

FIRE JUNGLE

CAPS-aligned mathematics for South African learners



GRADE 6

Mathematics

TEXTBOOK

Definitions • Worked Examples • Exercises • Full Answers



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by Joseph Matthew Mitchell

Fire Jungle Grade 6 Mathematics

A CAPS-aligned study textbook for the FET phase

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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.



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CHAPTER 1

Whole Numbers

- Place** Place value
- Round** Rounding numbers
- Order** Order of operations — BODMAS
- Order** BODMAS with brackets
- Long** Long Division — interactive game

Place value to billions

DEFINITIONS

Digit	A single number symbol from 0 to 9.
Place value	The value of a digit based on its position in the number.
Millions place	The 7th position from the right: ones, tens, hundreds, thousands, ten-thousands, hundred-thousands, millions.

KEY FORMULAS

- **Place values (right to left):** ones, tens, hundreds, thousands, ten-thousands, hundred-thousands, millions
- **Value of a digit** = digit $\times$ its place value
- **Example:** in 3 000 000, the 3 is worth $3 \times 1\,000\,000 = 3\,000\,000$

WORKED EXAMPLES

Example 1: In 4 528 137, what is the value of the digit 4?

- The 4 is the leftmost digit of a 7-digit number.

Count the places.

- That position is the millions place.

7th from the right.

- Value = $4 \times 1\,000\,000 = 4\,000\,000$.

Digit $\times$ place value.

- **4 000 000.**

Final answer.



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**Example 2: In 6 743 210, what is the value of the 6?**

► 6 is in the millions place.

Leftmost of 7 digits.

► $6 \times 1\,000\,000 = 6\,000\,000$.

Done.

EXERCISES (EASY → DIFFICULT)

1. In 2291295, value of the millions digit:
2. In 6759008, value of the millions digit:
3. In 9312942, value of the millions digit:
4. In 6396895, value of the millions digit:
5. In 9832392, value of the millions digit:
6. In 4149782, value of the millions digit:
7. In 9673888, value of the millions digit:
8. In 6890899, value of the millions digit:
9. In 6737640, value of the millions digit:
10. In 9391068, value of the millions digit:

Round to nearest 10000

Rounding numbers

DEFINITIONS**Round**

Replace a number with a nearby simpler number (a multiple of 10, 100, 1000, etc.).

Rounding digit

The digit to the RIGHT of the place you are rounding to. It decides up or down.

KEY FORMULAS

- **Rule:** look at the digit to the right of the rounding place
- **If it is 5 or more** → round UP
- **If it is 4 or less** → round DOWN (keep the same)
- **Nearest 10 000:** look at the thousands digit

WORKED EXAMPLES**Example 1: Round 47 300 to the nearest 10 000.**

► Rounding to 10 000 → look at the thousands digit.

Digit to the right of ten-thousands.

► Thousands digit is 7 (in 47 300).

That is 5 or more.

► Round UP: $47\,300 \rightarrow 50\,000$.

5 or more rounds up.

► **50 000.**

Final answer.

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**Example 2: Round 32 100 to the nearest 10 000.**

► Thousands digit is 2.

4 or less.

► Round DOWN: **30 000.**

Done.

EXERCISES (EASY → DIFFICULT)

1. Round 79869 to nearest 10000:
2. Round 764016 to nearest 10000:
3. Round 506019 to nearest 10000:
4. Round 18472 to nearest 10000:
5. Round 812273 to nearest 10000:
6. Round 514739 to nearest 10000:
7. Round 888313 to nearest 10000:
8. Round 220653 to nearest 10000:
9. Round 40561 to nearest 10000:
10. Round 794542 to nearest 10000:

Order of operations (BODMAS)

Order of operations — BODMAS

DEFINITIONS**BODMAS**

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

KEY FORMULAS

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

WORKED EXAMPLES**Example 1: Calculate $4 + 5 \times 3$.**

► Multiplication comes before addition.

M before A in BODMAS.

► $5 \times 3 = 15$.

Multiply first.

► $4 + 15 = 19$.

Then add.

► **19.**

Final answer.

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**Example 2: Calculate $20 - 3 \times 4$.**

► $3 \times 4 = 12$.

Multiply first.

► $20 - 12 = 8$.

Then subtract.

EXERCISES (EASY → DIFFICULT)

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

Order of operations with brackets

BODMAS with brackets

DEFINITIONS**Brackets**

The () symbols. Whatever is inside them must be done FIRST.

KEY FORMULAS

- **Always do brackets first**, even before multiplication
- **Example:** $(4 + 2) \times 3 = 6 \times 3 = 18$
- **Without brackets:** $4 + 2 \times 3 = 4 + 6 = 10$ (different answer!)

WORKED EXAMPLES**Example 1: Calculate $(4 + 2) \times 3$.**

► Brackets first: $4 + 2 = 6$.

Do inside the brackets.

► Then multiply: $6 \times 3 = 18$.

Now the rest.

► **18.**

Final answer.

Example 2: Calculate $(10 - 4) \times 5$.

► Brackets: $10 - 4 = 6$.

Inside first.

► $6 \times 5 = 30$.

Then multiply.

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**EXERCISES (EASY → DIFFICULT)**

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

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.

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End of Chapter 1 — Mixed Exercise

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

1. In 2291295, value of the millions digit:
2. Round 764016 to nearest 10000:
3. $9 + 9 \times 4 = ?$
4. $(2 + 2) \times 9 = ?$
5. Open the Long Division game to practise step by step.
6. In 4149782, value of the millions digit:
7. Round 888313 to nearest 10000:
8. $8 + 7 \times 7 = ?$
9. $(5 + 6) \times 8 = ?$
10. Open the Long Division game to practise step by step.



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CHAPTER 2

Number Theory

- Prime** Prime factorisation
HCF Highest Common Factor (HCF)
LCM Lowest Common Multiple (LCM)
Square Square numbers and square roots

Prime factorisation

DEFINITIONS

- Prime number** A number with exactly two factors: 1 and itself. (2, 3, 5, 7, 11, ...)
- Factor** A number that divides into another with no remainder.
- Prime factorisation** Writing a number as a product of only prime numbers.

KEY FORMULAS

- **Method:** divide by the smallest prime that fits, keep going
- **Use a factor tree** or repeated division
- **Example:** $24 = 2 \times 2 \times 2 \times 3 = 2^3 \times 3$

WORKED EXAMPLES

Example 1: Find the prime factorisation of 24.

- ▶ Divide by 2: $24 \div 2 = 12$.
Smallest prime.
- ▶ $12 \div 2 = 6$, then $6 \div 2 = 3$.
Keep dividing by 2.
- ▶ 3 is prime, stop.
Cannot divide further.
- ▶ $24 = 2 \times 2 \times 2 \times 3 = 2^3 \times 3$.
Final answer.

Example 2: Prime factorisation of 36.

- ▶ $36 = 2 \times 18 = 2 \times 2 \times 9$.
Divide by 2 twice.
- ▶ $9 = 3 \times 3$, so $36 = 2^2 \times 3^2$.
Done.



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**EXERCISES (EASY → DIFFICULT)**

1. Prime factorisation of 60:
2. Prime factorisation of 72:
3. Prime factorisation of 36:
4. Prime factorisation of 24:

HCF

Highest Common Factor (HCF)

DEFINITIONS

Common factor A number that divides into BOTH numbers exactly.

HCF Highest Common Factor — the biggest number that divides into both.

KEY FORMULAS

- **Method:** list the factors of each number, find the biggest shared one
- **Or:** use prime factorisation and multiply the shared primes
- **Example:** $\text{HCF}(12, 18) = 6$

WORKED EXAMPLES**Example 1: Find the HCF of 12 and 18.**

- Factors of 12: 1, 2, 3, 4, 6, 12.

List them.

- Factors of 18: 1, 2, 3, 6, 9, 18.

List them.

- Common factors: 1, 2, 3, 6.

Shared ones.

- Highest is **6**.

Final answer.

Example 2: HCF of 16 and 24.

- Common factors: 1, 2, 4, 8.

Shared factors.

- Highest is **8**.

Done.

EXERCISES (EASY → DIFFICULT)

1. $\text{HCF}(32, 17)$:
2. $\text{HCF}(39, 29)$:
3. $\text{HCF}(30, 13)$:
4. $\text{HCF}(13, 26)$:
5. $\text{HCF}(28, 16)$:
6. $\text{HCF}(29, 15)$:
7. $\text{HCF}(39, 16)$:
8. $\text{HCF}(31, 13)$:
9. $\text{HCF}(26, 33)$:
10. $\text{HCF}(29, 27)$:

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LCM

Lowest Common Multiple (LCM)

DEFINITIONS

Multiple	The answer when you multiply a number by 1, 2, 3, ... (e.g. multiples of 4: 4, 8, 12, ...)
LCM	Lowest Common Multiple — the smallest number that BOTH numbers divide into.

KEY FORMULAS

- **Method:** list multiples of each, find the smallest shared one
- **Shortcut:** $\text{LCM} = (a \times b) \div \text{HCF}$
- **Example:** $\text{LCM}(4, 6) = 12$

WORKED EXAMPLES

Example 1: Find the LCM of 4 and 6.

- Multiples of 4: 4, 8, 12, 16, ...

List them.

- Multiples of 6: 6, 12, 18, ...

List them.

- Smallest shared multiple is 12.

First common one.

- **12.**

Final answer.

Example 2: LCM of 3 and 5.

- 3 and 5 share no factors, so $\text{LCM} = 3 \times 5$.

Multiply.

- **15.**

Done.

EXERCISES (EASY → DIFFICULT)

1. $\text{LCM}(8, 6)$:
2. $\text{LCM}(5, 3)$:
3. $\text{LCM}(8, 3)$:
4. $\text{LCM}(5, 5)$:
5. $\text{LCM}(6, 9)$:
6. $\text{LCM}(9, 6)$:
7. $\text{LCM}(4, 4)$:
8. $\text{LCM}(4, 8)$:
9. $\text{LCM}(4, 9)$:
10. $\text{LCM}(8, 4)$:



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Square numbers and roots

Square numbers and square roots

DEFINITIONS

Square number A number multiplied by itself: $5^2 = 25$.

Square root The opposite of squaring. $\sqrt{25} = 5$ because $5 \times 5 = 25$.

KEY FORMULAS

- **Squares:** 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144
- $\sqrt{(n^2)} = n$
- **Example:** $\sqrt{49} = 7$ because $7 \times 7 = 49$

WORKED EXAMPLES

Example 1: What is $\sqrt{49}$?

