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

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STOP -- WAIT FOR SIGNAL!

(1) $122 \times 5 =$ _____

(2) $2\frac{1}{3} + 3\frac{1}{2} =$ _____ **(mixed number)**

(3) $1.62 \div 0.3 =$ _____ **(decimal)**

(4) $\frac{2}{5} - \frac{4}{7} =$ _____

(5) $12^3 =$ _____

(6) $23 \times 52 - 23 \times 29 =$ _____

(7) $\frac{4}{5} =$ _____ **(per cent)**

(8) 48 is x % of 160. Find x. _____

(9) $2 \times (3 + 5) \div (7 - 11) =$ _____

***(10)** $10722 + 20522 + 2122 =$ _____

(11) 3 gallons = _____ pints

(12) The GCD(12,40) + LCM(12, 40) = _____

(13) $14 \times 31 =$ _____

(14) A 15% tip on a $34.00 dinner bill is $ _____

(15) $\frac{10}{11} + \frac{11}{10} =$ _____ **(mixed number)**

(16) The mode of 2, 5, 1, 5, 2, 1, 3, 4, 1 is _____

(17) The number of positive integral divisors of 40 is __

(18) $33 \times 27 =$ _____

(19) 107205 ÷ 6 has a remainder of _____

***(20)** $701 \times 205 \times 22 =$ _____

(21) If $3x + 4 = 1$, then $4x - 3 =$ _____

(22) $42^2 + 16^2 =$ _____

(23) If $8^{(x)} = 12.8$, then $8^{(x-2)} =$ _____

(24) The multiplicative inverse of 2.5 is _____

(25) $[17 + 25 \times 20 - 22)] \div 3$ has a remainder of ____

(26) Given, 4:9 = x:12. Find 3x. _____

(27) $\sqrt{324} + \sqrt{225} =$ _____

(28) 0.1333... = _____ **(proper fraction)**

(29) 95 written in base 6 is _____ 6

***(30)** 152722 ÷ 123 = _____

(31) If $x + 4y = 8$ and $x - 2y = 6$, then y = _____

(32) Let A ={a, u, s, t, i, n}, B = {b, o, i, s, e}, and C = {c, a, r, s, o, n}. How many unique elements are in $(A \cap B) \cup C$? _____

(33) $|1 - 7| - |2 + 5| - 22 =$ _____

(34) The product of the coefficients of $(2x - y)^2$ is ____

(35) Given: 1, 3, 6, 10, 15, p, q, r, 45, ... r = _____

(36) The sum of the product of the roots taken two at a time of $x^3 - 3x^2 - 13x + 15 = 0$ is _____

(37) 22×28 = _____

(38) How long is it between the end of Jan. 6, 2022 and the end of Feb. 5, 2022? _____days

(39) $\frac{1}{14}$ = _____% (mixed number)

*(40) $\sqrt{225271}$ = _____

(41) The area of a circle is 9π cm^2. The circumference of the circle is _____ π cm

(42) If $x + y < 4$ and $y > 1$, then $x <$ _____

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

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

(45) $19^2 + 19$ = _____

(46) $55^2 + 54^2$ = _____

(47) $31^{13} \div 13$ has a remainder of _____

(48) $(205_8 - 107_8) \times 2_8$ = _____ 8

(49) The measure of an inscribed angle is k°. The measure of its intercepted arc is 75°. Find k. _____

*(50) $(1875) \div (0.625)$ = _____

(51) If y varies directly with x, and y = 6 when x = 2, then x = _____ when y = 9.

