CHAPTER 10: DECIMALS

DECIMALS

LEARNING OBJECTIVES

This lesson will help you to:

- study about the concept of decimals.
- study about the conversion of a fraction into a decimal.
- learn to compare the fractions.
- study about the basic mathematical functions of decimals.

Real Life Examples

One of the most instances will be money! Whenever we have some numbers of cents that do not add up to a full dollar, we express the amount as a decimal. For example $3.75, $12.69, and even $100 are all examples of decimals.

QUICK CONCEPT REVIEW

➢ Decimals?

- Decimals are also a way of expressing whole numbers like fractions and percentage.
- Decimals are used in situations which require more precision than whole numbers can provide. Three and one – fourth dollars is an amount between 3 dollars and 4 dollars. We use decimals to write this amount as $3.25.
- A decimal may have both a whole number part and a fractional part. The whole-number part of a decimal is those digits to the left of the decimal point. The fractional part of a decimal is represented by the digits to the right of the decimal point. The decimal point is used to separate these parts.
- Decimal is denoted by a small dot (.)

Examples:

Decimal	Whole – number part	Fractional part
3.25	3	25
4.172	4	172
0.168	0	168

❖ PLACE VALUE AND DECIMALS

- The zeros before the whole part and the zeros after the decimal part of a decimal number do not matter.

  345.65

(2)

- Decimal numbers are written according to some rules. The decimal rules are also consistent with normal whole numbers. A decimal number can be thought of as two numbers plus together. The first number is the whole part, and the other one is the decimal part. Therefore 3.45 is 3 plus with .45.

❖ The leading zeros

Let's look at a normal whole number; 345

Hundreds	Tens	Units (ones)
3	4	5

We can break the number up to see how the number 345 is constructed.

The construction of a number 345 actually means 3 of 100s + 4 of 10s + 5 of ones.

Now imagine extending this number 345 to show some hidden numbers. These numbers have been taken away because they have no real value at all

Thousands	Hundreds	Tens	Unit (ones)
0	3	4	5

❖ Amazing Fact

When we add two decimal numbers, the answers will have the same number of decimal digits ads the given numbers.

Historical Preview

According to Joseph Needham, decimal fractions were first developed and used by the Chinese in the 1st century BC, and then spread to the Middle East and from there to Europe.

The Jewish mathematician Immanuel Bonfils invented decimal fractions around 1350.

Similarly the construction of the number 0345 is 0 of 1000s + 3 of 100s + 4 of 10s + 5 of ones.

We can see that 0 of 1000s means zero. So we do not count the number of 0s leading a number.

The trailing zeros after the decimal part of a decimal number.

Let's look at this number 0.650

Decimal point	Tenths / 10th	Hundredth / 100th	Thousandths / 1000th
0	3	4	5

The construction of this decimal part of a decimal number means

6/10 + 5/100 + 0/1000.

We can see that 0 out of 1000 is nothing. So we can ignore this 0. What it means is that 0.65 is the same as 0.650.

Similarly 0.6500 is the same as 0.65 because it means

6/10 + 5/100 + 0/1000 + 0/10000.

➢ ADDITION AND SUBTRACTION OF DECIMALS

❖ To add decimal numbers

1. Put the numbers in a vertical column, aligning the decimal points.
2. Add each column of digits, starting on the right and working left. If the sum of a column is more than ten, "carry" digits to the next column on the left.
3. Place the decimal point in the answer directly below the decimal points in the terms.

Let's look at an example:

123 + 0.0079 + 43.5 =

To add these numbers, first arrange the terms vertically, aligning the decimal points in each term. Don't forget, for a whole number like the first term, the decimal point lies just to the right of the ones column. You can add zeroes to the right of the decimal point to make it easier to align the columns. Then add the columns working from the right to the left, positioning the decimal point in the answer directly under the decimal points in the terms.

123.0000

0.0079

+43.5000

166.5079

❖ To subtract decimal numbers:

1. Put the numbers in a vertical column, aligning the decimal points.
2. Subtract each column, starting on the right and working left. If the digit being subtracted in column is larger than the digit above it, "borrow" digit from the next column to the left.
3. Place the decimal point in the answer directly below the decimal points in the terms.
4. Check your answer by adding the result to the number subtracted. The sum should equal the first number.

Here's a subtraction example:

27.583 – 0.2 =

To subtract these numbers, first arrange the terms vertically, aligning the decimal points in each term. You can add zeroes to the right of the decimal point, to make it easier to align the columns. Then subtract the columns working from the right to the left, putting the decimal point in the answer directly underneath the decimal points in the terms. Check your answer by adding it to the second term and making sure it equals the first.

$$\begin{array}{r} 27.583 \\ -\,0.200 \\ \hline 27.383 \end{array}$$

Note: To add (or subtract) decimals, always fill empty place values with zeros so that all of the numbers have the same number of decimal places.

➢ CONVERTING FRACTIONS INTO DECIMALS

Fractions and decimals are two different ways to show the same values; parts of wholes.

Step 1: Find a number you can multiply by the bottom of the fraction to make it 10, or 100, or 1000, or any 1 followed by 0s.

Step 2: Multiply both top and bottom by that number.

Step 3: Then write down just the top number, putting the decimal point in the correct spot. (one space from the right hand side for every zero in the bottom number.)

