

SECTION A

Basic calculations review

INTRODUCTION

Many healthcare professionals perform poorly when it comes to calculation skills, both in examination and in practice. Calculation skills can be a source of anxiety for many, and although the calculations you need in clinical situations are not always complex, they can be challenging when you are under pressure. Healthcare professionals need to be able to use numbers with confidence and safety, particularly when administering drugs.

Within the field of nursing, the importance of numeracy and calculation skills is emphasized by the fact that the Nursing and Midwifery Council (NMC) has recently changed the essential entry requirements for undergraduate courses to include proficiency in manipulating and utilizing numbers. Furthermore, the NMC now includes numeracy in its standards of proficiency, and requires students to undergo examination at two points within the nurse training programme.

This first section of the book tests your understanding of basic numeracy and calculation skills. The second section looks at specific areas of nursing practice that commonly use these number manipulations. This will enable you to assess your skills and see where you need to improve.

You should start by attempting all the questions in the *diagnostic test*, and then compare your answers with the ones given at the end of the test. If you find you've made consistent errors, you should read the appropriate chapter, which will give you specific help with that type of calculation.

For example, if you have problems with questions relating to *division*, you should go to the chapter that looks at division in greater detail. Then, when you are confident that you understand the approach to take, you should attempt the *check-up test* included at the end of the chapter. A second diagnostic test at the end of this first section will help you reassess your overall understanding of all these areas, and show how you have improved.

To get the most benefit from these tests, we suggest that that you use an electronic calculator only to check your answers.

Remember, this text is designed primarily as a self-help resource for the most common areas of calculation that people have difficulty with. Some of the areas may seem trivial to you, but to someone else they may be a source

of extreme concern and anxiety. Equally, other people may have no problem with areas that you find difficult.

Work through the areas that you have difficulty with, at your own pace, and never be afraid to ask for help if there are areas that you continue to find difficult. Above all, be honest with yourself when checking your answers.

The essential thing to remember is that, if you use this text properly, it will help you become proficient in all these areas of calculation, making you a safer and more confident practitioner.

Diagnostic test 1:

QUESTIONS



FOR EACH OF THE FOLLOWING CALCULATE THE CORRECT ANSWER

1 Addition

a. $4 + 8$

b. $6 + 9$

c. $8 + 8$

d. $3 + 7$

e. $5 + 6$

f. $7 + 2$

2 Addition

a. $0.2 + 0.7$

b. $0.4 + 0.8$

c. $0.5 + 0.6$

d. $0.5 + 0.9$

e. $0.8 + 0.7$

f. $0.2 + 0.6$

3 Subtraction

a. $9 - 5$

b. $4 - 3$

c. $8 - 5$

d. $5 - 3$

e. $7 - 4$

f. $6 - 2$

4 Subtraction

a. $0.8 - 0.6$

b. $0.5 - 0.4$

c. $0.7 - 0.2$

d. $0.6 - 0.4$

e. $0.9 - 0.2$

f. $0.3 - 0.1$

5 Multiplication

- | | | |
|------------------|------------------|------------------|
| a. 4×10 | b. 6×10 | c. 8×10 |
| d. 5×10 | e. 7×10 | f. 9×10 |

6 Multiplication

- | | | |
|--------------------|--------------------|--------------------|
| a. 0.5×10 | b. 0.7×10 | c. 0.4×10 |
| d. 0.8×10 | e. 0.3×10 | f. 0.1×10 |

7 Multiplication

- | | | |
|-----------------|-----------------|-----------------|
| a. 5×4 | b. 6×3 | c. 4×8 |
| d. 7×5 | e. 3×8 | f. 2×9 |

8 Multiplication

- | | | |
|------------------|------------------|------------------|
| a. 14×8 | b. 11×4 | c. 12×7 |
| d. 17×3 | e. 15×6 | f. 13×5 |

9 Division

- | | | |
|----------------|----------------|----------------|
| a. $3 \div 10$ | b. $8 \div 10$ | c. $5 \div 10$ |
| d. $4 \div 10$ | e. $9 \div 10$ | f. $6 \div 10$ |

10 Division

- | | | |
|------------------|------------------|------------------|
| a. $6.2 \div 10$ | b. $9.8 \div 10$ | c. $7.9 \div 10$ |
| d. $5.5 \div 10$ | e. $4.1 \div 10$ | f. $8.7 \div 10$ |

