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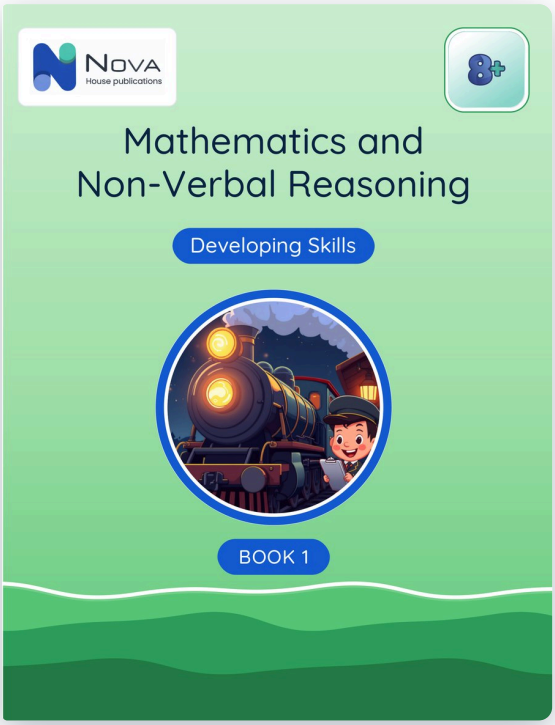
8+ Mathematics and Non-Verbal Reasoning

Developing Skills · Book 1

Unit 2: The Spice Merchants



Inside this sample

p. 2	Unit opener: The Spice Merchants
p. 3	Warm-up: Before You Start!
p. 4	Factor pairs: The Spice Warehouse
p. 5	Prime numbers and divisibility rules: The Trading Routes
p. 6	Challenge: The Grand Merchant's Cipher
p. 7	Mystery number and cube nets (NVR)
p. 8	Answers for every question

1 Print

Print on A4 at home. Every page fits the sheet, so choose "Fit to page" if your printer asks.

2 Have a go

Let your child work through the pages at their own pace. Allow 40 to 50 minutes.

3 Check together

Use the answers on page 8 and talk through anything that went wrong.

About the book

A ten-unit workbook for children preparing for the 8+ entrance exam in Year 3. Every unit develops number work, problem solving and one non-verbal reasoning question type together, inside a single themed adventure.

The full book is available on Amazon: amazon.co.uk/dp/B0HHBNCLZQ

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Unit 2

The Spice Merchants

Factor Pairs, Prime Numbers & Divisibility • Cube Nets NVR

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Warm-Up

Before You Start!

Talk about these questions together.

1. You have 12 biscuits to share equally. How many different ways could you arrange them into equal groups?
2. Some numbers of sweets cannot be shared equally between 2 or more children, unless each child gets just 1 sweet. Can you think of a number like that?
3. Why might a market trader stack jars in neat rectangles rather than one long line?
4. What is special about arranging things in a square, with the same number of rows as columns?

★

Along the ancient Spice Route, merchants travelled thousands of miles to trade rare spices: cinnamon from Ceylon, pepper from India, saffron from Persia. Every transaction required careful mathematics.

Every time a merchant arranged jars in equal rows, packed crates or divided a shipment between buyers, they were working with factor pairs, pairs of numbers that multiply together to make the total. And whenever a quantity could only be divided by 1 and itself, they had found a very special kind of number.

In this unit you will master factor pairs and divisibility rules. You will also meet square numbers and cube numbers, the mathematics of perfectly shaped stacks.

★

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Activity 1

The Spice Warehouse

Factor Pairs

A factor pair of a number is two numbers that multiply together to give that number. For example: 3 and 8 are a factor pair of 24 because 3 × 8 = 24. Every factor pair represents a different way to arrange jars in equal rows.

Worked Example

Find all factor pairs of 24.

Start with 1: 1×24=24. Try 2: 2×12=24. Try 3: 3×8=24. Try 4: 4×6=24. Try 5: 5 does not go into 24 exactly (skip). Try 6: 6×4 is already listed, so stop.

Rule: stop as soon as the pairs start to repeat.

All factor pairs of 24: (1,24), (2,12), (3,8), (4,6). That is 4 pairs.

Question 1 **Find all factor pairs for each number. Write them as (smaller, larger) pairs.**

18: _____

30: _____

42: _____

60: _____

Which of the four numbers has the most factor pairs?

Answer: _____

Question 2 **A merchant has 48 sacks of cinnamon to arrange in equal rows.**

A Write all possible arrangements (rows × columns) using factor pairs of 48.

_____

_____

15

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B Which arrangement is most 'square-shaped'? Write its dimensions.

C A shelf is exactly 6 sacks wide. How many rows of 6 can be made from 48 sacks? Any left over?

Rows: ☐ Left over: ☐

Question 3 **A merchant has a number of jars that can only be arranged in rectangular groups where one side is 1 jar wide.**

A How many factor pairs does this number have? ☐

B Circle the numbers that fit this description:

7 12 17 25 31 36 41 49

C What is the name of this special type of number?

★

Activity 2

The Trading Routes

Prime Numbers and Divisibility

Divisibility rules let you quickly decide whether a number is divisible by 2, 3, 5 or 10 without doing the full division: the merchant's shortcuts.

Divisibility Rules

÷2: last digit is 0, 2, 4, 6 or 8. **÷3:** digit sum divisible by 3.

