Exercise 2.3

Rules for Finding the Characteristic

(i) For a number greater than 1:

Characteristic = number of digits to the left of the decimal point - 1

(ii) For a number less than 1:

 $Characteristic = -(number\ of\ zeros\ between\ the\ decimal\ point\ and\ the\ first\ non\ zero\ digit+1)$

Note: When the characteristic is negative, we write it with *bar*.

Logarithm of a Number

Logarithm = Characteristic + Mantissa

1. Find the characteristic of the following numbers:

(i) 5287

$$Characteristic = 4 - 1$$

= 3

(ii) 59.28

$$Characteristic = 2 - 1$$

= 1

(iii) 0.0567

Characteristic =
$$-(1+1)$$

= $\overline{2}$

(iv) 234.7

$$Characteristic = 3 - 1$$

= 2

(v) 0.000049

$$Characteristic = -(4+1)$$
$$= \overline{5}$$

(vi) 145000

$$Characteristic = 6 - 1$$

= 5

2. Find the logarithm of the following numbers:

(i) 43

$$Characteristic = 2 - 1 = 1$$
 $Mantissa = 0.6335$ (Table Value = 6335)
 $log 43 = 1 + 0.6335$
 $log 43 = 1.6335$

(ii) 579

Characteristic =
$$3 - 1 = 2$$

Mantissa = 0.7627 (Table Value = 7627)
 $\log 579 = 2 + 0.7627$
 $\log 579 = 2.7627$

(iii) 1.982

Characteristic =
$$1 - 1 = 0$$

Mantissa = 0.2971 (Table Value = $2967 + 4 = 2971$)

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$$\log 1.982 = 0 + 0.2971$$
$$\log 1.982 = 0.2971$$

(iv) 0.0876

$$Characteristic = -(1 + 1) = -2$$

 $Mantissa = 0.9425$ (Table Value = 9425)
 $\log 0.0876 = -2 + 0.9425$
 $\log 0.0876 = -1.0575$

(v) 0.047

$$Characteristic = -(1 + 1) = -2$$
 $Mantissa = 0.6721$ (Table Value = 6721)
 $\log 0.047 = -2 + 0.6721$
 $\log 0.047 = -1.3279$

(vi) 0.000354

$$Characteristic = -(3 + 1) = -4$$

 $Mantissa = 0.5490$ ($Table Value = 5490$)
 $log 0.000354 = -4 + 0.5490$
 $log 0.000354 = -3.4510$

Note: The place between the first non-zero digit from left and its next digit is called reference position. For example, in 1332, the reference position is between 1 and 3 (1.332).

3. If $\log 3.177 = 0.5019$, then find:

Since $\log 3.177 = 0.5019$. So, Characteristic = 0 and Mantissa = 0.5019

(i) log 3177

Mantissa =
$$0.5019$$

 $\log 3177 = 3 + 0.5019$
 $\log 3177 = 3.5019$

(ii) log 31.77

$$Characteristic = 2 - 1 = 1$$
 $Mantissa = 0.5019$
 $log 3177 = 1 + 0.5019$
 $log 3177 = 1.5019$

(iii) log 0.03177

Characteristic =
$$-(1 + 1) = -2$$

Mantissa = 0.5019
 $\log 0.03177 = -2 + 0.5019$
 $\log 0.03177 = -1.4981$

4. Find the value of x:

(i) $\log x = 0.0065$

Since
$$\log x = 0.0065$$
. So, Characteristic = 0 and Mantissa = 0.0065
Table value of $0.0065 = 1014 + 1 = 1.015$

So

$$x = Anti \log 0.0065$$
$$x = 1.015$$

Since characteristic = 0, therefore decimal point will be at reference position.

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(ii) $\log x = 1.192$

Since $\log x = 1.192$. So, Characteristic = 1 and Mantissa = 0.192

Table value of 0.192 = 1.556

So

$$x = Anti \log 1.192$$
$$x = 15.56$$

Since characteristic = 1, therefore decimal point will be after 1 digits right from the reference position.

(iii) $\log x = -3.434$

$$\log x = -3.434$$

$$\log x = -4 + 4 - 3.434$$

$$\log x = -4 + 0.566$$

$$\log x = \bar{4}.566$$

Since $\log x = \overline{4}.566$. So, Characteristic = $\overline{4}$ and Mantissa = 0.566

Table value of
$$0.566 = 3.681$$

So

$$x = Anti \log \bar{4}.566$$

$$x = 0.0003681$$

Since $characteristic = \overline{4}$, therefore decimal point will be before 4 digits left from the reference position.

(iv) $\log x = -1.5726$

$$\log x = -1.5726$$

$$\log x = -2 + 2 - 1.5726$$

$$\log x = -2 + 0.4274$$

$$\log x = \overline{2}.4274$$

Since $\log x = \overline{2}$. 4274. So, Characteristic = $\overline{2}$ and Mantissa = 0.4274 and Daska)

Table value of 0.4274 = 2673 + 2 = 2.675

So

$$x = Anti \log \overline{2}.4274$$

$$x = 0.02675$$

Since $characteristic = \overline{2}$, therefore decimal point will be before 2 digits left from the reference position.

(v) $\log x = 4.3561$

Since $\log x = 4.3561$. So, Characteristic = 4 and Mantissa = 0.3561

Table value of
$$0.3561 = 2270 + 1 = 2.271$$

So

$$x = Anti \log 4.3561$$

$$x = 22710$$

Since characteristic = 4, therefore decimal point will be after 4 digits right from the reference position.

(vi) $\log x = -2.0184$

$$\log x = -2.0184$$

$$\log x = -3 + 3 - 2.0184$$

$$\log x = -3 + 0.9816$$

$$\log x = \bar{3}.9816$$

Since $\log x = \bar{3}.9816$. So, Characteristic = $\bar{3}$ and Mantissa = 0.9816

Table value of
$$0.9816 = 9572 + 13 = 9.585$$

So

$$x = Anti \log \overline{3}.9816$$

$$x = 0.009585$$

Since $characteristic = \overline{3}$, therefore decimal point will be before 3 digits left from the reference position.

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