CHAPTER 2

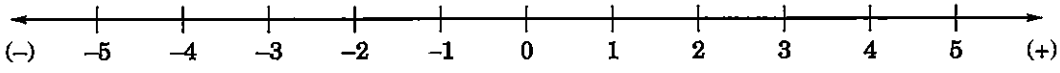
Whole Numbers

Understanding the Lesson

- Natural numbers and whole numbers.
- Successor and predecessor of natural numbers and whole numbers.
- The number line and representation of whole numbers on it.
- Addition and subtraction of whole number on number line.
- Properties of whole number.
- Closure property:
  - (*a*) Commutative property of addition and multiplication.
  - (*b*) Associative property of addition and multiplication.
  - (*c*) Distributive property of multiplication over addition.
  - (*d*) Identity (for addition and multiplication).
- Patterns in whole numbers.

Conceptual Facts

- The numbers 1, 2, 3, 4, 5, ... which are used for counting are known as natural numbers. They are represented by N.
- All natural numbers together with zero are called whole numbers. They are represented by W. So, W = 0, 1, 2, 3, 4, ...
- Every natural number is a whole number but reverse not true.
- 0 is the smallest whole number whereas 1 is the smallest natural number.
- We have no largest natural number or whole number.
- The successor of a whole number is 1 more than the whole number.
- The predecessor of a whole number is 1 less than the whole number but 0 has no predecessor.
- All the natural numbers and whole numbers can be represented on number line.
- On number line, positive numbers are taken on right side of the zero and negative numbers on left side.



- Properties of whole numbers

  If a, b, c are any whole numbers, then

  (*i*) Closure property for addition: $a + b$ is a whole number.

  (*ii*) Closure property for multiplication: $a \times b$ is a whole number.

  (*iii*) Commutative property for addition: $a + b = b + a$.

  (*iv*) Commutative property for multiplication: $a \times b = b \times a$

  (*v*) Associative property for addition: $a + (b + c) = (a + b) + c$

  (*vi*) Associative property for multiplication: $a \times (b \times c) = (a \times b) \times c$

(*vii*) Distributive property: $a \times (b + c) = a \times b + a \times c$

(*viii*) Identity for addition: $a + 0 = 0 + a = a$

(*ix*) Identity for multiplication: $a \times 1 = 1 \times a = a$

(*x*) $0 \div a = 0$ but $a \div 0$ is not defined.

Solutions to NCERT Textbook Questions

TRY THESE (*PAGE 28*)

Q1. Write the predecessor and successor of:
19; 1997; 12000; 49; 100000.

Sol. (*i*) Predecessor of 19 = 19 – 1 = 18
Successor of 19 = 19 + 1 = 20

(*ii*) Predecessor of 1997 = 1997 – 1 = 1996
Successor of 1997 = 1997 + 1 = 1998

(*iii*) Predecessor of 12000 = 12000 – 1 = 11999
Successor of 12000 = 12000 + 1 = 12001

(*iv*) Predecessor of 49 = 49 – 1 = 48
Successor of 49 = 49 + 1 = 50

(*v*) Predecessor of 100000 = 100000 – 1 = 99999
Successor of 100000 = 100000 + 1 = 100001

Q2. Is there any natural number that has no predecessor?

Sol. Since, 1 – 1 = 0 which is not a natural number. Hence natural number 1 has no predecessor.

Q3. Is there any natural number which has no successor? Is there a last natural number?

Sol. All natural numbers have successors. There is no last natural number.

TRY THESE (*PAGE 29*)

Q1. Are all natural numbers also whole numbers?

Sol. Yes, all the natural numbers are also whole numbers.

Q2. Are all whole numbers also natural numbers?

Ans. No, all whole numbers are not natural numbers. Example: 0 is the whole number but 0 is not the natural number.

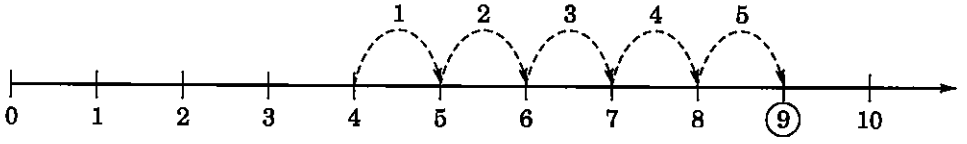
Q3. Which is the greatest whole number?

Ans. There is no such greatest whole number.

TRY THESE (*PAGE 30*)

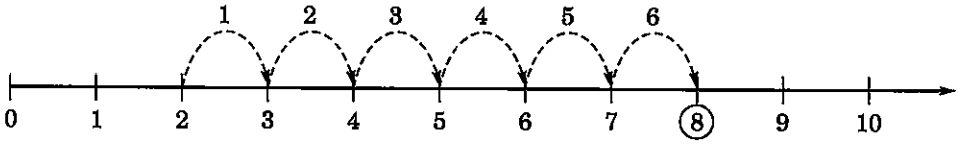
Q1. Find 4 + 5; 2 + 6; 3 + 5 and 1 + 6 using the number line.

