

***Effectiveness of the Tutoring Services in Algebra  
at the College Level***

*This thesis was presented to  
The Faculty of the Mathematics Program  
California State University Channel Islands*

*The Thesis conducted in partial fulfillment  
of the requirement for the degree  
Masters of Science in Mathematics*

*By*

*Hoda Kerissa*

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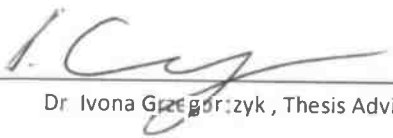
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Effectiveness of the tutoring services at the College level  
Title of Item

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Author s Name (Print)

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To my mother Kedissa Kerissa and my father Moried Ibrahim Kerissa.

I would like to Thank my mother Kedissa Kerissa, and my father Moried Ibrahim Kerissa, for everything they have done for me and always supporting me throughout my education. They encouraged me to achieve my goals.



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## **Chapter 1. Introduction.**

Tutoring Centers are designed to assist students in becoming independent learners with study skills and strategies that will help them succeed in classes across the curriculum. Those are not intended to replace direct instructions classroom, but to enhance studying and learning habits. In addition, tutoring helps students who work off campus and those who may have difficulty asking instructors questions during the class sessions by providing unstructured learning environment.

### **1.1 Purpose of the study.**

In this study, we evaluated the effectiveness of the tutoring services at two college centers and one university center. We collected data on their ability to provide students with improvement of their learning skills and achievement of their academic goals. We created a survey to get an accurate evaluation for specific tutoring services given in algebra. The survey included anonymous questions and we expected the students to rate the algebra tutoring services honestly, as well as share their thoughts about the centers.

### **1.2 Survey.**

The survey included questions about learning and the influences that affect the students' experience at the tutoring center. Also, we evaluated the students' background and attitudes towards algebra. For the statistical analysis of data we used Excel software. This study has provided interesting results and we made conclusions from our data analysis. We included some recommendations as well as the students' comments about how to improve the tutoring services at the end of this paper.

### **1.3 Typical Mission of Tutoring Centers:**

1. Tutoring Center is designed to assist students in becoming independent learners with excellent study skills.
2. Tutoring Center is helping all students, especially the ones who work outside of campus and the ones who have difficulty asking instructors questions during the class sessions.

## Chapter 2. Motivation.

Our mission is to find various issues and ways to improve services of tutoring centers. We decided to evaluate tutoring services because the students rely on them for supplemental instructions. Below we stated commonly held opinions about tutoring centers:

1. Tutoring Centers not only help students in their classes. They also help to create self-sufficient learners with accountability and independence.
2. Attending Tutoring Center motivates the students to study.
3. Students have the opportunity to study in groups.
4. Students get help solving difficult questions.
5. Students are motivated to do their homework.
6. Going to the Tutoring Center helps students to review and prepare for quizzes and tests.
7. Tutoring gives students the opportunity to review mistakes in their quizzes, tests, and the chance to learn from their mistakes.
8. Attending Tutoring regularly may help students improve their grades.
9. For students who missed lectures, the tutors are the source of invaluable knowledge explaining the content of the lectures.
10. Students gain more self-confidence in understanding the material with tutors.
11. When students learn more through tutoring, they will have self-sufficiency skills and rely on themselves.

## Chapter 3. Methodology

The purpose of this research is to evaluate the effectiveness of the tutoring center to find ways to help students improve their academic success in algebra. We designed the survey for the students that consisted of 22 multiples choice questions. Here are some examples of the survey questions [see Appendix 1]

### 3.1 Survey Questions:

- Do you like math?
- How many courses are you taking this semester?
- Do you work?
- How many hours a day do you spend doing your math homework?
- How often do you go to Tutoring Center for help?
- Why do you go to Tutoring Center for help?
- Do you get the help you need at the Tutoring Center?

### 3.2 Sample population:

Participants were randomly selected from students that attended tutoring centers at Ventura College, Oxnard College and California State University Channel Islands. All of the students *were* enrolled in algebra classes and they have been in college for at least one semester.

### 3.3 Demographic characteristics:

- Most of the students were younger than 24.
- All the students understood and spoke English well.
- All of them were enrolled in introductory algebra classes at college level.
- About half of the participants were from the university and the other half from community colleges.
- All participants of this study asked for help at one of the Tutoring Centers.

### 3.4 Description of the sample experiment:

The data consists of students' multiple choice, answers rating specific services on a given scale. The results followed one of the two distributions below:

#### 1. Multinomial distribution:

- Multinomial distribution answers that have multiple discrete outcomes.

#### 2. Binomial distribution:

- Discrete probability distribution with two outcomes.
- Binomial distribution is a specific type of multinomial distribution in which there are only two possible outcomes to an event.

The raw data was collected in a Microsoft Excel spreadsheet, scores were assigned to each answer, frequencies were calculated and results were displayed on graphs.

## Chapter 4. Relations between variables:

### 4.1 Statistical method.

We used Pearson's correlation coefficient to compare the data. We calculated the quantity  $r$ , called the linear correlation coefficient measuring the strength and the direction of a linear relationship between two variables. The linear correlation coefficient  $r$  is referred to as the Pearson Product Moment Correlation coefficient in honor of its developer Karl Pearson.

### 4.2 Pearson correlation $r$ :

- The closer  $r$  is to +1 or -1, the greater the absolute value of a correlation coefficient, the stronger the linear relationship.
- The strongest linear relationship is indicated by a correlation coefficient of -1 or 1.
- The weakest linear relationship is indicated by a correlation coefficient close to 0.
- A positive correlation : if one variable gets bigger, the other variable tends to get bigger.
- A negative correlation: if one variable gets bigger, the other variable tends to get smaller.

- No correlation,  $r$  approximately equal to 0: If there is no relationship between the two variables such that the value of one variable changes and the other variable remains constant.

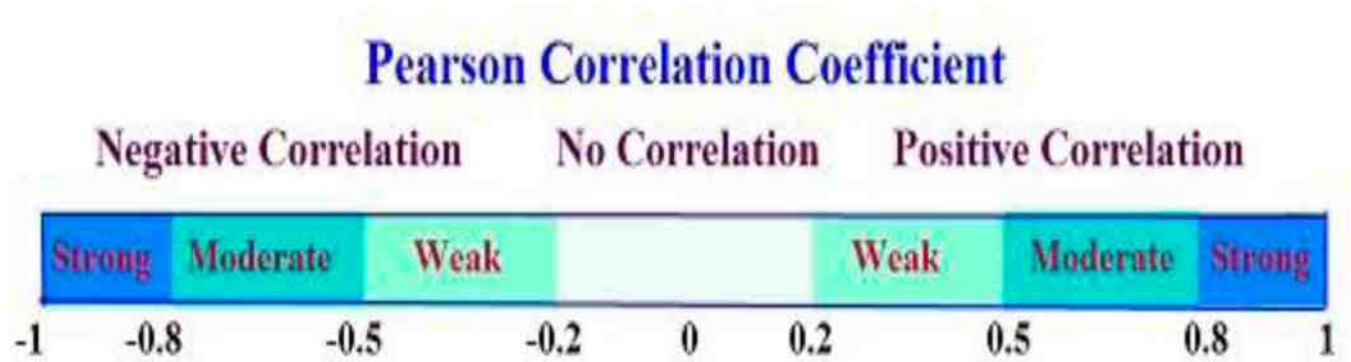


Figure 1. Karl Pearson's Correlation.

We will report on the interesting findings from our statistical analysis i.e the relationships that give the correlation coefficient close to 1 or -1 between selected questions.

#### 4.3 Research Hypotheses:

We tested for correlation between various questions  $Q_i$ ,  $Q_j$  where  $i, j$  are not equal. We expected to find the following relations between various variables:

1. Negative correlation between the students who were working and the hours they spent doing their math homework (Q4, Q5).
2. Positive correlation between the knowledge of the tutors and the help the students received from the tutoring center (Q11, Q12).
3. No correlation between the students who took math as a required course and considered math as a useful subject (Q16, Q15).
4. Negative correlation between the students' understanding of variables and their difficulties in math (Q13, Q14).
5. Positive correlation between the students' achievements in math and students who like math (Q17, Q2).

6. Negative correlation between working students and the number of classes they were taking (Q4, Q3).
7. Positive correlation between the students' opinions on the usefulness of the tutoring services and the number of hours the students visited the tutoring center (Q10, Q6).
8. Negative correlation between the quality of the course instructors and the number of hour's students visited the tutoring center (Q18, Q6).
9. Positive correlation between the students' enrollment statues and the number of their visits to the tutoring center (Q3, Q6).
10. Negative correlation between the students' employment status and their visits to the tutoring center (Q4, Q6).

## Chapter 5. Analysis of the survey responses.

1. In this chapter, we analyze the students' responses to the survey questions and provide data description constructing tables and charts for each question. Students' responses were coded for the data analysis. The statistical parameters such as mean, mode, median and standard deviation were analyzed.
2. We calculated correlations to find relations between students' responses to various questions later.

### 5.1. Q1: Title of the algebra course you are enrolled in:

All of the 75 participants from California State University Channel Islands and Ventura College enrolled in the same introductory level college algebra classes.

### 5.2. Q2: Do you like Math?

Answer	Code	Number	p
Not at all	1	22	29%
Somewhat	2	11	15%
Average	3	20	27%
Like	4	13	17%
Very much	5	9	12%
Total		75	100%

Table Q2. Liking Math.

- 1: Do not like math at all.
- 2: Like math somewhat.
- 3: Neither like nor dislike math.
- 4: Like math.
- 5: Like very much.

The results show that 44 % of the students answered 1 or 2, including 29% who do not like math at all. We considered 66% of the students who answered 3, 4 & 5 to like math. Note that 12% like math very much, which is a large percentage for students in similar population. For a summary of the results see Figure Q2.



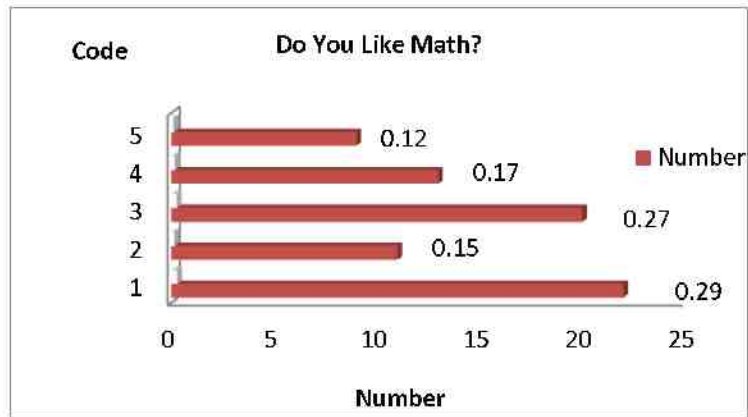


Figure Q2. Do you like math?

