

FIRE JUNGLE

CAPS-aligned mathematics for South African learners



GRADE 7

Mathematics

TEXTBOOK

Definitions • Worked Examples • Exercises • Full Answers



Scan for the free interactive digital edition

by Joseph Matthew Mitchell

Fire Jungle Grade 7 Mathematics

A CAPS-aligned study textbook for the FET phase

Author Joseph Matthew Mitchell

Publisher Fire Jungle — TsukaMath

Digital edition https://firejungle.com/math/TsukaMath_G7.php

Edition 2026

© 2026 Joseph Matthew Mitchell. Published under the Fire Jungle / TsukaMath learning brand. This textbook accompanies the interactive digital edition. Every page carries a QR code that opens the online version, where each topic includes animated diagrams, narrated lessons and auto-generated practice. Content is aligned to the South African CAPS curriculum for Grade 7 Mathematics.



DIGITAL TEXTBOOK

Scan for the interactive
digital edition

firejungle.com

How to use this book

Definitions. Each topic opens with the key terms you must know and be able to state in an exam.

Key formulas. The formulas and rules for the topic, gathered in one box for quick revision.

Worked examples. Fully solved problems. The right-hand notes explain the reason for every step.

Exercises. Practice questions. Try them before checking the back of the book.

Answers. Complete answers with working are collected in the Answers section at the end.

Digital edition. Scan the QR code on any page to open the interactive version of this textbook, with animated lessons, narration and unlimited generated practice.

Tip: work through the worked examples with a pen in hand, then attempt the exercises with the book closed. Use the digital edition for extra randomised practice on any topic you find hard.



DIGITAL TEXTBOOK

Scan for the interactive
digital edition

Contents

Whole Numbers and Integers 7

Properties: associative, commutative	7
Order of operations (BODMAS)	8
Add integers	9
Subtract integers	11
Multiply integers	12
Divide integers	13
Long Division (game)	14

Exponents 15

Exponents and bases	15
Squares and cubes	16
Square roots	17
Cube roots	18

Fractions 20

Add and subtract fractions	20
Multiply fractions	21
Divide fractions	22
Mixed numbers $\leftrightarrow$ improper	23
Fraction of a quantity	24

Decimals 26

Add and subtract decimals	26
Multiply decimals	27
Divide decimals	28
Decimal $\leftrightarrow$ fraction $\leftrightarrow$ percent	29

Ratios and Proportion 31

Simplify ratios	31
Direct proportion	32
Speed, distance, time	33
Sharing in a ratio	34

Percentage 36



Percent of a quantity	36
Discount and increase	37
Percent profit/loss	38
Find original price	39
Patterns and Sequences	41
Number patterns: linear	41
Find the rule (T_n)	42
Term value of a pattern	43
Algebraic Expressions	45
Substitute into expressions	45
Simplify by collecting like terms	46
Add and subtract like terms	47
Distributive property (basic)	48
Equations	50
Solve one-step equations (+/-)	50
Solve one-step equations ($\times/\div$)	51
Solve two-step equations	52
Word problems $\rightarrow$ equations	53
Lines and Angles	55
Angles on a straight line	55
Angles around a point	56
Vertically opposite angles	58
Co-interior, alternate, corresponding angles	59
Triangles and Quadrilaterals	61
Triangle angle sum	61
Exterior angle of triangle	62
Quadrilateral angle sum	64
Properties of special triangles	65
Properties of quadrilaterals	66
Mensuration	68
Perimeter	68
Area of rectangle	69



Area of triangle	71
Volume of rectangular prism	72
Surface area	73
Coordinate Geometry	75
Identify quadrant of a point	75
Distance on grid (horizontal/vertical)	76
Plot points (all four quadrants)	78
Statistics	80
Mean, median, mode	80
Range	81
Read graphs and tables	82
Probability	84
Probability of single event	84
Sample space	85
Theoretical vs experimental	86
Worked solutions to all exercises	88





CHAPTER 1

Whole Numbers and Integers

Properties: Properties of addition and multiplication

Order Order of operations — BODMAS

Add Adding integers

Subtract Subtracting integers

Multiply Multiplying integers

Divide Dividing integers

Long Long Division — interactive game

Properties: associative, commutative

Properties of addition and multiplication

DEFINITIONS

Commutative property The order does NOT matter. $3 + 5 = 5 + 3$ and $3 \times 5 = 5 \times 3$.

Associative property The grouping does NOT matter. $(2 + 3) + 4 = 2 + (3 + 4)$.

Identity A number that leaves things unchanged. 0 is the identity for +; 1 is the identity for $\times$.

KEY FORMULAS

- **Commutative:** $a + b = b + a$ and $a \times b = b \times a$
- **Associative:** $(a + b) + c = a + (b + c)$
- **Identity:** $a + 0 = a$ and $a \times 1 = a$
- **NOT commutative or associative:** subtraction and division

WORKED EXAMPLES



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (A.1)

**Example 1: Is $(2 + 5) + 3 = 2 + (5 + 3)$? True or false?**

► Left side: $7 + 3 = 10$.

Brackets first.

► Right side: $2 + 8 = 10$.

Brackets first.

► Both equal 10.

Same answer.

► **True — associative property.**

Grouping does not matter.

Example 2: Is $4 \times 7 = 7 \times 4$?

► Both = 28.

Multiplication is commutative.

► **True.**

Order does not matter for $\times$.

EXERCISES (EASY → DIFFICULT)

1. $(7 + 3) + 6 = 7 + (3 + 6)$. True or false?
2. $(8 + 6) + 6 = 8 + (6 + 6)$. True or false?
3. $(2 + 4) + 9 = 2 + (4 + 9)$. True or false?
4. $(4 + 7) + 5 = 4 + (7 + 5)$. True or false?
5. $(4 + 9) + 6 = 4 + (9 + 6)$. True or false?
6. $(3 + 2) + 7 = 3 + (2 + 7)$. True or false?
7. $(9 + 3) + 7 = 9 + (3 + 7)$. True or false?
8. $(3 + 7) + 9 = 3 + (7 + 9)$. True or false?
9. $(7 + 5) + 2 = 7 + (5 + 2)$. True or false?
10. $(9 + 2) + 5 = 9 + (2 + 5)$. True or false?

Order of operations (BODMAS)

Order of operations — BODMAS

DEFINITIONS

BODMAS The order to do calculations: Brackets, Orders (powers), Division, Multiplication, Addition, Subtraction.

Brackets Do whatever is inside () FIRST.

KEY FORMULAS

- **B** — Brackets first
- **O** — Orders (powers and roots)
- **DM** — Division and Multiplication (left to right)
- **AS** — Addition and Subtraction (left to right)

**DIGITAL TEXTBOOK**

Scan to open this section
in the interactive edition (A.2)



WORKED EXAMPLES

Example 1: Calculate $2 + 3 \times 4$.

- Multiplication BEFORE addition (BODMAS).

M comes before A.

- $3 \times 4 = 12$.

Multiply first.

- $2 + 12 = 14$.

Then add.

- **14.**

Final answer.

Example 2: Calculate $10 - 2 \times 3$.

- $2 \times 3 = 6$.

Multiply first.

- $10 - 6 = 4$.

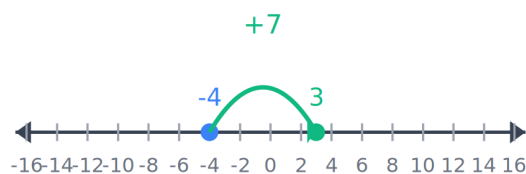
Then subtract.

EXERCISES (EASY → DIFFICULT)

1. $2 + 2 \times 9 - 2 = ?$
2. $9 + 7 \times 2 - 9 = ?$
3. $5 + 9 \times 5 - 5 = ?$
4. $7 + 5 \times 5 - 7 = ?$
5. $9 + 8 \times 7 - 9 = ?$
6. $5 + 3 \times 4 - 5 = ?$
7. $9 + 5 \times 9 - 9 = ?$
8. $9 + 5 \times 7 - 9 = ?$
9. $7 + 5 \times 8 - 7 = ?$
10. $9 + 7 \times 7 - 9 = ?$

Add integers

Adding integers



$$-4 + 7 = 3$$

**DIGITAL TEXTBOOK**

Scan to open this section
in the interactive edition (A.3)



DEFINITIONS

Integer A whole number — positive (3, 7), negative (−2, −9), or zero.

Absolute value The size of a number, ignoring sign. $|-5| = 5$; $|3| = 3$.

KEY FORMULAS

- **Same signs:** add absolute values, keep the sign
- **Different signs:** subtract smaller absolute from larger, keep sign of the larger
- **Examples:** $(-4) + (-3) = -7$; $(-4) + 7 = +3$; $4 + (-7) = -3$

WORKED EXAMPLES

Example 1: Calculate $(-4) + 7$.

- ▶ Signs are different (− and +).
Subtract smaller absolute from larger.
- ▶ $|7| - |-4| = 7 - 4 = 3$.
Subtract.
- ▶ Larger absolute is 7 (positive), so answer is +.
Keep sign of larger.
- ▶ **$(-4) + 7 = 3$.**
Final answer.

Example 2: Calculate $(-5) + (-3)$.

- ▶ Same signs (both negative).
Add absolute values.
- ▶ $5 + 3 = 8$, keep negative.
Sign rule.
- ▶ **−8.**
Done.

EXERCISES (EASY → DIFFICULT)

1. $(-14) + 1 = ?$
2. $(-15) + 15 = ?$
3. $(-8) + 2 = ?$
4. $(-4) + 15 = ?$
5. $(-12) + 6 = ?$
6. $(-10) + 4 = ?$
7. $(-10) + 1 = ?$
8. $(-9) + 4 = ?$
9. $(-1) + 11 = ?$
10. $(-13) + 10 = ?$

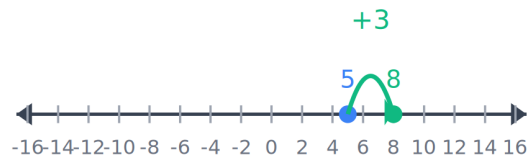


DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (A.3)

Subtract integers

Subtracting integers



$$5 + 3 = 8$$

DEFINITIONS

Subtraction Taking away. $a - b$ means start at a , go b steps DOWN.

Double negative rule Two negatives in a row make a positive: $a - (-b) = a + b$.

KEY FORMULAS

- **Subtract a positive:** $a - b = a + (-b)$ (just subtract normally)
- **Subtract a negative:** $a - (-b) = a + b$ (the two negatives become a plus)
- **Example:** $5 - (-3) = 5 + 3 = 8$

WORKED EXAMPLES

Example 1: Calculate $5 - (-3)$.

- Two negatives in a row become a plus.

Double negative rule.

► $5 - (-3) = 5 + 3$.

Apply rule.

► **= 8.**

Add.

Example 2: Calculate $4 - (-6)$.

► $4 - (-6) = 4 + 6$.

Two negatives = plus.

► **= 10.**

Done.

EXERCISES (EASY → DIFFICULT)

1. $2 - (-1) = ?$
2. $10 - (-3) = ?$
3. $8 - (-13) = ?$



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (A.4)



4. $6 - (-11) = ?$
5. $13 - (-14) = ?$
6. $10 - (-1) = ?$
7. $1 - (-12) = ?$
8. $5 - (-3) = ?$
9. $9 - (-1) = ?$
10. $4 - (-4) = ?$

Multiply integers

Multiplying integers

DEFINITIONS

Sign rule (×) Same signs give POSITIVE. Different signs give NEGATIVE.

KEY FORMULAS

- $(+) \times (+) = +$
- $(-) \times (-) = +$
- $(+) \times (-) = -$
- $(-) \times (+) = -$
- **Quick rule:** count the negatives. Even number $\rightarrow +$. Odd number $\rightarrow -$.

WORKED EXAMPLES

Example 1: Calculate $(-4) \times 3$.

- Different signs ($- \times +$).

Apply sign rule.

- Different signs $\rightarrow$ answer is negative.

Sign rule.

- $4 \times 3 = 12$, attach negative.

Multiply the sizes.

- **$= -12$.**

Final answer.

Example 2: Calculate $(-5) \times (-2)$.

- Same signs ($- \times -$).

Both negative.

- Same signs $\rightarrow$ positive.

Sign rule.

- $5 \times 2 = 10$. = **10.**

Done.

EXERCISES (EASY $\rightarrow$ DIFFICULT)

1. $(-7) \times 2 = ?$
2. $(-8) \times 8 = ?$
3. $(-6) \times 9 = ?$
4. $(-7) \times 8 = ?$
5. $(-4) \times 9 = ?$
6. $(-2) \times 7 = ?$



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (A.5)



7. $(-9) \times 6 = ?$
8. $(-8) \times 6 = ?$
9. $(-6) \times 4 = ?$
10. $(-4) \times 2 = ?$

Divide integers

Dividing integers

DEFINITIONS

Sign rule ($\div$)

Same signs give POSITIVE. Different signs give NEGATIVE. Same as multiplication.

KEY FORMULAS

- $(+) \div (+) = +$
- $(-) \div (-) = +$
- $(+) \div (-) = -$
- $(-) \div (+) = -$
- **Division by 0: not allowed!**

WORKED EXAMPLES

Example 1: Calculate $(-18) \div 3$.

- Different signs.

Apply sign rule.

- Different signs $\rightarrow$ negative answer.

Sign rule.

- $18 \div 3 = 6$, attach negative.

Divide the sizes.

- **$= -6$.**

Final answer.

Example 2: Calculate $(-20) \div (-4)$.

- Same signs $\rightarrow$ positive.

Sign rule.

- $20 \div 4 = 5$.

Done.

EXERCISES (EASY $\rightarrow$ DIFFICULT)

1. $(-81) \div 9 = ?$
2. $(-9) \div 3 = ?$
3. $(-72) \div 9 = ?$
4. $(-21) \div 3 = ?$
5. $(-18) \div 2 = ?$
6. $(-16) \div 4 = ?$
7. $(-4) \div 2 = ?$
8. $(-40) \div 8 = ?$
9. $(-18) \div 3 = ?$
10. $(-48) \div 6 = ?$



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (A.6)

Long Division (game)

Long Division — interactive game

DEFINITIONS

Long division	A step-by-step way to divide big numbers: divide, multiply, subtract, bring down.
Dividend	The number being divided (goes under the bracket).
Divisor	The number you divide by.
Quotient	The answer that sits on top.
Remainder	What is left over when it does not divide evenly.

KEY FORMULAS

- **Divide → Multiply → Subtract → Bring down**, then repeat
- **$\text{dividend} \div \text{divisor} = \text{quotient (remainder r)}$**

WORKED EXAMPLES

Example 1: This opens the Division Quest game, where Tsuka guides you through every step with apple groups and 3-choice answers.

- Divide: how many times does the divisor fit?

Step 1.

- Multiply that digit by the divisor.

Step 2.

- Subtract, then bring down the next digit.

Step 3, then repeat.

EXERCISES (EASY → DIFFICULT)

1. Open the Long Division game to practise step by step.

End of Chapter 1 — Mixed Exercise

Ten questions across the whole chapter, from easy to difficult.

1. $(7 + 3) + 6 = 7 + (3 + 6)$. True or false?
2. $9 + 7 \times 2 - 9 = ?$
3. $(-8) + 2 = ?$
4. $6 - (-11) = ?$
5. $(-4) \times 9 = ?$
6. $(-16) \div 4 = ?$
7. Open the Long Division game to practise step by step.
8. $(3 + 7) + 9 = 3 + (7 + 9)$. True or false?
9. $7 + 5 \times 8 - 7 = ?$
10. $(-13) + 10 = ?$



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (A.7)



CHAPTER 2

Exponents

Exponents Exponents and bases

Squares Squares and cubes

Square Square roots

Cube Cube roots

Exponents and bases

DEFINITIONS

Base	The number being multiplied. In 2^4 , the base is 2.
Exponent (power)	The small raised number that tells how many times to multiply the base by itself. In 2^4 , the exponent is 4.
Power	A number written with an exponent, like 2^4 or 5^3 .

