     THIS LEARNING ACTIVITY PACKAGE (LAP) IS DESIGNED TO
GUIDE STUDENTS IN LEARNING HOW TO USE AXIOMS, IN WRITING
PROBLEMS INTO EQUATION FORM, AND IN SOLVING EQUATIONS. IN
ORDER TO ATTAIN THESE GOALS, THE STUDENT AT SOME POINT IN HIS
PROGRAM MUST BE ABLE TO (1) WRITE A DEFINITION OF "AXIOM",
(2) USE THE AXIOMS OF A FIELD IN SOLVING EQUATIONS, (3)
TRANSFORM A WRITTEN PROBLEM INTO AN ALGEBRAIC "SENTENCE" AND
USE THE FIELD PROPERTIES TO SOLVE THE RESULTING EQUATION, AND
(4) SOLVE EQUATIONS WITH A VARIABLE IN BOTH MEMBERS. PERIODIC
CHECKPOINTS ARE BUILT INTO THE SYSTEM TO ENABLE THE
ACCELERATED STUDENT TO BY-PASS FAMILIAR ASSIGNMENTS AND TO
ENABLE THE SLOWER STUDENT TO CORRECT DEFICIENCIES. (RP)

Algebra I.

L.   A.   P.

Learning Activity Package

#3

AXIOMS, EQUATIONS, AND PROBLEM SOLVING

Average Completion Time:_____

Written for use at
Hughson Union High School
Mathematics Department
By: Euel Glenn
July 1967

Flow Chart

Everyone Will Read

Directions
Why This L.A.P.?
Main Ideas
What you must be
able to do.

Activities

Pretest

Less
Than
70%
on
Final.
Then
do all
Activities

Different
L.A.P.
or
Course

Second

Final

NEXT L.A.P.

**Final
Test**

70% min.

NEXT L.A.P.

● **Teacher Contact Points**

Table of Contents

Axioms, Equations and Problem Solving

In this L.A.P. you are going to learn how to use axioms, how to solve equations and how to write words of a problem into equation form and solve.

NEXT PAGE PLEASE. . .

The main ideas you should learn from this

L.A.P. are:

1. How to identify and use number axioms.

2. How to transform equations with Equality Properties. (How to solve equations.)

3. How to solve written problems by putting the information in the problem into an equation and solve the equation.

In order to attain the goal (learn the main ideas) you must be able to:

1. Write a definition of "axiom".

2. Write a definition of and use in solving equations the following:

   a. The Symm. ... Property of equality

   b. The Closure Properties

   c. The Substitution Principle

   d. Commutative and Associative Properties

   e. The Distributive Property: Special Properties of 1 and 0

   f. Use the addition, subtraction, multiplication and division properties of equality.

   g. Combine terms and use the Transformation Principles

3. Read a written problem and put the data in an algebraic "sentence" and then use all principles in #2 above to solve the equation.

4. Solve equations having a variable in both members.

NEXT PAGE PLEASE . . .

Now that you have considered carefully what
you must be able to do, if you think you can do it
turn to page 98 in "Text" and solve all 19 problems
on 98, 99, and 100 in your "Text." When you finish
check your answers on page 577 in "ansbk." If you
have 4 or fewer incorrect answers, turn to page 6.
If you have more than 4 incorrect answers, turn to
page 5 in L.A.P. 3.

OR

After careful consideration you may feel you
need to get some experience before taking the chapter
test on page 98 in "Text"; if so, turn to page 5 in
L.A.P. 3.

The reason you are on this page is that you
elected not to take the Pre-test at this time or you
made more than 4 mistakes on the Pre-test. In either
case you are now ready to gain valuable experience
and skills that will enable you, to do well on the
Pre-test and Final Test.

We have several activities set up that will
aid you in gaining the experience and skills you
need, but you need not follow them in sequence. You
may have some activity that we have not considered
that would enable you to do great on the Final Test.
Please see your teacher and arrange to do your
activity.

Remember this L.A.P. is for you!

Turn to page 7 in L.A.P. 3 and begin activities.

You did the chapter test on pages 98, 99, and 100 in "Text" and you missed 4 or fewer. You are doing great!

You may now see the teacher and arrange for the Final Test. If you would like to look over the problems on the chapter test that you "bungled" and solve them correctly (you may ask the teacher for help) before taking the Final Test, that will be fine.

Don't take the Final Test untill "you" are ready.

