NAPLEX Calculations Quick-Reference Sheet

For the North American Pharmacist Licensure Examination (NAPLEX): key formulas with units, common conversions, frequent traps, and eight short worked examples. Version 1.1, October 2026.

How to use this sheet

- **Learn the setup, not just the formula.** For each line, say out loud which units go in and which unit comes out.
- **Cover the worked examples** and solve them yourself first, then compare each step: formula, substitution, calculation, answer.
- **Always follow the question.** If an item states which weight, rounding rule, or equation to use, that instruction beats any default on this sheet.
- **Log your misses** by trap type (units, weight choice, rounding, salt form) so you can see patterns over time.

1. Patient parameters

Quantity	Formula	Units and notes
Creatinine clearance (CrCl), Cockcroft-Gault	**CrCl = [(140 − age) × weight] ÷ (72 × SCr)** Multiply the result by 0.85 for females.	Age in years, weight in kg, serum creatinine (SCr) in mg/dL; result in mL/min.
Ideal body weight (IBW), Devine	**Male: 50 kg + 2.3 kg per inch over 5 ft** **Female: 45.5 kg + 2.3 kg per inch over 5 ft**	Result in kg. Intended for heights of 5 ft (60 in) or more.
Adjusted body weight (AdjBW)	**AdjBW = IBW + 0.4 × (TBW − IBW)**	TBW = total (actual) body weight in kg. Used when TBW is well above IBW.
Which weight for CrCl?	A common teaching default: TBW if TBW < IBW; IBW if TBW is near IBW; AdjBW if TBW is well above IBW (commonly > 120% or > 130% of IBW).	Cut-offs differ between institutions and references. Use the rule the question gives.
Body surface area (BSA), Mosteller	**BSA = √[(height cm × weight kg) ÷ 3,600]** US units: √[(height in × weight lb) ÷ 3,131]	Result in m^2. Used for many oncology and pediatric doses (mg/m^2).

2. Intravenous (IV) flow rates

Quantity	Formula	Units and notes
Volume rate	**mL/h = total volume (mL) ÷ time (h)**	Convert minutes to hours first (divide by 60).

Quantity	Formula	Units and notes
Drip rate	**gtt/min = [volume (mL) × drop factor (gtt/mL)] ÷ time (min)**	Common sets: 10, 15, or 20 gtt/mL (macrodrip); 60 gtt/mL (microdrip). Round to a whole drop.
Weight-based dose to pump rate	**mL/h = [dose (mcg/kg/min) × weight (kg) × 60] ÷ concentration (mcg/mL)**	The × 60 converts per minute to per hour. Concentration = drug amount ÷ bag volume.
Pump rate to dose	**mcg/kg/min = [rate (mL/h) × concentration (mcg/mL)] ÷ (weight × 60)**	Same equation rearranged; useful for "what dose is the patient receiving?"

3. Concentrations, dilution, and compounding

Quantity	Formula	Units and notes
Percent weight in volume (% w/v)	**grams of solute per 100 mL**	5% w/v = 5 g/100 mL = 50 mg/mL. Default for solids dissolved in liquids.
Percent weight in weight (% w/w)	**grams of solute per 100 g of product**	Ointments, creams, powders.
Percent volume in volume (% v/v)	**mL of solute per 100 mL of product**	Liquids in liquids, such as alcohol.
Ratio strength	**1:x means 1 g in x mL** (solid in liquid) or 1 g in x g (w/w) Convert: **% = 100 ÷ x**; and **x = 100 ÷ %**	1:1,000 = 0.1% = 1 mg/mL. 1:10,000 = 0.01% = 0.1 mg/mL.
Dilution and concentration	**C1 × V1 = C2 × V2** (or Q1 × C1 = Q2 × C2 for weights, where Q = quantity in g)	Both concentrations must be in the same units (both % or both ratio converted to %).
Alligation alternate	Parts of **higher** strength = desired − lower Parts of **lower** strength = higher − desired	Divide each part by total parts, then multiply by the total amount needed. Use 0% for a diluent (base, water).
Specific gravity (SG)	**SG = weight of substance (g) ÷ weight of an equal volume of water (g)** **grams = mL × SG**; **mL = grams ÷ SG**	SG has no units. Water has SG 1.0 (1 mL weighs about 1 g).

4. Electrolytes and osmolarity

Quantity	Formula	Units and notes
Milliequivalents (mEq)	**mEq = (mg × valence) ÷ molecular weight** **mg = (mEq × molecular weight) ÷ valence**	Molecular weight (MW) in g/mol (equal to mg/mmol). Valence is the total charge of the cation or anion.
Millimoles (mmol)	**mmol = mg ÷ molecular weight**	For a monovalent ion, 1 mmol = 1 mEq.
Milliosmoles (mOsmol)	**mOsmol = mmol × number of particles** **mOsmol/L = [(g/L) ÷ MW] × particles × 1,000**	"Ideal" value assuming complete dissociation. NaCl = 2 particles; $CaCl_2$ = 3; dextrose = 1 (does not dissociate).

