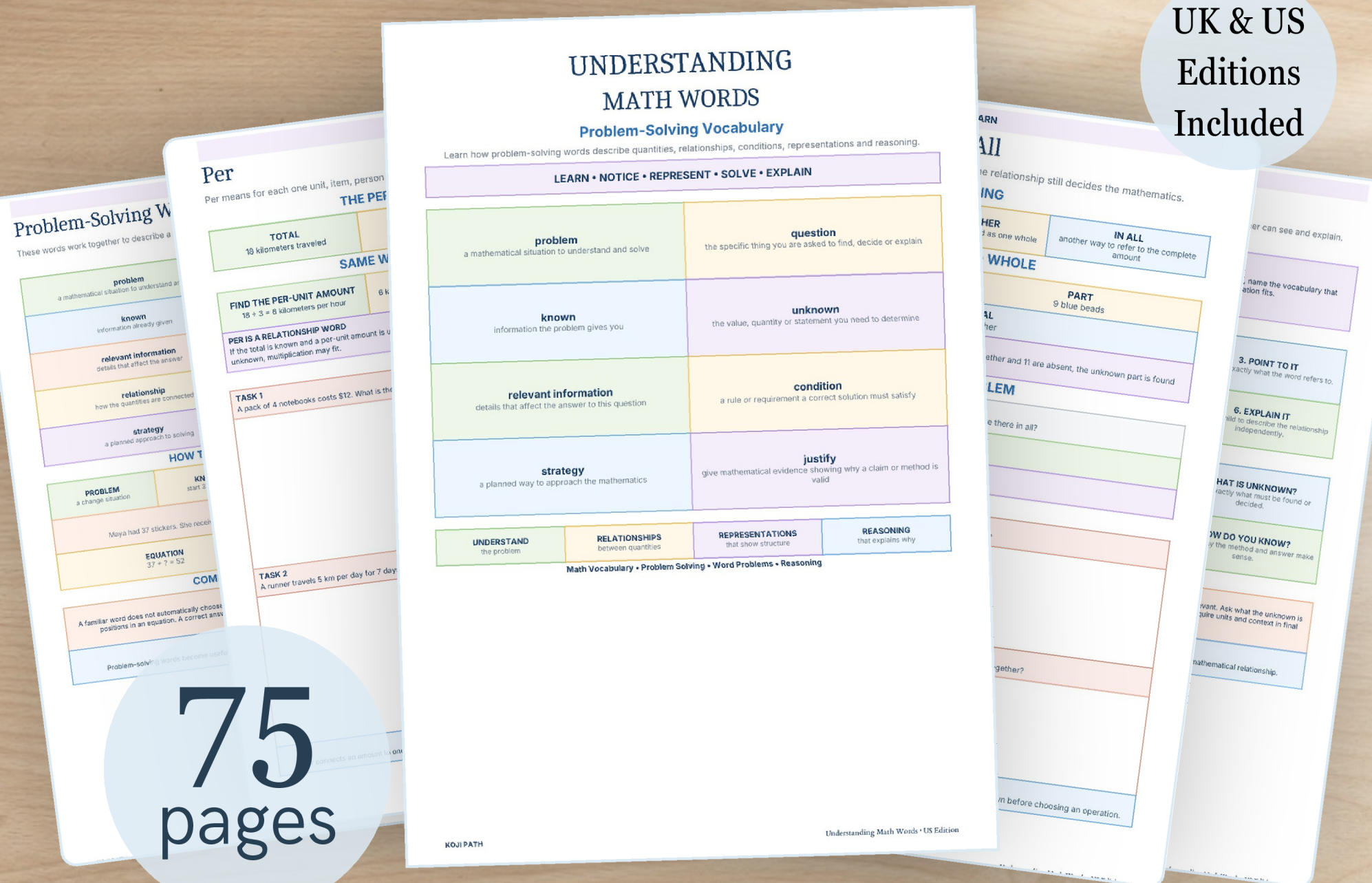


Understanding Math Words

Problem-Solving Vocabulary

Maths vocabulary • Question comprehension • Problem-solving

UK & US
Editions
Included



Math Vocabulary • Question Comprehension • Problem Solving

What's Included

75 pages per edition • UK & US versions included

- Problem-Solving Teaching Pages
- Key Math Vocabulary
- Known & Unknown Information
- Relevant & Irrelevant Information
- Relationships & Representations
- Strategies, Reasoning & Justification
- Word-Problem Practice Activities
- Mixed Problem-Solving Review
- Reference Pages
- Full Worked Solutions
- UK & US English Editions Included

LEARN

Total • Altogether • In All

These words can describe a complete amount, but the relationship still decides the mathematics.

