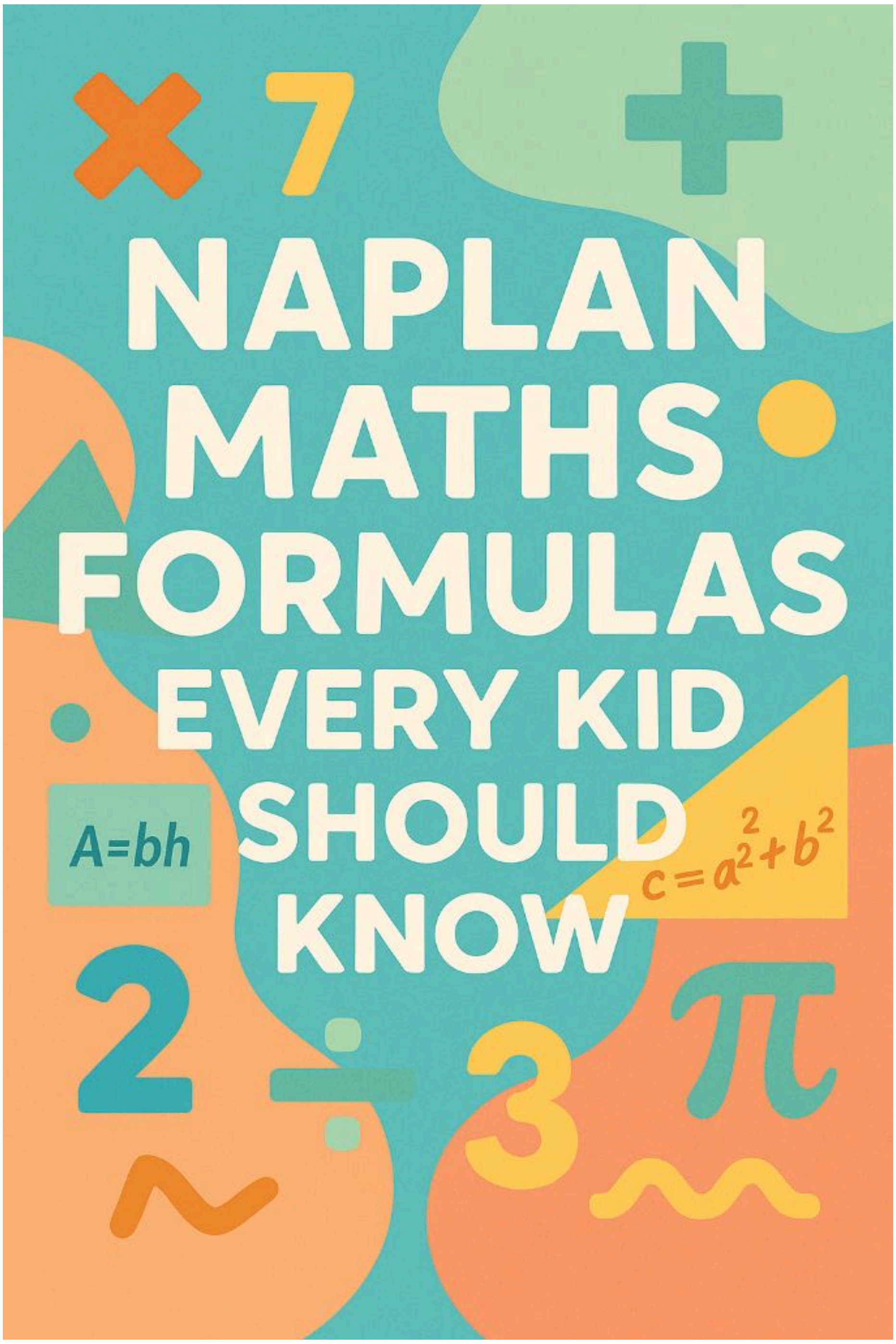


Table of Contents

Introduction to NAPLAN Maths Assessment

The National Assessment Program – Literacy and Numeracy (NAPLAN) is an annual assessment for students in Years 3, 5, 7, and 9. The maths component of NAPLAN tests a student's numerical knowledge, mathematical reasoning, and problem-solving abilities.

Understanding key mathematical formulas is essential for NAPLAN success. These formulas serve as tools that help students tackle a wide range of problems efficiently. Rather than trying to derive formulas during the test (which costs valuable time), knowing them by heart allows students to focus on applying them correctly.

This guide presents the most important maths formulas every student should know for NAPLAN, organized by mathematical strand. Each formula is explained simply, with worked examples and practice problems to reinforce understanding.

Why Formulas Matter

Mathematical formulas are like recipes that tell you exactly how to solve specific types of problems. When you know these formulas well, you can:

- Solve problems more quickly

- Avoid making calculation errors
- Feel more confident during the test
- Improve your overall NAPLAN score

Number and Algebra

Basic Operations

The four basic operations form the foundation of all mathematics. Mastering them is essential for success in NAPLAN.

