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Medical Math vs Intermediate Algebra

AMATYC Section Identification Code: S061

October 31, 2013
The scariest day of the year!
Pre-nursing students can improve their mathematical skills by taking a medical math class that is designed for such a purpose. The presentation covers curriculum, syllabus, grading standards, and pedagogy so that future nurses are able to solve and check dosages and other related mathematical problems accurately and efficiently.
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Students’ Success

Current at SLCC
The brief history was from Professor Joe Gallegos. He could not come today.

Before year 2000, the prerequisite Math class for Nursing and Medical Assistant programs was Math 1030 Quantitative Reasoning.
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The course description:
MATH 1030  Quantitative Reasoning 3 cr
Prereq: RDG 0990; within the last year, MATH 1010 w/C grade or better, or appropriate Accuplacer score.
The course focuses on the development of analytical thinking through the application of math to real-life problems. Topics include modeling, logic, financial math, probability, statistics, and geometry.
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Math 1010 Intermediate Algebra

The course description:
MATH 1010 Intermediate Algebra
Prereq: RDG 0900; within the last year, MATH 0990 w/C grade or better, or appropriate Accuplacer score.
Linear and quadratic equations; inequities; polynomials; rational expressions; radicals; negative and rational exponents; complex numbers; linear systems; introduction to functions; logarithms; and exponential functions.
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Accreditation recommendation: Include more medical computations in the prerequisite.

Math 1020 course curriculum was developed.
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MATH 1020  Math - Health Disciplines 3 cr
Prereq: ...
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Medical Assistant program and Professor Joe Gallegos’ research

Yearly meeting
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Matthew 6:24 “No man can serve two masters: for either he will hate the one, and love the other; or else he will hold to the one, and despise the other.”
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Why me?
Medical Assistant program and Professor Joe Gallegos’ research

Yearly meeting

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Why me?
Socrates’ suggestion:

“When you desire my knowledge like you desired that breath of air, then you shall have it.”

http://www.klemmer.com/blog/lesson-2-the-desire-for-air/
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My suggestion:

When you don’t desire to kill your patients, take SLCC’s Medical Math class.
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2007...
Memorizations: Medical Abbreviations

qam = every morning
q1h = every hour
q2h = every 2 hours
q4h = every 4 hours
p.c. = after meals
a.c. = before meals
qd = every day
qod = every other day
bid = two times a day
tid = three times a day
qid = four times a day
hs = hour of sleep
č = with
š = without
mEq = milliequivalent

prn = as needed
IM = intramuscular
IV = intravenous
SubQ = subcutaneous
SQ = subcutaneous
PO = by mouth
NPO = nothing by mouth
SL = sublingual
OD = right eye
OS = left eye
OU = both eyes
AD = right ear
AS = left ear
AU = both ears
Stat = immediately
Memorizations: Unit abbreviations

**Time**
yr = year
mon = month
wk = week
h = hour
min = minute
sec = second

**Length**
km = kilometer
m = meter
cm = centimeter
mm = millimeter
yd = yard
ft = feet
in = inch

**Volume**
L = liter
mL = milliliter
cc = cubic centimeter
gal = gallon
qt = quart
pt = pint
fl oz = fluid ounce
fl dr = fluid dram
tbsp or T = Tablespoon
tsp or t = teaspoon

**Volume**
gtt = drop
µgtt = microdrop
c = cup

**Weight**
kg = kilogram
g = gram
mg = milligram
mcg or µg = microgram
lb = pound
oz = ounce
dr = dram
gr = grain
# Memorizations: Conversions

## Time
- 1 yr $\sim$ 365 days
- 1 yr = 12 mon
- 1 mon $\sim$ 30 days
- 1 wk = 7 days
- 1 day = 24 h
- 1 h = 60 min
- 1 min = 60 sec

## Length: Metric
- 1 km = 1,000 m
- 1 m = 100 cm
- 1 cm = 10 mm

## Length: U. S.
- 1 yd = 3 ft
- 1 ft = 12 in

## Between Systems
- 1 in $\sim$ 2.54 cm

## Weight: Metric
- 1 kg = 1,000 g
- 1 g = 1,000 mg
- 1 mg = 1,000 mcg

## Weight: U. S.
- 1 lb = 16 oz
- 1 oz = 8 dr
- 1 dr = gr 60

## Between Systems
- 1 kg $\sim$ 2.2 lb
- 1 g $\sim$ gr 15
- gr 1 $\sim$ 60 mg
# Memorizations: Conversions

## Volume: Metric
- 1 L = 1,000 mL
- 1 mL = 1 cc

## Volume: Household
- 1 cup = 16 T
- 1 T = 3 t

## Volume: Apothecary
- 1 gal = 4 qt
- 1 qt = 2 pt
- 1 pt = 16 fl oz
- 1 fl oz = 8 fl dr
- 1 fl dr = 60 minim

## Between Systems
- 1 qt ∼ 1 liter
- 1 c = 240 mL
- 1 c = 8 fl oz
- 1 fl oz = 2 T
- 1 fl oz = 30 mL
- 1 t = 5 mL
- 1 minim ∼ 1 gtt
Medical Math vs Intermediately Algebra

Topics

▶ Medical Math: conversions, dosages, flow rates, strength, mixing solutions, . . .

