contents

Sample pages

Maths revisited

■ MATHEMATICAL SYMBOLS

TERMINOLOGY	SYMBOL
Equal to	$=$
Not equal to	$\neq$
Approximately equal to	$\approx$
Greater than	$>$
Less than	$<$
Square root	$\sqrt{}$
Per cent	$\%$
Degree	$\circ$
Ratio	$:$

■ ORDER OF OPERATIONS

There are four fundamental operations used to solve mathematical problems. These are:

1. Addition $+$
2. Subtraction $-$
3. Multiplication $\times$
4. Division $\div$

If a mathematical problem requires more than one operation, there is a rule of order for performing each. This is best

remembered as **BIDMAS** (the mnemonic 'Belly Itches Do Make A Scratch').

1st Brackets   ( )
2nd Index notation (or 'power of') e.g. $4^3 = 4 \times 4 \times 4$
     (where 4 is the base and 3 is the index)
3rd Division $\div$
4th Multiplication $\times$
5th Addition $+$
6th Subtraction $-$

Please note, the 3rd and 4th operations (division and multiplication) have the same priority and should be performed in the order they first occur, moving left to right. This is also true for the 5th and 6th operations (addition and subtraction).

Step 1 Calculate what is inside the brackets.
Step 2 Do Index notation, or 'power of'.
Step 3 Do $\div$ or $\times$ working from left to right, whichever comes first.
Step 4 Do $+$ or $-$ working from left to right, whichever comes first.

$$\begin{array}{cccc} \text{2nd} & \text{1st} & \text{4th} & \text{3rd} \\ \downarrow & \downarrow & \downarrow & \downarrow \end{array}$$

Rule applied: $70 \div (2 + 3) - 2 \times 2 = 10$ (✓)

$70 \div 5 - 2 \times 2$

$14 - 2 \times 2$

$14 - 4 = 10$

Rule not applied: $70 \div (2 + 3) - 2 \times 2 = 72$ (✗)

■ APPLYING ADDITION AND SUBTRACTION TO FLUID BALANCE CHARTS

Many health consumers require strict fluid monitoring. Record the actual input and output on a fluid balance chart. Calculating positive or negative balances requires application of addition and subtraction.

			PATIENT LABEL
	Intake and Output Record		
INTAKE	0600–1800	1800–0600	TOTAL
Oral			
Tube feeding			
IV (primary)			
IV Meds			
TPN			
Blood			
TOTAL			24-Hour Total
OUTPUT	0600–1800	1800–0600	TOTAL
Urine			
Emesis			
G.I. Suction			
Stool			
TOTAL			24-Hour Total

Sample 24-hour fluid intake and output record

Source: Pearson.

■ NUMBER FACT GRIDS

Below is an addition grid for quick reference with basic addition facts up to 20.

+	1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10	11
2	3	4	5	6	7	8	9	10	11	12
3	4	5	6	7	8	9	10	11	12	13
4	5	6	7	8	9	10	11	12	13	14
5	6	7	8	9	10	11	12	13	14	15
6	7	8	9	10	11	12	13	14	15	16
7	8	9	10	11	12	13	14	15	16	17
8	9	10	11	12	13	14	15	16	17	18
9	10	11	12	13	14	15	16	17	18	19
10	11	12	13	14	15	16	17	18	19	20

The multiplication grid is a useful tool for quick reference of multiplication tables up to 12×.

×	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72	80	88	96
9	9	18	27	36	45	54	63	72	81	90	99	108
10	10	20	30	40	50	60	70	80	90	100	110	120
11	11	22	33	44	55	66	77	88	99	110	121	132
12	12	24	36	48	60	72	84	96	108	120	132	144

■ TIME

Time is one of the six rights of medication administration.

All medication charts should have drug times written in 24-hour time. For this reason, nurses must be familiar with the 24-hour clock (see the following illustration).

When using a 24-hour clock, midnight is both the end of one day and the start of the next. When administering

'as needed' (prn) medications at midnight, it is recommended to use 2359 to signify the end of one day or 0001 to indicate the beginning of another. This provides clarity to others when reading your documentation or if you have to refer back to it (e.g. in a coroner's court).

