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The effects of cooperative learning on mathematics achievement for third grade students

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Rowan University

THE EFFECTS OF COOPERATIVE LEARNING ON MATHEMATICS
ACHIEVEMENT FOR THIRD GRADE STUDENTS

By
Angelina M. Carione

A Thesis

Submitted in partial fulfillment of the requirements of the
Masters of Science in Teaching Degree
of
The Graduate School
at
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Approved by
                                              Professor

Date Approved July 1, 2002

ABSTRACT

Angelina M. Carione
The effects of cooperative learning on mathematics achievement for third grade students
2002
Dr. Randall Robinson, thesis advisor
Maters of Science in Teaching

The purpose of this study was to examine the effects of cooperative learning on mathematics achievement. It was hypothesized that students who worked cooperatively during mathematics practice would achieve a higher test score on the post-test than students who did not work together. The subjects of the study were forty third grade students form a southern New Jersey school district. The study consisted of an experimental and a control group. Both groups were administered a pre-test. The experimental group then participated in cooperative learning during mathematics practice for a seven-week period. Both groups were post-tested after seven weeks.

Calculations proved there was no significant difference between the experimental group and control group, therefore rejecting the hypothesis.

MINI-ABSTRACT

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ACKNOWLEDGEMENTS

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Chapter One

Scope of the study

Introduction

Teachers use many different strategies to aid students learning. Cooperative learning is implemented by teachers who are trying a different teaching strategy to possibly improve students learning of the didactic material and also encourage social interaction (Mueller & Fleming, 2001).

In cooperative learning the teacher's instruction is supplemented by giving students and their peers a forum for discussing information and ideas along with practicing skills. Teachers need to create an atmosphere of cooperation in order to have successful cooperative learning take place in their classroom. (Cross & Walker-Knight, 1997).

Cooperative learning has the potential to become a primary format used by the teachers to achieve both traditional and innovative goals. Many new strategies have grown out of the cooperative learning structures. All differ just slightly but have the same cooperative learning emphasis. Although a myriad of research has already been collected, new research is still being conducted on all aspects of cooperative learning. It is an important subject that is crucial in many classrooms today (Slavin, 1995).

Working together not only has educational ramifications, but also social implications (Johnson & Johnson, 1992). Cooperative learning does not end upon graduation of school. Many courses in college require it and an often it is used by

businesses and companies at the workplace. Cooperative learning benefits students of all ability levels and all backgrounds throughout their lives (Goldsworthy, 2000).

Purpose

The purpose of this study was to investigate the effects of cooperative learning on third grade students. The implications of this research are wide spread. The objective was to prove the importance of cooperative learning as a study method. By measuring achievement, teachers have evidence proving the positive effects of the implementation of cooperative learning (Johnson & Johnson, 1992).

The following questions were proposed as the research problem: Do students who participate in cooperative learning during mathematics practice have higher test scores and does cooperative learning effect mathematics achievement?

Statement of the Hypothesis

Third grade students who use cooperative learning as a method of study for mathematics will score significantly higher on the post-test than students who do not use cooperative learning as a method of study.

Operational Definitions

The following terms used within the study are operationally defined as:

Cooperative Learning – the process in which two students work together to solve mathematics problems. The students were fully interdependent. They interacted in face to face situations and verbally communicated. The students perceived personal accountability in achieving the pair's goals.

Achievement – the measurement of learning that resulted in a significantly higher post-test score than the student had previously scored on the pre-test.

Mathematics Practice – the period of time after the teacher has taught the lesson when the students would then engage in cooperative learning to solve mathematics problems.

Amount Learned – the difference between the pre-test and post-test scores of one group.

Limitations

Limitations of the study include factors that could have affected the outcome of the experiment. One limitation of this study was teacher variability. This could negatively affect internal validity. The researcher taught the experimental group for the seven-week period while another teacher taught the control group. Although both groups were learning the same material, different people taught them, therefore, teaching styles and methods of instruction were different.

A second limitation was the sample size. This effected external validity. The sample was from only one, small, elementary school in southern New Jersey.

Also, there was only a seven-week period to complete this study; therefore, time constraints proved to be another limitation.

Chapter Two

Literature Review

Introduction

The purpose of this study was to investigate the effects of cooperative learning on mathematics achievement for third grade students. It was hypothesized that students who worked cooperatively during mathematics practice would achieve a significantly higher score on the post-test than students who did not work together.

A Preface on Cooperative Learning

There has been a plethora of research conducted on cooperative learning, although new research is still being collected on the subject. It is a controversial, yet important subject that is poignant in classrooms today (Slavin, 1995).

Cooperative learning has been researched for a long time in this country and many others. The concept has a solid research base, which has accumulated over several decades (Walters, 2000).

Cooperative learning simultaneously models interdependence and provides students with the experiences they need to understand the nature of cooperation. Cooperative learning is now an accepted instructional strategy that promotes learning and achievement across the curriculum (Cohen, 1994).

The Implementation of Cooperative Learning

When using cooperative learning, two elements must be realized. Students are be interdependent and work together for a common goal, while at the same time they are still individually accountable for knowing the didactic material (Walters, 2000).

Working together has a profound effect on students. Students collaboratively work together to complete tasks and learn how to socially interact. When groups are maximally heterogeneous, students tend to interact and achieve in ways and at levels that are usually not found in other teaching strategies (Stahl, 1994).

In a study done by Griffin and Griffin (1998), reciprocal peer tutoring, a form of cooperative learning, had positive effects on achievement. Also, a study by Nath and Ross (2001), found that grade 1 – 3 students performed better in cooperative groupings than did the grade 4 – 6 students.

It is controversial as to whether higher achieving students or lower achieving students benefit more form cooperative learning. Some studies found better outcomes for higher achievers, while others found better outcomes for lower achievers (Slavin, 1995).

Gillies and Ashman (1997) found in a study using heterogeneous groups in cooperative learning that, when the interactions of the children were analyzed by ability level, the high-ability children provided more explanations than the others. Also, the medium-ability and low-ability children were relatively active in the group (Gillies & Ashman, 2000).

Well designed cooperative learning systems can be beneficial to students of all ability and interest levels (Schniedewind & Davidson, 2000). Mixed ability grouping for cooperative learning has been found to be successful. A study by Jones and Carter

(1994) found that students of low ability may not improve their performance when grouped homogeneously for cooperative learning.

Inclusion and Cooperative Learning

Students of different ability levels and students with physical disabilities are placed together in what is called an inclusive classroom. Cooperative learning works in an inclusion classroom because heterogeneous groupings can be made and students can support each other. It is to be used to supplement the teacher's instruction by providing students with practice in the skills they had previously learned in a forum where they can utilize peer advice and support (Slavin, 1991).

Broad classroom needs, time constraints, and the magnitude of curriculum demands make individualizing the curriculum not pragmatic or desirable. This realization had led many inclusion advocates to promote cooperative learning and peer tutoring as the instruction of choice. Successful peer tutoring and cooperative learning must take place in an overall atmosphere of cooperation and peer support (Sapon-Shevin, Ayres, and Duncan 1994).

Cooperative learning is an effective instructional practice that involves students in inclusive classrooms as instructional aides for their peers (Udvari-Solnar & Thousand, 1996). The instructional practices have advantages over teacher instruction. By students working together, everyone is receiving attention. Social interaction and student support for common goals are elicited in cooperative learning situations (Cross & Walker-Knight, 1997).

Students and Cooperative Learning

Teachers are often criticized for not being able to identify what each child needs as an individual. With all the work teachers must deal with, it is hard for them to have a strong one-on-one relationship with each student. Often, teachers miss crucial signs or signals from children. When using cooperative learning, a teacher can create a diverse climate with many options to help the child that may otherwise be missed. It is believed when teachers implement cooperative learning thoughtfully and assign tasks with in it, they can personalize student learning, help students work together while challenging each individual, and encourage students to appreciate their peers' diverse attributes and experiences (Schniedewind & Davidson, 2000).

Each child had different interests and talents. Using cooperative learning groups provides a forum for all students. It is a situation where students can participate in a way they feel comfortable, elicit their talents, and be involved in simple or complex discussions. They are in charge of how far they want to go. Cooperatively structured lessons where everyone performs the same activity barely hints at cooperative learning's potential. Students in a cooperative learning group can engage in tasks with different levels of complexity and learn different amounts of material. Every student learns something that he or she doesn't already know; all students contribute to a common goal (Schniedewind & Davidson, 2000).

