

PROBLEM SOLVING STRATEGIES

Parent Symposium (Primary 5 & 6)

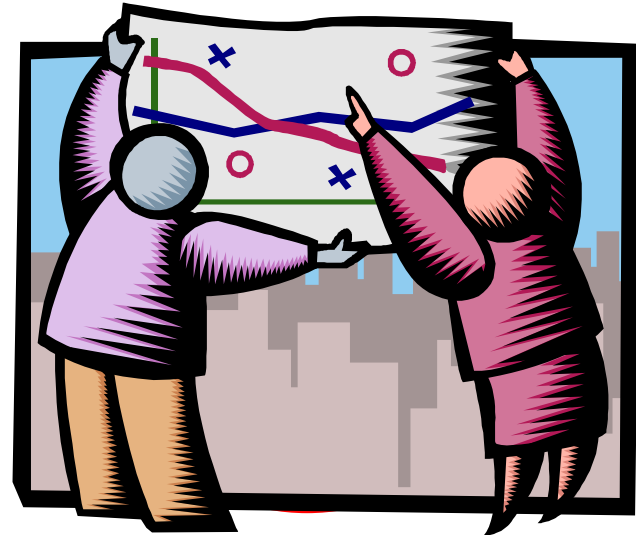
7 April 2018

Outline

1. Problem solving process
2. Question Type
 - Unchanged Total
 - Unchanged Difference

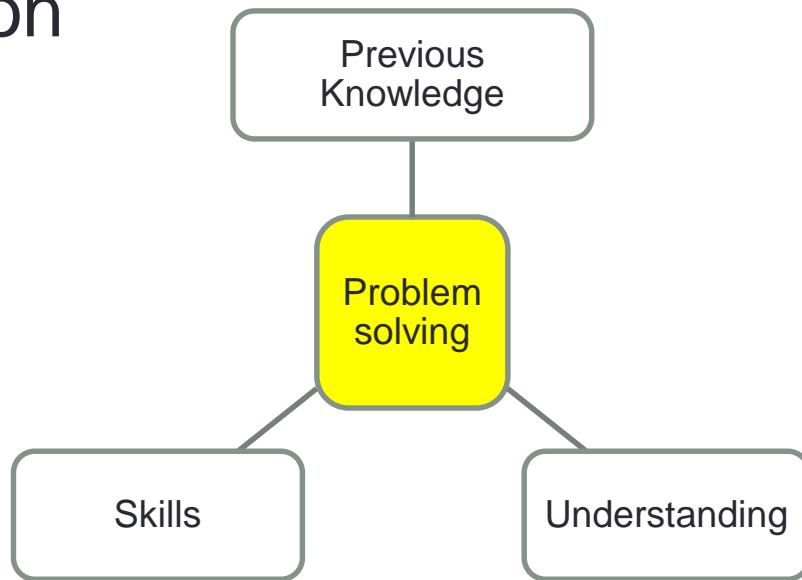
Mathematics Curriculum

The primary aim of the Mathematics curriculum is to enable pupils to develop their ability in Mathematical **PROBLEM SOLVING**



What is Mathematical Problem Solving?

- A process where student uses
 - previously acquired knowledge,
 - skills and understanding to satisfy the demands of a situation



Non-routine: a situation that cannot be resolved by merely applying a standard algorithm, formula or procedure, which is usually readily available to a problem solver



Types of Problems

Routine: students can follow certain known algorithm, formula or procedure

Problem Solving Process - SPARE

- **S**tudy the problem
- **P**lan
- **A**ct
- **R**easonableness
- **E**xplain

Study the Problem



Plan (choose a heuristic)



Act – Carry out the plan



Needs modification/ a new plan?

No



Checking

Is the answer Reasonable?

Yes

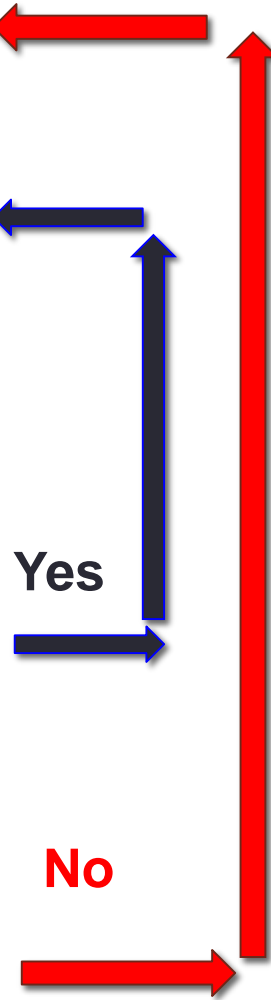


Explain (Reflection)

Problem Solving Process

Explain (Reflection)

- Improving on the method used.
- Seeking alternative solutions.
- Extending the method to other problems.
- Can you explain what you did?



