

Exercise 16.1

Question 1:

Find the values of the letters in the following and give reasons for the steps involved.

$$\begin{array}{r} 3 \ A \\ + 2 \ 5 \\ \hline B \ 2 \end{array}$$

Answer:

The addition of A and 5 is giving 2 i.e., a number whose ones digit is 2. This is possible only when digit A is 7. In that case, the addition of A (7) and 5 will give 12 and thus, 1 will be the carry for the next step. In the next step, $1 + 3 + 2 = 6$

Therefore, the addition is as follows.

$$\begin{array}{r} 3 \ 7 \\ + 2 \ 5 \\ \hline 6 \ 2 \end{array}$$

Clearly, B is 6.

Hence, A and B are 7 and 6 respectively.

Question 2:

Find the values of the letters in the following and give reasons for the steps involved.

$$\begin{array}{r} 4 \ A \\ + 9 \ 8 \\ \hline C \ B \ 3 \end{array}$$

Answer:

The addition of A and 8 is giving 3 i.e., a number whose ones digit is 3. This is possible only when digit A is 5. In that case, the addition of A and 8 will give 13 and thus, 1 will be the carry for the next step. In the next step, $1 + 4 + 9 = 14$

Therefore, the addition is as follows.

$$\begin{array}{r} 45 \\ + 98 \\ \hline 143 \end{array}$$

Clearly, B and C are 4 and 1 respectively.

Hence, A, B, and C are 5, 4, and 1

respectively. Question 4:

Find the values of the letters in the following and give reasons for the steps involved.

$$\begin{array}{r} A\ B \\ + 3\ 7 \\ \hline 6\ A \end{array}$$

Answer:

The addition of A and 3 is giving 6. There can be two cases.

(1) First step is not producing a carry

In that case, A comes to be 3 as $3 + 3 = 6$. Considering the first step in which the addition of B and 7 is giving A (i.e., 3), B should be a number such that the units digit of this addition comes to be 3. It is possible only when $B = 6$. In this case, $A = 6 + 7 = 13$. However, A is a single digit number. Hence, it is not possible.

(2) First step is producing a carry

In that case, A comes to be 2 as $1 + 2 + 3 = 6$. Considering the first step in which the addition of B and 7 is giving A (i.e., 2), B should be a number such that the units digit of this addition comes to be 2. It is possible only when $B = 5$ and $5 + 7 = 12$.

$$\begin{array}{r} 2\ 5 \\ + 3\ 7 \\ \hline 6\ 2 \end{array}$$

Hence, the values of A and B are 2 and 5 respectively.

Question 5:

Find the values of the letters in the following and give reasons for the steps involved.

$$\begin{array}{r} \text{A B} \\ \times 3 \\ \hline \text{C A B} \end{array}$$

Answer:

The multiplication of 3 and B gives a number whose ones digit is B again.

Hence, B must be 0 or 5.

Let B is 5.

Multiplication of first step = $3 \times 5 = 15$

1 will be a carry for the next step.

We have, $3 \times A + 1 = CA$

This is not possible for any value of A.

Hence, B must be 0 only. If $B = 0$, then there will be no carry for the next step. We should obtain, $3 \times A = CA$

That is, the one's digit of $3 \times A$ should be A. This is possible when $A = 5$ or 0.

However, A cannot be 0 as AB is a two-digit number.

Therefore, A must be 5 only. The multiplication is as follows.

$$\begin{array}{r} 50 \\ \times 3 \\ \hline 150 \end{array}$$

Hence, the values of A, B, and C are 5, 0, and 1 respectively.

Question 6:

Find the values of the letters in the following and give reasons for the steps involved.

$$\begin{array}{r} \text{A B} \\ \times 5 \\ \hline \text{C A B} \end{array}$$

Answer:

The multiplication of B and 5 is giving a number whose ones digit is B again. This is possible when $B = 5$ or $B = 0$ only.

In case of $B = 5$, the product, $B \times 5 = 5 \times 5 = 25$ will be a carry for the next step.

We have, $5 \times A + 2 = CA$, which is possible for $A = 2$ or $A = 7$. The multiplication is as follows.

$$\begin{array}{r} 25 \quad 75 \\ \times 5 \quad \times 5 \\ \hline 125 \quad 375 \end{array}$$

If $B = 0$,

$$B \times 5 = B \Rightarrow 0 \times 5 = 0$$

There will not be any carry in this step.

In the next step, $5 \times A = CA$

It can happen only when $A = 5$ or $A = 0$

However, A cannot be 0 as AB is a two-digit number.

Hence, A can be 5 only. The multiplication is as follows.

$$\begin{array}{r} 50 \\ \times 5 \\ \hline 250 \end{array}$$

Hence, there are 3 possible values of A, B, and C.

- (i) 5, 0, and 2 respectively
- (ii) 2, 5, and 1 respectively
- (iii) 7, 5, and 3 respectively

Question 7:

Find the values of the letters in the following and give reasons for the steps involved.

$$\begin{array}{r} A \ B \\ \times 6 \\ \hline B \ B \ B \end{array}$$

Answer:

The multiplication of 6 and B gives a number whose one's digit is B again.

It is possible only when $B = 0, 2, 4, 6, \text{ or } 8$

If $B = 0$, then the product will be 0. Therefore, this value of B is not possible.

If $B = 2$, then $B \times 6 = 12$ and 1 will be a carry for the next step.

$6A + 1 = BB = 22 \Rightarrow 6A = 21$ and hence, any integer value of A is not possible.

If $B = 6$, then $B \times 6 = 36$ and 3 will be a carry for the next step.

$6A + 3 = BB = 66 \Rightarrow 6A = 63$ and hence, any integer value of A is not possible.

If $B = 8$, then $B \times 6 = 48$ and 4 will be a carry for the next step.

