A STUDY OF THE INFLUENCE OF INSTRUCTIONAL OBJECTIVES ON STUDENT SELF-EFFICACY

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A Study of the Influence of Instructional Objectives on Student Self-efficacy

by

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A thesis submitted to the School of Graduate Studies in partial fulfilment of the requirements for the degree of Master of Education

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Abstract

The main purpose of this study was to determine whether instruction with the aid of instructional objectives had any effect on student self-efficacy. Secondary aims were investigated as well. These included whether the use of instructional objectives had any effect on student achievement, and whether any potential effect of instructional objectives on self-efficacy and achievement was mediated by perceived ability.

To do this a two part study dealing with a unit of work on coordinate geometry was taught to four classes of heterogeneously grouped grade nine students. Two classes were taught with the aid of instructional objectives and two were taught without such assistance.

From the analysis of variance mixed results were obtained as to whether the use of instructional objectives had any effect on perceived self-efficacy. However, the results showed that there was a significant difference in achievement levels, but no difference in level of perceived self-efficacy or achievement among students of different ability levels.

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Chapter 1

The Problem

Introduction

The present study is an investigation into student motivation based on the premise that motivation is a cognitive process. According to Deci (1975) a cognitive approach to motivation places much of the emphasis on thought processes. It is his view that a person acts in a particular way after an assessment of each of the possible behavioral alternatives.

Through an inspection of cognitive theories of motivation, it can be deduced that our beliefs have a major effect on behaviour. The ways in which these beliefs affect behaviour is assessed by several cognitive theories of motivation. These include attribution theory, self-worth theory, goal theory, self-efficacy theory, and self-determination theory. For purpose of this study emphasis will be placed on self-efficacy theory, with content goal setting as a mediating factor.

The research conducted in this study investigated students' level of self-efficacy. First, students'

level of self-efficacy was assessed in relation to short term goals, known as instructional objectives, set by the teacher at the beginning of each lesson, and repeated throughout the lesson. The researcher's objective was to determine whether a student's self-efficacy was affected by these instructional objectives. Second, an attempt was made to determine whether the use of instructional objectives had any effect on student achievement. Third, the researcher tried to determine whether perceived ability mediates the effect of instructional objectives on self-efficacy and achievement.

Definition of Key Terms

For purpose of this study there are two terms which need clarification. First, self-efficacy refers to one's judgements of how well he or she can perform given tasks in given situations. Second, instructional objectives refers to statements which specify a particular behaviour or behaviours a person will be able to successfully exhibit at the end of a given lesson or period of time.

Rationale

The effect of goal setting on student behaviour has been studied many times (Schunk 1983, 1984, 1985; Schunk & Swartz, 1993; Stock & Cervone, 1990). These researchers, as well as others, have done extensive work on goal setting and self-efficacy. The purpose of this study is to extend their work and to study the setting of short term content goals, instructional objectives, in a classroom setting and determine their effect on student motivation, specifically self-efficacy.

Instructional objectives have been investigated with respect to their effectiveness for guiding student learning (Kirk & Gustafson, 1986; Britton, Glynn, Muth, & Penland, 1985; Towle & Merrill, 1975), and guiding program development and evaluation (Kibler, Cegala, Barker, & Miles, 1974; Mager, 1984). Again, the intent is to go beyond this point and determine whether the setting of instructional objectives in the context of a lesson has any effect on student motivation.

From the research, most importantly, the researcher hopes to determine whether or not the use of instructional objectives has any effect on student

self-efficacy. If it is determined that instructional objectives do have a positive effect in heightening students' self-efficacy, then it would be another strong reason to advocate usage by teachers in their instruction. This would be beneficial given that not all educators are supportive of the use of instructional objectives. As Taylor (1987) points out, this may be partly due to the inconclusive results of studies conducted in the area. Hence, favourable results of the present study would be beneficial to the teachers, in that the use of instructional objectives could help raise students' self-confidence. Consequently, another educational tool, which is already in use, could prove to be of more value than it is presently considered.

Purpose of the Study

As outlined earlier, the primary purpose of the study is to determine whether the teacher's use of instructional objectives at the beginning of the lesson enhances, has no effect, or diminishes a student's self-efficacy. The secondary purpose is divided into two parts. The first purpose is to determine whether

the use of instructional objectives enhances student performance. The second purpose is to determine if there is any connection in perceived ability and perceived self-efficacy or perceived ability and achievement.

Hypotheses

In seeking answers to the questions outlined in the purpose of the study, the following hypotheses are tested. They are stated in the null form.

1. There is no significant difference in the level of perceived self-efficacy between those students taught with and those taught without the aid of instructional objectives.

2. There is no significant difference in the level of achievement between those students taught with and those taught without the aid of instructional objectives.

3. There is no significant difference in students' level of perceived self-efficacy among students of different ability levels.

4. There is no significant difference in students' level of achievement among students of different ability levels.

Outline of the Study

The remaining part of the study is delineated in the following manner. In Chapter II a review of related literature is examined. Chapter III contains a description of the instruments used, the procedure used to collect the data, and the plan for analysis of the data. Chapter IV contains the results of the analysis of the data. Finally, Chapter V summarizes the conclusions reached as a result of the study, and contains recommendations for future research in this area.

Chapter II

Review of Related Literature

In this chapter two areas of research will be reviewed. First, studies of self-efficacy will be examined, followed by work on instructional objectives. After defining the concept of self-efficacy, three major aspects of the theory will be outlined. These are the effects it has on individuals, the factors which influence self-efficacy, and ways in which self-efficacy can be changed. For the review of instructional objectives, after a definition, emphasis will be on the rationale for usage and the contribution of instructional objectives to effective instruction.

Self-efficacy

Introduction

The term self-efficacy was introduced by Albert Bandura in 1977. At that time he used the term self-efficacy to refer to personal judgements of performance capabilities in a given domain of activity that may contain novel, unpredictable, and possibly stressful

features (Bandura, 1977). To diminish the complexity of the definition, he later stated, that perceived self-efficacy was concerned with "judgements of how well one can execute courses of actions required to deal with prospective situations" (Bandura, 1982, p.122). Both of these definitions suggest that Bandura is of the opinion that specific expectations of one's ability to perform given actions can influence the person's attempt at the task.

Similar to Bandura, Schunk (1984a) defines self-efficacy as "the personal judgements of how well one can perform actions in specific situations that may contain ambiguous, unpredictable and stressful features" (p. 29). To add to this, Schunk (1984b) also states that self-efficacy refers to "personal judgements of one's capability to organize and implement behaviours in specific situations" (p.48). In line with this, Norwich (1987) states that self-efficacy judgements are "personal factors that mediate the interaction between behaviour and environmental factors" (p.384). Consequently, an individual does not act in a certain manner solely because of the situation he or she is in. Instead, it is an individual's

expected performance level which directs his or her actions (Kirsch, 1986). Therefore, a self-efficacy expectation is "the conviction that one can successfully execute the behaviour required to produce the outcome" (Bandura, 1977, p.193). Consequently,, self-efficacy can be summarized as one's judgements of how well he or she can perform given tasks.

Bandura (1977) also outlines how self-efficacy variation occurs along three dimensions. These dimensions are magnitude, generality and strength. According to Maddux and Stanley (1986), "magnitude of self-efficacy, in a hierarchy of behaviours, refers to the number of behavioral steps a person believes himself capable of performing successfully" (p.251). Therefore, how close to successful completion of a given task a person perceives himself or herself able to achieve, has an effect on the level of self-efficacy. Consequently, task difficulty can influence self-efficacy.

Self-efficacy expectations also vary in generality, which refers to the extent to which it extends to similar situations or other domains. Some experiences may instill a generalized sense of self-

efficacy that extends beyond a given domain, whereas others foster situational specific views of self-efficacy. Hence something that extends to other domains or situations can have a much greater effect on an individual than something which only affects an individual's self-efficacy in one given area.

Finally, self-efficacy expectations vary in strength. This refers to the concept of the strength of a person's expectations. Bandura (1977) outlines that weak expectations are easily erased by inconsistent experiences, while strong expectations will persevere for longer periods of time through inconsistent experiences. Consequently, if a person develops a high sense of self-efficacy, as a result of repeated success, sudden failure may have little effect on that individual. Conversely, if a person develops a high sense of self-efficacy as a result of one or two successes, a sudden failure may cause considerable damage to his or her level of self-efficacy.

Although self-efficacy is a relatively new term, given that it was introduced in 1977, other work prior to this date dealt with similar concepts. Much of the earlier work dealt with what is termed outcome

expectancy. However, as Bandura (1977) explains, the terms can not be interchanged. Despite the fact that they both refer to personal judgements as to whether or not a person can successfully complete a given task, there is considerable difference in the two. He defines an outcome expectancy to be "a person's estimate that a given behaviour will lead to certain outcomes" (p.193). Hence, unlike beliefs of self-efficacy, an individual can believe that a certain course of action will produce the desired results, but unless that person has serious doubts as to whether he or she can perform what is necessary, the information does not influence the behaviour. Conversely, with self-efficacy the beliefs are thought to have a major impact on the behaviour.

Effects on Individuals

Self-efficacy, due to its broad range of influence, has many diverse effects on individuals. "People's beliefs about their operative capabilities function as one set of proximal determinants of how they behave, their thought patterns, and the emotional reactions they experience in taxing situations"

(Bandura, 1986, p.393). Such beliefs can affect an individual in several ways.

One way in which self-efficacy can influence an individual is in his or her choice of activity. Bandura (1977) explains that people tend to avoid tasks, which they believe to be beyond their capabilities, but are usually willing to perform tasks which they feel capable of handling. Consequently, self-efficacy beliefs can have a profound effect on an individual. As Bandura (1986) adds, any self-efficacy beliefs that encourage active participation in activities can foster a growth in competencies. Conversely, perceived self-inadequacies that lead to avoidance can hamper development of potentialities, and may shield negative self-perceptions from positive change.

However, problems also arise when people judge themselves to be capable of given tasks, when in reality they are not. This overestimation of capability can lead to needless failure and a thwarting of one's credibility. Therefore, "the self-efficacy judgements which are the most functional are probably those that slightly exceed what one can already do at

any given time" (Bandura, 1986, p.394). This leads people to undertake tasks which are attainable, but still challenging.

Secondly, self-efficacy can influence an individual in his or her effort expenditure and persistence at a given task. The stronger the perceived self-efficacy, the more effort and extra persistence he or she shows in attempting a task. In a study conducted by Bandura and Cervone (1983), students who had self-doubts of their capabilities usually lowered their standards and consequently exerted less effort than those who were confident of their ability. Also of note, in most instances, the students who had very few self-doubts exerted extra effort, which led to increased performance.

Similar to the notion of increased effort, individuals with high self-efficacy are known to persist longer at given tasks. Highly efficacious individuals persist longer at a difficult task and also attempt more tasks. In a meta-analyses conducted by Multon, Brown, and Lent (1991), it was determined that beliefs of self-efficacy do contribute to academic persistence. According to Multon et al., self-efficacy

beliefs were responsible for, on average, twelve percent more persistence at academic tasks.

Similar to the idea of persistence at a given task, persistence over a period of time is also affected by an individual's feelings of self-efficacy. Lent, Brown, and Larkin (1984) found that students with higher self-efficacy ratings persisted longer in the courses necessary for their intended major than those with lower self-efficacy. Consequently, self-efficacy can have a long term effect on an individual, given that success in life is dependent on persistence.

The third way in which individuals can be affected by self-efficacy beliefs, is in their thought processes and emotional reactions. Bandura (1989) states that "self-beliefs of efficacy can enhance or impair performance through their effects on cognitive, affective, or motivational intervening processes" (p.729). Hence, a person can be affected in several ways. First, self-efficacy affects an individual's analytic thinking. Bandura and Wood (1989) report that people with strong beliefs in their problem solving ability are highly efficient in their analytic thinking, especially in complex decision making

situations. Conversely, those who are troubled with self-doubts are erratic in their analytic thinking. This is of importance given that quality of analytic thinking has an effect on performance accomplishments.

Second, "individuals' perceptions of their efficacy influence the types of anticipatory scenarios they construct and reiterate" (Bandura, 1989, p.729). Those who have high self-efficacy visualize success scenarios which are useful in providing positive guides for performance. These individuals rehearse positive solutions to problems. Conversely, those with low self-efficacy visualize failure scenarios, which weaken motivation. These individuals would focus on the things that could go wrong. Bandura and Adams (1977) outline the fact that perceived self-efficacy and cognitive simulation affect each other bidirectionally. A high perception of self-efficacy nurtures cognitive constructions of effective actions, while cognitive repeating of efficacious actions strengthen self-percepts of efficacy.

The third cognitive process affected by self-efficacy is cognitive motivation. Individuals are partially motivated by their self-beliefs of efficacy.

Specifically, "people motivate themselves and guide their actions anticipatorily through the exercise of forethought" (Bandura, 1989, p.729). On this basis, people decide on the tasks to attempt, and the effort to exert in accomplishing these tasks. The higher a person's level of confidence in his or her ability, the more difficult task he or she will attempt, and the more effort and persistence he or she will show at attempting to complete that task successfully.

Factors Affecting Self-efficacy

An individual's self-efficacy is affected in several different ways by several different sources. According to Schunk (1991), "people acquire information to appraise self-efficacy from their performance accomplishments, vicarious experiences, forms of persuasion, and physiological indexes" (p.208).

The first, and most powerful, influence on self-efficacy expectancies is performance experiences (Maddux and Stanley, 1986; Schunk, 1984b; Lent, Lopez, & Bieschke, 1991). In particular, clear past successes and failures impact on an individual's self-efficacy. In a study conducted by Lopez and Lent (1992), it was

determined that past mathematics performances impacted on students' appraisal of their mathematics abilities. Failure experiences were found to significantly diminish high school students' confidence in their present course work, as well as deter them from enrolment in future mathematics courses. These results are consistent with that of Locke, Frederick, Lee, and Bobko (1984), Norwich (1986), and Hackett, Betz, O'Halloran, and Romac (1990) who determined in their studies that there is a definite correlation between task performance and self-efficacy.

Similar to the conclusions reached by others, Bandura (1986) explains that success raises self efficacy and repeated failure tends to lower it. However, he goes on to point out that in the event of repeated success, occasional failure will have little effect on a person's judgement of his or her ability. Therefore, the percepts of self-efficacy will usually remain stable.

Second, vicarious experiences which include observational learning, imitation, and modelling, affect an individual's self-efficacy. According to Schunk (1986) there are six vicarious influences on

self-efficacy. These are attribute similarity, perceived competence, number of models, strategies modeled, information on task demands, and outcomes of models' actions. In this section, the term "model" is synonymous with the individual being observed.

Similarity to a model can have an effect on an individual's self-efficacy. The main attributes are similarity in age, gender, background and even competence. Schunk and Hanson (1985), substantiated this idea in an experiment they conducted. Also, similarity is directly linked to the second vicarious experience, perceived competence. Individuals judge their self-efficacy through the above mentioned comparison to others.

The third vicarious or observational factor is the number of models. Bussey and Bandura (1984) state that observing multiple models, rather than a single model, is one means of increasing perceived similarity. When examining multiple individuals, single successes and failures are not as meaningful. Rather, it is the group as a whole, on which the person judges his or her capabilities.

The fourth vicarious influence is modelling strategies. In a study conducted by Schunk and Gunn (1985), it was determined that when a model outlined the importance of task strategies, an individual's perception of self-efficacy was higher than when it was omitted.

With respect to the fifth vicarious influence, it is beneficial for individuals to convey information regarding task demands. This involves statements such as "how the use of a particular strategy can help overcome the problem", and "this problem isn't too difficult". By understanding the demands placed on an individual, he or she will likely have a more realistic level of self-efficacy.

The sixth vicarious factor which affects an individual's self-efficacy is the outcome of models' actions. Schunk (1986) explains that whether a model succeeds or fails has an important influence on the observer. As Bandura (1981) outlines, this is also dependent on perceived similarity to the model. For example, if the model is perceived to be of equal or higher ability, and has success with the particular task, then the observer's self-efficacy will be high.

The third influence on an individual's perceived self-efficacy is verbal persuasion. Schunk (1986) points out that verbal persuasion boosts individuals' confidence and self-efficacy enough for them to exert sufficient effort to succeed. Unfortunately, unrealistic beliefs which may be formed through verbal persuasion are an invitation for failure, and usually lead to lowered self-efficacy.

Maddux and Stanley (1986) point out, "verbal persuasion is influenced by factors such as expertness, trustworthiness, and attractiveness of the source" (p.2050). Similar to the idea of modelling, verbal persuasion has the most effect when a person is confident that the individual who is verbalizing is competent and honest.

Bandura (1977) cites emotional arousal as the fourth influence on a person's self-efficacy. Stressful situations elicit various emotional arousals which can impact on an individual's self-confidence. He (1986) also states that "because high arousal usually debilitates performance, people are more inclined to expect success when they are not beset by aversive arousal than if they are tense and viscerally

agitated" (p.401). Given that people use their physiological arousal to judge anxiety, the lack of such negative emotions can lead to an heightened self-efficacy. Bandura and Adams (1977) also found the same to be true.

Changing Self-efficacy

Aside from the factors outlined above which affect self-efficacy, there are ways in which self-efficacy can be enhanced. Two educational practices which may alter individuals' self-efficacy are setting goals and offering rewards. In this section the various aspects of goal setting will be reviewed.

Schunk (1984a) states, "goal setting involves establishing a standard or objective to serve as the aim of one's actions" (p.30). Once the standard is determined, it is then the task of the individual to achieve this. With respect to goal setting most research has centred around four properties. These are goal specificity, difficulty, proximity, and whether the goals are self-set or assigned.

Goal specificity refers to the precision used in instructing the students as to what is expected of

them. General goals, such as "try your best", are vague and tend to make it difficult for the student to judge what is expected of him or her. Specific goals, however, are more precise and enable a student to assess whether or not he or she is successful at completing the required task.

Schunk (1990) reports that specific goals promote a higher self-efficacy than do general goals. The main reason for this is that progress is easier for the student to gauge when given specific goals. Consequently, as progress is observed, the level of one's self-efficacy tends to increase. This is of importance, given that an increase in self-efficacy can lead to increased performance and greater skill acquisition. This supports findings by Matherly (1986), who also found the same to be true.

Goal proximity refers to the length of time during which goals are to be attained. Proximal, or short term goals, can be achieved rapidly, whereas distant goals take a greater length of time and can span weeks, months or even years.

In a study conducted by Bandura and Schunk (1981), subgoals, which are actually proximal goals, heightened

perceived self-efficacy. Also, there was no increase in the perceived self-efficacy of students who had distant goals. As Schunk (1983a) contends, the main reason for this result is that it is much easier to gauge progress for an immediate goal than it is for more distant goals.

Stock and Cervone (1990) found similar results in an experiment they conducted. They determined that subgoals raised perceived self-efficacy as soon as they were assigned, whereas distant goals did not. They also found that self-efficacy was heightened after reaching each proximal subgoal. For those who were not assigned subgoals, self-efficacy remained constant even after reaching the same point. These findings are consistent with other research demonstrating a positive influence of proximal goal attainment on performance expectations and self-efficacy (Schunk, 1983b; Manderlink & Harackiewicz, 1984).

Goal difficulty also affects individuals' self-efficacy. Schunk (1983c) conducted a study in which students were given instruction on long division problems. They were given either difficult but attainable goals, or easy goals. The results showed

that children who received difficult goals displayed the highest self-efficacy. Given that an individual has sufficient ability to complete the assigned task, difficult goals foster an increased self-efficacy which contributes to more productive performance.

Finally, the distinction between self-set goals and assigned goals has an effect on self-efficacy. Schunk (1985) tested the hypothesis that self-set goals lead to higher self-efficacy than goals assigned by another individual, such as a teacher. The results from the study confirmed this, as it was established that self-set goals led to higher self-efficacy and also higher performance levels.

Instructional Objectives

Introduction

Over the past thirty years, one of the most significant instructional tools has been the instructional objective. The term instructional objective varies from person to person, but remains consistent in that it describes "the class of performances that may be used to determine whether the

implied human capability has been learned" (Gagne & Briggs, 1979, p.127). In line with this definition there have been many definitions of the term.