(*i*) 4 + 5



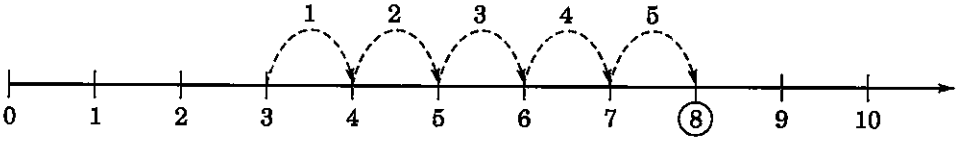
Start from 4 and count 5 more divisions on number line to reach at 9. Hence,4 + 5 = 9.

(*ii*) 2 + 6



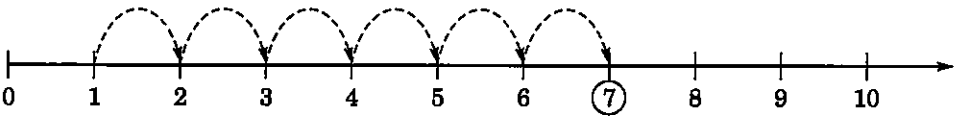
Start from 2 and count 6 more divisions on number line to get 8.

(*iii*) 3 + 5



Start from 3 and count 5 more divisions on number line reach at 8.
Hence, 3 + 5 = 8.

(*iv*) 1 + 6

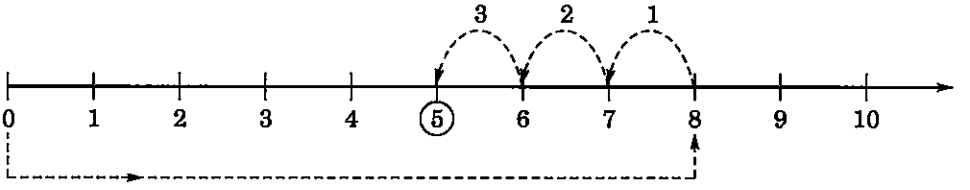


Start from 1 and count 6 more divisions on number line to reach at 7.
Hence, 1 + 6 = 7.

TRY THESE (*PAGE 30*)

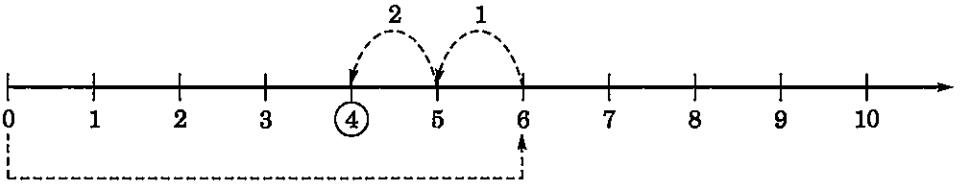
Q1. Find 8 – 3; 6 – 2; 9 – 6 using the number line.

Sol. (*i*) 8 – 3



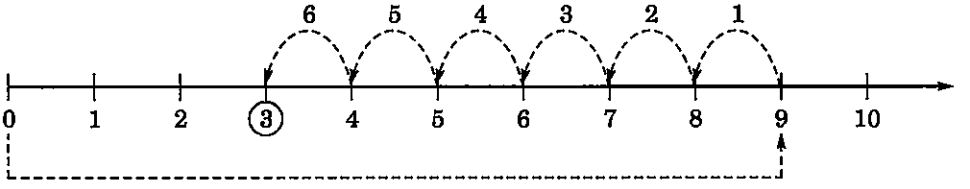
Start from 0 to 8 then count 3 divisions to negative side on number line to reach at 5.
Hence, 8 – 3 = 5.

(*ii*) 6 – 2



Start from 0 to 6 then count 2 divisions to the negative side on the number line to reach at 4.
Hence, 6 – 2 = 4.

(*iii*) 9 – 6



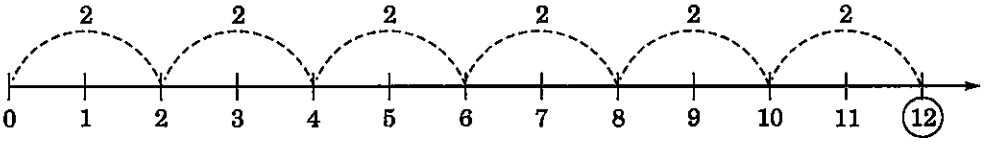
Start from 0 to 9 then count 6 divisions to the left on the number line to reach at 3.
Hence, 9 – 6 = 3

TRY THESE (*PAGE 31*)

Q1. Find 2 × 6; 3 × 3; 4 × 2 using the number line.

Sol. (*i*) 2 × 6

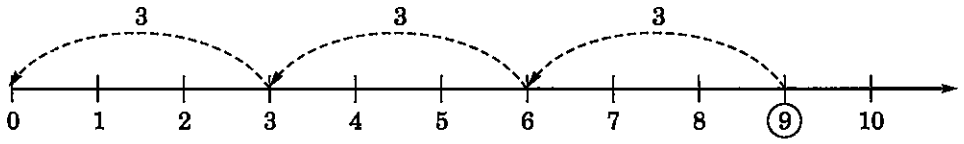
We have 2 × 6 = 2 + 2 + 2 + 2 + 2 + 2



Start from 0 and then count 2 divisions 6 times on the number line to reach at 12
Hence, 2 × 6 = 12.