KEY FORMULAS

- 2^4 means $2 \times 2 \times 2 \times 2 = 16$
- a^n means a multiplied by itself n times
- $2^2 = 4$, $2^3 = 8$, $2^4 = 16$, $2^5 = 32$
- $3^2 = 9$, $3^3 = 27$, $3^4 = 81$

WORKED EXAMPLES

Example 1: What is 2^4 ?

- 2^4 means $2 \times 2 \times 2 \times 2$.

Multiply base by itself 4 times.

- Step by step: $2 \times 2 = 4$.

First pair.

- $4 \times 2 = 8$.

Continue.

- $8 \times 2 = 16$.

Final answer.



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (B.1)

**Example 2: What is 3^3 ?**

► $3 \times 3 \times 3$.

3 multiplied 3 times.

► $9 \times 3 = 27$.

Done.

EXERCISES (EASY → DIFFICULT)

1. $3^3 = ?$
2. $2^4 = ?$
3. $4^4 = ?$
4. $2^3 = ?$
5. $5^3 = ?$
6. $3^4 = ?$
7. $4^3 = ?$
8. $4^2 = ?$
9. $3^2 = ?$
10. $5^2 = ?$

Squares and cubes

DEFINITIONS

Square	A number multiplied by itself. $5^2 = 25$ means "5 squared".
Cube	A number multiplied by itself THREE times. $4^3 = 64$ means "4 cubed".
Perfect square	A number that is the square of a whole number: 1, 4, 9, 16, 25, 36...

KEY FORMULAS

- **Squares:** $1^2 = 1$, $2^2 = 4$, $3^2 = 9$, $4^2 = 16$, $5^2 = 25$, $6^2 = 36$, $7^2 = 49$, $8^2 = 64$, $9^2 = 81$, $10^2 = 100$
- **Cubes:** $1^3 = 1$, $2^3 = 8$, $3^3 = 27$, $4^3 = 64$, $5^3 = 125$
- **Worth memorising** the squares up to $12^2 = 144$

WORKED EXAMPLES**Example 1: What is 5^3 ?**

► 5^3 means $5 \times 5 \times 5$.

Cube = multiply 3 times.

► $5 \times 5 = 25$.

First pair.

► $25 \times 5 = 125$.

Final answer.

Example 2: What is 7^2 ?

► $7 \times 7 = 49$.

Square = multiply twice.

**DIGITAL TEXTBOOK**

Scan to open this section
in the interactive edition (B.2)

EXERCISES (EASY → DIFFICULT)

1. $8^3 = ?$
2. $6^3 = ?$
3. $9^3 = ?$
4. $4^3 = ?$
5. $5^3 = ?$
6. $2^3 = ?$
7. $7^3 = ?$
8. $3^3 = ?$
9. $10^3 = ?$

Square roots

DEFINITIONS

Square root	The OPPOSITE of squaring. $\sqrt{25}$ asks: what number times itself equals 25?
Radical sign	The $\sqrt{\quad}$ symbol. $\sqrt{9}$ is read as "the square root of 9".

KEY FORMULAS

- $\sqrt{(n^2)} = n$
- **Common roots:** $\sqrt{1}=1$, $\sqrt{4}=2$, $\sqrt{9}=3$, $\sqrt{16}=4$, $\sqrt{25}=5$, $\sqrt{36}=6$, $\sqrt{49}=7$, $\sqrt{64}=8$, $\sqrt{81}=9$, $\sqrt{100}=10$
- **Inverse:** $\sqrt{\quad}$ and 2 undo each other. $(\sqrt{9})^2 = 9$ and $\sqrt{(9^2)} = 9$

WORKED EXAMPLES

Example 1: What is $\sqrt{36}$?

- Ask: what number squared equals 36?

Definition.

- Try 6: $6 \times 6 = 36$.

Check.

- $\sqrt{36} = 6$.

Final answer.

Example 2: What is $\sqrt{81}$?

- $9 \times 9 = 81$.

Find the number.

- $\sqrt{81} = 9$.

Done.

EXERCISES (EASY → DIFFICULT)

1. $\sqrt{81} = ?$
2. $\sqrt{49} = ?$
3. $\sqrt{16} = ?$
4. $\sqrt{64} = ?$
5. $\sqrt{9} = ?$
6. $\sqrt{4} = ?$



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (B.3)



7. $\sqrt{100} = ?$
8. $\sqrt{144} = ?$
9. $\sqrt{121} = ?$
10. $\sqrt{36} = ?$

Cube roots

DEFINITIONS

Cube root	The OPPOSITE of cubing. $\sqrt[3]{27}$ asks: what number times itself THREE times equals 27?
Perfect cube	A number that is the cube of a whole number: 1, 8, 27, 64, 125, 216...

KEY FORMULAS

- $\sqrt[3]{(n^3)} = n$
- **Common cube roots:** $\sqrt[3]{1}=1$, $\sqrt[3]{8}=2$, $\sqrt[3]{27}=3$, $\sqrt[3]{64}=4$, $\sqrt[3]{125}=5$, $\sqrt[3]{216}=6$
- **Inverse:** $\sqrt[3]{}$ and ^3 undo each other

WORKED EXAMPLES

Example 1: What is $\sqrt[3]{64}$?

- Ask: what number cubed equals 64?

Definition.

- Try 4: $4 \times 4 \times 4 = 64$.

Check.

- $\sqrt[3]{64} = 4$.

Final answer.

Example 2: What is $\sqrt[3]{27}$?

- $3 \times 3 \times 3 = 27$.

Find the number.

- $\sqrt[3]{27} = 3$.

Done.

EXERCISES (EASY → DIFFICULT)

1. $\sqrt[3]{216} = ?$
2. $\sqrt[3]{64} = ?$
3. $\sqrt[3]{27} = ?$
4. $\sqrt[3]{125} = ?$
5. $\sqrt[3]{8} = ?$



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (B.4)



End of Chapter 2 — Mixed Exercise

Ten questions across the whole chapter, from easy to difficult.

1. $3^3 = ?$
2. $6^3 = ?$
3. $\sqrt{16} = ?$
4. $\sqrt[3]{125} = ?$
5. $5^3 = ?$
6. $2^3 = ?$
7. $\sqrt{100} = ?$
8. $\sqrt[3]{8} = ?$
9. $3^2 = ?$
10. $10^3 = ?$



DIGITAL TEXTBOOK

Scan for the interactive
digital edition



CHAPTER 3

Fractions

- Add** Adding and subtracting fractions
- Multiply** Multiplying fractions
- Divide** Dividing fractions
- Mixed** Mixed numbers and improper fractions
- Fraction** Fraction of a quantity

Add and subtract fractions

Adding and subtracting fractions

DEFINITIONS

Numerator	The TOP number of a fraction. In $\frac{3}{4}$, the numerator is 3.
Denominator	The BOTTOM number. In $\frac{3}{4}$, the denominator is 4.
Common denominator	A denominator both fractions share. Needed before adding or subtracting.

KEY FORMULAS

- **Same denominator:** just add (or subtract) the tops, keep the bottom
- **Different denominators:** find a common denominator first
- **Common denominator trick:** multiply the two denominators (or use LCM if smaller)

WORKED EXAMPLES

Example 1: Calculate $\frac{1}{2} + \frac{1}{3}$.

- Find a common denominator: LCM of 2 and 3 = 6.

Smallest number both go into.

- Rewrite: $\frac{1}{2} = \frac{3}{6}$ and $\frac{1}{3} = \frac{2}{6}$.

Equivalent fractions.

- Add: $\frac{3}{6} + \frac{2}{6} = \frac{5}{6}$.

Same denominator now.

- = $\frac{5}{6}$.

Final answer.



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (C.1)

**Example 2: Calculate $3/4 - 1/2$.**

- ▶ Common denominator: 4.

2 goes into 4.

- ▶ $1/2 = 2/4$.

Convert.

- ▶ $3/4 - 2/4 = 1/4$.

Subtract tops.

EXERCISES (EASY → DIFFICULT)

1. $1/2 + 1/3 = ?$
2. $2/3 + 1/4 = ?$
3. $3/4 - 1/2 = ?$

Multiply fractions

Multiplying fractions

DEFINITIONS**Multiply fractions**

Multiply the TOPS together and the BOTTOMS together. NO common denominator needed!

KEY FORMULAS

- $a/b \times c/d = (a \times c) / (b \times d)$
- **Always simplify** if possible
- **Example:** $2/3 \times 3/4 = 6/12 = 1/2$
- **Shortcut:** cancel common factors BEFORE multiplying to make smaller numbers

WORKED EXAMPLES**Example 1: Calculate $2/3 \times 3/4$.**

- ▶ Multiply tops: $2 \times 3 = 6$.

Top of answer.

- ▶ Multiply bottoms: $3 \times 4 = 12$.

Bottom of answer.

- ▶ Result: $6/12$.

Combine.

- ▶ Simplify: $6/12 = 1/2$.

Divide top and bottom by 6.

Example 2: Calculate $1/2 \times 4/5$.

- ▶ $1 \times 4 = 4$; $2 \times 5 = 10$.

Top $\times$ top, bottom $\times$ bottom.

- ▶ $4/10 = 2/5$.

Simplify.

**DIGITAL TEXTBOOK**

Scan to open this section
in the interactive edition (C.2)

**EXERCISES (EASY → DIFFICULT)**

1. $1/2 \times 4/5 = ?$
2. $3/5 \times 5/6 = ?$
3. $2/3 \times 3/4 = ?$

Divide fractions

Dividing fractions

DEFINITIONS**Reciprocal**

A fraction flipped upside down. Reciprocal of $3/4$ is $4/3$.

Divide fractions rule

Flip the SECOND fraction (take its reciprocal), then MULTIPLY.

KEY FORMULAS

- $a/b \div c/d = a/b \times d/c$
- **Memory:** "Keep, Change, Flip" — keep the first, change $\div$ to $\times$, flip the second
- **Example:** $1/2 \div 1/4 = 1/2 \times 4/1 = 4/2 = 2$

WORKED EXAMPLES**Example 1: Calculate $1/2 \div 1/4$.**

- Keep $1/2$.

First fraction unchanged.

- Change $\div$ to $\times$.

Switch operation.

- Flip $1/4$ to $4/1$.

Reciprocal.

- Multiply: $1/2 \times 4/1 = 4/2 = 2$.

Final answer.

Example 2: Calculate $2/3 \div 1/3$.

- $2/3 \times 3/1$.

Keep-Change-Flip.

- $6/3 = 2$.

Multiply and simplify.

EXERCISES (EASY → DIFFICULT)

1. $3/4 \div 1/2 = ?$
2. $1/2 \div 1/4 = ?$
3. $2/3 \div 1/3 = ?$

**DIGITAL TEXTBOOK**

Scan to open this section
in the interactive edition (C.3)



Mixed numbers ↔ improper

Mixed numbers and improper fractions

DEFINITIONS

- | | |
|--------------------------|--|
| Mixed number | A whole number with a fraction beside it: $2\frac{1}{2}$ means $2 + \frac{1}{2}$. |
| Improper fraction | A fraction where the top is BIGGER than the bottom: $\frac{5}{2}$, $\frac{7}{3}$. |
| Proper fraction | A fraction where the top is SMALLER than the bottom: $\frac{1}{2}$, $\frac{3}{4}$. |

KEY FORMULAS

- **Mixed → Improper:** (whole $\times$ bottom) + top, all over the bottom
- **Example:** $2\frac{3}{4} = (2 \times 4 + 3) / 4 = 11/4$
- **Improper → Mixed:** divide top by bottom. Whole part is the quotient; remainder over bottom is the fraction

WORKED EXAMPLES

Example 1: Convert $2\frac{3}{4}$ to an improper fraction.

- Multiply whole by bottom: $2 \times 4 = 8$.

Step 1.

- Add the top: $8 + 3 = 11$.

Step 2.

- Place over the bottom (4).

Step 3.

- $2\frac{3}{4} = 11/4$.

Final answer.

Example 2: Convert $3\frac{2}{5}$ to improper.

- $(3 \times 5 + 2) / 5$.

Apply formula.

- $17/5$.

$= 17/5$.

EXERCISES (EASY → DIFFICULT)

1. $2\frac{3}{5}$ as improper:
2. $5\frac{3}{5}$ as improper:
3. $5\frac{3}{6}$ as improper:
4. $2\frac{3}{6}$ as improper:
5. $4\frac{3}{6}$ as improper:
6. $1\frac{3}{6}$ as improper:
7. $3\frac{3}{5}$ as improper:
8. $5\frac{3}{4}$ as improper:
9. $5\frac{1}{4}$ as improper:
10. $3\frac{3}{6}$ as improper:



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (C.4)



Fraction of a quantity



$$\frac{1}{4} \text{ of } 60 = 15$$

15 out of 60 shaded

"of" means $\times$ in maths

DEFINITIONS

Fraction of a quantity

"Of" means MULTIPLY. $\frac{1}{2}$ of 20 = $\frac{1}{2} \times 20 = 10$.

KEY FORMULAS

- **Fraction of an amount:** divide by the bottom, multiply by the top
- $\frac{1}{2}$ of 20: $20 \div 2 = 10$
- $\frac{3}{4}$ of 20: $20 \div 4 \times 3 = 5 \times 3 = 15$
- **Memory:** "OF" means " $\times$ " in maths

WORKED EXAMPLES

Example 1: What is $\frac{1}{4}$ of 60?

► $\frac{1}{4}$ of 60 = $60 \div 4$.

Divide by the bottom.

► = **15**.

Final answer.

Example 2: What is $\frac{2}{3}$ of 30?

► $30 \div 3 = 10$.

Divide by bottom.

► $10 \times 2 = \mathbf{20}$.

Multiply by top.

EXERCISES (EASY → DIFFICULT)

1. $\frac{1}{6}$ of 48 =
2. $\frac{1}{4}$ of 36 =
3. $\frac{1}{2}$ of 24 =
4. $\frac{1}{3}$ of 24 =
5. $\frac{1}{6}$ of 36 =
6. $\frac{1}{4}$ of 48 =



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (C.5)



7. $\frac{1}{2}$ of 60 =
8. $\frac{1}{6}$ of 60 =
9. $\frac{1}{6}$ of 24 =
10. $\frac{1}{2}$ of 48 =

End of Chapter 3 — Mixed Exercise

Ten questions across the whole chapter, from easy to difficult.

1. $\frac{1}{2} + \frac{1}{3} = ?$
2. $\frac{3}{5} \times \frac{5}{6} = ?$
3. $\frac{2}{3} \div \frac{1}{3} = ?$
4. $2 \frac{3}{6}$ as improper:
5. $\frac{1}{6}$ of 36 =
6. $\frac{3}{4} - \frac{1}{2} = ?$
7. $\frac{2}{3} \times \frac{3}{4} = ?$
8. $\frac{3}{4} \div \frac{1}{2} = ?$
9. $5 \frac{1}{4}$ as improper:
10. $\frac{1}{2}$ of 48 =



CHAPTER 4

Decimals

Add Adding and subtracting decimals

Multiply Multiplying decimals

Divide Dividing decimals

Decimal Converting between decimals, fractions, and percents

Add and subtract decimals

Adding and subtracting decimals

DEFINITIONS

Decimal point The dot that separates the whole part from the fraction part. In 3.5, the point is between 3 and 5.

Place value The value of a digit based on its position: tens, ones, tenths, hundredths...

KEY FORMULAS

- **Line up the decimal points** vertically before adding/subtracting
- **Pad with zeros** if numbers have different decimal places
- **Example:** $3.4 + 0.27 \rightarrow 3.40 + 0.27 = 3.67$

WORKED EXAMPLES

Example 1: Calculate $3.4 + 1.5$.

► Line up decimal points.

Same place values together.

