DOCUMENT RESUME

ABSTRACT
        Utilizing word problems relevant to allied health
occupations, this workbook provides a concept-oriented approach to
competency development in six areas of basic mathematics: (1) the
expression of numbers as figures and words: (2) the addition,
subtraction, multiplication, and division of whole numbers,
fractions, and decimals: (3) ratios and proportions: (4) percents:
(5) measurement: and (6) Roman numerals. For each competency area,
the workbook offers a series of word problems designed to reinforce
student learning and to demonstrate the applicability of the
mathematical concept to situations encountered in allied health
occupations. An answer key for the problems is appended. (JP)

PERSONAL ACHIEVEMENT

MATHEMATICS

Health Occupations

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CURRICULUM MATERIALS DEVELOPED

UNDER THE AUSPICES OF

FUND TO IMPROVE POST SECONDARY EDUCATION

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Math. Specialists
1977

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The problems found in this booklet are not
meant to instruct you in the field of Health
Occupations. They are practices of the
various mathematical concepts and are content
oriented to help show the practicality of
each concept.

Study each mathematical competency in the
general learning packets before attempting
these applied problems.

Numeration

1. In 1970 there were one million four hundred six thousand, eight hundred forty three hospital beds in the United States and seven thousand sixty one hospitals. Write the numeral for each number.

2. In 1972 people spent thirty two billion six hundred seven million three hundred twenty four thousand dollars at hospitals. Write the numeral for the amount spent to provide services in hospitals.

3. The daily population for public hospitals in 1972 averaged 1,094,588. Write that number in words.

4. At the end of 1971, there were 308,024 people residing in state and county mental hospitals. Write that number in words.

5. During 1971, there were 322,228 doctors practicing in the United States. Write that number in words.

6. At the close of 1972 there were nine hundred seventeen thousand seven hundred seven beds in nursing care homes. Write that number using numerals.

Addition & Subtraction

1. In 1976, 79,614 patients at University Hospital were from Johnson County; 14,962 patients were from Linn County, and 3,358 patients were from Iowa County. How many more patients came from Johnson County than from Linn County?

2. The total number of patients at Mercy Hospital on Sunday was 459. On Monday afternoon 79 patients checked into the hospital and 58 patients left the hospital. What was the patient population of the hospital Monday evening?

3. The store room needs to be cleared of some partially filled bottles of alcohol so Terry combines some of the bottles. After combining the bottles Terry has a 128 oz. (or a gallon bottle) of alcohol. To fill the bottle she added an 8 oz. bottle, a 16 oz. bottle, and a 32 oz. bottle. How many ounces were in the gallon bottle before the additions?

4. Dr. Harvey has a large personal library. The library contains 75 books on obstetrics, 68 books concerning gynecology, 72 on general medicine, and 139 books on various other specialized topics. Find the total number of volumes in Dr. Harvey's library.
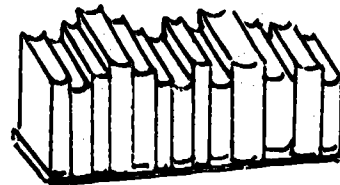
5. Ms. Green was given 500 ml of glucose intravenously, between 6 AM and noon. She was given 800 ml of glucose between noon and 8 PM and 1250 ml of glucose between 8 PM and 6 AM. How much glucose did Ms. Green receive intravenously during the 24 hour period?

6. You have just ordered the usual set of supplies: 30 boxes of 4" square gauze pads, 12 boxes of safety pins, 14 bottles of milk of magnesia, 17 bottles of aspirin, 35 boxes of bandaids, 18 rolls of adhesive, and 28 pads of order blanks. How many items were ordered altogether?

7. Mercy Hospital in Cedar Rapids has 160 practicing doctors, 6 associate doctors, and 28 courtesy doctors. They also employ the following nurses: 163 full-time RN's, 141 part-time RN's, 104 full-time LPN's, and 64 part-time LPN's. How many more nurses (all types) are there than doctors? What is the total number of professional employees at Mercy Hospital? Compare the number of LPN's to RN's.

