

# 3. A PEEK BEYOND THE POINT

## COMPLETE CHAPTER NOTES WITH SOLUTIONS

Decimals | Tenths | Hundredths | Place Value | Measurement

### 3.1 The Need for Smaller Units

#### 💡 Why Do We Need Smaller Units?

In daily life, we often need to measure objects very precisely. A standard centimeter ruler is divided into 10 equal smaller parts called one-tenths ( $\frac{1}{10}$ ). These smaller divisions help us measure lengths more accurately — for example, two screws that look nearly identical may actually differ by just a fraction of a centimetre!

**Real-Life Story:** Sonu's mother was fixing a toy using screws. Two screws looked the same, but one did not fit. When measured carefully with a fine ruler, Sonu discovered the screws had slightly different lengths — one was  $2\frac{7}{10}$  cm and the other was  $3\frac{2}{10}$  cm. This tiny difference made a big impact!

#### Reading Mixed Measurements

The ruler is divided into centimetres. Each centimetre is further divided into 10 equal smaller parts. These parts are called one-tenths.

##### Screw 1 measures: $2\frac{7}{10}$ cm

Reading: "Two and seven-tenth centimetres" = 2 cm + 7 parts of ( $\frac{1}{10}$  cm)

##### Screw 2 measures: $3\frac{2}{10}$ cm

Reading: "Three and two-tenth centimetres" = 3 cm + 2 parts of ( $\frac{1}{10}$  cm)

#### RULER DIAGRAM (showing tenths):

|                                                |                |                |                |                |                |                |                |                |                |
|------------------------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 0                                              | $\frac{1}{10}$ | $\frac{2}{10}$ | $\frac{3}{10}$ | $\frac{4}{10}$ | $\frac{5}{10}$ | $\frac{6}{10}$ | $\frac{7}{10}$ | $\frac{8}{10}$ | $\frac{9}{10}$ |
| ← One centimetre divided into 10 equal parts → |                |                |                |                |                |                |                |                |                |

#### **? Q: Q: Which scale helped measure the length of the screws accurately? Why?**

**Answer:** The scale with small subdivisions (divided into tenths) helped measure screws accurately. The unit between each centimetre is divided into 10 equal smaller parts, allowing us to read measurements like  $2\frac{7}{10}$  cm instead of just saying 'between 2 and 3 cm'.

#### **? Q: Q: Write the measurements of the objects shown in the picture (Eraser, Pencil, Chalk).**

**Solution:**

**Step 1:** Look at each object's end position on the ruler.

**Step 2:** Count full centimetres first, then count the smaller subdivisions.

**Step 3:** Write as whole number and fraction.

| Object | Measurement                              | Reading                         |
|--------|------------------------------------------|---------------------------------|
| Eraser | $2 \frac{4}{10}$ cm                      | Two and four-tenth centimetres  |
| Pencil | $4 \frac{5}{10}$ cm = $4 \frac{1}{2}$ cm | Four and five-tenth centimetres |
| Chalk  | $1 \frac{4}{10}$ cm                      | One and four-tenth centimetres  |

☑ **Final Answer:** Eraser →  $2 \frac{4}{10}$  cm | Pencil →  $4 \frac{5}{10}$  cm | Chalk →  $1 \frac{4}{10}$  cm

## 3.2 A Tenth Part

### 💡 What is One-Tenth?

One-tenth ( $\frac{1}{10}$ ) means dividing one whole unit into 10 equal parts. Each part is called one-tenth. Key Fact: 10 one-tenths = 1 whole unit  $\frac{1}{10} + \frac{1}{10} + \frac{1}{10} + \dots$  (10 times) =  $\frac{10}{10} = 1$

★ **KEY FORMULA:**  $3 \frac{4}{10} = 34$  one-tenths [because  $3 \times 10 + 4 = 34$ ]

### Understanding the Conversion: $3 \frac{4}{10} = \frac{34}{10}$

Explanation: A pencil of length  $3 \frac{4}{10}$  units means:

- 3 whole units = 30 one-tenths (since 10 one-tenths = 1 unit)
- Plus 4 more one-tenths
- Total =  $30 + 4 = 34$  one-tenths =  $\frac{34}{10}$

$$\begin{aligned} 34 \times \left(\frac{1}{10}\right) &= \frac{34}{10} = \left(\frac{10}{10}\right) + \left(\frac{10}{10}\right) + \left(\frac{10}{10}\right) + \left(\frac{4}{10}\right) \\ &= 1 + 1 + 1 + \frac{4}{10} = 3 \text{ and } \frac{4}{10} \end{aligned}$$

### How to Read Fractional Numbers

| Number            | Reading                                    |
|-------------------|--------------------------------------------|
| $4 \frac{1}{10}$  | Four and one-tenth                         |
| $\frac{4}{10}$    | Four one-tenths (or four-tenths)           |
| $\frac{41}{10}$   | Forty-one one-tenths (or forty-one tenths) |
| $41 \frac{1}{10}$ | Forty-one and one-tenth                    |

### Writing Lengths in Two Ways

Example: USB Cable =  $4 \frac{8}{10}$  units OR  $\frac{48}{10}$  units (both mean the same!)