► Add tenths: $4 + 5 = 9$.

Right-most column.

► Add ones: $3 + 1 = 4$.

Next column.

► **= 4.9.**

Done.



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (D.1)

**Example 2: Calculate $5.6 + 2.7$.**

► Tenths: $6 + 7 = 13$ (write 3, carry 1).

Right column.

► Ones: $5 + 2 + 1 = 8$.

With carry.

► = **8.3**.

Done.

EXERCISES (EASY → DIFFICULT)

1. $3.1 + 4.2 = ?$
2. $4.8 + 5.6 = ?$
3. $7.2 + 3.8 = ?$
4. $8.3 + 9.2 = ?$
5. $4.3 + 7.2 = ?$
6. $7.5 + 3.6 = ?$
7. $7.0 + 2.7 = ?$
8. $6.2 + 5.6 = ?$
9. $8.9 + 9.3 = ?$
10. $8.6 + 4.5 = ?$

Multiply decimals

Multiplying decimals

DEFINITIONS

Decimal places The number of digits AFTER the decimal point. 2.5 has 1 decimal place; 2.50 has 2.

KEY FORMULAS

- **Step 1:** ignore the decimal points — multiply as whole numbers
- **Step 2:** count total decimal places in BOTH original numbers
- **Step 3:** put the decimal that many places from the right in the answer

WORKED EXAMPLES**Example 1: Calculate 2.5×3 .**

► Ignore decimal: $25 \times 3 = 75$.

Multiply as whole numbers.

► Count places: 2.5 has 1, 3 has 0 → total 1.

Sum of decimal places.

► Place decimal 1 from right: 7.5.

Move from right.

► **$2.5 \times 3 = 7.5$.**

Final answer.

**DIGITAL TEXTBOOK**

Scan to open this section
in the interactive edition (D.2)

**Example 2: Calculate 1.2×4 .**

► $12 \times 4 = 48$.

As whole numbers.

► 1 decimal place → **4.8**.

Place decimal.

EXERCISES (EASY → DIFFICULT)

1. $2.1 \times 7 = ?$
2. $3.1 \times 2 = ?$
3. $3.7 \times 8 = ?$
4. $4.4 \times 8 = ?$
5. $1.8 \times 2 = ?$
6. $1.5 \times 3 = ?$
7. $4.1 \times 5 = ?$
8. $4.0 \times 5 = ?$
9. $1.2 \times 6 = ?$
10. $3.0 \times 9 = ?$

Divide decimals

Dividing decimals

DEFINITIONS**Dividing a decimal**

Carry the decimal point straight up into the answer, then divide as normal.

KEY FORMULAS

- **Decimal ÷ whole number:** bring the decimal point straight up into the answer, then divide normally
- **Example:** $4.8 \div 2 = 2.4$ (because $48 \div 2 = 24$, then add decimal back)

WORKED EXAMPLES**Example 1: Calculate $4.8 \div 2$.**

► Bring decimal point straight up.

Mark position in answer.

► Divide $48 \div 2 = 24$.

Ignoring decimal.

► Put decimal back: **2.4**.

Final answer.

Example 2: Calculate $6.3 \div 3$.

► $63 \div 3 = 21$.

As whole numbers.

► Put decimal back: **2.1**.

Done.

**DIGITAL TEXTBOOK**

Scan to open this section
in the interactive edition (D.3)

**EXERCISES (EASY → DIFFICULT)**

1. $2.4 \div 2 = ?$
2. $4.4 \div 2 = ?$
3. $11.0 \div 5 = ?$
4. $18.0 \div 5 = ?$
5. $13.5 \div 5 = ?$
6. $18.8 \div 4 = ?$
7. $2.2 \div 2 = ?$
8. $14.4 \div 4 = ?$
9. $6.6 \div 3 = ?$
10. $14.1 \div 3 = ?$

Decimal ↔ fraction ↔ percent

Converting between decimals, fractions, and percents

DEFINITIONS

Percent (%) Means "out of 100". 50% means 50 out of 100.

Decimal-Fraction-Percent Three ways to write the same value. $0.5 = 1/2 = 50\%$.

KEY FORMULAS

- **Decimal → Percent:** multiply by 100 (move decimal 2 right). $0.5 = 50\%$
- **Percent → Decimal:** divide by 100 (move decimal 2 left). $25\% = 0.25$
- **Decimal → Fraction:** $0.5 = 5/10 = 1/2$; $0.25 = 25/100 = 1/4$
- **Common conversions:** $0.5 = 1/2 = 50\%$; $0.25 = 1/4 = 25\%$; $0.75 = 3/4 = 75\%$; $0.2 = 1/5 = 20\%$

WORKED EXAMPLES**Example 1: Write 0.5 as a percent.**

- Multiply by 100.

Decimal to percent.

- $0.5 \times 100 = 50$.

Move decimal 2 right.

- = **50%**.

Final answer.

Example 2: Write 0.25 as a percent.

- $0.25 \times 100 = 25$.

Move 2 right.

- = **25%**.

Done.

EXERCISES (EASY → DIFFICULT)

1. 0.75 as percent:
2. 0.25 as percent:
3. 0.5 as percent:

**DIGITAL TEXTBOOK**

Scan to open this section
in the interactive edition (D.4)



4. 0.2 as percent:

End of Chapter 4 — Mixed Exercise

Ten questions across the whole chapter, from easy to difficult.

1. $3.1 + 4.2 = ?$
2. $3.1 \times 2 = ?$
3. $11.0 \div 5 = ?$
4. 0.2 as percent:
5. $4.3 + 7.2 = ?$
6. $1.5 \times 3 = ?$
7. $2.2 \div 2 = ?$
8. 0.75 as percent:
9. $8.9 + 9.3 = ?$
10. $3.0 \times 9 = ?$





CHAPTER 5

Ratios and Proportion

Simplify Simplifying ratios
Direct Direct proportion
Speed, Speed, distance, and time
Sharing Sharing in a ratio

Simplify ratios

Simplifying ratios

DEFINITIONS

Ratio A comparison of two amounts, written a:b. Read "a to b".
Simplest form When the two numbers share no common factor (other than 1).

KEY FORMULAS

- **To simplify:** divide both parts of the ratio by their HCF (highest common factor)
- **Example:** 6:8 → divide both by 2 → 3:4
- **Example:** 10:15 → divide both by 5 → 2:3

WORKED EXAMPLES

Example 1: Simplify the ratio 8:12.

- ▶ Find HCF of 8 and 12 → 4.
Biggest number dividing both.
- ▶ Divide both by 4: $8 \div 4 = 2$; $12 \div 4 = 3$.
Apply.
- ▶ = **2:3**.
Simplest form.

Example 2: Simplify 15:25.

- ▶ HCF = 5.
5 divides both.
- ▶ $15 \div 5 = 3$; $25 \div 5 = 5$.
Divide.
- ▶ = **3:5**.
Done.



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (E.1)

**EXERCISES (EASY → DIFFICULT)**

1. Simplify 6:6:
2. Simplify 15:9:
3. Simplify 4:8:
4. Simplify 20:16:
5. Simplify 16:16:
6. Simplify 6:10:
7. Simplify 9:15:
8. Simplify 20:10:
9. Simplify 12:6:
10. Simplify 4:10:

Direct proportion

DEFINITIONS**Direct proportion**

When one quantity doubles, the other also doubles. They go up together.

Unit rate

How much of something costs per ONE unit. E.g. R5 per pen.

KEY FORMULAS

- **Strategy:** find the cost (or amount) per ONE unit, then multiply
- **If 3 pens cost R15:** 1 pen costs R5, so 7 pens cost R35

WORKED EXAMPLES**Example 1: 5 pens cost R20. How much do 7 pens cost?**

- Find cost per 1 pen: $20 \div 5 = R4$.

Unit rate.

- Cost of 7: $7 \times R4 = R28$.

Multiply.

- **= R28.**

Final answer.

Example 2: 4 apples cost R12. Cost of 6?

- Per apple: $12 \div 4 = R3$.

Unit rate.

- $6 \times R3 = R18$.

Multiply.

EXERCISES (EASY → DIFFICULT)

1. 3 pens at R5 each. Total?
2. 8 pens at R5 each. Total?
3. 2 pens at R10 each. Total?
4. 4 pens at R5 each. Total?
5. 2 pens at R5 each. Total?
6. 3 pens at R19 each. Total?
7. 5 pens at R18 each. Total?
8. 7 pens at R7 each. Total?

**DIGITAL TEXTBOOK**

Scan to open this section
in the interactive edition (E.2)



9. 3 pens at R14 each. Total?
10. 2 pens at R12 each. Total?

Speed, distance, time

Speed, distance, and time

DEFINITIONS

Speed	How fast something moves, usually km/h (kilometres per hour).
Distance	How far something travels, in km or m.
Time	How long the journey takes, in hours or seconds.

KEY FORMULAS

- $d = s \times t$ (distance = speed $\times$ time)
- $s = d \div t$ (speed = distance $\div$ time)
- $t = d \div s$ (time = distance $\div$ speed)
- **Triangle trick:** cover what you want — the others tell you what to do

WORKED EXAMPLES

Example 1: A car travels at 60 km/h for 3 hours. How far?

- Use $d = s \times t$.

Find distance.

- $d = 60 \times 3$.

Substitute.

- = **180 km.**

Calculate.

Example 2: Speed 50 km/h for 2 hours. Distance?

- $d = 50 \times 2 = \mathbf{100\ km.}$

Apply formula.

EXERCISES (EASY $\rightarrow$ DIFFICULT)

1. Speed 81 km/h for 5 h. Distance?
2. Speed 61 km/h for 2 h. Distance?
3. Speed 51 km/h for 2 h. Distance?
4. Speed 77 km/h for 4 h. Distance?
5. Speed 81 km/h for 4 h. Distance?
6. Speed 113 km/h for 5 h. Distance?
7. Speed 74 km/h for 5 h. Distance?
8. Speed 54 km/h for 4 h. Distance?
9. Speed 61 km/h for 4 h. Distance?
10. Speed 55 km/h for 2 h. Distance?



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (E.3)



Sharing in a ratio

DEFINITIONS

Total parts Add the numbers in the ratio. For 2:3, total parts = 5.

Value per part Divide the total amount by the total parts.

KEY FORMULAS

- **Step 1:** add the ratio parts
- **Step 2:** divide the total amount by the total parts → value per part
- **Step 3:** multiply each ratio number by the value per part

WORKED EXAMPLES

Example 1: Share R50 in the ratio 2:3. What's the larger share?

► Total parts: $2 + 3 = 5$.

Add ratio numbers.

► Value per part: $R50 \div 5 = R10$.

Each part is worth R10.

► Larger share: $3 \times R10 = R30$.

Multiply.

► **R30.**

Final answer.

Example 2: Share R30 in ratio 2:3. Larger share?

► Parts 5, per part R6.

Total parts then divide.

► $3 \times R6 = \mathbf{R18}$.

Multiply.

EXERCISES (EASY → DIFFICULT)

1. Share R30 in ratio 2:3. Larger share?
2. Share R20 in ratio 2:3. Larger share?
3. Share R40 in ratio 2:3. Larger share?
4. Share R50 in ratio 2:3. Larger share?

End of Chapter 5 — Mixed Exercise

Ten questions across the whole chapter, from easy to difficult.



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (E.4)



1. Simplify 6:6:
2. 8 pens at R5 each. Total?
3. Speed 51 km/h for 2 h. Distance?
4. Share R50 in ratio 2:3. Larger share?
5. Simplify 16:16:
6. 3 pens at R19 each. Total?
7. Speed 74 km/h for 5 h. Distance?
8. Share R30 in ratio 2:3. Larger share?
9. Simplify 12:6:
10. 2 pens at R12 each. Total?



CHAPTER 6

Percentage

Percent Finding a percentage of a quantity

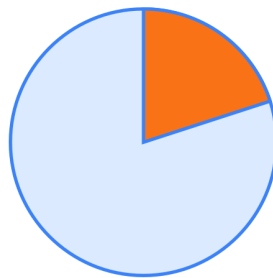
Discount Discount and percentage increase

Percent Percent profit and loss

Find Finding the original price

Percent of a quantity

Finding a percentage of a quantity



$$20\% \text{ of } 80 = 16$$

16 out of 80

% means "out of 100"

DEFINITIONS

Percent (%) Out of 100. 25% means 25 out of every 100.

KEY FORMULAS

- **p% of n = $(p/100) \times n$**
- **Strategy:** turn % into a fraction or decimal, then multiply
- **Common ones:** $10\% = \div 10$; $50\% = \div 2$; $25\% = \div 4$; $20\% = \div 5$



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (F.1)

**WORKED EXAMPLES****Example 1: Find 20% of 80.**

► $20\% = 20/100 = 0.2.$

Convert percent to decimal.

► $0.2 \times 80.$

"Of" means multiply.

► **= 16.**

Final answer.

Example 2: Find 25% of 60.

► $25\% = \frac{1}{4}.$

Quarter shortcut.

► $60 \div 4 = 15.$

Divide.

EXERCISES (EASY → DIFFICULT)

1. 10% of 26 =
2. 25% of 95 =
3. 20% of 62 =
4. 25% of 163 =
5. 10% of 172 =
6. 10% of 23 =
7. 25% of 44 =
8. 10% of 64 =
9. 15% of 154 =
10. 25% of 143 =

Discount and increase

Discount and percentage increase

DEFINITIONS

Discount A reduction in price, given as a percentage.

Sale price The price AFTER the discount.

KEY FORMULAS

- **Discount amount:** (discount %) $\times$ original price
- **Sale price:** original – discount amount
- **Shortcut:** if discount is d%, sale price = $(100 - d)\%$ of original
- **20% off R200 = 80% of R200 = R160**

WORKED EXAMPLES**DIGITAL TEXTBOOK**

Scan to open this section
in the interactive edition (F.2)

**Example 1: R200 less 20%. Find the sale price.**

► Discount: $20\% \times R200 = R40$.

Find discount.

► Sale price: $R200 - R40 = R160$.

Subtract.

► **R160.**

Final answer.

Example 2: R300 less 25%. Sale price?

► Discount: $25\% \times 300 = R75$.

Find discount.

► $300 - 75 = \mathbf{R225}$.

Subtract.

EXERCISES (EASY → DIFFICULT)

1. R163 less 10% =
2. R236 less 15% =
3. R436 less 10% =
4. R251 less 10% =
5. R249 less 20% =
6. R140 less 20% =
7. R170 less 25% =
8. R224 less 10% =
9. R170 less 20% =
10. R382 less 15% =

Percent profit/loss

Percent profit and loss

DEFINITIONS

Profit	When you sell for MORE than it cost. Profit = selling – cost.
Loss	When you sell for LESS than it cost. Loss = cost – selling.
Percent profit/loss	Profit or loss as a % of the COST price.

KEY FORMULAS

- **Profit:** selling – cost
- **% profit:** $(\text{profit} \div \text{cost}) \times 100$
- **% loss:** $(\text{loss} \div \text{cost}) \times 100$
- **Always divide by COST price**, not selling price

**DIGITAL TEXTBOOK**

Scan to open this section
in the interactive edition (F.3)

**WORKED EXAMPLES****Example 1: Cost R100, sold R125. What's the % profit?**

► Profit: $125 - 100 = R25$.

Sold for more than cost.

► % profit: $(25 \div 100) \times 100$.

Apply formula.

► = **25%**.

Final answer.

Example 2: Cost R50, sold R60. % profit?

► Profit R10.

$60 - 50$.

► $10/50 \times 100 = \mathbf{20\%}$.

Apply formula.

EXERCISES (EASY → DIFFICULT)

1. Cost R127, sold R142. % profit?
2. Cost R154, sold R181. % profit?
3. Cost R175, sold R191. % profit?
4. Cost R174, sold R196. % profit?
5. Cost R131, sold R156. % profit?
6. Cost R88, sold R105. % profit?
7. Cost R64, sold R94. % profit?
8. Cost R129, sold R149. % profit?
9. Cost R165, sold R188. % profit?
10. Cost R132, sold R149. % profit?

