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ABSTRACT

This document contains the lesson plans for a 12-week course in basic workplace math that was developed for clothing and textile workers through the joint efforts of Northeastern Illinois University's Chicago Teachers' Center and the Amalgamated Clothing and Textile Workers Union. A chart for recording students' mastery of 25 course objectives is provided. The following topics are covered in the 12 course units: goal setting and math phobia; enumerating and computing; basic operations and workplace computing (addition and subtraction); basic operations and workplace computing (multiplication and division); workplace problems for production; introduction to fractions; basic operations for fractions; word problems using fractions; percentages and fractional equivalents; measurement (imperial versus metric); numerical interpretations on blueprints; and calculators and estimating and general review. The lesson plan included for each unit contains the following: objectives, learning activities, evaluation activities and criteria, and reinforcement activity. (MN)

Phoenix Closures, Inc.

Curriculum • Basic Workplace Math

Worker Education Program
Chicago Teachers' Center of Northeastern Illinois University &
the Amalgamated Clothing and Textile Workers Union

Submitted by: Virginia Trusiak
January 1995

* WORKPLACE MATH CURRICULUM OUTLINE *

Week 1: Goal Setting and Math Phobia

Week 2: Enumerating & Computing

Week 3: Basic Operations and Workplace Computing [Addition and Substraction]

Week 4: Basic Operations and Workplace Computing [Multiplication and Division]

Week 5: Workplace Problems for Production

Week 6: Introduction to Fractions

Week 7: Basic Operations for Fractions

Week 8: Word Problems Using Fractions

Week 9: Percentages and Fractional Equivalents

Week 10: Measurement (Imperial vs. Metric)

Week 11: Numerical Interpretations on Blueprints

Week 12: Calculators and Estimating and General Review

Class Objectives and Student Progress Report

OBJECTIVES	NO	Some What	YES	EXPLANATION
To develop workplace word problems				
To identify fractional equivalents				
To identify proper & improper fractions				
To add & subtract fractions with similar denominators				
To add & subtract fractions with dissimilar denominators				
To multiply and divide fractions				

Class Objectives and Student Progress Report

OBJECTIVES	NO	Some What	YES	EXPLANATION
To distinguish between fractions & their equivalents				
To multiply & divide mixed numbers				
To use decimal number with measurements				
To use correct estimates to make correct projections				
To review basic operations using whole numbers				
To review basic operations using fractions				
To review basic operations using decimals				
To evaluate personal math competencies				

Class Objectives and Student Progress Report

OBJECTIVES	NO	Some What	YES	EXPLANATION
To know and realize the reason for MATH review				
To reveal personal learning style for MATH				
To identify Arabic numerals, roman numerals				
To differentiate between the terms "numbers" & "numerals"				
To use ordinal numbers correctly				
To spell & write numerical & decimal words				
To provide definitions for various Math words				
To perform the basic operations on whole numbers				
addition				
subtraction				
multiplication				
division				

WORKPLACE MATH at Phoenix Closures, Inc.

Week 1: October 26,1994

Objectives: To enable the participants to acknowledge their math phobia and to reveal their individual learning style.

Activities: (in terms of the actions of the participants)

Warm Up: Introduce oneself to the instructor, relating their immediate past job history, and their past experiences in learning math. Discuss their "phobias" about math and what basis for their reticence is present. (10 minutes)

Review topics of course and select those that would be interesting to explore during the next twelve weeks.(25 minutes)

Complete form on personal learning style as it relates to learning math. Discuss how they have "self taught" themselves a skill in the past.(20 minutes)

Begin to complete a three page pretest of basic math concepts that will be reviewed in the class. (30 minutes)

Complete the numerical discrimination pretest in the shortest possible time. (5 minutes)

Evaluations: (in terms of teacher's action)

Interpret selections of topics which seemed to most relevant to the participants. Evaluate the participants' related impressions of their personal learning style. Check and record data from the computation and discrimination pretest.

Reinforcement:

Return to class session with a list of everyday and on the job uses for math computation and comprehension.

WORKPLACE MATH at Phoenix Closures, Inc.

Week 2: November 2, 1994

Objectives: To acknowledge the importance of understanding mathematical concepts in the workplace and everyday life.

Activities:

Warm up: Reveal the "where", "when", "how" and "why" one uses math in everyday life. (15 mins.)

With a partner complete chart on math in everyday life. Reveal usefulness of math. Report to the group about agreements and differences.(25 mins.)

Select one of two larger groups to join. (Rearrange the room configuration to maintain distinctiveness). Develop a primitive numerical system to represent the concepts of amounts. Decide on pictorial representations of quantities, lengths, time, etc. As a group reach a consensus of what is needed to "operate" the numerical system in a trade market economy in which one group needs to acquire the goods of the other to maintain a certain life style. (40 mins.)