Common compound or ion	MW (g/mol)	Valence used for mEq	Particles
Sodium chloride (NaCl)	58.5	1	2
Potassium chloride (KCl)	74.5	1	2
Sodium bicarbonate ($NaHCO_3$)	84	1	2
Calcium chloride dihydrate ($CaCl_2 \cdot 2H_2O$)	147	2	3
Magnesium sulfate heptahydrate ($MgSO_4 \cdot 7H_2O$)	246.5	2	2
Ions: Na^+ 23, K^+ 39, Cl^- 35.5, Ca^{2+} 40, Mg^{2+} 24.3	Use the MW printed in the question if one is given; rounded values change answers slightly.		

5. Pharmacokinetics (one-compartment, first-order)

Quantity	Formula	Units and notes
Elimination rate constant (k)	**k = ln(C1 ÷ C2) ÷ (t2 − t1)**	Units h^{-1}. Use natural log (ln), not $\log_{10}$. Both levels must be in the elimination phase.
Concentration over time	**$C = C0 \times e^{-kt}$**	C0 = starting concentration.
Half-life (t½)	**t½ = 0.693 ÷ k**	Same time unit as k.
Volume of distribution (Vd)	**Vd = (F × S × dose) ÷ C0**	Liters (L) or L/kg. F = bioavailability; S = salt factor (fraction that is active drug).
Clearance (CL)	**CL = k × Vd**	L/h. Check units: $(h^{-1})(L)$ = L/h.
Loading dose (LD)	**LD = (C target × Vd) ÷ (F × S)** If drug is already present: (C target − C current) × Vd ÷ (F × S)	mg, when C is in mg/L and Vd in L.

Quantity	Formula	Units and notes
Maintenance dose (MD)	**MD = (Css × CL × τ) ÷ (F × S)**	τ (tau) = dosing interval in hours.
Average steady-state concentration	**Css,avg = (F × S × dose) ÷ (CL × τ)**	mg/L.
Continuous infusion steady state	**Css = (S × infusion rate) ÷ CL**	Infusion rate in mg/h; CL in L/h.
Time to steady state	Fraction reached = $1 - (½)^n$, where n = number of half-lives	About 90% at 3.3 half-lives; about 97% at 5 half-lives.

6. Biostatistics

Quantity	Formula	Units and notes
Event rates	**CER** = events ÷ total in control group; **EER** = events ÷ total in experimental group	CER = control event rate; EER = experimental event rate. Use decimals in the formulas below.
Absolute risk reduction (ARR)	**ARR = CER − EER**	Expressed as a decimal or percentage points.
Relative risk (RR)	**RR = EER ÷ CER**	RR < 1 means lower risk with the experimental treatment.
Relative risk reduction (RRR)	**RRR = ARR ÷ CER** (equivalently 1 − RR)	Often looks larger than ARR; know both.
Number needed to treat (NNT)	**NNT = 1 ÷ ARR**	ARR as a decimal. Round **up** to a whole patient. State the time frame of the study.
Number needed to harm (NNH)	**NNH = 1 ÷ ARI**, where ARI = EER (harm) − CER (harm)	ARI = absolute risk increase. Rounding conventions for NNH vary (many references round **down**); follow the question.

7. Common unit conversions

Conversion	Value	Conversion	Value
1 kilogram	2.2 lb	1 teaspoon (tsp)	5 mL
1 pound (avoirdupois)	454 g	1 tablespoon (tbsp)	15 mL
1 ounce (avoirdupois)	28.35 g	1 fluid ounce	29.57 mL (often rounded to 30 mL)
1 grain	64.8 mg (often rounded to 65 mg)	1 pint (16 fl oz)	473 mL

Conversion	Value	Conversion	Value
1 inch	2.54 cm	1 gallon	3,785 mL
1 g = 1,000 mg	1 mg = 1,000 mcg	1 L = 1,000 mL	1 mL of water ≈ 1 g
1 mcg/mL	1 mg/L	1 mg/dL	10 mg/L
°C from °F	(°F − 32) ÷ 1.8	°F from °C	(°C × 1.8) + 32
Dextrose (IV, monohydrate)	3.4 kcal/g	Amino acids (protein)	4 kcal/g
Fat	9 kcal/g	Nitrogen (g)	protein (g) ÷ 6.25

Lipid emulsion calories (for example, about 2 kcal/mL for many 20% products) vary by product; use the value on the label or in the question.