Find original price

Finding the original price

DEFINITIONS

Original price The price BEFORE a discount was applied.

KEY FORMULAS

- **If d% off:** sale price = $(100 - d)\%$ of original
- **To find original:** divide sale price by $(100 - d)\%$ (as a decimal)
- **Example:** sale R80 after 20% off $\rightarrow 80 \div 0.80 = R100$ original

WORKED EXAMPLES**Example 1: Sale price R150 after 25% off. Find the original.**

► Sale = 75% of original ($100\% - 25\%$).

Discount left 75%.

► Original = $150 \div 0.75$.

Divide by 0.75.

► = **R200**.

Check: 25% of 200 = R50; $200 - 50 = R150$.

**DIGITAL TEXTBOOK**

Scan to open this section
in the interactive edition (F.4)

**Example 2: Sale R240 after 20% off. Original?**

► Sale = 80% of original.

$100 - 20$.

► $240 \div 0.80 = \mathbf{R300}$.

Divide.

EXERCISES (EASY → DIFFICULT)

1. Sale R87 after 25% off. Original?
2. Sale R254.70000000000002 after 10% off. Original?
3. Sale R375.3 after 10% off. Original?
4. Sale R346.40000000000003 after 20% off. Original?
5. Sale R99.9 after 10% off. Original?
6. Sale R276.8 after 20% off. Original?
7. Sale R277.5 after 25% off. Original?
8. Sale R105.75 after 25% off. Original?
9. Sale R147 after 25% off. Original?
10. Sale R95.25 after 25% off. Original?

End of Chapter 6 — Mixed Exercise

Ten questions across the whole chapter, from easy to difficult.

1. 10% of 26 =
2. R236 less 15% =
3. Cost R175, sold R191. % profit?
4. Sale R346.40000000000003 after 20% off. Original?
5. 10% of 172 =
6. R140 less 20% =
7. Cost R64, sold R94. % profit?
8. Sale R105.75 after 25% off. Original?
9. 15% of 154 =
10. R382 less 15% =





CHAPTER 7

Patterns and Sequences

Number Linear number patterns

Find Finding the rule (general term)

Term Finding a specific term

Number patterns: linear

Linear number patterns

DEFINITIONS

Sequence	A list of numbers that follow a rule. Each number is called a TERM.
Linear pattern	A pattern where you ADD the same number each step. The difference is constant.
Common difference	The amount added each step. For 3, 7, 11, 15... the common difference is 4.

KEY FORMULAS

- **Find common difference:** subtract any term from the next one
- **Continue the pattern:** add the common difference
- **Example:** 3, 7, 11, 15 → difference 4 → next term $15 + 4 = 19$

WORKED EXAMPLES

Example 1: Pattern 3, 7, 11, 15, ... What's the next term?

- Find the difference: $7 - 3 = 4$.

Subtract consecutive terms.

- Check: $11 - 7 = 4$; $15 - 11 = 4$.

Constant difference.

- Next term: $15 + 4 = 19$.

Add to last term.

- **= 19.**

Final answer.



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (G.1)

**Example 2: Pattern 5, 8, 11, 14. Next?**

► Difference: 3.

$$8 - 5 = 3.$$

► $14 + 3 = 17$.

Add to last.

EXERCISES (EASY → DIFFICULT)

1. Pattern: 3, 9, 15, __
2. Pattern: 2, 8, 14, __
3. Pattern: 7, 14, 21, __
4. Pattern: 5, 8, 11, __
5. Pattern: 9, 11, 13, __
6. Pattern: 5, 9, 13, __
7. Pattern: 9, 13, 17, __
8. Pattern: 8, 10, 12, __
9. Pattern: 7, 13, 19, __
10. Pattern: 3, 6, 9, __

Find the rule (T_n)

Finding the rule (general term)

DEFINITIONS

General term (T_n) A formula that gives ANY term T_n when you put in the position number n .

KEY FORMULAS

- **Linear pattern $T_n = (\text{difference}) \times n + (\text{constant})$**
- **Step 1:** find the common difference — that's the coefficient of n
- **Step 2:** use T_1 to find the constant
- **Example:** 5, 8, 11, 14 → difference 3, $T_1 = 5$, so $3(1) + ? = 5$, $? = 2 \rightarrow T_n = 3n + 2$

WORKED EXAMPLES**Example 1: Pattern 5, 8, 11, 14... Find T_n .**

► Common difference: 3.

$$8 - 5 = 3.$$

► T_n starts as $3n + ?$

Coefficient is the difference.

► Test T_1 : $3(1) + ? = 5$, so $? = 2$.

Find constant.

► **$T_n = 3n + 2$.**

Final formula.

**DIGITAL TEXTBOOK**

Scan to open this section
in the interactive edition (G.2)

**Example 2: Pattern 4, 9, 14, 19. T_n ?**

► Difference 5.

Common difference.

► $T_1: 5(1) + ? = 4$, so $? = -1$.

Find constant.

► **$T_n = 5n - 1$.**

Done.

EXERCISES (EASY → DIFFICULT)

1. Pattern: 6, 10, 14. $T_n = ?$
2. Pattern: 4, 6, 8. $T_n = ?$
3. Pattern: 15, 21, 27. $T_n = ?$
4. Pattern: 9, 15, 21. $T_n = ?$
5. Pattern: 14, 20, 26. $T_n = ?$
6. Pattern: 16, 23, 30. $T_n = ?$
7. Pattern: 12, 17, 22. $T_n = ?$
8. Pattern: 11, 18, 25. $T_n = ?$
9. Pattern: 8, 13, 18. $T_n = ?$
10. Pattern: 14, 21, 28. $T_n = ?$

Term value of a pattern

Finding a specific term

DEFINITIONS**Substitute**

Replace n with a specific number, then calculate.

KEY FORMULAS

- **To find T_n for any n :** substitute n into the general term formula
- **Example:** if $T_n = 3n + 2$, then $T_{10} = 3(10) + 2 = 32$

WORKED EXAMPLES**Example 1: $T_n = 4n + 3$. Find T_{10} .**

► Substitute $n = 10$.

Replace n with 10.

► $T_{10} = 4(10) + 3$.

Apply formula.

► $= 40 + 3 = 43$.

Calculate.

Example 2: $T_n = 5n + 2$. Find T_8 .

► $5(8) + 2$.

Substitute.

► $= 42$.

Done.

**DIGITAL TEXTBOOK**

Scan to open this section
in the interactive edition (G.3)

**EXERCISES (EASY → DIFFICULT)**

1. $T_n = 3n + 6$. Find T_8 :
2. $T_n = 3n + 8$. Find T_9 :
3. $T_n = 2n + 3$. Find T_{13} :
4. $T_n = 7n + 9$. Find T_{11} :
5. $T_n = 4n + 9$. Find T_{12} :
6. $T_n = 6n + 5$. Find T_{14} :
7. $T_n = 5n + 8$. Find T_9 :
8. $T_n = 5n + 4$. Find T_{12} :
9. $T_n = 5n + 9$. Find T_{15} :
10. $T_n = 4n + 6$. Find T_{15} :

End of Chapter 7 — Mixed Exercise

Ten questions across the whole chapter, from easy to difficult.

1. Pattern: 3, 9, 15, __
2. Pattern: 4, 6, 8. $T_n = ?$
3. $T_n = 2n + 3$. Find T_{13} :
4. Pattern: 5, 8, 11, __
5. Pattern: 14, 20, 26. $T_n = ?$
6. $T_n = 6n + 5$. Find T_{14} :
7. Pattern: 9, 13, 17, __
8. Pattern: 11, 18, 25. $T_n = ?$
9. $T_n = 5n + 9$. Find T_{15} :
10. Pattern: 3, 6, 9, __





CHAPTER 8

Algebraic Expressions

Substitute Substituting values into expressions

Simplify Collecting like terms

Add Subtracting like terms

Distributive Distributive property

Substitute into expressions

Substituting values into expressions

DEFINITIONS

Variable	A letter that stands for a number, like x or n .
Substitute	Replace the letter with a given number.
Expression	A maths sentence with no equals sign, like $3x + 2$ or $5y - 1$.

KEY FORMULAS

- **To substitute:** replace every letter with its value, then calculate using BODMAS
- **Example:** if $x = 4$, then $3x - 2 = 3(4) - 2 = 12 - 2 = 10$
- **Tip:** use brackets around substituted values to avoid sign mistakes

WORKED EXAMPLES

Example 1: If $x = 5$, find the value of $3x - 4$.

► Substitute $x = 5$.

Replace x with 5.

► $3(5) - 4$.

Apply BODMAS.

► $= 15 - 4 = 11$.

Multiply then subtract.

Example 2: If $x = 4$, find $2x + 7$.

► $2(4) + 7$.

Substitute.

► $= 8 + 7 = 15$.

Done.



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (H.1)

**EXERCISES (EASY → DIFFICULT)**

1. If $x=7$, value of $3x - 9$:
2. If $x=8$, value of $3x - 6$:
3. If $x=2$, value of $3x - 8$:
4. If $x=2$, value of $3x - 2$:
5. If $x=6$, value of $3x - 2$:
6. If $x=3$, value of $3x - 6$:
7. If $x=7$, value of $3x - 1$:
8. If $x=4$, value of $3x - 4$:
9. If $x=7$, value of $3x - 3$:
10. If $x=2$, value of $3x - 5$:

Simplify by collecting like terms

DEFINITIONS

Like terms	Terms with the SAME variable raised to the same power. $3x$ and $5x$ are like terms; $3x$ and $5y$ are NOT.
Coefficient	The number in front of a variable. In $7x$, the coefficient is 7.

KEY FORMULAS

- **Rule:** ADD the coefficients of like terms, keep the variable
- **Example:** $3x + 5x = 8x$ (NOT $8x^2$)
- **Watch:** $3x + 5$ stays as $3x + 5$ (not like terms)

WORKED EXAMPLES**Example 1: Simplify $3x + 5x$.**

- Both terms have x — they ARE like terms.

Same variable.

- Add coefficients: $3 + 5 = 8$.

Coefficients only.

- Keep the variable: **$8x$** .

Final answer.

Example 2: Simplify $4x + 7x$.

- $4 + 7 = 11$.

Add coefficients.

- **$11x$** .

Done.

EXERCISES (EASY → DIFFICULT)

1. $7x + 8x = ?$
2. $5x + 6x = ?$
3. $8x + 7x = ?$
4. $7x + 2x = ?$
5. $2x + 6x = ?$
6. $5x + 3x = ?$
7. $3x + 8x = ?$

**DIGITAL TEXTBOOK**

Scan to open this section
in the interactive edition (H.2)



8. $7x + 4x = ?$
9. $9x + 7x = ?$
10. $8x + 9x = ?$

Add and subtract like terms

Subtracting like terms

DEFINITIONS

Subtract like terms

Subtract the coefficients, keep the variable.

KEY FORMULAS

- **Rule:** subtract the coefficients of like terms, keep the variable
- **Example:** $8x - 3x = 5x$
- **Watch order:** $8x - 3x \neq 3x - 8x$ (different answers!)

WORKED EXAMPLES

Example 1: Simplify $8x - 3x$.

- Subtract coefficients: $8 - 3 = 5$.

Coefficients only.

- Keep x .

Variable stays.

- **$= 5x$.**

Final answer.

Example 2: Simplify $10x - 4x$.

- $10 - 4 = 6$.

Subtract.

- **$6x$.**

Done.

EXERCISES (EASY → DIFFICULT)

1. $11x - 3x = ?$
2. $6x - 4x = ?$
3. $10x - 4x = ?$
4. $10x - 3x = ?$
5. $6x - 3x = ?$
6. $9x - 3x = ?$
7. $7x - 4x = ?$
8. $5x - 2x = ?$
9. $10x - 2x = ?$
10. $12x - 2x = ?$



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (H.3)



Distributive property (basic)

DEFINITIONS

Distributive property

Multiply the outside number by EACH term inside the brackets.

Expand

Remove brackets using the distributive property.

KEY FORMULAS

- **Rule:** $a(b + c) = a \cdot b + a \cdot c$
- **Example:** $3(x + 2) = 3 \cdot x + 3 \cdot 2 = 3x + 6$
- **Both terms get multiplied!** Don't forget the second one.

WORKED EXAMPLES

Example 1: Expand $3(x + 2)$.

- Multiply 3 by EACH term inside.

Distributive property.

- $3 \times x = 3x$.

First term.

- $3 \times 2 = 6$.

Second term.

- **$3(x + 2) = 3x + 6$.**

Combine.

Example 2: Expand $5(x + 4)$.

- $5 \cdot x + 5 \cdot 4$.

Distribute.

- **$= 5x + 20$.**

Done.

EXERCISES (EASY → DIFFICULT)

1. $4(x + 5) = ?$
2. $2(x + 3) = ?$
3. $3(x + 6) = ?$
4. $4(x + 3) = ?$
5. $5(x + 4) = ?$
6. $4(x + 6) = ?$
7. $3(x + 1) = ?$
8. $4(x + 1) = ?$
9. $2(x + 6) = ?$
10. $5(x + 1) = ?$

**DIGITAL TEXTBOOK**

Scan to open this section
in the interactive edition (H.4)



End of Chapter 8 — Mixed Exercise

Ten questions across the whole chapter, from easy to difficult.

1. If $x=7$, value of $3x - 9$:
2. $5x + 6x = ?$
3. $10x - 4x = ?$
4. $4(x + 3) = ?$
5. If $x=6$, value of $3x - 2$:
6. $5x + 3x = ?$
7. $7x - 4x = ?$
8. $4(x + 1) = ?$
9. If $x=7$, value of $3x - 3$:
10. $8x + 9x = ?$





CHAPTER 9

Equations

Solve One-step equations: + and –

Solve One-step equations: $\times$ and $\div$

Solve Two-step equations

Word Word problems to equations

Solve one-step equations (+/–)

One-step equations: + and –

DEFINITIONS

Equation	A maths sentence with an equals sign. Both sides must balance.
Solve	Find the value of the letter that makes the equation true.
Inverse operation	The opposite operation. + and – are inverses.

KEY FORMULAS

- **Golden rule:** whatever you do to ONE side, do to BOTH
- **To undo +b:** subtract b from both sides
- **To undo –b:** add b to both sides

WORKED EXAMPLES

Example 1: Solve $x + 5 = 12$.

- Undo the +5 by subtracting 5 from both sides.

Inverse operation.

► $x + 5 - 5 = 12 - 5$.

Apply to both sides.

► $x = 7$.

Check: $7 + 5 = 12$.

Example 2: Solve $x - 4 = 9$.

- Add 4 to both sides.

Undo –4.

► $x = 9 + 4 = 13$.

Done.

**DIGITAL TEXTBOOK**

Scan to open this section
in the interactive edition (I.1)

**EXERCISES (EASY → DIFFICULT)**

1. Solve: $x + 15 = 30$
2. Solve: $x + 13 = 27$
3. Solve: $x + 8 = 13$
4. Solve: $x + 3 = 16$
5. Solve: $x + 3 = 15$
6. Solve: $x + 18 = 33$
7. Solve: $x + 1 = 9$
8. Solve: $x + 16 = 18$
9. Solve: $x + 15 = 23$
10. Solve: $x + 14 = 23$

Solve one-step equations ($\times/\div$)

One-step equations: $\times$ and $\div$

DEFINITIONS**Inverse for $\times$
and $\div$**

Multiplication and division are inverse operations of each other.

KEY FORMULAS

- **To undo $\times a$:** divide both sides by a
- **To undo $\div a$:** multiply both sides by a
- **Example:** $3x = 12 \rightarrow$ divide both sides by 3 $\rightarrow x = 4$

WORKED EXAMPLES**Example 1: Solve $4x = 20$.**

- Undo $\times 4$ by dividing both sides by 4.