(*ii*) 3×3

We have $3 \times 3 = 3 + 3 + 3$

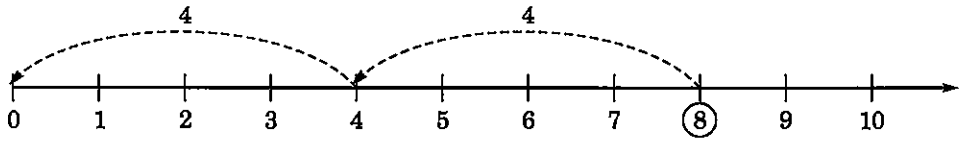


Start from 0 and then count 3 divisions 3 times on the number line to reach at 9.

Hence, $3 \times 3 = 9$.

(*iii*) 4×2

We have $4 \times 2 = 4 + 4$



Start from 0 and then count 4 division 2 times on the number line to reach at 8.

Hence, $4 \times 2 = 8$.

EXERCISE 2.1

Q1. Write the next three natural numbers after 10999.

Sol. The next three natural numbers after 10999 are 11000, 11001 and 11002.

Q2. Write three whole numbers occurring just before 10001.

Sol. $10001 - 1 = 10000$

$10000 - 1 = 9999$

$9999 - 1 = 9998$

Hence, three whole numbers just before 10001 are 10000, 9999 and 9998.

Q3. Which is the smallest whole number?

Sol. 0 is the smallest whole number.

Q4. How many whole numbers are there between 32 and 53?

Sol. The whole numbers between 32 and 53 are 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52.

Q5. Write the successor of:

(*a*) 2440701 (*b*) 100199

(*c*) 1099999 (*d*) 2345670

Sol. (*a*) Successor of 244070 is $244070 + 1 = 244071$

Hence, successor of 244070 is 244071.

(*b*) Successor of 100199 is $100199 + 1 = 100200$

Hence, successor of 100199 is 100200

(*c*) Successor of 1099999 is $1099999 + 1 = 1100000$

Hence, successor of 1099999 is 1100000

(*d*) Successor of 2345670 is $2345670 + 1 = 2345671$

Hence, successor of 2345670 is 2345671

Q6. Write the predecessor of:

(*a*) 94 (*b*) 10000

(*c*) 208090 (*d*) 7654321

Sol. (*a*) Predecessor of 94 is $94 - 1 = 93$

Hence, predecessor of 94 is 93.

(*b*) Predecessor of 1000 is $10000 - 1 = 9999$

Hence, predecessor of 10000 is 9999.

(*c*) Predecessor of 208090 is $208090 - 1 = 208089$

Hence, predecessor of 208090 is 208089.

(*d*) Predecessor of 7654321 is $7654321 - 1 = 7654320$

Hence, predecessor of 7654321 is 7654320.

Q7. In each of the following pairs of numbers, state which whole number is on the left of the other number on the number line. Also write them with the appropriate sign (>, <) between them.

(*a*) 530, 503

(*b*) 370, 307

(*c*) 98765, 56789

(*d*) 9830415, 10023001

Sol. We know that the smaller number is always on the left side of the greater number on number line.

(*a*) 530, 503

Clearly 503 is smaller than 530.

Hence, 503 will be on left side of 530 on number line.

Expression: $503 < 530$ or $530 > 503$

(*b*) 307 < 370

Clearly 307 is smaller than 370.

Hence, 307 will be on the left side of 370 on number line.

Expression: 307 < 370 or 370 > 307.

(*c*) 98765, 56789

Clearly 56789 is smaller than 98765.

Hence, 56789 will be on left side of 98765 on number line.

Expression: 56789 < 98765 or 98765 > 56789.

(*d*) 9830415, 10023001

Clearly, 9830415 is smaller than 10023001

Hence, 9830415 will be on the left side of 10023001 on the number line.

Expression: 9830415 < 10023001 or 10023001 > 9830415.

Q8. Which of the following statements are true (T) and which are false (F)?

(*a*) Zero is the smallest natural number.

(*b*) 400 is the predecessor of 399.

(*c*) Zero is the smallest whole number.

(*d*) 600 is the successor of 599.

(*e*) All natural numbers are whole numbers.

(*f*) All whole numbers are natural numbers.

(*g*) The predecessor of a two-digit number is never a single-digit number.

(*h*) 1 is the smallest whole number.

(*i*) The natural number 1 has no predecessor.

(*j*) The whole number 1 has no predecessor.

(*k*) The whole number 13 lies between 11 and 12.

(*l*) The whole number 0 has no predecessor.

(*m*) The successor of a two-digit number is always a two-digit number.

Sol. (*a*) This statement is false (F)

(*b*) This statement is false (F)

(c) This statement is true (T)

(*d*) This statement is true (T)

(*e*) This statement is true (T)

(*f*) This statement is false (F)

(*g*) This statement is false (F)

(*h*) This statement is false (F)

(*i*) This statement is true (T)

(*j*) This statement is false (F)

(*k*) This statement is false (F)

(*l*) This statement is true (T)

(*m*) This statement is false (F).

