

UIL Number Sense Contest

Practice and Test Taking Tips For Coaches

Larry White

UIL State Number Sense Contest Director

texasmath@centex.net

<http://www.uil texas.org/academics/stem/number-sense>

Number Sense ---- **The ability to work quickly with numbers and solve problems in your head without the use of other materials.**

UIL Contest information

1. The number sense test has 80 problems. (see sequence chart)
2. The test has a 10 minute time limit.
3. Erasing, mark-overs, and/or scratch work is not permitted.
4. Scoring is plus 5 points for each correct answer and minus 4 points for each wrong answer or skipped problem up to the last one attempted.

Why do UIL Number Sense?

- Competition
- Team work
- Scholarships
- Mind stretching
- Ability to think on ones feet

UIL Number Sense in the regular classroom

- Can help create 'mind' thinking ...
- Can help stretch 'mind' speed ...
- Can help strengthen 'mind' confidence ...
- Can be a good review of concepts for TAKS ...
- Can be used to introduce new and exciting tricks to work old problems ...
- Can be used to introduce new concepts ...
- Can help create competitiveness and be used for fun ...
- Can be used for sponge activities ...
- Can be used as extra credit to help recover from a bad grade ...
- Can help students become self-challenged and self-motivated ...

Resources for Help

Number Sense tests are written on three levels:

Elementary (grades 3-6)

Middle School (grades 7-8)

High School (grades 9-12)

Books

- *No Sense in Mathematics* – by Don Skow (dps1221@hotmail.com)
- *RAM Materials* – by Leo Ramirez (www.rammaterials.com)
- AMT Test Writing Service - Andy Zapata (adzapata74@gmail.com)
- Middle School and High School Packets – Dr. John Hobbs (call 972-442-3168)
- Bryan Heath Number Sense Tricks (bryanheath.com)
- Hexco - Linda Terrant (<http://www.hexco.com>)
- *Number Dojo* - by Jonathan Cluff (<http://www.numberdojo.com/>)
- *Mental Mathematics for Number Sense* – Frances Walzel (mentalmathbook@gmail.com)

Practice Tests

- University Interscholastic League (UIL) (www.uil.utexas.edu/)
- Texas Math and Science Coaches Association (TMSCA) (www.tmsca.org)
- RAM Materials – by Leo Ramirez (www.rammaterials.com)
- AMT Test Writing Service by Andy Zapata (adzapata74@gmail.com)
- Hexco – Linda Terrant (<http://www.hexco.com>)
- Bryan Heath Number Sense Tricks (bryanheath.com)

Computer Software

- Number Sense Computerized – by Larry White (texasmath@centex.net)
- UIL Number Sense Mental Math Mentor (<http://www.hexco.com>)

Websites

- UIL - www.uil.utexas.edu
- TMSCA – www.tmsca.org
- Dr. Numsen - www.academicmeet.com
- Math Forum - www.mathforum.org
- Virtual Challenge Meet - www.virtualchallengemeets.com
- Bryan Heath Number Sense Tricks (bryanheath.com)
- Number Dojo - by Jonathan Cluff (<http://www.numberdojo.com/>)

Practice Tips

Speed and accuracy comes from increased knowledge and practice not from taking tests!

- 1. Create note card rings** --- have 3x5, 4x6, etc. note cards available to put an example of a problem on one side and the shortcut on the other side --- create a new card as they learn each new shortcut.
- 2. Knowledge** --- work on groups of 20 --- (see the sequence chart)
 - > Run off 5 practice sheets from the same test with just problem #1-20.
 - > Have the students work #1-10 on one of the practice sheets using pencil and paper or mentally. Have them write the correct answer next to their answer.
 - > Have them create an index card for any shortcuts they came across if they know one. Students should share each others shortcuts, so they can add them to their rings.
 - > Then have them circle the number of each problem that they couldn't do quickly. These are the ones that need to be looked at carefully for a possible shortcut or a quicker way to work them.
 - > Now do the same 10 problems on another one of the practice sheets using pencil and paper or mentally. They can use their cards if needed. If they needed to use their cards have them mark that problem with a big C over the number. Any problem with a big C or any problem missed needs to be looked over again carefully.
 - > Now have them do the same 10 problems on another practice sheet without paper, just mentally and time them. They should skip the slower ones and come back to them after doing the faster ones. Have them write down how long it took them to complete the 10 problems. They should create 3 or more similar practice problems for the ones they missed. They can share each other's practice problems.
 - > They should do #1-10 on the 4th practice sheet and the 5th practice sheet. Be sure they write down how long it took them to do each set.
 - > Go through the same process on #11-20 as they did above with #1-10.