Abbreviations: AdjBW, adjusted body weight; ARI, absolute risk increase; ARR, absolute risk reduction; BSA, body surface area; C, concentration (C0, starting; C1 and C2, first and second); CER, control event rate; CL, clearance; CrCl, creatinine clearance; Css, steady-state concentration; EER, experimental event rate; F, bioavailability; gtt, drops; h, hour; IBW, ideal body weight; IV, intravenous; k, elimination rate constant; kcal, kilocalorie; LD, loading dose; ln, natural logarithm; MD, maintenance dose; mcg, microgram; mEq, milliequivalent; mmol, millimole; mOsmol, milliosmole; MW, molecular weight; NNH, number needed to harm; NNT, number needed to treat; RR, relative risk; RRR, relative risk reduction; S, salt factor; SCr, serum creatinine; SG, specific gravity; t½, half-life; TBW, total body weight; Vd, volume of distribution; v/v, w/v, w/w, volume in volume, weight in volume, weight in weight; τ, dosing interval.

8. Common traps

Pounds vs kilograms. Convert weight before using any per-kg formula.	**Ratio strength.** Convert 1:x to a percent before using C1V1 = C2V2.
Inches over 5 feet. IBW uses only the inches above 60, not total height.	**Divalent ions.** Calcium and magnesium have valence 2 in the mEq formula.
The 0.85 factor applies to the whole female Cockcroft-Gault result, once.	**Particles.** Dextrose does not dissociate; salts do. Count each ion.
Wrong weight. Check TBW vs IBW before choosing TBW, IBW, or AdjBW.	**Hydrates and salts.** Use the MW of the form actually weighed (for example, $CaCl_2 \cdot 2H_2O$), and the salt factor S for drugs given as salts.
Minutes vs hours. mcg/kg/*min* doses need × 60 to reach mL/*h*.	**ln vs log.** Kinetics uses the natural log; $\log_{10}$ gives the wrong k.
mg vs mcg. Convert the bag concentration to the same unit as the dose.	**Rounding.** Round only at the end, round NNT up, and round drops to whole numbers.

9. Worked examples

All examples are original practice problems. Values are rounded at the final step unless noted.

Example 1: Adjusted body weight and creatinine clearance

A 72-year-old woman weighs 154 lb, is 5 ft 4 in tall, and has a serum creatinine of 1.2 mg/dL. Her actual weight is more than 120% of her ideal body weight, so the protocol says to use adjusted body weight. Estimate her creatinine clearance with the Cockcroft-Gault equation.

Formula	IBW (female) = 45.5 + 2.3 × (inches over 5 ft); AdjBW = IBW + 0.4 × (TBW − IBW); CrCl = [(140 − age) × weight] ÷ (72 × SCr) × 0.85
Substitution	TBW = 154 ÷ 2.2 = 70 kg. IBW = 45.5 + 2.3 × 4 = 54.7 kg (70 ÷ 54.7 = 128% of IBW). AdjBW = 54.7 + 0.4 × (70 − 54.7) = 54.7 + 6.12 = 60.82 kg.
Calculation	140 − 72 (age) = 68, and 68 × 60.82 = 4,135.8. Denominator: 72 × 1.2 = 86.4. 4,135.8 ÷ 86.4 = 47.868; then 47.868 × 0.85 = 40.7
Answer	**CrCl ≈ 41 mL/min**

Example 2: BSA-based dose

An adult patient is 170 cm tall and weighs 68 kg. A drug is ordered at 75 mg/m^2. Calculate the dose using the Mosteller formula.

Formula	BSA = √[(height cm × weight kg) ÷ 3,600]; dose = mg/m^2 × BSA
Substitution	BSA = √[(170 × 68) ÷ 3,600] = √(11,560 ÷ 3,600) = √3.211
Calculation	BSA = 1.792 m^2 (about 1.79 m^2); dose = 75 mg/m^2 × 1.792 m^2 = 134.4 mg
Answer	**Dose ≈ 134 mg**

Example 3: Weight-based infusion to mL/h

Dopamine is ordered at 5 mcg/kg/min for an 80-kg patient. The premixed bag contains dopamine 400 mg in 250 mL. At what rate in mL/h should the pump be set?

Formula	mL/h = [dose (mcg/kg/min) × weight (kg) × 60] ÷ concentration (mcg/mL)
Substitution	Concentration = 400 mg ÷ 250 mL = 1.6 mg/mL = 1,600 mcg/mL. Hourly dose = 5 × 80 × 60 = 24,000 mcg/h.
Calculation	24,000 mcg/h ÷ 1,600 mcg/mL = 15 mL/h
Answer	**15 mL/h**

Example 4: Ratio strength and dilution

How many milliliters of a 1:1,000 (w/v) stock solution are needed to prepare 200 mL of a 1:5,000 (w/v) solution?