- Ask: what number times itself equals 49?

Definition of square root.

- $7 \times 7 = 49$.

Find it.

- $\sqrt{49} = 7$.

Final answer.

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

- $9 \times 9 = 81$.

Find the number.

- $\sqrt{81} = 9$.

Done.

EXERCISES (EASY → DIFFICULT)

1. $\sqrt{49} = ?$
2. $\sqrt{9} = ?$
3. $\sqrt{4} = ?$
4. $\sqrt{121} = ?$
5. $\sqrt{25} = ?$
6. $\sqrt{16} = ?$
7. $\sqrt{144} = ?$
8. $\sqrt{81} = ?$
9. $\sqrt{64} = ?$
10. $\sqrt{36} = ?$



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End of Chapter 2 — Mixed Exercise

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

1. Prime factorisation of 60:
2. HCF(39, 29):
3. LCM(8, 3):
4. $\sqrt{121} = ?$
5. Prime factorisation of 24:
6. HCF(29, 15):
7. LCM(4, 4):
8. $\sqrt{81} = ?$
9. Prime factorisation of 72:
10. HCF(29, 27):



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CHAPTER 3

Integers

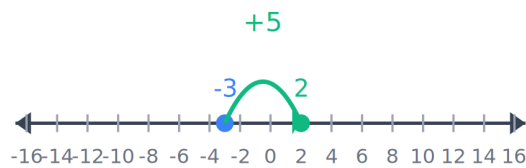
Negative Negative numbers on a number line

Add Adding integers

Subtract Subtracting integers

Compare Comparing integers

Negative numbers on a number line



$$-3 + 5 = 2$$

DEFINITIONS

Integer A whole number — positive, negative, or zero (... -2, -1, 0, 1, 2 ...).

Number line A line showing numbers in order. Negatives go left, positives go right.

KEY FORMULAS

- **Moving right** = adding (getting bigger)
- **Moving left** = subtracting (getting smaller)
- **Example:** start at -3, move right 5 → $-3 + 5 = 2$



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WORKED EXAMPLES

Example 1: What is $-3 + 5$?

- ▶ Start at -3 on the number line.

Starting point.

- ▶ Adding 5 means move 5 steps RIGHT.

Add = move right.

- ▶ $-3 \rightarrow -2 \rightarrow -1 \rightarrow 0 \rightarrow 1 \rightarrow 2$.

Count 5 steps.

- ▶ **2.**

Final answer.

Example 2: What is $-2 + 6$?

- ▶ Start at -2 , move 6 right.

Add = right.

- ▶ **4.**

Done.

EXERCISES (EASY $\rightarrow$ DIFFICULT)

1. What is $-7 + 9$?
2. What is $-8 + 10$?
3. What is $-5 + 7$?
4. What is $-6 + 8$?
5. What is $-1 + 3$?
6. What is $-4 + 6$?
7. What is $-2 + 4$?
8. What is $-10 + 12$?
9. What is $-3 + 5$?
10. What is $-9 + 11$?

Add integers

Adding integers

DEFINITIONS

Same signs Both positive or both negative.

Different signs One positive and one negative.

KEY FORMULAS

- **Same signs:** add the numbers, keep the sign
- **Different signs:** subtract, keep the sign of the bigger number
- **Example:** $(-4) + (-3) = -7$

WORKED EXAMPLES



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**Example 1: Calculate $(-4) + (-3)$.**

- Both signs are negative (same).

Same signs.

- Add the numbers: $4 + 3 = 7$.

Add their sizes.

- Keep the negative sign.

Same-sign rule.

- **-7.**

Final answer.

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

- $6 + 2 = 8$, both negative.

Same signs.

- **-8.**

Done.

EXERCISES (EASY → DIFFICULT)

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

Subtract integers

Subtracting integers

DEFINITIONS**Double negative**

Two minus signs in a row become a plus: $a - (-b) = a + b$.

KEY FORMULAS

- **Subtracting a negative = adding:** $a - (-b) = a + b$
- **Example:** $7 - (-3) = 7 + 3 = 10$
- **Memory:** two negatives make a positive

WORKED EXAMPLES**DIGITAL TEXTBOOK**

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**Example 1: Calculate $7 - (-3)$.**

► Two minus signs in a row become a plus.

Double negative.

► $7 - (-3) = 7 + 3$.

Apply the rule.

► **$= 10$.**

Add.

Example 2: Calculate $5 - (-4)$.

► $5 + 4 = 9$.

Two negatives = plus.

► **9.**

Done.

EXERCISES (EASY → DIFFICULT)

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

Compare integers

Comparing integers

DEFINITIONS

Greater than ($>$) The number further RIGHT on the number line.

Less than ($<$) The number further LEFT on the number line.

KEY FORMULAS

- **Further right = bigger.** Further left = smaller
- **Any positive $>$ any negative**
- **For negatives:** the one closer to zero is bigger ($-2 > -5$)

WORKED EXAMPLES**DIGITAL TEXTBOOK**

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**Example 1: Compare -2 and -5 . Use $<$, $>$, or $=$.**

- ▶ On the number line, -2 is to the RIGHT of -5 .

-2 is closer to zero.

- ▶ Further right means bigger.

Rule.

- ▶ $-2 > -5$.

Final answer.

Example 2: Compare 3 and -4 .

- ▶ Any positive beats any negative.

Rule.

- ▶ $3 > -4$.

Done.

EXERCISES (EASY → DIFFICULT)

1. Compare 7 $\underline{\hspace{1cm}}$ -3
2. Compare 8 $\underline{\hspace{1cm}}$ -1
3. Compare -6 $\underline{\hspace{1cm}}$ 3
4. Compare 8 $\underline{\hspace{1cm}}$ -8
5. Compare -2 $\underline{\hspace{1cm}}$ -6
6. Compare 6 $\underline{\hspace{1cm}}$ 0
7. Compare 5 $\underline{\hspace{1cm}}$ 4
8. Compare -10 $\underline{\hspace{1cm}}$ 4
9. Compare -10 $\underline{\hspace{1cm}}$ 3
10. Compare -4 $\underline{\hspace{1cm}}$ -3

End of Chapter 3 — Mixed Exercise

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

1. What is $-7 + 9$?
2. $(-3) + (-6) = ?$
3. $8 - (-6) = ?$
4. Compare 8 $\underline{\hspace{1cm}}$ -8
5. What is $-1 + 3$?
6. $(-9) + (-2) = ?$
7. $1 - (-4) = ?$
8. Compare -10 $\underline{\hspace{1cm}}$ 4
9. What is $-3 + 5$?
10. $(-1) + (-4) = ?$





CHAPTER 4

Fractions

Add Adding fractions

Subtract Subtracting fractions

Multiply Multiplying fractions

Divide Dividing fractions

Fraction Fraction of a quantity

Add fractions (different denoms)

Adding fractions

DEFINITIONS

Numerator The TOP number of a fraction.

Denominator The BOTTOM number of a fraction.

Common denominator The same bottom number for both fractions. Needed before adding.

KEY FORMULAS

- **Same denominator:** add the tops, keep the bottom
- **Different denominators:** find a common denominator first
- **Example:** $\frac{1}{2} + \frac{1}{4} = \frac{2}{4} + \frac{1}{4} = \frac{3}{4}$

WORKED EXAMPLES

Example 1: Calculate $\frac{1}{2} + \frac{1}{4}$.

- Find a common denominator: 4 (since 2 goes into 4).

Both bottoms must match.

- Rewrite: $\frac{1}{2} = \frac{2}{4}$.

Equivalent fraction.

- Add: $\frac{2}{4} + \frac{1}{4} = \frac{3}{4}$.

Add the tops.

- **$\frac{3}{4}$.**

Final answer.



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**Example 2: Calculate $\frac{1}{3} + \frac{1}{6}$.**

- Common denominator 6: $\frac{1}{3} = \frac{2}{6}$.

Convert.

- $\frac{2}{6} + \frac{1}{6} = \frac{3}{6} = \frac{1}{2}$.

Add and simplify.

EXERCISES (EASY → DIFFICULT)

1. $\frac{1}{2} + \frac{1}{4} = ?$
2. $\frac{2}{3} + \frac{1}{4} = ?$
3. $\frac{1}{3} + \frac{1}{6} = ?$

Subtract fractions

Subtracting fractions

DEFINITIONS**Subtract fractions**

Make the bottoms the same, then subtract the tops.

KEY FORMULAS

- **Same denominator:** subtract the tops, keep the bottom
- **Different denominators:** find a common denominator first
- **Example:** $\frac{3}{4} - \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$

WORKED EXAMPLES**Example 1: Calculate $\frac{3}{4} - \frac{1}{4}$.**

- Same denominator (4).

No conversion needed.

- Subtract tops: $3 - 1 = 2$.

Subtract numerators.

- $\frac{2}{4} = \frac{1}{2}$.

Simplify.

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

Final answer.

Example 2: Calculate $\frac{5}{6} - \frac{1}{3}$.

- Common denominator 6: $\frac{1}{3} = \frac{2}{6}$.

Convert.

- $\frac{5}{6} - \frac{2}{6} = \frac{3}{6} = \frac{1}{2}$.

Subtract and simplify.

EXERCISES (EASY → DIFFICULT)

1. $\frac{1}{2} - \frac{1}{4} = ?$
2. $\frac{3}{4} - \frac{1}{4} = ?$
3. $\frac{5}{6} - \frac{1}{3} = ?$

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Multiply fractions

Multiplying fractions

DEFINITIONS

Multiply fractions

Multiply tops together and bottoms together. No common denominator needed!

KEY FORMULAS

- $a/b \times c/d = (a \times c) / (b \times d)$
- **Then simplify** if you can
- **Example:** $2/3 \times 3/4 = 6/12 = 1/2$

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.

- $6/12$ simplifies to $1/2$.

Divide top and bottom by 6.

- **$1/2$.**

Final answer.

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

- $1 \times 1 = 1$; $2 \times 3 = 6$.

Tops and bottoms.

- **$1/6$.**

Done.

EXERCISES (EASY → DIFFICULT)

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



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Divide fractions

Dividing fractions

DEFINITIONS

Reciprocal A fraction flipped upside down. The reciprocal of $\frac{1}{4}$ is $\frac{4}{1}$.

Keep-Change-Flip Keep the first fraction, change $\div$ to $\times$, flip the second.