MEANING

TOTAL	ALTOGETHER	IN ALL
the complete amount being considered	all the parts considered as one whole	another way to refer to the complete amount

PART • PART • WHOLE

PART	PART	WHOLE / TOTAL
13 red beads	9 blue beads	22 beads altogether

WORDS ARE CLUES - NOT COMMANDS

"Altogether" does not always mean add. If a class has 28 students altogether and 11 are absent, the unknown part is found by subtraction: $28 - 11 = 17$.

SEE IT IN A PROBLEM

PROBLEM

There are 16 green counters and 7 purple counters. How many counters are there in all?

THINK

Two known parts are being combined to find the unknown whole.

ANSWER

$16 + 7 = 23$. There are 23 counters in all.

TRY IT

TASK 1

A club has 35 students altogether. 19 are in Group A. How many are in Group B?

TASK 2

A shelf has 14 fiction books and 18 non-fiction books. How many books are there altogether?

REMEMBER

Total, altogether and in all describe the whole. Ask whether the whole or a part is unknown before choosing an operation.

ROB PEARCE

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LEARN

Sum

The word sum belongs specifically to addition.

DEFINITION

SUM

The sum is the result obtained when two or more numbers are added. Example: the sum of 18 and 27 is 45 because $18 + 27 = 45$.

RELATED BUT NOT IDENTICAL

ADD	ADDITION	SUM
the action or operation	the operation of combining quantities	the result of addition

SUM vs TOTAL

A sum is specifically connected to addition. Total is broader: it describes a complete amount and may appear in problems where the unknown is found by subtraction.

SEE IT IN A PROBLEM

PROBLEM

Find the sum of 24, 17 and 9.

THINK

The word sum tells us the requested result comes from addition. All three addends must be included.

ANSWER

$24 + 17 + 9 = 50$. The sum is 50.

TRY IT

The sum of two numbers is 63. One number is 28. Find the other number and explain why the word "sum" does not mean you should add 63 and 28.

REMEMBER

Sum names an addition result, but a problem containing the word sum may still require subtraction to find a missing addend.

LEARN

Commands

Different mathematical structures.

CLUE WORDS

The full situation determines what operation or strategy is appropriate.

DIFFERENT OPERATIONS

ALTOGETHER • SUBTRACTION EXAMPLE

There are 22 beads altogether. 13 are red. How many are blue?

Known whole: 22
Known part: 13
Unknown part: ?
 $22 - 13 = 9$

ASK QUESTIONS INSTEAD

WHY?

Is part, a clue or a command?

WHAT IS THE RELATIONSHIP?

How are the quantities related?

HOW CAN I REPRESENT IT?

Would an equation, tape diagram, bar model, number line or flow make the structure clearer?

WHY THIS MATTERS

"Altogether" may choose an operation before understanding the problem. It makes the method flexible and reliable.

TRY IT

Eff to decide whether to multiply or divide. Give one example of each relationship.

Teach the Meaning First

Words Are Clues —
Not Commands

Known • Given •
Unknown

Relevant •
Irrelevant
Information

LEARN

Words Are Clues - Not Commands

The same problem-solving word can appear in different mathematical structures.

CLUE WORDS

A clue word can help you notice a relationship, but the full situation determines what operation or strategy is appropriate.

SAME WORD • DIFFERENT OPERATIONS

ALTOGETHER • ADDITION EXAMPLE	ALTOGETHER • SUBTRACTION EXAMPLE
13 red beads and 9 blue beads. How many beads altogether? Known parts: 13 and 9 Unknown whole: ? $13 + 9 = 22$	There are 22 beads altogether. 13 are red. How many are blue? Known whole: 22 Known part: 13 Unknown part: ? $22 - 13 = 9$

ASK THESE QUESTIONS INSTEAD

WHAT IS KNOWN?	WHAT IS UNKNOWN?	WHAT IS THE RELATIONSHIP?	HOW CAN I REPRESENT IT?
Which quantities are given?	Are we finding a whole, a part, a difference, a group size or something else?	How do the quantities fit together?	Would an equation, tape diagram / bar model, number line or table make the structure clearer?

