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Maths for Nurses:
Numeracy: The Essentials

This booklet will provide an overview of the basic numeracy skills for Nursing students.

If you have any problems in answering the questions within the booklet please contact skills@library.leeds.ac.uk for personal help using the maths support drop-in sessions. Also check out these e-videos and quizzes:

- University of Leeds *Maths for nurses*
- Queen's University Belfast *Numeracy skills for drug calculations*.

Contents

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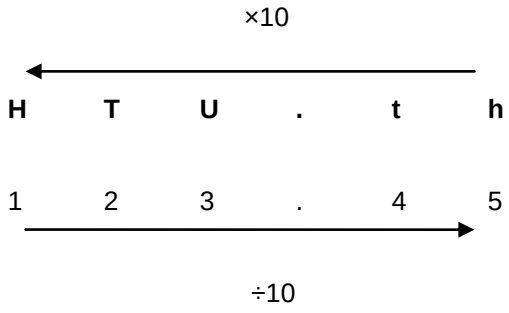
1. Place value



In any number each digit has a different place value.
Going from left to right we have **H**undreds, **T**ens, **U**nits, **t**enths, and **h**undredths

There are
10 hundredths in 1 tenth
10 tenths in 1 unit,
10 units in 1 ten, and
10 tens in 1 thousand

To move digits one column to the left e.g. Units to Tens, you x 10.
To move digits one column to the right, e.g. Hundreds to Tens, you ÷ 100

Example: if we multiply the following number by 10

H	**T**	**U**	**.**	**t**	**h**
	2	3	.	4	5

it becomes:

H	**T**	**U**	**.**	**t**	**h**
2	3	4	.	5	

Note what has happened to the digits. The number 23.45 has become 234.5, each digit moving 1 place to the left..

The digits move	**1**	place to the	**left**	when multiplying		by	**10**
The digits move	**2**	places to the	**left**	when multiplying	by	**100**	
The digits move	**3**	places to the	**left**	when multiplying		by	**1000**
The digits move	**1**	place to the	**right**	when dividing	by	**10**	
The digits move	**2**	places to the	**right**	when dividing	by	**100**	
The digits move	**3**	places to the	**right**	when dividing	by	**1000**	

Ordering Numbers

To determine the highest number start from the left and go through each place value selecting the highest digit(s) until just one number is left.

1 5 . 1 8	1 5 . 1 8	1 5 . 1 8	
1 4 . 9 4	1 4 . 9 4		
1 5 . 3	1 5 . 3	1 5 . 3	**15.3 is the highest number**
1 4 . 0 9	1 4 . 0 9		

Examples to try; find the lowest number in the following questions:

(a)	(i) 87.87	(b)	(i) 0.23	(c)	(i) 624.01
	(ii) 87.97		(ii) 0.2		(ii) 642.01
	(iii) 88.07		(iii) 0.32		(iii) 624.0
	(iv) 88.1		(iv) 0.3		(iv) 624.1

2. Times Tables

×	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

TIPS

Try learning by rote as many as you can and then use what you know to work out what you don't know.

5 times tables always end in either 5 or 0

You can use your fingers for 9 times tables:

- Hold your hands in front of you with your fingers spread out.
- For 9 X 3 bend your third finger down. (9 X 4 would be the fourth finger etc.)
- You have 2 fingers in front of the bent finger and 7 after the bent finger
- Thus the answer must be 27!

Alternatively for the 9 times tables use the 10 times tables and subtract one lot of the number you are multiplying by..

To work out the 4 times tables double and double again.

Knowing how to square numbers is useful ie
1 x 1 = **1**, 2 x 2 =**4**, 3 x 3 =**9**, 4 x 4 =**16**, 5 x 5 =**25**, 6 x 6 =**36**, 7 x 7 =**49**, 8 x 8 =**64,** 9 x 9 = **81**, 10 x 10 = **100**

It's useful to know that x 12 is the same as x 10 and x 2 and adding the two results.

