

**COLLEGE OF ECONOMIC AND
MANAGEMENT SCIENCES
SCHOOL OF ECONOMIC SCIENCES
DEPARTMENT OF DECISION SCIENCES**

Basic Numeracy

Workbook for

BNU1501

**UNISA
PO Box 392, Unisa, 0003**

WORKBOOK

The purpose of this workbook is to give students extra examples and exercises for all the topics covered in the study guide.

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Contents

1	Numbers	1
2	Rounding of numbers	2
3	Variables	3
4	Basic operations on numbers	5
4.1	Addition and subtraction	5
4.2	Multiplication and division	5
5	Basic operations on variables	7
5.1	Addition and subtraction	7
5.2	Multiplication and division	8
6	Powers and roots	10
6.1	Powers (Exponents)	10
6.2	Roots	13
7	Order of operations	15
8	Factors and the Lowest Common Multiple (LCM)	18
8.1	Factors	18
8.2	LCM (Lowest common multiple)	19
9	Fractions	21
9.1	Types of fractions	21
9.2	Multiplication of fractions	22
9.3	Division of fractions	24
9.4	Adding and subtraction of fractions	26
10	Decimals, percentages and ratios	29
10.1	Decimals	29
10.2	Percentages	30

10.3 Ratios	31
11 Length	32
12 Perimeter	33
13 Area	37
14 Volume	41
15 Conversion of units	42
16 Applications	43
17 Solving Equations	45
18 Changing the subject of the formula	49
19 Straight lines	53
20 Basic Financial Calculations	64
A Answers to exercises	68
Worksheet 1	68
Worksheet 2	68
Worksheet 3	68
Worksheet 4	69
Worksheet 5	70
Worksheet 6	72
Worksheet 7	76
Worksheet 8	78
Worksheet 9	79
Worksheet 10	83
Worksheet 11	86
Worksheet 12	87
Worksheet 13	89
Worksheet 14	91
Worksheet 15	92
Worksheet 16	93
Worksheet 17	94
Worksheet 18	96
Worksheet 19	98
Worksheet 20	106

WORKSHEET 1

Numbers

Before you can do this worksheet please study pages 9 to 12 of the study guide. Worksheet 1 is based on **numbers** in Chapter 1 of the study guide. Please do the exercises before you proceed with Worksheet 2.

Exercise 1.1 (See page 68 for the answers)

What kind of number is:

1. 3 _____
2. $-3,5$ _____
3. $\frac{5}{8}$ _____

WORKSHEET 2

Rounding of numbers

Before you can do this worksheet please study pages 12 and 13 of the study guide. Worksheet 2 is based on **rounding of numbers** in Chapter 1 of the study guide. Please do the examples and exercises before you proceed with Worksheet 3.

Example 2.1

Round 14,69375 off to four decimals digits.

We see there are five decimals. We want four decimals. As the last number is a five we have to change the digit before the five, therefore the seven will change to an eight.

$$14,69375 = 14,6938.$$

Exercise 2.1 (See page 68 for the answers)

Round 34,9974321 off to six, four and two decimal digits, respectively.

1. 34,9974321 _____ six decimals
2. 34,9974321 _____ four decimals
3. 34,9974321 _____ two decimals

WORKSHEET 3

Variables

Before you can do this worksheet please study pages 14 to 16 of the study guide. Worksheet 3 is based on **variables** in Chapter 1 of the study guide. Please do the examples and exercises before you proceed with Worksheet 4.

Example 3.1

1. Subtract 12 from 34.

We have 34 and from that we must subtract 12. We write it as:

$$34 - 12$$

2. Subtract x from a .

We have a and from that we must subtract x . We write it as follows:

$$a - x$$

3. The sum of a and b is equal to c .

The “sum” of two numbers means the total when we add two numbers. We write the given statement as follows:

$$a + b = c$$

4. Write an expression for adding nine to an unknown number and multiply the answer with 5.

Let x be the unknown number. To this we add 9.

Thus $x + 9$ must now be multiplied with 5. We use brackets to indicate that the sum of x and 9, namely $x + 9$, should be multiplied with 5.

$$(x + 9)5$$

5. Make use of variables and write the following as an algebraic equation.

Two litres of grease and 30 litres of petrol cost R450.

First define the variables.

Let p equals the price of a litre of petrol in rand.

Let g be the price of a litre of grease in rand.

$$2g + 30p = 450$$

Exercise 3.1 (See page 68 for the answers)

Make use of variables and write the following as algebraic equations.

1. Three times a number minus six is equal to 24.

2. Twice a number plus three times another number is 120.

Let f be the first number and s be the second number.

3. A father is twenty-five years older than his son.

4. Set up two equations for the following situation:

A tin contains a total of 85 red and white buttons. Twice the number of red buttons is eight more than the number of white buttons.

WORKSHEET 4

Basic operations on numbers

Before you can do this worksheet please study pages 17 to 22 of the study guide. Worksheet 4 is based on basic **operations on numbers** in Chapter 2 of the study guide. Please do the examples and exercises before you proceed with Worksheet 5.

4.1 Addition and subtraction

Exercise 4.1 (See page 69 for the answers)

Simplify the following **expressions**:

1. $35 + 42 - 16 - 8$

2. $22 - 34 - 5 + 66$

3. $12 - 9 + 21 - 32$

4.2 Multiplication and division

Example 4.1

Simplify the following **expressions**:

1. $22 \times 6 \div 4 = 132 \div 4$
 $= 33$

2. $55 \div 11 \times 4 = 5 \times 4$
 $= 20$

3.

$$\begin{aligned}720 \times 3 \div 40 \times 8 \div 2 &= 2160 \div 40 \times 8 \div 2 \\&= 54 \times 8 \div 2 \\&= 432 \div 2 \\&= 216\end{aligned}$$



Exercise 4.2 (See page 69 for the answers)

Simplify the following **expressions**:

1. $35 \times 2 \times 3$

2. $70 \times 3 \div 6 \times 20$

3. $15 \times 4 \times 6 \div 5 \div 9 \times 7$

4. $32 \div 8 \div 2 \times 25 \times 4 \div 5$

WORKSHEET 5

Basic operations on variables

Before you can do this worksheet please study pages 23 to 28 of the study guide. Worksheet 5 is based on **basic operations on variables** in Chapter 2 of the study guide. Please do the examples and exercises before you proceed with Worksheet 6.

5.1 Addition and subtraction

Example 5.1

Study the following examples of the **simplification of expressions**:

1. $6x + 3x = 9x$
2. $13y - 7y = 6y$
3. $6a + 3b - 5a + 7b = 6a - 5a + 3b + 7b$
 $= a + 10b$

Exercise 5.1 (See page 70 for the answers)

Simplify the following **expressions**:

1. $15a - 6a - 7a$

2. $23b + 4b + 3a$

3. $3x - 7y - 24x + 8y$

4. $6c + 13d + 7c - 23d - 3c - 12d$

5.2 Multiplication and division

Example 5.2

Simplify the following **expressions**:

1. $2x \times 3y = 6xy$

2. $2a \times 7b \times 3c = 42abc$

3.
$$14ab \div 7b = \frac{14^1 \times a \times b^1}{7^1 \times b^1}$$

$$= \frac{2 \times a \times 1}{1 \times 1}$$

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

$$= 2a$$

Numerator: $b \div b = 1$
Denominator: $b \div b = 1$

Numerator: $14 \div 7 = 2$
Denominator: $7 \div 7 = 1$

4.
$$2x \times 15y \div 20xyz = \frac{2^1 x 15y}{20^1 xyz}$$

$$= \frac{15xy}{10xyz}$$

$$= \frac{15^1 xy}{10^1 xyz}$$

$$= \frac{3}{2z}$$

Numerator: $2 \div 2 = 1$
Denominator: $20 \div 2 = 10$

Numerator: $xy \div xy = 1$
Denominator: $xy \div xy = 1$

Numerator: $15 \div 5 = 3$
Denominator: $10 \div 5 = 2$

Exercise 5.2 (See page 71 for the answers)

Simplify the following **expressions**:

1. $13a \times 4b \times 3c \times 2a$

2. $4x \times 4y \times 2x \times 6y$

3. $5a^2 \times 4b \div 3a \times 6b$

4. $16x \div 8y \times 7y \div 4x$

WORKSHEET 6

Powers and roots

Before you can do this worksheet please study pages 28 to 34 of the study guide.
Worksheet 6 is based on **powers and roots** in Chapter 2 of the study guide.
Please do the examples and exercises before you proceed with Worksheet 7.

6.1 Powers (Exponents)

Example 6.1

Write the following expressions in the exponential form:

$$\begin{aligned} 1. \quad 2 \times 2 \times 2 \times 2 \times 2 \times 2 &= 2^1 \times 2^1 \times 2^1 \times 2^1 \times 2^1 \times 2^1 \\ &= 2^{1+1+1+1+1+1} \\ &= 2^6 \end{aligned}$$

Add the exponents

$$2. \quad 5 \times 5 \times 5 + 3 \times 3 \times 3 \times 3 \times 3 = 5^3 + 3^5$$

$$\begin{aligned} 3. \quad \frac{1}{4} \times \frac{1}{4} \times \frac{1}{4} &= 4^{-1} \times 4^{-1} \times 4^{-1} \\ &= 4^{-3} \end{aligned}$$

Get rid of the denominator

Add the exponents

Example 6.2

Simplify the following expressions by using the exponential laws:

$$\begin{aligned} 1. \quad b^3 b^4 a^2 a^6 &= b^{3+4} a^{2+6} \\ &= b^7 a^8 \end{aligned}$$

Add the different variables' exponents

$$\begin{aligned} 2. \quad (x^2)^3 &= (xx)^3 \\ &= (xx)(xx)(xx) \\ &= x^6 \end{aligned}$$

$$\begin{aligned} 3. \quad y^6 \div y^4 &= \frac{yyyyyy}{yyyy} \\ &= yy \\ &= y^2 \end{aligned}$$

OR

$$\begin{aligned} y^6 \div y^4 &= y^{6-4} \\ &= y^2 \end{aligned}$$

$$\begin{aligned} 4. \quad (xy)^4 &= (xy) \times (xy) \times (xy) \times (xy) \\ &= x \times y \times x \times y \times x \times y \times x \times y \\ &= x^1 \times x^1 \times x^1 \times x^1 \times y^1 \times y^1 \times y^1 \times y^1 \\ &= x^{1+1+1+1} y^{1+1+1+1} \\ &= x^4 y^4 \end{aligned}$$

$$\begin{aligned} 5. \quad (a^2 b^3)^2 &= (a^2 b^3) \times (a^2 b^3) \\ &= (aabb b) \times (aabb b) \\ &= a \times a \times a \times a \times b \times b \times b \times b \times b \times b \\ &= a^4 b^6 \end{aligned}$$

Exercise 6.1 (See page 72 for the answers)

Simplify the following **expressions**:

1. $a^3 \times b^2 \times a^{-1} \times b^4$

2. $x^4 \times x^3 \times y^4 \times y \times y^2 \times x$

3. $p^3 \div p^2$

4. $t^4 \times t^3 \times r \div t^6$

5. $(xy)^3$

6. $(a^3b^3)^2$

7. $2x^3 \times 4x^4$

8. $12a^3 \div 4a^6b^2$

9. $(3x^2)^3$

10. $(5a^22b)^3$

6.2 Roots

Example 6.3

Simplify the following expressions:

1.

$$\begin{aligned}\sqrt{9} &= \sqrt{3 \times 3} \\ &= 3\end{aligned}$$

2.

$$\begin{aligned}\sqrt{49} &= \sqrt{7 \times 7} \\ &= 7\end{aligned}$$

3.

$$\begin{aligned}\sqrt[3]{64} &= \sqrt[3]{4 \times 4 \times 4} \\ &= (4 \times 4 \times 4)^{\frac{1}{3}} \\ &= \left(4^{\frac{3}{1}}\right)^{\frac{1}{3}} \\ &= 4 \quad \text{because } (a^m)^n = a^{m \times n}\end{aligned}$$

4.

$$\begin{aligned}\sqrt[5]{32} &= \sqrt[5]{2 \times 2 \times 2 \times 2 \times 2} \\ &= \sqrt[5]{2^5} \\ &= \left(2^{\frac{5}{1}}\right)^{\frac{1}{5}} \\ &= 2 \quad \text{because } (a^m)^n = a^{m \times n}\end{aligned}$$

5.

$$\begin{aligned}\sqrt{64} + \sqrt{36} &= \sqrt{8 \times 8} + \sqrt{6 \times 6} \\ &= (8 \times 8)^{\frac{1}{2}} + (6 \times 6)^{\frac{1}{2}} \\ &= (8^2)^{\frac{1}{2}} + (6^2)^{\frac{1}{2}} \\ &= 8 + 6 \\ &= 14 \quad \text{because } (a^m)^n = a^{m \times n}\end{aligned}$$

AND NOT

$$\begin{aligned}\cancel{\sqrt{64} + \sqrt{36}} &= \cancel{\sqrt{64 + 36}} \\ &= \cancel{\sqrt{100}} \\ &= \cancel{\sqrt{10 \times 10}} \\ &= \cancel{10}\end{aligned}$$

Exercise 6.2 (See page 74 for the answers)

Simplify the following **expressions**:

1. $\sqrt{169}$

2. $\sqrt{144} - \sqrt{64}$

3. $(\sqrt{6})^2$

4. $\sqrt[3]{1000}$

WORKSHEET 7

Order of operations

Before you can do this worksheet please study pages 34 to 38 of the study guide.
Worksheet 7 is based on **order of operations** in Chapter 2 of the study guide.
Please do the examples and exercises before you proceed with Worksheet 8.

Example 7.1

Simplify the following **expressions**:

1. $12 + 3 + 16 - 9 - 11 = 31 - 20$
 $= 11$

2. $(12 + 3 + 16) - (9 - 11) = 31 - (-2)$
 $= 31 + 2$
 $= 33$

First simplify the brackets

A negative multiplied by a negative gives a positive

3. $(2 + 3)^2 - 9 = (5)^2 - 9$
 $= 25 - 9$
 $= 16$

First simplify the brackets

4. $2 \times 5 + 9 \div 3 = 10 + 3$
 $= 13$

First multiply and divide

5. $2 + 5 \times 6 \div 3 = 2 + 30 \div 3$
 $= 2 + 10$
 $= 12$

First multiply and divide

6. $5^2 + 7 - \sqrt{9} \times 4 = 25 + 7 - 3 \times 4$
 $= 25 + 7 - 12$
 $= 32 - 12$
 $= 20$

First simplify the power and root

Multiply

7. $\sqrt{5^2 + 12 \div 2 + \sqrt{64}} - 3 = \sqrt{25 + 6 + 8 - 3}$
 $= \sqrt{36}$
 $= 6$

First simplify the power and root underneath the root sign

Add and subtract

Simplify the root

$$\begin{aligned} 8. \quad 4(5 + 3) - 16 \div 8 \times 3 &= 4(8) - 16 \div 8 \times 3 \\ &= 32 - 6 \\ &= 26 \end{aligned}$$

First simplify the bracket

Multiply and divide

Subtract



Exercise 7.1 (See page 76 for the answers)

Simplify the following **expressions**:

1. $13 - 29 + 17$

2. $19 + 23 - 52 - 7$

3. $(3 + 6)^2 - (5 - 2)^3$

4. $(3 - 6)^2 - (5 + 2)$

5. $(3 - 5)^4 \div (4 - 2)^4$

6. $3(8 - 5) - 64 \div 8 \times 3$

7. $(40 - (3 + 4 \times 6) + 15 \div 3 \times 5) - (32 \div 4 + 5)$

8. $\sqrt{56 - (3 - 1)^2 + 8^2 \div 2} - \sqrt{4^2 - 7}$

WORKSHEET 8

Factors and the Lowest Common Multiple (LCM)

Before you can do this worksheet please study pages 39 to 42 of the study guide.
Worksheet 8 is based on **factors** and **lowest common multiple** (LCM) in Chapter 3 of the study guide. Please do the examples and exercises before you proceed with Worksheet 9.

8.1 Factors

Example 8.1

Factorise the following numbers as far as possible:

1. $16 = 2 \times 8$
 $= 2 \times 2 \times 4$
 $= 2 \times 2 \times 2 \times 2$

Factorise 8 further: that is 4×2

Factorise 4 further: that is 2×2

2. $36 = 2 \times 18$
 $= 2 \times 2 \times 9$
 $= 2 \times 2 \times 3 \times 3$

Factorise 18: that is 9×2

Factorise 9: that is 3×3

3. $54 = 2 \times 27$
 $= 2 \times 3 \times 9$
 $= 2 \times 3 \times 3 \times 3$

Factorise 27: that is 9×3

Factorise 9: that is 3×3

Exercise 8.1 (See page 78 for the answers)

Factorise the following numbers as far as possible:

1. 21

2. 48

3. 72

8.2 LCM (Lowest common multiple)

Example 8.2

Study the following example

Determine the LCM of:

1. 6, 12 and 18

We first factorise all three numbers as far as possible.

$$6 = 2 \times 3$$

$$12 = 2 \times 2 \times 3$$

$$18 = 2 \times 3 \times 3$$

$$\text{LCM} = 2 \times 3 \times 2 \times 3$$

$$= 36$$

See the guide on how to determine the LCM

2. 15, 35 and 45

$$15 = 3 \times 5$$

$$35 = 5 \times 7$$

$$45 = 3 \times 3 \times 5$$

$$\text{LCM} = 3 \times 5 \times 7 \times 3$$

$$= 315$$

3. 17, 51 and 102

$$\begin{aligned}17 &= 17 \\51 &= 3 \times 17 \\102 &= 2 \times 3 \times 17 \\ \text{LCM} &= 17 \times 3 \times 2 \\ &= 102\end{aligned}$$



Exercise 8.2 (See page 78 for the answers)

Determine the LCM for:

1. 9, 15 and 30

2. 8, 32 and 96

3. 18, 30 and 50

WORKSHEET 9

Fractions

Before you can do this worksheet please study pages 43 to 54 of the study guide. Worksheet 9 is based on **fractions** in Chapter 3 of the study guide. Please do the examples and exercises before you proceed with Worksheet 10.