According to Mager (1984), the term objective refers to "a description of a performance you want learners to be able to exhibit before you consider them competent" (p.3). Similarly, Eisner (1979) defines instructional objectives as statements which "specify unambiguously the particular behaviour (skill, item of knowledge, and so forth) the student is to acquire after having completed one or more learning activities" (p.14). Other individuals focus on the specific information which teachers attempt to convey to students. For example, Muth, Glynn, Britton, & Graves (1988) define instructional objectives as "either statements or questions designed to point out the important information to identify" (p.315).

The problem of being able to measure the resulting behaviour or outcome has been a major consideration when considering instructional objectives. To overcome this problem, it is necessary for objectives to be expressed in behavioral terms. As Popham, Eisner, Sullivan, and Tyler (1969) state, "a properly stated

behavioral objective must describe without ambiguity the nature of learner behaviour or product to be measured" (p.37). Consequently, some individuals identify instructional objectives by the term behavioral objectives. Kibler, Barker, & Miles (1970) define behavioral objectives to be "statements which describe what students will be able to do after a prescribed unit of instruction" (p.1). Analogous to this, Taylor (1987) defines a behavioral objective to be a statement of "what the learner should be able to do at the end of the instructional sequence" (p.232). Also, Eisner (1979) defines a behavioral objective to be "an intent communicated by a statement describing a proposed change in a learner-a statement of what the learner is to be like when he has successfully completed a learning experience" (p.94). Given the close nature of the terms instructional and behavioral objectives, for purpose of this study, the term instructional objective will be used to refer to all intended learning outcomes that have been stated in behavioral terms.

Rationale For Using Instructional Objectives

Popham (1971) claims that "without question the most important instructional advance during the 1960s was a widespread advocacy and increased use of measurable instructional objectives" (p.11). Some of the main reasons for making such a bold statement are outlined in this section.

One reason for using instructional objectives is for purposes of teacher accountability. Currently, teachers are increasingly being held accountable for the performance of students in the classroom. Using instructional objectives is one way for a teacher to justify his or her evaluation of students. Popham (1987) contends that the use of instructional objectives leads to a more defensible evaluation. Teachers are able to show that they are evaluating the material in the appropriate manner, by evaluating what is outlined in the instructional objectives. Consequently, students can receive a more precise evaluation.

Second, the use of instructional objectives can allow for more effective learning on the part of the student. First and foremost, students know what is to

be learned. Muth et al. (1988) point out that this enables students to focus their attention on certain ideas. This is in line with an earlier study conducted by Britton et al. (1985). At this time, they demonstrated that objectives increase the amount of time students spend on objective relevant information. This supports the results from a survey conducted by Towle and Merrill (1975), at which time it was determined that graduate students used instructional objectives to help distinguish the relevant from the irrelevant material. As Kibler et al. (1974) point out, this is important because students are spared the frustration and time-consuming effort of guessing what is expected of them, in given instructional situations.

Also, it would seem logical that students learn more easily if they know what they have to learn, and also know how they are expected to demonstrate their knowledge. Learning is also made easier because students are able to use instructional objectives to guide learning. As Knirk and Gustafson (1986) suggest, objectives can also serve as expository advance organizers for unfamiliar material. This makes it easier for studying and learning new material. Related

to this, students use instructional objectives for self-evaluation purposes. Students are able to judge how well they are doing at the end of a unit of work, or at any time throughout the unit. As Towle and Merrill (1975) suggest, generating questions for self-evaluation is one of the main purposes of instructional objectives.

Also, effective learning is facilitated by a feeling of security on the part of the student. For example, Merrill and Towle (1976) suggest that student anxiety will be lower if students know what is expected of them.

The reasons outlined above for enhancing effective learning may also be of importance in relation to self-efficacy. In order for a person to determine whether or not he or she can successfully complete a given task, it may be beneficial for that person to know what is expected. If it is the case that instructional objectives, which relate new material to old, are used, the individual will likely make a more accurate assessment of his or her ability to complete the given task. This affects self-efficacy in that more precise judgement is made.

The third reason for using instructional objectives is educational planning or curriculum planning. Curriculum planning may be positively affected by the use of instructional objectives. Curriculum planners are better able to arrange sequence of courses or units of instruction, when clearly specified instructional objectives are defined (Kibler et al., 1974). Also, the use of instructional objectives allows for more effective professional sharing of ideas and material. Teachers receiving assistance from colleagues tend to find it more helpful when instructional objectives accompany units of work. This enables one individual to tell another exactly what is being taught.

The list of reasons for using instructional objectives is extensive. In the rationale outlined above, the purposes or reasons are not priorized, mainly because all of these are important for accurate instruction and evaluation, as well as students' sense of assurance as to what is expected of them. Closely related to the rationale, is the final section in this review, which is effective instruction through the use of instructional objectives.

Effective Instruction

Mager (1984) states, "instruction is effective to the degree that it succeeds in changing students, in desired directions, and not in undesired directions" (p.1). Consequently, if any of these stipulations are not adhered to, then instruction is not deemed effective. Given that in the teaching profession ineffective instruction is not acceptable, it is necessary for instruction to be productive. The likelihood of effectiveness is increased through the use of instructional objectives. This is supported by Duchastel and Merrill (1973), who point out that instructional objectives are always never detrimental, and they give direction to the teaching process.

Frudden and Stow (1985) state that the selection of instructional objectives for a lesson should be the first preinstructional planning act. All further planning should then be related to that decision. Once instructional objectives are in place, the teacher can then gather all subsequent necessities for an effective lesson.

In order for objectives to be useful, they must maintain certain characteristics. Gronlund, (1978)

states that when developing instructional objectives it is essential to "state the objectives so they clearly convey the learning outcomes expected from the instruction" (p.35). In an experiment conducted by Dalis (1970), it was determined that specifically articulated objectives were more effective, and led to higher student achievement than vague objectives. This is of relevance to the present study, given that setting specific, proximal goals has been shown to have a positive effect on student self-efficacy. The correct word usage is an important aspect of writing specific objectives. The student must know, from the objective, exactly what is expected of him or her.

Also, for instructional objectives to be effective, they must cover all levels of learning, from knowledge through to evaluation. If the higher levels of learning, such as synthesis and evaluation are omitted, which is sometimes the case, individuals are not given the challenge of higher level thinking and learning.

If the appropriate instructional objectives are in place, it is then necessary that the instruction itself parallel the instructional objectives. Frudden and

Stow (1985) support this idea, in claiming that student activities must be relevant to the instructional objectives. Otherwise, the teaching practice will not be as effective.

Finally, effective instruction must be completed with valid testing. As Gronlund (1978) points out, for valid test results, which is one of the major contributors to student evaluation, "the sample of behaviour must be in harmony with both the instructional objectives and the subject matter emphasized in the instruction" (p.48). Consequently, if the test questions parallel the intended learning outcomes, a true indication of what the students have learned will be obtained.

If all of these points are considered and followed, successful instruction is still not guaranteed. However, with the proper use of instructional objectives, effective teaching strategies and fair evaluation, it is much more likely to be effective than if any of these are missing.

Summary

As can be seen from the synopsis of the literature covering these extensive topics, much consideration has been given to the concepts of self-efficacy and instructional objectives. Despite the fact that there may be a connection between them, little research has been done on the two collectively. For this reason, the researcher feels that at this time it is beneficial to do an investigation to determine whether the use of instructional objectives has any effect on student self-efficacy. Also, the outline of the study lends itself to investigate other questions relating to self-efficacy and instructional objectives. The research previously conducted on these topics now serves as a basis from which to begin the present study.

Chapter III

Methodology

In this chapter a description of the design of the study and the procedures used to carry out the study are presented. It includes a description of the sample, instruments, and procedure.

Sample

The subjects for the study were four intact classes of grade nine mathematics students at Discovery Collegiate High School, Bonavista. The number of students in each class, that took part in the study, were 19, 20, 21, and 20 respectively. The actual class sizes were larger, but due to irregular attendance, some students did not participate. The students were assigned to classes by the principal. This decision was made on the basis of past performance and behaviour. They were assigned with an effort made to have four classes with relatively equal numbers of students with respect to ability and behaviour. Consequently, the students were heterogeneously grouped and classes numbered one, two, three and four. Classes

one and two represent the control group and were taught without the use of instructional objectives, similar to the type outlined by Gronlund (1978). Classes three and four represent the experimental group and were taught with the aid of instructional objectives. Table 1 gives a breakdown of the sample with respect to method of instruction and gender.

Table 1

Group, Treatment and Sex of Students

		Sex		
Class	Group	Male	Female	Treatment
1	Control 1	9	10	No Instructional Objectives
2	Control 2	12	8	No Instructional Objectives
3	Experimental 1	9	13	Instructional Objectives
4	Experimental 2	10	10	Instructional Objectives

Measures

The measures consisted of a mathematics ability questionnaire, four self-efficacy questionnaires, two

pretests, and two posttests. The mathematics ability questionnaire was administered twice, once at the beginning and again at the end of the study (see Appendix A). The questionnaire contained five questions pertaining to the students' perceived mathematics ability. Each question had a 7 point rating scale, ranging from very poor perceptions to very high perceptions. Consequently, when scoring the questionnaire, the higher the score the more capable a person perceived himself or herself to be. Note that due to the wording, questions one and two were scored inversely.

The four self-efficacy questionnaires each contained twenty items (see Appendix B). Questionnaires one and two pertained to lesson one, while questionnaires three and four pertained to lesson two. All four questionnaires contained items similar to those the students would complete in the practice portion of the lessons. The students had to decide how confident they were that they could get the correct answer to each question. The students had seven responses to choose from. The responses ranged from one which represented "definitely could not get the

answer" to seven which represented "definitely could get the answer". All questions were worded so that the scoring could be done by simply adding the number circled for each question. Therefore, a score of seven was always the highest. The highest possible score on each of the questionnaires was 140 while the lowest possible score was 20.

To test for reliability on each of these questionnaires, an internal consistency measure, the Cronbach Alpha Coefficient, was determined. The results showed very high reliability for all four self-efficacy questionnaires (questionnaire 1, α =.95; questionnaire 2, α = .98; questionnaire 3, α = .98; questionnaire 4: α = .99). Cronbach alphas this high suggest that students are responding consistently to the questions. This is understandable, given that within a narrow domain, self-efficacy is a fairly stable construct, meaning that students have a fairly clear judgement about their capability to perform the tasks.

The two pretests and two posttests were designed on the same lines as the self-efficacy questionnaires in that they each contained twenty questions (see

Appendix C). For each of the tests, the students were expected to find as many correct solutions to the questions as possible. The tests were scored on the basis of each question being either correct or incorrect. Therefore, the highest possible score on each test was twenty and the lowest possible score was zero.

To check these tests for reliability, again a Cronbach Alpha Coefficient was determined for each one. The results showed high consistency for these tests as well (pretest 1, $\alpha = .79$; pretest 2, $\alpha = .89$; posttest 1, $\alpha = .90$; posttest 2, $\alpha = .82$).

Procedure

Four classes were used for the research study. Two classes were taught with the aid of instructional objectives. The teachers in these classes would begin each lesson by naming the topic and then writing the instructional objectives on the white board. The students were told that this was what they were expected to know how to do by the end of the lesson. They were also instructed to write these objectives in their notebooks. The teachers would then repeat these

instructional objectives throughout the lesson, in order to remind the students what they should be learning.

The other two classes were taught without the aid of instructional objectives. These classes were taught by the teacher simply naming the topic and then beginning instruction. Unlike the experimental group, the students in these classes did not know in advance what they were expected to learn through participation in the lesson.

All four groups in the study spent six, sixty minute classes on the material on which the study was based. These classes consisted of instruction, practice, correction and explanation, and administration of questionnaires and tests.

The study consisted of two sections of work on coordinate geometry. Prior to beginning lesson one, the students were asked to complete a mathematics ability questionnaire. Once this was completed, the teachers then began lesson one. The control group were simply told that the section dealt with "slope of a line". The experimental group were told that the section dealt with "slope of a line" and were given the

instructional objectives for the section (see Appendix D). After the introduction of the section both groups were given Self-efficacy Questionnaire 1. The students were asked to determine how confident they were that they would be able to get the correct answer to the questions after completing the section. It was explained to them that the section would be complete after they had received instruction, practice, and correction and explanation of the examples.

After completion of the questionnaire the students were given Pretest 1. Next, the teachers of both groups proceeded with classroom instruction of the section. The lesson plan was developed by the researcher and was identical for both the control and experimental groups.

After completion of the lesson the students were given Self-efficacy Questionnaire 2. Then the teachers gave the students Posttest 1. It contained the same twenty questions that were on Questionnaire 2. The students had to do as many as possible correctly. This signified the end of the first section.

After lesson one was completed, the following class the teachers moved directly to lesson two, the

final section for the study. As with lesson one, the control group were simply told the topic being covered in the lesson, which was "determining the length of line segments". Again, the experimental group were told this and also given the instructional objectives for the section (see Appendix D). After the introduction of the section both groups were given Self-efficacy Questionnaire 3. As with Self-efficacy Questionnaire 1, the students were asked to determine how confident they were they would be able to get the correct answer to the questions after completing the lesson.

After completion of this questionnaire, the students were administered Pretest 2. After completion of the pretest, the teachers of both groups proceeded with classroom instruction of the section. Again, the lesson plan was developed by the researcher and was identical for both the control and experimental groups.

When the lesson was completed the students were given the mathematics ability questionnaire again. Then, the students were asked to complete Self-efficacy Questionnaire 4 and to complete the study, the students were given Posttest 2.

With respect to a time frame for the study, it was completed in six 60 minute classes. One additional point which needs to be addressed, is the length of time allocated for the administration of each of these instruments. Given that the groups were heterogeneously grouped, there was a wide variety of ability in each class. For this reason, no specific time limit was set. The teachers were instructed to give the students the amount of time necessary to complete all parts of the questionnaires and tests.

The remaining two chapters centre around the results of the study and what recommendations can be drawn from these results.

Chapter IV

Analysis of Data

The main purpose of this study was to determine whether the use of instructional objectives in classroom instruction had any effect on student self-efficacy. Other secondary aims were investigated as well. These included whether the use of instructional objectives had any effect on student performance, whether there was any relation between perceived ability and perceived self-efficacy, and whether there was any relation between perceived ability and level of achievement. This chapter gives a detailed analysis of the data collected during the research and the results of testing the hypotheses.

Hypothesis 1

Hypothesis: There is no significant difference in students' level of self-efficacy between those taught with the aid of instructional objectives and those taught without.

The hypothesis was tested using a set of between group comparisons. More specifically, a two way repeated measures ANOVA with group membership as a between groups factor and time of test as a repeated measure was used. It is necessary to note that the interaction effects are of most interest, so these are the statistics reported in this study. Also, to assist in showing that the groups were evenly matched, a between groups comparison was performed on the self-efficacy scores for the first questionnaire in both Lesson 1 and Lesson 2. It was determined from these results that there was no significant difference, at the time of pretest, in the self-efficacy between groups in Lesson 1 ($F=1.97$, $P>.05$) or Lesson 2 ($F=3.74$, $P>.05$).

In the ANOVA for Lesson 1, the scores on Self-efficacy Questionnaire 1, administered before instruction, were compared with those on Self-efficacy Questionnaire 2, administered after instruction. Table 2 gives the means and standard deviations of these questionnaires for both the control and experimental groups.

Table 2

Means and Standard Deviations of Self-efficacy Questionnaires (Lesson 1)

Group	Questionnaire 1		Questionnaire 2	
	Mean	Standard Deviation	Mean	Standard Deviation
Control	81.33	21.40	94.71	29.80
Experimental	88.78	25.76	107.37	24.25

An analysis of the interaction effects showed no statistically significant difference in the variation of scores ($F=0.74$, $P>.05$). Hence, the scores on the questionnaire did not change differently between the two groups. Consequently, on the basis of these results the hypothesis would not be rejected. However, there were some descriptive differences, which were not statistically detectable. The experimental group did show slightly higher gains in self-efficacy than did the control group. In line with this, Lesson 2 of the study showed statistical results different from those in Lesson 1. The scores of Self-efficacy Questionnaire

3 were compared to those of Self-efficacy Questionnaire 4. Table 3 gives the means and standard deviations of the results of these questionnaires for both the control and experimental groups.

Table 3

Means and Standard Deviations of Self-efficacy Questionnaires (Lesson 2)

	Questionnaire 3		Questionnaire 4	
Group	Mean	Standard Deviation	Mean	Standard Deviation
Control	86.05	27.52	89.79	25.09
Experimental	97.93	26.34	114.17	22.15

An analysis of the interaction effect from this part of the study yielded a statistically significant variation in the scores of the questionnaires ($F=8.16$, $P<.05$). Therefore the scores on the questionnaires did change differently between groups. Hence from this part of the study, the hypothesis would be rejected Consequently, from the combined results of the two

parts of the study, the hypothesis can be partially accepted. There is not enough conclusive evidence to either fully accept or reject the hypothesis. There may be several reasons for these varied results. A detailed explanation of the possible reasons for such results is given in the next chapter.

Hypothesis 2

Hypothesis: There is no significant difference in the level of achievement between those students taught with the aid of instructional objectives and those taught without.

This hypothesis was tested as well using a set of between group comparisons. Again, a two way repeated measures ANOVA with group membership as a between groups factor and time of test as a repeated measure was used. Again, to assist in showing that the groups were evenly matched, a between groups comparison was performed on the pretest scores for both Lesson 1 and Lesson 2. It was determined from these results that there was no significant difference in the achievement

between groups in Lesson 1 ($F=1.18$, $P>.05$) or Lesson 2 ($F=0.32$, $P>.05$) prior to the beginning of the lesson.

In the ANOVA on Lesson 1, the scores on Pretest 1, administered before instruction, were compared with those on Posttest 1, administered after instruction. Table 4 gives the means and standard deviations of these tests for both the control and experimental groups.

Table 4

Means and Standard Deviations of Pretest and Posttest (Lesson 1)

	Pretest 1		Posttest 1	
Group	Mean	Standard Deviation	Mean	Standard Deviation
Control	1.54	1.48	10.39	4.90
Experimental	1.87	1.31	13.43	5.82

An analysis of the interaction effect showed a significant difference in the results of the tests for both groups ($F=4.64$, $P<.05$). This means that the

scores from the two groups did change differently from the pretest to the posttest. On the basis of these results the hypothesis can be rejected. Similarly, the results from the second part of the study, showed consistent results. The scores of Pretest 2 were compared to those of Posttest 2. Table 5 gives the means and standard deviations of the results of these tests for both the control and experimental groups.

Table 5

Means and Standard Deviations of Pretest and Posttest (Lesson 2)

	Pretest 2		Posttest 2	
Group	Mean	Standard Deviation	Mean	Standard Deviation
Control	7.07	5.26	13.95	4.06
Experimental	6.43	5.11	17.29	2.70

An analysis of the interaction effect on this part of the study yielded a significant difference in the variation of scores between the two groups (F=8.16,

$P<.05$). Again, the scores from the two groups did change differently from the pretest to the posttest. On the basis of these results, the hypothesis would again be rejected. Hence, from the combined results, the hypothesis can be rejected. Given that a statistically detectable interaction effect was obtained for both parts of the study, this suggests that the use of instructional objectives may lead to enhanced achievement. Possible reasons for the results will be explored further in the final chapter.

Hypothesis 3

Hypothesis: There is no difference significant difference in students' level of perceived self-efficacy among students of different ability groups.

In order to test this hypothesis, it was necessary to determine whether or not students' level of perceived ability remained relatively consistent over the course of the study. To do this, a between groups ANOVA was conducted on Math Ability Questionnaire 1, administered at the beginning of the study and Math

Ability Questionnaire 2, administered at the end of the study. Again for purposes of this study the interaction effects is of most importance. The results yielded no significant difference in the two groups ($F=0.27$, $P>.05$). Therefore it can be concluded that students' level of perceived ability did remain consistent throughout the study. Once this was established, the full sample was divided into three groups according to perceived ability. These can be labelled high, medium and low perceived ability.

