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ABSTRACT

This publication for adult basic education (ABE)/General Educational Development program (GED) instructors contains some ideas for altering attitudes about mathematics. It provides ideas for broadening ABE/GED mathematics curricula and finding more effective ways of bridging mathematics in the GED classroom with mathematics in postsecondary training/education or the workplace. Section 1 presents a philosophy, describes what mathematics education is, and discusses changing mathematics education. Section 2 begins with a Student Bill of Rights. A paper on "A Current and (Still) Developing Mathematics Curriculum" developed at Mt. Hood Community College follows. It includes the diagnostic tests--Comprehensive Adult Student Assessment System (CASAS) and Scott-Foresman Test I Part A and Test II Part B--used to assign students to mathematics groups and Scott-Foresman correlation charts, CASAS pre/posttests and correlations charts, and GED practice tests used to monitor student progress. Lists of 11 sources/resources and of topics covered on the new KET Math Basics videotape series are provided. Section 2 concludes with a brief comment on delivery ideas regarding both students and instructors. Section 3 is a sampling of definitions, processes, worksheets, and games. Areas covered include identifying and reducing math anxiety; a mathematics-English dictionary (translations); working with word problems (continuing and applying the translations); estimation; confronting the calculator; attacking algebra; and fun and games. (YLB)

MATHEMATICS

FOR THE

90's

TOWARD A NEW PERSPECTIVE

MT. HOOD COMMUNITY COLLEGE, 26000 S.E. STARK, GRESHAM, OREGON
353 PROJECT - 1991/1992

MATHEMATICS

FOR THE

90's

TOWARD A NEW PERSPECTIVE

Mathematics is often considered a difficult and mysterious science, because of the numerous symbols which it employs. Of course, nothing is more incomprehensible than a symbolism which we do not understand. Also a symbolism, which we only partially understand and are unaccustomed to use, is difficult to follow. In exactly the same way the technical terms of any professions or trade are incomprehensible to those who have never been trained to use them. But this is not because they are difficult in themselves. On the contrary they have invariably been introduced to make things easy. So in mathematics, granted that we are giving any serious attention to mathematical ideas, the symbolism is invariably an immense simplification.

Whitehead, A.N.

Introduction to Mathematics
(New York, 1911), pp. 59-60

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ACKNOWLEDGEMENT

We would like to express our gratitude to the members of the Mt. Hood Community College Mathematics Division and to the Associate Dean of Mathematics and Physics, Pamela Matthews. Without their time and effort, patience, encouragement, and contributions, this work would not have been possible.

SECTION ONE:

AN INTRODUCTION TO NEW AND CHANGING PERSPECTIVES

INTRODUCTION

In recent years there has been a tremendous groundswell of support both within and outside of the education community to re-evaluate and redefine attitudes and approaches to mathematics. From kindergarten through adult education it is clearly becoming increasingly necessary to provide students with a better, more positive understanding of mathematics as a tool, as a language, as a method of perceiving and defining the world, rather than as an experience in frustration and failure. (Everybody Counts, National Research Council, 1989.)

Moreover, we know that America's future depends upon a better educated workforce (Jump Start, Workforce 2000, America's Choices, etc.) and that computation alone will not meet that need. John Allen Paulos, in his book Innumeracy, describes the numerical misunderstandings common in even educated people, misconceptions that disallow reasoned responses to apprehension of everyday math: polls, averages, chance occurrences, percentages, and so forth.

The style and format of the GED tests published in 1988 create the potential for instructors to help students approach mathematics in such a way. Drill and practice in simple computation are not adequate for a student to pass these tests; rather, the student must learn to analyze and apply material from written passages, restate it mathematically, and then perform the appropriate computation.

It is for us, ABE/GED instructional staff, to convince our students (and ourselves, depending on our own mathematics background) that mathematics is not about memorizing tables and formulae; it is a living, vital method of perceiving, organizing, analyzing, and simplifying information. The following pages, then, contain some ideas for altering attitudes about mathematics, broadening ABE/GED mathematics curricula, and finding more effective ways of bridging mathematics in the GED classroom with mathematics in post-secondary training/education or in the workplace.

A PHILOSOPHY

1. Students can succeed in mathematics and in general education.

2. Students should have access to calculators and other technology to empower them in their learning and to relate their learning to the way it is experienced in the workplace.

3. Students learn best in context where they can relate learning to their personal experiences. Program focus should be to motivate the learning of concepts through a broad range of applications.

4. Students should be provided the opportunity to understand concepts in order to successfully transfer knowledge. Understanding mathematic concepts replaces the emphasis on the mastery of techniques.

5. Students better retain information if they participate in the discovery of it.

Developed and adopted division - wide by the MHCC Mathematics Faculty

WHAT IS MATHEMATICS?

(Quoted from EVERYBODY COUNTS)

Mathematics is the **key to opportunity.** p.1

Mathematics **reveals hidden patterns** that help us understand the world around us. p.31

As a practical matter, mathematics is a **science of pattern and order.** p.31

Mathematics is the invisible culture of our age. p. 32

Mathematics is one way we **make sense of things.** p.43

As a science of abstract objects, mathematics **relies on logic** rather than on observation as its standard of truth. p.31

Mathematics is a natural mode of human thought, better suited to certain types of problems than to others, yet always subject to confirmation and checking with other types of analyses. **There is no place in a proper curriculum for mindless mimicry mathematics.** p.44

More than most other school subjects, mathematics offers special opportunities for children to learn the **power of thought** as distinct from the power of authority. p.4

Modern mathematics provides a powerful instrument for **understanding the world** in which we live. p.4

Mathematics today **involves far more than calculation** ; clarification of the problem, deduction of consequences, formulation of alternatives, and development of appropriate tools are as much a part of the modern mathematician's craft as are solving equations or providing answers. p.5

WHAT IS MATHEMATICS EDUCATION?

(Quoted from Everybody Counts)

Among the many subjects taught in school, mathematics is probably the most universal, depending least on a student's background and culture. p.20

Education in any discipline helps students learn to think, but education also must help students take responsibility for their thoughts. While this objective applies to all subjects, it is particularly apt in mathematics education because **mathematics is an area in which even young children can solve a problem and have confidence that the solution is correct** -- not because the teacher says it is, but because its inner logic is so clear. p.3

The **study of mathematics can help develop critical habits of mind**--to distinguish evidence from anecdote, to recognize nonsense, to understand chance, and to value proof. p.8

Experience with mathematical modes of thought builds mathematical power - - a capacity of mind of increasing value in this technological age that enables one to read critically, to identify fallacies, to detect bias, to assess risk, and to suggest alternatives. Mathematics empowers us to understand better the information - laden world in which we live. pp.31-32

Doing mathematics is much like writing. In each, the final product must express good ideas clearly and correctly, but the ideas must be present before the expression can take form. Good ideas poorly expressed can be revised to improve their form; empty ideas well expressed are not worth revising. **A mathematics curriculum that emphasizes computation and rules is like a writing curriculum that emphasizes grammar and spelling: both put the cart before the horse.** p.44

CHANGING MATHEMATICS EDUCATION

Goals for student performance are shifting from a narrow focus on routine skills to development of broad-based mathematical power.

Broad-based mathematical power refers to the students' ability to discern relationships, reason logically, and use a range of mathematical methods to solve a wide variety of non-routine problems. The repertoire of skills that now undergird mathematical power includes not only some traditional paper-and-pencil skills but also many more powerful capabilities. All of today's students must be able to:

- Perform mental calculations and estimates with proficiency.
- Decide when an exact answer is needed and when an estimate will serve the purpose.
- Know which mathematical methods are appropriate in a particular context.
- Use a calculator correctly, confidently, and appropriately.
- Estimate orders of magnitude to confirm mental or calculator results.
- Make decisions based upon the collection, representation, and interpretation of real data.
- Use tables, graphs, spreadsheets, and statistical techniques to organize, interpret, and present numerical information.
- Judge the validity of mathematical and technical information presented by the media and others.
- Use computer software for mathematical tasks.
- Formulate specific questions from vaguely defined problems.
- Select effective problem-solving strategies.

Goals for teacher performance are shifting from authoritarian models based on "transmission of knowledge" and "drill and practice" to student-centered methods featuring "stimulation of learning" and "active exploration."

- Encourage students to explore.
- Help students to verbalize their mathematical ideas.
- Show students that many mathematical questions have more than one right answer.
- Teach students, through experience, the importance of careful reasoning and disciplined understanding
- Provide evidence that mathematics is alive and exciting.
- Build confidence in all students that they can learn mathematics.

Quoted directly from Counting On You, National Academy Press, Washington, DC, 1991, pp.5-7

SECTION TWO:

WORKING TOWARD REVISED CURRICULUM AND DELIVERY

STUDENT BILL OF RIGHTS

I have the right to learn at my own pace and not feel put down or stupid if I'm slower than someone else.

I have the right to ask whatever questions I have.

I have the right to need extra help.

I have the right to ask a teacher for help.

I have the right not to understand.

I have the right to say I don't understand.

I have the right to feel good about myself regardless of my abilities.

I have the right not to base my self-worth on my skills as a student.

I have the right to view myself as capable of learning.

I have the right to evaluate my instructors and how they teach.

I have the right to relax.

I have the right to be treated as a competent adult.

I have the right to dislike any subject.

I have the right to define success in my own terms.

A CURRENT AND (STILL) DEVELOPING MATHEMATICS CURRICULUM

CURRICULUM DESIGN

OLD OBJECTIVES	NEW OBJECTIVES
Work Hard	Work Smart
Right to fail (low expectations)	Right to succeed (high expectations)
Spiral learning	Focus learning
Manual work	Mental work
Mechanical processes	Electronic
Routine and rote	Verbal and thoughtful
Static	Varied
Passive learning	Active learning
Listening	Doing
Copying	Discovering
Obeying	Deciding
Using rules	Using logic and common sense
Right or wrong answers	Justify results
Acceptance	Determine
Memorization	Understanding

Mt. Hood Community College
Associate Dean
Mathematics/Physics Division
1990-91

The development at Mt. Hood Community College of an expanded ABE/GED mathematics curriculum and, more importantly, the development of effective alternative delivery methods for that curriculum, was the result of an intense collaboration between the MHCC Mathematics Division and the ABE/GED department. For over two years, the mathematics division has been in the forefront state wide in developing new curricula and instituting alternative delivery systems in mathematics courses. Therefore, the division was an optimum resource (as well as an impetus!) to guide the development of a curriculum which would better prepare students for the work force or for post-secondary education/training and to train staff for more effective delivery of that curriculum.

Several factors were essential for the development of new perspectives on mathematics, new curriculum, and new delivery systems:

Meetings between the ABE/GED math curriculum committee and the Associate Dean and faculty of the MHCC Mathematics Division to establish philosophy, evaluate materials, and ex plore the use of technology and other "new" perspectives on mathematics.

An all-staff in-service conducted by the Associate Dean of Mathematics to introduce the concepts and processes to the ABE/GED staff as a whole.

Follow-up inservice sessions conducted by the ABE/GED curriculum committee on the use of the calculator and alternative delivery methods.

Availability of calculators for student use and the training and encouragement for them to do so.

Establishment of multi-level mathematics class groups to incorporate the use of different methods and materials.

Continued staff training sessions at regular intervals.

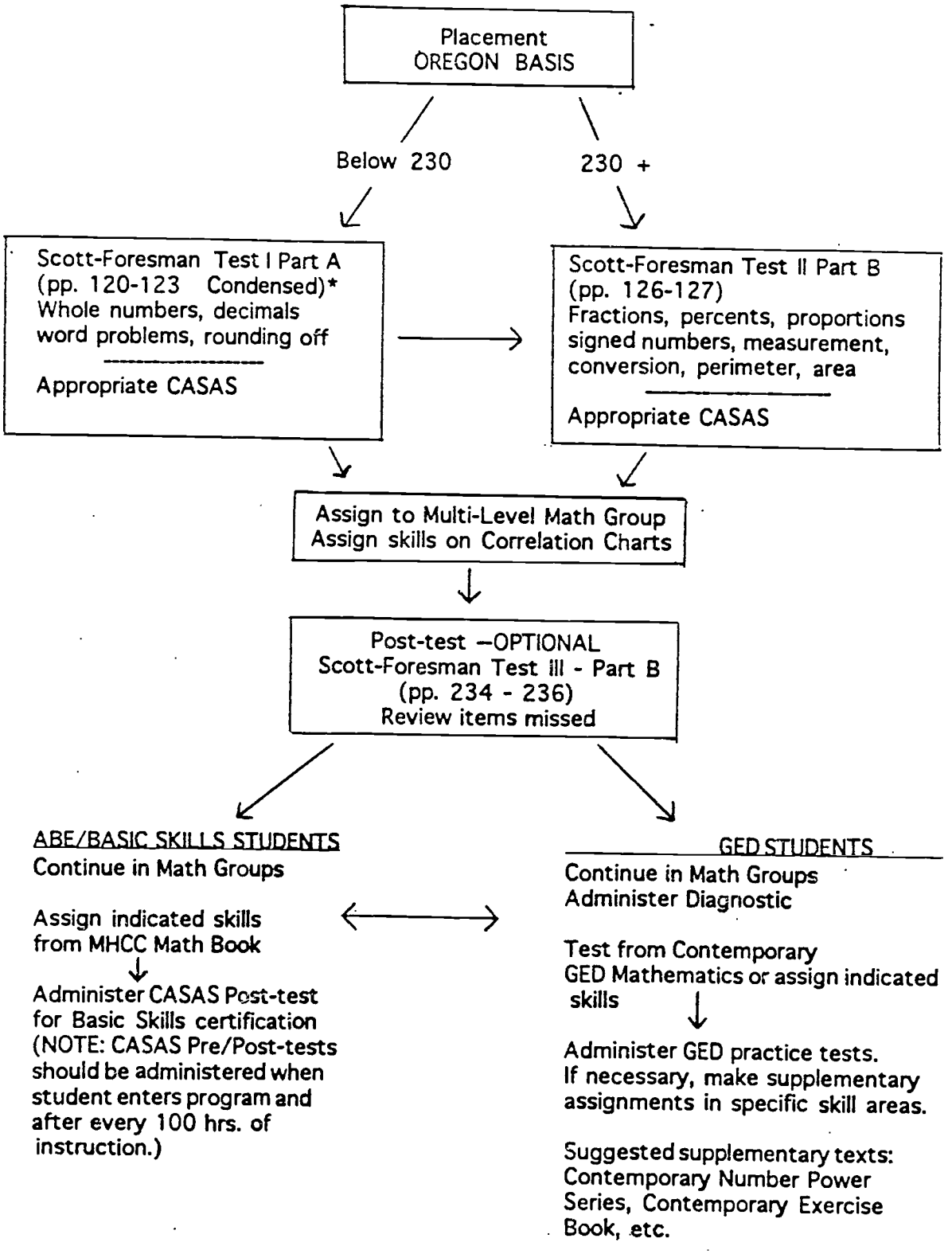
Although the curriculum appears to be linear (see ABE/GED Mathematics flow chart, p. 7), it need not and should not be approached that way. Once the placement test (BASIS) and the diagnostic test(s) (CASAS and/or Scott-Foresman) have been administered, specific skills that need to be addressed by each student are noted, and the student is assigned to **multi-level** mathematics group. Specific skills may then be approached in any order, some concurrently, in the groups. For example, if students in a group are working with whole numbers on the calculator to become familiar with its functions, it is an ideal time to introduce area and perimeter problems and their accompanying formulae. This process than easily leads to demonstration of the use of the square and square-root keys on the calculator.

Emphasis in the groups is on problem-solving, problem set-up, ways to approach word problems, use of the calculator, and so forth. Each group session is structured as an independent lesson of fifty minutes, centered on a specific skill (i.e., percent, multiplication of fractions, etc.), and presented from the context of functional life skills so that the students understand **why** they need to be able to work with percents. When the students are working independently or in pairs, then textbook problems and/or study sheets may be assigned, again with the emphasis on word problems rather than on simple computational skills.

Student progress is monitored through the use of Scott-Foresman correlation charts, CASAS pre/post tests and correlation charts, and the GED practice tests.

The use of calculators and other technology, the emphasis on problem-solving rather then computation, and the effective use of multi-level groups alleviate math anxiety, promote creative thinking, and stimulate a more positive attitude toward mathematics. Given this approach, the mathematics skills with which a student enters the program tend to be a negligible factor in his/her success in mathematics.

ABE/GED MATHEMATICS FLOWCHART



TEST I--PART A
Measuring What You've Learned

1. $\begin{array}{r} 235 \\ +119 \\ \hline \end{array}$

2. $\begin{array}{r} 1,346 \\ 1,270 \\ +\ 799 \\ \hline \end{array}$

3. 22,642 + 5,019 + 863 = _____

4. $\begin{array}{r} 285 \\ -119 \\ \hline \end{array}$

5. $\begin{array}{r} 28,341 \\ -19,550 \\ \hline \end{array}$

6. 32,003 - 1,718 = _____

7. $\begin{array}{r} 5,680 \\ \times\ 35 \\ \hline \end{array}$

8. $\begin{array}{r} 14,008 \\ \times\ 109 \\ \hline \end{array}$

9. 8,001 x 428 = _____

10. $6\overline{)336}$

11. $37\overline{)208}$

12. $820\overline{)7,364}$

13. 1,420 ÷ 285 = _____

14. .131 + 5.6 + 17.1 = _____

15. 8.356 + .43 + 5.8 = _____

16. 12.6 + 4.7 + 8.09 = _____

17. 17.238 − 14.9 = _____

18. 39.14 − 17.280 = _____

19. 21 − .14 = _____

20. 1.82×4

21. $2.12 \times .56$

22. $3.81 \times 1{,}000$

23. $4\overline{)4.8}$

24. $.7\overline{)35}$

25. $4.5\overline{)9}$

26. $100\overline{)5.5}$

27. Amalia paid $180.50 for a round trip plane ticket to Boston. At the airport, she also paid $17.85 for extra luggage. How much did she pay in all? _____

28. The Kohls bought a rocking chair on sale for $120. The regular price of the rocking chair was $149. How much money did the Kohls save? _____

29. Mr. Olendzki owns a building with 6 apartments in it. He rents each apartment for $420 a month. How much rent does he get from all the apartments each month? _____

30. Lydia paid $75 to attend one day of a five-day nursing workshop. It would have cost her three times as much to attend the workshop for all five days. What was the cost of attending the workshop for all five days? _____

31. Tulsa is 772 miles from Atlanta. Tulsa is 683 miles from Chicago. How much farther is Tulsa from Atlanta than it is from Chicago? _____

32. The highest temperature ever recorded in California is 134 degrees F. The highest temperature ever recorded in Connecticut is 105 degrees. How may degrees hotter has California been than Connecticut? _____

33. Bob worked 3.5 hours one night. The next night he worked 4.25 hours, and on the weekend he worked 9.75 hours. What was th total number of hours Bob worked? _____

34. Three roommates share the cost of their apartment rent evenly. Their apartment rent is $450 a month. One roommate also pays $80 for garage space. How much is each roommate paying for the apartment rent each month? _____

35. Dave ran 3.2 miles on Tuesday. On Thursday, he ran 4 miles. How may more miles did Dave run on Thursday than on Tuesday?