8. University Hospital in Iowa City served 288,178 patients in 1976. How many of these patients came from outside the three counties listed in problem #1?

Multiplication

1. The patient population of St. Luke's Hospital is 563. On the average, 2 people visit each patient each day. How many visitors are there in one day? In one week?

2. Chris was given 250 mg of the antibiotic tetracycline 4 times each day. Find the total number of mg Chris has taken in 10 days.

3. The doctor wants Mr. Pease to take 5,000 units of Vitamin A daily. Since Mr. Pease will not be back for a month (30 days) his prescription will need to be written for a total of how many units of Vitamin A?

4. The patient population at St. Joseph's Hospital averages 438 patients per day. How many patients do they have in a year?

5. Aspirin is purchased by the hospital in large quantities. A case (24 bottles) of bottles containing 1,800 tablets each is ordered monthly. How many tablets are purchased in a year's time?

Division

1. Drs. Dobson and Von Drasick cover 3 communities each with a population of 600. If evenly divided between the two doctors, how many people would each be responsible for?

2. Dr. Ben has given Renee an 18,000 unit bottle of Vitamin D. He has told Renee to take 1,200 units daily. How many days will the bottle last?

3. You must make out a requisition for the regular supply of milk of magnesia and aspirin. You are required to have 320 ounces of milk of magnesia and 1,800 tablets of aspirin. If the milk of magnesia comes in 4 ounce bottles and the aspirin comes in bottles with 500 tablets each, how many bottles of each will you need to order?

4. Oleandomycin, an antibiotic, has been ordered for a pneumonia patient. The patient is to take 500 mg 4 times daily. The hospital only has 50 mg tablets. How many tablets will be needed for three days?

5. Codeine phosphate, a narcotic pain killer, is given in 30 mg dosages. The pharmacy has a bottle containing 2,280 mg of codeine phosphate. How many dosages are contained in this bottle?

Introduction To Fractions

1. A hospital floor is subdivided into 5 areas for
   different types of treatment. Each area is
   $\frac{1}{5}$ of the entire floor space. How many $\frac{1}{5}$ths
   make up the entire floor?

2. A dosage of $\frac{5}{12}$ grain of drug A must be
   decreased. What would be a smaller dosage
   by changing the demoninator? the numerator?

3. Which is greater: $\frac{3}{4}$ grain or $\frac{3}{7}$ grain?

4. A tablet contains 5 milligrams of morphine
   sulphate. If a patient is required to have
   3 milligrams, what part of the tablet would
   you use?

5. If you divide the entire contents of a
   bottle of medicine into 6 equal parts,
   what fraction represents each one part?

6. If a patient is given 2 identical tablets and swallows all of the first and $\frac{1}{2}$ of the second, represent this amount with a mixed number.

7. A baby is to receive $\frac{3}{4}$ grain of aspirin from a 1 grain tablet. If the mother divides the tablet in 8 pieces, how many $\frac{1}{8}$ths should the baby receive?

Fractions, + −

1. To consolidate the supply of a non-sterile antiseptic solution, the contents of 3 bottles are combined. What would be the total amount if the three contained $2\frac{1}{4}$ oz., $3\frac{1}{8}$ oz., and $1\frac{1}{2}$ oz.?

2. If a patient is given two doses of atropine, $\frac{5}{100}$ grain and $\frac{13}{100}$ grain, what was the total dosage?

3. Two medical dictionaries are sitting side by side on a shelf. If each cover is $\frac{1}{16}$ inch thick and Volume I is $\frac{3}{4}$ inch and Volume II is $\frac{7}{8}$ inch thick, how much space do they take on the shelf?

4. If a new born infant drinks $\frac{2}{3}$ oz. of formula at one feeding, and drinks $\frac{3}{5}$ the next, what was her total consumption?

