

+hinkingMath@™
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Essential Problem Solving Skills

Answer Booklet

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P6 Solutions

In all solutions, u represents units and p represents parts

Chapter 1 Recap of EPSS Primary 5

Answer to Unit 1.1

Question 1

$$\begin{array}{l} A : B+C+D \\ 2^{x5} : 3^{x5} \\ 10 : 15 \end{array} \quad \begin{array}{l} B+C : D \\ 1^{x3} : 4^{x3} \\ 3 : 12 \end{array} \quad \begin{array}{l} : B+C+D \\ : 5^{x3} \\ : 15 \end{array}$$

Summary

$$\begin{array}{l} A : B+C : D \\ 10 : 3 : 12 \end{array}$$

$$\text{Total} = 10u + 15u$$

$$= 25u$$

$$25u = 1000$$

$$1u = 1000 \div 25$$

$$= 40$$

$$12u = 12 \times 40$$

$$= 480$$

Daniel's contribution was **\$480**.

Question 2

$$\begin{array}{l} A : C : M : W : A : B : G : C \\ 3^{x10} : 2^{x10} : 1^{x6} : 4^{x6} : 5^{x6} : 9 : 11 : 20 \\ 30 : 20 : 6 : 24 : 30 \end{array}$$

Summary

$$\begin{array}{l} M : W : B : G \\ 6 : 24 : 9 : 11 \end{array}$$

$$\text{Difference (W and B)} = 24u - 9u$$

$$= 15u$$

$$15u = 75$$

$$1u = 75 \div 15$$

$$= 5$$

$$\text{Total} = 30u + 20u$$

$$= 50u$$

$$50u = 50 \times 5$$

$$= 250$$

There are **250 people** in the tour group.

Answer to Unit 1.2

Question 1

$$\begin{array}{l} \text{At first} \\ G : V+F \\ 3^{x7} : 5^{x7} \\ 21 : 35 \end{array} \quad \begin{array}{l} \text{In the end} \\ G : V+F \\ 7^{x3} : 13^{x3} \\ 21 : 39 \end{array}$$

$$\text{Change} = 39u - 35u$$

$$= 4u$$

$$4u = 12$$

$$1u = 12 \div 4$$

$$= 3$$

Answer to Unit 1.2

Question 1 (cont.)

$$\text{Total (end)} = 21u + 39u$$

$$= 60u$$

$$60u = 60 \times 3$$

$$= 180$$

The music department had **180 instruments** in the end.

Question 2

$$\begin{array}{l} A : C \\ 3^{x2} : 7^{x2} \\ 6 : 14 \end{array} \quad \begin{array}{l} B : G : C \\ 1^{x7} : 1^{x7} : 2^{x7} \\ 7 : 7 : 14 \end{array}$$

Summary

$$\begin{array}{l} A : B : G \\ 6 : 7 : 7 \end{array}$$

$$\begin{array}{l} \text{At first} \\ A+B : G \\ 13^{x4} : 7^{x4} \\ 52 : 28 \end{array} \quad \begin{array}{l} \text{In the end} \\ A+B : G \\ 1^{x7} : 4^{x7} \\ 7 : 28 \end{array}$$

$$\text{Change} = 52u - 7u$$

$$= 45u$$

$$45u = 90$$

$$1u = 90 \div 45$$

$$= 2$$

$$28u = 28 \times 2$$

$$= 56$$

There are **56 girls** in the swimming pool.

Answer to Unit 1.3

Question 1

$$\begin{array}{l} B+C : A+B : \text{Diff} \\ 7^{x2} : 5^{x2} : 2^{x2} \\ 14 : 10 : 4 \end{array} \quad \begin{array}{l} A : C : \text{Diff} \\ 3 : 7 : 4 \end{array}$$

Summary

$$\begin{array}{l} A : B : C \\ 3 : 7 : 7 \end{array}$$

$$7u = 77$$

$$1u = 77 \div 7$$

$$= 11$$

$$\text{Total} = 3u + 7u + 7u$$

$$= 17u$$

$$17u = 17 \times 11$$

$$= 187$$

The total area of the figure is **187 cm²**.

Question 2

$$\begin{array}{l} \text{6 years' ago} \\ E : T : \text{Diff} \\ 3 : 5 : 2 \end{array} \quad \begin{array}{l} \text{In 6 years' time} \\ E : T : \text{Diff} \\ 2^{x2} : 3^{x2} : 1^{x2} \\ 4 : 6 : 2 \end{array}$$

Answer to Unit 1.3

Question 2 (cont.)

$$1u = 6 + 6$$

$$= 12$$

$$\text{Total age (6 years' ago)} = 3u + 5u$$

$$= 8u$$

$$\text{Total age (now)} = 8u + 12$$

$$= 8 \times 12 + 12$$

$$= 108$$

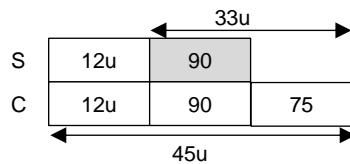
The sum of their current ages is **108 years**.

Answer to Unit 1.4

Question 1

| (Actual) | S | C |
|------------|-------------|-------------|
| At first | $4u^{x3}$ | $9u^{x5}$ |
| Change | $+ 30^{x3}$ | $- 15^{x5}$ |
| In the end | $5p^{x3}$ | $3p^{x5}$ |

| (Working) | S | C |
|------------|--------|--------|
| At first | $12u$ | $45u$ |
| Change | $+ 90$ | $- 75$ |
| In the end | $15p$ | $15p$ |



$$45u - 12u = 90 + 75$$

$$33u = 165$$

$$1u = 165 \div 33$$

$$= 5$$

$$4u = 4 \times 5$$

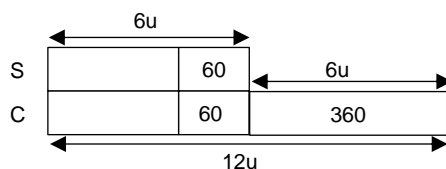
$$= 20$$

Shelly had **20 figurines** at first.

Question 2

| (Actual) | P | Q |
|------------|-------------|--------------|
| At first | $3u^{x2}$ | $4u^{x3}$ |
| Change | $- 30^{x2}$ | $- 140^{x3}$ |
| In the end | $3p^{x2}$ | $2p^{x3}$ |

| (Working) | P | Q |
|------------|--------|---------|
| At first | $6u$ | $12u$ |
| Change | $- 60$ | $- 420$ |
| In the end | $6p$ | $6p$ |



$$6u = 360$$

$$1u = 360 \div 6$$

$$= 60$$

$$4u - 140 = 4 \times 60 - 140$$

$$= 100$$

There was **100 l** of water in Tank Q in the end.

Answer to Unit 1.5

Question 1

$$B : T \qquad C : B$$

$$5 : 1 \qquad 2^{x5} : 1^{x5}$$

$$10 : 5$$

Summary

$$B : T : C$$

$$5 : 1 : 10$$

| Items | Quantity | x | Value (\$) | Total value (\$) |
|-------|----------|---|------------|------------------|
| B | $5u$ | x | 22 | $110u$ |
| T | $1u$ | x | 12 | $12u$ |
| C | $10u$ | x | 32 | $320u$ |
| Total | $16u$ | | | $442u$ |

$$442u = 884$$

$$1u = 884 \div 442$$

$$= 2$$

$$16u = 16 \times 2$$

$$= 32$$

He bought a total of **32 ties, belts and cufflinks**.

Question 2

| Items | Quantity | x | Value (\$) | Total value (\$) |
|-------|----------|---|------------|------------------|
| C | 24 | x | 7u | $168u$ |
| S | 14 | x | 2u | $28u$ |
| Total | 38 | | | $196u$ |

$$196u = 215.6$$

$$1u = 215.6 \div 196$$

$$= 1.1$$

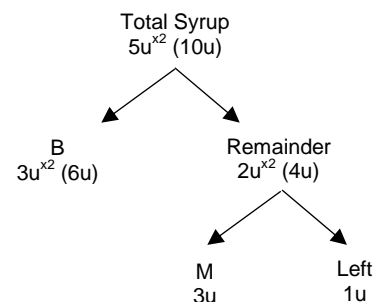
$$7u = 7 \times 1.1$$

$$= 7.7$$

A cup cost **\$7.70**.

Answer to Unit 1.6

Question 1



$$1u = 210$$

$$6u = 210 \times 6$$

$$= 1260$$

$$\frac{7}{10} \text{ of bottle} = 1260$$

$$\frac{1}{10} \text{ of bottle} = 1260 \div 7$$

$$= 180$$

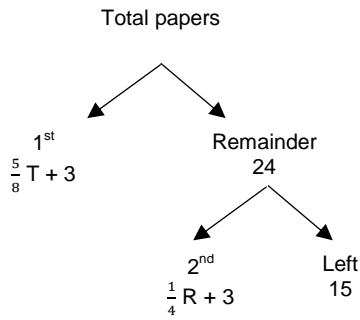
$$\frac{3}{10} \text{ of bottle} = 3 \times 180$$

$$= 540$$

Mrs Wong would need to prepare **540 l more** to fill up the bottle completely.

Answer to Unit 1.6

Question 2



$$\frac{3}{4}R = 3 + 15$$

$$= 18$$

$$\frac{1}{4}R = 18 \div 3$$

$$= 6$$

$$\frac{4}{4}R = 6 \times 4$$

$$= 24$$

$$\frac{3}{8}T = 24 + 3$$

$$= 27$$

$$\frac{1}{8}T = 27 \div 3$$

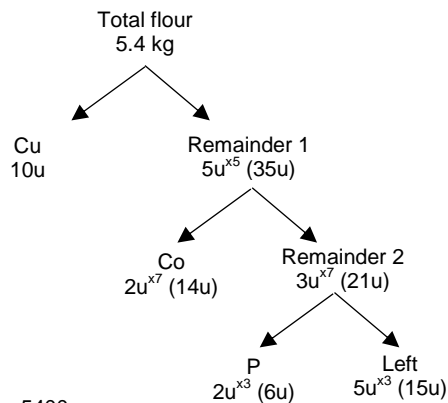
$$= 9$$

$$\frac{8}{8}T = 9 \times 8$$

$$= 72$$

Lina used **72 pieces** of origami paper.

Question 3



$$5.4 \text{ kg} = 5400 \text{ g}$$

$$45u = 5400$$

$$1u = 5400 \div 45$$

$$= 120$$

$$10u = 10 \times 120$$

$$= 1200$$

$$1200 \text{ g} = 1 \text{ kg } 200 \text{ g}$$

There were **1 kg 200 g** of flour left in the container.

Answer to Unit 1.7

Question 1

$$\frac{2}{3}M = \frac{3}{5}F$$

$$\frac{6}{9}M = \frac{6}{10}F$$

$$M : W$$

$$9 : 10$$

$$\text{Total} = 9u + 10u$$

$$= 19u$$

$$19u = 190$$

$$1u = 190 \div 19$$

$$= 10$$

$$\text{Total children} = 3u + 4u$$

$$= 7u$$

$$7u = 7 \times 10$$

$$= 70$$

There were **70 children** at the engagement party.

Question 2

$$\frac{9}{10}S = \frac{3}{4}M$$

$$\frac{9}{10}S = \frac{9}{12}M$$

$$S : M$$

$$10^{x4} : 12^{x4}$$

$$40 : 48$$

$$\frac{9}{10}S = \frac{4}{5}C$$

$$\frac{36}{40}S = \frac{36}{45}C$$

$$S : C$$

$$40 : 45$$

Summary

$$S : M : C$$

$$40 : 48 : 45$$

$$48u = 96$$

$$1u = 96 \div 48$$

$$= 2$$

$$\text{Total} = 40u + 48u + 45u$$

$$= 133u$$

$$133u = 133 \times 2$$

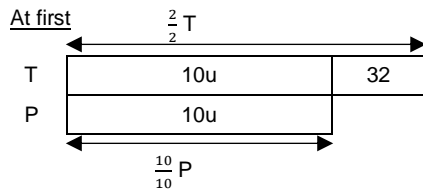
$$= 266$$

Karen's total score was **266 marks**.

Chapter 2 Advanced Model Drawing

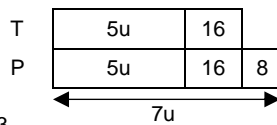
Let's Get Started

2.



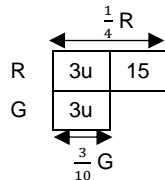
| | At first | Sold | In the end (Left) |
|---|-------------------------|------------------------|------------------------|
| T | $\frac{2}{2}(10u + 32)$ | $\frac{1}{2}(5u + 16)$ | $\frac{1}{2}(5u + 16)$ |
| P | $\frac{10}{10}(10u)$ | $\frac{3}{10}(3u)$ | $\frac{7}{10}(7u)$ |

In the end



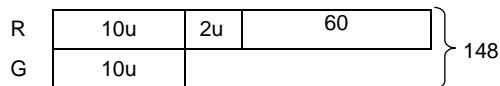
3.

In the end



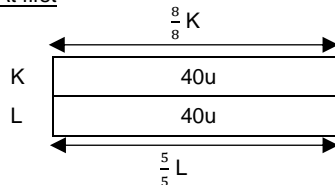
| | In the end | Sold | At first |
|---|------------------------|------------------------|-------------------------|
| R | $\frac{1}{4}(3u + 15)$ | $\frac{3}{4}(9u + 45)$ | $\frac{4}{4}(12u + 60)$ |
| G | $\frac{3}{10}(3u)$ | $\frac{7}{10}(7u)$ | $\frac{10}{10}(10u)$ |

At first



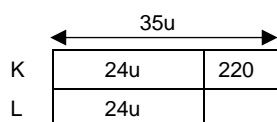
4.

At first



| | At first | Spent | In the end ((Left) |
|---|--------------------|--------------------|--------------------|
| K | $\frac{8}{8}(40u)$ | $\frac{1}{8}(5u)$ | $\frac{7}{8}(35u)$ |
| L | $\frac{5}{5}(40u)$ | $\frac{2}{5}(16u)$ | $\frac{3}{5}(24u)$ |

In the end



Let's Learn

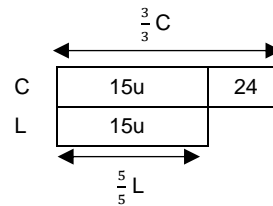
Ask Yourself

1. There is sufficient information given at the beginning of the question to form a relationship to solve the question.
2. The problem should be solved using the Model-drawing approach as it involves the keywords "more than/less than" as well as a whole number.

Answer to Advanced Model Drawing (More than/Less than)

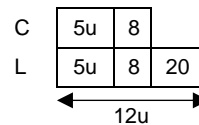
Question 1

At first



| | At first | Cleared | In the end (Left) |
|---|-------------------------|-------------------------|-----------------------|
| C | $\frac{3}{3}(15u + 24)$ | $\frac{2}{3}(10u + 16)$ | $\frac{1}{3}(5u + 8)$ |
| L | $\frac{5}{5}(15u)$ | $\frac{1}{5}(3u)$ | $\frac{4}{5}(12u)$ |

In the end



$$7u = 8 + 20$$

$$= 28$$

$$1u = 28 \div 7$$

$$= 4$$

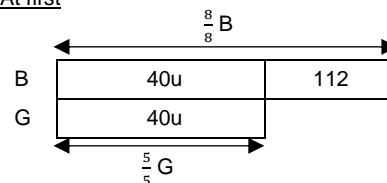
$$10u + 16 = 10 \times 4 + 16$$

$$= 56$$

56 cars cleared the gantry.

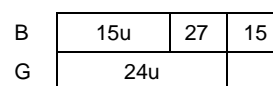
Question 2

At first



| | Total | Took part | Did not |
|---|--------------------------|-------------------------|-------------------------|
| B | $\frac{8}{8}(40u + 112)$ | $\frac{5}{8}(25u + 70)$ | $\frac{3}{8}(15u + 42)$ |
| G | $\frac{5}{5}(40u)$ | $\frac{2}{5}(16u)$ | $\frac{3}{5}(24u)$ |

In the end



Answer to Advanced Model Drawing (More than/Less than)

Question 2 (Cont.)

$$24u - 15u = 9u$$

$$9u = 27$$

$$1u = 27 \div 9$$

$$= 3$$

$$\text{Total (took part)} = 25u + 70 + 16u$$

$$= 41u + 70$$

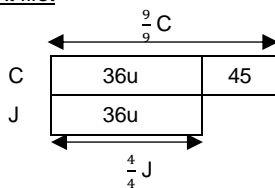
$$41u + 70 = 41 \times 3 + 70$$

$$= 193$$

193 students took part in the performance.