_____

36. Jaime set aside $85 for groceries. He spend $77.43 at the supermarket. How much did he have left over? _____

37. Mary took a skirt and two sweaters to the dry cleaners. It cost $4 for the skirt to be cleaned, $2.50 for one sweater, and $3.25 for the other sweater. What was the total cost of Mary's dry cleaning bill? _____

38. The time is Seattle is two hours earlier than in Chicago. If it is 12 noon in Chicago, what time is it in Seattle? _____

39. An office clerk earns $6.25 an hour. A word processor earns twice as much. How much does a word processor earn an hour?

_____

40. Julia traveled a total of 345 miles by car on a business trip. She made a stop every 115 miles. How many times did she stop? ___

41. Seymour flew 1,362 miles on one trip. On his next trip, he flew 879 miles. How many miles did he fly altogether on the two trips? _____

42. Three relatives received equal amounts of an inheritance of $27,000. How much did each relative receive? _____

43. Every morning on her school bus route, Martine makes 27 stops. How many stops does she make on 4 mornings? _____

44. Rebecca received a $100 bonus at Christmas. She gave equal amounts of this money to her 4 children as gifts. How much did each child receive? _____

45. Juan and his partner made $850 painting a house. They split the money evenly. How much did each earn? _____

46. Tony paid the dentist $45 for a checkup and cleaning and $25 more for X-rays. How much did he pay in all? _____

47. Round to the nearest ten. 38 _____

48. Round to the nearest hundred. 359 _____

49. Round to the nearest hundred. 4,789 _____

50. Round to the nearest thousand. 5,209 _____

TEST I — PART A
Measuring What You've Learned
Scott, Foresman
Mathematics Skills
Student Answer Sheet

Name _____ Date _____

Lesson		Lesson	
8-11	1. _____	57-58	23. _____
	2. _____		24. _____
	3. _____		25. _____
			26. _____
18-23	4. _____		
	5. _____	61	27. _____
	6. _____		
		26-27	28. _____
28, 30-33, 35-37	7. _____		
	8. _____	38-39,49	29. _____
	9. _____		30. _____
44-46	10. _____	24-27	31. _____
	11. _____		32. _____
	12. _____		
	13. _____	61	33. _____
53	14. _____	47-49	34. _____
	15. _____		
	16. _____	61	35. _____
			36. _____
54	17. _____		37. _____
	18. _____		
	19. _____	24-27	38. _____
55	20. _____	62	39. _____
	21. _____		
	22. _____	47-49	40. _____
		12-15, 26-27	41. _____

TEST I -- PART A
Scott, Foresman
Math Skills Correlation

Name _____

Lesson	Skill	Part A Working It Out		Page	Date Completed
(2.1)	Rounding Numbers				
5	Rounding Numbers	3-10, 15-22, 37-42		14	
			Benchmark		_____
(1.1)	Adding Whole Numbers				
8	Adding Larger Numbers	1-8		20	
9	Adding More Than Two Numbers	13-19		22	_____
10	Carrying	23-28		24	_____
11	Addition Review	1-27	Benchmark	25	_____
12	Solving Word Problems	1-4		27	
13	Picturing The Problem	1-3		29	_____
14	What Are Addition Word Problems?	read		30	_____
15	Solving Addition Word Problems	1-4		32	
(1.2)	Subtracting Whole Numbers				
18	Subtracting Larger Numbers	1-7		37	
19	Borrowing Once	7-9, 25-28		39	_____
20	Borrowing More Than Once	10-15		41	_____
21	Subtracting From Zero	4-9		43	_____
22	(2.1) Estimating Answers	1-9		44	_____
23	Subtraction Review	1-29	Benchmark	45	_____
24	What Are Subtraction Word Problems	read		46	
25	Solving Subtraction Word Problems	1-3		48	_____
26	Add or Subtract?	1-5		50	_____
27	Skill With Word Problems	1-10		52	_____
(1.3)	Multiplying Whole Numbers				
28	Basic Multiplication Facts	study		54	
30	Multiplying by One-Digit Numbers	25-32		58	_____
31	Multiplying by Two-Digit Numbers	12-18		60	_____
32	Multiplying by Three-Digit Numbers	5-8, 19-21		62	_____
33	Multiplying With Zeros	9-11, 22-24		64	_____
35	Carrying	26-30		67	_____
36	(2.1) Estimating Answers	5-11		68	_____
37	Multiplication Review	9-13, 18-31, 45-50		69	
			Benchmark		_____
38	What Are Multiplication Word Problems	read		70	
39	Solving Multiplication Word Problems	1-4		72	_____

Lesson	Skill	Part A Working It Out		Page	Date Completed
(1.4)	Dividing Whole Numbers				
44	Dividing by Two-Digit Numbers	19-24		82	
45	Dividing by Three-Digit Numbers	10-15		84	
46	Division Review	41-46, 53-64		85	
			Benchmark		
47	What Are Division Word Problems?	read		86	
48	Solving Division Word Problems	1-3		88	
49	Should You Multiply or Divide?	1-8		90	
Word Problems Review:					
50	Add, Subtract, Multiply, Divide	1-18		91	
(1.9, 1.10)	Decimals Adding & Subtracting				
53	(1.9) Adding Decimals	1-10 Practice B		100	
53		1-10 Practice A,B,C		101	
			Benchmark		
54	(1.10) Subtracting Decimals	1-10 Practice A		102	
54		1-12 Practice A,B		103	
			Benchmark		
61	Word Problems With Decimals Adding and Subtracting	1-8	Benchmark	115	
(1.11, 1.12)	Decimals Multiplying & Dividing				
55	(1.11) Multiplying Decimals	4-9		104	
55		1-18 Practice B		105	
			Benchmark		
57	(1.12) Dividing Decimals by a Whole Number	1-12 bottom of page		108	
58	Dividing by a Decimal	1-10 Practice B,C		110	
			Benchmark		
60	(2.1) Getting a Rough Idea of the Answer	1-10 Practice A		113	
			Benchmark		
62	Word Problems With Decimals: Multiplying and Dividing	1-8	Benchmark	117	
Part A Word Problem Practice					
63	More Practice With Word Problems Add, Subtract, Multiply, and Divide, Decimals	1-5 Practice A,B,C		118	

TEST I -- PART A

Measuring What You've Learned

Scott, Foresman
Mathematics Skills
Student Answer Sheet

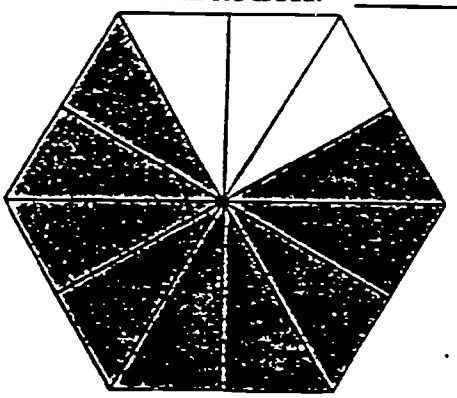
Name _____ Date _____

1.	354	26.	.055
2.	3,415	27.	$198.35
3.	28,524	28.	$ 29
4.	166	29.	$ 2,520
5.	8,791	30.	$ 225
6.	30,285	31.	89
7.	198,800	32.	29
8.	1,526,872	33.	17.50
9.	3,424,428	34.	150
10.	56	35.	.8
11.	5 r 23	36.	$7.57
12.	8 r 804	37.	9.75
13.	4 r 280	38.	10
14.	22.831	39.	$12.50
15.	14.586	40.	3
16.	25.39	41.	2,241
17.	2.338	42.	9,000
18.	21.86	43.	108
19.	20.86	44.	25
20.	7.28	45.	425
21.	1.1872	46.	70
22.	3,810	47.	40
23.	1.2	48.	400
24.	50.	49.	4,800
25.	2	50.	5,000

MHCC
ABE/GED
9/91

Test II-Part B
Measuring What You Know

1. Write a fraction that tells what part of the figure is shaded. Reduce the fraction. _____



2. Write 5/3 as a mixed number. _____

3. Which of the fractions listed below is greater than 3/8?

   1/4 7/16 7/24 _____

4. Multiply: 3/4 x 2/9 = _____

5. Divide: 5/6 ÷ 1/3 = _____

6. Add: 1/4 + 3/8 = _____

7. Subtract: 7 1/3 - 2 1/2 = _____

8. A landowner has 17 1/2 acres of land. She wants to sell it in 10 lots that are all the same size. How many acres will each lot contain? _____

9. Write 9/20 as a decimal. _____

10. To figure about how much overtime pay she would earn

all year, Ms. Linn wanted to find her average overtime for the first 5 months. Her overtime for these months was as follows:

Month	*Overtime Hours*
January	22
February	14
March	20
April	20
May	19

What was her average number of overtime hours for these five months? _____

11. Solve this proportion: 2:6 = ____:15

12. Write 25% as a fraction. _____

13. Write 1/5 as a percent. _____

14. Write 40% as a decimal. _____

15. Write .3 as a percent. _____

16. A city street project will cost $250,000. The state will pay 15% of the cost. How much in all will the state pay?

_____

17. An apartment building had 240 tenants. During the year, 12 tenants moved out. What percent of the tenants moved out? _____

18. Add: (+16) + (-12) = _____

19. Subtract: (-20) - (-33) = _____

20. Change to feet and inches:

67 inches = _____ feet and _____ inches

21. Change to grams:

3,820 milligrams = _____ grams

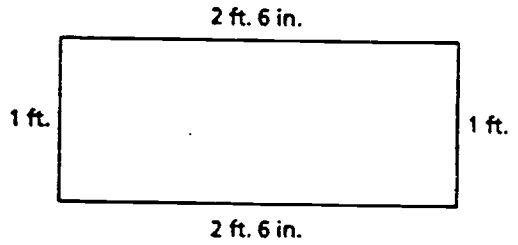
22. Divide:

	_____ yards	_____ feet	_____ inches
3)	9 yards	1 foot	

23. Subtract:

3 hours	45 minutes	40 seconds
- 2 hours	30 minutes	55 seconds
hours	minutes	seconds

Questions 24 and 25 refer to the figure below.



24. What is the *perimeter* of the figure in feet?

_____ feet

25. What is the *area* of the figure in square inches?

_____ square inches

TEST II — PART B
Measuring What You've Learned
Scott, Foresman
Mathematics Skills
Student Answer Sheet

Name _____ Date _____

Lesson		Lesson	
1-4, 7	1. _____	43-45	18. _____
8	2. _____	43, 46	19. _____
5	3. _____	47-48	20. _____
7, 10-12	4. _____	49-50	21. _____
7, 13-15	5. _____	51	22. _____
6, 18	6. _____	51-52	23. _____
6, 18	7. _____	53, 55	24. _____
9, 14-15, 24-28	8. _____	54-55	25. _____
23	9. _____		
29	10. _____		
30-32	11. _____		
33-35	12. _____		
37	13. _____		
33, 36	14. _____		
33, 36	15. _____		
39-42	16. _____		
39-42	17. _____		

TEST II — PART B
Scott, Foresman
Math Skills Correlation

Name _____

Lesson	Skill	Part B Working It Out		Test Item	Page	Date Completed
	Fractions					
1	What Are Fractions?	1-5		1	131	
2	Kinds of Fractions	5-10		1	132	
3	Equal Fractions	4-6		1	133	
4	Finding Equal Fractions	5-8		1	134	
5	Comparing Fractions	1-10		3	135	
6	Finding Common Denominators	16-20		6,7	137	
7	Reducing Fractions	10-21		1,4,5	138	
8	Changing Fractions to Mixed Numbers	1-10		2	139	
9	Changing Mixed Numbers to Fractions	1-10		8	140	
1.7	**Multiplying Fractions**					
10	Multiplying Fractions by Fractions	11-20	4	Benchmark	142	
11	Canceling	1-10	4	Benchmark	143	
12	Multiplying Fractions by Mixed and Whole Numbers	1-10		4	145	
1.8	**Dividing Fractions**					
13	Dividing Fractions by Fractions	21-30	5	Benchmark	147	
14	Dividing With Whole Numbers and Fractions	9-18	5,8	Benchmark	148	
15	Dividing With Mixed Numbers	7-16		5,8	149	
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16	Adding Like Fractions	7-11	Not on test		150	
17	Subtracting Like Fractions	6-10	Not on test		151	
18	Adding and Subtracting Unlike Fractions	1-15, 21-35	6,7	Benchmark	153	
19	Adding Like Mixed Numbers	10-14	Not on test		154	
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21	Subtracting Like Mixed Numbers	10-14	Not on test		157	
22	Subtracting Unlike Mixed Numbers	21-30	Not on test	Benchmark	160	
3.1	**Writing Fractions as Decimals**					
23	Writing Fractions as Decimals	1-18	9	Benchmark	162	
	Fraction Word Problems					
24	Solving Word Problems	read		8	163	
25	What's The Question?	1-3		8	166	
26	What Information Do You Need?	1-5		8	168	
27	What Should You Do?	1-6		8	170	
28	Checking Your Answer	1-7		8	172	
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29	Finding the Average	1-9	10	Benchmark	175	

Lesson	Skill	Part B Working It Out	Test Item	Page	Date Completed
2.3	Ratio/Proportions				
30	Ratios	1-8	11	176	
31	Proportions	1-10	11	178	
32	Solving Proportions	1-15	11 Benchmark	180	
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33	What are Percents?	8-10, 15-17, 18-25	12,14,15	183	
34	Change Percents to Fractions	2-11	12	184	
35	Change Fractions to Percents	2-10	12	185	
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37	Percents That Contain Fractions	1-8	9,13	187	
38	Common Percents, Fractions, and Decimals	1-9	Not on test	188	
39	Setting Up a Percent Problem	1-10	16,17	190	
40	Solving a Percent Problem	3-12	16,17	192	
41	More Percent Problems	5-10	16,17	194	
42	Solving Percent Word Problems	1-8	16,17 Benchmark	196	
	Negative and Positive Numbers				
43	Going Below Zero	19-32	18,19	199	
44	Adding When Signs are the Same	1-6	18	201	
45	Adding When Signs are Different	10-20	18	203	
46	Subtraction Positive and Negative Numbers	10-20	19	205	
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47	Understanding Standard Measures	read	20	209	
48	Changing Standard Units	1-24	20 Benchmark	211	
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49	Understanding Metric Measures	1-7	21	212	
50	Changing Metric Units	1-20	21 Benchmark	214	
4.2	Measurements				
51	Working With Measures	1-8	22,23	216	
52	Measuring Time	1-8	23	218	
4.5	Perimeter				
53	Measuring Perimeter	1-7	24 Benchmark	220	
4.6	Area				
54	Measuring Area	1-10	25 Benchmark	222	
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56	Angles	4-10	Not on test	227	
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58	Identifying Geometric Figures	1-6	Not on test Benchmark	231	
59	Working With Triangles	1-11	Not on test	233	
Measuring What You've Learned		1-40	Benchmark	234-236	

TEST II -- PART B

Measuring What You Know

Scott, Foresman
Mathematics Skills
Student Answer Sheet

Name _____ Date _____

1. 3/4
2. 1 2/3
3. 7/16
4. 1/6
5. 2 1/2
6. 5/8
7. 4 5/16
8. 1 3/4 acres
9. 0.45
10. 19 hrs.
11. 5
12. 1/4
13. 20%
14. .40
15. 30%
16. $37,500
17. 5%
18. +4
19. +13
20. 5 ft. 7 in.
21. 3.82 grams
22. 3 yds. 0 ft. 4 in
23. 1 hr. 14 min. 45 sec.
24. 7 ft.
25. 360 sq. in.

MHCC GED MATH SKILL TEST

(1) Round off to the nearest hundred: 5,249

a. 5,300
b. 5,245
c. 5,250
d. 5,200
e. None of these

(2) Round off to the nearest tenth: 7.3556

a. 7.4
b. 7.5
c. 7.3
d. 8.0
e. None of these

(3) Find the fifth term in the series 102, 152, 202,

a. 252
b. 302
c. 312
d. 292
e. None of these

(4) Find the sixth term in the series 128, 64, 32,

a. 8
b. 4
c. 160
d. 2
e. None of these

(5) The value of 2^5 is:

a. 160
b. 32
c. 10
d. 1,250
e. None of these

(6) Write fourteen cubed as a numeral.

a. 14×14^2
b. 14×3
c. 14^3
d. $14 \times 2 \times 1$
e. None of these

(7) Paula's five GED scores were 55, 61, 48, 63, and 58. What was her average score on the five tests?

a. 56
b. 50
c. 61
d. 58
e. None of these

(8) Change 1,080 minutes to hours.

a. 108
b. 180
c. 18
d. 26
e. None of these

(9) Divide: 4 9 da. 12 hr.

a. 2 da. 9 hr.
b. 5 da. 1 hr.
c. 2 da. 3 hr.
d. 3 da. 3 hr.
e. None of these

(10) An airplane left Miami, Florida, at 6:00 p.m. and took five hours flying time to reach Seattle, Washington. What time was it in Seattle when the plane arrived?

a. 7:00 p.m.
b. 8:00 p.m.
c. 9:00 p.m.
d. 11:00 p.m.
e. None of these

(11) Subtract: 5 gal. 2 qt. 1 pt.
- 2 gal. 3 qt. 2 pt.

a. 2 gal. 2 qt. 1 pt.
b. 4 gal. 5 qt. 3 pt.
c. 2 gal. 3 qt. 2 pt.
d. 2 gal. 3 qt. 1 pt.
e. None of these

(12) Add: 1 yd. 2 ft. 7 in.
+ 2 yd. 1 ft. 8 in.

a. 4 yd. 1 ft. 3 in.
b. 4 yd. 11 in.
c. 3 yd. 3 ft. 11 in.
d. 3 yd. 4 ft. 3 in.
e. None of these

(13) Multiply: 8 lb. 10 oz.
x 5

a. 40 lb. 15 oz.
b. 43 lb. 15 oz.
c. 46 lb.
d. 43 lb. 2 oz.
e. None of these

(14) Find the perimeter of a rectangle 26 feet long and 17 feet wide.

$P = (2 \times L) + (2 \times W)$

a. 21 1/2 ft.
b. 69 ft.
c. 53 ft.
d. 86 ft.
e. None of these

(15) Find the circumference of a circle with a radius of 21 inches.

$C = 2 \times R \times \pi$ (Use 3.14 for π.)

a. 126.00 in.
b. 131.88 in.
c. 132.57 in.
d. 133.00 in.
e. None of these

(16) Find the area of a triangle with an altitude of 26 ft. and a base of 17 ft.

