



The Dosage Calculation Survival Sheet

*Six formulas, twelve conversions, and the six mistakes
that quietly cost you points.*

PLEASE READ

Before you use this.

This is a study aid built for nursing students. It is not a clinical reference, not a substitute for your pharmacology or fundamentals coursework, and not medical advice. Nothing here replaces licensed instruction, clinical supervision, your facility's policies, or your own professional judgment.

Before administering any medication in clinical practice, verify every calculation against the original order, the drug label, your institution's protocol, and — for high-alert medications — an independent double check by a second licensed nurse.

ON ROUNDING

Rounding conventions vary between nursing programs and testing bodies. Where an exam question specifies how to round, follow the question. Where your program specifies, follow your program. The conventions on page 10 are the ones most commonly taught in U.S. nursing programs.

TRADEMARK

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START HERE

Med math is not hard.

It is unforgiving, which is a different problem. The arithmetic in dosage calculation rarely goes past division. What ends careers-in-progress on an exam is a pound left unconverted, a decimal in the wrong column, a daily dose handed over as a single dose.

So this sheet is not a course. It is the short list of things that have to be automatic — the conversions you should never have to look up, the six formulas that cover almost every question you will be asked, and the specific errors that show up again and again in the same places.

HOW TO USE IT

Read pages 4 through 6 once, properly. Then work the three examples with a pen — not by reading along, by actually solving. Then take the ten questions on page 12 cold, no notes. Whatever you miss tells you exactly which page to go back to.

You are not bad at math. You are fast at math and slow at units, and those are not the same weakness.

WHAT THIS IS NOT

This is one chapter, not a course. It does not cover pharmacology mechanisms, lab values, IV compatibility, or the clinical judgment items that make up the rest of your exam. It covers the arithmetic — completely — and nothing else.

METHOD

Pick one. Never switch.

There are three accepted ways to set up a dosage problem. They give the same answer every time. Students lose points not by choosing the wrong one but by switching between them mid-semester and half-remembering all three.

THE THREE METHODS

1 · FORMULA METHOD ($D / H \times Q$)

Desired $\div$ Have $\times$ Quantity

Fastest. Best if you think in numbers. The one used throughout this sheet.

2 · RATIO AND PROPORTION

Have : Quantity :: Desired : X

Cross-multiply and solve for X. Best if you think in relationships.

3 · DIMENSIONAL ANALYSIS

Chain the units until only the answer unit is left

Slowest to write, hardest to get wrong. Best for multi-step conversions.

THE HONEST RECOMMENDATION

Use the formula method for everything simple, and dimensional analysis for anything involving weight, time, and concentration at once — the critical-care drips on page 9. Those are the problems where writing the units out saves you.



REFERENCE · MEMORIZE COLD

Twelve conversions.

If you have to think about any line on this page during an exam, you have already lost time you needed elsewhere. These should be reflex.

FROM	EQUALS
1 kilogram (kg)	1,000 grams (g)
1 gram (g)	1,000 milligrams (mg)
1 milligram (mg)	1,000 micrograms (mcg)
1 liter (L)	1,000 milliliters (mL)
1 kilogram (kg)	2.2 pounds (lb)
1 teaspoon (tsp)	5 mL
1 tablespoon (tbsp)	15 mL · 3 tsp
1 fluid ounce (fl oz)	30 mL · 2 tbsp
1 cup	240 mL · 8 fl oz
1 pint	480 mL · 2 cups
1 quart	960 mL · 2 pints
1 hour (hr)	60 minutes (min)

DIRECTION OF TRAVEL

Going down the metric ladder — kg to g to mg to mcg — you *multiply* by 1,000 and the number gets bigger. Going up, you divide. Pounds to kilograms is the one that isn't a power of ten: **divide pounds by 2.2**. Every weight-based question starts there, and a patient in pounds treated as kilograms is a 2.2-fold overdose.

The household equivalents are the rounded values U.S. nursing programs teach — 1 fl oz is really 29.57 mL. If your program teaches different figures, use your program's.

Six formulas.

Between them these cover the overwhelming majority of dosage questions on a nursing exam. Everything else is a variation.

1 · AMOUNT TO GIVE — TABLETS, CAPSULES, LIQUIDS

$$(\text{Desired} \div \text{Have}) \times \text{Quantity}$$

2 · IV FLOW RATE ON A PUMP

$$\text{mL/hr} = \text{total volume (mL)} \div \text{total time (hr)}$$

3 · DRIP RATE BY GRAVITY

$$\text{gtt/min} = (\text{volume mL} \times \text{drop factor}) \div \text{time in minutes}$$

4 · WEIGHT-BASED DOSE

$$\text{dose} = \text{ordered mg/kg} \times \text{weight in kg}$$

5 · SAFE DOSE RANGE CHECK

$$\text{low mg/kg/day} \times \text{kg} \rightarrow \text{high mg/kg/day} \times \text{kg}$$

Compare like with like — if the order is per dose, divide the range by doses per day.