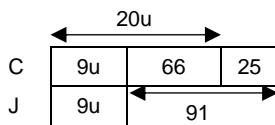
Question 3

At first



| | At first | Sold | In the end (Left) |
|---|-------------------------|-------------------------|-------------------------|
| C | $\frac{9}{9}(36u + 45)$ | $\frac{5}{9}(20u + 25)$ | $\frac{4}{9}(16u + 20)$ |
| J | $\frac{4}{4}(36u)$ | $\frac{1}{4}(9u)$ | $\frac{3}{4}(27u)$ |

Sold



$$20u - 9u = 11u$$

$$11u = 66$$

$$1u = 66 \div 11$$

$$= 6$$

$$\text{Total (end)} = 16u + 20 + 27u$$

$$= 43u + 20$$

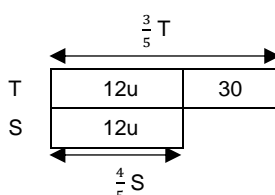
$$43u + 20 = 43 \times 6 + 20$$

$$= 278$$

278 crossword puzzle books and jigsaw puzzles remained in total.

Question 4

In the end

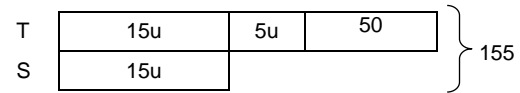


Answer to Advanced Model Drawing (More than/Less than)

Question 4 (Cont.)

| | | At first |
|---|-------------------------|-------------------------|
| T | $\frac{3}{5}(12u + 30)$ | $\frac{5}{5}(20u + 50)$ |
| S | $\frac{4}{5}(12u)$ | $\frac{5}{5}(15u)$ |

At first



$$35u = 155 - 50$$

$$= 105$$

$$1u = 105 \div 35$$

$$= 3$$

$$T \text{ (at first)} = 20 \times 3 + 50$$

$$= 110$$

$$T \text{ (left)} = \frac{7}{10} \times 110$$

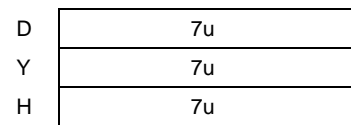
$$= 77$$

77 table lamps remained.

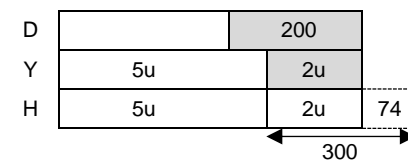
Answer to Advanced Model Drawing (Equal stage at first)

Question 1

At first



In the end



$$2u = 300 - 74$$

$$= 226$$

$$1u = 226 \div 2$$

$$= 113$$

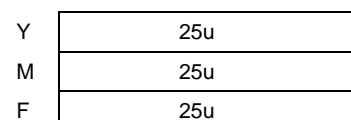
$$D \text{ (end)} = 7 \times 113 - 200$$

$$= 591$$

Deanna had **\$591** in the end.

Question 2

At first



Answer to Advanced Model Drawing (Equal Stage at first)

Question 2 (Cont.)

In the end

| | | | |
|---|-----|-----|------|
| Y | 10u | 15u | } 78 |
| M | 7u | 18u | |
| F | | 48 | |

$$10u + 7u + 25u = 78 + 48$$

$$42u = 126$$

$$1u = 126 \div 42$$

$$= 3$$

$$25u = 25 \times 3$$

$$= 75$$

Each of them received **75 pins** at first.

Answer to Advanced Model Drawing (Equal Stage End)

Question 1

In the end

| | |
|---|-----|
| D | 15u |
| W | 15u |
| S | 15u |

At first

| | | | |
|---|-----|----|-------|
| D | 56 | | } 298 |
| W | 15u | 5u | |
| S | 15u | 9u | |

$$15u + 15u + 15u + 5u + 9u = 298 + 56$$

$$59u = 354$$

$$1u = 354 \div 59$$

$$= 6$$

$$D \text{ (at first)} = 15 \times 6 - 56$$

$$= 34$$

Davis had **34 cards** at first.

Question 2

In the end

| | |
|---|--|
| I | |
| D | |
| S | |
| R | |

At first

| | | |
|---|-----|-----|
| I | 20u | 8u |
| D | 252 | |
| S | | 222 |
| R | 28u | 7u |

Answer to Advanced Model Drawing (Equal Stage End)

Question 2 (Cont.)

$$28u = 252$$

$$1u = 252 \div 28$$

$$= 9$$

$$\text{Total (at first)} = 20u + 252 + 252 + 222 + 35u$$

$$= 20 \times 9 + 726 + 35 \times 9$$

$$= 1221$$

They made **1221 balloons** altogether at first.

Answer to Advanced Model Drawing (Repeated Items)

Question 1

| | | | |
|---|----|-----|-------|
| K | 1u | 72 | } 25u |
| C | 3u | 216 | |
| S | 3u | | |

$$\frac{3}{25} \text{ of total} = 3u$$

$$\frac{1}{25} \text{ of total} = 1u$$

$$\frac{25}{25} \text{ of total} = 25u$$

$$25u - 3u - 3u - 1u = 216 + 72$$

$$18u = 288$$

$$1u = 288 \div 18$$

$$= 16$$

$$25u = 25 \times 16$$

$$= 400$$

There are **400 buns** in the bakery shop.

Question 2

| | | | |
|---|----|---|----|
| H | 2u | 6 | 23 |
| R | 2u | 6 | |
| B | 2u | 6 | 15 |
| N | 2u | | |

$$5u = 6 + 15 + 6 + 23$$

$$= 50$$

$$1u = 50 \div 5$$

$$= 10$$

$$2u + 6 = 2 \times 10 + 6$$

$$= 26$$

There are **26 rings** in the shop.

Answer to Advanced Model Drawing (Internal Transfer)

Question 1

| | | |
|---|-----|-----|
| B | 10u | 200 |
| K | 10u | |

| | At first | Change | End |
|---|----------------------------|-------------------------|--------------------------|
| B | $\frac{10}{10}(10u + 200)$ | $\frac{3}{10}(3u + 60)$ | $\frac{7}{10}(7u + 140)$ |
| K | 10u | $+(3u + 60)$ | 13u + 60 |

In the end

| | | | |
|---|-----|-----|----|
| B | 7u | 126 | 14 |
| K | 13u | 14 | 46 |

$$13u - 7u = 126$$

$$6u = 126$$

$$1u = 126 \div 6$$

$$= 21$$

$$3u + 60 = 3 \times 21 + 60$$

$$= 123$$

123 people had moved to Kusu Beach.

Question 2

At first

| | | |
|---|-----|----|
| A | 12u | 48 |
| B | 12u | |

| | At first | Change | End |
|---|---------------------------|-------------------------|-------------------------|
| A | 12u | $+(5u + 20)$ | 17u + 20 |
| B | $\frac{12}{12}(12u + 48)$ | $\frac{5}{12}(5u + 20)$ | $\frac{7}{12}(7u + 28)$ |

In the end

| | | | | | |
|---|----|----|---|----|---|
| A | 7u | 28 | 2 | 18 | 2 |
| B | 7u | 28 | | | |

$$17u - 7u = 28 + 2$$

$$10u = 30$$

$$1u = 30 \div 10$$

$$= 3$$

$$22u + 48 = 24 \times 3 + 48$$

$$= 120$$

There are **120 children** altogether in both campsites.

Question 3

At first

| | | |
|---|----|------|
| L | 5u | |
| M | 5u | 2400 |

Answer to Advanced Model Drawing (Internal Transfer)

Question 3 (Cont.)

At first

| | At first | Change | End |
|---|--------------------------|--------------------------|-------------------------|
| L | $\frac{5}{5}(5u + 2400)$ | $\frac{3}{5}(3u + 1440)$ | $\frac{2}{5}(2u + 960)$ |
| M | 5u | $+(3u + 1440)$ | 8u + 1440 |

2nd change

| | Change | End |
|---|--------------------------|--------------------------|
| L | $+(2u + 360)$ | 4u + 1320 |
| M | $\frac{4}{4}(8u + 1440)$ | $\frac{3}{4}(6u + 1080)$ |

In the end

| | | | | |
|---|----|----|------|-----|
| L | 4u | 52 | 1080 | 188 |
| M | 4u | 52 | 1080 | |

$$2u = 52$$

$$1u = 52 \div 2$$

$$= 26$$

$$3u + 1440 = 3 \times 26 + 1440$$

$$= 1518$$

Lynette transferred **\$1518** to Michelle.

Question 4

At first

| | | |
|---|----|----|
| H | 5u | 45 |
| L | 5u | |

| | At first | Change | End |
|---|------------------------|-----------------------|------------------------|
| H | $\frac{5}{5}(5u + 45)$ | $\frac{1}{5}(1u + 9)$ | $\frac{4}{5}(4u + 36)$ |
| L | 5u | $+(1u + 9)$ | 6u + 9 |

2nd Change

| | Change | End |
|---|-----------------------|-----------------------|
| H | $+(4u + 6)$ | 8u + 42 |
| L | $\frac{3}{3}(6u + 9)$ | $\frac{2}{3}(4u + 6)$ |

In the end

| | | | | |
|---|----|---|----|----|
| H | 2u | 3 | 27 | 42 |
| L | 2u | 3 | | |

$$6u = 3 + 27$$

$$= 30$$

$$1u = 30 \div 6$$

$$= 5$$

$$1u + 9 = 5 + 9$$

$$= 14$$

Mrs Hagen gave Letilia **14 dumplings**.

Answer to Unit 3.1

Let's Get Started 3.1

1.

| | | | | | | | | |
|-------------|---|---|---|----|----|---|-----|----|
| Figure no. | 1 | 2 | 3 | 4 | 5 | 6 | ... | 18 |
| No. of dots | 2 | 5 | 8 | 11 | 14 | | | |

$+3$ $+3$ $+3$ $+3$

- (a) Difference is 3.
 (b) Test (Figure 1): $1 \times 3 - 1 = 2$
 Test (Figure 2): $2 \times 3 - 1 = 5$
 Unique term: Figure no. $\times 3 - 1$
 (c) No. of dots in Figure 6 = $6 \times 3 - 1$
 $= 17$
 No. of dots in Figure 18 = $18 \times 3 - 1$
 $= 53$

2. (a) Difference = $7 - 3$
 $= 4$
 (b) Unique term (No. of dots) = Fig no. $\times 4 - 1$
 (c) No. of dots in Figure 6 = $6 \times 4 - 1$
 $= 23$
 No. of dots in Figure 15 = $15 \times 4 - 1$
 $= 59$

Lets' Learn 3.1

Ask yourself

- There is an increase in the number of squares by 1.
This is a number pattern involving common difference.
- General pattern: Number of squares is the same as the Figure Number.

Think Further

(a)

| Figure no. | Pattern to find (No. of squares) | Pattern to find (No. of circles) |
|------------|----------------------------------|----------------------------------|
| 1 | 1×2 | $1 \times 4 + 2$ |
| 2 | 2×2 | $2 \times 4 + 2$ |
| 3 | 3×2 | $3 \times 4 + 2$ |
| 4 | 4×2 | $4 \times 4 + 2 = 18$ |
| 5 | 5×2 | $5 \times 4 + 2 = 22$ |

- (b) Unique term (No. of circles) = Figure no. $\times 4 + 2$

Let's Practise 3.1

Question 1

(a)

| Figure no. | No. of triangles | Total no. of dots |
|------------|------------------|-------------------|
| 1 | 2 | 10 |
| 2 | 4 | 14 |
| 3 | 6 | 18 |
| 4 | 8 | 22 |
| 5 | 10 | 26 |

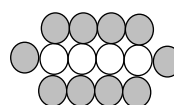
Answer to Unit 3.1

Question 1 (Cont.)

- (b) Unique term (No. of triangles) = Figure no. $\times 2$
 No. of triangles in Figure 83 = 83×2
 $= 166$
 (c) Unique term (Total no. of dots) = Figure no. $\times 4 + 6$
 Working backwards
 Figure no. $\times 4 = 282 - 6$
 $= 276$
 Figure no. = $276 \div 4$
 $= 69$
 There will be 282 dots in **Figure 69**.

Question 2

(a)



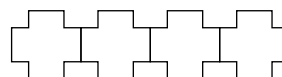
- (b) (i) Unique term (No. of shaded coins)
 $= \text{Figure no.} \times 2 + 2$
 Working Backwards
 $A \times 2 = 40 - 2$
 $= 38$
 $A = 38 \div 2$
 $= 19$
 (ii) Unique term (No. of unshaded coins)
 $= \text{Figure no.}$
 $B = 19$
 (iii) Unique term (Total no. of coins)
 $= \text{Figure no.} \times 3 + 2$
 $C = 19 \times 3 + 2$
 $= 59$

Question 3

- (a) Unique term (No. of matchsticks) = Figure no. $\times 5 + 1$
 No. of matchsticks in Figure 5 = $5 \times 5 + 1$
 $= 26$
 (b) Working backwards
 Figure no. $\times 5 = 131 - 1$
 $= 130$
 Figure no. = $130 \div 5$
 $= 26$
 The figure number formed is **Figure 26**.

Question 4

(a)



Answer to Unit 3.1

Question 4 (Cont.)

(b) Unique term (No. of squares) = Figure no. \times 10 + 2
 No. of squares in Figure 500 = $500 \times 10 + 2$
 $= 5002$

Working backwards

Figure no. \times 10 = $182 - 2$
 $= 180$

Figure no. = $180 \div 10$
 $= 18$

| Figure No. | Number of squares |
|------------|-------------------|
| 1 | 12 |
| 2 | 22 |
| 3 | 21 |
| ... | ... |
| 18 | 182 |
| 500 | 5002 |

Answer to Unit 3.2

Let's Get Started 3.2

1. (a)
 $1 = 1 \times 1$
 $4 = 2 \times 2$
 $9 = 3 \times 3$
 $16 = 4 \times 4$

(b)
 Figure 1: $1 \times 1 = 1$
 Figure 2: $2 \times 2 = 4$
 Figure 3: $3 \times 3 = 9$

The number of dots in each figure is the square of its figure number or it can be represented as (Figure no. \times Figure no.).

(c)
 No of dots in Figure 5 = 5×5
 $= 25$
 No of dots in Figure 6 = 6×6
 $= 36$
 No of dots in Figure 13 = 13×13
 $= 169$

2.
 (a) Figure 1 = $1 \times 1 = 1$
 Figure 2 = $2 \times 2 = 4$
 Figure 3 = $3 \times 3 = 9$
 Figure 4 = $4 \times 4 = 16$

The number of squares in each figure is the square of its figure number.

(b) Unique term (No. of squares) = Figure no. \times Figure no.

Answer to Unit 3.2

Let's Learn 3.2

Ask Yourself

- There is an increase in the number of squares. This type of number pattern is known as square numbers.
- General pattern: No. of dots = Figure no. \times Figure no.

Think Further

(a)

| Figure no. | No. of dots | Pattern to find no. of dots |
|------------|-------------|-----------------------------|
| 1 | 2 | $1^2 + 1$ |
| 2 | 5 | $2^2 + 1$ |
| 3 | 10 | $3^2 + 1$ |
| 4 | 17 | $4^2 + 1$ |
| 5 | 26 | $5^2 + 1$ |

(b) Unique term (No. of dots)
 $=$ Figure no. \times Figure no. + 1

Let's Practise 3.2

Question 1

| Figure no. | Number of dots | Pattern to find number of dots |
|------------|----------------|--------------------------------|
| 1 | 1 | 1×1 |
| 2 | 4 | 2×2 |
| 3 | 9 | 3×3 |
| 4 | 16 | 4×4 |
| 5 | (a) | 5×5 |
| ... | | |
| (b) | 81 | |

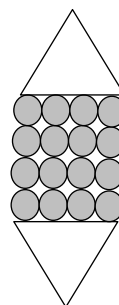
(a) No. of dots (Figure 5) = 5×5
 $= 25$

(b) Figure no. = $\sqrt{81}$
 $= 9$

(c) Figure no. = $\sqrt{256}$
 $= 16$

Question 2

(a)



(b) Unique term (No. of circles) = Figure no. \times Figure no.
 No. of circles = 11×11
 $= 121$

(c) No. of triangles = 2
 No. of circles = $402 - 2$
 $= 400$

Question 2 (Cont.)

Working backwards

$$\begin{aligned} \text{Figure no.} &= \sqrt{400} \\ &= 20 \end{aligned}$$

There will be 402 circles and triangles in **Figure 20**.