$A = 1/2\ ab$

a. 220 sq. ft.
b. 21 1/2 sq. ft.
c. 43 1/2 sq. ft.
d. 442 sq. ft.
e. None of these

(17) Find the volume of a wood pile 20 ft. long, 16 ft. wide, and 8 ft. high.

$V = LWH$

a. 2,560 cu. ft.
b. 44 cu. ft.
c. 1,280 cu. ft.
d. 40 cu. ft.
e. None of these

(18) What is the ratio of Jim Brown's age, which is 30, to that of his son, Gary, who is 10?

a. 1:3
b. 3:3
c. 1:10
d. 3:1
e. None of these

(19) Find the missing term in the proportion: $\frac{10}{25} = \frac{4}{?}$

a. 40
b. 20
c. 30
d. 10
e. None of these

(20) Find the missing term in the proportion: $\frac{24}{?} = \frac{2\ 1/3}{5\ 5/6}$

a. 4 1/3
b. 60
c. 12 1/3
d. 50
e. None of these

(21) Find the missing term in the proportion: $\frac{9}{1\ 1/4} = \frac{?}{10}$

a. 72
b. 11
c. 90
d. 1 7/8
e. None of these

(22) If the leading scorer on a basketball team had 92 points in 3 games and maintains that rate, how many points will he have at the end of an 18 game season?

a. 1,276
b. 542
c. 1,656
d. 552
e. None of these

(23) A picture 2 1/4 ft. wide and 5 1/4 ft. high is to be enlarged. If the width of the enlargement will be 3 1/2 ft., how high will it be?

a. 8 3/4 ft.
b. 8 ft.
c. 8 1/6 ft.
d. 6 1/4 ft.
e. None of these

(24) The percent formula is:

a. $\frac{R}{100} = \frac{\text{Amount}}{\text{Base}}$

b. $\frac{\text{Base}}{\text{Rate}} = \frac{\text{Amount}}{?}$

c. $\frac{\text{Amount}}{100} = \frac{\text{Base}}{\text{Rate}}$

d. $\frac{100 \text{ Rate}}{?} = \frac{\text{Amount}}{\text{Rate}}$

e. None of these

(25) In the problem "What is 40% of 15?" identify the rate, the base, and the amount.
DO NOT WORK THE PROBLEM.

a. r = 15 b = ? a = 40

b. r = ? b = 15 a = 40

c. r = 40 b = 15 a = ?

d. r = 40 b = ? a = 15

e. None of these

(26) What percent of 84 is 21?

a. 63 %
b. 18 1/2%
c. 31 1/2%
d. 41 %
e. None of these

(27) 84 is 12 % of what number?

a. 1,008
b. 700
c. 10.08
d. 1,428
e. None of these

(28) Find 140% of 60

a. 840
b. 427
c. 266 2/3
d. 84
e. None of these

(29) 42 is what percent of 56?

a. 75%
b .75%
c. 3/4%
d. 23.5%
e. None of these

(30) A department store bought one dozen pipes for $36.00 and sold them for $5.00 each. The profit on each pipe amounts to what percent of the selling price?

a. 40%
b. 30%
c. 20%
d. 10%
e. None of these

(31) On an English test, Marcie Mason made a score of 72 out of 96 possible.
What was her percent score?

a. 75%
b. 78%
c. 86%
d. 88%
e. None of these

(32) Mrs. Harris ordered a set of china for $142.50. There was a 3% sales tax on the china and a shipping charge of $5.63. What was the total amount Mrs. Harris paid?

a. $159.39
b. $157.40
c. $152.41
d. $152.57
e. None of these

(33) Harper's General Store had a yearly total sales of $52,386.00. The cost of goods sold was $38,453.00, and the overhead expenses amounted to $10,496.00. Find the gross and net profits for this business.

	GROSS	NET
a.	$13,933.00	$3,437.00
b.	$14,211.00	$4,127.00
c.	$41,890.00	$3,447.00
d.	$38,453.00	$10,496.00
e.	None of these	

(34) Mark Williams had $612.84 in his checking account at the beginning of June. During the month he wrote these checks: $25.00, $112.50, and $86.42. For each check there is a 25 cent charge. Mark made one deposit of $226.42 to his account. At the end of the month Mark had, in addition to the check fees of 25 cents each, a service charge of $1.75. What was Mark's account balance on July 1?

a. $613.54
b. $615.34
c. $614.49
d. $612.84
e. None of these

(35) Find the simple interest on $100.00 at 5% for 2 years.
I = PRT

a. $25.00
b. $10.00
c. $15.00
d. $ 5.50
e. None of these

(36) Max Norton has a loan of $452.00 from a friend who is charging Max 11% interest compounded annually (once a year). What amount will Max pay back to his friend at the end of two years? (In figuring compound interest, the interest is added to the principal each time it is computed.) I = PRT

a. $501.82
b. $551.89
c. $554.37
d. $556.91
e. None of these

(37) Betty Rose bought a watch priced at $59.50. Betty paid $7.00 down and paid the balance in 8 months at $7.95 each. What was the total price for buying on the installment plan?

a. $63.60
b. $73.40
c. $70.60
d. $62.65
e. None of these

(38) A used piano was priced at $537.00. A down payment of $90.00 was required. The balance was to be paid in 20 monthly payments of $25.83 each. How much would have been saved if cash had been paid for the piano?

a. $90.00
b. $89.60
c. $69.60
d. $25.83
e. None of these

(39) The junior class charged $3.00 per ticket for their spring variety show. If their sales amounted to $981.00, how many tickets were sold?

a. 336
b 2,943
c. 327
d. 331
e. None of these

(40) Mary Ames went shopping for shampoo, vitamins, and toothpaste. She found the $1.95 shampoo on sale for $1.59, the $4.95 vitamins were marked down to $3.15, and the toothpaste at its regular price of $1.29. Mary bought 5 bottles of shampoo, 6 tubes of toothpaste, and 3 bottles of vitamins. How much did she save because of the sale?

a. $1.80
b. $3.15
c. $5.40
d. $7.60
e. None of these

(41) Jane Carr has $79.76 in cash and $201.25 in her savings account. How much more does Jane need to make a $500.00 down payment on a car?

a. $388.51
b. $364.96
c. $218.99
d. $273.47
e. None of these

(42) Which of the following is the correct way to write the algebraic phrase, the sum of five times n and eight.

a. 5n + 8
b. 5n (x) + 8
c. 5 x 5n + 8
d. 5n (x) - 8
e. None of these

(43) Combine the following algebraic terms if possible:
16z - 12x =

a. 4zx
b. 4z - x
c. -28zx
d. Can not combine
e. None of these

(44) Add: (-15) + (-3) + (-1)

a. +19
b. -45
c. +45
d. -19
e. None of these

(45) Add: (-5) + (-7) + (+3)

a. -15
b. +15
c. +9
d. +1
e. None of these

(46) Subtract: (-8) - (-2)

a. -10
b. +6
c. +10
d. -6
e. None of these

(47) Subtract: (+4) - (-8)

a. +4
b. +12
c. -12
d. -4
e. None of these

(48) Multiply: (-8) x (-6)

a. +48
b. +56
c. +1 1/3
d. -48
e. None of these

(49) Divide: $(+8) \div (-2)$

a. -1/4
b. -4
c. +4
d. -16
e. None of these

(50) Find the value of $2(L + W)$ when $L = 17$ and $W = 14$.

a. 31
b. 33
c. 62
d. 64
e. None of these

(51) In the equation, $\frac{x}{12} = 4$, what is the value of x?

a. 16
b. 48
c. 24
d. 36
e. None of these

(52) In the equation, $\frac{4}{5}x - 3 = 77$, what is the value of x?

a. 56
b. 74
c. 80
d. 100
e. None of these

(53) The sum of three consecutive odd numbers equals 15. Find the three numbers.
(Odd numbers have an interval of two between them.)

a. 1, 7, and 7
b. 0, 3, and 5
c. 3, 5, and 7
d. 5, 7, and 9
e. None of these

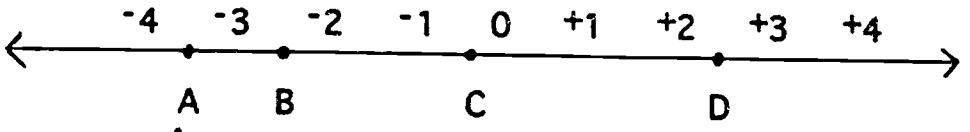
(54) Lin Moss is twice as old as his youngest daughter. The sum of their ages is 51.
How old is Mr. Moss?

a. 34
b. 26
c. 38
d. 28
e. None of these

(55) Mr. Lewis spent $70.00 on a coat and a pair of shoes. The coat cost $16.00 more than twice the amount of the shoes. How much did the shoes cost?

a. $36.00
b. $27.00
c. $22.00
d. $18.00
e. None of these

(56) On the number line below, what lettered point stands for -1/2?



a. A
b. B
c. C
d. D
e. None of these

(57) The common point from which the line of an angle proceeds is called the:

a. Chord
b. Segment
c. Right Angle
d. Coordinate
e. None of these

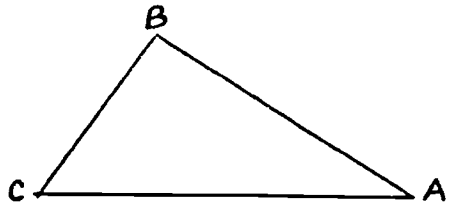
(58) The symbol (__|__) means:

a. Parallel
b. Right Angle
c. Perpendicular
d. Vertical line
e. None of these

(59) If a clock hand starts from 12 and moves to 6, how many degrees has it moved?

a. 90
b. 150
c. 180
d. 220
e. None of these

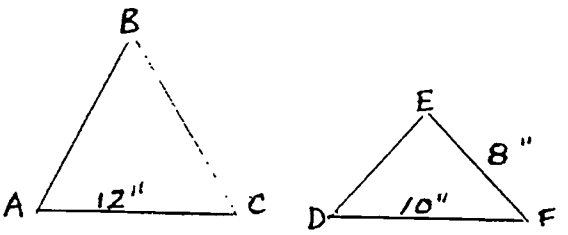
(60)



In Δ ABC above, ∠ A = 25, ∠ B = 85; what is the measure of ∠ C?

a. 50
b. 70
c. 250
d. 90
e. None of these

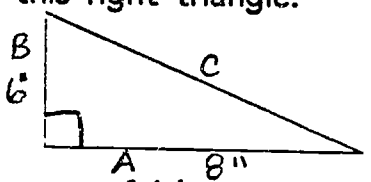
(61)



Above are two similar triangles. What is the length of BC ?

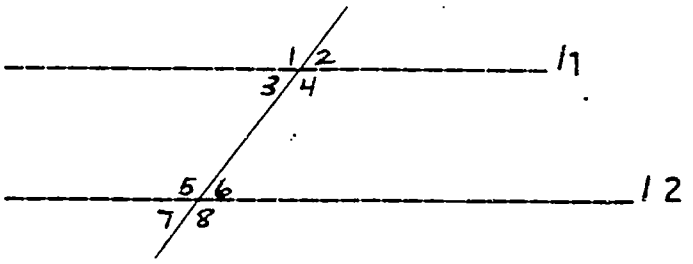
a. 9.6 in.
b. 8.0 in.
c. 6.6 in.
d. 9.8 in.
e. None of these

(62) Using the formula $[a^2 + b^2 = c^2]$ find the length of "c" in this right triangle.



a. 14 in.
b. 25 in.
c. 10 in.
d. 100in.
e. None of these

(63) In the figure below $l_1 \parallel l_2$ and $\angle 5 = 110^\circ$

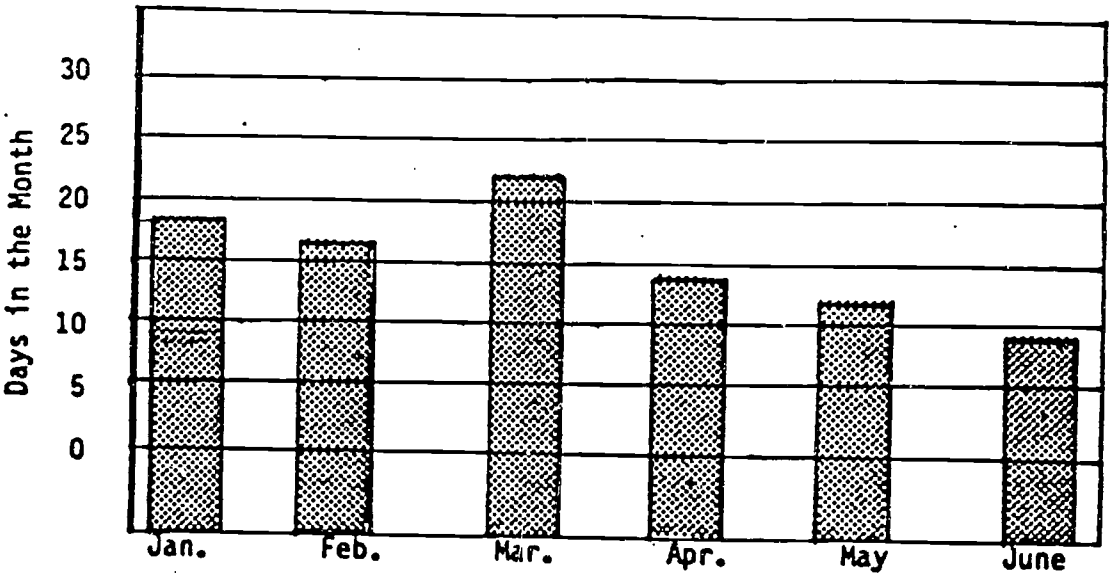


What is the measure of $\angle$ 1?

a. 60
b. 90
c. 110
d. 120
e. None of these

Use the graph below to answer questions 64, 65, and 66.

Average Number of Rainy Days in Oregon



(64) What number does the 15 on the side of the graph represent?

a. Inches of rain
b. Ounces of rain
c. Number of days in the month
d. Months of the year
e. None of these

(65) In which month are there twice as many days of rain as there are in June?

a. May
b. April
c. March
d. February
e. None of these

(66) From studying the graph, which of the following statements is most likely to be true?

a. January has snowy days.
b. It rains the same in May and June.
c. February has 28 days.
d. March is the month it rains the most.
e. None of these.

MHCC GED MATH SKILL TEST
STUDENT ANSWER SHEET

Name _____ Date _____

1. ___	S-1	23. ___	S-17	45. ___	S-30
2. ___	S-2	24. ___	S-18	46. ___	S-31
3. ___	S-3	25. ___	S-18	47. ___	S-32
4. ___	S-4	26. ___	S-19	48. ___	S-33
5. ___	S-5	27. ___	S-19	49. ___	S-34
6. ___	S-5	28. ___	S-19	50. ___	S-35
7. ___	S-6	29. ___	S-19	51. ___	S-36
8. ___	S-7	30. ___	S-20	52. ___	S-37
9. ___	S-7	31. ___	S-20	53. ___	S-38
10. ___	S-8	32. ___	S-20	54. ___	S-38
11. ___	S-9	33. ___	S-21	55. ___	S-38
12. ___	S-9	34. ___	S-22	56. ___	S-39
13. ___	S-9	35. ___	S-23	57. ___	S-40
14. ___	S-10	36. ___	S-24	58. ___	S-40
15. ___	S-11	37. ___	S-25	59. ___	S-41
16. ___	S-12	38. ___	S-25	60. ___	S-42
17. ___	S-13	39. ___	S-26	61. ___	S-43
18. ___	S-14	40. ___	S-26	62. ___	S-44
19. ___	S-15	41. ___	S-26	63. ___	S-45
20. ___	S-16	42. ___	S-27	64. ___	S-46
21. ___	S-16	43. ___	S-28	65. ___	S-46
22. ___	S-17	44. ___	S-29	66. ___	S-46

IV. MHCC GED MATH SKILL TEST
INSTRUCTOR ANSWER KEY

Name _____ Date _____

1. d	23. c	45. e
2. a	24. a	46. d
3. b	25. c	47. b
4. b	26. e	48. a
5. b	27. b	49. b
6. c	28. d	50. c
7. e	29. a	51. b
8. c	30. d	52. d
9. a	31. a	53. c
10. b	32. c	54. a
11. a	33. a	55. d
12. a	34. d	56. c
13. d	35. b	57. e
14. d	36. d	58. c
15. b	37. c	59. c
16. e	38. c	60. b
17. a	39. c	61. a
18. d	40. e	62. c
19. d	41. c	63. c
20. b	42. a	64. c
21. a	43. d	65. e
22. d	44. d	66. d

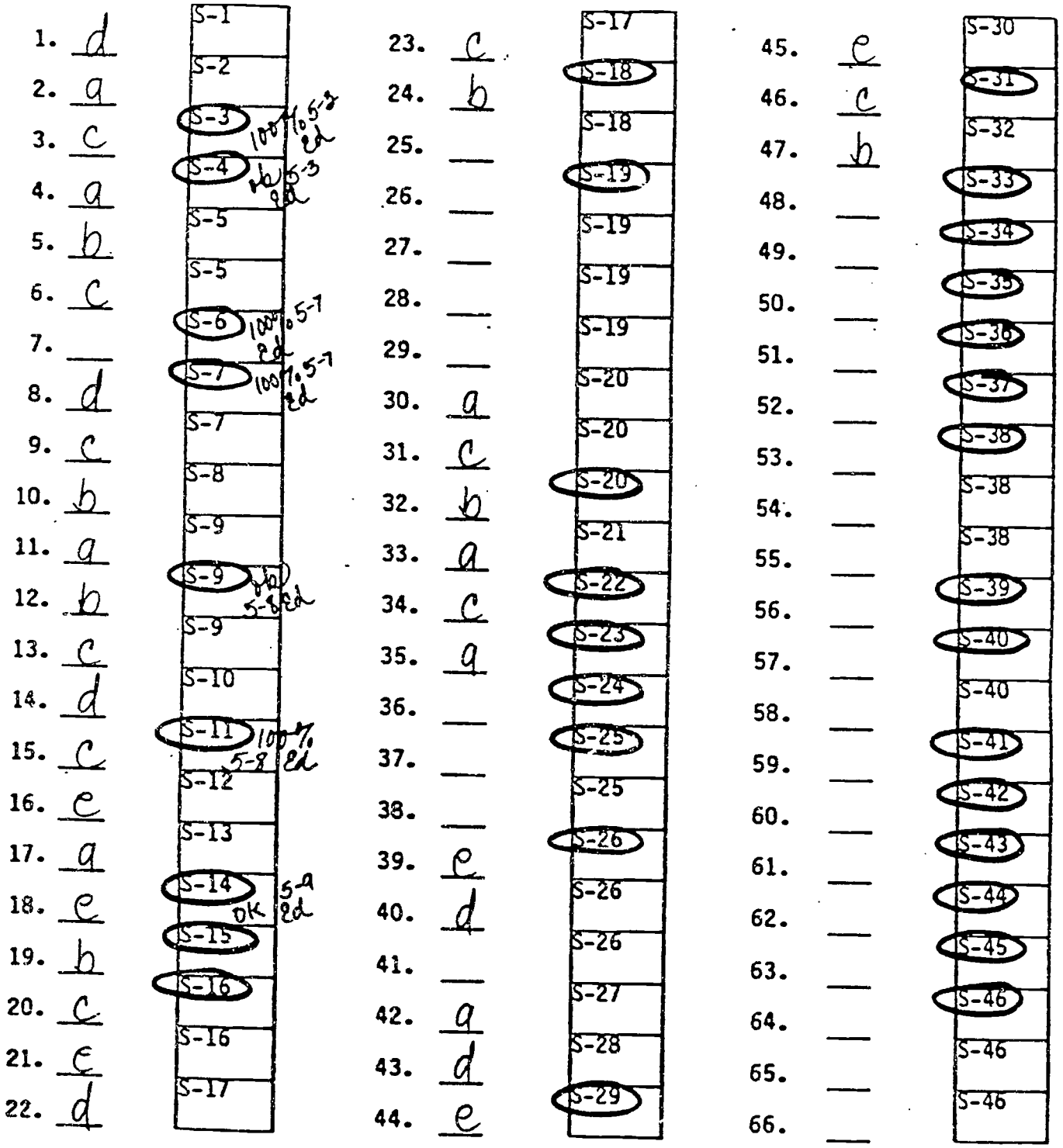
S-1 S-2 S-3 S-4 S-5 S-5 S-6 S-7 S-7 S-8 S-9 S-9 S-9 S-10 S-11 S-12 S-13 S-14 S-15 S-16 S-16 S-17

