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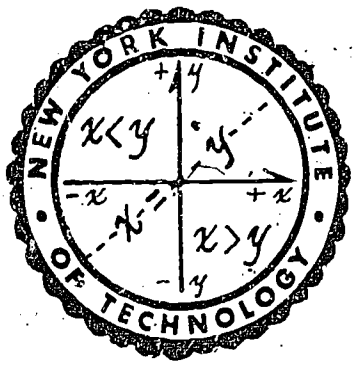
ABSTRACT

This programed instruction study guide is one of a series that form a first-year algebra course. Structured in a multiple-choice question-answer format with scrambled pages, it is intended to be used in conjunction with a computer-managed instructional system. The following topics are covered in Volume 5: operations on directed numbers, transforming equations, and properties of inequalities. Reading and homework assignments are taken from the text "Modern Algebra - Book I" by Dolciani. (Related documents are SE 015 854 - SE 015 870.) (DT)

PROGRAMMED MATH CONTINUUM

level one

ALGEBRA



VOLUME

5

NEW YORK INSTITUTE OF TECHNOLOGY
OLD WESTBURY, NEW YORK

PROGRAMMED MATH CONTINUUM

LEVEL ONE

A L G E B R A

VOLUME 5

New York Institute of Technology

Old Westbury - New York

PREFACE

This volume is one of a set of 18

that form a complete course

in

ALGEBRA - LEVEL ONE

The volume has been structured

in a multiple choice question-answer format,

with the pagination scrambled

and

is to be used in conjunction with

a program control console

utilizing

punch card input.

It is one exhibit in the demonstration of a model

developed under the direction of

the U.S. Department of Health Education and Welfare

Project 8-0157

at the

New York Institute of Technology

Westbury, New York

VOLUME 5

TABLE OF CONTENTS

VOLUME 5

This volume covers the following material as shown in this excerpt from the Syllabus:

SEGMENT	DESCRIPTION	REFERENCE BOOK SECTION		
		DOLCIANI	DRESSLER	DODES
1	Adding directed numbers Subtracting directed numbers	4-6 4-7	6- 7 6- 9	3-6 , 3- 7 3-5 , 3- 8
2	Multiplying directed numbers	4-8	6- 8	3-9 , 3-10
3	Dividing directed numbers	4-9	6-10 (6-11)	2-6 , 4- 3
4	Transforming equations	5-1	9- 5	5-2 , 5-3
5	Properties of inequality	5-2	9- 8 9- 9	5-4

D

READING ASSIGNMENT

VOLUME 5

Before you begin to answer the questions in this STUDY GUIDE you should read the pages indicated.

SEGMENT	FROM PAGE	TO PAGE
1	124	130
2	133	135
3	138	140
4	157	158
5	159	162

Modern Algebra Book I
Dolciani, Berman and Freilich
Houghton Mifflin, 1965

Read EVERYTHING contained in these pages.

EXAMINE every illustrative problem

Write in your NOTEBOOK:

1) Every RULE that has been stated
2) Every DEFINITION that has been presented
3) Solve at least ONE PROBLEM of each type covered in the lesson.

If you wish additional information for enrichment purposes consult:

Algebra I
Dodes and Greitzer
Hayden Book Co., 1967

You will be given additional notes at various places in the STUDY GUIDE. These, too, should be entered in your NOTEBOOK.

E

HOMEWORK ASSIGNMENT

VOLUME NO. 5

BOOK: DOLCIANI

HOMEWORK QUESTION NO.	PAGE NO.	EXAMPLE NUMBER	MBO REFERENCE
1	127	7 , 9 , 11 , 12	05110
2	127	13 , 14 , 15 , 18	05110
3	131	1 , 3 , 5 , 7	05120
4	131	14 , 17 , 19 , 20	05120
5	137	1 , 6 , 11 , 15	05210
6	137	21 , 26 , 32 , 37	05110 , 05120
7	138	49 , 50 , 52 , 53	05110 , 05120
8	138	54 , 55 , 56 , 57	05110 , 05210
9	141	1 , 3 , 5 , 7 , 9	05310
10	141	11 , 13 , 15 , 17	05310
11	141	19 , 21 , 23 , 25	05310
12	142	31 , 32 , 33	05310
13	159	2 , 4 , 6 , 8	05410 , 05420
14	159	10 , 12 , 17 , 19	05410 , 05420
15	159	13 , 21 , 24 , 25	05430
16	159	40 , 42 , 46	05410 , 05420
17	163	1 , 3 , 5 , 7	05531
18	163	11 , 13 , 15 , 17	05531
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GENERAL INSTRUCTIONS

Ask your teacher for:

PUNCH CARD
PROGRAM CONTROL
ANSWER MATRIX

When you are ready at the PROGRAM CONTROL

Insert the PUNCH CARD in the holder
Turn to the first page of the STUDY GUIDE
Read all of the instructions
Read the First Question

Copy the question
Do your work in your notebook
Do all of the computation necessary
Read all of the answer choices given

Choose the Correct answer
(remember, once you've punched the card it can't be changed)

Punch the card with the STYLUS

Read the instruction on the PROGRAM CONTROL
(it tells you which page to turn to)

TURN TO THAT PAGE:

If your choice is <u>not correct</u> you will be given additional hints, and will be directed to return to the question and to choose another answer.

If your choice is <u>correct</u> then you will be directed to proceed to the next question located immediately below, on the same page.

If you have no questions to ask your teacher now, you can turn the page and begin. If you have already completed a SEGMENT turn to the beginning of the following segment;

CHECK THE PAGE NUMBER BY LOOKING AT THE TABLE OF CONTENTS

VOLUME 5 SEGMENT 1 BEGINS HERE:

Obtain a PUNCH CARD from your instructor. In addition to the other identifying information that must be furnished by you, you are asked to punch out the following:

COLUMNS	48	and	50	2 1	(Sequence Number)
	54	and	56	0 4	(Type of Punch Card)
	60	and	62	0 5	(Volume Number)
	66	and	68	0 1	(Segment Number)

Your READING ASSIGNMENT for this Segment is pages 124 - 130 .

SUPPLEMENTARY NOTES:

In the previous Volume, you have seen how the NUMBER LINE can be used as a reference to allow you to add and subtract signed numbers.

You will no doubt agree that although it gives a concrete illustration of the operation, it is a time consuming process. Now, just as you long ago advanced from counting on your fingers to the memorizing of the number combinations, you will now be told to advance from counting along the NUMBER LINE to memorizing the RULES FOR THE ADDITION AND SUBTRACTION OF SIGNED NUMBERS.

Of course, you will always be able to fall back, at least mentally, on the picture of the NUMBER LINE to support your memory; but your main task now is to commit the following rules to memory.

Please turn to page 2.

V

Statement or RULE:	Symbolic Form of RULE:
(1) The SUM of two positive numbers is positive. The absolute value of the sum is the sum of their absolute values.	(1) If $a > 0$ and $b > 0$ then, $a + b = +(|a| + |b|)$
(2) The SUM of two NEGATIVE numbers is negative. The absolute value of the sum is the sum of their absolute values.	(2) If $a < 0$ and $b < 0$ then, $a + b = -(|a| + |b|)$
(3) & (4) The SUM of a POSITIVE and a NEGATIVE number has the sign of the number with the larger absolute value. The absolute value of the sum is the DIFFERENCE of their absolute values.	(3) If $a > 0$ and $b < 0$ and $\|a\| > \|b\|$ then, $a + b = +(|a| - |b|)$ (4) If $a > 0$ and $b < 0$ and $\|b\| > \|a\|$ then, $a + b = -(|b| - |a|)$

RULE FOR SUBTRACTION:

Since subtraction can be accomplished by adding the " additive inverse " we make that substitution and then use the addition rule that applies.

$$a - (+b) = a + (-b)$$

$$a - (-b) = a + (+b)$$

You will now be asked a series of questions to draw your attention to the more important points.

Question 1

Apply the proper rule to find the value of

$$(+2) + (+7)$$

(A) 14

(B) + 9

(C) + 5

(D) - 5

Since the two negative quantities in parentheses are separated by a plus sign, this is an addition of two negative numbers.
Then Rule 2 should be applied.
Please review Rule 2 , since you have made a mistake.
Remember, most decisions in Algebra involve

(1) Recognizing which rule to use, and then

(2) Using the rule precisely.

Please return to page 19/2 and try question 4 again.

Let us consider the inequality in two parts.
The left side asks for the absolute value of the sum of positive 7 and negative 8 . By Rule 4 , the sum of +7 and -8 is -1 . By the definition of absolute value, the absolute value of -1 is 1 .

The right side of the inequality asks for the sum of the individual absolute values. The absolute value of 7 is 7 ; the absolute value of negative 8 is 8 . The sum of these two absolute values by Rule 1 is 15 .

The Third step to take is to compare the left side with the right side.

Is the left side greater than the right side as the problem states? Is 1 greater than 15 ? Since this is not the case, then the inequality is not true.

Please return to page 29/2 and reconsider this question.

V

$\frac{4}{1}$

It appears that you have added 7 and 10 , but the only time when it is proper to add absolute values is when you are adding numbers which have the sa s not the case here.

Did you apply a subtraction rule? You should not have done so, because this problem calls for the sum of a positive 7 and a negative 10 .

Please return to page $\frac{22}{2}$ and try question 2 again.

$\frac{4}{2}$

From negative 2 we are asked to subtract negative 3 . Then the subtraction rule calls for the addition of the opposite of the subtrahend. That is:

$$(-2) - (-3)$$

becomes $(-2) + (\text{opposite of } -3)$

the opposite of -3 is $+3$

or $(-2) + (+3)$

Now if you apply the proper addition rule, you will find that this choice is not correct.

Please return to page $\frac{21}{2}$ and try question 10 again.

5/1

It appears that you did part of the problem correctly, but then made a mistake. The sum of the positive numbers is +31.9 while the sum of the negative numbers is -57.3 .

Now Rule 4 applies. tells you to subtract one absolute value from the other. You will probably be more comfortable if we put one number under the other.

$$\begin{array}{r} 57.3 \\ \underline{31.9} \\ 25.4 \end{array}$$

Since this deals with absolute values, we must subtract smaller from larger, and the result is an absolute value.

Please return to page 20/2 and try question 6 again.

5/2

The absolute value of

$$p + q$$

is never negative by the definition of absolute value.
But the sum of p and q can be negative when p is positive and q is negative. For example, suppose

$$p = +5$$

and

$$q = -12$$

Then

$$p + q = -7$$

which would not equal the absolute value of 7 . Since there is at least one set of numbers which makes the statement false, this choice is not correct.

