

# Number Sense

Every day, individuals are called upon to use their ability to make quick mental calculations to make decisions. The development of such abilities is an integral part of the math curriculum.

## Section I450: NUMBER SENSE

### (a) REPRESENTATION.

- (1) *Contestants.* Students in the fourth, fifth, sixth, seventh and eighth grades who are eligible under Sections I400 and I405 may enter this contest.
- (2) *Divisions.* This contest will consist of two divisions, one for students in grades 4, 5 and 6 and one for students in grades 7 and 8, unless the district executive committee approves separate divisions for each grade.
- (3) *Individual Competition.* For each division, each participant school may enter as many as three contestants in the district meet.
- (4) *Team Competition.* If the district has elected to include team competition, the combined scores of the three contestants in each division from a school shall constitute the school's team score. A team must have three contestants compete to participate in the team competition.

### (b) NATURE OF THE CONTEST.

- (1) *Summary.* Individuals are called upon every day to use their ability to make quick mental calculations to make decisions. The development of such abilities should be an integral part of the math curriculum. Concepts covered include, but are not limited to: addition, subtraction, multiplication, division, proportions, and use of mathematical notation.

- (2) *Contest Format.* Students will be given a 10-minute, fill-in-the-blank test which they shall complete without doing calculations on paper or on a calculator. Erasures, mark-overs and mark-outs are not permitted.
- (3) *Test.* The test will cover basic arithmetic and mathematical functions in grades four through six. Another test for the junior high level will include algebra, geometry and number theory.

### (c) CONTEST ADMINISTRATION.

- (1) *Personnel.* All personnel in this contest may be coaches of participating students.
  - (A) *Contest Director.* The contest director will be in charge of running the contest and resolving any problems that arise. The director may appoint an assistant director.
  - (B) *Graders.* At least three graders should be familiar with the instructions for grading and the contest rules. The contest director may recruit more than three graders.
- (2) *Time Allotted for Contest.* Ten minutes are allowed for the contest.



- (3) *Materials.*
  - (A) *Provided by UIL.* The following materials will be provided to schools submitting the appropriate requisitions. See Section 1408 (c) for the dates when invitational materials will be available. See Section 1408 (e) for the dates when district materials will be available.
    - (i) Tests.
    - (ii) Answer key.
    - (iii) Contest rosters.
  - (B) *Provided by the School or Student.* Pencils or pens.
  - (C) *Other.* No other materials or notes may be used in the contest.
- (d) **CONDUCTING THE CONTEST.**
  - (1) *Number Contestants.* The contest director shall number the folded sheets and keep notes of the name and school of each contestant.
  - (2) *Clear Room.* Contestants and coaches should be informed of the time and place of the verification period. Spectators and coaches not assigned a specific duty in administering the contest should be dismissed from the contest room before the contest begins.
  - (3) *Distribute Tests.* Place the folded test sheets on the writing surface in front of each contestant. Instruct contestants not to handle or unfold the test sheets until the signal is given for the contest to begin. Instruct contestants to write their answers in the blank immediately following the problem without attempting to solve the problem on paper, in accordance with instructions on the test sheet. This is a test in mental mathematics, and only the results of calculations arrived at without the use of pencil and paper should be accepted. The director of the contest should disqualify a contestant for violating these instructions.
  - (4) *Signal to Stop.* After exactly 10 minutes, give the stop signal. Instruct contestants to rise and fold the test sheet and be ready to deliver it to the person designated to collect the sheets.
  - (5) *Collect Tests.* Collect all tests immediately.
- (e) **GRADING.**
  - (1) *Briefing Graders.* Brief graders on procedure to be used for grading and explain the scoring process.
  - (2) *Scoring.* Each test should be independently scored twice, and papers contending to place should be scored a third or fourth time as needed. Award five points for each problem solved correctly. Deduct four points for each problem not solved correctly and for each problem skipped. No deduction is taken for problems after the last problem attempted. An illegible figure constitutes an incorrect answer. The contest director, with the assistance of graders, may determine whether a figure is legible.
    - (A) *Fractions.* All fractions in test papers must be reduced to lowest terms. Improper fractions are permitted. Decimal answers are permitted for those unstarred problems whose answers are exactly expressible as decimals. For example,  $\frac{1}{2}$ ,  $1\frac{1}{2}$ , and 1.5 are all acceptable. Starred problems on the test sheets require approximate integral answers, i.e., they permit 5% error; unstarred problems require exact answers.
    - (B) *Symbols.* Symbols such as  $^{\circ}$  and % are usually printed on the sheet. Therefore, answers require only the writing of numerals. If a symbol is omitted from the printed sheet, it is not the responsibility of the contestant to make sure the answer is complete. If