TRY THESE (*PAGE 37*)

Q1. Find 7 + 18 + 13; 16 + 12 + 4

Sol. (*i*) 7 + 18 + 13

Using combination of associative and commutative properties, we have

First way: $7 + 18 + 13 = (7 + 18) + 13$

$= 25 + 13 = 38$

Second way: $7 + 18 + 13 = 7 + (18 + 13)$

$= 7 + 31 = 38$

(*ii*) 16 + 12 +4

Using combination of associative and commutative properties, we have

First way: $16 + 12 + 4 = (16 + 12) + 4$

$= 28 + 4 = 32$

Second way: $16 + 12 + 4 = 16 + (12 + 4)$

$= 16 + 16 = 32$

TRY THESE (*PAGE 37*)

Q1. Find : 25 × 8358 × 4; 625 × 3759 × 8

Sol. (*i*) 25 × 8358 × 4

Using associative property of multiplication, we have

$25 \times 8358 \times 4 = (25 \times 4) \times 8358$

$= 100 \times 8358 = 835800$

(*ii*) 625 × 3759 × 8

Using associative property of multiplication, we have

$625 \times 3759 \times 8 = (625 \times 8) \times 3759$

$= 5000 \times 3759$

$= 5 \times 1000 \times 3759$

$= 1000 \times (5 \times 3759)$

$= 1000 \times 18795$

$= 18795000$

TRY THESE (*PAGE 39*)

Q1. Find 15 × 68; 17 × 23; 69 × 78 + 22 × 69 using distributive property.

Sol. (*i*) $15 \times 68 = 15 \times (70 - 2) = 15 \times 70 - 15 \times 2$

[Using distributive property]

$= 1050 - 30 = 1020$

(*ii*) $17 \times 23 = 17 \times (20 + 3) = 17 \times 20 + 17 \times 3$

[Using distributive property]

$= 340 + 51 = 391$

(*iii*) $69 \times 78 + 22 \times 69 = 69 \times (78 + 22)$

[Using distributive property]

$= 69 \times 100 = 6900$

EXERCISE 2.2

Q1. Find the sum by suitable arrangement:

(*a*) 837 + 208 + 363

(*b*) 1962 + 453 + 1538 + 647

Sol. (*a*) 837 + 208 + 363 = (837 + 363) + 208

= 1200 + 208

[Using associative property]

= 1408

(*b*) 1962 + 453 + 1538 + 647

= (1962 + 1538) + (453 + 647)

= 3500 + 1100 = 4600

Q2. Find the product by suitable arrangement:

(*a*) 2 × 1768 × 50 (*b*) 4 × 166 × 25

(*c*) 8 × 291 × 125 (*d*) 625 × 279 × 16

(*e*) 285 × 5 × 60 (*f*) 125 × 40 × 8 × 25

Sol. (*a*) 2 × 1768 × 50 = (2 × 50) × 1768 = 176800

(*b*) 4 × 166 × 25 = 166 × (25 × 4) = 166 × 100

= 16600

(*c*) 8 × 291 × 125 = (8 × 125) × 291 = 1000 × 291

= 291000

(*d*) 625 × 279 × 16 = (625 × 16) × 279

= 10000 × 279 = 2790000

(*e*) 285 × 5 × 60 = 285 × (5 × 60) = 285 × 300

= (300 – 15) × 300

= 300 × 300 – 15 × 300

= 90000 – 4500 = 85500

(*f*) 125 × 40 × 8 × 25 = (125 × 8) × (40 × 25)

= 1000 × 1000 = 1000000

Q3. Find the value of the following:

(*a*) 297 × 17 + 297 × 3

(*b*) 54279 × 92 + 8 × 54279

(*c*) 81265 × 169 – 81265 × 69

(*d*) 3845 × 5 × 782 + 769 × 25 × 218

Sol. (*a*) 297 × 17 × 297 × 3 = 297 × (17 + 3)

= 297 × 20 = 297 × 2 × 10

= 594 × 10 = 5940

(*b*) 54279 × 92 + 8 × 54279 = 54279 × (92 + 8)

= 54279 × 100 = 5427900

(*c*) 81265 × 169 – 81265 × 69

= 81265 × (169 – 69) = 81265 × 100

= 8126500

(*d*) 3845 × 5 × 782 + 769 × 25 × 218

= 3845 × 5 × 782 + 769 × 5 × 5 × 218

= 3845 × 5 × 782 + (769 × 5) × 5 × 218

= 3845 × 5 × 782 + 3845 × 5 × 218

= 3845 × 5 × 782 + 3845 × 5 × 218

= 3845 × 5 × (782 + 218)

= 3845 × 5 × 1000

= 19225 × 1000 = 19225000

Q4. Find the product using suitable properties.

(*a*) 738 × 103 (*b*) 854 × 102

(*c*) 258 × 1008 (*d*) 1005 × 168

Sol. (*a*) 738 × 103 = 738 × (100 + 3)

= 738 × 100 + 738 × 3

[Using distributive property]

= 73800 + 2214 = 76014

(*b*) 854 × 102 = 854 × (100 + 2)

= 854 × 100 + 854 × 2

[Using distributive property]

= 85400 + 1708 = 87108

(*c*) 258 × 1008 = 258 × (1000 + 8)

= 258 × 1000 + 258 × 8

[Using distributive property]

= 258000 + 2064 = 260064

(*d*) 1005 × 168 = (1000 + 5) × 168

= 1000 × 168 + 5 × 168

[Using distributive property]

= 168000 + 840 = 168840

Q5. A taxidriver filled his car petrol tank with 40 litres of petrol on Monday. The next day, he filled the tank with 50 litre of petrol. If the petrol cost ₹ 44 per litre, how much did he spend in all on petrol?