Addition (+)

Used to find the total of two or more numbers.

Formula: $a + b = c$

Where a and b are the numbers being added, and c is their sum.

Subtraction (-)

Used to find the difference between two numbers.

Formula: $a - b = c$

Where a is the minuend, b is the subtrahend, and c is their difference.

Multiplication (×)

Used to find the product of two or more numbers.

Formula: $a \times b = c$

Where a and b are the factors being multiplied, and c is their product.

Division (÷)

Used to find how many times one number goes into another.

Formula: $a \div b = c$

Where a is the dividend, b is the divisor, and c is the quotient.

Worked Example: Basic Operations

Calculate: $25 + 17 - (8 \times 3) \div 4$

Step 1: Calculate inside the parentheses: $8 \times 3 = 24$

Step 2: Calculate the division: $24 \div 4 = 6$

Step 3: Calculate the addition: $25 + 17 = 42$

Step 4: Calculate the subtraction: $42 - 6 = 36$

Answer: 36

Practice Problem

Calculate: $48 \div 6 + 12 \times 2 - 5$

Answer: 27

Solution: $48 \div 6 = 8$, $12 \times 2 = 24$, $8 + 24 = 32$, $32 - 5 = 27$

Order of Operations (BODMAS/BIDMAS)

The order of operations tells us which operations to perform first when calculating an expression.

BODMAS/BIDMAS Rule

B - Brackets (or Parentheses) first

O/I - Orders/Indices (powers, square roots) second

D/M - Division and Multiplication (from left to right) third

A/S - Addition and Subtraction (from left to right) last

Worked Example: Order of Operations

Calculate: $4 + 2 \times (7 - 3)^2 \div 4$

Step 1: Calculate inside brackets: $7 - 3 = 4$

Step 2: Calculate the exponent: $4^2 = 16$

Step 3: Calculate multiplication and division from left to right: $2 \times 16 = 32$, $32 \div 4 = 8$

Step 4: Calculate addition: $4 + 8 = 12$

Answer: 12

Practice Problem

Calculate: $36 \div (3 + 3) \times 2^2 - 5$

Answer: 19

Solution: $3 + 3 = 6$, $36 \div 6 = 6$, $2^2 = 4$, $6 \times 4 = 24$, $24 - 5 = 19$

Fractions, Decimals, and Percentages

These three forms of representing numbers are interconnected and frequently tested in NAPLAN.

Converting Between Fractions, Decimals, and Percentages

$$\text{Fraction to Decimal}: \frac{a}{b} = a \div b$$

$$\text{Decimal to Percentage}: a \times 100\%$$

$$\text{Percentage to Decimal}: a\% \div 100$$

$$\text{Percentage to Fraction}: \frac{a\%}{100}$$

Operations with Fractions

$$\text{Addition}: \frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

$$\text{Subtraction}: \frac{a}{c} - \frac{b}{c} = \frac{a-b}{c}$$

$\text{Multiplication}: \frac{a}{b} \times \frac{c}{d} = \frac{a \times c}{b \times d}$

$\text{Division}: \frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \times \frac{d}{c} = \frac{a \times d}{b \times c}$

Finding Percentages

$a\% \text{ of } b = \frac{a}{100} \times b$

Worked Example: Fractions, Decimals, and Percentages

Convert $\frac{3}{4}$ to a decimal and a percentage.

Step 1: Convert to a decimal: $\frac{3}{4} = 3 \div 4 = 0.75$

Step 2: Convert to a percentage: $0.75 \times 100\% = 75\%$

Answer: $\frac{3}{4} = 0.75 = 75\%$

Practice Problem

Find 35% of 80.

Answer: 28

Solution: $35\% \text{ of } 80 = \frac{35}{100} \times 80 = 0.35 \times 80 = 28$

Ratio and Proportion

Ratios compare quantities of the same kind, while proportions express relationships between quantities.

Ratio

A ratio compares quantities in the form $a : b$

To express a ratio in simplest form, divide both quantities by their GCD (Greatest Common Divisor).

Proportion (Direct)

If $a : b = c : d$, then $\frac{a}{b} = \frac{c}{d}$

This can be rearranged as $ad = bc$ (cross-multiplication)

Proportion (Inverse)

If y is inversely proportional to x, then $y = \frac{k}{x}$, where k is a constant.

Worked Example: Ratio and Proportion

If 3 pencils cost $2.40, how much will 8 pencils cost?

Step 1: Set up a proportion: $\frac{3 \text{ pencils}}{\$2.40} = \frac{8 \text{ pencils}}{x}$

Step 2: Cross-multiply: $3x = 8 \times \$2.40$

Step 3: Solve for x: $3x = \$19.20$, so $x = \$6.40$

Answer: 8 pencils will cost $6.40

Practice Problem

A recipe requires 250g of flour for 4 people. How much flour is needed for 10 people?

