THE EFFECTS OF SPACING AND HANDWRITTEN OR TYPED TESTS UPON ACHIEVEMENT OF STUDENTS IN ALGEBRA AND GEOMETRY CLASSES

By

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THE EFFECTS OF SPACING

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UPON ACHIEVEMENT OF STUDENTS IN

ALGEBRA AND GEOMETRY CLASSES

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D.L.S.

CHAPTER I

INTRODUCTION

The purpose of this study was to determine the effect of testing formats upon achievement. More specifically it was a study to determine the effects of spacing and handwritten or typed teacher-made tests upon the achievement of students in algebra and geometry classes.

Achievement tests play an important role in the teaching-learning process in the schools. One of the major types of achievement tests used in the classroom is the teacher prepared pencil and paper test (Butler, Wren & Banks, 1970). Its major advantage over other types of tests is its flexibility and adaptability to local situations and its repeated evaluation (Butler, et al., 1970). The teacher plays a major role in this type of evaluation in that he must construct valid and reliable tests and then evaluate the students based upon the results of the tests. It is therefore necessary for the teacher to examine continually those factors influencing the results. Some of these factors are item arrangement, placement of answers on a test, item selection for a test and test format.

Recent studies have been conducted to determine factors which may influence students' achievement on tests. Breener (1964) and Flaugher, Melton and Myers (1964) have conducted studies to determine the effect of item arrangement on a test. Berk (1974) conducted an experiment to determine the effect of answer format on achievement. Furst (1958) and Fremont (1969) have written about item selection on tests and test construction. Another factor which may influence students' achievement on a test is the format in which problems on the test are presented. Specifically the spacing of items on a test and whether a test is typed or handwritten may influence student achievement.

Although a number of studies have approached the problem of the effects of testing upon achievement, few researchers have concerned themselves with the effect of testing formats upon students' achievement in mathematics classes. An examination of the literature on testing formats by the writer has revealed that much of the information dealing with testing formats in mathematics classes is an author's opinion or conjecture which has not been subjected to experimental research.

The writer has observed that a number of different testing formats are used by teachers of mathematics. Some tests, while using similar questions, vary in length, numeration of problems, spacing of items, and in mode of presentation (typed or handwritten). It appears that there is no format which is accepted and used by all mathematics

teachers.

In this chapter the need for and the purpose of the study were discussed. Chapter II includes the pertinent research related to the construction of effective tests and the effect of formats in mathematics tests upon student achievement.

CHAPTER II

REVIEW OF RELATED LITERATURE

There exists a large body of research dealing with item analysis on mathematics tests and the development of questions for a test, but there is little research on how these questions should appear on a test.

There exists some information, although not based on research, which is useful in developing effective teacher-made tests in mathematics. Fremont (1969), Butler and Wren (1970), Poole (1970) and others have mentioned that there are certain aspects of test construction which should be considered whenever a test is being developed:

1. The test should be as objective as possible.
2. The test should be reliable.
3. The test should be valid.
4. The test should be student-conscious.
5. The test should be written so that it is economical of the teacher's time in both construction and grading.
6. The test should have format which is not confusing to the students.

Poole (1970) also indicated that the directions for the test should include items related to format. The

directions to the students should include the number of items, the number of pages, how and where to answer the questions, the amount of time available and how the test will be scored.

Spaulding (1951) remarked on a number of other items concerning the layout and construction of tests. She indicated that each item or question should be presented completely on a page and that all items should be numbered serially. When diagrams or drawings for reference are used, they should precede the question for which they apply. Spaulding also indicated that when multiple choice questions are used, it is best to have the alternatives listed with a sufficient amount of space between them. Gronlund (1968) suggested that multiple choice questions should appear with the stem followed by the alternatives listed vertically.

Spaulding (1951), Gronlund (1968), and Furst (1958) indicated that all test questions should be spaced on a page so that they are easy for the student to read and easy for the teacher to score.

Furst (1958) stated that when items are being placed on a page, one should allow space for students with large handwriting.

There exists a large amount of research which indicates that on a non-speeded test, the arrangement of items by degree of difficulty has no significant effect upon achievement. Flaugher, Melton, and Myers (1968)

conducted an experiment with 5000 pre-college students using selected questions from the mathematics section of the Scholastic Aptitude Test. They found that the order in which items appeared on the test had no significant effect upon the results. Breener (1964), using college students in a psychology class, also found that item arrangement on a test had no significant influence on test scores. Marso (1970) found that on lengthy examinations which were teacher-prepared, item arrangement did not influence test scores.

Berk (1974) conducted an experiment to determine the effect of answer format on achievement. Using third and fourth graders in arithmetic, he found that the reliability of scores was not significantly altered when the students responded to achievement test items on separate answer sheets rather than directly on the test. Spaulding (1951) recommended that the layout of the test should provide space for the student's answers at the right of the page. She indicated that this format would be better for the examinee and would make the test easier to score.

Furst (1958) indicated that after the sequence of test items has been decided upon, one must get the items into a legible, attractive and economical format. Furst stated, "Format effects not only the attractiveness and acceptance of a test but also the validity of its results."

Although researchers have concerned themselves with topics such as sequence of items and placement of

answers on a test, it appears that there has not been any research conducted concerning the effect upon achievement of spacing of items on a test and whether the test is typed or handwritten. A perusal of the related literature by this researcher has revealed that much of the information dealing with testing formats in mathematics classes was conjecture which had not been subjected to experimental research.