WHY THIS MATTERS

If children are taught "altogether = add" or "each = multiply", they may choose an operation before understanding the problem. Reading for structure makes the method flexible and reliable.

TRY IT

Explain why the word "each" is not enough by itself to decide whether to multiply or divide. Give one example of each relationship.

REMEMBER

Vocabulary points toward meaning. The known quantities, the unknown and their relationship determine the mathematics.

KOLUPATH Understanding Math Words • UK Edition

LEARN

Known • Given • Unknown

Separate information you already have from the value, quantity or statement you need to determine.

DEFINITIONS

KNOWN / GIVEN	UNKNOWN
Information the problem tells you directly or that can be established before solving.	The value, quantity or statement that must be found, decided or proved.

SEE THE STRUCTURE

KNOWN	KNOWN	UNKNOWN	RELATIONSHIP
start: \$12	spent: \$5	money left: ?	start - spent = left

PROBLEM

Noah has \$12. He spends \$5. How much money is left?
 $\$12 - \$5 = \$7$

THE UNKNOWN CAN APPEAR IN DIFFERENT POSITIONS

$7 + 8 = 23$	$15 + 7 = 23$	$15 + 8 = 7$
unknown starting amount	unknown change / missing part	unknown result / whole

KNOWN INFORMATION CAN BE MORE THAN NUMBERS

Known information can include units, conditions and relationships as well as quantities. Phrases such as "shared equally", "must be even" or "heavily three" can be known facts that shape the solution.

LOOK FOR THESE CLUES

GIVEN VALUES	TARGET LANGUAGE	UNITS	POSITION
What numbers or facts are stated?	What does the question ask for?	What kind of quantity is missing?	Where does the unknown sit in the relationship?

TRY IT

In "36 apples are packed equally into 6 bags. How many apples are in each bag?", list the known information and state the unknown.

Known: _____
Unknown: _____

REMEMBER

Known information supports the reasoning. The unknown is the target - and it can appear in different places in a mathematical relationship.

KOLUPATH Understanding Math Words • UK Edition

LEARN

Relevant • Irrelevant Information

Not every detail in a word problem belongs in the calculation.

DEFINITIONS

RELEVANT INFORMATION	IRRELEVANT INFORMATION
Information that affects the answer to the question being asked.	Information that may describe the context but does not affect the answer to this question.

TEST EACH DETAIL

DOES IT AFFECT A QUANTITY?	DOES IT AFFECT THE RELATIONSHIP?
If removing the detail changes a needed amount, it is likely relevant.	A condition or relationship can be relevant even when it is not a number.
IS IT NEEDED FOR THIS QUESTION?	IS IT JUST BACKGROUND?
A detail can be useful for one question and irrelevant for another.	Color, names or descriptions may be contextual rather than mathematical.

SEE IT IN A PROBLEM

PROBLEM

A red bus has 32 passengers. The driver wears a blue cap. 7 passengers get off. How many passengers remain?

THINK

Relevant: 32 passengers and 7 getting off. Irrelevant: the bus color and the driver's cap.

ANSWER

$32 - 7 = 25$, so 25 passengers remain.

THE SAME DETAIL CAN CHANGE JOBS

INFORMATION	QUESTION A	QUESTION B
A jar has 43 buttons. 18 are green. The jar is 22 cm tall.	How many buttons are not green? Relevant: 43 and 18 Irrelevant: 22 cm	How tall is the jar? Relevant: 22 cm Irrelevant: button counts

IMPORTANT IDEA

Relevance depends on the question. Do not use a number simply because it appears in the text.

TRY IT

Underline the relevant information: A basket contains 28 apples. 9 are red. The basket has a green handle. How many apples are not red?

REMEMBER

Use information because it matters to the target and relationship - not simply because it appears in the problem.