S-17 S-18 S-18 S-19 S-19 S-19 S-19 S-20 S-20 S-20 S-21 S-22 S-23 S-24 S-25 S-25 S-26 S-26 S-26 S-27 S-28 S-29

S-30 S-31 S-32 S-33 S-34 S-35 S-36 S-37 S-38 S-38 S-38 S-39 S-40 S-40 S-41 S-42 S-43 S-44 S-45 S-46 S-46 S-46

V. MHCC GED MATH SKILL TEST
STUDENT ANSWER SHEET SAMPLE

Name _____ Date _____



Name _____

MATH PRACTICE TEST CORRELATION CHART

Question Number	FORM AA	Question Number	FORM BB
1	Arithmetic +	1	Arithmetic (Fractions)
2	Problem Set-up	2	Algebra (number lines)
3	Percent	3	Arithmetic +
*4	Measurement (Area)	4	Percent +
5	Arithmetic (Fractions)	5	Arithmetic
6	Algebra	6	Insufficient data
7	Problem Set-up	*7	Measurement (Perimeter)
8	Percent +	8	Geometry (Square Root)
9	Arithmetic	9	Arithmetic +
10	Algebra	10	Graph
*11	Arithmetic + (Average/Mean)	11	Insufficient data (Ratio)
12	Graph (Arithmetic)	12	Problem Set-up
*13	Problem Set-up (Exponents)	*13	Measurement (Volume)
14	Problem Set-up	14	Geometry
15	Graph (Arithmetic)	15	Percent +
16	Arithmetic +	16	Ratio/Proportion
17	Algebra	17	Arithmetic (Exponents)
18	Percent +	18	Algebra
19	Arithmetic +	19	Percent +
20	Geometry	*20	Arithmetic (Average/Mean)
21	Algebra +	*21	Geometry (Slope)
*22	Geometry (Pythagorean Theorem)	22	Problem Set-up (Algebra)
23	Measurement (Arithmetic)	23	Algebra
24	Problem Set-up (Proportion)	24	Algebra
25	Exponents	25	Ratio/Proportion
26	Problem Set-up	26	Algebra
27	Geometry +	*27	Geometry (Pythagorean Theorem)
*28	Problem Set-up (Volume)	28	Problem Set-up (Algebra)

Number Missed _____ Score _____

_____ Arithmetic (6)
_____ Problem Set-up (6)
_____ Percent (3)
_____ Algebra (4)
_____ Geometry (3)
_____ Measurement (3)
_____ Graphs (2)
_____ Exponents (1)

Number Missed _____ Score _____

_____ Arithmetic (6)
_____ Problem Set-up (3)
_____ Percent (3)
_____ Algebra (5)
_____ Geometry (4)
_____ Measurement (2)
_____ Graphs (1)
_____ Ratio (2)
_____ Insufficient data (2)

+ Indicates a problem with more than one step
* Indicates student could utilize formula page

AREA	BOOK	ASSIGNMENT	DATE COMPLETED
Arithmetic	1. Scott, Foresman Pre-GED 2. MHCC Math Book 3. Contemporary, GED Mathematics 4. Contemporary Exercise Book 5. KET/GED Math Tapes	130-175 Section I 10-114 12-13, 18-29 #1,2,3,4,5,6,7	
Problem Set-up	1. Contemporary, GED Mathematics 2. Contemporary Exercise Book	19-46 8-11,14-17	
Percent	1. Scott, Foresman Pre-GED 2. MHCC Math Book 3. Contemporary, GED Mathematics 4. Contemporary Exercise Book 5. KET/GED Math Tapes	182-196 Section IV 128-157 35-39 #9, 10	
Algebra	1. Scott, Foresman Pre-GED 2. MHCC Math Book 3. Contemporary, GED Mathematics 4. Contemporary Exercise Book 5. KET/GED Math Tapes	198-205 Section VI 202-223 56-61 #11, 12	
Geometry	1. Scott, Foresman Pre-GED 2. MHCC Math Book 3. Contemporary, GED Mathematics 4. Contemporary Exercise Book 5. KET/GED Math Tape	226-233 Section VII 224-275 62-71 #13	
Measurement	1. Scott, Foresman Pre-GED 2. MHCC Math Book *3. Contemporary, GED Mathematics 4. Contemporary Exercise Book 5. KET/GED Math Tape	208-224 Section II 269-275 40-45 #14	
Graphs	1. MHCC Math Book 2. Contemporary, GED Mathematics 3. Contemporary Exercise Book 4. KET/GED Math Tape	Section VIII 180-201 46-55 #8	
Ratio/ Proportion	1. Scott, Foresman Pre-GED 2. MHCC Math Book 3. Contemporary, GED Mathematics 4. Contemporary Exercise Book 5. KET/GED Math Tape	176-180 Section III 119-127 30-34 #8	
Exponents	1. MHCC Math Book 2. Contemporary, GED Mathematics	Section I, p. 13-16 234-236	
Insufficient Data	1. Contemporary, GED Mathematics 2. Contemporary Exercise Book	152-157 10-11	
Item Sets	1. Contemporary, GED Mathematics 2. Contemporary Exercise Book	70-72 113 (19-21), 149 (1-3) 16-17	

*Using the Formulas Page

SOURCES/RESOURCES

Contemporary: New GED Test 5: Mathematics

Contemporary: Number Power Series: 1-7: Calculator Power

KET/GED Mathematics (video tape series)

KET Math Basics (new video series - see attached)

Mt. Hood Community College: Math Skills

National Research Council: Everybody Counts
(National Academy Press, Washington, D.C.), 1989.
Highly recommended reading for staff.

Oregon CBE Task Force:
Functional Life Skills: Lesson Guides for Competency-Based Adult Basic Education

Oregon CBE Task Force: Ideas That Work for ABE

Scott-Foresman: Pre-GED Mathematics

Skills Bank Mathematics (software)

TI-34 Calculators/Classroom Kit

In addition to these basic sources, ideas for small-group or cooperative learning activities can be drawn from charts and graphs in newspapers; telephone, electricity, medical or credit card bills; insurance statements; W-2 forms; grocery receipts; anything the students wish to bring from their own lives that they have or can create mathematical questions about; any manipulative or game (a dollar's worth of pennies is great for beginning work with 10th's and 100th's). The source of ideas is virtually limitless!

MATH BASICS PROGRAM

Following is a list of topics covered on the new KET Math Basics videotape series. Those segments which have been reviewed so far, are excellent. They are short, very concrete, and very clear. The series would appear to be a valuable addition to any mathematics curriculum.

Topic	Lesson Number
basic number facts	2
adding	2
subtracting	2
multiplying	2
dividing	2
measuring tools and terms	3
customary system	3
metric system	3
using a calculator	3
solving problems	4
estimating	5, 9, 10
common fractions	6
negative numbers	6
decimal fractions	6,7
percents	7
figuring discounts	7
powers of ten	8
figuring sales tax	8
rounding	8
weight and volume	9
area	10
distances and dimensions	11
using maps	11
coordinate systems	11
patterns	12
graphs (line, bar and circle)	12
organizing data	13
polls	13
probability	13
shapes (rectangles, triangles, etc.)	14
solids (cubes, pyramids, etc.)	14
shape vs. volume	14
figuring unit costs	15
comparison shopping	15
ratios	15

A BRIEF COMMENT ON DELIVERY IDEAS

It is becoming more and more widely recognized in educational circles that certain instructional methods are more effective than others:

- instructor-coaching is more effective than instructor lecturing
- small-group and cooperative learning situations are more effective than independent study
- student discovery and participation are more effective than passive reception of information

Many of these concepts directly oppose traditional classroom styles, particularly in the area of mathematics; they may require, on the part of the instructors, a rather wrenching alteration of schema and a willingness to take risks, experiment, and explore new possibilities.

And while instructors are enthusiastically attending workshops and reading new information about alternative methods and materials, listed below are some ideas regarding both students and instructors that should be kept in mind when approaching any mathematics curriculum.

STUDENTS NEED TO BE ENCOURAGED TO --

-- believe that using a calculator is not "cheating." The calculator is an invaluable tool that allows students to experiment with numbers and concepts, perform basic computation without fear, and become familiar with a part of technology that is an integral part of their experiences, whether at work or at school.

-- recognize what they already know. Most students can estimate the total of a grocery bill, the price of an item on sale, and so forth; however, **they don't equate these skills with applying mathematics.**

-- express their feelings about mathematics freely and without fear of ridicule. Discussion and exploration of emotional responses can be a great small-group exercise, especially if the instructor is willing to begin by expressing his/her attitudes.

-- **play** with numbers without seeking the answer to a specific problem. The calculator is a great boon in this area.

-- answer "Why do I need to know this?" for themselves. Does it help establish a mathematical pattern? Does it help develop reasoning skills? Does it help clarify thinking processes? Does it make daily tasks simpler?

-- create and articulate their own process questions as they approach a problem.

a) What do I need to find?
b) What do I know?
c) What process(es) should I use?

-- express **in complete thoughts,** the answers to the questions that they have posed. For example, given the problem:

In one pay period, Kim earned $276.00 before taxes were taken out. $38.00 were taken out for taxes. How much money did Kim take home?

a) **I need to find out** how much money Kim had left in the paycheck after taxes.
(There are many ways to express this statement.)
b) **I know** that Kim made $276.00 before taxes and paid **$38.00** in taxes.
c) **I need to subtract** the amount of taxes ($38.00) from the total pay ($276.00).

Expressing questions and answers in complete sentences helps the student clarify not only the problem, **but also his/her thinking processes!**

-- estimate an answer **before** they compute it. This skill is essential, particularly when students use a calculator for computation.

-- realize that there may be many different approaches to a problem, and that there may be more than one correct answer.

-- use mathematical terminology precisely. Although finding the "correct " answer to a problem may not always be necessary, being able to express the problem correctly and precisely is necessary. (Compare learning mathematical terminology to learning the necessary vocabulary to perform a job.)

-- observe and comment on mathematical phenomena in order to recognize patterns:

- Is the answer to an addition or multiplication problem larger or smaller than the numbers in the problem?
- What about the answer in a subtraction or division problem?
- Do the same observations hold true when fractions are multiplied?
- What happens to a number containing a decimal pint if the point is moved to the left? to the right?

These and other such questions help the students realize that there are, in fact, patterns they can see.

-- become valuable sources of inspiration, assistance, and encouragement to one another.

INSTRUCTORS SHOULD BE ENCOURAGED TO --

-- get rid of the notion that allowing the use of a calculator is "cheating" or doing a disservice to students. If a student's number sense and conceptual, processing, and estimation skills are well-developed, it is often possible to arrive at a perfectly acceptable answer without computation. If complete precision is required, a calculator is much quicker.

-- freely express their own attitudes, feelings, experiences regarding mathematics.

-- take risks; be able to say " I don't know the answer to that question, but I'm sure together we'll be able to discover it."

-- work from a base of word problems rather than pages of drill and practice.

-- emphasize process rather than outcome:

- What do you think you need to do to solve this problem?
- What do you think you should do first? next?
- Now that you know **what** to do and **when**, do you want to go ahead and solve it?

-- play with numbers themselves as well as encourage students to do so. In addition to all the mathematical benefits that accrue, number play is just plain fun!

An important aspect of altering the delivery of mathematics instruction is staff collegiality. New approaches to teaching require a great deal of trial and error; if staff ware willing to keep track of and share ideas (both those that work and those that don't), they become valuable sources of inspiration, assistance, and encouragement to one another as well as being an excellent model for students of people working together.

SECTION THREE:

OF CABBAGES AND KINGS....

A sampling of definitions, processes, worksheets and games

IDENTIFYING AND REDUCING MATH ANXIETY

1. Anxiety Rating Scale
2. Math Autobiographies/Diariesß
3. Sentence Completion Exercise
4. Facts & Figures
5. Mathematics Myths & Realities

RATINGS OF ANXIETY

Use the following scale to rate how you feel in each of the situations listed below:

1 = very relaxed
2 = a little uncomfortable
3 = quite uncomfortable
4 = very uncomfortable
5 = panic sets in

1.	Asking a question in math class	1 2 3 4 5
2.	Counting change back to another person	1 2 3 4 5
3.	Going to a grocery store checkout that uses computerized cash registers	1 2 3 4 5
4.	Applying for a loan and not fully understanding the computations before I have to sign the agreement	1 2 3 4 5
5.	Being confronted by a salesperson who is explaining the sale price is 1/3 off	1 2 3 4 5
6.	Having to compute the gas mileage and number of miles to the next town in a limited amount of time	1 2 3 4 5
7.	Having to work math problems without the use of a calculator	1 2 3 4 5
8.	Getting to a section in a math course that is mostly word problems	1 2 3 4 5
9.	Applying for a job and being asked to take a math computational test	1 2 3 4 5
10.	Having to perform some basic arithmetic calculations in my head before another person	1 2 3 4 5

MATH AUTOBIOGRAPHIES AND DIARIES

Math Autobiography

Why: Writing about our own history with math can help us get in touch with our own anxieties and other feelings. We can look back to how we formed our ideas about math and our ways of dealing with math. Spending some time on this will help us decide how to improve our skills. It will show us what influences were strongest. It will help us learn from the past to make a better math future. To do it well will take time.

What: Maybe our parents pushed too hard, maybe not enough, maybe we got contradictory messages. Maybe one parent always had the other one help us with math or maybe an older brother or sister was really good and never had any patience when they tried to help. We can write about all of these experiences to get in touch with how our family contributed to the pattern of dealing with math related tasks we now have. Understanding the pattern is a first step to developing a different pattern, one of confidence.

Not just our family influenced us, there is also school. When was learning math fun and interesting, when was it hard? What are the differences in the situations?

What about peer pressure? Did we get kidded about being a brain or being slower than others. What was our reaction? How has that experience become part of our pattern now?

Who are we now when it comes to math? How did we get that way? How are our everyday experiences with math related to our past experiences?

How: You may wish to do a timeline to begin with and write down events and ideas. You may wish to ask others' opinions.

Example: age 6: liked first grade teacher, was proud of my skills
age 7: was sick a lot, got behind, was afraid to ask questions because I looked dumb
age 8: sister helped me practice my math, got good at it.

Or you may wish to write about your family members, your teachers, your friends.

Example: father: impatient when I didn't understand the first time
mother: told me to ask my brother
brother:laughed when I made a mistake

After you have some information, elaborate on each event or activity. How you felt about it, what impact it had on you, where you can see you have carried an idea over to other areas of your life.

Maybe it will help to write some each day as you remember more. It will be something we can learn from now, and continue to learn from in the future..

Math Diary

Why: One reason for keeping a diary is to record your feelings and ideas. Another has to do with the fact that writing can help us think more clearly. A math diary is a place to work on your feelings about doing math and to better understand your own block to doing math. It will help you arrive at solutions. It is also a place to record what you do with math-related activities: new things you try, new things you learn, etc.

How: Each day spend a little time looking at the math related activities you have been involved in. Write about how you felt about doing it or not doing it, what you did with it, what you learned from it. We all do a lot of self-talking every day where we have conversations with ourselves about different things. The diary is a place to record the conversations or self talk you have with yourself about math. Talk about frustration, anger, disappointment, embarrassment. Then, use your diary to plan a way to face the same situation and do better. Write about the everyday math-related activities you do well and how that feels. Try to analyze how you approach these problems. Can the same approach or self talk work with the areas where you don't feel so confident or get so frustrated?

Write about what you would have to do to try a new approach to an old problem.

Rewrite new concepts and ways of solving problems in your diary to refresh your memory and check for comprehension. If you work with fractions for example, write a paragraph on how to reduce them as though you were explaining it to someone else. Use this as an opportunity to reinforce what you have learned and to help formulate questions about areas you are not so sure about.

Dare the impossible. Take a problem you would normally avoid. Write about why you are avoiding it, suggest ways of solving it. Ask for help if you need it. Write down the suggestions.

Keep track of questions or areas of confusion.

Keep at it. Math skills take practice like anything else. Remember your spelling lessons - writing every word 5 times.

SENTENCE COMPLETION EXERCISE

Take a few minutes to think of or jot down your first responses to these items. You will be sharing your responses with one other person.

1. When I see a problem I can't do I. . . . .

2. If I were better at math I would. . . . . .

3. My most positive experience with math was when. . . . . .

4. Doing math makes me feel. . . . . .

5. I liked math until. . . . . .

6. When I hear someone say "math is fun" I. . . . . .

7. My reason for taking this class is. . . . . .

FACTS ABOUT FIGURES

1. **Factors leading to competence with mathematics:**

   a. seeing math as relevant to future career plans and function in the world.

   b. encouragement by parents, guidance counselors, member of math department, teachers, peers.

   c. interest in eventual career in commercial areas - business, science, etc.

   d. teachers who make math interesting, fun.

   e. tendency to feel that hard work can lead to success.

   f. emphasis by teachers, parents or peer on understanding the process rather than getting the right answer.

   g. encouragement by parents and teachers for self-reliance and taking risk.

