Chapter 03: Mathematics Review and Introduction to Dosage Calculation
Workman & LaCharity: Understanding Pharmacology: Essentials for Medication Safety, 2nd Edition

MULTIPLE CHOICE

1. What is the most important consideration when using a calculator for drug dosages?
   a. Always check the answers with a pharmacist.
   b. Ensure the numbers are entered in the correct order.
   c. Work the problem by hand and then check all work using the computer.
   d. Calculate the answer with the computer and then check the answer by working the problem by hand.

   ANS: B
   Remember that math problems are punched into the calculator just like they are written or just like you would say them out loud. For example, 24 × 12 is punched in as 2, 4, ×, 1, 2 = *answer*. If you punch in either of the numbers backward (e.g., 4, 2, × 1, 2 or 2, 4, ×, 2, 1) the answer will be wrong.

   DIF: Cognitive Level: Remembering REF: p. 46

2. What is the best definition of a fraction?
   a. Part of a whole number obtained by dividing one number by a larger number.
   b. The answer obtained when one number divided another number is always an even number.
   c. The smallest unit or part of a number that can be obtained by dividing one number by itself.
   d. The dividing point between whole numbers and parts of numbers in a system based on units of ten.

   ANS: A
   A fraction is always a part of a whole number. A proper fraction is always less than a single whole number.

   DIF: Cognitive Level: Remembering REF: p. 46

3. In the equation $2X = \frac{4}{6}$, which element is the numerator?
   a. 2
   b. 4
   c. 6
   d. *X*

   ANS: B
   The numerator is always the top number in a fraction that will be divided by the bottom number (denominator).

   DIF: Cognitive Level: Remembering REF: p. 46

4. What does the “N” indicate in the PINCH high alert drugs?

a. Narcotics
b. Niacin
c. Naphthalene
d. Neurotransmitter

ANS: A
The PINCH term for high alert drugs stands for potassium, insulin, narcotics (also known as opioids), cancer chemotherapy drugs, and heparin or any other drug that strongly affects blood clotting. Niacin is a vitamin. Naphthalene is a poisonous organic chemical that is never used as a drug. A neurotransmitter is a class of biologic chemicals the body makes and uses to control nerve impulses.

DIF: Cognitive Level: Remembering REF: p. 46

5. Which term is used to describe the bottom number of a fraction?
a. Denominator
b. Subtractor
c. Numerator
d. Dividend

ANS: A
The top of a fraction is the numerator, the bottom is the denominator.

DIF: Cognitive Level: Remembering REF: p. 46

6. Which statement about an improper fraction is true?
a. It is always greater than 1.
b. It has no lowest common denominator.
c. It cannot be multiplied or divided by another fraction.
d. It can only be multiplied or divided by a whole number.

ANS: A
An improper fraction is one in which the numerator is greater than the denominator. Therefore, the value of an improper fraction is always greater than 1.

DIF: Cognitive Level: Remembering REF: p. 47

7. The term “percent” is related to which number?
a. 5
b. 10
c. 50
d. 100

ANS: D
The expression of how a number is related to 100; “literally for each hundred.”

DIF: Cognitive Level: Remembering REF: p. 53

8. What is the first step in dividing two fractions?
a. Ensuring both numbers are proper fractions
b. Converting the numerators into their lowest common number
c. Converting the denominators into their lowest common number

d. Inverting the second fraction and multiplying the numerators separately from the denominators

ANS: D
Dividing fractions is almost exactly the same as multiplying fractions. The only difference is that the second fraction is always inverted first (changing the positions of the numerator and the denominator).

DIF: Cognitive Level: Remembering REF: pp. 49-50

9. Which statement about the relationship between fractions and decimals is true?
   a. A fraction can be expressed as a decimal but a decimal cannot be expressed as a fraction.
   b. A decimal can be expressed as a fraction but a fraction cannot be expressed as a decimal.
   c. All fractions can be expressed as decimals and all decimals can be expressed as fractions.
   d. Fractions can only be expressed as decimals if they are proper fractions.