Please return to page 23/2 and try question 8 again.

6/1

Whenever two numbers are written in this manner, it represents an ADDITION.

a - b is rewritten as a + (-b)

7 - 10 becomes 7 + (-10)

or +7 + (-10)

[illegible] calls for the addition of positive 7 and negative 10 . Remember that 7 means the same as +7 . The -10 means that the second number is a negative 10 ; you must not think of it as a subtraction example. If you apply the proper addition rule, you will find that this result is not correct.

Please return to page 14/2 and try this question again.

6/2

This problem deals with the sum of positive 7 , negative 12 , and positive 1 . Applying the addition rules , this equals -4 . Performing the addition offered in this choice gives the result -4 . Then this choice is incorrect, since we wanted the one which did NOT equal the original expression.

Please return to page 13/2 and try question 11 again.

It appears that you multiplied numbers. You must not think that parentheses call for multiplication; they do not.

This problem asks for the sum of positive 2 and positive 7 .

Please return to page 2/2 and try question 1 again.

The original problem calle the addition of positive x , negative y , and negative z .

Remembering that quantities written in this manner mean an addition, this choice equals the sum of positive x , negative y , and positive z .

Then this choice is not correct.

Please return to page 28/2 and try question 9 again.

V

This is a perfect illustration of Rule 2, the addition of two negative numbers. The rule states that the result is to be negative, and that we add the two absolute values.

Remember:

if	a	$<$	0	and	b	$<$	0					
then	a	+	b	=	−	(	|a|	+	|b|	)		

Therefore, this choice is correct.

Please proceed to question 5 below.

Question 5

Apply the proper rule to find the value of

18 + 6 − 41

(A) 53

(B) −17

(C) 65

(D) None of these.

This problem calls for the addition of a positive 7 and a negative 10 . Then it is necessary to apply Rule 3 and 4 . The sign of the result is the same as the sign of the number with the larger absolute value. Since 10 is the larger absolute value, this result should be negative.

Then this choice is not correct.

Please return to page 22/2 and try question 2 again.

Let us consider the inequality in two parts. The left side asks for the absolute value of -7 and -8 . By Rule 2 , the sum of -7 and -8 is -15 , and the absolute value of -15 is 15 .

The right side of the expression is equal to 7 - 8 , since we need the absolute values of the quantities.

But, by Rule 4

$$7 - 8 = -1$$

Then this choice says that the left side is smaller than the right side. Upon substituting the values, we find 15 is smaller than -1 , which is certainly not correct.

Please return to page 29/2 and try question 7 again.

10/1

This was supposed to be an addition of four signed numbers. It appears that you treated it as having a subtraction. Did you subtract 2.6 from 54.7 ? That was incorrect since you were supposed to add -54.7 to -2.6 and to the two positive numbers as well. Remember, you must use addition rules. Let's convert the problem to symbols:

$$a + b - c - d \quad \text{becomes:}$$

$$(a + b) + [(-c) + (-d)]$$

and there are two separate addition problems for. Then, these two answers, themselves, form a third addition problem.

Please return to page 20/2 and try question 6 again.

10/2

You were given that p was positive and q was negative. Now the ABSOLUTE VALUE of any number or combination of numbers is never negative by the very definition of ABSOLUTE VALUE. Therefore, $|p + q|$ will be positive, and its value will be bound by subtracting the absolute values of p and q . (Rule 3) On the other hand, the expression $p - q$ means the sum of p and $-q$. The value of this expression will be found by adding the absolute values since,

$p + (-q)$ (when q itself is negative) becomes

$p +$ (the additive inverse of negative-valued q)

NOTE: $-(-5) = 5$

or $p + |q|$ (Rule 1)

Therefore, we see that in the equation $|p + q| = p - q$

(a) the value of one side is found by subtracting the absolute values, and

(B) the value of the other side is found by adding the same absolute values.

The only case where this would produce an equality is when q is zero, and this was ruled out when it was given that q is negative.
Therefore, this choice is not an identity.

Please return to page 23/2 and reconsider this question.

You came very close, but this answer is not correct.

Did you recognize that this is an ADDITION problem? That's right, addition! When two numbers are written in this manner, it should be considered as addition,

is rewritten as

$$a + (-b)$$

In this case, we are adding positive 7 and negative 10 . If you will use the proper rule, you will get the correct result. Some students read this problem as " 7 subtract 10 " and since that makes no sense, they consider it to be " subtract 7 from 10 ." Of course, this is completely wrong; the minus sign is the sign of the number, rather than indicating an operation to be performed.

Please return to page 14/2 and try question 3 again.

Since this problem involves addition, it is possible to omit the parentheses without changing the value.

In the following case:

$$a + (b + c) =$$

$$a + b + c$$

This is the reflexive form of the ASSOCIATIVE PROPERTY OF ADDITION. The original expression is equal to this choice. However, this choice is not correct. What further simplification is possible?

Please return to page 26/2 and try question 12 again.

12
1

Since this problem asks for the sum of two positive numbers, we apply Rule 1 . The absolute value of the sum is the sum of the absolute values. What did you do with the absolute values?

This choice is not correct.

Please return to page 2 2 and try question 1 again.

12
2

The original problem called for the addition of positive x , negative y , and negative z . But this choice calls for the addition of positive x , positive y and positive z .

Then this choice is not correct.

Please return to page 28 2 and try question 9 again.

V

...ative 2 we are asked to subtract negative 3 . Then the subtraction rule calls for the addition of the opposite of the subtrahend.

That is (-2) - (-3)

becomes (-2) + (opposite of -3)

or (-2) + (+3)

Now, we use addition rules 3 and 4 .

(a) The sign of the result is plus.

(b) The absolute value of the sum is the result of subtracting 2 from 3 .

Then the correct result is +1 , and you have chosen the correct answer.

Please proceed to question 11 below.

Question 11

Apply the proper rules to find the choice which is NOT equal to

7 - 12 + 1

(A) 7 - 13

(B) -5 + 1

(C) 8 - 12

(D) 8 - 10 - 2

V

This example requires the use of Rules 3 and 4, which tell us that the sign of the result is the same as that of the number which has the larger absolute value. Since 10 is larger than 7, our result should be negative (the sign of the 10). Also, to get the absolute value of the result, we must subtract absolute values, which gives us 3.

Therefore, the correct result is -3, and you have chosen correctly.

Please proceed to question 3 below.

Question 3

Apply the proper rule to find the value of

7 - 10

(A) 17

(B) 3

(C) +3

(D) -3

This problem is an addition of three numbers; the first two are positive, and the third is negative.

The ASSOCIATIVE PROPERTY says that you can group them as you wish, either the first two together or the last two together.

The COMMUTATIVE PROPERTY permits you to change the order of any two numbers. You will end up by having to apply the addition rules twice. The easiest calculation arises from first adding 18 and 6 and then adding the negative 41 .

If you do it that way, you will find that your choice is not correct.

Please return to page 8/2 and try question 5 again.

Since these quantities are to be added, we may remove the parentheses being careful that the sign of each term is shown.

Thus we have:

$$(x + 2y) + (2x - y) =$$
$$+x + 2y + 2x - y$$

Now if you combine like terms, you will discover that this choice is not correct.

Please return to page 40/2 and try question 14 again.

V

16/1

Let us consider the inequality in two parts. The left side calls for the absolute value of the sum of -7 and -8. The sum of -7 and -8 by Rule 2 is -15, and its absolute value is 15. The absolute values of -7 and -8 are respectively 7 and 8, and their sum is 15. The right side calls for the sum of the individual, absolute values of the same numbers. The left side is said to be larger than the right.

Then this choice states that 15 is larger than 15 which is not correct.

Please return to page 29/2 and try question 7 again.

16/2

Since this problem involves addition, it is possible to omit the parentheses without changing the value.
In the following case:

$$a + (b + c) =$$

$$a + b + c$$

This is the reflexive form of the ASSOCIATIVE PROPERTY OF ADDITION. But this choice indicates that you used the opposite of $m - 4$. What caused you to use the opposite?

Note: $a + (b - c) = a + b - c$

but $a + (b - c) \neq a + (c - b)$

However, $a - (b - c)$ does $=$

$$a + (c - b) !$$

This choice is not correct.

Please return to page 26/2 and try question 12 again.

This problem deals with the sum of two positive numbers. Then we should apply Rule 1 . But this states that the sum is positive, which disagrees with this choice. In addition the rule calls for adding the absolute values, which was not done in this choice. What rule did you apply?

Please return to page 2/2 and try question 1 again.

The original problem calls for the addition of positive x , negative y , and negative z . This choice offers the difference between x and $y - z$. Let's analyze this to see how it compares with the original problem. Using the subtraction rule, we need the sum of x and the opposite of $y - z$.

But

$$y - z = y + (-z)$$

and, therefore, the opposite of $y - z$ is $-y + z$.

That gives us

$$x - y + z$$

as the equivalent of this choice. Then this is the sum of positive x , negative y , and positive z , which does not equal the original expression.

Then this choice is not correct.

Please return to page 28/2 and try question 9 again.

18/1

One of the techniques for making a decision about the truth of an identity is to test it with typical values from the replacement set. If one case is found where the identity doesn't hold, then the statement in question cannot be considered an identity. In order for this statement to be correct, it must be true for any values of p and q . Suppose

$$p = +5 \quad \text{and} \quad q = -12$$

Then, by Rule 4 the sum of p and q is -7 , and its absolute value is 7 .

Now the absolute values of p and q are respectively 5 and 12 , and their sum is 17 . When these values are substituted in the statement in question which says the two parts are always equal, we find a contradiction since 7 does not equal 17 .

This choice is not correct.

Please return to page 23/2 and try question 8 again.

18/2

The original problem is in the form:

$$a - (b - c)$$

This choice is in the form

$$a + (b - c)$$

which is not equivalent.

You have made a mistake in applying the rule for subtraction:

in the case $a - (b - c)$ we change it to an

addition problem $a + [-(b - c)]$

which be $a + (-b + c)$ by employing the opposite

and th $a \quad -b + c$

What is the opposite $(2r - 1)$?

This choice is wrong for another reason. It offers an addition, and we could omit the parentheses and then combine terms. Then this is not the simplest form even if it were a correct expression.

Please return to page 35/2 and try question 13 again.

V

It is important that you recognize a - b to be an example in ADDITION of two signed numbers, (a) + (-b) , positive 7 and negative 10 . Then we can apply Rules 3 and 4 getting the minus sign for the result, since negative 10 has a larger absolute value than positive 7 . The rule tells us to subtract absolute values, which gives us 3 .

Then the correct answer is -3 .

Please proceed to question 4 below.