9.1 Types of fractions

Exercise 9.1 (See page 79 for the answers)

Write the following improper fractions as mixed fractions:

1. $\frac{7}{5}$

2. $\frac{13}{7}$

3. $\frac{22}{6}$

9.2 Multiplication of fractions

Example 9.1

Simplify the following expressions:

1.

$$\begin{aligned}
 \frac{3}{5} \times \frac{10}{12} &= \frac{3}{5} \times \frac{10}{12} \quad \text{OR} \quad \frac{3}{\cancel{5}^1} \times \frac{\cancel{10}^2}{12} = \frac{3}{1} \times \frac{2}{12} && \begin{array}{l} \text{Numerator: } 10 \div 5 = 2 \\ \text{Denominator: } 5 \div 5 = 1 \end{array} \\
 &= \frac{\cancel{30}^1}{\cancel{60}^2} && \begin{array}{l} \text{Numerator: } 3 \div 3 = 1 \\ \text{Denominator: } 12 \div 3 = 4 \end{array} \\
 &= \frac{1}{2} && \begin{array}{l} \text{Numerator: } 2 \div 2 = 1 \\ \text{Denominator: } 4 \div 2 = 2 \end{array} \\
 &= \frac{1}{2}
 \end{aligned}$$

2.

$$\begin{aligned}
 \frac{4}{7} \times \frac{5}{6} \times \frac{14}{15} &= \frac{4}{7} \times \frac{\cancel{5}^1}{6} \times \frac{14}{\cancel{15}^3} && \begin{array}{l} \text{Numerator: } 5 \div 5 = 1 \\ \text{Denominator: } 15 \div 5 = 3 \end{array} \\
 &= \frac{4}{\cancel{7}^1} \times \frac{1}{6} \times \frac{\cancel{14}^2}{3} && \begin{array}{l} \text{Numerator: } 14 \div 7 = 2 \\ \text{Denominator: } 7 \div 7 = 1 \end{array} \\
 &= \frac{4}{\cancel{8}^3} \times \frac{2^1}{3} && \begin{array}{l} \text{Numerator: } 2 \div 2 = 1 \\ \text{Denominator: } 6 \div 2 = 3 \end{array} \\
 &= \frac{4 \times 1}{3 \times 3} \\
 &= \frac{4}{9}
 \end{aligned}$$

3.

$$\begin{aligned}
 \frac{9a^2}{16b^2} \times \frac{12b}{15a} &= \frac{9aa}{\cancel{16}^4bb} \times \frac{\cancel{12}^3b}{15a} && \begin{array}{l} \text{Numerator: } 12 \div 4 = 3 \\ \text{Denominator: } 16 \div 4 = 4 \end{array} \\
 &= \frac{\cancel{9}^3aa}{4bb} \times \frac{3b}{\cancel{15}^5a} && \begin{array}{l} \text{Numerator: } 9 \div 3 = 3 \\ \text{Denominator: } 15 \div 3 = 5 \end{array} \\
 &= \frac{3a\cancel{a}}{4b\cancel{b}} \times \frac{3\cancel{b}}{5\cancel{a}} && \begin{array}{l} \text{Numerator: } ab \div ab = 1 \\ \text{Denominator: } ab \div ab = 1 \end{array} \\
 &= \frac{3a}{4b} \times \frac{3}{5} \\
 &= \frac{9a}{20b}
 \end{aligned}$$

Exercise 9.2 (See page 79 for the answers)

Simplify the following **expressions**:

1. $\frac{7}{9} \times \frac{15}{14}$

2. $\frac{5}{13} \times \frac{7}{16} \times \frac{39}{45}$

3. $\frac{4x^3}{7y} \times \frac{10x}{14y} \times \frac{35y^2}{36x^2}$

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

9.3 Division of fractions

Example 9.2

Simplify the following expressions:

1.

$$\begin{aligned}
 & \frac{2}{5} \div \frac{10}{13} \\
 &= \frac{2^1}{5} \times \frac{13}{10^5} \\
 &= \frac{1}{5} \times \frac{13}{5} \\
 &= \frac{13}{25}
 \end{aligned}$$

Only invert the term directly to the right hand side of the division sign

Numerator: $2 \div 2 = 1$
 Denominator: $10 \div 2 = 5$

2.

$$\begin{aligned}
 \frac{3}{13} \div \frac{15}{26} \times \frac{7}{8} &= \frac{3^1}{13} \times \frac{26}{15^5} \times \frac{7}{8} \\
 &= \frac{1}{13^1} \times \frac{26^2}{5} \times \frac{7}{8} \\
 &= \frac{2^1 \times 7}{5 \times 8^4} \\
 &= \frac{7}{5 \times 4} \\
 &= \frac{7}{20}
 \end{aligned}$$

Only invert the term directly to the right hand side of the division sign

Numerator: $3 \div 3 = 1$
 Denominator: $15 \div 3 = 5$

Numerator: $26 \div 13 = 2$
 Denominator: $13 \div 13 = 1$

Numerator: $2 \div 2 = 1$
 Denominator: $8 \div 2 = 4$

3.

$$\begin{aligned}
 \frac{11}{6} \times \frac{12}{22} \div \frac{4}{9} &= \frac{11^1}{6} \times \frac{12}{22^2} \times \frac{9}{4} \\
 &= \frac{1}{6^1} \times \frac{12^2}{2} \times \frac{9}{4} \\
 &= \frac{2^1 \times 9}{2^1 \times 4} \\
 &= \frac{9}{4}
 \end{aligned}$$

Only invert the term directly to the right hand side of the division sign

Numerator: $11 \div 11 = 1$
 Denominator: $22 \div 11 = 2$

Numerator: $12 \div 6 = 2$
 Denominator: $6 \div 6 = 1$

Numerator: $2 \div 2 = 1$
 Denominator: $2 \div 2 = 1$

Exercise 9.3 (See page 80 for the answers)

Simplify the following **expressions**:

1. $\frac{7}{8} \div \frac{5}{4}$

2. $\frac{5}{6} \times \frac{11}{16} \div \frac{15}{24}$

3. $\frac{25}{36} \div \frac{18}{5} \times \frac{27}{45}$

4. $\frac{25a^2}{8b} \div \left(\frac{16b}{5a} \times \frac{25a}{32b} \right)$

9.4 Adding and subtraction of fractions

Example 9.3

Simplify the following **expressions**:

1.

$$\begin{array}{lcl} \frac{3}{4} + \frac{1}{2} & \text{OR} & \frac{3}{4} + \frac{1}{2} \\ = \frac{3}{4} + \frac{2}{4} & & = \frac{3(1) + 1(2)}{4} \quad \text{LCM} = 4 \\ = \frac{5}{4} & & = \frac{3 + 2}{4} \\ = 1\frac{1}{4} & & = \frac{5}{4} \\ & & = 1\frac{1}{4} \end{array}$$

2.

$$\begin{array}{lcl} \frac{5}{3} + \frac{6}{10} & \text{OR} & \frac{5}{3} + \frac{6}{10} \\ = \frac{50}{30} + \frac{18}{30} & & = \frac{5(10) + 6(3)}{30} \quad \text{LCM} = 30 \\ = \frac{68}{30} & & = \frac{50 + 18}{30} \\ = \frac{34}{15} & & = \frac{68}{30} \\ = 2\frac{4}{15} & & = \frac{8}{3} \\ & & = 2\frac{4}{15} \end{array}$$

3.

$$\begin{array}{lcl} 2\frac{3}{5} - \frac{2}{3} & \text{OR} & 2\frac{3}{5} - \frac{2}{3} \\ = \frac{13}{5} - \frac{2}{3} & & = \frac{2(5) + 3}{5} - \frac{2}{3} \\ = \frac{39}{15} - \frac{10}{15} & & = \frac{10 + 3}{5} - \frac{2}{3} \\ = \frac{29}{15} & & = \frac{13(3) - 2(5)}{15} \quad \text{LCM} = 15 \\ = 1\frac{14}{15} & & = \frac{39 - 10}{15} \\ & & = \frac{29}{15} \\ & & = 1\frac{14}{15} \end{array}$$

Convert the mixed fraction $(2\frac{3}{5})$ to an improper fraction

Convert the improper fraction to a mixed fraction

$$\begin{array}{lll} 4. & \frac{2a}{3b} + \frac{b}{a} & \text{OR} \quad \frac{2a}{3b} + \frac{b}{a} \\ & = \frac{2a(a) + b(3b)}{3ab} & = \frac{2aa}{3ab} + \frac{3bb}{3ab} \quad \boxed{\text{LCM} = 3ab} \\ & = \frac{2a^2 + 3b^2}{3ab} & = \frac{2a^2 + 3b^2}{3ab} \end{array}$$

$$\begin{array}{lll} 5. & \frac{1}{2} + \frac{3}{8} - \frac{5}{6} & \text{OR} \quad \frac{1}{2} + \frac{3}{8} - \frac{5}{6} \\ & = \frac{1(12) + 3(3) - 5(4)}{24} & = \frac{12}{24} + \frac{9}{24} - \frac{20}{24} \quad \boxed{\text{LCM} = 24} \\ & = \frac{12 + 9 - 20}{24} & = \frac{12 + 9 - 20}{24} \\ & = \frac{21 - 20}{24} & = \frac{1}{24} \\ & = \frac{1}{24} & \end{array}$$

Exercise 9.4**Simplify** the following **expressions**:

(See page 81 for the answers)

1. $\frac{4}{7} + \frac{2}{3}$

2. $\frac{5}{9} - \frac{3}{5}$

3. $\frac{3}{8} + \left(\frac{4}{3} \times \frac{11}{24}\right)$

4. $\frac{ab}{c} + \frac{c}{ab}$

5. $1\frac{3}{5} - 2\frac{3}{4} + \frac{7}{8}$

WORKSHEET 10

Decimals, percentages and ratios

Before you can do this worksheet please study pages 54 to 60 of the study guide.
Worksheet 10 is based on **decimals, percentage and ratios** in Chapter 3 of the study guide. Please do the exercises before you proceed with Worksheet 11.

10.1 Decimals

Exercise 10.1 (See page 83 for the answers)

1. Write the following as decimal numbers:

(a) $\frac{2}{5}$

(b) $2\frac{1}{6}$

(c) $\frac{7}{8}$

2. Write the following numbers as ordinary fractions:

(a) 0,4

(b) 1,6

(c) 5,075

10.2 Percentages

Exercise 10.2 (See page 84 for the answers)

1. You have 6 out of 15 for your first assignment. Determine the percentage you received for this assignment.

2. Henry want to buy a computer for R5 500. He paid cash for it and got a 25% discount. Determine the amount of discount that Henry received.

3. Pete's salary increased with 10,5% per year. Determine his new salary if his old salary was R360 000 per year.

4. Sophia paid R34 000 for a new lounge suite. If the original price was R40 000 determine the percentage discount that she received.

5. A Persian carpet value of R25 000 increased in one year's time to R33 000. Determine the percentage increase in the value of the Persian carpet.

10.3 Ratios

Exercise 10.3 (See page 85 for the answers)

1. There are 15 green apples and 25 red apples in a bowl. Determine the ratio of green apples to red apples.

2. Jacob decides to divide his flock of sheep of 57 000 among his three sons Thabo, Lucas and Sipho in the ratio 3:11:5. Determine how many sheep Lucas will receive.

WORKSHEET 11

Length

Before you can do this worksheet please study pages 61 to 64 of the study guide.
Worksheet 11 is based on **conversion of length** in Chapter 4 of the study guide. Please do the exercises before you proceed with Worksheet 12.

Exercise 11.1 (See page 86 for the answers)

Convert the following as indicated:

1. 150 mm to cm

2. 150 cm to m

3. 26 000 m to km

4. 6,5 m to cm

5. 5 000 000 mm to m

6. 2 678 000 cm to km

7. 7,5 km to m

WORKSHEET 12

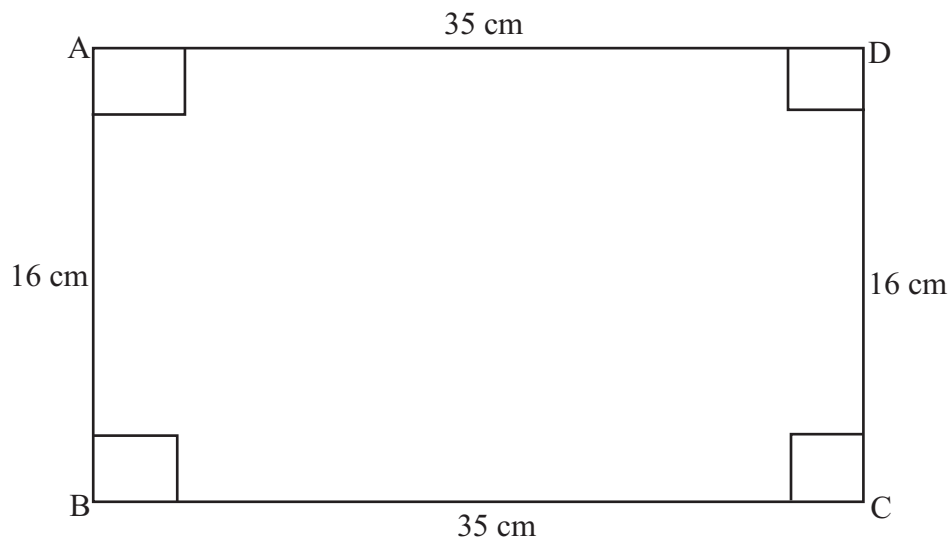
Perimeter

Before you can do this worksheet please study pages 64 to 69 of the study guide. Worksheet 12 is based on the **perimeter** of different figures in Chapter 4 of the study guide. Please do the exercises before you proceed with Worksheet 13.

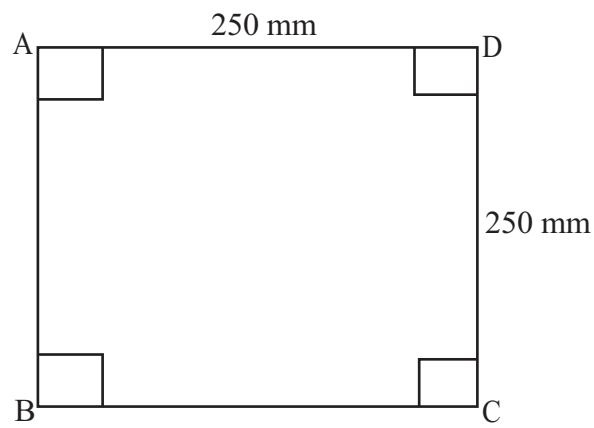
Exercise 12.1 (See page 87 for the answers)

Determine the **perimeter** of the following figures:

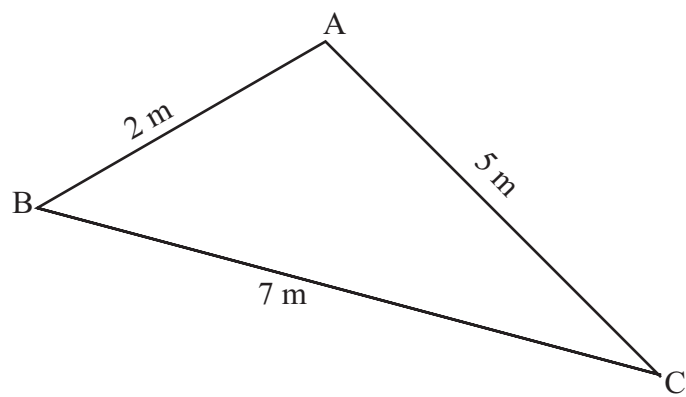
1.



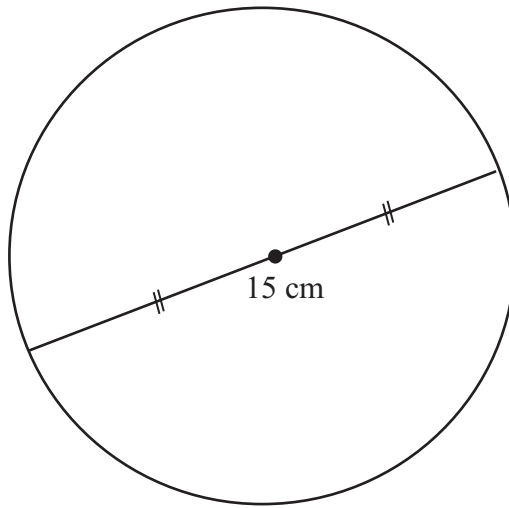
2.



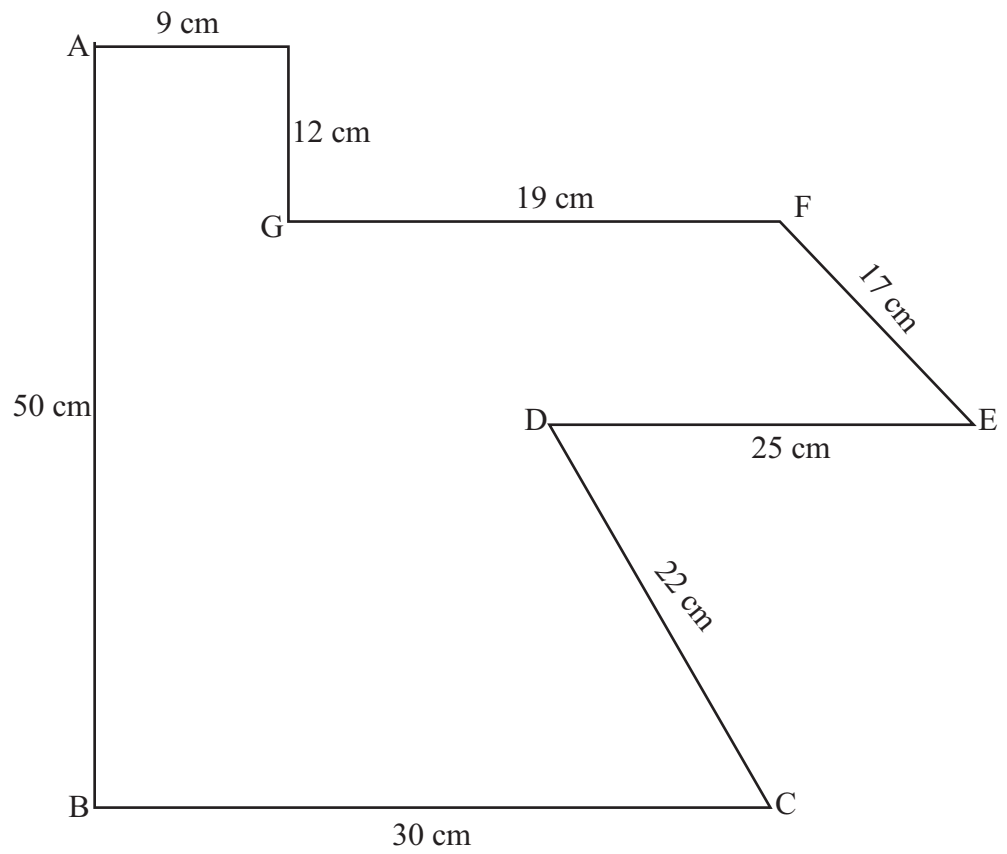
3.