Inverse operation.

- $4x \div 4 = 20 \div 4$.

Apply to both sides.

- $x = 5$.

Check: $4(5) = 20$.

Example 2: Solve $6x = 30$.

- Divide both sides by 6.

Undo $\times 6$.

- $x = 30 \div 6 = 5$.

Done.

EXERCISES (EASY → DIFFICULT)

1. Solve: $4x = 28$
2. Solve: $9x = 99$
3. Solve: $5x = 20$
4. Solve: $7x = 56$
5. Solve: $3x = 24$
6. Solve: $8x = 48$
7. Solve: $4x = 32$

**DIGITAL TEXTBOOK**

Scan to open this section
in the interactive edition (I.2)



8. Solve: $8x = 64$
9. Solve: $9x = 72$
10. Solve: $7x = 35$

Solve two-step equations

DEFINITIONS

Two-step equation

An equation needing TWO operations to solve, like $3x + 5 = 17$.

KEY FORMULAS

- **Strategy: undo in reverse BODMAS order**
- **Step 1:** undo $+/−$ first (the "outer" operation)
- **Step 2:** then undo $×/÷$
- **Example:** $3x + 5 = 17 \rightarrow$ subtract 5 $\rightarrow 3x = 12 \rightarrow$ divide 3 $\rightarrow x = 4$

WORKED EXAMPLES

Example 1: Solve $3x + 5 = 17$.

- Step 1: subtract 5 from both sides.

Undo the $+5$ first.

► $3x = 12$.

Now simpler.

- Step 2: divide both sides by 3.

Undo the $\times 3$.

► $x = 4$.

Check: $3(4) + 5 = 17$.

Example 2: Solve $2x + 3 = 13$.

- Subtract 3: $2x = 10$.

Undo $+3$.

- Divide by 2: $x = 5$.

Undo $\times 2$.

EXERCISES (EASY $\rightarrow$ DIFFICULT)

1. Solve: $5x + 8 = 28$
2. Solve: $2x + 5 = 23$
3. Solve: $3x + 6 = 18$
4. Solve: $3x + 1 = 19$
5. Solve: $4x + 3 = 31$
6. Solve: $3x + 4 = 34$
7. Solve: $3x + 7 = 25$
8. Solve: $5x + 6 = 36$
9. Solve: $4x + 8 = 28$
10. Solve: $5x + 1 = 26$

**DIGITAL TEXTBOOK**

Scan to open this section
in the interactive edition (I.3)



Word problems → equations

Word problems to equations

DEFINITIONS

Translate

Turn words into a maths equation. "A number plus 5" → $n + 5$.

KEY FORMULAS

- **Word → Symbol:**
- "A number" → n (or any letter)
- "Plus / sum / more" → $+$
- "Minus / less / fewer" → $-$
- "Times / product" → $\times$

WORKED EXAMPLES

Example 1: A number plus 7 equals 20. Find the number.

- Let n = the number.

Define variable.

- Translate: $n + 7 = 20$.

Build equation.

- Solve: $n = 20 - 7$.

Subtract 7.

- **$n = 13$.**

Check: $13 + 7 = 20$.

Example 2: A number plus 8 = 15. Find n .

- $n + 8 = 15$.

Translate.

- **$n = 7$.**

Subtract 8.

EXERCISES (EASY → DIFFICULT)

1. A number plus 1 = 8. Find the number.
2. A number plus 3 = 22. Find the number.
3. A number plus 3 = 8. Find the number.
4. A number plus 7 = 20. Find the number.
5. A number plus 2 = 12. Find the number.
6. A number plus 3 = 19. Find the number.
7. A number plus 1 = 15. Find the number.
8. A number plus 1 = 19. Find the number.
9. A number plus 1 = 21. Find the number.
10. A number plus 7 = 25. Find the number.



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (I.4)



End of Chapter 9 — Mixed Exercise

Ten questions across the whole chapter, from easy to difficult.

1. Solve: $x + 15 = 30$
2. Solve: $9x = 99$
3. Solve: $3x + 6 = 18$
4. A number plus 7 = 20. Find the number.
5. Solve: $x + 3 = 15$
6. Solve: $8x = 48$
7. Solve: $3x + 7 = 25$
8. A number plus 1 = 19. Find the number.
9. Solve: $x + 15 = 23$
10. Solve: $7x = 35$



CHAPTER 10

Lines and Angles

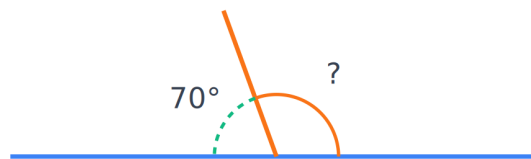
Angles Angles on a straight line

Angles Angles around a point

Vertically Vertically opposite angles

Co-interior, Angles in parallel lines

Angles on a straight line



Angles on a straight line sum to 180°

DEFINITIONS

Straight line An angle of 180° . Half of a full turn.

Adjacent angles Angles next to each other that share a common arm.

KEY FORMULAS

- **Rule:** angles on a straight line add to 180°
- **If one angle is a , the other is $180^\circ - a$**
- **Example:** if one is 60° , the other is 120°



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (J.1)



WORKED EXAMPLES

Example 1: Angles on a straight line, one is 70° . What's the other?

► Sum = 180° (straight line).

Rule.

► Other = $180^\circ - 70^\circ$.

Subtract.

► = **110°** .

Final answer.

Example 2: One angle is 50° . The other?

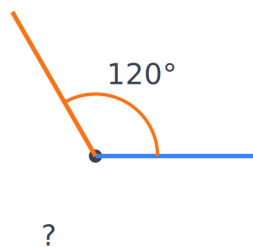
► $180 - 50 = \mathbf{130^\circ}$.

Apply rule.

EXERCISES (EASY → DIFFICULT)

1. Angles on a line, one is 109° . Other?
2. Angles on a line, one is 54° . Other?
3. Angles on a line, one is 61° . Other?
4. Angles on a line, one is 117° . Other?
5. Angles on a line, one is 116° . Other?
6. Angles on a line, one is 123° . Other?
7. Angles on a line, one is 57° . Other?
8. Angles on a line, one is 106° . Other?
9. Angles on a line, one is 147° . Other?
10. Angles on a line, one is 65° . Other?

Angles around a point



Angles around a point sum to 360°

DEFINITIONS

Full turn A complete rotation: 360° .

Around a point All the angles meeting at a single point add to 360° .



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (J.2)



KEY FORMULAS

- **Rule:** angles around a point add to 360°
- **If one angle is a , the rest sum to $360^\circ - a$**
- **Example:** if one is 100° , the other (if only two) is 260°

WORKED EXAMPLES

Example 1: Angles around a point, one is 120° . What's the other (if only two)?

► Sum = 360° .

Full turn.

► Other = $360^\circ - 120^\circ$.

Subtract.

► = **240°** .

Final answer.

Example 2: One angle is 150° . Other?

► $360 - 150 = \mathbf{210^\circ}$.

Subtract.

EXERCISES (EASY → DIFFICULT)

1. Angles around a point, one is 70° . Other?
2. Angles around a point, one is 99° . Other?
3. Angles around a point, one is 198° . Other?
4. Angles around a point, one is 114° . Other?
5. Angles around a point, one is 75° . Other?
6. Angles around a point, one is 60° . Other?
7. Angles around a point, one is 117° . Other?
8. Angles around a point, one is 71° . Other?
9. Angles around a point, one is 160° . Other?
10. Angles around a point, one is 103° . Other?

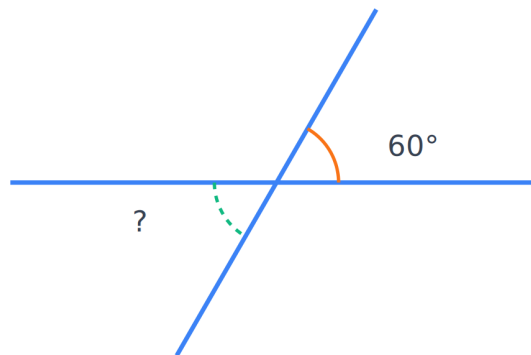


DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (J.2)



Vertically opposite angles



Vertically opposite angles are equal

DEFINITIONS

Vertically opposite angles

Angles formed across from each other when two lines cross. They are EQUAL.

X-shape

Two crossing lines form an X with 4 angles. Opposite pairs are equal.

KEY FORMULAS

- **Rule:** vertically opposite angles are EQUAL
- **If one is a, the one opposite is also a**
- **The two pairs of vertically opposite angles in an X**

WORKED EXAMPLES

Example 1: Two lines cross. One angle is 80° . Find the vertically opposite angle.

- Vertically opposite angles are EQUAL.

Property.

- **Opposite = 80° .**

Same as given.

Example 2: One angle is 125° . Vertically opposite?

- Equal to original.

Property.

- **125° .**

Same.

EXERCISES (EASY → DIFFICULT)

1. Vertically opposite of 134° :
2. Vertically opposite of 114° :
3. Vertically opposite of 137° :
4. Vertically opposite of 64° :
5. Vertically opposite of 125° :

**DIGITAL TEXTBOOK**

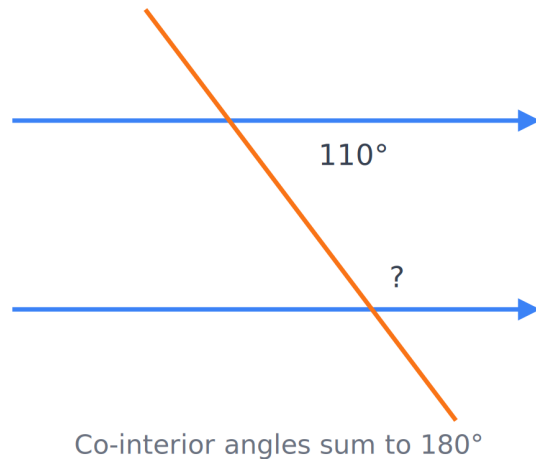
Scan to open this section
in the interactive edition (J.3)



6. Vertically opposite of 107° :
7. Vertically opposite of 115° :
8. Vertically opposite of 62° :
9. Vertically opposite of 60° :
10. Vertically opposite of 48° :

Co-interior, alternate, corresponding angles

Angles in parallel lines



DEFINITIONS

Parallel lines	Two lines that never meet.
Transversal	A line that crosses two parallel lines.
Co-interior	Angles on the SAME SIDE of the transversal, BETWEEN the parallel lines. They sum to 180° .
Alternate	Angles on OPPOSITE sides of the transversal, BETWEEN the parallel lines (Z-shape). They are EQUAL.
Corresponding	Angles in the SAME position at each crossing (F-shape). They are EQUAL.

KEY FORMULAS

- **Co-interior angles add to 180°** (same side, between parallels)
- **Alternate angles are equal** (Z-shape)
- **Corresponding angles are equal** (F-shape)

WORKED EXAMPLES



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (J.4)

**Example 1: Two parallel lines cut by a transversal. One co-interior angle is 110° . Find the other.**

- Co-interior angles sum to 180° .

Property.

- $\text{Other} = 180^\circ - 110^\circ$.

Subtract.

- $= 70^\circ$.

Final answer.

Example 2: One co-interior is 65° . Other?

- $180 - 65 = 115^\circ$.

Subtract.

EXERCISES (EASY → DIFFICULT)

1. Two parallel lines cut by a transversal. Co-interior of 111° :
2. Two parallel lines cut by a transversal. Co-interior of 121° :
3. Two parallel lines cut by a transversal. Co-interior of 54° :
4. Two parallel lines cut by a transversal. Co-interior of 56° :
5. Two parallel lines cut by a transversal. Co-interior of 85° :
6. Two parallel lines cut by a transversal. Co-interior of 68° :
7. Two parallel lines cut by a transversal. Co-interior of 40° :
8. Two parallel lines cut by a transversal. Co-interior of 102° :
9. Two parallel lines cut by a transversal. Co-interior of 83° :
10. Two parallel lines cut by a transversal. Co-interior of 55° :

End of Chapter 10 — Mixed Exercise

Ten questions across the whole chapter, from easy to difficult.

1. Angles on a line, one is 109° . Other?
2. Angles around a point, one is 99° . Other?
3. Vertically opposite of 137° :
4. Two parallel lines cut by a transversal. Co-interior of 56° :
5. Angles on a line, one is 116° . Other?
6. Angles around a point, one is 60° . Other?
7. Vertically opposite of 115° :
8. Two parallel lines cut by a transversal. Co-interior of 102° :
9. Angles on a line, one is 147° . Other?
10. Angles around a point, one is 103° . Other?

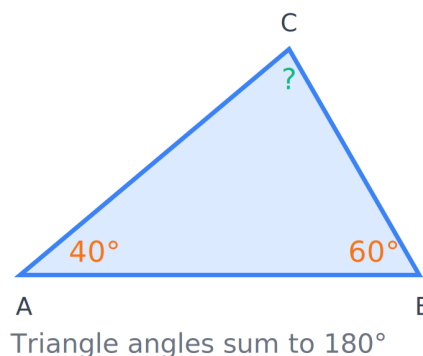


**CHAPTER 11**

Triangles and Quadrilaterals

Triangle Triangle angle sum
Exterior Exterior angle of a triangle
Quadrilateral Quadrilateral angle sum
Properties Special triangles
Properties Properties of quadrilaterals

Triangle angle sum



DEFINITIONS

Interior angles The angles INSIDE a shape.

Triangle angle sum The three interior angles of ANY triangle always add to 180° .

KEY FORMULAS

- **Triangle rule:** angle A + angle B + angle C = 180°
- **To find missing angle:** $180^\circ - (\text{sum of known angles})$
- **Equilateral triangle:** all 60°
- **Right triangle:** one is 90° , the other two sum to 90°

**DIGITAL TEXTBOOK**

Scan to open this section
in the interactive edition (K.1)



WORKED EXAMPLES

Example 1: Two angles of a triangle are 40° and 60° . Find the third.

► Sum = 180° .

Triangle rule.

► Known sum: $40 + 60 = 100$.

Add given angles.

► Third: $180 - 100 = 80^\circ$.

Subtract.

► = 80° .

Final answer.

Example 2: Two angles 50° , 70° . Third?

► $180 - (50 + 70) = 180 - 120$.

Apply rule.

► = 60° .

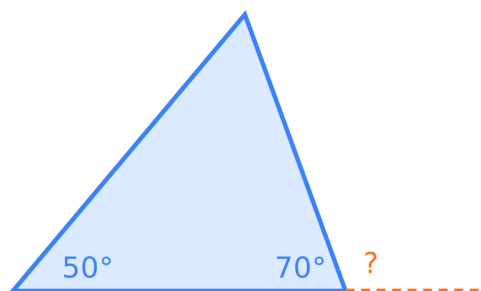
Done.

EXERCISES (EASY → DIFFICULT)

1. Two angles: 57° , 54° . Third?
2. Two angles: 76° , 72° . Third?
3. Two angles: 44° , 66° . Third?
4. Two angles: 59° , 36° . Third?
5. Two angles: 51° , 51° . Third?
6. Two angles: 62° , 38° . Third?
7. Two angles: 72° , 34° . Third?
8. Two angles: 49° , 61° . Third?
9. Two angles: 74° , 40° . Third?
10. Two angles: 50° , 53° . Third?

Exterior angle of triangle

Exterior angle of a triangle



Exterior = sum of two opposite interior

**DIGITAL TEXTBOOK**

Scan to open this section
in the interactive edition (K.2)



DEFINITIONS

Exterior angle	The angle OUTSIDE a triangle, made by extending one side.
Exterior angle theorem	The exterior angle equals the SUM of the two opposite interior angles.

KEY FORMULAS

- **Theorem:** exterior angle = sum of two non-adjacent interior angles
- **Also:** exterior + adjacent interior = 180° (straight line)

WORKED EXAMPLES

Example 1: Triangle has interior angles 50° and 70° . Find the exterior angle at the third vertex.

