Medical Math

Event Category: Health Science

Eligible Divisions: Secondary & Postsecondary/ Collegiate	**Round One:** 50 Q test (90 minutes)	**Digital Upload:** NO
Solo Event: 1 competitor	HOSA will provide a handheld calculator for this test.	

New for 2026-2027

Math for Health Care Professionals has been retired. *Pharmacy Calculations: An Introduction for Pharmacy Technicians* has been added. The tiebreaker question has been updated to essay format. Editorial changes have been made.

Event Summary

Medical Math allows members to gain the knowledge and skills required to identify, solve, and apply mathematical principles. This competitive event consists of a written test. In the event of a tie, the tie-breaker questions will be judged to break the tie. It aims to inspire members to learn about the integration of mathematics in health care, including temperature, weights, and measures used in the health community.

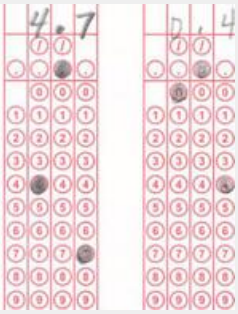
General Event Information

General Rules	Competitors must be familiar with and adhere to the General Rules and Regulations.
Dress Code	Proper business attire or official HOSA uniform. Bonus points will be awarded for proper dress.
Competitors Must Provide	• Photo ID • Two #2 lead pencils (not mechanical) with an eraser • Neon colored foam earplugs, NOT earbuds, for noise control (optional) HOSA Conference Staff will provide equipment and supplies listed in Appendix I.
Official References	The references below are used in developing the test questions: • Simmers, L., Simmers-Nartker, K., Simmers-Kobelak, S., Morris, L. *DHO: Health Science.* Cengage Learning, Latest edition • Craig, Gloria P., *Dosage Calculations Made Easy.* Wolters Kluwer, Latest edition. • Rewald,M. Lorang, B. and Schramm, G. *Pharmacy Calculations: An Introduction for Pharmacy Technicians.* Latest edition. (Use this HOSA student promo code at checkout for a discount on this ASHP resource: **ASHPxHOSA**)

ROUND ONE- Test

Test Instructions	All competitors will be given a test and test answer sheet. The written test will consist of 50 multiple choice questions in a maximum of 90 minutes. See test instructions here. An essay tiebreaker question will be administered with the original test. Essay tiebreakers will be completed in the space provided in the test booklet.
Time Remaining Announcements	There will be NO verbal announcements for time remaining during ILC testing. All ILC testing will be completed in the Testing Center, and competitors are responsible for monitoring their own time.

The expectation is that competitors read and are aware of all the content within these guidelines and associated links. Successful competitors will study all links for the detailed information.

Written Test Plan	The test plan for the Medical Math Test is: ● Mathematical essentials - 5% ● Measurement and conversion problems - 20% ● Drug dosages and intravenous solutions - 35% ● Dilutions, solutions, and concentrations - 25% ● Interpreting medical information - 15% ○ Charts, graphs, tables ○ Basic statistics: mean, median, mode At the International Leadership Conference, HOSA will provide basic handheld calculators (no graphing calculators) for addition, subtraction, division, multiplication, and square root calculations. Personal calculators are NOT allowed. Abbreviations will be used in the written problems. In addition, the test will use standard medical abbreviations as designated in the Simmers DHO: Health Science reference. At least half of the computation and calculation problems involve conversions. The medical math "Reference Materials Summary" included in these guidelines (page 4) will be used as the official reference for the test for uniformity. **Competitors may NOT use this summary page or any conversion chart or resource during the test.**
Test Answer Sheet	The test answer sheet for this event will require competitors to grid their responses with pencils. Numbers must be written with the last number of the answer in the far right box. (See sample to the right.) When a paper/pencil test is used or administered on a computer, the competitor will write in or key in their response to each question. A forward slash (/) and period (.) are the only characters available as part of the answer. 
Rounding	1. Converting between measurement systems often yields a different answer depending on which systems and conversions are used. However, the answer to a calculation problem will ultimately be the same after appropriate rounding. When determining a solution, round only the final answer after completing all calculation steps. 2. When rounding decimal numbers to the nearest tenths, hundredths, or thousandths place, look to the immediate right of the digit located in the position to be rounded. If the number to the direct right is 5 or larger, round up one number and drop everything that follows. If the number to the direct right is 4 or smaller, leave the position being rounded as is and drop everything that follows. 3. In specific situations, answers will be rounded per medical protocol. For example, pediatric dosage is always rounded DOWN to avoid potential overdose. Unless otherwise indicated, all answers should be rounded to the nearest whole number. (Examples: 31.249 (rounded down) = 31 and 23.75 (rounded up) = 24).
Use of Zero	Decimal expressions of less than 1 should be preceded by a zero – "leading zero." A whole number should never be followed by a decimal point and a zero – "trailing zero."

