Title: Determining Drug Dosages

Objectives

Students will be able to use multiplication and division to determine correct drug dosages.

Time frame to Complete

30 minutes

NRS EFL

4

Stackable Cert. Documentation	Technology	Study / Life skills	EL-Civics	Career Pathways	Police	Paramedic	Fire Rescue	Medical Asst.	EKG / Cardio	Phlebotomy	Practical Nursing	Healthcare Admin	Pharmacy Tech	IMT	AMT	HVAC	Welding	Other:	STNA				
X				X		X		X			X		X						X				

Standard(s) Addressed in Lesson

Use Math to Solve Problems and Communicate

Benchmark(s) Addressed in Lesson

- M.4.2. Solve, with a high degree of accuracy, multi-digit addition, subtraction, multiplication and division problems in horizontal and vertical notation with regrouping, using whole numbers, fractions, decimals and positive/negative integers.
- M.4.13. Convert fluently, within measurement systems (metric, customary, time), from one unit to another in order to solve contextual problems and express the conversions using appropriate unit labels.
- M.4.16 Evaluate and simplify algebraic expressions and solve equations.
- M.4.35. Perform with increasing independence, range and fluency in demonstrating level-appropriate mathematical skills in contextual situations (community, family, work).

Materials

Drug Dosage Formula worksheet

Learner Prior Knowledge

Students should have a firm command of multiplication and division including whole numbers and decimals. Prior experience converting metric units will also be beneficial.

Activities

Step 1 Introduce the lesson: Ask students what they believe is the biggest cause of death in hospitals. Reveal that approximately 100,000 people die each year due to preventable medical errors (Institute of Medicine, 2000). A large percentage of these deaths are related to incorrect medicines and dosages. It is essential that health care workers are able to provide proper medical treatment because lives depend upon their careful and accurate care. Today's lesson will provide practice multiplication, division, and conversion to determine the correct dosage of medicine.

Step 2 Distribute the *Drug Dosage Formula* worksheet. Explain the formulas to the students and solve the example problems together.

Step 3 Students complete the worksheet. Check answers and re-teach as necessary.

Assessment/Evidence

Mastery is demonstrated by a score of 90% on the worksheet.
This worksheet can be used as documentation for a stackable certificate. Collect it as needed.

Adaptations for Beginning Students

Beginning students may use a calculator to solve equations.

Adaptations for Advanced Students

Advanced students could complete a similar activity with different dosage strengths in the “vehicles”.

Teacher Reflection/Lesson Evaluation

This lesson was created by Middletown ABLE.

Determining Drug Dosages

One of the most common errors in health care is incorrect dosage of medicines. It is important to carefully calculate the appropriate amounts of medicine for patients

Part One:

When dosages and quantities are given in different types of units, convert to equal units before solving.

Household Measures and Metric Equivalents	
1 ounce	30 milliliters (mL)
1 tablespoon	15 milliliters (mL)
1 teaspoon	5 milliliters (mL)

Sample Problem:
A patient must take 2.5 teaspoons of Amoxicillin twice a day for 10 days in order to treat a strep throat infection. How many milliliters of medicine must the pharmacy provide for the treatment program?

2.5 teaspoons x 2 doses = 5 teaspoons per day
5 teaspoons per day x 10 days = 50 teaspoons
50 teaspoons x 5 milliliters = ***250 milliliters of medicine needed***

1. A patient weighs 200 pounds. He should be given 15 mL of cough medicine for every 100 pounds of body weight, two doses per day. How many tablespoons will he take each day.

2. A child weighs 65 pounds. She should be given 2 teaspoons of cold medicine every six hours. How many tablespoons of cold medicine can she have in one day?

Part Two:

One formula to convert dosages of medicine is as follows:

$$\frac{D}{H} \times V = A$$

D = Desired dose or medication order
H = Strength available ("on-hand") from the pharmacy
V = Vehicle (type of medication – capsule, tablet, pill, mL)
A = Amount

Sample problem:
The order is for Ibuprofen 400 mg every 6 hours. The pharmacy carries 200 mg tablets (the strength is 200 mg in one tablet). How much medicine is needed per dose?

$$\frac{D = 400\ mg}{H = 200\ mg} \times 1\ tablet = \textbf{2 tablets every six hours}$$

1. The doctor's directions call for 600 mg of Xanax daily, divided into three doses. The pharmacy carries 100 mg tablets. How many tablets will the patient take in each dose?

2. To treat an infection, the prescription orders 500 mg of Amoxicillin to be taken every six hours. Amoxicillin 250 mg tablets are available from the pharmacy. How many tablets will you take each dose?

3. A patient weighs 180 pounds. He should be given 1.25 mg of medicine for every pound of body weight. How many milligrams of medicine are needed?

4. The doctor writes a prescription for 240 mg, and the available strength is 80mg in a 0.80 mL solution. How much medicine is needed?

5. The doctor writes a prescription for 600 mg, and the strength available is 200 mg in 2.6 mL. How much medicine is needed?