This study was designed to determine if the spacing of items on a test and whether the test was typed or handwritten had an effect upon students' achievement in algebra and geometry. These are factors which can be easily controlled by the teacher. In order to determine if test format effects achievement, the following questions were asked:

1. Does the amount of space provided for student work on a teacher-made test and whether the test is typed or handwritten have a significant effect upon students' achievement in geometry?

2. Does the amount of space provided for student work on a teacher-made test and whether the test is typed or handwritten have a significant effect upon students' achievement in algebra?

In this chapter, research related to this study has been discussed and the questions to be considered have been presented. In Chapter III the procedures of the study will be discussed.

CHAPTER III

PROCEDURES

Subjects

The subjects for this study consisted of a group of algebra students and a group of geometry students. The sample consisted of 147 students; fifty-six were algebra students and ninety-one were geometry students.

The algebra students were ninth and tenth graders enrolled in two classes of first year algebra at Bakersfield High School, Bakersfield, California. Both classes were taught by the same instructor. Prior to the experiment, all of the algebra students had followed similar class procedures, had used the same materials and were given the same assignments.

The geometry students were tenth and eleventh graders enrolled in three geometry classes at North High School, Bakersfield, California. All three classes were taught by the same instructor. Prior to the experiment all of the geometry students had followed similar class procedures, had used the same materials and were given the same assignments.

Hypotheses

In order to determine if test format effects achievement, the following hypotheses were tested:

1. The amount of space provided for student work on a teacher-made test and whether the test is typed or handwritten has no significant effect upon students' achievement in geometry.

2. The amount of space provided for student work on a teacher-made test and whether the test is typed or handwritten has no significant effect upon students' achievement in algebra.

In the case of the hypotheses under consideration, if the level of significance decided upon was too low, then there would exist a greater chance of acceptance of the stated hypothesis, when in fact it might not be true. On the other hand, if the level of significance selected was too high, the experiment might not be powerful enough to reach the level of significance selected, resulting in a rejection of the hypothesis when in fact it was true. After consideration of the alternatives and the size of the sample to be used, this investigator chose a significance level of .05 for the stated hypotheses.

Development of the Tests

For this experiment it was necessary to develop teacher prepared tests in both geometry and algebra which could be used to determine the effect of format upon

student achievement. The tests were to evaluate the students only on a limited amount of subject matter for which there were no appropriate standardized tests available.

In order to determine if spacing had an effect upon achievement, it was necessary to vary the spacing of the items on the test. Two of the tests were handwritten and two were typed. The varying of the space between the items on the test and whether the test was typed or handwritten served as an independent variable. The measurement of students' achievement on the test was the dependent variable.

There were two variations in the spacing. One provided little or no space for the student to do the work; approximately one-half inch between items. This made it necessary for the student to do his work on a separate sheet of paper. The other variation had spaces of three to five inches between the problems, which allowed room for the student to do his work on the test sheet. The increase in spacing increased the number of pages in the test. The test questions were placed on both front and back sides of the test pages. The students in both the algebra and geometry classes were familiar with having questions on both sides of a sheet of paper. It was the policy of both mathematics departments to use both sides of a sheet of paper whenever possible. This also saved in the amount of paper used for the experiment.

Using these variables, four possible test formats

were designed for both algebra and geometry classes:

1. The test was not typed and had no space for the students' work.

2. The test was not typed and had three to five inches of space for students' work with each problem.

3. The test was typed and had no space for the students' work.

4. The test was typed and had three to five inches of space for students' work with each problem.

Copies of the algebra and geometry tests are included in Appendices A and B. All tests in the appendices are three-quarter reductions of the original tests.

Each teacher provided the researcher with the problems for the tests and the order in which the problems were to be presented. The researcher used the problems to develop tests in both algebra and geometry, based on the four desired formats. All of the algebra tests had the same problems. This was also true for the geometry tests.

Each of the four types of tests in each subject contained information about the number of pages in the test and the number of items on the test. In the directions on the tests, the students were informed as to where to do their work--either on the test or on separate sheets of paper and where to record their answers. All answers were placed on the test. All items on the test were numbered serially and no problem was divided at the

bottom of the page. After the four formats were completed for both algebra and geometry, the tests were duplicated.

Data Collection

Since the students in the experiment belonged to intact groups, selection bias was controlled by randomizing the tests, rather than the students. For both algebra and geometry, the tests were randomized by a table of random numbers.

The tests were returned to the teachers who then distributed them to the students by passing them out by rows on the examination day. The tests were given as regular classroom tests, although the students were informed that they were involved in an experiment and that all of the tests contained the same problems. Although some of the students expressed a preference for certain test formats, there were no problems by having the students take different tests.

The geometry tests were graded twice, once by the instructor and once by the researcher. The instructor graded the tests giving the students partial credit for their work. The researcher regraded the tests by a right-wrong method since the teacher's method of grading by partial credit could have been influenced by the different test formats. Since the method of grading the tests could influence the outcomes of the statistical tests, both methods of grading were used when testing the

hypothesis for the geometry students.

Because of the nature of the problems in the algebra test, they could only have been effectively graded by a right-wrong method. The algebra problems were concerned with simplification of radicals which required only a few steps to complete and were not appropriate for grading with partial credit. In both the geometry and algebra tests, there were one hundred possible points. All tests were assigned a raw score, based on one hundred being a perfect paper. The scores for both methods of grading the geometry tests are presented in Tables 1 and 2. The scores for the algebra tests are presented in Table 3.