6 · TITRATED DRIP (CRITICAL CARE)

$$\text{mL/hr} = (\text{dose per min} \times 60) \div \text{mcg/mL}$$

Multiply the dose by the patient's weight in kg first if it is ordered per kg.

DROP FACTORS WORTH KNOWING

Macrodrop tubing is 10, 15, or 20 gtt/mL — the box tells you which. Microdrop is always 60 gtt/mL, and that constant hides a shortcut: with microdrop tubing, **gtt/min equals mL/hr**.

WORKED EXAMPLE 1

Tablets and oral liquids.

THE ORDER

Levothyroxine 0.075 mg PO daily.

Available: 25 mcg tablets. How many tablets do you give?

1 MATCH THE UNITS FIRST

The order is in milligrams, the supply is in micrograms. Convert before you do anything else. Going down the ladder, multiply by 1,000: **0.075 mg = 75 mcg**.

2 APPLY THE FORMULA

$\text{Desired} \div \text{Have} \times \text{Quantity} = 75 \text{ mcg} \div 25 \text{ mcg} \times 1 \text{ tablet}.$

3 SANITY-CHECK IT

Three tablets is plausible, and still worth a second look at the order. Thirty would not be plausible at all.

ANSWER 3 tablets

SAME FORMULA, LIQUID FORM

Amoxicillin 400 mg PO ordered. Available: 250 mg per 5 mL.

$400 \div 250 \times 5 \text{ mL} = 1.6 \times 5 = \mathbf{8 \text{ mL}}$. Note that Quantity is 5, not 1 — with liquids the quantity is the volume the stated dose comes in. Using 1 here is the single most common error on this question type.

ONE NOTE ON THAT ORDER

In practice levothyroxine is written in micrograms — **75 mcg** — because expressing a sub-milligram dose in milligrams is exactly the decimal risk page 10 is about. Exams write it as 0.075 mg on purpose, to see whether you convert.

WORKED EXAMPLE 2

IV rates and drips.

THE ORDER

1,000 mL of 0.9% sodium chloride over 8 hours.

(a) Set the pump. (b) Then run it by gravity with 15 gtt/mL tubing.

1 PART A — THE PUMP WANTS ML PER HOUR

Total volume $\div$ total time in hours = $1,000 \text{ mL} \div 8 \text{ hr} = \mathbf{125 \text{ mL/hr}}$. It divides evenly, so there is nothing to round here.

2 PART B — GRAVITY WANTS DROPS PER MINUTE

Convert the time to minutes first: $8 \text{ hr} \times 60 = \mathbf{480 \text{ minutes}}$. Then $(\text{volume} \times \text{drop factor}) \div \text{minutes} = (1,000 \times 15) \div 480 = 15,000 \div 480 = 31.25$.

3 ROUND DROPS TO A WHOLE NUMBER

You cannot deliver a quarter of a drop. 31.25 becomes **31 gtt/min**. Drops are always whole numbers — this is one of the few places the rounding rule is absolute.

ANSWER **125 mL/hr · 31 gtt/min**

WORKED EXAMPLE 3

Weight, safety, titration.

THE ORDER

Cefazolin 50 mg/kg/day divided every 8 hours for a child weighing **44 lb**. The safe range is 25–100 mg/kg/day. Is the order safe, and what is each individual dose?

1 POUNDS TO KILOGRAMS, ALWAYS FIRST

$44 \text{ lb} \div 2.2 = 20 \text{ kg}$. Nothing else on this page is valid until this line is done.

2 TOTAL DAILY DOSE

$50 \text{ mg/kg/day} \times 20 \text{ kg} = 1,000 \text{ mg per day}$.

3 CHECK IT AGAINST THE SAFE RANGE

Low: $25 \times 20 = 500 \text{ mg/day}$. High: $100 \times 20 = 2,000 \text{ mg/day}$. The ordered 1,000 mg falls between them, so the order is **safe**. If it had not, the correct action is to hold and clarify with the prescriber — not to adjust it yourself.

4 NOW DIVIDE INTO DOSES

Every 8 hours means **3 doses** in 24 hours. $1,000 \div 3 = 333.3$, so **333 mg per dose**. Giving 1,000 mg as one dose is the trap this question is built around.