   ANS: C
   Decimals and fractions are related because they are both parts of a whole. All fractions, whether they are proper or improper, can be correctly expressed as a corresponding decimal. All decimals can be correctly expressed as fractions.

   DIF: Cognitive Level: Remembering REF: p. 50

10. Which dosage expression should be avoided?
    a. 0.25 mg
    b. 2.5 mg
    c. 2.500 mg
    d. 25 mg

    ANS: C
    The zeros after a decimal point serve no purpose and are known as “trailing zeros.” When they are written as part of a dosage, they can contribute to confusion about the exact dose.

    DIF: Cognitive Level: Remembering REF: p. 50

11. What specific safety technique is always used when calculating an insulin dose?
    a. Use a calculator and never calculate the dose by hand.
    b. Calculate the dose by hand and never use a calculator.
    c. Have another health care professional check the dose.
    d. Wear sterile gloves to administer the calculated dose.

    ANS: C
    Insulin is a high alert (PINCH) drug that can cause serious damage if the wrong dose is administered. Always have another health care professional double check the dose you calculate by independently recalculating the dose and comparing it to the dose you calculated.

    DIF: Cognitive Level: Understanding REF: p. 46

12. Which fraction represents the whole number 10?

a. $\frac{10}{0}$
b. $\frac{10}{10}$
c. $\frac{1}{10}$
d. $\frac{10}{1}$

ANS: D
All whole numbers can be converted to fractions by placing the whole number as the numerator with the denominator of 1. When the denominator is anything other than 1, the result is a number that is only a part of 10. So, $\frac{10}{0}$ = 0, $\frac{10}{10}$ = 1, $\frac{1}{10}$ = 1 tenth of 1 (*much* less than 10, in only 1% of 10), and only $\frac{10}{1}$ = the whole number 10.

DIF: Cognitive Level: Understanding REF: p. 47

13. Which number is expressed as a proper fraction?
a. $\frac{10}{0}$
b. $\frac{10}{10}$
c. $\frac{1}{10}$
d. $\frac{10}{0}$

ANS: C
A proper fraction is one that is always less than a whole number, with the numerator always being smaller than the denominator.

DIF: Cognitive Level: Understanding REF: p. 47

14. Which fraction accurately represents the mixed number 6 5/8?
a. $\frac{30}{5}$
b. $\frac{38}{5}$
c. $\frac{48}{8}$
d. $\frac{53}{8}$

ANS: D
The number 6 is a whole number that reflects 6 × $\frac{8}{8}$ or $\frac{48}{8}$. This number ($\frac{48}{8}$) is added to $\frac{5}{8}$ to make the improper fraction of $\frac{53}{8}$.

DIF: Cognitive Level: Understanding REF: p. 47

15. Which fraction is expressed as its lowest common denominator?
    a. $\frac{2}{4}$
    b. $\frac{5}{7}$
    c. $\frac{3}{15}$
    d. $\frac{6}{24}$

    ANS: B

    The fraction $\frac{5}{7}$ cannot be further reduced. The number $\frac{2}{4}$ can be reduced to $\frac{1}{2}$, the number $\frac{3}{15}$ can be reduced to $\frac{1}{3}$; and the number $\frac{6}{24}$ can be reduced to $\frac{1}{4}$.

    DIF: Cognitive Level: Understanding REF: p. 47

16. What is the lowest common denominator for the fraction series of 10/15, 9/27, 10/30, 34/51?
    a. 3
    b. 5
    c. 6
    d. 10

    ANS: A

    The fraction $\frac{10}{3}$ can be reduced to $\frac{2}{3}$, $\frac{9}{27}$ can be reduced to $\frac{1}{3}$, $\frac{10}{30}$ can be reduced to $\frac{1}{3}$, and $\frac{34}{51}$ can be reduced to $\frac{2}{3}$.

