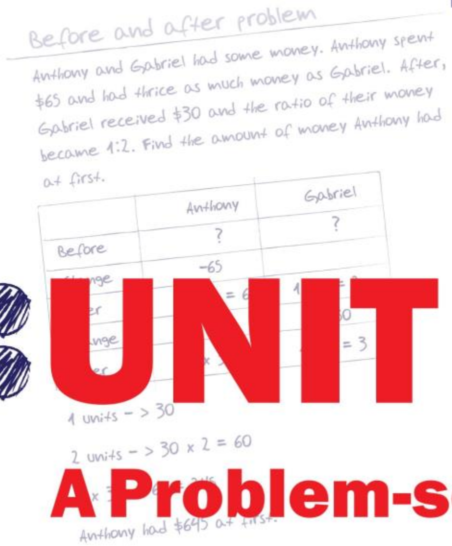
Mastering Heuristics Series
Handbooks for discerning parents

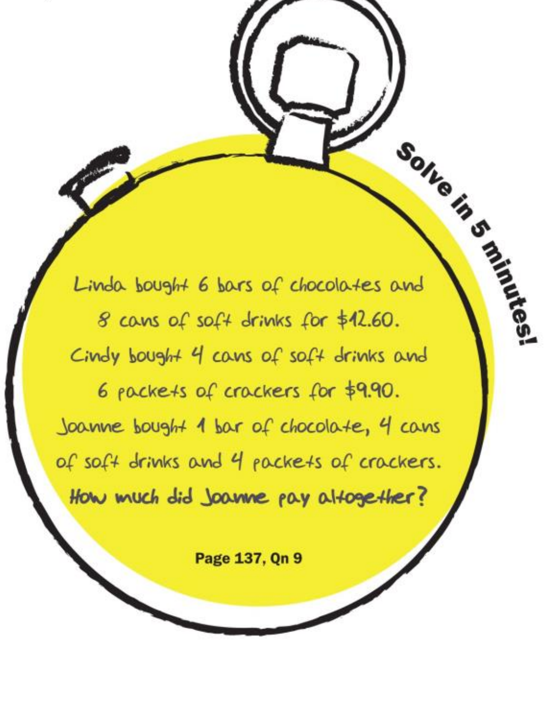


2nd edition

1:UNIT TRANSFER METHOD

A Problem-solving Tool

**for Challenging Problems
in Upper Primary Mathematics
(Primary 5 & 6)**



Sunny Tan

Mastering Heuristics Series
Handbook for discerning parents

Unit Transfer Method (2nd Edition)
A Problem-solving Tool
for Challenging Problems
in Upper Primary Mathematics
(Primary 5 & 6)

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Maths Heuristics Private Limited

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PREFACE

Heuristics in Primary Maths Syllabus

Heuristics is a specialised mathematical problem-solving concept. Mastering it facilitates efficiency in solving regular as well as challenging mathematical problems. The Ministry of Education in Singapore has incorporated 11 Problem-Solving Heuristics into all primary-level mathematical syllabus.

Learning Heuristics Effectively

Instead of containing the 11 Problem-Solving Heuristics neatly into specific chapters though, they have been integrated into the regular curriculum. This not only makes it difficult for students to pick up Heuristics skills, but can also make mathematics confusing for some students. For us parents, it is difficult for us to put aside the regular-syllabus mathematical concepts we were brought up on to re-learn Heuristics, much less teach our own children this new concept.

Take Algebraic Equations, for instance. Although it is a Heuristics technique, the topic has never been, and is still not, taught at primary level. Yet, primary-level Mathematics Papers these days include questions from the topic. Parents, being familiar with the topic, will attempt to teach their children to solve the question using Algebraic Equations. This will only confuse their children. According to current primary-level mathematical syllabus, other Heuristics techniques should be used instead.

These and other challenges were what I observed first hand during my years as a mathematics teacher, and what provided me the impetus for my post-graduate studies, mathsHeuristics™ programmes and, now, the Mastering Heuristics Series of books.

About Mastering Heuristics Series

This series of books is a culmination of my systematic thinking, supported by professional instructional writing and editing, to facilitate understanding and mastery of Heuristics. Through it, I have neatly packaged Heuristics into logical topics (Series of books) and sub-topics (Chapters within each book). For each sub-topic, I offer many examples, showing how the sub-topic may be applied, and then explaining the application in easy-to-follow steps and visualisations without skipping a beat.