A study in 1992 conducted by [Ga] with the sample of 110 college students reported that , “ Students who enroll in the intermediate algebra course generally have a long history of experiences in mathematics in their high school years. When the students were interviewed about their feeling toward mathematics, some common responses were “it is not my best subject”, “I hate it”, 'it is always my weak area' or 'I have never liked it, but I am required to take it.” These negative feelings towards math may be affecting their ability to learn the subject. “

Note that our participants were in introductory algebra courses. About 44 % of them reported they did not like math. Hence learning may have been influenced by students’attitudes.

Statistical parameters for the code data in Q2:

<b>Mean</b>	<b>2.68</b>
<b>Mode</b>	<b>1.00</b>
<b>Median</b>	<b>3.00</b>
<b>StDev</b>	<b>1.38</b>

Mean= 2.68, says that on average students’ attitudes toward math were neutral. Almost 27% of students moderately like math.

Mode = 1.00, typically students did not like math at all.

5.3. Q3: How many courses are you taking per semester?

Answer	Numbers of Courses	Code	Number	p
Part time student	One class	1	10	13%
More than part time	2-3 classes	2	24	32%
Full time	4-5 classes	3	41	55%
More than full time	more than 6 classes	4	0	0%
Total			75	100%

TableQ3. Numbers of courses per semester.

Note that 55% of students are full time and 45% of the students are part time. Full time students who represent the high percentage may want to graduate sooner or to get financial aid. This explains the high percentage of full time students in this study. For a summary of the results, see Figure Q3.

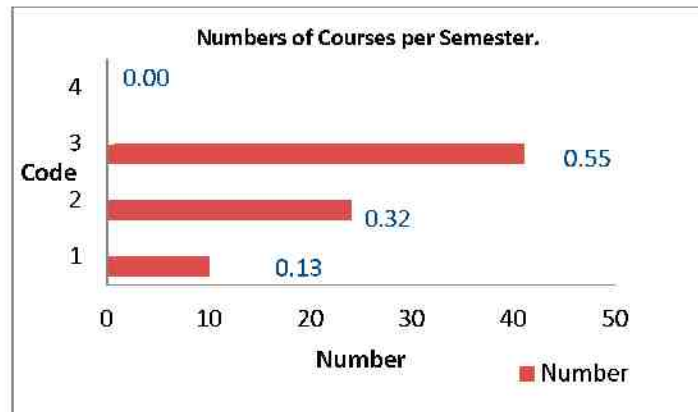


Figure Q3. Numbers of courses per semester.

Statistical parameters for the data in Q3:

<b>Mean</b>	<b>2.41</b>
<b>Mode</b>	<b>3.00</b>
<b>Median</b>	<b>3.00</b>
<b>StDev</b>	<b>0.72</b>

**Mean** = 2.41, the average number of courses the students were taking per semester is close to 3.

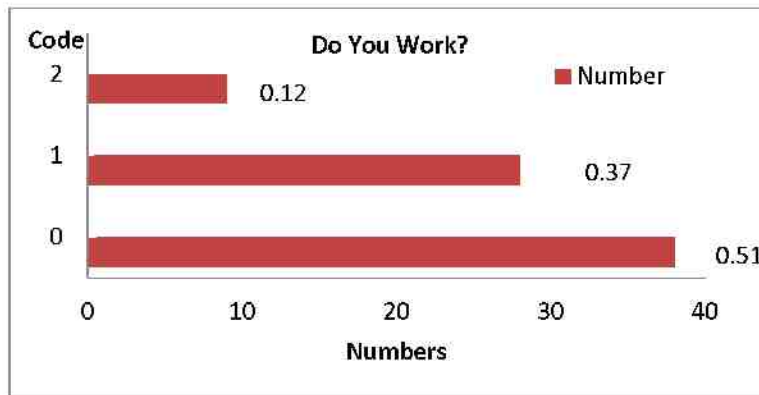
**Mode** = 3.00, typically students were taking 3-4 courses per semester.

5.4 . Q4: Do you work?

Answer	Code	Number	p
Not working	0	38	51%
working part time	1	28	37%
working full time	2	9	12%
Total		75	100%

Table Q4. Do you work?

Table Q4 shows that 37% of the students were working part time. There are only about 12% of students were working full time. The remaining 51% were not working( that includes probably students who studied full time). For a summary of the results, see Figure Q4.



FigureQ 4. Do you work?

Several recent studies showed that large number of students work while in college. The study conducted by [NH] in 1990 showed an “increase the number of college students who are employed either part time or full time. According to [Go] 1998, 39% of college freshmen work 16 or more hours per week, an increase of 4% since 1993. Also, Study in 1999 conducted by [STJM] showed that among all business majors, marketing students typically work even more hours per week than do other students. In 2002 survey conducted by the [HERI] also found that 65.3% of entering freshmen have either "some concern" or "major concerns" about not having enough money to complete their college degrees. This was an increase of almost 1% from 2001 and most likely to increase in the years ahead because of reduced funding for higher education by state legislatures".

Because of the increase the debt of students, many are required to finance their tertiary study as well as working during the school terms.

Statistical parameters for the code data in Q4:

<b>Mean</b>	<b>0.61</b>
<b>Mode</b>	<b>0 00</b>
<b>Median</b>	<b>0 00</b>
<b>StDev</b>	<b>0.70</b>

**Mean** = 0.61, means that on average students are at most part time workers.

**Mode** = 0.00, means that in fact typically students do not work. But, there are 51% of students are not working.

**5.5. Q5: How many hours a day do you spend doing your math homework?**

Answer	Code	Number	p
0-1 hour	<b>0</b>	6	8%
2-3 hours	<b>1</b>	52	69%
4-5 hours	<b>2</b>	9	12%
More than 5 hours	<b>3</b>	8	11%
Total		75	100%

Table Q5. Daily hours doing homework.

- 0** : 0-1 hour to do HW a day.
- 1** : 2-3 hours to do HW a day.
- 2** : 4-5 hours to do HW a day.
- 3** : More than 5 hours a day.

Table Q5 shows 69% of students spend an average 2- 3 hours a day on their homework. The students who study an average 2 hours a day, they study 8 to 10 hours per week. which However, there are 8% of students who study from 0-1 hour a day which may not be enough. These may be the students who are working full-time. For a summary of the results, see Figure Q5.

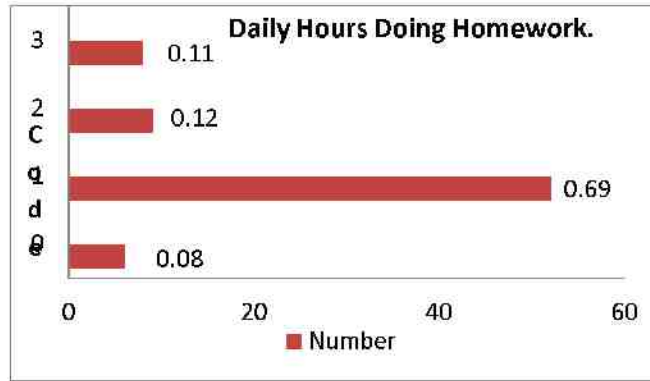


Figure Q5. daily hours doing homework.

Other research conducted by [Ba] 2009 and [Je] 2011 cited by [US] showed the total hours the students spent studying math depended on the difficulties of courses and total hours the students spent inside the classroom.

Predict Course Difficulty	Study Hours Based on Difficulty
High Difficulty Course	3 hours
Medium Difficulty Course	2 hours
Low Difficulty Course	1 hour

For example: To estimate the hours needed for studying.

Course Semester	Difficulty Level (High, Medium or Low)	Hours in Class Each Week	Times	Study Hours Based in Difficulties	=	Needed Study Hours per week
Mathematics	medium	4	x	2	=	8

Statistical parameters for the code data in Q5:

<b>Mean</b>	<b>1.25</b>
<b>Mode</b>	<b>1.00</b>
<b>Median</b>	<b>1.00</b>
<b>StDev</b>	<b>0.76</b>

**Mean** = 1.25, on average students spend slightly above one hour daily doing their math homework

**Mode** = 1.00, typically students spend 1 hour doing math homework per day.

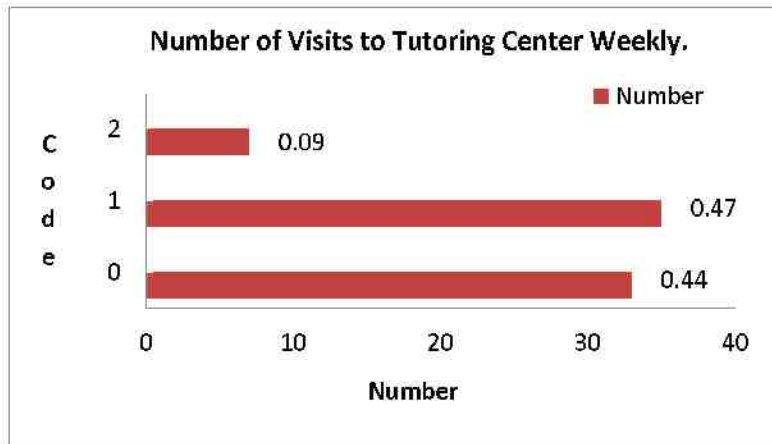
**5.6. Q6: How often do you go to the Tutoring Center for help?**

Answer	code	Number	p
0-1 per week	0	33	44%
2-5 week	1	35	47%
More than 6 times	2	7	9%
Total		75	100%

**Table Q6. Number of visits to Tutoring Center weekly.**

- 0:** Students who are going to the tutor center between 0-1 times.
- 1:** Students who are going to the tutor center between 2-5 times.
- 2:** Students who are going to the tutor center more than 6 times.

Table Q6 shows that 47% of students go to the tutoring center 2-5 times a week. In addition only 9% of students who are going to the tutoring center for more than 6 hours. Therefore, the total number of students who are going to the tutoring center at least one day a week is over 56%. For a summary of the results, see Figure Q6.



**Figure Q6. Number of Visits Tutoring Center Weekly.**

- Note that students who are not working have the opportunity to increase their visits to the tutoring center asking for help at any time. On the other hand, students who are working at least part time have also some opportunities to visit tutoring center asking

for help more often than full time working students. We tested for relationships between the students' employment status and their visits to the tutoring center later.

Statistical parameters for the code data in Q6:

<b>Mean</b>	<b>0.65</b>
<b>Mode</b>	<b>1.00</b>
<b>Median</b>	<b>1.00</b>
<b>StDev</b>	<b>0.65</b>

**Mean** = 0.65, shows that on average the students visit the tutoring center for help about once a week.

**Mode** = 1.00, typically students visit tutoring center at least twice per week.

**5.7. Q7: Why do you go to the tutoring Center for for help?**

Range	Number	percent
To review class notes	3	4%
To do homework	50	67%
For difficult problem	65	87%
Other	6	8%

Table Q7. Reasons for going to Tutoring Center.

Table Q7 shows that the majority of the students go to the tutoring center when they have difficulty problems, 87%. 67% of them go to the tutoring center in order to do their homework. Only 4% of the students go to the tutoring center to review class notes. This results are consistent with the mission of tutoring centers. For a summary of the results, see Figure Q7.

