

CONTENTS

(TOPICS • PROBLEM SOLVING HEURISTICS)

1 WHOLE NUMBERS

1.1	Look For Pattern	4
1.2	Systematic Listing.....	10
1.3	Solve In Parts	13
1.4	Make-A-Whole Model Concept	16
1.5	Before-After Model Concept	19
1.6	Internal-Transfer Model Concept	25
1.7	*Restate In Another Way	31
1.8	*Integrated Strategies	37

2 FRACTIONS

2.1	Simplify The Calculation	43
2.2	Part-Whole Unit Model Concept	46
2.3	Comparison Unit Model Concept	50
2.4	Parts-And-Units Model Concept I	53
2.5	Restate In Another Way	58
2.6	*Before-After Model Concept	63
2.7	*Solve In Parts	69
2.8	*Parts-And-Units Model Concept II	72
2.9	*Work Backwards.....	75

3 RATIO

3.1	Unit Model Concept	78
3.2	Before-After Model Concept I	81
3.3	Restate In Another Way	85

3.4	Draw A Diagram	90
3.5	Use Before-After Concept	93
3.6	*Before-After Model Concept II	98

4 DECIMALS

4.1	Draw A Model	105
4.2	*Restate In Another Way	109

5 PERCENTAGE OF A QUANTITY

5.1	Part-Whole Model Concept I	113
5.2	Part-Whole Model Concept II	117
5.3	Comparison Model Concept	121
5.4	*Use Before-After Concept	126

6 AVERAGE

6.1	Solve In Parts	129
6.2	*Restate In Another Way	135

7 AREA OF TRIANGLE

7.1	Restate In Another Way	138
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8 VOLUME

8.1	Solve In Parts I	141
8.2	Solve In Parts II	144

	Answer Key & Detailed Solutions.....	148 ~ 176
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*More challenging problems especially for advanced pupils.

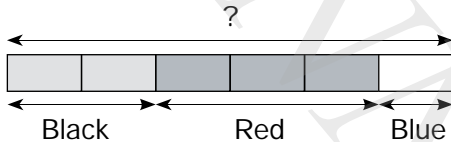
2.2 PART-WHOLE UNIT MODEL CONCEPT

EXAMPLE 1

$\frac{1}{3}$ of the markers in a box are black, $\frac{1}{2}$ of them are red and the rest are blue.
 There are 96 more red markers than blue markers.
 How many markers are there altogether in the box?

SOLUTION:

$$\frac{1}{3} = \frac{2}{6} \text{ (Black); } \frac{1}{2} = \frac{3}{6} \text{ (Red)}$$



$$3 - 1 = 2 \text{ units (Red - Blue)}$$

$$2 \text{ units} \rightarrow 96 \qquad 6 \text{ units} \rightarrow 3 \times 96 = 288 \text{ (Total)}$$

There are 288 markers altogether in the box.

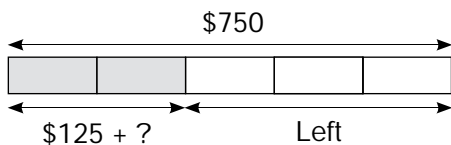
THINK

Convert $\frac{1}{3}$ and $\frac{1}{2}$ to like fractions before drawing a model with 6 equal units representing the total number of markers. (6 is the smallest common multiple of 3 and 2.)

* EXAMPLE 2

Alice had \$750. She spent \$125 on a handbag and some on a watch.
 If she had $\frac{3}{5}$ of her money left, what was the cost of the watch?

SOLUTION:



THINK

Draw a model with 5 equal units representing the *total amount of money Alice had at first*.
 Since 3 equal units represent the amount left, 2 equal units represent the total amount spent.

$$5 \text{ units} \rightarrow \$750 \text{ (Total)}$$

$$1 \text{ unit} \rightarrow \$750 \div 5 = \$150$$

$$2 \text{ units} \rightarrow 2 \times \$150 = \$300 \text{ (Handbag + Watch)}$$

$$\text{Cost of the watch} = \$300 - \$125 = \$175$$

The watch cost \$175.

WORKSHEET 2.2

Solve the problems. Show your working clearly.

1. Tim spent $\frac{1}{2}$ of his monthly income on transport, $\frac{2}{5}$ of it on food and saved the rest. If he saved \$600 each month, how much did he earn in a month?
2. $\frac{1}{3}$ of a pole was painted blue, $\frac{4}{9}$ of it was painted red and the remaining pole was painted yellow. If 36 cm of the pole was painted yellow, what was the length of the pole?
3. $\frac{3}{5}$ of the balls in a basket are white, $\frac{1}{3}$ of them are orange and the rest are purple. There are 176 more white balls than purple balls. How many balls are there in the basket altogether?

*2.6 BEFORE-AFTER MODEL CONCEPT

* EXAMPLE 1

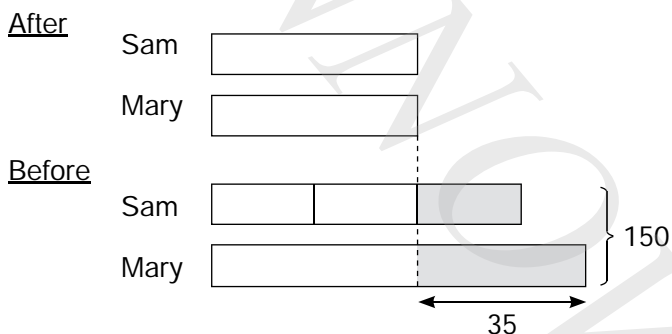
Sam and Mary had 150 envelopes altogether.

After Sam used $\frac{1}{3}$ of his envelopes and Mary used 35 envelopes, they had the same number of envelopes left.

How many envelopes did each of them have at first?

SOLUTION:

Draw a model to help visualise the problem.



THINK

From the model, we can see:

Before

Sam → 3 units; *Mary* → 2 equal units + 35;

Total → 5 equal units + 35 = 150.

Subtract 35 from 150 to get the value of 5 equal units (Make-A-Whole Model Concept).

Before

$$5 \text{ units} \rightarrow 150 - 35 = 115$$

$$1 \text{ unit} \rightarrow 115 \div 5 = 23$$

$$3 \text{ units} \rightarrow 3 \times 23 = 69 \quad (\text{Sam})$$

$$\text{Number of envelopes Mary had} = 150 - 69 = 81$$

Sam had 69 envelopes and Mary had 81 envelopes at first.

WORKSHEET 2.6

Solve the problems. Show your working clearly.

- *1. Mark and Linda had 90 sweets altogether. After Mark ate $\frac{1}{3}$ of his sweets and Linda ate 25 sweets, they had an equal number of sweets left. How many sweets did each of them have at first?
- *2. Roger and Danny had 136 stamps altogether. Roger used $\frac{1}{4}$ of his stamps and Danny used 38 stamps. After that, they had an equal number of stamps left. How many stamps did each of them have at first?