Note: After completing all of this the students should be familiar with several shortcuts, have a good start on their index card rings, and have a good sense of what it takes to work the first 20 problems.

What's next: Run off several more practice sheets with problem #1-20 only. Use an elementary test, a junior high test, and a couple of different high school SAC tests. Have them take each of them, writing down the time on each one. Go through the process of creating a card for any new shortcuts and discuss any slow problems.

- 3. Speed** --- make copies of #1-20 from elementary test, a junior high test, and a SAC test.
 - > Give them 10 minutes to work as many as they can on the elementary test. It is okay for them to skip and come back if they have any time left. When finished have them put the correct answer next to their answer. Discuss any slow problems and make any new cards. Give them 5 points for each correct answer and deduct 4 points for each wrong answer or skipped problem. Repeat for the junior high test and the SAC test.
 - > Do the same as above with the same 3 tests except this time have them start with #11 instead of #1.

Repeating the process: The same process above should be used for #21-40 when the students have become comfortable with #1-20.

Test Taking Tips

1. **Warming up** --- Students should warm up before taking a test in competition. Elementary tests are good warm ups because they help build confidence and creates a nice rhythm.
2. **Timers** --- It is my opinion that looking at timers during the short 10 minute test is a distraction. It breaks the rhythm and increases stress and errors when they see the time is nearly up.
3. **Goal setting** --- Test taking goals for beginners should be very basic, finish 1 problem more than the last test taken and improve the score of the last test taken by 9 points.
4. **Skip and return** --- Students should skip those problems that they don't know how to do or they think will be too slow provided they are sure they can get the next two problems correct. If they are not sure they can then they should not skip. They can return to the skipped ones if time permits.
5. **Estimations (* problems)** --- These are the most missed problems on the number sense test. Students need to practice special rounding and estimation techniques as much as possible. Their answer can be within 5% of the correct answer.
6. **Distractions** --- Students can be easily distracted by a dropped pencil, a flipped paper, the slightest noise, etc. The 10 minute period is sometimes the loudest quiet there is. A way to block out distractions is to improve their concentration level. They can do that by taking practice tests with 2 radios playing, each on a different type of music.
7. **Speed vs Accuracy** --- It is hard to predict how fast a test will be. Some tests have very little rhythm and are slow, while others are up-beat and fast. So, the key is accuracy. Students can control their accuracy. They cannot control the speed of the test.
8. **Mark-overs** --- Mark-overs, mark-outs, and erasing is not permitted. Students should not take any time to try to change a number. If a wrong number is written they should go to the next problem immediately.
9. **Pens vs Pencils** --- In my opinion, students should use standard wooden pencils. Click pencils break lead easily causing smudges and take up time being clicked to get more lead. Pens blotch possibly causing something that looks like a mark-over and causes skips in the number. Students try to fill in the skip, again causing a possible mark-over.

Number Sense -- Helpful Hints

***** The following hints are just a drop in the bucket of ideas to help with number sense teams. The list of ideas is endless. Every coach and every team have their own ideas and techniques to use. *****

Index cards -- Have students create a "3x5 card" ring or a 3x5 file box. Put one shortcut and example on each card. Connect the cards with a large ring or put them in a small file box. GREAT FOR CARRYING TO CONTESTS FOR PRETEST PRACTICE!!!

Bulletin boards -- Make a bulletin board that contains information about upcoming events, results of past events, shortcuts, scholarship information, and messages. VISIBILITY IS A KEY TO SUCCESS AND A MOTIVATION FOR ASPIRING STUDENTS!!!

Honor board -- This board contains pictures and data about each of the past members, present members, and (some) future members. Data included should be past/current results, achievements, scholarships received, college attending, profession, etc. VISIBILITY, ONCE AGAIN, IS A GREAT MOTIVATOR!!!

