

## How to Solve Drug Calculations

- **Identify what type of drug calculation** and as a first step, **use common sense to estimate a rough answer.**  
In many cases, drawing a picture that visually represents the problem is often a helpful strategy.
- Remember that a formula often used for working out how many *tablets* to take or for a *drug taken orally or injected* is:

$$\text{volume required} = \frac{\text{Strength Required}}{\text{Stock Strength}} \times \frac{\text{volume of stock}}{1}$$

You can think of  
Sunrise SR  
Sunset SS  
To remember this formula

- Remember that a formula often used to work out the number of drops per minute delivered by an *intravenous infusion* is:

$$\text{drip rate (dpm)} = \frac{\text{volume(mL)} \times \text{drops / mL}}{\text{time(h)} \times 60}$$

Note: dpm stands for *drops per minute*

- Remember that for *intravenous infusion*, sometimes you are asked to calculate volume, time, or rate, and the following formulae can be useful:

$$\text{volume(mL)} = \text{rate(mL / h)} \times \text{time(h)}$$

$$\text{rate} = \frac{\text{volume(mL)}}{\text{time(h)}}$$

$$\text{time(h)} = \frac{\text{volume(mL)}}{\text{rate(mL / h)}}$$

- After applying the formula (if relevant), or calculating an exact answer using common sense, go back and check: is your final answer close to your initial estimate? If not, why not?

## Example 1: Drug Made Up From Stock Solution

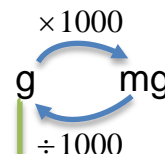
This example illustrates how to work out injections or orally taken drugs made up from stock solution – for example, working out how many mLs to inject when the drug is in a stock solution.

**A patient is ordered 70mg of pethidine. Find the volume required if the stock solution contains 10g of pethidine per 200mL.**

To solve:

- Rough answer? More than 1mL and a lot less than 200mL
- Note down the strength of medication the patient needs and the stock strength  
**Strength Required** is 70mg, **Stock Strength** is 10g in 200mL
- Since you need units to be the same, convert 10g to mg by multiplying by 1000:
  - 10g = 10 x 1000 mg = 10,000mg

Conversion Tip



Now put this value into the equation:

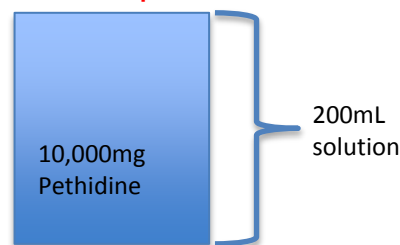
$$\text{volume required} = \frac{\text{Strength Required}}{\text{Stock Strength}} \times \frac{\text{volume of stock}}{1}$$

$$\text{volume required} = \frac{70}{10000} \times \frac{200}{1} \text{ mL} = \frac{14000}{10000} \text{ mL} = \frac{14}{10} \text{ mL} = 1.4 \text{ mL}$$

Answer

Notice that 70mg (what the patient needs) is a very small part of this 10,000mg – so you expect your answer in mL to be much smaller than 200mL .

Visual Representation



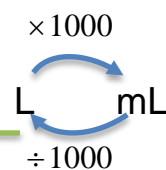
## Example 2: Intravenous Infusion

This example indicates how many mLs to give in a certain time, and how many drops per minute a patient will receive.

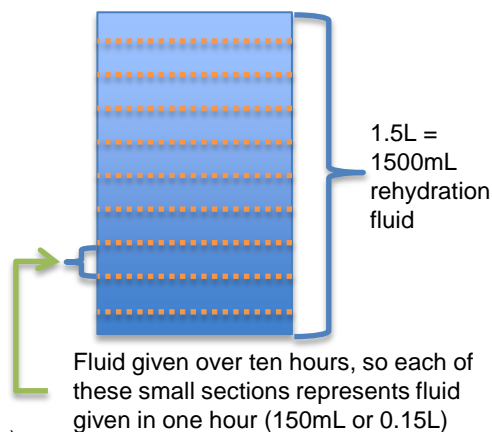
**A teenager who is badly dehydrated is to receive 1.5 L over 10 hours of rehydration fluid by IV infusion. The giving set delivers 20 drops/mL. Calculate the drip rate.**

- Rough answer? Since the drops per mL is 20, and there are 60 minutes in an hour, you'll calculate an answer in drops per mL by multiplying the fluid per hour by 20/60 = 1/3. So one-third of your mL per hour (150mL) should be your answer – i.e. 50mL.
- Remember drip rate is calculated in *drops per minute*
- Notice units of rehydration fluid (L) different from giving set (mL), so convert 1.5L to mL by multiplying by 1000:
  - 1.5L = 1.5 x 1000 mL = 1500mL

Conversion Tip



Visual Representation



$$\text{drip rate (dpm)} = \frac{\text{volume(mL)} \times \text{drops / mL}}{\text{time(h)} \times 60}$$

$$\text{drip rate} = \frac{1500 \times 20}{10 \times 60} = \frac{1500 \times 20}{10 \times 60} = \frac{150 \times 2^{+2}}{1 \times 6_{-2}} = \frac{150 \times 1}{1 \times 3} = \frac{150}{3} = 50 \text{ dpm}$$

Answer

(agrees with estimation)

# Drug Calculations

## Example 3: Tablets Taken Orally

This example illustrates how to calculate how many tablets to give for a certain dose.