To test the hypothesis, a three-way repeated measures ANOVA with group membership and ability as between groups factors and time as a repeated measure was used, for both parts A and B of the study, to determine whether the variation in student self-efficacy, over time, was consistent among groups. The results from both parts of the study were consistent. The results of Part A yielded no significant difference ($F=0.83$, $P>.05$) in the variance of student self-efficacy among groups over time among different levels of ability. Consistent with this, the results of Part B showed no significant difference as well ($F=0.32$, $P>.05$). On the basis of these results, the hypothesis

can be accepted. Therefore, it can be concluded that there is no significant difference in students' level of perceived self-efficacy among students of different ability levels.

Hypothesis 4

Hypothesis: There is no significant difference in students' level of achievement among students of different ability levels.

To test this hypothesis, the same groupings were used as with Hypothesis 3. Again, a three-way repeated measures ANOVA with group membership and ability as between groups factors and time as a repeated measure was used, for both parts of the study, to determine if there was any difference in the perceived ability of students and the achievement. As with the results from question 3, the results for both parts of the study were consistent for this question as well. For this part of the study the interaction effects are reported as well. In Part A, it was determined that there was no significant difference in the level of perceived ability and level of performance ($F=0.70$, $P>.05$) among

different levels of ability. Consistent with this, the results from Part B did not show any significant difference either ($F=0.30$, $P>.05$). On the basis of these results, the hypothesis can be accepted. Therefore, it can be concluded that there is no significant difference in students' level of achievement among students of different ability levels.

Summary

From the information gathered in the study and analysis of this data, the following conclusions were reached. First, from the results it was not possible to draw a definite conclusion as to whether there was any difference in perceived self-efficacy for students taught with or without the use of instructional objectives, but there were definite trends in favour of the use of instructional objectives. The fact that there was a significant difference shown in the second lesson may be an indication that it takes a certain amount of time for such a difference to become visible.

Second, it was possible to draw a conclusion as to whether there was any significant difference in level of achievement for those students taught with or

without the aid of instructional objectives. It was determined from both parts of the study that students taught with the aid of instructional objectives had higher achievement levels than those taught without such assistance.

Third, the evidence suggests that there was no significant difference in the students' level of perceived self-efficacy among students of different ability levels.

Fourth, there was strong evidence to support the hypothesis that there was no significant difference in students' level of achievement among students of different ability levels.

In the final chapter of this study some possible reasons for the above results are outlined.

Chapter V

Summary, Recommendations and Implications

This chapter includes a summary of the study, a discussion of the results, limitations of the study, and recommendations for further research, based on the information obtained from the study.

Summary and Discussion of Results

From the study, one question being investigated was not completely answered. First and foremost, the main hypothesis of the study was not clearly supported, but the results were mixed. The results from Lesson 1 indicated that there was no statistically significant difference in the level of self-efficacy between the group being taught with the aid of instructional objectives and those taught without. Nevertheless, there was a descriptive difference, with the experimental group showing a slightly higher gain in level of self-efficacy. However, the results from Lesson 2 indicated that there was a significant difference between the two groups. There may be a possible reason for obtaining such results.

A possible reason for a discrepancy in the results is the time factor. It is possible for self-efficacy beliefs to change over time, especially when goals are being reached. In the second part of this study, students who were instructed with the aid of instructional objectives showed higher levels of self-efficacy. Therefore, it is likely, the results of the first part of the study influenced their thinking. Success on the first part, by those in the experimental group, may have led to higher self-efficacy later in the study. Consequently, because students reached some of the goals assigned by the teacher in the first part of the study, it led to increased self-efficacy in the second part. Conversely, the control group did not show any significant change in self-efficacy. This may be due to the fact that they did not know what they were expected to learn, and therefore did not realize they were progressing toward an end. Therefore, success on the first part of the study did not have any impact on their level of self-efficacy in the second part of the study.

This is supportive of research findings that suggest that goal setting enhances self-efficacy.

Schunk (1981, 1985), and Elliott and Dweck (1988) found that observing goal progress conveys a feeling of skill development and consequently a heightened self-efficacy.

The second hypothesis was clearly supported, with consistent results from Lesson 1 and Lesson 2. The results from Lesson 1 indicated that there was a significant difference in the level of achievement between the group being taught with the aid of instructional objectives and those taught without. Consistent with this, the results from Lesson 2 also indicated that there was a significant difference between the two groups. The students taught with the aid of instructional objectives again showed a higher level of achievement.

Hence, from the above results, a possible pattern may be developing. After Lesson 1 there was a difference in achievement but not self-efficacy. It may be the case that achievement is necessary for increased self-efficacy. Instructional objectives may lead to higher achievement, which in turn might lead to higher self-efficacy. Therefore, it stands to reason that after Lesson 2 a noticeable difference in self-

efficacy was detected. If the study continued for a longer period of time and covered more material, it may be possible to make more definite conclusions.

For the remaining two questions in the study, conclusive evidence was obtained. The third question centred around whether there was any significant difference in students' level of perceived self-efficacy among students of different ability levels. The results from both parts of the study show that there is no significant difference in this. Consequently, perceived self-efficacy, among students of different ability levels, is relatively consistent. This is supportive of results from a study conducted by Sexton and Tuckman (1991), in which they determined that despite the fact that perceived ability and self-efficacy are different and distinct concepts, they are related. Hence, there should be some consistency in an individual's perceived ability and perceived self-efficacy.

The final question deals with any difference in achievement level among students of different ability levels. As with the third question, the results from both parts of the study were consistent and led to a

conclusion. The results show that there is no significant difference in the level of achievement among students of different ability levels. The main reason for obtaining the consistent results is that past performance is viewed as a good indicator of future performance. Therefore, if individuals base their perceived ability on past performance, then it is likely to be consistent with future performance. Consequently, there is no significant difference in perceived ability and actual achievement.

From the discussion of the results of the study it is evident that many factors contribute to these results. Consequently, from one study, covering a relatively short time frame, it is very difficult to make definite conclusions. Hence, the results of the study can be used to lead into further research in the area. In a later section, some of the possibilities for further research are discussed.

Limitations of the Study

Despite the effort by all those involved, there are several limitations to the present study. First, the possibility of generalizing from the study is

minimal. This is due to two reasons. The first deals with geographical location. Only students from one school in the province were included in the sample. Secondly, only one grade level of students was used. These were heterogeneously grouped grade nine students. Consequently, generalizations over a larger geographical area and other grade levels are not possible, given the specifics of the study.

Second, the study was limited to the use of one specific area of mathematics. The study dealt with coordinate geometry only. Again, it is difficult to make generalizations to other areas of mathematics, when only one area is studied.

The third limitation centres around the teachers. There were three teachers involved in the study. Despite the fact that every possible effort was made by the teachers to do an equally good job, it is not always possible. Two different teachers instructed the classes using instructional objectives, while one teacher taught the other two classes, which were instructed without the aid of instructional objectives. Even though a concerted effort was made by each teacher, the possibility of teacher bias still exists.

Recommendations for Further Research

Based upon the findings of the present study, the following suggestions for further research are made:

1. It is recommended that additional research be carried out using a different sample being taught the same material as in the present study. The reason for this would be to determine if results similar to those obtained from this study would be found once again.

2. It is recommended that further research be carried out using other grade levels. The reason for this would be to determine if the results are consistent over various grades.

3. It is recommended that further research be carried out using other subject areas, in order to determine if the results are consistent across subject areas.

4. It is recommended that research similar to this be conducted over a longer time period, involving more lessons. The reason for this would be to find more conclusive evidence. A larger study is essential, if the first questions is to be answered. Also, a longer study would possibly strengthen the results of the final three questions.

Implications for Classroom Teaching

Based upon the findings of the present study, the following recommendation for classroom teachers is made:

It is recommended that instructional objectives be used in classroom instruction. The results from the study show that the usage of this instructional tool is not harmful to students. Despite the fact that the results were mixed but encouraging in attempting to determine that they were always effective in enhancing self-efficacy, there was no evidence to show that their usage could have a negative influence on students. Therefore, in line with much of the research conducted in the area, it is recommended that teachers should use instructional objectives, even if they do not enhance self-efficacy at all times.

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APPENDIX A

Mathematics Ability Questionnaire

Some students do well in math. Some students do not do well in math. Overall how well do you do in math. Read each question carefully. Circle the number that best describes how well you do in math.

1.Do you have trouble with math?

Very little trouble						A lot of trouble
1	2	3	4	5	6	7

2.Do you think math is hard?

Really easy						Really hard
1	2	3	4	5	6	7

3.How good are you at learning math?

Not very good						Really good
1	2	3	4	5	6	7

4.Do you do well in math?

Not very well						Really well
1	2	3	4	5	6	7

5.Can you understand most things in math?

No, I can not						Yes, I can
1	2	3	4	5	6	7

APPENDIX B

Self-efficacy Questionnaires

Questionnaire # 1

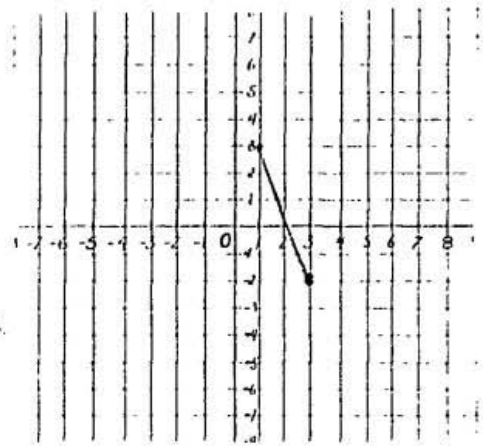
Some students are really confident that they could do a math problem correctly. Some students are not very confident at all. How confident are you in answering the following math problems? Read each of the following questions carefully. Circle the number that best describes how confident you are you could get the right answer.

1.Determine whether or not the following three points are collinear. A(3,5), B(5,5), C(6,4).

Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

2.Find the slope of the following line segment.



Do you think you could get the right answer?

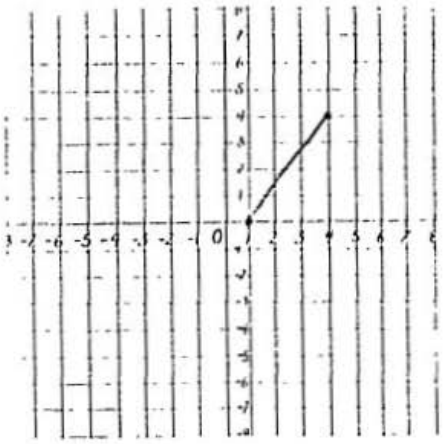
Definitely could not						Definitely could
1	2	3	4	5	6	7

3.Construct a line with a slope 3/5 and passing through point (2,1).

Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

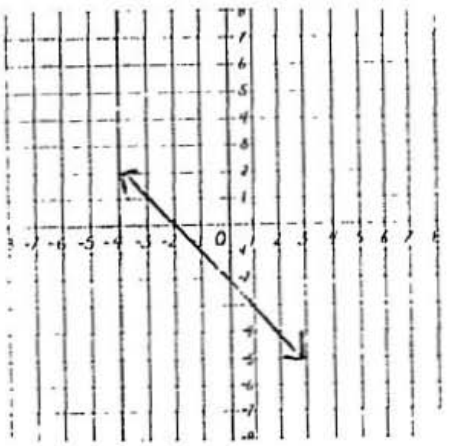
4.Find the slope of the following line segment.



Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

5.Find the slope of the following line.



Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

6.Determine whether or not the following three points are collinear. A(2,3), B(4,5), C(6,7).

Do you think you could get the right answer?

Definitely could not 1 2 3 4 5 6 7 Definitely could

7.Construct a line with slope -2/3 and passing through point (-1,-1).

Do you think you could get the right answer?

Definitely could not 1 2 3 4 5 6 7 Definitely could

8.Draw the graph of the line Y = -2/3 X - 1

Do you think you could get the right answer?

Definitely could not 1 2 3 4 5 6 7 Definitely could

9.Draw the graph of the line Y = 2 X + 2

Do you think you could get the right answer?

Definitely could not 1 2 3 4 5 6 7 Definitely could

10.Draw the graph of the line Y = 3/4 X

Do you think you could get the right answer?

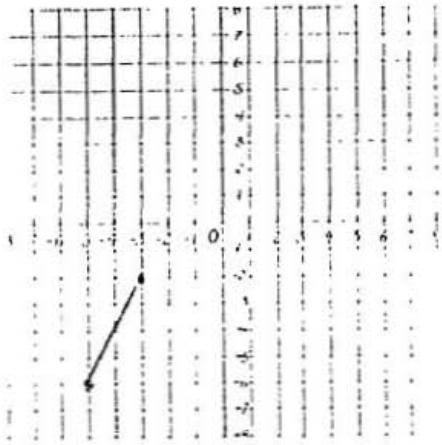
Definitely could not 1 2 3 4 5 6 7 Definitely could

11.Find the slope of line segment AB with A(-4,-2) and B(4,2).

Do you think you could get the right answer?

Definitely could not 1 2 3 4 5 6 7 Definitely could

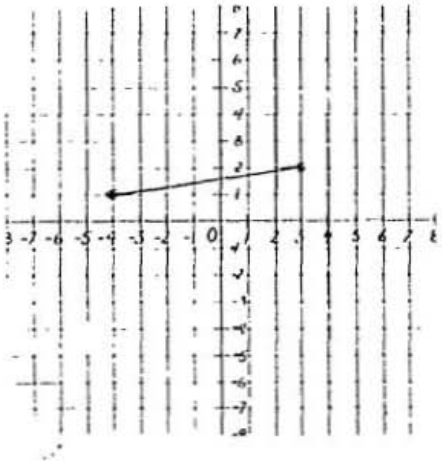
12.Find the slope of the following line segment.



Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

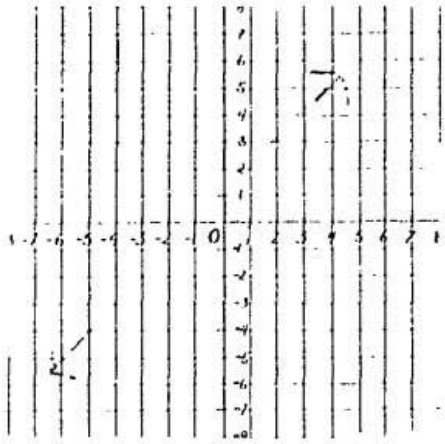
13.Find the slope of the following line segment.



Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

14.Find the slope of the following line.



Do you think you could get the right answer?

Definitely could not 1 2 3 4 5 6 7 Definitely could

15.Find the slope of line segment AB with A(-6,-4) and B(2,2).

Do you think you could get the right answer?

Definitely could not 1 2 3 4 5 6 7 Definitely could

16.Construct a line with a slope 2/7 and passing through point (1,2).

Do you think you could get the right answer?

Definitely could not 1 2 3 4 5 6 7 Definitely could

17.Construct a line with slope -3/4 and passing through point (2,1).

Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

18.Draw the graph of the line Y = -1/4 X + 1

Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

19.Draw the graph of the line Y = -2 X + 3

Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

20.Draw the graph of the line Y = 1/3 X

Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

Questionnaire # 2

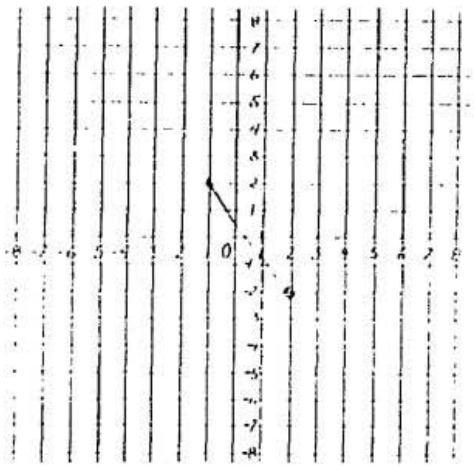
Some students are really confident that they could do a math problem correctly. Some students are not very confident at all. How confident are you in answering the following math problems? Read each of the following questions carefully. Circle the number that best describes how confident you are you could get the right answer.

1.Determine whether or not the following three points are collinear. A(4,5), B(3,1), C(2,-2).

Do you think you could get the right answer?

Definitely could not 1 2 3 4 5 6 7 Definitely could

2.Find the slope of the following line segment.



Do you think you could get the right answer?

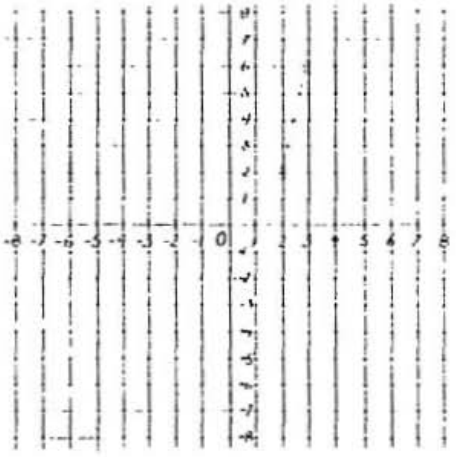
Definitely could not 1 2 3 4 5 6 7 Definitely could

3.Construct a line with a slope 2/7 and passing through point (1,-3).

Do you think you could get the right answer?

Definitely could not 1 2 3 4 5 6 7 Definitely could

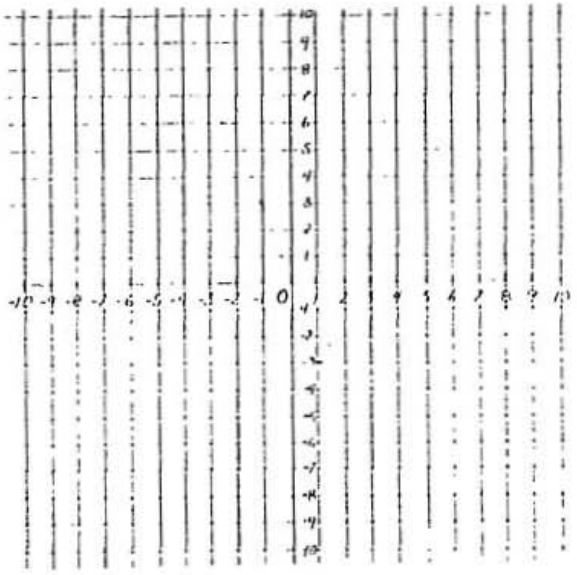
4.Find the slope of the following line segment.



Do you think you could get the right answer?

Definitely could not 1 2 3 4 5 6 7 Definitely could

5.Find the slope of the following line.



Do you think you could get the right answer?

Definitely could not 1 2 3 4 5 6 7 Definitely could

6.Determine whether or not the following three points are collinear. A(-1,3), B(2,3), C(6,4).

Do you think you could get the right answer?

Definitely could not 1 2 3 4 5 6 7 Definitely could

7.Construct a line with slope -3/4 and passing through point (-2,4).

Do you think you could get the right answer?

Definitely could not 1 2 3 4 5 6 7 Definitely could

8.Draw the graph of the line Y = -1/3 X + 1

Do you think you could get the right answer?

Definitely could not 1 2 3 4 5 6 7 Definitely could

9.Draw the graph of the line Y = 4 X - 2

Do you think you could get the right answer?

Definitely could not 1 2 3 4 5 6 7 Definitely could

10.Draw the graph of the line Y = -1/2 X

Do you think you could get the right answer?

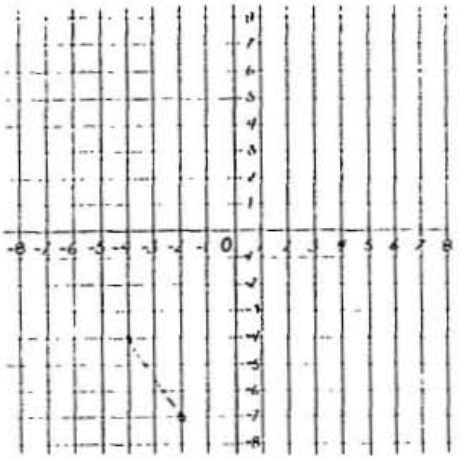
Definitely could not 1 2 3 4 5 6 7 Definitely could

11.Find the slope of line segment AB with A(-1,2) and B(4,3).