Answer: 625g

Solution: $\frac{250g}{4 \text{ people}} = \frac{x}{10 \text{ people}}$, $4x = 250 \times 10$, $4x = 2500$, $x = 625$

Algebraic Expressions and Equations

Algebra uses letters (variables) to represent unknown values in expressions and equations.

Simplifying Expressions

Combine like terms: $ax + bx = (a + b)x$

Distributive property: $a(b + c) = ab + ac$

Solving Linear Equations

For an equation in the form $ax + b = c$:

1. Move all terms with the variable to one side

2. Move all constant terms to the other side

3. Divide both sides by the coefficient of the variable

Worked Example: Solving a Linear Equation

Solve: $3x + 7 = 22$

Step 1: Subtract 7 from both sides: $3x = 15$

Step 2: Divide both sides by 3: $x = 5$

Answer: $x = 5$

Practice Problem

Solve: $5x - 8 = 3x + 4$

Answer: $x = 6$

Solution: $5x - 3x = 4 + 8$, $2x = 12$, $x = 6$

Linear Relationships

Linear relationships show how two variables change in relation to each other at a constant rate.

Slope-Intercept Form

$y = mx + b$

Where m is the slope (gradient) and b is the y-intercept.

Calculating Slope

$m = \frac{y_2 - y_1}{x_2 - x_1}$

Where (x_1, y_1) and (x_2, y_2) are two points on the line.

Worked Example: Linear Relationships

Find the equation of a line that passes through the points (2, 5) and (4, 9).

Step 1: Calculate the slope: $m = \frac{9-5}{4-2} = \frac{4}{2} = 2$

Step 2: Use the slope-intercept form and one of the points (e.g., (2, 5)): $5 = 2 \times 2 + b$

Step 3: Solve for b: $5 = 4 + b$, so $b = 1$

Answer: The equation is $y = 2x + 1$

Practice Problem

A line passes through the points (3, 7) and (6, 13). Find its equation in slope-intercept form.

Answer: $y = 2x + 1$

Solution: $m = \frac{13-7}{6-3} = \frac{6}{3} = 2, 7 = 2 \times 3 + b, 7 = 6 + b, b = 1$

Measurement and Geometry

Length, Perimeter, and Area Formulas

These formulas help calculate the distance around (perimeter) and the space covered by (area) different shapes.

Rectangle

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

Area: $A = l \times w$

Where l is length and w is width.

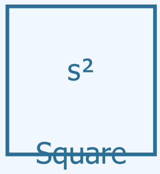
Rectangle

Square

Perimeter: $P = 4s$

Area: $A = s^2$

Where s is the side length.



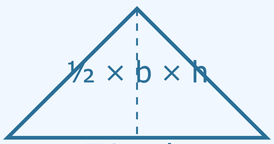
Square

Triangle

Perimeter: $P = a + b + c$

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

Where a, b, and c are the sides, and h is the height.



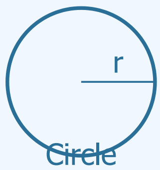
Triangle

Circle

Circumference: $C = 2\pi r$ or $C = \pi d$

Area: $A = \pi r^2$

Where r is radius and d is diameter.



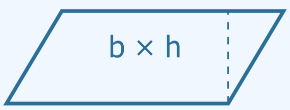
Circle

Parallelogram

Perimeter: $P = 2(a + b)$

Area: $A = b \times h$

Where a and b are the sides, and h is the height.



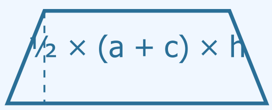
Parallelogram

Trapezoid

Perimeter: $P = a + b + c + d$

Area: $A = \frac{1}{2} \times (a + c) \times h$

Where a, b, c, and d are the sides, and h is the height.



Trapezoid

Worked Example: Area and Perimeter

A rectangular garden has a length of 12m and a width of 8m. Calculate its perimeter and area.

Step 1: Calculate the perimeter: $P = 2(l + w) = 2(12 + 8) = 2 \times 20 = 40m$

Step 2: Calculate the area: $A = l \times w = 12 \times 8 = 96m^2$

Answer: Perimeter = 40m, Area = 96m²

Practice Problem

A circular garden has a radius of 3.5m. Calculate its circumference and area. (Use π = 3.14)

Answer: Circumference = 21.98m, Area = 38.465m²

Solution: $C = 2\pi r = 2 \times 3.14 \times 3.5 = 21.98m$,
$A = \pi r^2 = 3.14 \times 3.5^2 = 3.14 \times 12.25 = 38.465m^2$

Volume and Capacity Formulas

These formulas help calculate the space occupied by (volume) and the amount that can be held in (capacity) 3D objects.

Rectangular Prism

Volume: $V = l \times w \times h$

Where l is length, w is width, and h is height.

Cube

Volume: $V = s^3$

Where s is the side length.

Cylinder

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

Sphere

Volume: $V = \frac{4}{3}\pi r^3$

Where r is the radius and h is the height.

Where r is the radius.