KOLUPATH Understanding Math Words • UK Edition

Explicit teaching pages help children understand the language of maths questions, not just memorise keyword tricks.

Practice & Apply

WORKED SOLUTIONS

Worked answers for source pages 57-59. Other correct methods and explanations may also be accepted.

LL WORKED CHALLENGE

bottles. Four teams receive 18 bottles each. The bottles are blue. The between 6 helpers. How many bottles does each helper receive?

Information: 96 bottles in total; 4 teams; 18 bottles per team; 6 helpers. Final

at the bottles are blue is irrelevant because color does not change any quantity or

EXPLAIN • Justify • Check Practice

Use precise mathematical language to show why an answer or method is valid.

EXPLAIN

Explain why $42 \div 6 = 7$. Use equal-groups or sharing language in your response.

Read • Mark • Plan

Before calculating, slow the problem down: understand then choose a plan.

THREE PRE-S

READ retell what is happening and identify the target	MARK notice known unknown, conc voca
---	--

WORKED

PROBLEM
A library has 72 books on a display. 18 are borrowed in the

THINK
READ: the amount decreases twice. MARK: start = 72; ch; subtract both changes, either separately or by combining

ANSWER
One method: $72 - 18 = 54$; $54 - 9 = 45$. So 45 books remain

TRY IT • PLAN B

TASK
A class collects 6 boxes of 24 cans. Then 35 cans are taken

READ • MARK
What is known? What is unknown? Which information matters?

WORKED

Planning is mathematical thinking. A clear plan reduces

LEARN

Solve • Solution

These words separate the process of finding an answer from the result that satisfies the mathematics.

DEFINITIONS

SOLVE work through the mathematics to determine an unknown or answer a question	SOLUTION a value, statement or result that satisfies the problem or equation
---	--

PROCESS • RESULT

READ identify the relationship	REPRESENT show what is known and unknown	CALCULATE carry out a suitable method	CHECK test whether the result fits
--	--	---	--

SEE IT IN AN EQUATION

PROBLEM
 $6 \times ? = 42$

THINK
The unknown is the missing factor. If 6 is the number of groups, ? is the amount in each group. Use the inverse relationship: $42 \div 6 = 7$.

ANSWER
 $6 \times 7 = 42$, so the solution is 7.

SOLUTION IN CONTEXT
If 42 pencils are shared equally among 6 groups, the solution is 7 pencils in each group. A final answer should match the question and include units when needed.

TRY IT

A number plus 18 equals 47. Solve the equation. Then write the solution as a complete mathematical statement and check it.

LEARN

Chart • Diagram

Organize or display information in different ways so patterns and relationships

DEFINITIONS

CHART displays information or comparisons visually	DIAGRAM shows structure, parts, positions or relationships
--	--

USE THE REPRESENTATION THAT FITS

COMPARE CATEGORIES a chart can make differences easier to notice	SHOW STRUCTURE a diagram can reveal how parts or quantities connect
--	---

WORKED TABLE

r has the runner traveled after 1, 2, 3 and 4 days?

	TOTAL DISTANCE
	5 km
	10 km
	15 km
	20 km

TRY IT

problem with repeated groups. Create the representation and

NUMBER
makes the information or relationship easiest to interpret.

Identify • Represent • Solve • Explain • Justify

Same Word • Different Operation

The same vocabulary can appear in different structures. Use the relation of the word alone - to choose the operation.

"ALTOGETHER" IN TWO DIFFERENT STRUCTURES

UNKNOWN WHOLE

There are 18 red counters and 7 blue counters. How many counters are there altogether?

$$18 + 7 = 25$$

UNKNOWN PART

There are 25 counters and 7 blue counters. How many red counters are there?

$$25 - 7 = 18$$

"EACH" IN TWO DIFFERENT STRUCTURES

UNKNOWN TOTAL

6 bags hold 4 apples each. How many apples are there?

$$6 \times 4 = 24$$

UNKNOWN NUMBER

24 apples are packed with 4 apples in each bag. How many bags are there?

$$24 \div 4 = 6$$

THE DECISION QUESTION

What is known, what is unknown, and how are the quantities related?