With two other participants start to complete worksheet on personal definitions of terms used in mathematics. Select different terms for each person and then collaborate findings in order to share as a team does in the workplace. (10 mins.)

Evaluations:

Subjectively record the performance of the participants in pair work, large group performance and small team interaction.

Reinforcement:

Homework--Complete mathematical concept definition sheet and collaborate with team outside of class. Answer open ended questions from numerical concepts worksheet.

WORKPLACE MATH at Phoenix Closures, Inc.

Week 3: November 9, 1994

Objectives: To review the basic operations of addition and substraction using whole numbers, decimals, and time measurements.

Activities:

Warmup: Review definitions of numerical terms. Develop an axiom for addition of two odd numbers. two even numbers and one odd and one even number. Prove and expand axiom to include operation of subtraction.(15 min.)

Add single digit numbers that produce a sum greater than ten. Add double digit numbers that produce a sum greater than one hundred. (15 min.)

Substract double digit number that require the concept of regrouping or "borrowing". Apply techniques to decimals.(15 min.)

In small groups create three word problems that display the basic operations as they are used in the workplace. (20 min.)

Exchange word problems with other groups and answer each correctly. Discuss any confusions created by "wording". (15 min.)

Evaluations:

Listen to other groups critiques of one selected word problem and rewrite each. Present problem to the entire group. (10 min.)

Reinforcement:

Complete unit on addition and subtraction from Math for the Real Work. Book Two

Workplace Math at Phoenix Closures,Inc.

Week 4: November 16, 1994

Objectives: To review the basic operations of addition, subtraction, multiplication, and division using whole numbers or decimals.

Activities:

Warmup: Review axiom for addition of two odd numbers. two even numbers and one odd and one even number. Develop an axiom for multiplication. Prove and expand axiom to include operation of division.(15 min.)

Add multiply single and double digit numbers. Correlate the operation of division as a opposing operation. Develop an axiom for the multiplying of zero. Expand it to division.(30 min.)

In small groups create three word problems that display the basic operations as they are used in the workplace. Suggestions: packing and shipping containers. (20 min.)

Exchange word problems with other groups and answer each correctly. Discuss any confusions created by "wording". (15 min.)

Evaluations:

Listen to other groups critiques of one selected word problem and rewrite each. Present problem to the entire group. (10 min.)

Reinforcement:

Complete unit on basic operations selected from Math for the Real Work. Book Two

Workplace Math at Phoenix Closures, Inc.

Week 5: November 30, 1994

Objectives: To analyze and compute word problems using basic operations.

Activities:

Warm up: Read carefully sample workplace production word problems. Decide which numbers show value and are relevant to compute answers. (5 mins.)

Reread sample problems and decide which operation would be used to complete problem. Note key words that suggest the appropriate operation. (20 mins.)

In small groups read worksheet on which participants created workplace word problems that depicted actual production at the plant. Note the numbers that are presented in the problems. Select which number are of value and relevant to the problem. Set up numbers for computation. Decide the order of operations to compute the answers and perform those operations. Discuss the results with other groups. Display computations in the area indicated on the worksheet. Discuss the use of "short cuts" used by other groups. (55 mins.)

Evaluation:

Present homework of practice worksheets and quizzes. Discuss "trouble spots". (10 mins.)

Reinforcement:

Complete various worksheets that present drills for operations. Complete workplace problems and provide a means of self checking.

Workplace Math at Phoenix Closures,Inc.

Week 6: December 7, 1994

Objectives: To review the basic operations of addition and subtraction using fractions with like and unlike denominators.

Activities:

Warm up: Participants discuss the use of fractions and their equivalents in the workplace; i.e. measurements, shipping and packing, etc. (10 mins.)

Complete the worksheet about fractions and review the English words used to express them. Read and locate the underlined words. Give personal definitions and examples for each. Create a graphic representations for each.(30 mins.)

Combine fractions with like denominators to express addition operation. Give examples of fractional equivalents that will enable fractions that are unlike to be combined. (25 mins.)

Evaluation:

In small groups complete worksheet that uses words and small squared graph paper to represent the addition and subtraction of fractions. (25 mins.)

Reinforcement:

Complete Chapter 28, 29, 30 of Math for the Real World, Book Two for home work.

Workplace Math at Phoenix Closures,Inc.

Week 7: December 14, 1994

Objectives: To review the format of the new text book.

To review the basic operations of addition and subtraction using fractions with like and unlike denominators.

Special Note: Two classes are being combined into one so introductions are make and the explanation of the reason is discussed by both the participants and the instructor. Any "ill" feelings should be resolved.