    DIF: Cognitive Level: Understanding REF: p. 48

17. Which fraction represents the largest part of a whole number?
    a. $\frac{1}{2}$
    b. $\frac{5}{15}$
    c. $\frac{3}{4}$
    d. $\frac{3}{24}$

    ANS: C

    When reduced to their lowest terms, $\frac{1}{2} = \frac{1}{2}$; $\frac{5}{15} = \frac{1}{3}$; $\frac{3}{4} = \frac{3}{4}$; and $\frac{3}{24} = \frac{1}{3}$. Then reducing these to their lowest common denominator (24), we have $\frac{1}{2} = \frac{12}{24}$; $\frac{1}{3} = \frac{8}{23}$; $\frac{3}{4} = \frac{18}{24}$; and $\frac{1}{8} = \frac{3}{24}$. $\frac{18}{24}$ is the largest part of the whole. (In this case, the whole number would be 24/24, which is equal to 1.)

DIF: Cognitive Level: Understanding REF: p. 48

18. What is the correct response when $\frac{3}{4}$, $\frac{1}{16}$, and $2\frac{1}{2}$ are added together and then reduced to the lowest terms?
    a. $2\frac{5}{8}$
    b. $2\frac{3}{32}$
    c. $3\frac{5}{16}$
    d. $3\frac{1}{4}$

    ANS: C

    First converting the mixed number fraction $2\frac{1}{2} = \frac{5}{2}$. Then convert all fractions to their lowest common denominator (16). $\frac{3}{4} = \frac{12}{16} + \frac{1}{16} + \frac{40}{16} = \frac{53}{16} = 3\frac{5}{16}$.

    DIF: Cognitive Level: Understanding REF: pp. 48-49

19. Which fraction represents 0.6?
    a. $\frac{1}{2}$
    b. $\frac{2}{3}$
    c. $\frac{3}{4}$
    d. $\frac{3}{5}$

    ANS: D

    The decimal 0.6 represents 6 tenths ($\frac{6}{10}$) of the number 1. The fraction $\frac{6}{10}$ can be reduced to $\frac{3}{5}$.

    DIF: Cognitive Level: Understanding REF: p. 53

20. Which fraction represents the largest part of a whole?
    a. 2/16
    b. 4/16
    c. 8/16
    d. 12/16

    ANS: D

    In this case, the whole number is 16/16 (1). The closes fraction to the whole number is the largest fraction, 12/16.

    DIF: Cognitive Level: Understanding REF: p. 47

21. Which fraction represents the largest part of a whole?
    a. 1/3
    b. 1/5
    c. 1/10
    d. 1/20

    ANS: A
    In order to find this answer, first convert all the fractions to their lowest common denominator, which in this case is 60. So, 1/3 = 20/60, 1/5 = 12/60, 1/10 = 6/60, and 1/20 = 3/60. The whole number is 60/60. The fraction closest (larger than the others, representing the largest part of the whole) to the whole is 20/60.

    DIF: Cognitive Level: Understanding REF: p. 48

22. Which fraction represents a whole number?
    a. 4/20
    b. 5/20
    c. 10/20
    d. 20/20

    ANS: D
    These fractions all have the same denominator, although it is not the lowest common denominator. The fraction that is the whole number is 20/20 (which can be reduced to 1).

    DIF: Cognitive Level: Understanding REF: p. 47

23. Which fraction is improper?
    a. 20/15
    b. 15/15
    c. 10/15
    d. 5/15

    ANS: A
    An improper fraction is one in which the numerator has a greater value than the denominator and is therefore always greater than 1. Only 20/15 has a numerator greater than the denominator. It can be expressed as 1 and 5/15 (so it is greater than 1).

    DIF: Cognitive Level: Understanding REF: p. 47

24. Which fraction is reduced to its lowest common denominator?
    a. 3/17
    b. 4/8
    c. 2/20
    d. 5/15

    ANS: A
    Of these fractions, 4/8 can be further reduced to 1/4, 2/20 can be further reduced to 1/10, 5/15 can be further reduced to 1/3. Only 3/17 cannot be further reduced.