5. A patient on a limited liquid diet spilled part of her glass of water. If the glass had contained $7\frac{3}{4}$ oz. and now contains only $3\frac{1}{2}$ oz., how much did she spill?

6. A patient undergoing brain surgery needed $6\frac{1}{8}$ pints of blood for a transfusion. If the blood bank has only $3\frac{2}{3}$ pints to offer, how many pints must be donated?

7. A respiratory therapy technician needs an average of $13\frac{1}{2}$ quarts of distilled water to make her daily rounds. If she has 6 full quart bottles, 7 full pint bottles, and 3 partial bottles containing $\frac{3}{4}$ quart, $\frac{5}{6}$ quart, and $\frac{8}{9}$ quart, will she have enough water to make her rounds? (2 pints = 1 quart)

Dividing Multiplying Fractions

1. How many doses can be dispensed if $1\frac{4}{5}$ oz. are available and each dose requires $\frac{3}{20}$ oz.?

2. If a patient uses $1\frac{1}{5}$ liter of saline solution intravenously in 6 hours, how many liter are used in $1\frac{1}{2}$ days?

3. If a tablet weighs $\frac{5}{7}$ oz., what is the weight of 3 tablets? of $\frac{1}{2}$ tablet?

4. A member of the Mafia was told $\frac{1}{20}$ oz. of arsenic will cause death. By illegal means he purchased $\frac{1}{4}$ oz. of arsenic. He poured $\frac{3}{11}$ of this into his associate's coffee. Was this enough to kill him? Why or why not?

5. One ounce of Cheerio's contains 112 calories. If individual serving boxes contain $\frac{7}{8}$ oz., how many calories is this?

15
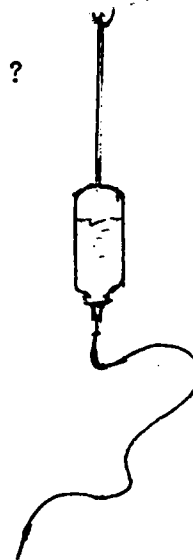
6. Mr. Klimczyk has 8 tablets of medication and must take $\frac{1}{3}$ tablet each day. How many days should his supply last?

7. How many pieces $\frac{2}{3}$" in length can be cut from a piece of 6" tape?

8. Ward B of St. Anthony's Hospital treats an average of 75 patients a week. If each patient is given $1\frac{1}{2}$ boxes of Kleenex, how many boxes do they use in a month?

9. If a lb. of hamburger contains $2\frac{3}{4}$ oz. of fat, what is the fat content in $5\frac{1}{5}$ lbs.?
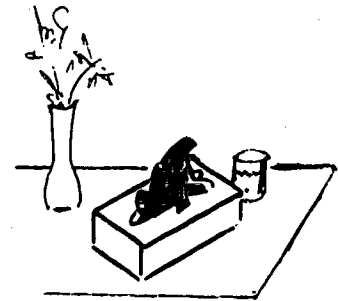
Addition & Subtraction Decimals

1. At 6 AM Mr. Branden's temperature was 101.6° By 4 PM that afternoon his temperature had dropped 2.9° What was his temperature then?

2. A graduate student in statistics gathered the following information on local hospital patients. Of this group six tenths were college grads, twenty-six hundredths were graduate students, five thousandths were business executives and eight tenths were Protestants. Write these figures as decimal numerals.

3. Nurse June Lehr needed 3 different solutions containing atropine. If the quantities were 0.052 mg, 0.8 mg, and 0.12 mg, what was the total amount of atropine used?.

4. An infant measured 19.7 inches at birth. One month later, he was 21.25 inches. How much had he grown?

5. Over a four day period, Mrs. Throm received the following doses of her special medicine: 1.5 mg, 0.5 mg, 0.4 mg, and 0.25 mg. At the end of this time what would be left of the original 3.5 mg supply?
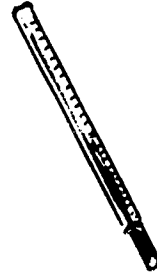
Multiplying Dividing Decimals

1. There are 49.32 g of sodium in 100 cc of solution. How many grams of sodium are there per cc?

2. Mrs. Baen uses 0.3 ml of Lugol's solution 3 times daily for temporary relief of hyperthyroid symptoms. How many ml of the solution would she use in 10 days?