Because students interact with each other, it is a different form of learning than when a student interacts with a teacher. At times a teacher may not explain the material in a manner the children could understand or the teacher may find it hard to relate to how a student is thinking. Cooperative learning is based upon students' interactions with each

other. The children who need the most help in a subject area benefit greatly for many reasons. Peers are usually more aware than the teacher of what other students' need. Peers can also explain concepts and information in terms that are easy to understand (Webb & Farivar, 1994).

Learning Outcomes

Author, Robert Stahl, believes that cooperative learning and cooperative learning groups are means to an end rather than an end in themselves. Therefore, teachers should describe what they expect students to know and what they want students to be able to do on their own, when planning their lessons for a unit. It is does not matter whether these outcomes emphasize academic content, cognitive processing abilities, or skills, teachers should very clearly delineate the specific knowledge and abilities students are to gain and then display on their own. (Stahl, 1994).

Cooperative learning is not the definitive answer to the problems in education. It is a supplemental tool that helps children learn in schools today. Teachers must know when it is appropriate to use cooperative learning to facilitate students' understanding. In cooperative learning, the teacher's instruction is supplemented by providing students with a structure to practice skill and discuss information with their peers (Cross & Walker-Knight, 1997).

Future Ramifications of Cooperative Learning Skills

Students who work cooperatively on solving problems complete their tasks much faster than students who work either individually or competitively (Laughlin & Jaccard,

1975). Johnson and Johnson (1989), link cooperative learning to enhancing critical thinking skills. They state that despite its benefits most students choose to work independently rather than cooperatively. They also found that cooperative learning is only implemented in schools about 7 to 20 percent of instructional time.

Western industrial societies tend to promote competitive school environments that rely heavily upon teacher-directed lessons rather than on peer collaboration for classroom instruction. Cooperative learning needs to be implemented more (Kewley, 1998).

The idea of competitive schools is shifting due to business. The face of business is rapidly changing. A new era has emerged that engenders change in how people interact personally and professionally. Businesses and other work places are using cooperative learning more and more. They are increasingly utilizing small work groups and teams to attain goals. Cooperative learning is used in business frequently, from completing everyday tasks to accomplishing large projects (Goldsworthy, 2000).

This trend of cooperative learning in the work place is undoubtedly going to continue to rise. Businesses are going to begin looking for employees that can work as part of a team and their training begins in school. Because of this some teachers use cooperative learning in their classrooms to elicit social development, the importance for those who will enter the business world, and for its effectiveness in recall and application skills (Goldsworthy, 2000).

Teachers can start advocating this trend by being an appropriate role model for cooperative learning. Teachers must model for students ways of working collaboratively. This creates an organizing base for developing an inclusive learning community. To build and sustain this community, educators must describe and elaborate on effective

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practices of fostering collaboration and cooperation between and among students and professionals. It is possible to alleviate ability differences and meet the needs of students with diverse academic and social needs in general education classrooms (Cross & Walker-Knight, 1997).

Summary

Dr. Robert Slavin researched sixty-seven studies on cooperative learning in 1991. He found forty-one studies to have significantly greater achievement in cooperative learning situations as opposed to traditional classrooms instruction for all types of students. Also, Slavin found that cooperative learning situations help improve relationships between disabled and nondisabled students, increasing self-esteem and development of more positive attitudes towards school (Slavin, 1991).

Chapter Three

Procedure

Introduction

This study was to determine the affects of cooperative learning on achievement. Cooperative learning has many positive implications (Vygotsky, 1978). Research has already shown that cooperative learning benefits both teachers and students (Slavin, 1995). The experimental group of students were given a pre-test in mathematics. After a seven-week period of using cooperative learning in the classroom during mathematics practice, the students were given a posttest. The control group was given a pre-test and post-test, but they did not receive a cooperative learning treatment.

Description of subjects

The site selected for this study was a middle class, public elementary school with kindergarten through third grade, in Williamstown, New Jersey. The sample consisted of 38 third grade students. The experimental group consisted of 19 subjects. There were eight girls and eleven boys. Eight of the children were classified as special education students and two students were classified as needing basic skills instruction. There were no students that required a 504 plan. The control group contained 19 students. There were eight boys and eleven girls. Three students were classified as needing special education and four were classified as needing basic skills instruction.

One student required a 504 plan. Neither group had used cooperative learning during mathematics lessons prior to the research.

Procedure

A quasi-experimental design was used for the study. It was decided that the study would consist of both a control group and an experimental group.

First, the researcher obtained permission from the cooperating teacher to use the class as the experimental group. Then the researcher asked the permission of the other third grade teacher to use that class as the control group. The researcher then created an instrument that tested the skills that the students would be learning. It was based upon problems from the upcoming sections in the students' mathematics book (see appendix A). The researcher pretested both the experimental group and control group.

Over a seven-week period the researcher implemented the treatment to the experimental group. The experimental group engaged in cooperative learning activities, during mathematics practice. The students were placed in pairs after each mathematics lesson to complete the practice worksheets (see appendix B). The researcher assigned them to a different partner each time. The students did not have the same partner consecutively. The students were allotted twenty-five minutes to complete the paper with their partner. The control group continued to complete the daily assessments without a partner. After the seven-week period the researcher post-tested both groups.

Description of Instruments

A pre-test and post-test of mathematics skills was used. The pre-test was given to both the experimental and the control groups. The same test was given to both groups as the post-test seven weeks later. The test that was used was created from problems in the Saxon third grade mathematics curriculum, lessons 90 – 115. The test was comprised of forty problems. Some of the problems were multiple choice while others were fill in the blank (see appendix A).

Chapter Four

Analysis of Findings

Introduction

The purpose of this study was to investigate the effects of cooperative learning on mathematics achievement for third grade students. The study comprised two third grade classes. Both groups were given a pre-test in mathematics. The experimental group received the treatment of cooperative learning, while the other class did not. After a seven-week period both groups were post-tested. It was hypothesized that students who worked cooperatively during math practice would achieve a significantly higher score on the post-test than students who did not work together.

Tabulation of Mean and Standard Deviation

The experimental and control groups were both administered a pre-test and a post-test. The test consisted of forty questions (see appendix A). There were 19 subjects in each group. The mean for the pre-test for the experimental group was 34.79, which was lower than the mean for the control group which was 46.58. The standard deviation for the pre-test for the experimental group was 16.78. The standard deviation for the control group was 17.17.

On the post-test the mean for the experimental group was 61.89, indicating there was a change from the experimental group's pre-test score. The standard deviation was

14.29. The control group had a mean of 58.71, also indicating a change from their pre-test score. The standard deviation for the control group's post-test score was 20.51.

The amount scored subtracted the difference between each child's pre-test and post-test score. The mean for the amount learned for the experimental group was 28.26 and the standard deviation was 10.76. The mean for the amount learned for the control group was 25.26 and the standard deviation was 14.51.

These scores were then used in the calculations of the t-test.

table 1

Means and Standard Deviations Scores

		Pre-test	Post-test	Amount Learned*
Experimental group N=19	Mean	34.79	61.89	28.26
	Standard Deviation	16.78	14.29	10.76
Control group N=19	Mean	46.58	58.71	25.26
	Standard Deviation	17.17	20.51	14.51

* Difference between pre-test and post-test scores

Tests for Significance

A t-test for nonindependent samples was calculated to determine if there was a significant difference between the pre-test score and post-test score of the experimental

group. The researcher found there was a highly significant difference of <.001 between the scores.

A t-test for nonindependent samples was calculated to determine if there was a significant difference between the pre-test and post-test scores of the control group. The researcher found there was a highly significant difference of <.001 between the scores.

A t-test for independent samples was analyzed to determine if there was a significant difference between the pre-test scores of the experimental group and the pre-test scores of the control group. The researcher found there was a significant difference of <.05 between the scores. There was a significant difference between the control group and the experimental group on the pre-test, therefore, this indicated that the groups were not equal from the beginning.