Question 4

Apply the proper rule to find the value of

(-9) + (-6)

(A) -15

(B) - 3

(C) + 3

(D) +15

V

his problem is an addition of three numbers, two positive and one ...ive. ou can apply the ASSOCIATIVE and CO..MUTATIVE PROPERTIES to ma... ...anges n the appearance of the problem.

vever, the easiest calculation results from adding the first ... ting 24 , and then adding 24 and -41 .

plying Rule 2 , we find that our result is -17 , so that this ... correct.

lease proceed to question 6 below.

0

uestion 6

Perform the calculation to find the value of

$$24.3 + 7.6 - 54.7 - 2.6$$

(A) -25.4

(B) -34.6

(C) -20.2

(D) None of these.

The original problem called for the addition of positive x, negative y, and negative z. Remembering that quantities written in this manner mean an addition, this choice is the sum of positive x, negative y, and negative z.

Then this choice is correct.

Please proceed to question 10 below.

Question 10

Apply the proper rule to find the value of

$$(-2) - (-3)$$

(A) +5

(B) -5

(C) +1

(D) -1

V

Since we are looking for sum of two positive numbers Rule 1 says that the result is positive and that the absolute value of the result is the sum of the absolute values.

Then,

(+2) + (+7) =

+ (2 + 7) =

+ 9

if a > 0 b > 0
then a + b = + (|a| + |b|)

Please proceed to question 2 below.

Question 2

Apply the proper rule to find the value of

(+7) + (- 10)

(A) - 3

(B) +17

(C) 3

(D) + 3

V

Let us consider the two parts of the inequality separately. The left side calls for the absolute value of the sum of -7 and 8. The sum of -7 and $+8$ is $+1$ and its absolute value is 1. The right side calls for the sum of the individual absolute values. The absolute values of -7 and 8 are respectively 7 and 8, and their sum is 15.

Then this choice states that 1 is smaller than 15, which is correct.

Please proceed to question 8

Question 8

If $p \in \{\text{positive integers}\}$ and $q \in \{\text{negative integers}\}$ which choice do you recognize as an identity?

(A) $|p - q| = p + q$

(B) $|p - q| = p - q$

(C) $|p + q| = |p| + |q|$

(D) None of these.

Y[illegible] done a good job of [illegible] the rule for subtracting since you are adding the opposite of the [illegible] ahead. However, in the form

$$a + (-b - c)$$

the parentheses may be omitted giving

$$a - b - c$$

which will result in having what could be combined. Thus this choice is incorrect, because it is not in simplest form.

Please return to page $\frac{35}{2}$ and try question 13 again.

$\frac{24}{2}$

This problem requires that the like terms be combined by using the appropriate addition rules. It might be advisable to rearrange the terms first using the COMMUTATIVE PROPERTY so as to group the like terms.

Thus:

$$2m - 3 - 5m - 10m + 8$$

$$2m + (-5m) - 10m - 3 \quad 8$$

If you now combine terms, you will discover that this choice is not correct.

Please return to page $\frac{31}{2}$ and try question 2 again.

If you will carefully the rules for addition of signed numbers, you will find one of the other choices is correct. This choice is not correct.

Consider the problem symbolically:

$$+ b - c - d$$

becomes

$$+ b + [(-c) + (-d)]$$

this becomes

$$a + f$$

Thus we are faced with one separate addition problem.

Please return to page 21 and try question 6 again.

$$a - b = a + (\text{additive inverse of } b)$$

Applying the subtraction rule we have:

$$2w - 5x - (-3w + 2x) =$$

$$2w - 5x + (+3w - 2x)$$

You can remove parentheses and combine terms; and we find that this choice is not the correct result.

Please return to page 32
2 and try question 17 again.

The problem deals with the sum of positive 7 , negative 12 , and positive 1 . We can check each solution offered as a choice by applying the addition rules. The original problem equals -4 . Applying the addition rules to the choices we do not get -4 . As a matter of fact, we get -6 . Since we wanted the choice which was NOT equal to the original, this choice is correct.

Remember we can use the COMMUTATIVE LAW FOR ADDITION and then group two adjacent terms by the ASSOCIATIVE LAW. This gives us much latitude for different approaches to the solution.

Note:

$$7 - 12 + 1 = (7 + 1) - 12 \quad \text{or}$$

$$7 - 12) + 1 \quad \text{or}$$

$$= 7 + (-12 + 1)$$

but $7 - 12 + 1 = 7 - (12 + 1)$!

Please proceed to question 12 below.

Question 12

Apply the proper rules to simplify the expression

$$\quad + (m - 4)$$

as far as possible.

(A) $\quad - m - 4$

(B) $m + 28$

(C) $36 - m$

(D) $28m$

V

You have done part of the problem correctly. However, you overlooked something. The rule for subtraction tells us to add the opposite of the subtrahend. You seem to have made a mistake in getting the opposite of

$$2r - 1$$

What is the opposite of -1 ?

Please return to page 35/2 and try question 13 again.

There are two ways to solve this type problem.

(1) Simplify first, then substitute and further simplify.

or (2) Substitute first, then simplify.

Using the second method and substituting the given values, we have:

$$(p + q) - p =$$

$$(3 - 1.5) - 6$$

If you now calculate the value of the expression in parentheses and then add the negative 6 , you will find that this result is not correct.

Please return to page 37/2 and try question 16 again.

A careful check of each of the other choices shows that none of them is correct for all values of p and q. Then this choice is correct.

Please proceed to question 9 below.

Question 9

Apply the proper rules to find the choice which is equal to

$$(x) + (-y) + (-z)$$

if x, y, and z are all positive integers.

(A) $x - y + z$

(B) $x + y + z$

(C) $x - y - z$

(D) $x - (y - z)$

You have done a fine job; this choice is correct.

While this can be done in many ways, it is best if you first add the two positive quantities, then the two negative quantities. For convenience, we may write it as follows:

	24.3	- 54.7	One case uses Rule 1
+	7.6	- 2.6	and the other uses
	31.9	- 57.3	Rule 2 .

Now we need to subtract absolute values, and you are probably most comfortable with the larger absolute value on top.

57.3	Applying Rules 3 and 4 , we find that
31.9	our result is negative so that we
25.4	get -25.4 .

Please proceed to question 7 below.

Question 7

Perform the calculation to find which inequality is correct.

(A) $|(7) + (-8)| > |7| + |-8|$

(B) $|-7 \quad -8| < |-7| - |-8|$

(C) $|(-7) + (-8)| > |-7| + |-8|$

(D) $|-7 + 8| < |-7| + |8|$

30
1

Since this problem involves addition, it is possible to omit the parentheses without changing the value.

In the case:

$$a + (b + c) =$$

$$a + b + c$$

This is the reflexive form of the ASSOCIATIVE PROPERTY OF ADDITION.

Then,

$$32 + (m - 4) =$$

$$32 + m - 4$$

and combining terms

we get $28 + m$

How did you combine these terms? Or did you select this choice because you didn't notice that it does not have the plus sign? In any case, this choice is not correct.

Please return to page 26/2 and try question 12 again.

30
2

The rule for subtraction tells us to add on the opposite of the subtrahend.

What is the opposite of

$$(3r - s + 9) \quad ?$$

You have made an error in signs.

Please return to page 39/2 and try question 18 again.

Since these quantities have to be added, we may remove the parentheses being careful to show the sign of each term.

Thus we have:

$$(x + 2y) + (2x - y) =$$

$$+x + 2y + 2x - y =$$

$$+ 3x + y$$

Of course, the plus sign in front of the $3x$ is written for emphasis; it may be omitted without changing the value.

Therefore, this choice is correct.

Please proceed to question 15 below.

Question 15

Apply your knowledge to combine terms:

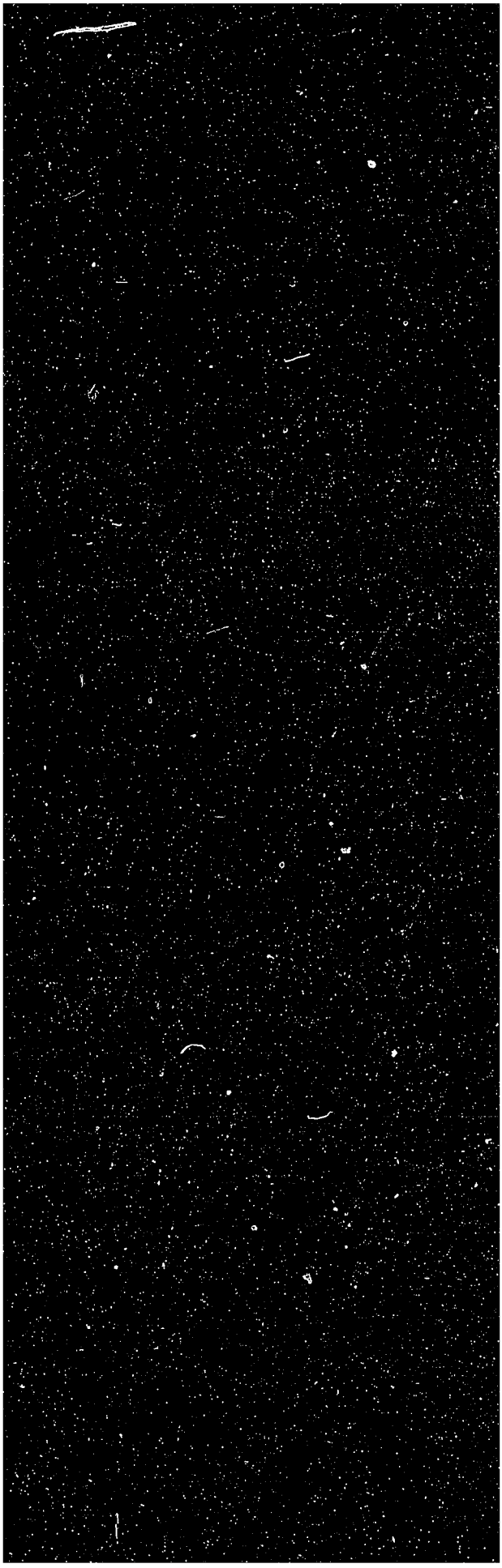
$$2m - 3 + 5m - 10m + 8$$

(A) $3m + 5$

(B) $-3m + 5$

(C) $3m - 11$

(D) $-3m - 11$



We can solve this problem by substituting the given values.