Sol. Petrol filled on Monday = 40 litres

Cost of petrol = ₹ 44 per litre

Petrol filled on Tuesday = 50 litre

Cost of petrol = ₹ 44 pet litre

∴ Total money spent in all

= ₹ (40 × 44 + 50 × 44)

= ₹ (40 + 50) × 44 = ₹ 90 × 44

= ₹ 3960

Q6. A vendor supplies 32 litres of milk to a hotel in the morning and 68 litres of milk in the evening. If the milk costs ₹ 15 per litre, how much money is due to the vendor per day?

Sol. Milk supplied in the morning = 32 litres
Cost of milk = ₹ 15 per litre
Milk supplied in the evening = 68 litres
Cost of milk = ₹ 15 per litre

$\therefore$ Money paid to the vendor
= ₹ (32 × 15 + 68 × 15)
= ₹ (32 + 68) × 15 = ₹ 100 × 15
= ₹ 1500

Q7. Match the following:

(*i*) 425 × 136 = 425 × (6 + 30 + 100) — (*a*) Commutativity under multiplication

(*ii*) 2 × 49 × 50 = 2 × 50 × 49 — (*b*) Commutativity under addition

(*iii*) 80 + 2005 + 20 = 80 + 20 + 2005 — (*c*) Distributivity of multiplication over addition

Hence (*i*) ↔ (*c*), (*ii*) ↔ (*a*) and (*iii*) ↔ (*b*)

TRY THESE (*PAGE 42*)

Q1. Which numbers can be shown only as a line?

Sol. The number 2, 5, 7, 11, 13, 14, 17, 19, ... can be shown only as a line. [all number except 1 can be represented as line].

Q2. Which can be shown as squares?

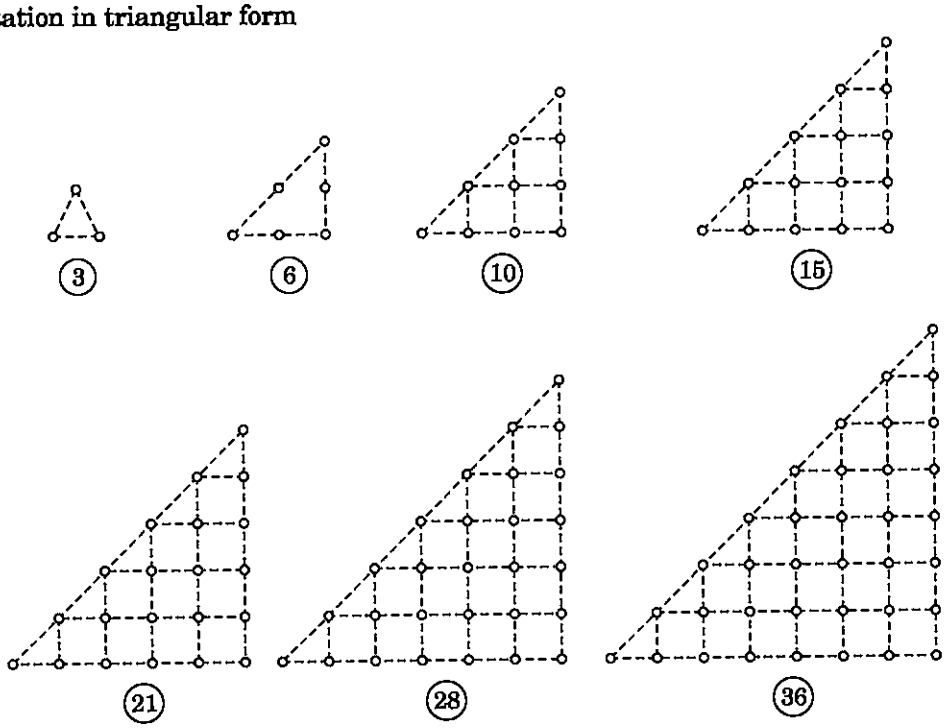
Sol. The number like 2^2, 3^2, 4^2, 5^2, ... i.e., 4, 9, 16, 25, ... can be shown as squares.

Q3. Which can be shown as rectangles?

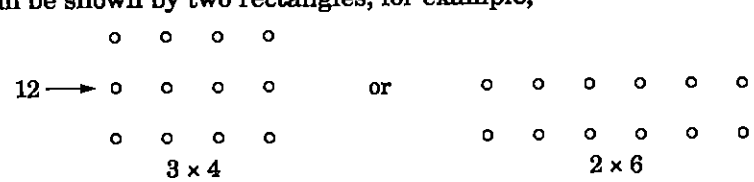
Sol. The number 4, 6, 8, 9, 10, 12, ... can be shown as rectangles.

Q4. Write down the first seven numbers that can be arranged as triangles, e.g., 3, 6, ...