<u>Required Activity #1:</u>

1. On page 69 and 70 in "Text" read "Axioms of Equality".

   and if needed

2. Attend a discussion session with the teacher on "Axioms of Equality".

When you finish one or both of the above,

turn to page 8 in L.A.P. 3.

Now do the 8 oral exercises on page 70 in
"Text." Check your answers on green page___ in
L.A.P. 3. When you finish checking, turn to page
9 in L.A.P. 3.

You got 6 of the 8 problems correct on page 70 in "Text," great! Go to page 10 in L.A.P. 3.

What? You missed more than 2 of the 8 problems on page 70 in "Text?" You need help.

1. Sign up for a small group discussion on oral exercises on page 70 in "Text."

and/or

2. Go back and read page 69 in "Text" again.

and/or

3. Ask the teacher for an explanation.

When you can do the oral exercises on page 70 in "Text," turn to page 10 in L.A.P. 3.

The worst thing you can do in algebra is to do nothing!

Required Activity #2:

Read the bottom of page 70 through 71 and
the top of page 72 in "Text." "The Closure Proper-
ties". If you need help you may ask for it.

When you finish reading pages 70, 71 and 72
in "Text" do the oral exercises in "Text" page 72.
Check your answers in green page _-7_ in L.A.P. 3.
When you have checked your answers, turn to page
11 in L.A.P. 3.

You answered all the oral exercises on page
72 in "Text" correctly except 4. You're doing Okay,
so solve correctly the questions you answered incorrect-
ly and then turn to "lucky" page 13 in L.A.P. 3.

You need some help if you missed more than 4
of the oral exercises on page 72 in "Text," so kind-
ly turn to page 12 in L.A.P. 3.

You missed more than 4 of the oral exercises on page 72 in "Text." Now:

1. Sign up for a small group discussion on oral exercises, page 72 in "Text."

and/or

2. Ask the teacher for help.

and/or

3. Read pages 70, 71, and 72 in "Text" again.

and/or

4. See your teacher for doing something else that will help you.

When you finish the above, turn to page 13 in L.A.P. 3.

Do the written exercises at the top of page
73 in "Text" and check your answers in "ansbk", page
556.

When you have checked the answers to the ...
written exercises on page 73 in "Text," turn to page
14 in L.A.P. 3.

If you missed 3 or fewer of the written exercises
on page 73 in "Text", you are tremendous. Turn to
page 16 in L.A.P. 3 and go! go! go!

If you missed more than 3 of the written
exercises on page 73 in "Text", this is not good.
Turn to page 15 in L.A.P. 3.

You missed more than 3 of the written exercises on page 73 in "Text"; now:

1. Sign up for a small group discussion on written exercises page 73 in "Text."

    and/or

2. Ask the teacher for an explanation.

    and/or

3. Secure a "Key" from the teacher and go through the step-by-step explanation of the written exercises page 73 in "Text" on page 11 in "Key."

    and/or

4. See if you can get a classmate to explain to you your mistakes and straighten you out.

When you finish one or all of the above, move to page 16 in L.A.P. 3.

Only <u>you</u> know when you are ready for page 16 in L.A.P. 3.

Required Activity #3:

You should now:

1. Read and discuss with a classmate section
   3-3, page 73 in "Text."

   and, if needed

2. Attend a discussion session with the
   teacher on section 3-3.

When you have done the above, turn to page

17 in L.A.P. 3.

You are now ready to do oral exercises on
page 74 and 75 in "Text." You may not want to do
all of them so do the odd and check your answers
on the green sheet in L.A.P. 3; if you miss more
than 3 of the odd, do the even exercises. You may
do them any way you like: with a friend, with a
small group or by yourself. You know how you learn
best.

If you need help, ask the teacher.

When you finish the oral exercises on pages
74 and 75 in "Text," turn to page 18 in L.A.P. 3.

You are now ready to do:

<u>Required Activity #4</u>:

1. Read 3-4, pages 75, 76, and ᵉ ᵢₙ "Text."
   You should read this carefully and pay
   particular attention to the information
   in the red boxes. You may ask for help
   or you may want to discuss the informa-
   tion with a classmate.

   and, if needed

2. Attend a discussion session with the
   teacher on 3-4, pages 75, 76, and 77 in
   the "Text."

You are now ready to solve the oral exercises
on page 78 in "Text." Check your answers on the
green page_____ in L.A.P. 3.

