

# Mathematics

## Chapter 11: Algebra



## Important Questions

### Multiple Choice Questions:

Question 1. The rule, which gives the number of matchsticks required to make the matchstick pattern L, is

- (a)  $2n$
- (b)  $3n$
- (c)  $4n$
- (d)  $5n$ .

Question 2. The rule, which gives the number of matchsticks required to make the matchstick pattern C, is:

- (a)  $2n$
- (b)  $3n$
- (c)  $4n$
- (d)  $5n$ .

Question 3. The rule, which gives the number of matchsticks required to make the matchstick pattern F, is:

- (a)  $2n$
- (b)  $3n$
- (c)  $4n$
- (d)  $5n$ .

Question 4. The rule, which gives the number of matchsticks required to make the matchstick pattern U, is

- (a)  $2n$
- (b)  $3n$
- (c)  $4n$
- (d)  $5n$ .

Question 5. The rule, which gives the number of matchsticks required to make the matchstick pattern V, is:

- (a)  $2n$
- (b)  $3n$
- (c)  $4n$
- (d)  $5n$ .

Question 6. The rule, which gives the number of matchsticks required to make

the matchstick pattern A, is:

- (a)  $2n$
- (b)  $3n$
- (c)  $4n$
- (d)  $5n$ .

Question 7. The rule, which gives the number of matchsticks required to make the matchstick pattern [], is

- (a)  $2n$
- (b)  $3n$
- (c)  $4n$
- (d)  $5n$

Question 8. The rule, which gives the number of matchsticks required to make the matchstick pattern  $\cong$ , is:

- (a)  $2n$
- (b)  $3n$
- (c)  $4n$
- (d)  $5n$ .

Question 9. The rule, which gives the number of matchsticks required to make the matchstick pattern E, is:

- (a)  $2n$
- (b)  $3n$
- (c)  $4n$
- (d)  $5n$ .

Question 10. The rule, which gives the number of matchsticks required to make the matchstick pattern A, is:

- (a)  $3n$
- (b)  $An$
- (c)  $5n$
- (d)  $6n$ .

Question 11. The rule, which gives the number of matchsticks required to make the matchstick pattern A, is

- (a)  $3n$
- (b)  $4n$
- (c)  $5n$

(d)  $6n$ .

Question 12. The rule, which gives the number of matchsticks required to make the matchstick pattern S, is:

- (a)  $3l$
- (b)  $4n$
- (c)  $5n$
- (d)  $6n$ .

Question 13. The side of a square is  $l$ . Its perimeter is:

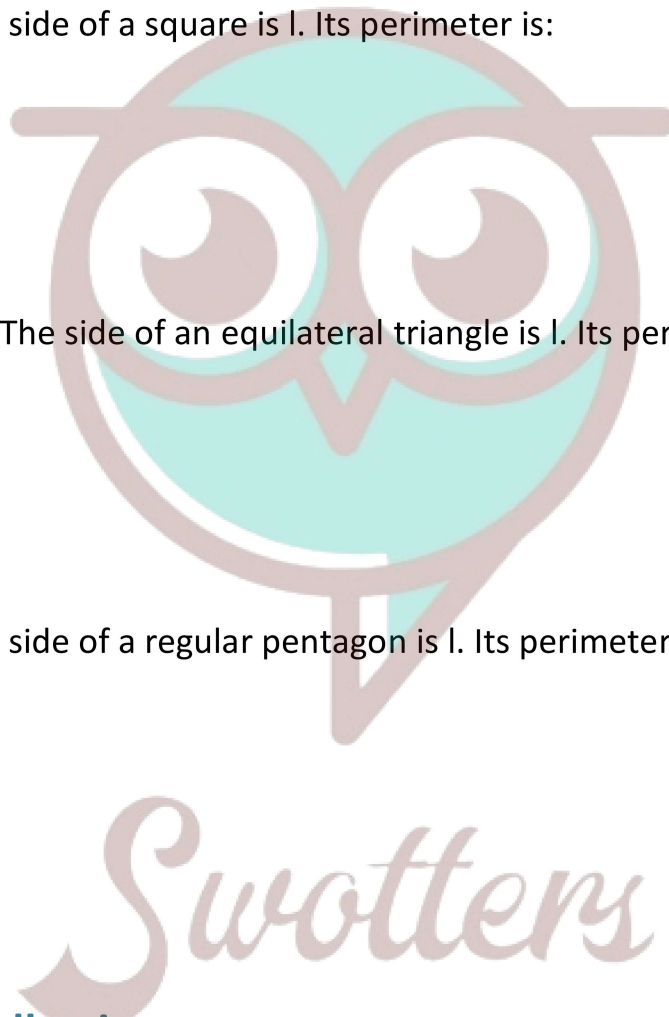
- (a)  $3l$
- (b)  $2l$
- (c)  $4l$
- (d)  $6l$

Question 14. 14. The side of an equilateral triangle is  $l$ . Its perimeter is:

- (a)  $l$
- (b)  $2l$
- (c)  $3l$
- (d)  $6l$ .