Cone

Volume: $V = \frac{1}{3}\pi r^2 h$

Where r is the radius and h is the height.

Capacity Conversion

$1 \text{ cubic centimetre } (cm^3) = 1 \text{ millilitre } (mL)$

$1000 \text{ cubic centimetres } (cm^3) = 1 \text{ litre } (L)$

$1 \text{ cubic metre } (m^3) = 1000 \text{ litres } (L)$

Worked Example: Volume and Capacity

A fish tank has a length of 60cm, width of 30cm, and height of 40cm. Calculate its volume in cubic centimetres and its capacity in litres.

Step 1: Calculate the volume: $V = l \times w \times h = 60 \times 30 \times 40 = 72,000cm^3$

Step 2: Convert to litres: $72,000cm^3 \div 1000 = 72L$

Answer: Volume = 72,000cm^3, Capacity = 72L

Practice Problem

A cylindrical water tank has a radius of 1.2m and a height of 2.5m. Calculate its volume in cubic metres and its capacity in litres. (Use π = 3.14)

Answer: Volume = 11.304m^3, Capacity = 11,304L

Solution: $V = \pi r^2 h = 3.14 \times 1.2^2 \times 2.5 = 3.14 \times 1.44 \times 2.5 = 11.304m^3$, Capacity = 11.304 × 1000 = 11,304L

Time Calculations

Time calculations involve converting between different units of time and calculating duration.

Time Conversions

$1 \text{ minute } = 60 \text{ seconds}$

$1 \text{ hour } = 60 \text{ minutes } = 3600 \text{ seconds}$

$1 \text{ day } = 24 \text{ hours } = 1440 \text{ minutes}$

$1 \text{ week } = 7 \text{ days } = 168 \text{ hours}$

Duration Calculation

For times in the same day: $\text{Duration} = \text{End time} - \text{Start time}$

For times across days: Add 24 hours (or appropriate units) to the end time before subtracting.

Worked Example: Time Calculation

A movie started at 2:45 PM and ended at 5:10 PM. How long was the movie?

Step 1: Calculate the hours: 5 - 2 = 3 hours

Step 2: Calculate the minutes: 10 - 45 = -35 minutes

Step 3: Adjust for negative minutes: 3 hours - 1 hour + 60 minutes - 35 minutes = 2 hours and 25 minutes

Answer: The movie was 2 hours and 25 minutes long.

Practice Problem

A train journey starts at 09:45 AM and ends at 2:20 PM. How long is the journey?

Answer: 4 hours and 35 minutes

Solution: From 09:45 to 2:20 PM (14:20) = 14:20 - 09:45 = 4 hours and 35 minutes

Angle Relationships

Understanding angle relationships is crucial for solving geometric problems.

Angle Properties

Sum of angles in a triangle: 180°

Sum of angles in a quadrilateral: 360°

Sum of angles around a point: 360°

Angles on a straight line: 180°

Special Angle Pairs

Complementary angles: Two angles that sum to 90°

Supplementary angles: Two angles that sum to 180°

Vertically opposite angles: Equal angles formed by intersecting lines

Alternate angles: Equal angles formed when a transversal crosses parallel lines

Corresponding angles: Equal angles in corresponding positions when a transversal crosses parallel lines

Worked Example: Angle Relationships

In a triangle, two angles measure 45° and 65°. What is the measure of the third angle?

Step 1: Use the sum of angles in a triangle: $45^\circ + 65^\circ + x = 180^\circ$

Step 2: Solve for x: $110^\circ + x = 180^\circ$, so $x = 70^\circ$

Answer: The third angle measures 70°

Practice Problem

Two angles in a quadrilateral measure 80°, 70°, and 120°. What is the measure of the fourth angle?

Answer: 90°

Solution: In a quadrilateral, angles sum to 360°. So, 80° + 70° + 120° + x = 360°, 270° + x = 360°, x = 90°

Geometric Properties of 2D Shapes

Understanding the properties of 2D shapes helps in identifying and working with them.

Triangle Properties

Equilateral triangle: All sides and angles are equal (angles = 60°)

Isosceles triangle: Two sides and two angles are equal

Scalene triangle: All sides and angles are different

Right-angled triangle: Contains one right angle (90°)

Quadrilateral Properties

Square: Four equal sides, four right angles

Rectangle: Opposite sides equal, four right angles

Parallelogram: Opposite sides parallel and equal

Rhombus: Four equal sides, opposite angles equal

Trapezium (Trapezoid): One pair of parallel sides

Kite: Two pairs of adjacent sides equal

Circle Properties

Diameter: Twice the radius $d = 2r$

Circumference: $C = 2\pi r$ or $C = \pi d$

Arc length: $L = \frac{\theta}{360} \times 2\pi r$ (where θ is the angle in degrees)

Sector area: $A = \frac{\theta}{360} \times \pi r^2$ (where θ is the angle in degrees)

Worked Example: 2D Shapes

A circle has a diameter of 14cm. Calculate the circumference and area.