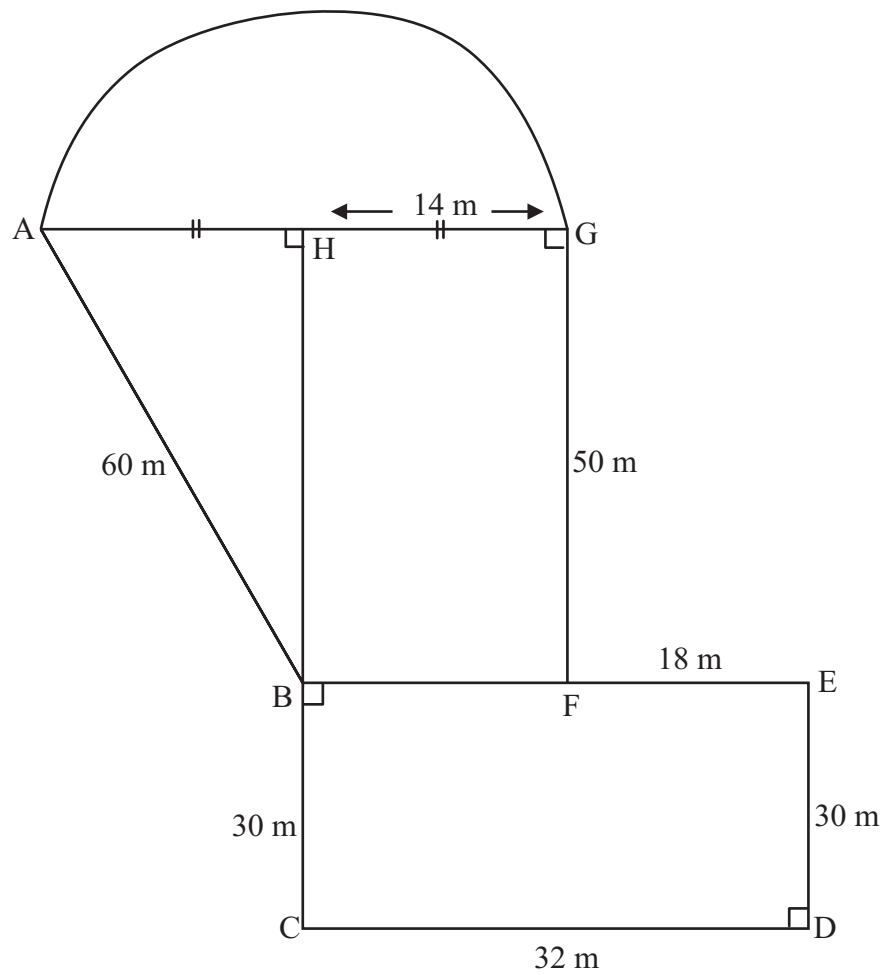
4.



5.



6.



WORKSHEET 13

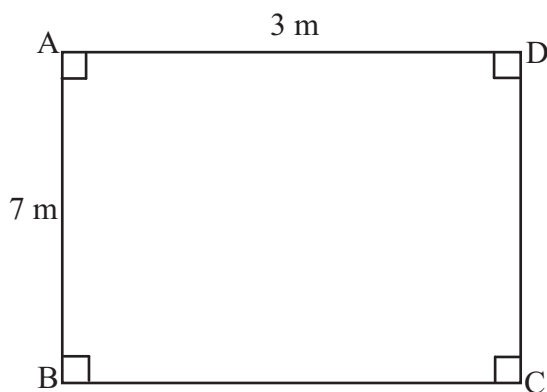
Area

Before you can do this worksheet please study pages 70 to 77 of the study guide. Worksheet 13 is based on the **area** of different figures in Chapter 4 of the study guide. Please do the exercises before you proceed with Worksheet 14.

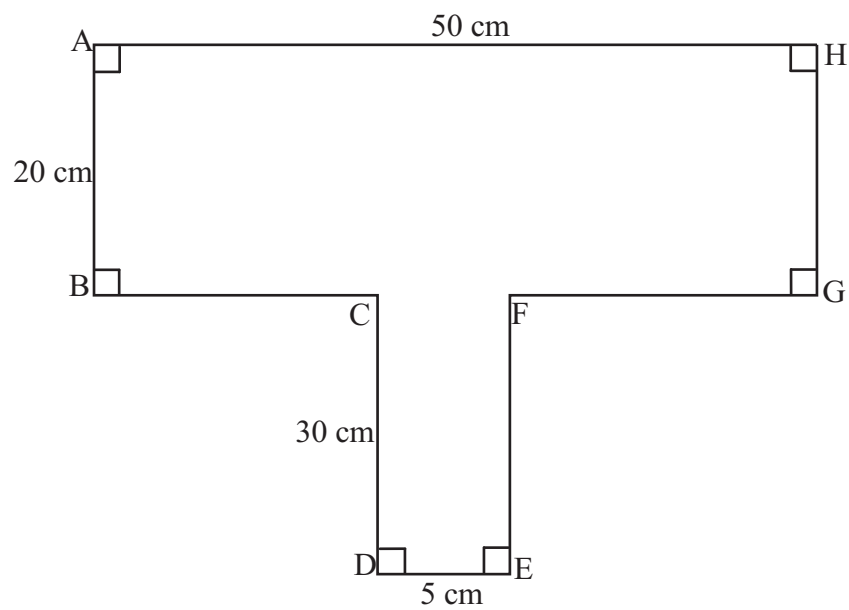
Exercise 13.1 (See page 89 for the answers)

Determine the **area** of the following figures:

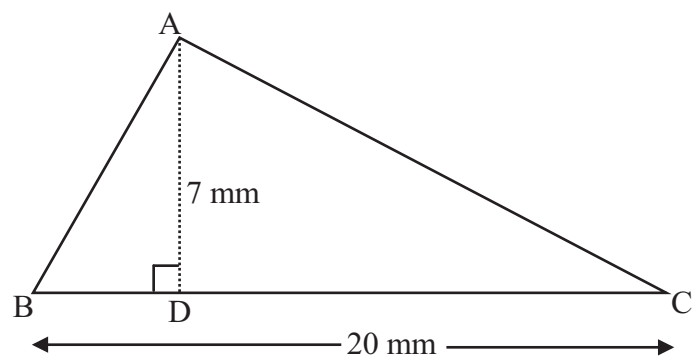
1.



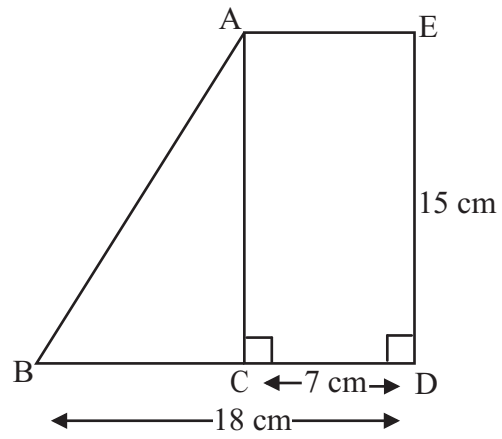
2.



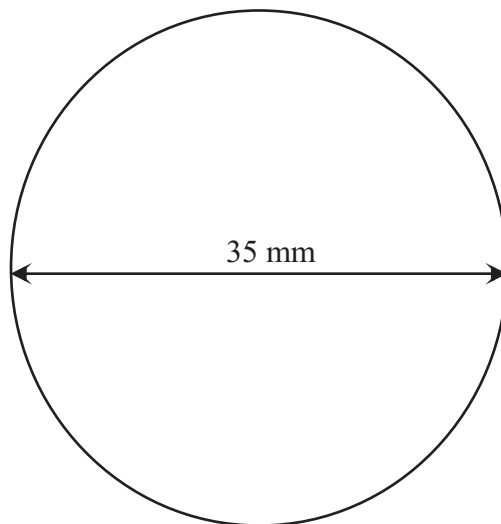
3.



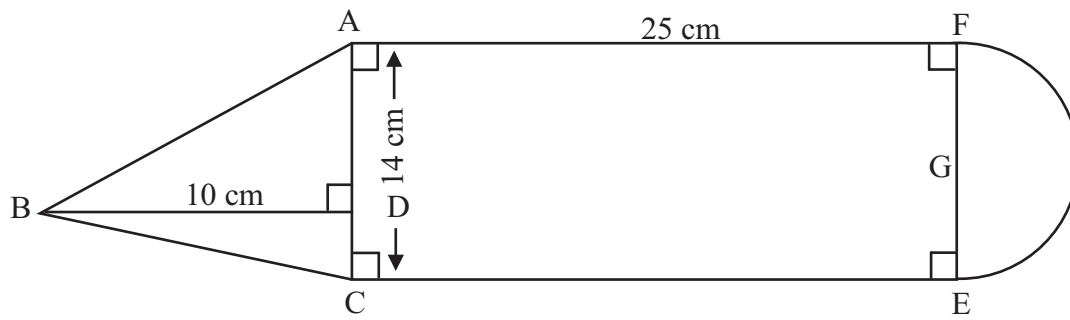
4.



5.



6.



WORKSHEET 14

Volume

Before you can do this worksheet please study pages 77 to 79 of the study guide. Worksheet 14 is based on **volume** of different figures in Chapter 4 of the study guide. Please do the exercises before you proceed with Worksheet 15.

Exercise 14.1 (See page 91 for the answers)

1. Determine the volume of a rectangular prism with sides 50 cm, 30 cm and 15 cm.

2. Determine the volume of a cube with sides 35 metres long.

3. Determine the volume of a cylinder with radius of 0,75 metres and a perpendicular height of 3,2 metres.

WORKSHEET 15

Conversion of units

Before you can do this worksheet please study pages 79 to 82 of the study guide.
Worksheet 15 is based on **conversion of units** in Chapter 4 of the study guide.
Please do the exercises before you proceed with Worksheet 16.

Exercise 15.1 (See page 92 for the answers)

Convert the following as indicated:

1. 10 000 mm² to cm².

2. 5,6 m² to cm²

3. 555 000 cm³ to m³

4. 5 m³ to litres

WORKSHEET 16

Applications

Before you can do this worksheet please study pages 82 to 84 of the study guide. Worksheet 16 is based on **applications of measurements** in Chapter 4 of the study guide. Please do the exercises before you proceed with Worksheet 17.

Exercise 16.1 (See page 93 for the answers)

1. Sizwe wants to lay carpets on the bedroom's floor. The carpets tiles are 500 mm by 500 mm each. The room measurements are 3,5 metres by 6 metres. If the tiles interlock with each other determine how many carpet tiles are needed to cover the floor.

2. The water tank has a height of 5 metres and a diameter of 2,1 metres. Determine how many **liters** of water can this tank holds if it is filled to the brim.

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WORKSHEET 17

Solving Equations

Before you can do this worksheet please study pages 85 to 93 of the study guide. Worksheet 17 is based on **solving of equations** in Chapter 5 of the study guide. Please do the exercises before you proceed with Worksheet 18.

Example 17.1

Solve the following equations:

1. $x + 3 = 5$

$$x + 3 - 3 = 5 - 3$$

$$x = 2$$

To get rid of the +3 on the left hand side we subtract 3 on both sides of the equation

2. $y - 5 = 4$

$$y - 5 + 5 = 4 + 5$$

$$y = 9$$

Add 5 on both sides of the equation

3. $2a + 13 = a + 17$

$$2a - a + 13 = a + 17 - a$$

$$a + 13 = 17$$

$$a + 13 - 13 = 17 - 13$$

$$a = 4$$

All the variables must be on the same side of the equation, therefore subtract a on both sides

Subtract 13 on both sides

4. $3x - 4 = 14 - 6x$

$$3x - 4 + 6x = 14 - 6x + 6x$$

$$9x - 4 = 14$$

$$9x - 4 + 4 = 14 + 4$$

$$9x = 18$$

$$\frac{9x}{9} = \frac{18}{9}$$

$$x = 2$$

Add $6x$ on both sides of the equation

Add 4 on both sides of the equation

To get rid of the 9, divide both sides by 9

5. $\frac{y}{3} - 6 = 2$

$$\frac{y}{3} - 6 + 6 = 2 + 6$$

First get rid of the 6 on the left hand side by adding 6 on both sides

$$\frac{y}{3} = 8$$

$$\frac{y}{3} \times \frac{3}{1} = \frac{8}{1} \times \frac{3}{1}$$

Get rid of the 3 by multiplying by 3 on both sides of the equation

$$y = 24$$

6. $2(x + 3) = 24$

$$2x + 6 = 24$$

First simplify the brackets

$$2x + 6 - 6 = 24 - 6$$

Subtract 6 on both sides

$$2x = 18$$

$$\frac{2x}{2} = \frac{18}{2}$$

Divide both sides by 2

$$x = 9$$

7. $12 - y = 8 + 3y$

$$12 - y - 3y = 8 + 3y - 3y$$

Subtract 3y from both sides of the equation

$$12 - 4y = 8$$

$$12 - 4y - 12 = 8 - 12$$

Subtract 12 from both sides of the equation

$$-4y = 4$$

$$\frac{-4y}{-4} = \frac{4}{-4}$$

Divide both sides with -4

$$y = 1$$



Exercise 17.1 (See page 94 for the answers)

Solve the following equations:

1. $x - 3 = 2$

2. $a + 4 = 3a - 8$

3. $24 - \frac{b}{3} = 12$

4. $5x + 16 = 3x + 24$

5. $13x + 26 = 9x + 10$

6. $\frac{y}{3} + 15 = y + 19$

WORKSHEET 18

Changing the subject of the formula

Before you can do this worksheet please study pages 93 to 97 of the study guide. Worksheet 18 is based on **changing the subject** of a formula in Chapter 5 of the study guide. Please do the examples and exercises before you proceed with Worksheet 19.

Example 18.1

Change the following equations to have what is indicated in brackets as **the subject of the formula**:

1.

$$y = x - 2$$

(x)

$$x - 2 = y$$

Remember that $2 + 3 = 3 + 2$

$$x = y + 2$$

Add 2 both sides of the equation

2.

$$2a + c = 9$$

(c)

$$c = 9 - 2a$$

Subtract $2a$ on both sides of the equation

3.

$$3b - 6 = 9c$$

(b)

$$3b = 9c + 6$$

Add 6 on both sides of the equation

$$\frac{3b}{3} = \frac{9c + 6}{3}$$

Divide both sides of the equation by 3

$$\frac{3b}{3} = \frac{9c}{3} + \frac{6}{3}$$

Write each term on the right-hand side as a fraction with denominator 3

$$b = 3c + 2$$

4.

$$ab - x = y$$

(x)

$$-x = y - ab$$

Get rid of the ab on the left by subtracting it on both sides of the equation

$$(-1) - x = (-1)y - (-1)ab$$

Multiply each term of the equation with -1 to make the x positive

$$x = -y + ab$$

5.

$$\frac{y}{x} - b = c$$

(x)

$$\frac{y}{x} = c + b$$

Add b on both sides of the equation

$$(x)\frac{y}{x} = (x)(c + b)$$

Multiply each side by x

$$y = x(c + b)$$

$$x(c + b) = y$$

Re-arrange the sides

$$\frac{x(c + b)}{c + b} = \frac{y}{(c + b)}$$

Divide both sides by $(c + b)$

$$x = \frac{y}{(c + b)}$$

6.

$$a^2 = b$$

(a)

$$a^{2 \times \frac{1}{2}} = b^{\frac{1}{2}}$$

Multiply the exponent 2 by $\frac{1}{2}$ to get rid of the 2.
Do it on both sides.

$$a = b^{\frac{1}{2}}$$

7.

$$\sqrt{x + y} = 4$$

(x)

$$(x + y)^{\frac{1}{2}} = 4$$

Multiply the exponent of $\frac{1}{2}$ by 2 to get rid of the $\frac{1}{2}$.
Do it on both sides.

$$(x + y)^{\frac{1}{2} \times 2} = 4^2$$

$$(x + y) = 16$$

4 to the power 2 means 4×4 and that is 16

$$x = 16 - y$$

Subtract y on both sides of the equation.



Exercise 18.1 (See page 96 for the answers)

Change the following equations so that the variables given in brackets become **the subject of the equations**.

1. $a + b - c = 5$ (b)

2. $2x + 4y = 8$ (y)

3. $7 - 3b - 6x = -5$ (b)

4. $a + b^2 - \sqrt{c} = d$ (c)

5. $\frac{x}{3} - \frac{y}{6} = 4$ (x)

6. $V = \pi r^2 h$ (r)

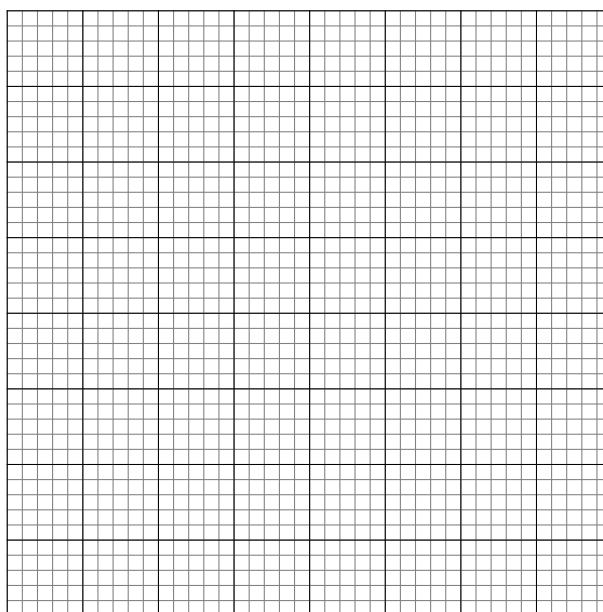
WORKSHEET 19

Straight lines

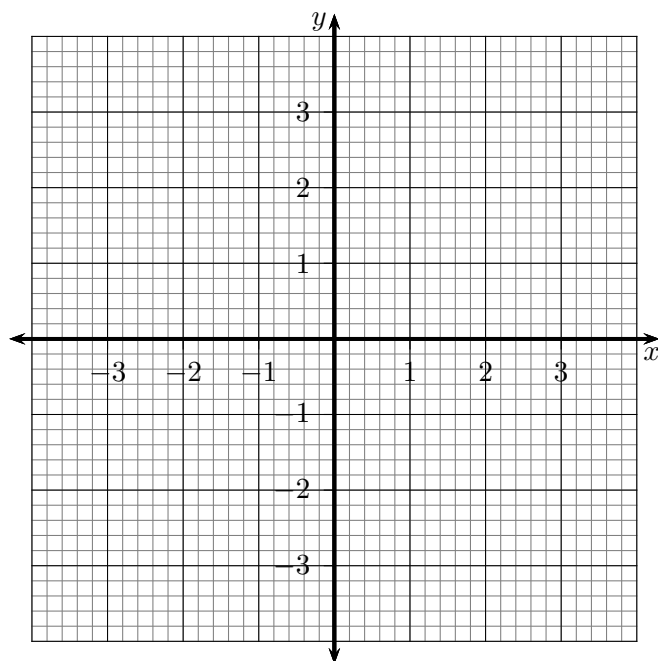
Before you can do this worksheet please study pages 99 to 112 of the study guide. Worksheet 19 is based on **straight lines** in Chapter 6 of the study guide. Please do the examples and exercises before you proceed with Worksheet 20.

