Making Medical Math Manageable

A Hands-On Approach for Veterinary Technician Educators

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Dogs and Cats EMERGENCY & SPECIALTY

Learning Objectives

1. Demonstrate effective methods for teaching veterinary medical math using case-based learning.
2. Identify common areas of difficulty for students and apply techniques to improve comprehension.
3. Develop strategies for incorporating interactive and hands-on exercises into math education.

Why Medical Math is Challenging for Students

Emotional + Cognitive Barriers

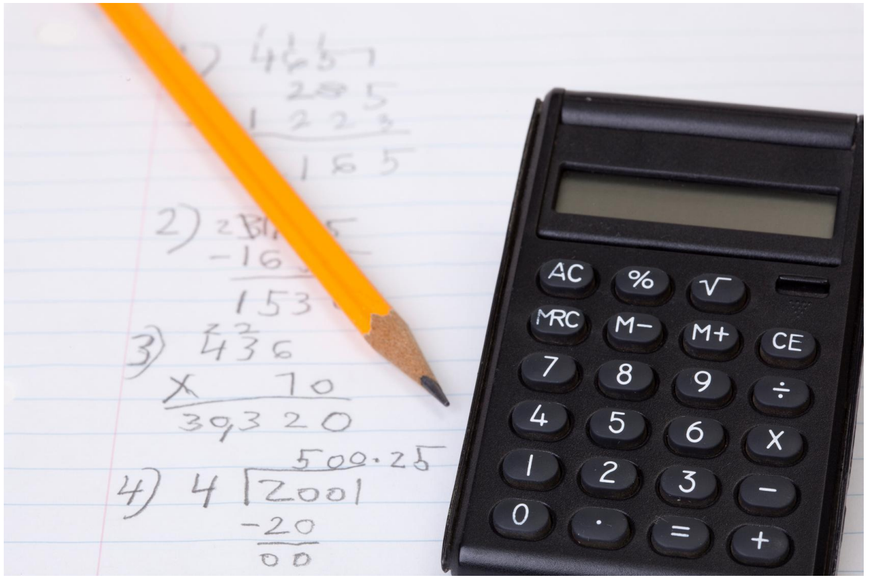
- Math anxiety leads to panic or avoidance
- Weak skills in decimals, conversions, basic math
- Low confidence after mistakes
- Pressure to be fast and accurate in clinical settings

Educational Gaps

- Formulas often taught without real-world context
- Overemphasis on memorization vs. understanding
- Minimal repetition or feedback in most programs

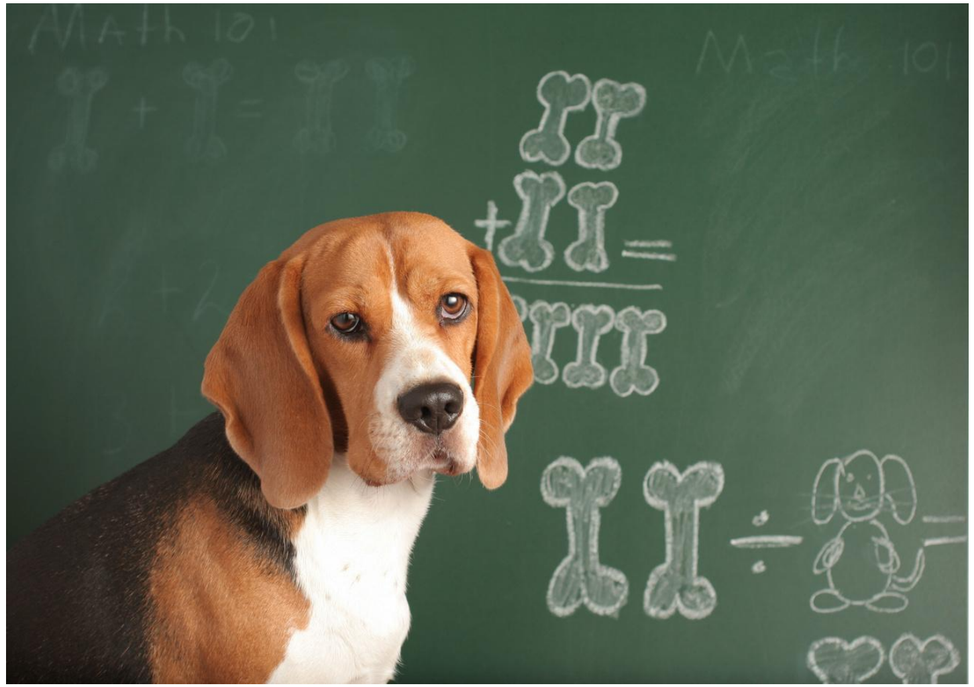
Why Medical Math Matters in Vet Med

- Dosing accuracy = patient safety
- Fluid therapy depends on precise calculations
- CRI errors can lead to serious complications
- Time Pressure — Students feel rushed/fear getting it wrong.
- Builds long-term confidence in new grads and techs



