



HANDS-ON EQUATIONS® LEVEL II RESEARCH DOCUMENT

Dear Colleague,

You will soon be introducing your students to Level II of Hands-On Equations. **Would you like to have achievement results to let you know whether or not this program has been effective in teaching your students the concepts of Level II?** If you are interested in conducting pre and post-testing with your students, we are able to assist you. Below you will find a procedure to consider, including the actual pre-test, post-test after Lesson #15, post-test after Lesson #16, instructions for administering the tests, and a summary form in which to enter the data. If you need our help in scoring the student papers or in doing the statistical analysis, we can assist you in that regard.

We recommend that the initial **pre-test** be given to the students without any introductory comments of any kind at the completion of Level I and prior to introducing Level II. If you have already introduced Level II of Hands-On Equations to your class, this study design will be of little value to you. **Note:** Both the pre and the post-tests have a place for the student to write in the value of x , that value of star, and the value of the check. Nonetheless, the scoring of tests will be based exclusively on the values for x that the student provides (except for question #1, where only a value for star is sought). Although the students have not been taught the meaning of the star notation, the Pre-Test provides a simple definition, namely that, "The symbol \star is read as 'star'. Star is the opposite of x , i.e., $\star = -x$. This means, for example, that if $x = 2$, then $\star = -2$ " **The teacher is asked not to elaborate on this definition, but simply respond to the students with, "We just want to know what you can do with only this written definition. After the pre-test, I will explain it to you."** The student kits are to be provided to the students for the pre-test, as well as for the post-test after Lesson #15. The post-test after Lesson #16 is done pictorially..

Once the pre-test is administered, the teacher is to teach the students Lesson #8 through Lesson #15. of the program. Ideally, these lessons will be taught on consecutive days. By "lesson" it is understood a typical 40 to 50-minute lesson in which the teacher introduces the concept of the lesson using the Teachers Demonstration Balance Scale and game pieces and then provides the students with the opportunity to complete the accompanying worksheet using the student game pieces. The post-test administered after Lesson #15 may be administered to the students either immediately at the conclusion of Lesson #15, later that same day, or the next day. Please indicate which you do on the reverse side of the Summary Form. The students are encouraged to use the student game pieces for this post-test.

Next, please teach Lesson #16 which uses the pictorial notation. Then administer the **Post-Test Following Lesson #16** either immediately at the conclusion of Lesson #16, later that same day, or the next day. Please indicate which you do on the reverse side of the Summary Form. The student kits are **not** to be used for this post-test.

Attached you will find the pre-test, the post-test after Lesson #15, and the post-test after Lesson #16. You will also find a Summary Form. Please assign each student a code number or code name

to be used on each of the pre and post-tests, as well as for recording their responses on this Summary Form. **IT IS ESSENTIAL THAT YOU KEEP CAREFUL RECORD OF THIS CODE**, since all the scores on any horizontal line must belong to the same student.

If a student is classified as gifted or learning disabled, please enter the symbols “**GT**” or “**LD**” after the student code for that student on the Summary Form. If the student response is correct, that is, he/she has the correct value for x , (except for question #1 where the value for star is requested) please place a check mark in the appropriate box. If it is not correct, please place a horizontal dash, “-”, in the appropriate box. (The correct responses are provided below.) Please tally* the number of correct responses for each student for each test and enter that number in the last column of each test, the column labeled “# Correct”.

Please tally the number of correct responses for each item for your class by adding up the number of check marks in each column and entering that number in the last row of the column, the row labeled, “Item Summary Results.” If you send us the Summary Form, we will be happy to do the statistics for you and provide you with a report so that you know if this program has been effective for your students. Please send the summary form and the teacher questionnaire to: Borenson and Associates, PO Box 3328, Allentown, PA 18106. If you have questions, please call 800-993-6284.

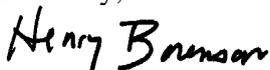
Note: If you prefer, you can send to us the student response forms and we will score the tests, complete the summary form, and do the statistics. If you send us the student forms, please be very sure that the correct student code has been entered on the pre-test and on each of the post-tests for each student, and that you have three tests for each student. Also, **please be sure that no student names are included**, just student codes.

Correct Responses to the Questions

<u>Pre-Test</u>	<u>Post-Test following Lesson #15</u>	<u>Post-Test following Lesson #16</u>
1. $x = 1$	1. $x = 3$	1. $x = 4$
2. 9	2. 7	2. 9
3. $x = 8$	3. $x = 8$	3. $x = 5$
4. $x = -1$	4. $x = -6$	4. $x = -6$
5. $x = 7$	5. $x = 5$	5. $x = 6$
6. $x = 3$	6. $x = 1$	6. $x = 2$

We are happy to assist you with the statistical analysis if you wish to do pre and post-testing with your students on Level II of the Hands-On Equations program.

Sincerely,



Henry Borenson, Ed. D.