Question 15. The side of a regular pentagon is  $l$ . Its perimeter is:

- (a)  $3l$
- (b)  $6l$
- (c)  $4l$
- (d)  $5l$



**Match The Following:**

	Column I		Column II
1.	3 times $y$ added to 13	A.	$5y - 8$
2.	8 subtracted from 5 times $y$	B.	$3x - 5$
3.	5 reduced from 3 times $x$	C.	$2x + 5$
4.	5 added to double of $x$	D.	$3y + 13$

**Fill in the blanks:**

1. The value of  $2x - 12$  is zero, when  $x =$  \_\_\_\_\_.
2. The product of 2 and  $x$  is being added to the product of 3 and  $y$  is expressed as \_\_\_\_\_.
3. The numerical coefficient of the terms  $\frac{1}{2}xy^2 + \frac{1}{2}xy^2$  is \_\_\_\_\_.
4. The no. of terms in the expression  $3x^2y - 4x^2y^2 + \frac{1}{2}xy^2 - 5x$  is \_\_\_\_\_.

### True /False:

1. The parts of an algebraic exponent which are connected by + or – sign are called its terms.
2. 5 times  $x$  subtracted from 8 times  $y$  is  $5x - 8y$ .
3. A number having fixed value is called variable.
4. The numerical coefficient of  $-2x^2y$  is  $-2$ .

### Very Short Questions:

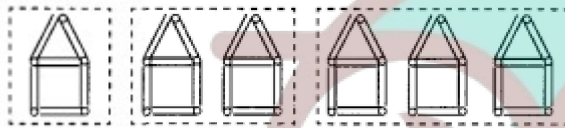
1. Write which letters give us the same rule as that given by L.
2. Rearrange the terms of the following expressions in ascending order of powers of  $x$ :  
 $5x^2, 2x, 4x^4, 3x^3, 7x^5$
3. Give expressions for the following
  - i. 7 added to
  - ii. 7 subtracted from
  - iii.  $p$  multiplied by
  - iv.  $p$  divided by
  - v. 7 subtracted
  - vi.  $-p$  multiplied by
  - vii.  $-p$  divided by
  - viii.  $p$  multiplied by  $-5$ .
4. The teacher distributes 5 pencils per student. Can you tell how many pencils are needed, given the number of students? (Use  $s$  for number of students.)
5. Form expressions using  $y, 2$  and  $7$ . Every expression must have  $y$  in it. use only two number operations. These should be different.
6. Find the value of the expression  $2x - 3y + 4z$ , if  $x = 10, y = -12$  and  $z = 11$ .
7. Six less than a number equals to two. What is the number?
8. Write an algebraic expression for each of the following:

- (a) 3 subtracted from a number  $y$ .
  - (b) 5 is added to three times a number  $x$ .
9. Write an algebraic expression for the following expressions:
- (a) The sum of a number  $x$  and 4 is doubled.
  - (b) One fourth of a number  $x$  is added to one third of the same number.

**Short Questions:**

1. Think of a number  $x$ . Multiply it by 3 and add 5 to the product and subtract  $y$  subsequently. Find the resulting number.

2. Here is a pattern of houses with matchsticks:



Write the general rule for this pattern.

3. If the side of an equilateral triangle is  $x$ , find its perimeter.

4. If  $x = 3$ , find the value of the following:

- (i)  $x + 5$
- (ii)  $2x - 3$
- (iii)  $x - 7$
- (iv)  $\frac{x}{3} - 1$

5. If  $x = 2$ ,  $y = 3$  and  $z = 5$ , find the value of;

- (a)  $2x + y + z$
- (b)  $4x - y + z$
- (c)  $x - y + z$

6. State which of the following are equations with a variable?

- (a)  $12 = x - 5$
- (b)  $2x > 7$
- (c)  $\frac{x}{2} = 5$
- (d)  $5 + 7 = 3 + 9$
- (e)  $7 = (11 \times 5) - (12 \times 4)$