Snapshot folder -- Create a folder of snapshots taken at practice meets and UIL meets including pictures of participants, trophies, good times, etc. PICTURES OF STUDENTS HAVING A GOOD TIME AND DOING SPECIAL THINGS ARE IMPORTANT AND A GREAT MOTIVATOR!!!

Shortcut folders -- Be sure to create a folders containing examples of shortcuts and shortcut practice sheets. AVAILABILITY OF MATERIALS WHEN YOU ARE NOT AVAILABLE IS ANOTHER KEY TO SUCCESS!!!

Practice tests -- Have many different types (UIL, TMSCA, etc.) and levels (elementary, middle school, and high school) of practice tests available. PRACTICE! PRACTICE! PRACTICE!

Mandatory expectations -- Students must know certain facts and be able to recall them immediately. Some of the most important ones are the first 35 perfect squares, the first 15 perfect cubes, the "onesies" (percent-fraction-decimal equivalents $1/2$, $1/3$, ... , $1/10$), the square roots of 2, 3, 5, 6, 7, 8, and 10 (first 3 decimal places), and the 5 Platonic solids. THESE MEMORIZATIONS MAKE MENTAL MATH A SNAP!!!

Shortcut of the week -- Put a shortcut with an example on the corner of your chalkboard the first day of each week. Add a practice problem each day of the week. NO NEED TO DISCUSS IT. IF STUDENTS WANT TO KNOW MORE ABOUT IT THEY WILL ASK SOONER OR LATER. LET THEM INITIATE THE DESIRE TO KNOW!!!

Block practice -- Practice tests can be broken up into groups of 20 (see UIL sequence charts). If a student only reaches #17 in the allotted time, be sure they work to the next multiple of 20.
ex. time ends at #17 - draw a line under #17 - work through #20
ex. time ends at #28 - draw a line under #28 - work through #40
A GOOD RUNNER MUST RUN 110 METERS TO BE GOOD IN THE 100 METER DASH!!!

Practice first, time later -- Have the students work the first 10 problems on 10 different practice tests without timing and let them use scratch paper if needed. Then have them work the same 10 problems without scratch paper and with a timer. Record the problems correct/wrong and the time needed to finish on a chart. When they feel comfortable with these, have them do the same things on the next 10 problems. SPEED AND ACURACY COMES FROM KNOWLEDGE NOT TIMED TESTS!!!

Ideas for improving speed for more advanced students --

- > Have students start on problem #11 instead of # 1 and work as far as possible in 10 minutes. When scoring treat the first 10 they didn't work as if they got 8 correct and 2 wrong.
- > Allow students 1 minute to work as many of the first 10 as they can (allow skipping but can't go past #10). After 1 minute, allow 1 minute to do #11-20. Continue this for 5 minutes, then allow 5 minutes to go back and do the ones they skipped.
- > For the real advanced students, start on the back of the test and work to #80, then begin on #1 and work as far as possible. Score all missed, skipped, and not done as being wrong. This is good for those students who are advanced enough to complete or nearly complete the test.

THERE ARE MANY WAYS TO WORK ON SPEED. THE KEY TO SUCCESS IS "WORK"!!!

Practice missed problems -- Students need to create and work at least 5 problems similar to each one they miss on a practice test or a competition test. You can make a folder of these problems for future use. PRACTICE WHAT THEY DON'T KNOW, NOT WHAT THEY DO KNOW!!!

Attending practice meets -- Require students to turn in a certain number of practice tests in order for them to earn the right to attend practice meets. Inform them of which tests they must take, grade, and turn in before they will be allowed to travel to meets. STUDENTS NEED TO EARN THE CHANCE TO GO TO COMPETITIONS AND MUST BE PREPARED. ONLY "WORKERS" ARE ALLOWED TO TRAVEL!!!

Shortcuts everywhere -- Students need to find uses for their shortcuts on their regular class assignments, on calculator and math tests, and in everyday life (15% tip - use the 1 1/2 shortcut). THE MORE USEFUL THE SHORTCUT THE MORE DESIRE TO LEARN IT AND REMEMBER IT!!!