Part Three:

Metric Equivalents	
1 gram (g)	1000 milligrams (mg)
1 milligram (mg)	1000 micrograms (mcg)
1 liter (L)	1000 milliliters (mL)
1 milliliter (mL)	1000 microliters (mcL)

1. How many micrograms are in 1 gram?

2. Prescription is for 400 micrograms, and the medicine comes in 0.3 milligrams per 1 mL of liquid. How much medicine is needed?

3. Prescription is for 0.4 milliliters, and the dose is available in 500 microliters per 1 mL of liquid. How much medicine is needed?

4. Prescription is for 0.5 milliliters, and the medicine is available in 400 microliters per 0.80 mL of liquid. How much medicine is needed?

Determining Drug Dosages Answer KEY

One of the most common errors in health care is incorrect dosage of medicines. It is important to carefully calculate the appropriate amounts of medicine for patients.

Part One:

When dosages and quantities are given in different types of units, convert to equal units before solving.

Household Measures and Metric Equivalents	
1 ounce	30 milliliters (mL)
1 tablespoon	15 milliliters (mL)
1 teaspoon	5 milliliters (mL)

Sample Problem:
A patient must take 2.5 teaspoons of Amoxicillin twice a day for 10 days in order to treat a strep throat infection. How many milliliters of medicine must the pharmacy provide for the treatment program?

2.5 teaspoons x 2 doses = 5 teaspoons per day
5 teaspoons per day x 10 days = 50 teaspoons
50 teaspoons x 5 milliliters = ***250 milliliters of medicine needed***

1. A patient weighs 200 pounds. He should be given 15 mL of cough medicine for every 100 pounds of body weight, two doses per day. How many tablespoons will he take each day.

   200 = 2 x 15 mL x 2 doses = 30 x 2 = 60 mL = 60/15 = **4 tablespoons per day**

   100

2. A child weighs 65 pounds. She should be given 2 teaspoons of cold medicine every six hours. How many tablespoons of cold medicine can she have in one day?

   2 teaspoons = 10 mL x 4 doses (in 24 hours) = 40 mL

   40 mL = **2 2/3 tablespoons** *OR* **2 tablespoons + 2 teaspoons**

   15

Part Two:

One formula to convert dosages of medicine is as follows:

$$\frac{D}{H} \times V = A$$

D = Desired dose or medication order
H = Strength available ("on-hand") from the pharmacy
V = Vehicle (type of medication – capsule, tablet, pill, mL)
A = Amount

Sample problem:
The order is for Ibuprofen 400 mg every 6 hours. The pharmacy carries 200 mg tablets (the strength is 200 mg in one tablet). How much medicine is needed per dose?

D = 400 mg
*---------- x 1 tablet = **2 tablets every six hours***
H = 200 mg

1. The doctor's directions call for 600 mg of Xanax daily, divided into three doses. The pharmacy carries 100 mg tablets. How many tablets will the patient take in each dose?
   600 mg three times a day = 200 mg each dose.

   D = 200 mg
   ---------- x 1 tablet = **2 tablets each dose**
   H = 100 mg

2. To treat an infection, the prescription orders 500 mg of Amoxicillin to be taken every six hours. Amoxicillin 250 mg tablets are available from the pharmacy. How many tablets will you take each dose?

   2 tablets

3. A patient weighs 180 pounds. He should be given 1.25 mg of medicine for every pound of body weight. How many milligrams of medicine are needed?

   180 x 1.25 = **225 mg**

4. The doctor writes a prescription for 240 mg, and the available strength is 80mg in a 0.80 mL solution. How much medicine is needed?

   240 x 0.8mL = **2.4 mL**

   80

5. The doctor writes a prescription for 600 mg, and the strength available is 200 mg in 2.6 mL. How much medicine is needed?

   600 x 2.6 mL = **7.8 mL**

   200

Part Three:

Metric Equivalents	
1 gram (g)	1000 milligrams (mg)
1 milligram (mg)	1000 micrograms (mcg)
1 liter (L)	1000 milliliters (mL)
1 milliliter (mL)	1000 microliters (mcL)

1. How many micrograms are in 1 gram?

   1,000 x 1,000 = **1,000,000 mcg** in 1 gram

2. Prescription is for 400 micrograms, and the medicine comes in 0.3 milligrams per 1 mL of liquid. How much medicine is needed?

   Convert 0.3 milligrams = 300 micrograms

   400 x 1 mL = **1.33 mL**

   300

3. Prescription is for 0.4 milliliters, and the dose is available in 500 microliters per 1 mL of liquid. How much medicine is needed?

   Convert 0.4 millilters = 400 microliters

   400 x 1 mL **= 0.8 mL**

   500

4. Prescription is for 0.5 milliliters, and the medicine is available in 400 microliters per 0.80 mL of liquid. How much medicine is needed?

   Convert 0.5 mL = 500 mcL

   500 x 0.8 mL = **1 mL**

   400