7. Think of a number, add 2 to it and then multiply the sum by 6, the result is 42.

8. The side of a regular hexagon is  $s$  cm. Find its perimeter.

9. If  $a = 3$ ,  $b = \frac{1}{2}$  and  $c = \frac{1}{4}$ , find the value of



$$\frac{2ab - bc}{3ac}$$

10. Complete the table and find the solution of the equation  $19 - x = 13$

$x$	2	3	4	5	6	7	8	9	10	----
$19 - x$										

**Long Questions:**

- If  $x = -\frac{1}{2}$ ,  $y = \frac{1}{4}$  and  $z = 0$ , find the value of the given expressions
  - $8z + 2x - y$
  - $z - y + 3x$
- A starts his car from Delhi at 6.00 am to Amritsar. The uniform speed of his car is  $x$  km/h. At 12.00 noon, he finds that he is still 50 km away from Amritsar. Find the distance between Delhi and Amritsar.
- Anshika's Score in Science is 15 more than the two-third of her score in Sanskrit. If she scores  $x$  marks in Sanskrit, find her score in Science.
- Deepak's present age is one-third his mother's present age. If the mother's age was five times his age 6 years ago, what are their present ages?

**Assertion and Reason Questions:**

1.) **Assertion (A)** – The rule, which gives the number of matchsticks required to make the matchstick pattern L, is  $2n$ .

**Reason (R)** – For  $n = 1$ , the number of matchsticks required =  $2 \times 1 = 2$

- Both A and R are true and R is the correct explanation of A
- Both A and R are true but R is not the correct explanation of A
- A is true but R is false
- A is false but R is true

2.) **Assertion (A)** – The rule, which gives the number of matchsticks required to make the matchstick pattern C, is  $3n$

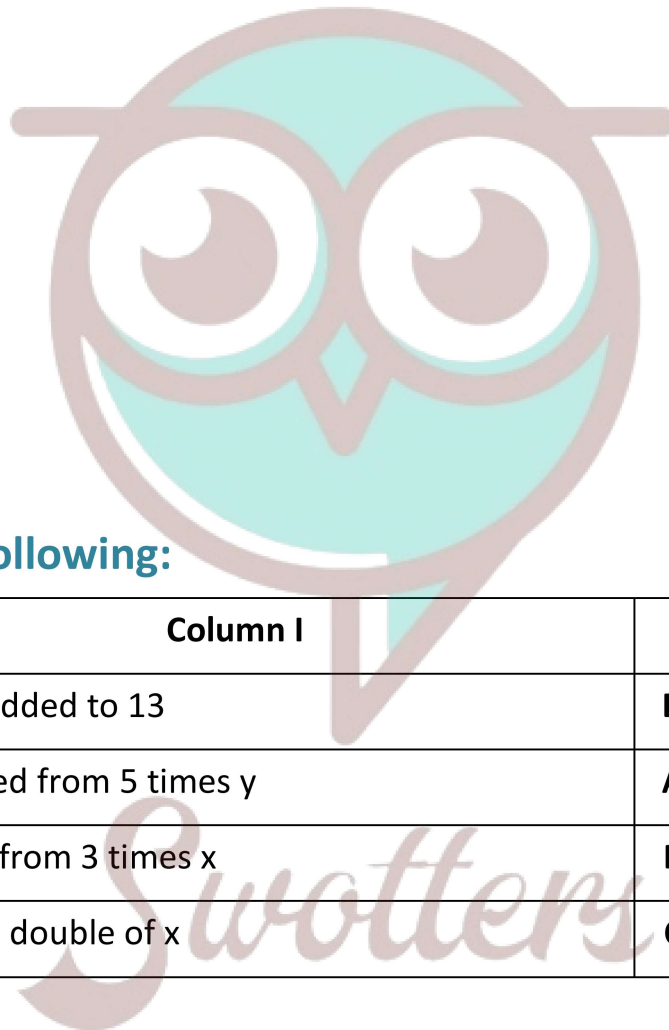
**Reason (R)** – For  $n = 2$ , the number of matchsticks required =  $2 \times 2 = 4$

- Both A and R are true and R is the correct explanation of A
- Both A and R are true but R is not the correct explanation of A
- A is true but R is false
- A is false but R is true