Activities:

Warm up: [Participants are introduced to the format of the new text.]
The use of fractions and their equivalents in the workplace is discussed and the introduction to the unit on fractions is completed.(20 mins.)

Decide if statements on the worksheet are true or false. Depict or demonstrate by use of graph paper or drawings the validity of your opinion.(30 mins.)

Begin a math vocabulary using your own words or phrases. The use of graphic representations are also encouraged. Save the list in your notebook. Additions will be made at a later date.(10 mins.)

Evaluation:

In **small groups** complete worksheet that creates actual **addition and substraction** workplace problems using like and **unlike fractions**.Problems are presented to the group for **editing.(25 mins.)**

Reinforcement:
Complete chapter pages on addition and substraction of fractions for home work.

Workplace Math at Phoenix Closures,Inc.

Week 8: December 21, 1994

Objectives: To review the format of the new text book.

To review the basic operations of addition and subtraction using fractions with like and unlike denominators.

Special Note: This week is devoted to review of the problem areas. Some of the participants can present their concerns to the group as a whole or they can conference with the instructor individually.

Activities:

Warm up: As a holiday treat the participants are ask to divide the quantities fairly and state these parts in fractional terms. A whole gallon of juice needs to be served along with a whole cake. [Participants are introduced to the format of the new text.] .(20 mins.)

Decide if statements on the worksheet are true or false. Depict or demonstrate by use of graph paper or drawings the validity of your opinion.(30 mins.)

Begin a math vocabulary using your own words or phrases. The use of graphic representations are also encouraged. Save the list in your notebook. Additions will be made at a later date.(10 mins.)

Evaluation:

In small groups complete worksheet that creates actual addition and substraction workplace problems using like and unlike fractions.Problems are presented to the group for editing.(25 mins.)

Reinforcement:
Complete chapter pages on addition and substraction of fractions for home work.

Workplace Math at Phoenix Closures,Inc.

Week 9: January 4, 1995

Objectives: To compare percentages and their fractional equivalents
To review the addition and substraction of fractions with unlike denominators.

Special note: This class has been on vacation over the holidays and some "catch up" and review time should be provided. (25 mins.)

Activities: Three ways to express a part of a whole are reviewed and discussed. Special attention is given to the method of expressing the quantities in English. Stress the "age" in percentage. Write the symbol for %. Discuss the terms fraction and fractional equivalents.(20 mins.)

Relate workplace examples of the use of percentages to express quotas, safety records,etc. Check everyday newspapers or magazines that use percents, decimal or fractions. Write these in a different form. Discuss the probable reason for the use of the original in the advertisements and why the other method is not used. (20 mins.)

Create workplace oriented word problems that reflect the use of percents, fractions and their equivalents. (Work in small groups or pairs.) Exchange problems with others. (25 mins.)

Evaluation: Complete worksheet quiz about fractional equivalents and the addition and substraction of unlike fractions. (10 mins.)

Reinforcement: Complete p.20-->31 and p.72-->88 in textbook Math Skills That Work for homework.

Workplace Math at Phoenix Closures, Inc.

Week 10: January 11, 1995

Objectives: To use simple mathematical formulas to convert to metric system for measurement.

To review the multiplication and division of fractions.

To incorporate the use of fractions in measurement in the workplace.

Activities: Review homework form the week before. (5 mins.)

Discuss the use of measurement in the workplace. Bring in samples of products that have different measurements. Decide if the imperial or metric system is used by the quality assurance personnel. Decide if there is a correlation between the number of the part and the size of the part. (10 mins.)

In small groups develop a "formula" to convert from inches to centimeters or feet to meters. Practice using measurement of object in the training room. (45 mins.)

With a partner create a workplace problem that involves measurement and fractions. Exchange your problem with another pair and solve it.(20 mins.)

Evaluation: Complete worksheets from Understaning Measurement by Taylor and Taylor pgs.10, 90 & 91. (10 mins.) If not completed in class the worksheets can be taken home.

Reinforcement: Complete pages 92 through 105.

WEEK 11: January 18, 1995

Objectives: To multiply and divide fractions with fractions, whole numbers and mixed numbers

To apply the concepts of multiplication and division of fractions to measurements .

To apply the concepts of multiplication and division of fractions to the ordering of raw material projections in the workplace

Activities: Review homework from the In your life section about working with weight limits.(10 mins.)
Multiply simple fractions without using canceling. Multiply fractions that have numerators that are factors of denominators and visa versa. Multiply fractions with whole numbers and mixed numbers. (30 mins.)
Identify the components of the division problem and invert the divisor. Divide fractions by fractions, whole number andmixed numbers (30 mins.)
Use multiplication and division of fractions to establish projections for raw materials used in thse workplace.(10 mins.)