## Figure It Out: Arrange Lengths in Increasing Order

**? Q: Arrange these lengths in increasing order:  $\frac{9}{10}$ ,  $1\frac{7}{10}$ ,  $\frac{130}{10}$ ,  $13\frac{1}{10}$ ,  $10\frac{5}{10}$ ,  $7\frac{6}{10}$ ,  $6\frac{7}{10}$ ,  $\frac{4}{10}$**

**Solution — Step-by-Step:**

**Step 1:** Convert all to improper fractions over 10:

- (a)  $\frac{9}{10} = \frac{9}{10}$
- (b)  $1\frac{7}{10} = \frac{17}{10}$
- (c)  $\frac{130}{10} = \frac{130}{10}$
- (d)  $13\frac{1}{10} = \frac{131}{10}$
- (e)  $10\frac{5}{10} = \frac{105}{10}$
- (f)  $7\frac{6}{10} = \frac{76}{10}$
- (g)  $6\frac{7}{10} = \frac{67}{10}$
- (h)  $\frac{4}{10} = \frac{4}{10}$

**Step 2:** Arrange numerators in increasing order:  $4 < 9 < 17 < 67 < 76 < 105 < 130 < 131$

☒ **Final Answer:**  $\frac{4}{10} < \frac{9}{10} < 1\frac{7}{10} < 6\frac{7}{10} < 7\frac{6}{10} < 10\frac{5}{10} < \frac{130}{10} < 13\frac{1}{10}$

**? Q: Arrange in increasing order:  $4\frac{1}{10}$ ,  $\frac{4}{10}$ ,  $\frac{41}{10}$ ,  $41\frac{1}{10}$**

**Solution:**

**Step 1:** Convert to improper fractions:  $4\frac{1}{10} = \frac{41}{10}$ ,  $\frac{4}{10} = \frac{4}{10}$ ,  $\frac{41}{10} = \frac{41}{10}$ ,  $41\frac{1}{10} = \frac{411}{10}$

**Step 2:** Compare:  $\frac{4}{10} = 0.4$ ,  $\frac{41}{10} = 4.1$ ,  $4\frac{1}{10} = 4.1$ ,  $41\frac{1}{10} = 41.1$

*Note:  $\frac{4}{10}$  and  $\frac{41}{10} = 4\frac{1}{10}$  are equal (both = 4.1)*

☒ **Final Answer:**  $\frac{4}{10} < \frac{41}{10} = 4\frac{1}{10} < 41\frac{1}{10}$

## Operations with Tenths

### Addition of Tenths — Sonu's Arm Length Problem

**? Q: Sonu's lower arm =  $2\frac{7}{10}$  units, upper arm =  $3\frac{6}{10}$  units. Find total arm length.**

Given: Lower arm =  $2\frac{7}{10}$  units, Upper arm =  $3\frac{6}{10}$  units

To Find: Total length = Lower + Upper

Concept Used: Separate the whole units and tenths, then add.

**Method (a) — Separating Parts:**

$$\begin{aligned} & (2 + 3) + \left(\frac{7}{10} + \frac{6}{10}\right) \\ &= 5 + \frac{13}{10} \\ &= 5 + \frac{10}{10} + \frac{3}{10} \quad [\text{since } \frac{10}{10} = 1] \\ &= 5 + 1 + \frac{3}{10} = 6 + \frac{3}{10} = 6\frac{3}{10} \end{aligned}$$

**Method (b) — Column Addition:**

$$\begin{array}{r} 2 \quad \frac{7}{10} \\ + 3 \quad \frac{6}{10} \\ \hline = 5 \quad \frac{13}{10} = 6 \quad \frac{3}{10} \end{array}$$

**Method (c) — Converting to Tenths:**

$$27/10 + 36/10 = 63/10$$

$$63/10 = 60/10 + 3/10 = 6 + 3/10 = 6 \frac{3}{10}$$

☒ **Final Answer: Total arm length =  $6 \frac{3}{10}$  units**

**Honeybee Total Length Problem**

**? Q: Head =  $2 \frac{3}{10}$  units, Thorax =  $5 \frac{4}{10}$  units, Abdomen =  $7 \frac{5}{10}$  units. Find total length.**

**Solution:**

**Step 1:** Add all whole parts:  $2 + 5 + 7 = 14$

**Step 2:** Add all tenths:  $3/10 + 4/10 + 5/10 = 12/10 = 1 \frac{2}{10}$

**Step 3:** Total =  $14 + 1 \frac{2}{10} = 15 \frac{2}{10}$  units

☒ **Final Answer: Total length of honeybee =  $15 \frac{2}{10}$  units**

**Subtraction with Borrowing — Finger Length Problem**

**? Q: Shylaja's hand =  $12 \frac{4}{10}$  units, palm =  $6 \frac{7}{10}$  units. Find length of middle finger.**

Concept: Finger = Hand – Palm =  $12 \frac{4}{10} - 6 \frac{7}{10}$

**Method (a) — Algebraic:**

$$12 + 4/10 - 6 - 7/10$$

$$= (12 - 6) + (4/10 - 7/10)$$

$$= 6 - 3/10$$

$$= 5 + 1 - 3/10 \quad [\text{write } 6 \text{ as } 5 + 1]$$

$$= 5 + 10/10 - 3/10 \quad [\text{convert } 1 \text{ to } 10/10]$$

$$= 5 + 7/10 = 5 \frac{7}{10}$$

**Method (b) — Borrowing Method:**

$$12 \frac{4}{10} \rightarrow 11 \frac{14}{10} \quad [\text{borrow } 1 \text{ unit} = 10/10]$$

$$- 6 \frac{7}{10} \rightarrow - 6 \frac{7}{10}$$

$$= 5 \frac{7}{10}$$

☒ **Final Answer: Length of middle finger =  $5 \frac{7}{10}$  units**

**Fish Difference Problem**

**? Q: Celestial Pearl Danio =  $2 \frac{4}{10}$  cm, Philippine Goby =  $9/10$  cm. Find the difference.**

**Solution:**

**Step 1:** Difference =  $2 \frac{4}{10} - 9/10$

**Step 2:** Convert to tenths:  $24/10 - 9/10 = 15/10 = 1 \frac{5}{10}$  cm

☒ **Final Answer: Difference =  $1 \frac{5}{10}$  cm (Celestial Pearl Danio is  $1 \frac{5}{10}$  cm longer)**