Goal setting -- Students need to set various types of goals including: daily goals; early competition goals; improving the number of worked problems goals; acceptable scoring goals; wishful goals; ultimate goals. WINNING CHAMPIONSHIPS AND FIRST PLACE MEDALS CANNOT HAPPEN FOR EVERYONE. REACHING GOALS AND FEELING A SENSE OF SUCCESS CAN!!!

Concluding remarks -- Successful coaches, successful teams, successful students do not become that way due to some magical formula. The amount of success can be determined by the amount of hard work and practice that has been applied. However, do not forget to add in some fun, some adventure, some love, and some hugs. IN THE END THEY MAY NOT BE STATE CHAMPIONS, BUT THEY WILL BE YOUR CHAMPIONS AND THEY WILL ALWAYS REMEMBER!!!!!!!!!!!!

Problem Sequencing
UIL High School Number Sense Test

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Problem 1 - 20 *

- 1) Addition, subtraction, multiplication, & division of Integers, Mixed Numbers, Fractions, and Decimals
- 2) Order of Operations
- 3) Use of the Distributive Property
- 4) Comparison of Fractions and Decimals
- 5) Multiplication Short-Cuts
- 6) Squaring Numbers
- 7) Conversion Problems (either way):
Percent/Fractions, English/Metric,
Roman Numerals/Arabic Numerals,
Measurement units
(length, weight, capacity, time)
- 8) Greatest Common Divisor (GCD) and
Least Common Multiple (LCM)
- 9) Percent Problems
- 10) Mean, Median, & Mode
- 11) Sums of Integers
- 12) Remainder Problems
- 13) Consumer Type Problems
- 14) Number Theory Problems Involving:
Prime Numbers, Divisors, Sums of Divisors, etc.

Problems 21 - 40 *

- 1) Powers of Numbers
- 2) Substitution
- 3) Word Problems
- 4) Inverses
- 5) Absolute Value
- 6) Ratio/Proportion
- 7) Square Roots/Cube Roots
- 8) Sets
- 9) Base System Conversion Problems
- 10) Solving Simple Equations
- 11) Systems of Equations
- 12) Repeating Decimals to Fractions
- 13) More Remainder Type Problems
- 14) Perimeter & Area of Polygons and Circles
- 15) Sequences
- 16) Quadratic & Cubic Equation Problems

Problems 41 - 60 *

- 1) Laws of Exponents
- 2) Right Triangle Problems
- 3) Coordinate Geometry Problems
- 4) Regular Polygon Problems
- 5) Inequalities
- 6) Applications of Theorems from Geometry
- 7) Direct and Inverse Variation
- 8) Sequences & Series (Finite & Infinite)
- 9) Complex Numbers
- 10) Logarithms & Logarithmic Equations
- 11) Factorials, Permutations, & Combinations
- 12) Probability/Odds
- 13) Conics
- 14) Binomial Theorem (Expansion)
- 15) Base System Problems Using Operations
- 16) Roots of equations
- 17) Polygonal numbers

Problems 61 - 70 *

- 1) Volume & Surface Area
- 2) Greatest Integer
- 3) Application of Remainder Theorem
- 4) Trigonometry
- 5) Determinants
- 6) Matrices
- 7) Vectors
- 8) Composite Functions
- 9) Bases Involving Decimals or Fractions
- 10) Polar/Rectangular Coordinates

Problems 71 -80 *

- 1) Function domains and ranges
- 2) Modular Arithmetic
- 3) Limits
- 4) Derivatives
- 5) Slopes of Tangent Lines
- 6) Horizontal & Vertical Asymptotes
- 7) Determining Critical Values
- 8) Maximum & Minimum Problems
- 9) Definite Integration
- 10) Inverse functions

* A type of problem from a particular section could appear later in the test.
Example: A base problem could appear as problem #55, but should not appear earlier than problem #21.

Integrating the

UIL Number Sense Contest

into the

Classroom Curriculum

??? How – When – What - Where – Why ???