The computer facilities at California State College, Bakersfield, were utilized for analysis of the data. The type of format used and the students' scores on the tests were numerically coded onto punch cards. The data were analyzed by use of a computer program of analysis of variance with one variable of classification.

Each format used in this study could be considered independent of the other test formats since classroom instructors usually select one of the four formats for any test constructed. A factorial design was not used, since according to Bruning and Kintz (1968), it is usually best to have a equal number of subjects in each experimental group or have the number of subjects in the groups proportional.

In this chapter a description of the design and

TABLE 1

SCORES ON THE GEOMETRY TESTS GRADED BY A PARTIAL CREDIT METHOD

handwritten no space	handwritten space	typed no space	typed space
89	46	37	37
77	86	83	91
89	80	43	87
99	73	90	80
72	95	80	84
99	90	39	98
77	95	99	60
94	39	76	86
61	79	52	70
56	70	67	63
94	96	99	77
36	46	61	69
78	89	72	74
89	87	79	70
83	80	73	86
100	85	76	85
88	99	84	73
91	84	63	100
80	80	61	100
84	91	99	59
	60	98	81
		84	83
		96	
		29	
		71	
		97	
		88	
		52	
n=20	n=21	n=28	n=22

TABLE 2

SCORES ON THE GEOMETRY TESTS GRADED BY A RIGHT-WRONG METHOD

handwritten no space	handwritten space	typed no space	typed space
80	42	14	33
73	75	70	95
75	75	35	80
93	54	80	75
52	90	54	80
95	78	37	95
82	80	90	55
90	26	65	80
51	50	40	60
39	45	55	55
89	80	95	58
21	22	55	55
59	82	68	55
85	68	65	80
70	65	50	75
100	75	65	50
85	95	68	100
84	77	35	100
75	75	45	45
80	90	90	75
	45	98	70
		73	55
		95	
		25	
		40	
		90	
		80	
		45	
n=20	n=21	n=28	n=22

TABLE 3

SCORES ON THE ALGEBRA

TESTS

handwritten no space	handwritten space	typed no space	typed space
31	56	81	31
37	87	63	87
44	100	31	56
69	75	81	100
100	100	81	25
56	31	63	63
44	87	56	81
25	50	37	87
31	81	75	75
75	9	56	31
63	25	69	19
31	62	25	50
69		56	
56		44	
50		50	
69			
81			
n=17	n=12	n=15	n=12

procedures utilized were presented. The results of the analysis of the data are presented in Chapter IV.

CHAPTER IV

DATA ANALYSIS

The hypotheses presented in Chapter III were tested by use of analysis of variance with one variable of classification at the .05 level of significance. The hypotheses were:

1. The amount of space provided for student work on a teacher-made test and whether the test is typed or handwritten has no significant effect upon students' achievement in geometry.

2. The amount of space provided for student work on a teacher-made test and whether the test is typed or handwritten has no significant effect upon students' achievement in algebra.

The means and standard deviations of the geometry treatment groups are presented in Tables 4 and 5. The means and standard deviations of the algebra treatment groups can be found in Table 6. As Tables 4, 5 and 6 indicate, there were large differences among some of the means and also large standard deviations in all of the treatment groups.

The results of the analysis of variance for the geometry tests graded by a partial credit method are

TABLE 4

MEANS AND STANDARD DEVIATIONS OF THE GEOMETRY TESTS GRADED BY PARTIAL CREDIT METHOD

format	handwritten no space	handwritten space	typed no space	typed space
mean	82.3	78.6	73.1	77.9
S.D.	16.2	17.3	20.4	15.0

TABLE 5

MEANS AND STANDARD DEVIATIONS OF THE GEOMETRY TESTS GRADED BY RIGHT-WRONG METHOD

format	handwritten no space	handwritten space	typed no space	typed space
mean	73.9	66.2	61.5	69.6
S.D.	20.2	20.7	23.1	18.5

TABLE 6

MEANS AND STANDARD DEVIATIONS OF THE ALGEBRA TESTS

format	handwritten no space	handwritten space	typed no space	typed space
format	54.7	68.6	57.9	58.9
S.D.	20.9	24.7	18.1	27.7

summarized in Table 7. Table 8 summarizes the results of the analysis of variance for the same geometry tests graded by a right-wrong method. For both statistical tests, hypothesis 1 was not rejected at the .05 level of significance. Although there were large differences among some of the means, the analysis in both tests resulted in a low *F*-ratio.

The results of the analysis of variance for the algebra tests are summarized in Table 9. Hypothesis 2 was not rejected at the .05 level of significance. As Table 5 indicates, there were major differences in the means of the comparison groups, but it also indicates that there were extremely large standard deviations in all of the treatment groups. As with the geometry tests, the analysis of variance of the algebra tests resulted in a low *F*-ratio.