11 Division

a. $8 \div 2$

b. $6 \div 3$

c. $9 \div 3$

d. $5 \div 1$

e. $4 \div 2$

f. $8 \div 4$

12 Division

a. $14 \div 2$

b. $18 \div 3$

c. $15 \div 3$

d. $27 \div 9$

e. $28 \div 2$

f. $49 \div 7$

13 Simplification

a. $\frac{4}{2}$

b. $\frac{6}{3}$

c. $\frac{6}{4}$

d. $\frac{2}{6}$

e. $\frac{3}{9}$

f. $\frac{3}{18}$

14 Simplification

a. $\frac{14}{2}$

b. $\frac{18}{3}$

c. $\frac{64}{8}$

d. $\frac{2}{24}$

e. $\frac{24}{36}$

f. $\frac{6}{18}$

15 Simplification

a. $\frac{400}{500}$

b. $\frac{350}{450}$

c. $\frac{320}{600}$

d. $\frac{360}{300}$

e. $\frac{630}{540}$

f. $\frac{840}{720}$

16 Simplification

a. $\frac{0.4}{0.2}$

b. $\frac{0.6}{0.3}$

c. $\frac{0.8}{0.4}$

d. $\frac{0.4}{0.8}$

e. $\frac{0.2}{0.1}$

f. $\frac{0.9}{0.3}$

17 Round to one decimal place

a. 0.47

b. 0.89

c. 0.93

d. 1.24

e. 3.82

f. 4.55

18 Round to two decimal places

a. 5.877

b. 8.995

c. 6.327

d. 5.233

e. 3.755

f. 2.499

19 Round to three decimal places

a. 1.0166

b. 3.6832

c. 7.5554

d. 6.4338

e. 4.8326

f. 5.5555

20 Change to improper fractions

a. $2\frac{4}{5}$

b. $3\frac{7}{8}$

c. $5\frac{3}{4}$

d. $9\frac{2}{3}$

e. $8\frac{7}{9}$

f. $6\frac{1}{4}$

21 Change to improper fractions

a. $9\frac{11}{14}$

b. $7\frac{8}{13}$

c. $4\frac{10}{16}$

d. $6\frac{8}{27}$

e. $5\frac{6}{41}$

f. $8\frac{8}{29}$

22 Change to mixed numbers

a. $\frac{11}{4}$

b. $\frac{16}{7}$

c. $\frac{27}{6}$

d. $\frac{13}{5}$

e. $\frac{19}{8}$

f. $\frac{14}{3}$

23 Change to decimal equivalents

a. $\frac{3}{8}$

b. $\frac{4}{5}$

c. $\frac{1}{4}$

d. $\frac{3}{6}$

e. $\frac{3}{4}$

f. $\frac{6}{8}$

24 Change to decimal equivalents

a. $\frac{27}{30}$

b. $\frac{12}{24}$

c. $\frac{21}{84}$

d. $\frac{18}{90}$

e. $\frac{11}{44}$

f. $\frac{10}{80}$

25 Convert the following volumes

- 250 microlitres to millilitres
- 500 microlitres to millilitres
- 635 microlitres to millilitres
- 1.27 millilitres to microlitres
- 2.63 millilitres to microlitres
- 4.61 millilitres to microlitres

26 Convert the following volumes

- 100 millilitres to litres
- 240 millilitres to litres
- 825 millilitres to litres
- 0.5 litres to millilitres
- 0.64 litres to millilitres
- 0.785 litres to millilitres

27 Convert the following weights

- 200 milligrams to grams
- 375 milligrams to grams
- 950 milligrams to grams
- 0.4 grams to milligrams
- 0.55 grams to milligrams
- 0.684 grams to milligrams

28 Convert the following weights

- 120 grams to kilograms
- 250 grams to kilograms
- 588 grams to kilograms
- 0.2 kilograms to grams
- 0.45 kilograms to grams
- 0.825 kilograms to grams

29 Express as a percentage

- a. 0.25 b. 0.45 c. 0.95
- d. 0.27 e. 0.63 f. 0.47

30 Express as a percentage

- a. $\frac{1}{2}$ b. $\frac{3}{4}$ c. $\frac{4}{8}$
- d. $\frac{9}{10}$ e. $\frac{9}{12}$ f. $\frac{16}{20}$

Diagnostic test 1:

ANSWERS

1 Addition

- | | | |
|-------|-------|-------|
| a. 12 | b. 15 | c. 16 |
| d. 10 | e. 11 | f. 9 |

2 Addition

- | | | |
|--------|--------|--------|
| a. 0.9 | b. 1.2 | c. 1.1 |
| d. 1.4 | e. 1.5 | f. 0.8 |