Common Struggles for Educators

- Balancing depth with time constraints
- Overwhelmed by student variability in math skills
- Translating complex math into teachable steps
- Uncertainty about which method is “best” to teach
- Limited time for repetition, feedback, and practice



Core Teaching Strategies

Scaffolded Learning

Build from basic conversions to complex CRIs in logical steps

Teach → Do → Review

Explain, apply, & reinforce each concept

Visual breakdowns

Use diagrams, charts, and color coding to simplify multi-step problems

Error-based learning

Let students analyze and correct common math mistakes

Teach-back method

Have students explain the steps to reinforce retention and check understanding

Teaching with Real-World Context

- Case-based learning makes numbers meaningful and memorable
- Attach formulas to patient care decisions (e.g., why the dose matters)
- Use actual medication labels, fluid bags, and syringe images
- Walk through ER or ICU scenarios, not word problems
- Highlight the consequences of miscalculation

Dosage Calculations

Patient Weight: 10 kg

Dose: 2 mg/kg

Concentration: 10 mg/mL

Step 1: 10 kg × 2 mg/kg = 20 mg needed

Step 2: 20 mg ÷ 10 mg/mL = 2 mL to give

- Start with weight-based dosing (mg/kg)
- Teach units and conversions (g → mg, lbs → kg)
- Walk through one formula step-by-step
- Connect calculation to the drug label and syringe volume
- Practice with real case examples

Fluid Therapy Rates

Patient Weight: 25 kg

Maintenance Rate: 60 mL/kg/day

Step 1: 25 kg × 60 mL/kg/day = 1500 mL/day

Step 2: 1500 mL/day ÷ 24 hr = 62.5 mL/hr

- Start with maintenance rates (mL/kg/day → mL/hr)
- Practice using shock, dehydration, and surgical cases
- Highlight common unit confusion (mL/hr vs mL/kg/hr)
- Incorporate IV pump setup and syringe pump examples
- Use tables and color-coded steps to reinforce calculations

Constant Rate Infusion Calculations

Drug: Lidocaine

Dose: 50 mcg/kg/min

Patient Weight: 25 kg

Fluid Volume: 500 mL

Concentration: 20 mg/mL

Step 1: Convert dose to mg/hr

50 mcg × 10 kg = 500 mcg/min = 0.5 mg/min

0.5 mg/min × 60 = 30 mg/hr

Step 2: Figure out total drug needed

Total bag rate = 25 mL/hr

30 mg/hr ÷ 25 mL/hr = 1.2 mg/mL concentration

Step 3: Volume to add from stock (20 mg/mL)

1.2 mg/mL × 500 mL = 600 mg total

600 mg ÷ 20 mg/mL = 30 mL to add to bag

- Break it into clear steps: dose → total drug → volume → rate
- Use simple, familiar drugs first (e.g., metoclopramide, lidocaine)
- Teach units explicitly: mcg/kg/min vs mg/kg/hr
- Use color-coded steps to track each part of the process
- Have students use calculators + visual tools (charts, templates)