Because of low *F*-ratios in all three statistical tests, the null hypotheses were not rejected. The low *F*-ratios were probably a direct result of having large standard deviations in all of the experimental groups. When the standard deviations are large, the sum of squares are correspondingly large. When the sum of squares is divided by the appropriate number of degrees of freedom, the mean square is obtained. The *F*-ratio is the ratio of the between-groups mean squares and the within-groups mean squares. In this experiment the between-groups means were small relative to the within-groups means; therefore

TABLE 7

ANALYSIS OF VARIANCE OF GEOMETRY TESTS GRADED BY A PARTIAL CREDIT METHOD

Source	Sum of Squares	df	Mean Square	*F*-Ratio	P
Between Groups	1019.16	3	339.72	1.094	.3565
Within Groups	27021.33	87	310.59		
Total	28040.40	90	311.56		

TABLE 8

ANALYSIS OF VARIANCE OF GEOMETRY TESTS GRADED BY A RIGHT-WRONG METHOD

Source	Sum of Squares	df	Mean Square	*F*-Ratio	P
Between Groups	1956.51	3	652.17	1.498	.2195
Within Groups	37874.58	87	435.34		
Total	39831.30	90	442.57		

TABLE 9

ANALYSIS OF VARIANCE OF THE ALGEBRA TESTS

Source	Sum of Squares	df	Mean Square	*F*-Ratio	P
Between groups	1417.59	3	472.53	0.921	.5608
Within Groups	26676.00	52	512.00		
Total	28093.45	55	510.79		

the *F*-ratios were small.

If the results of the analysis of variance had indicated significant *F*-ratios, then comparison tests would have been conducted employing multiple *t*-tests (Willemsen, 1974).

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The purpose of this study was to determine if the spacing of items on a test and whether the test was typed or handwritten had an effect upon student achievement.

In the spring of 1975, tests were conducted with geometry students at North High School and with algebra students at Bakersfield High School. Four tests which varied in spacing and whether they were typed or handwritten were developed for both the algebra and geometry classes. The students were randomly assigned one of the four tests as a regular classroom test. The tests were graded and in the case of the geometry tests, by two methods. Then the results were analyzed by analysis of variance with one variable of classification. The statistical tests of analysis of variance indicated that there were no significant differences in the means of the four formats in both algebra and geometry. The results of this study support the null hypotheses that the amount of space provided for student work on a teacher-made test and whether the test is typed or handwritten has no significant effect upon student achievement in algebra

and geometry.

Conclusions

Since the results indicate that testing format has no significant effect upon student achievement, taking into consideration the limitations mentioned below, the classroom teacher may select a format which is best suited to his needs and the needs of his class. Since the results indicate that a typed test does not have a significant influence upon students' achievement, the teacher need not spend the extra time necessary to type a test. If a school district is faced with fiscal problems, then the teacher could give a test with the items placed closed together which would limit the amount of paper used.

An examination of the tests in both algebra and geometry revealed that when the students were required to do their work on the test, their work was neater and easier to follow. Therefore, if partial credit is to be given, it is advisable to use a format which allows space for student work.

When evaluating the results and the conclusions of this study, certain limitations should be considered. One of the major limitations was the small samples used in both the algebra and geometry experimental groups. The small samples and the large standard deviations were probably factors which contributed to the small *F*-ratios. Although larger samples could have been used by including

students taught by different instructors, there would have been a loss in internal validity. When different instructors are used, classroom procedures, assignments and instruction are not the same for all students.

Another limitation to this study was that the test problems in both algebra and geometry were selected by the instructor. It is not known if the test problems were valid and reliable measurements of the students' knowledge of the subject matter.

Recommendations

In attempting further study in the area of testing formats, a number of items should considered. A major limitation to this study was the limited sample size; it is therefore recommended that any further studies incorporate larger samples. In future studies, consideration should be given to expand the experimental design from a single variable of classification to a factorial design. Future studies could also be expanded to indlude general arithmetic classes as well as higher mathematics classes. It is also recommended that the problems used in any future experiments be carefully examined for reliability and validity.

It is the recommendation of this investigator that additional studies be conducted on the effect of testing formats upon students achievement and that these studies be expanded to include larger samples and expanded designs.

APPENDIX A

THE GEOMETRY TESTS

Geometry Test

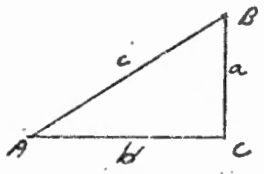
Handwritten

No Space for Work

Geometry Per _____ Name _____

Directions: There are 14 problems on this test. Do all of your work on the separate sheets of paper provided, but place your answers on the test in the given spaces. You will turn in the sheets of paper on which you have worked the problems.

① Given the right triangle ABC, find:



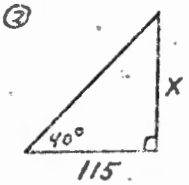
a) tan A = _____

b) sin A = _____

c) cos A = _____

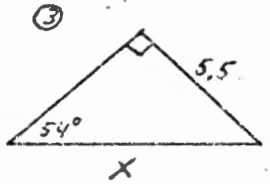
Determine x in the problems 2 to 6. Express computed lengths to the same number of digits as are found in the given lengths, and angle measures to the nearest integer.