2. **Factors leading to difficulty with mathematics :**

a. being told math is irrelevant to future career plans.

b. parents, counselors, teachers, or peers who imply that math is unnecessary.

c. interest in eventual career in nurturing areas - social services, child care, etc.

d. teachers who make math boring, confusing, frightening, or humiliating.

e. tendency to feel that success or failure is due to luck, basic intelligence, or other uncontrollable factors.

f. emphasis by teachers, parents, or peers on getting the right answer fast, and/or noncompetitive situations.

g. parents and teachers who encourage dependence and shyness.

Developed by Goldston/Vermi',ea from Kogelman and Tobias.

(P. Slingerland, MHCC Mathematics Division, ODSO Conference, 1988)

MYTHS AND REALITIES ABOUT MATHEMATICS

1. **Myth:** Math requires logic, not intuition.

   Reality : Although some logic is involved in math, many people rely on what "seems to be" the right answer, or the best way to approach a problem. This intuitive way of doing math is perfectly acceptable; it is not always necessary to know how you got the answer.

2. **Myth:** There is one best way to do a math problem.

   Reality : Many problems allow multiple approaches to getting the answer, all of which are equally acceptable.

3. **Myth:** It's always important to get the answer exactly right.

   Reality: Although there are times when the right answer is important, (as on math tests), many times an approximate answer is sufficient (as in knowing how many gallons the gas tank will take, figuring out the grocery bill). In these cases, the most important thing is having an understanding of how to do the problem.

4. **Myth:** It's bad to count on your fingers.

   Reality: Using "props" such as fingers, oranges and apples, or even the abacus is perfectly O.K.

5. **Myth:** People who are good at math do problem quickly in their heads.

   Reality: This may be true of some mathematicians, but most people who are good at math have gotten there by starting slowly and with pencil and paper. Over time, and with practice, some may build up the ability to do math quickly and mentally. Some may not.

6. **Myth:** Math requires a good memory.

   Reality: People who don't feel they have good memories can do math by keeping with them basic facts and rules and/or calculators, and by keeping everything written down when they are working on a problem.

7. **Myth:** Math is done by working intensely until the problem is solved.

   Reality: Many people find that it's best to take a break from a difficult problem, even sleep on it. Sometimes a fresh approach occurs to the problem solver if they don't "grind it into the ground."

8. **Myth:** Some people have a "math mind" and some people don't.

   Reality: There isn't much evidence of there being such a thing as a"math mind." People who are good at math have usually had certain advantages in learning over those who aren't. (See "Facts about Figures")

(P. Slingerland, MHCC Mathematics Division, ODSO Conference 1988)

MATHEMATICS - ENGLISH DICTIONARY

TRANSLATING MATHEMATICS STATEMENTS INTO ENGLISH AND VICE VERSA

LANGUAGE TRANSLATIONS
(Descriptive Processing)

When students are learning mathematics, they may be going through as many as four levels of language translations:

Level 1
Incomplete verbalizations in their native language

Level 2
Articulate responses in their native language

Level 3
Articulate responses using mathematical terminology

Level 4
Articulate responses using mathematical symbols

EXAMPLE : What are these? 1,2,3,4

Level 1 Numbers

Level 2 They are numbers we count with

Level 3 They are the first four elements in the set of natural numbers

Level 4 $\{n \mid 0 < n < 5, n \in \mathbf{N}\}$

Descriptive Processing should be distinguished from
REASONING SKILLS WHICH DEMONSTRATE THE ABILITY:

- TO THINK LOGICALLY
- TO ORGANIZE DATA
- TO INTEGRATE CONCEPTS
- TO MAKE CHOICES
- TO MAKE DECISIONS
- TO DETERMINE REASONABILITY

Language Parallels

English	Mathematics
Word	Term
Phrase	Expression
Declarative Statement	Relation (for example, the equation or inequality)

ENGLISH EXAMPLE:

"The person with the brown hair in the third seat in the front row is going to the Capitol of the United States."

Said more simply without changing the meaning or determining the truth of the sentence:

"Mary is going to Washington, D.C."

ARITHMETIC EXAMPLE:

$$\overset{15}{6 + 5 - 4 = 2(3 + 10) - 21}$$

$$6 + 3 - 4 = 2(13) - 21$$

$$5 = 5$$

Definitions of Mathematical Terminology

- Let a,b represent any two numbers.

The Operation	Symbolically Denoted	a,b are called	The result of the operation is called:
addition	$a + b$	terms	sum
subtraction	$a - b$	terms	difference
multiplication	ab, $a \cdot b$, $(a)(b)$	factors	product
division	$\frac{a}{b}$, $a \div b$		quotient
exponentiation	b^a	a: exponent; b: base	power
root extraction	$\sqrt[a]{b}$	a: index; b: radicand	root

- [ ], ( ), ___, $\sqrt{}$, are called grouping symbols and are used to denote the **RESULT** of an operation.

- Any number standing alone or any group of symbols denoting a power, root, product or quotient is called a **TERM.**

- An **EXPRESSION** is formed by writing the sum(s) and/or difference(s) of terms. Also, a term standing alone is an expression consisting of one term.

- To **SIMPLIFY** an expression means to perform the indicated operations. Perform the operations within each term exactly how it reads, then add or subtract the terms accordingly from left to right.

- To **EVALUATE** an expression means to assign a numerical value to each literal number in the expression then simplify the expression.

- An **EQUATION** is the equality of two expressions.

- To **SOLVE** an equation means to determine if it is true or false.

Step by Step Process

STEPS:

1. Select any positive whole number
2. Double it, then add **9**
3. Add your original number to your result
4. Divide by **3**
5. Add **7** to your quotient
6. Subtract your original number from the sum

USING A MATHEMATICAL EXPRESSION TO MODEL THE PROCESS:

Let x represent any positive whole number.

$$\frac{2x + 9 + x}{3} + 7 - x =$$

$$\frac{3x + 9}{3} + 7 - x =$$

$$x + 3 + 7 - x =$$

$$10$$

The result is always 10!!

As a way of practicing " translations," the expressions on the following page may be written on 3 x 5 cards, one side of the card bearing the English statement and the other the mathematical statement (see example below). One student may then read the statement to another student who writes it mathematically. The reader should spend equal time practicing both kinds of statements. The students then switch roles. Expressions may be solved with or without the use of a calculator.

FRONT

SEVEN TIMES THE SUM OF 82, 39, AND 10

BACK

7(82 + 39 + 10)

READING MATHEMATICAL EXPRESSIONS BY TERMS

RESPONSE KEY

Mathematical expressions can be read several ways. The way provided below emphasizes terms and how to correctly perform the operations. To assist in the reading, terms are separated by italicized words.

1a. 1 term: "Seven time the **sum of** 82,39, and 10."

2a. 2 terms: "31 *minus* 7 times the **sum of** 2.3 and 5.1."

3a. 2 terms: "37, 284 *minus* the **product of** .24 and 17, 989."

4a. 1 term: " The **sum of** 2 , 7 , 3 , and 9 , **divided** by 3."

5a. 1 term: "2 times **the square** of 3."

6a. 1 term: "The **fourth power of** negative two."

7a. 3 terms: "The **negative of** the fourth power of 7 *plus* 10.3 *minus* 4"

8a. 1 term: "The **product of** 17, the square of 2.7 and the square root of 84.1 or "17 times 2.7 squared times the square root of 84.1."

9a. 1 term: "The **negative of** the fourth root of 16."

10a. 1 term: "The square root of the **sum of** 16.1 squared and 13.4 squared."

11a. 2 terms: "81.3 *plus* 2 raised to the **power of** the difference of 20 and 17, divided by 5."

12a. 1 term: "The **square root of** 17,500 divided by the product of 20.5 and π"

13a. 1 term: "The **sum of** 10.7 and 1/3 **divided by** the difference of 1.8 and 4/3."

14a. 2 terms: "The **sum of** 2.78 and 8 times 3 **divided by** the square root of.4/3, *plus* 1.7."

15a. 3 terms: "3.7 times the **square root of** 81 *minus* 36 9, times 2 *plus* 7.1 times the **sum of** 12 and .5."

16a. 3 terms: "1/2 times 1/3 *minus* 1/5 divided by 2/3 *plus* the sum of 1/2 and 16.3."

READING MATHEMATICAL EXPRESSIONS BY TERMS

ANSWER KEY

	Calculator Display	Appropriate Answer	
		Exact	Approximate
1a.	917	917	
2a.	-20.8	-20.8	
3a.	32,966.64	32,966.64	
4a.	7 17/24 or 185/24	7 17/24 or 185/24	
5a.	18	18	
6a.	16	16	
7a.	-2,394.7	-2,394.7	
8a.	1,136.513104		1,136.5
9a.	-2	-2	
10a.	20.94683747		20.9
11a.	82.81571657		82.8
12a.	16.48417276		16.5
13a.	23.64285714		23.6
14a.	24.89216031		24.9
15a	120.05	120.05	
16a.	16.66666667		16.7

WORKING WITH WORD PROBLEMS:

CONTINUING AND APPLYING TRANSLATIONS

Suggested Word Problem Approaches

Suggested methods of approaching word problems may be found in the following texts:

1. Scott-Foresman - Pre-GED Mathematics Skills

Part A: Unit 2, Lesson 12, p. 26 "Solving Word Problems"
Lesson 13, p. 28 "Picturing the Problem"
Unit 3, Lesson 27, p. 51 "Skill with Word Problems: Unnecessary Information"

Part B: Unit 1, Lesson 24, p. 163 "Solving Word Problems"
Lesson 25, p. 165 "What's the Question?"
Lesson 26, p. 167 "What Info. do you Need?"
Lesson 27, p. 169 "What Should You Do?"

2. Contemporary - New GED Tests: Mathematics

Chapter 2, pp. 19 - 33 "The Five-Step Approach to Solving Word Problems"

Exercises to encourage word problem-solving

Meaning of Operations

I. In some way show **why** we would do each of the problems below. This might involve a picture, a verbal explanation or ?? An answer to the problem is not enough!

1. 2×3
2. $2 + 5$
3. $10 \div 2$
4. $10 \div 3$

II. Write a story problem that would use the given operation(s) to solve it.

1. Multiplication
2. Addition
3. Subtraction
4. Division
5. Addition and Subtraction
6. Addition and Division

Problem Solving

HINTS TO CONSIDER:

1) Read the problem carefully to see what is being asked. (If you don't know where you are headed, it's harder to get there.)

2) If you do not see a way of solving a problem, try changing to easier numbers to do your planning. Once you see how to proceed you can go back to your original numbers.

3) There may sometimes be information given in a problem that is not needed to solve the problem.

==========

1. Each month Pat earns $1,252 and pays $342 on her house payment. What does she pay in house payments each year? What is her annual salary?

2. Bob has been given 527 pencils to be put in packages of 12 each. How many packages will Bob have when he finishes? How many pencils will be left over?

3. It is 180 miles from Portland to Seattle. If Joe averaged 50 miles per hour, how many miles did he travel round trip to Seattle?

4. If 1/2 dozen popsicles cost 1/2 dollar, what will Julie be charged for one popsicle?

5. What number divided by 37 yields a quotient of 262 and a remainder of 5?

6. At the ABE School there are 18 classes. Seven of these classes have 23 students in each of them, 3 have 21 students each, 4 have 28 students, 3 others have 20 each, and one class has 18. What is the total enrollment of the school? If 35 students are absent, how many are present?

7. An airplane left Airport X at 11:00 a.m. and arrived at Airport Y, 2,538 miles away, at 5:00 p.m. What was the average speed of the plane? (Think about how speed is measured.)

8. What is the result if the product of 25 and 47 is divided by the sum of 25 and 47?

9. With 7 letters per word, 9 words per line, 51 lines to a page, how many words are there on 174 pages?

10. A fruit grower has two fields of trees. In field "A" there are 46 rows of 17 trees. In field "B" there are 38 rows of 19 trees. The grower expects to get 27 bushels from each tree in field "A" and 29 bushels per tree from field "B". Which field does he expect to get more fruit from? How many bushels more?

WALKING THROUGH SOME WORD PROBLEMS

This session we are concentrating on the first step in thinking through a problem.

DO NOT FIND ANSWERS (YET)! For each problem:

A)Write on your paper what you are trying to find. Include the units. For the first problem you might write *Find how many dollars Luis pays.*

B)Indicate which operation or operations you would use and be prepared to say why. For example, *multiply by 1/3 or divide by 3.*

1. Luis is going to pay for 1/3 of a bicycle. If the bicycle costs $178.95, what is his share?

2. Luis' sister is going to pay for the rest of the bicycle. Find her share.

3. One week Susan catches two fish for each of the six members of her family. How many fish does she catch?

4. The next week Susan catches 39 fish. How many will each family member have if each person receive the same number of fish?

5. The office has 2 3/4 cases of paper in one storeroom, 4 1/2 cases in another, and the store delivers 23 more. How many does the office have after the delivery?

6. If the office needs 48 cases per month, how many more do they need to order?

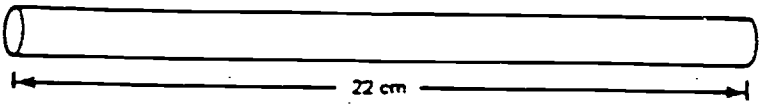
7. An electrician uses 23.5 feet of wire from a fifty-foot roll. How much wire is left on the roll?

8. If the electrician needs 8.25 feet of wire for each connection, how many connections will one fifty-foot roll supply?

9. You earn $6.25 per hour and work an average 12 hours a week. 15% of your wages is withheld for taxes and insurance. Find the amount withheld in an average week.

10. In the situation in Problem 9, how much money do you take home in an average week?

11. The illustration shows a pipe 22 centimeters long.



a. How many 2.5 centimeter pieces can be cut from the 22 centimeter pipe?
b. How much of the 22 centimeter pipe remains?

12. A carpenter uses 3/8 of a 12-foot plank. How much of the plank is left?

13. A secretary types 125 pages of a research report. This is 1/5 of the complete report. How many pages are in the complete report?

14. A real estate firm rents office space at $5 a square foot. How much total rent would it receive from 4 offices which measure 176 square feet, 253 square feet, 476 square feet, and 195 square feet?

15. A truck driver has to drive 987 miles to San Francisco. If he covers 351 miles the first day and 298 miles the second, how much does he have to drive the third?

16. Stock shares dropped from $87 to $75. If Monica owns 650 shares, how much did she lose?

17. A carpenter cut a 5 foot piece and an 8 foot piece from a 29 foot pole. The remainder was cut into 4 equal pieces. How big is each piece?

18. An 8 story building has five 2-room apartments and eight 3-room apartments on each floor. What is the total number of rooms?

19. Michelle began a trip when her car odometer read 40,956 miles. At the end of the trip the odometer read 41,327 miles. If her car gets 26 miles per gallon, was one tank full (11.6 gallons) enough to make the trip?

20. The average attendance for the eight professional football games last Sunday was 47,855. If the average cost per ticket was $9, what was the gross revenue from the games to the nearest ten thousand dollars?

21. Jamie has been asked to bring 2 lbs of peanuts for each of 4 groups of students in his class. He has bags of peanuts weighing 2 1/2 lbs, 1 3/8 lbs, 1 7/8 lbs and 2 3/4 lbs. What was the average weight of the bags of peanuts? Did he bring too much or too little and by how much?

22. A true-false test has 5 questions. How many different ways are there to answer this test? What if the test has 20 questions?

23. The total number of names in the city directory was reduced by 5,164 names this year. If ther were 30,800 names last y ear, how many names are there this year? Was thir reduction more or less than the 16% reduction that had been predicted?

24. The total number of names in the city directory was reduced by 22% between 1987 and 1988. If there were 35,658 in 1987, how many names were in the directory in 1988?

25. If the area of a square is 345 square meters, how long is each side of the square to the nearest tenth of a meter?

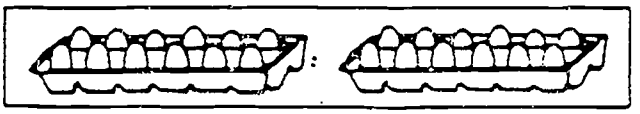
26. A high volume photocopier is advertised as being very reliable, averaging less than 0.2 paper jams per 1000 copies when using the proper paper. A small photocopy business buys one of these machines and logs 129 paper jams during the month when they run 382,926 copies. Did the machine meet the advertised guarantee during that month?

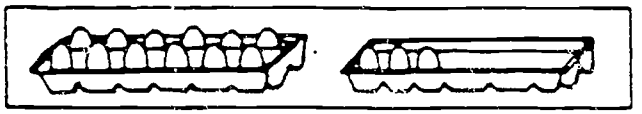
27. A production report shows that 1726 units of a machine part were produced, and 23 units were rejected by quality control. Standard procedure requires that the production line be shut down for investigation if the reject level exceeds 2%.
    a. What fraction of the units were rejected?
    b. What percentage is this?
    c. Are the rejects in excess of 2%?
    d. If the production line produces about 230 units per hour, about how many rejects might be tolerated during an hour before it was evident that the line was in excess of the standard?

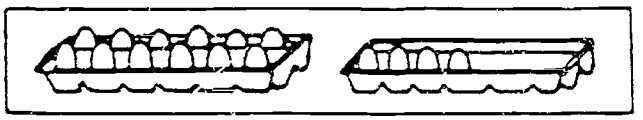
28. You manage a mail-order business that has 5 workers assigned to process and package the orders it receives. These workers are packaging an order for 2500 parts that need to be mailed by the end of the shift. So far they have packaged 900 parts during the first four hours. It is evident that they are not going to be able to finish the order during the remaining four hours without some help.
    a. What is the ratio of parts packaged to the number of workers assigned during the first four hours? What is the meaning of this ratio when expressed in simplest form?
    b. How many parts still have to be packaged during the remaining four hours?
    c. How many total workers will it take to be able to meet this goal? (Assume all workers work at the same rate as computed above.)

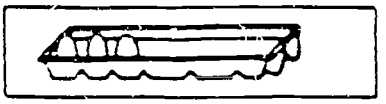
29. You have a bowl with 10 red marbles, 20 green marbles, and 20 blue marbles.
    a. What fraction of the marbles are green?
    b. What is the probability of choosing a green marble from the bowl with your eyes closed?
    c. What percent of the marbles are not green?

30. Each of the egg cartons below can hold a dozen eggs. Which choice shows 1 1/4 dozen eggs?

A. 

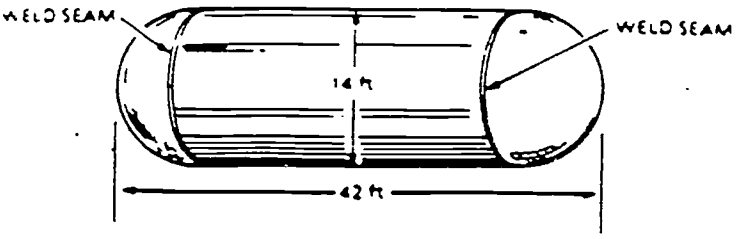
B. 