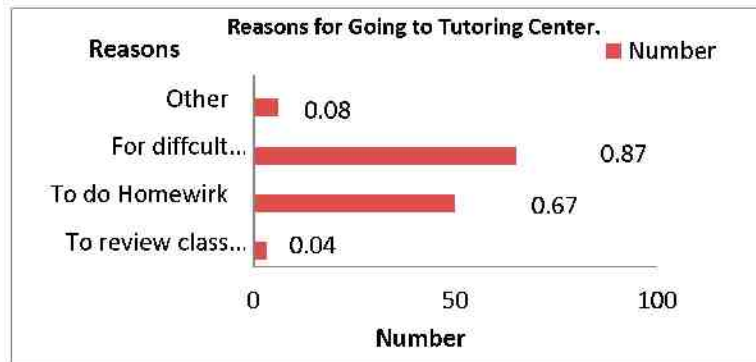


Figure Q7. Reason for going to Tutoring Center.

5.8. Q 8: Do you get the help you need at the tutoring center?

Answer	Code	Number	p
No	0	3	4%
Sometimes	1	14	19%
Usually	2	26	35%
Always	3	32	42%
Total		75	100%

Table Q8. Students' expectations from Tutoring Center.

- 0 : Tutoring Center do not provide help to the students.
- 1 : Sometimes the tutoring center provides help to the students.
- 2 : Usually the Tutoring Center provides help to the students.
- 3 : Tutoring always provides help to the students.

Table Q8 shows that most of the students (91%) are getting the help they need from the tutoring center. On the other hand, 4% of students said they did not get the help they needed, which is a very low percentage. Hence overall students are satisfied with the help they receive.

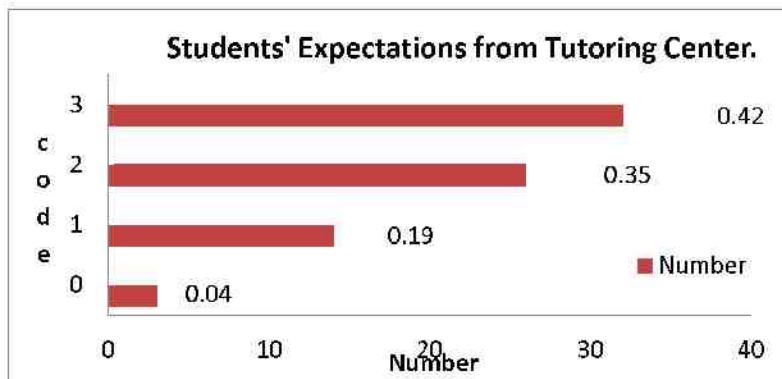


Figure Q8. Students' Expectations from Tutoring Center.

Statistical parameters for the code data in Q8:

Mean	2.16
Mode	3.00
Median	2.00
StDev	0.87

**Mean** = 2.16, on average students' satisfaction of getting help from the tutoring center services is moderate. There are almost 35% of students usually get help from the tutoring center.

**Mode** = 3.00, typically students always get help from tutoring center services.



5.9. Q9: What kind of help is available for your classes?

Range	Number	p
Tutoring	68	91%
Study group	22	29%
Solution guides	8	11%
computers	20	27%
Other	3	4%

Table Q 9. various help at Tutoring Center.

- 68 students out of 75, i.e. 91% of the total come for tutoring help. Study groups and computer use play a big role as well.
- Solution guides: Only 11% of the students need the solution guide.
- Computers: 27% of the students are using the computers. This percent represents computer-based assignments for various classes, especially for Math, English and computer classes. It is quite low overall.
- Other: 4% of the students are using the resources such as the instructors' office hours, library help, and collaboration with classmates.
- Study group: 29% of the students are using the study group time. Learning from peers is a great resource and should be supported.

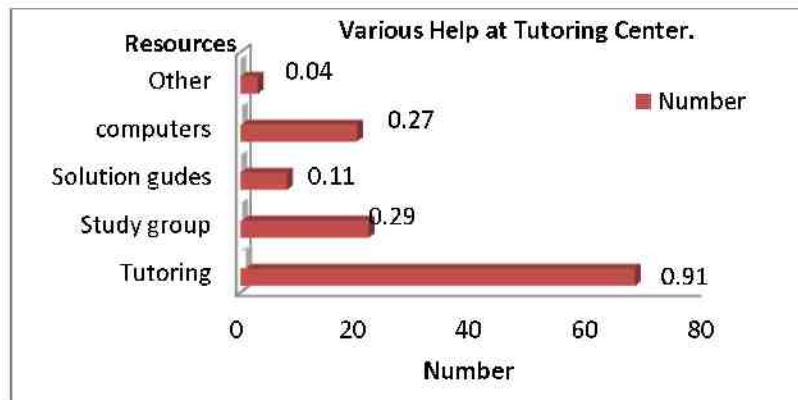


Figure Q9. Various help at tutoring center.

5.10. Q10: I found the Tutoring Center services useful.

Answer	Code	Number	p
Not useful	0	4	5%
Sometimes	1	5	7%
Useful	2	29	39%
Very useful	3	37	49%
Total		75	100%

Table Q10. Usefulness of tutoring.

Table Q10 shows that 95% of students find the usefulness of the tutoring center useful. However, 5% rated that the tutoring center as not useful, even though they are using it (all participants were surveyed in tutoring centers).

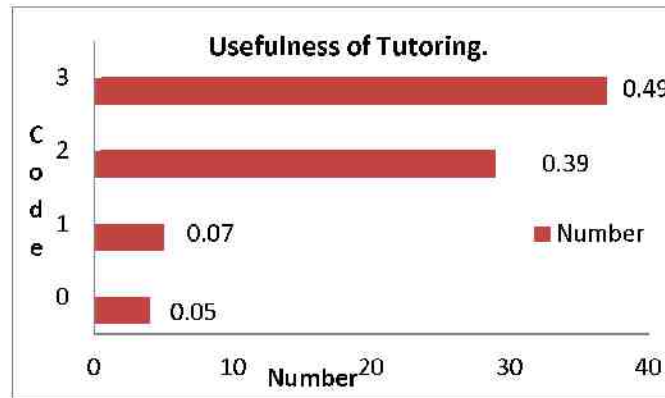


Figure Q10. Usefulness of tutoring.

Statistical parameters for the code data in Q10:

<b>Mean</b>	<b>2.32</b>
<b>Mode</b>	<b>3.00</b>
<b>Median</b>	<b>2.00</b>
<b>stDev</b>	<b>0.82</b>

**Mean** = 2.32, on average the usefulness of the tutoring center services was rated very high.

**Mode** = 3.00, typically student rated tutoring center services as very useful.

5.11. Q11: Tutors' knowledge of the material .

Answer	Code	Number	p
Poor	0	1	1%
Ok	1	1	1%
Good	2	30	40%
Very good	3	43	58%
Total		75	100%

Table Q11. Tutors' skills of the material.

Table Q11 shows that 99% of the tutors know the material well and they are able to provide help to the students. Hence tutors are a good source of knowledge and help. Only 1% of the tutors are rated poor.

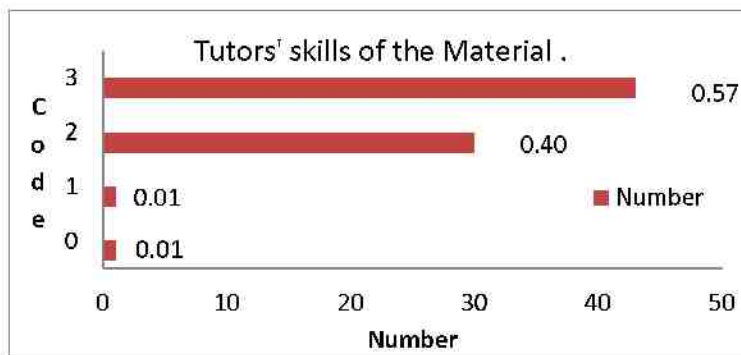


Figure Q11. Tutors' skills of the material.

Statistical parameters for the code data in Q11:

<b>Mean</b>	<b>2,53</b>
<b>Mode</b>	<b>3 00</b>
<b>Median</b>	<b>3 00</b>
<b>StDev</b>	<b>0,60</b>

**Mean** = 2.53, on average of tutors' knowledge of the subject they tutor was rated very well.

**Mode** = 3.00, typically students reported that tutors are very knowledgeable in algebra.

5.12. Q12: I received help at the Tutoring Center.

	Code	Number	p
Not at all	0	5	7%
Ok	1	1	1%
Much	2	27	36%
Very much	3	42	56%
Total		75	100%

Table Q12. Getting help.

Table Q12 shows the tutoring center plays a very effective role in the students' academic experience. 93% of the students are saying that the tutoring center helps them achieving their academic goals. Also, only 7% of students did not receive help from the tutoring center. Those students may come to the center for other reasons.

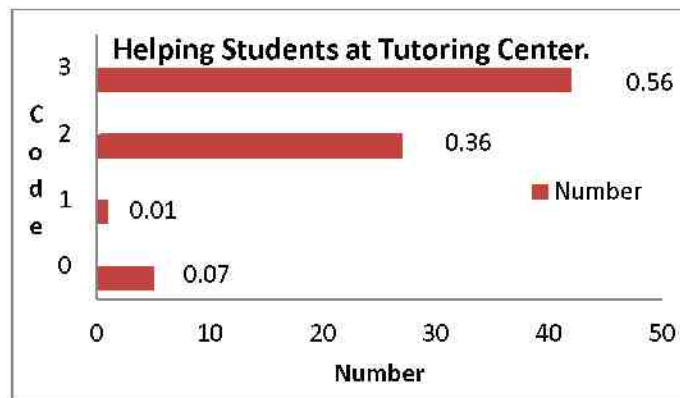


Figure Q12. Helping Students at Tutoring Center.

Statistical parameters for the code data in Q12:

<b>Mean</b>	<b>2.41</b>
<b>Mode</b>	<b>3.00</b>
<b>Median</b>	<b>3.00</b>
<b>StDev</b>	<b>0.82</b>

**Mean** = 2.41, on average the quality of help students get from tutoring services was rated high.

**Mode** = 3.00, typically help at the tutoring center was useful.

**5.13. Q13: Do you understand variables in Algebra ?**

Answer	Code	Number	p
No	0	1	1%
Some	1	6	8%
Ok	2	36	48%
Very well	3	32	43%
Total		75	100%

Table Q13. Variables.

- 0 : Students do not know the Variables in algebra
- 1 : Some of the students know the Variables.
- 2 : Some students know much about Variables
- 3 : Some of the students know the variables Very well.

Out of 75 students who filled out the survey questions, only 9% of them reported problems understood variables. However, 91% understood variables in algebra at least somewhat.

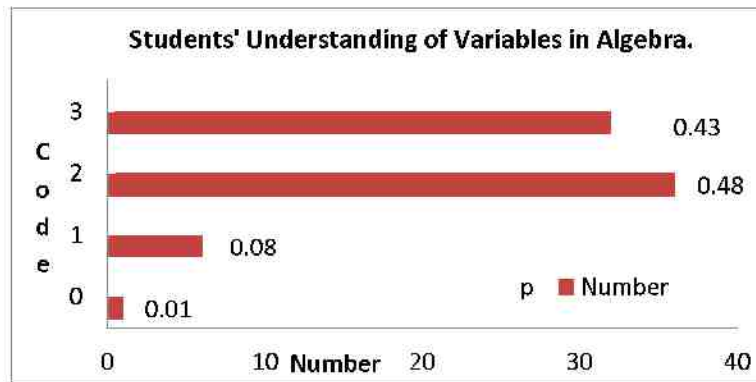


Figure Q13. Students' Understanding of Variables in Algebra.