3. A doctor prescribed 4 tablets daily of chlormerodrin for treatment of edema. If the drug is available in 18.3 milligram tablets, how many mg of chlormerodrin is the patient receiving daily?

4. A total of 2.44 oz. of medicine are to be given in 4 equal doses. How many ounces is that per dose?

5. To relieve a severe case of edema, the doctor prescribes a daily dose of 96.085 mg of chlormerodrin. Estimate how many 18.3 mg tablets would be required daily.

6. In 1971, there were 414,926 patients admitted to state and city mental hospitals. If the average expense per patient was $6,420.79, what was the total cost for the year?

18
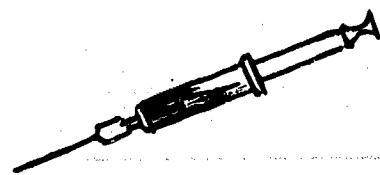
Ratio and Proportion

1. How many grams of bichloride of mercury do
   you need to prepare 2500 ml of a 2.5 : 1000
   solution? (2.5 g : 1000 ml)

2. A beaker of salt water contains 5 ml of
   solution and 2 mg of salt. If you were to
   measure 2 ml of solution, how much salt
   would you have?

3. A doctor's order reads 10 mg of a drug.
   On the shelf are 2.5 mg tablets. How many
   tablets should you give the patient?

4. Your patient is to receive aspirin grains
   10. You have available a bottle labeled
   1 tab = 0.3 grams. The patient should
   receive _____ tablets. (1 gram =
   15 grains)

5. The doctor orders KCl 20 meq. The stock
   preparation is 13.4 meq per 10 cc of
   solution. To give 20 meq, how many cc's
   would you get?

6. You are to give morphine SO_4 10 mg. The vial reads 15 mg per 1 cc. How many cc's would you give?

7. The order reads 500 mg of a drug. A vial of the drug contains 2000 mg in powder form. How much liquid do you add to make 500 mg/1 cc?

8. Prepare 40 ml of a 1:20 solution (1 g : 20 ml) using .5 g tablets.

9. If you are using U-100 insulin, how many units do you give if you administer .3 cc? (U-100 means 100 units/cc). How many minims would this be? (1 cc - 15 m)

10. Prepare 2000 ml of 1:10 glucose solution from crystal glucose.

Percent

1. A solution containing 48 ounces of water lost 20% of the water because of evaporation. How many ounces of water are left?

2. How many ounces of glycerin are there in 30 ounces of a 60% solution of glycerin?

3. In one year, the price of vitamins has gone up by 10%. If a capsule used to cost .03¢, how much does it now cost?

4. From a 6% stock solution of sodium phosphate, how can you prepare 8 oz. of a 5% sodium phosphate solution?

5. How much of a 15% solution should be used to prepare 6 ounces of a 2:3 solution?

6. If a person with an average daily total consumption of 3,000 calories has about 450 calories for breakfast, what percent of his total daily intake is consumed at breakfast?

7. The cost of an antihistamine tablet increased
    from 3¢ to 4¢ per tablet. What was the per-
    cent of increase?

8. A bottle contained 5 ounces. This was 22%
    of the original quantity. How many ounces
    (to the nearest ounce) were in the original
    quantity?

9. Prepare one quart of 10% glycerin solution
    from liquid glycerin.

10. How much 0.9% saline solution can be made
     from 4.5 gm of sodium chlorite crystals?

11. How much 2% cocaine solution can be made
     from 500 mg of crystalline cocaine?

12. Prepare 150 ml of 20% sodium bromide
     solution from 75% sodium bromide solution.

13. Prepare 400 ml of $2\frac{1}{2}$% dextrose solution
     from a 1:2 dextrose solution.

14. Prepare 30 ml of 5% sodium bicarbonate
     solution from tablets 0.3 gms.

Measurement

Medical areas use several different measurement
systems so it is often necessary to change from
one system to another. Among the many systems
are the metric system, the English system, the
apothecary system and the household system.