**Patterns in Tenths**

**? Q: Observe and extend each number pattern:**

| Pattern                                                        | Rule                        | Next 4 Terms                                                                 |
|----------------------------------------------------------------|-----------------------------|------------------------------------------------------------------------------|
| 4, 4 $\frac{3}{10}$ , 4 $\frac{6}{10}$ , ...                   | + $\frac{3}{10}$ each time  | 4 $\frac{9}{10}$ , 5 $\frac{2}{10}$ , 5 $\frac{5}{10}$ , 5 $\frac{8}{10}$    |
| 8 $\frac{2}{10}$ , 8 $\frac{7}{10}$ , 9 $\frac{2}{10}$ , ...   | + $\frac{5}{10}$ each time  | 9 $\frac{7}{10}$ , 10 $\frac{2}{10}$ , 10 $\frac{7}{10}$ , 11 $\frac{2}{10}$ |
| 7 $\frac{6}{10}$ , 8 $\frac{7}{10}$ , ...                      | +1 $\frac{1}{10}$ each time | 9 $\frac{8}{10}$ , 10 $\frac{9}{10}$ , 12, 13 $\frac{1}{10}$                 |
| 5 $\frac{7}{10}$ , 5 $\frac{3}{10}$ , ...                      | − $\frac{4}{10}$ each time  | 4 $\frac{9}{10}$ , 4 $\frac{5}{10}$ , 4 $\frac{1}{10}$ , 3 $\frac{7}{10}$    |
| 13 $\frac{5}{10}$ , 13, 12 $\frac{5}{10}$ , ...                | − $\frac{5}{10}$ each time  | 12, 11 $\frac{5}{10}$ , 11, 10 $\frac{5}{10}$                                |
| 11 $\frac{5}{10}$ , 10 $\frac{4}{10}$ , 9 $\frac{3}{10}$ , ... | −1 $\frac{1}{10}$ each time | 8 $\frac{2}{10}$ , 7 $\frac{1}{10}$ , 6, 4 $\frac{9}{10}$                    |

### 3.3 A Hundredth Part

#### What is One-Hundredth?

When we need even more precision, we split each one-tenth into 10 more equal parts. • Each one-tenth has 10 smaller parts • 10 one-tenths = 1 unit → 100 one-hundredths = 1 unit • One such small part =  $\frac{1}{100}$  of a unit Key: 10 one-hundredths = 1 one-tenth

★ KEY FORMULA:  $\frac{1}{10} = \frac{10}{100}$  | 1 unit = 100 one-hundredths

#### Folded Paper Example

? Q: A paper of length 8  $\frac{9}{10}$  units is folded in half. What is its new length?

**Solution:**

**Step 1:** Folded length =  $8 \frac{9}{10} \div 2 = \frac{89}{10} \div 2 = \frac{89}{20} = 4 \frac{45}{100}$

**Step 2:** On a fine ruler, we see it ends at 4  $\frac{4}{10}$  and 5  $\frac{1}{100}$

**Step 3:** The length can also be written as 4 units and 45 one-hundredths

Because:  $\frac{4}{10} = \frac{40}{100}$  and  $\frac{40}{100} + \frac{5}{100} = \frac{45}{100}$

☒ Final Answer: Folded length = 4  $\frac{4}{10}$   $\frac{5}{100}$  = 4  $\frac{45}{100}$  units

? Q: How many one-hundredths make one-tenth?

**Answer:**

$$\frac{1}{10} = \frac{10}{100}$$

☒ Final Answer: 10 one-hundredths = 1 one-tenth

#### Three Ways to Write the Same Length

Example: A wire of length 1  $\frac{1}{10}$  and  $\frac{4}{100}$  units can be written as:

| Notation                         | Reading                               |
|----------------------------------|---------------------------------------|
| 1 $\frac{1}{10}$ $\frac{4}{100}$ | One and one-tenth and four-hundredths |
| 1 $\frac{14}{100}$               | One and fourteen-hundredths           |
| $\frac{114}{100}$                | One hundred and fourteen-hundredths   |

#### Figure It Out — Longest and Shortest Lengths

**? Q: In each group, identify the longest and shortest lengths:**

(a)  $\frac{3}{10}$ ,  $\frac{3}{100}$ ,  $\frac{33}{100}$

Convert to hundredths:  $\frac{3}{10} = \frac{30}{100}$ ,  $\frac{3}{100} = \frac{3}{100}$ ,  $\frac{33}{100} = \frac{33}{100}$

☒ Final Answer: Longest =  $\frac{33}{100}$  | Shortest =  $\frac{3}{100}$

(b)  $3\frac{1}{10}$ ,  $\frac{30}{10}$ ,  $1\frac{3}{10}$

Convert:  $3\frac{1}{10} = 3.1$ ,  $\frac{30}{10} = 3$ ,  $1\frac{3}{10} = 1.3$

☒ Final Answer: Longest =  $3\frac{1}{10}$  | Shortest =  $1\frac{3}{10}$

(c)  $\frac{45}{100}$ ,  $\frac{54}{100}$ ,  $\frac{50}{100}$ ,  $\frac{40}{100}$

Convert:  $\frac{45}{100}$ ,  $\frac{54}{100}$ ,  $\frac{50}{100}$ ,  $\frac{40}{100}$

☒ Final Answer: Longest =  $\frac{54}{100}$  | Shortest =  $\frac{40}{100}$  (=  $\frac{4}{10}$ )

(d)  $3\frac{6}{10}$ ,  $\frac{36}{100}$ ,  $3\frac{6}{10}\frac{6}{100}$

Convert:  $3\frac{6}{10} = 3.6$ ,  $\frac{36}{100} = 3.06$ ,  $3\frac{6}{10}\frac{6}{100} = 3.66$

☒ Final Answer: Longest =  $3\frac{6}{10}\frac{6}{100}$  (= 3.66) | Shortest =  $\frac{36}{100}$  (= 3.06)

### Adding Hundredths — Two Methods

**? Q: Find:  $15\frac{3}{10}\frac{4}{100} + 2\frac{6}{10}\frac{8}{100}$**

**Method (a) — Separating Parts:**

$$\begin{aligned} & (15 + 2) + (\frac{3}{10} + \frac{6}{10}) + (\frac{4}{100} + \frac{8}{100}) \\ &= 17 + \frac{9}{10} + \frac{12}{100} \\ &= 17 + \frac{9}{10} + \frac{1}{10} + \frac{2}{100} \quad [\text{since } \frac{10}{100} = \frac{1}{10}] \\ &= 17 + \frac{10}{10} + \frac{2}{100} \\ &= 17 + 1 + \frac{2}{100} = 18\frac{2}{100} \end{aligned}$$