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- not printed, the student need not include it in the answer.
- (C) *Exception for Dollars and Cents.* In agreement with the philosophy that answers should be complete, all dollars and cents problems must have complete answers. That is, twenty-three dollars must be written as \$23.00 (with \$ and .00). Sixteen cents must be written as \$.16 or 16¢, depending on the answer blank format.
- (D) *Efficient Forms.* Numerical answers should be written so that the answers are complete as in the two examples above. However, the answer should be written in the most efficient form possible. For example, if the answer is 16, the written answer 16.000 is not acceptable for the purposes of the number sense competition. Extraneous zeroes are not to be used. For example, if .16 is the answer, 0.16 is not an acceptable format.
- (E) *Exponentials.* An answer such as  $3 \times 10^3$  should be expressed as 3000 and not left in exponential form.
- (3) *Ties.* Ties are not to be broken in either individual or team competition. If there is a tie for first place, there is no second place. If there is a tie for second place, there is no third place, etc.
- (4) *Points.* Individual points are awarded through sixth place. Team points are awarded through third place. See Section 1408 (i). Tied individuals or teams split the total points equally for the two or more places in which a tie exists.
- (f) **VERIFICATION PERIOD.** Contestants and coaches shall be given a period not to exceed 15 minutes to examine their test papers with official keys. Unofficial results should be posted. Questions should be directed to the contest director, whose decision will be final.
- (g) **OFFICIAL RESULTS.** After the verification period has ended and all test papers have been collected, the contest director shall announce the official results. Official results, once announced, are final.
- (h) **RETURNING MATERIALS.** No materials from the fall/winter district contest may be returned to contestants before January 31. No materials from the spring district contest may be returned to contestants before the Saturday prior to Memorial Day.

## Problem Sequencing Elementary Number Sense Test

### Problem 1 - 20\*

1. Addition, subtraction, multiplication, & division of whole numbers
2. Recognizing place value
3. Rounding off whole numbers
4. Multiplication short-cuts
5. Remainder type problems
6. Even & odd number type problems
7. Expanded notation
8. Sums of whole numbers
9. Roman numerals/arabic numbers

### Problems 21 - 40

1. Addition/subtraction of fractions with common denominators
2. Addition, subtraction, multiplication, & division of decimal fractions
3. Comparing decimal fractions & common fractions
4. Conversion problems (either way): fraction/decimal, percent/fraction, percent/decimal
5. Order of operations
6. More multiplication short-cuts
7. Ratio/proportion
8. Consumer type problems
9. Problems about prime numbers
10. Greatest common divisor (gcd) & least common multiple (lcm)
11. Conversion problems (either way): length, weight, volume

### Problems 41 - 60

1. Addition, subtraction, multiplication & division of fractions and mixed numbers
2. Substitution problems
3. Perimeter/area of: square, rectangle, triangle
4. Radius/diameter of a circle
5. Powers & roots of numbers
6. Solving simple equations
7. Sequences
8. Sets
9. Word problems
10. Volume of cube/rectangular box
11. Right triangle problems
12. More multiplication short-cuts
13. Base systems

### Problems 61 - 80

1. Addition, subtraction, multiplication & division of integers
2. Inverses
3. Basic geometry facts
4. More area problems
5. Squaring two-digit numbers
6. More multiplication short-cuts
7. Powers of numbers
8. More consumer type problems
9. Inequalities
10. Probability
11. More area problems: parallelogram, rhombus, trapezoid
12. Coordinate geometry - number line
13. More percent type problems

## Problem Sequencing Junior High Number Sense Test

### Problems 1 - 20\*

1. Addition, subtraction, multiplication & division of whole numbers, fractions, and decimals
2. Order of operations
3. Use of the distributive property
4. Comparison of fractions & decimals
5. Multiplication short-cuts
6. Squaring numbers
7. Roman numerals/arabic numbers
8. Mean, median, mode
9. Sums of whole numbers

### Problems 21 - 40

1. Addition, subtraction, multiplication & division of mixed numbers and integers
2. More multiplication short-cuts
3. Percent problems
4. Conversion problems (either way): English/metric, length, area, capacity, time
5. Consumer type problems
6. Substitution problems
7. Solving simple equations
8. Square roots/cube roots
9. Greatest common divisor (gcd) & least common multiple (lcm)
10. Number theory - prime numbers and divisors
11. Perimeter/area of: square, rectangle, circle
12. Ratio/proportion
13. Inverses

### Problems 41 - 60

1. Sets
2. Word problems
3. Pythagorean theorem
4. Sequences
5. Volume/surface area of rectangular solid/cube
6. Base systems
7. Area of: parallelogram, rhombus, trapezoid, circle
8. Solving inequalities
9. Basic geometry facts
10. Remainder problems

### Problems 61 - 80

1. Repeating decimals
2. More number theory
3. Powers of numbers
4. Volume of: circular cylinder, cone, sphere
5. Sequences & series
6. Multiplication of 101, 111
7. Factorial
8. Coordinate geometry
9. Probability
10. More percent type problems
11. More remainder type problems
12. More multiplication short-cuts



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\*A type of problem from a particular section could appear later in the test. For example, a GCD problem could appear as problem #43, but not any earlier than problem #21.