This particular book in the series deals specifically with Unit Transfer Method, the use of ratio to effectively analyse and solve challenging mathematical problems involving whole numbers, fractions, decimals, percentages and ratios. This simple, logical yet powerful problem-solving technique complements the model approach and the algebraic approach.

The entire series of four books provides a complete and comprehensive guide to Heuristics. While each book introduces parents to a few Heuristics topics, it gives students the opportunity to see how the specific Heuristics work as well as get in some practice.

For students enrolled in mathsHeuristics™ programmes, each book serves as a great companion, while keeping parents well-informed of what their children are learning.

Sunny Tan

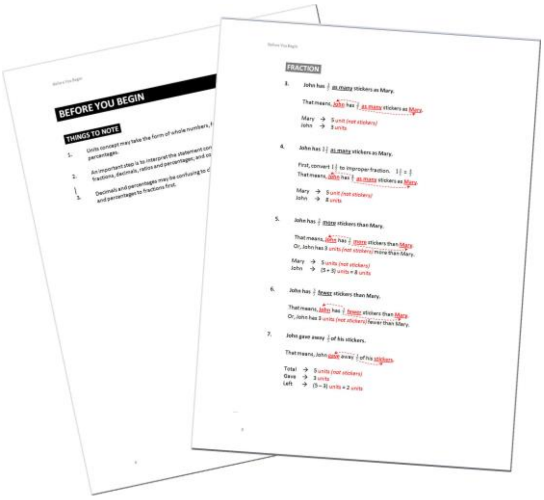
November 2010

HOW TO USE THIS BOOK

BEFORE YOU BEGIN

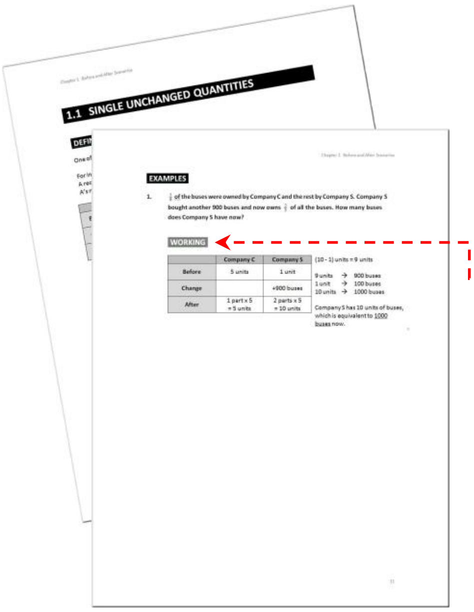
The “Before You Begin” chapter instills the basic but important step that must be applied across every question under this topic. This helps to standardise the given information for easy application of the techniques being taught.

In this book on Unit Transfer Method (UTM), this step is to convert whole numbers, fractions, decimals, percentages and ratios into units.



CHAPTERS AND SECTIONS

The various UTM techniques are neatly separated into different chapters and sections. Thus, examples of UTM application are classified according to problem-solving techniques for more focused learning.

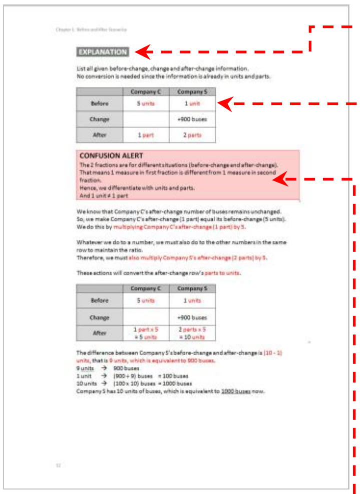


EXAMPLES

Each example of UTM application comes with “Working” and “Explanation”, which includes “Confusion Alert” boxes.

WORKING

“Working” shows heuristics application in action (how quick it is to solve a question).



EXPLANATION

"Explanation" shows the thought process behind the heuristics application (the detailed steps). It takes readers through the solution in the following manner:

- step-by-step without skipping a beat so that readers can follow what happens at each and every step.
- systematic so that readers begin to see a pattern in applying the technique.
- easy-to-follow so that readers can quickly understand the technique minus the frustration.

