



Making

Sense

With

Numbers

Andy Zapata

Azle High School

# Andy Zapata

- Azle Junior High → 1974 – 1982
- Azle High School → 1982 – Present
- Married (4 children)
- 1 granddaughter & 1 grandson
- Co-founder TMSCA (1981)
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# UIL Elem & JH Number Sense

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.



# UIL EJJ Number Sense

Students will be given a 10-minute, fill-in-the-blank test which they must complete without doing calculations on paper or on a calculator. Erasures and mark-outs are not permitted.

Every tenth problem is an estimation problem with an integral answer and a 5% range of the answer.



# Elementary Problem Guidelines

## **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



# Elementary Problem Guidelines

## **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



# Elementary Problem Guidelines

## **Problems 21 – 40 (Continued)**

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



# Elementary Problem Guidelines

## **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





# Elementary Problem Guidelines

## **Problems 41 – 60 (Continued)**

- 11. Right triangle problems
- 12. More multiplication short-cuts
- 13. Base systems



# Elementary Problem Guidelines

## **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



# Elementary Problem Guidelines

## **Problems 61 – 80 (Continued)**

- 10. Probability
- 11. More area problems: parallelogram, rhombus, trapezoid
- 12. Coordinate geometry - number line
- 13. More percent type problems



# Junior High Problem Guidelines

## **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



# Junior High Problem Guidelines

## **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



# Junior High Problem Guidelines

## **Problems 21 – 40 (Continued)**

- 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



# Junior High Problem Guidelines

## **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



# Junior High Problem Guidelines

## **Problems 41 – 60 (Continued)**

- 8. Solving inequalities
- 9. Basic geometry facts
- 10. Remainder problems





# Junior High Problem Guidelines

## **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



# Junior High Problem Guidelines

## **Problems 61 – 80 (Continued)**

- 10. More percent type problems
- 11. More remainder type problems
- 12. More multiplication short-cuts

# Problems

(1)  $25 \times 8 =$  \_\_\_\_\_

$$8 \div 4 = 2$$

$$2 \times 100 =$$

**200**

# Problems

(2)  $75 \times 23 =$  \_\_\_\_\_

$$23 \div 4 = 5.75$$

$$5.75 \times 300$$

$$75 = \frac{300}{4}$$

**1725**

# Problems

(3) XXIX = \_\_\_\_\_ Arabic Number

M = 1000; D = 500; C = 100; L = 50;  
X = 10; V = 5; I = 1

XXIX = 20 + 9

**= 29**

# Problems

(4)  $\frac{11}{8} - \frac{5}{8} =$  \_\_\_\_\_(fraction)

$$\frac{6}{8}$$

$$\frac{6}{8} \div \frac{2}{2}$$

$$\boxed{\frac{3}{4}}$$

# Problems

(5)  $24 \times 26 =$  \_\_\_\_\_

Since  $26 = 25 + 1$  and

$$24 = 25 - 1$$

$$24 \times 26 = (25 + 1)(25 - 1)$$

$$24 \times 26 = 25^2 - 1^2$$

$$24 \times 26 = 625 - 1$$

**624**

# Problems

(6)  $24 \times 26 = \underline{\hspace{2cm}}$  (Another Way)  $\underline{\hspace{2cm}}$

Since ten's digits are the same

And one's digits add up to 10

$4 \times 6 = 24$  – write this down  $\underline{\hspace{1cm}}24$

$2 \times (2 + 1) = 6$  – write this down for  
the finished answer

**624**



# Problems

(7)  $24 \times 26 = \underline{\hspace{2cm}}$  (Still Another Way)  $\underline{\hspace{2cm}}$

$4 \times 6 = 24$  – write down 4 and  
(*LAST*) keep 2 in your memory  $\underline{\hspace{1cm}}4$

$(4 \times 2) + (2 \times 6) + 2 = 22$  – write down  
(*INNER + OUTER*) 2 and keep  $\underline{\hspace{1cm}}24$   
2 in your  
memory