A t-test for independent samples was done to determine if there was a significant difference between the post-test scores of the experimental group and the post-test scores of the control group. The tabulation showed results that it was approaching significance. Since the t-test for the post-tests of both groups was approaching significance, a t-test for independent samples was done to determine if there was a significant difference for amount learned between the two groups. This was done to adjust for the anomaly of the two pre-test scores being unequal. This t-test determined that there was no significant difference in the amount learned between the two groups (see table 2).

table 2

t-test for Independent and Nonindependent Samples

	t	degrees of freedom	p
Experimental group Pre-test/post-test	10.68	18	<.001
Control group Pre-test/post-test	7.10	18	<.001
Experimental/Control group Pre-test	2.08	36	<.05
Experimental/Control group Post-test	1.78	36	N.S.*
Experimental/Control group Amount Learned	.70	36	N.S.*

*Not statistically significant

Chapter Five

Summary, Conclusions, and Recommendations

Introduction

The purpose of this study was to investigate the effects of cooperative learning on mathematics achievement for third grade students. The study was comprised of two third grade classes. Both groups were given a pre-test in mathematics. The experimental group received the treatment of cooperative learning, while the other class did not. After a seven-week period both groups were post-tested. It was hypothesized that students who worked cooperatively during mathematics practice would achieve a significantly higher score on the post-test than students who did not work together.

Summary of the Purpose

The purpose of this study was to investigate the effects of cooperative learning on third grade students. The objective was to prove the importance of cooperative learning as a study method.

Two questions were proposed: Do students who participate in cooperative learning during mathematics practice have higher test scores? Also, does cooperative learning have an effect on mathematics achievement?

Summary of the Hypothesis

Cooperative learning is a method used in classrooms today. Much research has already been conducted on the subject. There have been several studies proving the significance of cooperative learning. Therefore, it was hypothesized that third grade students who use cooperative learning as a method of study for mathematics will score higher on the post-test than students who do not use cooperative learning as a method of study.

Summary of the Procedures

The site selected for this study was middle class, public elementary school, in Williamstown, New Jersey. The sample consisted of 38 third grade students. There were two groups, an experimental group and a control group, both with 19 students each. The experimental group used cooperative learning in mathematics over a seven-week period while the control group did not.

All of the students were administered a pre-test and a post-test. The data was recorded and analyzed.

Summary of the Findings

Several t-tests were used to determine if there were significant differences in the data between the experimental group and the control group. The t-test was also used to determine the amount learned of both groups. Upon analysis of the findings, the scores determined that there was no significant difference between the two groups.

Conclusions, Implications, and Recommendations

Upon analysis of the data, there was a positive change in both groups regarding amount learned. Although, it was determined there was no significant difference in the amount learned between the two groups. This study was an unqualified success in the fact that each group had a positive change in the amount learned from pre-test to post-test.

The students in the experimental group learned how to work cooperatively to achieve a goal. This is an important skill that they will have to use time and time again in the future.

Due to rejection of the hypothesis, the following is recommended:

1. Since this study was conducted only over a seven-week period, the researcher recommends that a study based over the whole school year. This would allow students to become more familiar with engaging in cooperative learning and also give the researcher the opportunity to fully evaluate the ramifications of cooperative learning.

2. It is also recommended that, the same teacher instruct both groups, therefore eliminating teacher variability. This would eliminate the differences of styles of two different teachers negatively effecting the validity of the study.

3. In a further study the sample size should be much larger than just the two small groups that were used in this study. Having a small sample in one remote part of the world effects external validity. Using a larger sample will likely increase the accuracy of the test.

Although the hypothesis was rejected in this study, there has been a plethora

of research conducted on cooperative learning that proves it does effect achievement in a positive way. Research needs to be continuously conducted in this field. Also, teaching methods and strategies need to be continuously scrutinized. The only true way of determining if cooperative learning is an applicable, worthy method is by executing research.

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Appendix A

Pre-test/Post-test

NAME_____ DATE_____

Teacher _____

1. 539
   -275

2. $672
   - 369

3. Which is smaller? (circle the correct answer) 1/8 or 1/4

4. Which is larger? (circle the correct answer) 1/2 or 1/3

5. $3/8 + 2/8 =$ _____

6. $7/8 - 4/8 =$ _____

7. Write these fractions in order from least to greatest 1/6, 1/2, 1/10, 1/3

   _____

8. $N \times 3 = 12$ What does N equal? _____

9. Write 7 groups of 3 as a number sentence _____

10. Circle the correct answer
    lb. Stands for
    a. ounce   b. weight   c. pound   d. ton

11. 1lb. = ____oz.

12. $4 \times N = 24$ What does N equal? _____

13. $49 + \square = 100$ What does   equal? _____

14. $27 + \square = 100$ What does   equal? _____

15. You buy an ice cream cone for 78 . You give the clerk $1.00. How much change do you get back? _____

16. Write nineteen thousand, four hundred twenty-six using digits

_____

17. $84 \times 1,000 =$ _____

18. $60 \times 100 =$ _____

19. Write this number in expanded form 7, 692

_____

20. $15 - 5 =$ _____

21. $35/5 =$ _____

22. $24 - 4 =$ _____

23. $32/4 =$ _____

24. Write $52,321.82 as you would on a check

    _____

25. One kilogram = _____ lbs.

26. Show a quarter past seven in numbers _____

27. Circle the mixed number   1 1/3   1/4   3/8   2/6

28. There are 18 pieces of candy. Two children will share the candy. How
    much candy will each child have?
    Write a number sentence _____

                    Answer _____

29. 60   400   200
     x 3   x 7   x 8

30. 9 x 8 = _____

31. C ------ C   (circle the correct answer)
     a. slide   b. rotate   c. flip

32. What is 1/2 of 8? _____

33. What is 1/3 of 12? _____

34. 3 x 43 = _____

35. What kind of angle is this? _____
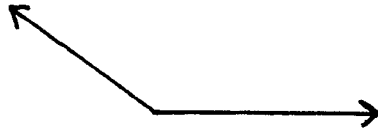
36. What kind of angle is this? _____
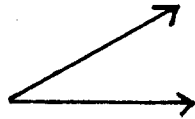
37. How many donuts are in 5 dozen? _____

38. Name a geometric solid _____

39. 9 x 6 = _____

40. Write 16 divided by 2 equals 8 three different ways

_____

Appendix B

Mathematics Practice Worksheets

If the small rope is 3 feet long, what is a reasonable estimate of the length of the longer rope?

Workspace:
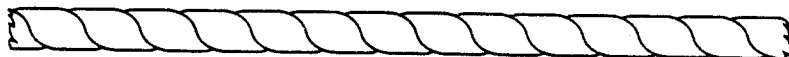
Answer: _____

Explain in words how you found your answer.

_____

_____

_____

_____

_____

_____

_____

Name _____• **Guided Class Practice 91A**

Math 3 (for use with Lesson 91)

Date •

Draw a line segment that is $\frac{1}{2}$" shorter than the name line. How long is the line segment? _____

Workspace

1. How many days are in the last three months of the year?

   Number sentence _____

   Answer _____
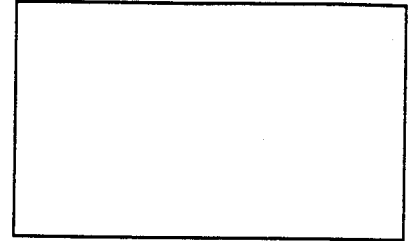
2. Circle the array that shows **2 × 4 = 8**.
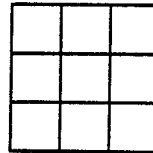
3. What temperature is shown on the thermometer? _____

   Draw a line across the thermometer to show − 20°C.
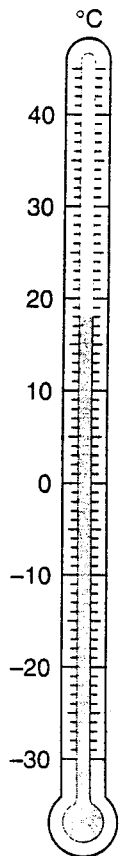
4. Crystal had a dozen cookies. Draw the cookies. She gave half of the cookies to Sue, four to Alex, and the rest to Paul. How many cookies did she give to each child?

   Sue _____   Alex _____   Paul _____
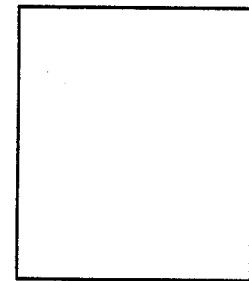
   What fractional part of the cookies does Alex have? _____

5. Your classroom door is about how tall?

   20 feet   7 feet   10 yards   14 inches

6. Find the sums.

   $298.50 + $67.95

$$\begin{array}{r} \$ 1\,2\,1\,.\,6\,5 \\ 3\,4\,7\,.\,6\,7 \\ +\ \ 4\,1\,2\,.\,9\,3 \\ \hline \end{array}$$

°C
40
30
20
10
0
−10
−20
−30

Name _____

Date .

