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Title of Study: Factors That May Have Influenced The Grades Made on The Junior Standing Examinations In Mathematics And English By Students At The Oklahoma Agricultural And Mechanical College In The Fall of 1951.

Number of Pages in Study: 95

Under Direction of What Department: Agricultural Education

Statement of Problem: Each semester many students fail the junior standing mathematics and English examination at Oklahoma Agricultural and Mechanical College. The primary purpose of this study was to recognize factors which may have been responsible for the failures of students to pass these junior standing examinations.

Method of Procedure: The high school and college transcripts of all students who failed the examinations were compared with the transcripts of students who passed the examinations. Comparisons were made to determine if the number of units completed in high school and the number of hours completed in college were factors that influenced the ability of students to pass the examinations. Comparisons were also made to determine if the number of units of science completed in high school had any influence upon the grades made in science in college.

Findings and Conclusions: The number of units of mathematics and English completed in high school seem to have little influence upon the ability of the student to pass the junior standing mathematics or English examination. Hours of mathematics and English completed in college also seem to have little influence upon the grades made by students on the examinations. This study also shows that there is little relationship between the number of units of science completed in high school and the grades made by students in science in college. The grade point made in technical agriculture seems to be a better indication of the student's ability to pass the examinations than units or hours of work completed. Dairy 123 and agricultural economics 233 seem to be of some benefit in preparing students for the mathematics examination. While students who failed the mathematics examination are definitely weak in solving percent problems, there is evidence that indicates that highly specialized problems were responsible for the failure of many of them.

ADVISER'S APPROVAL [signature]

FACTORS THAT MAY HAVE INFLUENCED THE GRADES MADE ON THE JUNIOR STANDING EXAMINATIONS IN MATHEMATICS AND ENGLISH BY STUDENTS AT THE OKLAHOMA AGRICULTURAL AND MECHANICAL COLLEGE IN THE FALL OF 1951

By

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Thesis Approved:

Thesis Adviser

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INTRODUCTION

The Oklahoma Agricultural and Mechanical College catalogue states that, before admission to the junior year, all students in the School of Agriculture are required to pass comprehensive tests in English and mathematics. These tests, commonly called junior standing examinations, are required of all students regardless of the number of hours of English or mathematics the student may have previously completed in college. Students who fail the tests have the privilege of taking them over at a later date; however, if the student fails the second time, it is usually required that he enroll in a basic course in the subject he failed, before being permitted to take the junior standing examinations again.

The results of these tests have brought dismay and embarrassment to many students and faculty members alike. Each semester a relatively high percent of the students fail the examinations; this is especially true of the mathematics examination. Of those who took the examination during the fall of 1951, seventeen percent failed in English, and forty-four percent failed in mathematics. These figures should indicate why teachers are so concerned over the matter.

In addition to mathematics and English, students also

seem to have difficulty with science courses, and low grades are common.

Factors responsible for the low grades made by students are many, and it is often difficult to determine the major ones. This study has been made in an attempt to determine some of the factors which may have been responsible for the high percent of failures in the junior standing English and mathematics examination.

This problem was limited to a study of the records of 196 students who took the mathematics examination and one hundred students who took the English examination during the fall semester of 1951.

Purposes of the Study

The purposes of this study are:

(1) To recognize factors which may be responsible for the failure of students to pass the junior standing English and mathematics examination at Oklahoma Agricultural and Mechanical College.

(2) To determine the relationship, if any, between the units of mathematics studied in high school and the grade made on the junior standing mathematics examination.

(3) To determine the relationship, if any, between the units of English studied in high school and the grade made on the junior standing English examination.

(4) To determine the relationship, if any, between certain college subjects taken and the grade made on the junior standing examinations.

(5) To determine the relationship, if any, between the grades made on the college entrance examinations and the grades made on the junior standing English and mathematics examinations.

(6) To determine the relationship, if any, between the number of units of science taken in high school and the grades made in science in college.

REVIEW OF LITERATURE

In attempting to predict the success of students in college, several studies have been made of various factors which may have influenced their grades. Scott and Gill[1] of the University of Alabama, considered only two factors, the number of years intervening between the last year of high school algebra and entrance into college and the number of units of high school mathematics; of these only the number of units of high school mathematics was significant in predicting probable success in college mathematics.

Payne[2] conducted a study to determine what effect the length of time intervening between the completion of high school algebra and the taking up of the study of college algebra had upon grades made in college algebra. He found that more than twice as many students make higher grades in college algebra after the lapse of one year than they do after the lapse of two years.

Douglass and Michaelson[3] found that the average mark

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[1] W. M. Scott and J. P. Gill, "A Prediction of Pupil Success in College Algebra," The Mathematics Teacher, XXXIV (December 1941) pp. 357-359.

[2] Seborn Julius Payne, "A Study of Some Factors That Tend To Affect Freshmen College Algebra Grades," M.S. Thesis, Oklahoma Agricultural and Mechanical College Library, 1933.

[3] H. R. Douglass and J. H. Michaelson, "The Relation of High School Mathematics to College Marks and of Other Factors To College Marks in Mathematics," School Review, XLIV (1936) pp. 615-619.

in high school mathematics had a definite correlation with the average college mark in every field. They also concluded from their studies that the success of students in college mathematics cannot be predicted with any high degree of accuracy from the number of units of mathematics taken in high school, rank on the psychological examination of the American Council on Education or a combination of these factors.

Daniel[4] compared the individual entrance scores on the arithmetic unit of the Oklahoma Agricultural and Mechanical College Mathematics Placement Test with the grades made in mathematics and chemistry in college. The study included 434 students who took the test in September 1937. She concluded that persons who score high in the arithmetic and entrance algebra tests tend to make higher grades in chemistry and mathematics, particularly in the more advanced courses in mathematics.

Shirley[5] conducted an experiment at Oklahoma Agricultural and Mechanical College to determine the value of grades made on placement tests as a means of determining the mathematics course in which beginning students should enroll. He concluded that in predicting grades for students

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[4] Margaret May Daniel, "Some Values of the 1937 Oklahoma Agricultural and Mechanical College Mathematics Placement Test in Predicting Scholarship," M.S. Thesis, Oklahoma Agricultural and Mechanical College Library, 1939.

[5] Walter Warren Shirley, "The Use of Placement Tests In Freshman Mathematics," M. S. Thesis, Oklahoma Agricultural and Mechanical College Library, 1949.

who enrolled in business mathematics and elementary algebra none of the placement tests given were of any value. However, in predicting grades made by students in the higher algebra courses the tests were of some value.

In a study at the University of Oregon, C. F. Kossack[6] states that of the different factors he considered for determining a student's probable success in a first course in college mathematics, the two most important ones were the student's grade on a placement or training test and his high school mathematics score. He found that the score on a psychological test, the high school scholastic rank, and the number of years since graduation were not significant.

Held[7] reports that placing students in mathematics classes on the basis of the number of units of mathematics completed in high school is not satisfactory. For the year of his study, failures were reduced from twenty-one percent to six percent by sectioning students according to their score on the placement test.

Freeman[8] conducted a study to determine the arithmetical abilities of eighth grade pupils and teachers in train-

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[6] C. F. Kossack, "Mathematics Placement at the University of Oregon," The American Mathematical Monthly, XLIX (April 1942) pp. 234-237.

[7] C. C. Held, "A College Mathematics Placement Test," Journal of Higher Education, XIII (1942) pp. 39-40.

[8] Bessie Lee Freeman, "Arithmetical Abilities of Eighth Grade Pupils and Teachers in Training," M.S. Thesis, Oklahoma Agricultural and Mechanical College Library, 1934.

ing. In this study she found that courses in high school and college mathematics did not seem to affect the college student's ability in elementary arithmetic.

Emme[9] states that Russell found that success depends more on certain factors--motivation; physical and mental health; personal and social relationships of the student with parents, fellow students, and faculty; on the degree which home and school have prepared students for independent living and self-direction--than on marks and tests.

It may be concluded that the value of certain factors in predicting college success is often disputed by different investigators. Contradictory findings were quoted in this study regarding the value of the number of units of mathematics taken in high school and the use of placement tests in predicting college success. Also difference of opinion existed as to what effect the length of time intervening between completion of high school mathematics had upon the grades made in college mathematics. As stated before, factors affecting the grades made by students in college are many, and these factors are often difficult to measure. This is especially true of the personal factors mentioned by Russell. It seems likely that the difficulty in measuring these personal factors may account for the fact that

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[9] Earle E. Emme, "Predicting College Success," Journal of Higher Education, XIII (May 1942) pp. 263-266.

often two investigators report different results from the same type of investigation.

METHOD OF PROCEDURE

The data used in this study were calculated from the records on file in the Registrar's Office and the Office of the Testing Bureau at the Oklahoma Agricultural and Mechanical College. Scholastic records of 196 students who took the mathematics examination were examined, and from these records the number of units of high school mathematics, vocational agriculture, and science completed by each student was obtained. Other scholastic data obtained for each student consisted of the total hours of college work completed, total hours of technical agriculture completed, average grade point made in technical agriculture and science in college, and total hours of mathematics completed in college. Students were also checked to see if they had taken dairy 123 and agricultural economics 233. In the laboratory exercises of these two courses, students are required to work many problems related to the dairy industry and farm management. They were included in this study to determine of what value they were in preparing students to pass the mathematics examination. Scores made on psychological tests at the time the student first enrolled at Oklahoma Agricultural and Mechanical College were obtained for 134 students. Scores for the other sixty-two were unavailable. These scores consisted of the grade made by the student on the section dealing with mathematics or quantitative reasoning and the total

score which represents the average of the score made on the quantitative reasoning section and the score made on the language section. The quantitative reasoning score, the language score, and the total score will hereafter be known as the Q score, L score, and T score respectively.