**Method (b) — Column Addition:**

$$\begin{array}{r} 15 \quad \frac{3}{10} \quad \frac{4}{100} \\ + 2 \quad \frac{6}{10} \quad \frac{8}{100} \\ \hline = 17 \quad \frac{9}{10} \quad \frac{12}{100} \\ = 17 \quad \frac{10}{10} \quad \frac{2}{100} \quad [\text{regroup } \frac{12}{100} = \frac{1}{10} + \frac{2}{100}] \\ = 18 \quad \frac{2}{100} \end{array}$$

☒ Final Answer: Sum =  $18\frac{2}{100}$

### Subtracting Hundredths — With Borrowing

**? Q: Find:  $25\frac{9}{10} - 6\frac{4}{10}\frac{7}{100}$**

**Solution — Borrowing Method:**

$$\begin{array}{r} 25 \quad \frac{9}{10} \quad \rightarrow 25 \quad \frac{8}{10} \quad \frac{10}{100} \quad [\text{convert } \frac{9}{10} = \frac{8}{10} + \frac{10}{100}] \\ - 6 \quad \frac{4}{10} \quad \frac{7}{100} \quad \rightarrow \quad - 6 \quad \frac{4}{10} \quad \frac{7}{100} \\ \hline = 19 \quad \frac{4}{10} \quad \frac{3}{100} \end{array}$$

☒ Final Answer: Difference =  $19\frac{4}{10}\frac{3}{100}$

**? Q: Find:  $15\frac{3}{10}\frac{4}{100} - 2\frac{6}{10}\frac{8}{100}$**

**Solution — Borrowing Twice:**

$$\begin{array}{r}
 15 \quad 3/10 \quad 4/100 \\
 \rightarrow 15 \quad 2/10 \quad 14/100 \quad [\text{borrow } 1/10 = 10/100 \text{ for the hundredths}] \\
 \rightarrow 14 \quad 12/10 \quad 14/100 \quad [\text{borrow } 1 \text{ unit} = 10/10 \text{ for the tenths}] \\
 - \quad 2 \quad 6/10 \quad 8/100 \\
 = 12 \quad 6/10 \quad 6/100
 \end{array}$$

✓ Final Answer: Difference =  $12 \frac{6}{10} \frac{6}{100}$

## Figure It Out — All Sums and Differences

**? Q: Find the sums and differences:**

**(a)  $3 \frac{3}{10} + 3 \frac{4}{100}$**

$$= 30/100 + 3 \frac{4}{100} = 3 \frac{34}{100}$$

✓ Final Answer:  $3 \frac{34}{100}$

**(b)  $9 \frac{5}{10} \frac{7}{100} + 2 \frac{1}{10} \frac{3}{100}$**

$$= (9+2) + (5/10+1/10) + (7/100+3/100)$$

$$= 11 + 6/10 + 10/100$$

$$= 11 + 6/10 + 1/10 = 11 + 7/10 = 11 \frac{7}{10}$$

✓ Final Answer:  $11 \frac{7}{10}$

**(c)  $15 \frac{6}{10} \frac{4}{100} + 14 \frac{3}{10} \frac{6}{100}$**

$$= (15+14) + (6/10+3/10) + (4/100+6/100)$$

$$= 29 + 9/10 + 10/100$$

$$= 29 + 9/10 + 1/10 = 29 + 10/10 = 29 + 1 = 30$$

✓ Final Answer: 30

**(d)  $7 \frac{7}{100} - 4 \frac{4}{100}$**

$$= (7-4) + (7/100-4/100) = 3 \frac{3}{100}$$

✓ Final Answer:  $3 \frac{3}{100}$

**(e)  $8 \frac{6}{100} - 5 \frac{3}{100}$**

$$= (8-5) + (6/100-3/100) = 3 \frac{3}{100}$$

✓ Final Answer:  $3 \frac{3}{100}$

**(f)  $12 \frac{6}{10} \frac{2}{100} - 9 \frac{9}{10} \frac{9}{100}$**

$$= 12 + 6/10 + 2/100 - 9/10 - 9/100$$

$$= (12) + (6/10-9/10) + (2/100-9/100)$$

$$\text{Need to borrow: } 12 \frac{6}{10} \frac{2}{100} \rightarrow 11 \frac{16}{10} \frac{2}{100} \rightarrow 11 \frac{15}{10} \frac{12}{100}$$

$$- 0 \frac{9}{10} \frac{9}{100}$$

$$= 11 \frac{6}{10} \frac{3}{100} = 11 \frac{63}{100}$$

✓ Final Answer:  $11 \frac{63}{100}$

## 3.4 Decimal Place Value

💡 Why the Decimal System?

The Indian place value system is based on the number 10 — each place is 10 times the next one to its right. When we need to write quantities smaller than 1, we extend this system beyond the ones place using a DECIMAL POINT ('.'). This creates the decimal system. 10 ones = 1 ten | 10 tens = 1 hundred | 10 one-tenths = 1 one | 10 one-hundredths = 1 one-tenth

### The Extended Place Value Chart

| 10,000        | 1,000     | 100         | 10        | 1           | •<br>(point) | 1/10        | 1/100      | 1/1000      |
|---------------|-----------|-------------|-----------|-------------|--------------|-------------|------------|-------------|
| Ten-thousands | Thousands | Hundreds    | Tens      | Units       | Decimal      | Tenths      | Hundredths | Thousandths |
| $\times 10$   | $\div 10$ | $\times 10$ | $\div 10$ | $\times 10$ | $\div 10$    | $\times 10$ | $\div 10$  | $\times 10$ |