ANSWER **Safe · 333 mg per dose**

THE CRITICAL-CARE VERSION

Same logic, one more layer. **Dopamine 5 mcg/kg/min for a 70 kg patient; the bag is 400 mg in 250 mL**. Find the concentration first — $400 \text{ mg} \div 250 \text{ mL} = 1.6 \text{ mg/mL} = 1,600 \text{ mcg/mL}$. Then formula 6: $(5 \times 70 \times 60) \div 1,600 = 21,000 \div 1,600 = 13.1 \text{ mL/hr}$. The $\times 60$ converts minutes to hours; the concentration converts micrograms to millilitres. Write the units out and neither step goes missing.

Zeros and rounding.

Two students can do identical arithmetic and get different scores. The one who loses is almost always the one whose answer was right but written wrong.

THE TWO ZERO RULES (ISMP)

LEADING ZERO — ALWAYS

0.5 mg never .5 mg

A naked decimal point disappears. .5 mg reads as 5 mg — a tenfold overdose.

TRAILING ZERO — NEVER

1 mg never 1.0 mg

If the point is missed, 1.0 mg reads as 10 mg. Same error, opposite direction.

ROUNDING CONVENTIONS

MEASURE	ROUND TO
Tablets	whole or half — scored tablets only
Oral liquids, injectables	nearest tenth (0.1 mL)
Volumes under 1 mL	nearest hundredth (0.01 mL)
Drops per minute	whole number, always
mL per hour	whole number (tenths on some pumps)

ROUND ONCE, AT THE END

Rounding at each step compounds the error. Carry the full decimal through and round only the final answer — and never break an unscored, enteric-coated, or extended-release tablet, whatever the arithmetic says.

The six that cost points.

Every one of these has a tell. Learn the tell and you catch the error before the grader does.

- 01 Dividing before converting.** Units must match on both sides of the fraction before any arithmetic happens. If one side says mg and the other says mcg, stop.
- 02 Treating pounds as kilograms.** The order is per kilogram; the chart is in pounds. Skipping the $\div 2.2$ produces a 2.2-fold overdose, and it is the single most dangerous error in this chapter.
- 03 Confusing per-day with per-dose.** "Divided every 6 hours" means the daily total is split across four administrations. Handing over the day's dose at once is the classic pediatric trap.
- 04 Rounding early.** Round the final answer only. Intermediate rounding compounds and will move you off the correct choice.
- 05 Losing the decimal.** Leading zero present, trailing zero absent. Write the answer the way page 10 says to write it.
- 06 Not asking whether the answer is plausible.** Twelve tablets, 0.02 mL, 900 gtt/min — the arithmetic can be internally consistent and still absurd. The last step of every problem is looking at your answer and asking whether you would actually hand it to a patient.

The calculation is not the test. The setup is the test.

A THIRTY-SECOND HABIT WORTH BUILDING

Before you touch a calculator, write the answer's unit on the page — mL, tablets, gtt/min, mg. Deciding what you are solving for before you solve makes numbers 1 and 3 above almost impossible to commit, because the units either line up to produce it or they don't.

Ten questions.

Cold, timed, twenty minutes. Answers and full rationales on the next two pages.

- 01 Digoxin 0.25 mg PO daily is ordered. Available: 0.125 mg tablets. How many tablets?
- 02 Furosemide 60 mg IV is ordered. Available: 10 mg/mL. How many mL?
- 03 Infuse 1,500 mL D5W over 12 hours on a pump. What rate in mL/hr?
- 04 Infuse 500 mL over 4 hours by gravity, drop factor 20 gtt/mL. What rate in gtt/min?
- 05 A patient weighs 176 lb. Heparin is ordered at 18 units/kg/hr. How many units per hour?
- 06 Amoxicillin 500 mg PO is ordered. Available: 125 mg per 5 mL. How many mL?
- 07 A child weighs 33 lb. Acetaminophen 15 mg/kg per dose is ordered. What is the dose in mg?
- 08 Infuse 50 mL over 60 minutes using microdrip tubing. What rate in gtt/min?
- 09 Nitroglycerin 50 mg in 250 mL D5W is running at 20 mcg/min. What rate in mL/hr?
- 10 A child weighs 25 kg. Ampicillin 200 mg/kg/day divided every 6 hours is ordered; the safe range is 100–400 mg/kg/day. Is it safe, and what is each dose?

SHOW THE SETUP, NOT JUST THE ANSWER

Write the conversion line, then the formula line, then the arithmetic — three lines per question, on paper. When you check your work on the next two pages, a wrong answer with a visible setup tells you which of the six errors on page 11 you made. A wrong answer with no setup tells you nothing at all.