Sol. Representation in triangular form

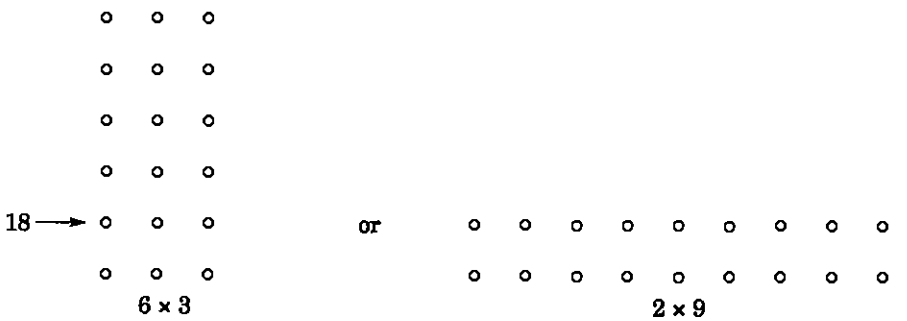


Q5. Some numbers can be shown by two rectangles, for example,

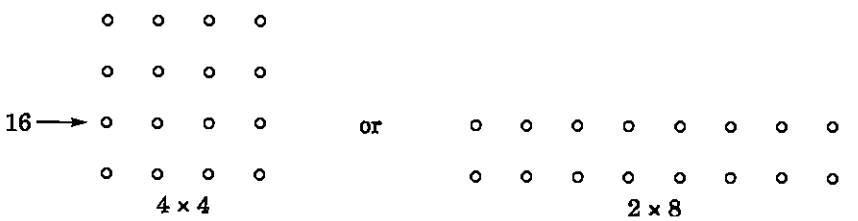


Give at least five other such examples.

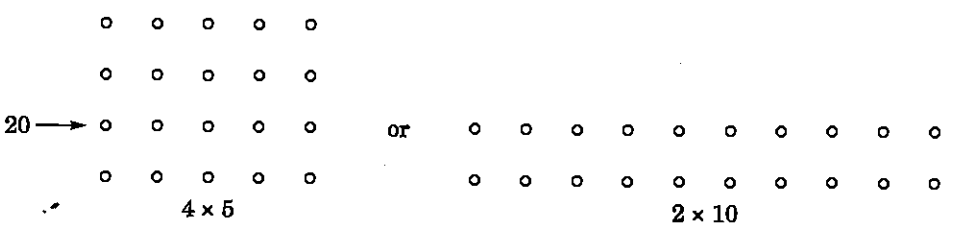
Sol. **Example 1:**



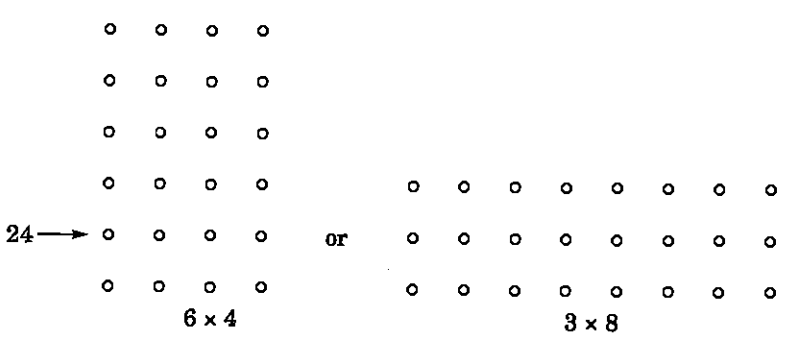
Example 2:



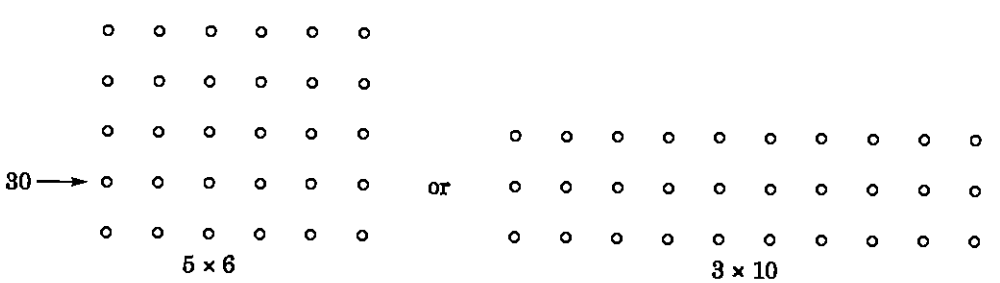
Example 3:



Example 4:



Example 5:



EXERCISE 2.3

Q1. Which of the following will not represent zero:

(a) $1 + 0$ (b) 0×0

(c) $\frac{0}{2}$ (d) $\frac{10 - 10}{2}$

Sol. (a) $1 + 0 = 1 \neq 0$, does not represent zero.

(b) $0 \times 0 = 0$, represents zero

(c) $\frac{0}{2} = 0$, represents zero.

(d) $\frac{10 - 10}{2} = \frac{0}{2} = 0$ represents zero.

Q2. If the product of two whole numbers is zero, can we say that one or both of them will be zero? Justify through examples.

Sol. Yes, Examples:

$5 \times 0 = 0$ $0 \times 8 = 0$ $0 \times 0 = 0$

Q3. If the product of two whole numbers is 1, can we say that one or both of them will be 1? Justify through examples.

Sol. This is only true, when each of the number are 1.