### Decimal Notation Examples

The number 705 can represent three DIFFERENT quantities depending on where the decimal point is placed:

| Quantity                          | Decimal Form | Read as                |
|-----------------------------------|--------------|------------------------|
| 7 hundreds + 0 tens + 5 ones      | 705          | Seven hundred and five |
| 7 tens + 0 units + 5 tenths       | 70.5         | Seventy point five     |
| 7 units + 0 tenths + 5 hundredths | 7.05         | Seven point zero five  |

### Place Value Table for 705, 70.5, 7.05

| Decimal Number | Hundreds       | Tens          | Units        | • Tenths        | Hundredths       |
|----------------|----------------|---------------|--------------|-----------------|------------------|
| 705            | $7 \times 100$ | $0 \times 10$ | $5 \times 1$ | —               | —                |
| 70.5           | —              | $7 \times 10$ | $0 \times 1$ | $5 \times 1/10$ | —                |
| 7.05           | —              | —             | $7 \times 1$ | $0 \times 1/10$ | $5 \times 1/100$ |

★ KEY FORMULA:  $705 \rightarrow 7 \times 100 + 0 \times 10 + 5 \times 1$  |  $70.5 \rightarrow 7 \times 10 + 0 \times 1 + 5 \times (1/10)$  |  $7.05 \rightarrow 7 \times 1 + 0 \times (1/10) + 5 \times (1/100)$

### How to Read Decimal Numbers

- 705 → 'seven hundred and five'
- 70.5 → 'seventy point five' (short for seventy and five-tenths)
- 7.05 → 'seven point zero five' (short for seven and five-hundredths)
- 0.274 → 'zero point two seven four' (NOT two hundred and seventy four)

### Place Value Table Exercise

**? Q: Write each quantity in decimal form, place value form, and read the number:**

| Quantity                       | Decimal Form | Read as              |
|--------------------------------|--------------|----------------------|
| 2 ones, 3 tenths, 5 hundredths | 2.35         | Two point three five |

|                               |        |                                |
|-------------------------------|--------|--------------------------------|
| 1 ten and 5 tenths            | 10.5   | Ten point five                 |
| 4 ones and 6 hundredths       | 4.06   | Four point zero six            |
| 1 hundred, 1 one, 1 hundredth | 101.01 | One hundred one point zero one |
| 8/100 and 9/10                | 0.98   | Zero point nine eight          |
| 5/100                         | 0.05   | Zero point zero five           |
| 1/10                          | 0.1    | Zero point one                 |

### Converting 234 Tenths to Decimal Form

**? Q: How do we write 234 tenths in decimal form?**

**Solution:**

$$\begin{aligned}
 234 \text{ tenths} &= 234/10 \\
 &= 200/10 + 30/10 + 4/10 \\
 &= 20 + 3 + 4/10 \\
 &= 23 + 4/10 = 23.4
 \end{aligned}$$

| Hundreds | Tens | Units | Tenths           |
|----------|------|-------|------------------|
| —        | —    | —     | 234 (input)      |
| —        | 2    | 3     | 4 (decimal 23.4) |

☒ **Final Answer: 234 tenths = 23.4**

**? Q: Write in decimal form: (a) 234 hundredths (b) 105 tenths**

**(a) 234 hundredths:**

$$234/100 = 200/100 + 30/100 + 4/100 = 2 + 30/100 + 4/100 = 2.34$$

☒ **Final Answer: 234 hundredths = 2.34**

**(b) 105 tenths:**

$$105/10 = 100/10 + 5/10 = 10 + 5/10 = 10.5$$

☒ **Final Answer: 105 tenths = 10.5**

## 3.5 Units of Measurement

### Length Conversion Relationships

1 cm = 10 mm → 1 mm = 1/10 cm = 0.1 cm  
 1 m = 100 cm → 1 cm = 1/100 m = 0.01 m  
 1 m = 1000 mm → 1 mm = 1/1000 m = 0.001 m  
 1 km = 1000 m → 1 m = 1/1000 km = 0.001 km

### mm ↔ cm Conversions

**? Q: (a) How many cm is 1 mm?**

**Solution:**

$$1 \text{ mm} = 1/10 \text{ cm} = 0.1 \text{ cm}$$

☒ Final Answer: 1 mm = 0.1 cm

**? Q: (b) How many cm is 5 mm?**

**Solution:**

$$5 \text{ mm} = 5 \times (1/10) \text{ cm} = 5/10 \text{ cm} = 0.5 \text{ cm}$$

☒ Final Answer: 5 mm = 0.5 cm

**? Q: (c) How many cm is 12 mm?**

**Solution:**

$$\begin{aligned} 12 \text{ mm} &= 10 \text{ mm} + 2 \text{ mm} \\ &= 1 \text{ cm} + 2/10 \text{ cm} \\ &= 1.2 \text{ cm} \end{aligned}$$

☒ Final Answer: 12 mm = 1.2 cm

**? Q: (d) How many mm is 5.6 cm?**

**Solution:**

$$\begin{aligned} 5.6 \text{ cm} &= 5 \text{ cm} + 0.6 \text{ cm} = 5 \text{ cm} + 6/10 \text{ cm} \\ &= 50 \text{ mm} + 6 \text{ mm} = 56 \text{ mm} \end{aligned}$$

☒ Final Answer: 5.6 cm = 56 mm

**Fill in the Blanks: mm ↔ cm**

| mm      | cm       |
|---------|----------|
| 12 mm   | 1.2 cm   |
| 56 mm   | 5.6 cm   |
| 70 mm   | 7.0 cm   |
| 9 mm    | 0.9 cm   |
| 134 mm  | 13.4 cm  |
| 2036 mm | 203.6 cm |

**cm ↔ m Conversions**

**? Q: (a) How many m is 10 cm?**

**Solution:**

$$10 \text{ cm} = 10/100 \text{ m} = 1/10 \text{ m} = 0.1 \text{ m}$$

☒ Final Answer: 10 cm = 0.1 m

**? Q: (b) How many m is 15 cm?**

**Solution:**

$$15 \text{ cm} = 15/100 \text{ m} = (10/100 + 5/100) \text{ m} = (1/10 + 5/100) \text{ m} = 0.15 \text{ m}$$