The junior standing test papers of all 196 students who took the mathematics examination were obtained from the Dean of Agriculture. Problems were studied, and the kinds of errors made in arithmetic were recorded.

Comparisons were made between the 109 students who passed the mathematics examination and the eighty-seven who failed the examination on a basis of the percent of each group taking vocational agriculture and mathematics in high school, and the average number of units of these subjects completed by each group. Other comparisons made between the students who passed the mathematics examination and those who failed it were made on a basis of the average hours of college work completed, average hours of technical agriculture completed, average grade point made in technical agriculture, percent of students who had completed dairy 123 and agricultural economics 233, and the Q and T scores made on the psychological tests. Problems missed and the kinds of errors made in arithmetic were the basis for another comparison between the group that passed and the group that failed. Comparisons were also made between students completing all college mathematics at Oklahoma Agricultural and Mechanical College and students completing all college mathematics at other institutions, and between students taking the mathe-

matics examination who had not completed any mathematics in college and students taking the mathematics examination who had credit in one or more hours of mathematics in college.

Scholastic records of the fifty-four students who failed the English examination and forty-six of the 256 students who passed it were examined. The number of units of English, vocational agriculture, and science completed in high school were obtained for each student. The data obtained for each student from the college records consisted of the total number of hours of college work completed, total hours of technical agriculture completed, average grade point made in technical agriculture and college science, total hours of English completed in college, and the L and T scores made on the psychological tests. The L and T scores were obtained for sixty-nine students; scores for the other thirty-one were unavailable.

The check list of forty-six students who passed the English examination was chosen at random from the total of 256 students who passed the English examination.

Comparisons were made between the group that passed the English examination and the group that failed in number of units of English and vocational agriculture completed in high school, average number of hours completed in college, average number of hours of technical agriculture completed, average grade point made in technical agriculture, average number of hours of English completed in college, and average L and T scores made on the psychological tests.

The grades made in science in college by 221 students were compared on the basis of the number of units of high school science completed.

In this study the term completed means the high school units and college hours the student had on record with a grade of D or higher at the time of the examination.

The following instructions and problems were given on the junior standing mathematics examination, November 1, 1951.

INSTRUCTIONS:

Show the major steps in solving each problem using the space provided. Trial calculations may be made on another sheet. Please circle the answer for each problem. You will have 2 hours to complete the examination. Grades will be posted on the Agricultural bulletin board in about one week.

1. A certain hybrid corn outyielded an open pollinated variety by 25%. How much more money per acre did a farmer make by using the hybrid corn in a year when the hybrid yielded 50 bushels per acre and corn sold for $2.00 per bushel?
2. If nitrogen, available phosphoric acid, and potash in fertilizers are considered worth, respectively, 14¢, 7¢, and 6¢ per pound, what should be the total cost of a 4-8-4 fertilizer applied to 60 acres of corn land at the rate of 250 lb. per acre?
3. A wheat bin is 8 ft. long, 6 ft. wide, and 4 ft. deep. How many bushels of wheat does it contain if it is three-

fourths full? (1 bu. of wheat occupies 1¼ cu. ft.)

4. If a board foot of lumber is 1 ft. long, 1 ft. wide and 1 inch thick, how many board feet are in a timber 30 ft. long and 18 inches square?
5. 1,000 lbs. of milk when separated gave 105 pounds of cream testing 35% butterfat and 895 lbs. of skim milk testing 0.05% butterfat. What percent butterfat did the milk contain?
6. A butcher buys a 1200 lb. steer at $30.00 per cwt. The steer shrank 5% during his trip to the slaughter house and dressed out 60%. For how much per pound will he have to sell the dressed carcass to break even? Labor costs are not considered.
7. Three cows produced a total of 30,000 pounds of milk in a year. Cow A produced 450 lbs. butterfat. Cows B and C together produced 20,000 lbs. of milk. If milk from the three cows averaged 5% butterfat, what was the average percent of Cows B and C?
8. A load of 30 feeder calves weighed 15,500 pounds when loaded in Texas and cost $8.00 per cwt. During shipment to Stillwater these calves shrank 3%, and the freight cost was $45.00, what would be the final cost per cwt. when unloaded in Stillwater?
9. How many pounds of cottonseed meal analyzing 41.9% crude protein should be added to 100 lbs. of feed analyzing 16.3% crude protein to produce a feed containing 23% crude protein?

10. A man pays $200 per acre for 160 acres of land. His taxes are $200 per year and his repair costs for fences, buildings, etc., are $50.00 per year. For how much will he have to rent his farm per year to make 5% on his original investment?

PRESENTATION AND ANALYSIS OF DATA

FACTORS RESPONSIBLE--While it is generally recognized that the factors responsible for the inability of a student to pass the mathematics examination are many, it is often assumed that a major one is the student's failure to take sufficient units of mathematics in high school. In order to determine the validity of the above assumption, the 196 students who took the mathematics examination were divided into two groups for study and comparison. The two groups consisted of the 109 students who passed the mathematics examination and the eighty-seven who failed it. From the high school transcripts, total units of mathematics and vocational agriculture completed by each group were found, and averages computed from the totals. Table I presents a comparison of the number of units of mathematics and vocational agriculture completed by each group in high school.

INFLUENCE OF HIGH SCHOOL MATHEMATICS--Table I indicates that there is very little relationship between the units of mathematics completed in high school and a student's ability to pass the junior standing mathematics examination. It is interesting to note that the average number of units of mathematics completed in high school by each group is practically the same. The percent of each group completing $\frac{1}{2}$ unit or more of algebra and geometry is slightly higher in the group that failed the examination than in the group

TABLE I

COMPARISON OF THE RECORDS OF 109 STUDENTS WHO PASSED THE MATHEMATICS EXAMINATION WITH THE RECORDS OF 87 WHO FAILED IT AS TO NUMBER OF UNITS OF CERTAIN HIGH SCHOOL SUBJECTS COMPLETED

High School Subject Studied	Students Who Passed The Examination		Students Who Failed The Examination	
	Percent Completing ½ Unit or More	Average Number of Units	Percent Completing ½ Unit or More	Average Number of Units
Vocational Agriculture	44.95	3.08	40.23	2.31
Algebra	94.49	1.29	97.70	1.26
Geometry	71.55	1.02	79.31	1.03
Composite Mathematics	26.60	1.00	28.73	1.00
Other Mathematics	26.60	.70	22.98	.67

that passed the examination. The greatest difference to be found between the two groups is in the average number of units of vocational agriculture completed, and it is doubtful if this difference is great enough to be significant.

From the college records the average number of hours completed in college, average number of hours of technical agriculture completed, and the average grade point made in technical agriculture were found for the group that failed the mathematics test and the group that passed it. Table II presents a comparison of the two groups on this basis.

INFLUENCE OF COLLEGE HOURS COMPLETED--Table II shows that the group that passed the examination averaged 5.72 more college hours, and 2.64 more hours of technical agriculture than the group that failed the examination. Within the group that failed the examination, total hours of college work completed ranged from a low of one student with only twenty-six hours to a high of one student with 150 hours. Within the group that passed the examination, the range was from one student with thirty-one college hours completed to one student with 194 hours. The range in hours of technical agriculture completed was from zero to fifty-seven in the group that failed and from zero to sixty-eight in the group that passed the examination. While the group that passed the examination averaged only .30 of a grade point higher in technical agriculture than the group that failed, this difference may have been greater if all opportunity for cheating during the examination had been elimi-

TABLE II

A COMPARISON OF THE COLLEGE RECORDS OF 109 STUDENTS WHO PASSED THE MATHEMATICS EXAMINATION WITH THE COLLEGE RECORDS OF 87 STUDENTS WHO FAILED IT IN TOTAL COLLEGE HOURS COMPLETED AND AVERAGE GRADE POINT MADE IN TECHNICAL AGRICULTURE

Students Who Passed The Examination		Students Who Failed The Examination	
Total Number That Passed	109	Total Number That Failed	87
Percent of Total	55.61	Percent of Total	44.39
Average College Hours Completed	85.44	Average College Hours Completed	79.72
Average College Hours of Technical Agriculture Completed	30.48	Average College Hours of Technical Agriculture Completed	27.84
Average Grade Point Made In All Technical Agriculture	2.78	Average Grade Point Made In All Technical Agriculture	2.48

nated. Differences between the group that failed and the group that passed in average hours of college work completed and average hours of technical agriculture completed do not seem to be great enough to be of any importance.

What effect does the completion of certain college subjects prior to the examination have upon a student's ability to pass the mathematics examination? Table III shows the results of a comparison made between the group that passed and the group that failed on the basis of the percent of each group that had completed one or more hours of mathematics in college, agricultural economics 233, and dairy 123.