Units of time and conversions

1 minute (min)	60 seconds (s)	52 weeks	1 year (y)
1 hour (h)	60 minutes	365 days	1 year
1 day (d)	24 hours	366 days	1 leap year
1 week (w)	7 days	12 months	1 year
2 weeks	1 fortnight	10 years	1 decade
4 weeks	1 month (mth)	100 years	1 century

Sample pages

24-hour time
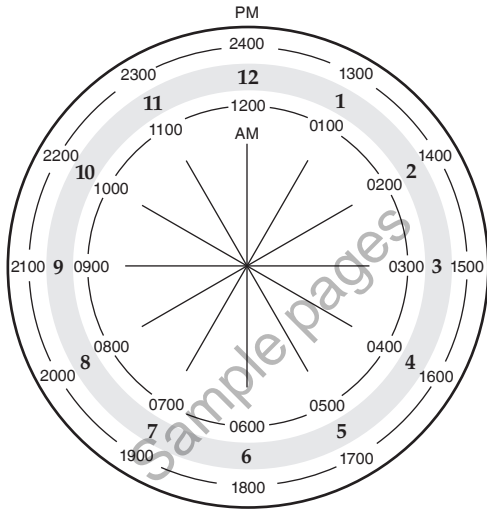
Source: Pearson.

■ FRACTION, DECIMAL AND PERCENTAGE CONVERSIONS

Fractions should be avoided in all written medication
orders and documentation as they can be misinterpreted.
Nonetheless, they are used in medication calculation

formulas. Nurses also need to understand decimals and percentages. The following is a quick reference guide for simple conversions.

FRACTION	SIMPLIFIED FRACTION	TERMINOLOGY	DECIMAL FRACTION	PERCENTAGE
$\frac{10}{100}$	$\frac{1}{10}$	One-tenth	0.1 (0.10)	10%
$\frac{20}{100}$	$\frac{1}{5}$	One-fifth	0.2 (0.20)	20%
$\frac{25}{100}$	$\frac{1}{4}$	One-quarter	0.25	25%
$\frac{30}{100}$	$\frac{3}{10}$	Three-tenths	0.3 (0.30)	30%
$\frac{33}{100}$	$\frac{1}{3}$	One-third	0.33	33%
$\frac{40}{100}$	$\frac{2}{5}$	Two-fifths	0.4 (0.40)	40%
$\frac{50}{100}$	$\frac{1}{2}$	One-half	0.5 (0.50)	50%
$\frac{60}{100}$	$\frac{3}{5}$	Three-fifths	0.6 (0.60)	60%
$\frac{67}{100}$	$\frac{2}{3}$	Two-thirds	0.67	67%
$\frac{70}{100}$	$\frac{7}{10}$	Seven-tenths	0.7 (0.70)	70%
$\frac{75}{100}$	$\frac{3}{4}$	Three-quarters	0.75	75%
$\frac{80}{100}$	$\frac{4}{5}$	Four-fifths	0.8 (0.80)	80%

■ THE BASE SYSTEM

The base 10 (ten) system uses the digits 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9. The decimal system is a base 10 system. Each digit has a face value and a place value. Place value in the decimal system is fundamental to drug administration. Each place has a value:

- 10 times that of the place value to the right of it
- one-tenth of the place value to the left.

For example, 10 is ten times greater than 1 and ten times less than 100.

The place-value chart indicates placement value. Numbers to the **left** side of the **decimal point** are whole numbers; numbers to the **right** are less than one and represent fractions.

You may find it helpful to refer back to this chart when working through addition, multiplication and division calculations.

Place-value chart

EXAMPLES	TEN MILLIONS	MILLIONS	HUNDRED THOUSANDS	TEN THOUSANDS	THOUSANDS
1654					1
1/10					
10^4				1	0

Decimal point
↓

HUNDREDS	TENS	UNITS	•	TENTHS	HUNDREDTHS	THOUSANDTHS	TEN THOUSANDTHS
6	5	4					
		0	.	1			
0	0	0					

Note: The decimal point separates whole numbers from decimal fractions or fractions of a number.

■ THE DECIMAL POINT

Medication errors can occur when calculating dosages if observation of the decimal point placement is not adhered to.

> ### *IMPORTANT RULE: DECIMALS AND DRUG ADMINISTRATION*
>
> When working with decimal fractions, always place a zero to the left of the decimal point (leading zero) to indicate there are no whole numbers. Importantly, *do not* add a zero after a decimal point (trailing zero) when working with whole number.
>
> #### *Example*
> Use **0.34** if the dose is **.34**
> If the dose was written as .34 it could be mistaken as 34.
>
> Adding a zero to a whole number could also cause a mistake.
>
> #### *Example*
> If the dose was calculated to be **3 mg**, do not add a zero after the decimal point to the whole number as this could be read as **30 mg**.