KEY FORMULAS

- $\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \times \frac{d}{c}$
- **Keep, Change, Flip**
- **Example:** $\frac{1}{2} \div \frac{1}{4} = \frac{1}{2} \times \frac{4}{1} = \frac{4}{2} = 2$

WORKED EXAMPLES

Example 1: Calculate $\frac{1}{2} \div \frac{1}{4}$.

- Keep $\frac{1}{2}$, change $\div$ to $\times$, flip $\frac{1}{4}$ to $\frac{4}{1}$.

Keep-Change-Flip.

- $\frac{1}{2} \times \frac{4}{1} = \frac{4}{2}$.

Multiply.

- $\frac{4}{2} = 2$.

Simplify.

- **2.**

Final answer.

Example 2: Calculate $\frac{1}{3} \div \frac{1}{6}$.

- $\frac{1}{3} \times \frac{6}{1} = \frac{6}{3}$.

Keep-Change-Flip.

- **2.**

Simplify.

EXERCISES (EASY → DIFFICULT)

1. $\frac{1}{2} \div \frac{1}{4} = ?$
2. $\frac{3}{4} \div \frac{1}{2} = ?$
3. $\frac{1}{3} \div \frac{1}{6} = ?$



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Fraction of a quantity



$$\frac{1}{4} \text{ of } 20 = 5$$

5 out of 20 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

- **Divide by the bottom, multiply by the top**
- $\frac{1}{2}$ of 20: $20 \div 2 = 10$
- $\frac{3}{4}$ of 20: $20 \div 4 \times 3 = 15$

WORKED EXAMPLES

Example 1: What is $\frac{1}{4}$ of 20?

► $\frac{1}{4}$ of 20 = $20 \div 4$.

Divide by the bottom.

► = 5.

Final answer.

Example 2: What is $\frac{1}{2}$ of 16?

► $16 \div 2 = 8$.

Divide by the bottom.

EXERCISES (EASY → DIFFICULT)

1. $\frac{1}{2}$ of 20 =
2. $\frac{1}{2}$ of 16 =
3. $\frac{1}{4}$ of 16 =
4. $\frac{1}{4}$ of 24 =
5. $\frac{1}{4}$ of 12 =
6. $\frac{1}{2}$ of 12 =
7. $\frac{1}{4}$ of 20 =
8. $\frac{1}{2}$ of 24 =



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End of Chapter 4 — Mixed Exercise

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

1. $\frac{1}{2} + \frac{1}{4} = ?$
2. $\frac{3}{4} - \frac{1}{4} = ?$
3. $\frac{2}{3} \times \frac{3}{4} = ?$
4. $\frac{1}{3} \div \frac{1}{6} = ?$
5. $\frac{1}{4}$ of 12 =
6. $\frac{1}{3} + \frac{1}{6} = ?$
7. $\frac{5}{6} - \frac{1}{3} = ?$
8. $\frac{1}{2} \times \frac{1}{2} = ?$
9. $\frac{1}{2} \div \frac{1}{4} = ?$
10. $\frac{1}{2}$ of 24 =





CHAPTER 5

Decimals

Add Adding decimals

Subtract Subtracting decimals

Multiply Multiplying decimals by whole numbers

Divide Dividing decimals

Convert Converting decimals and fractions

Add decimals

Adding decimals

DEFINITIONS

Decimal point The dot separating whole numbers from the fraction part.

Line up the dots Write the numbers so the decimal points are directly above each other.

KEY FORMULAS

- **Line up the decimal points** before adding
- **Add column by column**, carrying when needed
- **Example:** $2.50 + 1.30 = 3.80$

WORKED EXAMPLES

Example 1: Calculate $2.50 + 1.30$.

- Line up the decimal points.

Same place values together.

- Add hundredths: $0 + 0 = 0$.

Right column.

- Add tenths: $5 + 3 = 8$; ones: $2 + 1 = 3$.

Continue.

- **3.80.**

Final answer.



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**Example 2: Calculate $4.20 + 0.65$.**

► Line up dots, add columns.

Process.

► **4.85.**

Done.

EXERCISES (EASY → DIFFICULT)

1. $5.60 + 3.90 = ?$
2. $4.60 + 3.40 = ?$
3. $3.90 + 7.60 = ?$
4. $7.60 + 7.80 = ?$
5. $5.00 + 4.90 = ?$
6. $8.40 + 6.90 = ?$
7. $8.80 + 4.90 = ?$
8. $2.90 + 4.80 = ?$
9. $7.10 + 8.00 = ?$
10. $3.30 + 2.70 = ?$

Subtract decimals

Subtracting decimals

DEFINITIONS**Subtract decimals**

Line up the decimal points, then subtract column by column.

KEY FORMULAS

- **Line up the decimal points** before subtracting
- **Borrow** when the top digit is smaller
- **Example:** $5.70 - 2.30 = 3.40$

WORKED EXAMPLES**Example 1: Calculate $5.70 - 2.30$.**

► Line up the decimal points.

Same places together.

► Subtract tenths: $7 - 3 = 4$; ones: $5 - 2 = 3$.

Column by column.

► **3.40.**

Final answer.

Example 2: Calculate $6.50 - 1.25$.

► Line up dots, subtract columns.

Process.

► **5.25.**

Done.

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**EXERCISES (EASY → DIFFICULT)**

1. $9.90 - 3.30 = ?$
2. $5.60 - 2.10 = ?$
3. $9.30 - 3.50 = ?$
4. $9.40 - 4.10 = ?$
5. $9.00 - 2.60 = ?$
6. $8.10 - 4.60 = ?$
7. $9.00 - 2.10 = ?$
8. $9.50 - 2.60 = ?$
9. $6.20 - 2.40 = ?$
10. $5.00 - 2.20 = ?$

Multiply decimals by whole numbers

Multiplying decimals by whole numbers

DEFINITIONS

Decimal place A digit after the decimal point. 2.5 has one decimal place.

KEY FORMULAS

- **Step 1:** ignore the decimal, multiply as whole numbers
- **Step 2:** put the decimal back, same number of places
- **Example:** $2.5 \times 3 \rightarrow 25 \times 3 = 75 \rightarrow 7.5$

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

- Ignore the decimal: $25 \times 3 = 75$.

Multiply as whole numbers.

- 2.5 has 1 decimal place, so the answer does too.

Count places.

- Put decimal back: 7.5.

One place from right.

- **7.5.**

Final answer.

Example 2: Calculate 1.4×5 .

- $14 \times 5 = 70$.

As whole numbers.

- 1 decimal place → **7.0.**

Done.

EXERCISES (EASY → DIFFICULT)

1. $2.6 \times 4 = ?$
2. $4.4 \times 8 = ?$
3. $1.9 \times 4 = ?$
4. $4.6 \times 6 = ?$
5. $1.1 \times 6 = ?$
6. $4.0 \times 9 = ?$

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7. $1.6 \times 7 = ?$
8. $4.0 \times 4 = ?$
9. $4.2 \times 8 = ?$
10. $1.9 \times 7 = ?$

Divide decimals

Dividing decimals

DEFINITIONS

Divide a decimal

Bring the decimal point straight up into the answer, then divide.

KEY FORMULAS

- **Decimal ÷ whole number:** bring the decimal point straight up, divide as normal
- **Example:** $4.8 \div 2 = 2.4$

WORKED EXAMPLES

Example 1: Calculate $4.8 \div 2$.

- Bring the decimal point straight up.

Mark its place in the answer.

- Divide $48 \div 2 = 24$.

Ignoring the decimal.

- Put decimal back: 2.4.

Same position.

- **2.4.**

Final answer.

Example 2: Calculate $6.3 \div 3$.

- $63 \div 3 = 21$.

As whole numbers.

- Put decimal back: **2.1.**

Done.

EXERCISES (EASY → DIFFICULT)

1. $14.00 \div 4 = ?$
2. $21.50 \div 5 = ?$
3. $8.50 \div 5 = ?$
4. $20.50 \div 5 = ?$
5. $14.40 \div 4 = ?$
6. $8.00 \div 2 = ?$
7. $20.00 \div 5 = ?$
8. $5.60 \div 2 = ?$
9. $3.20 \div 2 = ?$
10. $18.80 \div 4 = ?$



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Convert decimal ↔ fraction

Converting decimals and fractions

DEFINITIONS

Decimal-fraction link Decimals and fractions are two ways to write the same value. $0.5 = \frac{1}{2}$.

KEY FORMULAS

- $0.5 = \frac{5}{10} = \frac{1}{2}$
- $0.25 = \frac{25}{100} = \frac{1}{4}$
- **Common ones:** $0.5 = \frac{1}{2}$, $0.25 = \frac{1}{4}$, $0.75 = \frac{3}{4}$, $0.2 = \frac{1}{5}$

WORKED EXAMPLES

Example 1: Write 0.5 as a fraction.

- 0.5 means 5 tenths = $\frac{5}{10}$.

Read the place value.

- Simplify: $\frac{5}{10} = \frac{1}{2}$.

Divide top and bottom by 5.

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

Final answer.

Example 2: Write 0.25 as a fraction.

- $0.25 = \frac{25}{100}$.

Hundredths.

- Simplify: $\frac{1}{4}$.

Done.

EXERCISES (EASY → DIFFICULT)

1. 0.75 as a fraction:
2. 0.5 as a fraction:
3. 0.2 as a fraction:
4. 0.25 as a fraction:

End of Chapter 5 — Mixed Exercise

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

1. $5.60 + 3.90 = ?$
2. $5.60 - 2.10 = ?$
3. $1.9 \times 4 = ?$
4. $20.50 \div 5 = ?$
5. 0.25 as a fraction:
6. $8.40 + 6.90 = ?$
7. $9.00 - 2.10 = ?$
8. $4.0 \times 4 = ?$
9. $3.20 \div 2 = ?$
10. 0.75 as a fraction:



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CHAPTER 6

Ratio and Proportion

Simplify Simplifying ratios
Equivalent Equivalent ratios
Unit Unit rates
Proportional Proportional reasoning

Simplify ratios

Simplifying ratios

DEFINITIONS

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

KEY FORMULAS

- **To simplify:** divide both parts by their 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 the 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 is 5.
5 divides both.
- ▶ **3:5.**
Done.