INFLUENCE OF OTHER COLLEGE SUBJECTS--As shown in Table III, a slightly higher percent of the students who passed the examination had completed one or more hours of college algebra, trigonometry, and other mathematics than the group which failed. However, the group which failed showed a higher average in number of college hours of algebra, trigonometry, and other mathematics completed than the group which passed. This seems to indicate that the college mathematics completed by a student had very little influence upon his ability to pass the junior standing examination. Table III shows that the percent of students completing agricultural economics 233 and dairy 123 was considerably higher for the group that passed than for the group that failed. This difference amounted to over seventeen percent for agricultural economics 233 and over thirteen percent for dairy 123. This indicates that the problems worked in

TABLE III

COMPARISON OF 109 STUDENTS WHO PASSED THE MATHEMATICS EXAMINATION WITH 87 WHO FAILED IT AS TO HOURS OF CERTAIN COLLEGE SUBJECTS COMPLETED WITH A GRADE OF D OR HIGHER

College Subject	Students Who Passed The Examination		Students Who Failed The Examination	
	Percent Completing 1 Hour or More	Average Number of Hours	Percent Completing 1 Hour or More	Average Number of Hours
Algebra	36.70	3.75	29.88	4.08
Trigonometry	14.68	2.87	10.34	3.33
Other Mathematics	18.35	3.50	13.79	4.08
Agricultural Economics 233	38.53	3.00	20.68	3.00
Dairy 123	59.63	3.00	45.97	3.00

the laboratory exercises of these two subjects are of aid to the student in passing the mathematics examination.

Tables IV and V show the distribution of the Q scores of sixty-two students who failed the mathematics examination and seventy-two students who passed. These percentile scores indicate the rank of the students in comparison with other college freshmen throughout the United States.

TABLE IV

DISTRIBUTION OF Q SCORES* MADE ON PSYCHOLOGICAL TESTS BY 62 STUDENTS WHO FAILED THE MATHEMATICS EXAMINATION

Scores	Frequency
91-100	3
81- 90	2
71- 80	2
61- 70	3
51- 60	9
41- 50	3
31- 40	9
21- 30	11
11- 20	8
1- 10	12

N 62
Median 30.50
Mean 35.98

*Q scores--Quantitative Reasoning Scores

TABLE V

DISTRIBUTION OF Q SCORES* MADE ON PSYCHOLOGICAL TESTS BY 72 STUDENTS WHO PASSED THE MATHEMATICS EXAMINATION

Scores	Frequency
91-100	5
81- 90	4
71- 80	4
61- 70	8
51- 60	8
41- 50	8
31- 40	9
21- 30	4
11- 20	10
1- 10	12

N	72
Median	41.75
Mean	43.00

*Q Scores--Quantitative Reasoning Scores

ANALYSIS OF Q SCORES--In Table IV it may be noted that seven of the sixty-two students who failed the examination made scores above the seventieth percentile while in Table V, twelve of the seventy-two who passed the examination made scores below the eleventh percentile. Approximately thirty percent of the group that passed and the group that failed made scores below the twenty-first percentile. Students who passed the examination have a mean score that is 7.02 higher than the students who failed. The difference in the median is 11.25 in favor of the students who passed. It seems that

there is not as much difference between the quantitative reasoning ability of the two groups as may have been expected.

Tables VI and VII show the distribution of the T scores of sixty-two students who failed the mathematics examination and seventy-two students who passed. These percentile scores represent the average of the scores made on the quantitative reasoning section and the language section of the psychological tests.

TABLE VI

DISTRIBUTION OF T SCORES* MADE ON PSYCHOLOGICAL TESTS BY 62 STUDENTS WHO FAILED THE MATHEMATICS EXAMINATION

Scores	Frequency
91-100	1
81- 90	1
71- 80	3
61- 70	2
51- 60	4
41- 50	7
31- 40	6
21- 30	9
11- 20	8
1- 10	21

N	62
Median	22.72
Mean	28.40

*T Scores--Total score is the average of the scores made on the quantitative reasoning and language sections of the placement test.

TABLE VII

DISTRIBUTION OF T SCORES* MADE ON PSYCHOLOGICAL TESTS BY 72 STUDENTS WHO PASSED THE MATHEMATICS EXAMINATION

Scores	Frequency
91-100	1
81- 90	3
71- 80	4
61- 70	6
51- 60	5
41- 50	6
31- 40	7
21- 30	9
11- 20	19
1- 10	12

N	72
Median	26.06
Mean	33.83

*T Scores--Total score is the average of the scores made on the quantitative reasoning and language sections of the placement test.

ANALYSIS OF T SCORES--Table VI shows that of the sixty-two students who failed the examination, five were above the seventieth percentile while thirty-eight were below the thirty-first percentile. As shown in Table VII, eight of the seventy-two students who passed the examination were above the seventieth percentile and forty were below the thirty-first percentile. Students who passed the examination have a mean score that is 5.43 higher than for the students who failed. The difference in the median is 3.34 in favor of the

students who passed. It seems that there is very little relationship between the total scores made on the Oklahoma Agricultural and Mechanical College placement test and the ability to pass the junior standing mathematics examination.

Table VIII presents the results of a comparison of the average grades made on the examination by students who completed all college mathematics at Oklahoma Agricultural and Mechanical College and those students who completed all college mathematics at other institutions.

TABLE VIII

A COMPARISON OF THE EXAMINATION GRADES OF STUDENTS WHO COMPLETED ALL COLLEGE MATHEMATICS AT OKLAHOMA AGRICULTURAL AND MECHANICAL COLLEGE WITH THE EXAMINATION GRADES OF STUDENTS WHO COMPLETED ALL COLLEGE MATHEMATICS AT OTHER INSTITUTIONS

College	Students Credited With One or More Hours of College Mathematics		
	Number of Students	Percent of Total Students Taking Examination	Average Grade Made on The Mathematics Examination
Okla. A & M College	27	13.78	65.85
Other Institutions	56	28.57	73.29
Okla. A & M and Other Institutions	1	.51	70.00
Total	84	42.86	

INFLUENCE OF INSTITUTION WHERE MATHEMATICS WAS TAKEN--As indicated in Table VIII, students who took their college mathematics at other institutions demonstrated that they were as capable of passing the junior standing mathematics examination as were the students who took all of their college mathematics at Oklahoma Agricultural and Mechanical College. The group that took all of their college mathematics at other institutions made scores that averaged 7.44 higher than the average score made by the group that took all of their college mathematics at Oklahoma Agricultural and Mechanical College.

Table IX shows a comparison of the grades made on the examination by students without credit in any college mathematics. Students who completed all of their college work at Oklahoma Agricultural and Mechanical College are compared with students who completed part of their college work at other institutions.

TABLE IX

AVERAGE GRADES MADE ON THE MATHEMATICS EXAMINATION BY STUDENTS WITHOUT CREDIT IN ANY COLLEGE MATHEMATICS COMPARED ON THE BASIS OF WHERE OTHER COLLEGE WORK WAS COMPLETED

Institution Where Work Was Taken	Students Not Credited With Any College Mathematics		
	Number of Students	Percent of Total Students Taking Examination	Average Grade Made on Mathematics Examination
Okla. A & M College	65	33.16	64.92
Okla. A & M College and Other Institutions	47	23.98	70.23
Total	112	57.14	

INFLUENCE OF INSTITUTION WHERE OTHER COLLEGE WORK WAS COMPLETED--Table IX shows that students who transfered some college hours from other institutions averaged 5.31 points higher on the mathematics examination than did students who completed all college work at Oklahoma Agricultural and Mechanical College. This seems to indicate that transfer students are as capable of passing the junior standing examination as are students who have completed all of their college work at Oklahoma Agricultural and Mechanical College.

In Table X all students without credit in any college mathematics are compared to all students with credit in college mathematics on the basis of the average grade made on the examination.

TABLE X

COMPARISON OF GRADES MADE ON THE MATHEMATICS EXAMINATION BY STUDENTS WITH CREDIT IN COLLEGE MATHEMATICS AND STUDENTS WITHOUT CREDIT IN COLLEGE MATHEMATICS

Students With One or More Hours of College Mathematics		Students Without Credit In College Mathematics	
Total Number	84	Total Number	112
Percent of Total	42.86	Percent of Total	57.14
Average Grade Made on Examination	70.86	Average Grade Made On Examination	67.15

INFLUENCE OF COLLEGE MATHEMATICS--Table X is merely another way of showing that the number of hours of mathematics completed in college prior to the examination has very little influence upon the grade made by the student on the junior standing examination. Students with credit in college mathematics averaged 3.71 points higher on the test than students without credit in any mathematics in college. College mathematics seem to be of little benefit in preparing students for the mathematics examination. This may indicate that the junior standing examination is a specialized test composed of problems with which the students are unfamiliar.

Table XI shows the distribution of scores made by all students on the junior standing mathematics examination, and is self explanatory. Tables XII and XIII show the distribution of scores made on the examination by students who completed all college mathematics at Oklahoma Agricultural and Mechanical College and students who completed all college mathematics at other institutions.