■ REVISITING BASIC ALGORITHMS

Vertical addition

CLINICAL CONSIDERATION

- Apply the 'PUP' (points under points) rule when adding decimals.
- Addition is carried out moving in columns from right to left. ←

PROCESS

e.g. 1,389 + 4,378 Steps in vertical addition:

- Set out with numbers clearly and correctly placed under place-value columns (refer back to the place-value chart if needed).
- Add in vertical format, moving from right to left. ←
- Record only single digits under each column and regroup or carry over when required.
- Record 'carry over' digits at top of column in clear notation and don't forget to include when adding.
- This process is repeated as required.
- e.g. Working from right to left in the table below:
  — In the units column, add 9 to 8 to make 17.
  — Record the 7 under the units column and carry the 1 over to the tens column.
  — In the tens column, add the carried-over 1 to the 8 (makes 9) and then add the 7 to make 16.
  — Record the 6 in the tens column and carry the 1 over to the hundreds column.
  — In the hundreds column, add the carried-over 1 to the 3 (makes 4) and add the 3 to make 7.
  — In the thousands column, add the 1 to the 4 to make 5.

	THOUSANDS	HUNDREDS	TENS	UNITS
	1	$^{1+}3$	$^{1+}8$	9
+	4	3	7	8
=	5	7	6	7

CONSIDER

• Check the answer of an addition of **two numbers** by applying an inverse or reverse operation of subtraction, i.e. subtract one number from the answer and the other number should remain.

Vertical subtraction

CONSIDER

• When subtracting smaller numbers from larger numbers, the largest number is recorded on the top. Use vertical formations, moving from right to left. ←
• Subtraction answers can be checked by applying the inverse operation of addition, i.e. add the answer to the number subtracted; the original number subtracted from should be found.

PROCESS

e.g. $5,767 - 4,378$

• Set out with numbers clearly and correctly placed under place-value columns (refer back to the place-value chart if needed).
• Working from the top right number:
  — 7 take away 8 can't be done.
  — Regroup 1 ten from the existing 6 tens, leaving 5 tens and making 17 in the units column (show your workings).
  — 17 take away 8 leaves 9.
  — Record 9 under the units column.
  — 5 take away 7 can't be done.
  — Regroup 1 from the hundreds column, leaving 6 hundreds and making the 5 into 15 in the tens column (show your workings).

— 15 take away 7 leaves 8.
— Record 8 under the tens column.
— 6 take away 3 leaves 3.
— Record 3 under the hundreds column.
— 5 take away 4 leaves 1.
— Record 1 under the thousands column.

The answer is 1,389.

	THOUSANDS	HUNDREDS	TENS	UNITS
	5	$7^{-1} = 6$	$6^{-1} = 5$ $^{10+}5$	$^{10+}7$
−	4	3	7	8
=	1	3	8	9

When **subtracting with decimals**, follow the same format but ensure the 'PUP' rule is followed.

Multiplication

CONSIDER

• When multiplying using vertical formation, move from right to left. ←
• When carrying or regrouping in multiplication, the carried number is added *after* the multiplication in each column has been done.
• *When multiplying by 10, 100, 1,000, simply add the number of zeros of the base 10 number onto the end of the whole number, e.g. 23 × 1,000 = 23,000.*

MULTIPLYING BY ONE-DIGIT NUMBER

PROCESS

$$\begin{array}{r}
\overset{1}{342} \\
\times\ 4 \\
\hline
1,368
\end{array}$$

Steps:

- 4 times 2 is 8.
- Record 8 under the units column.
- 4 times 4 is 16.
- Record 6 under the tens column and regroup or carry over the 1 into the hundreds column. Record the 1 above the 3 and *ADD after* the next step.
- 4 times 3 is 12, plus the 1 regrouped = 13.

Record 13, as there are no more numbers to multiply.

The answer is 1,368.

MULTIPLYING BY TWO-DIGIT NUMBERS

PROCESS

$$\begin{array}{r}
\overset{1}{4,142} \\
\times\ 14 \\
\hline
16,568 \\
+\ 41,420 \\
\hline
57,988
\end{array}$$

Steps:

- Follow the same steps as per multiplication by one digit.
  ↓
- Multiply the top line by 4 to get 16,568.