    DIF: Cognitive Level: Understanding REF: p. 48

25. Which decimal represents the smallest part of a whole?

a. 0.2
b. 0.15
c. 0.085
d. 0.85

ANS: C
Of these decimals, 0.2 represents 2/10, 0.15 represents 15/100, 0.085 represents 85/1000, and 0.85 represents 85/100.

DIF: Cognitive Level: Understanding REF: p. 50

26. Which number expressed 7/8 as a decimal?
a. 0.78
b. 0.875
c. 1.14
d. 2.288

ANS: B
To calculate the decimal amount of a fraction, divide the numerator (7) by the denominator (8). 7/8 = 0.875.

DIF: Cognitive Level: Understanding REF: pp. 52-53

27. What amount represents the best rounding of 7.68 mL?
a. 5 mL
b. 7.6 mL
c. 7.7 mL
d. 10 mL

ANS: C
Common syringes, medication spoons, and medication cups are only calibrated to a tenth of an mL. If a calculation goes out to more than one place past the decimal (is uneven), round up or down to the next tenth of a place depending on whether the end number is below 5 or is 5 or above. In this case, the end decimal number is 8, which is higher than 5. So, round 7.68 up to 7.7.

DIF: Cognitive Level: Understanding REF: p. 53

28. What is 12% of 60?
a. 5
b. 7.2
c. 10.6
d. 12.8

ANS: B
To get the percent of a number, multiply the number by the percentage you want. In this case, $60 \times 0.12 = 7.2$. Remember that percent is based on 100. So, 12% is represented by the decimal 0.12.

DIF: Cognitive Level: Understanding REF: p. 53

29. What is the correct answer to adding the following three decimals: 5.82, 19.06, and 27.33?

a. 46.39
b. 51.21
c. 52.21
d. 104.39

ANS: C

$$\begin{array}{r} 5.82 \\ 19.06 \\ \underline{27.33} \\ 52.21 \end{array}$$

DIF: Cognitive Level: Understanding REF: pp. 50-51

30. What is the correct answer (without rounding) to multiplying 19.06 by 13.22?
a. 197.6231
b. 251.9732
c. 309.5522
d. 322.8121

ANS: B

$$\begin{array}{r} 19.06 \\ \times\ 13.22 \\ \hline 3812 \\ 3812 \\ 5718 \\ \underline{1906} \\ 251.9732 \end{array}$$

DIF: Cognitive Level: Understanding REF: pp. 51-52

COMPLETION

1. A patient is prescribed aspirin 650 mg orally. The aspirin form on hand is 325 mg/tablet. How many tablets is the correct dose?
_____ tablet(s)

ANS:
2

Want 650 mg/Have 325 mg; $\frac{650}{325} = 2$.

DIF: Cognitive Level: Applying or Higher REF: p. 55

2. A patient is prescribed 160 mg of acetaminophen (Tylenol). The drug on hand is acetaminophen $\frac{80\text{ mg}}{2.5\text{ mL}}$. How many milliliters is the correct dose?
_____ mL

ANS:
5

Want $\frac{160\text{ mg}}{X\text{ mL}}$, Have $\frac{80\text{ mg}}{2.5\text{ mL}}$; $\frac{160}{80}$ = 2 × 2.5 mL = 5 mL.

DIF: Cognitive Level: Applying or Higher REF: pp. 54-55

3. A patient is prescribed 0.0625 mg of digoxin (Lanoxin). The drug on hand is digoxin 0.05 mg/mL. How many milliliters is the correct dose?
_____ mL

ANS:
1.25

Want $\frac{0.0625\text{ mg}}{X\text{ mL}}$, Have $\frac{0.050\text{ mg}}{1\text{ mL}}$; $\frac{0.0625}{0.050}$ = 1.25 × 1 mL = 1.25 mL.