Exercise 19.1 (See page 98 for the answers)

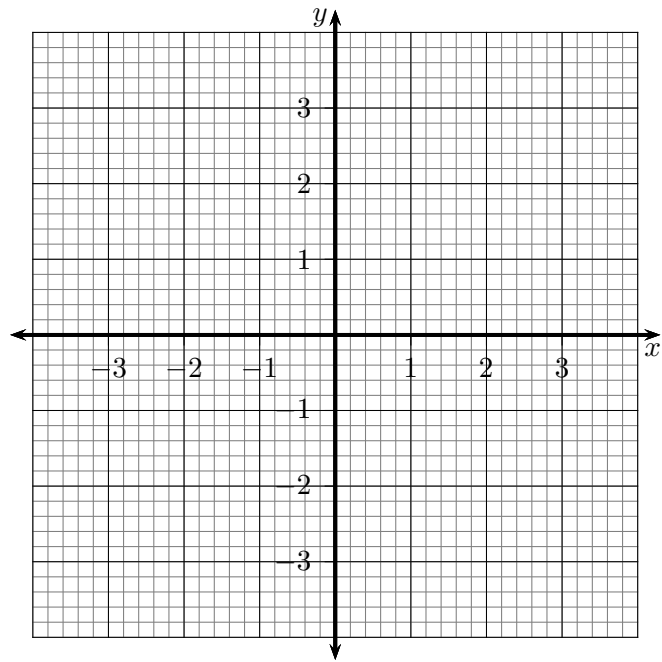
1. Draw a set of axes on the grid below. Label the axes and use a scale of five blocks as one unit to number them.



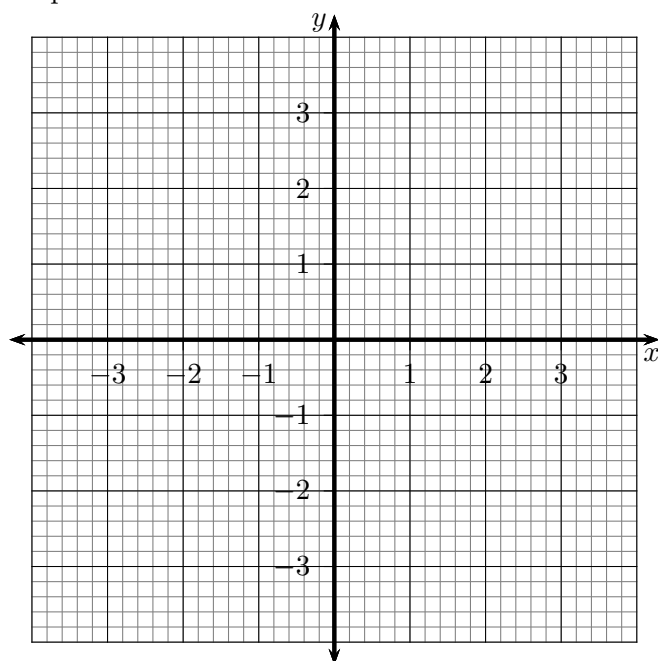
2. Plot the points $(2; 2)$ and $(-3; -3)$ on the grid below.

[illegible]

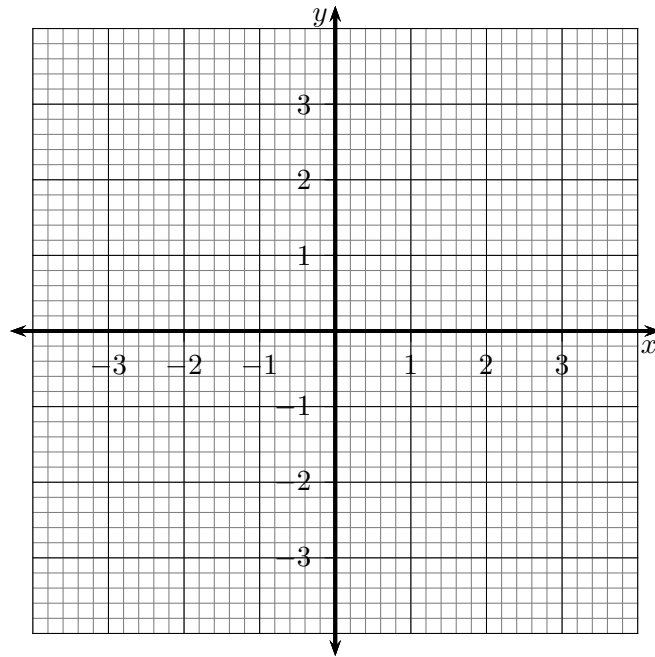
3. Draw a straight line through the points $(-1; +3)$ and $(2; -1)$ on the grid below.

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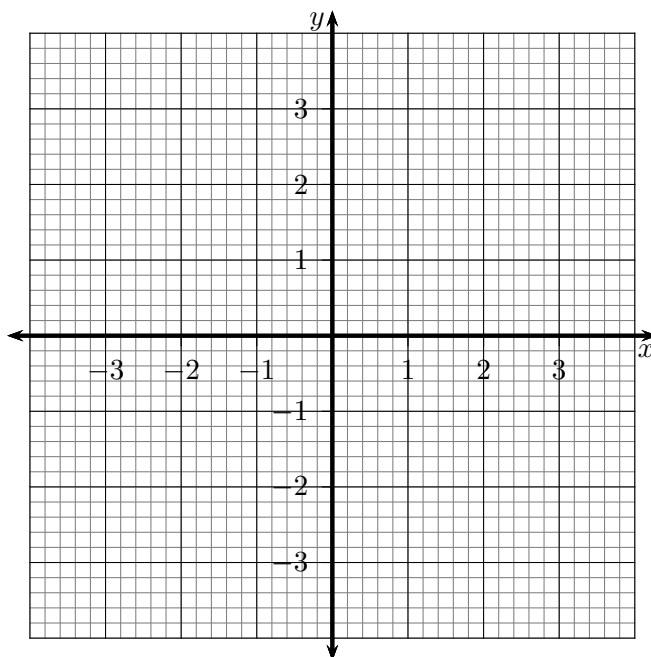
4. Draw a straight line through the points $(3; -1)$ and $(-1; 2)$ and indicate whether it has a positive or negative slope.

[illegible]

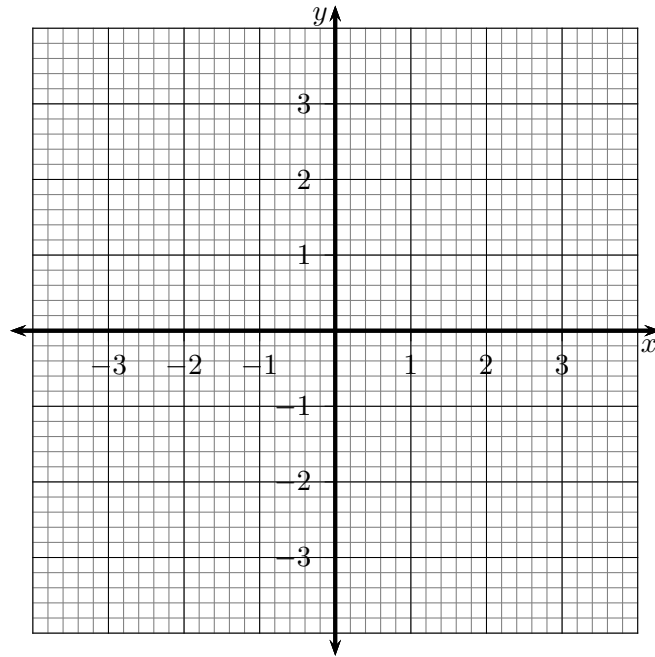
5. Draw a straight vertical line through the point $(1; 0)$ on the grid below. Also draw a straight horizontal line through the point $(0; 2)$ on the same grid.

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6. Determine the slope of a line going through the points $(2; 2)$ and $(-1; -1)$ by first drawing the line on the grid below.

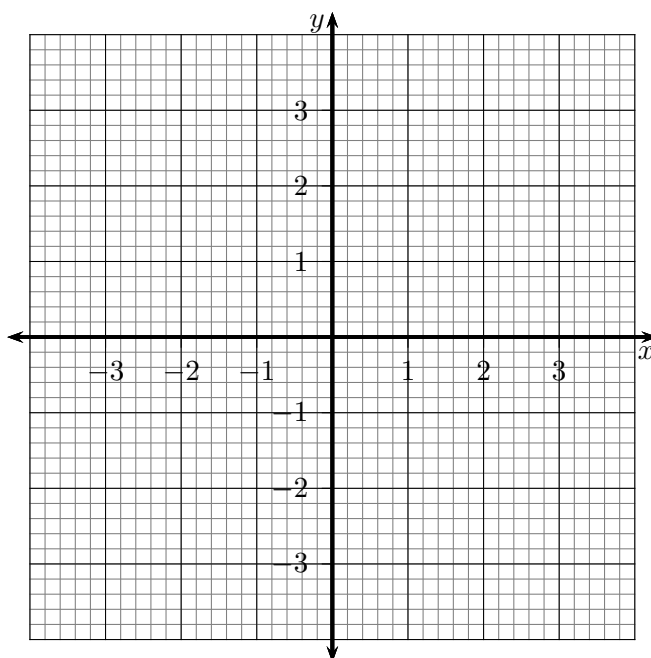


7. Draw the line through points $(-2; 1)$ and $(1; -3)$ and determine the slope of this line. Indicate if it has a positive or negative slope.

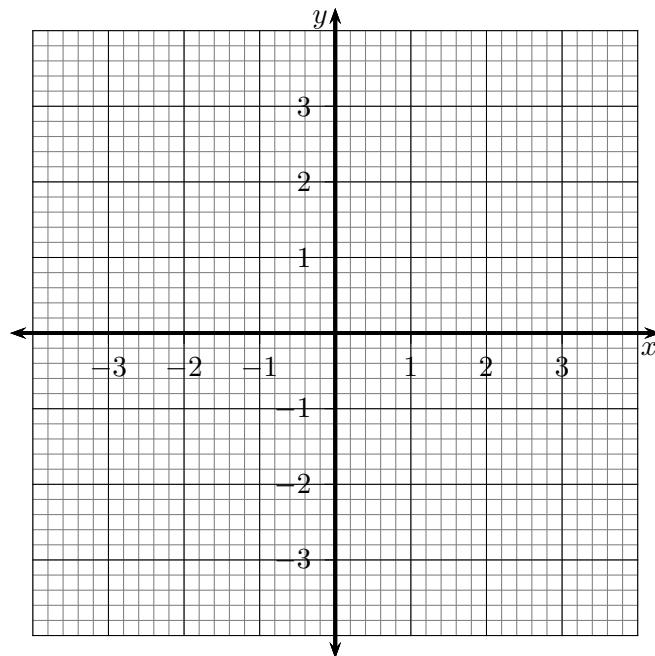
This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.

8. Draw the line with the following equation on the grid below.

$$y = x + 2$$

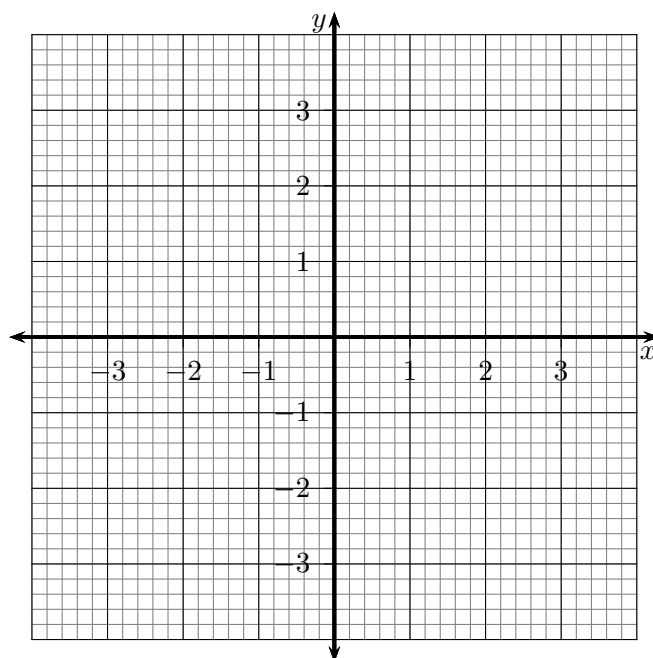
[illegible]

$$y = -x + 3$$

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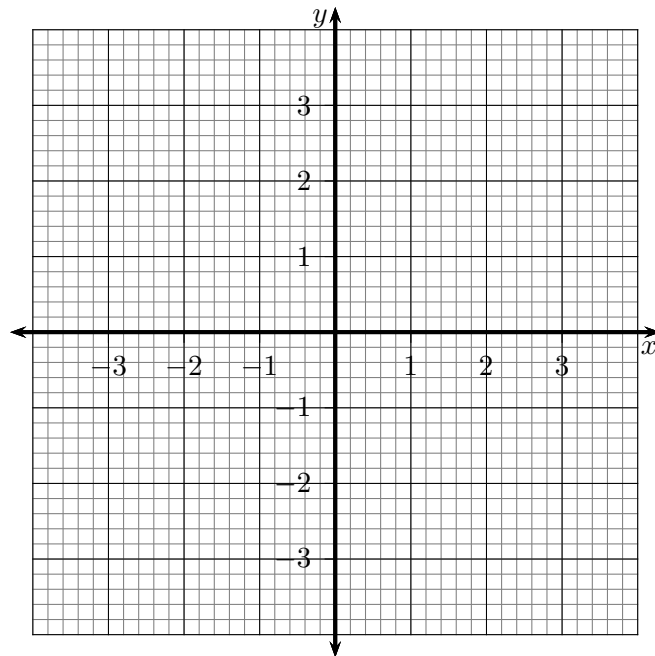
10. Draw the line with the following equation on the grid below:

$$y = x$$

[illegible]

11. Determine the equation of the straight line through the points $(1;2)$ and $(3;3)$. Then draw this line on the grid. Use the following formula to determine the equation:

$$\frac{y - y_1}{x - x_1} = \frac{y_2 - y_1}{x_2 - x_1}$$

[illegible]

WORKSHEET 20

Basic Financial Calculations

Before you can do this worksheet please study pages 113 to 134 of the study guide. Worksheet 20 is based on Basic Financial Calculations in Chapter 7 of the study guide.

Exercise 20.1 (See page 106 for the answers)

1. Write down the formula for the amount of interest gained for an invested amount if simple interest rate is applicable. Also define the variables.

2. Write down the formula for the accumulated amount or future value of an invested amount if a simple interest rate is offered. Also define the variables.

3. You borrowed R5 000 for four years at a simple interest rate of 9,5% per year. Determine the amount of interest that you will have to pay after four years.

-
4. You borrowed an amount of money from Sipho and have to pay him R2 400 interest after three years. Determine the amount borrowed if a simple interest rate of 8,00% is applicable.

5. Johnston invested R5 500. He received R1 650,00 interest. The applicable simple interest rate was 5% per year. Determine the period of time which the money was invested.

6. Mpho invested R30 000. After 27 months she received R4 050 interest. Determine the applicable simple interest rate.

7. Jody invested R13 500 for 45 months in an account earning 6,80% simple interest. Determine the accumulated amount in her account after 45 months.

8. Amos borrowed an amount of money from Percy on the condition that he will pay Amos R9 500 in three years' time. Determine the amount that Amos borrowed if simple interest rate of 8,2% is applicable.

9. Hercules invested R6 800 in an account earning 7,2% simple interest. Determine the time under consideration if he received R10 472 at the end of the investment time.

10. Write down the formula for compound interest and define the variables.

11. Patrick invested R120 000 in an account earning 9,3% per year, compounded monthly. Determine the balance in his account after 27 months.

12. Elias must pay Robert R15 000 four years from now. If an interest rate of 8% per year, compounded quarterly, is applicable determine the amount of money that Robert lent Elias.

13. Lorinda invested R14 000 into an account earning 9% per year, compounded weekly. She received R16 758,44. Determine the number of periods under consideration.

-
14. Write down the formula for a future value annuity. Define all the variables.

15. Write down the formula for a present value annuity and define the variables.

16. Determine the accumulated amount of an annuity with half-yearly payments of R2 400 each at an interest rate of 11,6% per year, compounded half yearly. The time under consideration is six years.

17. Vusi owes Jackie R38 000. He will pay him back over a five year period by paying equal monthly payments. The applicable interest rate is 15,7% per year, compounded monthly. Determine these monthly payments.

18. Lucy decides to deposit at the end of every three months R1 200 into an account earning 9,91% per year, compounded quarterly. Determine the balance in this account after seven years.

Answers to exercises

Worksheet 1. Numbers

Exercise 1.1:1

3 is a positive integer or a real number

Exercise 1.1:2

$-3,5$ is a negative decimal or a real number

Exercise 1.1:3

$\frac{5}{8}$ is real number (fraction)

Worksheet 2. Rounding of numbers

Exercise 2.1:1

$34,9974321 = 34,997432$ six decimal digits

Exercise 2.1:2

$34,9974321 = 34,9974$ four decimal digits

Exercise 2.1:3

$34,9974321 = 35,00$ two decimal digits

Worksheet 3. Variables

Exercise 3.1:1

Let x be the number. Therefore
 $3x - 6 = 24$.