If you can do the odd oral exercises on page
78 in "Text" with fewer than 3 mistakes you are
ready to go to page 20 in L.A.P. 3.   (Don't fudge!)

If you "goof" on more than 3 of the odd oral
exercises on page 78 in "Text" then do the even
exercises. Remember you can always get help if you
have trouble.

When you are ready "Fire" to page 20 in L.A.P. 3.

Turn to page 79 in "Text" and do problems 1
through 34 on written exercises. When you finish
check your answers in "ansbk" page 79. When you
finish turn to page 21 in L.A.P. 3.

You made 8 or fewer mistakes on the written exercises, page 79 in "Text." You're doing A-OK. Go to page 22 in L.A.P. 3.

You made 9 or more errors on the written exercises page 79 in "Text." Now for some aid:

1. Sign up for a small group discussion.

and/or

2. Secure a "Key" from the teacher and check on page 112 in "Key" for a step-by-step solution of exercises on page 79 in "Text."

and/or

3. See the teacher for an explanation

and/or

4. Try to get a classmate to discuss the exercises on page 79 in "Text" with you.

"Fire" to page 22 in L.A.P. 3, when ready.

You are now ready to do:

Required Activity #5:

1. Read 3-5 on pages 80 and 81 in "Text."

   and, if needed

2. Attend a discussion session with the teacher on 3-5, pages 80 and 81 in "Text."

Study carefully the examples at the top of
page 82 in "Text" then do all 24 of the oral exercises
on page 82 in "Text." You may use any method you
have used in previous L.A.P.'s to do the oral exercises.
The answers to oral exercises are on page 38 of
L.A.P. 3.

If you have trouble with the oral exercises
on page 82 in "Text" then:

1. Sign up for a small group discussion.

and/or

2. Ask the teacher for an explanation.

. . . and then go to page 24 in L.A.P. 3.

Now that you have finished the oral exercises
on page 82 in "Text" do all the 30 written exercises
on the top of page 83 in "Text." Check your answers
in "ansbk", page 556. If you have 5 or fewer mistakes
on the 30 problems on page 83 in "Text" you are ready
to turn to page 25 in L.A.P. 3.

If you missed more than 5 of the problems on
page 83 in "Text" then:

1. Sign up for a small group discussion.

            and/or

2. Ask the teacher for help.

            and/or

3. Secure a "Key" from the teacher and see
    the explanation on page 12 in "Key."

When you can do the problems correctly turn
to page 25 in L.A.P. 3.

Required Activity #6:

Read and study 3-6 on page 83 in "Text."
Pay careful attention to examples. When you finish
reading, solve the written exercises 1 through 36
on page 84 and 85 in "Text." Check your answers on
page 556 in "ansbk." If you have any trouble you
can always get help from teachers. When you finish
checking your answers to written exercises on pages
84 through 85 in "Text," turn to page 26 in L.A.P. 3.

You missed 5 or fewer of the exercises on pages 84 and 85 in 'Text." That is Great! Turn to page 27 in L.A.P. 3.

What? You missed 6 or more of the exercises on pages 84 and 85 in "Text." This is not good.

Pick out the problems you solved incorrectly and do one or all of the following:

1. Sign up for a small group discussion.

OR

2. Ask the teacher for help.

OR

3. Secure a "Key" and see solutions on page 13 in "Key."

When you know you can solve the problems correctly turn to page 27 in L.A.P.

Required Activity #7:

Read section 3-7 on page 86 in "Text",
"Combining Terms and Using Transformation Principles."
Read carefully the 4 steps in the grey box on
page 86. You need not use these steps in order.
This is just a guide.

Study the examples on pages 86, 87, and 88.
If you need help ask the Teacher.

When you finish reading page 86 in "Text"
and studying the examples on pages 86, 87, and 88
in "Text", turn to page 88 in "Text" and solve
the even problems 2 through 50 on pages 88 and 89.
Check your answers on page 556 in "ansbk", then
turn to page 28 in L.A.P. 3.

You solved the even problems on pages 88
and 89 in "Text" and made 5 or fewer mistakes.
You are going strong like "King Kong"; turn to
page 29 in L.A.P. 3.

You solved the even problems and missed 6
or more of them. You are now ready to:

1. Ask the teacher for an explanation.

and/or

2. Sign up for a small group discussion.

and/or

3. Get the "Key" and study the solutions
    on page 14 in "Key."

When you finish and you feel you need more
experience on this type of problem, solve the odd
exercises on pages 88 and 89 in "Text."