Step 1: Find the radius: $r = \frac{d}{2} = \frac{14}{2} = 7cm$

Step 2: Calculate the circumference: $C = 2\pi r = 2 \times 3.14 \times 7 = 43.96cm$

Step 3: Calculate the area: $A = \pi r^2 = 3.14 \times 7^2 = 3.14 \times 49 = 153.86cm^2$

Answer: Circumference = 43.96cm, Area = 153.86cm²

Practice Problem

A sector of a circle has a radius of 6cm and an angle of 45°. Find the arc length and area of the sector. (Use π = 3.14)

Answer: Arc length = 4.71cm, Area = 14.13cm²

Solution: $L = \frac{45}{360} \times 2 \times 3.14 \times 6 = \frac{1}{8} \times 37.68 = 4.71cm$, $A = \frac{45}{360} \times 3.14 \times 6^2 = \frac{1}{8} \times 113.04 = 14.13cm^2$

Geometric Properties of 3D Objects

Understanding 3D objects involves knowing their properties and how to calculate their surface area and volume.

Surface Area Formulas

Rectangular prism: $SA = 2(lw + lh + wh)$

Cube: $SA = 6s^2$

Cylinder: $SA = 2\pi r^2 + 2\pi rh$

Sphere: $SA = 4\pi r^2$

Cone: $SA = \pi r^2 + \pi rl$ (where l is the slant height)

3D Object Properties

Faces: Flat surfaces of a 3D object

Edges: Lines where two faces meet

Vertices: Points where edges meet

Euler's formula: $F + V - E = 2$ (where F is the number of faces, V is the number of vertices, and E is the number of edges)

Worked Example: 3D Objects

A cube has a side length of 5cm. Calculate its surface area and volume.

Step 1: Calculate the surface area: $SA = 6s^2 = 6 \times 5^2 = 6 \times 25 = 150cm^2$

Step 2: Calculate the volume: $V = s^3 = 5^3 = 125cm^3$

Answer: Surface area = $150cm^2$, Volume = $125cm^3$

Practice Problem

A cylinder has a radius of 4cm and a height of 10cm. Calculate its surface area and volume. (Use π = 3.14)

Answer: Surface area = $351.68cm^2$, Volume = $502.4cm^3$

Solution: $SA = 2\pi r^2 + 2\pi rh = 2 \times 3.14 \times 4^2 + 2 \times 3.14 \times 4 \times 10 = 100.48 + 251.2 = 351.68cm^2$, $V = \pi r^2 h = 3.14 \times 4^2 \times 10 = 3.14 \times 16 \times 10 = 502.4cm^3$

Statistics and Probability

Data Representation

Data representation involves organizing and displaying data in various formats.

Types of Data Displays

Tables: Organize data in rows and columns

Pictographs: Use symbols to represent quantities

Bar graphs: Compare quantities using bars of different heights

Line graphs: Show changes over time or other continuous variables

Pie charts: Show how parts contribute to a whole

Stem-and-leaf plots: Organize numerical data to show distribution

Box plots: Show distribution of data through quartiles

Reading Data Displays

1. Identify the title and axes (if applicable)
2. Understand the scale and what each unit represents
3. For graphs with keys or legends, identify what each symbol represents
4. Extract specific values from the display
5. Make comparisons between different parts of the data

Worked Example: Data Representation

The following table shows the number of books read by students in a class in one month:

Number of Books	Frequency (Number of Students)
0	3
1	5
2	8
3	4
4 or more	2

Questions:

1. How many students read exactly 2 books?
2. How many students are in the class?

3. What fraction of students read at least 2 books?

Answers:

1. 8 students read exactly 2 books.

2. 3 + 5 + 8 + 4 + 2 = 22 students in the class.

3. Students who read at least 2 books: 8 + 4 + 2 = 14. Fraction: $\frac{14}{22} = \frac{7}{11}$

Practice Problem

The pie chart below shows how a student spends their 24-hour day:

Sleep: 33.3%
School: 29.2%
Homework: 12.5%
Screen time: 8.3%
Other activities: 16.7%
How many hours does the student spend on each activity?

Answer:

Sleep: 33.3% of 24 hours = 0.333 × 24 = 8 hours

School: 29.2% of 24 hours = 0.292 × 24 = 7 hours

Homework: 12.5% of 24 hours = 0.125 × 24 = 3 hours

Screen time: 8.3% of 24 hours = 0.083 × 24 = 2 hours

Other activities: 16.7% of 24 hours = 0.167 × 24 = 4 hours

Mean, Median, Mode Calculations

These are measures of central tendency that help describe a data set's typical value.

Mean (Average)

$$\text{Mean} = \frac{\text{Sum of all values}}{\text{Number of values}}$$

Mean represents the average value in a data set.

Median

The middle value when data is arranged in order.

For an odd number of values: The middle value

For an even number of values: The average of the two middle values

Mode

The value that appears most frequently in a data set.