Core Teaching Strategies

Think–Pair–Share

Let students talk through their math process

Math stations or rotations

Focused, hands-on skill practice

Escape room challenges

Team-based case solving through math

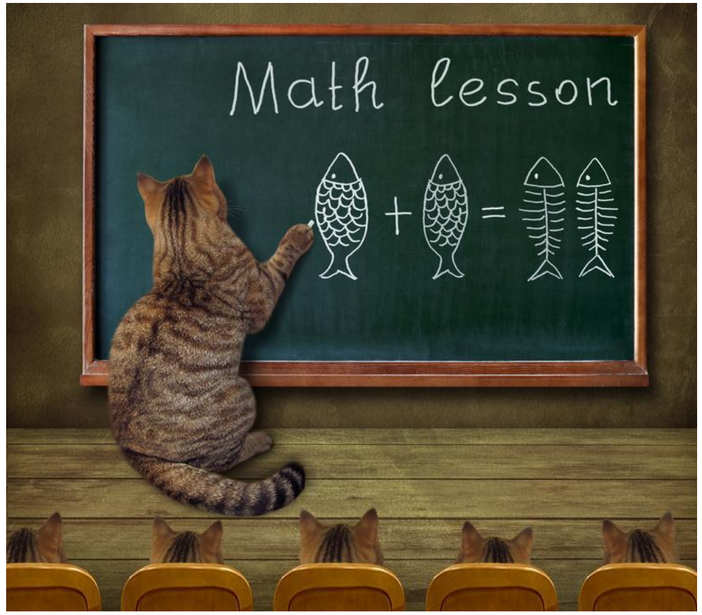
Whiteboards or dry erase templates

Low-stakes repetition

Apps, Kahoots, or polling

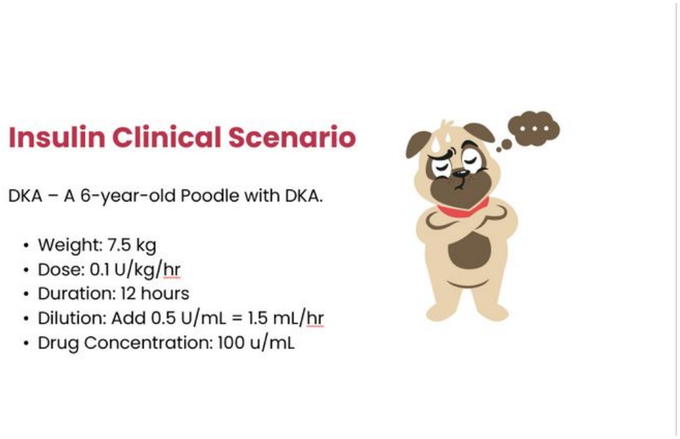
Digital tools for quizzes or group review

Identifying Student Struggles Early



- Use low-stakes math warmups or entry slips
- Listen for hesitation or verbalized uncertainty during group work
- Incorporate frequent formative check-ins (quick problems, polls, or teach-backs)
- Watch for inconsistent math across cases — same formula, different outcome
- Ask students to explain their why — this reveals misconceptions fast

Hands-On Activity Example: CRI Math Wet Lab

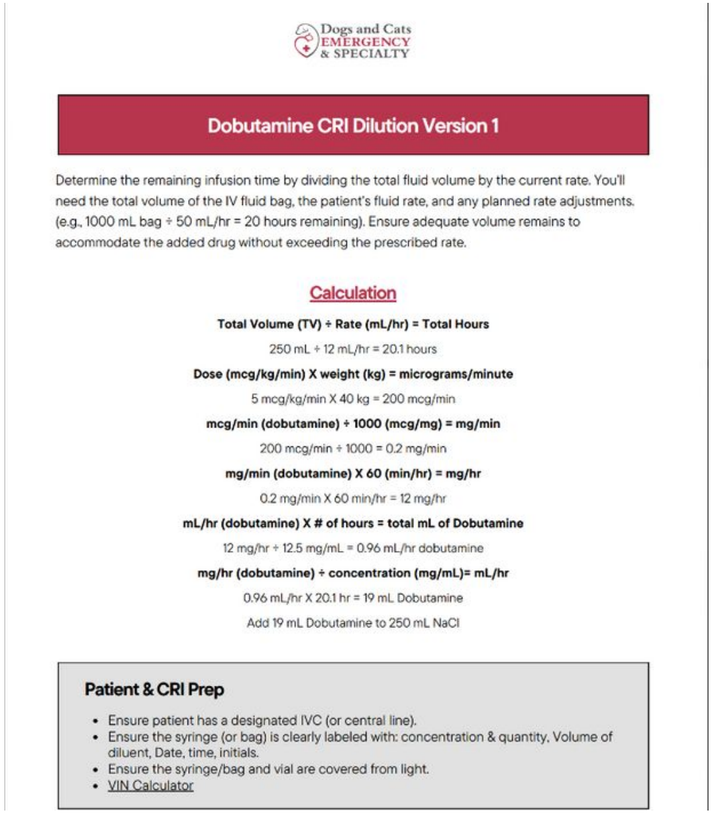


- Workshop Title: CRI Calculations Made Easy
- Scenario-based worksheet featuring patients needing various CRIs (fentanyl, metoclopramide, norepinephrine, etc.)
- Each student received:
  - A calculator
  - Laminated worksheet
  - Drug label mockups
  - Color-coded dry erase templates
- Objectives:
  - Calculate weight-based CRIs
  - Determine drug volumes to add
  - Program IV or syringe pump rates
- Debrief: Group review, error-checking, and real-time discussion