②



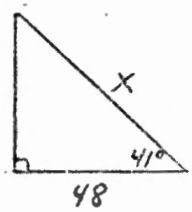
x = _____

③



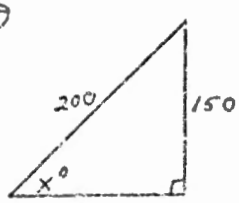
x = _____

④



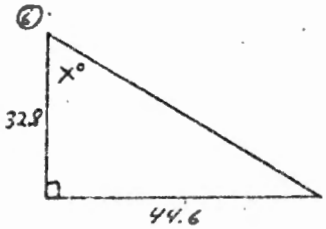
x = _____

⑤



x° = _____

⑥



x° = _____

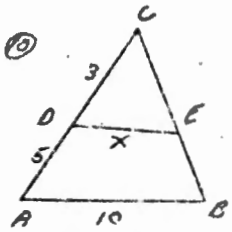
⑦ Find the elevation of the sun if a 15 foot flag pole casts a shadow 8 feet long. _____

⑧ The angle of depression from the top of a tower to a point on the ground 130 feet from the base of the tower is 50°; how tall is the tower? _____

⑨ Without using tables find the exact value of each of the following:

a) $(\sin 30°)^2 + (\cos 30°)^2 =$ _____ b) $\tan 30° \times \tan 60° =$ _____

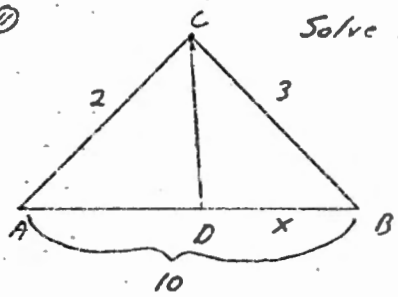
⑩



Solve for x if $\overline{DE} \parallel \overline{AB}$

$x =$ _____

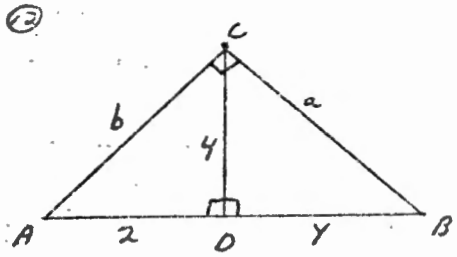
⑪



Solve for x if $\overline{DC}$ bisects $\angle C$

$x =$ _____

⑫



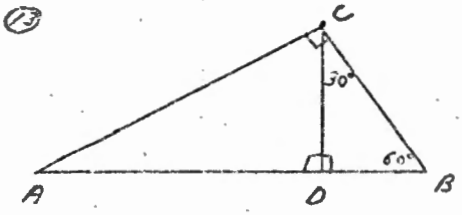
Find a, b and y

$a =$ _____

$b =$ _____

$y =$ _____

⑬



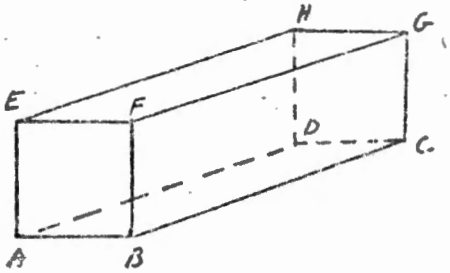
If $DB = 2$ determine:

$CD =$ _____ $AB =$ _____

$CB =$ _____ $AC =$ _____

$AD =$ _____

⑭ Given a rectangular solid



If $AB = 3$

$BC = 4$

$HD = 3$

Find $HA =$ _____

$HB =$ _____

Geometry Test

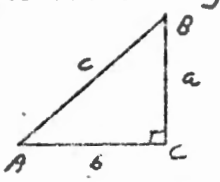
Handwritten

Three to Five Inches of Space Per Problem for Work

Geometry Per_____ Name_____

Directions - There are 14 problems on this test. Do all of your work on this test and place your answers in the space provided. There are 4 pages to the test.

① Given the right triangle find:



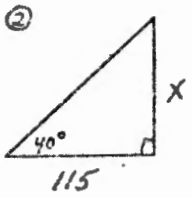
a) tan A = _____

b) sin A = _____

c) cos A = _____

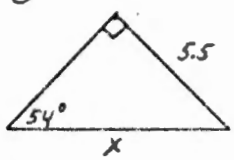
Determine X in problems 2 to 6. Express computed lengths to the same number of digits as are found in the given lengths, and angle measures to the nearest integer.

②



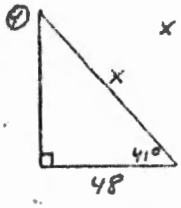
X = _____

③



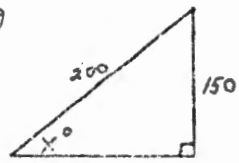
x = _____

④



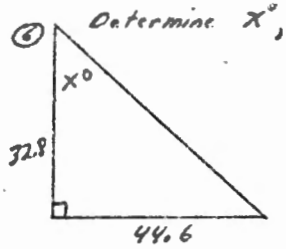
x = _____

⑤



X° = _____

6. Determine $x°$, $x° =$ _____



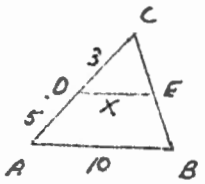
7. Find the elevation of the sun if a 15 foot flag pole casts a shadow 8 feet long. _____

8. The angle of depression from the top of a tower to a point on the ground 130 feet from the base of the tower is 50°, how tall is the tower? _____

9. Without using tables find the exact value of each of the following.

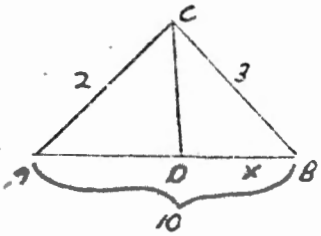
a) $(\sin 30°)^2 + (\cos 30°)^2$: _____ b) $\tan 30° \times \tan 60° =$ _____