Statistical parameters for code data in Q13:

<b>Mean</b>	<b>2.32</b>
<b>Mode</b>	<b>2.00</b>
<b>Median</b>	<b>2.00</b>
<b>StDev</b>	<b>0.68</b>

**Mean** = 2.32, on average students' understanding of the variables in algebra is good.

**Mode** = 2, typically students moderately understand variables in algebra.

5.14. Q14: Algebra is difficult for me .

Answer	Code	Number	p
Very difficult	0	9	12%
Difficult	1	28	37%
Easy	2	23	31%
Very easy	3	15	20%
Total		75	100%

Table Q14. Difficulty of Algebra.

- 0 : Algebra is very difficult.
- 1 : Algebra is difficult.
- 2 : Algebra is easy.
- 3 : Algebra is very easy.

Table Q14 shows that 49% of students considered algebra as difficult and 51% considered it easy. 12% rated algebra as very difficult.

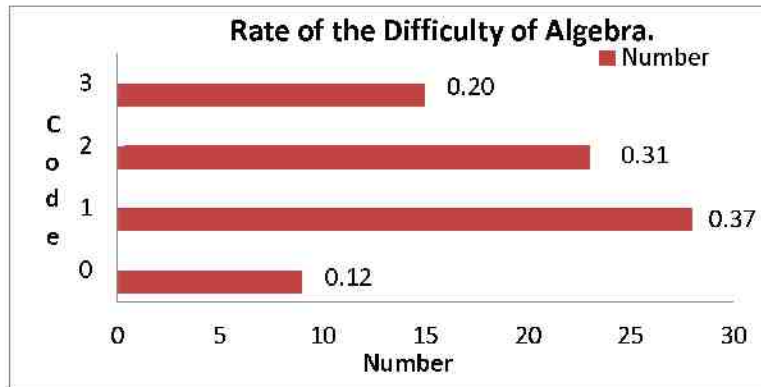


Figure Q14. Rate of the difficulty of algebra.

Statistical parameters for the code data in Q14:

<b>Mean</b>	<b>1.59</b>
<b>Mode</b>	<b>1.00</b>
<b>Median</b>	<b>2.00</b>
<b>StDev</b>	<b>0.95</b>

Mean = 1.59, on average students' find algebra difficult.

Mode = 1.00, typically students reported that algebra is difficult for them.

5.15. Q15: Algebra is very useful for my major.

Answer	Code	Number	p
Not at all	0	14	19%
Somewhat	1	16	21%
Usefull	2	30	40%
Very much	3	15	20%
Total		75	100%

Table Q15. Usefulness of Algrbra.

- 0 : Algebra is not useful.
- 1 :Algebra is somewhat useful.
- 2 :Algebra is useful.
- 3: Algebra is very useful.

Almost 81% of the students rated algebra as useful for their major in some degree. Therefore, they needed to take algebra classes. 19% of the students rated algebra as not useful for their majors. Those students might be taking this algebra course to meet the college requirements. 21% of students rated algebra as somewhat useful, hence the course is probably part of their major.

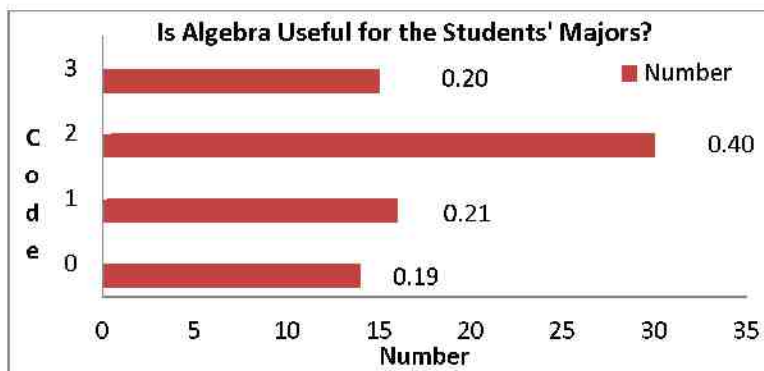


Figure Q15. Algebra useful for the students' majors.

Statistical parameters for the code data in Q15:

<b>Mean</b>	<b>1.61</b>
<b>Mode</b>	<b>2 00</b>
<b>Median</b>	<b>2 00</b>
<b>StDev</b>	<b>1.01</b>

Mean = 1.61, on average algebra is somewhat usefull.

Mode = 2.00, typically students rated alegbra as useful for their major.

**5.16. Q16: Algebra is required for my major.**

Answer	Code	Number	p
Strongly disagree	0	14	19%
Disagree	1	16	21%
Agree	2	30	40%
Strongly agree	3	15	20%
Total		75	100%

Table Q16.Required Algebra course.

0 : Students strongly disagree.

1 : Students disagree.

2 : Students agree.

3 : Students strongly agree.

19% of the students strongly disagree that algebra is required for their majors, which probably overlaps with 14 students from Q15. 21% of the students disagree that algebra is required for their majors 60% of the students agree that algebra is required for their majors, which represent 45 students out of 75. Note that the result is similar to the result in the previous Question Q15. Later we will calculate the correlation between them.

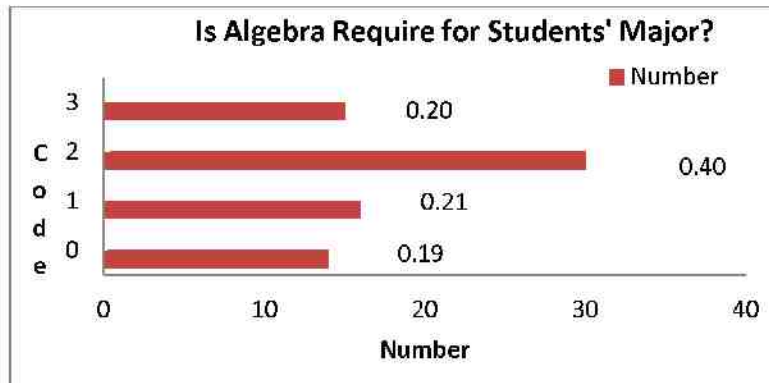


Figure Q16. Algebra required for the students' majors.

Statistical parameters for the code data in Q16:

<b>Mean</b>	<b>2.00</b>
<b>Mode</b>	<b>2.00</b>
<b>Median</b>	<b>2.00</b>
<b>StDev</b>	<b>0.96</b>



5.17. Q17: I am good in Algebra.

Answer	Code	Number	p
Not	0	14	19%
Somewhat	1	21	28%
Good	2	31	41%
Very good	3	9	12%
Total		75	100%

Table Q17. Students' skills in algebra.

- 0 :Students are not good in Algebra.
- 1 : Students are somewhat good in Algebra.
- 2 : Students are good in Algebra.
- 3 : Students are very good in Algebra.

Table Q17 shows that 81% of the students think that they are good in Algebra, and 19% are not good in Algebra. This is an interesting result since all participants were enrolled in algebra courses. For a summary of the results see Figure Q17.

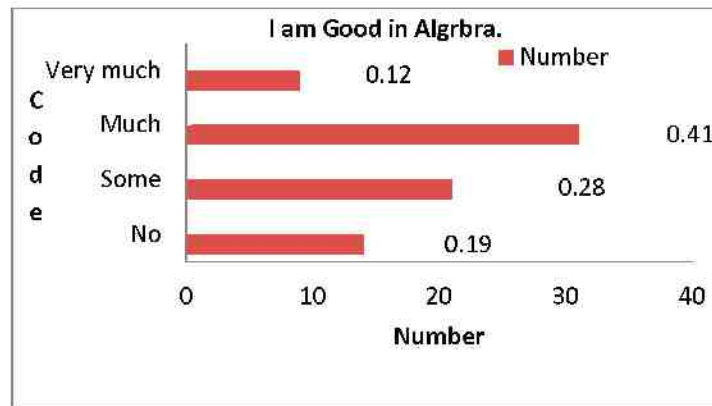


Figure Q17. Students' skills in Algebra.

Statistical parameters for the code data in Q17:

<b>Mean</b>	<b>1.47</b>
<b>Mode</b>	<b>2.00</b>
<b>Median</b>	<b>2.00</b>
<b>StDev</b>	<b>0.93</b>

**Mean** = 1.47, on average students' skills in algebra were reported as good.

**Mode** = 2.00, typically students reported that they are good in algebra.

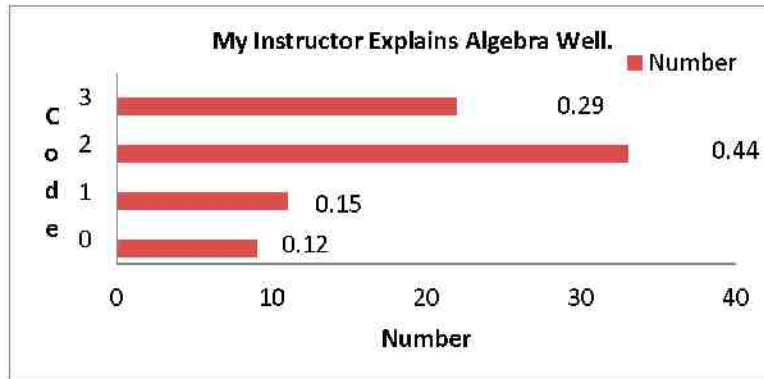
**5.18. Q18: My instructor explains Algebra very well.**

Answers	Code	Number	p
No	<b>0</b>	9	12%
Some	<b>1</b>	11	15%
Well	<b>2</b>	33	44%
Very well	<b>3</b>	22	29%
Total		75	100%

**Table Q18 . The quality of the Instructors' explanations.**

- 0:**Represents the instructor does not explain well.
- 1:** Instructors somewhat explain the material well.
- 2:** The instructors explain Algebra well.
- 3:**The instructors explain very well.

Table Q18 shows that approximately 27% of the students felt that the instructors did not explain Algebra well. On the other hand, 73% of the students felt that the instructors explained the material well or very well. Hence, majority of the participants did not blame the instructors for their issues with the course.



**Figure Q18 . The quality of the Instructors' explanations.**

Statistical parameters for the code data in Q18:

<b>Mean</b>	<b>1.91</b>
<b>Mode</b>	<b>2.00</b>
<b>Median</b>	<b>2.00</b>
<b>StDev</b>	<b>0.96</b>

**Mean** = 1.91, on average of instructors lectured well.

**Mode** = 2.00, typically students reported that their instructors explained algebra well.

5.19. Q19: I enjoy solving Algebra problems.

Answers	Code	Number	p
Never	0	18	24%
Some	1	10	13%
Likes	2	38	51%
Likes a lot	3	9	12%
Total		75	100%

Table Q19. Enjoy solving Algebra problems.