(52) Let $2\frac{4}{m} \times n\frac{1}{11} = 10$, where m, n are natural numbers. Find m + n. _____

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

(54) $\frac{10!}{8!\,2!}$ = _____

(55) The coefficient of the xy^2 term in the expansion of $(x + 2y)^3$ is _____

(56) The vertex of $y = 3x^2 - 2x - 1$ is (h, k). h = _____

(57) Two elements from the set {w, h, i, t, e} are drawn randomly, without replacement. The probability that both are vowels is _____%

(58) $7 + 11 + 18 + 29 + 47 + 76 + ... + 199$ = _____

(59) The sum of the third triangular number and the second hexagonal number is _____

*(60) $\sqrt[3]{20221715}$ = _____

(61) $9 + 35 \times 32$ = _____

(62) $222 \times \frac{2}{27}$ = _____ (mixed number)

(63) $\sum_{1}^{3} (-1)^k(k^2)$ = _____

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

(65) $\sin\left(\frac{5\pi}{6}\right) + \cos\left(\frac{2\pi}{3}\right)$ = _____

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

(67) The first four digits of the decimal for $\frac{5}{66}$ base 7 is 0._____ base 7

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

(69) Let $f(x) = x^2 - 2x + 1$ and $g(x) = 3 - x$. Find $f(g(-1))$. _____

*(70) 2 tons = _____ ounces

(71) The domain of $y^2 = 9 - x^2$ is $m \leq x \leq n$. n = ___

(72) $\lim_{x \to \infty} \frac{2x - 3}{x}$ = _____

(73) Let $f(x) = 4x^3 - 3x^2 - 2x$. Find $f''(-1)$. _____

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

(75) The horizontal asymptote of $y = \frac{3x + 2}{1 - 4x}$ is y = ____

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

(77) The maximum value of $f(x) = 4x - 3x^2$ is _____

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

(79) $3^3 - 4^3 + 5^3 - 6^3$ = _____

*(80) 8.333...% of $(4166 \div \frac{7}{12})$ = _____

DO NOT DISTRIBUTE TO STUDENTS BEFORE OR DURING THE CONTEST

University Interscholastic League - Number Sense Answer Key HS ● Invitation A ● 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) 610

(2) $5\frac{5}{6}$

(3) 5.4

(4) $-\frac{6}{35}$

(5) 1,728

(6) 529

(7) 80

(8) 30

(9) — 4

***(10) 31,698 — 35,034**

(11) 24

(12) 124

(13) 434

(14) 5.10

(15) $2\frac{1}{110}$

(16) 1

(17) 8

(18) 891

(19) 3

***(20) 3,003,435 — 3,319,585**

(21) — 7

(22) 2,020

(23) .2, $\frac{1}{5}$

(24) .4, $\frac{2}{5}$

(25) 0

(26) 16

(27) 33

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

(29) 235

***(30) 1,180 — 1,303**

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

(32) 7

(33) — 23

(34) — 16

(35) 36

(36) — 13

(37) 616

(38) 30

(39) $7\frac{1}{7}$

***(40) 451 — 498**

(41) 6

(42) 3

(43) 5

(44) — 4

(45) 380

(46) 5,941

(47) 5

(48) 174

(49) 37.5, $\frac{75}{2}$, $37\frac{1}{2}$

***(50) 2,850 — 3,150**

(51) 3

(52) 13

(53) — 5

(54) 45

(55) 12

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

(57) 10

(58) 510

(59) 12

***(60) 259 — 286**

(61) 1,129

(62) $16\frac{4}{9}$

(63) — 6

(64) — 23

(65) 0

(66) 7

(67) 0505

(68) 0

(69) 9

***(70) 60,800 — 67,200**

(71) 3

(72) 2

(73) — 30

(74) — 21

(75) — .75, $-\frac{3}{4}$

(76) 4

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

(78) $\frac{22}{3}$, $7\frac{1}{3}$

(79) — 128

***(80) 566 — 624**

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

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(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 $3x + 2 \cong 3 \pmod 8$. _____

(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 $(1875 \times \frac{8}{9})$ = _____

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

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(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**

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**

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

Final _____ _____

Contestant's Number _____ 2nd _____ _____

1st _____ _____

Score **Initials**

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STOP -- WAIT FOR SIGNAL!