C. 

D. 

MORE WORD PROBLEMS

GEOMETRY AND FORMULAS



1. What is the length of one of the weld seams that attaches a hemispherical end to the cylindrical tank?

2. Welding the hemispherical ends on the cylindrical tank adds volume to the tank. About how much volume is added by the pair of hemispherical ends?

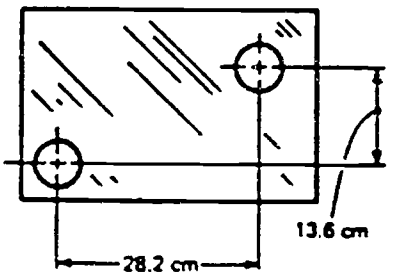
3. What is the length of the cylindrical section of the tank (between the hemispheres)?

4. The rate of flow of water through a fire hose can be computed with the formula:

$$\text{Flowrate} = 30d^2\sqrt{p}$$

where flow rate is in gallons per minute,
d is the nozzle diameter in inches, and
p is the nozzle pressure in pounds per square inch (psi)
What is the flow rate that could be expected from a hose with a 2.5" nozzle diameter and a nozzle pressure of 78.7 psi?

5. Find the distance between the two holes?



COMMUNITY COLLEGE BUDGETS

Here are the 1990-91 budgets for Oregon's 16 community colleges and the latest available enrollment figures. The enrollment figures are given two ways: in full-time equivalency, FTE, or one student taking 45 credit hours during a year and in head count, the actual number of full- and part-time students attending the college.

Community College, City	1990-91 budget	FTE	Headcount
Blue Mountain, Pendleton	$ 8.7 million	1,694	10,294
Central Oregon, Bend	$ 14.4 million	1,995	11,986
Chemeketa, Salem	$ 30.6 million	7,792	38,997
Clackamas, Oregon City	$ 20.6 million	4,356	28.016
Clatsop, Astoria	$ 5.8 million	974	6,355
Columbia Gorge, The Dalles	$ 2.3 million	525	4.450
Lane, Eugene	$ 40.2 million	8,330	32,593
Linn-Benton, Albany	$ 18.7 million	4,872	27,275
Mt. Hood, Gresham	$ 27.1 million	6,192	27,113
Oregon Coast, Newport	$ 1.6 million	402	5,638
Portland, Portland	$ 61.9 million	14,824	80,385
Rogue, Grants Pass	$ 7.1 million	2,144	12,316
Southwestern, Coos Bay	$ 8.1 million	1,603	9,924
Tillamook Bay, Tillamook	$ 1.2 million	283	2,658
Treasure Valley, Ontario	$ 6.5 million	1,302	6,502
Umpqua, Roseburg	$ 8.1 million	2,582	13,675

Refer to the chart above to answer the following questions:

1. What is the average headcount of all the community colleges listed? Explain how you got your answer.

2. List in order the five community colleges with the highest 1990-91 budgets. List the highest first.

3. a. Of the two colleges with the largest budgets, which one spends less money per student (headcount represents the number of students)? How much less does it spend per student than the other college? Explain how you arrived at your conclusions.

   b. Of the two colleges with the largest budgets, which spend less per FTE? Is the conclusion the same as part (a)? Which gives a more accurate way to compare expenditures?

4. Combine the FTE of the three colleges with the smallest FTE. Next identify the college with FTE that is closest to the combined total for the tree colleges. Which is larger, the budget of the fourth college you identified or the budget of the three smallest combined? How much larger? List the names of the colleges used and label the numerical data used to carry out your calculations.

Answer Key for Application Problems

1. A. Find how many dollars Luis pays.

   B. multiply by 1/3 or divide by 3

   C. 1/3 (178.95) ≈ 1/3 (180) = 120

   D. $59.65

2. A. Find how many dollars Luis's sister pays.

   B. Subtract or multiply

   C. $178.95 - $59.65 or 2/3 (178.95) ≈ 2/3 (180) = 120

   D. $119.30

3. A. How many fish does Susan catch?

   B. Multiply

   C. $\frac{2 \text{ fish}}{\text{person}} \cdot 6 \text{ people} = 12 \text{ fish}$

   D. 12 fish

4. A. Find how many fish per family member.

   B. Divide

   C. $\frac{39 \text{ fish}}{6 \text{ people}} \quad \frac{36 \text{ fish}}{6 \text{ people}} = 6 \text{ fish/person}$

   D. 6.5 or 6 1/2 fish/person

5. A. Find how many cases of paper the office has.

   B. Addition

   C. 2 3/4 + 4 1/2 + 23 = 3 + 4 + 23 = 30 cases

   D. 30 1/4 cases

6. A. Find how many cases the office needs to order.

   B. Subtract

   C. 48 - 30 1/4 ≈ 48 - 30 = 18 cases

   D. (17 3/4 cases) They will need to order 18 cases of paper.

7. A. Find how many feet of wire are left.

   B. Subtract

   C. $50 - 23.5 = 50 - 24 = 26$ feet

   D. 26.5 feet

8. A. Find how many connections can be done with one roll.

   B. Divide

   C. $50 \div 8.25 = 48 \div 8 = 6$ connections

   D. $50 \div 8.25 = 6.06$; 6 connections can be made.

9. A. Find the number of dollars you earn per week. Find the amount of dollars withheld per week.

   B. Multiply; multiply

   C. $\frac{\$6.25}{\text{hr}} \cdot \frac{12\ \text{hr}}{\text{wk}} \cdot 15\% = 6 \cdot 10 \cdot (.20) = \$12$

   D. \$11.25/wk

10. A. Find how many dollars you take home per week.

    B. Multiply; subtract

    C. $\frac{\$6.25}{\text{hr}} \cdot \frac{12\ \text{hr}}{\text{wk}} - \frac{11.25}{\text{wk}} = 6 \cdot 10 - 10 = \$50/\text{wk}$

    D. \$63.75/wk

11. A. a) How many pieces can be cut?
    b) How many centimeters are left?

    B. a) Divide
    b) Multiply; subtract

    C. a) $22\ \text{cm} \div \frac{2.5\ \text{cm}}{\text{piece}} = 20\ \text{cm} \div \frac{2\ \text{cm}}{\text{piece}} = 10$ pieces
    b) $22 - 8(2.5) = 20 - 16 = 4$ cm

    D. a) 8 pieces
    b) $22 - 8(2.5) = 2$ cm or $.8(2.5\text{cm}) = 2$ cm

12. A. Find how many feet of the plank are left.

B. Subtract; multiply or multiply; subtract

C. (1-3/8) (12 feet) or 12 - 3/8(12) A little more than 1/2 is left.

D. 7 1/2 ft

13. A. Find the number of pages in the complete report.

B. Multiply by 5 or divide by 1/5.

C. 5(125 pages) = 5(100) = 500 pg
or 1/5R = 125
R = 125 ÷ 1/5

D. 625 pages

14. A. Find the total number of square feet of office space. Find the number of dollars charged for rent.

B. Addition ; multiplication

C. $\frac{\$5}{ft^2}(176ft^2 + 253ft^2 + 476ft^2 + 195ft^2) =$
$5(200 + 300 + 500 = 200) = 5(1200) = \$6000$

D. $5500

15. A. Find how many miles have already been driven. Find how many miles are left.

B. Addition ; subtraction

C. 897 mi - (351 mi + 298 mi) = 900 - (400 + 300) = 200 mi

D. 248 miles

16. A. Find how many dollars each share lost. Find how many dollars total were lost.

B. Subtraction ; multiplication

C. $650 \text{ shares} \left(\frac{\$87}{\text{share}} - \frac{\$75}{\text{share}}\right) = 650(10) = \$6,500$

D. $7,800

17. A. Find how many feet are in the remainder. Find how many feet are in each of four pieces.

B. Addition, subtraction; division

C. $\frac{29\text{ft} - (8\text{ft} + 5\text{ft})}{4} = \frac{30 - 10}{4} = 5$

D. 4ft

18. A. Find how many rooms are on each floor. Find how many rooms are on 8 floors.

B. Multiplication, addition; multiplication

C. $8 \text{ floors } \left(\frac{5.2 \text{ rooms}}{\text{floor}} + \frac{8.3 \text{ rooms}}{\text{floor}}\right) = 8(10 + 24) = 8(30) = 240 \text{ rooms}$

D. 272 rooms

19. A. Find how many miles were traveled. Find the number of miles each tank of gas will allow.

B. Subtract; multiply (compare)

C. 41,237 miles - 40,956 miles = 41,200 - 41,000 = 200 miles

$\frac{26 \text{ mi}}{\text{gal}} \cdot \frac{11.6 \text{ gal}}{\text{tank}} = 30 \cdot 10 = \frac{300 \text{ mi}}{\text{tank}}$

D. 281 miles traveled; 301.6 miles/tank; 1 tank full was enough.

20. A. Find how many people attended games last Sunday. Find how many dollars were paid for tickets.

B. Multiply; multiply

C. $\frac{\$9}{\text{ticket}} \left(\frac{47,855}{\text{game}}\right) \cdot 8 \text{ games} = 10(47,000)(10) = \$4,700,000$

D. $3,445,560 or $3,450,000 to the nearest ten thousand

21. A. Find the average number of lbs of peanuts per bag. Find the total number of lbs of peanuts needed. Find the total number of lbs of peanuts brought. Find the number of lbs of peanuts too much or too little.

B. Addition, division; multiplication; addition; subtraction

C. $\frac{2\ 1/2 \text{ lb} + 1\ 3/8 \text{ lb}}{4} + 1\ 7/8 \text{ lb} + 2\ 3/4 \text{ lb} = \frac{2 + 1 + 2 + 3}{4} = 2\text{lb}$

2lb/person • 4 people = 8lb

2 1/2lb + 1 3/8lb + 1 7/8lb + 2 3/4 lb = 8lb (larger) - (smaller)

D. 2 1/8lbs/bag ; 8 lbs ;8 1/2lbs ; 1/2 lb too much

22. A. Find how many different ways each question can be answered. Find the number of different answer keys.

B. _____; power

C. 2; 2^5 ; 2^{20}

D. 2; 32 ; 1,048,576

23. A. Find the number of names in the directory this year. Find the percentage decreased from last year.

B. Subtract; divide (compare)

C. 30,800 names - 5,164 names = 25,000 names

$$\frac{\text{amt.dec.}}{\text{orig \#}} = \frac{5,164}{30,800} = 1/6 = 15\%$$

D. 25,636 names; ~ 16.8% more than predicted

24. A. find the number of names that were deleted. Find the number of names remaining.

B. Multiply; subtract or [subtract; multiply(different 1st question)]

C. 35,658 - .22(35,658) = 40,000 - .2(40,000) = 32,000

D. 27,813 names

25. A. Find the number of meters on each side of square.

B. Square root ($S^2 = 345m^2$)

C. $\sqrt{345} = \sqrt{400} = 20m$

D. ~18.6 meters

26. A. Find the ratio of jams per copies for advertised and actual.

B. Divide; divide

C. $\frac{.2 \text{ jams}}{1000 \text{ copies}} = .0002$; $\frac{129}{382,926} = \frac{100}{400,000} = \frac{1}{4000} = .00025$

D. .0002 jams/copy; .00034 jams/copy. It did not meet the advertised guarantee.

27. A. $\frac{23 \text{ rejects}}{1726 \text{ units}}$

B. Divide; ~1.3%

C. No (less than 2%)

D. 2% of 230 = 4.6 units. Four rejects would be tolerated per hour before they would be in excess of 2%.

28. A. ratio; $\frac{900 \text{ parts}}{5 \text{ workers}}$ -- 180 parts/worker
In the 4hr shift they packaged 180 parts per worker.

B. Subtract; 2500 - 900 = 1600 parts

C. Division; $\frac{1600 \text{ parts}}{180 \text{parts/workers}}$ = 8.8 workers.

D. They need 9 workers.

29. A. Find the total number of marbles first.

B. $\frac{20 \text{ green marbles}}{50 \text{ total marbles}}$ = 2/5 are green

C. 2/5 = .4 is the probability

D. 3/5 are not green. 3/5 = 60%

30. A. Find the number of eggs in 1/4 doz.

B. 1/4(12) = 3 eggs

C. B

Answer Key for Geometry and Formulas

A. Formula needed to solve
B. Substitute values and units, estimate
C. Solve

1. A. $C = \pi d$
   B. $C = \pi(14ft) \approx 3(15) = 45ft$
   C. 44.0 feet

2. A. $V = 4/3\ \pi r^3$
   B. $V = 4/3\ \pi(7ft)^3$
   C. 1436.8 cubic feet

3. A. $L = 42 - 2r$
   B. $L = 42\ ft - 2(7\ ft) \approx 40 - 10 = 30\ ft$
   C. 28 feet

4. B. Flowrate $= 30(2.5)^2\sqrt{78.7} \approx 30(3)^2\sqrt{81} = 2430$ gal/min
   C. 1663.4 gallons per minute

5. A. $d = \sqrt{a^2 + b^2}$
   B. $d = \sqrt{(28.2cm)^2 + (13.6cm)^2}$
   C. 31.3 cm

6. A. $L = 1 + \pi d$
   B. $L = 1in + \pi(2in) \approx 1 + 3(2) = 7in$
   C. 7.3 in.

7. A. Area to be fertilized = total area - area of driveway - area of house - area of patio, then compare to 5000 sq. ft
   B. $A = (104\ ft)(60\ ft) - (12\ ft)(30\ ft) - (40\ ft)^2 - (10\ ft)^2 \approx (100)(60) - (10)(30) - 40^2 - 10^2 = 4000\ ft^2$
   C. 4,180 square feet. You should have enough fertilizer.

8. B. $P = (75.2)2^{\left(\frac{010-1990}{50}\right)}$ million
   C. 100.15 million

9. B. $r = \frac{18{,}200ft^3}{\pi(23.8ft)}$, $d = 2r$
   C. 31.2 ft

10. B. $Q = \frac{2.83\ (2)(10)}{\sqrt{6}} \approx \frac{3 \cdot 2 \cdot 10}{\sqrt{4}} = 30$ gal/min
    C. 23.1 gallons per minute

ESTIMATE!

...THEN CALCULATE

ESTIMATION

I. Rounding off numbers.
There are two ways to round off numbers.

Method 1:
One method is to round off to a specific place value.

Let's round 287 to the **hundreds** place.

To do this first type of rounding, we note that 287 is between 200 and 300.

200 210 220 230 240 250 260 270 280 290 300

Since 287 is closer to 300 than to 200, we say that 287 rounded to the nearest hundred (or to the hundreds place) is 300.

If we need to round to the tens place we note that 287 is between 280 and 290. Since 287 is closer to 290 we say that 287 rounded to the nearest ten (or to the tens place) is 290.

A short cut to picturing a number line each time we round is to apply the following rules. (Make sure you understand why they work.) Let's use 287 as we did on the number line example.

1. Mark the place to be rounded to. (In this case, hundreds.)

287
*

2. Look at the digit to the **right** of this.
   a) If this number is less than 5, leave the marked digit unchanged and change all digits on its right to zeros.
   b) If this digit is 5 or greater, increase the marked digit by 1 and change all digits to the right of this to zeros.

1. Round to the nearest ten (to tens place)

a) 72_____

b) 69_____

c) 482_____

d) 7241_____

e) 9982_____

2. Round to the nearest hundred (to hundreds place)

a) 245_____ d) 41_____

b)271_____ e) 102,491_____

c)3271_____ f) 9,982____

3. Round to the nearest thousand (to thousands place)

a) 1,789_____ d) 102,426_____

b) 13,207_____ e) 9,982_____

c) 482_____

Method 2:

The second type of rounding is used more often in making working estimates.

Single digit estimation means that in rounding numbers to get rough guesses we want to keep only one digit that is not a zero.

EXAMPLES: 8900 becomes 9000 (or 8000)

5612 becomes 6000 (or 5000) not 5600

(I can multiply in my head by 5 or 6 but not by 56)

98.2 becomes 100 (not 100.0)

1,578,248 becomes 2,000,000

4235.987 becomes 4000

Note that the numbers we get are always whole numbers- not fractions or decimals.

1. Round these numbers to numbers you would use in single-digit estimation.

1. 87_____

2. 12_____

3. 283_____

4. 4,582_____

5. 98,436_____

6. 402,491_____

7. 567,812,345_____

8. 24,895_____

9. 16,527_____

II. Estimation of Arithmetic Calculations.

Making a rough guess of the answer to a problem is important. This guess combined with common sense, often allows you to catch your own errors. This can save you time--and red marks on your papers! The short time an estimation takes is time well spent.

A. Addition and Subtraction

As you get better at mental estimation you also protect yourself in your daily business transactions. Consider this situation:

Julie was at the grocery store. She was getting coffee @ $4.98, 5 pounds of oranges @ 4 pounds for $1.00, cheese @ $3.88, and a few small items worth about $2.00. She mentally figured that her total bill would be about $12.00.

Coffee	$5
Oranges	1
Cheese	4
Other	2
Total	$12

When the clerk totaled the items, he asked for $17.32. This was way off from Julie's guess so she looked carefully at the receipt. She saw that she had been charged $1.25 a pound for oranges! This is what had happened. The product code for oranges was 125. the clerk carelessly entered the 125 as the price rather than the code number. The clerk then correctly totaled the bill to 11.56. Julie had saved herself from a $5.72 error by her estimation.

Now try this estimate:

Ann was at the grocery store. She was getting 1 pound of coffee @ $4.98 per pound, 1 gallon of ice cream @ $3.17 per gallon, 5 pounds of oranges @ 4 pounds for $1.00, cheese @ $3.88, and cereal @ $1.81. She had coupons for 60¢ off coffee, 25¢ off ice cream, and 17¢ off cereal.

Item	Estimate	Coupon	Estimate
Coffee --	$_____	Coffee --	$_____
Ice Cream --	_____	Ice Cream --	_____
Oranges --	_____	Cereal --	_____
Cheese --	_____		
Cereal --	_____	Total	$_____
Total	$_____	Total rounded to the nearest dollar	$_____

Total Coupon Estimate Grocery Estimate

_____ - _____ = _____

From your above estimate, is $14.07 a fair price to pay for the groceries?_____

B. Estimates are also important to do when using a calculator to do computations. Many errors are possible when using a calculator. Some of the sources of error are:

1)entering wrong digits, skipping a digit, reversing digits
2)entering the wrong operation
3)a sticking key
4)reading the result incorrectly
5)weak batteries (which cause very strange results)

The two main ways to detect errors are visual checks and rough mental estimates. Here we are looking at ways of doing the mental estimates.

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C. Estimation with Addition and Subtraction

In addition or subtraction you will want to round everything to the same place value
(Method 1). Look at the largest place value present. Round every number to this place value. If all the digits are in one column the operations can be done in your head.