Question 3

(a)

| Figure no. | Number of shaded rectangles | Pattern to find no. of shaded rectangles |
|------------|-----------------------------|--|
| 1 | 2 | $1 \times 3 - 1$ |
| 2 | 5 | $2 \times 3 - 1$ |
| 3 | 8 | $3 \times 3 - 1$ |
| ... | | Figure no. $\times 3 - 1$ |

$$\begin{aligned} \text{No. of shaded rectangles} &= 16 \times 3 - 1 \\ &= 47 \end{aligned}$$

(b) Working backwards

$$\begin{aligned} \text{Figure no.} \times 3 &= 728 + 1 \\ &= 729 \end{aligned}$$

$$\begin{aligned} \text{Figure no.} &= 729 \div 3 \\ &= 243 \end{aligned}$$

There will be 728 shaded rectangles in **Figure 243**.

(c)

| Figure no. | Total number of rectangles | Pattern to find no. of shaded rectangles |
|------------|----------------------------|---|
| 1 | 4 | 2×2 |
| 2 | 9 | 3×3 |
| 3 | 16 | 4×4 |
| ... | | Figure no. $- 1 \times$ Figure no. $- 1$ |

Working backwards

$$\begin{aligned} \text{Figure no.} \times 3 &= 1091 + 1 \\ &= 1092 \end{aligned}$$

$$\begin{aligned} \text{Figure no.} &= 1092 \div 3 \\ &= 364 \end{aligned}$$

$$364 + 1 = 365$$

$$365 \times 365 = 133\,225$$

There will be a total of **133 225** rectangles in a figure with 1091 shaded rectangles.

Question 4

(a) Unique term (No. of unshaded squares)

$$= (\text{Fig no.} - 1) \times (\text{Fig no.} - 1)$$

$$\begin{aligned} \text{No. of unshaded squares in Figure 16} &= 15 \times 15 \\ &= 225 \end{aligned}$$

There are **225 unshaded squares** in Figure 16.

(b) No. of unshaded squares in Figure 42 = 41×41

$$= 1681$$

$$\begin{aligned} \text{Area of unshaded squares} &= 1681 \times 25 \\ &= 42\,025 \end{aligned}$$

The area of the unshaded squares in Figure 42 is **42 025 cm²**.

Question 4 (Cont.)

(c) Unique term (No. of shaded squares) = Figure no.

Working backwards

$$\begin{aligned} \text{No. of shaded squares} &= 1225 \div 25 \\ &= 49 \end{aligned}$$

There are **49 shaded squares**.

(d) No of shaded squares = 65

$$\begin{aligned} \text{No of unshaded squares} &= (65 - 1)^2 \\ &= 4096 \end{aligned}$$

Perimeter

$$\begin{aligned} &= 5 (64 + 64 + 32 + 32 + 31 + 33 + 1 + 1 + 1 + 1) \\ &= 1300 \end{aligned}$$

The perimeter of the figure in Pattern 65 is **1300 cm**.

Question 5

(a) No. of cubes in Figure 3 = $1 + 4 + 9$

$$= 14$$

No. of cubes in Figure 4 = $1 + 4 + 9 + 16$

$$= 30$$

Difference = $30 - 14$

$$= 16$$

16 more cubes are needed to make Figure 4.

(b) Difference = $(9 \times 9) + (10 \times 10)$

$$= 181$$

(c) No. of cubes in Layer 18 = 18×18

$$= 324$$

Question 6

(a) Unique term (No. of fishes)

$$= (\text{Day no.} - 1) \times (\text{Day no.} - 1) + 7$$

$$\begin{aligned} \text{No. of fishes in Day 45} &= 44 \times 44 + 7 \\ &= 1943 \end{aligned}$$

There will be **1943 fishes** on Day 45.

(b) Working backwards

$$3488 - 7 = 3481$$

$$\sqrt{3481} = 59$$

$$\text{Fig no.} = 59 + 1$$

$$= 60$$

There will be 3488 fishes on **Day 60**.

(c) No. of sets = $1573 \div 6.5$

$$= 242$$

No. of fish = 4×242

$$= 968$$

Working backwards

$$968 - 7 = 961$$

$$\sqrt{961} = 31$$

$$\text{Fig no.} = 31 + 1$$

$$= 32$$

Berlin's father will earn \$1573 on **Day 32**.

Let's Get Started 3.3

1. (a) There is a consecutive increase by 1 from one figure number to the next.

(b)

$$\text{Figure 1} = \frac{(1 \times 2)}{2}$$

$$= 1$$

$$\text{Figure 2} = \frac{(2 \times 3)}{2}$$

$$= 3$$

The number of dots in the consecutive figures follows the rule of triangle number where $\frac{(\text{Figure no.} \times \text{Figure no.} + 1)}{2}$.

2.

(a) $\text{Figure 1} = \frac{(1 \times 2)}{2}$

$$= 1$$

$$\text{Figure 2} = \frac{(2 \times 3)}{2}$$

$$= 3$$

$$\text{Figure 3} = \frac{(3 \times 4)}{2}$$

$$= 6$$

The number of squares in the consecutive figures follows the rule of triangle number where $\frac{(\text{Figure no.} \times \text{Figure no.} + 1)}{2}$.

(b) Unique terms : $\frac{(\text{Figure no.} \times \text{Figure no.} + 1)}{2}$

Let's Practise 3.3

Question 1

(a) Unique term (Total no. of circles) = $\frac{\text{Figure no.} \times \text{Figure no.} + 1}{2}$

$$\text{Total no. of circles in Figure 12} = \frac{12 \times 13}{2}$$

$$= 78$$

There are **78 circles** in Figure 12.

(b) Working backwards

$$1540 \times 2 = 3080$$

$$\sqrt{3080} \approx 55$$

$$\text{Test 1: } 54 \times 55 = 2970$$

$$\text{Test 2: } 55 \times 56 = 3080$$

There are **1540 circles** in **Figure 55**.

Question 2

(a) Unique term (Total no. of apples) = $\frac{\text{Figure no.} \times \text{Figure no.} + 1}{2}$

$$\text{Total no. of apples in Figure 10} = \frac{10 \times 11}{2} \times 10$$

$$= 550$$

There are **550 apples** harvested on the 10th day.

(b) $1530 \div 10 = 153$

$$\frac{\text{Figure no.} \times \text{Figure no.} + 1}{2} = 153$$

$$\text{Figure no.} \times (\text{Figure no.} + 1) = 306$$

$$\sqrt{306} = 17.49286$$

$$\approx 17$$

Question 2 (Cont.)

$$\text{(Check) } 17 \times 18 = 306$$

Figure no is 17

1035 apples were harvested on the **17th day**.

Question 3

(a) Unique term (Total no. of triangles)

$$= \text{Figure no.} \times \text{Figure no.}$$

$$\text{Total no. of triangles in Figure 22} = 22 \times 22$$

$$= 484$$

There are **484 triangles** in Figure 22.

(b) Working backwards

$$\sqrt{961} = 31$$

There will be a total of 961 triangles in **Figure 31**.

(b) Working backwards

$$\text{Figure no.} = \sqrt{121}$$

$$= 11$$

$$\text{Unique term (No. of shaded triangles)} = \frac{\text{Fig no.} \times \text{Fig no.} + 1}{2}$$

$$\text{No. of shaded triangles in Figure 11} = \frac{11 + 12}{2}$$

$$= 66$$

There are **66 shaded triangles**.

(c) Unique term (No. of unshaded triangles)

$$= \frac{\text{Fig no.} + 1 \times \text{Fig no.} + 2}{2}$$

Working backwards

$$2485 \times 2 = 4970$$

$$\sqrt{4974} \approx 70$$

$$\text{Test 1: } 69 \times 70 = 4830$$

$$\text{Test 2: } 70 \times 71 = 4970$$

There will be 2485 unshaded triangles in **Figure 69**.

Question 4

(a) Unique term (Total no. of crosses)

$$= \frac{\text{Figure no.} \times \text{Figure no.} + 1}{2}$$

$$\text{Total no. of crosses (Figure 5)} = \frac{5 \times 6}{2}$$

$$= 15$$

$$\text{No. of unshaded crosses} = 15 - 4$$

$$= 11$$

Unique term (No. of shaded crosses) = Fig no. - 1

$$\text{No. of shaded crosses (Figure 8)} = 8 - 1$$

$$= 7$$

$$\text{Total no. of crosses (Figure 8)} = \frac{8 \times 9}{2}$$

$$= 36$$

$$\text{No. of unshaded crosses} = 36 - 7$$

$$= 29$$

(b) Total no. of crosses (Figure 29) = $\frac{29 \times 30}{2}$

$$= 435$$

There is a total of **435 crosses** in Figure 29.

Question 4 (Cont.)

(c) Working backwards

$$741 \times 2 = 1482$$

$$\sqrt{1482} \approx 70$$

$$\text{Test 1: } 37 \times 38 = 1406$$

$$\text{Test 2: } 38 \times 39 = 1482$$

There will be 741 crosses in **Figure 38**.

(d) Working backwards

$$2080 \times 2 = 4160$$

$$\sqrt{4160} \approx 64$$

$$\text{Test 1: } 63 \times 64 = 4032$$

$$\text{Test 2: } 64 \times 65 = 4160$$

$$\begin{aligned} \text{No. of shaded crosses (Figure 64)} &= 64 - 1 \\ &= 63 \end{aligned}$$

$$\begin{aligned} \text{No. of unshaded crosses} &= 2080 - 63 \\ &= 2017 \end{aligned}$$

There are **2017 unshaded crosses**.**Question 5**

$$\begin{aligned} \text{(a) No. of blocks at Layer 12} &= (12 - 1) \times 2 \\ &= 22 \end{aligned}$$

Number on the extreme right of Layer 12

$$= 1 + (2 + 4 + 6 + \dots + 22)$$

$$= 1 + 2(1 + 2 + 3 + \dots + 11)$$

$$= 1 + 2\left[\frac{11+1}{2} \times 11\right]$$

$$= 133$$

(b) No. of blocks at Layer 68

$$= (68 - 1) \times 2$$

$$= 134$$

Number on the extreme right of Layer 68

$$= 1 + (2 + 4 + 6 + \dots + 134)$$

$$= 1 + 2(1 + 2 + 3 + \dots + 67)$$

$$= 1 + 2\left[\frac{(67+1)}{2} \times 67\right]$$

$$= 4557$$

(c) $1261 - 1 = 1260$

$$1260 \div 2 = 630$$

$$\frac{\text{Fig no.}}{2} \times (\text{Fig no.} + 1) = 630$$

$$(\text{Fig no.}) \times (\text{Fig no.} + 1) = 1260$$

$$\sqrt{1260} = 35.4964787$$

$$\text{Test : } 35 \times 36 = 1260$$

$$35 + 1 = 36$$

In **Layer 36**, the number 1261 will be on the extreme right of the layer.**Question 5 (Cont.)**(d) $2163 - 1 = 2162$

$$2162 \div 2 = 1081$$

$$\frac{\text{Fig No.}}{2} \times (\text{Fig No.} + 1) = 1081$$

$$(\text{Fig No.}) \times (\text{Fig No.} + 1) = 2162$$

$$\sqrt{2162} = 46.4973$$

$$\text{Test: } 46 \times 47 = 2162$$

$$\text{Layer: } 46 + 1 = 47$$

$$46 \times 2 = 92$$

$$2162 - 91 = 2071$$

The number on the extreme left of the layer is **2071**.**Chapter 4 Circles****Answer to Unit 4.1****Let's Get Started 4.1**

1. Area of shaded part

$$= 25 \text{ cm} \times 25 \text{ cm} - \frac{1}{4} \times \pi \times 25 \text{ cm} \times 25 \text{ cm}$$

$$\approx 134 \text{ cm}^2$$

2. Area of shaded part

$$= \frac{1}{4} \times \pi \times 5 \text{ cm} \times 5 \text{ cm} - \frac{1}{2} \times 5 \text{ cm} \times 5 \text{ cm}$$

$$\approx 7 \text{ cm}^2$$

Let's Learn 4.1**Ask Yourself**

1. The figures are 1 large quadrant of radius 20 cm, 1 small quadrant of radius 8 cm and a rectangle measuring 8 cm by 20 cm.

Let's Practise 4.1**Question 1**

Area of shaded parts

$$= 36 \text{ cm} \times 36 \text{ cm} - \pi \times 18 \text{ cm} \times 18 \text{ cm}$$

$$\approx 278 \text{ cm}^2$$

The area of the shaded parts is **278 cm²**.**Question 2**Perimeter of unshaded Region Q = $2 \times \pi \times 12 \text{ cm}$

$$\approx 75 \text{ cm}$$

The perimeter of the unshaded Region Q is **75 cm**.

Area of unshaded Region Q

$$= 24 \text{ cm} \times 24 \text{ cm} - \pi \times 12 \text{ cm} \times 12 \text{ cm}$$

$$\approx 124 \text{ cm}^2$$

The area of unshaded Region Q is **124 cm²**.**Question 3**

Perimeter of shaded region

$$= \frac{3}{2} \times 2 \times 3.14 \times 12 \text{ cm} + 36 \text{ cm} + 24 \text{ cm} + 36 \text{ cm}$$

$$= 209.04 \text{ cm}$$

The perimeter of the shaded region is **209.04 cm**.

Answer to Unit 4.1**Question 3 (Cont.)**

Area of shaded region

$$= 24 \text{ cm} \times 36 \text{ cm} - \frac{3}{2} \times 3.14 \times 12 \text{ cm} \times 12 \text{ cm}$$

$$= 185.76 \text{ cm}^2$$

The area of the shaded region is **185.76 cm²**.**Question 4**

Area of shaded part

$$= 2 \times \left(\frac{1}{4} \times \pi \times 5 \text{ cm} \times 5 \text{ cm} - \frac{1}{2} \times 5 \text{ cm} \times 5 \text{ cm}\right)$$

$$= 14 \text{ cm}^2$$

The area of the shaded part is **14 cm²**.**Question 5**

Area of shaded region

$$= 7 \times \left[\left(\frac{1}{4} \times \pi \times 20 \text{ cm} \times 20 \text{ cm}\right) - \left(\frac{1}{2} \times 20 \text{ cm} \times 20 \text{ cm}\right)\right]$$

$$= 700\pi - 1400 \text{ cm}^2$$

Area of unshaded regions

$$= \pi (20 \text{ cm} \times 20 \text{ cm}) - (700\pi - 1400)$$

$$\approx 458 \text{ cm}^2$$

The area of the shaded region is **458 cm²**.**Question 6**

Perimeter of large semicircle

$$= \left(\frac{1}{2} \times \pi \times 36\right) + 36$$

$$= 18(\pi + 2)$$

Perimeter of small semicircle

$$= \left(\frac{1}{2} \times \pi \times 12\right) + 12$$

$$= 6(\pi + 2)$$

Perimeter of large semicircle : Perimeter of small semicircle

$$= 18(\pi + 2) : 6(\pi + 2)$$

$$= \mathbf{3 : 1}$$

Area of the large semicircle

$$= \frac{1}{2} \times \pi \times 18^2$$

$$= 162\pi$$

Area of small semicircle

$$= \frac{1}{2} \times \pi \times 6^2$$

$$= 18\pi$$

Area of the large semicircle : Area of the small semicircle

$$= 162\pi : 18\pi$$

$$= \mathbf{9 : 1}$$

Question 7

Diameter of small circle = 16 cm

Diameter of medium circle = 32 cm

Area of shaded region

$$= \pi \times 32 \text{ cm} \times 32 \text{ cm} - 2 \times \pi \times 8 \text{ cm} \times 8 \text{ cm} - \pi \times 16 \text{ cm} \times 16 \text{ cm}$$

$$= 640\pi \text{ cm}^2$$

The area of the shaded region is **640π cm²**.**Answer to Unit 4.1****Question 8**

Area of A

$$= 2 \times \left(\frac{1}{4} \times \pi \times 10 \text{ cm} \times 10 \text{ cm} - \frac{1}{2} \times 10 \text{ cm} \times 10 \text{ cm}\right)$$

$$= 2 \times (25\pi - 50)$$

$$= (50\pi - 100) \text{ cm}^2$$

The area of Part A is **(50π - 100) cm²**.