TABLE XI

DISTRIBUTION OF THE SCORES MADE BY 196 STUDENTS ON THE MATHEMATICS EXAMINATION

Scores	Frequency
96-100	15
91- 95	2
86- 90	28
81- 85	4
76- 80	35
71- 75	5
66- 70	22
61- 65	5
56- 60	26
51- 55	10
46- 50	14
41- 45	7
36- 40	15
31- 35	0
26- 30	3
21- 25	0
16- 20	3
11- 15	0
6- 10	2

N	196
Median	68.45
Mean	66.80

TABLE XII

DISTRIBUTION OF THE SCORES MADE BY 27 STUDENTS ON THE MATHEMATICS EXAMINATION WHO TOOK ALL OF THEIR COLLEGE MATHEMATICS AT OKLA. A & M COLLEGE

Scores	Frequency
96-100	2
91- 95	1
86- 90	1
81- 85	0
76- 80	6
71- 75	0
66- 70	3
61- 65	1
56- 60	3
51- 55	2
46- 50	2
41- 45	2
36- 40	4

N	27
Median	63.00
Mean	63.93

TABLE XIII

DISTRIBUTION OF THE SCORES MADE BY 56 STUDENTS ON THE MATHEMATICS EXAMINATION WHO TOOK ALL OF THEIR COLLEGE MATHEMATICS AT INSTITUTIONS OTHER THAN OKLA. A & M COLLEGE

Scores	Frequency
96-100	5
91- 95	1
86- 90	10
81- 85	1
76- 80	14
71- 75	1
66- 70	6
61- 65	1
56- 60	6
51- 55	1
46- 50	3
41- 45	3
36- 40	3
31- 35	0
26- 30	1

N	56
Median	76.57
Mean	71.40

DISTRIBUTION OF SCORES--It will be noted that the mean scores given in Tables XII and XIII are slightly lower than the averages given for these two groups in Table VIII. Averages used in Table VIII were computed from ungrouped scores which would account for this difference. Tables XII and XIII show that the students who completed all college mathematics at other institutions have a mean score that is 7.47 higher and a median that is 13.57 higher than students who completed all college mathematics at Oklahoma Agricultural and Mechanical College.

Tables XIV and XV show the distribution of scores made on the mathematics examination by students without credit in any college mathematics. Table XIV shows the scores of students who completed all college work at Oklahoma Agricultural and Mechanical College, and Table XV shows the scores made by students who completed part of their college work at other institutions.

TABLE XIV

DISTRIBUTION OF THE SCORES MADE BY 65 STUDENTS ON THE MATHEMATICS EXAMINATION WHO DID ALL OF THEIR COLLEGE WORK AT OKLA. A & M COLLEGE, BUT DID NOT HAVE CREDIT IN ANY COLLEGE MATHEMATICS

Scores	Frequency
96-100	3
91- 95	0
86- 90	8
81- 85	3
76- 80	10
71- 75	3
66- 70	7
61- 65	2
56- 60	5
51- 55	5
46- 50	7
41- 45	1
36- 40	6
31- 35	0
26- 30	1
21- 25	0
16- 20	2
11- 15	0
6- 10	2

N	65
Median	66.57
Mean	62.95

TABLE XV

DISTRIBUTION OF THE SCORES MADE BY 47 STUDENTS ON THE MATHEMATICS EXAMINATION WHO DID COLLEGE WORK AT OKLA. A & M COLLEGE AND OTHER INSTITUTIONS, BUT DID NOT HAVE CREDIT IN ANY COLLEGE MATHEMATICS

Scores	Frequency
96-100	5
91- 95	0
86- 90	9
81- 85	0
76- 80	5
71- 75	1
66- 70	5
61- 65	1
56- 60	12
51- 55	2
46- 50	2
41- 45	1
36- 40	2
31- 35	0
26- 30	1
21- 25	0
16- 20	1

N	47
Median	67.00
Mean	68.32

ANALYSIS OF TABLES XIV AND XV--The mean scores shown in Tables XIV and XV are slightly lower than the averages shown in Table IX. Averages for Table IX were computed from ungrouped data which accounts for this difference. Students who completed some college work at other institutions have a mean score that is 5.37 higher than students who completed all college work at Oklahoma Agricultural and Mechanical College; however, the median for the two groups is practically the same. Tables XIV and XV seem to indicate that there is not as much difference between the two groups as is indicated from the averages computed from the ungrouped data.

ANALYSIS OF PROBLEMS AND ERRORS

DEFINITION OF TERMS--In the following analysis of the problems given on the junior standing mathematics examination, the term error in method is used frequently. The term error in method is used to denote an error in thinking--an error in the way the student attempted to solve the problem. Errors made in the use of the fundamental processes are those errors that students made in multiplication, division, addition, and subtraction.

The junior standing mathematics examination given November 1, 1951, consisted of ten problems. Each problem was given a value of ten points, and a student was required to make a grade of seventy or higher in order to pass the examination.

PROCEDURE--Of the 196 students who took the examination, eighty-seven students made below seventy on the test. Papers of all students were carefully checked and the errors made were recorded. Errors shown in the tables following each problem will be only the errors detected by the grader in grading the papers. Other errors found by the writer will be given in the analysis of each problem.

COMPARISON OF PROBLEMS--Table XVI presents a comparison of the problems based on the ability of the 196 students to solve them correctly.

TABLE XVI

RESULTS OF THE JUNIOR STANDING MATHEMATICS EXAMINATION SHOWING THE NUMBER AND PERCENT OF ALL STUDENTS WORKING EACH PROBLEM CORRECTLY AND INCORRECTLY

Problem Number	Problems Computed Correctly		Problems Computed Incorrectly	
	Number of Students	Percent of Students	Number of Students	Percent of Students
1	86	43.88	110	56.12
2	109	55.61	87	44.39
3	165	84.18	31	15.82
4	166	84.69	30	15.31
5	128	65.31	68	34.69
6	191	97.45	5	2.55
7	161	82.14	35	17.86
8	112	57.14	84	42.86
9	69	35.20	127	64.80
10	137	69.90	59	30.10

As indicated in Table XVI, problems nine, one, two, eight, five, and ten were the most difficult to solve in that order. Problems six, four, three, and seven were the easiest to solve in that order. Thw two most difficult problems to solve were problems nine and one. Only thirty-five percent of the students worked problem nine correctly, and only forty-four percent worked problem one correctly. In contrast over ninety-seven percent of the students worked problem six correctly.

Table XVII presents another comparison of the problems based upon the ability of the students to solve them. In this table, students who failed the examination and students who passed are compared as to ability to solve each problem correctly.

TABLE XVII

A COMPARISON OF 109 STUDENTS WHO PASSED THE MATHEMATICS EXAMINATION WITH 87 STUDENTS WHO FAILED THE EXAMINATION IN ABILITY TO SOLVE EACH PROBLEM

Problem Number	Students Who Passed The Examination		Students Who Failed The Examination	
	Percent Computed Correctly	Percent Computed Incorrectly	Percent Computed Correctly	Percent Computed Incorrectly
1	75.23	24.77	4.60	95.40
2	62.39	37.61	47.13	52.87
3	95.41	4.59	70.11	29.89
4	99.08	.92	66.67	33.33
5	82.57	17.43	43.68	56.32
6	99.08	.92	95.40	4.60
7	95.41	4.59	65.52	34.48
8	79.82	20.18	28.74	71.26
9	53.21	46.79	12.64	87.36
10	83.49	16.51	52.87	47.13

Table XVII shows that the five most difficult problems for the group that passed are also the five most difficult problems for the group that failed; however, the most difficult problem for the group that passed is not the most difficult problem for the group that failed the examination. As indicated in Table XVII, problems nine, two, one, eight, and five were the most difficult to solve, in that order, for the group that passed the examination; problems one, nine, eight, five, and two were the most difficult to solve, in that order, for the group that failed the examination.

In comparison with the students who passed the examination, it seems that an unduly high percent of the students who failed, missed problems one, three, four, five, seven, eight, and ten. This may indicate a definite weakness of this group in working certain kinds of problems. Also it will be noted that a rather high percent of the students who passed the examination missed problems nine and two. This may indicate that problems nine and two are of a specialized nature.

ERRORS MADE IN WORKING PROBLEMS--Table XVIII shows the errors made by students in attempting to solve each problem.

TABLE XVIII

ERRORS INDICATING WHY PROBLEMS WERE SCORED AS INCORRECT

Problem Number	Scored As Incorrect	Method		Fundamental Processes		Placing Decimal		Other Errors	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent
1	110	108	98.18					2	1.82
2	87	79	90.82	3	3.44	3	3.44	2	2.30
3	31	22	70.97	6	19.35			3	9.68
4	30	24	80.00	2	6.67	2	6.67	2	6.66
5	68	24	35.29	5	7.35	30	44.12	9	13.24
6	5	5	100.00						
7	35	24	68.57	7	20.00	1	2.86	3	8.57
8	84	67	79.76	10	11.91	6	7.14	1	1.19
9	127	116	91.34					11	8.66
10	59	57	96.61	1	1.70	1	1.69		

Table XVIII indicates that in nine of the ten problems more students missed the problem by method than all other errors combined. In problem five more students missed the problem by an error in placing the decimal than by method. It is interesting to note that only a relatively small number of students missed problems by errors other than an error in method used.

ANALYSIS OF PROBLEMS AND ERRORS--Problem 1. A certain hybrid corn outyielded an open pollinated variety by 25%. How much more money per acre did a farmer make by using the hybrid corn in a year when the hybrid yielded 50 bushels per acre and corn sold for $2.00 per bushel?