One of the best interactive web resources for times tables is BBC Skillswise:

http://www.bbc.co.uk/skillswise/numbers/wholenumbers/multiplication/timestables/index.shtml

Examples to try; using the table above or otherwise, calculate the following:

(a) 9 x 8 (b) 7 x 12 (c) 6 x 9 (d) 4 x 7 (e) 5 x 11 (f) 3 x 8 (g) 11 x 12

3. Addition

- Keep the decimal point in the same place.
- If you get a number greater than 10 then write down the number of units and carry the number of tens over to the next column on the left.

e.g.
```
   8 9      9 + 5 = 14
 + 1 5      write down 4 and carry the 1 over
 1 0 4
```

Examples to try:

(a)
```
  3 7 . 4
+ 7 8 . 9
      .
```
Keep decimal point in same place

(b)
```
INPUT:  I.V. Fluids   1 3 0 0
        Oral Fluids   + 2 7 5
```

(c)
```
OUTPUT:  Urine    1 2 5 0
         Vomit      1 0 0
         Wound    + 4 5
```

4. Multiplication

- Ignore the decimal point until the end. The rule is that you count the number of decimal places in your question and apply the same number to the answer.
- Carry over tens as before.
- If multiplying by a number with two or more digits, treat them separately, remembering to put one zero on the far right column when multiplying by tens, two zeros for hundreds etc.

e.g.

```
  4.2
x 8 1   ←——   split x 81 into (x1 and x80)
  4 2   ←——   x 1
3 3 6 0 ←——   x 80 i.e. x 10 (ie put one zero down) and then x 8
3 4 0.2 ←——   since there is one decimal place in the question, there should be the same in the answer.
```

Examples to try:

(a) A patient is to receive 2.5 micrograms per kilogram. What dose is required if the patient weighs 79 kilograms?

(b) If one tablet contains 20 milligrams, how many milligrams would 4 tablets contain?

5. Subtraction

- Keep the decimal point in the same place.
- Borrow 1 from the column on the left if necessary.

e.g. $^{6}\cancel{7}\ ^{1}\cancel{2}\ .\ ^{1}6$
$-\ \ 2\ 4\ .\ 9$
$\ \ \ 4\ 7\ .\ 7$

Examples to try:

(a) Jamie weighed 4.2 kilograms at birth. By week 2 his weight had dropped to 3.8 kilograms. How much weight had he lost in grams?

(b) What is the difference in kg between 1.6 kilograms and 825 grams?

6. Division

- Keep the decimal point in the same place.
- Divide into each digit in turn, from left to right. e.g. $8\overline{)1\ ^{1}2\ ^{4}0}$ $0\ 1\ 5$
- Carry over tens if applicable.
- If dividing by decimals then make into whole numbers by multiplying.

e.g. $20 \div \mathbf{3.2}$ is $\frac{\mathbf{20}}{\mathbf{3.2}} = \frac{\mathbf{200}}{\mathbf{32}} = \frac{\mathbf{100}}{\mathbf{16}} = \frac{\mathbf{50}}{\mathbf{8}} = \frac{\mathbf{25}}{\mathbf{4}} =$ $4\overline{)2\ ^{2}5\ .\ ^{1}0\ ^{2}0}$

- Simplify fractions by halving (if even), or try ÷ by 3, 5, or 7. This should reduce the need for long division.
- Furthermore, the same number of zeros can be removed in top and bottom numbers in the fraction to aid simplification.

Examples to try:

(a) 225 ÷ 6
(b) 1500 ÷ 250
(c) 1000 ÷ 8

7. Combined

Question: A baby is to be fed 75ml every 3 hours. How much is this per day?

Solution: 24 hours in a day, so there are 24 ÷ 3 = 8 feeds per day.
The total amount is 8 x 75 = 600ml.

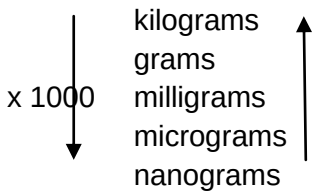
Examples to try:

(a) If 5ml contains 100mg, how many mg would there be in 20ml?
(b) If a patient is to receive 1500ml over 24hrs, how much is this in ml/hr?

8. Converting Weights and Volumes

a) Metric to metric

The following diagram can help remind you whether to x or ÷.
Put in order from largest to smallest, then draw an arrow down with ÷ 1000 beside it, and an arrow up with x 1000 beside it.



milligrams to micrograms = x 1000
grams to kilograms = ÷ 1000

e.g. 568 milligrams to grams = 568.0 ÷ 1000 (move digits 3 places to the

Examples to try:

(a) 45 grams to kilograms
(b) 0.75 grams to milligrams
(c) 0.025 milligrams to micrograms
(d) 650ml to litres **Note: 1 litre (l) = 1000 millilitres (ml)**

b) Metric to imperial and imperial to imperial

1kilogram (kg) = 2.2 pounds (lb)

1 stone (st) = 14 pounds (lb)
1 pound (lb) = 16 ounces (oz)

Question: A child weighs 2 stone 3lb, what is this weight in kg?