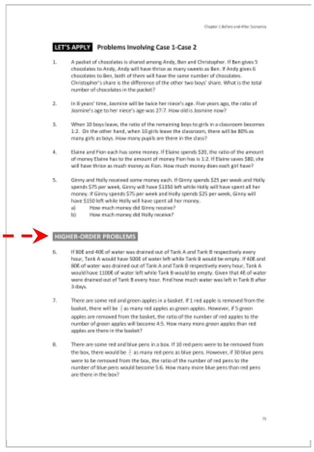
In UTM, readers will see that its application always begins with:

- the basic step explained in "Before You Begin", and
- the tabulation of all given information.

This quickly helps students see and understand the relationships among all the information given in the question.

"Confusion Alert" boxes in the midst of "Explanation" highlight areas where students are likely to be uncertain of or make mistakes in. It also gives the rationale to help clarify doubts in these areas.

LET'S APPLY



Learning is only effective when followed up with practice. Hence, at the end of each chapter/section is a list of questions related to the heuristics technique taught in that chapter/section.

HIGHER-ORDER PROBLEMS

Higher-order questions have also been added to every practice section. This aims to stretch students' skills in applying the heuristics technique.

ADDITIONAL TIPS

For on-going sharing and discussions on the use of UTM, visit:
www.unittransfermethod.blogspot.com

For detailed workings to all UTM "Let's Apply" and "Higher-order Problems" sections, visit:
www.mathsHeuristics.com/solution-s1-utm.html

BEFORE YOU BEGIN

THINGS TO NOTE

1. Units concept may take the form of whole numbers, fractions, decimals, ratios or percentages.

2. An important step is to interpret the statement containing whole numbers, fractions, decimals, ratios and percentages; and convert them into units.

3. Decimals and percentages may be confusing to children. So, convert any decimals and percentages to fractions first.

EXAMPLES

WHOLE NUMBER

1. John has 5 times <u>as many</u> stickers as Mary.

First, convert the whole number to fraction. $5 = \frac{5}{1}$

That means, <u>John</u> has $\frac{5}{1}$ times <u>as many</u> stickers as <u>Mary</u>.

Mary → 1 unit *(not stickers)*

John → 5 units

2. John has 5 times <u>more</u> stickers than Mary.

First, convert the whole number to fraction. $5 = \frac{5}{1}$

That means, <u>John</u> has $\frac{5}{1}$ times <u>more</u> stickers than <u>Mary</u>.

Mary → 1 unit *(not stickers)*

John → (1 + 5) units = 6 units

FRACTION

3. **John has $\frac{3}{5}$ <u>as many</u> stickers as Mary.**

That means, **<u>John</u>** has $\frac{3}{5}$ **<u>as many</u>** stickers as **<u>Mary</u>**.

Mary → 5 units *(not stickers)*
John → 3 units

4. **John has $1\frac{3}{5}$ <u>as many</u> stickers as Mary.**

First, convert $1\frac{3}{5}$ to improper fraction. $1\frac{3}{5} = \frac{8}{5}$
That means, **<u>John</u>** has $\frac{8}{5}$ **<u>as many</u>** stickers as **<u>Mary</u>**.

Mary → 5 units *(not stickers)*
John → 8 units

5. **John has $\frac{3}{5}$ <u>more</u> stickers than Mary.**

That means, **<u>John</u>** has $\frac{3}{5}$ **<u>more</u>** stickers than **<u>Mary</u>**.
Or, John has 3 units *(not stickers)* more than Mary.

Mary → 5 units *(not stickers)*
John → (5 + 3) units = 8 units

6. **John has $\frac{3}{5}$ <u>fewer</u> stickers than Mary.**

That means, **<u>John</u>** has $\frac{3}{5}$ **<u>fewer</u>** stickers than **<u>Mary</u>**.
Or, John has 3 units *(not stickers)* fewer than Mary.

Mary → 5 units *(not stickers)*
John → (5 – 3) units = 2 units

7. **John gave away $\frac{3}{5}$ of his stickers.**

That means, John **<u>gave</u>** away $\frac{3}{5}$ of his **<u>stickers</u>**.