► Exterior = sum of the two opposite interior angles.

Theorem.

► $= 50^\circ + 70^\circ$.

Add.

► $= 120^\circ$.

Final answer.

Example 2: Interior angles 60° , 75° . Exterior at third vertex?

► $60 + 75 = 135^\circ$.

Apply theorem.

EXERCISES (EASY → DIFFICULT)

1. Two interior angles 80° , 56° . Exterior at third vertex?
2. Two interior angles 54° , 68° . Exterior at third vertex?
3. Two interior angles 80° , 45° . Exterior at third vertex?
4. Two interior angles 49° , 57° . Exterior at third vertex?
5. Two interior angles 44° , 66° . Exterior at third vertex?
6. Two interior angles 63° , 54° . Exterior at third vertex?
7. Two interior angles 52° , 74° . Exterior at third vertex?
8. Two interior angles 44° , 46° . Exterior at third vertex?
9. Two interior angles 68° , 43° . Exterior at third vertex?
10. Two interior angles 63° , 49° . Exterior at third vertex?

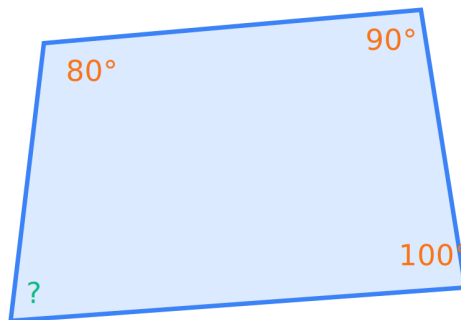


DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (K.2)



Quadrilateral angle sum



Quadrilateral angles sum to 360°

DEFINITIONS

Quadrilateral A four-sided polygon. Square, rectangle, rhombus, trapezium are all quadrilaterals.

KEY FORMULAS

- **Sum of interior angles of a quadrilateral:** 360°
- **To find missing angle:** $360^\circ - (\text{sum of known angles})$
- **Why 360° ?** Any quadrilateral splits into 2 triangles: $2 \times 180^\circ = 360^\circ$

WORKED EXAMPLES

Example 1: Three angles of a quadrilateral are 80° , 90° , 100° . Find the fourth.

► Sum = 360° .

Quadrilateral rule.

► Known sum: $80 + 90 + 100 = 270$.

Add given.

► Fourth: $360 - 270 = 90^\circ$.

Subtract.

► = **90°** .

Final answer.

Example 2: Three angles 70° , 80° , 110° . Fourth?

► Sum 260.

Add known.

► $360 - 260 = \mathbf{100^\circ}$.

Subtract.

EXERCISES (EASY → DIFFICULT)

1. Three angles 90° , 86° , 102° . Fourth?
2. Three angles 67° , 88° , 65° . Fourth?
3. Three angles 70° , 113° , 80° . Fourth?
4. Three angles 64° , 97° , 97° . Fourth?

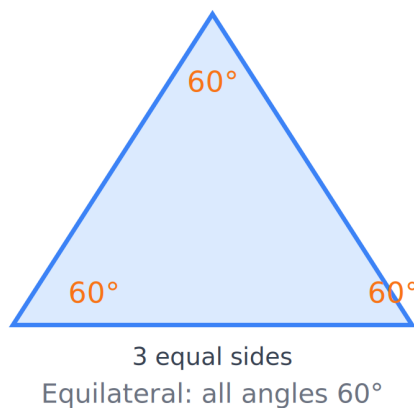


DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (K.3)

5. Three angles 70° , 84° , 100° . Fourth?
6. Three angles 67° , 66° , 68° . Fourth?
7. Three angles 87° , 72° , 87° . Fourth?
8. Three angles 61° , 74° , 74° . Fourth?
9. Three angles 83° , 85° , 78° . Fourth?
10. Three angles 75° , 87° , 106° . Fourth?

Properties of special triangles



DEFINITIONS

Equilateral triangle	All three sides equal, all three angles equal to 60° .
Isosceles triangle	Two sides equal, two angles equal (the base angles).
Scalene triangle	All sides and angles different.
Right triangle	One angle is 90° .

KEY FORMULAS

- **Equilateral:** all angles 60° (since $180^\circ \div 3 = 60^\circ$)
- **Isosceles:** two base angles equal
- **Right:** one angle is 90° , the other two sum to 90°

WORKED EXAMPLES

Example 1: What is each angle of an equilateral triangle?

- All three angles equal.

Equilateral property.

- Sum is 180° , so each = $180^\circ \div 3$.

Divide equally.

- = 60° .

Final answer.



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (K.4)

**Example 2: Isosceles triangle, apex angle 80° . Each base angle?**

- Base angles sum to 100° .

$$180 - 80.$$

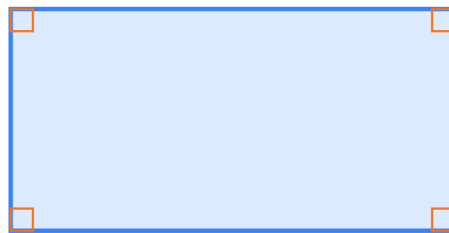
- Each: $100 \div 2 = 50^\circ$.

Divide equally.

EXERCISES (EASY → DIFFICULT)

1. Each angle of an equilateral triangle:

Properties of quadrilaterals



opposite sides equal, 4 right angles

Rectangle: 4 right angles

DEFINITIONS

Square	4 equal sides, 4 right angles (90°).
Rectangle	4 right angles, opposite sides equal.
Rhombus	4 equal sides, but angles are not 90° (a slanted square).
Trapezium	Only ONE pair of parallel sides.
Parallelogram	Both pairs of opposite sides parallel and equal.

KEY FORMULAS

- **Square:** 4 right angles, 4 equal sides
- **Rectangle:** 4 right angles, opposite sides equal
- **Rhombus:** 0 right angles (unless it's a square)
- **Trapezium:** 0 right angles (in general)

WORKED EXAMPLES**Example 1: How many right angles does a rectangle have?**

- A rectangle has 4 corners, each at 90° .

Definition.

- **4 right angles.**

Final answer.

**DIGITAL TEXTBOOK**

Scan to open this section
in the interactive edition (K.5)

**Example 2: Right angles in a rhombus?**

- Rhombus has slanted angles.

Definition.

- **0 right angles.**

Unless it's a square.

EXERCISES (EASY → DIFFICULT)

1. Right angles in a rectangle:
2. Right angles in a trapezium:
3. Right angles in a rhombus:
4. Right angles in a square:

End of Chapter 11 — Mixed Exercise

Ten questions across the whole chapter, from easy to difficult.

1. Two angles: 57° , 54° . Third?
2. Two interior angles 54° , 68° . Exterior at third vertex?
3. Three angles 70° , 113° , 80° . Fourth?
4. Each angle of an equilateral triangle:
5. Right angles in a square:
6. Two angles: 62° , 38° . Third?
7. Two interior angles 52° , 74° . Exterior at third vertex?
8. Three angles 61° , 74° , 74° . Fourth?
9. Each angle of an equilateral triangle:
10. Right angles in a rectangle:





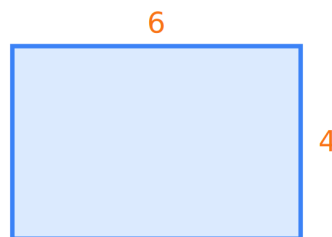
CHAPTER 12

Mensuration

- Perimeter** Perimeter of a rectangle
- Area** Area of a rectangle
- Area** Area of a triangle
- Volume** Volume of a rectangular prism (box)
- Surface** Surface area of a cube

Perimeter

Perimeter of a rectangle



$$P = 2(l + w)$$

Perimeter = distance around

DEFINITIONS

- Perimeter** The total distance around the outside of a shape.
- Rectangle** A 4-sided shape with 4 right angles and opposite sides equal.

KEY FORMULAS

- Perimeter of rectangle:** $P = 2(l + w) = 2l + 2w$
- l = length, w = width**
- Add all sides if irregular shape**



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (L.1)



WORKED EXAMPLES

Example 1: Find the perimeter of a 6×4 rectangle.

► Apply $P = 2(l + w)$.

Rectangle formula.

► $= 2(6 + 4) = 2 \times 10$.

Add inside, then double.

► **= 20.**

Final answer.

Example 2: Perimeter of 8×3 rectangle?

► $2(8 + 3) = 2 \times 11 = 22$.

Apply formula.

EXERCISES (EASY → DIFFICULT)

1. Perimeter of 5×10 rectangle:
2. Perimeter of 13×7 rectangle:
3. Perimeter of 12×6 rectangle:
4. Perimeter of 8×6 rectangle:
5. Perimeter of 7×7 rectangle:
6. Perimeter of 14×9 rectangle:
7. Perimeter of 13×4 rectangle:
8. Perimeter of 11×3 rectangle:
9. Perimeter of 10×5 rectangle:
10. Perimeter of 7×8 rectangle:

Area of rectangle

Area of a rectangle



$$A = l \times w = 24$$

Area = space inside

DEFINITIONS

Area

The space INSIDE a 2D shape, measured in square units (cm^2 , m^2).

**DIGITAL TEXTBOOK**

Scan to open this section
in the interactive edition (L.2)



KEY FORMULAS

- **Area of rectangle:** $A = l \times w$
- **l = length, w = width**
- **Area of square:** $A = \text{side}^2$ (since $l = w$)

WORKED EXAMPLES

Example 1: Find the area of a 6×4 rectangle.

► Apply $A = l \times w$.

Rectangle formula.

► $= 6 \times 4 = 24$.

Multiply.

► **$= 24$ (square units).**

Final answer.

Example 2: Area of 8×5 rectangle?

► $A = 8 \times 5 = 40$.

Apply formula.

EXERCISES (EASY → DIFFICULT)

1. Area of 14×10 :
2. Area of 6×11 :
3. Area of 9×9 :
4. Area of 9×11 :
5. Area of 6×8 :
6. Area of 10×12 :
7. Area of 11×8 :
8. Area of 14×11 :
9. Area of 6×3 :
10. Area of 5×12 :



DIGITAL TEXTBOOK

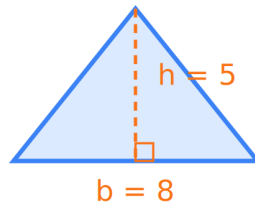
Scan to open this section
in the interactive edition (L.2)



Area of triangle

Area of a triangle

$$A = \frac{1}{2} \times b \times h = 20$$



Height $\perp$ base

DEFINITIONS

Base (b)	Any one side, usually the bottom one.
Height (h)	The PERPENDICULAR distance from the base to the opposite vertex.

KEY FORMULAS

- **Area of triangle:** $A = \frac{1}{2} \times \text{base} \times \text{height}$
- **Important:** height must be PERPENDICULAR to the base, not a slanted side

WORKED EXAMPLES

Example 1: Triangle with base 8 and height 5. Find the area.

► Apply $A = \frac{1}{2} \times b \times h$.

Triangle formula.

► $= \frac{1}{2} \times 8 \times 5 = \frac{1}{2} \times 40$.

Substitute.

► **= 20.**

Final answer.

Example 2: Base 6, height 4. Area?

► $\frac{1}{2} \times 6 \times 4 = 12$.

Apply formula.

EXERCISES (EASY → DIFFICULT)

1. Triangle base 8, height 5. Area:
2. Triangle base 12, height 3. Area:
3. Triangle base 10, height 7. Area:
4. Triangle base 10, height 10. Area:
5. Triangle base 8, height 10. Area:
6. Triangle base 4, height 9. Area:
7. Triangle base 12, height 5. Area:



DIGITAL TEXTBOOK

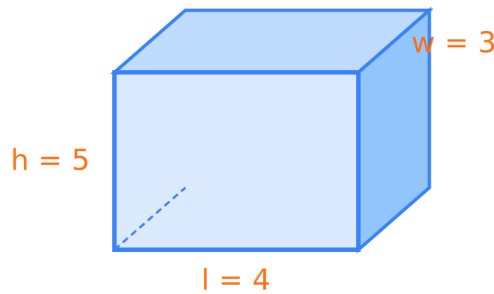
Scan to open this section
in the interactive edition (L3)



8. Triangle base 4, height 4. Area:
9. Triangle base 12, height 9. Area:
10. Triangle base 6, height 7. Area:

Volume of rectangular prism

Volume of a rectangular prism (box)



$$V = l \times w \times h = 60$$

Volume = space inside (cubic units)

DEFINITIONS

Volume	The space INSIDE a 3D shape, measured in cubic units (cm^3 , m^3).
Rectangular prism	A box-shaped 3D object with 6 rectangular faces.

KEY FORMULAS

- **Volume of box:** $V = l \times w \times h$
- **l = length, w = width, h = height**
- **Cube:** $V = \text{side}^3$ (since $l = w = h$)

WORKED EXAMPLES

Example 1: Find the volume of a $4 \times 3 \times 5$ box.

► Apply $V = l \times w \times h$.

Box formula.

► $= 4 \times 3 \times 5$.

Substitute.

► $= 12 \times 5 = \mathbf{60}$.

Multiply step by step.

Example 2: Box $2 \times 3 \times 4$. Volume?

► $2 \times 3 \times 4 = 24$.

Multiply.

► **24.**

Done.



DIGITAL TEXTBOOK

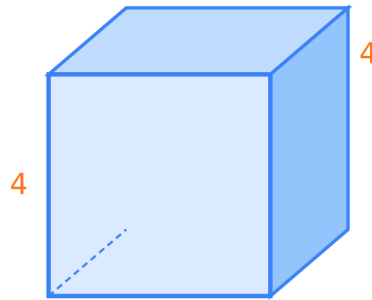
Scan to open this section
in the interactive edition (L.4)

**EXERCISES (EASY → DIFFICULT)**

1. Volume of $6 \times 6 \times 2$ box:
2. Volume of $5 \times 6 \times 2$ box:
3. Volume of $3 \times 4 \times 8$ box:
4. Volume of $4 \times 3 \times 7$ box:
5. Volume of $2 \times 4 \times 7$ box:
6. Volume of $3 \times 4 \times 7$ box:
7. Volume of $4 \times 8 \times 2$ box:
8. Volume of $6 \times 4 \times 4$ box:
9. Volume of $7 \times 4 \times 4$ box:
10. Volume of $6 \times 4 \times 3$ box:

Surface area

Surface area of a cube



side = 4

$$SA = 6 \times \text{side}^2 = 96$$

A cube has 6 identical square faces

DEFINITIONS

Surface area The TOTAL area of all faces of a 3D shape.

Cube A box where all 6 faces are squares ($l = w = h$).

KEY FORMULAS

- **Surface area of cube:** $SA = 6 \times \text{side}^2$
- **Why 6?** A cube has 6 identical square faces
- **Each face area = side^2** , so total = $6 \times \text{side}^2$

WORKED EXAMPLES**DIGITAL TEXTBOOK**

Scan to open this section
in the interactive edition (L.5)

**Example 1: Find the surface area of a cube with side 4.**

► Apply $SA = 6 \times \text{side}^2$.

Cube formula.

► $= 6 \times 4^2 = 6 \times 16$.

Square the side first.

► = **96**.

Multiply by 6.

Example 2: Cube side 3. SA?

► $6 \times 9 = \mathbf{54}$.

Square then $\times 6$.

EXERCISES (EASY → DIFFICULT)

1. Surface area of cube side 5:
2. Surface area of cube side 2:
3. Surface area of cube side 6:
4. Surface area of cube side 3:
5. Surface area of cube side 8:
6. Surface area of cube side 7:
7. Surface area of cube side 4:

End of Chapter 12 — Mixed Exercise

Ten questions across the whole chapter, from easy to difficult.