Solving equations is a very big idea in
Algebra. Your future progress and success in math
will depend on your ability to solve equations. When
you know you can solve equations, turn to page 29

You are now ready to apply your ability
in solving equations to some problems. Some of
the problems are simple and can be solved by means
other than equations, but use the equation method
for them; it will give you valuable experience and
build up your confidence. You will not be able
to solve the difficult problems without equations!

Now that you have reviewed page 57 in "Text,"
turn to page 89 and 90 in "Text" where you will find
32 written problems. You must solve some of these
problems. Try the odd problems and then check your
answers on page 556 in "ansbk." When you finish,
turn to page 31 in L.A.P. 3.

Ask for help if you need it.

If you solved the odd problems on pages 89 and 90 in "Text" and "bungled" 3 or fewer, you're ready to turn to page 32 in L.A.P. 3.

If you "bungled" more than 3 of the problems on pages 89 and 90 in "Text", you are ready to:

1. Sign up for a small group discussion.

and/or

2. Ask the teacher for help.

and/or

3. Secure a "Key" from the teacher and see the excellent step-by-step explanation on pages 15, 16 and 17 in "Key."

When you are able to solve the written problems turn to page 32 in L.A.P. 3.

Remember! There will be written problems on the Final Test for L.A.P. 3.

Required Activity #8:

Turn to page 91 in "Text" and read section
3-8, "Equations Having the Variable in Both Members."
Study the examples carefully. If you need help
you can:

1. Sign up for a small group discussion.

OR

2. Ask the teacher for an explanation.

You are now ready to do the oral exercises on page 93 in "Text." Be sure to check your answers on page 38 of the green sheets in the back of L.A.P. 3.

If you can solve the oral exercises, page 93 in "Text" with 4 or fewer mistakes, turn to page 34 in L.A.P. 3.

If you made 5 or more mistakes on the oral exercises on page 93 in "Text" you now:

1. Sign up for a small group discussion.

    and/or

2. Ask the teacher for an explanation.

    and/or

3. Get a classmate to discuss the oral exercises with you.

When you are ready, turn to page 34 in L.A.P. 3.

Turn to pages 93 and 94 in "Text" and
solve all the even written exercises 2 through
44. Check your answers on page 556 in "ansbk."

If you had 5 or fewer mistakes on the even
exercises on pages 93 and 94 in "Text" you are
ready to turn to page 36 in L.A.P. 3.

If you "fouled up" on more than 5 of the
even problems on pages 93 and 94 in "Text" then
do one or all of the following:

1. Ask the teacher for an explanation.

    and/or

2. Sign up for a small group discussion.

    and/or

3. Secure a "Key" from the teacher and
   study the explanation on page 17 and 18.

When you finish the above and if you think
the experience will help, do the odd exercises on
pages 93 and 94 in "Text." Check your answers on
page 556 in "ansbk."

Turn to page 36 in L.A.P. 3.

You are now ready to solve the problems on page 94 and 95 in "Text." Solve problems 1 through 16. Check your answers on page 556 in "ansbk."

You could do this -- solve 1 or 2 problems on pages 94 and 95 in "Text" and check your answers if you are not "making out". Then ask for help. You are reminded to review page 57 in "Text" and the examples on pages 57 through 58.

When you are satisfied you are ready for the Final Test, see the teacher. You may go back and study the chapter test on pages 98, 99, and 100 to check yourself for preparation for the Final Test. The final will be similar to the Chapter test.

ORAL EXERCISES ANSWERS

Page 70

T for transitive
S for symmetric
R for reflexive

1. S
2. T
3. R
4. T
5. a. S
   b. T
6. a. S
   b. T
7. a. S
   b. T
8. a. T
   b. T

Page 72

C = closed
NC = not closed

1. NC; 1+3 = 4, and 4 ∉ {0,1,2,3}
2. C; 0x0 = 0, 0x1 =0,
   1x0 = 0, and 1x1 =1
3. C; 1x1 = 1,
4. NC; 2-2 =0 and 0 ∉ {2}
5. NC; 0-2 ≠ 0 or 2
6. NC; 1/2 ÷ 2 = 1/4 and 1/4 ∉ {1/2,1,2}
7. C; 1 ÷ 1 = 1, 0 ÷ 1 = 0
8. NC; result of subtracting any member
   of set from a smaller element
   ∉ {0,1,2,3,4,. . .}
9. C; sum of 2 even numbers is even
10. C; product of 2 odd numbers is odd
11. NC; 1+3 = 4 and 4 ∉ {1,3,5,7,9,. . .}
12. CL sum of any two multiples of 3 is
    always a multiple of 3
13. C; quotient of any two members of
    set is always a member of set
14. C; product of 5 and any odd number
    is odd and ∈ {1,3,5,. . .}

