PHARM TECH BASICS · ONE-PAGER

Pharmacy Math

Conversions, days supply, doses, reconstitution, dilution, percent and ratio strength, alligation, IV rates, mEq, pediatric dosing and business math, each with a worked example

27 sources + more detail
pharmtechbasics.com/sheets/pharm-math.html
checked Nov 2026

1 Conversions

UNIT	EXAM VALUE	EXACT VALUE (NIST) OR NOTE
1 teaspoon (tsp)	5 mL	4.93 mL; FDA labeling uses 5 mL
1 tablespoon (tbsp)	15 mL (3 tsp)	14.79 mL
1 fluid ounce (fl oz)	30 mL	29.57 mL; 16 fl oz (1 pint) = 473 mL
1 gallon	3,785 mL (128 fl oz)	3.785 L; 3,840 mL if a question uses 30 mL per ounce
1 pound (lb)	454 g (16 oz)	453.59 g
1 kilogram (kg)	2.2 lb	2.2046 lb
1 ounce by weight (oz)	28.35 g	FDA food labels round to 28 g
1 grain (gr)	65 mg	64.8 mg; thyroid tablets are labeled 60 mg per grain
Metric steps	1 g = 1,000 mg; 1 mg = 1,000 mcg; 1 L = 1,000 mL	1 inch = 2.54 cm
Temperature	°C = (°F − 32) ÷ 1.8; °F = (°C × 1.8) + 32	98.6°F = 37°C; 2–8°C = 36–46°F; 20–25°C = 68–77°F

2 Dispensing math

PROBLEM	FORMULA	WORKED EXAMPLE
Ratio and proportion	have ÷ per = want ÷ x; cross-multiply	250 mg/5 mL, need 400 mg: 250 ÷ 5 = 400 ÷ x, x = 8 mL
Dose volume	volume = dose ÷ concentration	Epinephrine 1 mg/mL, dose 0.3 mg: 0.3 mL
Quantity to dispense	units per dose × doses per day × days	2 tablets three times daily for 10 days: 60 tablets
Days supply, tablets	quantity ÷ units per day, round down	100 tablets, 1 three times daily: 33.3, so 33 days
Days supply, liquid	mL dispensed ÷ mL per day	150 mL, 1 tsp (5 mL) three times daily: 150 ÷ 15 = 10 days
Days supply, insulin	(units/mL × mL) ÷ units per day; no more than the in-use limit	10 mL vial of U-100 = 1,000 units at 20 units daily: 50 by math, but an opened vial lasts 28 days, so 28
Days supply, inhaler	puffs in canister ÷ most puffs allowed per day	200 puffs, 2 puffs every 4 hours as needed (12 a day): 16 days
Days supply, eye drops	(mL × drops per mL) ÷ drops per day	5 mL at 20 drops/mL = 100 drops; 1 drop both eyes twice daily (4 a day): 25 days
Weight-based dose	kg × mg/kg/day ÷ doses per day	35.2 lb = 16 kg; 25 mg/kg/day every 12 hours: 400 mg/day, 200 mg a dose, 2.5 mL of 400 mg/5 mL
Reconstitution	powder volume = final volume − diluent added	Amoxicillin 400 mg/5 mL, 100 mL bottle, 68 mL water: powder takes 32 mL