1. Perimeter of 5×10 rectangle:
2. Area of 6×11 :
3. Triangle base 10, height 7. Area:
4. Volume of $4 \times 3 \times 7$ box:
5. Surface area of cube side 8:
6. Perimeter of 14×9 rectangle:
7. Area of 11×8 :
8. Triangle base 4, height 4. Area:
9. Volume of $7 \times 4 \times 4$ box:
10. Surface area of cube side 4:





CHAPTER 13

Coordinate Geometry

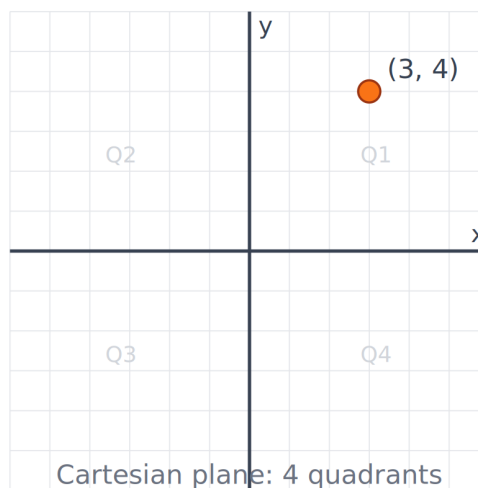
Identify Quadrants of the Cartesian plane

Distance Distance on a grid

Plot Plotting points in all four quadrants

Identify quadrant of a point

Quadrants of the Cartesian plane



DEFINITIONS

Cartesian plane A flat surface with two number lines — the x-axis (horizontal) and y-axis (vertical) — meeting at the origin.

Origin The point (0, 0) where the axes cross.

Quadrant One of the four regions of the plane, numbered Q1 to Q4 anticlockwise from top right.

KEY FORMULAS

- **Q1:** $x > 0$, $y > 0$ (both positive — top right)
- **Q2:** $x < 0$, $y > 0$ (top left)
- **Q3:** $x < 0$, $y < 0$ (both negative — bottom left)
- **Q4:** $x > 0$, $y < 0$ (bottom right)



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (M.1)



WORKED EXAMPLES

Example 1: Which quadrant is (3, 4) in?

- Check signs: $x = +3$, $y = +4$.

Both positive.

- Both positive → Quadrant 1.

Top right.

- **Quadrant 1.**

Final answer.

Example 2: Which quadrant is (-2, 5)?

- x negative, y positive.

Check signs.

- **Quadrant 2.**

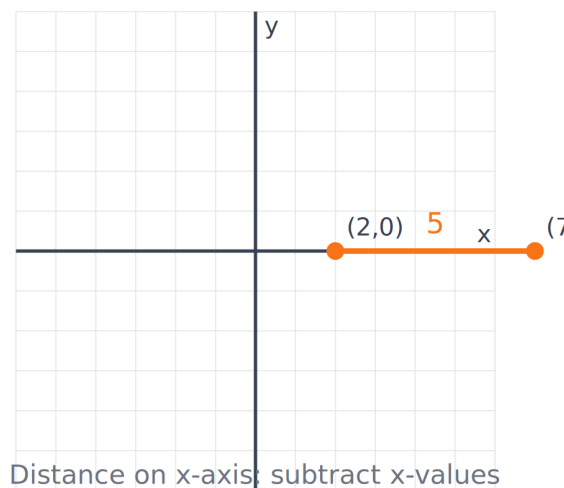
Top left.

EXERCISES (EASY → DIFFICULT)

1. Quadrant of $(-4, 5)$:
2. Quadrant of $(5, -3)$:
3. Quadrant of $(3, 4)$:
4. Quadrant of $(-2, 1)$:
5. Quadrant of $(-5, 5)$:
6. Quadrant of $(-1, -1)$:
7. Quadrant of $(2, 3)$:
8. Quadrant of $(4, 4)$:
9. Quadrant of $(5, -4)$:
10. Quadrant of $(-2, -5)$:

Distance on grid (horizontal/vertical)

Distance on a grid

**DIGITAL TEXTBOOK**

Scan to open this section
in the interactive edition (M.2)



DEFINITIONS

Horizontal distance

Distance ALONG the x-axis (same y-value). Subtract x-coordinates.

Vertical distance

Distance ALONG the y-axis (same x-value). Subtract y-coordinates.

KEY FORMULAS

- **Horizontal (same y):** distance = $|x_2 - x_1|$
- **Vertical (same x):** distance = $|y_2 - y_1|$
- **Take absolute value** to make the answer positive

WORKED EXAMPLES

Example 1: Find the distance from (2, 0) to (7, 0).

- Same y-value (both 0) → horizontal distance.

Both on x-axis.

- Subtract x-coordinates: $7 - 2 = 5$.

Difference.

- **= 5.**

Final answer.

Example 2: Distance from (3, 0) to (8, 0)?

- $8 - 3 = 5$.

Same y, subtract x.

EXERCISES (EASY → DIFFICULT)

1. Distance from (1,0) to (2,0):
2. Distance from (1,0) to (3,0):
3. Distance from (4,0) to (5,0):
4. Distance from (3,0) to (7,0):
5. Distance from (1,0) to (6,0):
6. Distance from (2,0) to (5,0):
7. Distance from (2,0) to (4,0):
8. Distance from (3,0) to (6,0):
9. Distance from (4,0) to (9,0):
10. Distance from (2,0) to (6,0):

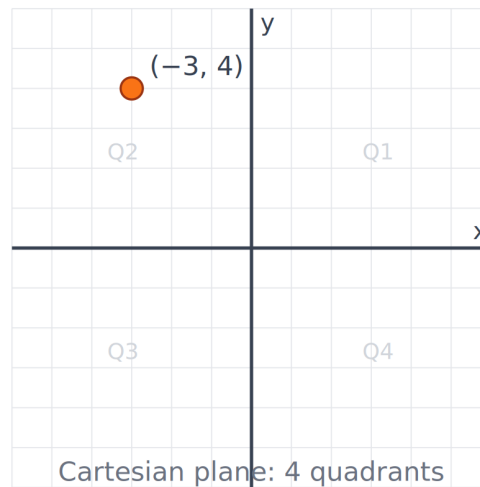


DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (M.2)

Plot points (all four quadrants)

Plotting points in all four quadrants



DEFINITIONS

Coordinate	A pair of numbers (x, y) giving the position of a point.
Plot	Mark a point at its (x, y) position on the plane.

KEY FORMULAS

- **To plot (x, y) :**
- **1.** Start at the origin $(0, 0)$
- **2.** Move x units left/right (right if x is positive, left if negative)
- **3.** Move y units up/down (up if y is positive, down if negative)

WORKED EXAMPLES

Example 1: Which quadrant is $(-3, 4)$ in?

- Check signs: $x = -3$ (negative), $y = 4$ (positive).

Read signs.

- Negative x , positive $y \rightarrow$ Quadrant 2.

Top left.

- **Quadrant 2.**

Final answer.

Example 2: Which quadrant is $(-2, -5)$?

- Both negative.

Read signs.

- **Q3.**

Bottom left.



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (M.3)

**EXERCISES (EASY → DIFFICULT)**

1. Point $(-3, 4)$ is in which quadrant?

End of Chapter 13 — Mixed Exercise

Ten questions across the whole chapter, from easy to difficult.

1. Quadrant of $(-4, 5)$:
2. Distance from $(1,0)$ to $(3,0)$:
3. Point $(-3, 4)$ is in which quadrant?
4. Quadrant of $(-2, 1)$:
5. Distance from $(1,0)$ to $(6,0)$:
6. Point $(-3, 4)$ is in which quadrant?
7. Quadrant of $(2, 3)$:
8. Distance from $(3,0)$ to $(6,0)$:
9. Point $(-3, 4)$ is in which quadrant?
10. Quadrant of $(-2, -5)$:

**DIGITAL TEXTBOOK**

Scan for the interactive
digital edition



CHAPTER 14

Statistics

Mean, Mean, median, mode
Range Range of a data set
Read Reading graphs and tables

Mean, median, mode

DEFINITIONS

Mean	The AVERAGE: add all numbers and divide by how many there are.
Median	The MIDDLE value when data is sorted in order.
Mode	The MOST FREQUENT value — appears most often.

KEY FORMULAS

- **Mean:** sum of all values $\div$ how many values
- **Median:** sort the data, pick the middle
- **Mode:** the value that appears most often
- **Memory:** Mean = aMOunt $\div$ number, MEdian = MIDdle, MOde = MOst

WORKED EXAMPLES

Example 1: Find the mean of 2, 4, 6, 8, 10.

► Add: $2 + 4 + 6 + 8 + 10 = 30$.

Sum.

► Count: 5 numbers.

Divisor.

► Mean: $30 \div 5 = 6$.

Divide.

► = **6**.

Final answer.

Example 2: Mean of 5, 5, 10, 10, 10?

► Sum 40. Count 5.

Add then count.

► **$40 \div 5 = 8$** .

Done.



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (N.1)

**EXERCISES (EASY → DIFFICULT)**

1. Mean of 3, 5, 8, 2, 4:
2. Mean of 3, 4, 4, 5, 5:
3. Mean of 6, 5, 10, 9, 7:
4. Mean of 9, 2, 5, 8, 8:
5. Mean of 4, 7, 4, 7, 4:
6. Mean of 2, 10, 4, 2, 2:
7. Mean of 4, 7, 9, 6, 9:
8. Mean of 10, 6, 9, 3, 8:
9. Mean of 4, 8, 9, 4, 9:
10. Mean of 8, 10, 9, 3, 4:

Range

Range of a data set

DEFINITIONS**Range**

The DIFFERENCE between the largest and smallest values.

KEY FORMULAS

- **Range = maximum – minimum**
- **Tells you how spread out the data is**
- **Small range:** values close together. **Big range:** values spread out

WORKED EXAMPLES**Example 1: Find the range of 3, 8, 12, 17.**

► Maximum: 17.

Largest value.

► Minimum: 3.

Smallest value.

► Range: $17 - 3 = 14$.

Subtract.

► **= 14.**

Final answer.

Example 2: Range of 4, 9, 15, 20?

► Max 20, min 4.

Find both.

► $20 - 4 = 16$.

Subtract.

EXERCISES (EASY → DIFFICULT)

1. Range of 1, 7, 11, 18:
2. Range of 3, 9, 11, 17:
3. Range of 1, 9, 11, 20:
4. Range of 5, 9, 15, 19:
5. Range of 5, 7, 15, 20:
6. Range of 1, 8, 12, 20:

**DIGITAL TEXTBOOK**

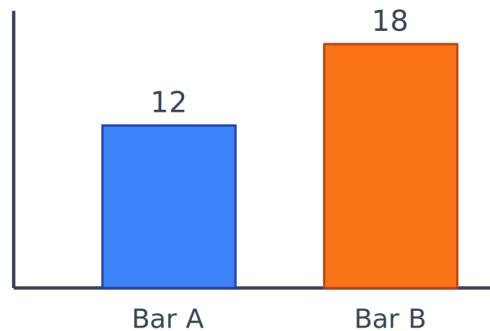
Scan to open this section
in the interactive edition (N.2)



7. Range of 1, 7, 12, 17:
8. Range of 2, 7, 15, 18:
9. Range of 1, 7, 11, 17:
10. Range of 4, 10, 12, 18:

Read graphs and tables

Reading graphs and tables



$$\text{Total} = 12 + 18 = 30$$

DEFINITIONS

Bar graph

A chart with bars whose heights show values.

KEY FORMULAS

- **To find a total:** add the bar heights
- **To find a difference:** bigger – smaller
- **To find an average:** add and divide by count

WORKED EXAMPLES

Example 1: Bar A = 12, Bar B = 18. Find the total.

- Add the two bars: $12 + 18$.

Sum.

- = 30.

Final answer.

Example 2: Bar A = 8, Bar B = 15. Total?

- $8 + 15 = 23$.

Add.

EXERCISES (EASY → DIFFICULT)

1. Bar A=29, Bar B=6. Total?
2. Bar A=27, Bar B=28. Total?
3. Bar A=5, Bar B=16. Total?
4. Bar A=27, Bar B=13. Total?



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (N.3)



5. Bar A=16, Bar B=15. Total?
6. Bar A=15, Bar B=27. Total?
7. Bar A=25, Bar B=15. Total?
8. Bar A=20, Bar B=11. Total?
9. Bar A=10, Bar B=12. Total?
10. Bar A=6, Bar B=23. Total?

End of Chapter 14 — Mixed Exercise

Ten questions across the whole chapter, from easy to difficult.

1. Mean of 3, 5, 8, 2, 4:
2. Range of 3, 9, 11, 17:
3. Bar A=5, Bar B=16. Total?
4. Mean of 9, 2, 5, 8, 8:
5. Range of 5, 7, 15, 20:
6. Bar A=15, Bar B=27. Total?
7. Mean of 4, 7, 9, 6, 9:
8. Range of 2, 7, 15, 18:
9. Bar A=10, Bar B=12. Total?
10. Mean of 8, 10, 9, 3, 4:



CHAPTER 15

Probability

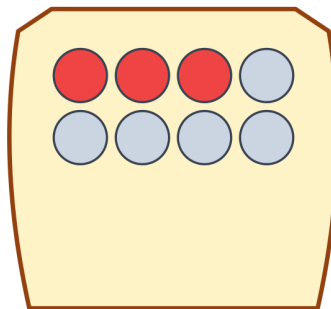
Probability Probability of a single event

Sample Sample space

Theoretical Theoretical vs experimental probability

Probability of single event

Probability of a single event



$$P(\text{red}) = \frac{3}{8}$$

favourable $\div$ total

DEFINITIONS

Probability A measure of how LIKELY something is, from 0 (impossible) to 1 (certain).

Favourable outcome An outcome that counts as the event happening.

Total outcomes All possible results.

KEY FORMULAS

- **$P(\text{event}) = \text{favourable outcomes} \div \text{total outcomes}$**
- **$P = 0$:** impossible. **$P = 1$:** certain. **$P = \frac{1}{2}$:** 50/50 chance
- **Always:** $0 \leq P \leq 1$



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (O.1)



WORKED EXAMPLES

Example 1: A bag has 8 balls; 3 are red. $P(\text{red})$?

- Favourable outcomes (red): 3.

Count reds.

- Total outcomes: 8.

Total balls.

- $P(\text{red}) = 3/8$.

Apply formula.

Example 2: Bag has 10 balls; 4 are blue. $P(\text{blue})$?

- 4 favourable out of 10.

Count.

- $4/10 = 2/5$.

Simplify.

EXERCISES (EASY → DIFFICULT)

1. Bag has 8 balls; 6 are red. $P(\text{red})$?
2. Bag has 6 balls; 3 are red. $P(\text{red})$?
3. Bag has 11 balls; 1 are red. $P(\text{red})$?
4. Bag has 12 balls; 8 are red. $P(\text{red})$?
5. Bag has 12 balls; 9 are red. $P(\text{red})$?
6. Bag has 7 balls; 2 are red. $P(\text{red})$?
7. Bag has 5 balls; 3 are red. $P(\text{red})$?
8. Bag has 12 balls; 1 are red. $P(\text{red})$?
9. Bag has 8 balls; 3 are red. $P(\text{red})$?
10. Bag has 6 balls; 2 are red. $P(\text{red})$?

Sample space

DEFINITIONS

Sample space The LIST of all possible outcomes of an experiment.

Outcome A single possible result.

KEY FORMULAS

- **Die:** sample space = $\{1, 2, 3, 4, 5, 6\}$ → size 6
- **Coin:** sample space = $\{H, T\}$ → size 2
- **Two dice:** $6 \times 6 = 36$ outcomes
- **Two coins:** $2 \times 2 = 4$ outcomes

WORKED EXAMPLES



DIGITAL TEXTBOOK

Scan to open this section
in the interactive edition (O.2)

**Example 1: How many outcomes when rolling one die?**

- ▶ Sample space: {1, 2, 3, 4, 5, 6}.

List outcomes.

- ▶ Count: 6.

Six sides.

- ▶ = 6.