Study the Problem

Understanding the question in terms of:

- Words.
- What needs to be found?
- What information is provided?
- Use picture / diagrams to understand the problem.
- Derive hidden information from given facts.

Plan (Using Heuristics – Strategies in Problem Solving)

- Give a representation (draw a diagram, make a list, use equations)
- Make a calculated guess (guess & check, look for patterns, make suppositions)
- Go through the process (act it out, work backwards, before-after)
- Change the problem (restate the problem, simplify the problem, solve part of the problem)

(Source: Curriculum Planning & Development Division, MOE, Mathematics Syllabus Primary 2007)

Act (Carry Out the Plan)

Ensure the following:

- **S**how and check all the steps
- **T**ransfer all numbers correctly
- **U**se correct units
- **N**eat

Reasonableness

- Does the answer make sense?
- Is there any alternative method?
- What worked? What did not?

Explain

Explain how your solution satisfies the conditions of the question?

Unchanged Total

The total number of items before and after the change is unchanged because:

Type 1

- internal transfers

Type 2

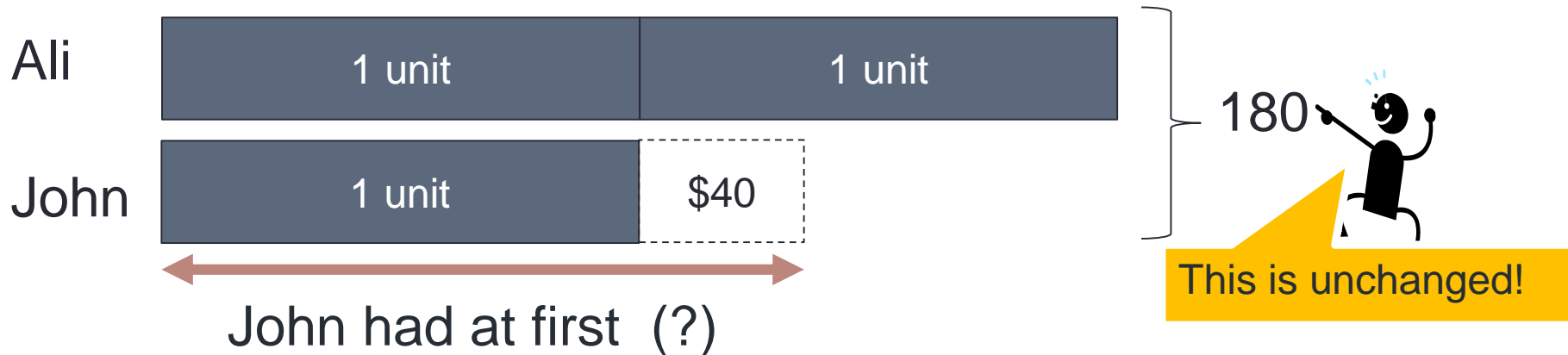
- The number of items taken away is the same as the number of items put back

1. John and Ali had \$180. After John gave Ali \$40, he had half as much money as Ali. How much did John have at first?

What are the
guiding questions?



1. John and Ali had \$180. After John gave Ali \$40, he had half as much money as Ali. How much did John have at first?



$$3u = 180$$

$$1u = 180 \div 3 = 60$$

$$\text{John at first} = 60 + 40 = 100$$

Ans: \$100

2. John had $\frac{1}{2}$ as much money as Ali at first. After Ali gave \$12 to John, the ratio of John's money to Ali's money became 2 : 3. How much did John have at first?

Before

John : Ali
1 : 2

After

John : Ali
2 : 3

What is the ratio of John's money to Ali's money at first?

What is the ratio of John's money to Ali's money in the end?