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# Sample Number Sense Test

**These sample test questions are from the 2010-11 Fall/Winter Test, grades 4-6. They are meant only to show the form of the test. Actual copies of Number Sense tests are available as part of the study materials booklets.**

University Interscholastic League  
2010-2011 Elementary Number Sense Test B

Contestant's Number \_\_\_\_\_

Read Directions Carefully  
Before Beginning Test

Do Not Unfold This Sheet  
Until Told to Begin

Final \_\_\_\_\_  
2<sup>nd</sup> \_\_\_\_\_  
1<sup>st</sup> \_\_\_\_\_  
Score \_\_\_\_\_ Initials \_\_\_\_\_

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!**

### Answer Key

- (1) 4019
- (2) 322
- (3) 300
- (4) 5
- (5) 68
- (6) 1400
- (7) 207
- (8) 563
- (9) 348.8
- \*(10) 2205 - 2437
- (11) 6.304; 6  
38/125
- (12) 5
- (13) 1850
- (14) 192
- (15) 47
- (16) 128
- (17) 836
- (18) 384
- (19) 64
- \*(20) 18970 -  
20966
- (21)  $\frac{3}{4}$ ; .75
- (22) 47
- (23) 5525
- (24) 361
- (25) 22
- (26) .12
- (27) 3596
- (28)  $\frac{2}{5}$ ; .4
- (29)  $\frac{1}{3}$
- \*(30) 381 - 420
- (31) 30.6;  $30\frac{3}{5}$
- (32) 45
- (33)  $\frac{8}{11}$
- (34)  $\frac{21}{25}$
- (35)  $\frac{9}{20}$ ; .45
- (36) 6969

- (1)  $2009 + 2010 =$  \_\_\_\_\_
- (2)  $446 - 124 =$  \_\_\_\_\_
- (3)  $10 \times 6 \times 5 =$  \_\_\_\_\_
- (4) The numeral in the thousandth's place for  
8730.2156 is \_\_\_\_\_
- (5)  $17 \times 4 =$  \_\_\_\_\_
- (6)  $56 \times 25 =$  \_\_\_\_\_
- (7)  $621 \div 3 =$  \_\_\_\_\_
- (8)  $476 + 87 =$  \_\_\_\_\_
- (9) 348.765 rounded to the tenth's place is \_\_\_\_\_
- \*(10)  $290 + 2010 + 21 =$  \_\_\_\_\_
- (11)  $6 \times 10^0 + 3 \times 10^{-1} + 4 \times 10^{-3} =$  \_\_\_\_\_
- (12) 3461  $\div$  9 has a remainder of \_\_\_\_\_
- (13)  $37 \times 50 =$  \_\_\_\_\_
- (14) A dozen packages of bolts with each package  
containing 16 bolts = \_\_\_\_\_ bolts
- (15) XLVII = \_\_\_\_\_ (Arabic number)
- (16)  $16 \times 8 =$  \_\_\_\_\_
- (17)  $76 \times 11 =$  \_\_\_\_\_
- (18)  $2 \times 4 \times 6 \times 8 =$  \_\_\_\_\_
- (19)  $13 + 15 + 17 + 19 =$  \_\_\_\_\_
- \*(20)  $624 \times 32 =$  \_\_\_\_\_
- (21)  $\frac{7}{24} + \frac{11}{24} =$  \_\_\_\_\_
- (22) What is the largest prime number less than 50? \_\_\_\_\_
- (23)  $65 \times 85 =$  \_\_\_\_\_
- (24)  $19 \times 19 =$  \_\_\_\_\_
- (25)  $20 + 10 \div 5 =$  \_\_\_\_\_
- (26) If 32 crayons cost \$3.84, then each crayon costs  
\$ \_\_\_\_\_
- (27)  $58 \times 62 =$  \_\_\_\_\_
- (28)  $\frac{4}{15} \times \frac{3}{2} =$  \_\_\_\_\_
- (29)  $\frac{19}{24} - \frac{11}{24} =$  \_\_\_\_\_
- \*(30)  $2497 \div 6.24 =$  \_\_\_\_\_
- (31) 3060 centimeters = \_\_\_\_\_ meters
- (32) 4 is to 9 as 20 is to \_\_\_\_\_
- (33) Which is smaller  $\frac{8}{11}$  or  $\frac{3}{4}$ ? \_\_\_\_\_
- (34) 84% = \_\_\_\_\_ (fraction)
- (35)  $\frac{9}{16} \div \frac{5}{4} =$  \_\_\_\_\_
- (36)  $101 \times 69 =$  \_\_\_\_\_