Table XIX presents a comparison of the errors made by students who passed the examination with the errors made by students who failed the examination in solving problem one.

TABLE XIX

COMPARISON OF ERRORS MADE BY STUDENTS WHO PASSED THE MATHEMATICS EXAMINATION WITH ERRORS MADE BY THOSE WHO FAILED IT IN SOLVING PROBLEM ONE

Students Who Passed The Examination			Students Who Failed The Examination		
Type of Error	Number of Students Computing Problem Incorrectly	Percent	Type of Error	Number of Students Computing Problem Incorrectly	Percent
Method	27	100	Method	81	97.59
Fundamental Processes			Fundamental Processes		
Multiplication			Multiplication		
Subtraction			Subtraction		
Addition			Addition		
Division			Division		
Placing Decimal			Placing Decimal		
Other Errors			Other Errors	2	2.41
Totals	27	100	Totals	83	100.00

ANALYSIS OF PROBLEM ONE--As indicated in Table XIX, problem one was a difficult problem for the students who failed the examination. Eighty-three of the eighty-seven students who failed the examination missed problem one. Only twenty-seven of the 109 students who passed the examination missed this problem. Of the 110 students who missed this problem, 102 of them made the same mistake. The common error was made by taking twenty-five percent of fifty bushels which gave twelve and five tenths bushels, and then multiplying this answer times two dollars to get an answer of twenty-five dollars.

Dispite the instructions given at the top of page one of the test, twelve students, of the 109 who passed, failed to show the major steps in solving this problem. All twelve of these papers were counted as correct. Two students of the 109 who passed the examination showed the correct answer, but all work shown was incorrect. These two papers were also counted as correct by the grader. The failure to show the major steps involved may indicate cheating. This is especially likely in the two examples where all of the work was incorrect, yet the correct answer was shown.

Evidently many students did not learn how to solve percentage problems, similar to problem one, in high school, or if they did learn, they have not been required to solve problems of this nature since, and have forgotten the necessary steps involved.

Problem 2--If nitrogen, available phosphoric acid, and

potash in fertilizers are considered worth, respectively, 14¢, 7¢, and 6¢ per pound, what should be the total cost of a 4-8-4 fertilizer applied to 60 acres of corn land at the rate of 250 lb. per acre?

Table XX shows a comparison of the errors made by students who passed the examination with the errors made by those who failed it in solving problem two.

TABLE XX

COMPARISON OF ERRORS MADE BY STUDENTS WHO PASSED THE MATHEMATICS EXAMINATION WITH ERRORS MADE BY THOSE WHO FAILED IT IN SOLVING PROBLEM TWO

Students Who Passed The Examination			Students Who Failed The Examination		
Type of Error	Number of Students Computing Problem Incorrectly	Percent	Type of Error	Number of Students Computing Problem Incorrectly	Percent
Method	35	85.36	Method	44	95.66
Fundamental Processes			Fundamental Processes		
Multiplication	2	4.88	Multiplication	1	2.17
Subtraction			Subtraction		
Addition			Addition		
Division			Division		
Placing Decimal	3	7.32	Placing Decimal		
Other Errors	1	2.44	Other Errors	1	2.17
Totals	41	100.00	Totals	46	100.00

ANALYSIS OF PROBLEM TWO--Table XX shows that out of the total of eighty-seven students who missed this problem, seventy-nine missed the problem by an error in method. Sixty-seven of the seventy-nine students made the same error. This error was made because the student did not understand the meaning of the numerals representing the formula of the fertilizer used. The student assumed that the formula 4-8-4 indicated that twenty-five percent of the fertilizer was nitrogen, fifty percent P_2O_5, and twenty-five percent K_2O. They evidently did not know that the fertilizer contained any filler.

Very few students have had any experience in distributing fertilizer, and have had little occasion for solving problems of this nature. Lack of experience in solving fertilizer problems was not limited to sophomores and juniors as is evidenced by the fact that twenty-nine of the eighty-seven students who missed this problem classified themselves as seniors.

Answers given for problem two by the students who missed it ranged from a low of twelve dollars and seventy-five cents to one student's high of $20,520. The most common answer given was $1275. These answers indicate that the student did not have any conception of the cost of fertilizing crops, or they did not check their answers to determine how reasonable the answers were.

From the evidence given, it seems that problem two is rather specialized.

As shown in Table XX, only eight students missed problem two by errors other than an error in method. One student failed to show the major steps involved in solving this problem, and another student gave the right answer although all work shown was incorrect. These two papers were counted as correct by the grader. Sixteen students who missed the problem by an error in method also made other errors. Twelve of these students made mistakes in the use of one or more of the fundamental processes, and four made errors in the placing of the decimal.

Problem Three--A wheat bin is 8 ft. long, 6 ft. wide, and 4 ft. deep. How many bushels of wheat does it contain if it is three-fourths full? (1 bu. of wheat occupies 1¼ cu. ft.)

Table XXI presents a comparison of the errors made by students who passed the examination with the errors made by those who failed it in solving problem three.

TABLE XXI

COMPARISON OF ERRORS MADE BY STUDENTS WHO PASSED THE MATHEMATICS EXAMINATION WITH ERRORS MADE BY THOSE WHO FAILED IT IN SOLVING PROBLEM THREE

Students Who Passed The Examination			Students Who Failed The Examination		
Type of Error	Number of Students Computing Problem Incorrectly	Percent	Type of Error	Number of Students Computing Problem Incorrectly	Percent
Method	1	20	Method	21	80.77
Fundamental Processes			Fundamental Processes		
Multiplication	1	20	Multiplication	4	15.38
Subtraction			Subtraction		
Addition			Addition		
Division			Division		
Placing Decimal			Placing Decimal	1	3.85
Other Errors	3	60	Other Errors		
Totals	5	100	Totals	26	100.00

ANALYSIS OF PROBLEM THREE--As indicated in Table XXI, twenty-two of the thirty-one students who missed this problem missed it by an error in method. Twenty-one of these were students who failed the examination. Ten of the students multiplied one and one-half cubic feet times the volume in cubic feet found in the bin instead of dividing this figure by one and one-half cubic feet. Five students failed to take three-fourths of the volume of the bin. Three students evidently did not know how to find the volume of the bin in cubic feet. One student worked the problem correctly, then scratched through his work and circled the wrong answer. As this student did not show how he arrived at this answer, it may be that he borrowed it from a neighbor.

Problem Four--If a board foot of lumber is 1 ft. long, 1 ft. wide and 1 inch thick, how many board feet are in a timber 30 ft. long and 18 inches square?

Table XXII presents a comparison of the errors made by students who passed the examination with the errors made by the students who failed the examination in solving problem four.

TABLE XXII

COMPARISON OF ERRORS MADE BY STUDENTS WHO PASSED THE MATHEMATICS EXAMINATION WITH ERRORS MADE BY THOSE WHO FAILED IT IN SOLVING PROBLEM FOUR

Students Who Passed The Examination			Students Who Failed The Examination		
Type of Error	Number of Students Computing Problem Incorrectly	Percent	Type of Error	Number of Students Computing Problem Incorrectly	Percent
Method Fundamental Processes	1	100	Method Fundamental Processes	23	79.31
Multiplication			Multiplication	2	6.90
Subtraction			Subtraction		
Addition			Addition		
Division			Division		
Placing Decimal			Placing Decimal	2	6.90
Other Errors			Other Errors	2	6.90
Totals	1	100	Totals	29	100.00

ANALYSIS OF PROBLEM FOUR--As indicated in Table XXII, thirty students missed problem four. Twenty-four of these students missed the problem by an error in method. The answers of thirty board feet given by two students are examples of the inability of many students to rationalize their answers. In Problem four, it may be seen that each running foot contains one and one-half board feet of lumber; therefore, in order to solve the problem, the student merely needed to multiply 30 X 1.5 X 18 to get the correct answer. Eight students multiplied 30 X 1.5 X 1.5 to get an answer of 67.5 board feet. Five students multiplied 30 X 1.5 to get an answer of 45 board feet.

Problem Five-- 1,000 lbs. of milk when separated gave 105 pounds of cream testing 35% butterfat and 895 lbs. skim milk testing 0.05% butterfat. What percent butterfat did the milk contain?

Table XXIII presents a comparison of the errors made by students who passed the examination with errors made by the students who failed the examination in solving problem five.

TABLE XXIII

COMPARISON OF ERRORS MADE BY STUDENTS WHO PASSED THE MATHEMATICS EXAMINATION WITH ERRORS MADE BY THOSE WHO FAILED IT IN SOLVING PROBLEM FIVE

Students Who Passed The Examination			Students Who Failed The Examination		
Type of Error	Number of Students Computing Problem Incorrectly	Percent	Type of Error	Number of Students Computing Problem Incorrectly	Percent
Method	2	10.53	Method	22	44.90
Fundamental Processes			Fundamental Processes		
Multiplication	3	15.79	Multiplication	1	2.04
Subtraction			Subtraction		
Addition	1	5.26	Addition		
Division			Division		
Placing Decimal	13	68.42	Placing Decimal	17	34.69
Other Errors			Other Errors	9	18.37
Totals	19	100.00	Totals	49	100.00

ANALYSIS OF PROBLEM FIVE--Table XXIII indicates that the major error made in solving problem five was made in the placing of the decimal. In this problem a higher percent of the students who passed the mathematics examination made errors in the placing of the decimal than did the students who failed the mathematics examination. In multiplying .05 % X 895, many students multiplied .05 X 895 instead of .0005.