Total → 5 units *(not stickers)*
Gave → 3 units
Left → (5 – 3) units = 2 units

DECIMAL

8. **John has 0.6 times <u>as many</u> stickers as Mary.**

First, convert the decimal to fraction. 0.6 = $\frac{6}{10}$ = $\frac{3}{5}$

That means, **<u>John</u>** has $\frac{3}{5}$ **<u>as many</u>** stickers as **<u>Mary</u>**. **(Just like Example 3)**

Mary → 5 units *(not stickers)*

John → 3 units

9. **John has 1.6 times <u>as many</u> stickers as Mary.**

First, convert the decimal to improper fraction. 1.6 = $1\frac{6}{10}$ = $1\frac{3}{5}$ = $\frac{8}{5}$

That means, **<u>John</u>** has $\frac{8}{5}$ **<u>as many</u>** stickers as **<u>Mary</u>**. **(Just like Example 4)**

Mary → 5 units *(not stickers)*

John → 8 units

10. **John has 0.6 times <u>more</u> stickers than Mary.**

First, convert the decimal to fraction. 0.6 = $\frac{6}{10}$ = $\frac{3}{5}$

That means, **<u>John</u>** has $\frac{3}{5}$ **<u>more</u>** stickers than **<u>Mary</u>**. **(Just like Example 5)**

Or, John has 3 units *(not stickers)* more than Mary.

Mary → 5 units *(not stickers)*

John → (5 + 3) units = 8 units

11. **John has 0.6 times <u>fewer</u> stickers than Mary.**

First, convert the decimal to fraction. 0.6 = $\frac{6}{10}$ = $\frac{3}{5}$

That means, **<u>John</u>** has $\frac{3}{5}$ **<u>fewer</u>** stickers than **<u>Mary</u>**. **(Just like Example 6)**

Or, John has 3 units *(not stickers)* fewer than Mary.

Mary → 5 units *(not stickers)*

John → (5 – 3) units = 2 units

12. **John gave away 0.6 of his stickers.**

First, convert the decimal to fraction. 0.6 = $\frac{6}{10}$ = $\frac{3}{5}$

That means, John **<u>gave</u>** away $\frac{3}{5}$ of his **<u>stickers</u>**. **(Just like Example 7)**

Total → 5 units *(not stickers)*

Gave → 3 units

Left → (5 – 3) units = 2 units

PERCENTAGE

13. **John has 60% <u>as many</u> stickers as Mary.**

First, convert the percentage to fraction. 60% = $\frac{60}{100}$ = $\frac{3}{5}$

That means, **<u>John</u>** has $\frac{3}{5}$ **<u>as many</u>** stickers as **<u>Mary</u>**. **(Just like Example 3)**

Mary → 5 units *(not stickers)*
John → 3 units

14. **John has 160% <u>as many</u> stickers as Mary.**

First, convert the percentage to improper fraction. 160% = $\frac{160}{100}$ = $\frac{8}{5}$

That means, **<u>John</u>** has $\frac{8}{5}$ **<u>as many</u>** stickers as **<u>Mary</u>**. **(Just like Example 4)**

Mary → 5 units *(not stickers)*
John → 8 units

15. **John has 60% <u>more</u> stickers than Mary.**

First, convert the percentage to fraction. 60% = $\frac{60}{100}$ = $\frac{3}{5}$

That means, **<u>John</u>** has $\frac{3}{5}$ **<u>more</u>** stickers than **<u>Mary</u>**. **(Just like Example 5)**
Or, John has 3 units *(not stickers)* more than Mary.

Mary → 5 units *(not stickers)*
John → (5 + 3) units = 8 units

16. **John has 60% <u>fewer</u> stickers than Mary.**

First, convert the percentage to fraction. 60% = $\frac{60}{100}$ = $\frac{3}{5}$

That means, **<u>John</u>** has $\frac{3}{5}$ **<u>fewer</u>** stickers than **<u>Mary</u>**. **(Just like Example 6)**
Or, John has 3 units *(not stickers)* fewer than Mary.