Draw a line segment that is 1" shorter than the name line. How long is the line segment? _____

1. My sister is 8 years older than I. I'm 14 years old. How old is my sister?

   difference

   Number sentence _____

   Answer _____

2. Find the area of each rectangle.

   7 cm

   2 cm

   3"

   5"

   _____ square centimeters

   _____ square inches
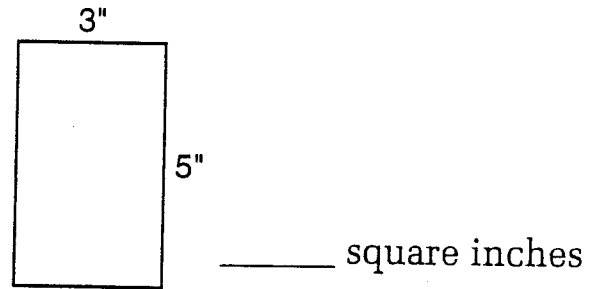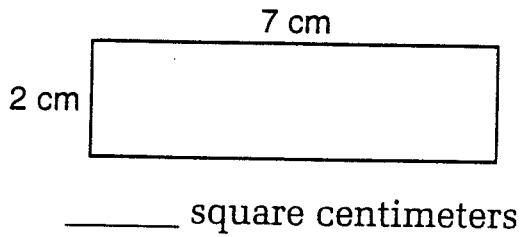
3. Circle the unit of measure you would use to measure the width of a computer screen.

   miles   pounds   quarts   inches   yards

4. Find the differences. Check your answers by adding.

   $340
   − 130

   $247
   − 109

   $436
   − 192
   ----

5. What number does each of these Roman numerals represent?

   XIV _____   XXI _____

6. Fill in the missing number in the pattern.

   81, 72, 63, 54, 45, _____, 27, 18, 9

   Write a sentence that tells how you found the missing number.

   _____

   _____

Name _____

Date _____

Draw a line segment that is $\frac{1}{2}$" shorter than the name line. How long is the line segment? _____

Workspace

1. There were 316 children present at Edgerton School on Tuesday. The second grade went on a field trip to the aquarium. Sixty-eight children and five teachers went on the field trip. How many children were left at school?

    Number sentence _____

    Answer _____
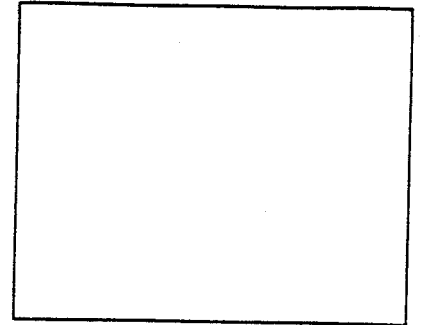
2. What is the area of this rectangle?

    Area = _____ square inches

    8"

    5"
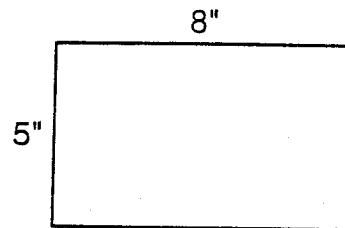
3. Draw a picture to show a 4 × 3 array of cookies on the pan.

    ☺ = 1 cookie
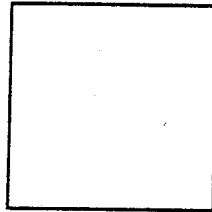
4. Fill in the missing numbers in the patterns.

    163, 173, 183, 193, _____, _____, _____

2	4	6
3	5	___
___	6	8

5. There are 3 red candies, 2 yellow candies, 1 green candy, and 8 purple candies in a bag. If Gina picks one candy without looking in the bag, which color will she most likely get?

    _____

6. Find the answers. Check subtraction answers by adding.

    $\frac{1}{3} + \frac{1}{3} =$ _____

    $\frac{5}{6} - \frac{4}{6} =$ _____

    ```
      $ 5 2 3
    -   1 6 9
    _____
    ```

    ```
      $ 2 5 9 . 3 7
        1 2 5 . 7 8
    +     8 1 . 2 6
    _____
    ```

Date .

Draw a line segment that is $1\frac{1}{2}$" shorter than the name line. How long is the line segment? _____

1. Gregory has 60 baseball cards, Brendon has 75 baseball cards, and Patrick has 40 baseball cards. How many more baseball cards does Brendon have than Patrick?

   difference

   Number sentence _____

   Answer _____
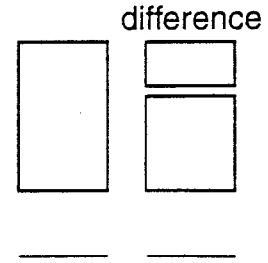
2. Show 12°C on the thermometer.

3. If you spin the spinner 10 times, which color will the spinner probably stop on the most?

   _____

   Which color will the spinner probably stop on the least?

   _____

   How do you know? _____

   _____

   _____
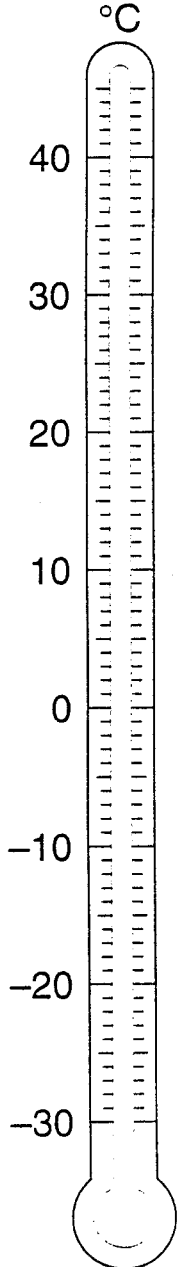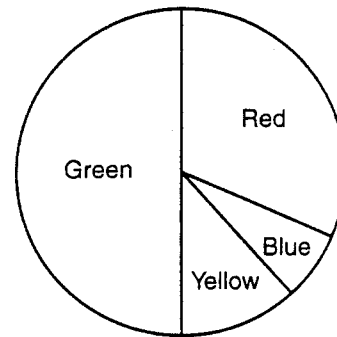
4. Write a number sentence for this array.

   _____
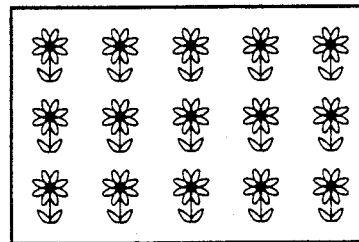
5. These are candy bars.
   Write the correct fraction inside each piece.
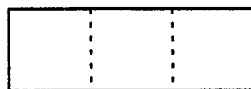
   Which fraction shows the largest piece? _____

6. Find the differences. Check your answers by adding.

   $$592 - 48$$

   $$451 - 258$$

°C

40

30

20

10

0

−10

−20

−30

Name _____

Date .

Draw a line segment that is $\frac{1}{2}$" longer than the name line. How long is the line segment? _____

1. The temperature on January 18 in Juneau, Alaska, was 19°F. The temperature on February 18 was 26°F. How much warmer was it on February 18?

    Number sentence _____

    Answer _____

    difference
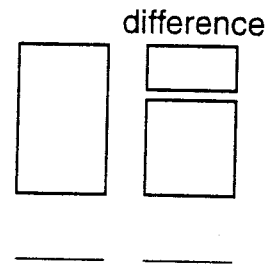
2. Each rectangle is a candy bar.

    Write the correct fraction inside each piece.

    Which fraction shows the smaller piece? _____
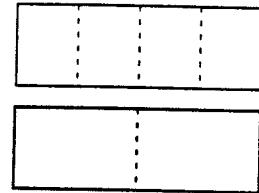
3. Draw a picture to show 6 groups of 3 oranges.
    Circle the number sentence that matches the picture.