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**EXERCISES (EASY → DIFFICULT)**

1. Simplest form of 15:25:
2. Simplest form of 4:4:
3. Simplest form of 20:15:
4. Simplest form of 9:6:
5. Simplest form of 9:15:
6. Simplest form of 8:16:
7. Simplest form of 25:15:
8. Simplest form of 15:12:
9. Simplest form of 10:20:
10. Simplest form of 20:16:

Equivalent ratios

DEFINITIONS**Equivalent ratios**

Ratios that mean the same thing, like 3:5 and 6:10.

KEY FORMULAS

- **Multiply (or divide) BOTH parts by the same number**
- **Example:** $3:5 = 6:10$ (both $\times 2$) = $9:15$ (both $\times 3$)

WORKED EXAMPLES**Example 1: Fill in: $3:5 = ?:10$.**

- The 5 became 10, so it was multiplied by 2.

$$10 \div 5 = 2.$$

- Multiply the 3 by 2 as well: $3 \times 2 = 6$.

Same factor.

- **6:10.**

Final answer.

Example 2: Fill in: $2:3 = ?:9$.

- $3 \times 3 = 9$, so multiply 2 by 3.

Same factor.

- **6:9.**

Done.

EXERCISES (EASY → DIFFICULT)

1. $3:5 = ?:25$
2. $3:5 = ?:10$
3. $3:5 = ?:15$
4. $3:5 = ?:20$

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Unit rates

DEFINITIONS

Rate	A comparison of two different units, like km per hour.
Unit rate	How much per ONE unit (per 1 hour, per 1 item).

KEY FORMULAS

- **Unit rate = total ÷ number of units**
- **Speed = distance ÷ time**
- **Example:** 120 km in 2 h → $120 \div 2 = 60$ km/h

WORKED EXAMPLES

Example 1: A car travels 120 km in 2 hours. Find the speed.

► Speed = distance ÷ time.

Unit rate formula.

► $= 120 \div 2$.

Substitute.

► **60 km/h.**

Final answer.

Example 2: 180 km in 3 hours. Speed?

► $180 \div 3 = 60$ km/h.

Divide.

EXERCISES (EASY → DIFFICULT)

1. 60 km in 2 h. Speed?
2. 180 km in 4 h. Speed?
3. 240 km in 2 h. Speed?
4. 60 km in 3 h. Speed?
5. 240 km in 4 h. Speed?
6. 240 km in 5 h. Speed?
7. 120 km in 5 h. Speed?
8. 60 km in 5 h. Speed?
9. 120 km in 2 h. Speed?
10. 240 km in 3 h. Speed?

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Proportional reasoning

DEFINITIONS

Proportion

When two quantities increase together at the same rate.

KEY FORMULAS

- **Find the cost per ONE item first**, then multiply
- **Example:** 3 pens cost R30 → 1 pen = R10 → 5 pens = R50

WORKED EXAMPLES

Example 1: If 3 pens cost R30, how much do 5 pens cost?

- Cost per 1 pen: $30 \div 3 = \text{R}10$.

Find the unit cost.

- Cost of 5: $5 \times \text{R}10 = \text{R}50$.

Multiply.

- **R50.**

Final answer.

Example 2: 3 pens cost R45. Cost of 4 pens?

- Per pen: $45 \div 3 = \text{R}15$.

Unit cost.

- $4 \times \text{R}15 = \text{R}60$.

Multiply.

EXERCISES (EASY → DIFFICULT)

1. If 3 pens cost R36, 2 pens cost?
2. If 3 pens cost R87, 2 pens cost?
3. If 3 pens cost R78, 3 pens cost?
4. If 3 pens cost R36, 5 pens cost?
5. If 3 pens cost R60, 2 pens cost?
6. If 3 pens cost R90, 2 pens cost?
7. If 3 pens cost R48, 3 pens cost?
8. If 3 pens cost R30, 3 pens cost?
9. If 3 pens cost R33, 2 pens cost?
10. If 3 pens cost R57, 4 pens cost?

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End of Chapter 6 — Mixed Exercise

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

1. Simplest form of 15:25:
2. $3:5 = ? : 10$
3. 240 km in 2 h. Speed?
4. If 3 pens cost R36, 5 pens cost?
5. Simplest form of 9:15:
6. $3:5 = ? : 20$
7. 120 km in 5 h. Speed?
8. If 3 pens cost R30, 3 pens cost?
9. Simplest form of 10:20:
10. $3:5 = ? : 25$



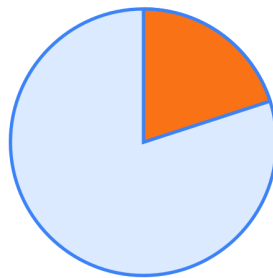
CHAPTER 7

Percentage

- Percent** Finding a percentage of a number
- Percent** Percentage change
- Percent** Converting percent, decimal, and fraction
- Discount** Discount and VAT

Percent of a number

Finding a percentage of a number



20% 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 = $(p \div 100) \times n$**
- **Shortcuts:** 10% = $\div 10$, 50% = $\div 2$, 25% = $\div 4$, 20% = $\div 5$
- **Example:** 20% of 80 = $0.2 \times 80 = 16$



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WORKED EXAMPLES

Example 1: Find 20% of 80.

► $20\% = 20/100 = 0.2.$

Convert to decimal.

► $0.2 \times 80 = 16.$

"Of" means multiply.

► **16.**

Final answer.

Example 2: Find 25% of 40.

► $25\% = \frac{1}{4}$, so $40 \div 4.$

Quarter shortcut.

► **10.**

Done.

EXERCISES (EASY → DIFFICULT)

1. 20% of 24 =
2. 10% of 28 =
3. 20% of 20 =
4. 20% of 32 =
5. 20% of 40 =
6. 20% of 8 =
7. 25% of 20 =
8. 50% of 12 =
9. 25% of 40 =
10. 10% of 8 =

Percent change

Percentage change

DEFINITIONS

Percent change How much something went up or down, as a % of the original.

KEY FORMULAS

- **% change = (change ÷ original) × 100**
- **Increase = positive, decrease = negative**
- **Example:** $100 \rightarrow 120$ is a change of 20, so $(20 \div 100) \times 100 = 20\%$

WORKED EXAMPLES



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**Example 1: A price goes from 100 to 120. What is the percent change?**

► Change: $120 - 100 = 20$.

New minus old.

► % change = $(20 \div 100) \times 100$.

Apply formula.

► = 20%.

An increase.

► **20%.**

Final answer.

Example 2: From 100 to 80. Percent change?

► Change: $80 - 100 = -20$.

A decrease.

► $(-20 \div 100) \times 100 = -20\%$.

Done.

EXERCISES (EASY → DIFFICULT)

1. From 100 to 110: % change?
2. From 100 to 80: % change?
3. From 100 to 120: % change?
4. From 100 to 90: % change?

Percent ↔ decimal ↔ fraction

Converting percent, decimal, and fraction

DEFINITIONS

Three forms Percent, decimal, and fraction are three ways to write the same value.

KEY FORMULAS

- **Percent → Decimal:** divide by 100 (move decimal 2 left). $25\% = 0.25$
- **Decimal → Percent:** multiply by 100. $0.5 = 50\%$
- **Common:** $25\% = 0.25 = \frac{1}{4}$; $50\% = 0.5 = \frac{1}{2}$; $10\% = 0.1 = \frac{1}{10}$

WORKED EXAMPLES**Example 1: Write 25% as a decimal.**

► Divide by 100 (move the dot 2 places left).

Percent to decimal.

► $25 \div 100 = 0.25$.

Calculate.

► **0.25.**

Final answer.

Example 2: Write 50% as a decimal.

► $50 \div 100 = 0.5$.

Move 2 left.

► **0.5.**

Done.

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**EXERCISES (EASY → DIFFICULT)**

1. 25% as decimal:
2. 50% as decimal:
3. 10% as decimal:

Discount and VAT

DEFINITIONS

Discount	A reduction in price, given as a percentage.
VAT	Value Added Tax — an extra percentage added to a price (15% in South Africa).

KEY FORMULAS

- **Discount amount = (discount %) × original price**
- **New price = original – discount**
- **Shortcut:** d% off → pay (100 – d)% of the price

WORKED EXAMPLES**Example 1: A R200 item is discounted by 20%. Find the new price.**

► Discount: 20% of 200 = R40.

Find discount amount.

► New price: $200 - 40 = \text{R}160$.

Subtract.

► **R160.**

Final answer.

Example 2: R300 discounted by 25%. New price?

► Discount: 25% of 300 = R75.

Find discount.

► $300 - 75 = \text{R}225$.

Subtract.

EXERCISES (EASY → DIFFICULT)

1. R102 discounted by 10%. New price:
2. R351 discounted by 20%. New price:
3. R253 discounted by 10%. New price:
4. R293 discounted by 20%. New price:
5. R154 discounted by 20%. New price:
6. R122 discounted by 20%. New price:
7. R111 discounted by 10%. New price:
8. R196 discounted by 10%. New price:
9. R266 discounted by 10%. New price:
10. R360 discounted by 10%. New price:

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End of Chapter 7 — Mixed Exercise

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

1. 20% of 24 =
2. From 100 to 80: % change?
3. 10% as decimal:
4. R293 discounted by 20%. New price:
5. 20% of 40 =
6. From 100 to 90: % change?
7. 25% as decimal:
8. R196 discounted by 10%. New price:
9. 25% of 40 =
10. From 100 to 110: % change?



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CHAPTER 8

Algebra

- Substitute** Substituting into expressions
- Solve** Solving simple equations
- Solve** Solving equations with multiplication
- Number** Number patterns and rules

Substitute into expressions

Substituting into expressions

DEFINITIONS

Variable	A letter that stands for a number, like x .
Substitute	Replace the letter with a given number.
Expression	A maths phrase with no equals sign, like $2x + 5$.

KEY FORMULAS

- **Replace the letter with the value, then calculate using BODMAS**
- **Example:** if $x = 4$, then $2x + 5 = 2(4) + 5 = 13$

WORKED EXAMPLES

Example 1: If $x = 4$, find the value of $2x + 5$.

- Replace x with 4.

Substitute.

- $2(4) + 5$.

Use BODMAS.

- $= 8 + 5 = 13$.

Multiply then add.

- **13.**

Final answer.

Example 2: If $x = 3$, find $2x + 7$.

- $2(3) + 7 = 6 + 7$.

Substitute.

- **13.**

Done.



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**EXERCISES (EASY → DIFFICULT)**

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

Solve simple equations

Solving simple equations

DEFINITIONS

Equation	A maths sentence with an equals sign. Both sides must balance.
Solve	Find the value of the letter that makes it true.