☒ Final Answer: 15 cm = 0.15 m

**Fill in the Blanks: cm ↔ m**

| cm     | m      |
|--------|--------|
| 36 cm  | 0.36 m |
| 50 cm  | 0.5 m  |
| 89 cm  | 0.89 m |
| 4 cm   | 0.04 m |
| 325 cm | 3.25 m |
| 207 cm | 2.07 m |

### Weight Conversion

1 kg = 1000 g  $\rightarrow$  1 g =  $1/1000$  kg = 0.001 kg

1 g = 1000 mg  $\rightarrow$  1 mg =  $1/1000$  g = 0.001 g

Example: 254 g =  $254/1000$  kg = 0.254 kg

Example: 5 g =  $5/1000$  kg = 0.005 kg

### Weight Conversion Examples

**? Q: How many kg is 254 g?**

**Solution:**

$$\begin{aligned}
 254 \text{ g} &= 254/1000 \text{ kg} \\
 &= (200/1000 + 50/1000 + 4/1000) \text{ kg} \\
 &= (2/10 + 5/100 + 4/1000) \text{ kg} \\
 &= 0.254 \text{ kg}
 \end{aligned}$$

☒ **Final Answer: 254 g = 0.254 kg**

### Fill in the Blanks: g $\leftrightarrow$ kg

| g      | kg       |
|--------|----------|
| 465 g  | 0.465 kg |
| 68 g   | 0.068 kg |
| 1560 g | 1.56 kg  |
| 704 g  | 0.704 kg |
| 560 g  | 0.56 kg  |
| 2500 g | 2.5 kg   |

### Rupee $\leftrightarrow$ Paise Conversion

1 rupee = 100 paise

1 paise =  $1/100$  rupee = 0.01 rupee

Example: 75 paise =  $75/100$  rupee = 0.75 rupee

Example: 99 paise = 0.99 rupee

### Fill in the Blanks: Rupee ↔ Paise

| Paise | Rupees |
|-------|--------|
| 10 p  | ₹0.10  |
| 5 p   | ₹0.05  |
| 36 p  | ₹0.36  |
| 50 p  | ₹0.50  |
| 99 p  | ₹0.99  |
| 250 p | ₹2.50  |

## 3.6 Locating and Comparing Decimals

### Locating Decimals on a Number Line

**? Q: Locate 1.4 on a number line.**

**Method:**

**Step 1:** 1.4 = 1 unit and 4 tenths

**Step 2:** Draw a number line. Mark 1 and 2.

**Step 3:** Divide the segment from 1 to 2 into 10 equal parts.

**Step 4:** Count 4 parts from 1. That point is 1.4

Number Line: 1.0 1.1 1.2 1.3 [1.4] 1.5 1.6 1.7 1.8 1.9 2.0

**? Q: Name all divisions between 1 and 1.1 on the number line.**

**Answer:**

Dividing the segment from 1 to 1.1 into 10 equal parts gives:

1.01, 1.02, 1.03, 1.04, 1.05, 1.06, 1.07, 1.08, 1.09

### Zero Dilemma — Trailing Zeros

**? Q: Are 0.2, 0.20, and 0.200 the same?**

**Answer:**

YES! Adding zeros to the right of the last decimal digit does NOT change the value.

| Number | Units | Tenths | Hundredths | Thousandths | Value  |
|--------|-------|--------|------------|-------------|--------|
| 0.2    | 0     | 2      | —          | —           | 2/10   |
| 0.20   | 0     | 2      | 0          | —           | 2/10   |
| 0.200  | 0     | 2      | 0          | 0           | 2/10   |
| 0.02   | 0     | 0      | 2          | —           | 2/100  |
| 0.002  | 0     | 0      | 0          | 2           | 2/1000 |

✓ Final Answer:  $0.2 = 0.20 = 0.200$  (all equal to 2 tenths) 0.02 and 0.002 are DIFFERENT (smaller)

**? Q: Which of these are the same: 4.5, 4.05, 0.405, 4.050, 4.50, 4.005, 04.50?**

Answer:

- 4.5, 4.50, 04.50 are ALL EQUAL (all = 4.5)
- 4.05 and 4.050 are EQUAL (both = 4.05)
- 0.405 and 4.005 are DIFFERENT from all others

✓ Final Answer: Same pairs:  $\{4.5 = 4.50 = 04.50\}$  and  $\{4.05 = 4.050\}$

## Comparing Decimal Numbers

**? Q: Which is larger: 6.456 or 6.465?**

Solution — Compare digit by digit:

Step 1: Compare units place: Both have 6. → Equal, move on.

Step 2: Compare tenths: Both have 4. → Equal, move on.

Step 3: Compare hundredths: 6.456 has 5 hundredths, 6.465 has 6 hundredths.

Step 4:  $6 > 5$ , so  $6.465 > 6.456$

✓ Final Answer:  $6.465 > 6.456$

**? Q: Which decimal number is greater?**

| Comparison     | Answer            | Reason              |
|----------------|-------------------|---------------------|
| 1.23 or 1.32   | 1.32 is greater   | Tenths: $3 > 2$     |
| 3.81 or 13.800 | 13.800 is greater | Tens: $1 > 0$       |
| 1.009 or 1.090 | 1.090 is greater  | Hundredths: $9 > 0$ |

## Closest Decimal

**? Q: Which of 0.9, 1.1, 1.01, 1.11 is closest to 1?**

Solution:

Step 1: Ascending order:  $0.9 < 1 < 1.01 < 1.1 < 1.11$

Step 2: Neighbors of 1: 0.9 is  $1/10$  ( $= 10/100$ ) away; 1.01 is  $1/100$  away.