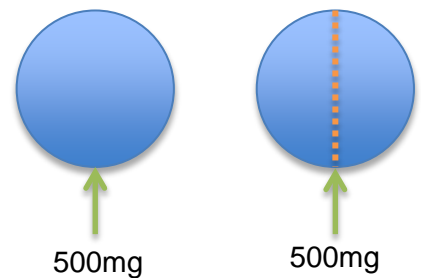
750mg of ciprofloxacin is prescribed. On hand are 500mg tablets. How many tablets should be given?

- Rough Answer? More than one tablet and less than two
- Note down the strength of medication the patient needs and the stock strength:

**Strength Required** is 750mg  
**Stock Strength** is 500mg

Same units already  
so no need to  
convert

### Visual Representation



Each tablet is 500mg since that is the stock strength. Since the strength required is 750mg (=500+250mg), and half a tablet will be 250mg, the patient will need one and a half tablets.

$$\text{volume required} = \frac{\text{Strength Required}}{\text{Stock Strength}} \times \frac{\text{volume of stock}}{1}$$

$$\text{volume required} = \frac{750}{500} \times \frac{1}{1} = \frac{750}{500} = \frac{3}{2} = 1.5 \text{ tablets} \quad \text{Answer}$$

When administering tablets, the volume of stock is always just 1, since the tablets are not supplied in a solution.

## Example 4: Intravenous Infusion

This example illustrates how to calculate how much fluid a patient receives.

A patient is receiving 100mL/h of a solution for 1.5 hours.  
How much fluid are they receiving?

- Rough answer? If the patient gets 100mL in an hour they would get half of that (50mL) in half an hour so expected answer is 150mL
- Note you're asked for the **volume** of fluid (how many mL the patient gets in total), rather than the drip rate, so this formula is appropriate:

$$\text{volume(mL)} = \text{rate(mL/h)} \times \text{time(h)}$$

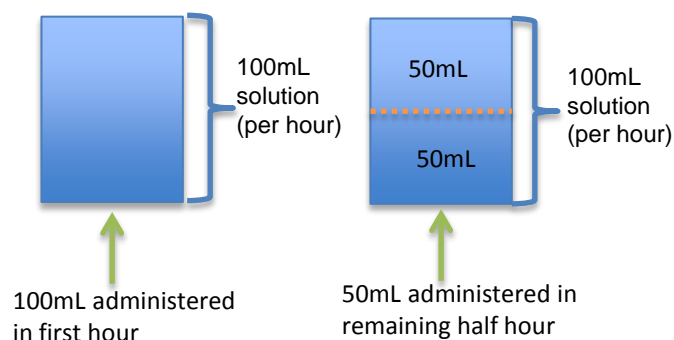
Note: rate = 100mL/h, time = 1.5 h

So volume = 100 x 1.5 = 150mL

**Answer**

(agrees with estimation)

### Visual Representation





# Drug Calculations

## Example 5: Intravenous Infusion

This example illustrates how to work out how long an infusion will take.

**A patient is prescribed 2L of a dextrose saline solution. The flow rate is set at 160mL/h. How long will the infusion take?**

- Rough answer? Since 2L = 2000mL and the flow rate is 160mL per hour, you need to work out how many lots of 160mL add up to 2000 to get your answer. A rough guess could be between 10 and 15 hours.
- Notice units of saline (L) different from mL used in flow rate, so convert 2L to mL by multiplying by 1000:  
 $2L \times 1000 = 2000mL$
- We need to calculate the **time**, so this formula is appropriate.

$$time(h) = \frac{volume(mL)}{rate(mL/h)}$$

Note: volume = 2000mL  
rate = 160mL/h

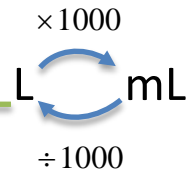
$$time = \frac{2000}{160} = \frac{200^{\div 4}}{16^{\div 4}} = \frac{50^{\div 2}}{4^{\div 2}} = \frac{25}{2} = 12.5 \text{ hours}$$