$(2 \times 2) + 2 = 6$  – write this down for  
(*FIRST*) the finished answer

**624**

# Problems

(8)  $.121212\dots = \underline{\hspace{2cm}}$  (fraction)

$$.121212\dots = \frac{12}{99}$$

$$\frac{12}{99} \div \frac{3}{3}$$

$$\frac{4}{33}$$

# Problems

$$(9) \quad 1 + 2 + 3 + \dots + 9 = \underline{\hspace{2cm}}$$

$$1 + 2 + 3 + \dots + n = \frac{n(n+1)}{2}$$

$$\text{SUM} = \frac{\cancel{9}(9+1)}{2} \quad \mathbf{45}$$

**Note: You should know the formulas for sums of odd and even integers also !**

# Problems

(10)  $14 + 17 + 20 + 23 + 26 = \underline{\hspace{2cm}}$

For sums of equally spaced numbers, multiply the **median** of the numbers by the number of terms.

$$\text{SUM} = 20 \times 5$$

**100**

# Problems

(11)  $21 + 24 + 27 + 30 =$  \_\_\_\_\_

For sums of equally spaced numbers, multiply the **median** of the numbers by the number of terms.

$$\text{SUM} = 25\frac{1}{2} \times 4$$

**102**

# Problems

**(12)**  $4\frac{1}{3} \times 4\frac{2}{3} = \underline{\hspace{2cm}}$  (mixed number)

$$\frac{1}{3} \times \frac{2}{3} = \frac{2}{9}$$

Write this down

$$20\frac{2}{9}$$

$$4 \times (4 + 1) = 20 \text{ Write this down}$$

$$20\frac{2}{9}$$

# Problems

**(13)**  $6\frac{1}{3} \times 3\frac{1}{3} = \underline{\hspace{2cm}}$  (mixed number)

$$\frac{1}{3} \times \frac{1}{3} = \frac{1}{9}$$

Write this down

$$6 \times 3 + (6 + 3)\frac{1}{3} = 21 - \text{Write this down}$$

$$21\frac{1}{9}$$

$$21\frac{1}{9}$$

# Problems

(14) 16% of 36 is 8% of \_\_\_\_\_

In equation form  
looks like this:

$$16\% \times 36 = 8\% \times ?$$

Solving for ?  $\rightarrow$   $\frac{16\%}{8\%} \times 36 = ?$

$$\frac{2}{1} \times 36 = ?$$

**72**



# Problems

(15) 5 base 8 + 7 base 8 = \_\_\_\_\_ base 8

$$5 + 7 = 12$$

$$12 \div 8 = 1 \text{ remainder } 4$$

Write down 4 and “carry” 1

**14**

**14**

# Problems

(16) The radius of a circle with an area of  $16\pi$  is\_\_\_\_\_

$$A = \pi r^2$$

$$r = \sqrt{\frac{16\pi}{\pi}}$$

**4**

# Problems

**(17)**  $12 \div 4 \times 3 =$  \_\_\_\_\_

$$12 \div 4 = 3$$

$$3 \times 3$$

**9**

**(18)**  $12 + 4^2 \times 3 =$  \_\_\_\_\_

$$4^2 = 16$$

$$16 \times 3 = 48$$

$$12 + 48$$

**60**

# Problems

(19)  $26 \times 86 =$  \_\_\_\_\_

Since one's digits are the same

And ten's digits add up to 10

$6 \times 6 = 36$  – write this down         36

$(2 \times 8) + 6 = 22$  – write this down for  
the finished answer

**2236**

# Problems

**(20)**  $113^2 \div 4$  has a remainder of \_\_\_\_\_

$$13 \div 4 \rightarrow \text{remainder} = 1$$

$$1^2 \div 4 = 0 + \text{remainder}$$

**1**

# Problems

**(21)**  $(13^2 + 11 \times 15) \div 7$  has a remainder of \_\_\_\_\_

$$13 \div 7 \rightarrow \text{remainder} = 6$$

$$6^2 \div 7 \rightarrow \text{remainder} = 1 \quad (1 + 4 \times 1) \div 7$$

$$11 \div 7 \rightarrow \text{remainder} = 4$$

$$15 \div 7 \rightarrow \text{remainder} = 1 \quad = 0 + \text{remainder}$$

**5**

# Problems

**(22)** How many total subsets can be made of  $\{A, U, S, T, I, N\}$ ? \_\_\_\_\_

The set has 6 elements, so the number of subsets is

$$2^6$$

**64**

# Problems

**(23)** The area of a rhombus with diagonals 17 and 20 is \_\_\_\_\_

$$\text{Area of a rhombus} = \frac{\text{diagonal(1)} \times \text{diagonal(2)}}{2}$$