Misconcept/Concept

Misconcept: Longer decimal numeral is larger.

Concept: This misconception is not true. Example: Let's take two numbers 2.54869 and 3.01. As we can see, the first number is longer than the second number, but it is not larger than the second numeral. 3.01 > 2.4869

❖ ROUNDING OF DECIMALS

1. Find the place value you want (the "rounding digit") and look at the digit just to the right of it.
2. If that digit is less than 5, do not change the rounding digit but drop all digits to the right of it.
3. If that digit is greater than or equal to five, add one to the rounding digit and drop all digits to the right of it.
4. If you're dealing with a decimal number, drop all of the digits following the rounding digit.

Questions:

1. Five swimmers are entered into a competition. Four of the swimmers have had their turns. Their scores are 9.8 s, 9.75 s, 9.79 s. and 9.81 s. What score must the last swimmer get in order to win the competition?

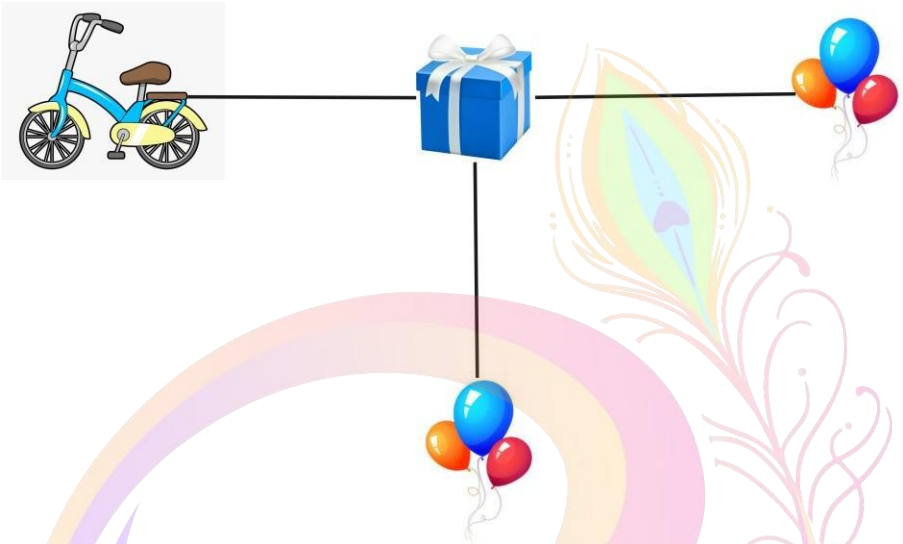
(a) Greater than 9.75 sec

(b) Lesser than 9.75 sec

(c) Greater than 9.81 sec

(d) Lesser than 9.81 sec

2. The gift shop is 15.6 kilometres east of the bicycle shop and 44.5 kilometres west of the party supply store. The grocery store is 50.2 kilometres south of the gift shop. Which is closer to the gift shop?



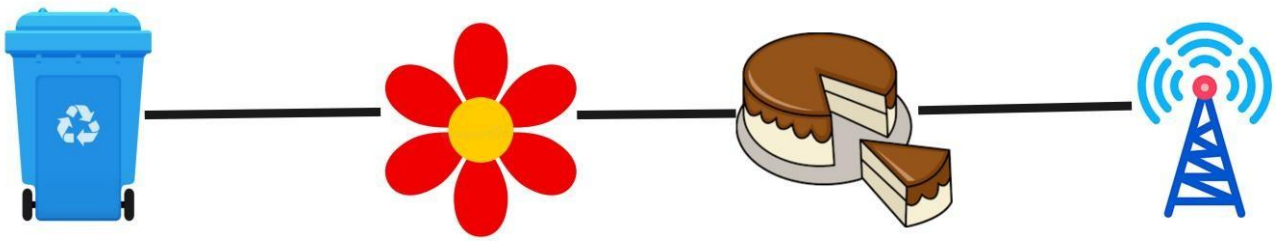
(a) Bicycle shop

(b) Grocery shop

(c) Party supply store

(d) All are at equal distance

3. The garbage dump is 24.3 miles west of the flower shop. The bakery is 43.2 miles east of the flower shop. The bakery is 26.1 miles west of the radio tower. How far apart are the bakery and the garbage dump?



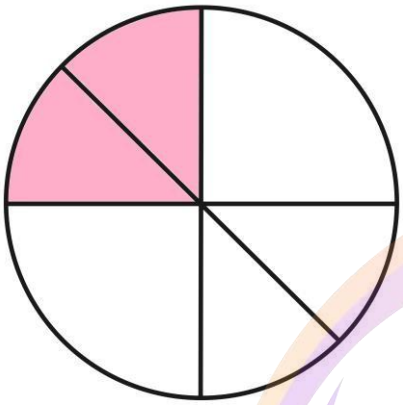
(a) 93.6 miles

(b) 68.6 miles

(c) 67.5 miles

(c) 69.3 miles

4. Write the shaded portion in the decimal form.



(a) 0.333

(b) 0.6

(c) 10.3

(d) 3.3

5. How many tens, units and tenths are there in 75.6?

(a) 7 tens, 5 units and 6 tenths

(b) 7 tens, 6 units and 5 tenths

(c) 6 tens, 5 units and 7 tenths

(c) 5 tens, 7 units and 6 tenths