3 Subtraction

- | | | |
|------|------|------|
| a. 4 | b. 1 | c. 3 |
| d. 2 | e. 3 | f. 4 |

4 Subtraction

- | | | |
|--------|--------|--------|
| a. 0.2 | b. 0.1 | c. 0.5 |
| d. 0.2 | e. 0.7 | f. 0.2 |

5 Multiplication

- | | | |
|-------|-------|-------|
| a. 40 | b. 60 | c. 80 |
| d. 50 | e. 70 | f. 90 |

6 Multiplication

- | | | |
|------|------|------|
| a. 5 | b. 7 | c. 4 |
| d. 8 | e. 3 | f. 1 |

7 Multiplication

- | | | |
|-------|-------|-------|
| a. 20 | b. 18 | c. 32 |
| d. 35 | e. 24 | f. 18 |

8 Multiplication

- a. 112 b. 44 c. 84
d. 21 e. 90 f. 65

9 Division

- a. 0.3 b. 0.8 c. 0.5
d. 0.4 e. 0.9 f. 0.6

10 Division

- a. 0.62 b. 0.98 c. 0.79
d. 0.55 e. 0.41 f. 0.87

11 Division

- a. 4 b. 2 c. 3
d. 5 e. 2 f. 2

12 Division

- a. 7 b. 6 c. 5
d. 3 e. 14 f. 7

13 Simplification

- a. $\frac{2}{1}$ b. $\frac{2}{1}$ c. $\frac{2}{1}$
d. $\frac{1}{3}$ e. $\frac{1}{3}$ f. $\frac{1}{6}$

14 Simplification

- a. $\frac{7}{1}$ b. $\frac{6}{1}$ c. $\frac{8}{1}$
d. $\frac{1}{12}$ e. $\frac{2}{3}$ f. $\frac{1}{6}$

15 Simplification

a. $\frac{4}{5}$

b. $\frac{7}{9}$

c. $\frac{8}{15}$

d. $\frac{6}{5}$

e. $\frac{7}{6}$

f. $\frac{7}{6}$

16 Simplification

a. $\frac{2}{1}$

b. $\frac{2}{1}$

c. $\frac{2}{1}$

d. $\frac{1}{2}$

e. $\frac{2}{1}$

f. $\frac{3}{1}$

17 Round to one decimal place

a. 0.5

b. 0.9

c. 0.9

d. 1.2

e. 3.8

f. 4.6

18 Round to two decimal places

a. 5.88

b. 9.00

c. 6.33

d. 5.23

e. 3.76

f. 2.50

19 Round to three decimal places

a. 1.017

b. 3.683

c. 7.555

d. 6.434

e. 4.833

f. 5.556

20 Change to improper fractions

a. $\frac{14}{5}$

b. $\frac{31}{8}$

c. $\frac{23}{4}$

d. $\frac{29}{3}$

e. $\frac{79}{9}$

f. $\frac{25}{4}$

21 Change to improper fractions

a. $\frac{137}{14}$

b. $\frac{99}{13}$

c. $\frac{74}{16}$

d. $\frac{170}{27}$

e. $\frac{211}{41}$

f. $\frac{240}{29}$

22 Change to mixed numbers

a. $2\frac{3}{4}$

b. $2\frac{2}{7}$

c. $4\frac{3}{6}$

d. $2\frac{3}{5}$

e. $2\frac{3}{8}$

f. $4\frac{2}{3}$

23 Change to decimal equivalents

a. 0.375

b. 0.8

c. 0.25

d. 0.5

e. 0.75

f. 0.75

24 Change to decimal equivalents

a. 0.9

b. 0.5

c. 0.25

d. 0.2

e. 0.25

f. 0.125

25 Convert the following volumes

a. 0.25 millilitres

b. 0.5 millilitres

c. 0.635 millilitres

d. 1270 microlitres

e. 2630 microlitres

f. 4610 microlitres

26 Convert the following volumes

a. 0.1 litres

b. 0.24 litres

c. 0.825 litres

d. 500 millilitres

e. 640 millilitres

f. 785 millilitres

27 Convert the following weights

- a. 0.2 grams
- b. 0.375 grams
- c. 0.950 grams
- d. 400 milligrams
- e. 550 milligrams
- f. 684 milligrams

28 Convert the following weights

- a. 0.12 kilograms
- b. 0.25 kilograms
- c. 0.588 kilograms
- d. 200 grams
- e. 450 grams
- f. 825 grams

29 Express as a percentage

- a. 25%
- b. 45%
- c. 95%
- d. 27%
- e. 63%
- f. 47%

30 Express as a percentage

- a. 50%
- b. 75%
- c. 50%
- d. 90%
- e. 75%
- f. 80%

For more information, and instruction on how to solve specific types of calculation, see the relevant chapter.