0 : Never enjoys solve algebra problems.

1 :Sometimes enjoys solving algebra problems .

2: Likes enjoy solving algebra problems.

3 :Enjoys solving the problems very much.

In Table Q19 out of 75 students, 18 of them never enjoy solving Algebra problems which represent 24%. On the other hand, 76% of the students enjoy solving Algebra problems at least sometimes.

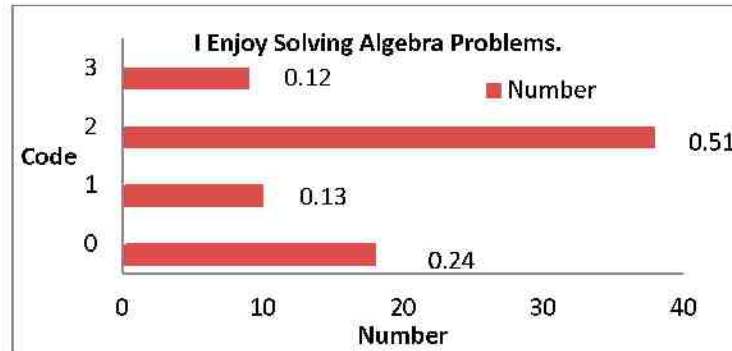


Figure Q19. I enjoy solving Algebra problems.

Statistical parameters for the code data in Q19:

<b>Mean</b>	<b>1.51</b>
<b>Mode</b>	<b>2 00</b>
<b>Median</b>	<b>2 00</b>
<b>StDev</b>	<b>0 99</b>

**Mean** = 1.51, on average students sometimes like solving problems in algebra.

**Mode** = 2.00, typically students somewhat enjoy solve algebra problems.

5.20. Q20: My instructor gives me review questions before the exam.

Answers	Code	Number	p
Never	0	6	8%
Sometimes	1	7	9%
Agree- usually	2	35	47%
Strongly agree- always	3	27	36%
Total		75	100%

Table Q20. My Instructors gives review before exam.

0 :Instructor never gives review before exam.

1 : Sometimes instructor gives review before exam.

2 : Instructor gives review before the exam often.

3: Instuctor always gives reviews.

Table Q20 shows that approximately 13 students out of 75 students do not get review questions before the exam. 83% of the students agree that the instructor gives them review questions before the exam. Hence, insturctors usually give review questions in algebra courses.

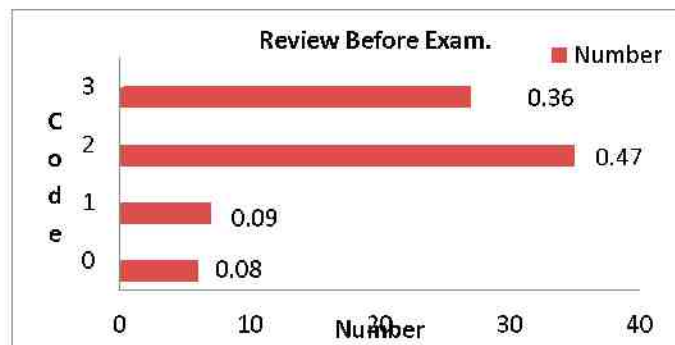


Figure Q20. My instuuctor gives review before exam.

Statistical parameters for the code data in Q20:

<b>Mean</b>	<b>2.11</b>
<b>Mode</b>	<b>2.00</b>
<b>Median</b>	<b>2.00</b>
<b>StDev</b>	<b>0.88</b>

**Mean** = 2.11, on average of the instructors give their students review questions.

**Mode** = 2.00, typically students agreed that their instructors give them review questions.

5.21. Q21: Online courses are better than the class courses.

Answers	Code	Number	p
Never	0	38	51%
Sometimes	1	28	37%
Agree	2	5	7%
Strongly agree	3	4	5%
Total		75	100%

Table Q21. Students' opinions toward online math classes.

- 0: Online courses are never be
- 1 Sometimes better.
- 2 Student likes online courses better.
- 3 Online courses are always better.

12% of the students agreed that online classes are better than the on campus courses.

However, 88% disagree that online classes are better, they prefer face-to-face courses.

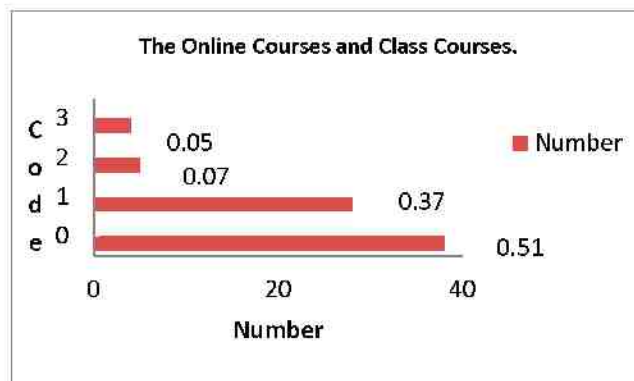


Figure Q21. Online courses and class courses.

Statistical parameters for the code data in Q21:

Mean	0.67
Mode	0.00
Median	0.00
StDev	0.83

Mean = 0.67, means that on average students prefer face-to-face algebra courses.

Mode = 0.00, typically students say that online math courses are never better than classroom math courses.

## Chapter 6. Testing for the correlations.

We calculated correlations between various questions and we report on the interesting findings here

### 6.1 The correlations between (Q4, Q5).

**Hypothesis 1:** There is a negative correlation between students who are working and the hours they spend doing their math homework.

Here we calculated correlation coefficient  $r$  and the equation of the regression equation line.

$$r = 0.060395304$$

$$R^2 = 0.0036$$

$$y = 0.06656x + 1.2131$$

We found that there is no correlation between the students who are working part time, full time or students who are not working and the hours they spend doing their math homework. That is a surprising result.  $R^2$  (determining coefficient) is very small so we cannot really predict the changes of the hours using the regression equation. The study in 2005 conducted by [MG] suggests that working is not always detrimental to the students' academic efforts, particularly if the hours worked are manageable given their course load. Lecturers should be more aware of the busy lives students lead and try to structure assignments and course requirements to recognize this, including the scheduling of class times and the offering of study support services. Additionally, a study in 1994 conducted by [DJ], study in 2004 conducted by [KDF], study in 1994 conducted by [PW], study in 2002 conducted by [SGD], and study in 1992 conducted by [Sm] stated that homework has a positive correlation with students' achievement not their work. The correlation is highest at the high school and college levels.

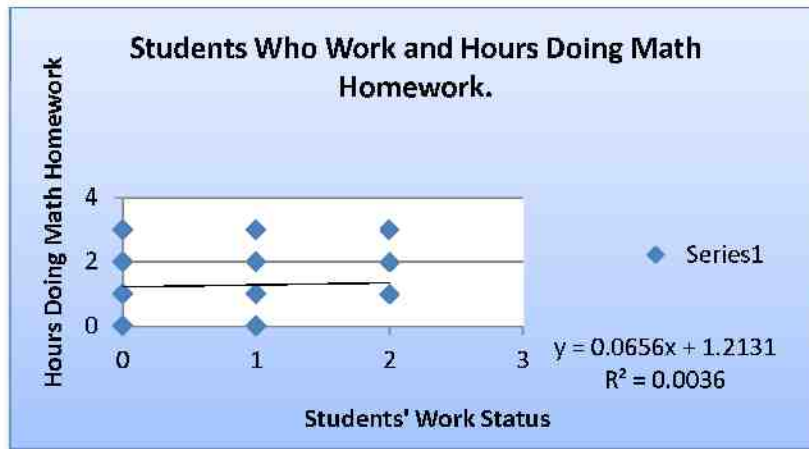


Figure 6.1. Regression line for "Working Students" vs "Homework".

Figure 6.1 shows that the regression line is almost horizontal with very small positive slope. Hence, we cannot predict from the student work status.

## 6.2 The correlations between (Q11, Q12).

- **Hypothesis 2:** There is a positive correlation between the knowledge of the tutors and the help the students get from the tutoring center.

$$r = 0.532695284$$

$$R^2 = 0.2838$$

$$y = 0.7725x + 0.203$$

There is moderate positive correlation between the tutors' knowledge of the material or the tutor subject and the help the students get from the tutoring center. As the tutors became more experienced, knowledgeable and specialized in the subjects, they will be able to simplify the material to the students. Also, Figure 2. shows regression equation and the determining coefficient. We can predict the quality of tutoring service when tutors' knowledge of the subject increase.

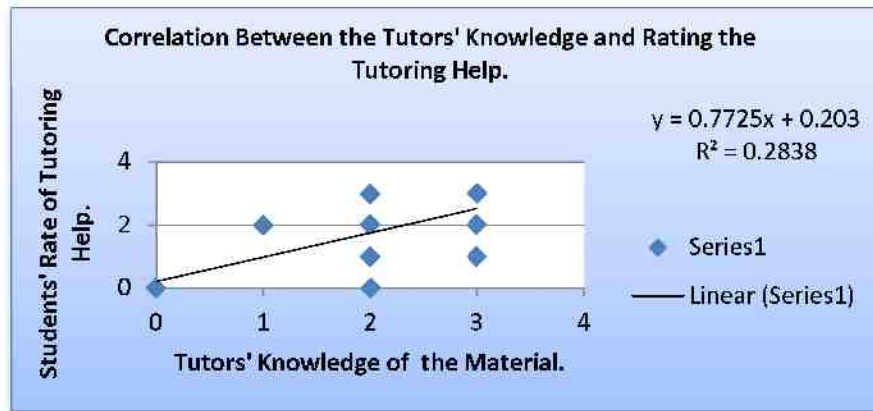


Figure 6.2. Regression line for “tutors’ knowledge “and “tutoring help”.

### 6.3. The correlations between (Q16 ,Q15).

**Hypothesis 3 :**There is no correlation between the students who take math as a required subject and math as a useful subject.

$r = 0.459687909$

$R^2 = 0.2113$

$y = 0.4853x + 0.6427$

There is a positive moderate correlation between the students who rate math as one of the required subject for their majors and their rates of the usefulness of math. Hence, students may be motivated to study by their major requirements. The prediction of increase can be calculated by the regression equation, with  $R^2 = 21\%$ .

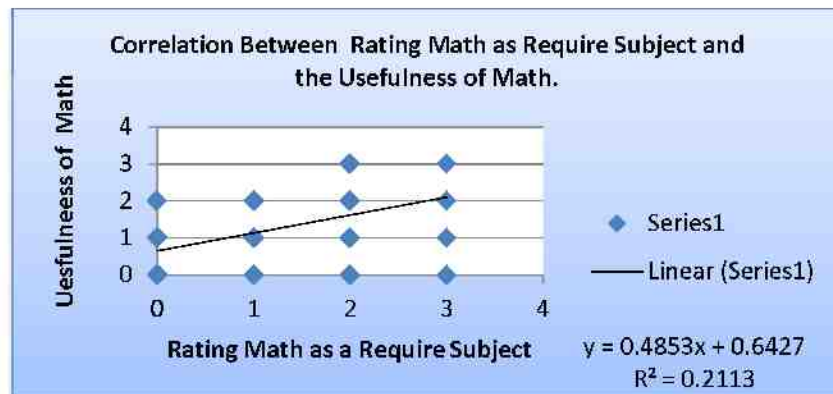


Figure 6.3. Regression line for “major requirements “and “usefulness of math”.