KEY FORMULAS

- **Golden rule:** do the same to both sides
- **To undo + b:** subtract b from both sides
- **Example:** $x + 5 = 12 \rightarrow x = 12 - 5 = 7$

WORKED EXAMPLES**Example 1: Solve $x + 5 = 12$.**

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

Inverse operation.

▶ $x = 12 - 5.$

Apply to both sides.

▶ $x = 7.$

Check: $7 + 5 = 12$.

▶ **$x = 7.$**

Final answer.

Example 2: Solve $x + 3 = 10$.

▶ $x = 10 - 3.$

Subtract 3.

▶ **$x = 7.$**

Done.

EXERCISES (EASY → DIFFICULT)

1. Solve $x + 17 = 24$:
2. Solve $x + 4 = 12$:
3. Solve $x + 20 = 22$:
4. Solve $x + 4 = 18$:
5. Solve $x + 12 = 26$:

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6. Solve $x + 19 = 29$:
7. Solve $x + 7 = 17$:
8. Solve $x + 10 = 18$:
9. Solve $x + 1 = 8$:
10. Solve $x + 15 = 30$:

Solve equations with multiplication

Solving equations with multiplication

DEFINITIONS

Coefficient

The number in front of a letter. In $3x$, the coefficient is 3.

KEY FORMULAS

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

WORKED EXAMPLES

Example 1: Solve $3x = 12$.

- Undo $\times 3$ by dividing both sides by 3.

Inverse operation.

- $x = 12 \div 3$.

Apply to both sides.

- $x = 4$.

Check: $3(4) = 12$.

- **$x = 4$.**

Final answer.

Example 2: Solve $5x = 30$.

- $x = 30 \div 5$.

Divide by 5.

- **$x = 6$.**

Done.

EXERCISES (EASY $\rightarrow$ DIFFICULT)

1. Solve $5x = 10$:
2. Solve $9x = 99$:
3. Solve $9x = 108$:
4. Solve $7x = 14$:
5. Solve $7x = 70$:
6. Solve $4x = 12$:
7. Solve $4x = 32$:
8. Solve $6x = 42$:
9. Solve $5x = 45$:
10. Solve $7x = 28$:

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Number patterns with rule

Number patterns and rules

DEFINITIONS

Sequence	A list of numbers that follow a rule.
Common difference	The amount added each step. For 3, 7, 11 the difference is 4.

KEY FORMULAS

- **Find the rule:** subtract one term from the next
- **If it goes up by the same amount each time**, the rule is +(that amount)
- **Example:** 5, 8, 11, 14 → rule is +3

WORKED EXAMPLES

Example 1: Find the rule for 5, 8, 11, 14, ...

- Subtract consecutive terms: $8 - 5 = 3$.

Find the difference.

- Check: $11 - 8 = 3$, $14 - 11 = 3$.

Constant difference.

- The rule is add 3.

Constant step.

- **+3.**

Final answer.

Example 2: Rule for 2, 6, 10, 14?

- $6 - 2 = 4$.

Difference.

- **+4.**

Done.

EXERCISES (EASY → DIFFICULT)

1. 9, 13, 17, __ Rule?
2. 4, 9, 14, __ Rule?
3. 4, 10, 16, __ Rule?
4. 5, 8, 11, __ Rule?
5. 5, 12, 19, __ Rule?
6. 6, 8, 10, __ Rule?
7. 2, 9, 16, __ Rule?
8. 5, 9, 13, __ Rule?
9. 7, 13, 19, __ Rule?
10. 6, 11, 16, __ Rule?



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End of Chapter 8 — Mixed Exercise

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

1. If $x = 5$, value of $2x + 6$:
2. Solve $x + 4 = 12$:
3. Solve $9x = 108$:
4. 5, 8, 11, __ Rule?
5. If $x = 7$, value of $2x + 2$:
6. Solve $x + 19 = 29$:
7. Solve $4x = 32$:
8. 5, 9, 13, __ Rule?
9. If $x = 4$, value of $2x + 7$:
10. Solve $x + 15 = 30$:



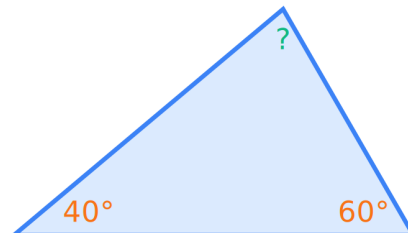


CHAPTER 9

Geometry

- Angles** Angles in a triangle
- Angles** Angles on a straight line
- Angles** Angles in a quadrilateral
- Properties** Properties of triangles
- Properties** Properties of quadrilaterals

Angles in a triangle



Triangle angles sum to 180°

DEFINITIONS

- Interior angles** The angles inside a shape.
- Triangle angle sum** The three angles of any triangle add to 180° .

KEY FORMULAS

- **Triangle rule:** $\text{angle A} + \text{angle B} + \text{angle C} = 180^\circ$
- **To find a missing angle:** $180^\circ - (\text{sum of the other two})$



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WORKED EXAMPLES

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

- All three angles add to 180° .

Triangle rule.

- Known sum: $40 + 60 = 100$.

Add the two.

- Third: $180 - 100 = 80^\circ$.

Subtract.

- **80° .**

Final answer.

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

- $180 - (50 + 70) = 180 - 120$.

Apply rule.

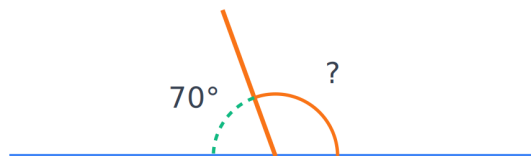
- **60° .**

Done.

EXERCISES (EASY → DIFFICULT)

1. Two angles of triangle: 62° , 59° . Third?
2. Two angles of triangle: 79° , 65° . Third?
3. Two angles of triangle: 42° , 77° . Third?
4. Two angles of triangle: 58° , 74° . Third?
5. Two angles of triangle: 57° , 58° . Third?
6. Two angles of triangle: 34° , 31° . Third?
7. Two angles of triangle: 56° , 70° . Third?
8. Two angles of triangle: 66° , 79° . Third?
9. Two angles of triangle: 50° , 62° . Third?
10. Two angles of triangle: 38° , 69° . Third?

Angles on a straight line



Angles on a straight line sum to 180°



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DEFINITIONS

Straight line An angle of 180° — half a full turn.

KEY FORMULAS

- Angles on a straight line add to 180°
- If one angle is a , the other is $180^\circ - a$

WORKED EXAMPLES

Example 1: Angles on a straight line, one is 70° . Find the other.

- They add to 180° .

Straight-line rule.

- Other = $180 - 70$.

Subtract.

- **110° .**

Final answer.

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

- $180 - 50 = \mathbf{130^\circ}$.

Subtract.

EXERCISES (EASY → DIFFICULT)

1. Angles on a line, one is 110° . Other?
2. Angles on a line, one is 56° . Other?
3. Angles on a line, one is 131° . Other?
4. Angles on a line, one is 59° . Other?
5. Angles on a line, one is 40° . Other?
6. Angles on a line, one is 100° . Other?
7. Angles on a line, one is 73° . Other?
8. Angles on a line, one is 46° . Other?
9. Angles on a line, one is 98° . Other?
10. Angles on a line, one is 30° . Other?

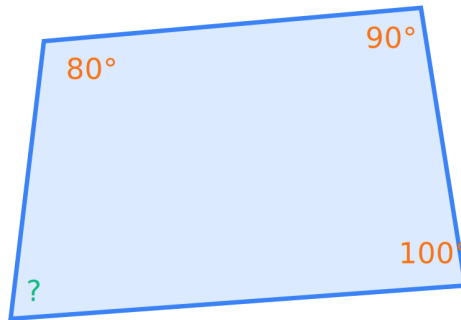


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Angles in a quadrilateral



Quadrilateral angles sum to 360°

DEFINITIONS

Quadrilateral A four-sided shape (square, rectangle, etc.).

KEY FORMULAS

- **Quadrilateral angles add to 360°**
- **To find a missing one:** $360^\circ - (\text{sum of the other three})$

WORKED EXAMPLES

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

- They add to 360° .

Quadrilateral rule.

- Known sum: $80 + 90 + 100 = 270$.

Add the three.

- Fourth: $360 - 270 = 90^\circ$.

Subtract.

- **90° .**

Final answer.

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

- $360 - 260 = 100^\circ$.

Subtract.

EXERCISES (EASY → DIFFICULT)

1. 3 angles of quad: 73° , 118° , 118° . Fourth?
2. 3 angles of quad: 66° , 86° , 69° . Fourth?
3. 3 angles of quad: 67° , 65° , 91° . Fourth?
4. 3 angles of quad: 72° , 82° , 89° . Fourth?
5. 3 angles of quad: 74° , 92° , 68° . Fourth?
6. 3 angles of quad: 86° , 60° , 102° . Fourth?
7. 3 angles of quad: 85° , 89° , 71° . Fourth?
8. 3 angles of quad: 79° , 86° , 113° . Fourth?



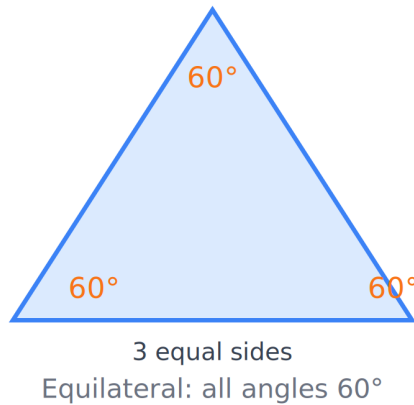
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9. 3 angles of quad: 81° , 74° , 106° . Fourth?
10. 3 angles of quad: 60° , 106° , 104° . Fourth?

Properties of triangles



DEFINITIONS

Equilateral triangle	All three sides equal and all three angles 60° .
Right triangle	Has one 90° angle.
Isosceles triangle	Two equal sides and two equal angles.

KEY FORMULAS

- **Equilateral:** each angle = $180 \div 3 = 60^\circ$
- **Right:** one angle is 90°
- **Isosceles:** two base angles equal

WORKED EXAMPLES

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

- All three angles are equal.
Equilateral property.
- $180 \div 3 = 60^\circ$.
Share equally.
- 60° .
Final answer.

Example 2: How many degrees in the right angle of a right triangle?

- A right angle is 90° .
Definition.
- 90° .
Done.