▶ When do students “directly” use any of the above after they become nurses?
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▶ Not very often.
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Intermediate Algebra: Accuracy (An Example)

- The prescription states: Cefaclor 0.5 g PO qid. The drug label states: Cefaclor, 250 mg/capsule. How much drug do you administer?

- This is how a typical student would approach the problem.
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- First, convert 250 mg to g. Suppose $250 \text{ mg} = x \text{ g}$. 
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\frac{1 \text{ g}}{1,000 \text{ mg}} = \frac{x \text{ g}}{250 \text{ mg}} \quad \text{OR} \quad 1 \text{ g} : 1,000 \text{ mg} = x \text{ g} : 250 \text{ mg}
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Solve to get \(x = .250\).
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- Suppose we administer $y$ capsule(s).
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Most students get \( y = 2 \).
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Their answer: administer 2 capsules. (It is not surprising that some get this answer right after they read the question.)
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- Students who take Medical Math should check and see if it is an overdose first!
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- Suppose the maximum dose for this patient: 1.5 g qd
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The prescription states: Cefaclor 0.5 g PO qid. The drug label states: Cafaclor, 250 mg/capsule, max: 4 g qd (for another patient). How much drug do you administer?

ordered amount = 0.5 g × \( \frac{4}{\text{day}} \) = \( \frac{2}{\text{day}} \) < \( \frac{4}{\text{day}} \) = max
Medical Math: Accuracy (Modified Question)

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- ordered amount = \(0.5 \text{ g} \times \frac{4}{\text{day}} = \frac{2}{\text{day}} < \frac{4}{\text{day}} = \text{max}\)

- Instructors should always teach students to ensure the ordered amount is not an overdose before any other computations.
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- Describe how to mix a 36.3% solution and a 11.3% solution to get 1,000 milliliter (mL) of 17.8% solution? (No calculator is allowed)

- Suppose we need \( x \) mL of the 36.3% solution.
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- Describe how to mix a 36.3% solution and a 11.3% solution to get 1,000 milliliter (mL) of 17.8% solution? (No calculator is allowed)

- $1,000 \text{ mL} \times \frac{17.8 - 11.3}{36.3 - 11.3} = 1,000 \text{ mL} \times \frac{6.5}{25} = 40 \text{ mL} \times 6.5 = 260 \text{ mL}$
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- Answer: Start with 260 mL of the 35% solution, add enough 10% solution until the volume is 1,000 mL.
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- This approach is about using the most efficient way to solve mixing solution problems.
Should students be able to do arithmetic without calculators?

- If you balance their check book without using the electronic devices, please raise your hand?
- We are in the 21st Century.
Should students be able to do arithmetic without calculators?

- If you balance their check book without using the electronic devices, please raise your hand?
- We are in the 21st Century.
- Remember the big storm Katrina. I was told that many nurses wished their arithmetic skills were better then!
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- Should instructors teach and require students to do some Medical Math problems without calculators?
Should students be able to do arithmetic without calculators?

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- Should instructors teach and require students to do some Medical Math problems without calculators?
Calculator Statement in Syllabus

No calculators will be allowed on Tests 1 and 2. Students will need a scientific calculator for Tests 3 and 4. The use of a calculator is not permitted on the first part of the final examination. A scientific calculator is needed for the second part of the final examination. The first part of the final examination constitutes more than 50% of the overall final exam score.
Grading Scale in Syllabus

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>A</th>
<th>A-</th>
<th>B+</th>
<th>B</th>
<th>B-</th>
<th>C+</th>
<th>C</th>
<th>C-</th>
<th>D+</th>
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<tbody>
<tr>
<td>Min. Overall %</td>
<td>93</td>
<td>90</td>
<td>87</td>
<td>83</td>
<td>80</td>
<td>78</td>
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<tr>
<td>Min. Final %</td>
<td>78</td>
<td>78</td>
<td>78</td>
<td>78</td>
<td>78</td>
<td>78</td>
<td>73</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Other classes min.</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
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</table>

<table>
<thead>
<tr>
<th>Final Project &amp; E-portfolio</th>
<th>4 tests Participation</th>
<th>HW &amp; Quizzes</th>
</tr>
</thead>
<tbody>
<tr>
<td>30%</td>
<td>4%</td>
<td>14% each</td>
</tr>
</tbody>
</table>
Surprise! Students can do Mathematics!

- Some recent students’ achievements:
  - SLCC student won 1st place in the State Skill USA Medical Math Competitions in 2013.
The Triumph of the Human Spirit!

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- In year 2012, SLCC student won National Skill USA Medical Math Competitions.
The Triumph of the Human Spirit!

Surprise! Students can do Mathematics!

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Curriculum Change

- This is the last semester that Math 1020 is taught.
- Students will need Math 1050 College Algebra and Math 1040 Statistics as prerequisite to SLCC nursing program.
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Thank you for coming!

Thank you for attending this session!
Enjoy the rest of the AMATYC conference!
Shane Tang
Shane.Tang@slcc.edu

Medical Math vs Intermediate Algebra

AMATYC Section Identification Code: S061

October 31, 2013
The scariest day of the year!