Area of C

$$= \frac{1}{4} \times \pi \times 20 \text{ cm} \times 20 \text{ cm} - \frac{1}{2} \times \pi \times 10 \text{ cm} \times 10 \text{ cm} - 10 \text{ cm} \times 10 \text{ cm}$$

$$= (100\pi - 50\pi - 100) \text{ cm}^2$$

$$= (50\pi - 100) \text{ cm}^2$$

The area of Part C is **(50π - 100) cm²**.**Question 9**

Area of quadrant

$$= \frac{1}{4} \times \frac{22}{7} \times 41 \text{ cm} \times 41 \text{ cm}$$

$$= 1386 \text{ cm}^2$$

Area of 1 small square

$$= 21 \text{ cm} \times 21 \text{ cm}$$

$$= 441 \text{ cm}^2$$

Area of the figure

$$= 2 (1386 \text{ cm}^2 - 441 \text{ cm}^2) + 3 \times 441 \text{ cm}^2$$

$$= 3213 \text{ cm}^2$$

The area of the shaded part is **3213 cm²**.**Answer to Unit 4.2****Let's Learn 4.2****Ask Yourself**

- Yes. The figure is made up of 2 semicircles of diameter 20 cm enclosed in a square of side 20 cm.
- Yes. Lines are needed to make the shapes that form the figure more distinct.

Let's Practise 4.2**Question 1**

Area of the shaded part

$$= 2 \times \frac{1}{2} \times 36 \text{ cm} \times 18 \text{ cm}$$

$$= 648 \text{ cm}^2$$

The area of the shaded parts is **648 cm²**.**Question 2**

Area of the big circle

$$= \pi \times 21 \text{ cm} \times 21 \text{ cm}$$

$$= \frac{22}{7} \times 21 \text{ cm} \times 21 \text{ cm}$$

$$= 1386 \text{ cm}^2$$

Question 2 (Cont.)

$$\begin{aligned} \text{Area of small circles} &= \frac{22}{7} \times 7 \text{ cm} \times 7 \text{ cm} \times 7 \\ &= \frac{22}{7} \times 49 \text{ cm}^2 \times 7 \\ &= 1078 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Area of shaded parts} &= \frac{1386-1078}{12} \times 2 \\ &= 51\frac{1}{3} \end{aligned}$$

The area of the shaded parts is **51 $\frac{1}{3}$ cm²**.

Question 3

$$\begin{aligned} \text{Area of the shaded parts} &= 3.14 \times 10 \text{ cm} \times 10 \text{ cm} \\ &= 314 \text{ cm}^2 \end{aligned}$$

The area of the shaded parts is **314 cm²**.

Question 4

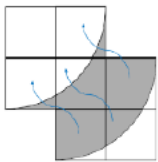
$$\begin{aligned} \text{Area of figure} &= 1\frac{1}{4} \times \frac{22}{7} \times 7 \text{ cm} \times 7 \text{ cm} \\ &= 192.5 \text{ cm}^2 \end{aligned}$$

The area of the figure is **192.5 cm²**.

$$\begin{aligned} \text{Perimeter of figure} &= 1\frac{1}{4} \times 2 \times \frac{22}{7} \times 7 \text{ cm} + 14 \text{ cm} \\ &= 69 \text{ cm} \end{aligned}$$

The perimeter of the figure is **69 cm**.

Question 5



$$\text{Area of shaded figure (3 small squares)} = 192 \text{ cm}^2$$

$$\begin{aligned} \text{Area of 1 small square} &= 192 \text{ cm}^2 \div 3 \\ &= 64 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Side of square} &= \sqrt{64} \text{ cm}^2 \\ &= 8 \text{ cm} \end{aligned}$$

$$\begin{aligned} \text{Radius of quadrant} &= 2 \times 8 \text{ cm} \\ &= 16 \text{ cm} \end{aligned}$$

$$\begin{aligned} \text{Perimeter of shaded parts} &= \frac{1}{2} \times 2 \times 3.14 \times 16 \text{ cm} + 4 \times 8 \text{ cm} \\ &= 82.24 \text{ cm} \end{aligned}$$

The perimeter of the shaded parts is **82.24 cm**.

Question 1

(a) $AB = 4u$, $BC = 3u$

$$\begin{aligned} \text{Perimeter} &= 4u + 3u + 4u + 3u \\ &= 14u \end{aligned}$$

$$14u = 84 \text{ cm}$$

$$1u = 84 \text{ cm} \div 14$$

$$= 6 \text{ cm}$$

$$3u = 3 \times 6 \text{ cm}$$

$$= 18 \text{ cm}$$

The length of each small rectangle is **18 cm**.

(b) $BC = 3 \times 6 \text{ cm}$

$$= 18 \text{ cm}$$

$$\text{Area of ABCD} = 24 \text{ cm} \times 18 \text{ cm}$$

$$= 432 \text{ cm}^2$$

Area of shaded portions

$$= 432 \text{ cm}^2 - \left(\frac{1}{4} \times 3.14 \times 18 \text{ cm} \times 18 \text{ cm}\right) + 6 \text{ cm} \times 6 \text{ cm}$$

$$= 213.66 \text{ cm}^2$$

The area of the shaded portions is **213.66 cm²**.

Question 2

(a) Circumference of ABC = $\frac{1}{2} \times 2 \times 3.14 \times 3 \text{ cm}$

$$= 9.42 \text{ cm}$$

$$\begin{aligned} \text{Circumference of CDE} &= \frac{1}{2} \times 2 \times 3.14 \times 4 \text{ cm} \\ &= 12.56 \text{ cm} \end{aligned}$$

$$\begin{aligned} \text{Circumference of ACE} &= \frac{1}{2} \times 2 \times 3.14 \times 5 \text{ cm} \\ &= 15.7 \text{ cm} \end{aligned}$$

$$\text{Perimeter of PQRS} = 4 \times \sqrt{50} \text{ cm}$$

Perimeter of shaded regions

$$\begin{aligned} &= 9.42 \text{ cm} + 12.56 \text{ cm} + 15.7 \text{ cm} + 4 \times \sqrt{50} \text{ cm} \\ &\approx 65.96 \text{ cm} \end{aligned}$$

The perimeter of the shaded regions is **65.96 cm**.

(b) Area of PQRS = $\frac{1}{2} \times 10 \text{ cm} \times 5 \text{ cm} \times 2$

$$= 50 \text{ cm}^2$$

Area of unshaded part in semicircle ACE not covered by triangle ACE

$$\begin{aligned} &= \frac{1}{2} \times 3.14 \times 5 \text{ cm} \times 5 \text{ cm} - \frac{1}{2} \times 6 \text{ cm} \times 8 \text{ cm} \\ &= 15.25 \text{ cm}^2 \end{aligned}$$

Area of shaded parts in semicircles ABC and CDE

$$\begin{aligned} &= \frac{1}{2} \times 3.14 \times 3 \text{ cm} \times 3 \text{ cm} + \frac{1}{2} \times 3.14 \times 4 \text{ cm} \times 4 \text{ cm} - \\ &15.25 \text{ cm}^2 \\ &= 24 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Total area of shaded regions} &= 50 \text{ cm}^2 + 24 \text{ cm}^2 \\ &= 74 \text{ cm}^2 \end{aligned}$$

The total area of the 3 shaded regions is **74 cm²**.

Question 3

$$\begin{aligned} \text{(a) OL} &= 5 \text{ cm} - 2 \text{ cm} \\ &= 3 \text{ cm} \end{aligned}$$

The length OL is **3 cm**.

$$\begin{aligned} \text{(b) Area of shaded triangle} &= \frac{1}{2} \times 4 \text{ cm} \times 3 \text{ cm} \\ &= 6 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Area of shaded } \frac{3}{4}\text{-circle} &= \frac{3}{4} \times \pi \times 5 \text{ cm} \times 5 \text{ cm} \\ &= 18.75\pi \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Area of shaded parts} &= 6 \text{ cm}^2 + 18.75\pi \text{ cm}^2 \\ &\approx 64.9 \text{ cm}^2 \end{aligned}$$

The area of the shaded parts is **64.9 cm²**.

Question 4

Area of the shaded parts

$$\begin{aligned} &= \frac{1}{2} \times \pi \times (9)^2 + 2 \times \frac{1}{2} \times 9 \times 9 \\ &= 208.2345 \text{ cm}^2 \\ &= \mathbf{208.2 \text{ cm}^2} \end{aligned}$$

Question 5

$$A + B = 110 \text{ cm}^2$$

$$A + B + C = 180 \text{ cm}^2$$

$$\begin{aligned} C &= 180 - 110 \\ &= 70 \text{ cm}^2 \end{aligned}$$

$$B + C + D = 130 \text{ cm}^2$$

$$\begin{aligned} B + D &= 130 - 70 \\ &= \mathbf{60 \text{ cm}^2} \end{aligned}$$

The area of shaded parts is **60 cm²**.

Question 6

Area of the shaded part

$$\begin{aligned} &= \left(\frac{1}{2} \times 7.5 \times 12\right) + \left[\left(\frac{1}{4} \times \pi \times (7.5)^2\right) - \left(\frac{1}{2} \times 7.5 \times 7.5\right)\right] \\ &= 45 + 16.0536 \\ &= 61.05 \text{ cm}^2 \end{aligned}$$

The area of shaded parts is **61.05 cm²**.

Question 7

Area of 4 half-rugby

$$\begin{aligned} &= 4 \times \left[\frac{1}{4} \times \pi \times (4 \text{ cm})^2 - \frac{1}{2} \times 4 \text{ cm} \times 4 \text{ cm}\right] \\ &= 4 \times (4\pi - 8) \text{ cm}^2 \\ &= (16\pi - 32) \text{ cm}^2 \end{aligned}$$

Area of shaded parts in the square

$$\begin{aligned} &= \left(\frac{1}{2} \times 16 \text{ cm} \times 8 \text{ cm} \times 2\right) - (\pi \times 4 \text{ cm} \times 4 \text{ cm}) - (2 \times \frac{1}{2} \times \\ &8 \text{ cm} \times 4 \text{ cm}) \\ &= (96 - 16\pi) \text{ cm}^2 \end{aligned}$$

Area of shaded parts

$$\begin{aligned} &= 16\pi - 32 + (96 - 16\pi) \\ &= \mathbf{64 \text{ cm}^2} \end{aligned}$$

The total area of the shaded parts is **64 cm²**.

Question 8

Area of shaded parts

$$\begin{aligned} &= 4 \times \frac{1}{2} \times 16 \text{ cm} \times 8 \text{ cm} \\ &= 256 \text{ cm}^2 \end{aligned}$$

$$16 \times 16 - 8 \left[\left(\frac{1}{4} \times 3.14 \times 8 \times 8\right) - \left(\frac{1}{2} \times 8 \times 8\right) \right]$$

$$= 256 - 8(18.24)$$

$$= 1108.08$$

The total area of the shaded parts is **1108.08 cm²**.

Chapter 5 Speed

Answer to Unit 5.1

Let's Get Started 5.1

$$\begin{aligned} 1. \text{ (a) Distance} &= 90 \times 2 \\ &= 180 \end{aligned}$$

Distance travelled for the first part of her journey was **180 km**.

$$\begin{aligned} \text{(b) Total distance} &= 3 \times 180 \\ &= 540 \end{aligned}$$

The total distance of her journey was **540 km**.

$$\begin{aligned} \text{(c) Time taken} &= 5 \text{ h} - 2 \text{ h} \\ &= 3 \text{ h} \end{aligned}$$

$$\begin{aligned} \text{Distance travelled} &= 540 - 180 \\ &= 360 \end{aligned}$$

$$\begin{aligned} \text{Speed} &= 360 \div 3 \\ &= 120 \end{aligned}$$

Jaime's speed for the last part of the journey was **120 km/h**.

$$\begin{aligned} \text{(d) Average speed for whole journey} &= 540 \div 7 \\ &= 77\frac{1}{2} \end{aligned}$$

Jaime's average speed for the whole journey was **77 $\frac{1}{2}$ km/h**.

$$\begin{aligned} 2. \text{ (a) } \frac{3}{4} \text{ Total} &= 300 \text{ km} \\ \frac{1}{4} \text{ Total} &= 300 \text{ km} \div 3 \\ &= 100 \text{ km} \end{aligned}$$

$$\begin{aligned} \frac{4}{4} \text{ Total} &= 4 \times 100 \text{ km} \\ &= 400 \text{ km} \end{aligned}$$

Town A and Town B is **400 km** apart.

$$\begin{aligned} \text{(b) Time taken} &= 100 \div 80 \\ &= 1\frac{1}{4} \end{aligned}$$

He took **1 $\frac{1}{4}$ h** to travel the first part of the journey.

Answer to Unit 5.1

$$\begin{aligned} \text{(c) Time taken} &= 400 \div 100 \\ &= 4 \end{aligned}$$

He took 4 h to travel from Town A to Town B.

Let's Learn 5.1

Ask Yourself

- The entire journey is made up of 4 parts.
- Yes. At any part of the journey, there is only one unknown where the other two variables are given.

Let's Practise 5.1

Question 1

$$\begin{aligned} \text{Speed for the 2}^{\text{nd}} \text{ part of the journey} &= 150 \div 1.5 \\ &= 100 \end{aligned}$$

Mr Wong was travelling at a constant speed of **100 km/h**.

Question 2

$$\frac{1}{5} \text{ Total} = 2.6 \text{ km}$$

$$\begin{aligned} \frac{3}{5} \text{ Total} &= 2.6 \text{ km} \times 3 \\ &= 7.8 \text{ km} \end{aligned}$$

$$\begin{aligned} \text{Time taken for } \frac{3}{5} \text{ of journey} &= 7.8 \div 12 \\ &= \frac{13}{20} \text{ (h)} \\ &= 39 \text{ (min)} \end{aligned}$$

$$\begin{aligned} \text{Time taken for } \frac{1}{2} \text{ of remaining journey} &= 2.6 \div 13 \\ &= \frac{1}{5} \text{ (h)} \\ &= 12 \text{ (min)} \end{aligned}$$

$$\begin{aligned} \text{Time taken} &= 39 + 12 + 15 \\ &= 66 \end{aligned}$$

Alice took **1 hr 6 min** to complete the whole journey.

Question 3

$$1^{\text{st}} \text{ part of journey} = \frac{7}{20} \text{ of Total}$$

$$\begin{aligned} 2^{\text{nd}} \text{ part of journey} &= \frac{2}{5} \text{ of Total} \\ &= \frac{8}{20} \text{ of Total} \end{aligned}$$

$$\begin{aligned} 3^{\text{rd}} \text{ part of journey} &= 1 - \frac{7}{20} - \frac{8}{20} \\ &= \frac{5}{20} \text{ (of Total)} \end{aligned}$$

$$\frac{7}{20} \text{ Total} = 84 \text{ km}$$

$$\begin{aligned} \frac{1}{20} \text{ Total} &= 84 \text{ km} \div 7 \\ &= 12 \text{ km} \end{aligned}$$

$$\begin{aligned} \frac{5}{20} \text{ Total} &= 5 \times 12 \text{ km} \\ &= 60 \text{ km} \end{aligned}$$

$$\begin{aligned} \text{Speed for last part of journey} &= 60 \div 1 \\ &= 60 \end{aligned}$$

His average speed for the last part of the journey was **60 km/h**.

Answer to Unit 5.1

Question 4

$$\begin{aligned} \text{Distance (1}^{\text{st}} \text{ part)} &= 59 \text{ km/h} \times \frac{1}{2} \text{ h} \\ &= 29.5 \text{ km} \end{aligned}$$

$$\begin{aligned} \text{Distance (middle part)} &= 352 \text{ km} - 126 \text{ km} - 29.5 \text{ km} \\ &= 196.5 \text{ km} \end{aligned}$$

$$\begin{aligned} \text{Time take (last part)} &= 126 \text{ km} \div 72 \text{ km/h} \\ &= 1\frac{3}{4} \text{ h} \\ &= 1 \text{ h } 45 \text{ min} \end{aligned}$$

$$\begin{aligned} \text{Time taken (middle part)} \\ &= 5 \text{ h } 15 \text{ min} - 30 \text{ min} - 1 \text{ h } 45 \text{ min} \\ &= 3 \text{ h} \end{aligned}$$

$$\begin{aligned} \text{Average speed (middle part)} &= 196.5 \text{ km} \div 3 \text{ h} \\ &= 65.5 \text{ km/h} \end{aligned}$$

The average speed for the middle part of the journey was **65.5 km/h**.