Exercise 3.1:2

Let f be the first number
Let s be the second number
 $2f + 3s = 120$

Exercise 3.1:3

Let s be the son's age, and
let f be the father's age. Therefore,

$$f - 25 = s$$

We have to subtract the 25 from the father's age in order to determine the son's age.
We could also add the 25 to the son's age to get the father's age.

$$f = s + 25$$

Exercise 3.1:4

Let r be the number of red buttons in the tin.
Let w be the number of white buttons in the tin.

$$\begin{aligned} r + w &= 85 \\ 2r &= w + 8 \end{aligned}$$

Worksheet 4. Basic operations on numbers**Exercise 4.1:1**

$$\begin{aligned} 35 + 42 - 16 - 8 &= 77 - 24 \\ &= 53 \end{aligned}$$

Exercise 4.1:2

$$\begin{aligned} 22 - 34 - 5 + 66 &= 22 + 66 - 34 - 5 \\ &= 88 - 39 \\ &= 49 \end{aligned}$$

Exercise 4.1:3

$$\begin{aligned} 12 - 9 + 21 - 32 &= 12 + 21 - 9 - 32 \\ &= 33 - 41 \\ &= -8 \end{aligned}$$

Exercise 4.2:1

$$\begin{aligned} 35 \times 2 \times 3 &= 70 \times 3 \\ &= 210 \end{aligned}$$

Exercise 4.2:2

$$\begin{aligned}70 \times 3 \div 6 \times 20 &= 210 \div 6 \times 20 \\&= 35 \times 20 \\&= 700\end{aligned}$$

Exercise 4.2:3

$$\begin{aligned}15 \times 4 \times 6 \div 5 \div 9 \times 7 &= 60 \times 6 \div 5 \div 9 \times 7 \\&= 360 \div 5 \div 9 \times 7 \\&= 72 \div 9 \times 7 \\&= 8 \times 7 \\&= 56\end{aligned}$$

Exercise 4.2:4

$$\begin{aligned}32 \div 8 \div 2 \times 25 \times 4 \div 5 &= 4 \div 2 \times 25 \times 4 \div 5 \\&= 2 \times 25 \times 4 \div 5 \\&= 50 \times 4 \div 5 \\&= 200 \div 5 \\&= 40\end{aligned}$$

Worksheet 5. Basic operations on variables**Exercise 5.1:1**

$$15a - 6a - 7a = 2a$$

Exercise 5.1:2

$$23b + 4b + 3a = 27b + 3a$$

Exercise 5.1:3

$$\begin{aligned}3x - 7y - 24x + 8y &= 3x - 24x - 7y + 8y \\&= -21x + y\end{aligned}$$

Exercise 5.1:4

$$\begin{aligned} 6c + 13d + 7c - 23d - 3c - 12d &= 6c + 7c - 3c + 13d - 23d - 12d \\ &= 10c - 22d \end{aligned}$$

Exercise 5.2:1

$$\begin{aligned} 13a \times 4b \times 3c \times 2a &= 13 \times 4 \times 3 \times 2 \times a \times b \times c \times a \\ &= 312abca \\ &= 312a^2bc \end{aligned}$$

Exercise 5.2:2

$$\begin{aligned} 4x \times 4y \times 2x \times 6y &= 4 \times 4 \times 2 \times 6 \times x \times y \times x \times y \\ &= 192xyxy \\ &= 192x^2y^2 \end{aligned}$$

Exercise 5.2:3

$$\begin{aligned} 5a^2 \times 4b \div 3a \times 6b &= \frac{5aa \times 4b \times \cancel{b}^2}{\cancel{3}^1 a} && \begin{array}{l} \text{Numerator: } 6 \div 3 = 2 \\ \text{Denominator: } 3 \div 3 = 1 \end{array} \\ &= \frac{5a\cancel{a} \times 4b \times 2b}{\cancel{a}} && \begin{array}{l} \text{Numerator: } a \div a = 1 \\ \text{Denominator: } a \div a = 1 \end{array} \\ &= 5 \times 4 \times 2 \times a \times b \times b \\ &= 40abb \\ &= 40ab^2 \end{aligned}$$

Exercise 5.2:4

$$\begin{aligned} 16x \div 8y \times 7y \div 4x &= \frac{16x}{8y} \times \frac{7y}{4x} && \begin{array}{l} \text{Only invert the term directly to the} \\ \text{right hand side of the division sign} \end{array} \\ &= \frac{\cancel{16}^2 x}{\cancel{8}^1 y} \times \frac{7y}{4x} && \begin{array}{l} \text{Numerator: } 16 \div 8 = 2 \\ \text{Denominator: } 8 \div 8 = 1 \end{array} \\ &= \frac{\cancel{2}^1 x}{y} \times \frac{7y}{\cancel{4}^2 x} && \begin{array}{l} \text{Numerator: } 2 \div 2 = 1 \\ \text{Denominator: } 4 \div 2 = 2 \end{array} \\ &= \frac{\cancel{x}}{\cancel{y}} \times \frac{7\cancel{y}}{2\cancel{x}} && \begin{array}{l} \text{Numerator: } xy \div xy = 1 \\ \text{Denominator: } xy \div xy = 1 \end{array} \\ &= \frac{7}{2} \end{aligned}$$

Worksheet 6. Powers and roots

Exercise 6.1:1

$$\begin{aligned} a^3 b^2 a^{-1} b^4 &= a^{3+(-1)} b^{(2+4)} \\ &= a^2 b^6 \end{aligned}$$

Exercise 6.1:2

$$\begin{aligned} x^4 \times x^3 \times y^4 \times y \times y^2 \times x &= x \times x \times x \times x \times x \times x \times x \times y \times y \times y \times y \times y \times y \times x \\ &= x \times x \times x \times x \times x \times x \times x \times x \times y \times y \times y \times y \times y \times y \times y \\ &= x^8 y^7 \end{aligned}$$

OR

$$\begin{aligned} x^4 \times x^3 \times y^4 \times y \times y^2 \times x &= x^{4+3+1} y^{4+1+2} \\ &= x^8 y^7 \end{aligned}$$

Exercise 6.1:3

$$\begin{aligned} p^3 \div p^2 &= p^{3-2} \\ &= p \end{aligned}$$

Exercise 6.1:4

$$\begin{aligned} t^4 \times t^3 \times r \div t^6 &= t^{4+3-6} r^1 \\ &= tr \end{aligned}$$

Exercise 6.1:5

$$\begin{aligned} (xy)^3 &= (xy) \times (xy) \times (xy) \\ &= x \times x \times x \times y \times y \times y \\ &= x^3 y^3 \end{aligned}$$

Exercise 6.1:6

$$\begin{aligned}
 (a^3b^3)^2 &= (a^3b^3)(a^3b^3) \\
 &= a \times a \times a \times b \times b \times b \times a \times a \times a \times b \times b \times b \\
 &= a \times a \times a \times a \times a \times a \times b \times b \times b \times b \times b \times b \\
 &= a^6b^6
 \end{aligned}$$

OR

$$\begin{aligned}
 (a^3b^3)^2 &= (a^3b^3)(a^3b^3) \\
 &= a^{3+3}b^{3+3} \\
 &= a^6b^6
 \end{aligned}$$

Exercise 6.1:7

$$\begin{aligned}
 2x^3 \times 4x^4 &= 2 \times 4 \times x \times x \times x \times x \times x \times x \times x \\
 &= 8x^7
 \end{aligned}$$

OR

$$\begin{aligned}
 2x^3 \times 4x^4 &= 2 \times 4 \times x^{3+4} \\
 &= 8x^7
 \end{aligned}$$

Exercise 6.1:8

$$\begin{aligned}
 12a^3 \div 4a^6b^2 &= \frac{12}{4}a^{3-6}b^{-2} \\
 &= 3a^{-3}b^{-2} \\
 &= 3a^{-3}b^{-2}.
 \end{aligned}$$

Exercise 6.1:9

$$\begin{aligned}
 (3x^2)^3 &= (3x^2) \times (3x^2) \times (3x^2) \\
 &= 3 \times x \times x \times 3 \times x \times x \times 3 \times x \times x \\
 &= 3 \times 3 \times 3 \times x \times x \times x \times x \times x \times x \\
 &= 27x^6
 \end{aligned}$$

OR

$$\begin{aligned}
 (3x^2)^3 &= 3 \times 3 \times 3 \times x^{2+2+2} \\
 &= 27x^6
 \end{aligned}$$

Exercise 6.1:10

$$\begin{aligned}
 (5a^22b)^3 &= (5a^22b)(5a^22b)(5a^22b) \\
 &= 5 \times 5 \times 5 \times 2 \times 2 \times 2 \times a \times a \times a \times a \times a \times a \times b \times b \times b \\
 &= 1000a^6b^3
 \end{aligned}$$

OR

$$\begin{aligned}
 (5a^22b)^3 &= 5 \times 5 \times 5 \times 2 \times 2 \times 2 \times a^{2+2+2}b^{1+1+1} \\
 &= 1000a^6b^3
 \end{aligned}$$

Exercise 6.2:1

$$\begin{aligned}
 \sqrt{169} &= \sqrt{13 \times 13} \\
 &= 13
 \end{aligned}$$

Exercise 6.2:2

$$\begin{aligned}
 \sqrt{144} - \sqrt{64} &= \sqrt{12 \times 12} - \sqrt{8 \times 8} \\
 &= 12 - 8 \\
 &= 4
 \end{aligned}$$

Exercise 6.2:3

$$\begin{aligned}
 (\sqrt{6})^2 &= (\sqrt{6})(\sqrt{6}) \\
 &= (\sqrt{6}\sqrt{6}) \\
 &= 6
 \end{aligned}$$

Exercise 6.2:4

$$\begin{aligned}\sqrt[3]{1\,000} &= \sqrt[3]{10 \times 10 \times 10} \\ &= 10\end{aligned}$$

Worksheet 7. Order of operations

Exercise 7.1:1

$$\begin{aligned}13 - 29 + 17 &= 30 - 19 \\ &= 1\end{aligned}$$

Exercise 7.1:2

$$\begin{aligned}19 + 23 - 52 - 7 &= 42 - 59 \\ &= -17\end{aligned}$$

Exercise 7.1:3

$$\begin{aligned}(3 + 6)^2 - (5 - 2)^3 &= 9^2 - 3^3 \\ &= 81 - 27 \\ &= 54\end{aligned}$$

First simplify the brackets

Exercise 7.1:4

$$\begin{aligned}(3 - 6)^2 - (5 + 2) &= (-3)^2 - 7 \\ &= (-3)(-3) - 7 \\ &= (+9) - 7 \\ &= 2\end{aligned}$$

First simplify the brackets

A negative number multiplied by a negative number is equal to a positive number

Exercise 7.1:5

$$\begin{aligned}(3 - 5)^4 \div (4 - 2)^4 &= (-2)^4 \div 2^4 \\ &= 16 \div 16 \\ &= 1\end{aligned}$$

$$(-2)^4 = (-2) \times (-2) \times (-2) \times (-2) = 16$$

Exercise 7.1:6

$$\begin{aligned}3(8 - 5) - 64 \div 8 \times 3 &= 3(3) - 8 \times 3 \\ &= 9 - 24 \\ &= -15\end{aligned}$$

Exercise 7.1:7

$$\begin{aligned}
 (40 - (3 + 4 \times 6) + 15 \div 3 \times 5) - (32 \div 4 + 5) &= (40 - (3 + 24) + 15 \div 3 \times 5) - (32 \div 4 + 5) \\
 &= (40 - 27 + 5 \times 5) - (8 + 5) \\
 &= (40 - 27 + 25) - 13 \\
 &= (40 + 25 - 27) - 13 \\
 &= (65 - 27) - 13 \\
 &= 38 - 13 \\
 &= 25
 \end{aligned}$$

Exercise 7.1:8

$$\begin{aligned}
 \sqrt{56 - (3 - 1)^2 + 8^2 \div 2 - \sqrt{4^2 - 7}} &= \sqrt{56 - 2^2 + 64 \div 2 - \sqrt{16 - 7}} && \text{Simplify the bracket and the } 4^2 \\
 &= \sqrt{56 - 4 + 32 - \sqrt{9}} && \text{Simplify underneath the inner } \sqrt{} \\
 &= \sqrt{56 - 4 + 32 - 3} && \text{Simplify the inner } \sqrt{} \\
 &= \sqrt{81} && \text{Simplify the term under the other } \sqrt{} \\
 &= 9 && \text{Simplify the last } \sqrt{}
 \end{aligned}$$

Worksheet 8. Factors and the Lowest Common Multiple (LCM)**Exercise 8.1:1**

$$21 = 3 \times 7$$

Exercise 8.1:2

$$\begin{aligned} 48 &= 2 \times 24 \\ &= 2 \times 2 \times 12 \\ &= 2 \times 2 \times 2 \times 6 \\ &= 2 \times 2 \times 2 \times 2 \times 3 \end{aligned}$$

Exercise 8.1:3

$$\begin{aligned} 72 &= 2 \times 36 \\ &= 2 \times 2 \times 18 \\ &= 2 \times 2 \times 2 \times 9 \\ &= 2 \times 2 \times 2 \times 3 \times 3 \end{aligned}$$

Exercise 8.2:1

$$\begin{aligned} 9 &= 3 \times 3 \\ 15 &= 3 \times 5 \\ 30 &= 2 \times 3 \times 5 \\ \text{LCM} &= 3 \times 3 \times 5 \times 2 \\ &= 90 \end{aligned}$$

Exercise 8.2:2

$$\begin{aligned} 8 &= 2 \times 2 \times 2 \\ 32 &= 2 \times 2 \times 2 \times 2 \times 2 \\ 96 &= 2 \times 2 \times 2 \times 2 \times 2 \times 3 \\ \text{LCM} &= 2 \times 2 \times 2 \times 2 \times 2 \times 3 \\ &= 96 \end{aligned}$$

Exercise 8.2:3

$$\begin{aligned} 18 &= 2 \times 3 \times 3 \\ 30 &= 2 \times 3 \times 5 \\ 50 &= 2 \times 5 \times 5 \\ \text{LCM} &= 2 \times 3 \times 3 \times 5 \times 5 \\ &= 450 \end{aligned}$$

Worksheet 9. Fractions

Exercise 9.1:1

$$\frac{7}{5} = 1\frac{2}{5}$$

Exercise 9.1:2

$$\frac{13}{7} = 1\frac{6}{7}$$

Exercise 9.1:3

$$\begin{aligned}\frac{22}{6} &= 3\frac{4}{6} \\ &= 3\frac{2}{3}\end{aligned}$$

Exercise 9.2:1

$$\begin{aligned}\frac{7}{9} \times \frac{15}{14} &= \frac{7^1}{9} \times \frac{15}{14^2} && \begin{array}{l} \text{Numerator: } 7 \div 7 = 1 \\ \text{Denominator: } 14 \div 7 = 2 \end{array} \\ &= \frac{\cancel{15}^5}{9^3 \times 2} && \begin{array}{l} \text{Numerator: } 15 \div 3 = 5 \\ \text{Denominator: } 9 \div 3 = 3 \end{array} \\ &= \frac{5}{3 \times 2} \\ &= \frac{5}{6}\end{aligned}$$

Exercise 9.2:2

$$\begin{aligned}\frac{5}{13} \times \frac{7}{16} \times \frac{39}{45} &= \frac{5}{\cancel{13}^1} \times \frac{7}{16} \times \frac{\cancel{39}^3}{45} && \begin{array}{l} \text{Numerator: } 39 \div 13 = 3 \\ \text{Denominator: } 13 \div 13 = 1 \end{array} \\ &= \frac{\cancel{7}^1 \times 7 \times 3}{16 \times \cancel{45}^9} && \begin{array}{l} \text{Numerator: } 5 \div 5 = 1 \\ \text{Denominator: } 45 \div 5 = 9 \end{array} \\ &= \frac{7 \times \cancel{3}^1}{16 \times 9^3} && \begin{array}{l} \text{Numerator: } 3 \div 3 = 1 \\ \text{Denominator: } 9 \div 3 = 3 \end{array} \\ &= \frac{7}{16 \times 3} \\ &= \frac{7}{48}\end{aligned}$$

Exercise 9.2:3

$$\begin{aligned}
 \frac{4x^3}{7y} \times \frac{10x}{14y} \times \frac{35y^2}{36x^2} &= \frac{\cancel{4}^1 xxx}{7y} \times \frac{10x}{14y} \times \frac{35yy}{\cancel{36}^9 xx} && \begin{array}{l} \text{Numerator: } 4 \div 4 = 1 \\ \text{Denominator: } 36 \div 4 = 9 \end{array} \\
 &= \frac{xxx}{\cancel{7}^1 y} \times \frac{\cancel{10}^5 x}{\cancel{14}^7 y} \times \frac{\cancel{35}^5 yy}{9xx} && \begin{array}{l} \text{Numerator: } 35 \div 7 = 5 \\ \text{Denominator: } 7 \div 7 = 1 \end{array} \\
 &= \frac{xxx \times \cancel{10}^5 x \times 5yy}{y \times \cancel{14}^7 y \times 9xx} && \begin{array}{l} \text{Numerator: } 10 \div 2 = 5 \\ \text{Denominator: } 14 \div 2 = 7 \end{array} \\
 &= \frac{x\cancel{x}x \times 5x \times 5\cancel{y}y}{\cancel{y} \times 7y \times 9\cancel{x}x} && \begin{array}{l} \text{Numerator: } xxyy \div xxyy = 1 \\ \text{Denominator: } xxyy \div xxyy = 1 \end{array} \\
 &= \frac{25x^2}{63}
 \end{aligned}$$

Exercise 9.2:4

$$\begin{aligned}
 4 \times \frac{3}{5} &= \frac{4}{1} \times \frac{3}{5} \\
 &= \frac{12}{5} \\
 &= 2\frac{2}{5}
 \end{aligned}$$

Exercise 9.3:1

$$\begin{aligned}
 \frac{7}{8} \div \frac{5}{4} &= \frac{7}{\cancel{8}^2} \times \frac{\cancel{4}^1}{5} && \begin{array}{l} \text{Only invert the term directly to the} \\ \text{right hand side of the division sign} \end{array} \\
 &= \frac{7 \times 1}{2 \times 5} && \begin{array}{l} \text{Numerator: } 4 \div 4 = 1 \\ \text{Denominator: } 8 \div 4 = 2 \end{array} \\
 &= \frac{7}{10}
 \end{aligned}$$

Exercise 9.3:2

$$\begin{aligned}
 \frac{5}{6} \times \frac{11}{16} \div \frac{15}{24} &= \frac{5}{6} \times \frac{11}{16} \times \frac{24}{15} && \begin{array}{l} \text{Only invert the term directly to the} \\ \text{right hand side of the division sign} \end{array} \\
 &= \frac{\cancel{5}^1}{6} \times \frac{11}{16} \times \frac{24}{\cancel{15}^3} && \begin{array}{l} \text{Numerator: } 5 \div 5 = 1 \\ \text{Denominator: } 15 \div 5 = 3 \end{array} \\
 &= \frac{1}{\cancel{6}^1} \times \frac{11}{16} \times \frac{\cancel{24}^4}{3} && \begin{array}{l} \text{Numerator: } 24 \div 6 = 4 \\ \text{Denominator: } 6 \div 6 = 1 \end{array} \\
 &= \frac{11}{\cancel{16}^4} \times \frac{\cancel{4}^1}{3} && \begin{array}{l} \text{Numerator: } 4 \div 4 = 1 \\ \text{Denominator: } 16 \div 4 = 4 \end{array} \\
 &= \frac{11 \times 1}{4 \times 3} \\
 &= \frac{11}{12}
 \end{aligned}$$