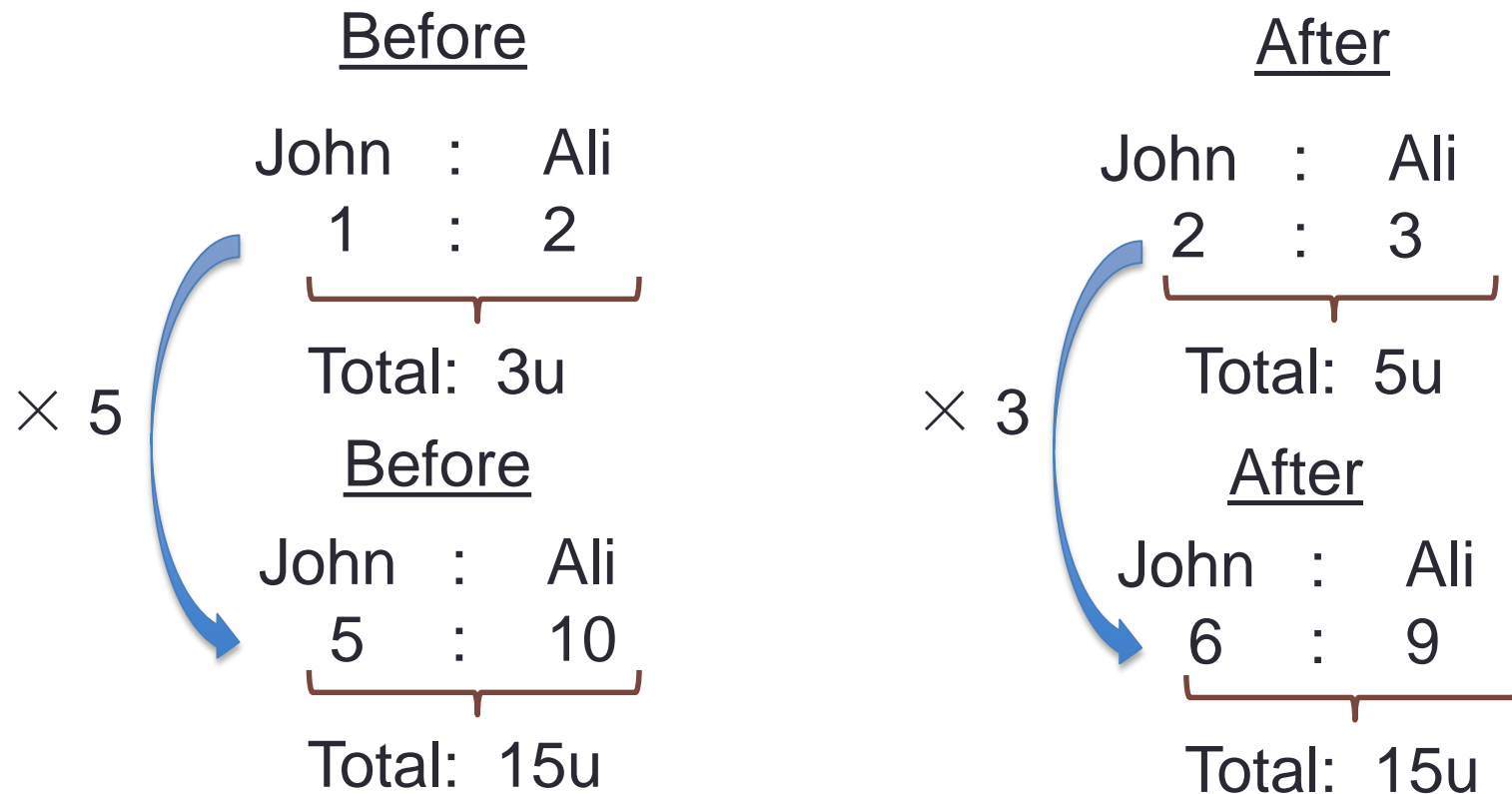
2. John had $\frac{1}{2}$ as much money as Ali at first. After Ali gave \$12 to John, the ratio of John's money to Ali's money became 2 : 3. How much did John have at first?

<u>Before</u>		<u>After</u>	
John	: Ali	John	: Ali
1	: 2	2	: 3
			
Total: 3u		Total: 5u	

What should be made the same? Why? How?

What is the common multiple of 3 and 5?

2. John had $\frac{1}{2}$ as much money as Ali at first. After Ali gave \$12 to John, the ratio of John's money to Ali's money became 2 : 3. How much did John have at first?



What are the changes in the number of units for each of them?

2. John had $\frac{1}{2}$ as much money as Ali at first. After Ali gave \$12 to John, the ratio of John's money to Ali's money became 2 : 3. How much did John have at first?

<u>Before</u>	<u>After</u>
John : Ali	John : Ali
1 : 2	2 : 3

<u>Before</u>	<u>After</u>
John : Ali	John : Ali
5 : 10	6 : 9

(reduced by 1u) Ali lost \$12

(increased by 1u) John gain \$12

Why is there a change in the number of units?

What do I need to find?