The problems on the UIL number sense contest are based on the concepts from the state's math curriculum and sequenced according to the UIL number sense sequence chart. The problems cover a wide range of topics from basic arithmetic to beginning calculus. The problems found on the test can be very beneficial for all students in the regular classroom, not just for those students involved in UIL competition. I used number sense problems in my regular classroom for years. I saw the value it held for all of my students. The following are some things I would like to share with you about integrating number sense into the regular classroom. If you would like more in-depth information on any of these, feel free to contact me. I will be happy to help you integrate some or all of these things into your regular classroom. --- Larry White

- **TEKS:** The number sense contest, as well as most of the other UIL academic contests, were, recently, correlated to the Texas Essential Knowledge and Skills. The contest complements the curriculum, enhances learning, and improves test taking skills.
(see http://www.uil.utexas.edu/academics/TEKS_support.html)
- **TAKS:** All students can work on the number sense problems to help them review skills needed for the TAKS test. Students in the classroom do not have to apply the UIL rules for competition. Letting them work problems with pencil and paper without timing issues gives the students a chance to practice needed skills for TAKS and all math classes.
- **Number Sense Shortcuts:** These are referred to many times as “math tricks”. There are no such things as “tricks” in mathematics. The shortcuts students learn are based on math facts and concepts and can be proven mathematically and/or by patterns. Students involved in UIL competitions must learn the shortcuts in order to compete, since it is a 10-minute timed test. Students in the classroom do not have to learn the shortcuts since they can use scratch paper to work out the problems and are not under time constraints. However, demonstrating the shortcuts and explaining why they work will get the students' attention. Students find shortcuts exciting and fun. As they learn the basic shortcuts they will become inquisitive about shortcuts for other problems.
- **Mental Thinking:** Students working these problems and learning shortcuts will improve their mental abilities. They will become more confident in solving problems. They will improve their ability to “think on their feet” quickly and with confidence. They will “stretch” their mental capabilities by being able to hold more data in their heads and be able to perform multiple tasks at the same time. They will improve their estimating skills and improve their ability to recognize answers as being reasonable or not.
- **Diamond in the Rough:** Finding students to compete in UIL competitions isn't always easy. Students don't believe they can do UIL. One never knows when a student in the regular classroom will become excited about number sense and want to join the team.
- **Sponge Activity:** Having number sense tests or worksheets available provides great sponge activities and time fillers for those students who finish their classroom work early. Students can be given extra credit points for problems worked. The points can be used to improve a bad grade on a daily assignment or for some other purpose.

- **Self Motivation:** Students working on number sense will become better self-motivators. They can work alone or in groups. They can do research on math topics and shortcuts they don't know, making use of multiple Internet sites and resources.
- **Classroom Competition:** Hold a class competition once a week or whenever time permits. It can be a 3, 5, 10, ... minute competition, whatever time is available. Let the students use scratch paper, erase, scratch out, mark over, skip problems, Give them 5 points for each correct answer and subtract 4 points for each incorrect answer. Don't penalize for skipping. Points can be use for extra credit or some other purpose. Design a classroom bulletin board for the competitions.
- **Class Bulletin Board:** Divide the board into four parts. One part for each of the following.
 - Each time you have a class competition put the pictures of the 5 students who score the highest on one part of the board called the "King/Queen and their Court" or whatever you want to name it.
 - Put the top 5 scores on the Class Record Score part of the board.
 - Put a shortcut of the week on one part with a few examples.
 - Put a challenge problem on the fourth part of the board. This could be a problem they have not learned yet.
- **Grade Level Competition:** Hold competitions with other classes in the same grade level, using the same procedures as the classroom competition. Create a hall bulletin board.
- **School competition:** Hold competitions between grade levels, grades 3-4, grades 5-6, grades 7-8, and grades 9-12. Use the same procedures as the classroom competition. Create a school bulletin board.

How do I find the time with everything else to do?

There is always a few minutes somewhere that can be used without taking away from the regular class work. Holding mini-competitions will give the students a chance to shine and show their stuff. Teaching shortcuts can be done via the bulletin board or some other method. The shortcuts can be used to introduce a new topic or used as a Monday classroom eye-opener. Students will teach themselves shortcuts by having number sense tests and worksheets available for sponge activities and/or will learn to become dependent on them selves to do research on the Internet or use other resources. Some students will become inquisitive and will want to spend a little time asking the teacher for help or working with other students.

Provide the materials, provide the resources, provide the opportunity, and perhaps a "diamond in the rough" will rise to the top. Whatever happens, all students can and will benefit from the experience.