Problem five seems to be a rather specialized problem, and it is doubtful if many students have had any experience in solving problems of this nature. This problem seems to emphasize the difficulty many students have with percent problems in general.

Problem Six--A butcher buys a 1200 lb. steer at $30.00 per cwt. The steer shrank 5% during his trip to the slaughter house and dressed out 60%. For how much per pound will he have to sell the dressed carcass to break even? Labor costs are not considered.

Table XXIV presents a comparison of the errors made by students who passed the examination with errors made by the students who failed the examination in solving problem six.

TABLE XXIV

COMPARISON OF ERRORS MADE BY STUDENTS WHO PASSED THE MATHEMATICS EXAMINATION WITH ERRORS MADE BY THOSE WHO FAILED IT IN SOLVING PROBLEM SIX

Students Who Passed The Examination			Students Who Failed The Examination		
Type of Error	Number of Students Computing Problem Incorrectly	Percent	Type of Error	Number of Students Computing Problem Incorrectly	Percent
Method	1	100	Method	4	100
Fundamental Processes			Fundamental Processes		
Multiplication			Multiplication		
Subtraction			Subtraction		
Addition			Addition		
Division			Division		
Placing Decimal			Placing Decimal		
Other Errors			Other Errors		
Totals	1	100	Totals	4	100

ANALYSIS OF PROBLEM SIX--Table XXIV indicates that only five students missed problem six, and all of these missed by an error in method. Nine other students calculated this problem incorrectly, but their answers were accepted as correct by the grader. Five students did not show the steps involved in solving this problem but the grader accepted their answers as correct.

Problem Seven--Three cows produced a total of 30,000 pounds of milk in a year. Cow A produced 450 lbs. butterfat. Cows B and C together produced 20,000 lbs. of milk. If milk from the three cows averaged 5% butterfat, what was the average percent of Cows B and C?

Table XXV presents a comparison of the errors made by students who passed the examination with the errors made by those who failed the examination in solving problem seven.

TABLE XXV

COMPARISON OF ERRORS MADE BY STUDENTS WHO PASSED THE MATHEMATICS EXAMINATION WITH ERRORS MADE BY THOSE WHO FAILED IT IN SOLVING PROBLEM SEVEN

Students Who Passed The Examination			Students Who Failed The Examination		
Type of Error	Number of Students Computing Problem Incorrectly	Percent	Type of Error	Number of Students Computing Problem Incorrectly	Percent
Method	4	80	Method	20	66.67
Fundamental Processes			Fundamental Processes		
Multiplication			Multiplication		
Subtraction			Subtraction	4	13.33
Addition			Addition		
Division	1	20	Division	2	6.67
Placing Decimal			Placing Decimal	1	3.33
Other Errors			Other Errors	3	10.00
Totals	5	100	Totals	30	100.00

ANALYSIS OF PROBLEM SEVEN--As indicated in Table XXV, thirty-five students missed problem seven. Twenty of the students who failed the examination missed the problem by an error in method, and seven missed the problem by an error in one or more of the fundamental processes. Only five of the students who passed the examination missed this problem. Many different answers were given for this problem. Answers ranged from one student's low of .25% to one student's high of .55%. Four students did not show the major steps involved in solving the problem, but their answers were accepted as correct. The work shown by one student was incorrect, but the answer was correct, and the student received credit for working the problem correctly. This problem again indicated that many students have difficulty in solving percent problems.

Problem Eight--A load of 30 feeder calves weighed 15,500 pounds when loaded in Texas and cost $8.00 per cwt. During shipment to Stillwater these calves shrank 3%, and the freight cost was $45.00, what would be the final cost per cwt. when unloaded in Stillwater?

Table XXVI presents a comparison of the errors made by students who passed the examination with the errors made by those who failed the examination in solving problem eight.

TABLE XXVI

COMPARISON OF ERRORS MADE BY STUDENTS WHO PASSED THE MATHEMATICS EXAMINATION WITH ERRORS MADE BY THOSE WHO FAILED IT IN SOLVING PROBLEM EIGHT

Students Who Passed The Examination			Students Who Failed The Examination		
Type of Error	Number of Students Computing Problem Incorrectly	Percent	Type of Error	Number of Students Computing Problem Incorrectly	Percent
Method	13	59.09	Method	54	87.10
Fundamental Processes			Fundamental Processes		
Multiplication	1	4.55	Multiplication		
Subtraction	1	4.55	Subtraction		
Addition	1	4.55	Addition		
Division	3	15.63	Division	4	6.45
Placing Decimal	3	13.63	Placing Decimal	3	4.84
Other Errors			Other Errors	1	1.61
Totals	22	100.00	Totals	62	100.00

ANALYSIS OF PROBLEM EIGHT--Table XXVI indicates that a total of eighty-eight students failed to compute problem eight correctly. Fifty-four of the students who failed the examination missed this problem by an error in method as compared to thirteen of the students who passed the examination. Nine of the students who passed the examination missed the problem by an error in the use of one or more of the fundamental processes as compared to eight of the students who failed.

Again it is noted that many students fail to rationalize their answers. Despite the fact that the problem calls for the cost per cwt., many students gave answers of over $1000, and one student gave an answer of $2,322.20. One student's answer of $6.11 is considerable lower than the $8.00 per hundred paid for the calves, yet it is stated in the problem that the calves shrank 3% and the freight cost was $45.00.

Twenty students added the 3% shrinkage to the original cost, then took 3% shrinkage from the weight of the calves which actually made a shrinkage of 6%. Twelve students divided the weight of the calves by the total cost instead of dividing the cost by the weight. Nine students failed to take into consideration the 3% shrinkage, and three students failed to add the freight rates.

Answers seem to indicate that many students were careless in checking the entire problem, and especially in checking their answers to determine if the answers were

reasonable for this problem.

Problem Nine--How many pounds of cottonseed meal analyzing 41.9 percent crude protein should be added to 100 lbs. of feed analyzing 16.3 percent crude protein to produce a feed containing 23% crude protein?

Table XXVII presents a comparison of the errors made by students who passed the examination with the errors made by those who failed the examination in solving problem nine.

TABLE XXVII

COMPARISON OF ERRORS MADE BY STUDENTS WHO PASSED THE MATHEMATICS EXAMINATION WITH ERRORS MADE BY THOSE WHO FAILED IT IN SOLVING PROBLEM NINE

Students Who Passed The Examination			Students Who Failed The Examination		
Type of Error	Number of Students Computing Problem Incorrectly	Percent	Type of Error	Number of Students Computing Problem Incorrectly	Percent
Method	50	98.04	Method	66	86.84
Fundamental Processes			Fundamental Processes		
Multiplication			Multiplication		
Subtraction			Subtraction		
Addition			Addition		
Division			Division		
Placing Decimal			Placing Decimal		
Other Errors	1	1.96	Other Errors	10	13.16
Totals	51	100.00	Totals	76	100.00

ANALYSIS OF PROBLEM NINE--Table XXVII indicates that problem nine was the most difficult problem, and was missed by a total of 127 students. Of the students who failed the examination, sixty-six missed this problem by an error in method as compared to fifty of the students who passed the examination.

Of the total students who missed this problem, thirty-eight subtracted 16.3% from 23% then divided this answer by .419. Eighteen students attempted to solve the problem by the square method. In most cases the student set up the square correctly, but did not realize the true meaning of the figures after he subtracted. Eight students subtracted 16.3% from 23% then multiplied the answer by .419. Ten students made no attempt to solve this problem. Three students circled the correct answer, but all the work shown by these students was wrong.

This seems to be another specialized problem that many students have had little experience in solving. It is true that many students have had problems of this type in certain college courses, however, without further practice, it is difficult to remember how to solve a problem of this nature.

Of the 127 students who failed to solve this problem, thirty-nine classified themselves as seniors.

Problem Ten--A man pays $200 per acre for 160 acres of land. His taxes are $200 per year and his repair costs for fences, buildings, etc., are $50.00 per year. For how much

will he have to rent his farm per year to make 5% on his original investment?

Table XXVIII presents a comparison of errors made by students who passed the examination with the errors made by those who failed the examination in solving problem ten.

TABLE XXVIII

COMPARISON OF ERRORS MADE BY STUDENTS WHO PASSED THE MATHEMATICS EXAMINATION WITH ERRORS MADE BY THOSE WHO FAILED IT IN SOLVING PROBLEM TEN

Students Who Passed The Examination			Students Who Failed The Examination		
Type of Error	Number of Students Computing Problem Incorrectly	Percent	Type of Error	Number of Students Computing Problem Incorrectly	Percent
Method	18	100	Method	39	95.12
Fundamental Processes			Fundamental Processes		
Multiplication			Multiplication		
Subtraction			Subtraction		
Addition			Addition		
Division			Division	1	2.44
Placing Decimal			Placing Decimal	1	2.44
Other Errors			Other Errors		
Totals	18	100	Totals	41	100.00

ANALYSIS OF PROBLEM TEN--As indicated in Table XXVIII, fifty-nine students missed problem ten. Only two students missed this problem by errors other than an error in method. Thirty-seven of the total of fifty-nine students who missed this problem added all expenses to the cost of the land, and then took five percent of this figure. Seventeen students took five percent of the cost of the land, but did not add the other expenses to this figure. One student had the correct answer, but all of his work was wrong.