$$A_{\text{rhombus}} = \frac{17 \times 20}{2}$$

**64**



# Problems

(24) What is the area of a square with diagonal 14? \_\_\_\_\_

$$\text{Area} = \frac{(\text{diagonal})^2}{2}$$

$$A = \frac{14^2}{2} \quad \mathbf{98}$$

# Problems

**(25)** What is the length of the side of an equilateral triangle with area  $9\sqrt{3}$  ?

$$\text{Area} = \frac{\text{side}^2 \sqrt{3}}{4}$$

$$\text{side} = \sqrt{\frac{4 \text{ Area}}{\sqrt{3}}}$$

$$\text{side} = \sqrt{\frac{4(9\sqrt{3})}{\sqrt{3}}}$$

**6**

# Problems

**(26)**  $91 \times 96 =$  \_\_\_\_\_

$100 - 91 = 9$  and  $100 - 96 = 4$ .

Multiply  $9 \times 4$  and write down.   
8736

Subtract 9 from 96 or 4 from 91 and write down. 

**8736**

# Problems

**(27)**  $6 \frac{3}{4} \div \frac{1}{4} = \underline{\hspace{2cm}}$

Recall  $\div \frac{1}{4}$  is same as multiplying by 4

Also recall  $6 \frac{3}{4}$  is the same as  $(6 + \frac{3}{4})$

$$(6 + \frac{3}{4}) \times 4 = 24 + 3 \quad \textbf{27}$$

# Problems

(28)  $\frac{5}{9} + \frac{9}{5} =$  \_\_\_\_\_ (mixed number)

Write down the number 2 for the whole number part of the answer

$$2 \frac{16}{45}$$

$$2 \frac{16}{45}$$

Square the difference between the numerator and denominator and place this over the product of the numerator and denominator as the fraction part of the answer.

# Problems

**(29)** 100101110 base 2 = \_\_\_\_\_base 8

Starting at the right end of the number group the digits into sets of 3 digits.

100	101	110
<b>4</b>	<b>5</b>	<b>6</b>

Convert each of the sets from base 2 to base 8 numbers and write down as final answer.

**456**

# Estimation Problems

**\*(30)**  $69 + 79 + 199 = \underline{\hspace{2cm}}$

$70 + 80 + 200$

350

**330 – 364**

# Estimation Problems

\*(31)  $624 \times 240 =$  \_\_\_\_\_

Recall  $\frac{5}{8} = .625$

$$\frac{5000}{8} \times 240 = 150\,000$$

**142 272 – 157 248**



# Estimation Problems

\*(32)  $101^2 - 99^2 =$  \_\_\_\_\_

$$(101 - 99) \times (101 + 99)$$

$$(2) \times (200)$$

$$= 400$$

$$380 - 420$$

# Estimation Problems

\*(33)  $167 \times 359 + 33 =$  \_\_\_\_\_

$$\frac{1}{6} \approx .167$$

$$\frac{1000}{6} \times 360 + 0$$

$$56\,987 - 62\,985$$

$$= 60\,000$$

# Estimation Problems

\*(34)  $269 \times 3\frac{5}{9} = \underline{\hspace{10em}}$

$$270 \times \frac{32}{9}$$

$$270 \div 9 = 30$$

$$30 \times 32 = 960$$

**909 – 1005**

# Estimation Problems

\*(35)  $\sqrt{224} \times \sqrt{325} =$  \_\_\_\_\_

Recall:  $15^2 = 225$  and  $18^2 = 324$

$$15 \times 18 = 270$$

**257 – 283**

# Estimation Problems

$$*(36) \quad 83 \frac{1}{3} \times 2390 = \underline{\hspace{2cm}}$$

$$\text{Recall: } \frac{5}{6} = .83333 \dots$$

$$\frac{500}{6} \times 2400 = 200000$$

**189209 – 209125**

# Practice Problems

(1)  $25 \times 32 =$  \_\_\_\_\_

(2)  $1 + 2 + 3 + \dots + 19 =$  \_\_\_\_\_

(3)  $97 \times 93 =$  \_\_\_\_\_

(4) What is the area of a square with diagonal 8? \_\_\_\_\_

(5)  $DCLX + IX =$  \_\_\_\_\_ (Arabic Number)