Thus,

$$(p + q) - p = (6 - 18) - 6 \qquad \text{Rule } 4$$
$$= -12 - 6 \qquad \text{Rule } 2$$
$$= -18$$

It turns out that the problem is easier if we do some algebra first:

$$(p + q) - p = p + q - p \quad [\text{COMMUTATIVE PROPERTY}$$
$$= p - p + q \quad [\text{ADDITIVE INVERSE}$$
$$= 0 + q$$
$$= q$$

Notice that in using the variables p and q, we do not care whether they represent positive or negative numbers. Of course, the result is the same whichever approach we use since all correct methods give us the correct answer.

Please proceed to question 17 below.

Question 17

Apply your knowledge to combine terms:

$$(2w - 5x) - (-3w + 2x)$$

(A) $5w - 3x$

(B) $5w + 7x$

(C) $5w - 7x$

(D) $-w - 3x$

Since I is an addition, we have

$$x + (y - z) = x + y - z$$

Item II is a subtraction, therefore,

$$x - (y + z) = x (-y - z)$$

which equals $x - y - z$

Therefore, I and II are not equal, and this choice is not correct.

Please return to page 45/2 and try question 19 again.

You have answered a different question correctly, but you were asked for the absolute value of the product of the two numbers. An absolute value does not have a sign attached.

What is the rule for finding the absolute value of a product?

Please return to page 47/2 and try question 2 again.

V

34/1

Since this choice has two quantities separated by a minus sign, it indicates an addition of the signed numbers, a and -1 . But the original problem did not have a plus or a minus sign separating the two quantities; it was a multiplication problem in the form

b (d) which means b x d

The fact that d was a negative value doesn't change the operation to subtraction or addition of a negative. It is still multiplication.

Since the addition and the multiplication do not give the same values, this choice is not correct.

Please return to page 42/2 and try question 1 again.

34/2

The numbers, each in parentheses, are written without a plus or a minus sign between them; this indicates a multiplication.

NOTE: (-a) (-b) = + (|a| • |b|)

You have made an error in one part of the rule for multiplying two numbers. Do you see which part?

Please return to page 58/2 and try the question again.

Since this problem involves addition, it is possible to omit the parentheses without changing the value.

In the following case:

$$a + (b + c) = a + b + c$$

This is the ASSOCIATIVE PROPERTY OF ADDITION in its reflexive form.

Then we have:

$$\begin{aligned} 32 + (m - 4) &= 32 + m - 4 \\ &= 32 - 4 + m \quad \text{Using the COMMUTATIVE PROPERTY} \\ &= 28 + m \quad \text{Combining similar terms} \\ &= m + 28 \quad \text{Using the COMMUTATIVE PROPERTY} \end{aligned}$$

Then this choice is correct since the two terms we now have cannot be combined.

Please proceed to question 13 below.

Question 13

If you apply the proper rules to the problem

$$5r - (2r - 1)$$

which is the result in simplest form?

(A) $5r + (2r - 1)$

(B) $5r + (-2r + 1)$

(C) $3r - 1$

(D) $3r + 1$

V

Since P represents the sum of three numbers which might be either negative or positive or zero, P may be positive or negative (or even zero). But Q is an absolute value, and it cannot be negative. Therefore, this choice is not correct. If you would be happier trying some numbers, suppose that

$$m = 1$$

$$t = 2$$

and $$w = 6$$

The value of P would be

$$1 + 2 - 6 = -3$$

The value of Q would be the absolute value of -3, which is 3.

Please return to page 38/2 and try question 20 again.

Since the quantities are not separated by a sign, either plus or minus, this indicates a multiplication. The rule for multiplication has two parts; one for the sign of the result, and the other for the absolute value of the result.

NOTE:

$$a\,(-b) = -(|a| \cdot |b|)$$

Which did you use incorrectly?

This result is not correct.

Please return to page 52/2 and try question 3 again.

This problem requires that the like terms be combined using the appropriate addition rules. It is best to rearrange terms first using the COMMUTATIVE PROPERTY so as to group the like terms.

Thus:

$$2m - 3 + 5m - m + 8 = \underbrace{2m + 5m} - 10m - \underbrace{3 + 8}$$

$$= \underbrace{7m - 10m} + 5$$

$$= -3m + 5$$

Therefore, this choice is correct.

Please proceed to question 16 below.

Question 16

If

$$p = 6$$

$$q = -18$$

apply your knowledge to find the value of

$$(p + q) - p$$

(A) -20

(B) 18

(C) - 6

(D) -18

V

38
1

Since I ' is an addition, we have

$$x + (y - z) = x + y - z$$

Item III , which cannot be simplified is

$$x - y - z$$

Then these are not equal, and this choice is [illegible]orre

lease [illegible] to page 45/2 and try question 19 again.

38
-

The parentheses indicate that the two quantities 4 and -3 are not separated by any signs, and that they are to be multiplied.

NOTE: (a (b) means a x b

But you did not multiply them; therefore, this choice is not correct.

Please return to page 47/2 and try question 2 again.

V

$$a - b = a + (\text{Additive Inverse of } b)$$

NOT Additive Inverse of: $-p + q$ is $+p -$

Applying the subtraction rule, have:

$$(2w - 5x) - (-3w + 2x = (2w - 5x) + (+3w - 2x)$$

$$+2w - 5x + 3w - 2x \quad [\text{Combine like terms}$$

$$5w - 7x$$

This choice is correct. Notice that it is possible to combine the similar terms without first rewriting the expression to put the similar terms next to each other. However, you must take care not to overlook any term.

Please proceed to question 18 below.

Question 18

In performing the calculation

$$7r - (3r - s + 9)$$

choose the expression which must be added to $7r$.

(A) $-3r + s - 9$

(B) $-3r - s + 9$

(C) $-3r - s - 9$

(D) $3r - s + 9$

The rule for subtraction tells us to add the opposite of the subtrahend. Then,

$$5r - (2r - 1)$$

becomes: $$5r + (-2r + 1)$$

and we can omit parentheses from this addition without changing the value. This gives us

$$5r - 2r + 1$$

Combining terms, we have

$$3r - 1$$

It is very important that you see what happened to the plus sign which was in front of the parentheses.
The meaning of the plus sign was "add" and the meaning of writing

$$5r - 2r + 1$$

is also "add". Therefore, when the parentheses are omitted as they may be in addition, the plus sign is also omitted. However, we must be sure to write the sign of the first term in the parentheses. For instance,

$$7x + (3x + 1) = 7x + 2x + 1$$

where the plus sign of the $2x$ was understood inside the parentheses, but must be written when the parentheses are omitted. In the problem we started with, the minus sign in front of the $2r$ is written at all times.

Please go on to question 14 below.

Question 14

Apply the proper rule to express in simplest form:

$$(x + 2y) + (2x - y)$$

(A) $3x + 3y$

(B) $3x - y$

(C) $3x + y$

(D) $-x + 3y$

V

Neither Q nor R can be negative quantities since one is an absolute value and the other is the sum of two absolute values. Nevertheless, we can show that they do not have to be equal.

Suppose

$$m = 1$$

$$t = 2$$

and $$w = 6$$

Then, $Q = |1 + 2 - 6|$ $\quad$ $R = |1| + |2 - 6|$

$= |-3|$ $\quad$ $= 1 + |-4|$

$= 3$ $\quad$ $= 1 + 4$

$= 5$

Therefore, this choice is not correct.

Please return to page $\frac{49}{2}$ and reconsider the problem.

Since the quantities are not separated by either a plus or minus sign, this indicates a multiplication. The rule for multiplying two signed numbers has two parts; one for the sign of the result, and the other for the absolute value of the result.

NOTE:

$$a(-b) = -(|a| \cdot |b|)$$

You have made a mistake in one of those parts; this result is not correct.

Please return to page $\frac{52}{2}$ and try question 3 again.

V

VOLUME 5 SEGMENT 2 BEGINS HERE:

Obtain a PUNCH CARD from your instructor. In addition to the other identifying information that must be furnished by you, you are asked to punch out the following:

COLUMNS	48	and	50	2	2 (Sequence Number)
	54	and	56	0	4 (Type of Punch Card)
	60	and	62	0	5 (Volume Number)
	66	and	68	0	2 (Segment Number)

Your READING ASSIGNMENT for this Segment is pages: 133 - 135.

SUPPLEMENTARY NOTES:

In the previous segment you saw how to add and subtract signed numbers without necessarily referring to the NUMBER LINE. You will now extend this skill to include multiplication of signed numbers. This is a logical development since multiplication can be considered as repeated addition.

You will now be asked a series of questions to draw your attention to the more important points.

Question 1

Which do you recognize as the same value as

$$a\,(-1)$$

(A) $a - 1$

(B) $(a) - 1$

(C) $-1a$

(D) $-1 + a$

You have correctly applied the COMMUTATIVE LAW OF MULTIPLICATION, but you still have to actually multiply the numbers in order to simplify the expression.

Please return to page 58/2 and finish the problem.

You must not concentrate so hard on one part of the problem that you overlook something else. This problem calls for the multiplication of four numbers. However, you can only multiply two numbers at a time. The ASSOCIATIVE PROPERTY tells you that you can multiply two numbers, then multiply the result by the next number and so on.

If you do that correctly, you will find that this choice is not correct.

Please return to page 65/2 and try question 7 again.

V

44
1

Since P is the sum of three signed numbers, it may have any value, positive, negative or zero. On the other hand, since Q is an absolute value, it must be non-negative. Also R is the sum of two absolute values and cannot be negative.

Then it is certainly not true that all three are equal.

Please return to page 49/2 and try question 20 again.

44
2

Since no plus or minus sign separates the two quantities, this is a multiplication. What operation did you perform?

This choice is not correct.

Please return to page 63/2 and try question 5 again.

The rule for subtraction tells us to add on the opposite of the subtrahend, that is, the quantity being subtracted. In this case the subtrahend is

$$(3r - s + 9)$$

Then its opposite is

$$-3r + s - 9$$

and this choice is correct.

Please proceed to question 19 below.

Question 19

Apply your knowledge to find which statement about the following expressions is correct.

I. $x + (y - z)$

II. $x - (y + z)$

III. $x - y - z$

(A) only I and III are equal

(B) only II and III are equal

(C) only I and III are equal

(D) all three are equal

V

56
1

Since the quantities are not separated by either a plus or a minus sign, this indicates multiplication. The rule for multiplying two signed numbers has two parts, one for the sign and the other for the absolute value of the result.

NOTE:

$$a\,(-b) = -(|a| \cdot |b|)$$

You have an error in both parts; this choice is not correct.

Please return to page 52/2 and try question 3 again.

46
2

You seem to be confused.

$$-3 \quad -5 \quad -2$$

calls for the addition of the negative numbers; where as

$$(-3)\ (-5)\ (-2)$$

indicates multiplication. Now examine the rules for multiplication.

a b c means a x b x c

By the COMMUTATIVE LAW, the order of these can be changed:

a x c x b

c x b x a etc.

without affecting the result. Therefore, multiply any two, and then multiply that answer by the third. Consider the signs carefully in each case.