Mary → 5 units *(not stickers)*
John → (5 – 3) units = 2 units

17. **John <u>gave</u> away 60% of his stickers.**

First, convert the percentage to fraction. 60% = $\frac{60}{100}$ = $\frac{3}{5}$

That means, John **<u>gave</u>** away $\frac{3}{5}$ of his **<u>stickers</u>**. **(Just like Example 7)**

Total → 5 units *(not stickers)*
Gave → 3 units
Left → (5 – 3) units = 2 units

RATIO

18. John and Mary have stickers in the <u>ratio</u> of 3:5.

<u>John</u> and **<u>Mary</u>** have stickers in the **<u>ratio</u>** of 3:5.

Mary → 5 units *(not stickers)*
John → 3 units

CHAPTER 1 BEFORE AND AFTER SCENARIOS

STEPS

- List all given before-action, change-action and after-action information.
- Convert the information into units and parts,
  where necessary and if not already in units and parts.
- Compare the information to find the unknown.

APPLICABILITY

There are five basic scenarios where the Before and After Concept may be applied.

- Single Unchanged Quantities
- Total Unchanged Quantities
- Difference Unchanged Quantities
- All Changing Quantities
- Case 1-Case 2

In the All Changing Quantities scenario, a modified version of Unit Transfer Method is used to solve the problem.

Each Case 1-Case 2 scenario is effectively one of the preceding four Before and After scenarios, except that the Case 1-Case 2 scenario requires higher-order thinking skills to be solved.

1.1 SINGLE UNCHANGED QUANTITIES

DEFINITION

One of the given quantities remains unchanged.

For instance, A and B have stickers in a certain quantities (Say, 20:50).
A receives 5 stickers from C (external party).
A’s number of stickers changed, B’s number of stickers remains unchanged.

	A	B
Before	20	50
Change	+5	
After	25	50

→ In the change row, the change figure appears in the column where the change occurred.

↓

In the column where the change cell is empty (no change occurred), the before-change and after-change quantities remain the same (quantities unchanged).

While A’s number of stickers changes (+5), B’s number of stickers remains unchanged (Single Unchanged Quantity).

EXAMPLES

1. $\frac{5}{6}$ **of the buses were owned by Company C and the rest by Company S. Company S bought another 900 buses and now owns** $\frac{2}{3}$ **of all the buses. How many buses does Company S have now?**

WORKING

	Company C	Company S
Before	5 units	1 unit
Change		+900 buses
After	1 part x 5 = 5 units	2 parts x 5 = 10 units

(10 - 1) units = 9 units

9 units → 900 buses
1 unit → (900 ÷ 9) buses = 100 buses
10 units → (100 x 10) buses = 1000 buses

Company S has 10 units of buses, which is equivalent to 1000 buses now.

EXPLANATION

List all given before-change, change and after-change information.
No conversion is needed since the information is already in units and parts.

	Company C	Company S
Before	5 units	1 unit
Change		+900 buses
After	1 part	2 parts

CONFUSION ALERT

The 2 fractions are for different situations (before-change and after-change).
That means 1 measure in first fraction is different from 1 measure in second fraction.
Hence, we differentiate with units and parts.
And 1 unit ≠ 1 part

We know that Company C's after-change number of buses remains unchanged.
So, we make Company C's after-change (1 part) equal its before-change (5 units).
We do this by multiplying Company C's after-change (1 part) by 5.

Whatever we do to a number, we must also do to the other numbers in the same row to maintain the ratio.
Therefore, we must also multiply Company S's after-change (2 parts) by 5.

These actions will convert the after-change row's parts to units.

	Company C	Company S
Before	5 units	1 units
Change		+900 buses
After	1 part x 5 = 5 units	2 parts x 5 = 10 units

The difference between Company S's before-change and after-change is (10 - 1) units, that is 9 units, which is equivalent to 900 buses.

9 units → 900 buses
1 unit → (900 ÷ 9) buses = 100 buses
10 units → (100 x 10) buses = 1000 buses

Company S has 10 units of buses, which is equivalent to <u>1000 buses</u> now.