1

Addition

Addition is the process of adding or combining numbers to find their *sum*. It is signified by the plus sign (+). It is also one of the commonest types of calculation that we routinely carry out. Generally addition gives little cause for concern, as it is constantly used in everyday situations.

In clinical situations we might use addition to determine the total number of tablets administered to a patient, for example, or to calculate total fluid output over a given period of time.

Addition follows several important patterns. It is *commutative*, which means that when two numbers are added, the order in which they are added does not matter. It is *associative*, which means that when more than two numbers are added, the order in which they are added does not matter. Repeated addition of 1 (that is, $1 + 1 + 1 + \dots$) is the same as counting. Addition of 0 to a number does not change it.

WORKED EXAMPLES: ADDITION

Calculate the following:

$$27.4 + 18$$

STEP 1

Write the numbers to be added in two horizontal lines, below each other, aligning the decimal points. If a number is a whole number (that is, containing no decimal fraction), add a decimal point to the end of the number. Add zeros to empty spaces on the right to line up the columns.

$$\begin{array}{r} 27.4 \\ + 18.0 \\ \hline \end{array}$$

STEP 2

Starting on the right, add the digits in that column and put the answer directly under the column. If the answer is greater than 10, place the last digit under the column and any remaining digits in the column directly to the left (this is commonly referred to as *carry over*).

Add all columns in the same way, being careful to include any digits that have carried over from the previous column.

$$\begin{array}{r} 2 \ 7.4 \\ + 1 \ 8.0 \\ \hline 4 \ 5.4 \end{array}$$

STEP 3

Place a decimal point in the answer, directly below the decimal point in the number above.

$$\begin{array}{r} 2 \ 7.4 \\ + 1 \ 8.0 \\ \hline 4 \ 5.4 \end{array}$$

The answer is **45.4**

We use the same basic procedure for adding larger numbers. Here's how it's done.

Calculate the following:

$$587.6 + 327.8$$

STEP 1

Again, write the numbers to be added in two horizontal lines below each other, aligning the decimal points.

$$\begin{array}{r} 587.6 \\ + 327.8 \\ \hline \end{array}$$

STEP 2

Starting on the right, add the digits in that column, and put the answer directly under the column. Remember, if the answer is greater than 10, place the last digit under the column, and any remaining digits in the column directly to the left.

Add all columns in the same way as above, being careful to include any digits carried over from the previous column.

$$\begin{array}{r} 587.6 \\ + 3271.8 \\ \hline 9154 \end{array}$$

STEP 3

Place a decimal point in the answer, directly below the decimal point in the number above.

$$\begin{array}{r} 587.6 \\ + 3271.8 \\ \hline 915.4 \end{array}$$

The answer is **915.4**

To add more than two numbers, we follow these same three steps.

Calculate the following:

$$12.8 + 27.3 + 16.5 + 24.8$$

STEP 1

This time write the numbers to be added in four horizontal lines, below each other, again aligning the decimal points.

$$\begin{array}{r} 12.8 \\ 27.3 \\ 16.5 \\ + 24.8 \end{array}$$

STEP 2

Starting on the right, add the digits in that column and put the answer directly under the column. Again, if the answer is greater than 10 (and this is more likely, the greater the size of the column), place the last digit under the column and any remaining digits in the column directly to the left.

Add all columns in the same way as above, being careful to remember any digits carried over from the previous column.

$$\begin{array}{r} 12.8 \\ 27.3 \\ 16.5 \\ + 224.8 \\ \hline 814 \end{array}$$

STEP 3

Place a decimal point in the answer, directly below the decimal point in the numbers above.

$$\begin{array}{r} 12.8 \\ 27.3 \\ 16.5 \\ + 224.8 \\ \hline 81.4 \end{array}$$

The answer is **81.4**

**CHECK-UP TEST: ADDITION**

Calculate the following:

- a. $5 + 6.3$
- b. $8.7 + 9.7$
- c. $24.6 + 32.8 + 27.5$
- d. $53.2 + 36.5 + 61.1$
- e. $452.4 + 374.6 + 321.8$
- f. $211.7 + 631.6 + 126.5$

ANSWERS

- | | | |
|----------|-----------|----------|
| a. 11.3 | b. 18.4 | c. 84.9 |
| d. 150.8 | e. 1148.8 | f. 969.8 |

