

LESSON 5: Proportion Concept

APPLICABILITY

For problems where proportions of objects are given, it is more efficient to approach it using:

$$\text{Total Value} = \text{Value} \times \text{Number}$$

GUIDED EXAMPLE 1

[At a carnival, every girl was given 2 candy floss and every boy was given 3 candy floss.] Value
 [There were thrice as many girls as boys.] No.
 [A total of 63 candy floss were given out.] TV
 How many girls were there at the carnival?

| | No. children | CF per child | Total CF |
|-------|--------------|--------------|----------|
| Boys | $1u$ | 3 | $3u$ |
| Girls | $3u$ | 2 | $6u$ |
| Total | | | $9u$ |

$$\begin{aligned}
 9u &= 63 \\
 \div 3 \downarrow \quad 3u &= 63 \div 3 \\
 &= 21
 \end{aligned}$$

Ans : 21

GUIDED EXAMPLE 2

* Simplify the problem.

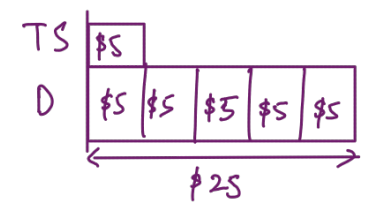
✓ [The ratio of the price of a T-shirt to the price of a dress was 1:5] ✓ [Each T-shirt cost \$5.]

On a weekend, the amount of money collected from the sale of both T-shirts and dresses was \$6720. If the total number of T-shirts sold made up of 20% of the total number of dresses and T-shirts sold, how many dresses were sold during the weekend?

TV

| | No. items | Value (\$) | Total Value (\$) |
|----------|-----------|------------|------------------|
| T-Shirts | 1u | 5 | 5u |
| Dresses | 4u | 25 | 100u |
| Total | 5u | | 105u |

Value



$$105u = 6720$$

$$4u = 4 \times \frac{6720}{105}$$

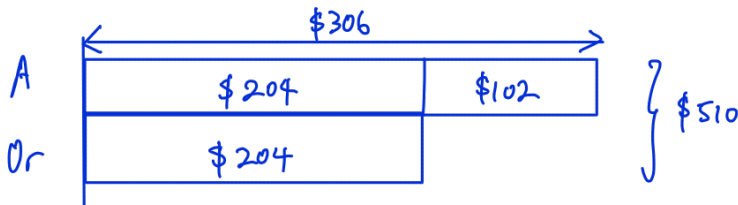
$$= 256$$

Ans : 256

GUIDED EXAMPLE 3

- TV (A fruit stall owner bought 2 times as many apples as oranges.) No. $2u$ $1u$
TV (He spent \$510 altogether.) An orange costs \$0.20 more than an apple. 0.20
TV (The total cost of the apples was \$102 more than the total cost of the oranges.)
 Find the cost each fruit.

① Total Value comparison



$$(510 - 102) \div 2 = 204$$

$$204 + 102 = 306$$

②

| | No. fruits | Value (\$) | Total Value (\$) |
|---------|------------|----------------------|------------------|
| Apples | $2u$ | $306 \div 2u = 153p$ | 306 |
| Oranges | $1u$ | $204 \div 1u = 204p$ | 204 |

③ Compare difference in value.

$$204p - 153p = 0.20$$

$$51p = 0.20$$

$$1p = 0.20 \div 51$$

$$= \frac{1}{255}$$

$$153p = 153 \times \frac{1}{255}$$

$$= 0.60$$

$$204p = 204 \times \frac{1}{255}$$

$$= 0.80$$

Ans: Apple: \$0.60

Oranges: \$0.80

GUIDED EXAMPLE 4

There are some 10-cent, 20-cent and some 50-cent coins in a box.
 There are thrice as many 10-cent coins as there are 50-cent coins.
 The number of 20-cent coins is twice the sum of number of 10-cent and 50-cent coins.
 Given that the total amount of money in the box is \$62.40,
 how many 10-cent coins are there?