2. **At a gathering, the ratio of the number of men to the number of women was 5:7. After 60 men left the gathering, the new ratio of the number of men to the number of women became 1:2. How many men were there at first?**

WORKING

	Men	**Women**
Before	5 units x 2 = 10 units	7 units x 2 = 14 units
Change	- 60 men	
After	1 part x 7 = 7 units	2 parts x 7 = 14 units

(10 - 7) units = 3 units

3 units → 60 men
1 unit → (60 ÷ 3) men = 20 men
10 units → (20 x 10) men = 200 men

There were 10 units of men, which is equivalent to 200 men at first.

EXPLANATION

List all given before-change, change and after-change information.
No conversion is needed since the information is already in units and parts.

	Men	Women
Before	5 units	7 units
Change	- 60 men	
After	1 part	2 parts

CONFUSION ALERT

The 2 ratios are for different situations (before-change and after-change).
That means 1 measure in first ratio is different from 1 measure in second ratio.
Hence, we differentiate with units and parts.
And 1 unit ≠ 1 part

We know that the number of women remains unchanged.
So, we make the women's after-change (2 parts) equal their before-change (7 units).
We do this by multiplying the women's after-change (2 parts) by 7,
and their before-change (7 units) by 2.

Whatever we do to a number, we must also do to the other numbers in the same row to maintain the ratio.
Therefore, we must also multiply the men's after-change (1 part) by 7,
and their before-change (5 units) by 2.

These actions will convert the after-change row's parts to units.

	Men	Women
Before	5 units x 2 = 10 units	7 units x 2 = 14 units
Change	- 60 men	
After	1 part x 7 = 7 units	2 parts x 7 = 14 units

The difference between the men's before-change and after-change is (10 - 7) units, that is 3 units, which is equivalent to 60 men.
3 units → 60 men
1 unit → (60 ÷ 3) men = 20 men
10 units → (20 x 10) men = 200 men
There were 10 units of men, which is equivalent to 200 men at first.

3. **Kane has 90 stamps in his album. 60% of them are from Singapore while the rest are from Thailand. After giving away some Singapore stamps, the percentage of Singapore stamps reduces to 55%. How many Singapore stamps does he have in the end?**

WORKING

60% = $\frac{60}{100} = \frac{3}{5}$

55% = $\frac{55}{100} = \frac{11}{20}$

	Singapore Stamps	**Thai Stamps**	**Total stamps**
Before	3 units ↓ 3 units x 9 = 27 units	(5 - 3) units = 2 units ↓ 2 units x 9 = 18 units	5 units ↓ 5 units x 9 = 45 units → 90 stamps
Change	- ? stamps		
After	11 parts ↓ 11 parts x 2 = 22 units	(20 - 11) parts = 9 parts ↓ 9 parts x 2 = 18 units	

45 units → 90 stamps
1 unit → (90 ÷ 45) stamps = 2 stamps
22 units → (2 x 22) stamps = 44 stamps

Kane has 22 units of Singapore stamps, which is equivalent to <u>44 Singapore stamps</u> in the end

EXPLANATION

Smaller numbers are more manageable.
So, convert the percentage to fraction first.

60% = $\frac{60}{100} = \frac{3}{5}$

55% = $\frac{55}{100} = \frac{11}{20}$

List all given before-change, change and after-change information.
No conversion is needed since the information is already in units and parts.

	Singapore stamps	Thai stamps	Total stamps
Before	3 units	(5 - 3) units = 2 units	5 units
Change	- ? stamps		
After	11 parts	(20 - 11) parts = 9 parts	

> **CONFUSION ALERT**
> The 2 fractions are for different situations (before-change and after-change).
> That means 1 measure in first fraction is different from 1 measure in second fraction.
> Hence, we differentiate with units and parts.
> And 1 unit ≠ 1 part

We know that the number of Thai stamps remains unchanged.
So, we make the Thai stamps' after-change (9 units) equal its before-change (2 units).
We do this by multiplying the Thai stamps' after-change (9 parts) by 2,
and its before-change (2 units) by 9.

Whatever we do to a number, we must also do to the other numbers in the same row to maintain the ratio.
Therefore, we must multiply the Singapore stamps' after-change (11 parts) by 2,
its before-change (3 units) by 9,
and the total stamps before-change (5 units) by 9.

These actions will convert the after-change row's parts to units.