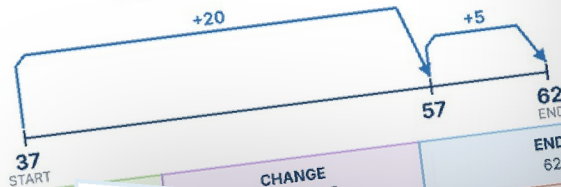
TRY IT

Write two word problems that both use the word "left" or "total" but require different operations. For each problem, explain what is unknown and why the operation fits.

Number Line

A number line represents numbers in order and can show position, distance, jumps and change.

WORKED EXAMPLE • $37 + 25$



START
37

WHY SPLIT 25?
 $25 = 20 + 5$. Decompose 25 into 20 and 5.

ADDITION
jumps forwards / to

$$37 + 25 = 62$$

Explain • Justify • Check Practice

Use precise mathematical language to show why an answer or method is valid.

EXPLAIN

Explain why $42 \div 6 = 7$. Use equal-groups or sharing language in your response.

Sharing • Grouping Division

Division can describe sharing a total equally or making equal groups.

TWO DIVISION STRUCTURES

SHARING

A total is shared equally among a known number of groups. The unknown is the amount in each group.

GROUPING

A total is organized into groups of a known size. The unknown is the number of groups.

SAME TOTAL • DIFFERENT QUESTION

SHARING

24 counters shared equally among 6 bags

GROUPING

24 counters arranged in groups of 4

DO NOT TREAT DIVISION AS ONE STORY

Sharing and grouping are different problem structures. Identify the unknown quantity before writing.

Read • Mark • Plan

Before calculating, slow the problem down: understand the problem, then choose a plan.

THREE PRE-STEP

READ

retell what is happening and identify the target

MARK

notice known information, unknown, and what is asked

WORKED SOLUTIONS

PROBLEM

A library has 72 books on a display. 18 are borrowed in the morning.

THINK

READ: the amount decreases twice. MARK: start = 72; change = 18; subtract both changes, either separately or by combining them.

ANSWER

One method: $72 - 18 = 54$; $54 - 9 = 45$. So 45 books remain on display.

TRY IT • PLAN IT

TASK

A class collects 6 boxes of 24 cans. Then 35 cans are recycled.

READ • MARK

What is known? What is unknown? Which information matters?

Planning is mathematical thinking. A clear plan reduces the chance of errors.

Planning is mathematical thinking. A clear plan reduces the chance of errors.

WORKED SOLUTIONS

Worked answers for source pages 6-9. Other correct methods and explanations may also be accepted.

P6 Words Are Clues - Not Commands

Question: Why is 'each' not enough to choose an operation?

Thinking: 'Each' describes a per-group or per-item amount. If the number of groups and the amount in each group are known, multiplication can find the total. If the total and the number of groups are known, division can find the amount in each group.

Answer: Example multiplication: 6 bags with 4 counters each $\rightarrow 6 \times 4 = 24$. Example division: 24 counters shared among 6 bags $\rightarrow 24 \div 6 = 4$ in each bag.

P7 Problem • Question

Question: Rewrite the question for the can-collection problem without changing the target.

Thinking: The situation stays the same: 75 cans were collected and 28 were recycled. The new wording must still ask for the cans that have not been recycled.

Answer: How many of the collected cans have not yet been recycled?

P8 Known • Given • Unknown

Question: 36 apples are packed equally into 6 bags. What is known and what is unknown?

Thinking: Known: 36 apples in total; 6 equal bags; the apples are shared equally. Unknown: the number of apples in each bag.

Answer: If solved: $36 \div 6 = 6$, so there are 6 apples in each bag.

P9 Relevant • Irrelevant Information

Question: A basket has 28 apples, 9 are red, and the basket has a green handle. Which information is relevant?

Thinking: The target is the number of apples that are not red. The total number of apples and the number that are red affect the answer. The color of the handle does not.

Answer: Relevant: 28 apples and 9 red apples. Irrelevant: green handle. If solved, $28 - 9 = 19$ apples are not red.

the exact total first.

for another valid check.

check tests whether the result is reliable.

REMEMBER

Strong proof depends on the claim. Use evidence that is sufficient for exactly what is being