Comparing no. coins,

$$10¢ : 20¢ : 50¢ : 10¢ \text{ and } 50¢$$

$$3 : 8 : 1 : 4$$

| | No. coins | Value (\$) | Total Value (\$) |
|-----------|-----------|------------|------------------|
| 10¢ coins | <u>3u</u> | 0.10 | 0.3u |
| 20¢ coins | 8u | 0.20 | 1.6u |
| 50¢ coins | 1u | 0.50 | 0.5u |
| | | | 2.4u |

$$2.4u = 62.40$$

$$1u = 62.40 \div 2.4$$

$$= 26$$

$$3u = 3 \times 26$$

$$= 78$$

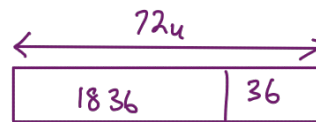
Ans : 78

GUIDED EXAMPLE 5

^{TU} Peter paid \$1836 for some \$2, \$10 and \$20 gift vouchers. ^V
 [He bought 18 more \$10 vouchers than \$2 vouchers.] No. ^{1u}
 [There were thrice as many \$20 vouchers as there were \$10 vouchers.] No. ^{3u}
 How many \$10 vouchers did he buy?

| | No. vouchers | Value (\$) | Total Value (\$) |
|--------------|--------------|------------|------------------|
| \$2 voucher | $1u - 18$ | 2 | $2u - 36$ |
| \$10 voucher | $1u$ | 10 | $10u$ |
| \$20 voucher | $3u$ | 20 | $60u$ |
| | | | $72u - 36$ |

$$72u - 36 = 1836$$



$$72u = 1836 + 36$$

$$= 1872$$

$$1u = 1872 \div 72$$

$$= 26$$

Ans : 26

BUILD YOUR UNDERSTANDING!

1. [The mass of a plate is three times the mass of a cup.] $3u$ $1u$ v
 The total mass of [3 plates and 2 cups] is [1320g.] TV
 What is the mass of a plate? No.

| | No. items | mass per item (g) | Total mass (g) |
|--------|-----------|-------------------|----------------|
| Plates | 3 | $3u$ | $9u$ |
| Cups | 2 | $1u$ | $2u$ |
| Total | | | $11u$ |

$$11u = 1320$$

$$3u = 3 \times \frac{1320}{11}$$

$$= 360$$

Ans : 360g

P5 Heuristics Approach to Problem Solving

Proportion Concept

2. (A computer ink cartridge costs \$16.) V
 (A shop owner bought 3.5 times as many computer mouse as ink cartridges.) 7u 2u No. ✓
 (Each computer mouse costs $\frac{1}{4}$ the cost of a computer ink cartridge.) 4 \$16 V
 (He paid a total of \$6600 altogether.) TV

- a) How many ink cartridges did he buy?
 b) How much did he pay for all the mouse?

| | No. items | Value (\$) | Total Value (\$) |
|---------------|-----------|------------|------------------|
| mouse | 7u | 4 | 28u (6) |
| ink cartridge | 2u (a) | 16 | 32u |
| Total | | | 60u |

$$60u = 6600$$

$$1u = 6600 \div 60$$

$$= 110$$

a) $2u = 2 \times 110$
 $= 220$

b) $28u = 28 \times 110$
 $= 3080$

Ans : a) \$220
 b) \$3080

P5 Heuristics Approach to Problem Solving

Proportion Concept

3. $\left[\begin{array}{l} \text{The ratio of the number of chickens to the number of goats is } 3:5. \end{array} \right]$ No.
 $\left[\begin{array}{l} \text{The ratio of the number of snakes to the number of goats is } 4:3. \end{array} \right]$ No.
 Given that these three groups of animals have $\left[2496 \text{ legs altogether,} \right]$ Total Legs
 how many snakes are there?

Comparing no. creatures,

$$\begin{array}{r} C : G : S \\ 3 : 5 : \\ 3 : 5 : 4 \quad (\times 3) \\ 3 : 4 \quad (\times 5) \\ 9 : 15 : 20 \end{array}$$

| | No. Creatures | Legs | Total Legs |
|----------|---------------|------|------------|
| Chickens | 9u | 2 | 18u |
| Goats | 15u | 4 | 60u |
| Snakes | 20u | 0 | 0 |
| Total | | | 78u |

$$78u = 2496$$

$$1u = 2496 \div 78$$

$$= 32$$

$$20u = 20 \times 32$$

$$= 640$$

$$\text{Ans : } \underline{640}$$

P5 Heuristics Approach to Problem Solving

Proportion Concept

4. Mrs. Yap used 4 types of spices to cook curry.

Each packet of spices A, B, C and D weighs 25g, 20g, 24g and 18g respectively. } mass

The ratio of the number of packets of spice A, B, C and D used was 3 : 2 : 1 : 5. } No.