DIF: Cognitive Level: Applying or Higher REF: p. 56

4. A patient is prescribed 750 mg of amoxicillin (Amoxil). The drug on hand is amoxicillin $\frac{250\text{ mg}}{5\text{ mL}}$. How many milliliters is the correct dose?
_____ mL

ANS:
15

Want $\frac{750\text{ mg}}{X\text{ mL}}$, Have $\frac{250\text{ mg}}{5\text{ mL}}$; $\frac{750}{250}$ = 3 × 5 mL = 15 mL.

DIF: Cognitive Level: Applying or Higher REF: p. 56

5. A pediatric patient is prescribed 20 mg of acetaminophen (Tylenol). The drug on hand is acetaminophen $\frac{80\text{ mg}}{2.5\text{ mL}}$. How many milliliters is the correct dose?
_____ mL

ANS:
0.6

Want $\frac{20\text{ mg}}{X\text{ mL}}$, Have $\frac{80\text{ mg}}{2.5\text{ mL}}$; $\frac{20}{80}$ = 0.25 × 2.5 mL = 0.625 mL, rounded down to 0.6 mL.

DIF: Cognitive Level: Applying or Higher REF: p. 56

6. A pediatric patient is prescribed 0.004 mg of digoxin (Lanoxin) orally as a one-time dose now. The drug on hand is digoxin 0.05 mg/mL. How many drops is the correct dose?
_____ gtt

ANS:
1

Want $\frac{0.004\text{ mg}}{X\text{ mL}}$, Have $\frac{0.050\text{ mg}}{1\text{ mL}}$; $\frac{0.004}{0.050}$ = 0.08 × 1 mL = 0.08 mL, at 15 gtt/mL = 0.08 × 15 = 1.2 gtt, rounded down to 1 gtt.

DIF: Cognitive Level: Applying or Higher REF: p. 56

7. An infant is prescribed 50 mg of amoxicillin (Amoxil). The drug on hand is amoxicillin $\frac{250\text{ mg}}{5\text{ mL}}$. How many milliliters is the correct dose?
_____ mL

ANS:
1

Want $\frac{50\text{ mg}}{X\text{ mL}}$, Have $\frac{250\text{ mg}}{5\text{ mL}}$; $\frac{50}{250} = \frac{1}{5}$ × 5 mL = 1 mL.

DIF: Cognitive Level: Applying or Higher REF: p. 56

8. A patient is prescribed 4 mg of morphine IV. The drug on hand is morphine 10 mg in a 1 mL syringe. How many milliliters is the correct dose?
_____ mL

ANS:
0.4

Want $\frac{4\text{ mg}}{X\text{ mL}}$, Have $\frac{10\text{ mg}}{1\text{ mL}}$; $\frac{4}{10}$ = 0.4 × 1 mL = 0.4 mL.

DIF: Cognitive Level: Applying or Higher REF: p. 56

9. A patient is prescribed 25 mg of meperidine (Demerol) IV. The drug on hand is meperidine 100 mg/mL. How many milliliters is the correct dose?
_____ mL

ANS:
0.23

Want $\frac{25\text{ mg}}{X\text{ mL}}$, Have $\frac{100\text{ mg}}{1\text{ mL}}$; $\frac{25}{100}$ = 0.25 × 1 mL = 0.25 mL.

DIF: Cognitive Level: Applying or Higher REF: p. 56

10. A patient is prescribed 2000 units of heparin subcutaneously. The drug on hand is heparin 5000 units/mL. How many milliliters is the correct dose?
_____ mL

ANS:
0.4

Want $\frac{2000 \text{ units}}{X \text{ mL}}$, Have $\frac{5000 \text{ units}}{1 \text{ mL}}$; $\frac{2000}{5000} = 0.4 \times 1 \text{ mL} = 0.4 \text{ mL}$.

DIF: Cognitive Level: Applying or Higher REF: p. 56