Solution: 2 stone = 2 x 14 lb = 28lb So the child weighs (28 + 3) lb = 31lb
Total weight in kg = 31 ÷ 2.2 $= \frac{31}{2.2} = \frac{310}{22} = \frac{155}{11} =$ 11|155.00
14.1 kg (approximately)

Examples to try:

(e) 3 stone 10lb to kilograms
(f) 2 stone 4lb to kilograms

9. Fractions & Decimals

Learn the following fractions:

1/10 = 0.1 Therefore 6/10 = 6 x 0.1 = 0.6
1/100 = 0.01 3/100 = 3 x 0.1 = 0.03

1/5 = 0.2	4/5	= 4 x 0.2 = 0.8
1/4 = 0.25	3/4	= 3 x 0.25 = 0.75
1/3 = 0.33 (recurring)	2/3	= 2 x 0.33 = 0.66
1/2 = 0.5		

$\frac{2}{5}$ of $250 = \frac{2}{5} \times \frac{250}{1} = \frac{500}{5} = 100$

Note: You could simplify the fractions first by ÷ top and bottom by 5 and then workout 2x 50 = 100.

When rounding decimals to 1 decimal place, look at the second d.p. and if it is 5 or above then round up, if less than 5 then keep it the same.

For example: 1.2**7**4 = 1.3 to 1 d.p. 1.2**3**4 = 1.2 to 1 d.p.

When adding decimals, keep d.p. in the same place.
When multiplying decimals, count the number of d.p.'s in the question and apply the same to the answer.

Examples to try:

(a) Find 4/10 of 42 (b) Find 3/4 of 420 (c) Find 1/3 of 39.6
Write the following to 1 d.p. (d) 3.333 (e) 0.657 (f) 23.97

10. Basic Drug Calculations

Use the following formula:

$$\frac{\text{Dose required}}{\text{Dose available}} \times \frac{\text{Volume}}{1}$$ **or**

$$\frac{\textbf{what you want}}{\textbf{what you have got}} \times \frac{\textbf{what it is in}}{\textbf{1}}$$

e.g. 240 milligrams is prescribed. The stock dose is 120 milligrams/5ml. What volume would you give?

Solution: $\frac{\mathbf{240}}{\mathbf{120}} \times \frac{\mathbf{5}}{\mathbf{1}} = \mathbf{2} \times \mathbf{5} = \mathbf{10\ ml}$

Examples to try:

(a) 6 milligrams is required. Stock is 10 milligrams/4ml. What volume is required?
(b) A patient required 10000 units. Stock is 25000 units/ml. What volume is required?

11. Percentages

- Always out of 100
- As a decimal, 0.1 = 0.10 = 10% and 0.06 = 6% (use the hundredths column to determine value)

30% of 150 $= \frac{30}{100} \times \frac{150}{1} = \frac{3}{10} \times \frac{150}{1} = \frac{3}{1} \times \frac{15}{1} = 45$

Examples to try:
(a) Work out 20% of 65
(b)(i) A patient is to receive IV Fluids over 8 hours. What % would be administered after 6hrs?
(b)(ii) How long would it take to administer 50%?

Answers

1. Place Value

(a) (i) 87.87 (b) (ii) 0.2 (c) (iii) 6240

2. Times Tables

(a) 72 (b) 84 (c) 54 (d) 28 (e) 55 (f) 24 (g) 132

3. Addition

(a) 116.3 (b) 1575 (c) 1395

4. Multiplication

(a) 197.5 milligrams (b) 80 milligrams

5. Subtraction

(a) 400 grams (b) 775 grams

6. Division

(a) 37.5 (b) 6 (c) 125

7. Combined

(a) 400 milligrams (b) 62.5 = 63ml/hr

8. Converting Weights and Volumes

(a) 0.045 kilograms (b) 750 milligrams (c) 25 micrograms (d) 0.65 litres (e) 23.6kg (f) 14.5kg

9. Fractions & Decimals

(a) 16.8 (b) 315 (c) 13.2

(d) 3.3 (e) 0.7 (f) 24.0

10. Basic Drug Calculations

(a) 2.4ml (b) 0.4ml

11. Percentages

(a) 13 (b) 75% (c) 4 hours