Exercise 9.3:3

$$\frac{25}{36} \div \frac{18}{5} \times \frac{27}{45} = \frac{25}{36} \times \frac{5^1}{18} \times \frac{27}{45^9}$$

Only invert the term directly to the right hand side of the division sign

Numerator: $5 \div 5 = 1$
Denominator: $45 \div 5 = 9$

$$= \frac{25}{36^4} \times \frac{1}{18} \times \frac{27^3}{9}$$

Numerator: $27 \div 9 = 3$
Denominator: $36 \div 9 = 4$

$$= \frac{25}{4} \times \frac{1}{18} \times \frac{3^1}{9^3}$$

Numerator: $3 \div 3 = 1$
Denominator: $9 \div 3 = 3$

$$= \frac{25}{4 \times 18 \times 3}$$

$$= \frac{25}{216}$$

Exercise 9.3:4

$$\frac{25a^2}{8b} \div \left(\frac{16b}{5a} \times \frac{25a}{32b} \right) = \frac{25a^2}{8b} \div \left(\frac{16^1 b}{5a} \times \frac{25a}{32^2 b} \right)$$

First simplify the brackets

Numerator: $16 \div 16 = 1$
Denominator: $32 \div 16 = 2$

$$= \frac{25a^2}{8b} \div \left(\frac{b}{5^1 a} \times \frac{25^5 a}{2b} \right)$$

Numerator: $25 \div 5 = 5$
Denominator: $5 \div 5 = 1$

$$= \frac{25a^2}{8b} \div \left(\frac{b^1}{a} \times \frac{5a}{2b} \right)$$

Numerator: $ab \div ab = 1$
Denominator: $ab \div ab = 1$

$$= \frac{25a^2}{8b} \div \frac{5}{2}$$

$$= \frac{25^5 a^2}{8b} \times \frac{2}{5^1}$$

Numerator: $25 \div 5 = 5$
Denominator: $5 \div 5 = 1$

$$= \frac{5a^2}{8^4 b} \times \frac{2^1}{1}$$

Numerator: $2 \div 2 = 1$
Denominator: $8 \div 2 = 4$

$$= \frac{5a^2}{4b}$$

Exercise 9.4:1

$$\begin{aligned} & \frac{4}{7} + \frac{2}{3} \\ = & \frac{4(3) + 2(7)}{21} \quad \text{LCM} = 21 \quad \text{OR} \quad = \frac{12}{21} + \frac{14}{21} \\ = & \frac{12 + 14}{21} \\ = & \frac{26}{21} \\ = & 1\frac{5}{21} \end{aligned}$$

Exercise 9.4:2

$$\begin{aligned}
 & \frac{5}{9} - \frac{3}{5} & \frac{5}{9} - \frac{3}{5} \\
 = & \frac{5(5) - 3(9)}{45} \quad \text{LCM} = 45 & \text{OR} \quad = \frac{25}{45} - \frac{27}{45} \\
 = & \frac{25 - 27}{45} & = \frac{25 - 27}{45} \\
 = & \frac{-2}{45} & = \frac{-2}{45} \\
 = & -\frac{2}{45} & = -\frac{2}{45}.
 \end{aligned}$$

Exercise 9.4:3

$$\begin{aligned}
 & \frac{3}{8} + \left(\frac{4}{3} \times \frac{11}{24} \right) \\
 = & \frac{3}{8} + \left(\frac{4^1}{3} \times \frac{11}{\cancel{24}^6} \right) \\
 = & \frac{3}{8} + \frac{11}{18} \quad \text{LCM} = 72 \\
 = & \frac{3(9) + 11(4)}{72} \\
 = & \frac{27 + 44}{72} \\
 = & \frac{71}{72}
 \end{aligned}$$

Exercise 9.4:4

$$\begin{aligned}
 & \frac{ab}{c} + \frac{c}{ab} \\
 = & \frac{ab(ab) + c(c)}{abc} \quad \text{LCM} = abc \\
 = & \frac{aabb + cc}{abc} \\
 = & \frac{a^2b^2 + c^2}{abc}
 \end{aligned}$$

Exercise 9.4:5

$$\begin{aligned}
 & 1\frac{3}{5} - 2\frac{3}{4} + \frac{7}{8} \\
 = & \frac{8}{5} - \frac{11}{4} + \frac{7}{8} \\
 = & \frac{8(8) - 11(10) + 7(5)}{40} \quad \text{LCM} = 40 \\
 = & \frac{64 - 110 + 35}{40} \\
 = & \frac{99 - 110}{40} \\
 = & \frac{-11}{40} \\
 = & -\frac{11}{40}
 \end{aligned}$$

Worksheet 10. Decimals, percentages and ratios

Exercise 10.1:1(a)

$$\frac{2}{5} = 0,4$$

$$\begin{array}{r}
 0,4 \\
 5 \overline{) 2,0} \\
 \underline{2 } \\
 0
 \end{array}$$

Exercise 10.1:1(b)

$$2\frac{1}{6} = 2,166\ldots$$

$$\begin{array}{r}
 0,166\ldots \\
 6 \overline{) 1,000} \\
 \underline{6} \\
 40 \\
 \underline{36} \\
 40
 \end{array}$$

Exercise 10.1:1(c)

$$\frac{7}{8} = 0,875$$

$$\begin{array}{r} 0,875 \\ 8 \overline{) 7,000} \\ \underline{64} \\ 60 \\ \underline{56} \\ 40 \\ \underline{40} \\ 0 \end{array}$$

Exercise 10.1:2(a)

$$\begin{aligned} & 0,4 \\ &= \frac{4}{10} \\ &= \frac{2}{5} \end{aligned}$$

Exercise 10.1:2(b)

$$\begin{aligned} & 1,6 \\ &= 1\frac{6}{10} \\ &= 1\frac{3}{5} \end{aligned}$$

Exercise 10.1:2(c)

$$\begin{aligned} & 5,075 \\ &= 5\frac{075}{1000} \\ &= 5\frac{3}{40} \end{aligned}$$

Exercise 10.2:1

$$\begin{aligned} & \frac{6}{15} \times \frac{100}{1} \\ &= 40 \end{aligned}$$

Thus, $\frac{6}{15} = 40\%$.

Exercise 10.2:2

$$\begin{aligned} & 25\% \text{ of } 5\,500 \\ &= \frac{25}{100} \times \frac{5\,500}{1} \\ &= 1\,375 \end{aligned}$$

Henry received R1 375 discount.

Exercise 10.2:3

$$\begin{aligned} & 10,5\% \text{ of } 360\,000 \\ & \frac{10,5}{100} \times \frac{360\,000}{1} \\ & = 37\,800 \end{aligned}$$

Pete received a yearly increase of R37 800.

His new yearly salary is $R(360\,000 + 37\,800) = R397\,800$.

Exercise 10.2:4

$$\begin{aligned} \text{Amount of discount received} &= 40\,000 - 34\,000 \\ &= 6\,000 \end{aligned}$$

$$\begin{aligned} \text{Percentage discount} &= \frac{6\,000}{40\,000} \times \frac{100}{1} \\ &= 15\% \end{aligned}$$

Sophia received 15% discount. (Remember that percentage is always on the original amount.)

Exercise 10.2:5

The price increased with $R(33\,000 - 25\,000) = R8\,000$.

$$\begin{aligned} \text{Percentage increase} &= \frac{8\,000}{25\,000} \times \frac{100}{1} \\ &= 32\% \end{aligned}$$

The value of the Persian carpet increased with 32%.

Exercise 10.3:1

$$\begin{aligned} & 15 : 25 \\ & = 3 : 5 \end{aligned}$$

The ratio is 3:5

Exercise 10.3:2

$$3 + 11 + 5 = 19$$

$$\begin{aligned} \text{Lucas will receive} &= \frac{11}{19} \times \frac{57\,000}{1} \\ &= 33\,000 \end{aligned}$$

Lucas will receive 33 000 sheep.

Worksheet 11. Length

Exercise 11.1:1

$$\begin{aligned}10 \text{ mm} &= 1 \text{ cm} \\ \therefore 1 \text{ mm} &= \frac{1}{10} \text{ cm} \\ \therefore 150 \text{ mm} &= \frac{150}{10} \\ &= 15 \text{ cm}\end{aligned}$$

Exercise 11.1:2

$$\begin{aligned}100 \text{ cm} &= 1 \text{ m} \\ \therefore 1 \text{ cm} &= \frac{1}{100} \text{ m} \\ \therefore 150 \text{ cm} &= \frac{150}{100} \\ &= 1,5 \text{ m}\end{aligned}$$

Exercise 11.1:3

$$\begin{aligned}1\,000 \text{ m} &= 1 \text{ km} \\ \therefore 1 \text{ m} &= \frac{1}{1\,000} \text{ km} \\ \therefore 26\,000 \text{ m} &= \frac{26\,000}{1\,000} \\ &= 26 \text{ km}\end{aligned}$$

Exercise 11.1:4

$$\begin{aligned}1 \text{ m} &= 100 \text{ cm} \\ \therefore 6,5 \text{ m} &= 6,5 \times 100 \text{ cm} \\ &= 650 \text{ cm}\end{aligned}$$

Exercise 11.1:5

$$\begin{aligned}&10 \text{ mm} = 1 \text{ cm} \\ \text{and } &100 \text{ cm} = 1 \text{ m} \\ \therefore &1\,000 \text{ mm} = 1 \text{ m} \\ \therefore &5\,000\,000 \text{ mm} = \frac{5\,000\,000}{1\,000} \\ &= 5\,000 \text{ m}\end{aligned}$$

Exercise 11.1:6

$$\begin{aligned}100 \text{ cm} &= 1 \text{ m} \\ \text{and } 1\,000 \text{ m} &= 1 \text{ km} \\ \therefore 2\,678\,000 \text{ cm} &= 26\,780 \text{ m} \\ &= 26,78 \text{ km}\end{aligned}$$

Exercise 11.1:7

$$\begin{aligned}1 \text{ km} &= 1\,000 \text{ m} \\ \therefore 7,5 \text{ km} &= 1\,000 \times 7,5 \\ &= 7\,500 \text{ m}\end{aligned}$$

Worksheet 12. Perimeter**Exercise 12.1:1**

$$\begin{aligned}\text{Perimeter of the figure} &= AB + BC + CD + DA \\ &= 16 + 35 + 16 + 35 \\ &= 102\end{aligned}$$

The perimeter of the rectangle ABCD is 102 cm.

Exercise 12.1:2

$$\begin{aligned}\text{Perimeter of the figure} &= AB + BC + CD + DA \\ &= 250 + 250 + 250 + 250 \\ &= 1\,000\end{aligned}$$

The perimeter of the square is 1 000 mm

Exercise 12.1:3

$$\begin{aligned}\text{Perimeter of the figure} &= AB + BC + CA \\ &= 2 + 7 + 5 \\ &= 14\end{aligned}$$

The perimeter of the triangle is 14 metres.

Exercise 12.1:4

Note: The π key on the calculator gives a more accurate value for π than what $\frac{22}{7}$ is. $\frac{22}{7}$ is the rational number closest to the irrational number π .

$$\begin{aligned}\frac{22}{7} &= 3,1428571 \quad \text{and} \\ \pi &= 3,1415926\end{aligned}$$

$$\begin{aligned}\text{Circumference of a circle} &= 2\pi r \\ &= \frac{22}{7} \times \frac{22}{7} \times \frac{15}{2} \\ &= \frac{22 \times 15}{7} \\ &= 47,14\end{aligned}$$

Remember, the radius' length is half of the diameter's

The circumference of the circle is 47,14 cm.

Alternatively, by using the π key on the calculator:

$$\begin{aligned}\text{Circumference of the circle} &= 2\pi r \\ &= 2\pi \cdot \frac{15}{2} \\ &= 47,12\text{cm}\end{aligned}$$

Exercise 12.1:5

$$\begin{aligned}\text{Perimeter of the figure} &= AB + BC + CD + DEEF + FG + HG + HA \\ &= 50 + 30 + 22 + 25 + 17 + 19 + 12 + 9 \\ &= 184\end{aligned}$$

The perimeter of the figure is 184 cm.

Exercise 12.1:6

$$\begin{aligned}\text{Circumference of a half circle} &= \frac{1}{2} \times 2 \times \pi \times r \\ &= \frac{1}{2} \times \frac{2}{1} \times \frac{22}{7} \times \frac{14}{1} \\ &= \frac{22}{7} \times \frac{14^2}{1} \\ &= 44\text{ m}\end{aligned}$$

$$\begin{aligned}\text{Perimeter of the total figure} &= \text{half circle} + AB + BC + CD + DE + FE + FG \\ &= 44 + 60 + 30 + 32 + 30 + 18 + 50 \\ &= 264\text{ m}\end{aligned}$$

The perimeter of the figure is 264 m.

Alternatively, by using the π key on the calculator:

$$\begin{aligned}\text{Circumference of the half circle} &= \frac{1}{2} \times 2 \times \pi \times 14 \\ &= 43,98 \text{ m}\end{aligned}$$

$$\begin{aligned}\text{Perimeter of the total figure} &= 43,98 + 60 + 30 + 32 + 30 + 18 + 50 \\ &= 263,98 \text{ m}\end{aligned}$$

Worksheet 13. Area

Exercise 13.1:1

$$\begin{aligned}\text{Area of rectangle ABCD} &= \text{Length} \times \text{width} \\ &= 7 \times 3 \\ &= 21\end{aligned}$$

The area of the rectangle is 21 m².

Exercise 13.1:2

$$\begin{aligned}\text{Total area of ABCDEFGH} &= \text{area of rectangles ABGH} + \text{CDEF} \\ &= 50 \times 20 + 30 \times 5 \\ &= 1\,000 + 150 \\ &= 1\,150 \text{ cm}^2\end{aligned}$$

The area of the figure is 1 150 cm².

Exercise 13.1:3

$$\begin{aligned}\text{Area of triangle ABC} &= \frac{1}{2}bh \\ &= \frac{1}{2} \times 20 \times 7 \\ &= \frac{1}{2^1} \times \frac{20^{10}}{1} \times \frac{7}{1} \\ &= 70\end{aligned}$$

The area of triangle ABC is 70 mm².

Exercise 13.1:4

$$\begin{aligned}\text{Area of triangle ABC} &= \frac{1}{2}bh \\ &= \frac{1}{2} \times \left(\frac{18-7}{1} \right) \times \frac{15}{1} \\ &= \frac{1}{2} \times \frac{11}{1} \times \frac{15}{1} \\ &= 82,50\end{aligned}$$

$$\begin{aligned}\text{Area of rectangle ACDE} &= AC \times CD \\ &= 15 \times 7 \\ &= 105\end{aligned}$$

The total area of ABDE is $82,50 + 105 = 187,50 \text{ cm}^2$.

Exercise 13.1:5

$$\begin{aligned}\text{Area of a circle} &= \pi r^2 \\ &= \frac{22}{7} \times \frac{35}{2} \times \frac{35}{2} \\ &= \frac{22}{1} \times \frac{35}{2} \times \frac{35}{2} \\ &= 962,50\end{aligned}$$

Remember, the diameter is twice as long as the radius

The area of the circle is $962,50 \text{ mm}^2$.

Alternatively, by using the π key on the calculator:

$$\begin{aligned}\text{Area of a circle} &= \pi r^2 \\ &= \pi \times \frac{35}{2} \times \frac{35}{2} \\ &= 962,11\end{aligned}$$

The area of the circle is $962,11 \text{ mm}^2$.

Exercise 13.1:6

$$\begin{aligned}\text{Area of triangle ABC} &= \frac{1}{2}bh \\ &= \frac{1}{2} \times \frac{14}{1} \times \frac{10}{1} \\ &= 70\end{aligned}$$

$$\begin{aligned}\text{Area of rectangle ACEF} &= 25 \times 14 \\ &= 350\end{aligned}$$

$$\begin{aligned}\text{Area of half circle} &= \frac{1}{2}\pi r^2 \\ &= \frac{1}{2} \times \frac{22^{11}}{7^1} \times \frac{7^1}{1} \times \frac{7}{1} \\ &= 77\end{aligned}$$

The total area of the figure is $70 + 350 + 77 = 497 \text{ cm}^2$.

Alternatively, by using π on the calculator:

$$\begin{aligned}\text{Area of half circle} &= \frac{1}{2} \cdot \pi \cdot 7.7 \\ &= 76,97 \text{ cm}^2\end{aligned}$$

Total area of the figure is $496,97 \text{ cm}^2$.

Worksheet 14. Volume

Exercise 14.1:1

$$\begin{aligned}\text{Volume of a rectangular prism} &= l \times b \times h \\ &= 50 \text{ cm} \times 30 \text{ cm} \times 15 \text{ cm} \\ &= 22\,500 \text{ cm}^3\end{aligned}$$

The volume of the rectangular prism is $22\,500 \text{ cm}^3$.

Exercise 14.1:2

$$\begin{aligned}\text{Volume of a cube} &= \ell \times \ell \times \ell \\ &= 35 \times 35 \times 35 \\ &= 42\,875\end{aligned}$$

The volume of the cube is $42\,875 \text{ m}^3$.

Exercise 14.1:3

$$\begin{aligned}\text{Volume of a cylinder} &= \pi r^2 h \\ &= \frac{22}{7} \times 0,75 \times 0,75 \times 3,2 \\ &= 5,6571\end{aligned}$$

The volume of cylinder is $5,6571 \text{ m}^3$.

Alternatively, by using π on the calculator:

The volume of the cylinder is $5,6549 \text{ m}^3$.