÷5: last digit 0 or 5. **÷10:** last digit 0.

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Challenge Activity

The Grand Merchant's Cipher

Question 10 The Grand Merchant's chest holds 360 silver coins. Test whether 360 is divisible by every number from 2 to 10.

÷	Test / working	✓ or ✗
2		
3		
4		
5		
6		
7		
8		
9		
10		

Which number from 2–10 is NOT a factor of 360?

Answer: _____

Question 11 The merchant hides his valuables using prime number codes.

A The first lock's code is the largest prime number less than 100. Code: ☐

20

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B Find two different pairs of prime numbers that add up to 40.

Pair 1: _____ + _____ Pair 2: _____ + _____

C The merchant claims: "The sum of any two prime numbers is always even." Is he correct?

YES / NO (circle one)

Explain: _____

_____

Question 12 **Find the mystery number from the four clues.**

Clue 1: It is a 2-digit number. Clue 2: It is divisible by 9. Clue 3: It is a square number.
Clue 4: It has exactly 3 factor pairs.

Working:

Mystery number: _____

★

Activity 4

The Merchant's Crates

Cube Nets (Introduction)

How to Test Whether a Net Folds into a Cube

A cube net is 6 joined squares that fold into a cube. Use the rules, then fold it in your head to be sure.

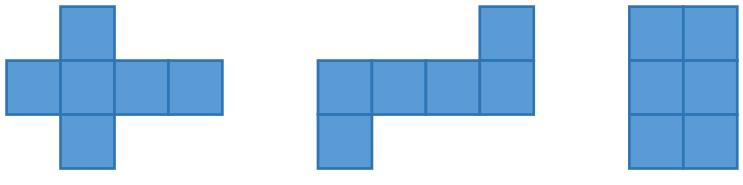
Rule 1: Exactly 6 squares, each connected to at least one other.

Rule 2: No 2×2 block: two squares would land on the same face.

Rule 3: No line of 5 or more squares: it cannot close into a cube.

Question 13 **In each set, ONE net will NOT fold into a cube. Write its number and the rule it breaks.**

A Which net is invalid?



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Answers

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For the adult checking this work. Talk through any wrong answer before showing the answer below. Open questions have no single right answer: look for a sensible answer backed by the text.

Question	Answer and guidance
Warm-up Before You Start!	**Discussion: any thoughtful answer.**
Q1 Factor pairs of 18, 30, 42 and 60	**18:** (1, 18) (2, 9) (3, 6) **30:** (1, 30) (2, 15) (3, 10) (5, 6) **42:** (1, 42) (2, 21) (3, 14) (6, 7) **60:** (1, 60) (2, 30) (3, 20) (4, 15) (5, 12) (6, 10) **Most pairs: 60** (6 pairs) Try 1, 2, 3, 4… in order and stop when the pairs start to repeat.
Q2 48 sacks in equal rows	**A)** 1 × 48, 2 × 24, 3 × 16, 4 × 12, 6 × 8 **B)** 6 × 8 **C)** Rows: 8. Left over: 0 6 × 8 is the most square-shaped because 6 and 8 are closest together.
Q3 Jars that only make a single row	**A)** 1 factor pair **B)** 7, 17, 31 and 41 **C)** Prime numbers 25 and 49 are traps: 5 × 5 and 7 × 7 are rectangles too.
Q10 Is 360 divisible by 2 to 10?	**Yes** for 2, 3, 4, 5, 6, 8, 9 and 10. **No** for 7. **Not a factor: 7** 360 ÷ 7 = 51 remainder 3.
Q11 Prime number codes	**A)** 97 **B)** Any two of 3 + 37, 11 + 29, 17 + 23 **C)** No: 2 + 3 = 5, which is odd. 2 is the only even prime, so 2 + any other prime gives an odd total.
Q12 The mystery number	**81** Two-digit multiples of 9 that are square: 36 and 81. Only 81 has exactly 3 factor pairs: (1, 81), (3, 27), (9, 9).
Q13 A Which net will not fold into a cube?	**Net 3.** It breaks Rule 2: it has a 2 × 2 block.

Want to go further?

The Teacher's Guide gives full working, common mistakes and support and extension ideas for every question, including the rest of the cube-nets activity.

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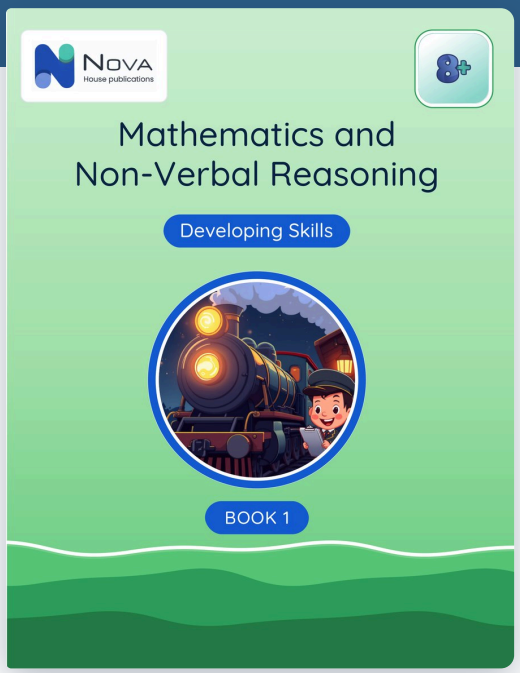

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