A data set can have no mode, one mode, or multiple modes.

Worked Example: Mean, Median, Mode

Find the mean, median, and mode of this data set: 7, 9, 3, 5, 9, 8, 9, 4

Step 1: Calculate the mean: $\text{Mean} = \frac{7+9+3+5+9+8+9+4}{8} = \frac{54}{8} = 6.75$

Step 2: Find the median (arrange the data first): 3, 4, 5, 7, 8, 9, 9, 9

Since there are 8 values (even), median = $\frac{7+8}{2} = 7.5$

Step 3: Find the mode: 9 (appears three times)

Answer: Mean = 6.75, Median = 7.5, Mode = 9

Practice Problem

Find the mean, median, and mode of this data set: 12, 15, 18, 12, 10, 15, 18, 20, 12

Answer: Mean = 14.67, Median = 15, Mode = 12

Solution:

Mean = (12 + 15 + 18 + 12 + 10 + 15 + 18 + 20 + 12) ÷ 9 = 132 ÷ 9 = 14.67

Arranged data: 10, 12, 12, 12, 15, 15, 18, 18, 20

Median = 15 (middle value)

Mode = 12 (appears three times)

Range and Spread

These measures help describe the dispersion or spread of data.

Range

$\text{Range} = \text{Maximum value} - \text{Minimum value}$

Range measures the difference between the largest and smallest values in a data set.

Quartiles

First quartile (Q1): The median of the lower half of the data

Second quartile (Q2): The median of the entire data set

Third quartile (Q3): The median of the upper half of the data

Interquartile Range (IQR)

$\text{IQR} = Q3 - Q1$

IQR measures the spread of the middle 50% of the data.

Worked Example: Range and Spread

Find the range and interquartile range of this data set: 6, 8, 10, 12, 15, 18, 20, 22, 25

Step 1: Calculate the range: $\text{Range} = 25 - 6 = 19$

Step 2: Find Q1 (median of lower half): 6, 8, 10, 12. Median = $\frac{8+10}{2} = 9$

Step 3: Find Q2 (median of entire data set): 15

Step 4: Find Q3 (median of upper half): 18, 20, 22, 25. Median = $\frac{20+22}{2} = 21$

Step 5: Calculate IQR: $\text{IQR} = Q3 - Q1 = 21 - 9 = 12$

Answer: Range = 19, IQR = 12

Practice Problem

Find the range and interquartile range of this data set: 5, 7, 8, 10, 12, 14, 18, 20

Answer: Range = 15, IQR = 9

Solution:

Range = 20 - 5 = 15

Lower half: 5, 7, 8, 10. Q1 = (7 + 8) ÷ 2 = 7.5

Upper half: 12, 14, 18, 20. Q3 = (14 + 18) ÷ 2 = 16.5

IQR = Q3 - Q1 = 16.5 - 7.5 = 9

Probability Formulas and Concepts

Probability measures the likelihood of an event occurring.

Basic Probability

$$P(\text{event}) = \frac{\text{Number of favorable outcomes}}{\text{Total number of possible outcomes}}$$

Probability is always between 0 (impossible) and 1 (certain).

Probability of Independent Events

$$P(A \text{ and } B) = P(A) \times P(B)$$

Used when the occurrence of one event does not affect the other.

Probability of Mutually Exclusive Events

$$P(A \text{ or } B) = P(A) + P(B)$$

Used when events cannot occur simultaneously.

Complement Rule

$P(\text{not } A) = 1 - P(A)$

The probability of an event not occurring equals one minus the probability of it occurring.

Worked Example: Probability

A bag contains 5 red marbles, 3 blue marbles, and 2 green marbles. If a marble is drawn at random, find the probability of drawing:

a) A red marble

b) A blue or green marble

c) Not drawing a red marble

Step 1: Calculate the total number of marbles: 5 + 3 + 2 = 10

Step 2: a) $P(\text{red}) = \frac{5}{10} = \frac{1}{2} = 0.5$

Step 3: b) $P(\text{blue or green}) = \frac{3+2}{10} = \frac{5}{10} = \frac{1}{2} = 0.5$

Step 4: c) $P(\text{not red}) = 1 - P(\text{red}) = 1 - 0.5 = 0.5$

Answer: a) 0.5, b) 0.5, c) 0.5

Practice Problem

A fair six-sided die is rolled. Find the probability of rolling:

a) An even number

b) A number greater than 4

c) An even number and a number greater than 4

Answer:

a) P(even) = 3/6 = 1/2 = 0.5

b) P(greater than 4) = 2/6 = 1/3 ≈ 0.33

c) P(even AND greater than 4) = 1/6 ≈ 0.17

Solution: Even numbers are 2, 4, 6. Numbers greater than 4 are 5, 6. The only number that is both even and greater than 4 is 6.

Problem-Solving Strategies

Step-by-Step Approaches to Applying Formulas

Having a systematic approach to applying formulas helps solve problems accurately.

