ is ___

(54) $60^{30} \div 31$ has a remainder of _____

(55) $49^2 + 49 = $ _____

(56) $33^2 - 32^2 = $ _____

(57) Let $6\frac{3}{m} \times n\frac{2}{11} = 21$, where m, n are natural numbers. Find $m + n$. _____

(58) $\frac{1}{3} + \frac{2}{3} + 1 + 1\frac{2}{3} + 2\frac{2}{3} + 4\frac{1}{3} + 7 + 11\frac{1}{3} = $ _____

(59) The area of a rectangle is 35 cm^2, where the side lengths are integers. Its perimeter is _____ cm

*(60) $\sqrt[3]{21131222} = $ _____

(61) The total surface area of a 2" by 3" by 4" rectangular prism is _____ sq. in

(62) The Greatest Integer Function is written as $f(x) = [x]$. Find $\left[2\sqrt{7}\right]$. _____

(63) The determinant of $\begin{bmatrix} -1 & 3 \\ k & 2 \end{bmatrix} = 5$. k = _____

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

(65) $\begin{bmatrix} 1 & 1 \\ 2 & 3 \end{bmatrix} + \begin{bmatrix} 2 & 3 \\ 5 & 7 \end{bmatrix} = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$. Find ad. _____

(66) $555 \times \frac{1}{27} = $ _____ (mixed number)

(67) Let $f(x) = x^2 - 9$ and $g(x) = x - 3$. $f(g(6)) = $ _____

(68) Let (x, y) be the rectangular coordinate for the polar coordinate $(1, \frac{\pi}{2})$. $y = $ _____

(69) $43 \times 47 + 4 = $ _____

*(70) $\frac{4}{9}$ of 3 miles = _____ feet

(71) The domain of $y^2 = 16 - x^2$ is $m \leq x \leq n$. m = ___

(72) Find x, $1 \leq x \leq 5$, if $3x + 2 \cong 3$ (mod 8). _____

(73) Let $f(x) = 4x^3 + 3x^2 + 2x$. Find $f'(-2)$. _____

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

(75) $F(x) = (x^2 - 4)^{\frac{2}{3}}$ has how many critical values? ___

(76) The minimum value of $f(x) = \frac{x}{x + 2}$ over the interval $[-1, 2]$ is _____

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

(78) $(.375)^{-2} = $ _____ (improper fraction)

(79) $4^3 - 3^3 + 2^3 - 1^3 = $ _____

*(80) 6.25% of $(1875 \times \frac{8}{9}) = $ _____

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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) 4,104

(2) $\frac{67}{40}$

(3) − 18.17

(4) $2\frac{1}{5}$

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

(6) 312

(7) 610

(8) 38

(9) 6

*(10) 2,150 — 2,376

(11) 1,564

(12) $2\frac{1}{90}$

(13) 256

(14) 2,000

(15) 210

(16) 7

(17) 3

(18) 2

(19) 98

*(20) 2,320 — 2,563

(21) − 1.3, − $\frac{13}{10}$, − $1\frac{3}{10}$

(22) 10

(23) 24

(24) 14

(25) 2

(26) 12.5, $\frac{25}{2}$, $12\frac{1}{2}$

(27) 0

(28) $\frac{107}{495}$

(29) 1200

*(30) 4,968 — 5,490

(31) 1

(32) 1,221

(33) 5,050

(34) 512

(35) 41

(36) 4

(37) .12, $\frac{3}{25}$

(38) 5.75

(39) $\frac{3}{14}$

*(40) 98 — 108

(41) $\frac{120}{17}$, $7\frac{1}{17}$

(42) − 2

(43) 132

(44) 4

(45) 2.5, $\frac{5}{2}$, $2\frac{1}{2}$

(46) 165

(47) 2

(48) − 3

(49) − 6

*(50) 3,517 — 3,886

(51) 3

(52) − 2

(53) 5

(54) 1

(55) 2,450

(56) 65

(57) 8

(58) 29

(59) 24

*(60) 263 — 290

(61) 52

(62) 5

(63) − $\frac{7}{3}$, − $2\frac{1}{3}$

(64) 10

(65) 30

(66) $20\frac{5}{9}$

(67) 0

(68) 1

(69) 2,025

*(70) 6,688 — 7,392

(71) − 4

(72) 3

(73) 38

(74) $\frac{11}{3}$, $3\frac{2}{3}$

(75) 3

(76) − 1

(77) $\frac{16}{3}$, $5\frac{1}{3}$

(78) $\frac{64}{9}$

(79) 44

*(80) 99 — 109