Worksheet 15. Conversion of units**Exercise 15.1:1**

10 000 mm² to cm².

$$\begin{aligned}1 \text{ cm}^2 &= 1 \text{ cm} \times 1 \text{ cm} \\&= 10 \text{ mm} \times 10 \text{ mm} \dots \text{ because } 1 \text{ cm} = 10 \text{ mm} \\1 \text{ cm} &= 10 \text{ mm} \\&= 100 \text{ mm}^2 \\10\,000 \text{ mm}^2 &= \frac{100\,000}{100} \text{ cm}^2 \\&= 1\,000 \text{ cm}^2\end{aligned}$$

Exercise 15.1:2

5,6 m² to cm²

$$\begin{aligned}1 \text{ m}^2 &= 1 \text{ m} \times 1 \text{ m} \\&= 100 \text{ cm} \times 100 \text{ cm} \\&= 10\,000 \text{ cm}^2 \\5,6 \text{ m}^2 &= 5,6 \times 10\,000 \text{ cm}^2 \\&= 56\,000 \text{ cm}^2\end{aligned}$$

Exercise 15.1:3

555 000 cm³ to m³

We know that

$$\begin{aligned}1 \text{ m}^3 &= 1 \text{ m} \times 1 \text{ m} \times 1 \text{ m} \\&= 100 \text{ cm} \times 100 \text{ cm} \times 100 \text{ cm} \\&= 1\,000\,000 \text{ cm}^3\end{aligned}$$

Therefore

$$\begin{aligned}555\,000 \text{ cm}^3 &= \frac{555\,000}{1\,000\,000} \text{ m}^3 \\&= 0,555 \text{ m}^3\end{aligned}$$

Exercise 15.1:4

5 m³ to litres

$$\begin{aligned}1 \text{ m} &= 100 \text{ cm} \\ \text{Thus, } 1 \text{ m}^3 &= 100 \text{ cm} \times 100 \text{ cm} \times 100 \text{ cm} \\ &= 1\,000\,000 \text{ cm}^3 \\ \text{Now, } 1 \text{ litre} &= 1\,000 \text{ cm}^3 \\ \text{Therefore} \\ 1 \text{ m}^3 &= \frac{1\,000\,000}{1\,000} \text{ litre} \\ &= 1\,000 \text{ litres} \\ \text{Therefore } 5 \text{ m}^3 &= 5\,000 \text{ litres}\end{aligned}$$

Worksheet 16. Applications**Exercise 16.1:1**

First convert the mm to metres because we have to use the same units right through.

$$\begin{aligned}1\,000 \text{ mm} &= 1 \text{ m} \\ 500 \text{ mm} &= 0,5 \text{ m}\end{aligned}$$

One tile will cover $0,5 \times 0,5 = 0,25 \text{ m}^2$.

$$\begin{aligned}\text{Floor area} &= 3,5 \times 6 \\ &= 21 \text{ m}^2\end{aligned}$$

Total number of tiles needed to cover the floor

$$\begin{aligned}&= \frac{21}{0,25} \\ &= 84\end{aligned}$$

Sizwe will need 84 tiles to cover the floor.

Exercise 16.1:2

$$\begin{aligned}\text{Volume of tank} &= \pi r^2 h \\ &= \pi \times \frac{2,1}{2} \times \frac{2,1}{2} \times \frac{5}{1} \\ &= 17,32 \text{ (by calculator)}\end{aligned}$$

The volume of the tank is 17,32 m³.

Now we convert the m³ to cm³.

$$\begin{aligned}\text{We know } 1 \text{ m}^3 &= 100 \times 100 \times 100 \text{ cm}^3 \\ \text{Thus } 1 \text{ m}^3 &= 1\,000\,000 \text{ cm}^3 \\ \text{and } 17,32 \text{ m}^3 &= 17\,320\,000 \text{ cm}^3 \\ \text{But } 1 \ell &= 1\,000 \text{ cm}^3 \\ \text{Therefore } 17\,320\,000 \text{ cm}^3 &= 17\,320 \text{ litre}\end{aligned}$$

Exercise 16.1:3

The area of the walls:

$$\begin{aligned}\text{First wall} &= l \times b \\ &= 2,5 \times 5,4 \\ &= 13,5 \\ \text{Second wall} &= l \times b \\ &= 2,5 \times 5,4 \\ &= 13,5 \\ \text{Third wall} &= l \times b \\ &= 7,2 \times 2,5 \\ &= 18,0 \\ \text{Fourth wall} &= l \times b - \text{sliding door} \\ &= 7,2 \times 2,5 - 2,2 \times 2,2 \\ &= 18,0 - 4,84 \\ &= 13,16\end{aligned}$$

Total area of the lounge is $18 + 13,5 + 13,5 + 13,16 = 58,16 \text{ m}^2$.

One litre of paint will cover five square metres.

Therefore, Winnie will need approximately $58,16 \div 5 = 12$ litres of paint.

Worksheet 17. Solving Equations**Exercise 17.1:1**

$$\begin{aligned}x - 3 &= 2 \\ x - 3 + 3 &= 2 + 3 \\ x &= 5\end{aligned}$$

Exercise 17.1:2

$$\begin{aligned}a + 4 &= 3a - 8 \\ a - 3a + 4 &= 3a - 8 - 3a \\ -2a + 4 &= -8 \\ -2a + 4 - 4 &= -8 - 4 \\ \frac{-2a}{-2} &= \frac{-12}{-2} \\ a &= 6\end{aligned}$$

Exercise 17.1:3

$$\begin{aligned}24 - \frac{b}{3} &= 12 \\ -\frac{b}{3} &= 12 - 24 \\ -\frac{b}{3} &= -12 \\ -b &= (-12) \times 3 \\ -b &= -36 \\ \frac{-b}{-1} &= \frac{-36}{-1} \\ b &= 36\end{aligned}$$

Exercise 17.1:4

$$\begin{aligned}5x + 16 &= 3x + 24 \\ 5x + 16 - 3x &= 24 \\ 5x - 3x + 16 &= 24 \\ 2x + 16 &= 24 \\ 2x &= 24 - 16 \\ 2x &= 8 \\ x &= 4\end{aligned}$$

Exercise 17.1:5

$$\begin{aligned}13x + 26 &= 9x + 10 \\ 13x - 9x + 26 &= 10 \\ 4x + 26 &= 10 \\ 4x &= 10 - 26 \\ 4x &= -16 \\ \frac{4x}{4} &= \frac{-16}{4} \\ x &= -4\end{aligned}$$

Exercise 17.1:6

$$\begin{aligned}
 \frac{y}{3} + 15 &= y + 19 \\
 \frac{y}{3} - y + 15 &= 19 \\
 \frac{y}{3} - y &= 19 - 15 \\
 \frac{y}{3} - \frac{y}{1} &= 4 \\
 \frac{1(y) - 3(y)}{3} &= 4 \\
 \frac{-2y}{3} &= 4 \\
 -2y &= 4 \times 3 \\
 \frac{-2y}{-2} &= \frac{12}{-2} \\
 y &= -6
 \end{aligned}$$

Worksheet 18. Changing the subject of the formula

Exercise 18.1:1

$$\begin{aligned}
 a + b - c &= 5 & (b) \\
 b - c &= 5 - a & \text{Subtract } a \text{ on both sides} \\
 b &= 5 - a + c & \text{Add } c \text{ on both sides}
 \end{aligned}$$

Exercise 18.1:2

$$\begin{aligned}
 2x + 4y &= 8 & (y) \\
 4y &= 8 - 2x & \text{Subtract } 2x \text{ on both sides} \\
 \frac{4y}{4} &= \frac{8 - 2x}{4} & \text{Divide both sides by 4} \\
 \frac{4y}{4} &= \frac{8}{4} - \frac{2x}{4} & \text{Remember, each term in the numerator on the right-hand side must be divided by 4} \\
 y &= 2 - \frac{x}{2}
 \end{aligned}$$

Exercise 18.1:3

$$7 - 3b - 6x = -5 \quad (b)$$

$$-3b - 6x = -5 - 7 \quad \text{Subtract 7 on both sides}$$

$$-3b - 6x = -12$$

$$-3b = -12 + 6x \quad \text{Add } 6x \text{ on both sides}$$

$$\frac{-3b}{-3} = \frac{-12}{-3} + \frac{6x}{-3} \quad \text{Divide both sides by } -3$$

$$b = 4 - 2x$$

Exercise 18.1:4

$$a + b^2 - \sqrt{c} = d \quad (c)$$

$$a + b^2 = d + \sqrt{c} \quad \text{Add } \sqrt{c} \text{ on both sides of the equation}$$

$$d + \sqrt{c} = a + b^2 \quad \text{Re-arrange the equation}$$

$$\sqrt{c} = a + b^2 - d \quad \text{Subtract } d \text{ on both sides of the equation}$$

$$c^{\frac{1}{2} \times \frac{2}{1}} = (a + b^2 - d)^{\frac{2}{1}} \quad \text{Multiply the exponent of } \frac{1}{2} \text{ with 2 to get rid of the square root on the left-hand side}$$

$$c = (a + b^2 - d)^2 \quad \text{Remember that } x^2 \text{ means } x \times x$$

Exercise 18.1:5

$$\frac{x}{3} - \frac{y}{6} = 4 \quad (x)$$

$$\frac{x}{3} = 4 + \frac{y}{6} \quad \text{Get rid of the } \frac{y}{6} \text{ on the left hand side of the equation by adding } \frac{y}{6} \text{ on both sides}$$

$$3 \times \frac{x}{3} = 3 \times (4 + \frac{y}{6}) \quad \text{Multiply both sides by 3}$$

$$x = 12 + \frac{y}{2} \quad \text{Each term in the bracket should be multiplied by 3}$$

Exercise 18.1:6

$$V = \pi r^2 h \quad (r)$$

$$\pi r^2 h = V$$

Re-arrange the equation

$$\frac{\pi r^2 h}{\pi h} = \frac{V}{\pi h}$$

Get rid of the πh on the left by dividing both sides by πh

$$r^2 = \frac{V}{\pi h}$$

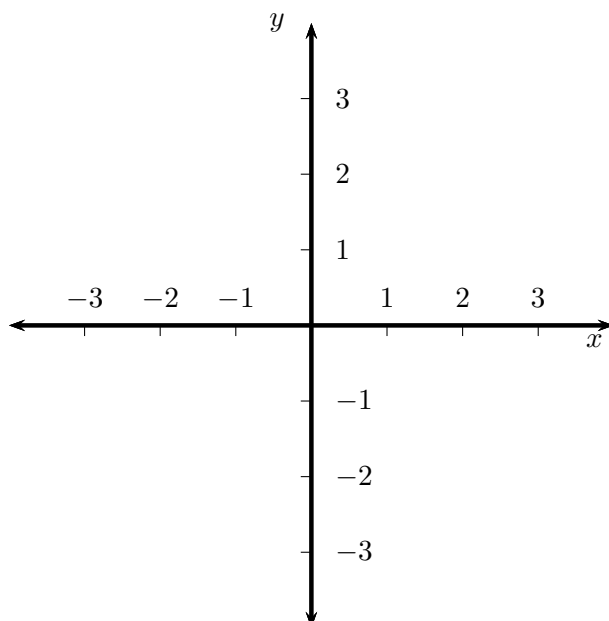
$$r^{\frac{2}{1} \times \frac{1}{2}} = \left(\frac{V}{\pi h} \right)^{\frac{1}{2}}$$

$$r = \sqrt{\frac{V}{\pi h}}$$

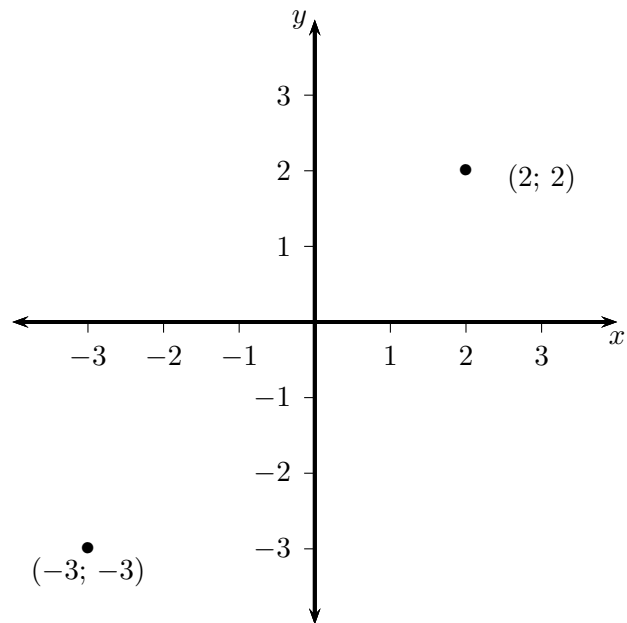
Get rid of the exponent 2 by multiplying both sides' exponent by $\frac{1}{2}$

Worksheet 19. Straight lines

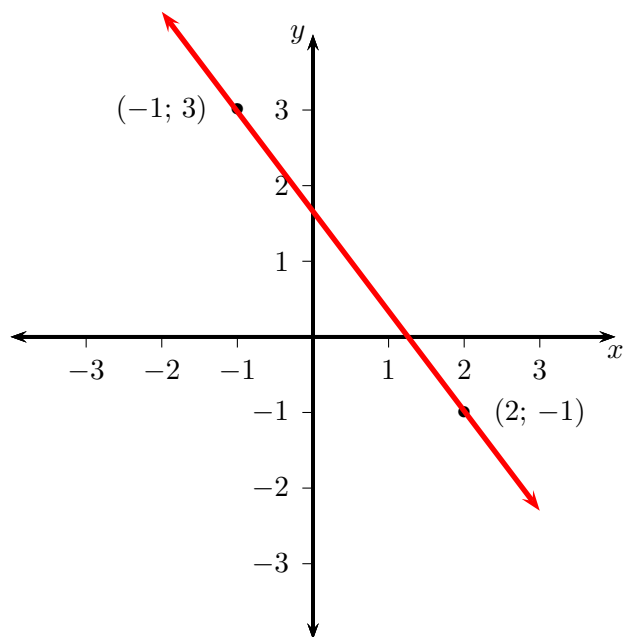
Exercise 19.1:1



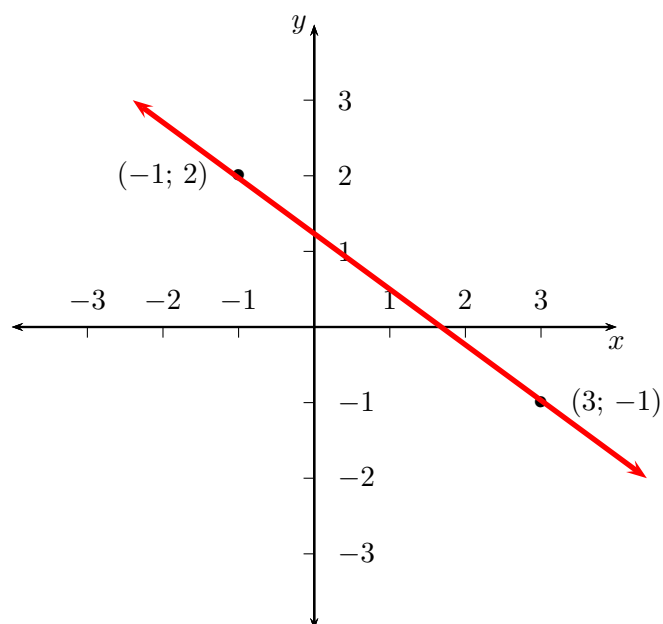
Exercise 19.1:2



Exercise 19.1:3

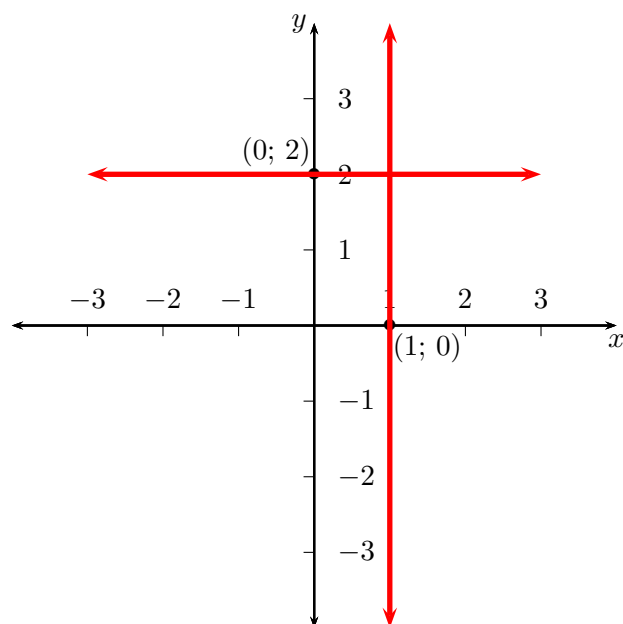


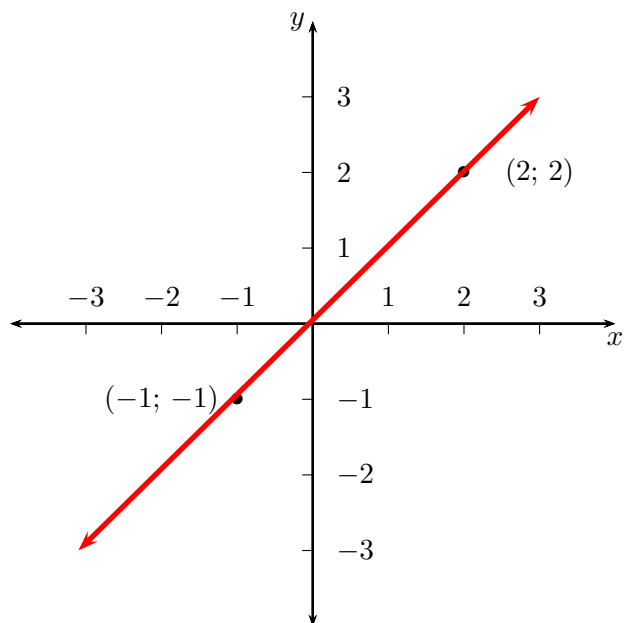
Exercise 19.1:4



Negative slope – going from left to right on the grid (system of axes).

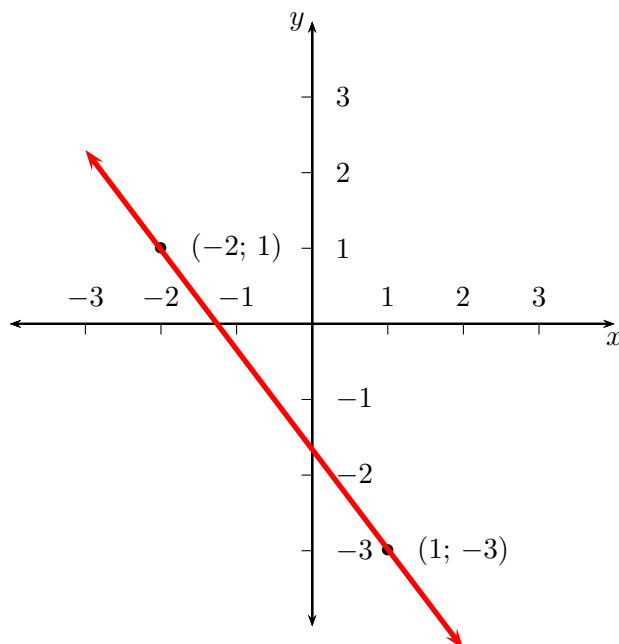
Exercise 19.1:5



Exercise 19.1:6

$$\begin{aligned}\text{Slope of this line} &= \frac{\text{change in the } y\text{-value}}{\text{change in the correspondence } x\text{-value}} \\ &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{2 - (-1)}{2 - (-1)} \\ &= \frac{2 + 1}{2 + 1} \\ &= \frac{3}{3} \\ &= 1\end{aligned}$$

The slope of the line is 1. It has a positive slope.