HANDS-ON EQUATIONS PRE-TEST: LEVEL II

Student's Name: _____ Code: _____

Teacher's Name: _____

I am in grade: _____

Today's Date: _____

Instructions to the Student:

Soon you will be introduced to Level II of Hands-On Equations. Before introducing the program to you, we wish to know how much you already know about this topic. For this reason, we are simply giving you this pre-test without any instructions on how to answer the questions. We will tell you, however that the symbol \star is read as 'star'. Star is the opposite of x , *i.e.*, $\star = -x$. This means, for example, that if $x = 2$, then $\star = -2$.

Please look over the questions and write down the answers to those problems you already know how to do. You will have 20 minutes to complete this pre-test. You may use the student kits to help you. How you do on this test will not affect your grade in any way.

<u>QUESTION</u>	<u>ANSWER</u>	<u>CHECK</u>
1. $4\star + 2 = 2\star + 4$	$\star =$ _____	Check: _____
2. If $x = 2$, what is the value of: $2x + \star + x + \star + 7$	Ans. _____	
3. $3x + \star = x + 8$	$x =$ _____ $\star =$ _____	Check: _____
4. $\star = x + 2$	$x =$ _____ $\star =$ _____	Check: _____
5. $2x - \star = 21$	$x =$ _____ $\star =$ _____	Check: _____
6. $2x + (-x) + 5 = 2(-x) + 14$	$x =$ _____ $-x =$ _____	Check: _____

HANDS-ON EQUATIONS POST-TEST: LESSON #15

Student's Name: _____

Code: _____

Teacher's Name: _____

I am in grade: _____

Today's Date: _____

Instructions to the Student:

You have now completed Lesson #15 of Hands-On Equations. We wish to know if this program was effective and if it helped you to learn something you did not know before. Please look over the questions below and write down the answers to those problems you are able to do. You will have 20 minutes to complete this post-test. You **may** use your student kits for this post-test. How you do on this test will not affect your grade in any way. Thank you for your participation.

<u>QUESTION</u>	<u>ANSWER</u>	<u>CHECK</u>
1. $4x + 2 = 2x + 8$	$x =$ _____	Check: _____
2. If $x = 2$, what is the value of: $2x + x + x + 5$ Ans. _____		
3. $3x + x = x + 8$	$x =$ _____	Check: _____
4. $x = x + 12$	$x =$ _____	Check: _____
5. $2x - x = 15$	$x =$ _____	Check: _____
6. $2x + (-x) + 5 = 2(-x) + 8$	$x =$ _____	Check: _____

HANDS-ON EQUATIONS POST-TEST: LESSON #16

Student's Name: _____

Code: _____

Teacher's Name: _____

I am in grade: _____

Today's Date: _____

Instructions to the Student:

You have now completed Lesson #16 of Hands-On Equations. We wish to know if this program was effective and if it helped you to learn something you did not know before. Please look over the questions below and write down the answers to those problems you are able to do. You will have 20 minutes to complete this post-test. You may **not** use your student kits for this post-test, but you may use the pictorial notation. How you do on this test will not affect your grade in any way. Thank you for your participation.

<u>QUESTION</u>	<u>ANSWER</u>	<u>CHECK</u>
1. $4x + 2 = 2x + 10$	$x =$ _____	Check: _____
2. If $x = 2$, what is the value of: $2x + x + x + x + 7$	Ans. _____	
3. $3x + x = x + 5$	$x =$ _____	$x =$ _____ Check: _____
4. $x = x + 12$	$x =$ _____	$x =$ _____ Check: _____
5. $2x - x = 18$	$x =$ _____	$x =$ _____ Check: _____
6. $2x + (-x) + 5 = 2(-x) + 11$	$x =$ _____	$-x =$ _____ Check: _____

Hands-On Equations Field Test Pre and Post Tests Questions

Level II March 04, 2011

Summary

Teacher's Name: _____ E-mail Address: _____ Phone Number: _____

School/District Name: _____ Address: _____ City: _____ State: _____ Zip: _____

How long have you been teaching Hands-On Equations? _____ Student Population: Inner-City: _____ Suburban: _____ Rural: _____

Grade Level: _____ Type of Students: Average: _____ Gifted: _____ LD: _____ ELL: _____ Total # of Students: _____

Place **GT, LD** or **ELL** next to the student code **below** for *any* students in these *categories*.

Instructions: Place a check mark in the box if the student had a correct response for the item; place a horizontal line in the box for an incorrect response.

Add the number of correct responses for each student for each test and place the sum in the "# Correct" column.

See instructions above for adding LD, GT next to the student code		Review Question Level I	Pre-Test							Post-Test after Lesson #15							Post-Test after Lesson #16							
#	Student Code		Date of Test: _____							Date of Test: _____							Date of Test: _____							
			1	2	3	4	5	6	# Correct	1	2	3	4	5	6	# Correct	1	2	3	4	5	6	# Correct	
1																								
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Item Summary Results: Please Place Total # of correct responses for each column on this line																								

We will be happy to complete the statistics for your study and send you a report