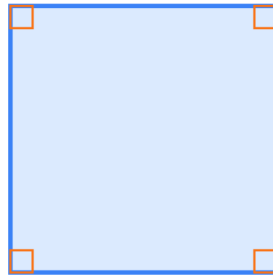
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**EXERCISES (EASY → DIFFICULT)**

1. Each angle of an equilateral triangle:

Properties of quadrilaterals



4 equal sides, 4 right angles

Square: 4 right angles

DEFINITIONS

Square	4 equal sides and 4 right angles (90° each).
Rectangle	4 right angles, opposite sides equal.
Right angle	An angle of exactly 90° .

KEY FORMULAS

- **Square:** 4 right angles, 4 equal sides
- **Rectangle:** 4 right angles, opposite sides equal
- **Both have 4 right angles**

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

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

Definition.

- **4 right angles.**

Final answer.

Example 2: How many right angles in a rectangle?

- A rectangle also has 4 corners at 90° .

Definition.

- **4.**

Done.

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**EXERCISES (EASY → DIFFICULT)**

1. A square has how many right angles?

End of Chapter 9 — Mixed Exercise

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

1. Two angles of triangle: 62° , 59° . Third?
2. Angles on a line, one is 56° . Other?
3. 3 angles of quad: 67° , 65° , 91° . Fourth?
4. Each angle of an equilateral triangle:
5. A square has how many right angles?
6. Two angles of triangle: 34° , 31° . Third?
7. Angles on a line, one is 73° . Other?
8. 3 angles of quad: 79° , 86° , 113° . Fourth?
9. Each angle of an equilateral triangle:
10. A square has how many right angles?

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CHAPTER 10

Coordinate Plane

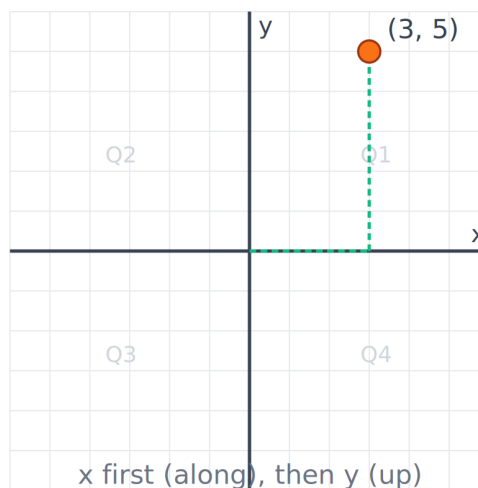
Plot Plotting points

Quadrants Quadrants

Read Reading coordinates from a grid

Plot points (first quadrant)

Plotting points



DEFINITIONS

Coordinates	A pair of numbers (x, y) giving a point's position.
x-axis	The horizontal number line (left-right).
y-axis	The vertical number line (up-down).

KEY FORMULAS

- **A point is written (x, y)**
- **x is first** — it tells you how far ALONG (horizontal)
- **y is second** — it tells you how far UP (vertical)
- **Memory:** "along the corridor, then up the stairs"



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WORKED EXAMPLES

Example 1: In the point (3, 5), which axis is the 3 on?

- The first number is the x-coordinate.

x comes first.

- x is the horizontal axis.

Along the corridor.

- **x-axis.**

Final answer.

Example 2: In (2, 4), which number tells you how far up?

- The second number (4) is the y-coordinate.

y is vertical.

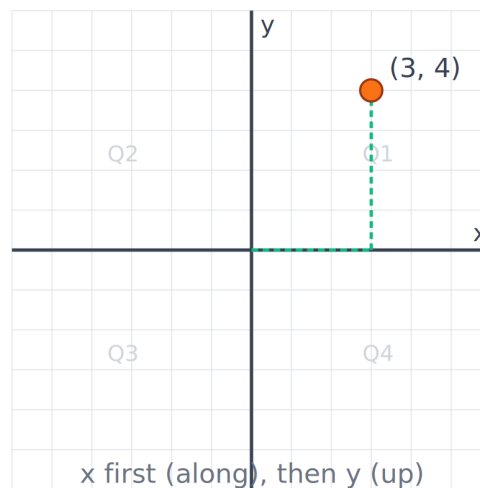
- **4 (up the y-axis).**

Done.

EXERCISES (EASY → DIFFICULT)

1. Point (4, 1): which axis is 4 on?
2. Point (1, 1): which axis is 1 on?
3. Point (5, 4): which axis is 5 on?
4. Point (3, 5): which axis is 3 on?
5. Point (1, 4): which axis is 1 on?
6. Point (3, 2): which axis is 3 on?
7. Point (2, 2): which axis is 2 on?
8. Point (2, 4): which axis is 2 on?
9. Point (5, 1): which axis is 5 on?
10. Point (2, 3): which axis is 2 on?

Quadrants



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DEFINITIONS

Quadrant	One of the four regions of the plane, numbered 1 to 4.
Origin	The point (0, 0) where the axes cross.

KEY FORMULAS

- **Quadrant 1:** x positive, y positive (top right)
- **Quadrant 2:** x negative, y positive (top left)
- **Quadrant 3:** x negative, y negative (bottom left)
- **Quadrant 4:** x positive, y negative (bottom right)

WORKED EXAMPLES

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

- Both x and y are positive.

Check signs.

- Both positive → top right → Quadrant 1.

Rule.

- **Quadrant 1.**

Final answer.

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

- Both positive.

Check signs.

- **Quadrant 1.**

Done.

EXERCISES (EASY → DIFFICULT)

1. Point (3, 5) is in which quadrant?
2. Point (1, 5) is in which quadrant?
3. Point (2, 1) is in which quadrant?
4. Point (3, 3) is in which quadrant?
5. Point (4, 3) is in which quadrant?
6. Point (1, 3) is in which quadrant?
7. Point (5, 3) is in which quadrant?
8. Point (3, 2) is in which quadrant?
9. Point (5, 4) is in which quadrant?
10. Point (4, 1) is in which quadrant?



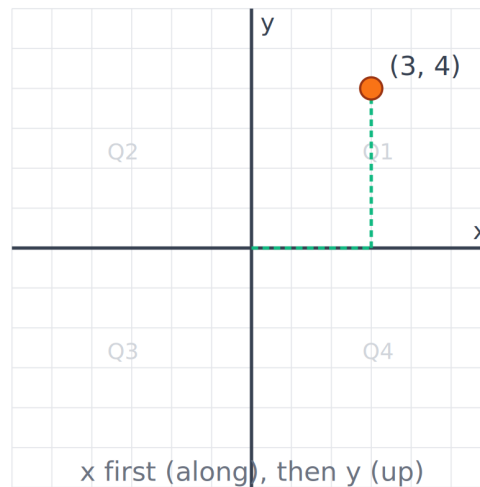
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Read points from a grid

Reading coordinates from a grid



DEFINITIONS

Reading coordinates

Count how far right (x) and how far up (y) the point is from the origin.

KEY FORMULAS

- Count right from the origin → that's x
- Count up from the origin → that's y
- Write as (x, y)

WORKED EXAMPLES

Example 1: A point is 3 right and 4 up from the origin. Write its coordinates.

- Right is the x-direction: $x = 3$.

Count right.

- Up is the y-direction: $y = 4$.

Count up.

- Write as (x, y): (3, 4).

x first.

- **(3, 4).**

Final answer.

Example 2: 2 right and 5 up. Coordinates?

- $x = 2$, $y = 5$.

Right then up.

- **(2, 5).**

Done.



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**EXERCISES (EASY → DIFFICULT)**

1. Coordinates of point 1 right and 4 up from origin:
2. Coordinates of point 3 right and 5 up from origin:
3. Coordinates of point 4 right and 1 up from origin:
4. Coordinates of point 2 right and 1 up from origin:
5. Coordinates of point 1 right and 5 up from origin:
6. Coordinates of point 5 right and 1 up from origin:
7. Coordinates of point 2 right and 3 up from origin:
8. Coordinates of point 5 right and 5 up from origin:
9. Coordinates of point 1 right and 3 up from origin:
10. Coordinates of point 4 right and 2 up from origin:

End of Chapter 10 — Mixed Exercise

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

1. Point (4, 1): which axis is 4 on?
2. Point (1, 5) is in which quadrant?
3. Coordinates of point 4 right and 1 up from origin:
4. Point (3, 5): which axis is 3 on?
5. Point (4, 3) is in which quadrant?
6. Coordinates of point 5 right and 1 up from origin:
7. Point (2, 2): which axis is 2 on?
8. Point (3, 2) is in which quadrant?
9. Coordinates of point 1 right and 3 up from origin:
10. Point (2, 3): which axis is 2 on?

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**CHAPTER 11**

Mensuration

- Area** Area of a rectangle
- Area** Area of a triangle
- Area** Area of compound shapes
- Volume** Volume of a rectangular prism
- Surface** Surface area of a cube

Area of rectangle

Area of a rectangle



$$A = l \times w = 40$$

Area = space inside

DEFINITIONS

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

KEY FORMULAS

- **Area of rectangle:** $A = \text{length} \times \text{width}$
- **Area of square:** $A = \text{side}^2$



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WORKED EXAMPLES

Example 1: Find the area of a rectangle 8 long and 5 wide.

► $A = \text{length} \times \text{width}.$

Rectangle formula.

► $= 8 \times 5.$

Substitute.

► $= 40$ square units.

Multiply.

► **40.**

Final answer.

Example 2: Area of a 6×4 rectangle?

► $6 \times 4 = 24.$

Multiply.

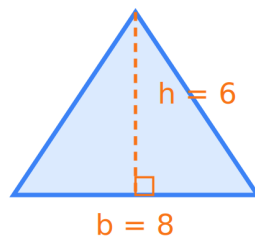
EXERCISES (EASY → DIFFICULT)

1. Area of 14×6 :
2. Area of 7×10 :
3. Area of 9×5 :
4. Area of 15×10 :
5. Area of 12×8 :
6. Area of 5×7 :
7. Area of 8×4 :
8. Area of 11×9 :
9. Area of 13×5 :
10. Area of 15×3 :

Area of triangle

Area of a triangle

$$A = \frac{1}{2} \times b \times h = 24$$



Height $\perp$ base

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DEFINITIONS

Base	A side of the triangle, usually the bottom.
Height	The perpendicular (straight up) distance from the base to the top point.

KEY FORMULAS

- **Area of triangle:** $A = \frac{1}{2} \times \text{base} \times \text{height}$
- **Height must be perpendicular** to the base

WORKED EXAMPLES

Example 1: Find the area of a triangle with base 8 and height 6.