# Sample Number Sense Test

University Interscholastic League  
2010 – 2011 Junior High Number Sense Test C

Contestant's Number \_\_\_\_\_

Final \_\_\_\_\_  
2<sup>nd</sup> \_\_\_\_\_  
1<sup>st</sup> \_\_\_\_\_  
Score \_\_\_\_\_ Initials \_\_\_\_\_

Read Directions Carefully  
Before Beginning Test

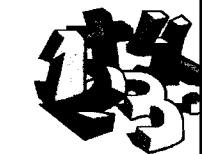
Do Not Unfold This Sheet  
Until Told to Begin

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)  $(5)(2011) - 2011 =$  \_\_\_\_\_
- (2)  $16 + (-24) + 5 =$  \_\_\_\_\_
- (3)  $25 \times 18 =$  \_\_\_\_\_
- (4)  $2011 + 211 =$  \_\_\_\_\_
- (5)  $2010 \div 6 =$  \_\_\_\_\_
- (6)  $2 + 4 + 6 + \dots + 16 =$  \_\_\_\_\_
- (7)  $\frac{8}{15} \times \frac{9}{16} =$  \_\_\_\_\_
- (8)  $4\frac{1}{5} \times 1\frac{3}{7} =$  \_\_\_\_\_
- (9)  $4.5 \div 60 =$  \_\_\_\_\_
- \*(10)  $2010 \times 166 =$  \_\_\_\_\_
- (11)  $18 \div .375 =$  \_\_\_\_\_
- (12) The mean of 18, 15, 24 and 20 is \_\_\_\_\_
- (13)  $8.15 + 3.55 + 4 =$  \_\_\_\_\_ (decimal)
- (14) Which is larger,  $\frac{7}{11}$  or  $\frac{5}{8}$ ? \_\_\_\_\_
- (15)  $14^2 =$  \_\_\_\_\_
- (16) CMLI = \_\_\_\_\_ (Arabic number)
- (17)  $16 \times 12\frac{1}{2} =$  \_\_\_\_\_
- (18)  $3234 \div 11 =$  \_\_\_\_\_

- (19)  $\frac{29}{24} - \frac{5}{8} =$  \_\_\_\_\_
- \*(20)  $188 \times 158 =$  \_\_\_\_\_
- (21)  $68 \times 72 =$  \_\_\_\_\_
- (22)  $15 \times 1\frac{2}{3} =$  \_\_\_\_\_
- (23)  $5\frac{1}{6} \times 5\frac{5}{6} =$  \_\_\_\_\_ (mixed number)
- (24)  $35 \times 85 =$  \_\_\_\_\_
- (25)  $3\frac{1}{4}$  square feet = \_\_\_\_\_ in<sup>2</sup>
- (26)  $7\frac{1}{2}\% =$  \_\_\_\_\_ (fraction)
- (27) If  $3n - 8 = 28$ , then  $n =$  \_\_\_\_\_
- (28)  $93 \times 94 =$  \_\_\_\_\_
- (29)  $\sqrt{1936} =$  \_\_\_\_\_
- \*(30)  $42\frac{6}{7} \times 698 =$  \_\_\_\_\_
- (31) What is the sum of the unique prime factors of 42? \_\_\_\_\_
- (32) 9 is 15 as 15 is to \_\_\_\_\_
- (33) Eleven caps that cost \$8.95 each = \$ \_\_\_\_\_
- (34) The least common multiple of 18 and 27 is \_\_\_\_\_



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These sample test questions are from the 2010-11 Spring District Test, grades 7-8. They are meant only to show the form of the test. Actual copies of Number Sense tests are available as part of the study materials booklets.

## Answer Key

- (1) 8044
- (2) -3
- (3) 450
- (4) 2222
- (5) 335
- (6) 72
- (7)  $\frac{3}{10}$ ; .3
- (8) 6
- (9)  $\frac{3}{40}$ ; .075
- \*(10) 316977 - 350343
- (11) 48
- (12)  $19\frac{1}{4}$ ; 19.25;  $77\frac{1}{4}$
- (13) 15.7
- (14)  $\frac{7}{11}$
- (15) 196
- (16) 951
- (17) 200
- (18) 294
- (19)  $\frac{7}{12}$
- \*(20) 28219 - 31189
- (21) 4896
- (22) 25
- (23)  $30\frac{5}{36}$
- (24) 2975
- (25) 468
- (26)  $\frac{3}{40}$
- (27) 12
- (28) 8742
- (29) 44
- \*(30) 28419 - 31410
- (31) 12
- (32) 25
- (33) 98.45
- (34) 54