Do you think you could get the right answer?

Definitely could not 1 2 3 4 5 6 7 Definitely could

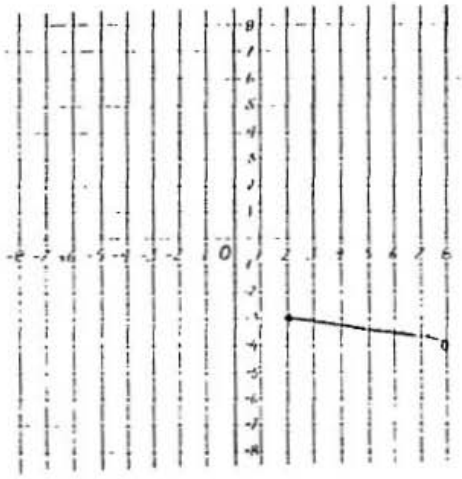
12.Find the slope of the following line segment.



Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

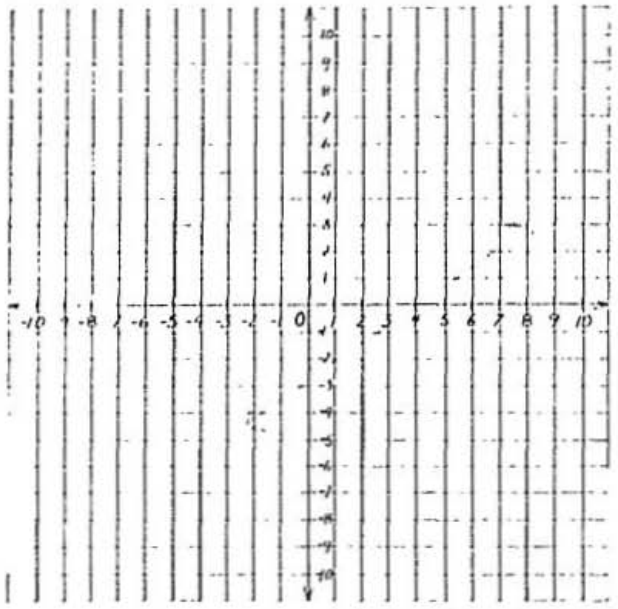
13.Find the slope of the following line segment.



Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

14.Find the slope of the following line.



Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

15.Find the slope of line segment AB with A(-3,-2) and B(1,4).

Do you think you could get the right answer?

Definitely could not					Definitely could	
1	2	3	4	5	6	7

16.Construct a line with a slope 1/5 and passing through point (-1,3).

Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

17.Construct a line with slope -3/5 and passing through point (3,2).

Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

18.Draw the graph of the line Y = 1/4 X + 2

Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

19.Draw the graph of the line Y = -3 X - 3

Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

20.Draw the graph of the line Y = 2/3 X

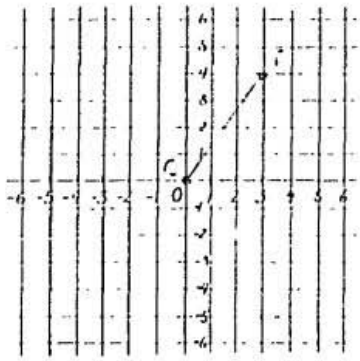
Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

Questionnaire # 3

Some students are really confident that they could do a math problem correctly. Some students are not very confident at all. How confident are you in answering the following math problems? Read each of the following questions carefully. Circle the number that best describes how confident you are you could get the right answer.

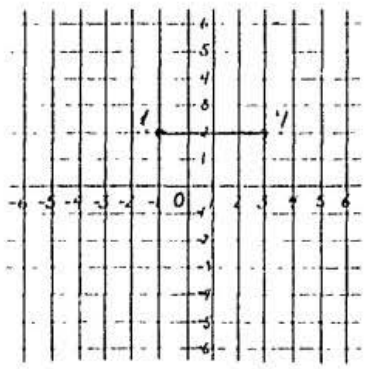
1.Calculate the length of line segment CD.



Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

2.Calculate the length of line segment XY.



Do you think you could get the right answer?

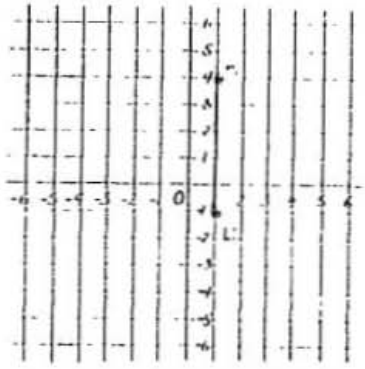
Definitely could not						Definitely could
1	2	3	4	5	6	7

3.Which line segment is longer?
AB with A(2,5) B(3,7) or
CD with C(1,3) D(2,6)

Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

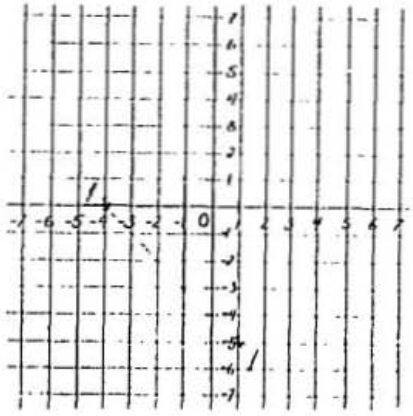
4.Calculate the length of line segment AB.



Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

5.Calculate the length of line segment XY.



Do you think you could get the right answer?

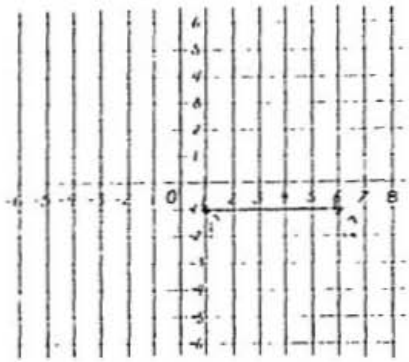
Definitely could not						Definitely could
1	2	3	4	5	6	7

6.Which line segemnt is longer?
XY with X(-3,4) Y(1,5) or
RS with R(-2,-1) S(3,1)

Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

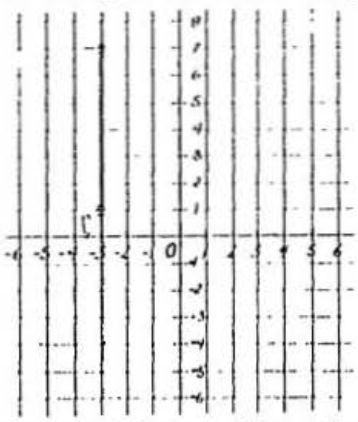
7.Calculate the length of line segment PQ.



Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

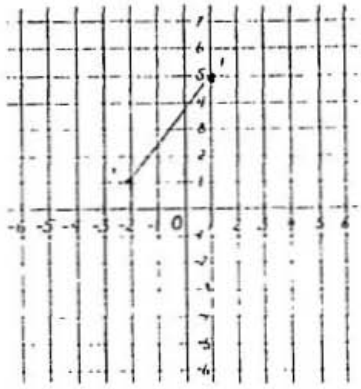
8.Calculate the length of line segment CD.



Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

9.Calculate the length of line segment XR.



Do you think you could get the right answer?

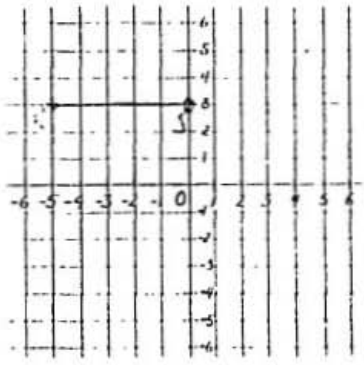
Definitely could not 1 2 3 4 5 6 7 Definitely could

10.Which line segment is longer?
GH with G(0,-4) H(6,2) or
KL with K(-6,2) L(0,-5)

Do you think you could get the right answer?

Definitely could not 1 2 3 4 5 6 7 Definitely could

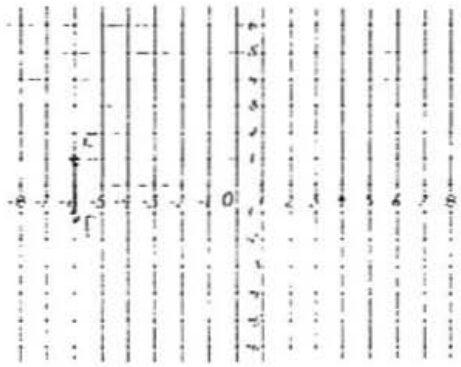
11.Calculate the length of line segment RS.



Do you think you could get the right answer?

Definitely could not 1 2 3 4 5 6 7 Definitely could

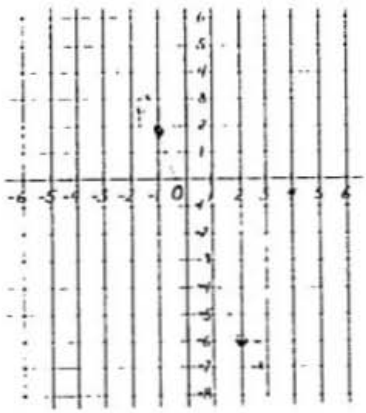
12.Calculate the length of line segment EF.



Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

13.Calculate the length of line segment PQ.



Do you think you could get the right answer?

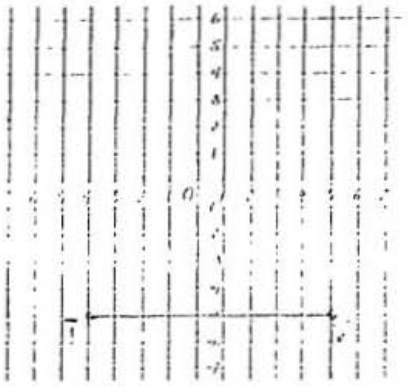
Definitely could not						Definitely could
1	2	3	4	5	6	7

14.Which line segment is longer?
PQ with P(5,1) Q(-3,1) or
RS with R(1,-4) S(1,5)

Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

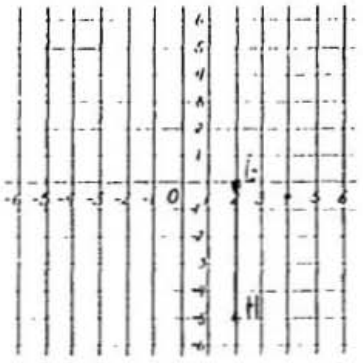
15.Calculate the length of line segment TV.



Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

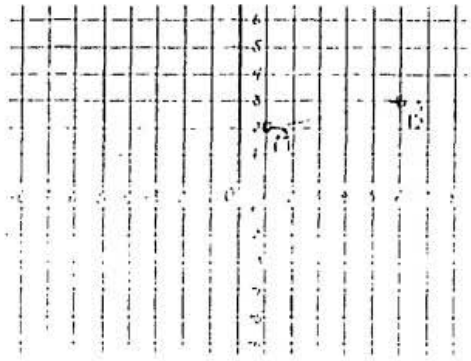
16.Calculate the length of line segment GH.



Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

17.Calculate the length of line segment AB.



Do you think you could get the right answer?

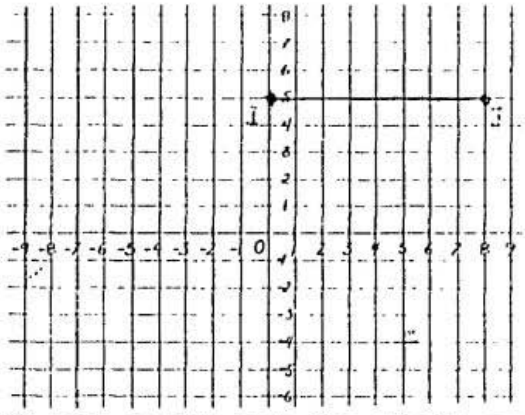
Definitely could not 1 2 3 4 5 6 Definitely could

18.Which line segment is longer?
XY with X(-3,4) Y(1,2) or
ZR with Z(2,-4) R(4,2)

Do you think you could get the right answer?

Definitely could not 1 2 3 4 5 6 Definitely could 7

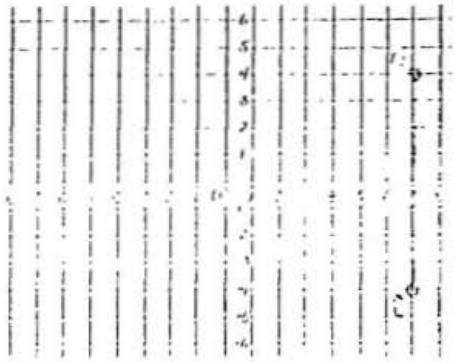
19.Calculate the length of line segment IJ.



Do you think you could get the right answer?

Definitely could not 1 2 3 4 5 6 Definitely could 7

20.Calculate the length of line segment NO.



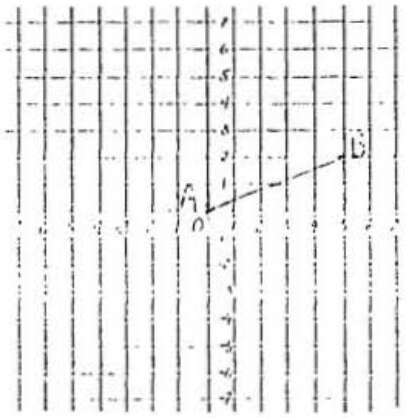
Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

Questionnaire # 4

Some students are really confident that they could do a math problem correctly. Some students are not very confident at all. How confident are you in answering the following math problems? Read each of the following questions carefully. Circle the number that best describes how confident you are you could get the right answer.

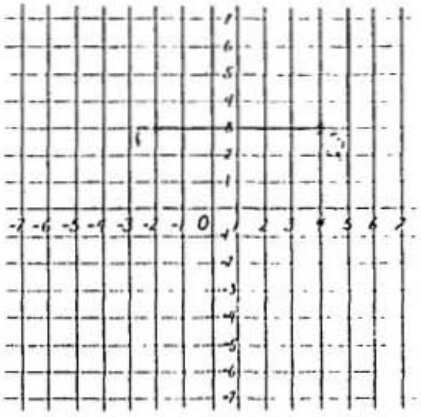
1.Calculate the length of line segment AB.



Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

2.Calculate the length of line segment PQ.



Do you think you could get the right answer?

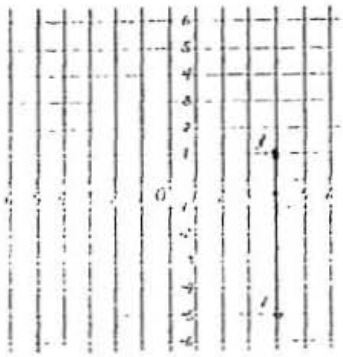
Definitely could not						Definitely could
1	2	3	4	5	6	7

3.Which line segment is longer?
CD with C(0,3) D(3,0) or
EF with E(1,3) F(2,6)

Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

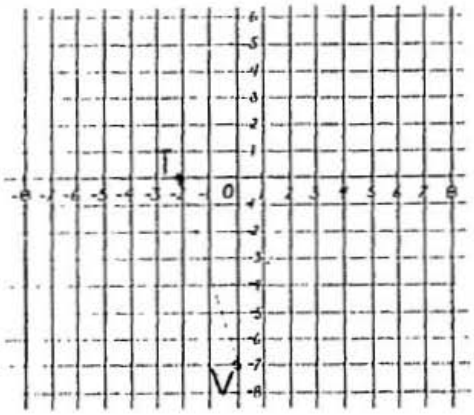
4.Calculate the length of line segment XY.



Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

5.Calculate the length of line segment TV.



Do you think you could get the right answer?

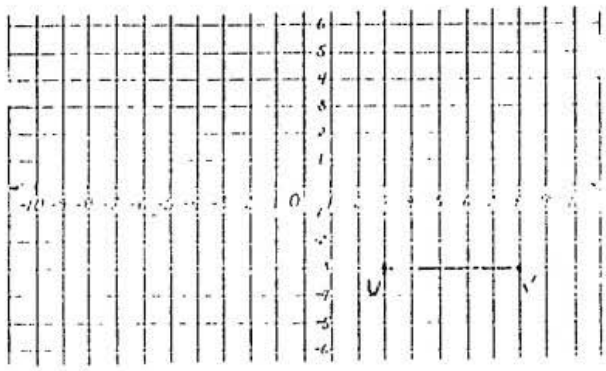
Definitely could not						Definitely could
1	2	3	4	5	6	7

6.Which line segment is longer?
MN with M(-3,4) N(1,5) or
OP with O(-3,1) P(3,1)

Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

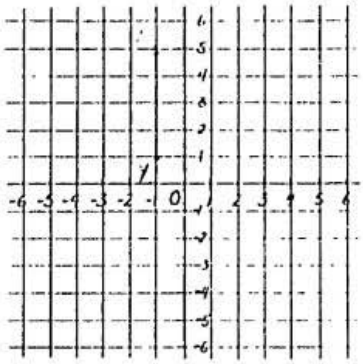
7.Calculate the length of line segment UV.



Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

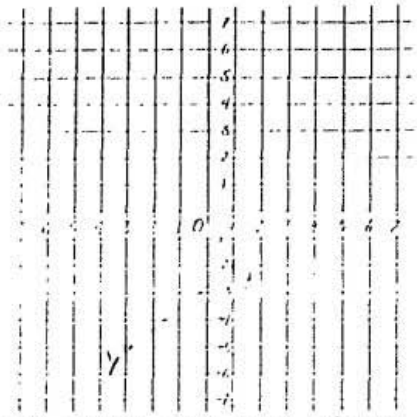
8.Calculate the length of line segment WX.



Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

9.Calculate the length of line segment YZ.



Do you think you could get the right answer?

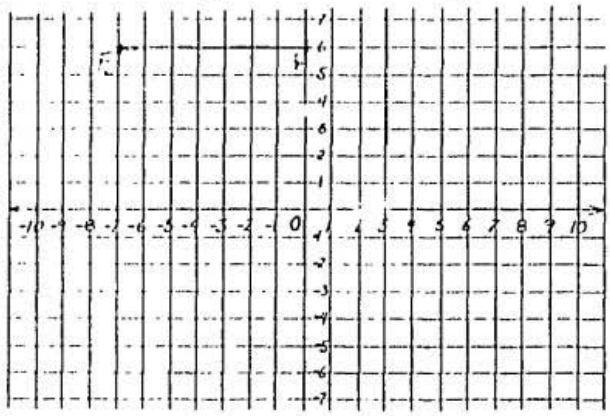
Definitely could not 1 2 3 4 5 6 7 Definitely could

10.Which line segment is longer?
AB with A(0,-4) B(2,2) or
CD with C(3,2) D(-1,-5)

Do you think you could get the right answer?

Definitely could not 1 2 3 4 5 6 7 Definitely could

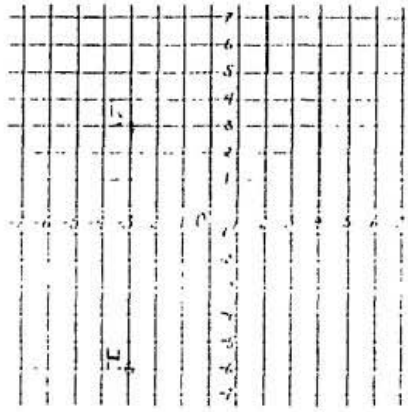
11.Calculate the length of line segment EF.



Do you think you could get the right answer?

Definitely could not 1 2 3 4 5 6 7 Definitely could

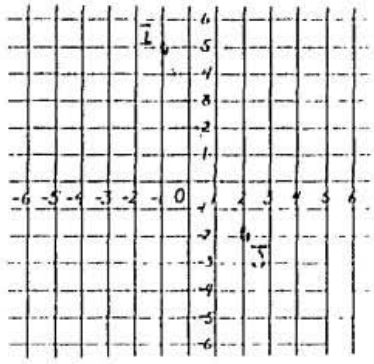
12.Calculate the length of line segment GH.



Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

13.Calculate the length of line segment IJ.



Do you think you could get the right answer?