Question 5

$$\begin{aligned} \text{Distance (A to B to C)} &= 6 \text{ km/h} \times \frac{2}{5} \text{ h} \\ &= 2.4 \text{ km} \end{aligned}$$

$$\begin{aligned} \text{Total distance} &= 2.4 \text{ km} \times 2 \\ &= 4.8 \text{ km} \end{aligned}$$

$$\begin{aligned} \text{Total time taken} &= 24 \text{ min} + 12 \text{ min} \\ &= 36 \text{ min} \\ &= \frac{3}{5} \text{ h} \end{aligned}$$

$$\begin{aligned} \text{Belinda's average speed} &= 4.8 \text{ km} \div \frac{3}{5} \text{ h} \\ &= 8 \text{ km/h} \end{aligned}$$

Belinda's average speed to walk around the rectangular path was **8 km/h**.

Answer to Unit 5.2

Let's Get Started 5.2

Scenario A

- sum; total distance
- Sunny; Hector; 20 m/min
- meet
- 100 m
- 80 m

Scenario B

- Sunny; 20 m/min
- 1000 m or 1 km
- 9 min
- 600 m
- 760 m
- 20 m
- 19 min
- 1.36 km

Answer to Unit 5.2

Let's Learn 5.2

Ask Yourself

1. The total distance travelled is the same.

Let's Practise 5.2

Question 1

$$\begin{aligned} \text{Time taken to meet} &= 544 \div (64 + 72) \\ &= 4 \text{ (hours)} \end{aligned}$$

4 hours after 5 p.m. is 9 p.m.

They will meet each other at **9 p.m.**

Question 2

$$\begin{aligned} \text{Distance bus travelled in 15 min} &= 100 \text{ km/h} \times \frac{1}{4} \text{ h} \\ &= 25 \text{ km} \end{aligned}$$

$$\begin{aligned} \text{Distance lorry travelled in 15 min} &= 80 \text{ km/h} \times \frac{1}{4} \text{ h} \\ &= 20 \text{ km} \end{aligned}$$

$$\begin{aligned} \text{Distance between two towns} &= 25 \text{ km} + 20 \text{ km} \\ &= 45 \text{ km} \end{aligned}$$

The distance between the two towns is **45 km.**

Question 3

$$\begin{aligned} \text{(a) Time taken to meet} &= 217.5 \div (80 + 65) \\ &= 1.5 \text{ (hours)} \end{aligned}$$

1.5 hours after 09 30 was 11 00.

They met at **11 00.**

$$\begin{aligned} \text{(b) Distance Adrian travelled more} &= 1.5 \text{ h} \times 15 \text{ km/h} \\ &= 22.5 \text{ km} \end{aligned}$$

Adrian had travelled **22.5 km** further than Ben when they met each other.

Question 4

$$\begin{aligned} \text{Distance Tom covered at 3 p.m.} &= 70 \text{ km/h} \times 4 \text{ h} \\ &= 280 \text{ km} \end{aligned}$$

$$\begin{aligned} \text{Distance Bill covered at 3 p.m.} &= 440 \text{ km} - 280 \text{ km} \\ &= 160 \text{ km} \end{aligned}$$

$$\begin{aligned} \text{Bills speed} &= 160 \text{ km} \div 4 \text{ h} \\ &= 40 \text{ km/h} \end{aligned}$$

Bill's speed was **40 km/h.**

Question 5

$$\begin{aligned} \text{Time taken to meet} &= 1600 \div (120 + 80) \\ &= 8 \text{ (seconds)} \end{aligned}$$

$$\begin{aligned} \text{Distance Bala covered in 8 s} &= 120 \text{ m/s} \times 8 \text{ s} \\ &= 960 \text{ m} \end{aligned}$$

$$\begin{aligned} \text{Distance more to reach Point P} &= 1600 \text{ m} - 960 \text{ m} \\ &= 640 \text{ m} \end{aligned}$$

Bala will have to cycle a further **640 m.**

Answer to Unit 5.3

Let's Get Started 5.3

Case 1:

| | Alex | Benson | Ratio |
|------------|-------------------------------|-------------------------------|----------------|
| Time taken | $480 \div 80 = 6 \text{ (h)}$ | $480 \div 60 = 8 \text{ (h)}$ | A : B 3 : 4 |

Case 2:

| | Alex | Benson | Ratio |
|--------------------|----------------------------------|----------------------------------|-----------------------------|
| Speed | 80 | 60 | A : B 4 : 3 |
| Distance travelled | $80 \times 4 = 320 \text{ (km)}$ | $60 \times 4 = 240 \text{ (km)}$ | A : B 320 : 240 4 : 3 |

Case 3:

| | Alex | Benson | Ratio |
|--------------------|----------------------------------|----------------------------------|-----------------------------|
| Time taken | 4 h | 2 h | A : B 2 : 1 |
| Distance travelled | $50 \times 4 = 200 \text{ (km)}$ | $50 \times 2 = 100 \text{ (km)}$ | A : B 200 : 100 2 : 1 |

Circle "opposite"

Circle "the same"

Circle "the same"

Let's Learn 5.3

Ask Yourself

1. Distance travelled is the common/the same.

Let's Practise 5.3

Question 1

$$\begin{aligned} S_J : S_T & & D_J : D_T \\ 3 : 4 & & 3 : 4 \end{aligned}$$

$$\begin{aligned} \text{Distance covered by J for 1}^{\text{st}} \text{ 30 mins} &= \frac{1}{2} \times 60 \\ &= 30 \text{ km} \end{aligned}$$

$$4 - 3 = 1$$

$$1u = 30$$

$$4u = 30 \times 4$$

$$= 120$$

$$\begin{aligned} \text{Time taken by T to overtake} &= \frac{120}{80} \\ &= \mathbf{1.5 \text{ h}} \end{aligned}$$

Tom would have travelled for **1.5 hours** before he overtook Julianna.

Question 2

$$\begin{aligned} S_J : S_B & & D_J : D_B \\ 54 : 63 & & 54 : 63 \\ 6 : 7 & & 6 : 7 \end{aligned}$$

$$60 \text{ mins} = 54 \text{ km}$$

$$1 \text{ min} = \frac{54}{60}$$

$$\begin{aligned} 20 \text{ mins} &= \frac{54}{60} \times 20 \\ &= 18 \end{aligned}$$

$$1u = 18 \text{ km}$$

Answer to Unit 5.3

Question 2 (Cont.)

$$7u = 7 \times 18 \text{ km} \\ = 126 \text{ km}$$

$$\text{Time taken by Ben} = \frac{126}{63} \\ = 2 \text{ h}$$

2 h after 06 20 = **08 20**

Ben will overtake John at **08 20**.

Question 3

Common distance

$$\begin{array}{l} T_L : T_F \\ 28 : 16 \\ 7 : 4 \end{array} \qquad \begin{array}{l} S_L : S_F \\ 4 : 7 \end{array}$$

$$\text{Difference (Speed)} = 7u - 4u \\ = 3u$$

$$3u = 24$$

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

$$4u = 4 \times 8 \\ = 32$$

(a) Linda's speed was **32 m/min**.

$$\text{Distance of the race} = 32 \text{ m/min} \times 28 \text{ min} \\ = 896 \text{ m}$$

(b) The distance of the race is **896 m**.

Question 4

Common distance

$$\begin{array}{l} S_A : S_B \\ 4 : 5 \end{array} \qquad \begin{array}{l} T_A : T_B \\ 5 : 4 \end{array}$$

$$5u = 6 \text{ (h)}$$

$$1u = 6 \div 5 \\ = 1.2 \text{ (h)}$$

$$4u = 4 \times 1.2 \\ = 4.8 \text{ (h)}$$

$$= 4 \text{ h } 48 \text{ min}$$

$$\text{Time difference} = 5 \text{ h} - 4 \text{ h } 48 \text{ min} \\ = 12 \text{ min}$$

Train B reached Station Q **12 minutes** ahead of Train A.

Question 5

(a) 7 a.m. to 7.12 a.m. = 12 mins

$$\text{Distance travelled by Jaycee} = 100 \times 12 \\ = 1200 \text{ m}$$

$$\text{Distance travelled by Delroy} = 1200 + 240 \\ = 1440 \text{ m}$$

$$\text{Delroy's speed} = \frac{1440}{12} \\ = 120 \text{ m/min}$$

Delroy's speed was 120m/min.

Answer to Unit 5.3

Question 5 (Cont.)

(b) Common distance

| Speed | Time |
|-----------|-------|
| J : D | J : D |
| 100 : 120 | 6 : 5 |
| 5 : 6 | |

$$1u = 40$$

$$5u = 40 \times 5 \\ = 200$$

$$\text{Distance of the race} = 200 \times 120 \\ = 24\,000 \text{ m} \\ = \mathbf{24 \text{ km}}$$

Answer to Chapter 5 Review Questions

Question 1

(a) $56 \times 1.5 = 84 \text{ km}$

$$\text{Kumar's speed} = 84 \div 1\frac{1}{4} \\ = 67.2 \text{ km/h}$$

Mr Kumar's speed was **67.2 km/h**.

(b) $67.2 \times 1.5 = 100.8 \text{ km}$

$$84 + 100.8 + 56 = 240.8 \text{ km}$$

$$\text{Time taken by Mr Lim} = \frac{240.8}{56} \\ = 4 \text{ h } 18 \text{ min}$$

4h 18 min before 7.45pm is 3.27 pm or 15 27.

Mr Lim left Town Y at **15 27**.

Question 2

(a) 11.30 am to 2.10 pm = 2 h 40 mins

$$= 2\frac{2}{3} \text{ h} \\ = \frac{8}{3} \text{ h}$$

$$70 \times \frac{8}{3} = \frac{560}{3} \text{ km}$$

$$350 - 35 - \frac{560}{3} = \frac{385}{3} \text{ km}$$

$$\frac{385}{3} + 45 = \frac{520}{3} \text{ km}$$

$$\text{Bill's speed} = \frac{520}{3} \div \frac{8}{3} \\ = 65 \text{ km/h}$$

Bill's speed was **65 km/h**.

(b) $70 + 65 = 135$

$$\text{Time taken to meet} = \frac{350-35}{135} \\ = \frac{7}{3} \text{ h} \\ = 2\frac{1}{3} \text{ h}$$

$$2\frac{1}{3} \text{ h after 11.30 am}$$

$$= 1.50 \text{ pm}$$

Tom and Bill met at **1.50pm**.

Question 3

| Speed | Time |
|-------|-------|
| Y : X | Y : X |
| 5 : 4 | 4 : 5 |

$$1u = 10\text{min}$$

$$5u = 50\text{ min}$$

50 mins after 9 am = 9.50 am

Train X reached Station B at **9.50am**.

Question 4

$$60 \times 2 = 120$$

$$120 + 25 = 145$$

$$5u = 145\text{ km}$$

$$1u = 145 \div 5$$

$$= 29\text{ km}$$

$$7u = 7 \times 29\text{ km}$$

$$= 203\text{ km}$$

$$\begin{aligned} \text{Time taken to travel from Town X to Town Y} &= \frac{203}{60}\text{ h} \\ &= 3\frac{23}{60}\text{ h} \\ &= 3\text{h } 23\text{ mins} \end{aligned}$$

It would take the van **3 h 23 mins** to travel from Town X to Town Y.

Question 5

(a) Difference for $\frac{1}{3}$ of the journey = 25 km

$$\begin{aligned} \text{Difference for } \frac{3}{3} \text{ of the journey} &= 25 \times 3 \\ &= 75\text{ km} \end{aligned}$$

$$10\text{ km} = 1\text{ h}$$

$$\begin{aligned} 75\text{ km} &= \frac{1}{10} \times 75 \\ &= 7.5\text{ h} \end{aligned}$$

It took Mr Cheong **7.5 hours** to complete the journey.

(b) Mr Soon's speed = $\frac{450}{7.5} + 10 = 70\text{ km/h}$

$$\begin{aligned} \text{Time taken by Mr Soon} &= \frac{450}{70} \\ &= 6\frac{3}{7}\text{ h} \\ &\approx 6\text{ h } 26\text{ mins} \end{aligned}$$

Mr Soon took **6 hr 26 mins** to complete the journey.

Question 6

(a) $3u = 36\text{ km}$

$$1u = 36 \div 3$$

$$= 12\text{ km}$$

$$2u = 12 \times 2$$

$$= 24\text{ km}$$

$$\begin{aligned} \text{Time taken for the 1st } 36\text{km} &= \frac{36}{108} \\ &= \frac{1}{3}\text{ h} \end{aligned}$$

Question 6 (Cont.)

$$\begin{aligned} \text{Time taken for the remaining } 24\text{ km} &= \frac{24}{72} \\ &= \frac{1}{3}\text{ h} \end{aligned}$$

$$\text{Total time taken} = \frac{1}{3} + \frac{1}{3}$$

$$= \frac{2}{3}\text{ h}$$

$$= 40\text{ mins}$$

40 mins before 1.20 pm = **12.40 pm**

$$\begin{aligned} \text{(b) Average speed of the van} &= \frac{36+24}{\frac{2}{3}} \\ &= \mathbf{90\text{ km/h}} \end{aligned}$$

Chapter 6 Simultaneous

Let's Get Started

2.

$$\frac{1}{4}C + \frac{1}{10}L = 26$$

$$\frac{4}{4}C + \frac{10}{10}L = 140$$

3.

$$\frac{1}{2}M + \frac{1}{2}S + J = 540$$

$$\frac{2}{2}M + \frac{2}{2}S + J = 540$$

Let's Learn

Ask Yourself

1. The fractions or relationship of the unknown can be formed.

Let's Practise

Question 1

$$\frac{1}{5}B + \frac{1}{4}F = 32 \dots(1)$$

$$\frac{5}{5}B + \frac{4}{4}F = 130 \dots(2)$$

Multiply (1) by 5,

$$\frac{5}{5}B + \frac{5}{4}F = 160 \dots(3)$$

$$(3) - (2),$$

$$\frac{1}{4}F = 160 - 130$$

$$= 30$$

$$\frac{4}{4}F = 4 \times 30$$

$$= 120$$

There are **120 fridge magnets** in the box.

Question 2

$$\frac{2}{7}C + \frac{3}{10}S = 68 \dots(1)$$

$$\frac{7}{7}C + \frac{10}{10}S = 231 \dots(2)$$

Multiply (1) by 10 and (2) by 3,

$$\frac{20}{7}C + \frac{30}{10}S = 680 \dots(3)$$

$$\frac{21}{7}C + \frac{30}{10}S = 693 \dots(4)$$

$$(4) - (3),$$

$$\frac{1}{7}C = 693 - 680$$

$$= 13$$

$$\frac{5}{7}C = 5 \times 13$$

$$= 65$$

65 cupcakes were eaten.

Question 3

$$40P = 25N$$

$$8P = 5N$$

$$32P = 20N$$

$$\begin{aligned} \text{Total items in the box (based on N)} &= 20 + 3 \\ &= 23 \end{aligned}$$

$$\begin{aligned} \text{Max no. of N to be added} &= 25 - 23 \\ &= 2 \end{aligned}$$

2 more nail-clippers can be added to the box.

Question 4

$$52P = 38B$$

$$26P = 19B$$

$$\begin{aligned} \text{Total items bought (based on B)} &= 19 + 14 \\ &= 33 \end{aligned}$$

$$\begin{aligned} \text{Additional bookmarks she can buy} &= 38 - 33 \\ &= 5 \end{aligned}$$

Jennifer can buy **5 more** bookmarks with her remaining money.

Question 5

$$7B + 2C = 10.3 \dots(1)$$

$$6B + 5C = 13.1 \dots(2)$$

Multiply (1) by 5 and (2) by 2,

$$35B + 10C = 51.5 \dots(1)$$

$$12B + 10C = 26.2 \dots(2)$$

$$(1) - (2),$$

$$23B = 25.3$$

$$1B = 25.3 \div 23$$

$$= 1.1$$

$$12B = 12 \times 1.1$$

$$= 13.2$$

$$10C = 26.2 - 13.2$$

$$= 13$$

$$1C = 13 \div 10$$

$$= 1.3$$

Question 5 (Cont.)

$$12C = 12 \times 1.3$$

$$= 15.6$$

$$12B + 12C = 13.2 + 15.6$$

$$= 28.8$$

1 dozen bottles of soft drink and 1 dozen cartons of milk cost **\$28.80**.