**ANSWER KEY -**

**Multiple Choice questions:**

1. (a)  $2n$
2. (b)  $3n$
3. (c)  $4n$
4. (b)  $3n$
5. (a)  $2n$
6. (b)  $3n$
7. (c)  $4n$
8. (a)  $2n$
9. (d)  $5n$
10. (c)  $5n$
11. (a)  $3n$
12. (c)  $5n$
13. (c)  $4l$
14. (c)  $3l$
15. (d)  $5l$



**Match The Following:**

	Column I		Column II
1.	3 times y added to 13	D.	$3y + 13$
2.	8 subtracted from 5 times y	A.	$5y - 8$
3.	5 reduced from 3 times x	B.	$3x - 5$
4.	5 added to double of x	C.	$2x + 5$

**Fill in the blanks:**

1. The value of  $2x - 12$  is zero, when  $x = \underline{6}$ .
2. The product of 2 and x is being added to the product of 3 and y is expressed as  $2x + 3y$ .
3. The numerical coefficient of the terms  $\frac{1}{2}xy^2 + \frac{1}{2}xy^2$  is  $\frac{1}{2}$ .
4. The no. of terms in the expression  $3x^2y - 4x^2y^2 + \frac{1}{2}xy^2 - 5x$  is 4.

**True /False:**



1. True
2. False
3. False
4. True

### Very Short Answer:

1. The other letters which give us the same rule as L are T, V and X because the number of matchsticks required to make each of them is 2.
2. If the given terms are arranged in the ascending order of powers of  $x$ , we get,  $2x, 5x^2, 3x^3, 4x^4, 7x^5$ .
3. (i)  $p + 7$   
 (ii)  $p - 7$   
 (iii)  $7p$   
 (iv)  $\frac{p}{7}$   
 (v)  $-m - 7$   
 (vi)  $-5p$   
 (vii)  $-\frac{p}{5}$   
 (viii)  $-5p$ .
4. Number of pencils to be distributed to each student = 5  
 And, let the number of students in class be 's'.  
 As per the logic, Number of pencils needed = (Number of students in the class)  $\times$  (Number of pencils to be distributed to one student)  
 So, Number of pencils needed =  $5 \times s = 5s$ .
5. The different expressions that can be formed are:  $2y + 7, 2y - 7, 7y + 2, 7y - 2, (y/2) - 7, (y/7) - 2, y - (7/2), y + (7/2)$
6. Given expression =  $2x - 3y + 4z$   
 If  $x = 10, y = -12$  and  $z = 11$ ,  
 The expression becomes,  $(2 \times 10) - (3 \times -12) + (4 \times 11)$   
 $= 20 - (-36) + 44$   
 $= 20 + 36 + 44$   
 $= 100$ .
7. Let the number be 'x'.  
 According to condition, we have  $x - 6 = 2$   
 By inspections, we have  $8 - 6 = 2$   
 $\therefore x = 8$

Thus, the required number is 8.

8. (a) The required expression is  $y - 3$   
 (b) The required expression is  $5 + 3x$
9. (a) The required expression is  $2x(x + 4)$   
 (b) The required expression is  $\frac{1}{4}x + \frac{1}{3}x$

**Short Answer:**

1. Required number is  $(3x + 5)$   
 Now we have to subtract  $y$  from the result i.e.,  $3x + 5 - y$
2. One house is made of 6 matchsticks i.e.  $6 \times 1$   
 Two houses are made of 12 matchsticks i.e.  $6 \times 2$   
 Three houses are made of 18 matchsticks i.e.  $6 \times 3$   
 $\therefore$  Rule is  $6n$  where  $n$  represents the number of houses.
3. We know that the three sides of an equilateral triangle are equal.  
 $\therefore x + x + x = 3x$ .  
 Thus, the required perimeter =  $3x$  units.
4. Given that  $x = 3$   
 (i)  $x + 5 = 3 + 5 = 8$   
 (ii)  $2x - 3 = 2 \times 3 - 3 = 6 - 3 = 3$   
 (iii)  $x - 7 = 3 - 7 = -4$   
 (iv)  $\frac{x}{3} - 1 = \frac{3}{3} - 1 = 1 - 1 = 0$
5. (a) Given that:  $x = 2$ ,  $y = 3$  and  $z = 5$   
 $\therefore 2x + y + z = 2 \times 2 + 3 + 5$   
 $= 4 + 3 + 5 = 12$   
 (b)  $4x - y + z = 4 \times 2 - 3 + 5$   
 $= 8 - 3 + 5 = 5 + 5 = 10$   
 (c)  $x - y + z = 2 - 3 + 5 = -1 + 5 = 4$
6. (a)  $12 = x - 5$  is an equation with a variable  $x$ .  
 (b)  $2x > 7$  is not an equation because it does not have '=' sign.  
 (c)  $x^2 = 5$  is an equation with a variable  $x$ .  
 (d)  $5 + 7 = 3 + 9$  is not an equation because it has no variable.  
 (e)  $7 = (11 \times 5) - (12 \times 4)$  is not an equation because it has no variable.
7. Let the number be  $x$ .