Step 3: 1.01 is much closer (only  $1/100$  away, vs  $10/100$  for 0.9)

✓ Final Answer: 1.01 is closest to 1

| Question                                    | Answer                 |
|---------------------------------------------|------------------------|
| Closest to 1.09 from {0.9, 1.1, 1.01, 1.11} | 1.1 (distance = 0.01)  |
| Closest to 4 from {3.56, 3.65, 3.099}       | 3.65 (distance = 0.35) |
| Closest to 1 from {0.8, 0.69, 1.08}         | 1.08 (distance = 0.08) |

## 3.7 Addition and Subtraction of Decimals

### Key Insight

Adding and subtracting decimals works EXACTLY like whole numbers — line up the decimal points, and add/subtract each place value column. The decimal point stays in the same position in the answer!

### Cloth Problem — Addition

**? Q: Priya needs 2.7 m of cloth; Shylaja needs 3.5 m. Total cloth needed?**

**Solution:**

$$\begin{array}{r} 2.7 \\ + 3.5 \\ \hline = 6.2 \end{array}$$

Check: 7 tenths + 5 tenths = 12 tenths = 1.2, write 2 carry 1; then  $2+3+1 = 6$ .

☒ **Final Answer: Total cloth = 6.2 m**

**? Q: How much longer is Shylaja's cloth than Priya's?**

**Solution — Subtraction:**

$$\begin{array}{rcl} 3.5 & \rightarrow & 2.15 \quad (\text{borrow 1 from units: } 3.5 = 2+15/10) \\ - 2.7 & \rightarrow & - 2.7 \\ \hline & & = 0.8 \end{array}$$

☒ **Final Answer: Shylaja's cloth is 0.8 m longer**

### Detailed Addition: 75.345 + 86.691

**Place value calculation:**

Thousandths:  $5 + 1 = 6$

Hundredths:  $4 + 9 = 13 \rightarrow$  write 3, carry 1

Tenths:  $3 + 6 + 1(\text{carry}) = 10 \rightarrow$  write 0, carry 1

Units:  $5 + 1 + 1(\text{carry}) = 7 \dots$  [continue]

$$75.345 + 86.691 = 162.036$$

☒ **Final Answer: 75.345 + 86.691 = 162.036**

### Figure It Out — Addition

**? Q: 1. Find the sums:**

| Problem            | Solution |
|--------------------|----------|
| (a) $5.3 + 2.6$    | 7.9      |
| (b) $18 + 8.8$     | 26.8     |
| (c) $2.15 + 5.26$  | 7.41     |
| (d) $9.01 + 9.10$  | 18.11    |
| (e) $29.19 + 9.91$ | 39.10    |
| (f) $0.934 + 0.6$  | 1.534    |
| (g) $0.75 + 0.03$  | 0.78     |

|                     |       |
|---------------------|-------|
| (h) $6.236 + 0.487$ | 6.723 |
|---------------------|-------|

### Figure It Out — Subtraction

**? Q: 2. Find the differences:**

| Problem             | Solution |
|---------------------|----------|
| (a) $5.6 - 2.3$     | 3.3      |
| (b) $18 - 8.8$      | 9.2      |
| (c) $10.4 - 4.5$    | 5.9      |
| (d) $17 - 16.198$   | 0.802    |
| (e) $17 - 0.05$     | 16.95    |
| (f) $34.505 - 18.1$ | 16.405   |
| (g) $9.9 - 9.09$    | 0.81     |
| (h) $6.236 - 0.487$ | 5.749    |

### Decimal Sequences

**? Q: Identify the pattern and extend each sequence:**

| Sequence                     | Rule  | Next 3 Terms        |
|------------------------------|-------|---------------------|
| 4.4, 4.8, 5.2, 5.6, 6.0, ... | +0.4  | 6.4, 6.8, 7.2       |
| 4.4, 4.45, 4.5, ...          | +0.05 | 4.55, 4.60, 4.65    |
| 25.75, 26.25, 26.75, ...     | +0.5  | 27.25, 27.75, 28.25 |
| 10.56, 10.67, 10.78, ...     | +0.11 | 10.89, 11.00, 11.11 |
| 13.5, 16, 18.5, ...          | +2.5  | 21.0, 23.5, 26.0    |
| 8.5, 9.4, 10.3, ...          | +0.9  | 11.2, 12.1, 13.0    |
| 5, 4.95, 4.90, ...           | -0.05 | 4.85, 4.80, 4.75    |
| 12.45, 11.95, 11.45, ...     | -0.5  | 10.95, 10.45, 9.95  |
| 36.5, 33, 29.5, ...          | -3.5  | 26.0, 22.5, 19.0    |

## Final Figure It Out — Complete Solutions

### 1. Convert Fractions to Decimals

| Fraction           | Working   | Decimal |
|--------------------|-----------|---------|
| $\frac{5}{100}$    | $= 0.05$  | 0.05    |
| $\frac{16}{1000}$  | $= 0.016$ | 0.016   |
| $\frac{12}{10}$    | $= 1.2$   | 1.2     |
| $\frac{254}{1000}$ | $= 0.254$ | 0.254   |

### 2. Convert Decimals to Tenths + Hundredths + Thousandths

| Decimal | Breakdown                           |
|---------|-------------------------------------|
| 0.34    | $3/10 + 4/100$                      |
| 1.02    | $1 + 2/100$ (or $100/100 + 2/100$ ) |
| 0.8     | $8/10$                              |
| 0.362   | $3/10 + 6/100 + 2/1000$             |

#### 4. Arrange in Descending Order

| Set                                       | Descending Order                           |
|-------------------------------------------|--------------------------------------------|
| 11.01, 1.011, 1.101, 11.10, 1.01          | $11.10 > 11.01 > 1.101 > 1.011 > 1.01$     |
| 2.567, 2.675, 2.768, 2.499, 2.698         | $2.768 > 2.698 > 2.675 > 2.567 > 2.499$    |
| 4.678g, 4.595g, 4.600g, 4.656g, 4.666g    | $4.678 > 4.666 > 4.656 > 4.600 > 4.595$    |
| 33.13m, 33.31m, 33.133m, 33.331m, 33.313m | $33.331 > 33.313 > 33.31 > 33.133 > 33.13$ |