    $9 \times 2 = 18$ $6 \times 3 = 18$

    $2 \times 9 = 18$ $3 + 6 + 3 + 6 = 18$
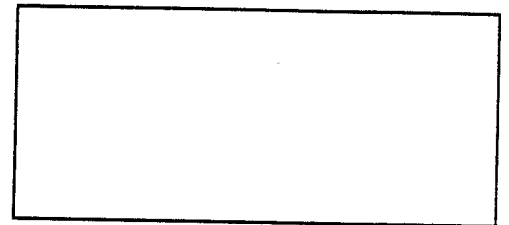
4. Which means the same as 5 tens and 12 ones?

    17   5,012   62   512   52

5. If you spin the spinner 10 times, which number will the spinner probably land on the most?

    _____

    Will the spinner stop on odd or even numbers more often?

    _____

    How do you know? _____

    _____

    _____
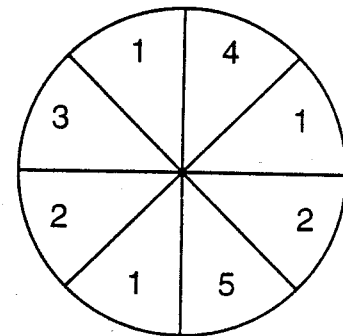
6. Simplify each expression and write the correct comparison symbol.

    $\sqrt{49} + \sqrt{4}$ ◯ 3^2 $\frac{1}{2}$ ◯ $\frac{1}{4}$ 6×3 ◯ 8×2

    _____   _____   _____   _____

Name _____

Date .

Draw a $3\frac{1}{2}$" line segment.

1. Mr. Brandon sold two hundred seven children's tickets and one hundred thirty-five adult tickets for the 6:00 p.m. movie. The theater has four hundred sixty seats. What is the closest estimate of the number of tickets he sold?

Estimation number sentence _____

Circle the closest estimate: a. 200   b. 300   c. 400   d. 500

2. Draw a pictograph to show the number of cloudy days.

Month	Sunny Days	Cloudy Days
January	12	10
February	8	7
March	9	14

Cloudy Days

January	
February	
March	

⌒⌒ = 2 days

3. Find the differences. Check your answers by adding.

$$\begin{array}{r} \$903 \\ -\ \ 729 \\ \hline \end{array}\qquad\begin{array}{r} \$600 \\ -\ \ 158 \\ \hline \end{array}\qquad\begin{array}{r} \$540 \\ -\ \ 317 \\ \hline \end{array}$$

4. What fractional part of this word is vowels? _____

What fractional part of this word is consonants? _____

CANADA

5. Someone found the sum of $472.53 and $37.91 like this.

$$\begin{array}{r} \$472.53 \\ +\ \ 37.91 \\ \hline \$851.63 \end{array}$$

Why is this not correct? _____

_____

_____

_____

Correct Answer

Write the correct answer in the box.

Name _____

Date .

Draw a $2\frac{1}{2}$" line segment.

1. Jason does 10 sit-ups each night. How many sit-ups will he do during the month of July?

    Number sentence _____

    Answer _____

2. Show quarter past eight on the clocks.
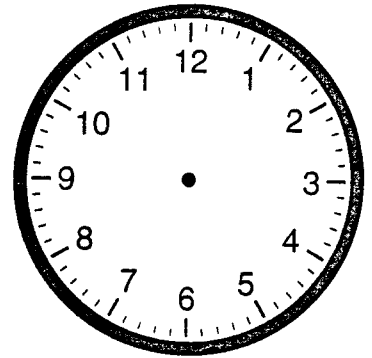
3. Circle the best number sentence to use to estimate the sum of 58 and 34.

    60 + 40 = 100   50 + 30 = 80

    60 + 30 = 90   50 + 40 = 90

4. What is the area of this rectangle?

    Area = _____ square centimeters

    10 cm

    3 cm
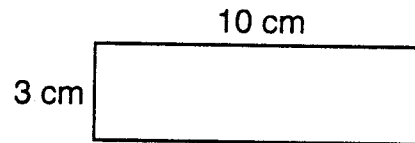
5. Color the spinner so that red and blue have an equal chance of winning.

    How do you know that this is a fair spinner?

    _____

    _____

    _____
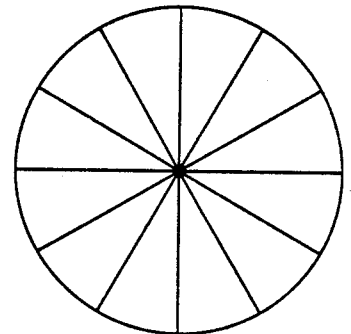
6. Find the answers.

    $756 − $78 $941 − $358 $37.48 + $259.79

Name _____

Date ___.

Draw a $1\frac{1}{2}$" line segment.

Workspace

1. There were 300 markers in the box. Mrs. Holt gave 37 markers to the first graders, 45 markers to the second graders, and 59 markers to the third graders. How many markers did she give away?

Number sentence _____

Answer _____
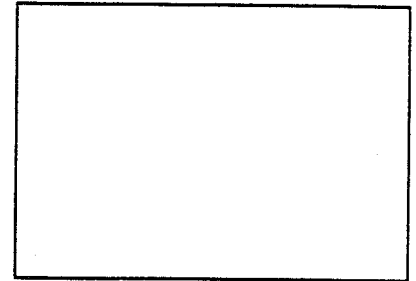
2. Mrs. Lee's class ate $2\frac{3}{4}$ pizzas. Shade the pizzas to show how much they ate.
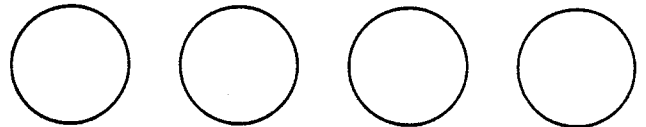
How much pizza is left? _____

3. Fill in the missing numbers in the patterns.

671, 661, 651, 641, 631, 621, 611, _____, _____

10	8	___
9	7	5
___	6	4

4. Write these numbers using Roman numerals.

18 _____   24 _____

5. What time is shown on the clock? Write the digital time. Write the time two ways using words.

┌───────┐
│   :   │   _____
└───────┘
            _____
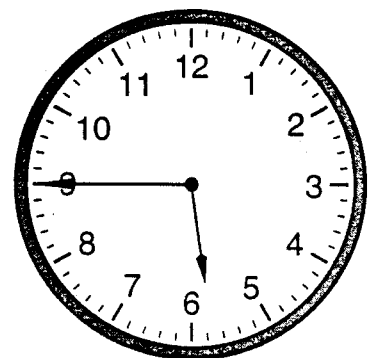
6. Find the differences. Check your answers by adding.

$$\begin{array}{r} \$517 \\ -\ 283 \\ \hline \end{array} \qquad \begin{array}{r} \$704 \\ -\ 386 \\ \hline \end{array} \qquad \begin{array}{r} \$500 \\ -\ 174 \\ \hline \end{array}$$

Name _____

Date .

Draw a $2\frac{1}{4}"$ line segment.

1. At 4:00 p.m. the temperature in Phoenix was 97°F.
    At midnight the temperature was 23 degrees lower.
    What was the temperature at midnight?

    difference

    Number sentence _____

    Answer _____

    _____ _____
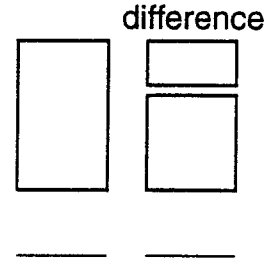
2. How many squares are there? _____

    How much is shaded? _____

    Circle the amount that is not shaded. $1\frac{1}{4}$ $1\frac{2}{4}$ $1\frac{3}{4}$ 1 $\frac{1}{4}$

3. Draw a picture to show a 6 × 3 array of candies in a box.
    ○ = 1 candy
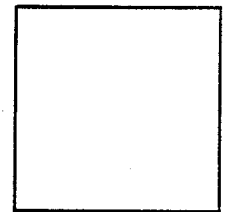
4. Nina has 5 pairs of white socks, 3 pairs of black socks, and 2 pairs of blue socks in
    her drawer. If she picks a sock without looking in the drawer, what color sock will
    she most likely get?