► $A = \frac{1}{2} \times \text{base} \times \text{height}.$

Triangle formula.

► $= \frac{1}{2} \times 8 \times 6 = \frac{1}{2} \times 48.$

Substitute.

► $= 24.$

Halve.

► **24.**

Final answer.

Example 2: Base 10, height 4. Area?

► $\frac{1}{2} \times 10 \times 4 = 20.$

Apply formula.

EXERCISES (EASY → DIFFICULT)

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

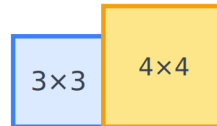


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Area of compound shapes



$$9 + 16 = 25$$

Split, find each area, add

DEFINITIONS

Compound shape

A shape made by joining simpler shapes together.

KEY FORMULAS

- Split the shape into rectangles/squares
- Find each area, then add them up
- **Example:** an L-shape = two squares added together

WORKED EXAMPLES

Example 1: An L-shape is made of a 3×3 square and a 4×4 square. Total area?

- Area of first square: $3 \times 3 = 9$.

First piece.

- Area of second square: $4 \times 4 = 16$.

Second piece.

- Add them: $9 + 16 = 25$.

Total.

- **25.**

Final answer.

Example 2: A 2×2 and a 5×5 square joined. Total area?

- $4 + 25 = 29$.

Add areas.

EXERCISES (EASY → DIFFICULT)

1. L-shape: $6 \times 6 + 4 \times 4$ squares. Total area?
2. L-shape: $3 \times 3 + 4 \times 4$ squares. Total area?
3. L-shape: $3 \times 3 + 3 \times 3$ squares. Total area?
4. L-shape: $6 \times 6 + 5 \times 5$ squares. Total area?
5. L-shape: $5 \times 5 + 3 \times 3$ squares. Total area?
6. L-shape: $4 \times 4 + 6 \times 6$ squares. Total area?

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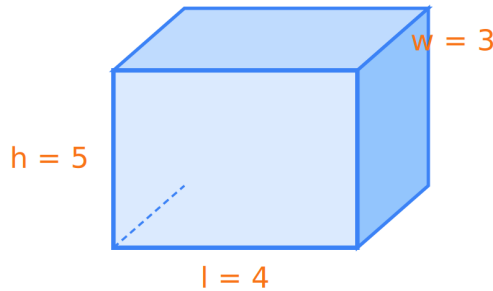
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7. L-shape: $5 \times 5 + 6 \times 6$ squares. Total area?
8. L-shape: $3 \times 3 + 5 \times 5$ squares. Total area?
9. L-shape: $4 \times 4 + 4 \times 4$ squares. Total area?
10. L-shape: $3 \times 3 + 6 \times 6$ squares. Total area?

Volume of rectangular prism

Volume of a rectangular prism



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

Volume = space inside

DEFINITIONS

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

KEY FORMULAS

- **Volume of box:** $V = \text{length} \times \text{width} \times \text{height}$
- **Multiply all three dimensions**

WORKED EXAMPLES

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

► $V = \text{length} \times \text{width} \times \text{height}$.

Box formula.

► $= 4 \times 3 \times 5$.

Substitute.

► $= 12 \times 5 = 60$.

Multiply step by step.

► **60.**

Final answer.

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

► $2 \times 3 \times 4 = 24$.

Multiply.



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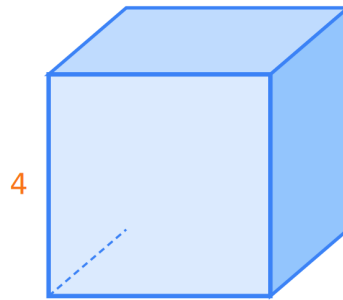
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**EXERCISES (EASY → DIFFICULT)**

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

Surface area of cube

Surface area of a cube



side = 4

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

A cube has 6 square faces

DEFINITIONS

Surface area The total area of all the faces of a 3D shape.

Cube A box with 6 identical square faces.

KEY FORMULAS

- **Surface area of cube:** $SA = 6 \times \text{side}^2$
- **A cube has 6 equal square faces**
- **Each face area = side^2**

WORKED EXAMPLES**DIGITAL TEXTBOOK**

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

► $SA = 6 \times \text{side}^2$.

Cube formula.

► $= 6 \times 4^2 = 6 \times 16$.

Square the side first.

► $= 96$.

Multiply by 6.

► **96.**

Final answer.

Example 2: Cube side 3. Surface area?

► $6 \times 9 = 54$.

Square then $\times 6$.

EXERCISES (EASY → DIFFICULT)

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

End of Chapter 11 — Mixed Exercise

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

1. Area of 14×6 :
2. Area of triangle base 10, height 6:
3. L-shape: $3 \times 3 + 3 \times 3$ squares. Total area?
4. Volume of $6 \times 5 \times 8$ box:
5. Surface area of cube side 2:
6. Area of 5×7 :
7. Area of triangle base 8, height 7:
8. L-shape: $3 \times 3 + 5 \times 5$ squares. Total area?
9. Volume of $2 \times 8 \times 7$ box:
10. Surface area of cube side 8:





CHAPTER 12

Statistics

Mean Mean (average)

Median Median

Mode Mode

Range Range

Mean (average)

DEFINITIONS

Mean The average: add all the values, then divide by how many there are.

KEY FORMULAS

- **Mean = sum of values ÷ how many values**
- **Example:** mean of 2, 4, 6 = $(2+4+6) \div 3 = 4$

WORKED EXAMPLES

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

- Add them: $4 + 6 + 8 + 10 + 2 = 30$.

Find the sum.

- Count: there are 5 values.

The 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.

EXERCISES (EASY → DIFFICULT)

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



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

Median

DEFINITIONS

Median

The middle value when the data is sorted in order.

KEY FORMULAS

- **Step 1:** sort the values from smallest to biggest
- **Step 2:** pick the middle one
- **If two are in the middle,** take their average

WORKED EXAMPLES

Example 1: Find the median of 3, 1, 4, 1, 5.

- Sort: 1, 1, 3, 4, 5.

Smallest to biggest.

- The middle value is the 3rd one.

5 values, middle is 3rd.

- Middle = 3.

Read it off.

- **3.**

Final answer.

Example 2: Median of 7, 2, 9, 4, 6?

- Sort: 2, 4, 6, 7, 9.

Order them.

- Middle = **6.**

Done.

EXERCISES (EASY → DIFFICULT)

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

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Mode

DEFINITIONS

Mode The value that appears most often.

KEY FORMULAS

- **Mode = the most frequent value**
- **Memory:** M_{Od}e = M_Ost often
- **There can be more than one mode**, or none

WORKED EXAMPLES

Example 1: Find the mode of 4, 4, 2, 7, 9.

- Count how often each appears.

Tally them.

- 4 appears twice; the rest appear once.

4 is most frequent.

- **Mode = 4.**

Final answer.

Example 2: Mode of 5, 5, 3, 8, 1?

- 5 appears most.

Count.

- **5.**

Done.

EXERCISES (EASY → DIFFICULT)

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



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Range

DEFINITIONS

Range

The difference between the biggest and smallest values.

KEY FORMULAS

- **Range = maximum – minimum**
- **Shows how spread out the data is**

WORKED EXAMPLES

Example 1: Find the range of 3, 8, 14.

- ▶ Biggest value: 14.
Maximum.
- ▶ Smallest value: 3.
Minimum.
- ▶ $\text{Range} = 14 - 3 = 11$.
Subtract.
- ▶ **11.**
Final answer.

Example 2: Range of 4, 9, 12?

- ▶ $12 - 4 = 8$.
Max – min.

EXERCISES (EASY → DIFFICULT)

1. Range of 5, 7, 11:
2. Range of 5, 8, 11:
3. Range of 1, 9, 11:
4. Range of 2, 7, 14:
5. Range of 4, 9, 12:
6. Range of 1, 8, 13:
7. Range of 4, 8, 13:
8. Range of 2, 8, 14:
9. Range of 3, 8, 12:
10. Range of 5, 10, 13:

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End of Chapter 12 — Mixed Exercise

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

1. Mean of 10, 10, 10, 7, 3:
2. Median of 2, 3, 5, 7, 8:
3. Mode of 2, 2, 7, 3, 9:
4. Range of 2, 7, 14:
5. Mean of 2, 8, 6, 8, 9:
6. Median of 1, 3, 6, 8, 8:
7. Mode of 4, 4, 4, 2, 6:
8. Range of 2, 8, 14:
9. Mean of 7, 9, 2, 3, 4:
10. Median of 3, 4, 5, 8, 9:



CHAPTER 13

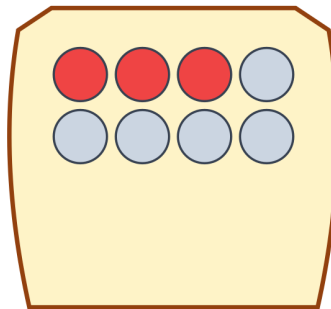
Probability

Probability Probability of an event

Certain, Certain, impossible, likely

Coin Coin and dice probabilities

Probability of an event



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

favourable $\div$ total

DEFINITIONS

Probability How likely something is, from 0 (impossible) to 1 (certain).

Favourable outcome An outcome that counts as the event happening.

Total outcomes All the possible results.

KEY FORMULAS

- $P(\text{event}) = \text{favourable outcomes} \div \text{total outcomes}$
- Always between 0 and 1
- **Example:** 3 red out of 8 balls $\rightarrow P(\text{red}) = \frac{3}{8}$



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WORKED EXAMPLES

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

- Favourable outcomes (red): 3.

Count the reds.

- Total outcomes: 8.

Total balls.

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

Favourable $\div$ total.

- **$3/8$.**

Final answer.

Example 2: 10 balls, 4 blue. $P(\text{blue})$?

- 4 out of 10 = $4/10$.

Favourable $\div$ total.

- **$2/5$.**

Simplify.

EXERCISES (EASY $\rightarrow$ DIFFICULT)

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

Certain, impossible, likely

DEFINITIONS

Certain	Definitely will happen. Probability = 1.
Impossible	Definitely will NOT happen. Probability = 0.
Likely / unlikely	In between — more or less than a 50/50 chance.

KEY FORMULAS

- **Certain:** $P = 1$
- **Impossible:** $P = 0$
- **Even chance:** $P = \frac{1}{2}$
- **All probabilities are between 0 and 1**



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WORKED EXAMPLES

Example 1: What is the probability of rolling a number from 1 to 6 on a normal die?

