The University Interscholastic League
Number Sense Test • HS State • 2021

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) $3394 + 902 =$ _____

(2) $34194 - 8542 =$ _____

(3) $\frac{9}{16} \times \frac{8}{15} =$ _____

(4) $794 \div 7 =$ _____ **(mixed number)**

(5) **The LCM of 78 and 24 is** _____

(6) $36 \times 22 - 14 \times 22 =$ _____

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

(8) $MCCLV \times II =$ _____ **(Arabic Numeral)**

(9) $(4 + 8) \times 12 \div 16 - (20 - 24) =$ _____

***(10)** $868 - 9708 + 8817 - 183 =$ _____

(11) **If 3 packs cost $2.28 then 5 packs cost $** _____

(12) **Which is smaller** $-\frac{3}{7}$ **or** $-\frac{4}{9}$**?** _____

(13) **The GCD of 24, 78, and 72 is** _____

(14) **21 is what percent of 105?** _____**%**

(15) **140 less 14% of 140 is** _____ **(decimal)**

(16) $3\frac{5}{7} \times 1\frac{3}{5} =$ _____**(mixed number)**

(17) $44^2 - 42^2 =$ _____

(18) $(11 \times 7 - 5) \div 6$ **has a remainder of** _____

(19) $15^3 =$ _____

***(20)** $781 \times 8007 \div 460 =$ _____

(21) $|1 - 3| + 6 - |10 - 15| + 21 =$ _____

(22) **24% of 2.375 =** _____ **(proper fraction)**

(23) $1B8_{12} =$ _____ **10**

(24) $42 \times 47 =$ _____

(25) **How many subsets containing 3 elements or less does the set {r,e,g,i,o,n} have?** _____

(26) $\sqrt{289} + \sqrt{324} =$ _____

(27) **Let** $\frac{5}{6} = \frac{x}{15}$**. Find** $\frac{12}{x}$**.** _____ **(proper fraction)**

(28) **Find the value of k so that the slope of the line** $kx + 2y = 5$ **is** -3**. k =** _____

(29) **If** $7^{(x+1)} = 86.1$**, then** $7^{(x)} =$ _____ **(decimal)**

***(30)** $26 \times 34 \times 42 =$ _____

(31) $(4)(13)(111)(k) = 40{,}404$**. k =** _____

(32) $321 =$ _____ **6**

(33) **If** $3.08333... \times k = 1$**, then k =** _____

(34) **If** $(5x - 2)^2 = ax^2 + bx + c$ **then** $a + b + c =$ _____

(35) Given: 3, p, 12, 21, q, r, 87, ... $p + q + r$ = _____

(36) If $f(x) = x^2 - 14x + 49$, then $f(21)$ = _____

(37) $1797 \times 3 + 18$ = _____

(38) $4\frac{1}{6}$ is _____ % less than 5

(39) If $x - y = 13$ and $x + y = 9$, then x = _____

***(40)** $\sqrt{700} \times \sqrt{600}$ = _____

(41) $(202)^3$ = _____

(42) A 7-digit number 502202k is divisible by 11. k = __

(43) Let $x + y = 17$ and $x - y = 18$. Find $x^2 - y^2$. _____

(44) $(i)^{18} \times (i)^{17} \div (i)^{20} = a\sqrt{b}$, where $a,b \in \{-1,1\}$. Find b − a. _____

(45) The median on the hypotenuse of a 9-40-41 cm triangle is _____ cm

(46) The fourth pentagonal number is _____

(47) Round $(\sqrt{2} + \sqrt{3} - \sqrt{5})$ to the tenths place. ___

(48) $31^{11} \div 11$ has a remainder of _____

(49) $52_6 + 13_6 + 4_6$ = _____ 6

***(50)** $\sqrt[3]{5032021}$ = _____

(51) $(5 - i)(20 - 21i) = a + bi$. $a + b$ = _____

(52) How many integers between 6 and 52 are relatively prime to 52? _____

(53) The simplified coefficient of the fourth term of the expansion of $(2x - y)^5$ is _____

(54) $16 \times \frac{20}{23}$ = _____ (mixed number)

(55) If $\log_8(x) = 2$, then $\log_4(x)$ = _____

(56) 512×251 = _____

(57) Let 7, 12, and x be the integral sides of a triangle. Find the greatest value of x. _____