General Problem-Solving Steps

1. Understand the problem - Read carefully and identify what you're being asked to find.

2. Identify the relevant information - Extract the given values and determine what formula to use.

3. Choose the appropriate formula - Select the formula that relates to the problem type.

4. Substitute the values - Insert the known values into the formula.

5. Solve the equation - Perform the calculations carefully, following the order of operations.

6. Check your answer - Verify if your answer makes sense and matches the expected units.

Worked Example: Applying the Problem-Solving Steps

Problem: A circular garden has a diameter of 8m. How much fencing is needed to surround it, and what is its area?

Step 1: Understand - We need to find the circumference (for fencing) and area of a circle.

Step 2: Identify information - Diameter = 8m, so radius = 4m.

Step 3: Choose formulas - Circumference: $C = 2\pi r$, Area: $A = \pi r^2$

Step 4: Substitute values - $C = 2 \times 3.14 \times 4 = 25.12$, $A = 3.14 \times 4^2 = 3.14 \times 16 = 50.24$

Step 5: Solve - Circumference = 25.12m, Area = 50.24m²

Step 6: Check - The answers have correct units and are reasonable for a garden with an 8m diameter.

Answer: 25.12m of fencing is needed, and the garden's area is $50.24m^2$.

Problem-Solving Tips

• Draw diagrams to visualize the problem

• Label all known values directly on the diagram

• Show your working clearly, step by step

• Use consistent units throughout your calculations

• Estimate your answer before calculating to check reasonableness

Word Problem Translation Techniques

Converting word problems into mathematical equations is a crucial skill.

Key Words and Their Mathematical Meaning

Operation	Key Words
Addition (+)	sum, total, increased by, more than, combined
Subtraction (-)	difference, less than, decreased by, reduced by, fewer
Multiplication (×)	product, times, multiplied by, of (as in "half of")
Division (÷)	quotient, divided by, per, shared equally
Equals (=)	is, results in, gives, amounts to, the same as

Word Problem Translation Steps

1. Read the entire problem - Understand what is being asked.

2. Identify the unknown(s) - Determine what you're solving for and assign variable(s).

3. Identify the given information - Extract all relevant values and relationships.

4. Translate verbal phrases to mathematical expressions - Use the key words table.

5. Form an equation - Construct a mathematical equation that represents the problem.

6. Solve the equation - Apply appropriate mathematical techniques.

7. Answer the original question - Make sure your answer addresses what was asked.

Worked Example: Word Problem Translation

Problem: Jack has 24 marbles, which is 8 more than twice the number Sara has. How many marbles does Sara have?

Step 1: Read - We need to find Sara's marbles.

Step 2: Identify unknown - Let s = the number of Sara's marbles.

Step 3: Identify given information - Jack has 24 marbles, which is 8 more than twice Sara's marbles.

Step 4: Translate - "Twice Sara's marbles" = $2s$, "8 more than twice Sara's marbles" = $2s + 8$

Step 5: Form equation - $24 = 2s + 8$

Step 6: Solve - $24 - 8 = 2s$, $16 = 2s$, $s = 8$

Step 7: Answer - Sara has 8 marbles.

Practice Problem

The sum of three consecutive even integers is 48. What are these integers?

Answer: 14, 16, and 18

Solution:

Let x = the first even integer

Then x + 2 = the second even integer and x + 4 = the third even integer

The sum is 48, so x + (x + 2) + (x + 4) = 48

3x + 6 = 48

3x = 42

x = 14

Therefore, the integers are 14, 16, and 18

Common Mistakes to Avoid

Being aware of common errors can help you avoid them in your calculations.

Calculation Errors

• Forgetting to convert units (e.g., using cm instead of m)

• Confusing formulas (e.g., using area formula for perimeter)

• Arithmetic errors in calculations

• Not following the order of operations (BODMAS/BIDMAS)

• Rounding too early in multi-step calculations

Conceptual Errors

• Misinterpreting what the question is asking

• Confusing diameter and radius in circle problems

• Not distinguishing between area and perimeter/volume and surface area

• Misunderstanding ratio and proportion concepts

• Confusing mean, median, and mode

Test-Taking Errors

• Not reading the question carefully

• Forgetting to show working or reasoning

• Providing the answer without proper units

• Not checking if the answer is reasonable

• Mismanaging time on complex problems

Error Prevention Strategies

• Re-read each question before answering

• List all given information before solving

• Show your working step by step

• Check your answer by estimation or reverse calculation

• Double-check your arithmetic, especially with negative numbers and fractions

• Verify that your answer includes the correct units

• Make sure your answer addresses what was asked in the question

Quick Reference Sheets

Essential Formulas by Year Level

Focus on these formulas based on your year level for NAPLAN preparation.