ANSWER KEY

Questions 1 – 5.

01 2 tablets

$0.25 \div 0.125 \times 1 = 2$. Units already match, so no conversion step.

02 6 mL

$60 \div 10 \times 1 \text{ mL} = 6 \text{ mL}$. Quantity is 1 because the supply is stated per single millilitre.

03 125 mL/hr

$1,500 \div 12 = 125$. Straight volume over time.

04 42 gtt/min

$4 \text{ hr} \times 60 = 240 \text{ min}$. $(500 \times 20) \div 240 = 10,000 \div 240 = 41.67$, which rounds to 42. Drops are whole numbers, so round to the nearest whole drop — not always up.

05 1,440 units/hr

$176 \div 2.2 = 80 \text{ kg}$. $18 \text{ units} \times 80 = 1,440$. The conversion is the whole question — heparin is a high-alert drug and this is why.

IF YOU MISSED 4

Go back to page 6, formula 3. Every gravity-drip question converts hours to minutes before anything else, and that is the step people skip.

IF YOU MISSED 5

Go back to page 5. The pound-to-kilogram line is the only conversion on that page that isn't a power of ten, which is exactly why it is the one that gets skipped under time pressure.

ANSWER KEY

Questions 6 – 10.

06 20 mL

$500 \div 125 \times 5 \text{ mL} = 4 \times 5 = 20 \text{ mL}$. Quantity is 5 here, not 1 — the dose is supplied per 5 mL.

07 225 mg

$33 \div 2.2 = 15 \text{ kg}$. $15 \text{ mg/kg} \times 15 \text{ kg} = 225 \text{ mg}$. Note this is per dose, not per day.

08 50 gtt/min

$(50 \times 60) \div 60 = 3,000 \div 60 = 50$. Or use the shortcut: 50 mL over 1 hr = 50 mL/hr, and with microdrip tubing gtt/min equals mL/hr. Same number, one step fewer.

09 6 mL/hr

Concentration first: $50 \text{ mg} \div 250 \text{ mL} = 0.2 \text{ mg/mL} = 200 \text{ mcg/mL}$. Then $(20 \text{ mcg/min} \times 60 \text{ min}) \div 200 \text{ mcg/mL} = 1,200 \div 200 = 6 \text{ mL/hr}$.

10 Safe • 1,250 mg per dose

$200 \times 25 = 5,000 \text{ mg/day}$. Range: $100 \times 25 = 2,500$ to $400 \times 25 = 10,000$. 5,000 sits inside it, so the order is safe. Every 6 hours is 4 doses: $5,000 \div 4 = 1,250 \text{ mg}$.

IF YOU MISSED 9

Concentration is its own step, and it is the one people try to skip. Any time a question gives you a drug in a bag — "50 mg in 250 mL" — convert that to a single number in mcg/mL *before* you go near the rate formula.

SCORING YOURSELF HONESTLY

Eight or more correct means the setup is sound and you need volume, not instruction. Five to seven means one specific habit is leaking — find it on page 11. Under five means go back to pages 5 and 6 and commit them properly before doing any more questions. More practice on a broken setup just makes the setup faster.

The five-day drill.

Dosage calculation is a motor skill. It decays if you touch it once a month and becomes automatic if you touch it daily for two weeks. Tick a box each time you complete a block — five columns, so you can run the cycle five times. Practice problems come from your course materials, your textbook's chapter sets, or the full system on page 16.

- Day 1 — Write the twelve conversions from memory

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- Day 2 — Write the six formulas from memory

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- Day 3 — Ten oral dose problems, timed

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- Day 4 — Ten IV rate and drip problems, timed

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- Day 5 — Ten weight-based and safe-range problems

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TRACK WHAT YOU MISS

- Missed a conversion

☐☐☐☐☐
- Missed a setup

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- Missed the rounding

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- Missed per-dose vs per-day

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- Answer was implausible

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THE PATTERN IS THE POINT

After two weeks, look at which row has the most ticks. That is not a knowledge gap spread across the topic — it is one specific habit, and one habit can be fixed in an afternoon.

Twenty minutes a day for two weeks will do more for this than one six-hour Sunday ever will.



WHAT'S NEXT

This was one chapter.

Dosage calculation sits inside Pharmacological and Parenteral Therapies — which, under the NCLEX-RN test plan effective April 2026, is 13–19% of your exam — one of the largest content areas on it. Worth getting automatic.

The rest of the exam still needs the same treatment: lab values, positioning, delegation, priority, the medications that actually recur. That is what the full system is — the same compression applied to everything else.

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