**Answer**  
(agrees with estimation)

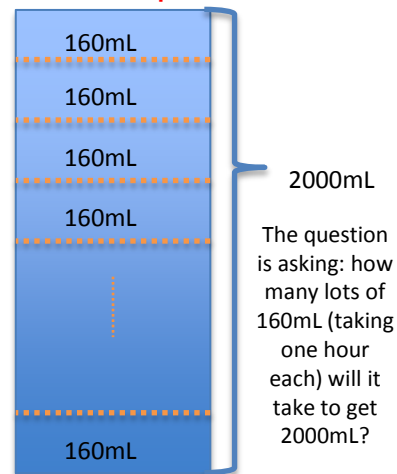
How to divide 25 by 2:

$$\begin{array}{r} 12.5 \\ 2 \overline{)25.0} \end{array}$$

### Conversion Tip



### Visual Representation



## Example 6: Dilution

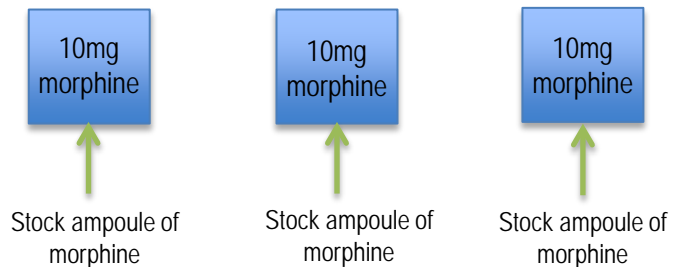
This example illustrates how to dilute a drug to the required concentration.

Prepare a morphine infusion 30mg to be made up to a final volume of 30mLs. Stock ampoules of morphine contain 10mg/mL. A strength of 1mg/mL is required. How much normal saline would need to be added to the syringe?

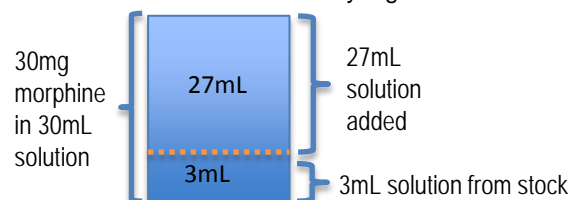
To solve:

- Since stock ampoules of morphine each contain 10mg morphine, you need 3 stock ampoules to get 30mg ( $3 \times 10 = 30$ ).
- Those three stock ampoules come in a total of 3mL of solution ( $1mL + 1mL + 1mL = 3mL$ ).
- So, just from your stock, you have 30mg morphine in 3mL solution.
- You want 30mg morphine in 30mL solution, so you add 27mL saline solution to the syringe ( $30 - 3 = 27$ ).

### Visual Representation



There is 10mg morphine in each stock ampoule, so you need 3 stock ampoules ( $3 \times 10mg = 30mg$ ) to get the required 30mg morphine. These stock ampoules come in a total of 3mL of solution ( $1mL + 1mL + 1mL = 3mL$ ). Since you need your 30mg to be in 30mL of solution, you need to add  $30 - 3 = 27mL$  saline to the syringe.



# Drug Calculations

## Practice Questions

### Exercise set 1

- 1) How much is drawn from a patient ordered an injection of 80mg of pethidine? Each stock ampoule contains 100mg per 1 mL.
- 2) A child requires 50 milligrams of Phenobarbitone. If stock ampoules contain 200 milligrams in 2mL, how much will you draw up?
- 3) What volume is required for the injection if a patient is ordered 500mg of capreomycin sulphate, & each stock ampoules contains 300mg/mL?
- 4) A patient needs 5000mg of medication. Stock solution contains 1g per 1mL. What volume is required?
- 5) If 1000mg of chloramphenicol is given & stock on hand contains 250mg/10mL in suspension, calculate the volume required.
- 6) A patient is prescribed 3g of sulphadiazine, the stock contains 600mg/5mL. How much stock should be given to the patient?
- 7) Complete the following table:

Strength Required	Stock	Volume Required
i) 1000U	1000U/2mL	
ii) 1.25micrograms	2.5micrograms/1mL	
iii) 20mg	100mg/50mL	
iv) 1megaunit	1megaunit/10mL	
v) 4g	1g/5mL	

### Exercise set 2

- 1) 500ml is to infuse over a 5 hour period. Find the flow rate in mL/h.
- 2) Mr Smith is to receive 800mL of an antibiotic via an IV infusion over 15 hours. Calculate the flow rate to be set.
- 3) An infusion is to run for 30 minutes and is to deliver 200mL. What is the rate of the infusion in mL/h?
- 4) Calculate the flow rate if 1.2L is to be infused over 24 hours.
- 5) An order states that 500mL albumin 5% is to be given in 4 hours. What is the flow rate that should be set?

*Answers on the back.*

# Drug Calculations

Answers:  
Set 1 (1) 0.8 mL (2) 0.5 mL (3) 1.7 mL (4) 5 mL (5) 40 mL (6) 25 mL  
7(i) 2 mL 7(ii) 0.5 mL 7(iii) 10 mL 7(iv) 10 mL 7(v) 20 mL  
Set 2 (1) 100mL/h (2) 53mL/h (3) 400mL/h(4) 50mL/h (5) 125mL/h

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