Please return to page 56/2 and try question 6 again.

V

This choice indicates a multiplication since the two quantities are written without a plus or minus sign between them. It is written in the form b (d) which means b x d . This is true whether or not either b or d are actually negative numbers. This is, therefore, another form of the given expression.

Since the COMMUTATIVE PROPERTY states that the result of multiplication is the same regardless of the order of the quantities, these have the same value.

Then this choice is correct.

Please proceed to question 2 below.

Question 2

Choose the absolute value of

(4) (-3)

(A) -12

(B) 12

(C) 1

(D) - 1

V

48
1

The fact that the two numbers each in parentheses are written without a plus or a minus sign separating them indicates that this is a multiplication.

What operation did you perform? You certainly did not perform a correct multiplication.

Please return to page 58 and try the question again.
2

48
2

How did you read the problem? It asks for the value of

$$(+2)^3 \quad \text{not} \quad (+2)3$$

Remember that the base is to be repeated as a factor in a multiplication. That is, the base +2 is tc be written three times and the three numbers must then be multiplied.

$$(a)^3 \quad \text{means} \quad (a)\ (a)\ (a)$$

Your choice is not correct.

Please return to page 53 and try question 8 again.
2

Since I is an addition, we have

$$x + (y - z) = x + y - z$$

Item II is a subtraction, therefore,

$$x - (y + z) = x + (-y - z)$$

Which equals

$$x - y - z$$

Item III , which cannot be simplified; is

$$x - y - z$$

Therefore, II and III are equal, but I is different.

Then this choice is correct.

Please proceed to question 20 below.

Question 20

Apply your knowledge to find which statement about the following expressions is correct: m , t , and w are integers,

$P = m + t - w$ $\quad Q = |m + t - w|$ $\quad R = |m| + |t - w|$

(A) only P and Q are equal

(B) only Q and R are equal

(C) all three are equal

(D) all three may have different values

50
1

It appears that you recognized correctly that this is a multiplication problem. Why did you get the wrong answer? Perhaps you should reread the rules for multiplication; you must have left out one part of the rule.

Please return to page 56 and try question 6 again.
2

50
2

In this problem the base is -2 and the exponent is 4 .

Then writing the problem as a multiplication gives us

(-2) (-2) (-2) (-2)

If you apply the multiplication rules for signed numbers, you will find that this choice is not correct. You may use the ASSOCIATIVE LAW and group the factors in pairs. Then each pair can be replaced by the equivalent product. These two products are then multiplied.

Please return to page 67 and try question 9 again.
2

It does not follow that since multiplying two negative numbers produces a positive number, multiplying two positive numbers produces a negative number.

Refer to the proper rule and then apply it.

Please return to page 63/2 and try question 5 again.

Since this problem involves a multiplication of a single term by an expression made up of two terms, you must apply the DISTRIBUTIVE PROPERTY; that is, you must use the multiplier with each term inside the parentheses. You certainly have not done that.

$$a (b + c) = ab + ac$$

Please return to page 69/2 and try question 11 again.

52
1

Since the rule states that the absolute value of a product is the product of the absolute values, it is only necessary to multiply 4 by 3 .

Note: $|(a)(b)| = |a| \times |b|$

Then this choice is correct.

Please proceed to question 3 below.

52
2

Question 3

Choose the value of

$$4(-3)$$

(A) -12

(B) 12

(C) 1

(D) - 1

V

There is a lot of detail in this problem, and you have handled it all carefully and correctly. Once you know that it is a multiplication, you can proceed as follows:

> There are four negative numbers, an even number of them, so that the result is plus. (Each multiplication of two negatives produces a positive product). Now you can multiply absolute values without having signs in your way. Of course, you may do the multiplication in any order you wish.

Please proceed to question 8 below.

Question 8

Apply your knowledge to find the value of $(+2)^3$

(A) 6

(B) 8

(C) 9

(D) 12

The fact that each quantity differs from the others in the placement of absolute value signs suggests that they have different values.

Let $m = 1$

$t = 2$

$w = 6$

Then

$P = m + t - w$	$Q = \lvert m + t - w \rvert$	$R = \lvert m \rvert + \lvert t - w \rvert$
$P = 1 + 2 - 6$	$Q = \lvert 1 + 2 - 6 \rvert$	$R = \lvert 1 \rvert + \lvert 2 - 6 \rvert$
$P = -3$	$Q = \lvert -3 \rvert$	$R = 1 + \lvert -4 \rvert$
	$Q = 3$	$R = 1 + 4$
		$R = 5$

Thus, we find that all three can have different values.

You have now finished this Segment. Hand in the PUNCH CARD.
You should have entered in your NOTEBOOK the rules for addition and subtraction from the beginning of this segment.

You should now be able to complete assignment 5 , problems 1 - 4 .

In this problem the base is -2 and the exponent is 4.

Therefore, we are asked for the value of

$$(-2)(-2)(-2)(-2)$$

There are four negative factors [illegible]re, the result is positive.

The product of the absolute values is 16 so that this choice is correct.

You might note this suggestion for the calculation:

$$\underbrace{(2)(2)}_{4}\cdot\underbrace{(2)(2)}_{4} = 16$$

[illegible] proceed to question 10 below.

Question 10

Apply your knowledge to find the value of

$$(-2)^5$$

(A) 32 (C) 10

(B) -32 (D) -10

V

56
1

Since the expression is in the form:

$$+a\ (\ +b\ )$$

this is a multiplication.

You have applied the rule correctly, and this is the correct choice.

$$+a\ (\ +b\ ) \quad = \quad +a \quad x \quad +b$$

Please proceed to question 6 below.

56
2

Question

Apply your knowledge to find the value of

$$(\ -3\ )(\ -5\ )(\ -2\ )$$

(A) -10 (C) -30

(B) 10 (D) 30

This problem requires the application of the DISTRIBUTIVE PROPERTY as you have recognized. But you have made an error; this choice is not correct. Did you forget to apply the rules for multiplying signed numbers?

Please return to page $\frac{69}{2}$ and try question 11 again.

$\frac{57}{2}$

Applying the DISTRIBUTIVE PROPERTY correctly, we get:

$$5(3a) + 5(r) - 4(3a) - 4(r)$$

If you perform the multiplications correctly and then combine terms, you will find that this choice is not correct.

Please return to page $\frac{84}{2}$ and try question 14 again.

V

Since the quantities are not separated by a sign, either plus or minus, this indicates a multiplication. Then the rule for multiplication tells us that the result is negative, and its absolute value is 12 .

Note:

$$a(-b) = -(|a| \cdot |b|)$$

Therefore, this choice is correct.

Please proceed to question 4 below.

Question 4

Choose the value of

$$(-5)(-1)$$

(A) - 5

(B) 5

(C) $(-1)(-5)$

(D) - 6

V

Once you recognize that there is an exponent, you should rewrite the problem to show the multiplication. When you try to multiply quantities in your mind without having them on your paper, it is too easy to make errors as you have done.

Since the base is +2 and the exponent is 3 the problem is to find the value of

$$(+2)(+2)(+2)$$

Please return to page 53/2 and try question 8 again.

This problem calls for the DISTRIBUTIVE PROPERTY.

Applying the property correctly means that each term in the parentheses is to be multiplied by the $-3x$.

Therefore, this choice is not correct.

Please return to page 73/2 and try question 13 again.

60/1

The base is -2 and the exponent is 5 so that this problem is equivalent to

$$(-2)(-2)(-2)(-2)(-2)$$

If you now perform the multiplication using the rules correctly, you will find that this choice is not correct.

Please return to page 55/2 and try question 10 again.

60/2

The meaning of

$$5x^3 \text{ is } 5 \cdot x \cdot x \cdot x$$

Therefore we have

$$5x^3 = 5(-3)(-3)(-3)$$

Did you forget the meaning of an exponent? If you are careful to write the multiplication out as shown above, you will get the correct result more often.

This result is not correct.

Please return to page 81/2 and try question 16 again.

This problem calls for the DISTRIBUTIVE PROPERTY first, giving us

$$3m(\ 2m\ ) + 3m(\ -5\ ) - 4(\ 3\ ) - 4(\ -2m\ )$$

Next you should perform the multiplications. This seems to be the place where you made the error. Have you found it?

Please return to page 71/2 and try question 15 again.

A common error in this problem is to consider that it asks for the third power of a negative quantity, and that the result is, therefore, negative. You must remember that a minus sign merely indicates the opposite of a number. Of course -3 is a negative number, but $-m$ is a positive number if m happens to be negative.

Go back to the meaning of a third power, and calculate the value correctly since you have the wrong choice.

Please return to page 79/2 and try question 18 again.

The problem requires the use of the DISTRIBUTIVE PROPERTY as you have recognized.

$$a(b + c) = ab + ac$$

It is important to keep in mind also that we are dealing with signed numbers, and to follow the rules for multiplying them. You have done very well; this choice is correct.

In detail, we might show the work as follows:

$$-5(2x - 3y) =$$

$$-5(2x) \; -5(-3y) =$$

$$-10x \qquad +15y$$

Please proceed to question 12 below.

Question 12

Apply the appropriate principle to find the choice equal to

$$-5 - (2x - 3y)$$

(A) $-10x + 15y$

(B) $10x + 15y$

(C) $10x - 3y$

(D) None of these.

The numbers each in parentheses are written without a plus or minus sign between them; this indicates a multiplication. The rule for multiplication has two parts: The absolute value of the product is the product of the absolute values, and the result is negative if the two numbers have different signs.

Note:

$$(-a)(-b) = +(|a| \cdot |b|)$$

Then you have used both parts of the rule correctly, and this choice is correct.

Please proceed to question 5 below.

Question 5

Choose the value of

$$+4(+3)$$

(A) 12

(B) + 7

(C) 7

(D) -12

64
1

It appears that you used the DISTRIBUTIVE PROPERTY correctly, and you have no mistakes in multiplying the signed numbers.

Then where did you make your mistake?

Please keep in mind: the more complicated an example becomes, the more careful you must be with all details.

Can you find your error?

Please return to page 73 and try question 13 again.

64
2

You have made a mistake probably due to doing too much mentally.

You should write down the multiplication that is to be performed,

$-2p^2$ means $-2(p)(p)$

Then you can substitute the numbers and perform the multiplication.

This choice is not correct.

Please return to page 75 and try question 17 again.

You have done a fine job!

First, because you recognized that this is a multiplication example.