1. The physician orders drams 3 of elixir of
   terpin hydrate (apothecary system). How
   many minims (apothecary system) is this?
   (1 dram = 60 minims)

2. Susan is given drams 4 of Maalox after
   each meal. How many ounces (household)
   does she take? (1 ounce = 8 drams)

3. A child is to receive 15 drops (household)
   of vitamins. How many teaspoons should
   you give him or her? (60 drops = 1 tea-
   spoon)

4. Julie is 62 inches tall. Since most medical
   facilities use the metric system it is
   necessary to know her height in centimeters.
   Convert 62 inches to cm. (1 in. = 2.54 cm)

5. A new born baby weighed 3136 grams. How
   many pounds was this? (454 gm = 1 lb.)

6. The patient has consumed   ⌐s of
    cranberry juice. How many ounces is this?
    (1 quart = 32 ounces)

7. The physician ordered 60 minims of Cascara,
    a cathartic that acts mainly on the large
    bowel. How many cubic centimeters (cc)
    would you give the patient? (15 minim =
    1 cc)

8. A patient is to be given 0.6 mg of scopo-
    lamine, a sleeping pill. How many grains
    would he be taking? (1 grain = 60 mg)

9. An order for the new patient says to
    administer .05 gms of diuril. How many
    grains is this? (1 gm = 15 grains)

10. Mr. Hogg weighs 115 kgs. How many pounds
    does he weigh? (1 kg = 2.2 lbs.)

11. For additional measurement problems, refer
    to Programmed Mathematics for Nurses,
    Sackheim and Lewis, MacMillan Publishing
    Co., New York, 1974, Chapters 4, 5, 6, 7,
    and 8.

Numbers Systems

1. An order reads ccclx minims of a drug.
   Write this amount in our number system.

2. Mary needs to drink XXIV ounces of fruit
   juice. Write the arabic number.

3. Bruce has taken VII grains of aspirin.
   Write the arabic number.

4. Write 132 ounces in Roman numerals.

5. Write 1576 grams in Roman numerals.

Numeration

1. 1,406,843 hospital beds
   7,061 hospitals
2. $32,607,324,000
3. one million ninety-four thousand five hundred eighty-eight
4. three hundred eight thousand twenty-four
5. three hundred twenty-two thousand two hundred twenty-eight
6. 917,707 beds

Addition & Subtraction

1. 64,652 patients
2. 480 patients
3. 72 oz. before additions
4. 354 volumes
5. 2550 ml glucose
6. 154 items
7. 278 more nurses than doctors
   666 professional employees
   136 more RN's than LPN's
8. 190,244 patients

Multiplication

1. 1126 visitors each day
   7882 visitors each week
2. 10,000 mg in 10 days
3. 150,000 units
4. 159,870 patients/year
5. 43,200 pills/case
   518,400 pills/year

Division

1. 900 patients each
2. 15 days
3. 4 bottles need to be ordered
4. 120 tablets for 3 days
5. 76 dosages

Introduction to Fractions

1. 5
2. $\frac{5}{13}$, $\frac{5}{14}$, $\frac{5}{15}$, etc. or $\frac{4}{12}$, $\frac{3}{12}$, $\frac{2}{12}$, etc.
3. $\frac{3}{4}$ grain
4. $\frac{3}{5}$ tablet
5. $\frac{1}{6}$

6. patient swallowed $1\frac{1}{2}$ tablets
7. 6

Fractions, + -

1. $6\frac{7}{8}$ oz.
2. $\frac{18}{100}$ grain
3. $1\frac{7}{8}$ in.
4. $1\frac{4}{15}$ oz.
5. $4\frac{1}{4}$ oz.
6. $2\frac{11}{24}$ pts.
7.
7. She does not have enough to make her rounds.