3 Compounding, IV and dosing formulas

PROBLEM	FORMULA	WORKED EXAMPLE
Percent w/v	grams per 100 mL	D5W is 5 g/100 mL: 50 g dextrose in 1,000 mL
Percent w/w	grams per 100 g	1% cream, 30 g tube: 0.3 g (300 mg) of drug
Percent v/v	mL per 100 mL	70% isopropyl alcohol, 480 mL: 336 mL alcohol
Ratio strength	1:x = 1 g in x mL total	1:1,000 = 1 g/1,000 mL = 1 mg/mL = 0.1%
Dilution	C1 × V1 = C2 × V2	500 mL of D10 from D50: 10 × 500 ÷ 50 = 100 mL D50 + 400 mL diluent
Alligation (ExCPT)	parts of stronger = want − weaker; parts of weaker = stronger − want	60 g of 2.5% from 10% and 1%: 1.5 + 7.5 = 9 parts, so 10 g of 10% + 50 g of 1%
IV rate	mL/h = total mL ÷ hours	1,000 mL over 8 hours: 125 mL/h
Drip rate	gtt/min = mL/h × drop factor ÷ 60	125 mL/h, 15 gtt/mL set: 31.25, so 31 gtt/min (a 60 gtt/mL set: 125)
Infusion time	hours = volume ÷ mL/h	1,000 mL at 80 mL/h = 12.5 hours: started 0800, ends 2030
Milliequivalents	mEq = mg × valence ÷ molecular weight	KCl 1,500 mg × 1 ÷ 74.55 = 20 mEq
BSA (Mosteller)	$m^2 = \sqrt{(\text{height cm} \times \text{weight kg} \div 3{,}600)}$	180 cm, 80 kg: $\sqrt{4} = 2.0\ m^2$; at 75 mg/m², 150 mg
Pediatric rules	Clark: lb ÷ 150 × adult dose; Young: age ÷ (age + 12) × adult; Fried: months ÷ 150 × adult	Adult dose 500 mg: 44 lb child 147 mg; 6-year-old 167 mg; 9-month-old 30 mg

4 Business math

MEASURE	FORMULA	WORKED EXAMPLE
Markup	price = cost × (1 + markup %)	Cost $24, 25% markup: $30
Gross profit	selling price − cost of the drug	$30 − $24 = $6 (margin $6 ÷ $30 = 20%)
Net profit	gross profit − operating costs	$6 − $4 cost to dispense = $2
AWP-based price	AWP − discount % + dispensing fee	AWP $100, paid AWP − 15% + $2: $85 + $2 = $87
Inventory turnover	annual purchases ÷ average inventory	Purchases $1,200,000; inventory $110,000 at the start and $130,000 at the end (average $120,000): 10 turns; 365 ÷ 10 = 36.5 days on the shelf

EXAM TIP Exams: write the units, convert first, cancel units, then ask whether the answer is sensible. Round days supply down to whole days and drops to whole drops. The PTCE outline effective January 6, 2026 no longer lists alligation; the ExCPT still tests it (K.120).

SAFETY The technician does the arithmetic; the pharmacist verifies every calculated dose, every pediatric or weight-based dose and every compounded product. Write a leading zero (0.5 mg) and never a trailing zero (5 mg, not 5.0 mg): a lost decimal point is a tenfold error.

The app's calculators do days supply, dilution (C1V1), alligation, percent and ratio strength, milliequivalents, markup and IV rate, drip rate and infusion time.

MORE Setting up any calculation

1. Write down what you have and what you want, each with its unit.
2. Convert everything to the same units first: pounds to kilograms, teaspoons to mL, grams to mg.
3. Set up a proportion, or multiply by conversion fractions so the unwanted units cancel (dimensional analysis).
4. Estimate before you trust the number: a child's dose should be smaller than an adult's, and a days supply of 300 for a 30-tablet bottle is wrong.
5. Round only at the end, using the rule the question or the pharmacy gives.

Dimensional analysis example: a patient needs 400 mg from a 250 mg/5 mL suspension. 400 mg × (5 mL ÷ 250 mg) = 8 mL. The mg cancel and mL are left, which is the unit you want.

Roman numerals still appear in quantities on prescriptions (PTCE 4.1).

ROMAN NUMERAL	VALUE	EXAMPLE
I, V, X	1, 5, 10	#XV = 15 tablets
L, C	50, 100	#LX = 60 tablets
D, M	500, 1,000	MD = 1,500
Smaller before larger subtracts	IV = 4, IX = 9, XC = 90	#XC = 90 tablets

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