$1 \times 1 = 1$

Q4. Find using distributive property:

(a) 728×101 (b) 5437×1001

(c) 824×25 (d) 4275×125

(e) 504×35

Sol. (a) $728 \times 101 = 728 \times (100 + 1)$

$= 728 \times 100 + 728 \times 1$

$= 72800 + 728 = 73528$

(b) $5437 \times 1001 = 5437 \times (1000 + 1)$

$= 5437 \times 1000 + 5437 \times 1$

$= 5437000 + 5437 = 5442437$

(c) $824 \times 25 = 824 \times (20 + 5)$

$= 824 \times 20 + 824 \times 5$

$= 16480 + 4120 = 20600$

(d) $4275 \times 125 = 4275 \times (100 + 20 + 5)$

$= 4275 \times 100 + 4275 \times 20 + 4275 \times 5$

$= 427500 + 85500 + 21375$

$= 534375$

(e) $504 \times 35 = (500 + 4) \times 35$

$= 500 \times 35 + 4 \times 35$

$= 17500 + 140 = 17640$

Q5. Study the pattern:

$1 \times 8 + 1 = 9$

$12 \times 8 + 2 = 98$

$123 \times 8 + 3 = 987$

$1234 \times 8 + 4 = 9876$

$12345 \times 8 + 5 = 98765$

Write the next two steps. Can you say how the pattern works?

Sol. Step I: $123456 \times 8 + 6 = 987654$

Step II: $1234567 \times 8 + 7 = 9876543$

Working pattern:

$(1) \times 8 + 1 = 9$

$(12) \times 8 + 2 = (11 + 1) \times 8 + 2 = 98$

$(123) \times 8 + 3 = (111 + 11 + 1) \times 8 + 3 = 987$

$(1234) \times 8 + 4 = (1111 + 111 + 11 + 1) \times 8 + 4 = 9876$

$(12345) \times 8 + 5 = (11111 + 1111 + 111 + 11 + 1) \times 8 + 5 = 98765$

Learning More Q & A

I. Very Short Answer (VSA) Questions

Q1. Write the smallest whole number.

Sol. 0 is the smallest whole number.

Q2. What is the predecessor of whole number 0?

Sol. Whole number 0 has no predecessor.

Q3. Which property do the following statements hold?

(a) $6 + 4 = 4 + 6$

(b) $3 + 2$ = whole number

Sol. (a) $6 + 4 = 4 + 6$ holds commutative property of addition

(b) $3 + 2$ = whole number holds closure property.

Q4. Add the following in three ways. Indicate the property used.

(a) $25 + 36 + 15$ (b) $30 + 18 + 22$

Sol. (a) $25 + 36 + 15$

Way I: $25 + (36 + 15) = 25 + 51 = 76$

Way II: $(25 + 36) + 15 = 61 + 15 = 76$

Way III: $(25 + 15) + 36 = 40 + 36 = 76$

Here, we have used associative property.

(b) $30 + 18 + 22$

Way I: $30 + (18 + 22) = 30 + 40 = 70$

Way II: $(30 + 18) + 22 = 48 + 22 = 70$

Way III: $(30 + 22) + 18 = 52 + 18 = 70$

Here, we have used associative property.

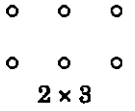
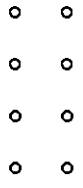
Q5. Using distributive property, solve the following:
(*a*) 360 × 102 (*b*) 35 × 98

Sol. (*a*) 36 × 102 = 36 × (100 + 2)
= 36 × 100 + 36 × 2
= 36000 + 72 = 36072
(*b*) 35 × 98 = 35 × (100 – 2) = 35 × 100 – 35 × 2
= 3500 – 70 = 3430

Q6. Find the product of the greatest 3-digit number and the smallest 2-digit number.

Sol. The greatest 3-digit number = 999
The smallest 2-digit number = 10
∴ Product = 999 × 10 = 9990

Q7. Write any two numbers which can be shown as rectangles.

Sol. (*i*) 6 ⟶ 
2 × 3
(*ii*) 8 ⟶ 
4 × 2

Q8. Write the predecessor of the smallest 4-digit number.

Sol. The smallest 4-digit number = 1000
∴ The predecessor of 1000
= 1000 – 1 = 999

Q9. For $n = 5$, verify the given statement $10 \times n + 1 = n1$

Sol. Given statement is
$10 \times n + 1 = n1$
Put $n = 5$, $10 \times 5 + 1 = 51$
⇒ $50 + 1 = 51$
⇒ 51 = 51. Hence, verified.

Q10. Write the next two steps:

$1 \times 9 + 2 = 11$
$12 \times 9 + 3 = 111$

Sol. Next two steps are
$123 \times 9 + 4 = 1111$ and $1234 \times 9 + 5 = 11111$

II. Short Answer (SA) Questions

Q11. Using the properties, find the values of each of the following:
(*a*) 736 × 102 (*b*) 8165 × 169 – 8165 × 69

Sol. (*a*) 736 × 102 = 736 × (100 + 2)
= 736 × 100 + 736 × 2
[Using distributive property]
= 73600 + 1472 = 75072
(*b*) 8165 × 169 – 8165 × 69
= 8165 × (169 – 69)
[Using distributive property]
= 8165 × 100 = 816500

Q12. Observe the following patterns and extend them by two more terms.

11 × 11 = 121
101 × 101 = 10201
10101 × 10101 = 102030201

Sol. Next two terms are
1010101 × 1010101 = 1020304030201
101010101 × 101010101 = 10203040504030201

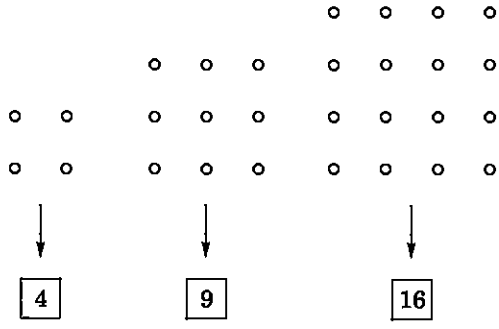
Q13. Observe the following patterns and extend them by two more terms:

15873 × 7 × 1 = 111111
15873 × 7 × 2 = 222222

Sol. Next two terms are
15873 × 7 × 3 = 333333
15873 × 7 × 4 = 444444

Q14. Write the three whole numbers which can be arranged as squares.