ANALYSIS OF DATA CONCERNING THE JUNIOR STANDING ENGLISH EXAMINATION

PURPOSE AND INSTRUCTIONS--The primary purpose of the junior standing English examination is to determine if the student is capable of expressing himself in writing in a clear, concise manner. Generally, minor errors in punctuation and occasional errors in grammar and spelling are ignored by the grader if the student can express his ideas clearly. Students are permitted to write on topics related to agriculture, and content of the theme is not as important as the manner in which it is stated.

An instruction sheet containing the following information was given to each of the 310 students who took the junior standing English examination October 25, 1951.

JUNIOR STANDING ENGLISH EXAMINATION

SUBJECT: "Recent Advances In Agriculture"

INSTRUCTIONS:
Put your name and major department on the front of the blue book.

OBJECT:
This test is to ascertain whether the student can express his ideas clearly in writing.

TEST:
Write a short theme about 4 pages on a subject that will be announced. The use of a dictionary will be permitted. (Please bring one with you) It is an excellent idea for a writer to outline a theme before starting to write, especially if he has trouble with English.

GRADING:
The theme will be read by 4 staff members of the major

department. The themes will be classified as satisfactory or unsatisfactory. In case two staff members mark satisfactory, and two mark unsatisfactory, a fifth individual will read the theme and pass judgment.

CAUTION:
The English and Mathematics Tests must be passed before a student can graduate. If a student fails either test twice, he must present evidence that he has made further study of the subject before he will be permitted to take the test a third time.

An examination of the test papers reveal that the students were not limited to the title given in the instruction sheet. They were permitted to write on "Farming As A Way of Life" or "Conservation of Our Natural Resources", if they preferred.

Table XXIX shows the percent of the students who failed this examination.

TABLE XXIX

RESULTS OF THE JUNIOR STANDING ENGLISH EXAMINATION

Students Who Passed		Students Who Failed	
Total Number	256	Total Number	54
Percent	82.58	Percent	17.42

HOW THEMES WERE GRADED--Evidently in most departments, the themes were read by three staff members, and the members graded the themes either satisfactory or unsatisfactory. If as many as two of the graders considered the theme satisfactory, it was considered that the student had passed the examination. Papers indicating how the graders scored each theme were available for six departments. These papers indicate

that the graders were not always in complete agreement as to whether a theme should be graded as satisfactory or unsatisfactory.

Table XXX shows how the graders of six departments graded the themes of students in their department.

TABLE XXX

THE JUDGMENT OF THE GRADERS OF SIX DEPARTMENTS AS TO THEMES BEING SATISFACTORY OR UNSATISFACTORY

How Themes Were Graded	Hort.	Poultry H.	Dairy	Animal H.	Soils	Field Crops
Total Themes Graded	8	5	5	118	24	32
Themes Graded Satisfactory by all Three Teachers	5	5	3	70	14	24
Themes Graded Satisfactory by Two Teachers and Unsatisfactory by One	3	0	2	18	3	3
Themes Graded Unsatisfactory by All Three Teachers	0	0	0	13	3	2
Themes Graded Unsatisfactory by Two Teachers and Satisfactory by One	0	0	0	17	4	3

ANALYSIS OF TABLE XXX--Table XXX shows that out of a total of 192 themes graded in the six departments, there was some disagreement as to how fifty-three of these papers should be graded.

In order to compare the students who passed the examination with the students who failed the examination, forty-six students were chosen at random from the students who passed the examination. Table XXXI presents a comparison of these students with the students who failed the examination in units of English and vocational agriculture completed in high school.

TABLE XXXI

A COMPARISON OF 46 STUDENTS, CHOSEN AT RANDOM FROM THE 256 STUDENTS WHO PASSED THE ENGLISH EXAMINATION, WITH THE 54 STUDENTS WHO FAILED AS TO THE UNITS OF CERTAIN HIGH SCHOOL SUBJECTS COMPLETED

High School Subject	Students Who Passed		Students Who Failed	
	Percent Completing ½ Unit or More	Average number of Units	Percent Completing ½ Unit or More	Average Number of Units
English	100	3.90	96.30	3.76
Vocational Agriculture	30.43	2.67	31.48	2.64

ANALYSIS OF TABLE XXXI--Table XXXI indicates that a slightly higher percent of the students who passed the examination had completed ½ unit or more of English in high school than had the students who failed the examination. Two of the students who failed the examination were special students without credit in any high school work. This fact accounts for the difference between these two groups in percent of students who had completed ½ unit or more of English. It may be noted that there is very little difference between these two groups in average number of units of English completed, average number of units of vocational agriculture completed, and in the percent of each group who had completed ½ or more units of vocational agriculture. It seems that the units of high school English and vocational agriculture completed by the student had little influence upon his ability to pass the junior standing English examination.

Table XXXII presents a comparison of forty-six students who passed the examination with the fifty-four students who failed it in average number of college hours completed, average hours of technical agriculture completed, and average grade point made in technical agriculture.

TABLE XXXII

A COMPARISON OF 46 STUDENTS, CHOSEN AT RANDOM FROM THE 256 STUDENTS WHO PASSED THE ENGLISH EXAMINATION, WITH THE 54 STUDENTS WHO FAILED, IN TOTAL HOURS OF COLLEGE WORK COMPLETED AND AVERAGE GRADE POINT MADE IN TECHNICAL AGRICULTURE

Students Who Passed		Students Who Failed	
Total Number	46	Total Number	54
Average Hours of College Completed	84.69	Average Hours of College Completed	76.00
Average College Hours of Technical Agriculture Completed	29.91	Average College Hours of Technical Agriculture Completed	24.79
Average Grade Point In Technical Agriculture	2.72	Average Grade Point In Technical Agriculture	2.42

ANALYSIS OF TABLE XXXII--Table XXXII shows that the students who passed the examination had completed more college hours and more hours of technical agriculture than had the group who failed. Students who passed the examination averaged 8.69 hours more of college work completed and 5.12 hours more of technical agriculture completed than did the students who failed. The difference in average grade point made in technical agriculture is .30 in favor of the students who passed the examination. It seems that the difference between the two groups in average number of college hours completed, average number of hours of technical agriculture completed, and average grade point made in technical agriculture is not great enough to be significant.

Table XXXIII presents a comparison of forty-six students who passed the examination with the fifty-four who failed in hours of English completed in college.

For the benefit of readers who are unfamiliar with the English courses listed in Table XXXIII, the following description is given: English 103 is a basic course for students who have difficulty in writing; it is especially recommended for students who make low scores on the entrance tests. English 113 is freshman composition. Students are trained in correct and effective writing of English through rhetoric, composition, correction of themes, and selected readings. English 203 is a more advanced course in English composition. This course is based upon discussion of required reading and the writing of papers based on the reading.

TABLE XXXIII

A COMPARISON OF 46 STUDENTS, CHOSEN AT RANDOM FROM THE 256 STUDENTS WHO PASSED THE ENGLISH EXAMINATION, WITH THE 54 STUDENTS WHO FAILED, AS TO HOURS OF COLLEGE ENGLISH COMPLETED WITH A GRADE OF D OR HIGHER

College Subject	Students Who Passed			Students Who Failed		
	Percent Completing 1 Hour or More	Average Hours	Average Grade Point	Percent Completing 1 Hour or More	Average Hours	Average Grade Point
English 103	6.52	3	2.00	27.78	3	1.27
English 113	100.00	3	2.13	92.59	3	1.68
English 203	97.83	3	2.15	77.78	3	1.90
Other English	2.17	3	3.00	9.26	3.80	2.05

ANALYSIS OF TABLE XXXIII--Table XXXIII shows that over twenty percent more of the students who failed the examination had completed English 103 than had the students who passed the examination; however, over twenty percent more of the students who passed the examination had completed English 203 than had the students who failed. Students who took English 113 and 203 demonstrated that they were more capable of passing the examination than were students who took English 103 and 113. Average hours of English completed in college are the same for both groups in all courses except courses listed as other English, and the percent of students taking other English courses is not large enough to be significant. It will be noted that students who failed had grade point averages in English composition below two point while the students who passed had grade point averages slightly above this figure. This study does not show any relationship between the number of hours of English completed in college and the student's ability to pass the junior standing English examination.

Tables XXXIV and XXXV show the distribution of the L scores of forty students who failed the examination and twenty-nine students who passed the examination. These percentile scores indicate the rank of the students in comparison with other college freshmen throughout the United States.