Question 6

$$6S = 8P$$

$$2S + 5P = 12.65$$

$$6S + 15P = 12.65 \times 3$$

$$= 37.95$$

$$8P + 15P = 37.95$$

$$23P = 37.95$$

$$1P = 37.95 \div 23$$

$$= 1.65$$

$$5P = 5 \times 1.65$$

$$= 8.25$$

$$2S = 12.65 - 8.25$$

$$= 4.4$$

$$1S = 4.4 \div 2$$

$$= 2.2$$

$$1S + 1P = 2.2 + 1.65$$

$$= 3.85$$

$$1GB = 3.85$$

$$7GB = 3.85 \times 7$$

$$= 26.95$$

Ali spent **\$26.95** on the goodie bags

Chapter 7 Pie Chart

Let's Get Started

$$\begin{aligned} 1. \text{ Durian} &= \frac{135}{360} \times 16 \\ &= 6 \end{aligned}$$

6 children like durian ice cream.

$$\begin{aligned} 2. \text{ Walk} &= 1600 \div 4 \\ &= 400 \end{aligned}$$

400 students walk to school.

Let's Learn

Ask Yourself

- Fractions

Let's Practise

Question 1

$$M + C = \frac{1}{4} + \frac{9}{20}$$

$$= \frac{7}{10}$$

$$V + B = 1 - \frac{7}{10}$$

$$= \frac{3}{10}$$

$$\text{No. of vans} = 400 \div 2$$

$$= 200$$

$$\text{No. of vans and bicycles} = 400 + 200$$

$$= 600$$

$$\frac{3}{10} \text{ Total} = 600$$

$$\frac{1}{10} \text{ Total} = 600 \div 3$$

$$= 200$$

$$\text{Total} = 10 \times 200$$

$$= 2000$$

$$\text{Percentage of bicycles} = \frac{400}{2000} \times 100\%$$

$$= 20\%$$

20% of the vehicles were bicycles.

Question 2

$$\text{Rent} = \frac{1}{2} - \frac{1}{12} - \frac{1}{4}$$

$$= \frac{1}{6}$$

(a) $\frac{1}{6}$ of her money was spent on rent.

$$\text{Savings} = 50\% - 2.5\%$$

$$= 47.5\%$$

(b) She saved **47.5%** of her money monthly.

$$\frac{1}{6} \text{ Total} = 850$$

$$\text{Total} = 6 \times 850$$

$$= 5100$$

$$\text{Savings a year} = 47.5\% \times 5100 \times 6$$

$$= 14\,535$$

(c) She would save **\$14 535** in half a year.

Question 3

$$\text{Fraction of hamsters} = 1 - \frac{1}{4} - \frac{1}{12} - \frac{1}{3}$$

$$= \frac{1}{3}$$

$$\text{Difference between hamsters and birds} = \frac{1}{3} - \frac{1}{4}$$

$$= \frac{1}{12}$$

$$\text{Percentage difference} = \frac{1}{12} \times 100\%$$

$$= 8\frac{1}{3}\%$$

There are **8 $\frac{1}{3}$ % more** hamsters than birds.

Question 4

$$\text{(a) Fraction of boys} = 1 - \frac{3}{20} - \frac{3}{10} - \frac{1}{10}$$

$$= \frac{9}{20}$$

$\frac{9}{20}$ of the people who attended the event were boys.

$$\text{(b) } \frac{9}{20} \text{ Total} = 180$$

$$\frac{1}{20} \text{ Total} = 180 \div 9$$

$$= 20$$

$$\frac{20}{20} \text{ Total} = 20 \times 20$$

$$= 400$$

400 people attended the event last December.

$$\text{(c) } 80\% = 400$$

$$1\% = 400 \div 80$$

$$= 5$$

$$100\% = 5 \times 100$$

$$= 500$$

500 people attended the event in the previous year.

Question 5

$$\text{(a) Percentage of Tiramisu and butter cakes sold}$$

$$= 50\% - 15\% - 10\%$$

$$= 25\%$$

$$\text{(b) } 5u = 25\%$$

$$1u = 25\% \div 5$$

$$= 5\%$$

$$3u = 3 \times 5\%$$

$$= 15\%$$

$$50\% = 80$$

$$1\% = 80 \div 50$$

$$= 1.6$$

$$15\% = 15 \times 1.6$$

$$= 24$$

24 Tiramisu cakes were sold.

Question 6

$$\text{(a) } 25\% = 16 + 14$$

$$= 30$$

$$100\% = 4 \times 30$$

$$= 120$$

120 students took part in the survey.

$$\text{(b) Oranges + Durians} = 60$$

$$\text{Oranges} = \frac{2}{3} \times 60$$

$$= 40$$

$$\text{Fraction} = \frac{40}{120}$$

$$= \frac{1}{3}$$

$\frac{1}{3}$ of the students preferred oranges.

Let's Get Started

1.

| Value of x | Value of $68 + x$ |
|--------------|-------------------|
| 1 | $68 + 1 = 69$ |
| 2 | $68 + 2 = 70$ |
| 3 | $68 + 3 = 71$ |
| 4 | $68 + 4 = 72$ |

2.

| Value of a | Value of b | Value of $\frac{a+b}{2}$ |
|--------------|--------------|--------------------------|
| 12 | 10 | $\frac{12+10}{2} = 11$ |
| 21 | 11 | $\frac{21+11}{2} = 16$ |
| 28 | 12 | $\frac{28+12}{2} = 20$ |
| 35 | 13 | $\frac{35+13}{2} = 24$ |
| 40 | 0 | $\frac{40+0}{2} = 20$ |

Let's Learn

Ask Yourself

- Add the values.
- Add the total values. Then divide the result by the quantity that make up the total value.

Think Further

- The solution x changes to the following:

Michelle = $8m$ sweets

Total no. of sweets eaten = $4m + 8m$
 $= 12m$

Average = $\frac{12m}{2}$
 $= 6m$

Both girls ate an average of **$6m$ sweets.**

Let's Practise

Question 1

Total no. of pencils = $10 + p + 3p$
 $= 10 + 4p$

Average = $\frac{10+4p}{3}$

The girls bought an average of $\frac{10+4p}{3}$ **pencils.**

Question 2

Total mass = $5x$ kg + $(5x + 7)$ kg
 $= (10x + 7)$ kg

Average mass = $\frac{10x+7}{2}$ kg

Their average mass was $\frac{10x+7}{2}$ **kg.**

Question 3

Mia's cookies = $8a - 16$
 $= 8 \times 17 - 16$
 $= 120$

Anita's cookies = 8×17
 $= 136$

Anita and Mia had **136 and 120 cookies** respectively.

Question 4

No. of plates sold on Tue = $(4k + 2 + 2k)$
 $= (6k + 2)$

No. of plates sold on Wed = $(4k + 2) + (4k + 2)$
 $= (8k + 4)$

Total no. of plates sold = $(6k + 2) + (8k + 4) + (4k + 2)$
 $= (18k + 8)$

Lena sold a total of **$(18k + 8)$ plates** of chicken rice over the 3 days.

Question 5

Keith's stamps = $3m$

Calissa's stamps = $3m + 8$

(a) Total stamps = $m + 3m + (3m + 8)$
 $= 7m + 8$

They have **$(7m + 8)$ stamps** altogether.

(b) Total stamps = $7 \times 9 + 8$
 $= 71$

The 3 children have **71 stamps** altogether.

Question 6

(a) Total (at first) = $(39y + 6)$ stickers

Mr Lee had **$(39y + 6)$ stickers** at first.

(b) Total (at first) = $39 \times 4 + 6$
 $= 162$

Mr Lee had **162 stickers** at first.

Question 7

Weiqi's age = $\frac{1}{3}n$

(a) Natalie's age = $\frac{1}{3}n - 4$

Natalie is **$(\frac{1}{3}n - 4)$ years old.**

(b) Total ages = $n + \frac{1}{3}n + \frac{1}{3}n - 4$
 $= 15 + 5 + 5 - 4$
 $= 21$

Their total ages is **21 years.**

Question 8

Perimeter (units) = $3u + 2u + 3u + 2u$
 $= 10u$

Question 8 (Cont.)

$$10u = 2h$$

$$2u = \frac{2h}{5}$$

The breadth of the rectangle is $\frac{2h}{5}$ cm.

Chapter 9 Mixed Review Questions

Question 1

| Case 1: 80 pears left | Case 2: 400 pears left |
|-----------------------|------------------------|
| A : P | A : P |
| 20 : 60 | 60 : 20 |
| 1^{x^3} : 3^{x^3} | 3 : 1 |
| 3 : 9 | |

Decrease of $8u$

$$8u = 400 - 80$$

$$= 320$$

$$1u = 320 \div 8$$

$$= 40$$

$$9u + 80 = 9 \times 40 + 80$$

$$= 440$$

There are **440 pears** at the stall.

Question 2

| At first | End |
|-----------------------------------|-------------|
| C : J : A | C : J : A |
| 2^{x^2} : 6^{x^2} : 9^{x^2} | 7 : 15 : 21 |
| 4 : 12 : 18 | 8 : 6 |

$$\begin{aligned} \text{Difference} &= 7u - 4u \\ &= 3u \end{aligned}$$

$$3u = 90$$

$$1u = 90 \div 3$$

$$= 30$$

$$\text{Total (in the end)} = 7u + 15u + 21u$$

$$= 43u$$

$$43u = 43 \times 30$$

$$= 1290$$

The 3 girls have **\$1290** now.

Question 3

Case 1 : Scott \rightarrow \$16 to Omera

S : O : Total

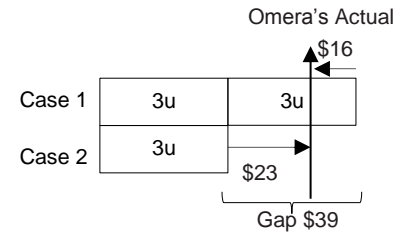
1^{x^2} : 3^{x^2} : 4^{x^2}

2 : 6 : 8

| Case 2 : Omera \rightarrow \$23 to Scott |
|--|
| S : O : Total |
| 5 : 3 : 8 |

$3u$

Question 3 (Cont.)



$$3u = 39$$

$$1u = 39 \div 3$$

$$= 13$$

$$\text{Omera} = 6u - 16$$

$$= 6 \times 13 - 16$$

$$= 62$$

Omera has **\$62**.

Question 4

Commission received for first 100 jerseys

$$= 100 \times 20$$

$$= \$2000$$

Commission earned from the remaining jerseys sold

$$= 3708 - 2000$$

$$= 828$$

$$\text{No. of jerseys sold for the } \$828 \text{ commission} = 828 \div 36$$

$$= 23$$

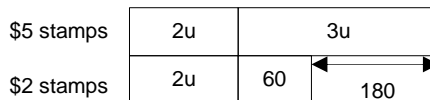
$$\text{Total jerseys sold} = 100 + 23$$

$$= 123$$

Fred sold **123 jerseys**.

Question 5

| Items | Quantity | \times | Value (\$) | Total value (\$) |
|---------------------|-----------|----------|------------|------------------|
| \$5-stamps (Arun) | 1u | \times | 5 | 5u |
| \$2-stamps (Kavita) | $1u + 30$ | \times | 2 | $2u + 60$ |
| Total | $2u + 30$ | | | $7u + 60$ |



$$3u = 60 + 180$$

$$= 240$$

$$1u = 240 \div 3$$

$$= 80$$

Arun has **80 stamps**.

Question 6

2-m : 3-m

1^{x^2} : 3^{x^2}

2 : 6

2-m : Incorrect

2 : 1

Question 6 (Cont.)

| Items | Quantity | × | Value (Marks) | Total value (Marks) |
|----------------------------|----------|---|---------------|---------------------|
| Correct answer (2-mark qn) | 2u | × | 2 | 4u |
| Correct answer (3-mark qn) | 6u | × | 3 | 18u |
| Total | 8u | | | 22u |

$22u = 176$

$1u = 176 \div 22$
 $= 8$

Total attempt = $8u$
 $= 8 \times 8$
 $= 64$

Unanswered questions = $75 - 64$
 $= 11$

11 questions were left unanswered.

Question 7

| | | | | |
|------------|---|------------|---|-----------|
| A (now) | : | R (before) | : | Total |
| 3 | : | 1 | : | 4 |
| A (before) | : | R (now) | : | Total |
| 1^{x^2} | : | 1^{x^2} | : | 2^{x^2} |
| 2 | : | 2 | : | 4 |

Total current age = $5u$
 $= 30$

$1u = 30 \div 5$
 $= 6$

A now = $3u$
 $= 3 \times 6$
 $= 18$

(a) Alda is **18 years old** now.

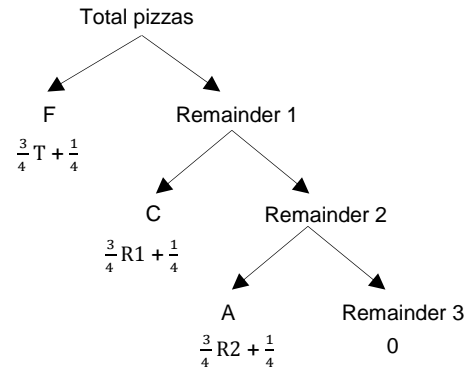
| Now | | | Future | | |
|-----|---|------|--------|---|------|
| A | R | Diff | A | R | Diff |
| 3 | 2 | 1 | 5 | 4 | 1 |

Difference = $2u$

$2u = 2 \times 6$
 $= 12$

(b) In 12 years' time, Rena's age will be 80% of Alda's age.

Question 8



$\frac{1}{4} R2 = \frac{1}{4}$

$\frac{4}{4} R2 = 4 \times \frac{1}{4}$
 $= 1$

$\frac{1}{4} R1 = 1 + \frac{1}{4}$
 $= 1\frac{1}{4}$

$\frac{4}{4} R1 = 4 \times 1\frac{5}{4}$
 $= 5$

$\frac{1}{4} T = 5 + \frac{1}{4}$
 $= 5\frac{1}{4}$

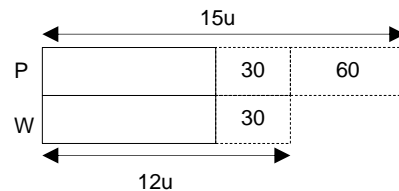
$\frac{4}{4} T = 4 \times 5\frac{1}{4}$
 $= 21$

Althea bought **21 pizzas**.

Question 9

| <u>(Actual)</u> | <u>P</u> | <u>W</u> |
|-----------------|-------------|-------------|
| At first | $3u^{x^5}$ | $4u^{x^3}$ |
| Change | -18^{x^5} | -10^{x^3} |
| End | $3p^{x^5}$ | $5p^{x^3}$ |

| <u>(Working)</u> | <u>P</u> | <u>W</u> |
|------------------|----------|----------|
| At first | 15u | 12u |
| Change | -90 | -30 |
| End | 15p | 15p |



$3u = 90 - 30$
 $= 60$

$1u = 60 \div 3$
 $= 20$

$3u = 3 \times 20$
 $= 60$

There are **60 pink meringues** in the jar.

Question 10

| | | | |
|-----------------|----------------------|----------------------|----------------------|
| <u>At first</u> | Silver | Platinum | Total |
| Shop A | $\frac{2}{5}A = 32$ | $\frac{3}{5}A = 48$ | $\frac{5}{5}A = 80$ |
| Shop B | $\frac{3}{10}B = 36$ | $\frac{7}{10}B = 84$ | $\frac{7}{7}B = 120$ |
| Total | $32 + 36 = 68$ | $48 + 84 = 132$ | $80 + 120 = 200$ |
| <u>End</u> | | | |
| Shop A | $\frac{2}{5}A$ | $\frac{3}{5}A$ | $\frac{5}{5}A$ |
| Shop B | $\frac{7}{25}B$ | $\frac{18}{25}B$ | $\frac{25}{25}B$ |
| | 68 | 132 | 200 |

$$\frac{2}{5}A + \frac{7}{25}B = 68 \quad \dots\dots\dots (1) \times 3$$

$$\frac{3}{5}A + \frac{18}{25}B = 132 \quad \dots\dots\dots (2) \times 2$$

$$\frac{6}{5}A + \frac{21}{25}B = 204 \quad \dots\dots\dots (3)$$

$$\frac{6}{5}A + \frac{36}{25}B = 264 \quad \dots\dots\dots (4)$$

$$(4) - (3)$$

$$\frac{15}{25}B = 60$$

$$\frac{1}{25}B = 4$$

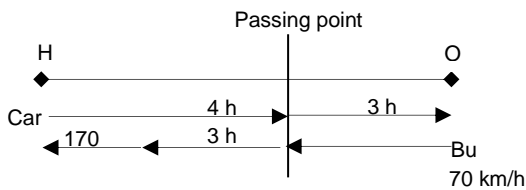
$$\frac{18}{25}B = 72$$

$$\text{Difference} = 84 - 72$$

$$= 12$$

The owner of Shop B passed **12 platinum bracelets** to Shop A.

