



## MEDICAL MATH

**Purpose:** To encourage Health Science students to improve their ability to identify, solve, and apply mathematical principles involving temperature, weights, and measures used in the health care delivery system.

**Description of Event:** This event shall be a written test dealing with selected problems involving conversions between the Fahrenheit and Celsius scales and the metric and household systems of measurement. It will also involve identification of related symbols and abbreviations. The competitors shall be expected to convert problems of weight, volume, and temperature by responding correctly to 50 multiple choice items in **1 ½ hours**.

**Dress Code:** Competitors must be in official HOSA uniform or in proper business attire. Bonus points will be awarded for proper dress.

- Rules and Procedures**
- Competitors in this event must be active members of HOSA in good standing in the category in which they are registered to compete (Secondary or Postsecondary/Collegiate).
  - The test shall be developed from the National HOSA test item bank.

### Test Plan:

- Dimensional Analysis ..... 5%
- Conversions ..... 15%
- Computation of drug dosages ..... 35%
- Calculate IV flow rate ..... 5%
- Calculate pediatric dosages ..... 10%
- Intake and Output ..... 5%
- Ratios; Proportions: Percent - Solution Problems ..... 25%

**NOTE:**

- Abbreviations should be used in written problems.
- At least half of the computation and calculation problems will involve conversions.

- Competitors may use calculators, provided by National HOSA, during the test at the 2012 HOSA National Leadership Conference.
- The conversion chart included in these guidelines will be used as the official reference for the test for uniformity. **Competitors may not use a conversion chart during the test.**
- A series of twenty-five (25) tie breaking questions will be administered with the original test. In case of a tie, successive sets of five tie-breaker questions will be used until a winner is determined. In the tie-breaker, correct spelling is required for an item to be considered correct.
- The official references for selection of symbols, abbreviations, and problems are:
  - *Taber's Cyclopedic Medical Dictionary.*, Edited by Clayton L. Thomas, M.D., F.A. Davis Company. Latest edition.
  - Simmers, Louise, *Diversified Health Occupations (OR Introduction to Health Science Technology)* Delmar, Latest edition.
  - Olsen, et al, *Medical Dosage Calculations*. Prentice Hall. Latest edition.

7. One section of this event shall be scheduled for secondary and one for postsecondary/collegiate competitors. Competitor numbers will be pre-assigned.
8. All competitors shall report to the site of the event at the time designated for the event orientation. The test will immediately follow the orientation. **No proxies will be allowed for the orientation.** No study materials are allowed in the room.
9. All competitors will be given a test, a Scantron answer form and two (2) sheets of blank paper. The test items will be turned face down. The competitors will be given instructions on the use of the Scantron form. After instructions have been given, the competitors will be notified to start the test. There will be a maximum of **1 1/2 hours** to complete the test. There will be a verbal announcement when there are 15 minutes remaining for the test period. Competitors should leave the testing site promptly after completion of the test.
10. The test tie-breakers are more challenging problems requiring critical thinking and multiple steps in solving problems.
11. Competitors must be familiar with and adhere to the **"General Rules and Regulations of the National HOSA Competitive Events Program."**

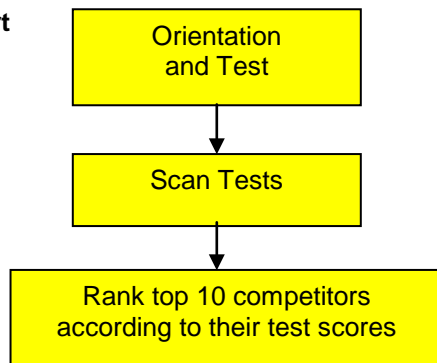
**Required Personnel (Per Section) - (SS level event; PS/C level event: No sections within levels.)**

1. One Event Manager (per event)
2. One Section Leader
3. Two-three Proctors
4. One-two event assistants per section

**Facilities, Equipment and Materials (Per Section)**

1. One room to accommodate the total number of competitors
  2. Tables/chair or schoolroom desks/chairs for total number of competitors
  3. Table/chairs for event personnel to provide for registration and distribution of materials
  - \*\*\* 4. Number 2 lead pencils should be brought to the event by competitors
  5. Test packets which are pre-numbered and Scantron answer forms
  - \*\*\* 6. Blank paper (2 sheets per competitor)
  - \*\*\* 7. Print copy of the event guidelines for the event orientation
  8. Timer or stopwatch
  - \*\*\* 9. (Optional) Competitors are encouraged to wear a watch to keep track of the time during the test. Most HOSA event rooms do not have wall clocks.
- \*\*\* To be brought to event by competitor.