Page 74

1. Comm. prop. of add.
2. Assoc. prop. of add.
3. Comm. prop. of mult.
4. Assoc. prop. of mult.
5. Assoc. prop. of mult.
   and subst. principle
6. Comm. of mult.
7. Comm. prop. of Mult.
8. Comm. prop. of add.
9. Assoc. prop. of add.
   and subst. principle
10. Comm. prop. of add.
11. Assoc. prop. of add.
12. Assoc. prop. of add.
13. Assoc. prop. of add.
    and subst principle.
14. Assoc. prop. of mult.

15. Assoc. prop. of add.
16. Comm. prop. of mult.
17. Assoc. prop. of mult.
18. Assoc. prop. of mult.
19. Assoc. prop. of mult.
20. Assoc. prop. of mult.
    and subst. principle
21. a. Comm. prop. of add.
    b. Assoc. prop. of add.
22. a. Comm. prop. of mult.
    b. Assoc. prop. of mult.
23. a. Comm. prop. of add.
    b. Assoc. prop. of add.
24. a. Comm. prop. of mult.
    b. Assoc. prop. of mult.
25. a. Comm. prop. of mult.
    b. Assoc. prop. of mult.
    c. Comm. prop. of mult.
26. a. Comm. prop of add.
    b. Assoc. prop. of add.
    c. Comm. prop. of add.

Page 78

1. Comm. prop. of mult.
   Assoc. prop. of mult.
   Subst. principle
   Mult. prop. of 1
2. Comm. prop. of mult.
   Distrib. prop.
   Subst. principle
   Subst. principle
3. Subst. principle
   Distrib. prop.
   Subst. principle and mult. prop.
   of 1
   Subst. principle
4. Subst. principle
   Distrib. principle
   Subst. principle
   Subst. principle
5. Comm. prop. of mult.
   Distrib. prop.
   Comm. prop. of mult.

ORAL EXERCISES ANSWERS

Page 78 (cont.)

Subst. principle	8. 8x	22. 19s + 20
Distrib. prop.	9. 11a	23. 4k + 6
Assoc. prop. of mult.	10. 30s	24. 3v + 35
and subst. principle	11. 40y	25. 6v + 21 + 7m
Subst principle	12. 10x	26. 0
Mult. prop. of 1	13. 11n	27. 19y + 3
Comm. prop. of add.	14. 11m + 7	28. 3x + 5y - 6u - 4
Assoc. prop. of add.	15. 10y - 3n	29. 4y + 20
Mult. prop. of 1	16. 5y + n	
Distrib. prop.	17. 0	
Subst. principle	18. 0	
Mult. prop. of 1	19. 2a	
and distrib. prop.	20. 3b	
	21. 11t + 15	

Page 82

A = add.   S = subtract

1. S 2; x = 4	9. S 2/3; k = 1	17. A 6; 24 = x
2. S 5; n = 2	10. S 3; m = 0	18. A 5; 70 = n
3. A 1; x = 9	11. A 40; a = 48	19. A 60; 15 = x
4. A 6; y = 13	12. A 8; p = 13	20. S 7; 7 = n
5. S 7; k = 4	13. A.8; n = 1.9	21. A 5/7; 1 = w
6. S 3/5; r = 4/5	14. A.5; b = 3.7	22. A 3/5; 1 = z
7. A 9; n = 20	15. S 4; x = 0	23. S 2/9; 1 = n
8. A 18; h = 24	16. S.2; t = .5	24. S 5/11; 12/11 = s

Page 93

A = add. S = sub.

1. Sx; x = 3	10. A .1t; t = 4
2. S2a; a = 8	11. A 9 and S 5x; x = y
3. A 2c; c = 3	12. A 10 and S 3v; v = 10
4. A m; m = 2	13. A 7s; S = 1/2
5. A y; y = 2	14. 72 = r
6. S 2r; r = 10	15. A 5 and S x; 5/2 = x
7. S 2x; 1 = x	16. S 5b; b = 1
8. S 2z; z = 1	17. S 4; a = 5
9. S .5x; x = 5	18. S 2z1; z = 3