Question 11



$$\text{Distance bus covered in 3 h} = 3 \text{ h} \times 70 \text{ km/h}$$

$$= 210 \text{ km}$$

$$\text{Distance bus covered from where they passed each other to H} = 210 + 170$$

$$= 380$$

$$\text{Speed of car} = 380 \div 4$$

$$= 95$$

$$\text{Distance between two towns} = 7 \text{ h} \times 95 \text{ km/h}$$

$$= 665 \text{ km}$$

The distance between the 2 towns is **665 km**.

Question 12

| | | |
|---|----|----|
| C | 4u | 63 |
| W | 4u | |
| B | 3u | |

Question 12 (Cont.)

$$\frac{1}{5} \text{ of total} = 4u$$

$$\text{Total} = 20u$$

$$20u - 11u = 63$$

$$9u = 63$$

$$1u = 63 \div 9$$

$$= 7$$

$$20u = 20 \times 7$$

$$= 140$$

There were **140 muffins** in the box altogether.

Question 13

| | |
|-------------------------------|------------------------------|
| <u>Case 1:</u> | <u>Case 2:</u> |
| <u>Sarah 360 muffins left</u> | <u>Sarah 72 muffins left</u> |
| S : J | S : J |
| 25 : 50 | 50 : 25 |
| 1 : 2 | $2^{x^2} : 1^{x^2}$ |
| | 4 : 2 |

Increase of 3u

$$3u = 360 - 72$$

$$= 288$$

$$1u = 288 \div 3$$

$$= 96$$

$$\text{Sarah} = 1u + 360$$

$$= 1 \times 96 + 360$$

$$= 456$$

Check

$$\text{Sarah} = 4u + 72$$

$$= 4 \times 96 + 72$$

$$= 456$$

Sarah baked **456 muffins**.

Question 14

| | | | |
|---|------|-----|----------|
| S | 5152 | 266 | } 10 570 |
| B | 5152 | | |

$$\text{Total cost of pairs of boots} = 5152$$

$$\text{Total cost of pairs of sneakers} = 5152 + 266$$

$$= 5418$$

| Items | Units | × | Value (\$) | Total value(\$) |
|----------|-------|---|------------|-----------------|
| Boots | 2u | × | ? | 5152 |
| Sneakers | 3u | × | ? | 5418 |
| Total | 5u | | | 10 570 |

$$\text{Cost of 3u of sneakers} = 5418$$

$$\text{Cost of 1u of sneakers} = 5418 \div 3$$

$$= 1806$$

$$\text{Cost of 2u of boots} = 5152$$

Question 14 (Cont.)

$$\begin{aligned} \text{Cost of 1u of boots} &= 5152 \div 2 \\ &= 2576 \end{aligned}$$

| | | |
|---|------|-----|
| B | 1806 | 770 |
| S | 1806 | |

$$\begin{aligned} 1u &= 770 \div 55 \\ &= 14 \end{aligned}$$

$$\begin{aligned} \text{No. of pairs of sneakers} &= 3u \\ &= 3 \times 14 \\ &= 42 \end{aligned}$$

$$\begin{aligned} \text{Cost of 1 pair of sneaker} &= 5418 \div 42 \\ &= 129 \end{aligned}$$

The cost of 1 pair of sneaker was **\$129**.

Question 15

Candle A (7.30 a.m. to 1.30 p.m.) = 6 hours

Candle B (9 a.m. to 1 p.m.) = 4 hours

Rate of burning in 1 hour,

$$\text{Candle A} = \frac{1}{6}$$

$$\text{Candle B} = \frac{1}{4}$$

Fraction of Candle A left unburnt at 11.30 a.m.

$$\begin{aligned} (11.30 \text{ a.m. to } 1.30 \text{ p.m.}) &= \frac{1}{6} \times 2 \\ &= \frac{1}{3} \end{aligned}$$

Fraction of Candle B left unburnt at 11.30 a.m.

$$\begin{aligned} (11.30 \text{ a.m. to } 1 \text{ p.m.}) &= \frac{1}{4} \times 1.5 \\ &= \frac{3}{8} \end{aligned}$$

$$\frac{3}{9}A = \frac{3}{8}B$$

A : B

9 : 8

$$1u = 3$$

$$\begin{aligned} \text{Length of Candle A} &= 9u \\ &= 9 \times 3 \\ &= 27 \end{aligned}$$

The original length of Candle A was **27 cm** respectively.

Question 16

In 2021

| | | |
|---|----|----|
| L | 1u | |
| A | 1u | 3u |

In 6 years' time

| | | | | | |
|---|---|----|---|----|---|
| L | 6 | 1u | | | |
| A | 6 | 1u | 6 | 1u | 8 |

$$2u = 6 + 8$$

$$= 14$$

$$1u = 7$$

Question 16 (Cont.)

$$\begin{aligned} \text{Abigail (in 2021)} &= 4u \\ &= 4 \times 7 \\ &= 28 \end{aligned}$$

$$\begin{aligned} \text{Abigail (in 2031)} &= 28 + 10 \\ &= 38 \end{aligned}$$

Abigail will be **38 years old** in the year 2031.

Question 17

$$\begin{aligned} A : B+C+D : \text{Total} & \quad B : A+C+D : \text{Total} & \quad C : A+B+D : \text{Total} \\ 1^{x20} : 2^{x20} : 3^{x20} & \quad 1^{x15} : 3^{x15} : 4^{x15} & \quad 1^{x12} : 4^{x12} : 5^{x12} \\ 20 : 40 : 60 & \quad 15 : 45 : 60 & \quad 12 : 48 : 60 \end{aligned}$$

Summary

$$\begin{aligned} A : B : C : D \\ 20 : 15 : 12 : 13 \end{aligned}$$

$$13u = 78$$

$$\begin{aligned} 1u &= 78 \div 13 \\ &= 6 \end{aligned}$$

$$\begin{aligned} \text{Ali and Bryan} &= 20u + 15u \\ &= 35u \end{aligned}$$

$$\begin{aligned} 35u &= 35 \times 6 \\ &= 210 \end{aligned}$$

Ali and Bryan have **210 marbles** altogether.

Question 18

Common volume

$$\frac{3}{10}R = \frac{1}{4}S$$

$$\frac{3}{10}R = \frac{3}{12}S$$

R : S

10 : 12

$$\text{Difference} = 12u - 10u = 2u$$

$$2u = 48$$

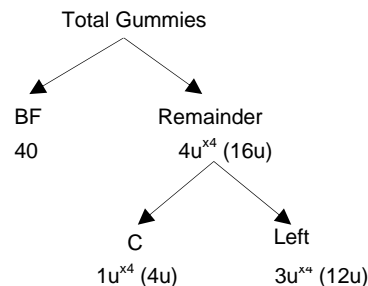
$$1u = 48 \div 2 = 24$$

$$10u = 10 \times 24 = 240$$

$$\text{Height of rectangular tank} = 240 \div (8 \times 6) = 5$$

The height of the rectangular tank is **5 m**.

Question 19



$$\frac{4}{7}T = 3u^{x4} (12u)$$

$$\frac{1}{7}T = 12u \div 4$$

$$= 3u$$

Question 19 (Cont.)

$$\begin{aligned} \frac{7}{7} T &= 7 \times 3u \\ &= 21u \\ \text{Friend} &= 21u - 16u \\ &= 5u \\ 5u &= 40 \\ 1u &= 40 \div 5 \\ &= 8 \\ 21u &= 21 \times 8 \\ &= 168 \end{aligned}$$

There were **168 gummies** in the bag at first

Question 20

9 steps

| | | |
|---|--|----|
| W | | 81 |
| R | | |

$$\begin{aligned} 9 \text{ more run than 9 walk} &= 100 - 19 \\ &= 81 \text{ (seconds)} \end{aligned}$$

$$\begin{aligned} 1 \text{ more run than 1 walk} &= 81 \div 9 \\ &= 9 \text{ (seconds)} \end{aligned}$$

$$\begin{aligned} 10 \text{ more run than 10 walk} &= 10 \times 9 \\ &= 90 \text{ (seconds)} \end{aligned}$$

To convert 10 run to 10 walk, take Luther 90 s more.

$$\begin{aligned} \text{Time taken to walk 1 flight} &= 100 + 90 \\ &= 190 \text{ (seconds)} \end{aligned}$$

$$\begin{aligned} \text{Time taken to walk 2 flights} &= 190 \times 2 \\ &= 380 \text{ (seconds)} \end{aligned}$$

Luther would take **380 s** to walk up both flights of stairs.

Question 21

At first

A : B

3 : 5

Since Box B has 110 more apples than Box A,

$$2u = 110$$

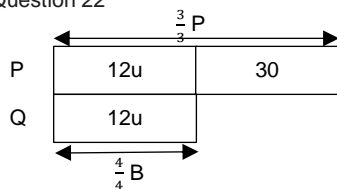
$$\begin{aligned} 1u &= 110 \div 2 \\ &= 55 \end{aligned}$$

$$\begin{aligned} \text{Total apples} &= 8u \\ &= 8 \times 55 \\ &= 440 \end{aligned}$$

$$\begin{aligned} \text{Red apples} &= \frac{3}{4} \times 440 \\ &= 330 \end{aligned}$$

There were **330 red apples**.

Question 22



Question 22 (Cont.)

$$\begin{aligned} \frac{3}{3} P &= 12u + 30 \\ \frac{1}{3} P &= 4u + 10 \text{ (red marbles)} \\ \frac{4}{4} Q &= 12u \\ \frac{3}{4} Q &= 9u \text{ (red marbles)} \\ 4u + 9u &= 62 - 10 \\ 13u &= 52 \\ 1u &= 52 \div 13 \\ &= 4 \\ 12u + 30 &= 12 \times 4 + 30 \\ &= 78 \end{aligned}$$

There were **78 marbles** in Box P.

Question 23

Case 1 :

Gretel gives 4 boxes

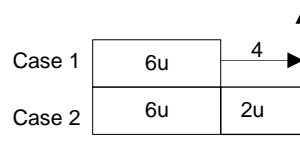
$$\begin{aligned} G : K : \text{Total} \\ 2^{x^3} : 5^{x^3} : 7^{x^3} \\ 6 : 15 : 21 \end{aligned}$$

Case 2 :

Keith gives 4 boxes

$$\begin{aligned} G : K : \text{Total} \\ 8 : 13 : 21 \end{aligned}$$

Gretel's Actual



$$2u = 4$$

$$1u = 4 \div 2 = 2$$

Gretel

$$\begin{aligned} C1: 6u + 4 &= 6 \times 2 + 4 \\ &= 16 \end{aligned}$$

$$\begin{aligned} C2: 8u &= 8 \times 2 \\ &= 16 \end{aligned}$$

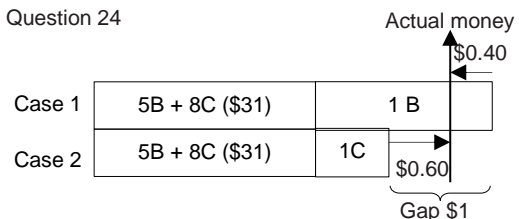
Keith

$$\begin{aligned} C1: 15u &= 15 \times 2 \\ &= 30 \end{aligned}$$

$$\begin{aligned} C2: 13u + 4 &= 13 \times 2 + 4 \\ &= 30 \end{aligned}$$

Gretel and Keith have **16 boxes of cookies and 30 boxes** of cookies respectively.

Question 24



$$\begin{aligned} B & \left[\begin{array}{|c|} \hline 1 \\ \hline \end{array} \right] \times 5 \\ C & \left[\begin{array}{|c|} \hline \times 8 \\ \hline \end{array} \right] \times 31 \end{aligned}$$

Question 24 (Cont.)

$$5u + 8u = 31 - 5$$

$$= 26$$

$$13u = 26$$

$$1u = 26 \div 13$$

$$= 2$$

$$2u + 1 = 2 \times 2 + 1$$

$$= 5$$

The total cost of 1 bracelet and 1 hairclip is **\$5**.

Question 25

| Choco | Gum | Mint | Total |
|---------------------|---------------------|--------------------|-------|
| $88 \times 4 = 352$ | $12 \times 7 = 84$ | $0 \times 22 = 0$ | 436 |
| $86 \times 4 = 344$ | $13 \times 7 = 91$ | $1 \times 22 = 22$ | 457 |
| $56 \times 4 = 224$ | $28 \times 7 = 196$ | $16 \times 22 = 0$ | 772 |

+ 21

Diff between 772 and 436 = 336

$$\text{Gap of } 336 \text{ divided by } 21 = 336 \div 21$$

$$= 16$$

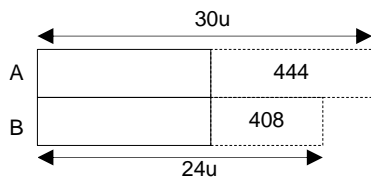
Graham ordered **28 gumballs**.

Question 26

$$\frac{2}{5}A = \frac{3}{4}B$$

$$\frac{6}{15}A = \frac{6}{8}B$$

| (Actual) | A | B |
|------------------|--------------|--------------|
| At first | $15u^{x^2}$ | $8u^{x^3}$ |
| Change | -222^{x^2} | -136^{x^3} |
| End | $3p^{x^2}$ | $2p^{x^3}$ |
| (Working) | A | B |
| At first | 30u | 24u |
| Change | -444 | -408 |
| End | 6p | 6p |



$$6u = 36$$

$$1u = 36 \div 6$$

$$= 6$$

$$\text{Total tarts at first} = 15u + 8u$$

$$= 23u$$

$$23u = 23 \times 6$$

$$= 138$$

There were **138 mini tarts** in both boxes at first.

Question 27

| Items | Change | End | At first |
|-------|--------------------|-------------------|--------------------|
| (3) L | $-\frac{1}{5}(1u)$ | $\frac{6}{5}(6u)$ | $\frac{5}{5}(5u)$ |
| (2) J | $-\frac{1}{2}(6u)$ | $\frac{1}{2}(6u)$ | $\frac{2}{2}(12u)$ |
| (1) K | +3 (9u) | 4 (12u) | 1 (3u) |

| | | | | | |
|----------|------------|---|-------------|---|------------|
| | K | : | J | : | L |
| End | $1u^{x^6}$ | : | $1u^{x^6}$ | : | $1u^{x^6}$ |
| Rev(3) | 6u | : | 6u | : | 6u |
| | | | | | -1u |
| | 6u | : | 6u | : | 5u |
| Rev(2) | | | +6u | | |
| | $6u^{x^2}$ | : | $12u^{x^2}$ | : | $5u^{x^2}$ |
| | 12u | : | 24u | : | 10u |
| Rev(1) | -9u | | | | |
| At first | 3u | : | 24u | : | 10u |

$$\text{Total (at first)} = 3u + 24u + 10u$$

$$= 37u$$

$$37u = 14\ 060$$

$$1u = 14\ 060 \div 37$$

$$= 380$$

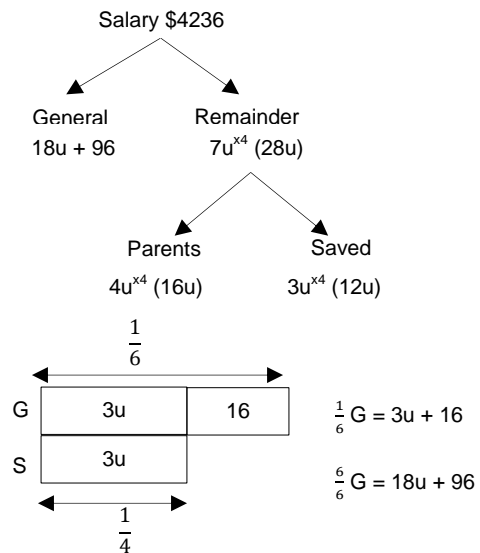
Lenny at first = 10u

$$= 10 \times 380$$

$$= 3800$$

Lenny saved **\$3800** at first.