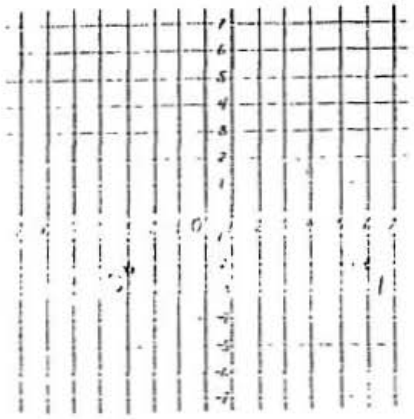
Definitely could not						Definitely could
1	2	3	4	5	6	7

14.Which line segment is longer?
KL with K(3,1) L(-3,1) or
MN with M(1,-4) N(2,3)

Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

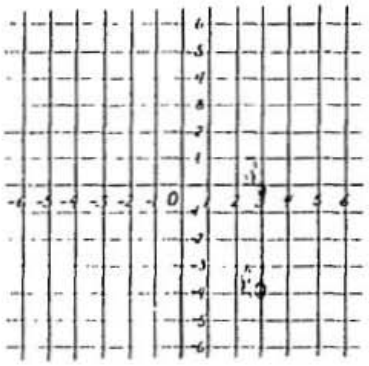
15.Calculate the length of line segment OP.



Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

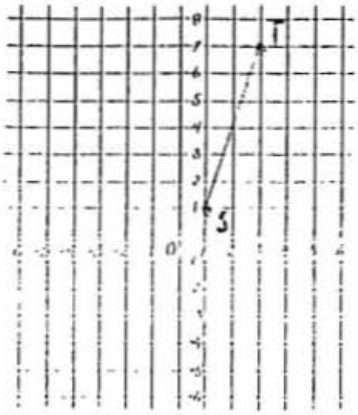
16.Calculate the length of line segment QR.



Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

17.Calculate the length of line segment ST.



Do you think you could get the right answer?

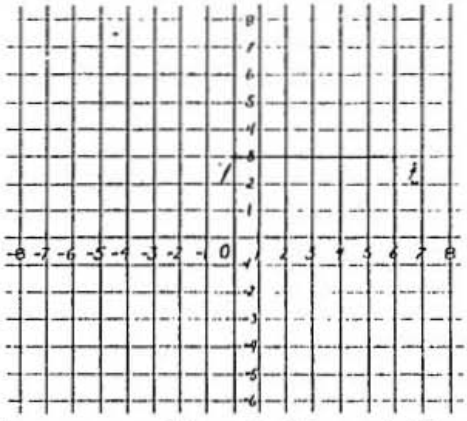
Definitely could not 1 2 3 4 5 6 7 Definitely could

18.Which line segment is longer?
UV with U(2,4) V(-1,2) or
WX with W(2,-4) X(3,-1)

Do you think you could get the right answer?

Definitely could not 1 2 3 4 5 6 7 Definitely could

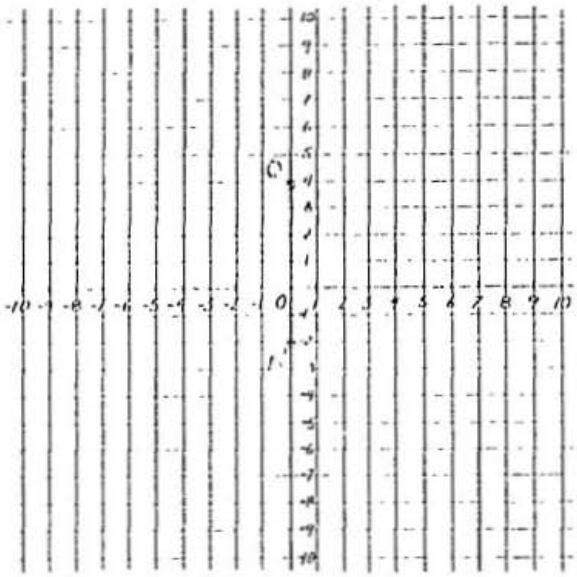
19.Calculate the length of line segment YZ.



Do you think you could get the right answer?

Definitely could not 1 2 3 4 5 6 7 Definitely could

20.Calculate the length of line segment ON.



Do you think you could get the right answer?

Definitely could not						Definitely could
1	2	3	4	5	6	7

APPENDIX C

Pretests and Posttests

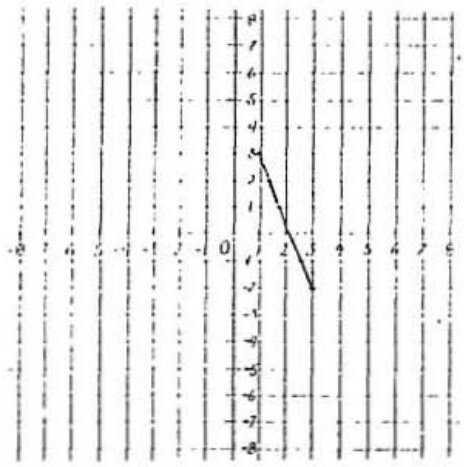
Pretest # 1

Find the correct answer to the following questions and place it in the space provided

1.Are the following three points collinear? A(3,5), B(5,5), C(6,4)

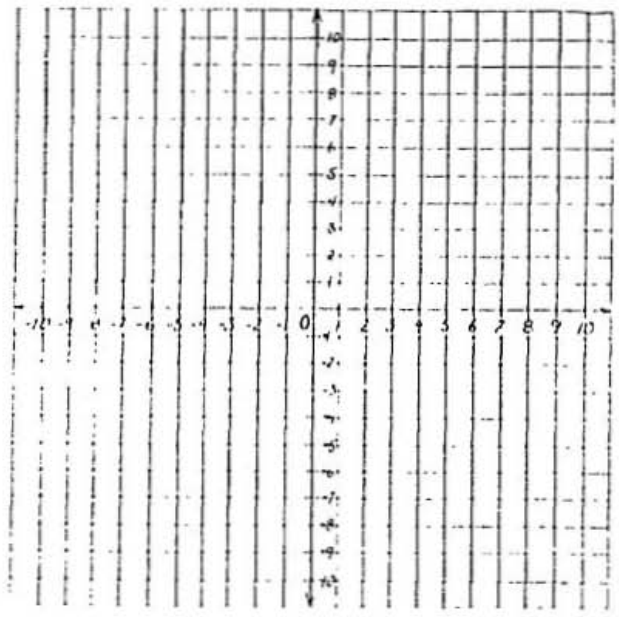
_____

2.Find the slope of the following line segment.

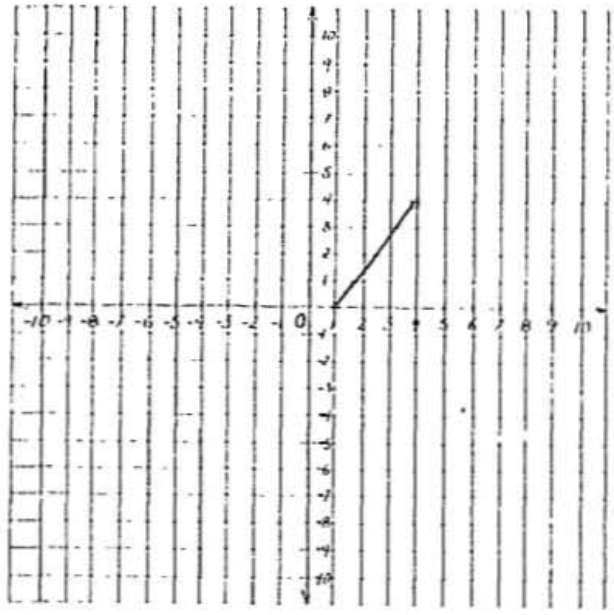


_____

3.Construct a line with a slope 3/5 and passing through point (2,1).

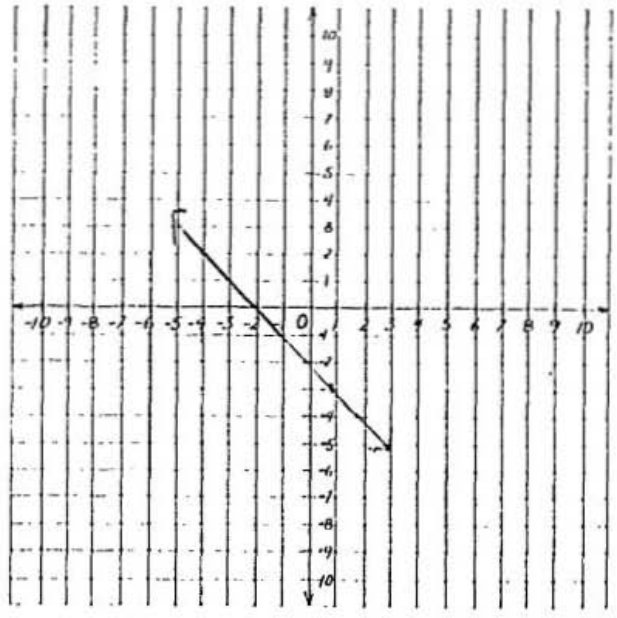


4.Find the slope of the following line segment.



_____

5.Find the slope of the following line.

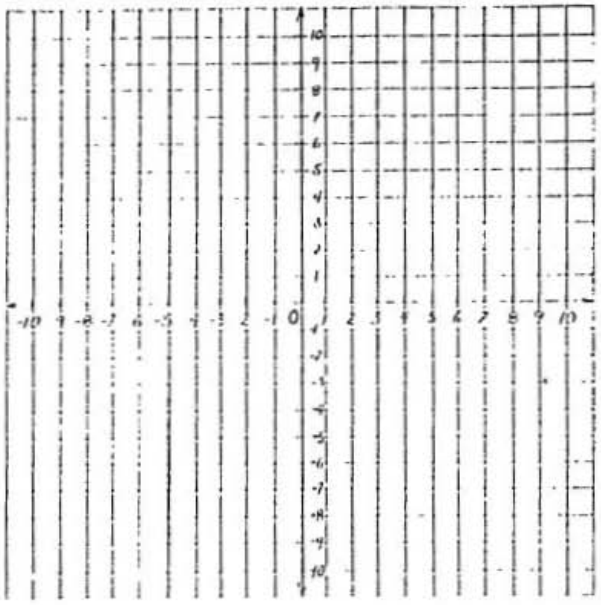


_____

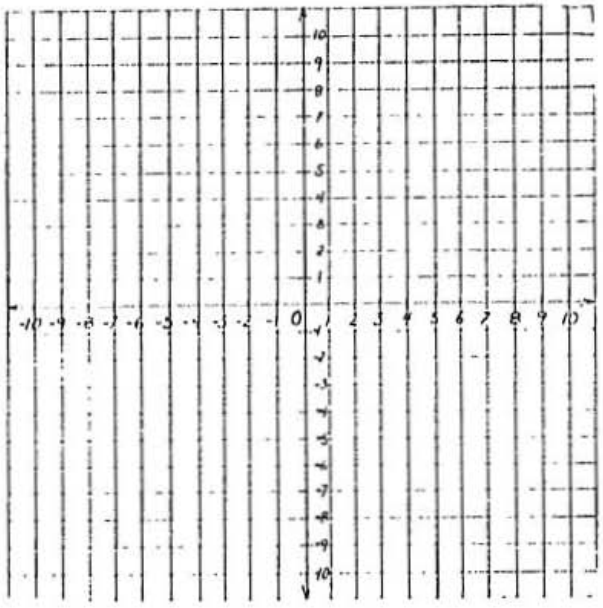
6.Are the following three points collinear? A(2,3), B(4,5), C(6,7)

_____

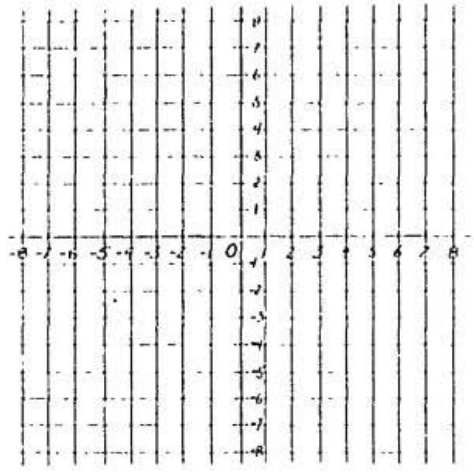
7.Construct a line with slope -2/3 and passing through point (-1,-1).



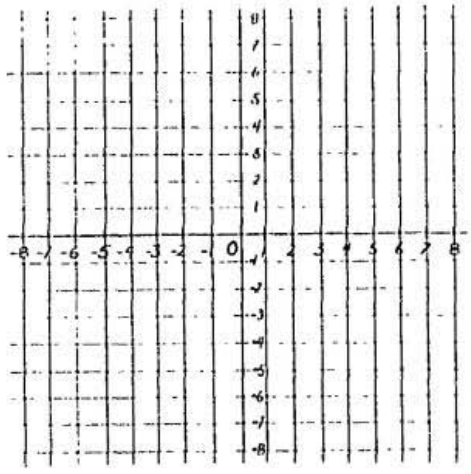
8.Draw the graph of the line Y = -2/3 X - 1



9.Draw the graph of the line Y = 2 X + 2



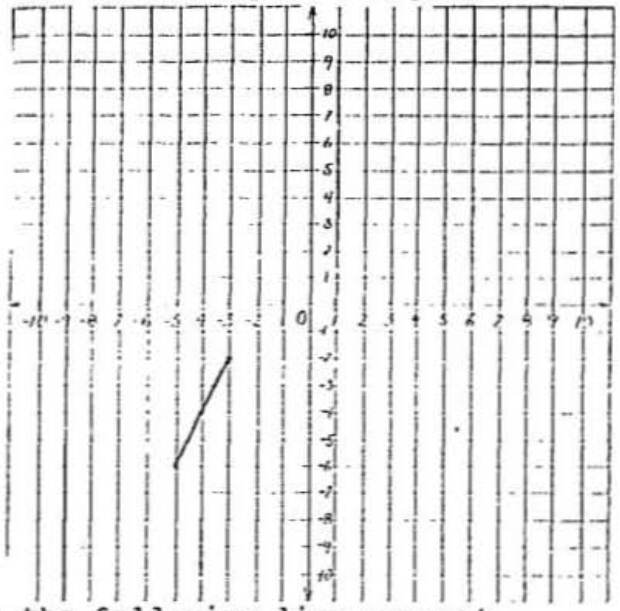
10.Draw the graph of the line Y = 3/4 X



11.Find the slope of line segment AB with A(-4,-2) and B(4,2).

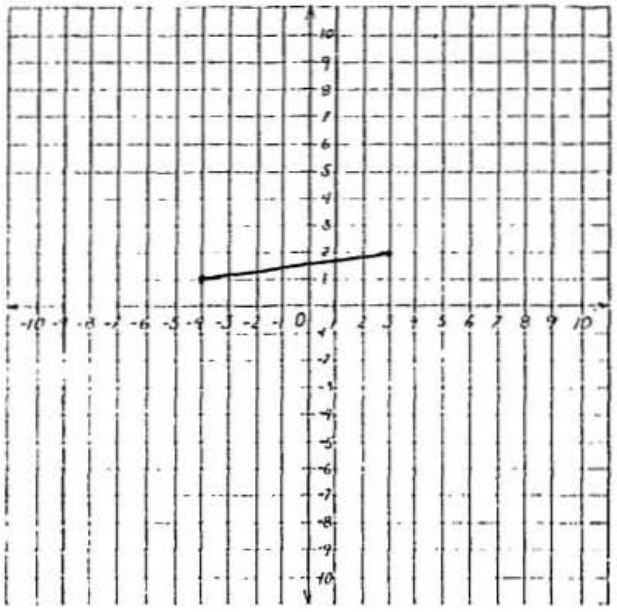
_____

12. Find the slope of the following line segment.



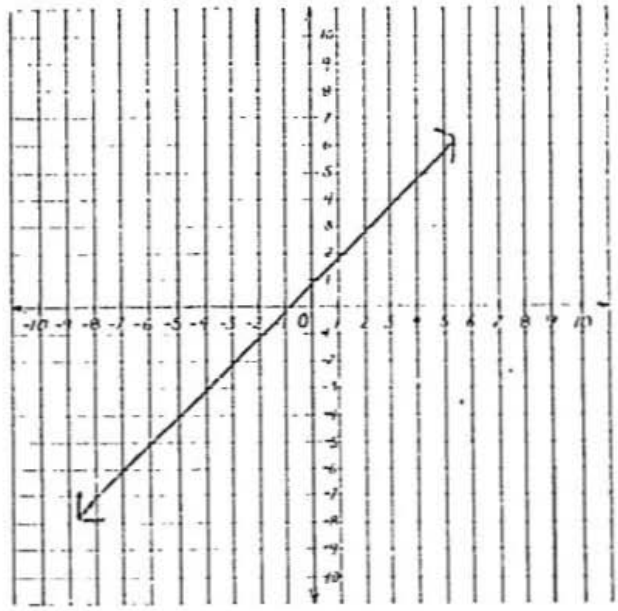
_____

13. Find the slope of the following line segment.



_____

14.Find the slope of the following line.

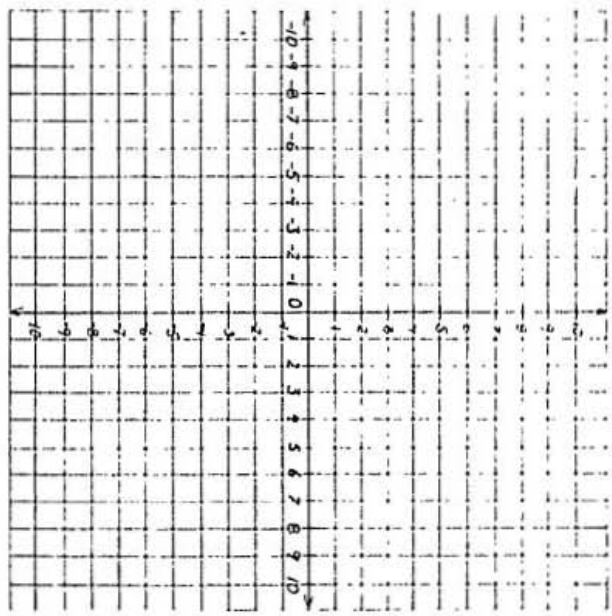


_____

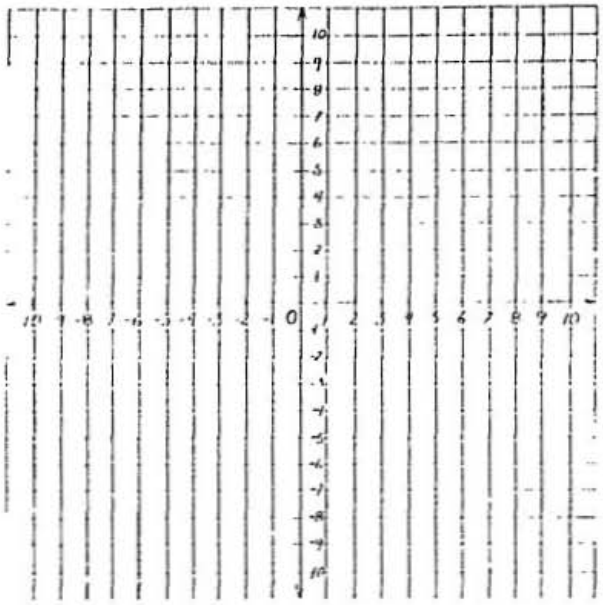
15.Find the slope of line segment AB with A(-6,-4) and B(2,2).

_____

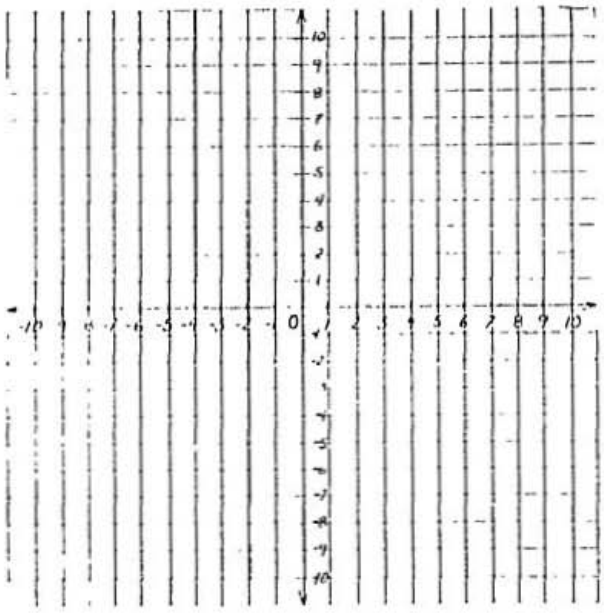
16.Construct a line with a slope 2/7 and passing through point (1,2).