(1) $5622 - 1247 + 525 =$ _____

(2) $1\frac{2}{3} \times 45.6 =$ _____

(3) $3672 \div 12 =$ _____

(4) $0.428571428571428571... =$ _____ **(fraction)**

(5) $2 - 1 \times (3 + 4) \div 7 - 11 =$ _____

(6) $35 \times 28 - 23 \times 35 =$ _____

(7) $\frac{11}{25} =$ _____ **(decimal)**

(8) $4\frac{1}{5} + 5\frac{1}{6} =$ _____ **(mixed number)**

(9) $72 \times 88 =$ _____

***(10)** $50622 - 62250 + 25062 =$ _____

(11) Which is greater, $\frac{11}{16}$ or $\frac{16}{21}$? _____

(12) The GCD of 72, 54, and 90 is _____

(13) The median of 2, 5, 1, 5, 2, 1, 3, 4, 1 is _____

(14) $2\frac{25}{84} - \frac{7}{12} =$ _____ **(mixed number)**

(15) The number of prime numbers less than 35 and greater than 5 is _____

(16) The number of composite numbers greater than 5 and less than 35 is _____

(17) DCV + MCCII = _____ **(Arabic Numeral)**

(18) How long is it between the beginning of May 6, 2022 and the end of Aug. 15, 2022? _____days

(19) 50622 ÷ 9 has a remainder of _____

***(20)** $650 \times 2220 =$ _____

(21) $73 \times 33 =$ _____

(22) If 9 pips cost $45.18, then 11 pips cost $ _____

(23) $74^2 + 33^2 =$ _____

(24) $\frac{41}{333}$ = 0.abcabcabc... and a + b + c = _____

(25) If $\frac{2x+3}{5} + 7 = 11$, then $x - 4 =$ _____

(26) $\sqrt{196} - \sqrt{289}$ = d and $d^3 =$ _____

(27) 50 base 10 = _____base 6

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

(29) $7\frac{3}{8} \times 7\frac{5}{8} =$ _____ **(mixed number)**

***(30)** $5062022 \div 1247 =$ _____

(31) The sum of the coefficients of $(2x - 3y)^5$ is _____

(32) $2401 = k^4$ and k = _____

(33) Given: 1, 7, 18, 34, 55, p, q, 148, ... p − q = _____

(34) $[20 + 22 \times 50 - 6)] \div 4$ has a remainder of _____

(35) If $4x - 7y = -3$ and $3x + 7y = 10$, then x = _____

(36) The smaller solution for $|5x + 6| = 22$ is _____

(37) If $\frac{11}{14} = 78\frac{k}{7}\%$, then k = _____

(38) The perimeter of a face of a cube is 16". The cube's lateral surface area is _____ sq. in

(39) Set N ={n, u, m, b, e, r}. How many distinct subsets of N contain at least 4 elements? _____

*(40) $\sqrt{6052202}$ = _____

(41) $70^2 - 69^2$ = _____

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

(43) Let $3x - 8y = 24$. The abscissa of the x-intercept plus the ordinate of the y-intercept is _____

(44) $49^2 + 49$ = _____

(45) $6! \div 8! \times 2!$ = _____

(46) Let $(1 + 3i)(6 - 10i) = a + bi$. Find b — a. _____

(47) Let $6\frac{9}{m} \times n\frac{1}{3} = 23$, where m, n are natural numbers. Find m × n. _____

(48) The sum of the coefficients of the x^3y^2 term and the x^2y^3 term in the expansion of $(x + y)^5$ is _____

(49) $135^9 \div 7$ has a remainder of _____

*(50) $0.41666... \div 0.3125 \times 506$ = _____

(51) The Greatest Integer Function is written as $f(x) = [x]$. Find $\left[\sqrt{2} + \sqrt{5} + \sqrt{7}\right]$. _____

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

(53) $\sqrt[3]{85184}$ = _____

(54) The focus of $(y - 2)^2 = 12(x - 5)$ is at (_____ , 2).