	Singapore Stamps	Thai Stamps	Total stamps
Before	3 units x 9 = 27 units	2 units x 9 = 18 units	5 units x 9 = 45 units → 90 stamps
Change	- ? stamps		
After	11 parts x 2 = 22 units	9 parts x 2 = 18 units	

45 units → 90 stamps
1 unit → (90 ÷ 45) stamps = 2 stamps
22 units → (2 x 22) stamps = 44 stamps
Kane has 22 units of Singapore stamps, which is equivalent to 44 Singapore stamps in the end.

4. **In a fruit stall, the ratio of number of apples to number of oranges is 2:9. The ratio of number of oranges to number of pears is 3:4. The next day, 135 oranges were sold, $\frac{4}{11}$ of the remaining fruits in the stall were oranges. How many more pears than apples were there in the stall at first?**

WORKING

	Apples	Oranges	Pears
Before	2 units	9 units	
		3 parts x 3 = 9 units	4 parts x 3 = 12 units

	Oranges	Apples & Pears
Before	9 units	(2 + 12) units = 14 units
Change	- 135 oranges	
After	4 parts x 2 = 8 units	7 parts x 2 = 14 units

(9 - 8) units = 1 unit → 135 fruits

There were (12 – 2) units, that is 10 units more pears than apples at first.

1 unit → 135 fruits
10 units → (135 x 10) fruits = 1350 fruits

There were 10 units, which is equivalent to 1350 more pears than apples at first.

EXPLANATION

List only the before-change information for now.
No conversion is needed since the information is already in units and parts.

	Apples	Oranges	Pears
Before	2 units	9 units	
		3 parts	4 parts

CONFUSION ALERT
The 2 ratios are for different situations
(apples compared to oranges, and oranges compared to pears).
That means 1 measure in first ratio is different from 1 measure in second ratio.
Hence, we differentiate with units and parts.
And 1 unit ≠ 1 part

We know that the oranges in both ratios are the same objects.
So, we make the oranges (3 parts) in the oranges to pears ratio equal 9 units.
We do this by multiplying the oranges (3 parts) in the oranges to pears ratio by 3.

Whatever we do to a number, we must also do to the other numbers in the same row to maintain the ratio.
Therefore, we must multiply the pears (4 parts) in the oranges to pears ratio by 3.

These actions will convert the oranges to pears ratio's parts to units.

	Apples	Oranges	Pears
Before	2 units	9 units	
		3 parts x 3 = 9 units	4 parts x 3 = 12 units

Next, we merge the tables.
Then list all other information, that is all the change and after-change information.
No conversion is needed since the information is already in units and parts.

	Oranges	Apples & Pears
Before	9 units	(2 + 12) units = 14 units
Change	- 135 oranges	
After	4 parts	7 parts

CONFUSION ALERT
The 2 ratios are for different situations (before-change and after-change).
That means 1 measure in first ratio is different from 1 measure in second ratio.
Hence, we differentiate with units and parts.
And 1 unit ≠ 1 part

Also note that earlier use of parts in the orange to pear ratio is different from current use of parts in the after-change ratio.

We know that the total number of apples and pears remains unchanged.
So, we make the apples and pears' after-change (7 parts) equal their before-change (14 units).
We do this by multiplying the apples and pears' after-change (7 parts) by 2.

Whatever we do to a number, we must also do to the other numbers in the same row to maintain the ratio.
Therefore, we must multiply the oranges' after-change (4 parts) by 2.

These actions will convert the after-change row's parts to units.

	Oranges	Apples & Pears
Before	9 units	14 units
Change	- 135 oranges	
After	4 parts x 2 = 8 units	7 parts x 2 = 14 units

The difference between the oranges' before-change and after-change is (9 - 8) units, that is 1 unit, which is equivalent to 135 fruits.

At first, there were 2 units of apples and 12 units of pears.
That means, there were (12 - 2) units, that is 10 units more pears than apples at first.

1 unit → 135 fruits
10 units → (135 x 10) fruits = 1350 fruits

There were 10 units, which is equivalent to <u>1350</u> more pears than apples at first.

LET'S APPLY Problems Involving Single Unchanged Quantities

1. $\frac{1}{5}$ of the children at the playground were girls and the rest were boys. When 8 girls left the playground, the fraction of girls decreased to $\frac{1}{7}$ of the total number of children at the playground. How many children were at the playground at first?

