# 16. Preparation for Algebra

**Vidula** : Sir, my brother said he was studying Algebra. What is Algebra ?

**Sir** : To put it simply, algebra consists of the use of numbers and letters to state and solve problems.

**Ravi** : Does that mean addition and subtraction of letters? How do we do that ?

**Sir** : To prepare for that, let's first learn a few things using numbers.

## ❒ Equality

Whenever we add, subtract, multiply or divide two numbers, the answer we get is always another number. For example, when we add 5 and 3, we get the number 8. We write this as '$5 + 3 = 8$'. Similarly, $13 - 6 = 7$, $12 \div 4 = 3$, $9 \times 1 = 9$.

Now let us think about this in another way.

Suppose that by performing a mathematical operation on two numbers, we have obtained the number 12. Let us find pairs of such numbers. They could be $(6 + 6)$, $(15 - 3)$, $(6 \times 2)$, $(24 \div 2)$, etc.

When we want to say 'a number obtained by adding six and six', it is easier to express it by using brackets like this : $(6 + 6)$

$(15 - 3)$ means 'a number obtained by subtracting 3 from 15'.

$(6 \times 2)$ means 'a number obtained by multiplying 6 by 2'.

$(24 \div 2)$ means 'a number obtained by dividing 24 by 2'.

Arrangements like $(6 + 6)$, $(15 - 3)$, $(6 \times 2)$, $(24 \div 2)$ are called expressions. The value of each of these expressions is 12, which means all these expressions are equal to each other.

We can also write this as $(6 + 6) = (15 - 3)$, $(6 + 6) = (24 \div 2)$, $(6 \times 2) = (15 - 3)$.

An expression such as $(6 + 6) = (15 - 3)$ or $(6 + 6) = (24 \div 2)$ is called an **'equality'**.

$5 + 3 = 8$ , $9 \times 1 = 9$ are also equalities.

### Problem Set 54

1. Using brackets, write three pairs of numbers whose sum is 13. Use them to write three equalities.
2. Find four pairs of numbers, one for each of addition, subtraction, multiplication and division that make the number 18. Write the equalities for each of them.

## ❒ Inequality

The values of $7 + 5$ and $7 \times 5$ are 12 and 35 respectively. It means that they are not equal. To represent 'not equal', the symbol '$\neq$' is used.

To show that $(7 + 5)$ and $(7 \times 5)$ are not equal, we write $(7 + 5) \neq (7 \times 5)$ in short.

This kind of representation is called an **'inequality'**.

(9 – 5) ≠ (15 ÷ 3) means that the expressions (9 – 5) and (15 ÷ 3) are not equal.

If two expressions are not equal, one of them is greater or smaller than the other. To show greater or lesser values, we use the symbols ‘<’ and ‘>’. Therefore, these symbols can also be used to show inequalities.

The value of (9 – 5) is 4 and the value of (15 ÷ 3) is 5. 4 < 5, so the relation between (9 – 5) and (15 ÷ 3) can be shown as (9 – 5) < (15 ÷ 3) or (15 ÷ 3) > (9 – 5).

✦ Fill in the boxes between the expressions with <, = or > as required.

(1) (9 + 8) $\boxed{\phantom{0}}$ (30 ÷ 2)

9 + 8 = 17, 30 ÷ 2 = 15

17 > 15

Therefore (9 + 8) $\boxed{>}$ (30 ÷ 2)

(2) (16 × 3) $\boxed{\phantom{0}}$ (4 × 12)

16 × 3 = 48, 4 × 12 = 48, 48 = 48

Therefore (16 × 3) $\boxed{=}$ (4 × 12)

(3) (16 – 5) $\boxed{\phantom{0}}$ (2 × 7)

16 – 5 = 11, 2 × 7 = 14,

11 < 14

Therefore (16 – 5) $\boxed{<}$ (2 × 7)

✦ Write a number in the box that will make this statement correct.

(1) (7 × 2) = ( $\boxed{\phantom{0}}$ – 6)

The value of the expression 7 × 2 is 14, so the number in the box has to be one that gives 14 when 6 is subtracted from it. Subtracting 6 from 20 gives us 14.

Therefore (7 × 2) = ( $\boxed{20}$ – 6 )

(2) (24 ÷ 3) < (5 + $\boxed{\phantom{0}}$ )

The value of the expression 24 ÷ 3 is 8, so the number in the box has to be such that when it is added to 5, the sum is greater than 8.

Now, 5 + 1 = 6, 5 + 2 = 7, 5 + 3 = 8. So the number in the box has to be greater than 3. Therefore, writing any number like 4, 5, 6 ... onwards will do. It means that this problem has several answers. (24 ÷ 3) < (5 + $\boxed{4}$ ) is one among many answers. Even if that is true, writing only one answer will be enough to complete this statement.

## Problem Set 55

**1.** Say whether right or wrong.

(1) (23 + 4) = (4 + 23) (2) (9 + 4) > 12 (3) (9 + 4) < 12 (4) 138 > 138

(5) $138 < 138$ (6) $138 = 138$ (7) $(4 \times 7) = 30 - 2$ (8) $\frac{25}{5} > 5$

(9) $(5 \times 8) = (8 \times 5)$ (10) $(16 + 0) = 0$ (11) $(16 + 0) = 16$ (12) $(9 + 4) = 12$

**2.** Fill in the blanks with the right symbol from <, > or =.

(1) $(45 \div 9)\ \square\ (9 - 4)$ (2) $(6 + 1)\ \square\ (3 \times 2)$ (3) $(12 \times 2)\ \square\ (25 + 10)$

**3.** Fill in the blanks in the expressions with the proper numbers.

(1) $(1 \times 7) = (\square \times 1)$ (2) $(5 \times 4) > (7 \times \square)$ (3) $(48 \div 3) < (\square \times 5)$

(4) $(0 + 1) > (5 \times \square)$ (5) $(35 \div 7) = (\square + \square)$ (6) $(6 - \square) < (2 + 3)$

## ❒ Using letters

Symbols are frequently used in mathematical writing. The use of symbols makes the writing very short. For example, using symbols, 'Division of 75 by 15 gives us 5' can be written in short as '$75 \div 15 = 5$'. It is also easier to grasp.

**Letters can be used like symbols to make our writing short and simple.**

While adding, subtracting or carrying out other operations on numbers, you must have discovered many properties of the operations.

For example, what properties do you see in sums like (9 + 4), (4 + 9)?

The sum of any two numbers and the sum obtained by reversing the order of the two numbers is the same.

Now see how much easier and faster it is to write this property using letters.

- Let us use $a$ and $b$ to represent any two numbers. Their sum will be '$a + b$'.

Changing the order of those numbers will make the addition '$b + a$'. Therefore, the rule will be : 'For all values of $a$ and $b$, $(a + b) = (b + a)$.'

Let us see two more examples.

- Multiplying any number by 1 gives the number itself. In short, $a \times 1 = a$.
- Given two unequal numbers, the division of the first by the second is not the same as the division of the second by the first.

In short, if $a$ and $b$ are two different numbers, then $(a \div b) \neq (b \div a)$.

Take the value of $a$ as 8 and $b$ as 4 and verify the property yourself.

## Problem Set 56

**1.** Use a letter for 'any number' and write the following properties in short.

(1) The sum of any number and zero is the number itself.

(2) The product of any two numbers and the product obtained after changing the order of those numbers is the same.

(3) The product of any number and zero is zero.

**2.** Write the following properties in words :

(1) $m - 0 = m$ (2) $n \div 1 = n$