(10) Solve for x if $\overline{DE} \parallel \overline{AB}$



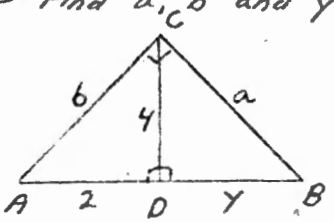
x = _____

(11) Solve for x if $\overline{DC}$ bisects $\angle C$



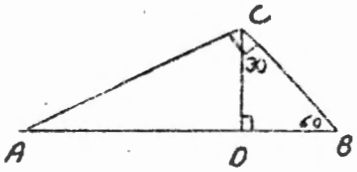
x = _____

(12) Find a, b and y



a= _____ b= _____ y= _____

(13)



If DB= 2

Determine:

CD= _____

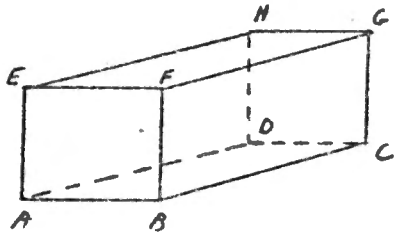
CB= _____

AD= _____

AB= _____

AC= _____

(18) Given a rectangular solid



If $AB = 3$
$BC = 4$
$HD = 3$

Find $HA =$ _____

$HB =$ _____

Geometry Test

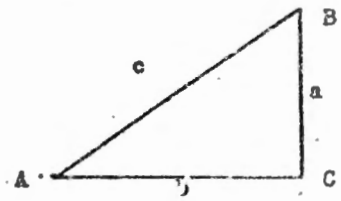
Typed

No Space for Work

Geometry Per_____ Name_____

Directions: There are 14 problems on this test. Do all of your work on the separate sheets of paper provided, but place your answers on the test in the given spaces. You will turn in the sheets of paper on which you have worked the problems.

1. Given the right triangle ABC, find:



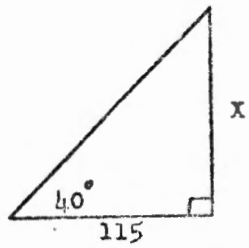
a) tan A =_____

b) sin A =_____

c) cos A =_____

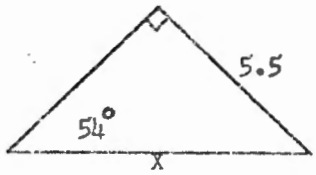
Determine X in the problems 2 to 6. Express computed lengths to the same number of digits as are found in the given lengths and angle measures to the nearest integer.

2.



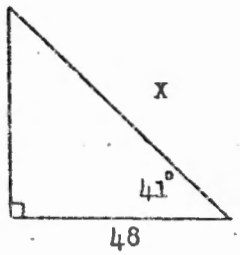
X= _____

3.



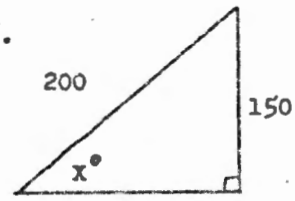
X= _____

4.



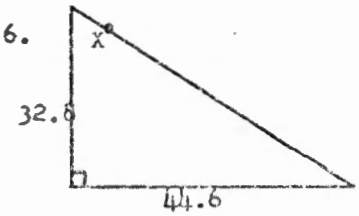
X= _____

5.



X= _____

6.



X= _____

7. Find the elevation of the sun if a 15 foot flag pole casts a shadow 8 feet long.

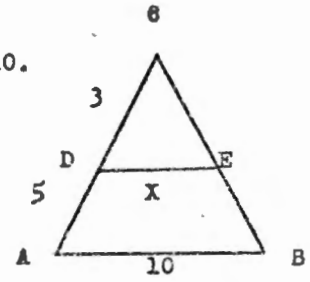
_____

8. The angle of depression from the top of a tower to a point on the ground 130 feet from the base of the tower is 50°, how tall is the tower?

_____

9. Without using tables find the exact value of each of the following:
a) $(\sin 30^\circ)^2 + (\cos 30^\circ)^2 =$ _____ b. $\tan 30^\circ \times \tan 60^\circ =$ _____

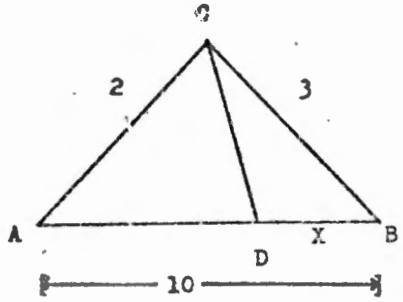
10.



Solve for X if $\overline{DE} \parallel \overline{AB}$

X= _____

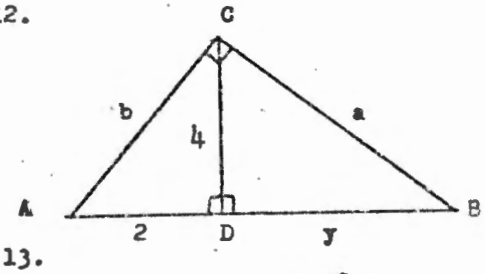
11.



Solve for X if $\overline{DC}$ bisects $\angle C$

X= _____

12.



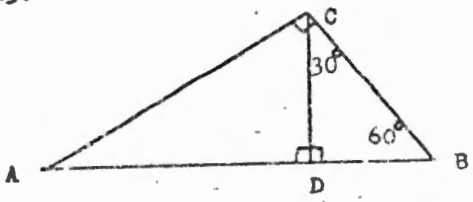
Find a, b, and y

a= _____

b= _____

y= _____

13.