Formula	% = 100 ÷ x (for ratio 1:x); C1 × V1 = C2 × V2
Substitution	1:1,000 = 100 ÷ 1,000 = 0.1%. 1:5,000 = 100 ÷ 5,000 = 0.02%. So 0.1% × V1 = 0.02% × 200 mL.
Calculation	V1 = (0.02 × 200) ÷ 0.1 = 4 ÷ 0.1 = 40 mL
Answer	**40 mL of stock, diluted to a final volume of 200 mL**

Example 5: Alligation

A pharmacist needs 120 g of a 4% (w/w) ointment and has 10% and 2% (w/w) ointments of the same drug in stock. How many grams of each should be mixed?

Formula	Parts of higher = desired − lower; parts of lower = higher − desired; amount = (parts ÷ total parts) × total needed
Substitution	Parts of 10% = 4 − 2 = 2. Parts of 2% = 10 − 4 = 6. Total = 8 parts.
Calculation	10%: (2 ÷ 8) × 120 g = 30 g. 2%: (6 ÷ 8) × 120 g = 90 g. Check: 3 g + 1.8 g = 4.8 g of drug in 120 g = 4%.
Answer	**30 g of the 10% ointment + 90 g of the 2% ointment**

Example 6: Milliequivalents and osmolarity

How many milliequivalents of sodium are in 500 mL of 0.45% (w/v) sodium chloride, and what is the calculated (ideal) osmolarity of the solution? Use NaCl MW 58.5 and assume complete dissociation into 2 particles.

Formula	mEq = (mg × valence) ÷ MW; mOsmol/L = [(g/L) ÷ MW] × particles × 1,000
Substitution	NaCl in 500 mL = 0.45 g/100 mL × 500 mL = 2.25 g = 2,250 mg. Concentration = 4.5 g/L.
Calculation	mEq Na = (2,250 × 1) ÷ 58.5 = 38.5 mEq. Osmolarity = (4.5 ÷ 58.5) × 2 × 1,000 = 0.0769 × 2 × 1,000 = 153.8 mOsmol/L
Answer	**About 38.5 mEq of sodium in 500 mL; about 154 mOsmol/L**

Example 7: Elimination rate constant and half-life

After an IV dose, two plasma concentrations are measured during the elimination phase: 12 mg/L at 2 hours and 3 mg/L at 8 hours. Calculate the elimination rate constant and the half-life.

Formula	k = ln(C1 ÷ C2) ÷ (t2 − t1); t½ = 0.693 ÷ k
Substitution	k = ln(12 ÷ 3) ÷ (8 − 2) = ln 4 ÷ 6

Calculation	k = 1.386 ÷ 6 = 0.231 h^{-1}; t½ = 0.693 ÷ 0.231 = 3.0 h. Check: 12 → 6 → 3 mg/L is two half-lives in 6 hours.
Answer	**k ≈ 0.231 h^{-1}; t½ ≈ 3 hours**

Example 8: ARR, RRR, and NNT

In a 2-year trial, a stroke occurred in 15% of patients taking placebo and in 11% of patients taking a new drug. Calculate the absolute risk reduction, relative risk reduction, and number needed to treat.

Formula	ARR = CER − EER; RRR = ARR ÷ CER; NNT = 1 ÷ ARR
Substitution	CER = 0.15; EER = 0.11
Calculation	ARR = 0.15 − 0.11 = 0.04 (4%). RRR = 0.04 ÷ 0.15 = 0.267 (26.7%). NNT = 1 ÷ 0.04 = 25.
Answer	**ARR 4%; RRR about 27%; NNT 25 patients treated for 2 years to prevent one stroke**

Practice next (free)

- Free CalcQuest calculation challenges (renal dose check, alligation, infusion case ladder): rxboardprep.com/play/
- NAPLEX Calculations: a 4-week practice plan: rxboardprep.com/naplex-calculations-4-week-practice-plan/
- Free NAPLEX Mock Exams 1 and 2: rxboardprep.com/free-practice-exams/#naplex-free-exams
- How to review a mock exam (the 5S method): rxboardprep.com/how-to-review-naplex-mock-exam/

Looking for structured preparation? See rxboardprep.com/naplex-prep/.

Sources for the named equations

1. Cockcroft DW, Gault MH. Prediction of creatinine clearance from serum creatinine. *Nephron*. 1976;16(1):31-41.
2. Devine BJ. Gentamicin therapy. *Drug Intell Clin Pharm*. 1974;8:650-655 (source of the ideal body weight equation).
3. Mosteller RD. Simplified calculation of body-surface area. *N Engl J Med*. 1987;317(17):1098.

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