(6)  $17 \times 97 =$  \_\_\_\_\_

(7)  $113^2 \div 9$  has a remainder of \_\_\_\_\_

(8)  $77 \times 73 =$  \_\_\_\_\_

\*(9)  $119 \times 165 =$  \_\_\_\_\_

\*(10)  $119 \times 251 =$  \_\_\_\_\_

**800; 190; 9021; 32; 669; 1649; 7; 5621; 18654-20616; 28376-31362**



# Some Resources

## **AMT Test Writing Service**

- 675 Miller Rd., Azle, TX 76020
- ghzapata@gmail.com
- Phone: 817-444-3655

Offers Number Sense: *Elements of Number Sense* by Jim Cummings. Contains preparatory material for the Number Sense Contest



# Some Resources

## **D & R Enterprises**

- 1101 W. Monte Cristo Rd. West, Edinburg, TX 78541
- Phone: 956-383-0372

***No Sense in Mathematics*** (4<sup>th</sup> edition). By Don Skow





# Some Resources

## **Hexco, Inc.**

- PO Box 199, Hunt, TX 78024-0199
- 800/725-2627; Fax: 830-367-3824
- Email: [hexco@hexco.com](mailto:hexco@hexco.com) Web site: [www.hexco.com](http://www.hexco.com)

Supplies materials for Dictionary Skills, Number Sense, and Spelling contests. Offers Dictionary Skills and Spelling practice tests. Also available, Spelling Complements for each graded list containing all the dictionary work for the *A+ Spelling List* and for Word Power, plus audio tapes, spelling software and spelling rules book. For Number Sense, offers software and practice tests.



# Some Resources

## **Mental Mathematics for Number Sense**

- Frances Walzel
- 2023 CR 08, Cameron, TX 76520
- E-Mail: [walzel@vvm.com](mailto:walzel@vvm.com)

Offers 103-page booklet of problems, keys and coded pages for elementary and secondary number sense.



# Some Resources

## **MRC Jr.**

- 1024 Scenic Drive, Justin, TX 76247
- Phone: 940-648-8587; Fax: 940-648-8580
- Email: [tomcat2243@ev1.net](mailto:tomcat2243@ev1.net)

Offers study materials and tests for Maps, Graphs and Charts, Dictionary Skills, 5/6 and 7/8 Social Studies, Science I, Science II, Number Sense and Mathematics.



# Some Resources

## **Dr. Numsen/Doug Ray**

- PO Box 312578, New Braunfels, TX 78131
- Phone: (512) 797-2158; Fax: (208) 575-9617
- Email: [doug@academicmeet.com](mailto:doug@academicmeet.com)
- Web site: [www.academicmeet.com](http://www.academicmeet.com)

Provides workbooks and practice tests for elementary and junior high Number Sense, Calculator Applications and Mathematics.



# Some Resources

## **Leo Ramirez**

- 9801 W. Parmer Lane #2622, Austin, TX 78717
- Phone: (956) 491-3155 (cell)
- Email: [toywiz127@aol.com](mailto:toywiz127@aol.com)
- Website: <http://www.rammaterials.com/>

Number Sense, Calculator Applications, Mathematics, and Science Workbooks (including Number Sense: A Starter's Kit, Middle School Magic, Number Sense Magic, Revised Calculator Applications workbook), DVDs and practice tests. Mr. Ramirez is available for writing invitational meet tests and conducting workshops.



# Some Resources

## **TMSCA Test Pool**

- Texas Math/Sciences Coaches Association
- PO Box 206, Olney Texas, 76374-0206
- (940) 563-1005
- [TMSCA.org](http://TMSCA.org)

Offers study materials for math, number sense, calculator and science contests.



# Some Resources

The handbook, *Developing Middle School Number Sense Skills*, is available. It is the same edition first published in 1996. Stock #217. Cost: \$6.00.

University Interscholastic League

PO Box 8028

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512-471-5883

FAX 512-232-6471