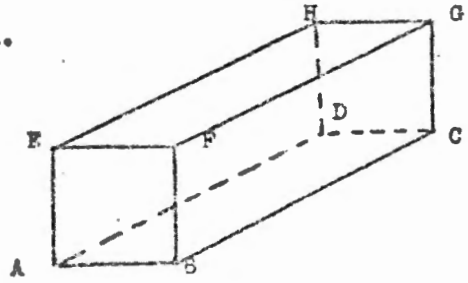
If DB= 2 determine

CD= _____ AB= _____

CB= _____ AC= _____

AD= _____

14.



Given the rectangular solid

If AB = 3
BC = 4
HD = 3

Find HA = _____

HB = _____

Geometry Test

Typed

Three to Five Inches of Space Per Problem for Work

Geometry Per_____ Name_____

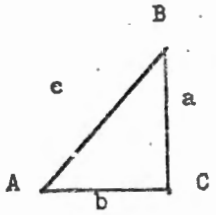
Directions: There are 14 problems on this test. Do all of your work on this test and place your answers in the space provided. There are 4 pages to the test

1. Given the right triangle find:

a) tan A =_____

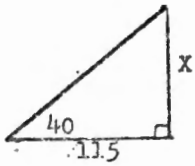
b) sin A =_____

c) cos A =_____

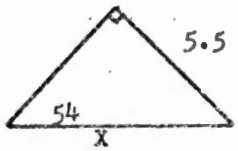


Determine X in problems 2 to 6. Express computed lengths to the same number of digits as are found in the given lengths and angle measure to the nearest integer.

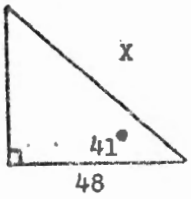
2. X = _____



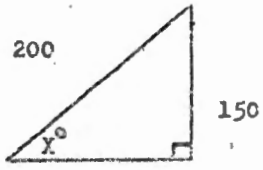
3. X = _____



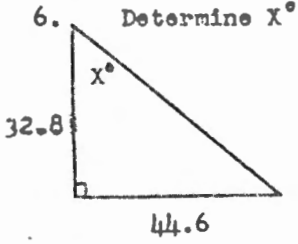
4. X = _____



5. X = _____



6. Determine X° X°=_____



7. Find the elevation of the sun if a 15 foot flag pole casts a shadow 8 feet long.

_____

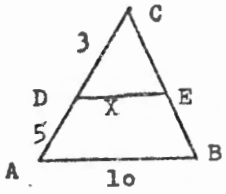
8. The angle of depression from the top of a tower to a point on the ground 130 feet from the base of the tower is 50°, how tall is the tower?

_____

9. Without using tables find the exact value of each of the following:

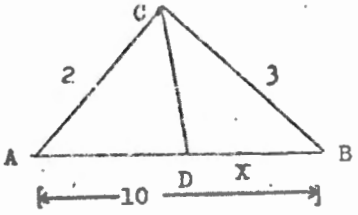
a. $(\sin 30^\circ)^2 * (\cos 30^\circ)^2$ =_____ b. $\tan 30^\circ \times \tan 60^\circ$ = _____

10. Solve for X: if $\overline{DE} \parallel \overline{AB}$



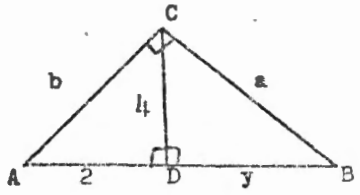
X= _____

11. Solve for X if $\overline{DC}$ bisects $\angle C$



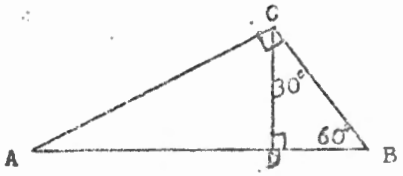
X= _____

12. Find a, b, and y



a= _____ b= _____ y= _____

13.



If DB = 2
Determine:

CD= _____

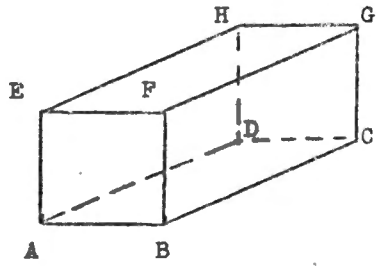
CB= _____

AD= _____

AB= _____

AC= _____

14. Given a rectangular solid



If AB = 3
BC = 44
HD = 3

Find HA= _____

HB= _____

APPENDIX B

THE ALGEBRA TESTS

Algebra Test

Handwritten

No Space for Work

Algebra Chapter 12 Per_____ Name _____

Directions: There are 16 problems on this test. Do all of your work on the separate sheets of paper provided, but place your answers on the test in the given spaces. You will turn in the sheets of paper on which you have worked the problems.