2. John had $\frac{1}{2}$ as much money as Ali at first. After Ali gave \$12 to John, the ratio of John's money to Ali's money became 2 : 3. How much did John have at first?

Before

John : Ali
1 : 2

After

John : Ali
2 : 3

Before

John : Ali
5 : 10

After

John : Ali
6 : 9

$$1u = 12$$

$$\text{John at first} = 12 \times 5 = 60$$

Ans: \$60

3. At a party, there were $\frac{4}{5}$ as many boys as girls. After 18 girls left and 18 boys joined the party, there were twice as many boys as girls. How many children were there at the party at first?

Sample questions

The ratio of the number of students in School X to the number of students in School Y is $5 : 7$. 90 students transferred from School X to School Y. Then the ratio became $1 : 2$. What was the number of students in School Y at first?

Janice and Mavis had some stamps in the ratio $1 : 2$. Mavis bought 10 more stamps and Janice gave away 10 stamps. Then Mavis has thrice as many stamps as Janice. How many stamps did Janice have at first?

Unchanged Difference

Type 1

- involving difference in age

Type 2

- when 2 individuals receive an equal amount from a third party

Type 3

- when 2 individuals give an equal amount to a third party

4. Mrs Tan is 31 years old and her son is 7 years old now. In how many years time will she be 4 times as old as her son?

Now

Mrs Tan = 31 years old

Son = 7 years old

Difference = 24 years

Future

Mrs Tan



Son



24

(unchanged difference)

What should be made the same? Why?
How?

Mrs Tan's age is how many times of her son's age in future?

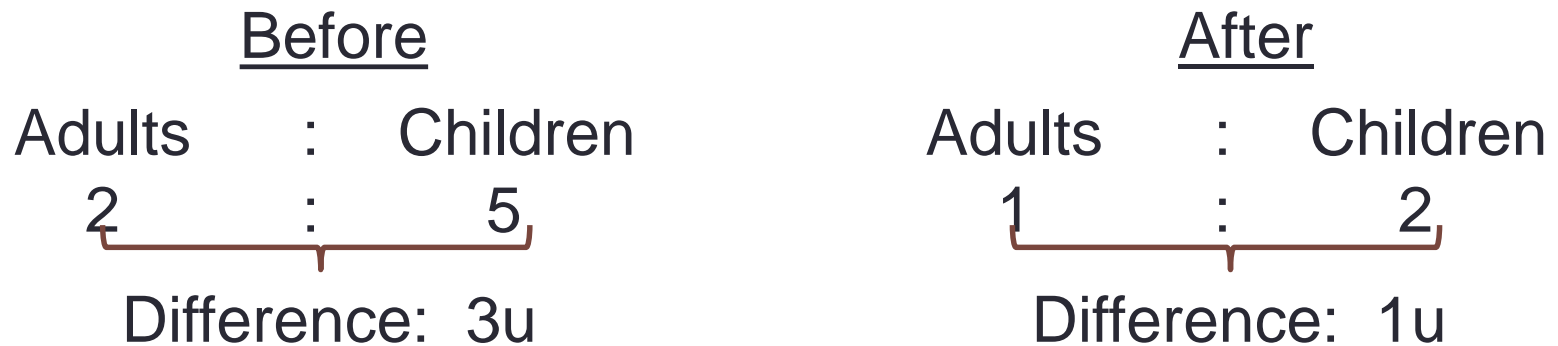
$$3u = 24$$

$$1u = 24 \div 3 = 8$$

$$8 - 7 = 1$$

Ans: 1

5. There were $\frac{2}{5}$ as many adults as children on a bus. At the next bus stop after 7 children and 7 adults boarded the bus, there were $\frac{1}{2}$ as many adults as children. How many children were on the bus at first?



What is the ratio of the number of adults to the number of children at first?

What is the ratio of the number of adults to the number of children in the end?

What should be made the same in the two ratios? Why? How?

5. There were $\frac{2}{5}$ as many adults as children on a bus. At the next bus stop after 7 children and 7 adults boarded the bus, there were $\frac{1}{2}$ as many adults as children. How many children were on the bus at first?