Question 28



$$18u + 96 + 28u = 4236$$

$$46u = 4236 - 96$$

$$= 4140$$

$$1u = 4140 \div 46$$

$$= 90$$

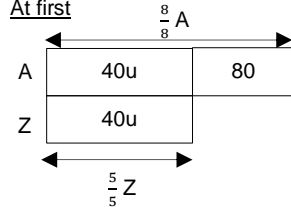
Question 28 (Cont.)

$$\begin{aligned} \text{General} &= 18u + 96 \\ &= 18 \times 90 + 96 \\ &= 1716 \end{aligned}$$

Sienna's monthly **general expenses was \$1716.**

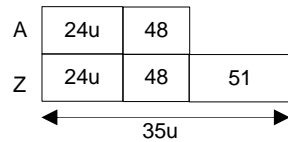
Question 29

At first



| | Spent | End | At first |
|--------|-------------------------|-------------------------|-------------------------|
| Zeph | $\frac{1}{8}(5u)$ | $\frac{7}{8}(35u)$ | $\frac{8}{8}(40u)$ |
| Adelia | $\frac{2}{5}(16u + 32)$ | $\frac{3}{5}(24u + 48)$ | $\frac{5}{5}(40u + 80)$ |

End



$$\begin{aligned} 11u &= 51 + 48 \\ &= 99 \end{aligned}$$

$$\begin{aligned} 1u &= 99 \div 11 \\ &= 9 \end{aligned}$$

$$\begin{aligned} \text{Adelia at first} &= 40u + 9 \times 80 \\ &= 440 \end{aligned}$$

Adelia had **\$440 at first.**

Question 30

In 1 h

$$\text{Fred} = \frac{1}{3} \text{ journey}$$

$$\text{William} = \frac{1}{4} \text{ journey}$$

$$\frac{24}{24} - \frac{1}{6} - \frac{1}{8} = \frac{17}{24}$$

$$\frac{17}{24} \text{ journey} = 170$$

$$\begin{aligned} \frac{1}{24} \text{ journey} &= 170 \div 17 \\ &= 10 \end{aligned}$$

$$\begin{aligned} \frac{24}{24} \text{ journey} &= 24 \times 10 \\ &= 240 \end{aligned}$$

$$\begin{aligned} \text{Fred's speed} &= 240 \div 3 \\ &= 80 \end{aligned}$$

Fred's speed was **80 km/h.**

In 30 min

$$\frac{1}{3} \div 2 = \frac{1}{6} \text{ journey}$$

$$\frac{1}{4} \div 2 = \frac{1}{8} \text{ journey}$$

Question 31

$$1 \text{ group of } \$72 = \$9 \text{ (discount)}$$

$$\begin{aligned} \text{Amount to pay for every group} &= \$72 - \$9 \\ &= \$63 \end{aligned}$$

$$\begin{aligned} \text{No. of groups of } \$63 &= \$840 \div \$63 \\ &= 13 \text{ R } \$21 \end{aligned}$$

$$\begin{aligned} 13 \text{ groups of } \$63 &= 13 \times \$9 \\ &= \$117 \text{ (discount)} \end{aligned}$$

Amelia was given **\$117 discount.**

Question 32

| Items | Quantity | × | Value(\$) | Total value (\$) |
|---------|----------|---|-----------|------------------|
| On time | 15u | × | 5 | 75u |
| Late | 4u | × | 3.5 | 14u |
| Total | 19u | | | 89u |

$$89u = 7298$$

$$\begin{aligned} 1u &= 7298 \div 89 \\ &= 82 \end{aligned}$$

$$\begin{aligned} \text{Late} &= 4u \\ &= 4 \times 82 \\ &= 328 \end{aligned}$$

(a) **328 parcels** were delivered late.

$$\text{Difference in cost of 1 parcel} = 5 - 3.5 = 1.5$$

$$\text{Difference in total cost} = 328 \times 1.5 = 492$$

(b) The company would collect an **additional \$492.**

Question 33

$$R : P+N \qquad P : N : P+N$$

$$5^{x^4} : 7^{x^4} \qquad 1^{x^7} : 3^{x^7} : 4^{x^7}$$

$$20 : 28 \qquad 7 : 21 : 28$$

Summary Ratio

$$R : N : P$$

$$20 : 21 : 7$$

| Items | Quantity | × | Value(\$) | Total(\$) |
|-------|----------|---|-----------|-----------|
| R | 20u | × | 2 | 40u |
| N | 21u | × | 8 | 168u |
| P | 7u | × | 4 | 28u |
| Total | 48u | | | 236u |

$$236u = 705$$

$$\begin{aligned} 1u &= 208 \div 236 \\ &= 3 \end{aligned}$$

$$\begin{aligned} \text{Total items} &= 48u \\ &= 48 \times 3 \\ &= 144 \end{aligned}$$

Sumitha bought **144 items** altogether.

Answer to Chapter 9

Question 34

| | | | | | | | | | |
|-----------------|---|-----------|------------|-----------|-----------|---|-----------|---|-----------|
| <u>At first</u> | | | <u>End</u> | | | | | | |
| J | : | F | : | Total | J | : | F | : | Total |
| 3^{x^3} | : | 1^{x^3} | : | 4^{x^3} | 2^{x^4} | : | 1^{x^4} | : | 3^{x^4} |
| 9 | : | 3 | : | 12 | 8 | : | 4 | : | 12 |

$1u = 77$

$8u = 8 \times 77$
 $= 616$

Jonas had **616 comic books** left.

Question 35

Diff in savings = $5 - 2$
 $= 3$

No. of days = $180 \div 3$
 $= 60$

(a) Alfred took **60 days** to save \$180 less than Bruce.

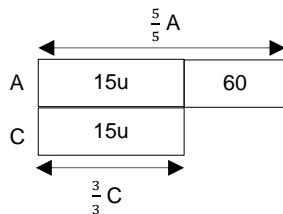
Total no. of days from Dec to Mar = $31 \times 3 + 28$
 $= 121$

Total savings = $2 \times 121 + 5 \times 121$
 $= 847$

(b) Both of them would have save **\$847** altogether at the end of March.

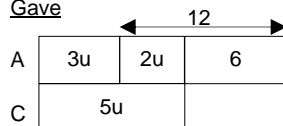
Question 36

At first



| | Gave | End | At first |
|---|------------------------------|-------------------------------|-------------------------------|
| A | $\frac{1}{5}$ $(3u + 12)$ | $\frac{4}{5}$ $(12u + 48)$ | $\frac{5}{5}$ $(15u + 60)$ |
| C | $\frac{1}{3}(5u)$ | $\frac{2}{3}(10u)$ | $\frac{3}{3}(15u)$ |

Gave



$2u = 12 - 6$
 $= 6$

$1u = 6 \div 2$
 $= 3$

Apples Pie remained = $12u + 48$
 $= 12 \times 3 + 48$
 $= 84$

84 apple pies remained in the end.

Answer to Chapter 9

Question 37

| | | | |
|--------------|---|-------------|---------|
| <u>Speed</u> | | <u>Time</u> | |
| S1 | : | S2 | T1 : T2 |
| 60 | : | 80 | 4 : 3 |
| 3 | : | 4 | |

$1u$ of time = $6 + 8$
 $= 14$

$4u$ of time = 4×14
 $= 56$

Time taken to reach on time = $56 - 6$
 $= 50$

Check

$3u$ of time = 3×14
 $= 42$

Time taken to reach on time = $42 + 8$
 $= 50$

Time to reach = 50 min after 7.30 a.m.
 $= 8.20$ a.m.

(a) Logan needs to reach his office at **8.20 a.m.** to be on time.

Distance = $60 \times \frac{56}{60}$
 $= 56$

Check

Distance = $80 \times \frac{42}{60}$
 $= 56$

(b) The distance between Logan's office and his house is **56 km.**

Question 38

| | Sold | Left | At first |
|---|----------------|-----------------|-----------------|
| A | $\frac{1}{5}$ | $\frac{4}{5}$ | $\frac{5}{5}$ |
| M | $\frac{3}{25}$ | $\frac{22}{25}$ | $\frac{25}{25}$ |

Left

$\frac{4}{5}A = \frac{22}{25}M$

Q

$\frac{44}{55}A = \frac{44}{50}M$

A : M : A+M
 $55 : 50 : 105$

S : A+M
 $2^{x^{35}} : 3^{35}$

70 : 105

Summary

A : M : S
 $55 : 50 : 70$

Question 38 (Cont.)

Apples and mango strudel left = $88u$

$$88u = 352$$

$$1u = 352 \div 88$$

$$= 4$$

Strawberry = $70u$

$$= 70 \times 4$$

$$= 280$$

(a) There were **280 strawberry strudels**.

Sold = $11u + 6u$

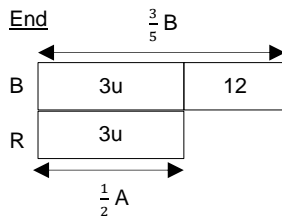
$$= 17u$$

$17u = 17 \times 4$

$$= 68$$

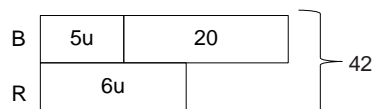
(b) **68 strudels** were sold.

Question 39



| | Gave | Left | At first |
|------|-------------------------------|--------------------------------|--------------------------------|
| Blue | $\frac{2}{5}$ ($2u + 8$) | $\frac{3}{5}$ ($3u + 12$) | $\frac{5}{5}$ ($5u + 20$) |
| Red | $\frac{1}{2}(3u)$ | $\frac{1}{2}(3u)$ | $\frac{2}{2}(6u)$ |

At first



$$11u = 42 - 20$$

$$= 22$$

$$1u = 22 \div 11$$

$$= 2$$

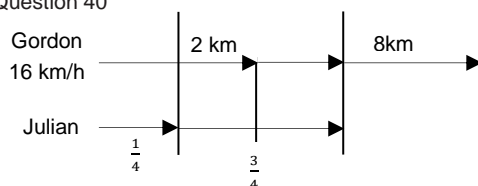
Red pens gave away = $3u$

$$= 3 \times 2$$

$$= 6$$

Amira gave away **6 red pens**.

Question 40



When Julian reached the finish line, Gordon would be 8 km ahead of him (assuming Gordon continues running).

Question 40 (Cont.)

Time taken for Gordon 8 km = $8 \div 16$

$$= \frac{1}{2} \text{ h}$$

Time Julian reached the finishing line

$$= \frac{1}{2} \text{ h} + 11.45 \text{ a.m.}$$

$$= 12.15 \text{ p.m.}$$

Julian reached the finishing line at **12.15 p.m.**

Question 41

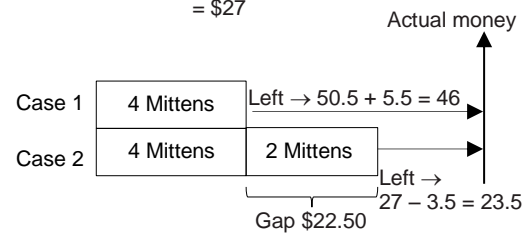
1 bootie = \$6.75

Case 1, 6 Booties = $6 \times \$6.75$

$$= \$40.50$$

Case 2, 4 Booties = $4 \times \$6.75$

$$= \$27$$



2 mittens = $46 - 23.5$

$$= 22.5$$

1 mitten = $22.5 \div 2$

$$= 11.25$$

Using Case 1,

Cassandra's \$ = $4M + 46$

$$= 4 \times 11.25 + 46$$

$$= 91$$

Check

$$6M + 23.5 = 6 \times 11.25 + 23.5$$

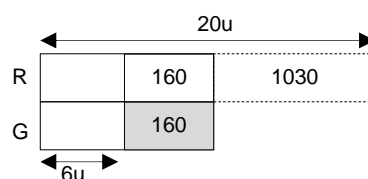
$$= 91$$

Cassandra has **\$91**.

Question 42

$$\frac{1}{4} R = \frac{1}{3} G$$

| (Actual) | R | G |
|------------------|-------------|------------|
| At first | $4u^{x5}$ | $3u^{x2}$ |
| Change | -206^{x5} | $+80^{x2}$ |
| End | $2p^{x5}$ | $5p^{x2}$ |
| (Working) | R | G |
| At first | 20u | 6u |
| Change | -1030 | +160 |
| End | 10p | 10p |



Question 42 (Cont.)

$$14u = 160 + 1030$$

$$= 1190$$

$$1u = 1190 \div 14$$

$$= 85$$

$$\text{Ryan at first} = 4u$$

$$= 4 \times 85$$

$$= 340$$

(a) **Ryan had \$340** at first.

$$\text{Gillian in the end} = 3u + 80$$

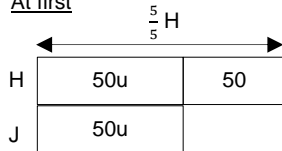
$$= 3 \times 85 + 80$$

$$= 335$$

(b) **Gillian had \$335** in the end.

Question 43

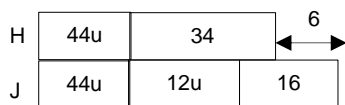
At first



| | At first (1) | Change | End (1) |
|---|--------------------------------------|--|--------------------------------------|
| H | $50u + 20 \left(\frac{5}{5}H\right)$ | Gave $20u + 20 \left(\frac{2}{5}H\right)$ | $30u + 30 \left(\frac{3}{5}H\right)$ |
| J | $50u$ | Received $20u + 20$ | $70u + 20$ |

| | At first (2) | Change | End (2) |
|---|--------------------------------------|---|--------------------------------------|
| H | $30u + 30$ | Received $14u + 4$ | $44u + 34$ |
| J | $70u + 20 \left(\frac{5}{5}J\right)$ | Gave $14u + 4 \left(\frac{1}{5}J\right)$ | $56u + 16 \left(\frac{4}{5}J\right)$ |

End (2)



$$12u = 34 + 6 - 16$$

$$= 24$$

$$1u = 24 \div 12$$

$$= 2$$

$$\text{Helena at first} = 50u + 50$$

$$= 50 \times 2 + 50$$

$$= 150$$

Helena had **\$150** at first.

Question 44

$$\text{No. of qns answered} = 30 - 4$$

$$= 26$$

Question 44 (Cont.)

$$\text{Total marks for 26 questions} = 34 + (4 \times 1)$$

$$= 38$$

| Correct | Wrong | Total |
|--------------------|----------------------------|-------|
| $26 \times 3 = 78$ | $0 \times 2 = 0$ (deduct) | 78 |
| $25 \times 3 = 75$ | $1 \times 2 = 2$ (deduct) | 73 |
| $18 \times 3 = 54$ | $8 \times 2 = 16$ (deduct) | 38 |

$$\text{Diff between the total marks} = 78 - 38$$

$$= 40$$

$$\text{Difference between 1 correct and 1 wrong} = 78 - 73$$

$$= 5$$

$$\text{No. of qns answered wrongly} = 40 \div 5$$

$$= 8$$

$$\text{No. of qns answered correctly} = 26 - 8$$

$$= 18$$

Tony answered **18 questions** correctly.

Question 45

| <u>Case 1:</u> | <u>Case 2:</u> |
|-----------------------------|----------------------|
| <u>Sharifah 800 cookies</u> | <u>Sharifah 1700</u> |
| <u>left</u> | <u>cookies left</u> |
| S : D | S : D |
| 6 : 3 | 3 : 6 |
| 2^{x^2} : 1^{x^2} | 1 : 2 |
| 4 : 2 | |

Increase of 3u

$$3u = 1700 - 800$$

$$= 900$$

$$1u = 900 \div 3$$

$$= 300$$

$$\text{Sharifah} = 4u + 800$$

$$= 4 \times 300 + 800$$

$$= 2000$$

Check

$$\text{Sharifah} = 1u + 1700$$

$$= 1 \times 300 + 1700$$

$$= 2000$$

$$\text{No. of boxes} = 2000 \div 50$$

$$= 40$$

Sharifah baked **40 boxes** of cookies.

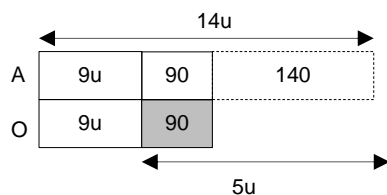
Question 46

| <u>(Actual)</u> | <u>Apples</u> | <u>Oranges</u> |
|-----------------|---------------|----------------|
| At first | $2u^{x^7}$ | $3u^{x^3}$ |
| Change | -20^{x^7} | $+30^{x^3}$ |
| End | $3p^{x^7}$ | $7p^{x^3}$ |

Question 46 (Cont.)

| <u>(Working)</u> | <u>Apples</u> | <u>Oranges</u> |
|------------------|---------------|----------------|
| At First | 14u | 9u |
| Change | -140 | +90 |
| End | 21p | 21p |

Work model from end



$$5u = 140 + 90$$

$$= 230$$

$$1u = 230 \div 5$$

$$= 46$$

$$\text{Apples at first} = 2u - 20$$

$$= 2 \times 46 - 20$$

$$= 72$$

$$\text{Oranges at first} = 3u$$

$$= 3 \times 46$$

$$= 138$$

Farmer Sam has **72 apples** in the crate.

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