Supportive Teaching Tools

For Student Success

- Laminated dry erase sheets for repeatable practice
- Color-coded calculation templates for CRIs, fluids, and dosages
- Drug label printouts to reinforce real-world connections
- Whiteboards and markers for low-pressure group work
- Digital flashcards, apps, and practice quizzes
- Plumb's, fluid charts, and conversion tables accessible at all times



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Dobutamine CRI Dilution Version 1

Determine the remaining infusion time by dividing the total fluid volume by the current rate. You'll need the total volume of the IV fluid bag, the patient's fluid rate, and any planned rate adjustments. (e.g., 1000 mL bag ÷ 50 mL/hr = 20 hours remaining). Ensure adequate volume remains to accommodate the added drug without exceeding the prescribed rate.

Calculation

Total Volume (TV) ÷ Rate (mL/hr) = Total Hours

250 mL ÷ 12 mL/hr = 20.1 hours

Dose (mcg/kg/min) X weight (kg) = micrograms/minute

5 mcg/kg/min X 40 kg = 200 mcg/min

mcg/min (dobutamine) ÷ 1000 (mcg/mg) = mg/min

200 mcg/min ÷ 1000 = 0.2 mg/min

mg/min (dobutamine) X 60 (min/hr) = mg/hr

0.2 mg/min X 60 min/hr = 12 mg/hr

mL/hr (dobutamine) X # of hours = total mL of Dobutamine

12 mg/hr ÷ 12.5 mg/mL = 0.96 mL/hr dobutamine

mg/hr (dobutamine) ÷ concentration (mg/mL)= mL/hr

0.96 mL/hr X 20.1 hr = 19 mL Dobutamine

Add 19 mL Dobutamine to 250 mL NaCl

Patient & CRI Prep

- Ensure patient has a designated IVC (or central line).
- Ensure the syringe (or bag) is clearly labeled with: concentration & quantity, Volume of diluent, Date, time, initials.
- Ensure the syringe/bag and vial are covered from light.
- VIN Calculator

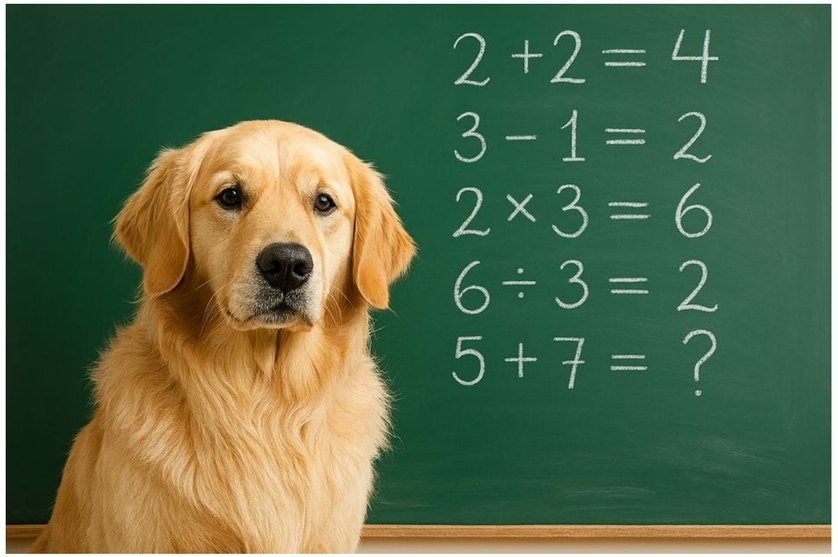
Building Your Math Teaching Toolkit

- Organize print-ready resources: worksheets, formulas, case templates
- Create reusable templates for CRIs, fluid rates, dosages
- Include reference charts (conversion tables, maintenance rates, etc.)
- Assemble real-world case banks for varied skill levels
- Use QR codes for video walkthroughs and practice sets
- Separate tools by training level (beginner, intermediate, advanced)