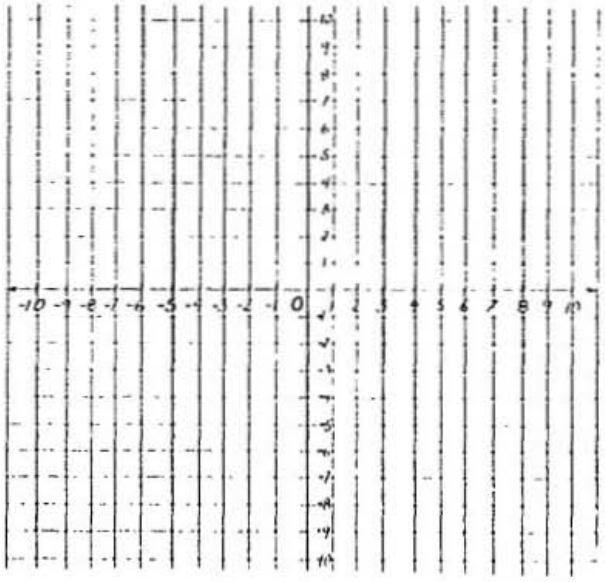
17. Construct a line with slope -3/4 and passing through point (2,1).



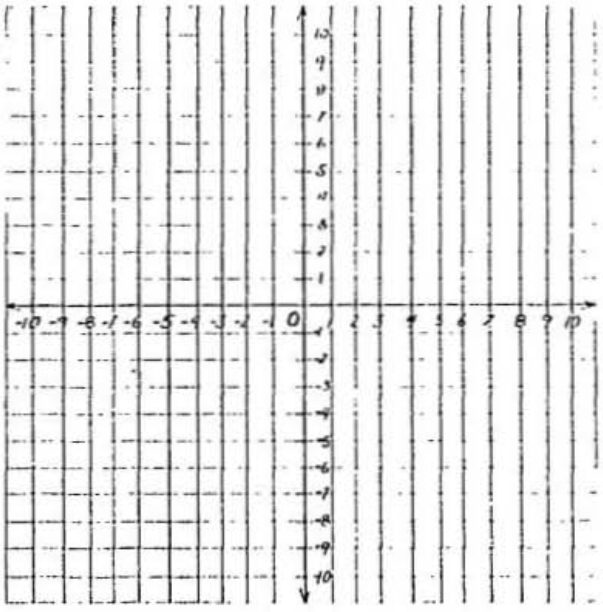
18. Draw the graph of the line Y = -1/4 X + 1



19.Draw the graph of the line Y = -2 X + 3



20.Draw the graph of the line Y = 1/3 X



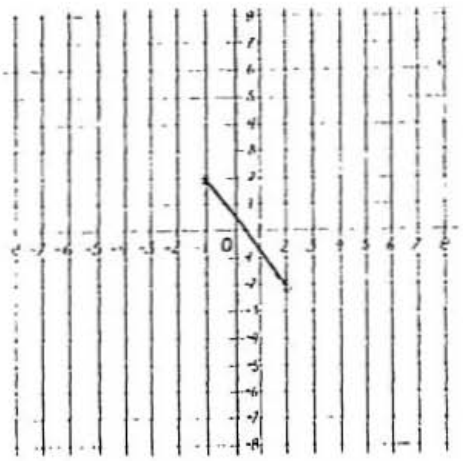
Posttest # 1

Find the correct answer to the following questions and place it in the space provided

1.Are the following three points collinear? A(4,5), B(3,1), C(2,-2)

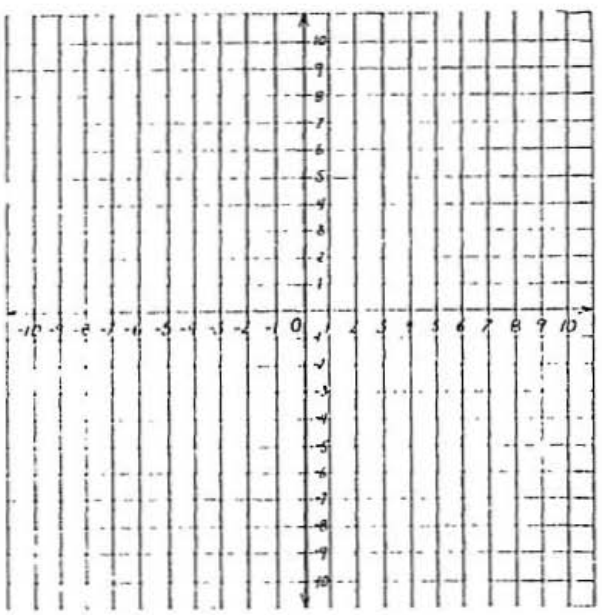
_____

2.Find the slope of the following line segment.

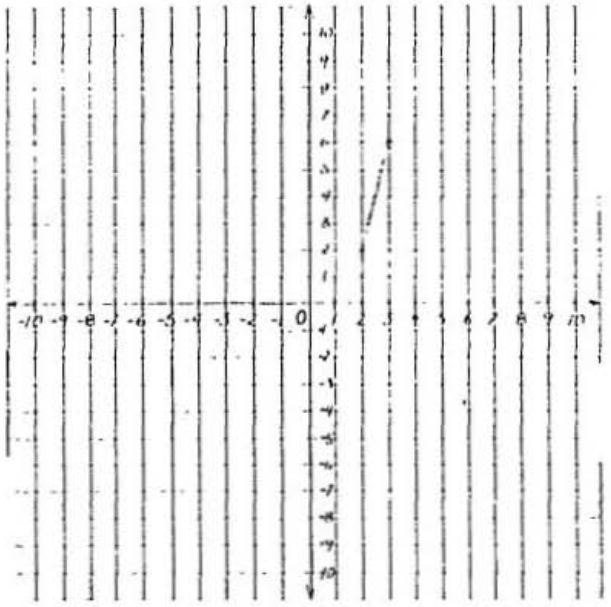


_____

3.Construct a line with a slope 2/7 and passing through point (1,-3).

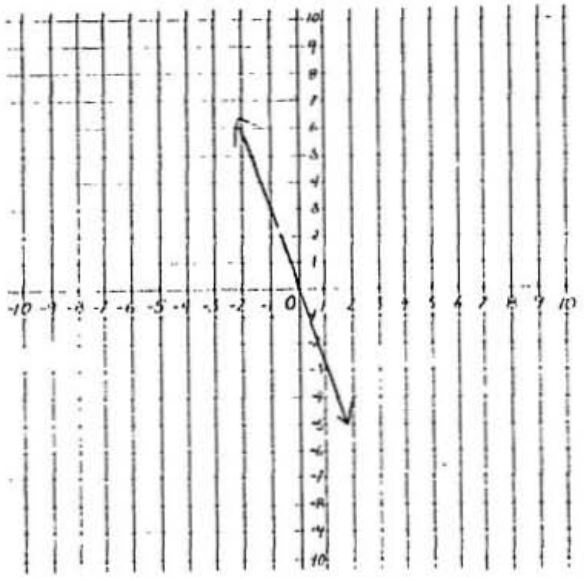


4.Find the slope of the following line segment.



_____

5.Find the slope of the following line.

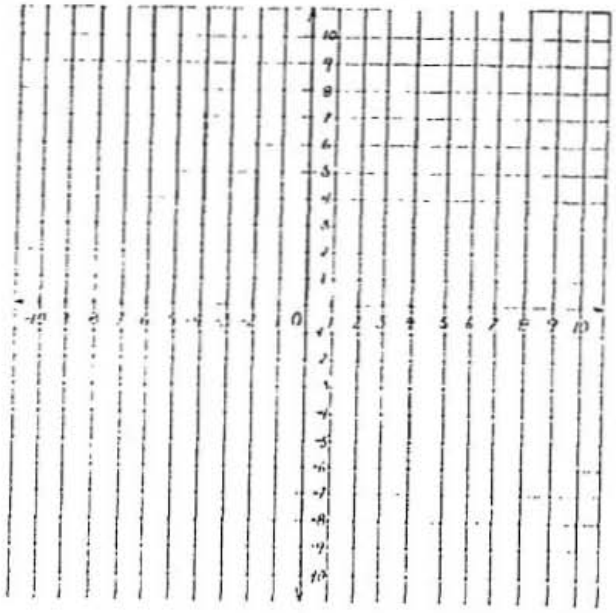


_____

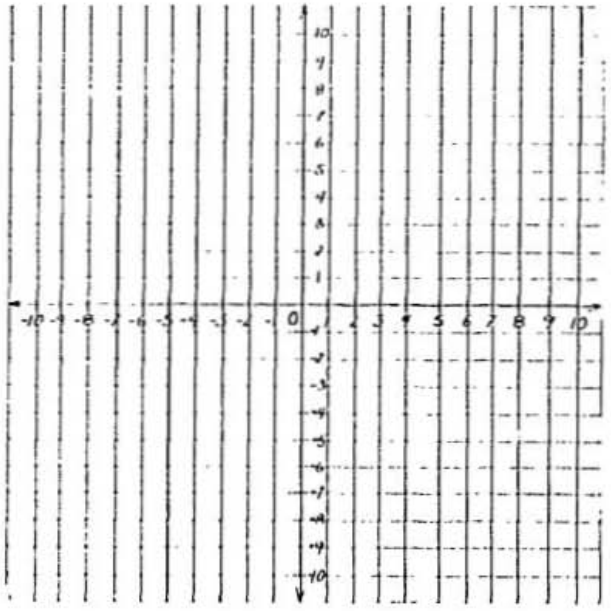
6.Are the following three points collinear? A(-1,3), B(2,3), C(6,4)

_____

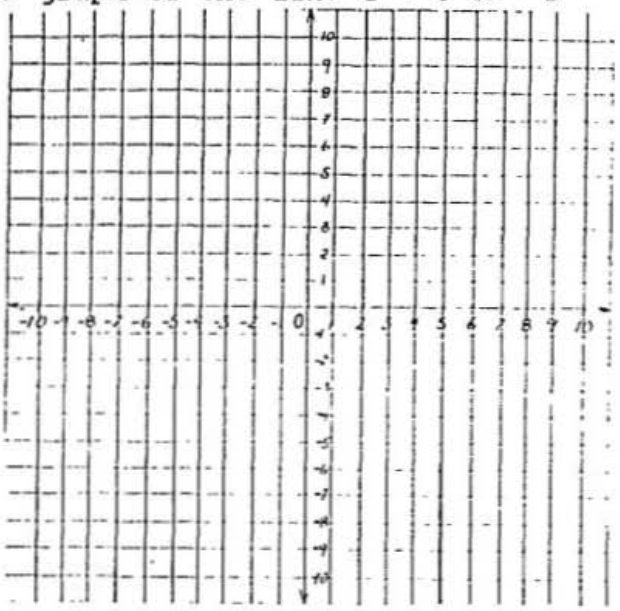
7.Construct a line with slope -3/4 and passing through point (-2,4).



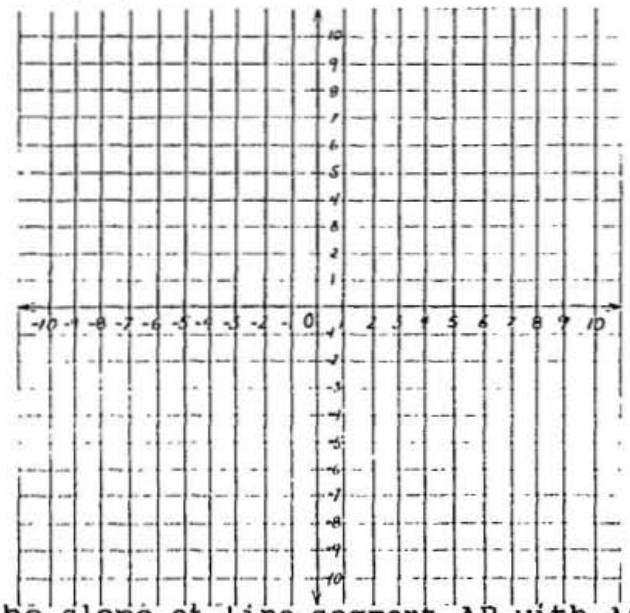
8.Draw the graph of the line Y = −1/3 X + 1



9.Draw the graph of the line Y = 4 X - 2

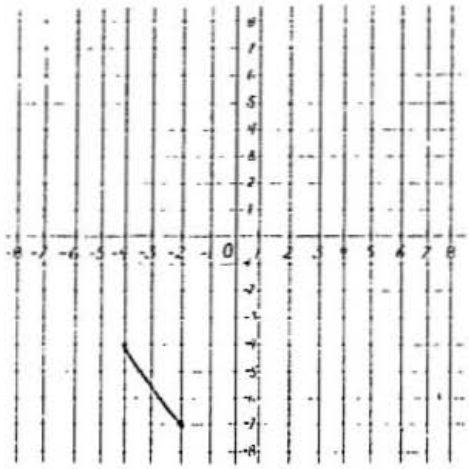


10.Draw the graph of the line Y = -1/2 X



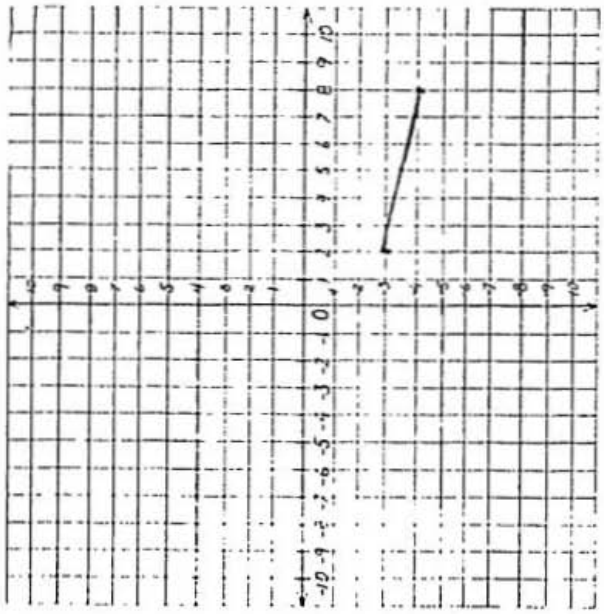
11.Find the slope of line segment AB with A(-1,2) and B(4,3).

12.Find the slope of the following line segment.



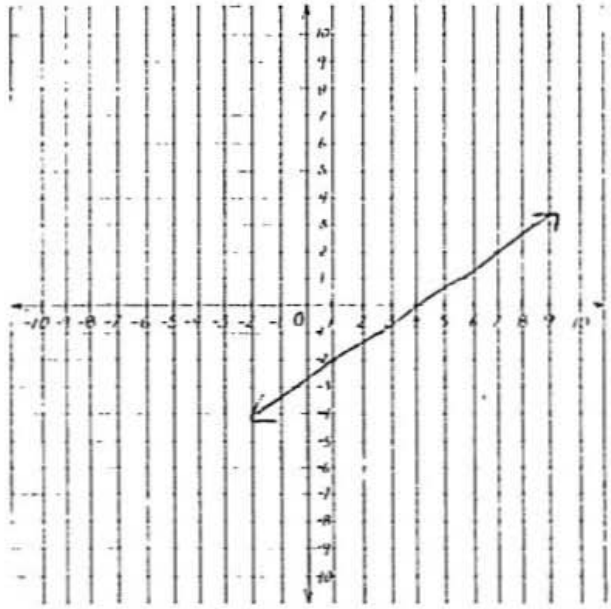
_____

13.Find the slope of the following line segment.



_____

14.Find the slope of the following line.

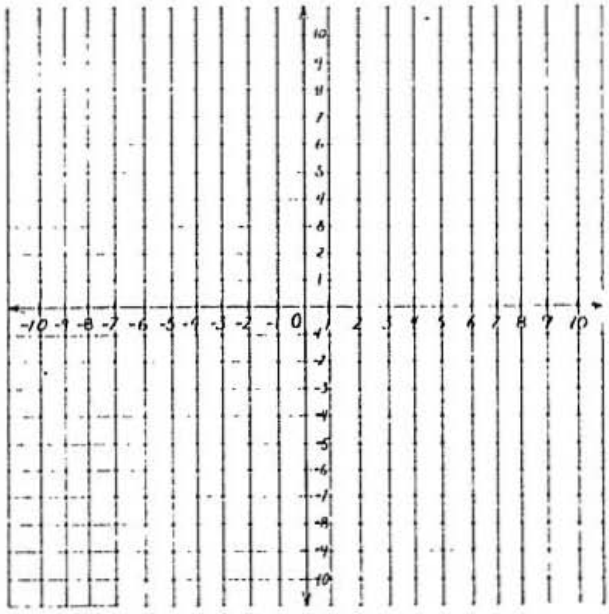


_____

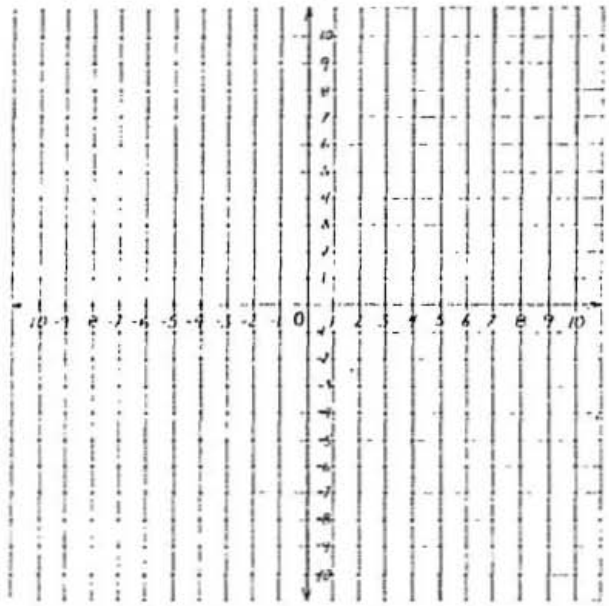
15.Find the slope of line segment AB with A(-3,-2) and B(1,4).

_____

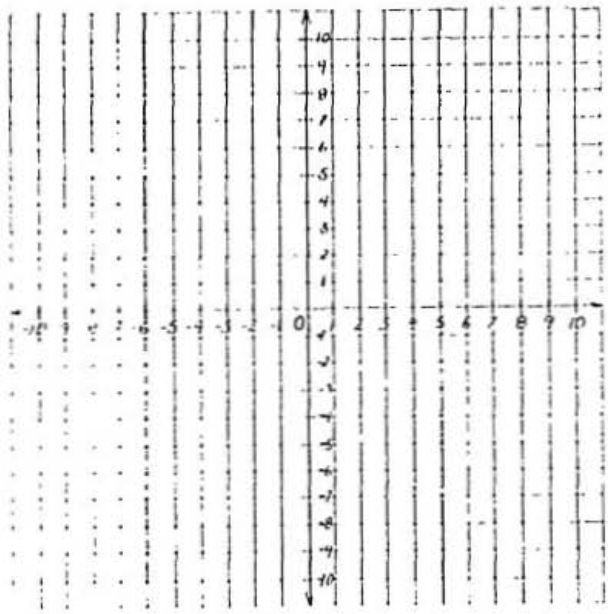
16.Construct a line with a slope 1/5 and passing through point (-1,3).