#### 7. Mahi's Shopping Problem

**? Q: Mahi buys: 0.25 kg beans + 0.3 kg carrots + 0.5 kg potatoes + 0.2 kg capsicums + 0.05 kg ginger. Total weight?**

**Solution:**

$$\begin{aligned}
 &0.25 + 0.30 + 0.50 + 0.20 + 0.05 \\
 &= 0.25 + 0.30 = 0.55 \\
 &0.55 + 0.50 = 1.05 \\
 &1.05 + 0.20 = 1.25 \\
 &1.25 + 0.05 = 1.30 \text{ kg}
 \end{aligned}$$

☒ **Final Answer: Total weight = 1.30 kg = 1.3 kg**

#### 8. Pinto's Milk Problem

**? Q: First 3 days: 3.79 L + 4.2 L + 4.25 L. Total in 6 days = 25 L. Find last 3 days' supply.**

**Solution:**

**Step 1:** First 3 days total =  $3.79 + 4.2 + 4.25$

$$3.79 + 4.20 = 7.99$$

$$7.99 + 4.25 = 12.24 \text{ L}$$

**Step 2:** Last 3 days =  $25 - 12.24 = 12.76 \text{ L}$

☒ **Final Answer: Last 3 days total = 12.76 L**

#### 9. Tinku's Weight Problem

**? Q: Tinku: January = 35.75 kg, February = 34.50 kg. Gained or lost? How much?**

**Solution:**

$$\text{Change} = 35.75 - 34.50 = 1.25 \text{ kg}$$

Since January weight > February weight, Tinku LOST weight.

☒ Final Answer: Tinku lost 1.25 kg of weight

## 10. Extend the Pattern

**? Q: 5.5, 6.4, 6.39, 7.29, 7.28, 8.18, 8.17, \_\_\_\_\_, \_\_\_\_\_**

**Solution — Identify the rule:**

- $5.5 \rightarrow 6.4$ :  $+0.9$
- $6.4 \rightarrow 6.39$ :  $-0.01$
- $6.39 \rightarrow 7.29$ :  $+0.9$
- $7.29 \rightarrow 7.28$ :  $-0.01$
- Pattern: alternately  $+0.9$  and  $-0.01$
- $8.17 + 0.9 = 9.07$ , then  $9.07 - 0.01 = 9.06$

☒ Final Answer: Next two terms = 9.07, 9.06

## 11. Millimetres in 1 Kilometre

**? Q: How many millimetres make 1 kilometre?**

**Solution:**

- 1 km = 1000 m
- 1 m = 100 cm
- 1 cm = 10 mm
- 1 km =  $1000 \times 100 \times 10$  mm = 1,000,000 mm

☒ Final Answer: 1 km = 10,00,000 mm (10 lakh mm)

## 12. Railway Insurance Problem

**? Q: Insurance = 45 paise/passenger. If 1 lakh passengers opt, what is total fee?**

**Solution:**

- 45 paise = ₹0.45
- 1 lakh = 1,00,000 passengers
- Total fee =  $1,00,000 \times ₹0.45 = ₹45,000$

☒ Final Answer: Total insurance fee = ₹45,000

## 13. Which is Greater?

| Comparison                       | Conversion                              | Answer                    |
|----------------------------------|-----------------------------------------|---------------------------|
| 10/1000 or 1/10?                 | $10/1000 = 1/100 = 0.01$ ; $1/10 = 0.1$ | 1/10 is greater           |
| One-hundredth or 90 thousandths? | $1/100 = 0.01$ ; $90/1000 = 0.09$       | 90 thousandths is greater |
| One-thousandth or 90 hundredths? | $1/1000 = 0.001$ ; $90/100 = 0.9$       | 90 hundredths is greater  |

## 14. Write in Decimal Form

| Quantity | Working | Decimal |
|----------|---------|---------|
|----------|---------|---------|

|                                            |                                  |        |
|--------------------------------------------|----------------------------------|--------|
| 87 ones, 5 tenths, 60 hundredths           | $87 + 0.5 + 0.60 = 88.10$        | 88.10  |
| 12 tens and 12 tenths                      | $120 + 1.2 = 121.2$              | 121.2  |
| 10 tens, 10 ones, 10 tenths, 10 hundredths | $100 + 10 + 1 + 0.1 = 111.1$     | 111.1  |
| 25 tens, 25 ones, 25 tenths, 25 hundredths | $250 + 25 + 2.5 + 0.25 = 277.75$ | 277.75 |

## 16. Fractions to Decimals

| Fraction      | Working            | Decimal |
|---------------|--------------------|---------|
| $\frac{1}{2}$ | $= \frac{5}{10}$   | 0.5     |
| $\frac{3}{2}$ | $= \frac{15}{10}$  | 1.5     |
| $\frac{1}{4}$ | $= \frac{25}{100}$ | 0.25    |
| $\frac{3}{4}$ | $= \frac{75}{100}$ | 0.75    |
| $\frac{1}{5}$ | $= \frac{2}{10}$   | 0.2     |
| $\frac{4}{5}$ | $= \frac{8}{10}$   | 0.8     |

## Chapter Summary — Key Points to Remember

### ★ SUMMARY OF KEY CONCEPTS ★

#### PLACE VALUE SYSTEM

1 unit = 10 tenths | 1 tenth = 10 hundredths | 1 hundredth = 10 thousandths  
 100 hundredths = 1 unit | 10 hundredths = 1 tenth

#### DECIMAL POINT

The decimal point ('.') separates whole number part from fractional part.

#### MEASUREMENT CONVERSIONS

1 mm = 0.1 cm | 1 cm = 0.01 m | 1 g = 0.001 kg | 1 paisa = 0.01 rupee

#### OPERATIONS

Adding/subtracting decimals: Line up decimal points. Add/subtract column by column. Carry and borrow as in whole numbers.

#### COMPARING DECIMALS

Compare digit by digit from highest place value (left to right). First unequal digit determines which is greater.

#### TRAILING ZEROS

$0.2 = 0.20 = 0.200$  (trailing zeros after decimal don't change value)