$6A + 4 = BB = 88 \Rightarrow 6A = 84$ and hence, $A = 14$. However, A is a single digit number. Therefore, this value of A is not possible.

If $B = 4$, then $B \times 6 = 24$ and 2 will be a carry for the next step.

$6A + 2 = BB = 44 \Rightarrow 6A = 42$ and hence, $A = 7$

The multiplication is as follows.

$$\begin{array}{r} 74 \\ \times 6 \\ \hline 444 \end{array}$$

Hence, the values of A and B are 7 and 4 respectively.

Question 8:

Find the values of the letters in the following and give reasons for the steps involved.

$$\begin{array}{r} A1 \\ + 1B \\ \hline B0 \end{array}$$

Answer:

The addition of 1 and B is giving 0 i.e., a number whose ones digit is 0. This is possible only when digit B is 9. In that case, the addition of 1 and B will give 10 and thus, 1 will be the carry for the next step. In the next step, $1 + A + 1 = B$

Clearly, A is 7 as $1 + 7 + 1 = 9 = B$

Therefore, the addition is as follows.

$$\begin{array}{r} 7 \ 1 \\ + 1 \ 9 \\ \hline 9 \ 0 \end{array}$$

Hence, the values of A and B are 7 and 9 respectively.

Question 9:

Find the values of the letters in the following and give reasons for the steps involved.

$$\begin{array}{r} 2 \ A \ B \\ + A \ B \ 1 \\ \hline B \ 1 \ 8 \end{array}$$

Answer:

The addition of B and 1 is giving 8 i.e., a number whose ones digit is 8. This is possible only when digit B is 7. In that case, the addition of B and 1 will give 8. In the next step,

$$A + B = 1$$

Clearly, A is 4.

$4 + 7 = 11$ and 1 will be a carry for the next step. In the next step,

$$1 + 2 + A = B$$

$$1 + 2 + 4 = 7$$

Therefore, the addition is as follows.

$$\begin{array}{r} 2 \ 4 \ 7 \\ + 4 \ 7 \ 1 \\ \hline 7 \ 1 \ 8 \end{array}$$

Hence, the values of A and B are 4 and 7 respectively.

Question 10:

Find the values of the letters in the following and give reasons for the steps involved.

$$\begin{array}{r} 12A \\ + 6AB \\ \hline A09 \end{array}$$

Answer:

The addition of A and B is giving 9 i.e., a number whose ones digits is 9. The sum can be 9 only as the sum of two single digit numbers cannot be 19. Therefore, there will not be any carry in this step.

In the next step, $2 + A = 0$

It is possible only when $A = 8$

$2 + 8 = 10$ and 1 will be the carry for the next step.

$1 + 1 + 6 = A$

Clearly, A is 8. We know that the addition of A and B is giving 9. As A is 8, therefore, B is 1.

Therefore, the addition is as follows.

$$\begin{array}{r} 128 \\ + 681 \\ \hline 809 \end{array}$$

Hence, the values of A and B are 8 and 1 respectively.

Exercise 16.2

Question 1:

If $21y5$ is a multiple of 9, where y is a digit, what is the value of y ?

Answer:

If a number is a multiple of 9, then the sum of its digits will be divisible by 9.

Sum of digits of $21y5 = 2 + 1 + y + 5 = 8 + y$

Hence, $8 + y$ should be a multiple of 9.

This is possible when $8 + y$ is any one of these numbers 0, 9, 18, 27, and so on ... However, since y is a single digit number, this sum can be 9 only. Therefore, y should be 1 only.

Question 2:

If $31z5$ is a multiple of 9, where z is a digit, what is the value of z ?

You will find that there are two answers for the last problem. Why is this so?

Answer:

If a number is a multiple of 9, then the sum of its digits will be divisible by 9.

Sum of digits of $31z5 = 3 + 1 + z + 5 = 9 + z$

Hence, $9 + z$ should be a multiple of 9.

This is possible when $9 + z$ is any one of these numbers 0, 9, 18, 27, and so on ... However, since z is a single digit number, this sum can be either 9 or 18. Therefore, z should be either 0 or 9.

Question 3:

If $24x$ is a multiple of 3, where x is a digit, what is the value of x ?

(Since $24x$ is a multiple of 3, its sum of digits $6 + x$ is a multiple of 3; so $6 + x$ is one of these numbers: 0, 3, 6, 9, 12, 15, 18.... But since x is a digit, it can only be that $6 + x = 6$ or 9 or 12 or 15 . Therefore, $x = 0$ or 3 or 6 or 9 . Thus, x can have any of four different values)

Answer:

Since $24x$ is a multiple of 3, the sum of its digits is a multiple of 3.

Sum of digits of $24x = 2 + 4 + x = 6 + x$

Hence, $6 + x$ is a multiple of 3.

This is possible when $6 + x$ is any one of these numbers 0, 3, 6, 9, and so on ...

Since x is a single digit number, the sum of the digits can be 6 or 9 or 12 or 15 and thus, the value of x comes to 0 or 3 or 6 or 9 respectively.

Thus, x can have its value as any of the four different values 0, 3, 6, or 9.

Question 4:

If $31z5$ is a multiple of 3, where z is a digit, what might be the values of z ?

Answer:

Since $31z5$ is a multiple of 3, the sum of its digits will be a multiple of 3.

That is, $3 + 1 + z + 5 = 9 + z$ is a multiple of 3.

This is possible when $9 + z$ is any one of 0, 3, 6, 9, 12, 15, 18, and so on ... Since z is a single digit number, the value of $9 + z$ can only be 9 or 12 or 15 or 18 and thus, the value of x comes to 0 or 3 or 6 or 9 respectively.

Thus, z can have its value as any one of the four different values 0, 3, 6, or 9.