Next, because you applied the rule properly and carefully. It is interesting to note that you can make use of the ASSOCIATIVE AND COMMUTATIVE PROPERTIES OF MULTIPLICATION to simplify this calculation. For example, it can be done as:

(a)	(b)	(c)
$(-3)(-5)(-2) =$	$(-3)(-5)(-2) =$	$(-3)(-2)(-5) =$
$-3 \cdot -5 \cdot -2 =$	$-3 \cdot -5 \cdot -2 =$	$-3 \cdot -2 \cdot -5 =$
$-3 \cdot +10 =$	$+15 \cdot -2 =$	$+6 \cdot -5 =$
-30	-30	-30

Of course, it could be done in other orders as well, all giving the same correct answer.

Please proceed to question 7 below.

Question 7

Apply the appropriate rule to find the value of

$$(-3)(-2)(-1)(-2)$$

(A) -8 (C) -12

(B) 8 (D) 12

66/1

This problem calls for the DISTRIBUTIVE PROPERTY first, giving us:

$$3m\ (\ 2m\ )\ +\ 3m\ (\ -5\ )\ -\ 4\ (\ 3\ )\ -\ 4\ (\ -2m\ )$$

Next, you should perform the multiplications and then combine similar terms.

It appears that you have done all that, and yet this choice is not correct. Where did you make your error? Better review each step carefully.

Return to page 71/2 and try question 15 again.

66/2

You have apparently ignored the parentheses in the original problem. It is

$$(\ -2p\ )^3 \quad \text{not} \quad -2p^3$$

If you will re-examine the meaning of a third power, you should be able to correct your error.

Return to page 79/2 and try question 18 again.

Since the exponent 3 tells us that the base is to be repeated three times as a factor, we have

$$(+2)(+2)(+2) = +8$$

This is an example of

$$(a)^3 = (a)(a)(a)$$

Then this choice is correct.

Please proceed to question 9 below.

Question 9

Apply the proper principles to find the value of $(-2)^4$.

(A) 16

(B) -16

(C) 8

(D) - 8

68/1

Since there is a minus sign separating the -5 from the quantity inside the parentheses, the -5 is <u>not</u> to be multiplied by the other quantity.

Then this choice is not correct.

When two quantities are separated by a plus or minus sign, it calls for application of the addition rules.

<u>Note</u>:

$$a - (b - c) \neq a(b - c)$$

Return to page 62/2 and try question 12 again.

68/2

The meaning of

$$5x^3 \quad \text{is} \quad 5(x)(x)(x)$$

Then if you substitute -3 for x it is possible to calculate the value.

However, you will find that this choice is not correct.

Return to page 81/2 and try question 16 again.

Since the base is -2 and the exponent is 5, this problem is equivalent to

$$(-2)(-2)(-2)(-2)(-2) =$$

$$(+4) \quad (+4) (-2) =$$

$$(+4) \quad (-8) =$$

-32

There is no reason why you must do the multiplication in the order shown above. In any order the multiplication will come out to this same value since it is correct. You could save some work by seeing that there are five negative numbers (an odd number) , which means that the result is negative. Then you can concentrate on the absolute values without any signs to bother you.

Please proceed to question 11 below.

Question 11

Apply your knowledge to find the choice equal to

$$-5 (2x - 3y)$$

(A) $-10x - 3y$

(B) $-10x + 3y$

(C) $10x - 15y$

(D) $-10x + 15y$

70/1

There is a difference between $-2p^2$ and $(-2p)^2$.

Which was the one you used?

Your choice is not correct.

Please return to page 75/2 and try question 17 again.

70/2

Were you tricked by the $-p$?

Since the value of p is -6, what is the value of $-p$?

That may explain why your choice is not correct.

Please return to page 85/2 and try question 19 again.

V

Applying the DISTRIBUTIVE PROPERTY correctly, we get:

$$5 (3a) + 5 (r) - 4 (3a) - 4 (r) =$$

$$15a + 5r - 12a - 4r =$$

$$3a + r$$

Therefore, this choice is correct.

Please proceed to question 15 below.

Question 15

Apply the proper principles to express as simply as possible:

$$3m (2m - 5) - 4 (3 - 2m)$$

(A) $6m^2 - 15m - 12 - 8m$

(B) $6m^2 - 23m - 12$

(C) $6m^2 - 15m - 12 + 8m$

(D) $6m^2 - 7m - 12$

72/1

You must learn to distinguish between

$$5x^3 \quad \text{and} \quad (5x)^3$$

The first means $5(x)(x)(x)$

while the second means $(5x)(5x)(5x)$

You have apparently used the second meaning, which is not what the problem called for.

Please return to page 81/2 and try question 16 again.

72/2

There is an error somewhere in your calculation, since one of the other choices is correct.

Are you sure of the proper theory?

$(-ky)^3$ means $(-ky)(-ky)(-ky)$

Now when y is itself negative, do you see how it affects the sign of each expression in the parentheses?

Please return to page 79/2 and try question 18 again.

The minus sign separating the -5 from the quantity $2x - 3y$ indicates that this can be considered an addition of a negative number: adding -5 and the opposite of $2x - 3y$. Then we have

$$-5 - (2x - 3y) =$$

$$-5 - 2x + 3y$$

Since this is not equal to any of the other choices, this choice is correct.

We might also interpret the problem as:

$$-5 - (2x - 3y) =$$

$$-5 - 1 (2x - 3y) =$$

$$-5 - 2x + 3y$$

Notice that we may assume the coefficient in front of the parentheses to be 1 since it was not written. Then multiplying by -1 gives us the same result as before.

$- (a - b)$ by additive inverse $= -a + b$

$-1 (a - b)$ by the DISTRIBUTIVE LAW $= -a + b$

Isn't is amazing that we get the same result using different methods? Not really. Any correct method must give the correct result, and there is only one.

Please proceed to question 13 below

Question 13

Apply the proper rule to find the choice equal to

$$(-3x)(-5x + 2y - z)$$

(A) $15x^2 + 2xy - z$

(B) $15x - 6xy + 3xz$

(C) $15x^2 - 6xy + 3xz$

(D) None of these.

74
1

This problem requires the combination of multiplication and addition, and it is therefore necessary to do the multiplication first. Let us consider each term as a product of factors. We have:

$$3x^2 + 2xy - y^2 =$$

$$3(x)(x) + 2(x)(y) - (y)(y)$$

Now it would be proper to substitute the given values in this expression and do all the multiplications, being careful not to omit or make an error in signs. Then you would need to combine the values of the terms by means of the addition rules. If you do this correctly, this is not the choice you arrive at.

Please return to page 80/2 and try question 20 again.

74
2

If you will review the procedure for solving an equation, you will find that subtraction is used to remove a quantity which has been added to the variable. How is the m attached to the variable? Then what operation of mathematics can be used to remove it? You should choose the inverse operation.

Please return to page 83/2 and try question 1 again.

The meaning of

$$5x^3 \quad \text{is} \quad 5 (x)(x)(x)$$

Therefore, we have

$$5x^3 = 5 (-3)(-3)(-3)$$

$$= (- 15) \quad (+ 9)$$

$$= - 135$$

Then this choice is correct.

Please proceed to question 17 below.

Question 17

Apply your knowledge to find the value of

$$-2p^2 \quad \text{when} \quad p = 5$$

(A) -50

(B) 50

(C) -100

(D) 100

V

76/1

If you concentrate very hard to avoid making an error in one part of the problem, you must not relax your caution in the other parts of the problem. Calculate the value of m^2 , then the value of $3m$, and then the value of $-p$.

Now it is necessary to put the parts together. Somewhere along the way you have made a mistake.

Return to page 85/2 and try question 19 again.

76/2

If we attempt to check this equation using the listed value, we get:

$$a \cdot \frac{a}{b} = \frac{a^2}{b}$$

But the equation you chose said that

$$a \cdot x = b$$

Therefore, this choice is incorrect.

Return to page 98/2 and try question 2 again.

V

This problem calls for the DISTRIBUTIVE PROPERTY first, giving us:

$$3m\ (\ 2m\ )\ +\ 3m\ (\ -5\ )\ -\ 4\ (\ 3\ )\ -\ 4\ (\ -2m\ )$$

Next you should perform the multiplications. It appears that you have done that. Then why is this choice not correct?

Have you simplified as far as possible?

Return to page $\frac{71}{2}$ and try question 15 again.

Your answer does equal the given expression, but your answer to the question is wrong. The question asked for the <u>absolute</u> value of the quotient.

You must be more alert when reading qu s.

Return to page $\frac{106}{2}$ and try question 4 again.

V

78/1

You should recognize that this problem requires the application of the DISTRIBUTIVE PROPERTY as well as the rules for signed numbers. If you work with these very carefully, you will find that one of the other choices is .

Return to page 73/2 and try question 13 again.

78/2

This problem calls for the multiplication of $5x$ by the reciprocal of $3s$. Then, according to the definition of division, it is equivalent to the quotient of these quantities.

$$a \cdot \frac{1}{b} = a \div b$$

Then this choice is not correct.

You might recall that $5x$ can be written as a fraction $\frac{5x}{1}$.

Then we would have: $\frac{5x}{1} \cdot \frac{1}{3s} = \frac{(5x)(1)}{(1)(3s)}$

$$= \frac{5x}{3s}$$

We shall find that this choice is not correct.

Please return to page 91/2 and try question 3 again.

Since $-2p^2$ means $-2 (p)(p)$, we note that the exponent applies only to the base, p . Substitution of 5 for p makes it equal to

$$-2 (5)(5)$$

Then this choice is correct.

By using the ASSOCIATIVE PROPERTY OF MULTIPLICATION:

$-2 (5)(5)$ equals either $(-10)(5) = -50$

or $(- 2)(25) = -50$

Please proceed to question 18 below.

Question 18

Apply your knowledge to find the value of

$(-2p)^3$ when $p = -3$

(A) 216

(B) -216

(C) 54

(D) None of these.

V

80
1

The expression is the product of two parts. Let us take them one at a time.

(a) The meaning of m^2 is $m \cdot m$ which is $3 \cdot 3$, and it equals 9.

(b) The value of $3m$ is $3 \cdot 3$, which is 9.

Now, since

$$p = -6$$

$$-p = 6$$

Then

$$3m - p =$$

$$9 + 6 =$$

$$15$$

Thus, we have $9 (15)$

which is equal to 135

Then this choice is correct.

Please proceed to question 20 below.