Examples:

Problem	Estimate
231	200
572	600
82	100
468	500
+ 47	+ 0
	1400

$225 + $482 - $172 + $82
200 + 500 - 200 + 100 = 600 (estimate)

Problem	Estimate
3241	3000
289	0
5318	5000
+714	+1000
	9000

Now work the original problems on your calculator & compare your answers to the estimates.

Estimate the answers to these problems. Show numbers you are using to get your estimate. Follow examples above.

Problem	Estimate	Problem	Estimate
342		4003	
878		124	
32		3729	
419		+824	
+ 93			

654 + 27 + 93 - 416 _____

$32.26 - $9.18 + $3.27 + $17.98 _____

D. Estimation with Multiplication

When estimating with multiplication, round each number to its largest place value. (Method I!). Then do a mental multiplication.

289 x 7219
300 x 7000 = 2100000 = 2,100,000

2 zeros 3 zeros 2 + 3 5 zeros

52 x 871
50 x 900 = 45000 = 45,000

Estimate the answers to these problems. Show the numbers you are using to get your estimate. Follow examples above.

1. 5782 x 81 _____

2. 435 x 8613 _____

3. 1398 x 9 _____

4. 753 x 426_____

5. Approximate your yearly income if you earn $213.45 a week.

_____

E. Estimation with Division

In estimating with division a modified first digit approximation is used.

1293 ÷ 57 $60\overline{)1000}$ This problem is difficult to do mentally.

$60\overline{)1200}$ This is much easier.

Choose your rounded numbers so that the division can be done easily, in your head.

2142 ÷ 36 becomes 40 2000 or 30 2100

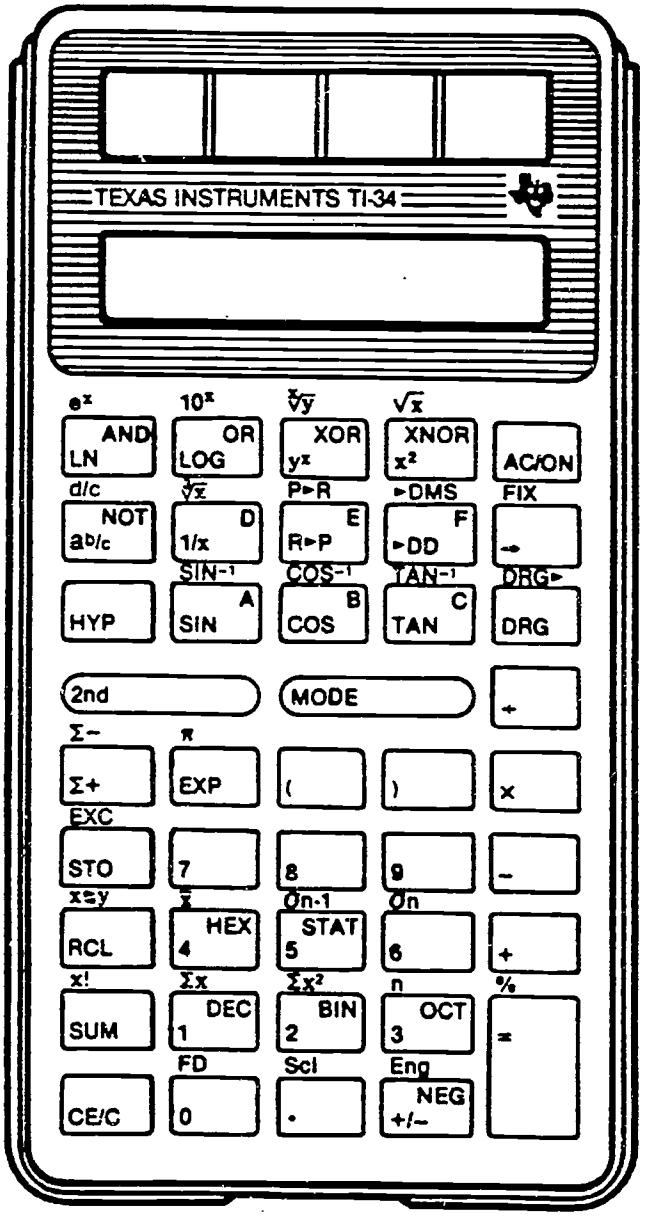
1. 3342 ÷ 71 _____
2. 263 ÷ 17 _____
3. 6342 ÷ 843 _____
4. 28,932 ÷ 63 _____
5. 214 ÷ 26 _____
6. 75,884 ÷ 243 _____

You bought a car on time for $2,595, including interest, for 12 months. Approximate your monthly payments.

CONFRONTING THE CALCULATOR*

*(Based on the TI-34 Calculator/Classroom Kit)

TI–34 Keyboard



Lesson 2: Arithmetic

Overview

Students can usually begin using arithmetic operations with minimal explanation. For calculations that include more than one operation, an internal system of the calculator observes the widely accepted algebraic hierarchy of operations.

Keys

[+], [−], [×], [÷], [=], [(], [)], [.], [+/−], [2nd] [%]

Transparency

The Algebraic Operating System (AOS™)

Student Worksheet

Arithmetic

Teaching Steps

1. Explain that students enter the numbers and operations of a simple arithmetic problem in the same order on the calculator as they see in the written problem.

2. Use "The Algebraic Operating System (AOS™)" transparency to review the priorities of functions on the TI-34.

   - The AOS™ feature has no effect on a problem that involves only one operation.
   - When a problem has more than one operation, the calculator evaluates the problem according to the AOS™ priorities.
   - An operation that is entered but not yet completed is called a pending operation. All other modes except statistics have a capacity of six pending operations. The statistics mode has a capacity of three pending operations.

3. Explain that parentheses override the Algebraic Operating System. To show this, calculate $(20-3)\times 5$, with and without parentheses.

   - With parentheses, the grouped portion $20-3$ is performed first for an intermediate result of 17. Multiplying 17×5 results in 85.
   - Without parentheses, the higher priority operation 3×5 is performed first for an intermediate result of 15. Subtracting 15 from 20 results in 5.

   Mention that the calculator does not perform implied multiplication of adjacent parenthetical expressions, as in the calculation $(99-11)(67-82)$. The student must enter [×] between [(] 99 [÷] 11 [)] and [(] 67 [−] 82 [)] to multiply these expressions.

(continued)

Lesson 2: Arithmetic (Continued)

Teaching Steps (Continued)

4. Demonstrate how to enter a decimal value using the [.] key.

5. Show students how to enter a negative number by entering a positive value and then pressing the [+/-] key.

6. Demonstrate how [2nd] [%] is used with [+], [−], [×], and [÷] to solve percentage problems.

Examples Using Percent	Key Sequence	Display
Add-on: add 8% to 12.50	12.50 [+] 8 [2nd] [%] [=]	13.5
Discount: 12.50 less 20%	12.50 [−] 20 [2nd] [%] [=]	10.
Percentage: 80% of 500	500 [×] 80 [2nd] [%] [=]	400.
Percent ratio: 400 is 80% of what value?	400 [÷] 80 [2nd] [%] [=]	500.

7. To help students use the calculator more efficiently, present Lesson 3 (Clearing and Correcting Entry Errors) in conjunction with this lesson.

Arithmetic

AOS™ and Parentheses

When you read an arithmetic problem, you can see all of the problem at the same time. The calculator does not see the whole problem at once. Instead, it receives numbers and functions in sequence and does not know how long the problem will be. The calculator can best contain the problem by performing suitable operations before you finish entering the problem.

To observe the AOS™ priorities in action, work each problem below and show the intermediate results.

By observing some of the intermediate results, you can see how the operations are being performed.

Calculate $4+3\times2$. Problems 2 and 3 give the correct answer. Discuss the answer to problem 1.

1. 4 [+] 3 [=] _____ [×] 2 [=] _____ (incorrect result)
2. 4 [+] 3 [×] 2 [=] _____
3. 4 [+] [(] 3 [×] 2 [)] _____ [=] _____

Calculate $15-2+7\times6$. Problems 5 and 6 give the correct answer. Discuss the answer to problem 4.

4. 15 [−] 2 [=] _____ [+] 7 [=] _____ [×] 6 [=] _____ (incorrect result)
5. 15 [−] 2 [+] _____ 7 [×] 6 [=] _____
6. [(] 15 [−] 2 [)] _____ [+] [(] 7 [×] 6 [)] _____ [=] _____

Parentheses in Two-Line Division

One application of parentheses is in division problems that have expressions in both the numerator and denominator. To ensure that the numerator and denominator are solved separately, enclose them in separate sets of parentheses. Find the answers to these problems.

7. $\dfrac{20\times65}{16+9}$ = _____

8. $\dfrac{20(8(8\div4+2))}{38-(76(6\div3))}$ = _____

Percentage Problems

9. Find the price of a stereo that is usually $234 but is on sale for 25% off. _____
10. How much does a customer pay for a car priced at $6399, discounted 15.5%, with 8.15% sales tax? _____

Using a Constant

[=]

Example: Multiply 81, 67, 210, and −3.2 by .6917438.

Procedure	Press	Display
Multiply by 81.	81 [×] .6917438 [=]	56.0312478
Multiply by 67.	67 [=]	46.3468346
Multiply by 210.	210 [=]	145.266198
Multiply by 3.2.	3.2 [+/−] [=]	−2.21358016

Try these:

- How much would it cost to buy 13 items costing $13.89 each? 25 items? 107 items? 1138 items?
- Divide various numbers by 89.

  9,792,937 ÷ 89 = 878,964 ÷ 89 =

  31,802.37 ÷ 89 =

Using a Constant

When you have entered a constant, it remains in effect until you enter another operation that qualifies as a constant. The constant is cleared if you press [2nd] [P►R], [R►P], [Σ+], [2nd] [Σ−], [AC/ON], or [CE/C] [CE/C]. Perform the following calculations using the constant feature. After working the first in a group of problems that have the same constant, enter each remaining value and press [=].

1. 356.78 × 9.7531 = _____
2. 7,654,321 × 9.7531 = _____
3. 4597.1357 × 9.7531 = _____
4. 417,012.75 − 65.25 = _____
5. 815.625 ÷ 65.25 = _____
6. 422,983.13 ÷ 65.25 = _____

7. You have the following recipe for Oriental Chicken and Vegetables for Four.

2 lbs. chicken strips	3 Tbs. soy sauce
1 tsp. paprika	1 medium onion, thinly sliced
1 clove garlic, chopped	2 medium green peppers, thinly sliced
1/2 (.5) tsp. salt	3/4 (.75) cup celery, chopped
1/4 (.25) tsp. pepper	1 1/2 (1.5) cups chicken broth
2 Tbs. salad oil	3 medium tomatoes, cut into wedges
2 Tbs. cornstarch	4 cups cooked rice

Season chicken with paprika, garlic, salt, and pepper. Saute' in oil until chicken is thoroughly cooked. Add onion, green pepper, celery, and half of the chicken broth. Cover and cook for 1 1/2 minutes. In a separate bowl, combine remaining chicken broth, cornstarch, and soy sauce and mix well. Add broth mixture to skillet, stirring well. Add tomatoes. Cook 1 minute. Serve over cooked rice. Serves 4.

You are having a dinner party and would like to make this dish for 16 people. The constant feature on your calculator can help you make this an easy task. Simply multiply the amount of each ingredient by 4, since the recipe already serves 4. Don't multiply by 16! Your new amounts are:

_____ lbs. chicken strips
_____ tsp. paprika
_____ cloves garlic, chopped
_____ tsps. salt
_____ tsp pepper
_____ Tbs. Salad oil
_____ Tbs. cornstarch
_____ Tbs. soy sauce
_____ medium onions, thinly sliced
_____ medium green peppers, thinly sliced
_____ cups celery, chopped
_____ cups chicken broth
_____ medium tomatoes, cut into wedges
_____ cups cooked rice

Now try dinner for 2!

Fractions

[a b/c], [2nd] [d/c]

Example: **Find 3 2/4 – 7/8 and show the answer as a Fraction. Also convert the answer to a decimal value.**

Procedure	Press	Display
Enter the first number.	3 [a b/c] 2 [a b/c] 4	3_2⌟4
Subtract.	[–]	3_1⌟2
Complete the problem.	7 [a b/c] 8 [=]	2_5⌟8
Display as an improper fraction.	[2nd] [d/c]	21⌟8
Convert back to the mixed number format.	[2nd] [d/c]	2_5⌟8
Convert to the decimal equivalent.	[a b/c]	2.625
Convert back to the mixed number format.	[a b/c]	2_5⌟8

Try these:

2/5 × 1/3 = 5 6/7 + 2 1/8 = 7/3 × 6 1/7 – 5/12 =

EVALUATING ALGEBRAIC EXPRESSIONS

To evaluate means to "find the value of". For example, if we want to evaluate $a^2 + bc$ when a = 3, b = 6 and c = 2, we would find the value of the expression when we substitute in those values.

$$a^2 + bc =$$
$$3^2 + 6 \bullet 2 =$$
$$9 + 12 = 21$$

Be careful when substituting to copy the expression exactly; pay special attention to parentheses.

The method that is most useful makes use of inverse operations and these properties of equations:

1. Addition property of equality: If a=b, then a + c = b + c
   (We can add the same thing to both sides of an equation)
2. Subtraction property of equality: If a = b, then a-c = b-c
   (We can subtract the same thing from both sides of an equation)
3. Multiplication property of equality: If a=b, then ac = bc.
   (We can multiply both side of an equation by the same amount.)
4. Division property of equality: IF a = b, then a/c = b/c if C ≠ 0.
   (We can divide both sides of any equation by the same number as long as the number is not zero.)

This may seem confusing and abstract but let's see how it works in practice.

Example 1)	The operation being done here is addition.
Solve x + 5 = 8	The inverse of addition is subtraction so we will undo the
x + 5 - 5 = 8 - 5	addition by subtracting 5 from both sides of the equation.
x = 3	This gives the result we would expect.
(Check: 3 + 5 = 8)	To check the solution, substitute 3 for x in the original equation.

Example 2)

Solve $3n = 8$

$$\frac{3n}{3} = \frac{18}{3}$$

$$n = 6$$

(Check: $3\ 6 = 18$)

The operation being done here is multiplication. Since the inverse of multiplication is division, we divide both sides by 3.

So n=6 is the solution to this equation.

Example 3)

Solve $p - 67 = 11$

$$p - 67 + 67 = 11 + 67$$

$$p = 78$$

(Check: $78 - 67 = 11$)

The operation here is subtraction.
The inverse of subtraction is addition so we add 67 to both sides.
So p = 78 is the solution.

Example 4)

Solve $\frac{x}{5} = 4$

$$\frac{x}{5} \cdot 5 = 4 \cdot 5$$

$$x = 20$$

(Check: $\frac{20}{5} = 4$)

The operation here is division.

The inverse of division is multiplication so we multiply both sides by 5
the solution is x = 20.

Problem Set 1:
Fill in each blank with the correct vocabulary word from the list on the left:

constant	sum
exponent	product
variable	quotient
expression	difference
equation	operation

1. In the expression $x^2 - 8y$, 2 is a(n)_____
2. In the expression $x^2 - 8y$, y is a(n)_____
3. In the expression $x^2 - 8y$, 8 is a(n)_____
4. In the expression $x^2 - 8y$, - is a(n)_____
5. $3n - 2$ is a(n)_____
6. $2x + 5 = 7$ is a(n)_____

Problem Set 2:

Evaluate each of the f following expressions when a= 5, b=3, x=4, k=0, and y = 2/5. Do on other paper, showing steps neatly.

1. $5a + b$
2. $5(a+b)$
3. $a^2b - x + ky$
4. $(ay + 2) - 3$
5. $5(x - 2) - 4$
6. $(a + x)(a - x)$
7. $a/5 + 6$
8. $\frac{a + 6}{5}$
9. $\frac{ax + kb}{x - b}$

Problem Set 3:
Translate each phrase or sentence into an algebraic expression or equation:

1. a number increased by four 1._____
2. the sum of a number and six 2._____
3. The product of two numbers 3._____
4. five less than a number 4._____
5. the sum of five and a number, divided by two 5._____
6. the sim of twice a number and five 6._____
7. twice the sum of a number and five 7._____
8. Five more than a number and two is six. 8._____
9. The difference of a number and two is six. 9._____
10. The quotient of six and x is equal to the sum of one and x 10._____

##

Answers:

Set 1	Set 2		Set 3	
1. exponent or constant	1. 28	6. 9	1. n+4	6. 2x + 5
2. variable	2. 40	7. 7	2. K+6	7. 2(n+5)
3. constant	3. 71	8. 2.2	3. AB	8. x + 5 = 9
4. operation	4. 1	9. 20	4. N-5	9. y-2=6
5. expression	5. 6		5. $\frac{x+5}{2}$	10. $6 = 1 + \frac{x}{x}$
6. equation				

KEY EXPRESSIONS FOR TRANSLATING WORD PROBLEMS

WORDS DENOTING ADDITION

sum	more than	difference	less than
plus	greater than	minus	smaller than
gain	larger than	lose	fewer than
increase	enlarge	decrease	shorten
rise	grow	drop	depreciate
expand	augment	lower	diminish

WORDS DENOTING SUBTRACTION

WORDS DENOTING MULTIPLICATION

multiplied by	double	
times	triple or treble	
product	quadruple	
twice	quituple	of

WORDS DENOTING DIVISION

divided by	ratio
quotient	

I. Express algebraically:

a. a increased by twice b _____

b. twice the sum of a and b _____

c. 30 decreased by three times c _____

d. three times the difference of 30 and _____

e. 50 minus the product of 10 and p _____

f. the product of 50 and the sum of p and 10 _____

g. ???? increased by the quotient of x and y _____

h. the quotient of x and the sum of y and 100 _____

i. the average o f s and 20 _____

II. Express algebraically:

a. half of a increased by the product of 25 and b _____

b. four times c decreased by one-fifth of d _____

c. half the sum of m and twice n _____

d. the average of m, r and 80 _____

e. 60 diminished by one-third the product of 7 and x _____

f. twice the sum of e and 30 diminished by 40 _____

g. two-thirds the sum of n and three-sevenths of p _____

h. the product of a and b decreased by twice the difference of c and d _____

i. the quotient of x and 10 minus four times their sum _____

III. Express algebraically:

a. a speed in mph that is 30 mph faster than twice another of r mph _____

b. a weight in lb that is 20 lb less than three times another of w lb. _____

c. a temperature in degrees that is 15 colder than two-thirds another of t. _____

d. a price in cents that is 25¢ cheaper than another of D dollars. _____

e. a length in inches that is 3 in. longer than another of f ft. _____

IV. If n represents a number, express algebraically:

a. 25 more than the number _____

b. 30 greater than the number _____

c. the sum of the number and 35 _____

d. the number increased by 40 _____

e. 45 plus the number _____

f. 50 added to the number _____

g. 30 less than the number _____

h. 35 fewer than the number _____

i. 40 less the number _____

j. 45 decreased by the number _____

k. 50 minus the number _____

l. 55 subtracted from the number _____

V. Express algebraically:

a. the no. of tons of a weight that is 15 tons lighter than w tons _____

b. the no. of ft in a length that is 50 ft shorter than 1 ft. _____

c. the no. of sec in a time interval that is 1 minute less than t sec. _____

d. the no. of cents in a price that is $1 more than p cents _____

e. the no. of ft per sec (fps) in a speed that is 20 fps slower than r fps. _____

f. the no. of ft in a distance that is 10 yd farther than d ft. _____

g. the no. of sq ft in an area that is 30 sq ft greater than A sq ft. _____

h. the no. of degrees in a temperature that is 40 colder than t . _____

i. the no. of floors in a building that is 8 floors higher than f floors. _____

j. the no. of yr in an age 5 yr younger than a yr. _____

VI. Express algebraically :

a. b decreased by one-half c _____

b. one-third of g decreased by 5 _____

c. four times r divided by 9 _____

d. the average of m and 60 _____

e. three-quarters of x less y _____

f. twice d less 25 _____

g. 8 more than the product of 5 and x _____

h. four times the sum of r and 9 _____

i. the average of 60, m, p and q _____

j. the ratio of b to three times c _____

VII. Express algebraically:

a. a distance in yd that is 25 yd shorter than three times another of d yd. _____

b. a weight in oz. that is 5 oz. more than twice another of w oz. _____

c. a tempreature in degrees that is 8 warmer than five times another of 7. _____

d. a price in dollars that is $50 dearer than one-half of another p dollars. _____

e. a price in cents that is 50¢ chaeaper than one-third another of p cents. _____

f. a length in ft that is 2 ft longer than y yd. _____

VIII. Using letters and symbols, replace each verbal statement by an **algebraic equation:**

a. Three times a number added to eight times the same number is equivalent to eleven times the number.