TABLE XXXIV

DISTRIBUTION OF L SCORES* MADE ON PSYCHOLOGICAL TESTS BY 40 STUDENTS WHO FAILED THE ENGLISH EXAMINATION

Scores	Frequency
61-65	1
56-60	0
51-55	0
46-50	0
41-45	1
36-40	2
31-35	1
26-30	1
21-25	6
16-20	5
11-15	3
6-10	13
1- 5	7

N	40
Median	10.50
Mean	15.88

*L Scores--language Ability

TABLE XXXV

DISTRIBUTION OF L SCORES* MADE ON PSYCHOLOGICAL TESTS BY 29 STUDENTS WHO PASSED THE ENGLISH EXAMINATION

Scores	Frequency
96-100	1
91- 95	0
86- 90	0
81- 85	0
76- 80	3
71- 75	0
66- 70	1
61- 65	1
56- 60	2
51- 55	0
46- 50	0
41- 45	2
36- 40	3
31- 35	1
26- 30	0
21- 25	2
16- 20	2
11- 15	5
6- 10	4
1- 5	2

N	29
Median	24.25
Mean	34.38

*L Scores--Language Ability

ANALYSIS OF TABLE XXXIV AND TABLE XXXV--Table XXXIV shows that only one of the forty students who failed the examination made an L score above the sixtieth percentile, and twenty of the forty students made scores below the eleventh percentile. The low median and mean score show that this group is definitely low in language ability compared to other college freshmen.

Table XXXV shows that six of the twenty-nine students who passed the examination made L scores above the sixtieth percentile and six made scores below the eleventh percentile. The median and mean scores of this group is definitely higher than those for the group who failed the examination. The difference between the median and mean scores of the two groups is 13.75 and 18.50 respectively.

Tables XXXVI and XXXVII show the distribution of the T scores of forty students who failed the English examination, and twenty-nine students who passed the English examination.

TABLE XXXVI

DISTRIBUTION OF T SCORES* MADE ON PSYCHOLOGICAL TESTS BY 40 STUDENTS WHO FAILED THE ENGLISH EXAMINATION

Scores	Frequency
61-65	1
56-60	2
51-55	0
46-50	1
41-45	1
36-40	2
31-35	1
26-30	3
21-25	3
16-20	8
11-15	4
6-10	9
1- 5	5

N	40
Median	16.75
Mean	20.38

*T Scores--Total Score

TABLE XXXVII

DISTRIBUTION OF T SCORES* MADE ON PSYCHOLOGICAL TESTS BY 29 STUDENTS WHO PASSED THE ENGLISH EXAMINATION

Scores	Frequency
96-100	0
91- 95	0
86- 90	2
81- 85	0
76- 80	0
71- 75	1
66- 70	1
61- 65	2
56- 60	2
51- 55	1
46- 50	0
41- 45	2
36- 40	0
31- 35	4
26- 30	2
21- 25	3
16- 20	2
11- 15	2
6- 10	3
1- 5	2
N	29
Median	31.12
Mean	36.10

*T Scores--Total Score

ANALYSIS OF TABLE XXXVI AND TABLE XXXVII--Table XXXVI shows that of the forty students who failed the English examination, only one student made a score above the sixtieth percentile while eighteen students made T scores below the sixteenth percentile. Table XXXVII shows that of the twenty-nine students who passed the examination, six made T scores above the sixtieth percentile while only seven made T scores below the sixteenth percentile. The median and mean scores of the students who passed are considerable higher than the scores of the students who failed. The difference between the median and mean scores of the two groups is 14.37 and 15.72 respectively. These scores seem to indicate that the students who passed the English examination score higher in reasoning and language ability than the students who failed the English examination.

ANALYSIS OF DATA CONCERNING GRADES MADE IN SCIENCE IN COLLEGE

INFLUENCE OF HIGH SCHOOL SCIENCE--A reason that is often given for low grades made by students in college science is that many students do not take enough science in high school to give them the proper background. In order to determine the influence that units of science completed in high school have upon the grades made in science in college, the average units of science completed in high school and the average grade point made in science in college were computed for 221 students whose records were checked for the English and mathematics examination study.

Table XXXVIII presents a comparison of the grades made in science in college by students who had completed from one to four units of science in high school.

TABLE XXXVIII

AVERAGE GRADES MADE IN SCIENCE IN COLLEGE COMPARED ON A BASIS OF THE NUMBER OF UNITS OF SCIENCE COMPLETED IN HIGH SCHOOL BY 221 STUDENTS

Number of Students	Units of High School Science	Average Grade Point In College Science
7	0	2.49
77	1	2.31
104	2	2.35
2	$2\frac{1}{2}$	2.73
23	3	2.52
1	$3\frac{1}{2}$	2.53
7	4	1.83

ANALYSIS OF TABLE XXVIII--Table XXXVIII indicates that units of science completed in high school have very little influence upon the grades made in science in college. Students who had completed one unit of science in high school and those who had completed two made practically the same grades in science in college. Students who had completed three units of science in high school made slightly higher grades in college than those who had completed one or two units. The difference does not appear great enough to be of any importance. Students without credit in any science in high school and those who had completed four units were too few to offer a true comparison.

SUMMARY AND CONCLUSIONS

Units of mathematics completed in high school and hours of mathematics completed in college have little influence upon the ability of students to make a passing grade on the junior standing mathematics examination. This is especially true in the case of algebra, geometry, and trignometry. It seems likely that the lack of similarity between the problems studied in these courses and the problems given on the junior standing examination is a major reason why these courses do not influence the grades made by students on the examination.

Agricultural economics 233 and dairy 123 seem to be of some benefit in preparing students for the junior standing examination. Similarity of problems worked in laboratory exercises to problems given on the examination is probably a major reason for this influence. Problems seven, five, and nine are good examples of the type of problems found in the laboratory exercises of dairy 123.

Students who failed the examination are definitely weak in the ability to solve percent problems. This was especially evident in problem five in which many students demonstrated that they could not convert .05% to the decimal form. Another weakness of the students was their inability to rationalize their answers. Failure to rationalize may be due to the lack of experience of the student or to neglect in comparing

answers to the demands of the problem.

Several problems given in this examination may be considered specialized. This is especially true of problems two, five, seven, and nine. While students may have solved problems similar to these in certain college courses, it is evident that they did not learn thoroughly enough to remember the necessary steps involved.

Is the ability to solve problems similar to the ones given on the junior standing examination necessary in order for the student to do satisfactory work in technical agriculture? Evidently it is not, when it is recalled that the students who failed the examination averaged 2.48 in technical agriculture. This seems to be further borne out by the fact that twenty-five of the eighty-seven students who failed the examination were seniors.

It is the opinion of the writer that the longer the student delays in taking the examination, the less likely he is of passing it; therefore, it seems that the mathematics examination should be given sometime during the freshman year. This examination should consist of problems of an unspecialized nature. If cheating were eliminated on this examination, students who were weak in mathematics could be detected. Students who were in need of more training in mathematics could then enroll in a basic course in farm arithmetic at the beginning of their sophomore year.

Units of English completed in high school and hours of English completed in college have little influence upon the

ability of students to make a passing grade on the junior standing English examination. However, students who took English 113 and 203 demonstrated that they were more capable of passing the junior standing English examination than were the students who took English 103 and 113.

In reading the themes of the students who failed the English examination, the writer found considerable evidence that indicated that the students did not read the themes after they had written them. This carelessness was evidenced by the number of students who had omitted words, and failed to use the correct tense in the use of simple verbs. Misspelled words were common, and a few students misspelled a word in the title. Poor sentence structure, incorrect punctuation, and a lack of coherence were other common errors.

Students who failed the English examination had an average of 2.42 in technical agriculture which shows that they were doing fairly satisfactory work without the ability to express themselves adequately in writing. This may indicate that the junior standing English examination is not an accurate measure of the student's ability to write, or that instructors in the school of agriculture have rather low standards for students written assignments.

Students who passed the mathematics examination made slightly higher scores on the college entrance examination than did the students who failed the examination. This difference did not appear great enough to be important. Students who passed the English examination made considerably higher

grades on the college entrance examination than did the students who failed. Explanations as to why there were greater difference between the scores made on the entrance examination between the group that failed and the group that passed the English examination than there were between the group that failed and the group that passed the mathematics examination is beyond the scope of this study. It may be mentioned here, however, that sixteen students failed both the English and the mathematics examination. If the scores made by these students were extremely low, these scores would lower the average of the group that failed the English examination more than they would lower the average score made by the group that failed the mathematics examination.

The fact that several seniors failed the tests indicates that there is very little advantage in waiting until the senior year to take the junior standing examinations. It may be that several of the senior students had taken the examinations before and failed them. Sophomores demonstrated that they were as capable of passing the examinations as were the juniors and seniors.

A few of the students who failed the examinations had extremely low grade point averages in all college subjects. It is probable that these students are incapable of doing satisfactory college work. This is especially true of senior students who have more than enough hours for a degree, but whose low grade point average prevents them from graduating.

There is some evidence that the college grade point of

the student is a better indication of the student's ability to pass the junior standing examination than units or hours of work completed. Students who failed the examination had average grade points under 2.5 while the students who passed had average grade points of approximately 2.7.

The writer must admit that the factors that may have influenced the grades made on the examination by the students are still rather obscure. Perhaps more was accomplished in disproving the influence of certain factors than in determining the factors that influence the grades made by students in college mathematics, English, and science.

This study shows that in the case of science, mathematics, and English, units completed in high school and hours completed in college have little influence upon the student's ability to make satisfactory grades in these subjects. Official credit in a course is no guarantee that the student has mastered the subject or that he will long remember what he did learn. It seems likely that many factors that are difficult to measure are more important than official credit in a course. The natural ability of the student, interest he had in the course at the time he was taking it, and the quality of the instruction he received, cannot be shown on a student's transcript, yet it may be that these and other personal factors are far more important than units or hours completed as factors influencing the grades made by students in college.

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TYPIST PAGE

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