    _____

5. Use the pictograph to answer these questions.

    How many lunch boxes does ⬜ equal? _____

    How many pink lunch boxes are there? _____

    How many more yellow lunch
    boxes are there than blue lunch boxes? _____

    Lunch Box Colors

    Blue
    Pink
    Yellow

    ⬜ = 10 lunch boxes
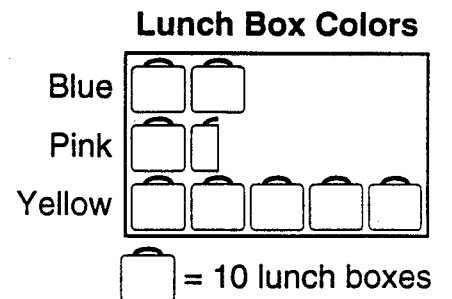
6. Find the answers.

    $302 − $83 $275.39 + $86.58

Name _____
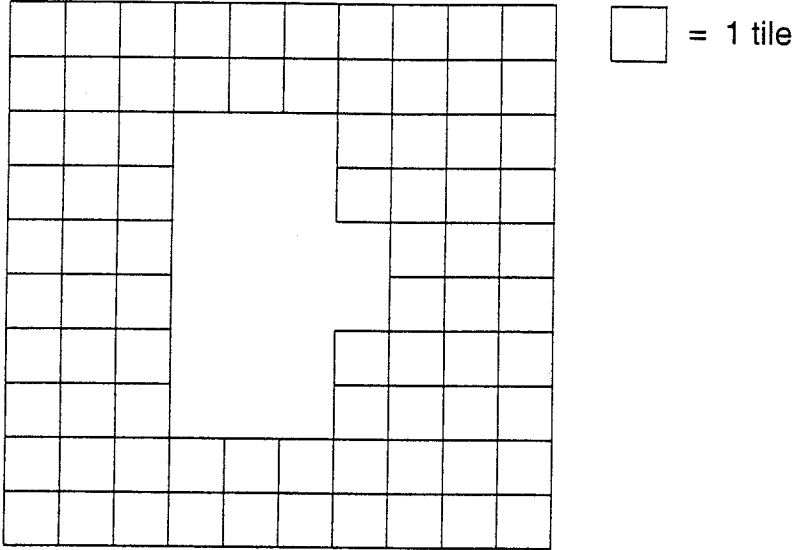
Date _____

The custodian is repairing the cafeteria floor. How many floor tiles will she need to replace the missing tiles?

Workspace:

□ = 1 tile

Answer: _____

Explain in words how you found your answer.

_____

_____

_____

_____

_____

_____

Name _____

Date _____

Measure the date line using inches. _____ "

1. Amber has 92¢. Erica has 27¢ less than Amber. How much money does Erica have?

   Number sentence _____

   Answer _____

   difference
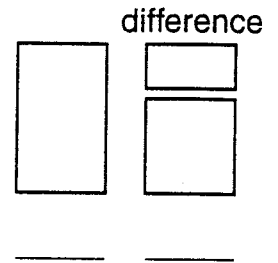
2. Fill in the missing addends.

   $13 + \boxed{} = 100$ $71 + \boxed{} = 100$ $54 + \boxed{} = 100$

3. Norman ate $2\frac{1}{4}$ miniature pies. Shade the pies to show how much he ate.
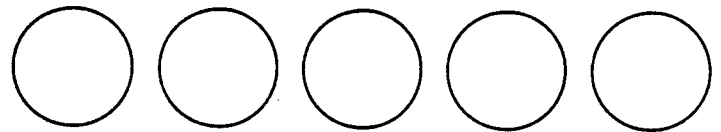
   How much is not shaded? _____

4. It's quarter past five in the afternoon.

   Write the time using digits. _____

   Show the time on the clock.

   What time was it two hours ago? _____
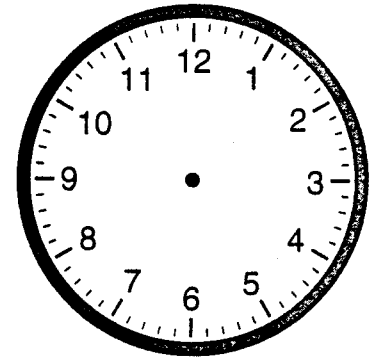
5. Find the answers.

   $\frac{3}{10} + \frac{4}{10} =$ _____ $\frac{1}{8} + \frac{6}{8} =$ _____ $\frac{5}{6} - \frac{4}{6} =$ _____

6. Circle the best number sentence to use to estimate the sum of 53 and 36.

   $60 + 30 = 90$ $60 + 40 = 100$ $50 + 30 = 80$ $50 + 40 = 90$

   Write 1 or 2 sentences to explain why you chose this answer.

   _____

   _____

Name _____

Date _____•

Measure the date line using inches. _____"

Workspace

1. Whitney had 462 pennies and Alex had 137 pennies. Whitney gave Alex 184 of her pennies. How many pennies does Whitney have left?

    Number sentence _____

    Answer _____
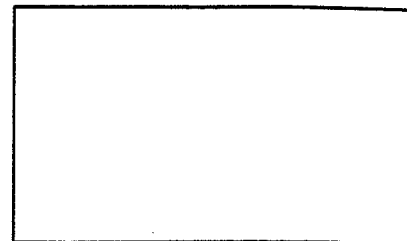
2. The cost of the ruler is 58¢. You give the clerk $1.00.

    How much change will you receive? _____

    What coins will you get? _____

3. Michael saved $372 last year and $418 this year. What is the closest estimate of how much money he saved altogether?

    $500 $600 $700 $800

    What number sentence did you use to find the closest estimate?

    _____

4. Sio ate $\frac{2}{3}$ of the oranges. Color the oranges he ate.
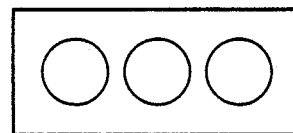
5. About how much might a book weigh?

    1 ounce   1 pound   1 centimeter   1 ton

6. Find the answers. Check subtraction answers by adding.

    28 + ☐ = 100

    15 + ☐ = 100

    $$\begin{array}{r} 9\ 0\ 0 \\ -\ 2\ 5\ 1 \\ \hline \end{array}$$

    $$\begin{array}{r} 5\ 4\ 0 \\ -\ 2\ 1\ 8 \\ \hline \end{array}$$

Name _____

Date _____

Measure the date line using inches. _____ "

1. The children in Room A scored 8 points less than the children in Room B. If the children in Room B scored 12 points, how many points did the children in Room A score?

   Number sentence _____

   Answer _____

   difference
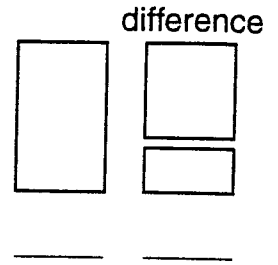
2. Trace the parallel line segments using a red crayon.

3. Write 48,156 using words. _____

   _____

   _____
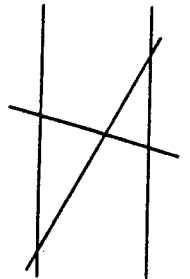
   Write twelve thousand, six hundred thirty using digits. _____

4. Find the products.

   $38 \times 1,000 =$ _____ $60 \times 100 =$ _____

5. Use the graph to answer the questions.

   How many books did Alycia read? _____

   How many more books did
   Alycia read than Shannte? _____

   How many books did Michelle read? _____

   Books Read

Alycia	□	□	□	□
Shannte	□	□	□	
Michelle	□	□	□	□

   □ = 2 books
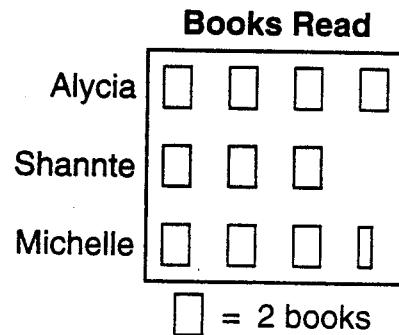
6. Find the answers. Check subtraction answers by adding.

   $$\begin{array}{r} 7\,5\,0 \\ -\,2\,8\,4 \\ \hline \end{array}$$

   $$\begin{array}{r} 5\,0\,0 \\ -\,2\,1\,8 \\ \hline \end{array}$$

   $$\begin{array}{r} \$2\,3,2\,9\,4.8\,1 \\ +\quad 8,5\,7\,0.4\,6 \\ \hline \end{array}$$

Name _____

Date •_____•

Measure the date line using inches. _____"

1. There are four girls and three boys. Each of the boys used seven pieces of paper and each of the girls used five pieces of paper. How many pieces of paper did the girls use?