- ▶ A die only has the numbers 1 to 6.

Every roll is 1-6.

- ▶ So this ALWAYS happens — it is certain.

Certain event.

- ▶ $P = 1$.

Certain = 1.

- ▶ **1.**

Final answer.

Example 2: Probability of rolling a 7 on a normal die?

- ▶ A die has no 7 — impossible.

Cannot happen.

- ▶ **0.**

Impossible = 0.

EXERCISES (EASY → DIFFICULT)

1. P(rolling a number 1-6 on a die):

Coin and dice probabilities

DEFINITIONS

Coin	Has 2 equally likely outcomes: heads or tails.
-------------	--

Die	Has 6 equally likely outcomes: 1 to 6.
------------	--

KEY FORMULAS

- $P(\text{heads}) = 1/2$ (1 favourable of 2)
- $P(\text{a chosen number on a die}) = 1/6$
- $P(\text{event}) = \text{favourable} \div \text{total}$

WORKED EXAMPLES

Example 1: What is the probability of getting heads on a fair coin?

- ▶ A coin has 2 outcomes: heads, tails.

Total outcomes = 2.

- ▶ Heads is 1 of them.

Favourable = 1.

- ▶ $P(\text{heads}) = 1/2$.

Favourable $\div$ total.

- ▶ **$1/2$.**

Final answer.



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

- 1 favourable out of 6.

Single number.

- $\frac{1}{6}$.

Done.

EXERCISES (EASY → DIFFICULT)

1. P(heads on a fair coin):

End of Chapter 13 — Mixed Exercise

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

1. Bag has 7 balls; 2 red. P(red):
2. P(rolling a number 1-6 on a die):
3. P(heads on a fair coin):
4. Bag has 6 balls; 4 red. P(red):
5. P(rolling a number 1-6 on a die):
6. P(heads on a fair coin):
7. Bag has 10 balls; 3 red. P(red):
8. P(rolling a number 1-6 on a die):
9. P(heads on a fair coin):
10. Bag has 12 balls; 8 red. P(red):





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

Place value to billions

1. 2000000
2. 6000000
3. 9000000
4. 6000000
5. 9000000
6. 4000000
7. 9000000
8. 6000000
9. 6000000
10. 9000000

Round to nearest 10000

1. 80000
2. 760000
3. 510000
4. 20000
5. 810000
6. 510000
7. 890000
8. 220000
9. 40000
10. 790000

Order of operations (BODMAS)

1. 12
2. 50
3. 45
4. 21
5. 27
6. 19
7. 16
8. 57
9. 22
10. 29



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**Order of operations with brackets**

1. 108
2. 90
3. 63
4. 36
5. 20
6. 16
7. 99
8. 39
9. 88
10. 90

Long Division (game)

1. play

End of Chapter 1 — Mixed Exercise

1. 2000000
2. 760000
3. 45
4. 36
5. play
6. 4000000
7. 890000
8. 57
9. 88
10. play

CHAPTER 2 — Number Theory**Prime factorisation**

1. $2^2 \times 3 \times 5$
2. $2^3 \times 3^2$
3. $2^2 \times 3^2$
4. $2^3 \times 3$

HCF

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

LCM

1. 24
2. 15
3. 24
4. 5
5. 18
6. 18





7. 4
8. 8
9. 36
10. 8

Square numbers and roots

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

End of Chapter 2 — Mixed Exercise

1. $2^2 \times 3 \times 5$
2. 1
3. 24
4. 11
5. $2^3 \times 3$
6. 1
7. 4
8. 9
9. $2^3 \times 3^2$
10. 1

CHAPTER 3 — Integers

Negative numbers on a number line

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

Add integers

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



**Subtract integers**

1. 19
2. 11
3. 14
4. 16
5. 14
6. 10
7. 5
8. 12
9. 14
10. 13

Compare integers

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

End of Chapter 3 — Mixed Exercise

1. 2
2. -9
3. 14
4. >
5. 2
6. -11
7. 5
8. <
9. 2
10. -5

CHAPTER 4 — Fractions**Add fractions (different denoms)**

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

Subtract fractions

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

Multiply fractions

1. $\frac{1}{4}$
2. $\frac{1}{6}$
3. $\frac{1}{2}$



**Divide fractions**

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

Fraction of a quantity

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

End of Chapter 4 — Mixed Exercise

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

CHAPTER 5 — Decimals**Add decimals**

1. 9.5
2. 8
3. 11.5
4. 15.4
5. 9.9
6. 15.3
7. 13.7
8. 7.7
9. 15.1
10. 6

Subtract decimals

1. 6.6
2. 3.5
3. 5.8
4. 5.3
5. 6.4
6. 3.5
7. 6.9
8. 6.9
9. 3.8
10. 2.8



**Multiply decimals by whole numbers**

1. 10.4
2. 35.2
3. 7.6
4. 27.6
5. 6.6
6. 36
7. 11.2
8. 16
9. 33.6
10. 13.3

Divide decimals

1. 3.5
2. 4.3
3. 1.7
4. 4.1
5. 3.6
6. 4
7. 4
8. 2.8
9. 1.6
10. 4.7

Convert decimal ↔ fraction

1. $\frac{3}{4}$
2. $\frac{1}{2}$
3. $\frac{1}{5}$
4. $\frac{1}{4}$

End of Chapter 5 — Mixed Exercise

1. 9.5
2. 3.5
3. 7.6
4. 4.1
5. $\frac{1}{4}$
6. 15.3
7. 6.9
8. 16
9. 1.6
10. $\frac{3}{4}$

CHAPTER 6 — Ratio and Proportion**Simplify ratios**

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



**Equivalent ratios**

1. 15
2. 6
3. 9
4. 12

Unit rates

1. 30
2. 45
3. 120
4. 20
5. 60
6. 48
7. 24
8. 12
9. 60
10. 80

Proportional reasoning

1. 24
2. 58
3. 78
4. 60
5. 40
6. 60
7. 48
8. 30
9. 22
10. 76

End of Chapter 6 — Mixed Exercise

1. 3:5
2. 6
3. 120
4. 60
5. 3:5
6. 12
7. 24
8. 30
9. 2:4
10. 15

CHAPTER 7 — Percentage**Percent of a number**

1. 4.8
2. 2.8
3. 4
4. 6.4
5. 8
6. 1.6
7. 5
8. 6
9. 10





10. 0.8

Percent change

1. 10
2. -20
3. 20
4. -10

Percent $\leftrightarrow$ decimal $\leftrightarrow$ fraction

1. 0.25
2. 0.5
3. 0.1

Discount and VAT

1. 91.8
2. 280.8
3. 227.7
4. 234.4
5. 123.2
6. 97.6
7. 99.9
8. 176.4
9. 239.4
10. 324

End of Chapter 7 — Mixed Exercise

1. 4.8
2. -20
3. 0.1
4. 234.4
5. 8
6. -10
7. 0.25
8. 176.4
9. 10
10. 10

CHAPTER 8 — Algebra

Substitute into expressions

1. 16
2. 22
3. 10
4. 14
5. 16
6. 12
7. 17
8. 9
9. 15
10. 22



**Solve simple equations**

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

Solve equations with multiplication

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

Number patterns with rule

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

End of Chapter 8 — Mixed Exercise

1. 16
2. 8
3. 12
4. +3
5. 16
6. 10
7. 8
8. +4
9. 15
10. 15



CHAPTER 9 — Geometry

Angles in a triangle

1. 59
2. 36
3. 61
4. 48
5. 65
6. 115
7. 54
8. 35
9. 68
10. 73

Angles on a straight line

1. 70
2. 124
3. 49
4. 121
5. 140
6. 80
7. 107
8. 134
9. 82
10. 150

Angles in a quadrilateral

1. 51
2. 139
3. 137
4. 117
5. 126
6. 112
7. 115
8. 82
9. 99
10. 90

Properties of triangles

1. 60

Properties of quadrilaterals

1. 4

End of Chapter 9 — Mixed Exercise

1. 59
2. 124
3. 137
4. 60
5. 4
6. 115
7. 107
8. 82
9. 60





10. 4

CHAPTER 10 — Coordinate Plane

Plot points (first quadrant)

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

Quadrants

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

Read points from a grid

1. (1,4)
2. (3,5)
3. (4,1)
4. (2,1)
5. (1,5)
6. (5,1)
7. (2,3)
8. (5,5)
9. (1,3)
10. (4,2)

End of Chapter 10 — Mixed Exercise

1. x-axis
2. 1
3. (4,1)
4. x-axis
5. 1
6. (5,1)
7. x-axis
8. 1
9. (1,3)
10. x-axis





CHAPTER 11 — Mensuration

Area of rectangle

1. 84
2. 70
3. 45
4. 150
5. 96
6. 35
7. 32
8. 99
9. 65
10. 45

Area of triangle

1. 20
2. 30
3. 14
4. 35
5. 48
6. 36
7. 28
8. 8
9. 24
10. 12

Area of compound shapes

1. 52
2. 25
3. 18
4. 61
5. 34
6. 52
7. 61
8. 34
9. 32
10. 45

Volume of rectangular prism

1. 128
2. 144
3. 112
4. 240
5. 70
6. 28
7. 64
8. 72
9. 112
10. 56



**Surface area of cube**

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

End of Chapter 11 — Mixed Exercise

1. 84
2. 30
3. 18
4. 240
5. 24
6. 35
7. 28
8. 34
9. 112
10. 384

CHAPTER 12 — Statistics**Mean (average)**

1. 8
2. 4.6
3. 5.2
4. 7
5. 6.6
6. 5
7. 7
8. 6.6
9. 5
10. 4.2

Median

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

Mode

1. 3
2. 5
3. 2
4. 4
5. 4
6. 3
7. 4





8. 2
9. 7
10. 2

Range

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

End of Chapter 12 — Mixed Exercise

1. 8
2. 5
3. 2
4. 12
5. 6.6
6. 6
7. 4
8. 12
9. 5
10. 5

CHAPTER 13 — Probability

Probability of an event

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

Certain, impossible, likely

1. 1

Coin and dice probabilities

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

End of Chapter 13 — Mixed Exercise

1. $\frac{2}{7}$
2. 1
3. $\frac{1}{2}$
4. $\frac{4}{6}$
5. 1
6. $\frac{1}{2}$





7. $\frac{3}{10}$

8. 1

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

10. $\frac{8}{12}$



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