Year 3 Essential Formulas

- Basic addition, subtraction, multiplication, and division
- Perimeter of rectangles and squares: $P = 2(l + w)$, $P = 4s$
- Area of rectangles and squares: $A = l \times w$, $A = s^2$
- Telling time: Hours, minutes, seconds relationships
- Money calculations: Adding and subtracting dollars and cents

Year 5 Essential Formulas

- All Year 3 formulas
- Order of operations (BODMAS/BIDMAS)
- Fractions, decimals, and percentages conversions
- Area of triangles: $A = \frac{1}{2} \times b \times h$
- Perimeter and area of composite shapes
- Mean calculation: $\text{Mean} = \frac{\text{Sum of values}}{\text{Number of values}}$
- Simple probability: $P(\text{event}) = \frac{\text{Favorable outcomes}}{\text{Total outcomes}}$

Year 7 Essential Formulas

- All Year 5 formulas
- Area and circumference of circles: $A = \pi r^2$, $C = 2\pi r$
- Volume of rectangular prisms: $V = l \times w \times h$
- Basic algebraic expressions and equations
- Ratio and proportion
- Angle relationships in triangles and parallel lines
- Statistical measures: mean, median, mode, range

Year 9 Essential Formulas

- All Year 7 formulas
- Pythagoras' theorem: $a^2 + b^2 = c^2$
- Linear equations and relationships: $y = mx + b$
- Surface area and volume of 3D objects
- Index laws and scientific notation
- Expanding and factorising algebraic expressions
- Solving linear and simple quadratic equations
- Interquartile range: $\text{IQR} = Q3 - Q1$
- Probability of independent and mutually exclusive events

Formula Memory Tips

Use these techniques to help remember key formulas.

Mnemonic Devices

BODMAS/BIDMAS - Brackets, Orders/Indices, Division, Multiplication, Addition, Subtraction

PEMDAS - Parentheses, Exponents, Multiplication/Division, Addition/Subtraction

"SOH CAH TOA" - For trigonometry: Sine = Opposite/Hypotenuse, Cosine = Adjacent/Hypotenuse, Tangent = Opposite/Adjacent

"Please Excuse My Dear Aunt Sally" - Another way to remember PEMDAS

Visual Memory Aids

Area formulas - Visualize the shapes: rectangle is like counting squares in a grid, triangle is half a rectangle

Circle formulas - Circumference is like measuring around the edge, area is like counting all the tiny squares inside

Pythagoras' theorem - Visualize squares on each side of a right-angled triangle

Logical Connections

Volume formulas - Think of volume as area × height for many 3D shapes

Perimeter vs. Area - Perimeter is about the boundary (1D), area is about the surface (2D)

Statistical measures - Mean is the "average" or "sharing equally," median is the "middle value," mode is the "most common"

Practice Techniques

Formula flashcards - Create cards with the formula name on one side and the formula on the other

Regular review - Spend a few minutes each day reviewing different formulas

Teach someone else - Explaining a formula to someone helps solidify your understanding

Use the formulas - Actively applying formulas in practice problems helps build memory

Application Examples

These examples show how formulas are applied in real-world situations.

Area and Perimeter

Scenario: Fencing a garden

A rectangular garden is 5m long and 3m wide. How much fencing is needed to surround it, and what is the area for planting?

Percentages

Scenario: Sale prices

A shirt normally costs $40 but is on sale for 25% off. What is the sale price?

Solution:

Discount = 25% of $40 = 0.25 × $40 = $10

Solution:

Perimeter = 2(5 + 3) = 2 × 8 = 16m of fencing

Area = 5 × 3 = $15m^2$ for planting

Sale price = \$40 - \$10 = \$30

Volume

Scenario: Fish tank capacity

A rectangular fish tank is 80cm long, 30cm wide, and 40cm high. What is its capacity in litres?

Solution:

Volume = 80 × 30 × 40 = $96{,}000cm^3$

Capacity = 96,000 ÷ 1000 = 96 litres

Ratio and Proportion

Scenario: Recipe scaling

A recipe for 4 people requires 300g of flour. How much flour is needed for 10 people?

Solution:

Ratio: 4 people : 300g = 10 people : x

Cross multiply: 4x = 300 × 10

4x = 3000, x = 750g of flour

Speed, Distance, Time

Scenario: Journey planning

A car travels at an average speed of 60km/h. How long will it take to travel 150km?

Solution:

Time = Distance ÷ Speed = 150 ÷ 60 = 2.5 hours (2 hours and 30 minutes)

Statistics

Scenario: Test scores

A student's test scores are: 75, 82, 68, 90, 85. What is the mean score and the range?

Solution:

Mean = (75 + 82 + 68 + 90 + 85) ÷ 5 = 400 ÷ 5 = 80

Range = 90 - 68 = 22

Conclusion

Mastering these key mathematical formulas will significantly improve your performance in the NAPLAN maths assessment. Remember that understanding how and when to apply each formula is just as important as memorizing them.

Regular practice with a variety of problem types will help build your confidence and speed in using these formulas correctly. Use the quick reference sheets to revise formulas that are relevant to your year level, and pay attention to the common mistakes to avoid.

Good luck with your NAPLAN preparation!