(55) The probability of picking a prime number from the set of factors of 45 is _____

(56) $\sum_{1}^{12} (-1)^k(k^2)$ = _____

(57) The roots of $6x^2 - 5x = 4$ are P and $-\frac{1}{2}$. P = _____

(58) $34 \times 46 + 36$ = _____

(59) $(4_7)^3 - (4_7)^2 - 4_7$ = _____ 7

*(60) $333 \times (0.1666.... \div \frac{1}{9})$ = _____

(61) If $\tan(\theta) = \frac{\sin(30°)}{1 + \cos(30°)}$, then θ = _____°

(62) 235_8 = _____ 2

(63) Let $f(x) = x^2 - 4$. Find f(f(2). _____

(64) A cylinder has a volume of 64π cm^3 and its height equals its radius. Find its height? _____ cm

(65) $222 \times \frac{5}{27}$ = _____ (mixed number)

(66) $\frac{1}{3} + \frac{3}{5} + \frac{14}{15} + \frac{23}{15} + \frac{37}{15} + 4 + \frac{97}{15} + \frac{157}{15}$ = _____

(67) $(0.41666...)^{-3}$ = _____ (improper fraction)

(68) If $x + 4 > 6$, then $4x >$ _____

(69) Let (x, y) be the rectangular coordinate for the polar coordinate $(6, \frac{\pi}{3})$. x = _____

*(70) 142857×43 = _____

(71) $8^3 - 6^3 + 4^3 - 2^3$ = _____

(72) Let $f(x) = x^3 - x - 5$. Find $f'(3)$. _____

(73) $\lim_{x \to 0} \frac{\sin(x)}{x}$ = _____

(74) $(1.444...)^{-2}$ = _____

(75) Find x, $0 \leq x \leq 4$, if $3x - 4 \cong 7 \pmod 5$. _____

(76) The vertical asymptote farthest to the left on the graph of $y = \frac{x + 5}{(x+3)(x - 3)}$ is x = _____

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

(78) $\frac{5}{63} + \frac{5}{99} + \frac{5}{143}$ = _____

(79) 5622×13 = _____

*(80) Crawling 6 miles at 6 in/sec takes _____ minutes

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University Interscholastic League - Number Sense Answer Key HS • State • 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) 4,900

(2) 76

(3) 306

(4) $\frac{3}{7}$

(5) — 10

(6) 175

(7) .44

(8) $9\frac{11}{30}$

(9) 6,336

***(10) 12,763 — 14,105**

(11) $\frac{16}{21}$

(12) 18

(13) 2

(14) $1\frac{5}{7}$

(15) 8

(16) 21

(17) 1,807

(18) 102

(19) 6

***(20) 1,370,850 — 1,515,150**

(21) 2,409

(22) 55.22

(23) 6,565

(24) 6

(25) 4.5, $\frac{9}{2}$, $4\frac{1}{2}$

(26) — 27

(27) 122

(28) 576

(29) $56\frac{15}{64}$

***(30) 3,857 — 4,262**

(31) — 1

(32) 7

(33) — 31

(34) 2

(35) 1

(36) — 5.6, $-\frac{28}{5}$, $-5\frac{3}{5}$

(37) 4

(38) 64

(39) 22

***(40) 2,338 — 2,583**

(41) 139

(42) 0

(43) 5

(44) 2,450

(45) $\frac{1}{28}$

(46) — 28

(47) 30

(48) 20

(49) 1

***(50) 641 — 708**

(51) 6

(52) — 2

(53) 44

(54) 8

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

(56) 78

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

(58) 1,600

(59) 62

***(60) 475 — 524**

(61) 15

(62) 10011101

(63) — 4

(64) 4

(65) $41\frac{1}{9}$

(66) 26.8, $\frac{134}{5}$, $26\frac{4}{5}$

(67) $\frac{1728}{125}$

(68) 8

(69) 3

***(70) 5,835,709 — 6,449,993**

(71) 352

(72) 26

(73) 1

(74) $\frac{81}{169}$

(75) 2

(76) — 3

(77) 4.5, $\frac{9}{2}$, $4\frac{1}{2}$

(78) $\frac{15}{91}$

(79) 73,086

***(80) 1,004 — 1,108**