Exercise 19.1:7

$$\begin{aligned}
 \text{Slope} &= \frac{y_2 - y_1}{x_2 - x_1} \\
 &= \frac{1 - (-3)}{-2 - 1} \\
 &= \frac{4}{-3} \\
 &= -1\frac{1}{3}
 \end{aligned}$$

This line has a negative slope of $-1\frac{1}{3}$.

Exercise 19.1:8

Set up a table

x	0	1	2
y			

Substitute the x -values into the equation

$$y = x + 2.$$

$$\text{If } x = 0 \text{ then } y = 1(0) + 2 = 2$$

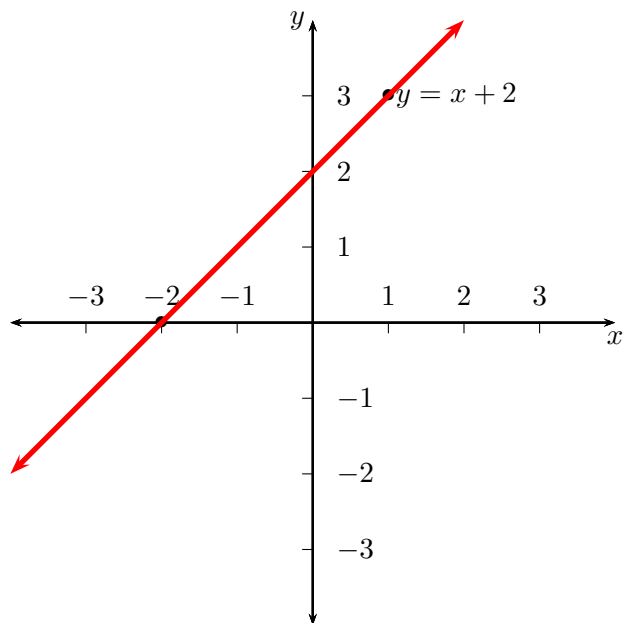
$$\text{If } x = 1 \text{ then } y = 1(1) + 2 = 3$$

$$\text{If } x = 2 \text{ then } y = 1(2) + 2 = 4$$

Fill these values into the table

x	0	1	2
y	2	3	4

Plot this data onto a prepared grid (system of axes) and join the points. Label the line.

**Exercise 19.1:9**

x	0	1	2
y			

Substitute these values into the equation

$$y = -x + 3$$

If $x = 0$ then $y = -(0) + 3 = 3$

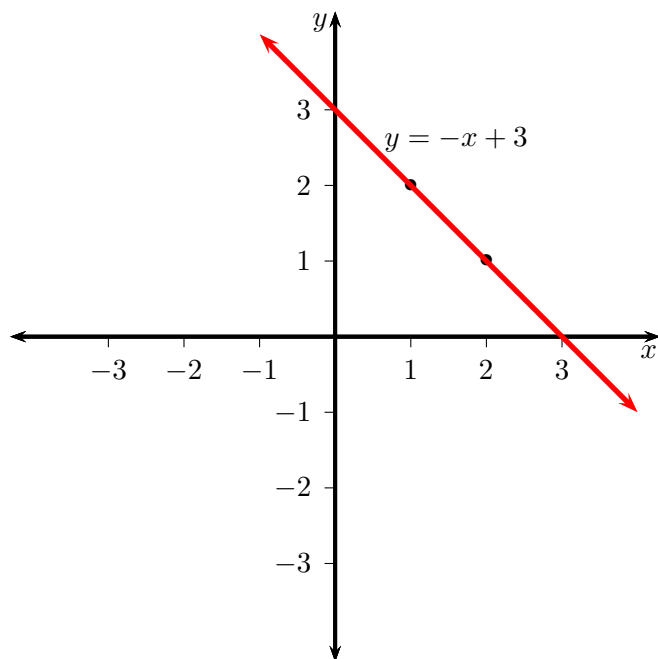
If $x = 1$ then $y = -(1) + 3 = 2$

If $x = 2$ then $y = -(2) + 3 = 1$

Fill these values into the table:

x	0	1	2
y	3	2	1

Plot this data on a prepared system of axes.



Exercise 19.1:10

Set up a table

x	0	1	2
y			

Substitute these values into the equation $y = x$

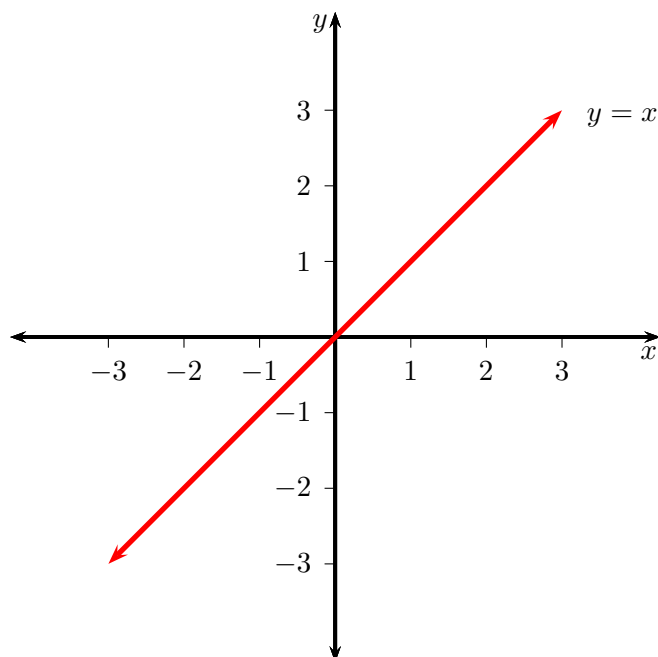
If $x = 0$ then $y = 0$

If $x = 1$ then $y = 1$

If $x = 2$ then $y = 2$

Fill these data into the table and draw the graph on the prepared system of axes.

x	0	1	2
y	0	1	2



Exercise 19.1:11

The point $(1; 2)$ can be denoted by $(x_1; y_1)$ and the point $(3; 3)$ by $(x_2; y_2)$. Substitute these values into the equation:

$$\frac{y - y_1}{x - x_1} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\frac{y - 2}{x - 1} = \frac{3 - 2}{3 - 1}$$

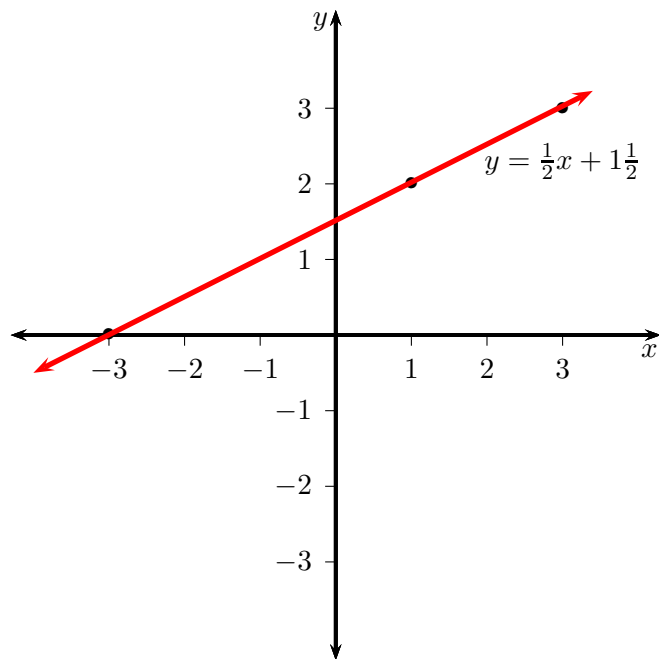
$$\frac{y - 2}{x - 1} = \frac{1}{2}$$

$$y - 2 = \frac{1}{2}(x - 1)$$

$$y - 2 = \frac{1}{2}x - \frac{1}{2}$$

$$y = \frac{1}{2}x - \frac{1}{2} + 2$$

$$= \frac{1}{2}x + 1\frac{1}{2}$$



Worksheet 20. Basic Financial Calculations

Exercise 20.1:1

$$I = Prt$$

where I is the total amount of interest received/paid after the time under consideration.

P is the original or principal amount which you have invested.

r is the simple interest rate per year offered by the investment company or bank.

t is the time, in years, for which the principle amount is invested.

Exercise 20.1:2

$$S = P(1 + rt)$$

where S is the accumulated amount or future value or total amount payable at the end of the time under consideration

P is the principal or the present value or the original amount invested.

r is the simple interest rate per year which is applicable.

t is the time, in years, for which the principle amount is invested.

Exercise 20.1:3

$$\begin{aligned} I &= Prt \\ &= 5\,000 \times 9,5\% \times 4 \\ &= 5\,000 \times \frac{9,5}{100} \times 4 \\ &= 1\,900 \end{aligned}$$

You will have to pay R1 900 interest after four years.

Exercise 20.1:4

$$\begin{aligned} I &= Prt \\ 2\,400 &= P \times 8\% \times 3 \\ P &= \frac{2\,400}{8\% \times 3} \\ &= \frac{2\,400}{0,08 \times 3} \\ &= 10\,000 \end{aligned}$$

You borrowed R10 000 from Sipho.

Exercise 20.1:5

$$\begin{aligned} I &= Prt \\ 1\,650 &= 5\,500 \times 5\% \times t \\ t &= \frac{1\,650}{5\,500 \times 5\%} \\ &= \frac{1\,650}{5\,500 \times 0,05} \\ &= 6 \end{aligned}$$

The amount was invested for six years.

Exercise 20.1:6

$$\begin{aligned}I &= Prt \\4\,050 &= 30\,000 \times r \times \frac{27}{12} \\r &= \frac{4\,050 \times 12}{30\,000 \times 27} \\&= 0,06\end{aligned}$$

The applicable simple interest rate was 6% per year.

Exercise 20.1:7

$$\begin{aligned}S &= P(1 + rt) \\&= 13\,500 \left(1 + 6,80\% \times \frac{45}{12} \right) \\&= 13\,500 \left(1 + 0,0680 \times \frac{45}{12} \right) \\&= 16\,942,50\end{aligned}$$

The balance in Jody's account will be R16 942,50.

Exercise 20.1:8

$$\begin{aligned}S &= P(1 + rt) \\9\,500 &= P(1 + 8,2\% \times 3) \\P &= \frac{9\,500}{1 + 0,082 \times 3} \\&= 7\,624,40\end{aligned}$$

Amos borrowed R7 624,40 from Percy.

Exercise 20.1:9

$$\begin{aligned}S &= P(1 + rt) \\10\,472 &= 6\,800(1 + 7,2\% t) \\\frac{10\,472}{6\,800} &= 1 + 0,072t \\0,072t &= \frac{10\,472}{6\,800} - 1 \\t &= \left(\frac{10\,472}{6\,800} - 1 \right) \div 0,072 \\&= 7,5\end{aligned}$$

The time under consideration is 7,5 years.

Exercise 20.1:10

$$S = P(1 + i)^n$$

S is the future value or accumulated amount

P is the principal or present value

i is the given nominal rate per year divided by the number of compounding periods per year

n is the time in years multiplied by the number of compounding periods per year

Alternatively (in more detail):

$$S = P \left(1 + \frac{j_m}{m} \right)^{tm}$$

S is the future value or accumulated amount

P is the principal amount invested or the present value

j_m is the interest rate as a decimal

m is the number of compounding periods per year

t is the number of years of the investment

Exercise 20.1:11

- By using the financial keys on the prescribed SHARP EL-738FB calculator:

2ndF **CA**
2ndF **P/Y** 12 **ENT** **ON/C**
± 120 000 **PV**
9,3 **I/Y**
(27 **÷** 12 **)** **2ndF** **× $\frac{P}{Y}$** **N**
COMP **FV**

The answer is 147 811,09

- By substituting into the Compound Interest formula

$$\begin{aligned} S &= P(1 + i)^n \\ &= 120\,000 \left(1 + \frac{9,3\%}{12} \right)^{\frac{27}{12} \times \frac{12}{1}} \\ &= 120\,000 \left(1 + \frac{0,093}{12} \right)^{\frac{27}{12} \times \frac{12}{1}} \\ &= 147\,811,09 \end{aligned}$$

Ordinary calculator steps:

$$120\,000 \left(1 + 0,093 \div 12 \right)^{27} =$$

The balance in Patrick's account will be R147 811,09.

Exercise 20.1:12

- By using the financial keys on the prescribed SHARP EL738FB calculator:

$$\begin{array}{l} \boxed{2\text{ndF}} \boxed{\text{CA}} \\ \boxed{2\text{ndF}} \boxed{\text{P/Y}} 4 \boxed{\text{ENT}} \boxed{\text{ON/C}} \\ \boxed{\pm} 15\,000 \boxed{\text{FV}} \\ 8 \boxed{\text{I/Y}} \\ 4 \boxed{2\text{ndF}} \boxed{\times \frac{\text{P}}{\text{Y}}} \boxed{\text{N}} \\ \boxed{\text{COMP}} \boxed{\text{PV}} \end{array}$$

The answer is 10 926,69

- By substituting into the Compound Interest formula:

$$\begin{aligned} S &= P(1+i)^n \\ 15\,000 &= P \left(1 + \frac{8\%}{4} \right)^{4 \times 4} \\ 15\,000 &= P \left(1 + \frac{0,08}{4} \right)^{4 \times 4} \\ P &= 10\,926,69 \end{aligned}$$

Ordinary calculator steps:

$$15\,000 \div \left(1 + 0,08 \div 4 \right)^{16} =$$

Elias borrowed R10 926,69 four years ago from Robert.

Exercise 20.1:13

- By using the financial keys on the prescribed SHARP EL738FB calculator:

$$\begin{array}{l} \boxed{2\text{ndF}} \boxed{\text{CA}} \\ \boxed{2\text{ndF}} \boxed{\text{P/Y}} 52 \boxed{\text{ENT}} \boxed{\text{ON/C}} \\ \boxed{\pm} 14\,000 \boxed{\text{PV}} \\ 9 \boxed{\text{I/Y}} \\ 16\,758,44 \boxed{\text{FV}} \\ \boxed{\text{COMP}} \boxed{\text{N}} \end{array}$$

The answer is 104 weeks.

Lorinda invested her money for 104 periods (weeks) and that is for two years.

- By substituting into the relevant Compound Interest formula

$$\begin{aligned}S &= P(1+i)^n \\16\,758,44 &= 14\,000 \left(1 + \frac{9\%}{52}\right)^n \\16\,758,44 &= 14\,000 \left(1 + \frac{0,09}{52}\right)^n \\n &= 104 \quad (\text{by using logarithms})\end{aligned}$$

Since the unknown is an exponent, it is easier to use the financial calculator.

Exercise 20.1:14

$$S = R \left[\frac{(1+i)^n - 1}{i} \right]$$

S is the future value of the annuity

R is equal amounts (payments) at equal time intervals

i is the given interest rate divided by the number of compounding periods per year

n is the time in years multiplied by the number of compounding periods

Exercise 20.1:15

$$P = R = R \left[\frac{(1+i)^n - 1}{i(1+i)^n} \right]$$

P is the present value of the annuity

R is the equal amounts (payments) made at equal time intervals

i is the applicable interest rate divided by the number of compounded periods per year

n is the time in years multiplied by the number of compounded periods per year

Exercise 20.1:16

- By using the financial keys on the prescribed SHARP EL-738B calculator:

2ndF **CA**
2ndF **P/Y** 2 **ENT** **ON/C**
± 2 400 **PMT**
11,6 **I/Y**
6 **2ndF** **× P/Y** **N**
COMP **FV**

The answer is 40 018,23.

The future value is R40 018,23.

- by substituting into the relevant formula

$$S = 2400 \left[\frac{\left(1 + \frac{0,116}{2}\right)^{2 \times 6} - 1}{\frac{0,116}{2}} \right]$$

$$= 40018,23.$$

Ordinary Calculator steps:

2 400 (((1 + 2) 2ndF y^x 12 - 1) ÷ (0,116 ÷ 2)) =

Exercise 20.1:17

- By using the financial keys on the calculator:

2ndF CA
 2ndF P/Y 12 ENT ON/C
 ± 38 000 PV
 15,7 I/Y
 5 2ndF $\times \frac{P}{Y}$ N
 COMP PMT

The answer is 918,04.

The monthly payments are R918,04.

- By substituting into the relevant formula:

$$P = R \left[\frac{(1+i)^n - 1}{i(1+i)^n} \right]$$

$$R = P \div \left[\frac{(1+i)^n - 1}{i(1+i)^n} \right]$$

$$= 38\,000 \div \left[\frac{\left(1 + \frac{0,157}{12}\right)^{5 \times 12} - 1}{\frac{0,157}{12} \left(1 + \frac{0,157}{12}\right)^{5 \times 12}} \right]$$

$$= 918,04$$

Ordinary calculator steps: 38 000 ÷ (((1 + 0,157 ÷ 12) 2ndF y^x 60 - 1) ÷ (0,157 ÷ 12 × (1 + 0,157 ÷ 12) 2ndF y^x 60)) =

Exercise 20.1:18

- By using the financial keys on the SHARP EL 738FB calculator:

2ndF CA
 2ndF P/Y 4 ENT ON/C
 ± 1 200 PMT
 9,91 I/Y
 7 2ndF × P/Y N
 COMP FV

The answer is 47 673,55.

The balance in Lucy's account will be R47 673,55.

- by substituting into the relevant formula:

$$\begin{aligned}
 S &= R \left[\frac{(1+i)^n - 1}{i(1+i)^n} \right] \\
 R &= 1\,200 \left[\frac{\left(1 + \frac{0,0991}{4}\right)^{4 \times 7} - 1}{\frac{0,0991}{4}} \right] \\
 &= 47\,673,55
 \end{aligned}$$

Ordinary calculator steps:

1 200 (((1 + 0,0991 ÷ 4) 2ndF y^x 28 -1) ÷ (0,0991 ÷ 4))
 =

Note:

If you use the **financial calculator**, you do not have to use the formulas for compound interest, annuities and amortisation of loans. The calculator is programmed to give you the correct answer if you use the financial keys in a **specific** way. Make sure you memorise and know the procedure to follow on the financial calculator.

If you use a scientific calculator, you have to substitute the correct values into the correct formulas and you have to have the mathematical knowledge, like that of logarithms, to find the correct answers. This is not part of the syllabus of this module. Therefore, you are advised to get familiar with the operation of the financial calculator.