   Number sentence _____

   Answer _____

2. Write 3,425 in expanded form. _____

3. Show quarter to ten in the morning on the clocks.

: :	○ a.m.
	○ p.m.
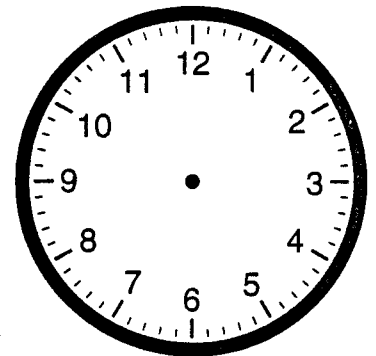
4. Fill in the missing addends.

   12 + ☐ = 100   33 + ☐ = 100

5. Which lines are parallel?

   _____ and _____
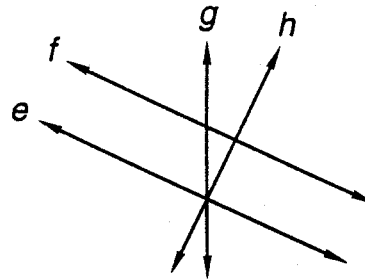
6. The cost of a marker is 59¢. How much change will you receive from $1.00? _____

7. Find the answers. Check subtraction answers by adding.

   $$\begin{array}{r} 4\,8\,2 \\ -\ \ 9\,1 \\ \hline \end{array}$$ $$\begin{array}{r} 3\,0\,0 \\ -\,2\,0\,8 \\ \hline \end{array}$$ $\frac{3}{4} - \frac{1}{4} =$

   $\frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} =$

Name _____

Date _____

Draw a $2\frac{1}{4}$" line segment. Make it 1" longer. How long is it now? _____

Workspace

1. Three hundred eleven children said yes on Monday. One hundred twenty-five children said no. How many more children said yes than said no?

   Number sentence _____

   Answer _____
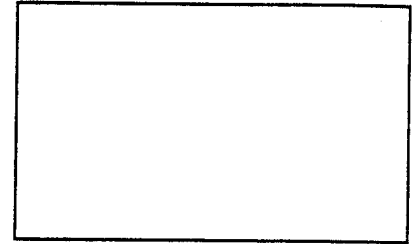
2. The clock shows the time Kory leaves for school. Write the digital time.

   Write the time using words.

   _____
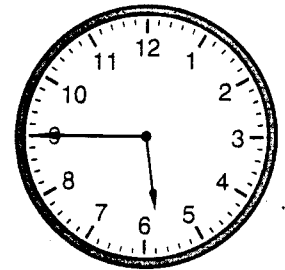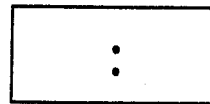
   It takes Kory one half hour to walk to school.

   At what time does Kory get to school? _____

3. Circle the word in which $\frac{4}{7}$ of the letters are vowels.

   Nevada   Delaware   Florida   Georgia   Ohio

4. Write 3,580 in expanded form. _____

5. Fill in each missing symbol (+, −, ×, or ÷).

   $\sqrt{16} = 9$ ☐ 5 $3^2 = 18$ ☐ 9 $7 \times 4 = 280$ ☐ 10

   _____   _____   _____

6. The Board of Education has fuel bills for $6,219.37, $729.35, and $1,623.63. Find how much they owe for fuel. Show how they will write this amount on a check.

   Workspace
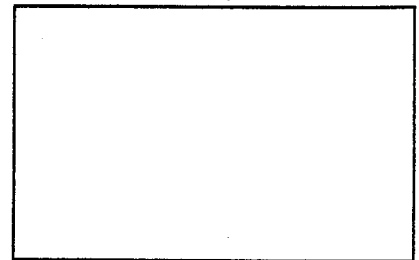
   _____ Dollars

Date .

Draw a $1\frac{3}{4}$" line segment. Make it 1" longer. How long is it now? _____

1. Ken collects stamps. He can put 5 stamps in each row in his book. There are 4 rows on each page. How many stamps can Ken put on a page? Draw a picture of the stamps on a page.
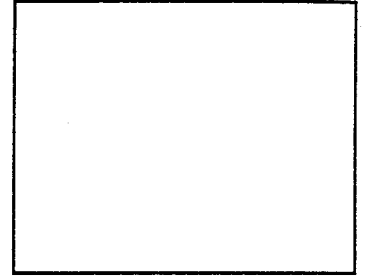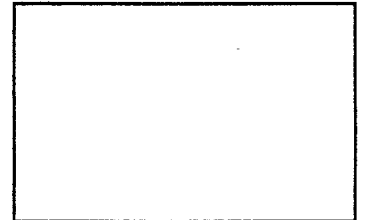
   Number sentence _____

   Answer _____

2. There are six red crayons, two yellow crayons, eight blue crayons, and three green crayons in a box.

   If you take one crayon out without looking in the box, which color are you most likely to get? _____

   Which color are you least likely to get? _____

   What color would it be impossible to get? _____

3. Five children will share twenty cookies. Show how they will do this.

   How many cookies will each child receive? _____

   Write a division problem to show this. _____

4. The cost of the eraser is 18¢. You give the clerk $1.00.

   How much change will you receive? _____

   What coins will you get? _____

5. Write $51,240.16 as you would on a check.

   _____ Dollars

6. Fill in the correct comparison symbol (>, <, or =).

   62 × 1,000 ◯ 584 × 100 $\sqrt{64} + \sqrt{49}$ ◯ 150 ÷ 10

   _____   _____   _____   _____

Name _____

Date .

Draw a $\frac{3}{4}$" line segment. Make it 2" longer. How long is it now? _____

1. There are 20 children in Mrs. Williamson's class. She divided the children into 5 groups. How many children are in each group?
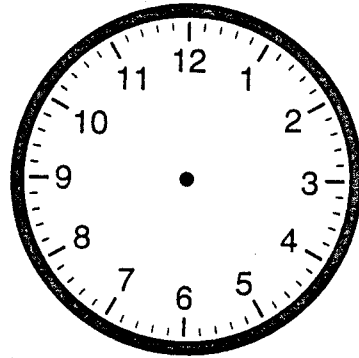
   Number sentence _____

   Answer _____

2. Write $25,690.17 as you would on a check.

   _____ Dollars

   Write thirty-six thousand, four hundred seven using digits. _____

3. It's quarter to five in the morning. Show the time on the clockface and write the digital time.

   _____

4. Fill in the missing addends.

   $32 + \boxed{} = 100$ $\boxed{} + 49 = 100$

5. How much change will you receive from $1.00?

   24¢ _____
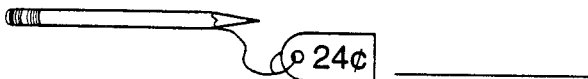
6. Trace a pair of perpendicular line segments using a green crayon.

7. Find the answers.

   $8 \times 400 =$ _____ $9 \times 30 =$ _____ $\begin{array}{r} 9\,0\,2 \\ -\,3\,1\,6 \\ \hline \end{array}$

   $3 \times 5{,}000 =$ _____ $20 \times 100 =$ _____

Name _____

Date _____

Gail has 62¢. How much more money does she need to buy 4 tickets?

| Tickets |
| 20¢ each |

Workspace:

Answer: _____

Explain in words how you found your answer.

_____

_____

_____

_____

_____

_____

Name _____

Date .

Draw a $1\frac{3}{4}$" line segment. Make it $\frac{1}{4}$" longer. How long is it now? _____

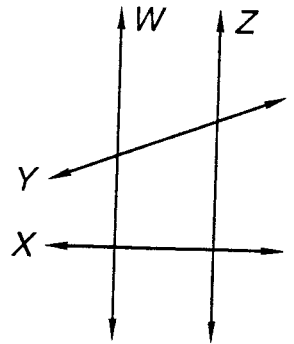1. Serina babysits for three hours each Saturday morning. How many hours will Serina babysit in four weeks?