Evaluation: Create a workplace word problem that utilizes the division of fractions and whole numbers or other fractions and then checks the answers by multiplying the quotient by the divisor.(10 mins.)

Reinforcement:
Complete pages 92-->103 in Math Skills that Work and for extra practice ages 94--107 in Math in the Real World.

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WEEK 13: February 1, 1995

Special Note: Only two participants showed up for class so I elected to do review and evaluation lesson after the assessment test of last week. There has been a lot of flu and some of the participants had to work different shifts this week. This lesson plan was written after the class to validate the activities of the participants. They did not want to cancel class.

Objectives:

To review the areas of difficulty on the assessment post test.
To review multiplication and division of fractions.
To start an introduction of signed numbers.

Activities:

As individuals (in a supportive atmosphere) the participants discussed how they felt about the workplace Tabe test. (10 mins.)
Without using the exact problems of the test similar examples were attempted. Each participant provided a step by step procedure for finding the answers. Areas that needed review were mentioned and appropriate pages of the standard text were cited.(30 mins.)
Some discussion about the selection of alternate answers was made. The use of "guestaments" as an alternate was also discussed.(15 mins.)
Because some fractions are used on the machines this pair of employees have operated these machines in the past , they developed workplace application for the multiplying of fractions.(20 mins.)
A workplace application for the division of various fractions was attempted.(15 mins.)

Evaluation:

Critique the workplace word problems. Edit the problems.

Reinforcement:

Bring in machine thermostat readings that show negative numbers

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WEEK 14: February 8, 1995

Objectives:

To multiply a decimal by a decimal number as in blueprint reading.
To multiply decimals with regard to zero as a significant number
To divide a decimal by decimal number.
To compare the use of zeros in the division operation.

Activities:

Review the use of individuals paper calculator for multiplication and apply it to the multiplication of decimal numbers.(10 mins.)
In a small group select a dimension that is on a workplace blueprint and use it in a workplace word problem. That measurement should be expressed as a decimal and multiplied by a decimal to represent the cost of the individual part produced. [Guessing is encouraged but if the participants can find the actual cost they can use it.](30 mins.)
Present the problem to the other small group . Edit the problem of the other group. Solve the problems and critique the answers of the other group.(15 mins.)
Figure the gas mileage used by a truck delivering the product used in the multiplication problems used in the first problems.
Practice dividing the decimals by other decimals (20 mins.)
Develop a rule that enables one to divide easily by "zero ending numbers, i.e. 10, 100, 1000.(15 mins.)

Evaluation:

Critique the workplace word problems. Edit the problems.

Reinforcement: Complete pages 50 to 63 in Math Skills That Work Book 2

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WEEK 15: February 15, 1995

Objectives:

To divide a decimal by decimal number.
To compare the use of zeros in the division operation.
To compute gas mileage
To estimate the cost of transportation for products

Activities:

Review the use of individuals paper calculator for multiplication and the method for dividing decimals using a calculator and notice the position of the decimal point.(10 mins.)

Review the problem from the workbook and create a workplace problem about the scrap or flash when the machines are performing properly and when it is not . Then use division to project the amounts per machine and per hour. The cost of excessive scrap can be added to the cost of the product or an alternative solution needs to be proposed. (30 mins.)

Use the division of decimals to compare the gas mileage of three different trucks that are used in their industry. A routing ticket or transportation sheet can be use or the student can find their gas mileage for their own vehicle.(35 mins.)

Compute distance and rate that is used for shipping charges of the company. Develop a workplace application for this computation.(15 mins.)

Evaluation:

Critique the workplace word problems. Edit the problems.

Reinforcement:

Complete pages 64 to 69 in Math Skills That Work Book 2

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WEEK 16: February 22, 1995

Objectives:

To calculate distance, rate, and time
To assess the progress of the students
To review all areas covered during class
To self evaluate their performance during the course as a whole

Activities:

List the different formulas that they may remember.Relate the usefulness of remembering formulas for math and other practical problems. (10 mins.)
Complete the skill review p. 68-69 in Math Skills that Work. (20 mins.)
Review the division of decimals. Relate personal attitudes toward the easiness of dividing decimals over fractions. (20 mins.)
Complete the 25 questions for the TABE math computation test. List those problem that prove difficult. (20 mins.)

Evaluation:

After collecting the test. Have the participants review those problems that seemed difficult.(10 mins.)
Initiate a discussion about the overall format of the future classes that will be conducted as a "lab" where the individual participants will self direct their rate and content of lessons. (10 mins.)

Reinforcement:

Provide the teacher with a self addressed stamped envelop to obtain the results from the test if they wish to know.

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