Final answer.

Example 2: Outcomes when tossing 2 coins?

- ▶ HH, HT, TH, TT.

List all.

- ▶ 4 outcomes.

Count.

EXERCISES (EASY → DIFFICULT)

1. Sample space size when rolling 1 die:

Theoretical vs experimental

Theoretical vs experimental probability

DEFINITIONS**Theoretical probability**

What we EXPECT to happen based on equal outcomes. $P(\text{heads}) = \frac{1}{2}$.

Experimental probability

What actually happens when we DO the experiment. May differ from theoretical.

KEY FORMULAS

- **Theoretical:** favourable $\div$ total possible (using equal chances)
- **Experimental:** times event happened $\div$ total trials
- **With many trials**, experimental gets close to theoretical (Law of Large Numbers)

WORKED EXAMPLES**Example 1: What is the theoretical probability of getting heads on a coin?**

- ▶ Coin has 2 equal outcomes: H or T.

Sample space.

- ▶ $P(H) = 1 \text{ favourable} \div 2 \text{ total} = \frac{1}{2}$.

Apply formula.

- ▶ = $\frac{1}{2}$.

Final answer.

Example 2: Theoretical P(rolling a 4 on a die)?

- ▶ 1 favourable out of 6.

Single outcome.

- ▶ $\frac{1}{6}$.

Done.

**DIGITAL TEXTBOOK**

Scan to open this section
in the interactive edition (O.3)

**EXERCISES (EASY → DIFFICULT)**

1. Theoretical $P(\text{heads on coin})$:

End of Chapter 15 — Mixed Exercise

Ten questions across the whole chapter, from easy to difficult.

1. Bag has 8 balls; 6 are red. $P(\text{red})$?
2. Sample space size when rolling 1 die:
3. Theoretical $P(\text{heads on coin})$:
4. Bag has 12 balls; 8 are red. $P(\text{red})$?
5. Sample space size when rolling 1 die:
6. Theoretical $P(\text{heads on coin})$:
7. Bag has 5 balls; 3 are red. $P(\text{red})$?
8. Sample space size when rolling 1 die:
9. Theoretical $P(\text{heads on coin})$:
10. Bag has 6 balls; 2 are red. $P(\text{red})$?

**DIGITAL TEXTBOOK**

Scan for the interactive
digital edition



ANSWERS

Worked solutions to all exercises

Each answer gives the final result first, followed by the key working steps. For fully animated, step-by-step solutions, open the digital edition with the QR code on any page.

CHAPTER 1 — Whole Numbers and Integers

Properties: associative, commutative

1. true
2. true
3. true
4. true
5. true
6. true
7. true
8. true
9. true
10. true

Order of operations (BODMAS)

1. 18
2. 14
3. 45
4. 25
5. 56
6. 12
7. 45
8. 35
9. 40
10. 49

Add integers

1. -13
2. 0
3. -6
4. 11
5. -6
6. -6
7. -9
8. -5
9. 10
10. -3



DIGITAL TEXTBOOK

Scan for the interactive digital edition

**Subtract integers**

1. 3
2. 13
3. 21
4. 17
5. 27
6. 11
7. 13
8. 8
9. 10
10. 8

Multiply integers

1. -14
2. -64
3. -54
4. -56
5. -36
6. -14
7. -54
8. -48
9. -24
10. -8

Divide integers

1. -9
2. -3
3. -8
4. -7
5. -9
6. -4
7. -2
8. -5
9. -6
10. -8

Long Division (game)

1. play

End of Chapter 1 — Mixed Exercise

1. true
2. 14
3. -6
4. 17
5. -36
6. -4
7. play
8. true
9. 40
10. -3



CHAPTER 2 — Exponents

Exponents and bases

1. 27
2. 16
3. 256
4. 8
5. 125
6. 81
7. 64
8. 16
9. 9
10. 25

Squares and cubes

1. 512
2. 216
3. 729
4. 64
5. 125
6. 8
7. 343
8. 27
9. 1000

Square roots

1. 9
2. 7
3. 4
4. 8
5. 3
6. 2
7. 10
8. 12
9. 11
10. 6

Cube roots

1. 6
2. 4
3. 3
4. 5
5. 2

End of Chapter 2 — Mixed Exercise

1. 27
2. 216
3. 4
4. 5
5. 125
6. 8
7. 10
8. 2
9. 9





10. 1000

CHAPTER 3 — Fractions

Add and subtract fractions

1. $\frac{5}{6}$
2. $\frac{11}{12}$
3. $\frac{1}{4}$

Multiply fractions

1. $\frac{2}{5}$
2. $\frac{1}{2}$
3. $\frac{1}{2}$

Divide fractions

1. $\frac{3}{2}$
2. 2
3. 2

Mixed numbers $\leftrightarrow$ improper

1. $\frac{13}{5}$
2. $\frac{28}{5}$
3. $\frac{33}{6}$
4. $\frac{15}{6}$
5. $\frac{27}{6}$
6. $\frac{9}{6}$
7. $\frac{18}{5}$
8. $\frac{23}{4}$
9. $\frac{21}{4}$
10. $\frac{21}{6}$

Fraction of a quantity

1. 8
2. 9
3. 12
4. 8
5. 6
6. 12
7. 30
8. 10
9. 4
10. 24

End of Chapter 3 — Mixed Exercise

1. $\frac{5}{6}$
2. $\frac{1}{2}$
3. 2
4. $\frac{15}{6}$
5. 6
6. $\frac{1}{4}$
7. $\frac{1}{2}$
8. $\frac{3}{2}$
9. $\frac{21}{4}$
10. 24



CHAPTER 4 — Decimals

Add and subtract decimals

1. 7.3
2. 10.4
3. 11
4. 17.5
5. 11.5
6. 11.1
7. 9.7
8. 11.8
9. 18.2
10. 13.1

Multiply decimals

1. 14.7
2. 6.2
3. 29.6
4. 35.2
5. 3.6
6. 4.5
7. 20.5
8. 20
9. 7.2
10. 27

Divide decimals

1. 1.2
2. 2.2
3. 2.2
4. 3.6
5. 2.7
6. 4.7
7. 1.1
8. 3.6
9. 2.2
10. 4.7

Decimal $\leftrightarrow$ fraction $\leftrightarrow$ percent

1. 75%
2. 25%
3. 50%
4. 20%

End of Chapter 4 — Mixed Exercise

1. 7.3
2. 6.2
3. 2.2
4. 20%
5. 11.5
6. 4.5
7. 1.1
8. 75%
9. 18.2





10. 27

CHAPTER 5 — Ratios and Proportion

Simplify ratios

1. 2:2
2. 5:3
3. 2:4
4. 5:4
5. 4:4
6. 3:5
7. 3:5
8. 4:2
9. 4:2
10. 2:5

Direct proportion

1. 15
2. 40
3. 20
4. 20
5. 10
6. 57
7. 90
8. 49
9. 42
10. 24

Speed, distance, time

1. 405
2. 122
3. 102
4. 308
5. 324
6. 565
7. 370
8. 216
9. 244
10. 110

Sharing in a ratio

1. 18
2. 12
3. 24
4. 30

End of Chapter 5 — Mixed Exercise

1. 2:2
2. 40
3. 102
4. 30
5. 4:4
6. 57
7. 370
8. 18





- 9. 4:2
- 10. 24

CHAPTER 6 — Percentage

Percent of a quantity

- 1. 2.6
- 2. 23.75
- 3. 12.4
- 4. 40.75
- 5. 17.2
- 6. 2.3
- 7. 11
- 8. 6.4
- 9. 23.1
- 10. 35.75

Discount and increase

- 1. 146.7
- 2. 200.6
- 3. 392.4
- 4. 225.9
- 5. 199.2
- 6. 112
- 7. 127.5
- 8. 201.6
- 9. 136
- 10. 324.7

Percent profit/loss

- 1. 11.81
- 2. 17.53
- 3. 9.14
- 4. 12.64
- 5. 19.08
- 6. 19.32
- 7. 46.88
- 8. 15.5
- 9. 13.94
- 10. 12.88

Find original price

- 1. 116
- 2. 283
- 3. 417
- 4. 433
- 5. 111
- 6. 346
- 7. 370
- 8. 141
- 9. 196
- 10. 127



**End of Chapter 6 — Mixed Exercise**

1. 2.6
2. 200.6
3. 9.14
4. 433
5. 17.2
6. 112
7. 46.88
8. 141
9. 23.1
10. 324.7

CHAPTER 7 — Patterns and Sequences**Number patterns: linear**

1. 21
2. 20
3. 28
4. 14
5. 15
6. 17
7. 21
8. 14
9. 25
10. 12

Find the rule (T_n)

1. $4n + 2$
2. $2n + 2$
3. $6n + 9$
4. $6n + 3$
5. $6n + 8$
6. $7n + 9$
7. $5n + 7$
8. $7n + 4$
9. $5n + 3$
10. $7n + 7$

Term value of a pattern

1. 30
2. 35
3. 29
4. 86
5. 57
6. 89
7. 53
8. 64
9. 84
10. 66



**End of Chapter 7 — Mixed Exercise**

1. 21
2. $2n + 2$
3. 29
4. 14
5. $6n + 8$
6. 89
7. 21
8. $7n + 4$
9. 84
10. 12

CHAPTER 8 — Algebraic Expressions**Substitute into expressions**

1. 12
2. 18
3. -2
4. 4
5. 16
6. 3
7. 20
8. 8
9. 18
10. 1

Simplify by collecting like terms

1. $15x$
2. $11x$
3. $15x$
4. $9x$
5. $8x$
6. $8x$
7. $11x$
8. $11x$
9. $16x$
10. $17x$

Add and subtract like terms

1. $8x$
2. $2x$
3. $6x$
4. $7x$
5. $3x$
6. $6x$
7. $3x$
8. $3x$
9. $8x$
10. $10x$



**Distributive property (basic)**

1. $4x + 20$
2. $2x + 6$
3. $3x + 18$
4. $4x + 12$
5. $5x + 20$
6. $4x + 24$
7. $3x + 3$
8. $4x + 4$
9. $2x + 12$
10. $5x + 5$

End of Chapter 8 — Mixed Exercise

1. 12
2. $11x$
3. $6x$
4. $4x + 12$
5. 16
6. $8x$
7. $3x$
8. $4x + 4$
9. 18
10. $17x$

CHAPTER 9 — Equations**Solve one-step equations (+/−)**

1. 15
2. 14
3. 5
4. 13
5. 12
6. 15
7. 8
8. 2
9. 8
10. 9

Solve one-step equations ($\times/\div$)

1. 7
2. 11
3. 4
4. 8
5. 8
6. 6
7. 8
8. 8
9. 8
10. 5



**Solve two-step equations**

1. 4
2. 9
3. 4
4. 6
5. 7
6. 10
7. 6
8. 6
9. 5
10. 5

Word problems → equations

1. 7
2. 19
3. 5
4. 13
5. 10
6. 16
7. 14
8. 18
9. 20
10. 18

End of Chapter 9 — Mixed Exercise

1. 15
2. 11
3. 4
4. 13
5. 12
6. 6
7. 6
8. 18
9. 8
10. 5

CHAPTER 10 — Lines and Angles**Angles on a straight line**

1. 71
2. 126
3. 119
4. 63
5. 64
6. 57
7. 123
8. 74
9. 33
10. 115



**Angles around a point**

1. 290
2. 261
3. 162
4. 246
5. 285
6. 300
7. 243
8. 289
9. 200
10. 257

Vertically opposite angles

1. 134
2. 114
3. 137
4. 64
5. 125
6. 107
7. 115
8. 62
9. 60
10. 48

Co-interior, alternate, corresponding angles

1. 69
2. 59
3. 126
4. 124
5. 95
6. 112
7. 140
8. 78
9. 97
10. 125

End of Chapter 10 — Mixed Exercise

1. 71
2. 261
3. 137
4. 124
5. 64
6. 300
7. 115
8. 78
9. 33
10. 257



CHAPTER 11 — Triangles and Quadrilaterals

Triangle angle sum

1. 69
2. 32
3. 70
4. 85
5. 78
6. 80
7. 74
8. 70
9. 66
10. 77

Exterior angle of triangle

1. 136
2. 122
3. 125
4. 106
5. 110
6. 117
7. 126
8. 90
9. 111
10. 112

Quadrilateral angle sum

1. 82
2. 140
3. 97
4. 102
5. 106
6. 159
7. 114
8. 151
9. 114
10. 92

Properties of special triangles

1. 60

Properties of quadrilaterals

1. 4
2. 0
3. 0
4. 4

End of Chapter 11 — Mixed Exercise

1. 69
2. 122
3. 97
4. 60
5. 4
6. 80





7. 126
8. 151
9. 60
10. 4

CHAPTER 12 — Mensuration

Perimeter

1. 30
2. 40
3. 36
4. 28
5. 28
6. 46
7. 34
8. 28
9. 30
10. 30

Area of rectangle

1. 140
2. 66
3. 81
4. 99
5. 48
6. 120
7. 88
8. 154
9. 18
10. 60

Area of triangle

1. 20
2. 18
3. 35
4. 50
5. 40
6. 18
7. 30
8. 8
9. 54
10. 21

Volume of rectangular prism

1. 72
2. 60
3. 96
4. 84
5. 56
6. 84
7. 64
8. 96
9. 112
10. 72



**Surface area**

1. 150
2. 24
3. 216
4. 54
5. 384
6. 294
7. 96

End of Chapter 12 — Mixed Exercise

1. 30
2. 66
3. 35
4. 84
5. 384
6. 46
7. 88
8. 8
9. 112
10. 96

CHAPTER 13 — Coordinate Geometry

Identify quadrant of a point

1. 2
2. 4
3. 1
4. 2
5. 2
6. 3
7. 1
8. 1
9. 4
10. 3

Distance on grid (horizontal/vertical)

1. 1
2. 2
3. 1
4. 4
5. 5
6. 3
7. 2
8. 3
9. 5
10. 4

Plot points (all four quadrants)

1. 2



**End of Chapter 13 — Mixed Exercise**

1. 2
2. 2
3. 2
4. 2
5. 5
6. 2
7. 1
8. 3
9. 2
10. 3

CHAPTER 14 — Statistics**Mean, median, mode**

1. 4.4
2. 4.2
3. 7.4
4. 6.4
5. 5.2
6. 4
7. 7
8. 7.2
9. 6.8
10. 6.8

Range

1. 17
2. 14
3. 19
4. 14
5. 15
6. 19
7. 16
8. 16
9. 16
10. 14

Read graphs and tables

1. 35
2. 55
3. 21
4. 40
5. 31
6. 42
7. 40
8. 31
9. 22
10. 29



**End of Chapter 14 — Mixed Exercise**

1. 4.4
2. 14
3. 21
4. 6.4
5. 15
6. 42
7. 7
8. 16
9. 22
10. 6.8

CHAPTER 15 — Probability**Probability of single event**

1. $\frac{6}{8}$
2. $\frac{3}{6}$
3. $\frac{1}{11}$
4. $\frac{8}{12}$
5. $\frac{9}{12}$
6. $\frac{2}{7}$
7. $\frac{3}{5}$
8. $\frac{1}{12}$
9. $\frac{3}{8}$
10. $\frac{2}{6}$

Sample space

1. 6

Theoretical vs experimental

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

End of Chapter 15 — Mixed Exercise

1. $\frac{6}{8}$
2. 6
3. $\frac{1}{2}$
4. $\frac{8}{12}$
5. 6
6. $\frac{1}{2}$
7. $\frac{3}{5}$
8. 6
9. $\frac{1}{2}$
10. $\frac{2}{6}$





Keep learning online

Scan to open the free interactive digital edition with animated lessons, narration and unlimited practice.

Fire Jungle Grade 7 Mathematics

by Joseph Matthew Mitchell • Fire Jungle / TsukaMath • 2026



DIGITAL TEXTBOOK

Scan for the interactive digital edition