2. There is a box full of pebbles and seashells. Pat put in an additional 80 pebbles into the box and the percentage of pebbles increased from 10% to 30%. How many more seashells than pebbles were there in the box in the end?

3. There was a total of 440 sparrows and pigeons in a park. 25% of these birds were pigeons. When some sparrows left the park, the percentage of pigeons in the park increased to 55%. How many sparrows were left in the park?

4. Mrs Liew baked 3 times as many apple pies as cakes. If she had baked 60 fewer apple pies, she would have baked twice as many cakes as apple pies.
   a) How many apple pies did she bake?
   b) How many cakes did she bake?

5. A concert hall has 600 seats. 10% of the seats are VIP seats while the rest are regular seats. How many VIP seats must be added so that the number of VIP seats is increased to 20%?

HIGHER-ORDER PROBLEMS

6. Three sisters, Angie, Bernice and Candice share some sweets. Angie's share is 40% of the total number of sweets the three sisters have. Bernice has 40 sweets more than Angie. Bernice's share is 4 times Candice's. Then Angie and Bernice gives an equal amount of sweets to their younger brother and the new ratio between the three sisters becomes 5:7:3. How many sweets were given to their younger brother?

7. Three children went on a trick-or-treat trip to collect candies. At the end of the day, the ratio of Caline's candies to Denise's candies is 2:3 and the ratio of Ella's candies to Denise's candies is 6:7. Later on, Ella and Caline donated half of their respective shares to the orphanage in a bag with 64 candies in it. Find out the total number of candies the three children have after the donation.

8. Tom had an album of Singapore and Malaysian stamps. When he gave away 50 Singapore stamps, there were 2.5 times as many Singapore stamps as Malaysian stamps. After his brother gave him another 63 Malaysian stamps, he had 2.5 times as many Malaysian stamps as Singapore stamps. How many more Singapore stamps than Malaysian stamps were there in the Tom's album at first?

9. Alice spent $\frac{3}{5}$ of her monthly allowance. The next month, her monthly allowance increased by $15 and she saved 25% of her new monthly allowance. If what she saved in both months were the same amount, find her new monthly allowance.

Answers to questions in the prior chapters' Let's Apply sections
are listed in this chapter. Detailed workings may be downloaded at:

www.mathsheuristics.com/solutions

CHAPTER 1 : SINGLE UNCHANGED QUANTITIES

LET'S APPLY Problems Involving Single Unchanged Quantities

1. 120 children

2. 144 more seashells than pebbles

3. 90 sparrows

4. a) 72 apple pies
   b) 24 cakes

5. 75 VIP seats

HIGHER-ORDER PROBLEMS

6. 200 sweets

7. 148 candies

8. 68 more Singapore stamps than Malaysia stamps

9. $40

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About the Book

Heuristics is a specialised problem-solving concept now taught at primary-level maths. Merged into the regular maths curriculum, it is difficult to isolate and learn, making maths confusing to some. Many parents must set aside the regular-syllabus they learned in their youth to re-learn and teach their children heuristics – much easier said than done!

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This book specifically teaches the Unit Transfer Method – the use of ratio to effectively analyse and solve challenging maths problems. This simple, logical yet powerful problem-solving technique is an alternative to the model and algebraic approaches.

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About the Author

Sunny Tan currently trains students in the application of various heuristics concepts, with special focus on students in their critical year – the PSLE year. He also conducts heuristics workshops for parents and educators.

For over 10 years in the 90s, NIE-trained Sunny taught primary and secondary maths in various streams. He observed how the transformed primary maths syllabus stumped children, parents and, sometimes, even teachers. How do you teach young children to accurately choose and sequentially apply different situational logic in solving non-routine problems?

Sunny resolved to simplify the learning and application of such skills. Through years of research and development, Sunny eventually established the mathsHeuristics™ programme. Result-oriented research has since proven the consistent effectiveness of the mathsHeuristics™ programme.

Sunny's ingenious methodology has attracted much media interest – ParentsWorld, Wawa Magazine, The Straits Times, KiasuParents.com, Absolutely Parents, TODAY, The Singapore's Child – as well as raving reviews by academia and parents.

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