80
2

Question 20

Apply your knowledge to evaluate

$$3x^2 + 2xy - y^2$$

when $x = -1$

and $y = -5$

(A) -18 (C) - 6

(B) -12 (D) 44

V

This problem calls for the DISTRIBUTIVE PROPERTY first, giving us:

$$3m\ (\ 2m\ )\ +\ 3m\ (\ -5\ )\ -\ 4\ (\ 3\ )\ -\ 4\ (\ -2m\ )$$

which equals $6m^2 \quad -15m \quad - \quad 12 \quad + 8m$

and this equals $6m^2 \quad - 7m \quad - \quad 12$

when we combine terms.

Therefore, this choice is correct.

Please proceed to question 16 below.

Question 16

Apply your knowledge to find the value of $5x^3$ when $x = -3$.

(A) - 45

(B) -135

(C) 135

(D) - 3375

You chose $\frac{b}{x} = a$

as the equation whose solution is $x = \frac{a}{b}$

We can check this by substituting the given solution in place of x in the equation you chose.

Your equation: $\frac{b}{x} = a$

or $b\frac{1}{x} = a$ (but $\frac{1}{x}$ is the inverse of x)

therefore,

Substituting: $b(\frac{b}{a}) \stackrel{?}{=} a$ ($\frac{1}{x}$ = the inverse of $\frac{a}{b} = \frac{b}{a}$)

As a check: $\frac{b^2}{a} \neq a$

Therefore, something is wrong.

Since the solution was " given " it can't be wrong. Since each step taken is legitimate, the conclusion must be that the original equation you chose must be wrong.

Please return to page 98/2 and try this question again.

You have divided the numbers in reverse order. Remember that 8 divided by 2 is 4 , but 2 divided by 8 is $\frac{1}{4}$.

This stated in symbols is:

$$\frac{a}{b} \neq \frac{b}{a} \quad \text{if} \quad a \neq 1 \quad \text{and} \quad a \neq 0$$
$$b \neq 1 \qquad b \neq 0$$

Please return to page 106/2 and try question 4 again.

V

VOLUME 5 SEGMENT 3 Begins here:

Obtain a PUNCH CARD from your instructor. In addition to the other identifying information that must be furnished by you, you are asked to punch out the following:

COLUMNS	48 and 50	2 3	(Sequence Number)
	54 and 56	0 4	(Type of Punch Card)
	60 and 62	0 5	(Volume Number)
	66 and 68	0 3	(Segment Number)

Your READING ASSIGNMENT for this Segment is pages 138 - 140 .

SUPPLEMENTARY NOTE:

In the two previous segments you investigated and applied the rules for the addition, subtraction, and multiplication of signed numbers. It will come as no surprise to you that we now propose to investigate the rules that apply to the division of signed numbers.

You will now be asked a series of questions to draw your attention to the more important points.

Question 1

Apply your knowledge to find the solution of the equation

$$mx = p$$

(A) $x = p - m$

(B) $x = m - p$

(C) $x = \frac{m}{p}$

(D) $x = \frac{p}{m}$

V

You have used the DISTRIBUTIVE PROPERTY and the rules for signed numbers correctly.

Although there is a lot of detail in this problem, you made no errors. In detail the steps can be shown in this manner:

$$(-3x)(-5x + 2y - z) = -3x(-5x) - 3x(+2y) - 3x(-z)$$

$$= +15x^2 - 6xy + 3xz$$

Please proceed to question 14 below.

Question 14

Apply the appropriate rules to express as simply as possible:

$$5(3a + r) - 4(3a + r)$$

(A) $3a + 9r$

(B) $3a - 3r$

(C) $3a + r$

(D) $3a$

V

Since

$$(-2p)^3 \text{ means } (-2p)(-2p)(-2p)$$

all that is necessary is to substitute the value for p.

Then we get

$$(-2p)(-2p)(-2p) = (+6)(+6)(+6)$$

$$= (36)(6)$$

$$= 216$$

Therefore, this choice is correct.

Please proceed to question 19 below.

Question 19

Apply the proper principles to evaluate

$$m^2(3m - p) \quad \text{when} \quad m = 3$$

$$\text{and} \quad p = -6$$

(A) 27

(B) 18

(C) 135

(D) 90

$\frac{88}{2}$

Since we were told that the solution is

$$x = \frac{a}{b}$$

We can check that value in this equation. Substituting the value for x we have

$$ab = \frac{a}{b}$$

But this statement is true only when b has the value 1.

Therefore, this choice is not correct.

Please return to page $\frac{98}{2}$ and try question 2 again.

$\frac{86}{2}$

It is important to keep the rules for signs clearly in mind as you do the problems. However, you must not forget other details in the process.

What mistake of ordinary arithmetic have you made?

Please return to page $\frac{94}{2}$ and try question 5 again.

V

This problem is made up of many parts and offers many opportunities for error. Let us approach it very carefully.

$$
\begin{aligned}
3x^2 + 2xy - y^2 &= 3(x)(x) + 2(x)(y) - (y)(y) \\
&= 3(-1)(-1) + 2(-1)(-5) - (-5)(-5) \\
&= 3(+1) + 2(+5) - (+25) \\
&= 3 + 10 - 25 \\
&= 13 - 25 \\
&= -12
\end{aligned}
$$

Then this choice is correct.

You have now finished Segment 2 . Hand in the PUNCH CARD.
You should have entered in your NOTEBOOK the three rules listed in your text near the top of page 135 . The second set of three rules are more general statements which can be learned later.

You should now be able to complete assignment 5 , examples 8 - 12 .

V

$$n + 5 < 3 \quad \cancel{\times} -5$$

$$n < -2$$

Subtracting 5 from each side of the inequality transforms this into an equivalent inequality, and we get

$$n < -2$$

Then this choice is correct. The symbol $\cancel{\times}$ means perform that operation on both sides of the inequality.

Note that the order of the inequality changes ONLY when you multiply or divide on both sides by a negative number.

Please proceed to question 7 below.

Question 7

If you are given that

$$x + 3 > -7$$

what can be said about the value of x ?

Choose the letter next to the conclusion.

(A) $x < -10$

(B) $x < -4$

(C) $2x + 6 > -14$

(D) $2x + 6 < -14$

The DISTRIBUTIVE PROPERTY can be applied whenever the expression

$$a (b + c)$$

appears. Here it is part of an inequality.

The first step necessary is to apply the DISTRIBUTIVE PROPERTY to simplify the left side of the inequality. It is then necessary to transform the inequality by performing addition and then division on both sides.

What is it that caused the order of the inequality to reverse. The only condition under which an inequality reverses order is when it is multiplied (or divided) on both sides by a negative number.

Since this choice is not correct, you have made at least one mistake somewhere in this process.

Please return to page 195/2 and try question 13 again.

The successive steps in this problem involve the DISTRIBUTIVE PROPERTY, the SUBTRACTION PROPERTY of inequalities, and the DIVISION PROPERTY of inequalities.

Unless each step is perfect the result is incorrect. How many mistakes did you make, and where were they?

Please return to page 202/2 and try question 16 again.

V

If we divide both sides of the inequality by $+5$, the order of the inequality does not change, and we get

$$n - 2 > -3$$

i. e. $$5n - 10 > -15 \quad \times \div 5$$

$$\frac{1}{5}(5n - 10) > -3 \quad [\text{D}$$

$$n - 2 > -3$$

Then this choice is correct.

Please proceed to question 9 below.

Question 9

If $m > n$

choose the value of w

for which $mw = nw$

(A) 0

(B) -1

(C) No value

(D) Some value not listed.

V

Let's review the problem:

Given:

$$-3x < -12 \qquad \div(-3)$$

$$x > +4 \qquad \text{(order reversed)}$$

In order to remove the -3 attached to the x by multiplication, we must divide both sides of the inequality by -3.

Then the order of the inequality also changes. Watching our rules for dividing signed numbers, we then get

$$x > 4$$

and this choice is correct.

Please proceed to question 12 below.

Question 12

Apply your knowledge of operations on inequalities to find the one correct statement listed below that can be derived from

$$3x + 6 > -9$$

(A) $6x < -30$

(B) $-6x < +30$

(C) $3x - 2 > -13$

(D) $3x - 2 > -1$

V

By reversing the order of the second inequality, we have

$$n > w \quad \text{and} \quad h > w$$

Then since both n and h are larger than w, the question is which one of these is larger. If both n and h are 2 larger than w they would be equal. If n were larger by 3 while h were larger by 2 then n would be larger than h.

But the situation could just as well be reversed. That is, it is impossible to tell from the given information, how the sizes of n and h compare.

Please proceed to question 4 below.

Question 5

State which choice is correct about the conclusion that

if $x > y$

then $x + z > y + z$

(A) It is always true

(B) It is never true

(C) It may be true or not, depending on the value of

(D) It may be true or not, but the value of x does not matter.

It appears that you have multiplied both sides of the inequality by the same number, which is correct. But why did you change the order of the inequality? There is a rule telling you when the order of the inequality is to be changed, but you have not used it correctly. The inequality sign changes order when the operation is either multiplication or division by a negative value.

if $a > b$ $\times(-k)$

then $-ak < -bk$

or

if $a > b$ $\div(-k)$

then $-\frac{a}{k} < -\frac{b}{k}$

Return to page 184/2 and try question 7 again.

The steps is the solution of this inequality are two different subtractions from both sides. It is important that you make no mistake in handling the signed numbers, or the fractions; you must also be careful to follow every rule you have learned for handling inequalitites.

Somewhere you have an error since this choice is not correct.

Return to page 196/2 and try question 17 again.

V

In solving this inequality, we proceed as follows:

$$\begin{aligned} 3(2n - 6) &> 6 && [\text{D} \\ 6n - 18 &> 6 && \text{+ } 18 \\ 6n &> 24 && \div\ 6 \\ n &> 4 \end{aligned}$$

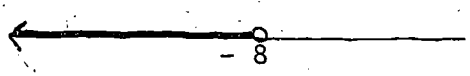
Note that the order of the inequality does not change since the divisor was positive.

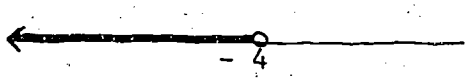
Please proceed to question 14 below.

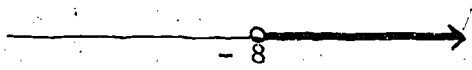
Question 14

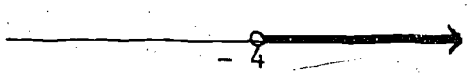
Apply your knowledge to find the graph of the solution set of the inequality

$$2(5 - y) < 18$$

(A) 

(B) 

(C) 

(D) 

The only multiplier which can turn an inequality into an equation is the number zero.

Given:

$$m > n \qquad \times 0$$

$$0 \cdot m \ ? \ 0 \cdot n$$

$$0 = 0$$

Therefore, this choice is correct.

Please proceed to question 10 below.