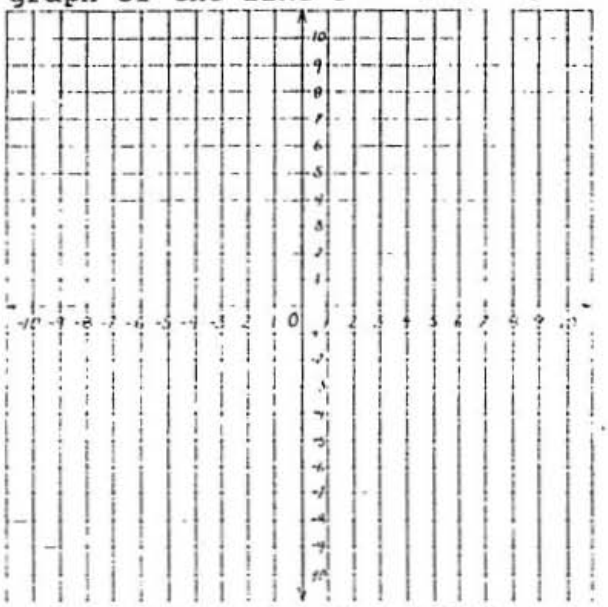
17.Construct a line with slope -3/5 and passing through point (3,2).



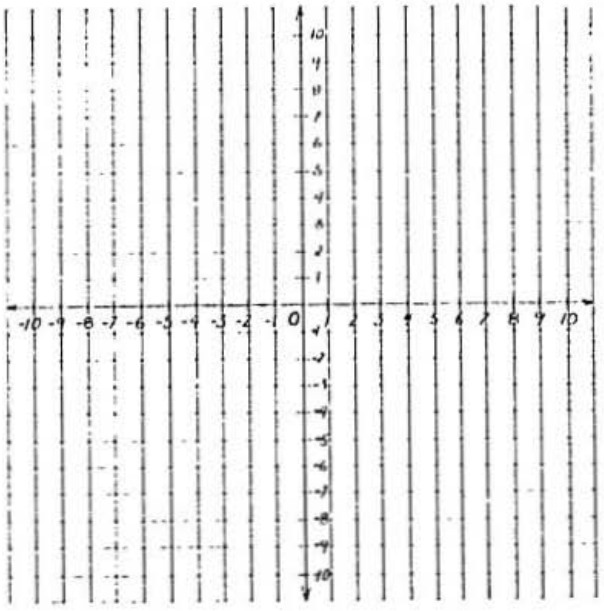
18.Draw the graph of the line Y = 1/4 X + 2



19.Draw the graph of the line Y = -3 X - 3



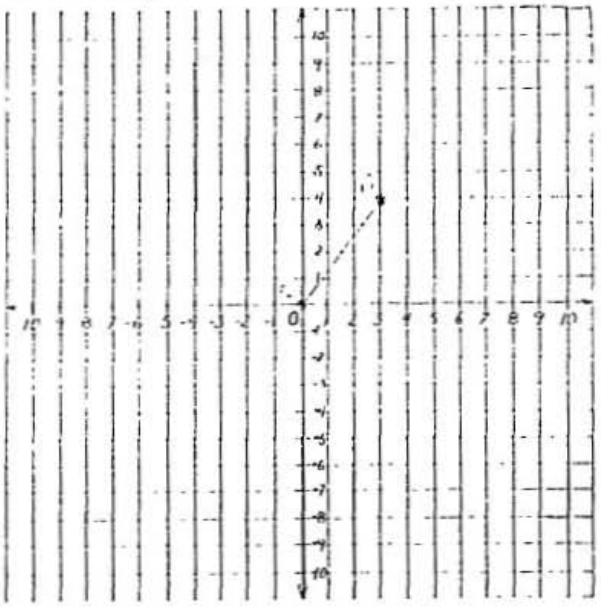
20.Draw the graph of the line Y = 2/3 X



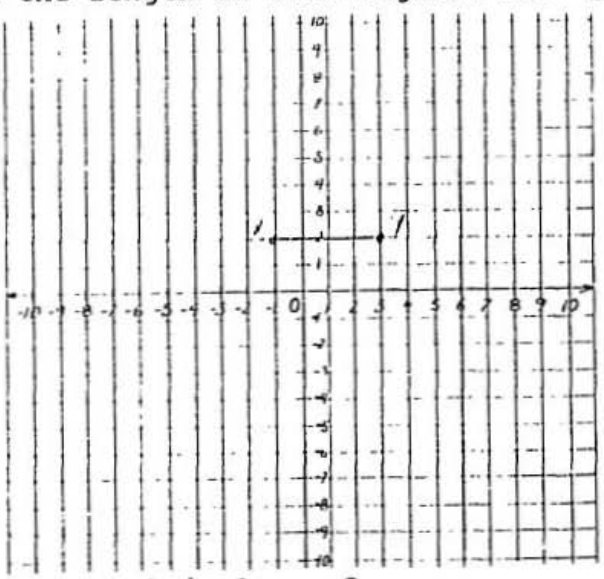
Pretest # 2

Find the correct answer to each of the following questions and place it in the space provided.

1.Calculate the length of line segment CD. _____

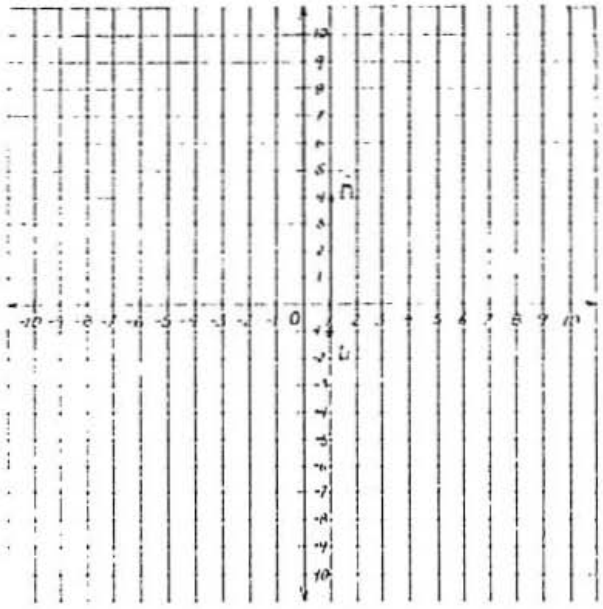


2.Calculate the length of line segment XY. _____

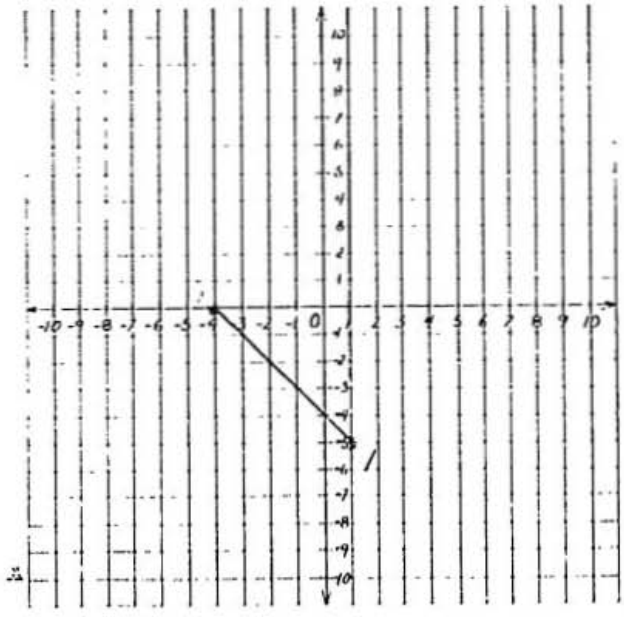


3.Which line segment is longer? _____
AB with A(2,5) B(3,7) or
CD with C(1,3) D(2,6)

4.Calculate the length of line segment AB. _____

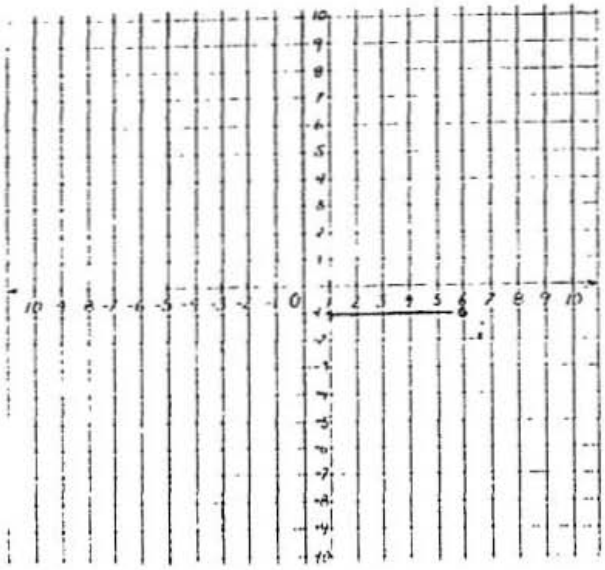


5.Calculate the length of line segment XY. _____

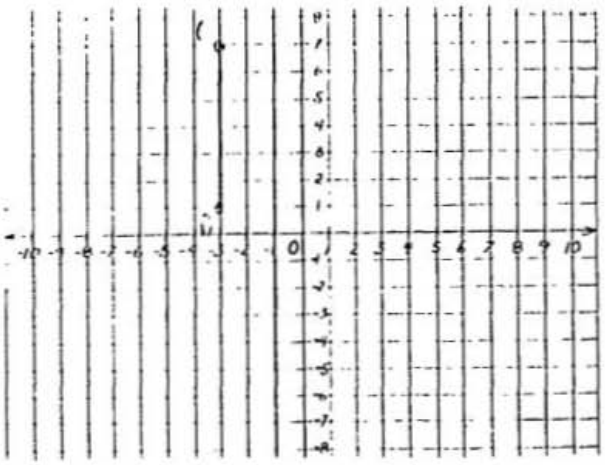


6.Which line segment is longer? _____
XY with X(-3,4) Y(1,5) or
RS with R(-2,-1) S(3,1)

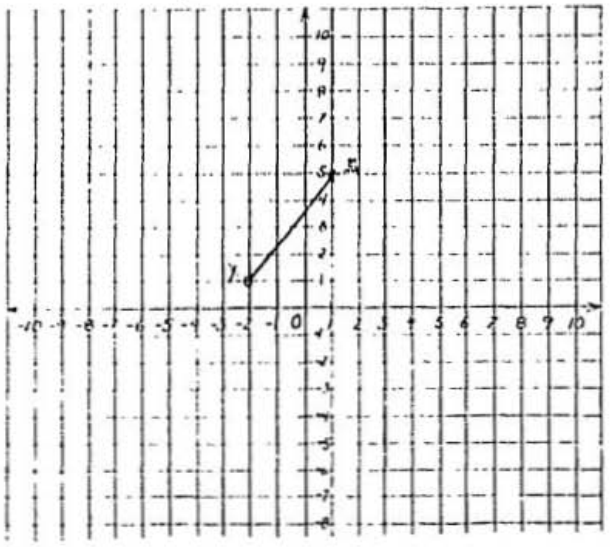
7.Calculate the length of line segment PQ. _____



8.Calculate the length of line segment CD. _____

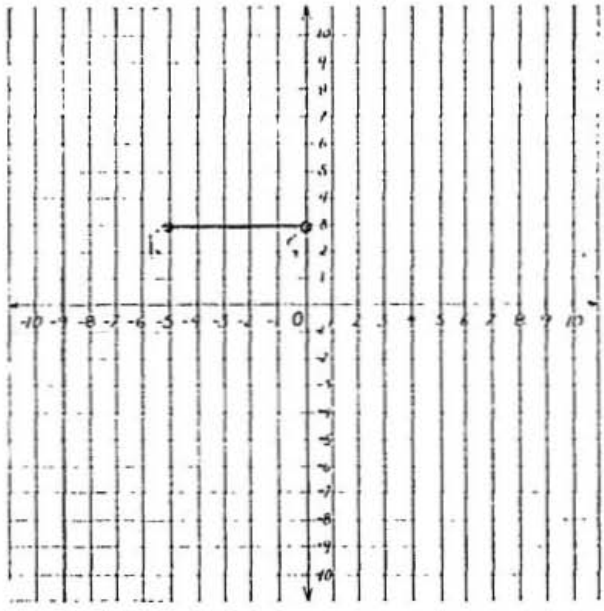


9.Calculate the length of line segment XR. _____

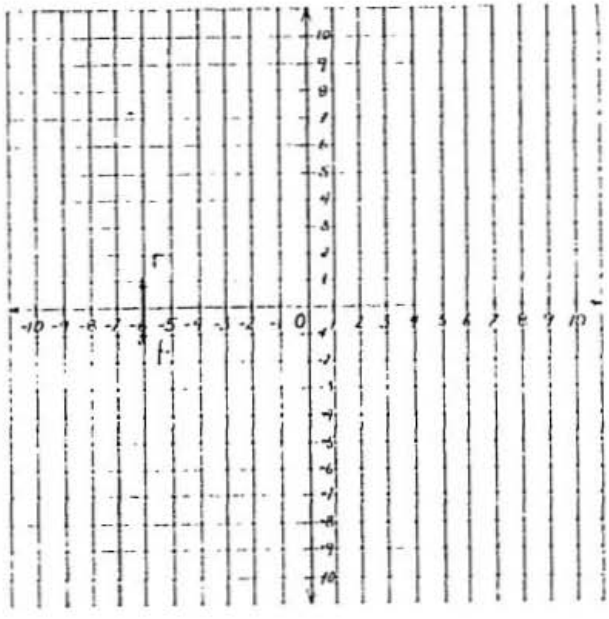


10.Which line segment is longer? _____
GH with G(0,-4) H(6,2) or
KL with K(-6,2) L(0,-5)

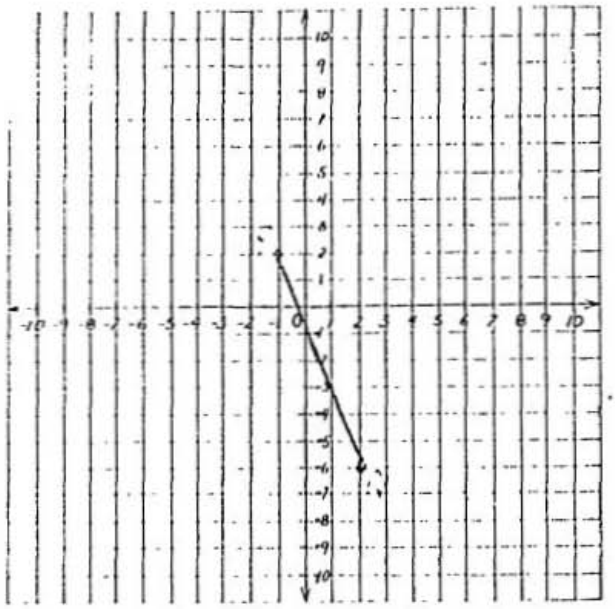
11.Calculate the length of line segment RS. _____



12.Calculate the length of line segment EF. _____

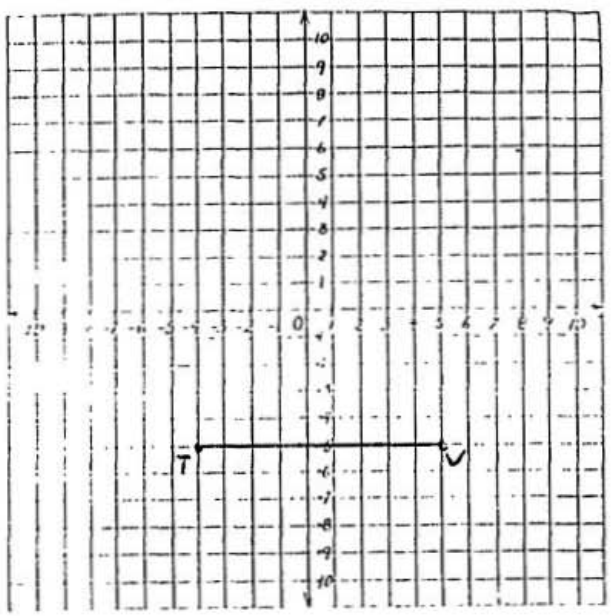


13.Calculate the length of line segment PQ. _____

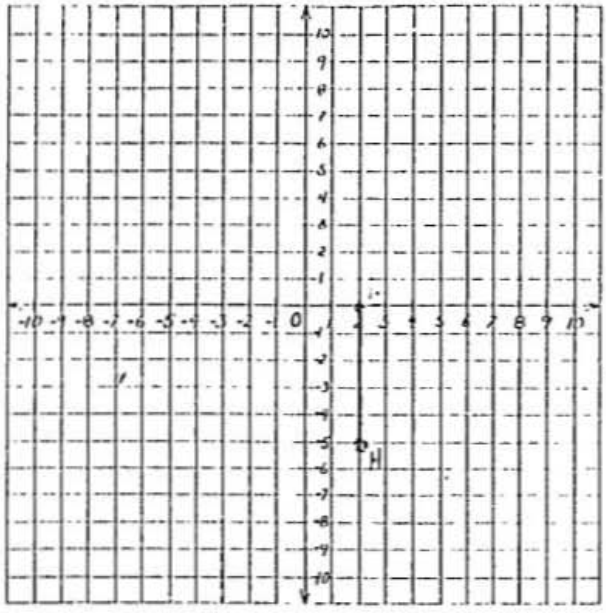


14.Which line segment is longer? _____
PQ with P(5,1) Q(-3,1) or
RS with R(1,-4) S(1,5)

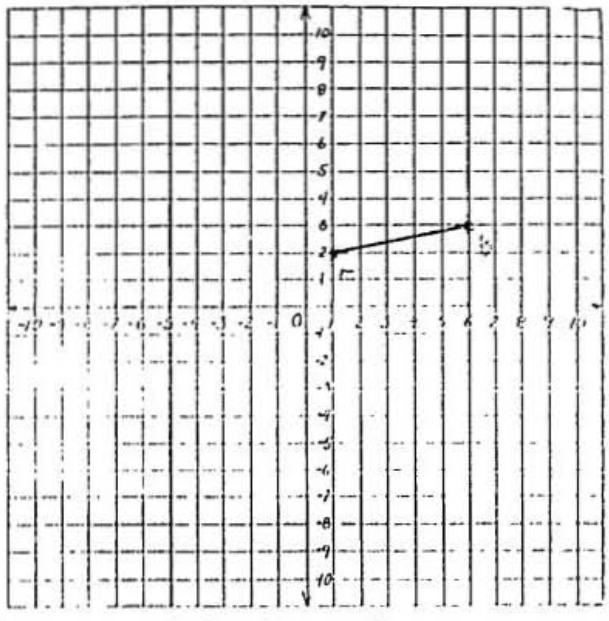
15.Calculate the length of line segment TV. _____



16.Calculate the length of line segment GH. _____

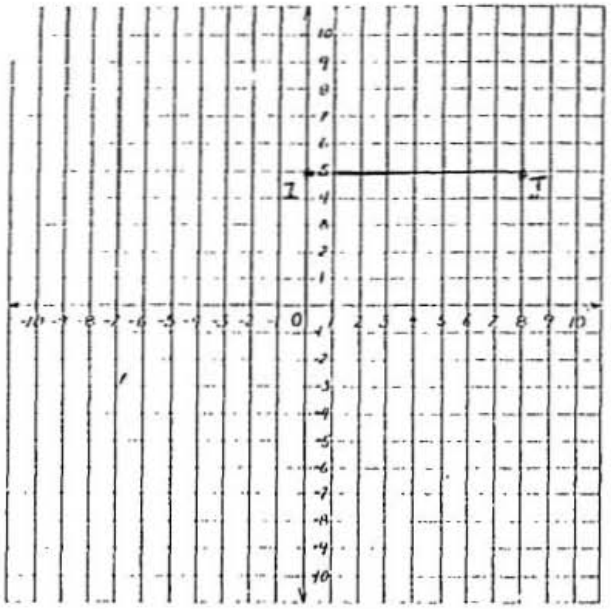


17.Calculate the length of line segment AB. _____

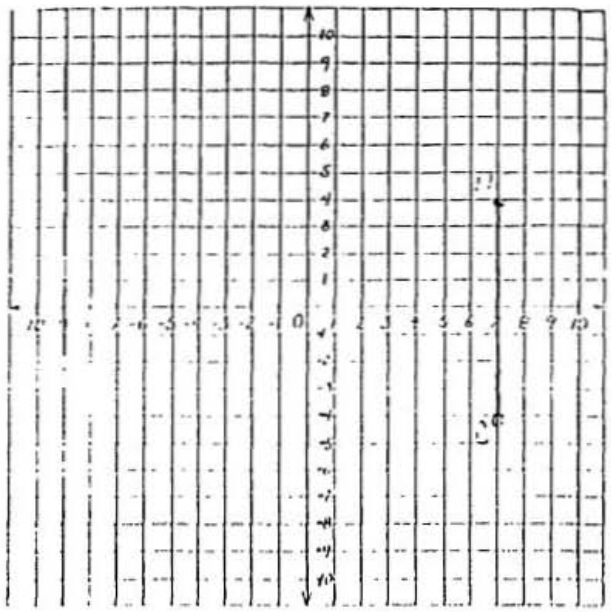


18.Which line segment is longer? _____
XY with X(-3,4) Y(1,2) or
ZR with Z(2,-4) R(4,2)