   Number sentence _____

   Answer _____

2. Which lines are parallel?   _____ and _____

   Which lines are perpendicular?   _____ and _____

                                    _____ and _____

3. Carla was born in 1995. How old is she this year? _____

4. Draw candies (●) to find each answer.
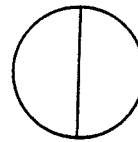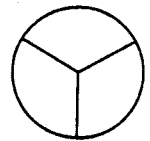
   $\frac{1}{2}$ of 18 = _____ $\frac{1}{3}$ of 15 = _____

5. Which picture shows how 4 children will share 20 cookies? _____

   How many cookies will each child have? _____

   A.   B.   C.
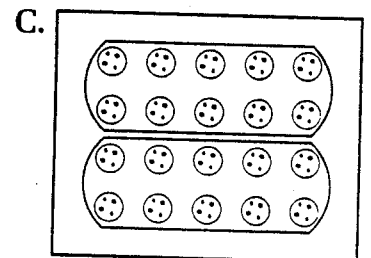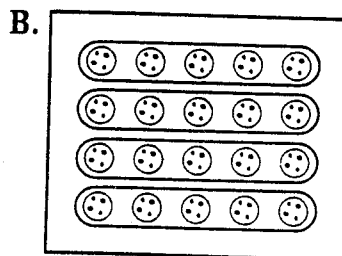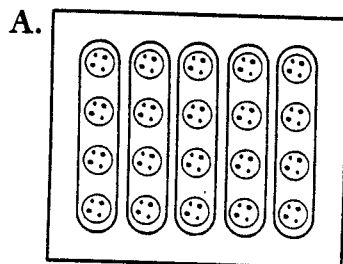
6. Find the answers.

   $5 \times 2,000 =$ _____ $\$800 - \$381$ $\$368 - \$91$
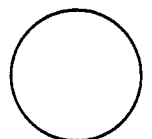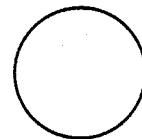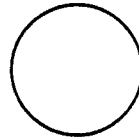
   $3 \times 800 =$ _____

Name _____

Date .

Draw a $2\frac{3}{4}$" line segment. Make it $\frac{1}{4}$" longer. How long is it now? _____"

1. There are 16 cups of milk in a gallon. If Curtis drinks four cups of milk a day, how many days will it take for Curtis to drink a gallon of milk?

   Number sentence _____

   Answer _____

2. These are pizzas.
   Divide the first pizza in half.

   Divide the second pizza into fourths.

   Divide the last pizza into eighths.

   $\frac{1}{2}$ of 8 = _____ $\frac{1}{4}$ of 8 = _____ $\frac{1}{8}$ of 8 = _____

   Each pizza will have eight pieces of pepperoni (●).
   Draw the pepperoni on the pizzas so that each piece has the same amount.

3. Find the products using mental computation.

   $7 \times 21 =$ _____ $3 \times 43 =$ _____ $2 \times 85 =$ _____

4. Write this number using words.

   60,392 _____

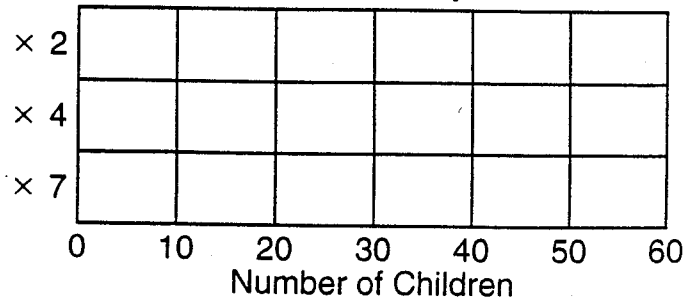   Which digit is in the thousands' place? _____

   What is the place value of the digit 3? _____

5. Donna was born in 1980. How old will she be on her birthday this year? _____

6. Shade the bar graph to show the children's favorite multiplication facts.

   Children's Favorite Multiplication Facts

	Number of Children
Twos	35
Fours	18
Sevens	42

   × 2

   × 4

   × 7

   0   10   20   30   40   50   60
   Number of Children

   How many more children chose multiplying by 7 than multiplying by 2? _____
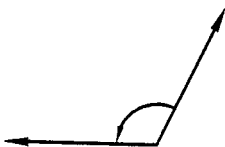
Name _____

Date .

Draw a $2\frac{1}{4}"$ line segment. Make it $\frac{3}{4}"$ longer. How long is it now? _____

1. How many inches are in 7 feet?

   Number sentence _____

   Answer _____

2. Label each angle (acute, right, or obtuse).
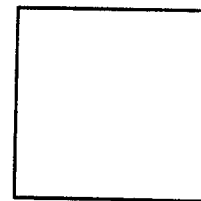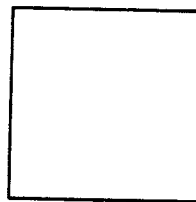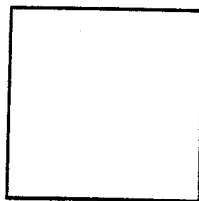
   _____   _____   _____

3. These are cheesecakes.
   Divide the first
   cheesecake into halves.
   Divide the second
   cheesecake into thirds.
   Divide the last
   cheesecake into fourths.

   $\frac{1}{2}$ of 12 = _____ $\frac{1}{3}$ of 12 = _____ $\frac{1}{4}$ of 12 = _____

   Each cheesecake will have 12 strawberries (🍓).
   Draw the strawberries on the cheesecakes so that each piece has the same amount.

4. Multiply using mental computation.

   $3 \times 42 =$ _____ $5 \times 81 =$ _____

5. Circle the letters with perpendicular line segments.   **A H L M T**

6. Find the answers. Check subtraction answers by adding.

   ```
        4 0 0              9 0 5            $ 3 , 5 9 2 . 1 7
      - 1 0 2            - 8 2 7              6 , 5 1 8 . 3 1
      -------            -------          +      9 3 7 . 2 0
                                          -------------------
   ```
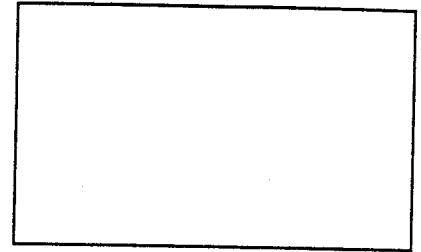
Name _____

Date .

Draw a 61-mm line segment. It is _____ cm _____ mm long.

1. Michael had 750 pennies. He gave his sister 175 pennies. How many pennies does Michael have left?
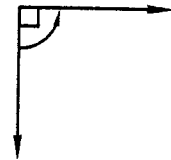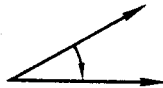
Number sentence _____

Answer _____

Workspace
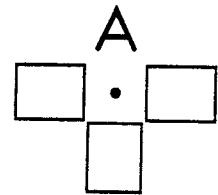
2. Measure line segment *AB* using millimeters. _____ mm

A •————————• B

3. Label each angle (acute, right, or obtuse).

_____   _____   _____

4. Draw what the letter **A** will look like when it is rotated around the point.

A

5. Which of the following shows 542 written in expanded form?

500 + 4 + 2   5 + 4 + 2   50 + 40 + 2   500 + 40 + 2

6. What fractional part of the beads is black? _____

●─○─○─●─○─○─●

7. Fill in the correct comparison symbol (>, <, or =).

4^2 ◯ 130 ÷ 10

_____

6 tens and 12 ones ◯ 9 × 7

_____   _____

Name _____

Date .

Draw an 87-mm line segment. It is _____ cm _____ mm long.

1. Mrs. Anastasio has a bag of 21 cookies. She wants to give each child 3 cookies. How many children can have cookies?

   Number sentence _____

   Answer _____

2. Measure each side of this trapezoid using millimeters.

   What is the perimeter?

   Number sentence

   _____

   Perimeter _____

   Write an **R** inside the right angles.

3. Use the trapezoid in Problem 2.
   Trace a pair of perpendicular line segments using a green crayon.
   Write an **A** inside the acute angle.
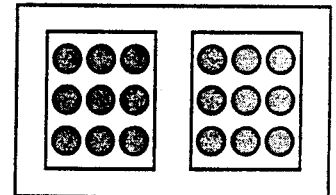
4. Circle the number sentence that matches this picture.

   $18 \div 6 = 3$ $18 - 2 = 16$

   $3 + 15 = 18$ $18 \div 2 = 9$

5. The movie began at quarter to seven in the evening. It is a two-hour movie.

   Use digits to write the time the movie will end. _____

6. Stephen wants to buy a shirt for $8.53 and pants for $23.28.
   Circle the best estimate of how much Stephen will spend.

   $20 $30 $40 $100

   Find the exact cost. _____   + _____

   Write this amount as you would on a check.

   _____ Dollars

VITA

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