Before

Adults : Children
 2 : 5

└──────────┘
 Difference: 3u

After

Adults : Children
 1 : 2

└──────────┘
 Difference: 1u

× 3

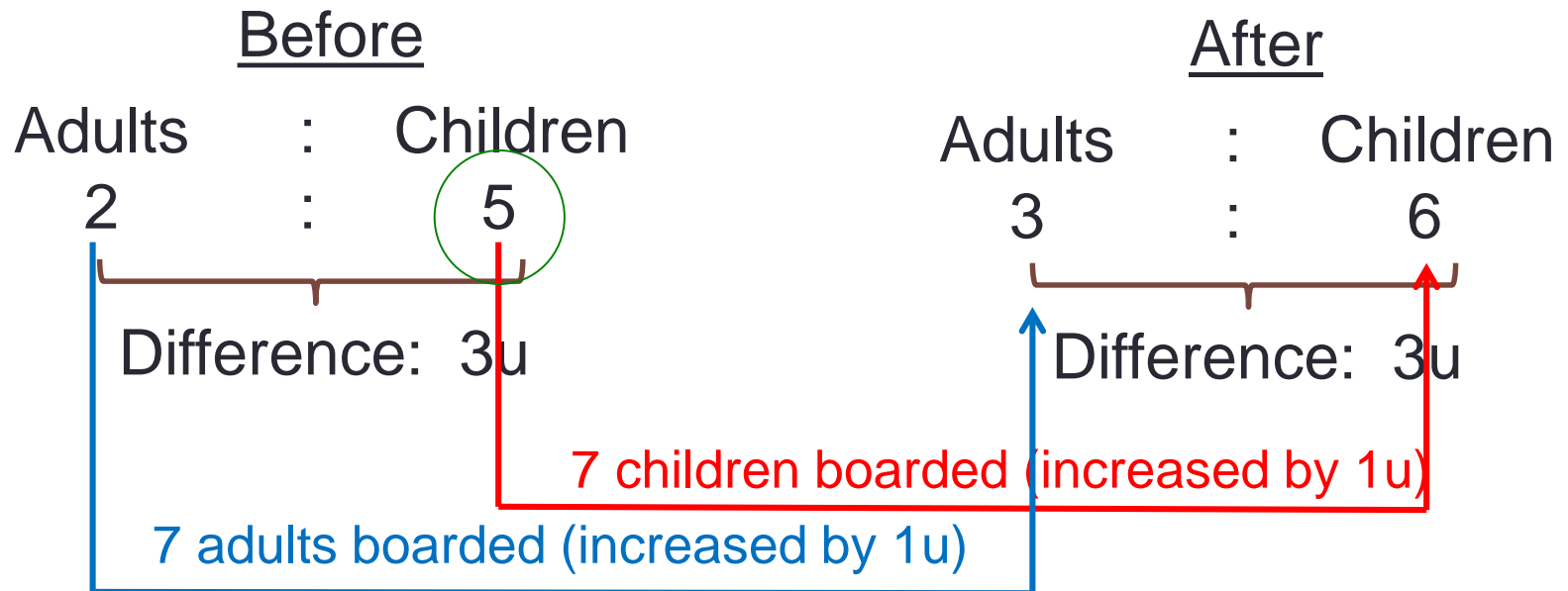
After

Adults : Children
 3 : 6

└──────────┘
 Difference: 3u

Why is there an increase in number of units for the adults and children?

5. There were $\frac{2}{5}$ as many adults as children on a bus. At the next bus stop after 7 children and 7 adults boarded the bus, there were $\frac{1}{2}$ as many adults as children. How many children were on the bus at first?



$$1u = 7$$

$$5u = 5 \times 7 = 35$$

What do I need to find?

Ans: 35

6. In a classroom, the ratio of the number of boys to the number of girls was $3 : 4$. After 14 boys and 14 girls left, the class the ratio became $2 : 5$. How many children were there in the classroom at first?

Sample questions

Ramesh and Simon shared an amount of money in the ratio 3 : 4. They each spent \$200. Then the ratio became 1 : 3. How much money did Ramesh have at first?

James had thrice as many stamps as Paul at first. They each bought an equal number of stamps. In the end, Paul has 48 stamps and James had twice as many stamps as Paul. How many stamps did James have at first?

Tips for Parents

- Get your child to understand and make sense of the problem
- Get your child to think about how to select a method
- Get your child to explain the steps and sequence in arriving at the solutions
- Show all workings clearly and label the number equations
- Teach your child how to check for the reasonableness of his / her answers

Tips for Parents

- Review what they have learnt in class – spending at least 15 – 30 minutes every day to revise their daily work
- If your child has made a mistake in a specific question, allow him / her to redo it without referring to the solution provided by the teacher
- Do not over-teach. Refer to <http://www.moe.edu.sg/> for the syllabus

**I hear, I forget.
I see, I remember.
I do, I understand.**

Study the problem

Plan

Act

Reasonableness

Explain

THANK YOU

Q & A