∴ Sum of  $x$  and  $2 = x + 2$

Now by multiplying the sum by  $6$ , we get

$$6 \times (x + 2) = 42$$

$$\Rightarrow 6 \times x + 6 \times 2 = 42$$

$$\Rightarrow 6x + 12 = 42$$

By inspection, we get

$$6 \times 5 + 12 = 42$$

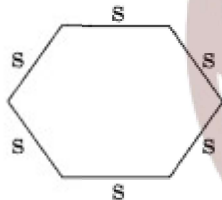
$$\Rightarrow 30 + 12 = 42$$

$$\therefore 42 = 42$$

So, the required number =  $5$

8. Each side of a regular hexagon =  $s$

∴ its perimeter =  $s + s + s + s + s + s = 6s$  cm



9.

Given that  $a = 3$ ,  $b = \frac{1}{2}$  and  $c = \frac{1}{4}$

$$\therefore \frac{2ab - bc}{3ac} = \frac{2 \times 3 \times \frac{1}{2} - \frac{1}{2} \times \frac{1}{4}}{3 \times 3 \times \frac{1}{4}}$$

$$= \frac{\frac{6}{2} - \frac{1}{8}}{\frac{9}{4}} = \frac{\frac{6 \times 4}{2 \times 4} - \frac{1 \times 1}{8 \times 1}}{\frac{9}{4}}$$

$$= \frac{\frac{24 - 1}{8}}{\frac{9}{4}} = \frac{23}{8} \times \frac{4}{9} = \frac{23}{2 \times 9} = \frac{23}{18}$$

10. By inspection, we have

$x$	2	3	4	5	6	7	8	9	10	----
$19 - x$	17	16	15	14	13	12	11	10	9	----

Thus, the required solution is  $6$ .

**Long Answer:**

1.

$$\begin{aligned} (a) \quad 8z + 2x - y &= 8 \times 0 + 2\left(-\frac{1}{2}\right) - \frac{1}{4} \\ &= 0 - 1 - \frac{1}{4} \\ &= \frac{-1 \times 4 - 1 \times 1}{4} = \frac{-4 - 1}{4} = \frac{-5}{4} \end{aligned}$$

$$\begin{aligned} (b) \quad z - y + 3x &= 0 - \frac{1}{4} + 3\left(-\frac{1}{2}\right) \\ &= 0 - \frac{1}{4} - \frac{3}{2} = \frac{-1 \times 1}{4 \times 1} - \frac{3 \times 2}{2 \times 2} \\ &= \frac{-1 - 6}{4} = \frac{-7}{4} \end{aligned}$$

2. Time taken by A to reach Amritsar = 12.00 noon – 6.00 am = 6 hour.

The uniform speed of the car = x km/ hr

∴ Total distance covered by A = Time x speed = 6x km.

∴ Distance between Delhi and Amritsar = (6x + 50) km

3. Anshika's score in Sanskrit = x

∴ Her marks in Science =  $\frac{2}{3}x + 15$

∴ Thus, Anshika's score in Science =  $\frac{2}{3}x + 15$

4. Let present age of mother = x years

Deepak's present age =  $\frac{x}{3}$  years

6 years ago, mother's age = (x – 6) years

Deepak's age =  $\left(\frac{x}{3} - 6\right)$  years

According to the problem, 6 years ago, mother's age is 5 times Deepak age.

$$\text{i.e., } (x - 6) = 5 \times \left(\frac{x}{3} - 6\right) = 5 \times \left(\frac{x}{3} - 6\right)$$

$$x - \frac{5x}{3} = -30 + 6 \quad x - \frac{5x}{3} = -30 + 6$$

$$\frac{3x - 5x}{3} = -24 \quad \frac{3x - 5x}{3} = -24$$

$$\frac{-2x}{3} = -24 \quad \frac{-2x}{3} = -24$$

$$2x = 24 \times 3 \quad 2x = 24 \times 3$$

$$x = \frac{72}{2} = 36 \quad x = \frac{72}{2} = 36$$

Therefore, present age of mother = 36 years and