Sample Test Questions	**Competitors will grid-in and write-in their final answers to the test problems on the test answer sheet.* 1. An IV bag of 500 mL solution is started at 1900. The flow rate is 38 gtts per minute, and the drop factor is 10 gtts per mL. At what time (24-hour clock) will this infusion finish? (Craig pp 174-178) *Solution* *38 gtts/1 min x 1 mL/10 gtts = 3.8 mL/min* *3.8 mL/1 min x 60 min/1 hr = 228 mL/hr* *500 mL x 1 hr/228 mL = 2.1929824 hr* *0.1929824 hr x 60 min/1 hr = 11.578944 minutes* *1900 hr + 2 hrs 11.578944 min (Rounded = 12 minutes)* *1900 hours + 2hrs 12 min =* ***2112 hours*** 2. A patient with an eating disorder weighs 95½ lbs. What is the patient's weight in kg? Round to the nearest tenth. (Simmers pp 383) *Solution* *95.5 lb x 1 kg/2.2 lbs = 43.40909 kg Rounded =* ***43.4 kg*** 3. How many grams of sodium chloride are needed to prepare 500 mL of a 5% solution? (Kennamer pp 235) *Solution* *5% = 5 g/100 mL = 0.05 g/1 mL* *0.05 g/1 mL x 500 mL =* ***25 g***

Final Scoring

In the event of a tie, the essay will be judged to break the tie.

Future Opportunities

The HOSA Scholarship program has funding available for HOSA members who have an interest in various health careers! The application process begins January 1, 2027, and can be found here: https://hosa.org/scholarships/.

Graduating from high school or completing your postsecondary/collegiate program does not mean your HOSA journey has to end. As a HOSA member, you are eligible to become a HOSA Lifetime Alumni Member- a free and valuable opportunity to remain connected, give back, and help to shape the future of the organization. Learn more and sign up at hosa.org/alumni.

Medical Math – SS/PSC

Reference Materials Summary

Length	Temperature
1 meter (m) = 100 centimeters (cm) = 1000 millimeters (mm) 1 centimeters (cm) = 10 millimeters (mm)	°C (Degrees Celsius) = (°F - 32) 5/9 °F (Degrees Fahrenheit) = (°C) 9/5 + 32
Weight	**Weight Conversion**
1 kilogram (kg) = 1000 grams (g)	1 kilogram (kg) = 2.2 pounds (lb)
1 gram (g) = 1000 milligrams (mg)	1 pound (lb) = 16 ounces (oz)
1 milligram (mg) = 1000 micrograms (mcg)	
Volume for Solids	**Volume for Fluids**
1000 cubic decimeters (dm) = 1 cubic meter (m^3)	1 liter (L) = 1000 milliliters (mL)
1000 cubic centimeters (cm^3) = 1 cubic decimeter (dm^3)	10 centiliters (cL) = 1 deciliter (dL)
1000 cubic millimeters (mm^3)= 1 cubic centimeter (cm^3 or cc)	10 deciliters (dL) = 1 liter (L)
	1 cubic centimeters (cm^3 or cc) = 1 milliliter (mL)
	Units (U) = a measure for drugs such as insulin

METRIC EQUIVALENTS

Metric	Household/English
240 milliliters (mL)	1 cup = 8 ounces (oz) = 16 tablespoons (tbsp)
30 milliliters (mL)	1 ounce (oz) = 2 tablespoons (tbsp) = 6 teaspoons (tsp)
15 milliliters (mL)	1 tablespoon (tbsp) = 3 teaspoons (tsp)
5 milliliters (mL)	1 teaspoon (tsp)
1 milliliter (mL)	15 drops (gtts)
0.0667 milliliters (mL)	1 drop (gtt)
1 meter (m)	39.4 inches (in)
2.54 centimeters (cm)	1 inch (in)
	1 foot (ft) = 12 inches (in)

APPROXIMATE EQUIVALENTS AMONG SYSTEMS Formulas

Standard Deviation Formula for Sample Data	Body Surface Area
$\sqrt{\frac{\sum (x-\bar{x})^2}{(n-1)}}$	BSA (m^2) = √([height (cm) x weight(kg)]/3,600) BSA (m^2) = √([height (in) x weight(lb)]/3,131)

NOTE: This reference may NOT be used during testing.

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