#### 6.4. The correlations between (Q13, Q14).

**Hypothesis 4:** There is a negative correlation between the students' ratings of the understanding of variables in Algebra and their difficulties in math.

$$r = -0.48425812$$

$$R^2 = 0.2345$$

$$y = -0.6725x + 3.1469$$

We confirm the negative moderate correlation between the students' understanding of variables in algebra and their difficulties in math. As the students understanding of the variables in Algebra increases the difficulties in Algebra will decrease.

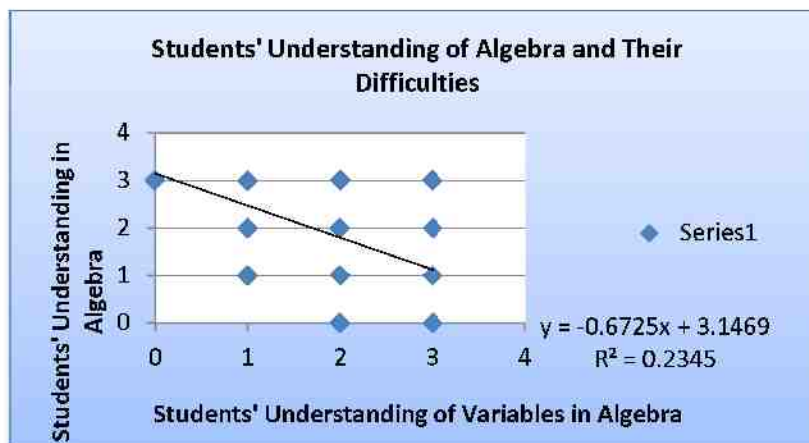


Figure 6.4. Regression line for "tutors' u understanding variables" vs "understanding algebra".

#### 6.5 The correlations between (Q17, Q2).

**Hypothesis 5:** There is a psitive correlation between the students who are good in math and the students who like math.

$$r = 0.663463526$$

$$R^2 = 0.4402$$

$$y = 0.9773x + 1.2466$$

There is a strong positive correlation between the students who are good in math and students who like math. As the students' ratings of being good in math increase, they like math. In addition, we can predict of how much the students will like math as a result of being good in math using the regression equation as shown in Figure 6.5.

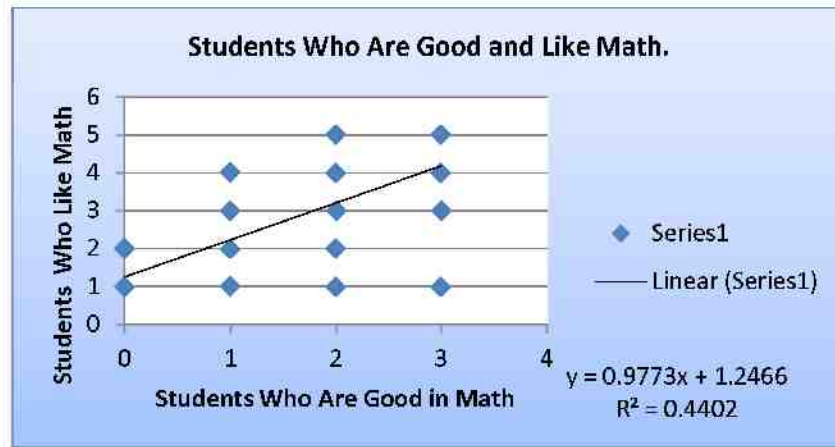


Figure 6.5. Regression line for “confidence in math” vs “liking math”.

## 6.6 The correlations between (Q4 , Q3).

**Hypothesis 6:** There is a negative correlation between the students who work and the number of classes they are taking.

$$r = -0.32497281$$

$$R^2 = 0.1056$$

$$y = 0.3357x + 2.6192$$

We could not conclude that there is a strong correlation between students who work and the number of classes they are taking. However, there is very weak correlation.

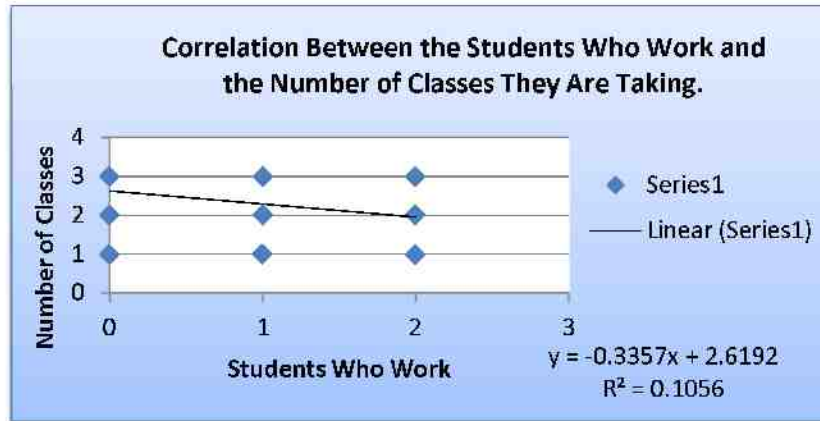


Figure 6.6. Regression line for “working students”vs. “number of classes”.

### 6.7 The correlations between (Q10 , Q6).

**Hypothesis 7:** There is a positive correlation between a student's opinion on the usefulness of the tutoring services and the number of hours the student visits the tutoring center.

$$r = 0.311998827$$

$$R^2 = 0.0973$$

$$y = 0.24448x + 0.0853$$

The Figure 7 shows that there is small positive correlation between the students' ratings of the tutoring center services and the number of their visits to the tutoring center.

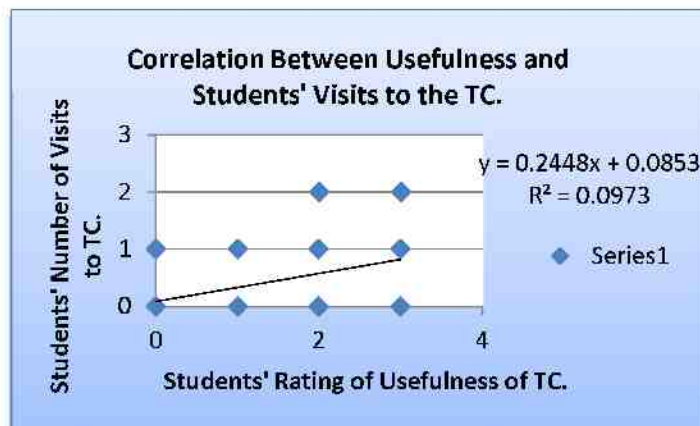


Figure 6.7. Regression line for “usefulness of TC”vs “number of visits”.

## 6.8 The correlations between (Q18 , Q6).

**Hypothesis 8:** There is a negative correlation between students' ratings of the instructors' explanation of the material and the number of students' visits to the Tutoring Center.

$$r = -0.248298136$$

$$R^2 = 0.0617$$

$$y = -0.1672x + 0.9721$$

There is a weak negative correlation between the students' ratings of the teachers' quality and the number of visits to the tutoring center.

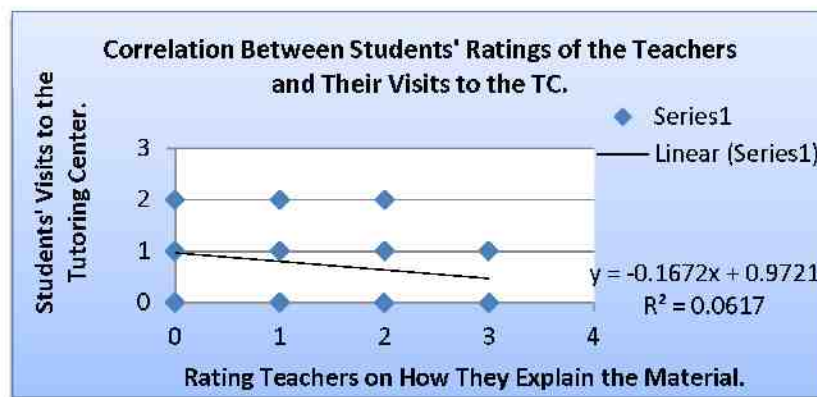


Figure 6.8. Regression line for "quality of teaching" vs "students' visits to TC".

## 6.9 Correlation between (Q3, Q6).

**Hypothesis 9:** There is a positive correlation between the students' enrollment status and the number of their visits to the tutoring center.

$$r = 0.021706183$$

$$R^2 = 0.0005$$

$$y = 0.0196x + 0.6061$$

The results in Figure 6.9 show that there is no correlation between the students' enrollment status and the number of their visits to the tutoring center. Therefore, being a part time or full time students will not affect the number of students' visits to the tutoring center.

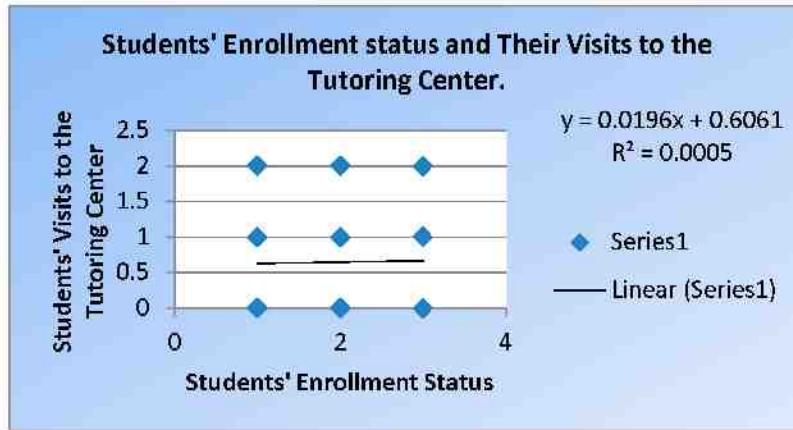


Figure 6.9. Regression line for "enrollment status" vs "students' visits to TC".

Figure 6.9 shows that the regression line is almost horizontal with the slope almost equal to zero, the line does not go through any points since the determination coefficient is 0.05% then, the number of students' visits to the tutoring can not be predicted.

### 6.10. Correlation between (Q4, Q6).

**Hypothesis 10:** Negative correlation between students' employment status and their visits to the tutoring center.

$$r = 0.028428178$$

$$R^2 = 0.0008$$

$$y = 0.24448x + 0.0853$$

The results show that there is no correlation between the students' employment status and their visits to the tutoring center. Being a part time employees or full time employees does not affect the number of visits to the tutoring center.