19.Calculate the length of line segment IJ. _____



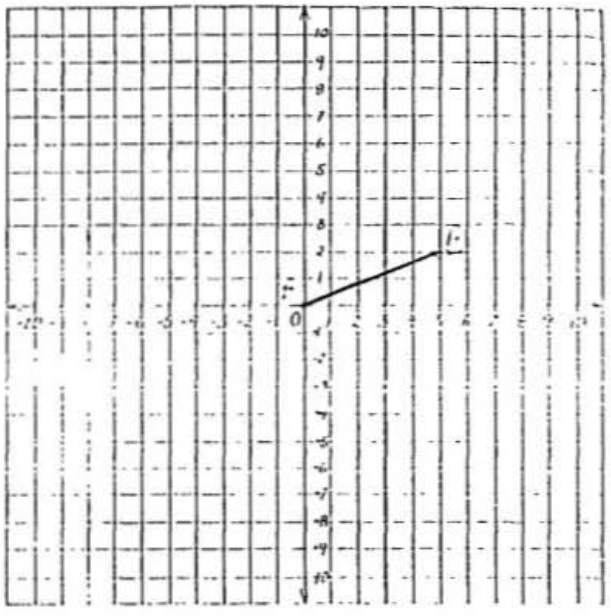
20.Calculate the length of line segment NO. _____



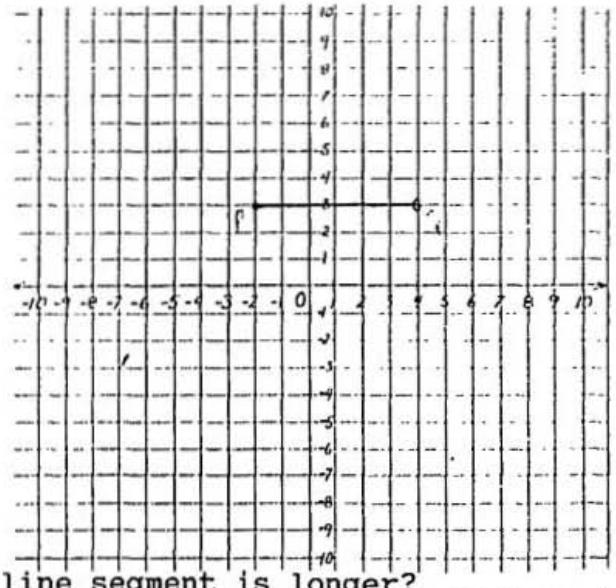
Posttest # 2

Find the correct answer to each of the following questions and place it in the space provided.

1.Calculate the length of line segment AB. _____

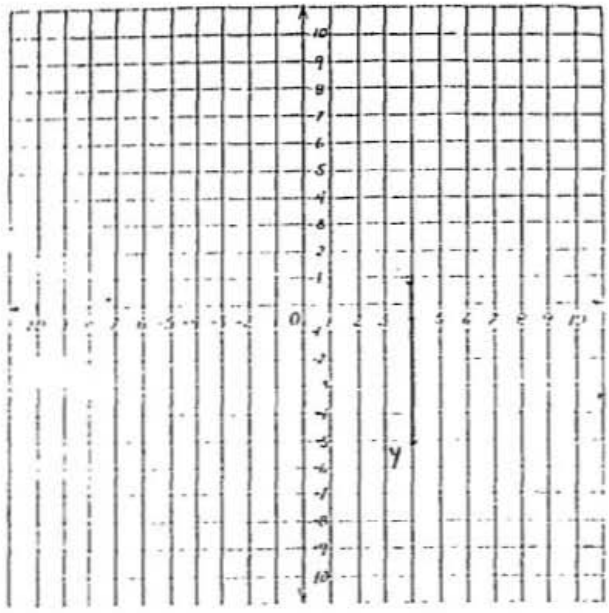


2.Calculate the length of line segment PQ. _____

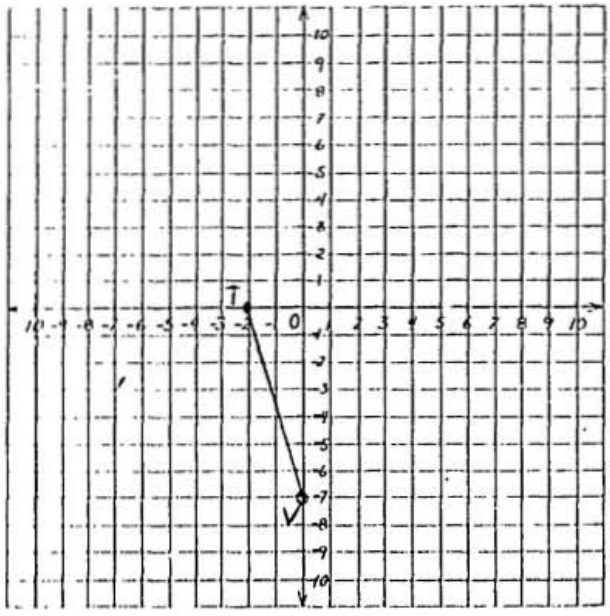


3.Which line segment is longer? _____
CD with C(0,3) D(3,0) or
EF with E(1,3) F(2,6)

4.Calculate the length of line segment XY. _____

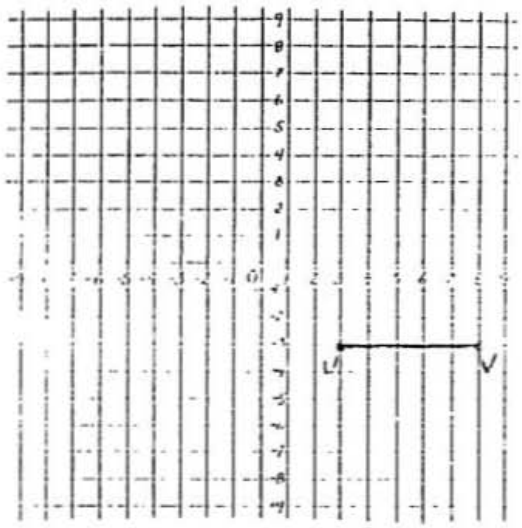


5.Calculate the length of line segment TV. _____

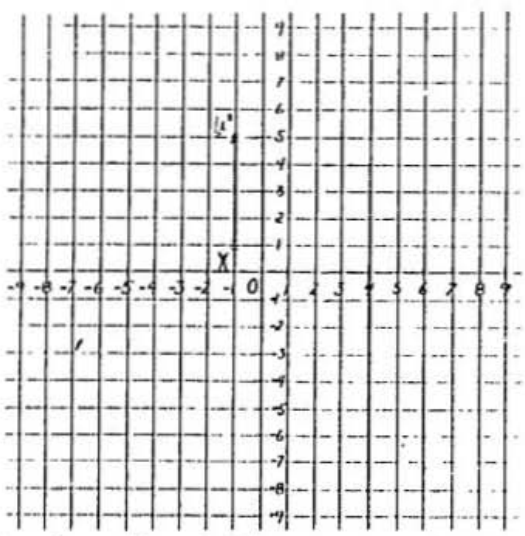


6.Which line segment is longer? _____
MN with M(-3,4) N(1,5) or
OP with O(-3,1) P(3,1)

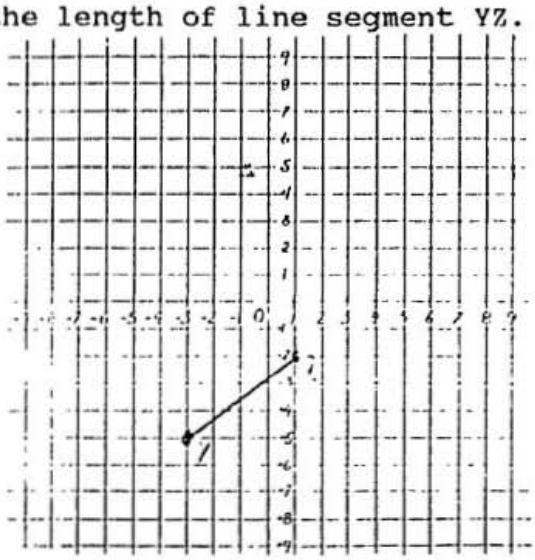
7.Calculate the length of line segment UV. _____



8.Calculate the length of line segment WX. _____

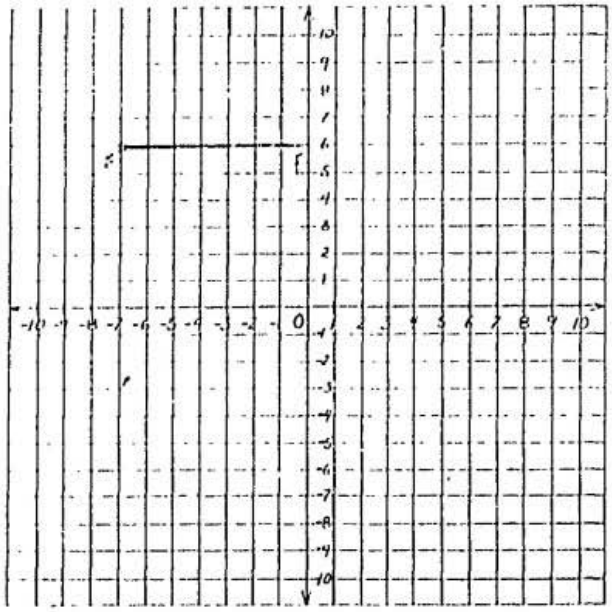


9.Calculate the length of line segment YZ. _____

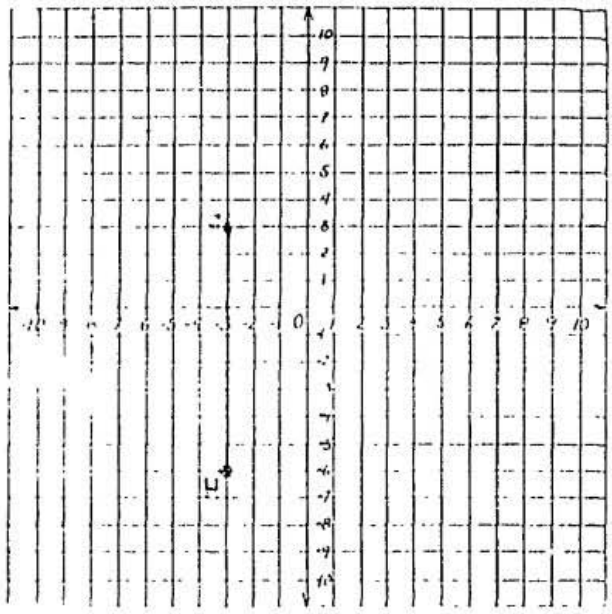


10.Which line segment is longer? _____
AB with A(0,-4) B(2,2) or
CD with C(3,2) D(-1,-5)

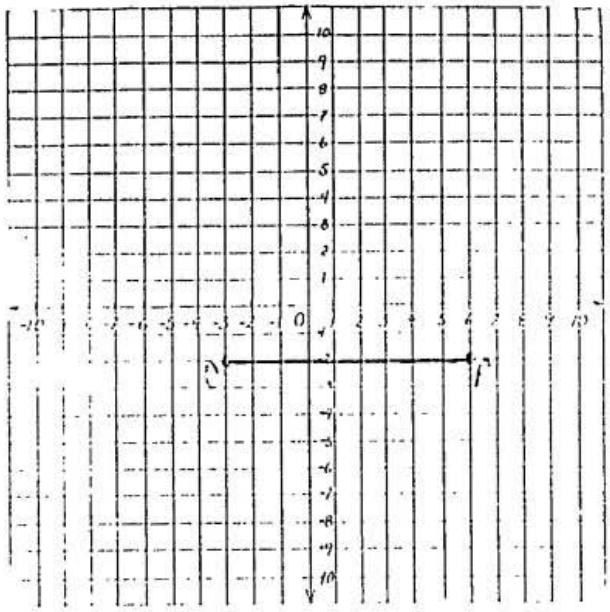
11.Calculate the length of line segment EF. _____



12.Calculate the length of line segment GH. _____

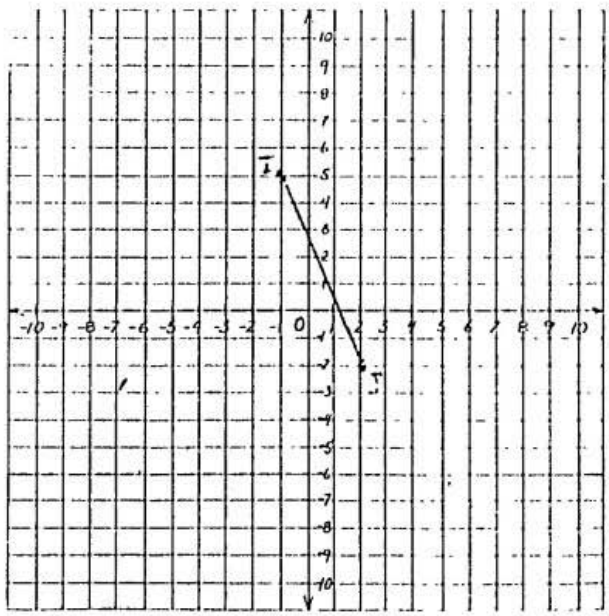


13.Calculate the length of line segment IJ. _____

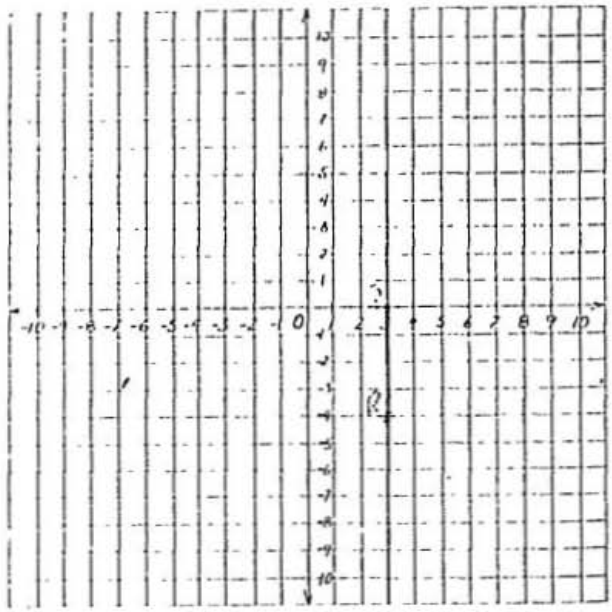


14.Which line segment is longer? _____
KL with K(3,1) L(-3,1) or
MN with M(1,-4) N(2,3)

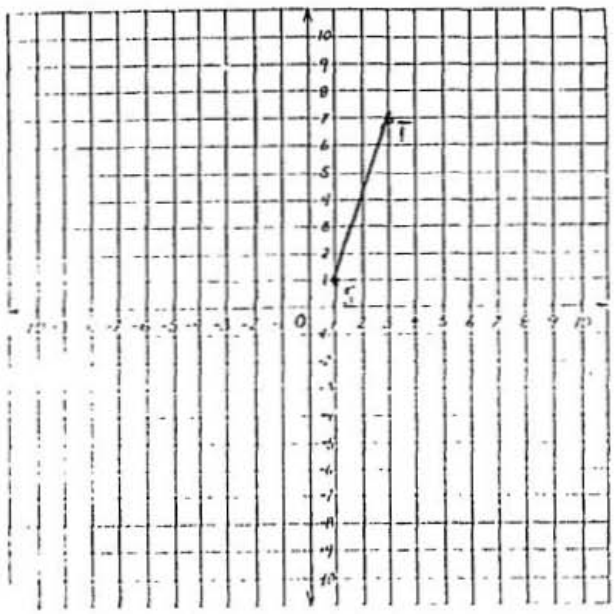
15.Calculate the length of line segment OP. _____



16.Calculate the length of line segment QR. _____

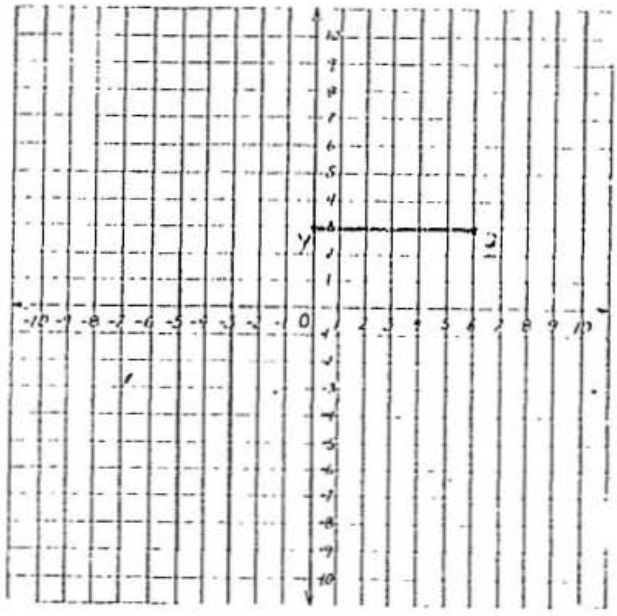


17.Calculate the length of line segment ST. _____

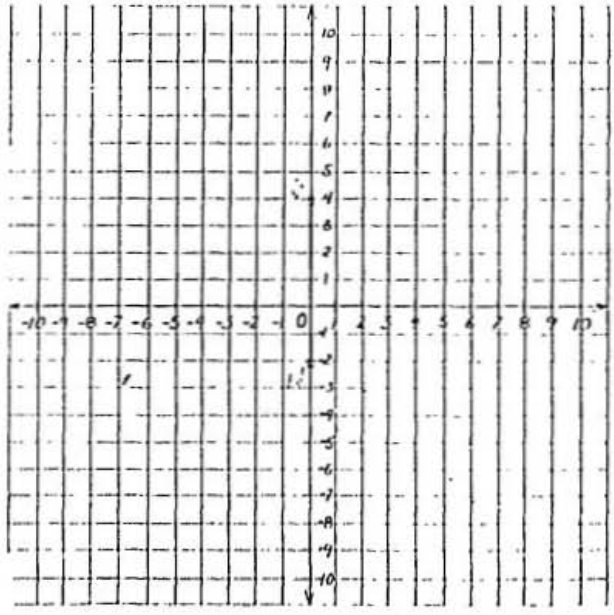


18.Which line segment is longer? _____
UV with U(2,4) V(-1,2) or
WX with W(2,-4) X(3,-1)

19.Calculate the length of line segment YZ. _____



20.Calculate the length of line segment ON. _____



Appendix D

Instructional Objectives

Following are the instruction objectives used in the study:

Section 1

At the end of this section students will be able to:

1. Calculate the slope of a line segment from its graph.
2. Calculate the slope of a line from its graph.
3. Determine if three given points are collinear.
4. Construct the graph of a line given its slope and a point on the line.
5. Construct the graph of a line given its equation.

Section 2

At the end of this section students will be able to:

1. Calculate the length of vertical line segments on a cartesian plane.
2. Calculate the length of horizontal line segments on a cartesian plane.
3. Calculate the length of sloped line segments on a cartesian plane.
4. Determine which of a set of line segments is longest.