(58) The side lengths of a right triangle are 9 ft, 40 ft and 41 ft. The length of the altitude to the hypotenuse is _____ ft

(59) $888 \times \frac{4}{37}$ = _____

***(60)** $8333 \div 666.6 \times 44.44$ = _____

(61) 5121×13 = _____

(62) $(5_7 \times 10_7 - 21_7) \div 6_7$ has a remainder of _____

(63) The odds of winning the game is 3 to 5. The probability of losing the game is _____ %

(64) How many days are there from the end of 05/01/21 to the beginning of 09/20/21? _____ days

(65) $\sin(\frac{5\pi}{3}) \times \sin(\frac{7\pi}{3})$ = _____

(66) $18 + 15 + 12.5 + 10\frac{5}{12} + ...$ = _____

(67) Find the sum of all negative integers x such that $3x + 5 \geq -8$. _____

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

(69) How many triangles can be formed using any three vertices of a regular septagon? _____

***(70)** 55 miles per hour = _____ feet per minute

(71) The first four digits of the decimal for $\frac{5}{11}$ base 7 is 0._____ base 7

(72) If $f(x) = \frac{2x-5}{3} - 7$, then $f^{-1}(11)$ = _____

(73) The sum of the reciprocals of all of the positive divisors of 18 is _____

(74) Find the sum of the squares of the roots of $5x^2 + 2x - 3 = 0$. _____

(75) Find k, if $\begin{vmatrix} 2 & 2k \\ 4 & 6 \end{vmatrix} = 8$. _____

(76) $\int_1^3 (2x - 3)\,dx$ = _____

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

(78) $\prod_{k=1}^{3} (2 - k^2)$ = _____

(79) ${}_{10}P_3$ = _____

***(80)** $1875 \div 0.3125 \times \frac{7}{16}$ = _____

DO NOT DISTRIBUTE TO STUDENTS BEFORE OR DURING THE CONTEST

University Interscholastic League - Number Sense Answer Key HS ● State ● 2021
***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) 4,296

(2) 25,652

(3) .3, $\frac{3}{10}$

(4) $113\frac{3}{7}$

(5) 312

(6) 484

(7) .1875

(8) 2,510

(9) 13

***(10) — 216 — — 196**

(11) $3.80

(12) $-\frac{4}{9}$

(13) 6

(14) 20

(15) 120.4

(16) $5\frac{33}{35}$

(17) 172

(18) 0

(19) 3,375

***(20) 12,915 — 14,274**

(21) 24

(22) $\frac{57}{100}$

(23) 284

(24) 1,974

(25) 42

(26) 35

(27) $\frac{24}{25}$

(28) 6

(29) 12.3

***(30) 35,272 — 38,984**

(31) 7

(32) 1253

(33) $\frac{12}{37}$

(34) 9

(35) 96

(36) 196

(37) 5,409

(38) $\frac{50}{3}$, $16\frac{2}{3}$

(39) 11

***(40) 616 — 680**

(41) 8,242,408

(42) 8

(43) 306

(44) 0

(45) 20.5, $\frac{41}{2}$, $20\frac{1}{2}$

(46) 22

(47) .9

(48) 9

(49) 113

***(50) 163 — 179**

(51) — 46

(52) 21

(53) — 40

(54) $13\frac{21}{23}$

(55) 3

(56) 128,512

(57) 18

(58) $\frac{360}{41}$, $8\frac{32}{41}$

(59) 96

***(60) 528 — 583**

(61) 66,573

(62) 2

(63) 62.5, $\frac{125}{2}$, $62\frac{1}{2}$

(64) 141

(65) — .75, $-\frac{3}{4}$

(66) 108

(67) — 10

(68) 0

(69) 35

***(70) 4,598 — 5,082**

(71) 4242

(72) 29.5, $\frac{59}{2}$, $29\frac{1}{2}$

(73) $\frac{13}{6}$, $2\frac{1}{6}$

(74) 1.36, $\frac{34}{25}$, $1\frac{9}{25}$

(75) .5, $\frac{1}{2}$

(76) 2

(77) 1

(78) 14

(79) 720

***(80) 2,494 — 2,756**