Scan the QR code for my medical math toolkit

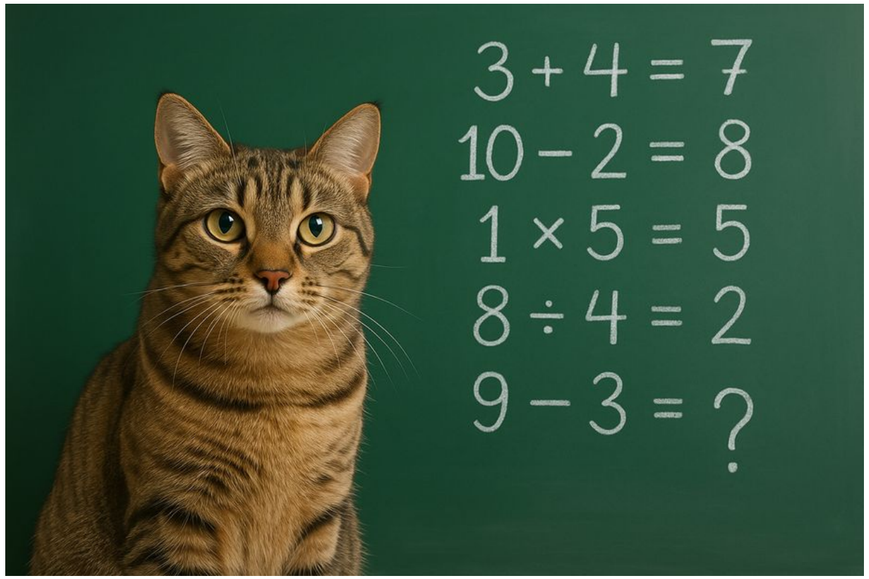
Making It Stick

- Spaced repetition — Revisit key math concepts regularly
- Interleaved practice — Mix question types (CRI, fluids, doses) together
- Teach-back exercises — Let students explain their steps aloud
- Math journaling or error reflection — Build pattern recognition
- Anchor learning with clinical cases to boost memory and application



Key Takeaways

- Math anxiety is real — we can reduce it through clarity & context
- Use scaffolded learning to build confidence step-by-step
- Always connect formulas to real patient care
- Interactive methods = better retention and engagement
- Use templates, dry erase, and visual tools liberally
- Build your own educator toolkit for repeatable success



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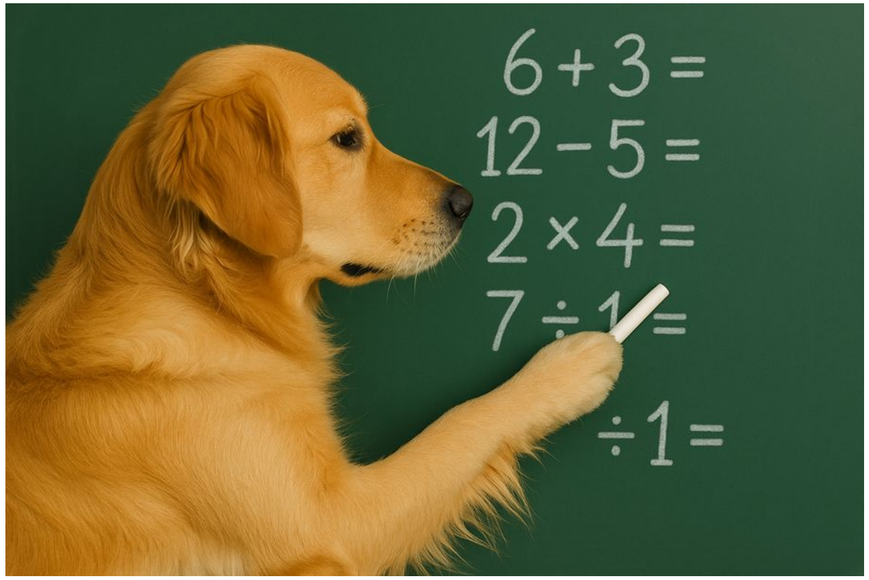

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Thank You!

💡 Keep math real. Keep it relevant. Keep it repeatable.

🌐 Download your free math toolkit: bit.ly/3U8Kvau

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