**Event Flow Chart**



# HOSA MEDICAL MATH CONVERSION CHART

## METRIC SYSTEM

<p><b>Length</b></p> <p>1 meter = 100 centimeters = 1000 millimeters 10 millimeters = 1 centimeter</p>	<p><b>Temperature</b></p> <p><math>^{\circ}\text{C} = (^{\circ}\text{F} - 32) \frac{5}{9}</math> <math>^{\circ}\text{F} = (^{\circ}\text{C}) \frac{9}{5} + 32</math></p>
<p><b>Weight</b></p> <p>1 gram = 1000 milligrams 1 milligram = 1000 micrograms 1 kilogram = 1000 grams</p>	<p><b>Weight Conversion</b></p> <p>1 kilogram = 2.2 pounds 1 pound = 16 ounces</p>
<p><b>Volume for Solids</b></p> <p>1000 cubic millimeters = 1 cubic centimeter 1000 cubic centimeters = 1 cubic decimeter 1000 cubic decimeters = 1 cubic meter</p>	<p><b>Volume for Fluids</b></p> <p>1 liter = 1000 milliliters 10 centiliters = 1 deciliter 10 deciliters = 1 liter</p>

## APPROXIMATE EQUIVALENTS AMONG SYSTEMS

*The following will be used for calculations instead of selecting from approximate equivalents.*

Metric	=	Household/English Liquid
1 liter		1 quart / 32 ounces / 2 pints
500 milliliters		1 pint / 16 ounces / 2 cups
240 milliliters		1 cup / 8 ounces
30 milliliters		1 ounce
15 milliliters		1 tablespoon / 3 teaspoons
5 milliliters		1 teaspoon
1 milliliter		15 drops
0.0667 milliliters		1 drop
Metric	=	Household/English Linear
1 meter		39.372 inches / 3.281 feet
0.914 meters		3 feet / 1 yard
0.3048 meters		12 inches / 1 foot
2.54 centimeters		1 inch

Source: Simmers, Louise, *Diversified Health Occupations (OR Introduction to Health Science Technology)* Delmar, Latest edition.

## MEDICAL MATHEMATICS ABBREVIATIONS

The following are the abbreviations that will be used on the HOSA National Medical Mathematics Exam. (Source: Simmers, Louise, *Diversified Health Occupations (OR Introduction to Health Science Technology)* Delmar, Latest edition.) Abbreviations of measurement terms not listed in the chart below will be spelled out. (Example: deciliter)

In addition, the test will use any and all standard medical abbreviations as designated in the: Simmers, Louise, *Diversified Health Occupations (OR Introduction to Health Science Technology)* text noted above.

Term	Abbreviation
millimeter	mm
meter	m
inch	in
gram	g
microgram	mcg
kilogram	kg
pound	lb
degrees Fahrenheit	$^{\circ}$ F
Unit	unit
pint	pt
gallon	gal

Term	Abbreviation
centimeter	cm
foot/feet	ft
milligram	mg
milliliter	ml or milliliter
liter	L
ounce	oz
degrees Celsius (Centigrade)	$^{\circ}$ C
quart	qt
tablespoon	tbsp or T
teaspoon	tsp or t
drop or drops	gtt or gtts

### I&O Standards

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Juice glass =	6 oz
Coffee cup =	8 oz
Tea cup =	6 oz
Soup bowl =	6 oz
Water glass =	7 oz
Jello cup =	5 oz
Ice cream =	4 oz
Creamer =	1 oz