Question 10

Given that

$$p > q \quad \text{and} \quad mp < mq$$

Choose the correct statement about the value of m .

(A) m is positive

(B) m is zero

(C) m might be negative or positive

(D) None of these.

There were many opportunities for you to make a mistake in solving this inequality. It appears that you were successful in avoiding errors since this choice is correct. The work could have been done as follows:

$$\begin{aligned} 3(x-5) - 2(3x-1) &\geq 2 && [\text{ D} \\ 3x - 15 - 6x + 2 &\geq 2 && [\text{ C} \wedge \text{A} \\ -3x - 13 &\geq 2 && \text{add } 13 \\ -3x &\geq 15 && \text{divide by } (3) \\ x &\leq -5 && (\text{reverse order of inequality}) \end{aligned}$$

Please proceed to question 19 below.

Question 19

Apply your knowledge to find the solution set of the inequality

$$8x + 5 - (2x + 1) < -8$$

(A) $x < -2$

(B) $x > \frac{3}{2}$

(C) $x < -\frac{7}{3}$

(D) $x > \frac{9}{2}$

The solution of this inequality involves subtractions to remove the x term from the right side and to remove the term 5 from the left side. It is then necessary to divide to get x alone. In which of these steps did you make your mistake?

This choice is not correct.

Return to page 198/2 and try question 15 again.

Applying the proper procedures to solve this inequality, we have:

$$5y + 3 \geq -32 \qquad \text{subtract } 3$$

$$5y \geq -35 \qquad \text{divide by } 5$$

$$y \geq -7$$

Since we divided by a positive number, the order of the inequality remains the same. Then this choice does not agree with the solution set given.

Return to page 199/2 and try question 20 again.

194
1

If we multiply both sides of the inequality by $+2$ we get

$$2x + 6 > -14$$

Since our multiplier was positive, the order of the inequality remains unchanged.

Given:

$$x + 3 > -7 \quad \times 2$$

$$2(x + 3) > 2(-7) \quad \text{D}$$

$$2x + 6 > -14$$

Then this choice is correct.

Please proceed to question 8 below.

194
2 Question 8

Apply your knowledge of operations on inequalities to find the proper derived inequality equivalent to:

$$5n - 10 > -15$$

Choose the letter next to the correct statement.

(A) $5n < -5$

(B) $n - 2 > -3$

(C) $n - 2 < -3$

(D) None of these.

In order to transform the left side of the given inequality into the left side of this choice we preform the following operations:

$$3x + 6 > -9 \qquad \times -6$$

$$3x > -15 \qquad \times (-2)$$

$$-6x < +30$$

Note: the order of the inequality is reversed.

Since the operations must be applied to both sides of the inequality, the right hand side was also transformed making the resulting inequality the same as your choice.

Please proceed to question 13 below.

Question 13

Apply your knowledge of operations on inequalities to find the solution set of the inequality:

$$3(2n - 6) > 6$$

(A) $n > 2$ (C) $n > 4$

(B) $n < 2$ (D) $n < 4$

196
1

Very good. This choice is correct.

The solution should look like this:

$$5m + 2(1 - 3m) \geq \quad [\text{ D}$$

$$5m + 2 - 6m \geq 10 \quad [\text{ C} \wedge \text{A}$$

$$2 - m \geq 10 \quad \cancel{\times} -2$$

$$-m \geq 8 \quad \cancel{\times}(-1)$$

$$m \leq -8 \quad \text{(Change the order of the inequality.)}$$

Please proceed to question 17 below.

196
2

Question 17

Apply your knowledge of inequality solution techniques to find the solution set of the inequality

$$2m + 7 > \frac{1}{2}m - 2$$

(A) $m < -6$

(B) $m > -6$

(C) $m > 3$

(D) $m > 0$

There were many opportunities for you to make a mistake.

You might look for the mistake in your use of the DISTRIBUTIVE PROPERTY at the beginning of the work, particularly in the case of

$$-2(3x - 1)$$

which equals

$$-6x + 2$$

The sign of the 2 is a typical trouble spot.

Please return to page 200/2 and try question 18 again.

There is one part of this problem which appears to have given you difficulty. You should consider

$$-(2x + 1)$$

as if it were written $-1(2x + 1)$

The two expressions have the same value, but the second form makes the application of the DISTRIBUTIVE PROPERTY easier to perform.

Secondly, the original inequality and your solution set have reversed orders of inequality. That condition could only have occured if you multiplied or divided by a negative number. You shouldn't have had to do that if you proceeded properly.

Be careful to apply specific rules in each step of your work.

Please return to page 192/2 and try question 19 again.

You have done very well. There are many steps which must be done correctly in order to get this correct choice. We should proceed as follows:

$$2(5 - y) < 18 \qquad [\ D$$

$$10 - 2y < 18 \qquad \not{-}\ 10$$

$$-2y < 8 \qquad \not{\div}\ (-2)$$

$$y > -4$$

Of course, we must be careful to change the order of the inequality since we divided by a negative number.

Since we want all those values greater than -4, our graph must include all points to the right of -4, and not -4.

Therefore, the -4 is circled on the graph.

Please proceed to question 15 below.

Question 15

Apply the appropriate principles of operations on inequalities and choose the correct statement about the solution set of the inequality

$$5 - 3x < x + 5$$

(A) $x > -2.5$ (C) $x > 0$

(B) $x > -5$ (D) $x \in \emptyset$

Very good. This choice is correct. Your work should look like this:

$$8x + 5 - (2x + 1) < -8 \quad [D$$

Note: $-(2x + 1) = -1(2x + 1)$

$$8x + 5 - 2x - 1 < -8 \quad [C \wedge A$$

$$6x + 4 < -8 \quad \not\times -4$$

$$6x < -12 \quad \not\times \div 6$$

$$x < -2$$

Please proceed to question 20 below.

Question 20

Apply your knowledge to find the inequality whose solution set is

$$\leq -7$$

(A) $5y + 3 \geq -32$

(B) $-7(y + 2) + 3(y - 5) \geq -1$

(C) $3(y + 6) + 2 \geq -1$

(D) $2(3 - y) - 7 \leq 13$

Applying the proper procedures, we have:

$2m + 7 > \frac{1}{2}m - 2$ (Change 2 to a fraction)

$\frac{4}{2}m + 7 > \frac{1}{2}m - 2$ $\times -\frac{1}{2}m$

$\frac{3}{2}m + 7 > -2$ $\times -7$

$\frac{3}{2}m > -9$ $\times 2$

$3m > -18$ $\div 3$

$m > -6$

Note that our divisor was positive, therefore, the inequality did not reverse in order.

Please proceed to question 18 below.

Question 18

Apply your knowledge to find the solution set of the inequality

$$3(x - 5) - 2(3x - 1) \geq 2$$

(A) $x \leq -\frac{19}{3}$

(B) $x \leq -6$

(C) $x \geq -5$

(D) $x \leq -5$

By this time you should realize that the technique of solving inequalities is almost identical with those methods you have already learned in solving equations.

There is one exception; when you multiply or divide by a negative number the order of the inequality changes.

You can always check your answer by choosing a member of the solution set and substituting that. It is not a perfect check, however. But if it doesn't check, you know you are wrong; whereas if it does check, it doesn't mean that you are right unless you have considered the limits of the possibilities.

Please return to page $\frac{192}{2}$ and try question 19 again.

Applying the proper procedure for solving the inequality, we have:

$$3(y + 6) + 2 \geq -1 \qquad [\text{D}$$

$$3y + 18 + 2 \geq -1 \qquad [\text{C} \wedge \text{A}$$

$$3y + 20 \geq -1 \qquad \not{-}\, 20$$

$$3y \geq -21 \qquad \not{\div}\, 3$$

$$y \geq -7$$

Since our divisor is positive, the order of the inequality does not change. Then this choice is not correct, since it does not agree with the solution set given.

Return to page $\frac{199}{2}$ and try question 20 again.

The work in this problem should be as follows:

$$5 - 3x < x + 5 \quad \text{✗} - x$$

$$5 - 4x < 5 \quad \text{✗} - 5$$

$$-4x < 0 \quad \text{✗} \div (-4)$$

$$x > \frac{0}{-4}$$

Remember to change the order of the inequality.

$$x > 0$$

Please proceed to question 16 below.

Question 16

Apply your knowledge to find the solution set of the inequality

$$5m + 2(1 - 3m) \geq 10$$

(A) $m \leq -8$

(B) $m \geq -8$

(C) $m \geq 4$

(D) $m \leq 4$

It is important to realize that you cannot find the solution to an inequality by trying offered choices. For example,

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is a value which fits this choice. Substituting $m = 10$ in the inequality, we have

$$20 + 7 > 5 - 2$$

or

$$27 > 3$$

which is certainly true. But even if we tried every number which fits this choice (and there are an infinite number of them) , we would still need to show that no number which does not fit the choice would check in the inequality. Since this is impossible, we must follow procedures as taught in this segment if we wish to solve inequalities.

In any event, this choice is not correct.

Please return to page $\frac{196}{2}$ and try question 17 again.

There were many opportunities for you to make a mistake in solving this inequality. It appears that you were successful in avoiding errors until you were almost at the end of the solution. But you did have an error; therefore, this choice is not correct.

Remember, the symbol $\geq$ is an inequality and as such is reversed if the operation is multiplication or division by a negative number.

Please return to page $\frac{200}{2}$ and try question 18 again.

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1

The procedure for this pro[illegible] involve[illegible] DI[illegible]JTIVE PROPERTY, [illegible] a quantity from bo[illegible] sides, and finally dividing both sides by the same number. You must then translate your result into a graph showing where your [illegible]olution would be located on the NUMBER LINE. It takes only one erro[illegible] in one of these steps to get a wrong answer. How many mistakes did you make to get this incorrect choice?

Please return to page 190/2 and try question 14 again.

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2

Applying the proper procedures to solve the inequality, we have:

$$-7(y+2)+3(y-5)\geq -1 \qquad [\text{D}$$

$$-7y-14+3y-15\geq -1 \qquad [\text{C}\wedge\text{A}$$

$$-4y-29\geq -1 \qquad +29$$

$$-4y\geq 28 \qquad \div(-4)$$

$$y\leq -7 \qquad \text{(change the order of inequality)}$$

Then this choice is correct.

You have now finished Segment 5 . Hand in the PUNCH CARD. Be sure you have entered in your NOTEBOOK the rules for inequalities which you found in your text on pages 159 - 161 .

You should now complete ASSIGNMENT 5 , problems 17 - 20 . After completing the assignment, you are advised to review all of your notes and to re-read the reading assignment in order to prepare yourself for the Volume test.

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