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

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) $512 \times 251 =$ _____

(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) $5121 \times 13 =$ _____

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

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

Larry White - Number Sense Contest Director - texasmath@centex.net

This will be the last update of my 'Number Sense Test Corrections and Comments' page for this 20-21 season. This has been a most unusual season. I encourage everyone to let the UIL staff know how thankful you are for all of the work it took them to put together a season amongst all of the surrounding difficulties. Finding ways to hold district, regional, and state competitions was not an easy task, to say the least. It would have been easier to cancel the season again as they had to last year, but that is not how UIL reacts to hardships. Kudos to all the UIL staff and all the coaches and hub workers for all their hard and tireless work to provide for our most valuable assets; our students and their competive spirit.
I would like to congratulate all of the students for working through all of the issues facing us this year and continuing to grow academically through UIL competitions. The knowledge and skills gained through the UIL experience is everlasting and can never be taken away from you. I would like to congratulate all 128 of the number sense students who made to state and a special congratulations to those state championship individuals and those state championship teams. I missed not getting to see you all and I sure missed not getting to put your medals around your necks. Please don't forget to thank your parents, thank your coaches, thank your schools, and, most importantly, thank HIM. I hope you all continue to find a few minutes each day in your life to walk with, talk with, and give thanks to your creator. Without HIM the path is lonely and bleak. I am looking forward to seeing you all in the Fall.

UIL Test Comments — 2020-21

*** NOTE: See **Off on a Tangent** below for information on workshops, Student Activity Conferences, and test discussions *******

SAC - - - > No errors, corrections, or comments reported at this time. (Release dates: 10/1/20)

A - - - >   No errors, corrections, or comments reported at this time. (Release dates: 1/8/21 - 2/6/21)

B - - - >   No errors, corrections, or comments reported at this time. (Release dates: 2/12/21 - 3/13/21)

District - - - > #36 … 0 and 3 are acceptable … see discussion below   (Release dates: 3/22/21 - 3/27/21)
                #37 … 48 is the correct answer, but … see discussion below

Regional - - - > No errors, corrections, or comments reported at this time. (Release dates: 4/16/21 - 4/17/21)

State - - - > No errors, corrections, or comments reported at this time.   (Release date: 4/29/21 - 5/1/21)

TMSCA Test Comments — 2020-21 (tests I write for TMSCA)

 # 6   - - - >   No errors, corrections, or comments reported at this time. (Release date: 12/07/19)

 # 13 - - - >   No errors, corrections, or comments reported at this time. (Release date: 3/07/20)

State - - - >   No errors, corrections, or comments reported at this time. (Release date: 3/21/20)

Off on a Tangent

Workshops and/or Presentations I will be doing:
1. UIL Capitol Conference, Austin - ~~June 23-24, 2020~~. Cancelled --- Virtual
   See the UIL Academic website for two recorded Zoom sessions and multiple downloads
   Keep an eye out on the UIL Academic Website for information of the upcoming 2021 virtual Capitol Conference.

2. *What's Your 11th Problem* - Math Camp at Texas Tech University, Lubbock on ~~July 13-18, 2020~~.
   Cancelled --- future camps have not been addressed at this time ---
   For more information contact Jack Barton at jack.barton@ttu.edu or 806-742-2350.

3. Student Activity Conferences: **The 2020 conferences will be virtual.**

   --- This Year in Number Sense and Mathematics: News -Updates- Hot Topics
   (prerecorded session to be posted on the UIL Academic website on Oct. 1)
   --- Number Sense Problem Solving
   (prerecorded session to be posted on the UIL Academic website on Oct. 29)
   --- Mathematics Problem Solving
   (prerecorded session to be posted on the UIL Academic website on Oct. 29)
   --- Number Sense and Math - Coaches Chat
   (live zoom session at 4:00 pm Wednesday, Nov. 4 --- register in advance)

History of Number Sense Project:
I had hoped to have my data compiled and ready to be seen. Unfortunately, the issues facing us today has not permitted me to complete my research. I hope to finish the research later this year and have a report next year.

Resources Update

I recently received an update on "the little red book" -- Mental Mathematics for Number Sense by Frances Walzel -- is available again. The new contact email for this book is mentalmathbook@gmail.com .

Test Discussions

I have been writing 12 number sense practice tests for HEXCO since 2012 and will be writing them again this year. Contact Linda at HEXCO.com if you are interested in ordering some of these tests.

The district, regional, and state tests will be created based on the problems from these 6 tests: 2020SAC, TMSCA 6, UIL A, UIL B, TMSCA 13, & TMSCA STATE.

District #36: The intent of this problem was for 3 to be the correct answer. We have done these types of problems in the past. I did not consider zero. However, 7 x 0 + 4 = 4 and 4 is a perfect square. The answer 0 is the correct answer for the problem as it is stated. I should have said "positive integers, k" or "0 < k < 11 ".

District #37: The actual linear term of this cubic is "48x", however number sense rules do not allow for letters or symbols or extraneous marks of any kind in the answers. So, 48x cannot be accepted. In the future I will try to put the word "coefficient" in the problem.