_____

b. The difference between ten times a number and one-half of the same number is exactly the same as nine and one-half times the number.

_____

c. The perimeter of an equivalent triangle is equal to three times the length of one of the sides.

_____

d. The area of a square is found by multiplying the length of a side by itself.

_____

ANSWER KEY

I.
a. a + 2b
b. 2(a + b)
c. 30 - 3c
d. 3(30-c)
e. 50-10p
f. 50(p + 10)
g. 100 • x/y
h. x/y + 100
i. s + 20/2

II.
a. a/2 + 2b
b. 4c - d/5
c. m + 2^5n/2
d. m + r + 80/3
e. 60 - 7x/3
f. 2(e + 30) - 40
g. 2/3(n + 3p/7)
h. ab - 2(c - d)
i. x/10 - 4(x + 10)

III.
a. 2r + 30
b. 3w - 20
c. 2t/3 - 15
d. 1000 - 25
e. 12f + 8

IV.
a. n + 25 or 25 + n
b. n + 30 or 30 + n
c. n + 35 or 35 + n
d. n + 40 or 40 + n
e. n + 45 or 45 + n
f. n + 50 or 50 + n
g. n 30
h. n - 35
i. 40 - n
j. 45 - n
k. 50 - n
l. n - 55

V.
a. w-15
b. 1 - 50
c. t - 60
d. p + 100
e. r - 20
f. d + 30
g. A + 30
h. t - 40
i. f + 8
j. a - 5

VI.
a. b - c/2
b. g/3 - 5
c. 4r/9
d. m + 60 /2
e. 3x/4 - y
f. 2d - 25
g. 5x + 8
h. 4(r + 9)
i. m+p+g+60/4
j. b/3c

VII.
a. 3d - 25
b. 2w + 5
c. 5T + 8
d. p/2 + 50
e. p/3 - 50
f. 3y + 2

VIII.
a. 3n + 8n = 11n
b. 10n - 1/2 n = 9 1/2 n
c. p = 3s
d. A = ss

ELEMENTARY ALGEBRA
SUPPLEMENT
Solving Equations for a Variable

1. An equation is considered solved when the variable being solved for is alone on one side of the equation and o occurs nowhere else in the equation.

2. How? Remember, an equation is like a balance with the two sides equal. You can add, subtract, multiply or divide by something on one side as long as you do the exact same thing on the other side. (Except divide by zero!)

$$2x + 3 = 15$$
$$(-3) + 2x + 3 = 15 + (-3)$$

The new equation formed has the same solution (or answer) as the original equation. That is, whatever value would make one of the equations true, will make the other one true also.

3. But how do you know what to do to each side? Well, you want to undo whatever has been done to the variable; this is how you go about it:

Example

A) If the variable is multiplied by a number you multiply by its reciprocal: Remember a reciprocal is found by writing a number as a fraction and turning it upside down.

$3x = 78$
$(1/3)3x = (1/3)78$
$x = 26$

Examples: Reciprocal of 2 or 2/1 is 1/2 Check: $3(26) = 78$

Reciprocal of 1/5 is 5/1 or 5

Reciprocal of 2/3 is 3/2

B) If the variable is divided by a number then you multiply by that number on both sides:

$x/6 = 7$

$(6)(x/6) = (6)(7)$

$x = 42$ Check: $42/6 = 7$

$7 = 7$

C) If a number is added to the variable, then you add its opposite to both sides.

$x + 11 = -23$

$x + 11 + -11 = -23 + -11$

Remember, the opposite of a positive number is its negative and the opposite of a negative number is its positive. (The opposite of zero is zero.)

$x = -34$

Check: $-34 + 11 = -23$

$-23 = -23$

D) If a number is subtracted from the variable or the variable is subtracted from a number, then change the expression to adding the opposite, then follow the above procedure for dealing with a variable with a number <u>added</u> to it.

$3 - x = 11$

$3 + (-x) = 11$

Now add a -3 to each side

$-3 + 3 + -x = 11 + -3$

$-x = 11 + -3$

$-x = 8$

When you have -x alone on one side, just multiply both sides by -1.

$(-1)(-x)=(8)(-1)$

$x = -8$

Check:

$3 - (-8) = 11$

$3 + 8 = 11$

$11 = 11$

4. But how do you know what to do first when several things have been done to the variable, like $2(x + 3)/5 = 6$.
Well, you think of the order of operations, and undo the operations in REVERSE ORDER from the way they have been done. For example, in the above problem, the order of operations for the left side of the equation is : First, add 3 to x, second, multiply by 2, third, divide by 5.

We want to undo the last operation first, so we multiply both sides by 5. $(5)\,2(x + 3)/5 = 6(5)$

$2(x + 3) = 30$

Next, we want to undo the next to last operation (which was multiply by 2) so we multiply by 1/2 or divide by 2, this means the same thing. $(1/2)2(x + 3) = (1/2)30$

$x + 3 = 15$

Lastly, we add -3 to each side. $x + 3 + -3 = 15 + -3$

$x = 12$

Check: $2(12 + 3)/5 = 6$

$30/5 = 6$

$6 = 6$

Another example: $5 + 3x = 23$

First: x is multiplied by 3,
Second: 5 is added to the result

Undo these in reverse order--

First: Add -5 to each side

$$-5 + 5 + 3x = 23 + (-5)$$
$$3x = 18$$

Second: Multiply each side by 1/3

$$(1/3)3x = (18)(1/3)$$
$$x = 6$$

5. What if the variable occurs in more than one place?

Example

You want all occurrences of the variable to be on one side of the equation. Pick one side on which to collect the terms with a variable; that means you want to get rid of the variable term on the other side. So add its opposite to each side:

$$3x + 2 = -4x + -19$$

If we choose to collect x's on left, we want to remove -4x on right:

$$4x + 3x + 2 = -4x + -19 + (-2)$$
$$7x + 2 = -19$$

Now solve as before:

$$7x + 2 + (-2) = -19 + (-2)$$
$$7x = -21$$
$$(1/7)7x = -21(1/7)$$
$$x = -3$$

EXERCISES

Solve for y: AND Check your answer by substituting it back for y .

1. y - 11 = -1
2. 2y = -8
3. -2y + 1 = 7
4. 6 = 4y + -2
5. -y + 6 = -2
6. 2y - 5 = -9
7. 6 - 3y = -21
8. 3(2y + 1) = -27
9. 3y - (2y - 1) = -3
10. 6y - 1 = -2y - 3
11. 3(3y - 2) = y - 4
12. y - 2(y - 8) = 15
13. -3 = -y - 1(3y + 2)
14. 3y - 6 = 4y - 1
15. y(3 - 6) = 5(2 - y)
16. 1/2(3y - 2) = 1/4(2y - 6)

Answers

1) 10
2) -4
3) -3
4) 2
5) 8
6) -2
7) 9
8) -5
9) -4
10) -1/4
11) -1/4
12) 1
13) 1/4
14) -5
15) 5/4
16) -1/2

AT LAST (or first if you prefer)....

FUN AND GAMES

"FUN" STORY PROBLEMS

A. What is the area of a square whose diagonal is one foot longer than the length of its side?

B. A number is 12 less than 3 times the same number. What si the number?

C. If a certain number, two-thirds of it, half of it, and one-seventh of it are added together the result is 97. What is the number? (From the Rhind papyrus, about 1650 B.C.)

D. The sum of two consecutive even integers is 74. What are the integers?

E. The average distance between the surface of the earth and moon is 2.31×10^5 miles. Radio waves travel at the speed of light, 1.86×10^5 miles per second. How long does it take an astronaut's voice, broadcast from the moon, to reach Earth?

F. The sum of twice a fraction and half that fraction, times that fraction equals that fraction.
What is that fraction?

(Taken from **BEGINNING ALGEBRA AND PROBLEM SOLVING.** Second Edition, by Alan Wise. Just published!)

CROSS NUMBER PUZZLES

In each blank fill in + , - , x , or ÷ so the equations are true both across and down.

9		3		2	=	5
4		2		7		1
6		2		5		7
=		=		=		=
6		4		9		11

Using only the numbers 0 to 9, fill in the blanks to make the equations true both across and down.

5	x		−		=	6
+		x		+		÷
	÷		+		=	3
−		−		−		+
	x		−		=	
=		=		=		=
6	−		+	5	=	9

Getting ready for a Federal Civil Service Exam? You'll need ex experience with number patterns. Look for a pattern and give the next three numbers:

A. 2, 4, 8, 16, ___, ___, ___

B. 26, 23, 20, ___, ___, ___

C. 1, 2, 4, 7, 11, ___, ___, ___

D. 3, 9, 27, ___, ___, ___

E. 9, 8, 10, 9, 11, 10, ___, ___, ___

F. 58, 55, 49, 40, ___, ___, ___

G. 1, 3, 5, 7, 9, ___, ___, ___

H. 0, 1, 3, 6, 10, ___, ___, ___

I. 29, 28, 26, 23, 19, ___, ___, ___

Fold

Answers

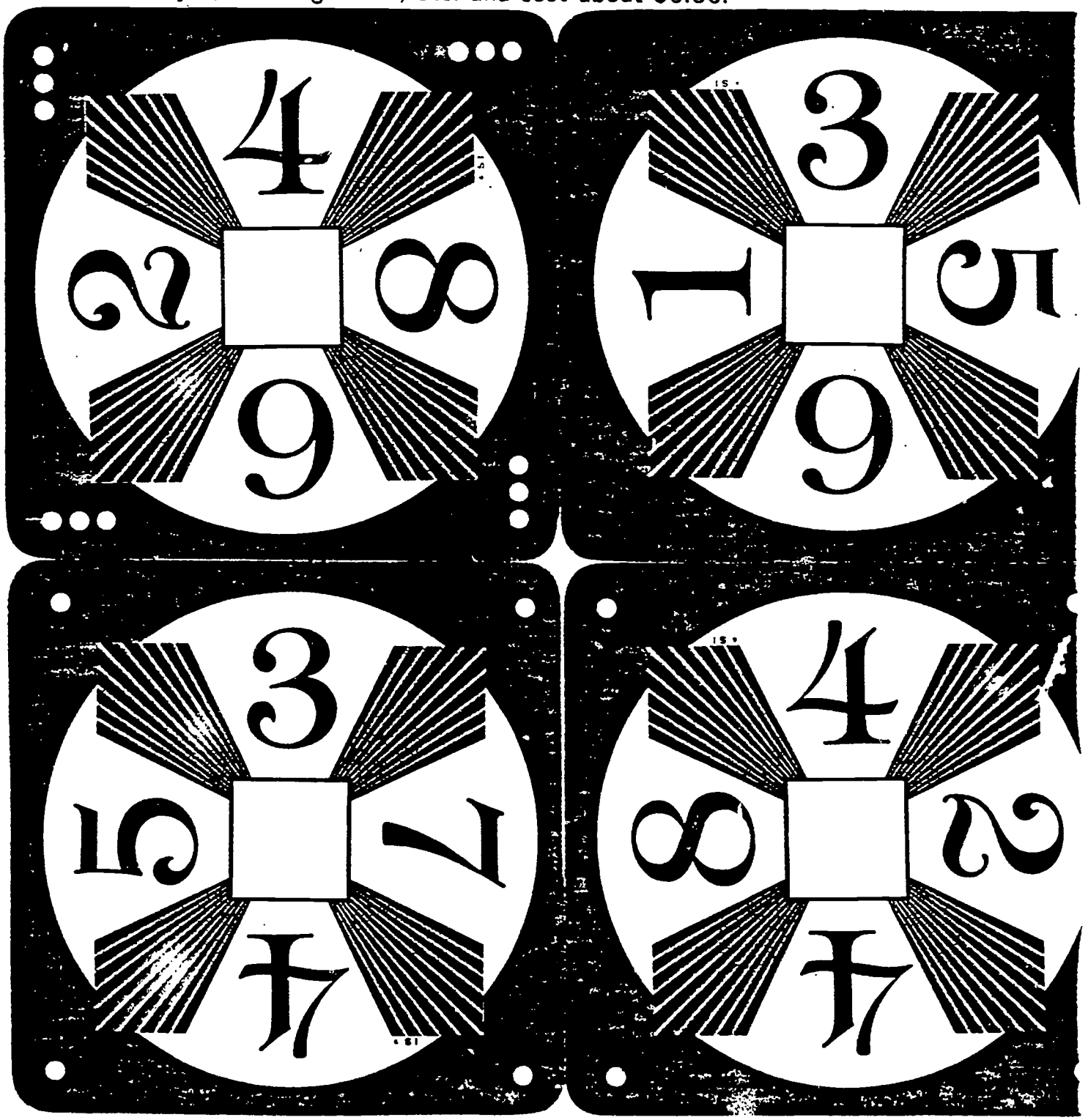
A. 32, 64, 128 B. 17, 14, 11 C. 16, 22, 29 D. 81, 243, 279

E. 12, 11, 13 F. 28, 13, -5 G. 11, 13, 15 H. 15, 21, 28

I. 14, 8, 1,

THE TWENTY-FOUR GAME

The object of the Twenty Four Game is to make the numbers on the face of the card equal 24 by adding, subtracting, multiplying and/or dividing in any order. This is great for showing the number of different approaches to a problem. Card packs are available at Fred Meyer, Learning World, etc. and cost about $6.00.



CUISINAIRE ROD EXERCISES

These exercises are designed to make you more comfortable with fractions
They must be done in the lab because that is where the equipment is!

KEY:

w = white	d = dark green
r = red	k = black
g = light green	n = brown
p = purple	e = blue
y = yellow	o = orange

Each box is a separate problem Do not take answers from one to the others

#1. If d = 1

then g = _____

r = _____

w = _____

e = _____

#2. If n = 1 [One is impossible!]

then _____ = $\frac{1}{2}$

_____ = $\frac{1}{4}$

_____ = $\frac{1}{3}$

_____ = $\frac{3}{4}$

w = _____

o = _____

#3. If r = $\frac{1}{2}$

then _____ = 2

_____ = $\frac{3}{4}$

w = _____

_____ = $1\frac{1}{2}$

k = _____

Hint: find what = 1

#4. If d = $\frac{2}{3}$

_____ = 1

w = _____

g = _____

r = _____

k = _____

_____ = $\frac{4}{9}$

_____ = $\frac{6}{9}$

_____ = $1\frac{1}{3}$

#5. Choose some rod to equal one so that you also have a rod = $\frac{1}{2}$ and one = $\frac{1}{3}$.

With these rods show:

$\frac{1}{2} + \frac{1}{3}$ = _____

Key

CUISINAIRE ROD EXERCISES

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	g = light green	n = brown	
	p = purple	e = blue	
	y = yellow	o = orange	

Each box is a separate problem Do not take answers from one to the others

#1. If d = 1

then g = $\frac{1}{2}$

r = $\frac{1}{3}$

w = $\frac{1}{6}$

e = $1\frac{1}{2}$

#2. If n = 1 [One is impossible!]

then p = $\frac{1}{2}$

r = $\frac{1}{4}$

can't do = $\frac{1}{5}$

d = $\frac{3}{4}$

w = $\frac{1}{8}$

o = $1\frac{1}{4}$

#3. If r = $\frac{1}{2}$

then n = 2

g = $\frac{3}{4}$

w = $\frac{1}{4}$

d = $1\frac{1}{2}$

k = $1\frac{3}{4}$

Hint: find what = 1

#4. If d = $\frac{2}{3}$

e = 1

w = $\frac{1}{9}$

g = $\frac{1}{3}$

r = $\frac{2}{9}$

k = $\frac{7}{9}$

p = $\frac{4}{9}$

d = $\frac{6}{9}$

e + g = $1\frac{1}{3}$

or e + r

or 2 d

#5. Choose some rod to equal one so that you also have a rod = $\frac{1}{2}$ and one = $\frac{1}{3}$.

With these rods show:

$\frac{1}{2} + \frac{1}{3}$ = _____

an example

Use d = 1

then g = $\frac{1}{2}$

r = $\frac{1}{3}$

whites →

$\frac{5}{6}$

Number Tricks .... Exercise Set 1

VERBAL	VISUAL	ALGEBRAIC	NUMERIC
1. Pick a number	1.	1.	1.
2. Add 3	2	2.	2.
3. Double it	3.	3.	3.
4. Add the original no.	4.	4.	4.
5. Find 1/3 of it	5.	5.	5.
6. Subtract the original number	6.	6.	6.

1.	1. □	1.	1.
2.	2. □□	2.	2.
3.	3. □□○○○	3.	3.
4.	4. □□□○○○	4.	4.
5.	5. □○	5.	5.
6.	6. ○	6.	6.

1.	1.	1. X	1.
2.	2.	2. X + 4	2.
3.	3.	3. _____ = 4X+16	3.
4.	4.	4. _____ = 4X+20	4.
5.	5.	5. _____ = 1X+5	5.
6.	6.	6. _____ = 5	6.

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