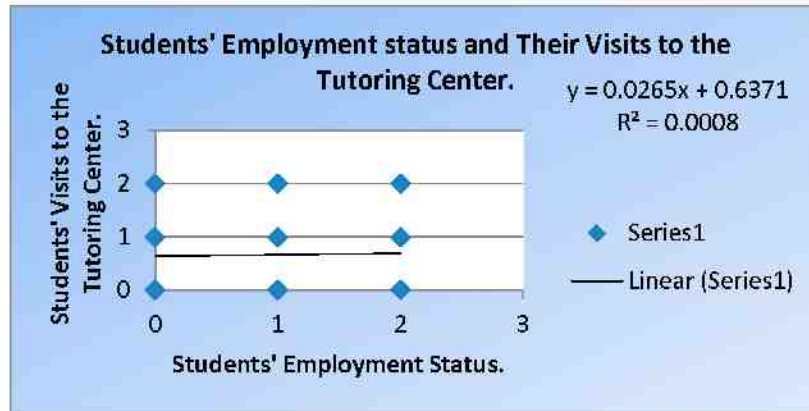


Figure 6. 10. Regression line for “employment status”vs “number of visits to TC”.

Figure 6.10 shows the regression equation and the determination coefficient. The regression line in the chart almost horizontal line. Also, the determination coefficient is very small which implies we can not predicte the total variation of the students’ visits to the tutoring center when students’ employment status vary using the regression equation.

### 6.11 Variables ( Q6 , Q7).

We tested the relation between the weekly number of visits to the tutoring center, and the students asking for help only when they have difficult problems doing math homework. The results showed that there is a weak correlation between them. The students who are going to the tutoring center more often do not necessarily have difficulties with their math homework. They may go to study different subject other than mathematics. Also they may go to study their notes, do their homework, work with a study group or use the computer.

## Chapter 7. The Results

- The results showed that there was no correlation between the students who are working and the hours they spend doing their math homework. The study conducted by [MG] found that working did not always determine the students' academics efforts. Also, our results showed that the hours the students spent doing their math homework are not affected by their students' employment status.
- In our survey results, we found that there was positive moderate correlation between the tutors' knowledge of the material and how often the students are getting the help they needed. Tutors are college students who are specialized and knowledgeable in the subjects they tutor. The statistics showed 92% of students positively rated that they do received the help they needed from tutoring center. Hence, experienced tutors who specialize in some subjects provide more help to the students in these cases.
- Using the regression equation, we can predict that the students' visits to the tutoring center for help will increase as tutors' knowledge of the material increase.
- The results showed that there were almost moderately positive correlations between the students who were taking required math and students who reported that math is useful for their academics. However, some students did not consider math as useful even is required for their major.
- By testing the correlation between the students' ratings of the understanding of variables in algebra and their difficulties in math, our results showed that there was positive moderate correlation. One of the studies in 2001 conducted by [Do] indicated that students have difficulty understanding the concept of variables. Also, they indicated that in more advanced courses, students have come up with sophisticated solutions, and had

less difficulties on using variables. Therefore, understanding of variables is a good predictor of students' knowledge of mathematics.

- In addition, the results showed strong positive correlation between the students who are good in math and how much they like math. Therefore, the students' affinity for math is a result of the requirement of their major and the students good in math then they like math.
  
- The results showed there was a weak negative correlation between the students' employment status and the number of classes the students can take. Some of the part time working students and full time working students cannot take as many classes as non-working students. However, the results showed that the majority of students did not work about one-third of them were working part time and only 12% were working full time. Majority participants were full time students. Some of the full time workers were full time students. Some of students who worked were not able to afford the school expenses. Those students were eager and motivated to take more classes and finish their degree at a faster rate.
  
- The results showed that Students' visits to the tutoring center increased with their positive rating on the efficiency of the tutoring services. The correlation was not as strong as it should be because students come to the tutoring center for other reasons as well.
  
- There were many kinds of help available to the students such as tutoring, study groups, solution guides and computers. The results showed that 91 % of the students prefer to receive help from the tutoring center as one of the main resource on the campus. The tutors are able to assist the students with their homework and their difficulties.
  
- There was a negative weak correlation between students' ratings of the teachers' explanation of the material and the students' visits to the Tutoring Center. We found that there were a few students who are not satisfied with their teachers, and they visit the Tutoring Center more often. They found that the tutoring is useful for them in many



ways. Also, having knowledgeable tutors available for them increased their visits and the reliability of the tutoring center. This is shown in the results of Question 7, which showed that only 4% of the students were going to the tutoring center for reviewing the class notes. 97% of the tutors knew the material very well and they were able to provide help that the students.

- We found that there was no correlation between the students' enrollment status and the number of their visits to the tutoring center. Our results showed 55% of students were full time students, and 45% of students were part time. However, being a full time student did not affect visits to the tutoring center.
- Surprisingly, we found that there was no correlation between the students' employment status and their visits to the tutoring center. We were expecting that full time workers do not get a chance to visit the tutoring center for help. But, we found that the students' working hours did not affect their visits to the tutoring center. Also, we found an interesting result: Students, who were not working, they did not visit the tutoring center more often.
- We found that 69 % of students spent between 2-3 hours a day doing their math homework, and 8% of students spent 0-1 hour. Hence, our students spend more time on homework than national averages.  
A study in 2014 conducted by [Bi] stated that 'Time spent on homework has increased in recent years, but educators say that's because the assignments have also changed.  
Although students nowadays are spending significantly more time on homework assignments -- sometimes up to 17.5 hours each week -- the type and quality of the assignments have changed to better capture critical thinking skills and higher levels of learning, according to a recent survey of teachers conducted by the University of Phoenix College of Education.

By comparison, 2011 study from the National Center for Education Statistics found high school students reported spending an average of 6.8 hours of homework per week, while a 1994 report from the National Center for Education Statistics -- reviewing trends in data from the National Assessment of Educational Progress -- found 39 percent of 17-year-olds said they did at least one hour of homework each day”.

## Chapter 8. Conclusion

➤ The results show that the Tutoring Center plays a very important role in the student’s performance and achievement. Therefore, high percentages of the students prefer to visit the tutoring center as one of the most important resource for receiving help. In addition, the tutors’ teaching styles intensely influence the students’ learning styles. Hence, we recommend the following actions for tutoring centers.

- Hire tutors who are knowledgeable and educated.
- Provide tutors for all subjects.
- Make tutors accessible to the students.
- Train tutors to be role models for the students.
- Have extended hours for the centers.

### ***Recommendations for future study:***

- Considering special needs students.
- Interviewing the tutors to get their input on various issues.
- Collect data on hours students spend at tutoring center to get help on specific topics.
- Measure better students’ attitudes toward math.
- Collect data and students’ comments about learning math and specific topics.
- Include a larger population of students to determine obstacles in learning.

Following our results we also recommend the following:

- In our study since 44% of students disliked math and 66% of the students liked math. Note that 12% of students liked math, hence, there is a need to improve students' attitudes towards mathematics.
- The tutoring was considered the best choice for the students to get additional from help they need among the other resources that the college offers. Therefore, more research on effectiveness of the centers.
- Students' choices or selections of their majors depend on what mathematics courses are required. Hence, better mathematics preparation on pre-college level should increase students' options. A study should be done on how students make decisions about their majors.

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## Appendix (1)

### Algebra survey questions

#### How Are We Doing?

Please take a few minutes to fill out the following survey.

Your feedback and your answers will be keep confidential. Thank you for your participation.

1 Title of the algebra course you are enrolled in: \_\_\_\_\_

2 Do you like math? Rate your answer below.

Not at all

very much

1

2

3

4

5

3 How many classes are you taking this semester?

One class

2-3 classes

4-5 classes

6 and more classes

4 Do you work?

Part time

full time

not working

5 How many hours a day do you spend doing your math homework?

0-1 hour

2-3 hours

4-5 hours

More than 5 hours

6 how often do you go to the tutoring center for help?

0-1 time per week

2-5 per week

More than 6 per week

7 Why do you go to tutoring center for help? Check all.

To review the class notes

to do my homework

For help with difficult problems

Other \_\_\_\_\_

8 Do you get help when you need at tutoring center for doing your homework?

Always

Usually

Sometimes

No

9- What kind of help is available for your classes?

- Tutoring       Study groups       solution guides       Computers       others

If others who helps you?

	Strongly agree	Agree	Disagree	Strongly-disagree
10 - I found the math tutoring Center services to be useful	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11 -Tutors know the materials well	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12- I get in the Tutoring Center	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13 -Do you understand variables in Algebra?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14 - Algebra is difficult for me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15- Algebra is very useful for my major	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16- Algebra is requirement for me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17 - I am good in Algebra.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18 - My teacher explains Algebra very well.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19 - I enjoy solving Algebraic problems.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Appendix (2) Q1-Q8.

	Q1	Q2	Q3	Q4	Q5	Q6	Q7				Q8
RANGE	M 94	1.5	1.4	0.2	0.3	0.2	Review notes	Homework	Difficult problems	Others	0.3
1	1	4	3	2	1	0	0	1	0	0	2
2	1	2	1	0	1	0	0	1	0	0	3
3	1	5	1	2	1	0	0	0	1	0	2
4	1	5	3	0	1	0	0	0	1	0	2
5	1	3	3	2	2	0	0	1	0	0	1
6	1	3	1	2	1	0	0	0	1	0	2
7	1	5	1	1	1	0	0	0	1	0	2
8	1	2	2	0	1	0	0	1	0	0	0
9	1	3	3	1	1	1	0	1	0	0	3
10	1	2	3	0	1	0	0	0	1	0	1
11	1	1	2	1	1	0	0	0	1	0	1
12	1	2	2	1	1	0	0	0	1	0	1
13	1	4	2	1	1	0	0	0	1	1	2
14	1	3	3	1	1	0	0	0	1	0	3
15	1	1	2	1	1	0	0	0	0	1	0
16	1	3	2	2	1	1	0	1	0	0	2
17	1	1	2	1	1	0	0	0	1	0	2
18	1	4	2	1	1	0	0	0	0	1	0
19	1	1	3	0	1	1	0	0	1	1	1
20	1	2	2	1	1	1	0	1	1	0	1
21	1	1	2	0	3	1	1	1	1	0	3
22	1	4	2	2	3	1	0	1	1	0	3
23	1	1	3	1	1	0	0	1	1	0	2
24	1	5	3	0	1	1	0	1	1	0	3
25	1	2	3	1	1	0	0	1	1	0	3
26	1	5	3	1	1	0	0	1	1	0	3
27	1	3	3	0	2	0	0	1	1	0	1
28	1	5	3	0	1	1	0	1	1	0	3
29	1	5	1	0	1	0	0	1	1	0	2
30	1	1	3	0	3	0	0	1	1	0	1
31	1	4	3	0	1	0	0	1	1	0	3
32	1	3	3	1	1	1	0	1	1	0	1
33	1	4	3	0	2	0	0	1	1	0	3
34	1	1	1	0	1	0	0	1	1	0	3
35	1	3	2	1	0	1	0	0	1	0	1
36	1	4	1	1	1	1	0	1	1	0	2
37	1	2	3	0	1	1	0	0	1	0	3
38	1	1	3	0	1	0	0	0	1	0	3
39	1	1	1	1	1	0	0	1	1	0	2
40	1	1	3	0	1	0	0	1	1	0	1
41	1	1	3	0	1	1	0	1	1	0	2
42	1	4	3	0	2	1	0	1	1	0	3
43	1	3	3	1	3	1	0	1	1	0	3