Write in simplest radical form:

① $\sqrt{192} =$ _____ ② $\sqrt{3/5} =$ _____ ③ $\frac{5}{\sqrt{3}} =$ _____

④ $10\sqrt{320} =$ _____ ⑤ $\sqrt{\frac{7}{8}} =$ _____ ⑥ $\frac{3}{3-\sqrt{5}} =$ _____

Write as a decimal:

⑦ $\frac{7}{40} =$ _____ ⑧ $\frac{8}{9} =$ _____ ⑨ $3\frac{2}{7} =$ _____

Write as a common fraction:

⑩ $.181818\ldots =$ _____ ⑪ $3.\overline{13} =$ _____

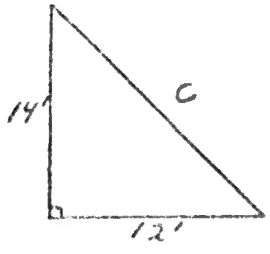
Simplify the following:

⑫ $3\sqrt{8} - 2\sqrt{1/2} =$ _____ ⑬ $(2+\sqrt{3})(2-\sqrt{3}) =$ _____

Solve:

⑭ $\sqrt{2x} - 4 = 0$ $x =$ _____ ⑮ $\sqrt{x} = x - 6$ $x =$ _____

⑯



Determine c to the nearest tenth of a foot. _____

Algebra Test

Handwritten

Three to Five Inches of Space Per Problem for Work

Algebra Chapter 12 Per_____ Name _____

Directions: There are 16 problems on this test. Do all of your work on the test and place your answers in the given spaces.

Write in simplest radical form:

① $\sqrt{192} =$ _____ ② $\sqrt{3/5} =$ _____ ③ $\frac{5}{\sqrt{3}} =$ _____

④ $10\sqrt{320} =$ _____ ⑤ $\sqrt{\frac{7}{8}} =$ _____ ⑥ $\frac{3}{3-\sqrt{5}} =$ _____

Write as a decimal:

⑦ $\frac{7}{40} =$ _____ ⑧ $\frac{8}{9} =$ _____ ⑨ $3\frac{2}{7} =$ _____

Write as a common fraction:

⑩ $.181818\ldots =$ _____ ⑪ $3.\overline{13} =$ _____

Simplify the following

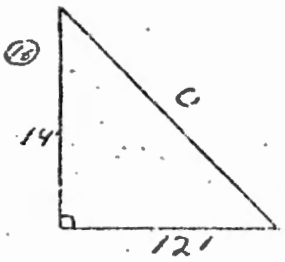
⑫ $3\sqrt{8} - 2\sqrt{\frac{1}{2}} =$ _____ ⑬ $(2+\sqrt{3})(2-\sqrt{3}) =$ _____

Solve:

(14) $\sqrt{2x} - 4 = 0$ $x =$ _____

(15) $\sqrt{x} = x - 6$ $x =$ _____

(16)



Determine c to the nearest tenth of a foot. _____

Algebra Test

Typed

No Space for Work

Algebra Chapter 12 Per_____ Name_____

Directions: There are 16 problems on this test. Do all of your work on the separate sheets of paper provided, but place your answers on the test in the given spaces. You will turn in the sheets of paper on which you have have worked the problems.

Write in simplest radical form:

1. $\sqrt{192}$ = _____ 2. $\sqrt{3/5}$ = _____ 3. $\frac{5}{\sqrt{3}}$ = _____

4. $10\sqrt{320}$ = _____ 5. $\sqrt{\frac{7}{8}}$ = _____ 6. $\frac{3}{3-\sqrt{5}}$ = _____

Write as a decimal:

7. $\frac{7}{40}$ = _____ 8. $\frac{8}{9}$ = _____ 9. $3\frac{2}{7}$ = _____

Write as a common fraction:

10. .181818... = _____ 11. $3.\overline{13}$ = _____

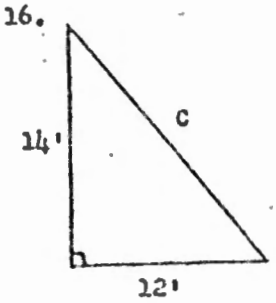
Simplify the following:

12. $3\sqrt{8} - 2\sqrt{1/2}$ = _____ 13. $(2+\sqrt{3})(2-\sqrt{3})$ = _____

Solve

14. $\sqrt{2X} - 4 = 0$ X = _____ 15. $\sqrt{X} = X - 6$ X= _____

16.



Determine C to the nearest tenth of a foot. _____

Algebra Test

Typed

Three to Five Inches of Space Per Problem for Work

Algebra Chapter 12 Per _____ Name _____

Directions : There are 16 problems on this test. Do all of your work on the test and place your answers in the given spaces.

Write in simplest radical form:

1. $\sqrt{192}$ = _____ 2. $\sqrt{3/5}$ = _____ 3. $\frac{5}{\sqrt{3}}$ = _____

4. $10\sqrt{320}$ = _____ 5. $\sqrt{\frac{7}{8}}$ = _____ 6. $\frac{3}{3-\sqrt{5}}$ = _____

Write as a decimal:

7. $\frac{7}{40}$ = _____ 8. $\frac{8}{9}$ = _____ 9. $3\frac{2}{7}$ = _____

Write as a common fraction:

10. ..181818... = _____ 11. $3.\overline{13}$ = _____

Simplify the following:

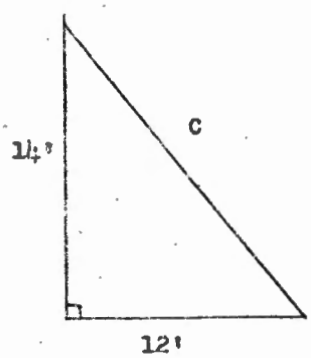
12. $3\sqrt{8} - 2\sqrt{1/2}$ = _____ 13. $(2+\sqrt{3})(2-\sqrt{3})$ = _____

Solve:

14. $\sqrt{2X} - 4 = 0$ X= _____

15. $\sqrt{X} = X - 6$ X= _____

16.



Determine C to the nearest tenth of a foot.

_____

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