Dividing Multiplying Fractions

1. 12 dosages
2. $7\frac{1}{5}$ liters
3. $2\frac{1}{7}$ oz., $\frac{5}{14}$ oz.
4. Yes. $\frac{15}{220} > \frac{11}{220}$
5. 98 calories
6. 24 days
7. 9 pieces
8. 450 boxes/month
9.
9. $14\frac{3}{10}$ oz.

Addition & Subtraction Decimals

1. 98.7°
2. 0.6, 0.26, 0.005, 0.8
3. 0.972 mg
4. 1.55 in.
5. 0.85 mg left

26

Multiplying Dividing Decimals

1. 0.49 grams/cc
2. 9 ml
3. 73.2 mg/day
4. 0.61 oz./dose
5. 5 tablets
6. $2,664,152,712/year

Ratio & Proportion

1. $\dfrac{2.5}{1000} = \dfrac{x}{2500}$ ANS. 6.25 g

2. $\dfrac{2}{5} = \dfrac{x}{2}$ ANS. $\dfrac{4}{5}$ mg

3. $\dfrac{2.5}{1} = \dfrac{10}{x}$ ANS. 4 tablets

4. $\dfrac{1}{15} = \dfrac{x}{10}$ $\dfrac{.3}{1} = \dfrac{\frac{2}{3}}{t}$ ANS. Give 2 tablets

5. $\dfrac{13.4}{10} = \dfrac{20}{c}$ ANS. 15cc

6. $\dfrac{15}{1} = \dfrac{10}{x}$ ANS. $\dfrac{2}{3}$ cc

7. $\dfrac{500}{1} = \dfrac{2000}{4}$ ANS. 4cc

8. $\dfrac{1}{20} = \dfrac{x}{40}$ $\dfrac{.5}{1} = \dfrac{2}{t}$ ANS. 4 tablets

9. $\dfrac{100}{1} = \dfrac{u}{.3}$ $\dfrac{1}{15} = \dfrac{.3}{x}$ ANS. 4.5 minims

10. $\dfrac{1}{10} = \dfrac{x}{2000}$ ANS. 200 g

Percent

1. $\dfrac{80}{100} = \dfrac{x}{48}$ ANS. 38.4 cc

2. $\dfrac{60}{100} = \dfrac{x}{30}$ ANS. 18 oz.

3. $\dfrac{110}{100} = \dfrac{4}{103}$ ANS. .033¢

4. Add $1\frac{1}{3}$ oz. of H_2O to $6\frac{2}{3}$ oz. of 6% solution to make 8oz. of 5% solution.

5. Problem error. Impossible

6. $\dfrac{450}{3000} = \dfrac{x}{100}$ ANS. 15%

7. $\dfrac{1}{3} = \dfrac{x}{100}$ ANS. $33\frac{1}{3}$%

8. $\dfrac{22}{100} = \dfrac{5}{x}$ ANS. 23 oz.

9. Add 0.9 qts. of H_2O to 0.1 qt. of 10% solution.

10. $\dfrac{.9}{100} = \dfrac{4.5}{x}$ ANS. 500 ml

11. $\dfrac{2}{100} = \dfrac{.5}{x}$ ANS. 25 ml

12. Add 110 ml of H_2O to 40 ml of 75% solution to make 150 ml of 20% solution.

13. Add 380 ml of H_2O to 20 ml of 1:2 solution.

14. Dissolve 5 tablets in 30 ml of H_2O.

Measurement

1. 180 m
2. $\dfrac{1}{7}$ 3
3. $\dfrac{1}{4}$ t.
4. @ 157 cm tall
5. 6.9 lbs.
6. 48 oz.
7. 4 cc
8. 0.01 grains
9. 0.75 grains
10. 253 lbs.

Number Systems

1. 360 minims
2. 24 oz.
3. 7 grains
4. cxxii oz.
5. MDLXXVI grains