44	1	3	2	0	1	0	0	1	1	0	2
45	1	3	3	0	1	1	0	1	1	0	3
46	1	1	2	0	2	2	0	1	1	0	3
47	1	2	3	0	1	1	0	1	1	0	2
48	1	1	3	0	1	0	0	1	1	0	3
49	1	3	3	0	1	0	0	1	1	0	3
50	1	1	3	1	1	2	0	0	1	0	2
51	1	4	3	0	1	1	0	1	1	0	3
52	1	1	2	0	3	1	0	1	1	0	2
53	1	1	3	0	0	1	0	1	1	1	2
54	1	3	3	1	1	1	0	1	0	0	3
55	1	3	3	0	0	1	0	1	1	0	2
56	1	3	1	1	2	1	0	0	1	0	3
57	1	3	2	2	2	2	0	1	1	0	2
58	1	3	1	2	3	2	0	0	1	0	3
59	1	2	2	1	2	1	0	1	1	0	2
60	1	1	3	0	3	1	0	1	1	0	3
61	1	5	2	1	1	1	0	0	1	0	3
62	1	5	2	0	1	2	0	1	1	1	1
63	1	3	2	1	1	1	0	0	1	0	2
64	1	1	3	2	1	1	1	1	1	0	3
65	1	1	2	1	1	1	0	1	1	0	3
66	1	3	2	0	3	2	0	1	1	0	3
67	1	2	3	0	1	0	0	0	1	0	1
68	1	1	3	0	0	0	0	1	1	0	2
69	1	2	3	1	0	1	0	1	1	0	2
70	1	3	3	0	1	1	0	0	1	0	3
71	1	4	3	1	1	1	0	0	1	0	1
72	1	1	2	0	0	1	0	1	0	0	2
73	1	4	2	1	1	1	0	1	1	0	3
74	1	4	3	0	2	2	1	1	1	0	3
75	1	4	3	0	1	1	0	0	1	0	2
<b>Mean</b>	<b>1 00</b>	<b>2 68</b>	<b>2 41</b>	<b>0 61</b>	<b>1 25</b>	<b>0 65</b>					<b>2 16</b>
<b>Mode</b>	<b>1 00</b>	<b>1 00</b>	<b>3 00</b>	<b>0 00</b>	<b>1 00</b>	<b>1 00</b>					<b>3 00</b>
<b>Median</b>	<b>1 00</b>	<b>3 00</b>	<b>3 00</b>	<b>0 00</b>	<b>1 00</b>	<b>1 00</b>					<b>2 00</b>
<b>stDev</b>	<b>0 00</b>	<b>1 38</b>	<b>0 72</b>	<b>0 70</b>	<b>0 76</b>	<b>0 65</b>					<b>0 87</b>

### Appendix (3) Q 9 - Q16

Range	Q 9					Q10	Q 11	Q 12	Q 13	Q14	Q15	Q16
	Tutorin g	Study groups	Solutio n guides	Computer s	Others	0 3	0-3	0-3	0-3	0-3	0-3	0-3
1	1	2	0	0	0	2	2	2	3	0	3	3
2	0	0	0	1	0	2	2	2	3	0	2	1
3	1	0	0	1	0	3	3	3	3	1	3	3
4	1	0	0	1	0	3	2	2	2	1	2	2
5	0	0	0	1	0	0	2	0	2	1	2	2
6	1	1	0	0	0	2	2	2	2	2	1	1
7	1	0	0	0	0	2	3	2	3	0	2	2
8	1	0	0	0	0	2	2	2	2	2	2	2
9	1	0	0	0	0	2	2	2	2	1	2	2
10	1	0	1	0	0	2	2	2	2	2	0	1
11	1	0	0	0	0	2	2	2	2	2	2	1
12	1	1	0	1	0	1	2	0	2	1	2	1
13	1	1	0	1	1	2	2	2	2	2	2	2
14	1	0	0	1	0	2	2	2	2	1	2	2
15	0	0	0	0	1	0	0	0	2	3	0	0
16	1	0	0	1	0	2	2	0	3	1	2	2
17	1	1	0	1	0	2	3	3	3	2	0	0
18	0	0	0	0	1	2	2	0	2	0	3	3
19	1	0	0	0	0	2	2	3	2	2	0	0
20	0	0	0	0	0	3	2	3	3	2	0	3
21	1	0	0	1	0	2	2	2	1	1	3	3
22	1	1	0	1	0	3	3	3	2	1	3	3
23	1	1	0	0	0	2	3	2	2	1	2	2
24	1	1	0	0	0	3	3	3	3	1	2	2
25	1	1	0	0	0	0	3	3	3	1	1	2
26	1	1	0	0	0	2	3	3	3	0	2	0
27	1	0	0	1	0	1	2	2	2	1	1	1
28	1	1	0	0	0	1	3	3	3	1	1	3
29	1	0	0	0	0	1	2	2	2	1	2	2
30	1	0	0	0	0	1	2	2	1	2	0	2
31	1	1	0	0	0	3	3	3	2	3	1	3
32	1	0	0	1	0	3	2	1	3	2	0	1
33	1	0	0	0	0	3	3	2	2	3	0	2
34	1	0	1	0	0	3	3	3	3	1	1	1
35	1	0	0	1	0	2	2	2	2	3	2	2
36	1	0	0	0	0	2	3	2	3	2	3	3
37	1	0	0	0	0	3	3	3	3	2	0	0
38	1	0	0	0	0	3	3	3	3	0	2	2
39	1	0	0	0	0	3	3	3	3	1	1	1
40	1	0	0	0	0	3	3	3	2	3	2	3
41	1	0	0	0	0	3	3	3	3	1	3	3
42	1	0	0	0	0	3	3	3	3	1	3	3

43	1	0	0	1	0	3	3	3	1	3	1	2
44	1	1	0	0	0	2	2	2	2	2	1	3
45	1	0	0	0	0	3	3	3	3	1	3	2
46	0	1	1	0	0	3	3	3	2	2	0	3
47	1	0	0	1	0	2	2	2	1	3	1	3
48	1	0	0	0	0	3	3	3	0	3	2	1
49	1	0	0	0	0	3	2	3	3	1	0	2
50	1	1	0	0	0	2	2	2	2	1	1	2
51	1	0	0	0	0	3	3	3	3	0	2	3
52	1	0	0	0	0	3	3	3	3	2	0	2
53	1	1	0	0	0	2	3	3	2	3	0	2
54	1	0	0	0	0	2	2	2	2	2	2	2
55	1	0	0	0	0	3	3	3	3	2	1	0
56	1	0	1	1	0	3	3	3	2	2	2	2
57	1	0	0	0	0	3	3	3	3	0	2	2
58	1	0	0	0	0	3	3	3	3	3	3	3
59	1	1	0	0	0	0	3	3	2	3	1	2
60	1	0	0	1	0	3	3	3	2	3	2	3
61	1	0	0	0	0	3	3	3	3	1	3	3
62	1	0	0	0	0	2	3	3	3	1	3	2
63	1	0	1	0	0	2	3	2	2	1	2	2
64	1	1	1	0	0	3	2	2	2	3	1	2
65	1	1	0	0	0	3	3	3	1	2	0	0
66	1	0	0	0	0	3	3	3	1	3	2	2
67	1	1	1	0	0	2	2	2	2	2	2	2
68	0	0	0	1	0	3	3	3	2	3	1	3
69	1	0	0	0	0	3	3	3	3	2	2	3
70	1	0	0	0	0	3	3	3	2	1	2	3
71	1	1	0	0	0	2	2	2	3	0	3	3
72	1	1	0	0	0	2	1	3	2	2	2	0
73	1	0	0	0	0	3	3	3	3	1	3	3
74	1	1	1	1	0	3	3	3	2	1	3	3
75	1	0	0	0	0	3	3	3	3	2	1	3
Mean						2.32	2.53	2.41	2.32	1.59	1.61	2.00
Mode						3.00	3.00	3.00	2.00	1.00	2.00	2.00
Median						2.00	3.00	3.00	2.00	2.00	2.00	2.00
sDev						0.82	0.60	0.82	0.68	0.95	1.01	0.96

### Appendix (4) Q17- Q21

	Q17	Q 18	Q19	Q20	Q21
Range	0-3	0-3	0-3	0-3	0-3
1	1	3	3	3	1
2	2	3	2	2	3
3	2	3	3	3	1
4	2	3	3	3	2
5	2	2	2	2	3
6	1	3	1	2	1
7	3	3	3	3	2
8	2	2	2	2	0
9	2	2	2	2	1
10	0	2	0	1	1
11	2	2	2	1	1
12	2	3	2	3	1
13	2	2	2	2	2
14	2	2	2	3	0
15	0	3	0	3	2
16	2	3	2	3	1
17	1	3	0	3	3
18	3	3	3	3	1
19	0	3	1	3	1
20	1	3	0	3	0
21	1	3	0	2	1
22	2	0	3	2	1
23	1	2	1	2	0
24	3	2	2	3	1
25	1	2	1	2	1
26	3	1	3	3	0
27	2	1	2	2	1
28	3	3	3	3	0
29	2	2	2	2	0
30	1	1	1	2	1
31	2	3	2	3	0
32	2	2	2	2	0
33	2	3	0	3	0
34	1	2	0	3	0
35	1	1	2	2	1
36	2	3	2	3	0
37	0	3	2	2	0
38	2	2	2	2	1
39	0	2	0	2	0
40	1	2	2	1	0
41	3	2	1	3	0
42	3	2	2	2	1

43	1	1	1	3	0
44	1	0	2	1	1
45	1	2	2	3	3
46	0	0	0	3	0
47	0	3	0	2	0
48	0	2	0	2	0
49	3	2	2	0	0
50	2	0	1	2	1
51	2	1	2	3	0
52	0	0	0	2	0
53	0	0	0	2	0
54	2	2	2	0	0
55	2	2	2	2	1
56	1	2	2	2	0
57	2	2	2	2	1
58	1	2	2	2	0
59	0	1	0	3	0
60	1	3	0	0	1
61	3	3	3	3	1
62	2	2	2	2	1
63	2	2	2	2	0
64	0	2	0	2	0
65	0	2	0	3	0
66	1	1	2	2	0
67	2	1	2	0	0
68	0	0	0	0	0
69	1	1	1	1	1
70	1	1	1	1	2
71	2	0	2	0	0
72	1	2	2	2	0
73	2	2	2	2	0
74	2	2	2	2	0
75	2	0	2	1	1
<b>Mean</b>	<b>1.47</b>	<b>1.91</b>	<b>1.51</b>	<b>2.11</b>	<b>0.67</b>
<b>Mode</b>	<b>2.00</b>	<b>2.00</b>	<b>2.00</b>	<b>2.00</b>	<b>0.00</b>
<b>Median</b>	<b>2.00</b>	<b>2.00</b>	<b>2.00</b>	<b>2.00</b>	<b>0.00</b>
<b>sDev</b>	<b>0.93</b>	<b>0.96</b>	<b>0.99</b>	<b>0.88</b>	<b>0.83</b>