The total mass of the spices used was 916g. } Total mass

How many packets of spices were used altogether?

| | No. packets | mass per packet (g) | Total mass (g) |
|-------|-------------|---------------------|----------------|
| A | 3u | 25 | 75u |
| B | 2u | 20 | 40u |
| C | 1u | 24 | 24u |
| D | 5u | 18 | 90u |
| Total | <u>11u</u> | | 229u |

$$229u = 916$$

$$11u = 11 \times \frac{916}{229}$$

$$= 44$$

$$\text{Ans: } \underline{44}$$

P5 Heuristics Approach to Problem Solving

Proportion Concept

5. Alice had some 20-cent and \$1 coins with a total value of \$55.40.
 If there are 29 more \$1-coins than 20-cent coins,
- (a) how many coins does he have altogether?
 (b) what is the total value of the 20-cent coins?

| | No. coins | Value (\$) | Total Value (\$) |
|-----------|---------------|------------|------------------|
| \$1 coins | $u + 29$ | 1.00 | $u + 29$ |
| 20¢ coins | u | 0.20 | $0.2u$ (b) |
| Total | $2u + 29$ (a) | | $1.2u + 29$ |

$$1.2u + 29 = 55.40$$

$$1.2u = 55.40 - 29$$

$$= 26.40$$

$$u = 26.40 \div 1.2$$

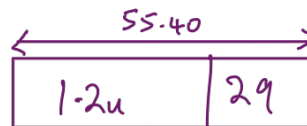
$$= 22$$

$$a) 2u + 29 = 2 \times 22 + 29$$

$$= 73$$

$$b) 0.2u = 0.2 \times 22$$

$$= 4.40$$



Ans : a) 73

b) \$4.40

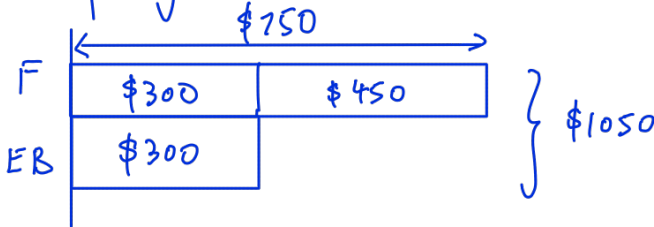
P5 Heuristics Approach to Problem Solving

Proportion Concept

6 TV
TV
 A stationary shop owner spent \$1050 on some exercise books and files. 7
 The total amount spent on the files was \$450 more than the amount spent on the exercise books. I He bought $\frac{3}{5}$ times as many exercise books as he did files. 3u 5u No.
 Value E Each exercise books costs \$0.40 less than each file. 7

- Find the total number of exercise books and files the owner bought.
- Find the cost of each file

① Comparing total value,



$$(1050 - 450) \div 2 = 300$$

$$300 + 450 = 750$$

| ② | No. items | Value (\$) (\$1.20) | Total Value (\$) |
|-------|-----------|-------------------------------|------------------|
| F | 5u | $750 \div 5u$ (b) $= 150p$ | 750 |
| EB | 3u | $300 \div 3u$ $= 100p$ | 300 |
| Total | 8u (a) | | |

③ Compare values

$$150p - 100p = 0.40$$

$$50p = 0.40$$

$$1p = \frac{0.40}{50}$$

$$= \frac{1}{125}$$

$$b) 150p = 150 \times \frac{1}{125}$$

$$= 1.20$$

$$a) 5u = 750 \div 1.20$$

$$= 625$$

$$8u = 8 \times \frac{625}{5}$$

$$= 1000$$

$$\text{Ans : a) } \underline{1000}$$

$$b) \underline{\$1.20}$$

CHALLENGE YOURSELF

Mary had 1.5 times as many 20-cent coins as 50-cent coins.

She spends \$3.20 worth of her 20-cent coins.

The value of her 50-cent coins became \$12 more than the value of her 20-cent coins.

What was the total value of her 20-cent coins?

CHALLENGE YOURSELF

Ali bought 3 times as many toy cars as game cartridges.

He spent \$1615 altogether. A game cartridge cost \$15 more than a toy car.

The total cost of the toy car was \$425 more than the total cost of the game cartridges.

Find the cost of a game cartridge.