Sol. The required number are 4, 9, 16.



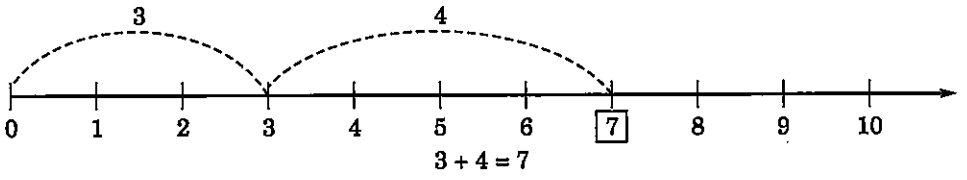
Q15. Using the properties of whole numbers, find the value of the following in suitable way:
(*a*) 945 × 4 × 25
(*b*) 40 × 328 × 25

Sol. (*a*) 945 × 4 × 25 = 945 × (4 × 25)
= 945 × 100 = 94500
(*b*) 40 × 328 × 25 = 328 × (40 × 25)
= 328 × 1000 = 328000

Q16. Represent the following on number line:

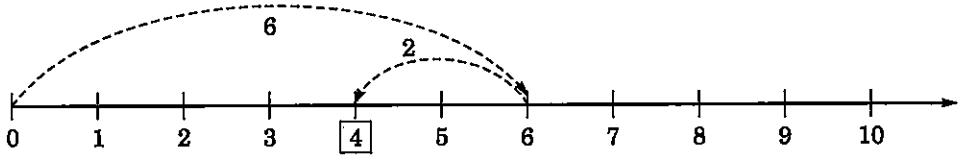
(*a*) 3 + 4 (*b*) 6 – 2 (*c*) 2 × 4

Sol. (*a*) 3 + 4



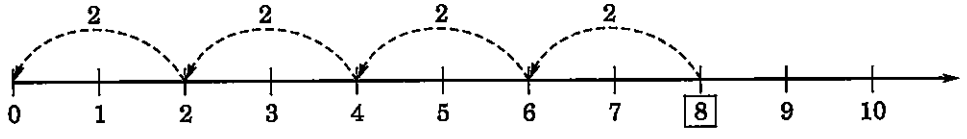
3 + 4 = 7

(*b*) 6 – 2



6 – 2 = 4

(*c*) 2 × 4



2 × 4 = 2 + 2 + 2 + 2 = 8

Q17. Give one example for each of the following properties for whole numbers.

(*a*) Closure property

(*b*) Commutative property

(*c*) Associative property

(*d*) Distributive property

Sol. (*a*) 3 + 4 = 7 (whole number) closure property

(*b*) 4 + 5 = 5 + 4 Commutative property

(*c*) 3 + (5 + 7) = (3 + 5) + 7 Associative property

(*d*) 6 × (8 + 3) = 6 × 8 + 6 × 3 Distributive property.

Q18. A dealer purchased 124 LED sets. If the cost of one set is ₹ 38,540, determine their total cost.

Sol. Total cost of 124 LED sets

= ₹ (38,540 × 124)

= ₹ [38,540 × (100 + 20 + 4)]

= ₹ [38,540 × 100 + 38,540 × 20 + 38,540 × 4]

= ₹ [38,54,000 + 7,70,800 + 1,54,160]

= ₹ 47,789,60

Q19. Find the product of the greatest 3-digit number and the greatest 2-digit number.

Sol. Greatest 3-digit number = 999

Greatest 2-digit number = 99

∴ Product = 999 × 99 = 999 × (100 – 1)

= 999 × 100 – 999 × 1

= 99900 – 999 = 98901

Q20. Write 10 such numbers which can be shown only as line.

Sol. 2, 5, 7, 11, 13, 17, 19, 23, 29 and 31 are such numbers which can be shown only as line.

123 × 9 + 4 = 1111

III. Long Answer (LA) Questions

Q21. 320 km distance is to be covered partially by bus and partially by train. Bus covers 180 km distance with a speed of 40 km/h and the rest of the distance is covered by the train at a speed of 70 km/h. Find the time taken by a passenger to cover the whole distance.

Sol. Total distance = 320 km

Distance covered by the bus = 180 km

Speed of the bus = 40 km/h

$$\therefore \text{ Time taken by the bus} = \frac{\text{Distance}}{\text{Speed}}$$

$$= \frac{180}{40} \text{ hours} = \frac{9}{2} \text{ hours}$$

Distance covered by the train

= 320 – 180 = 140 km.

Speed of the train = 70 km/h

$$\therefore \text{ Time taken by the train} = \frac{\text{Distance}}{\text{Speed}} = \frac{140}{70} \text{ hours} = 2 \text{ hours}.$$

Hence, the total time taken by the passenger

$= \frac{9}{2}$ hours + 2 hours

= 4 hours 30 min + 2 hours

= 6 hours 30 min

Q22. Solve the following and establish a pattern:

(*a*) 84 × 9 (*b*) 84 × 99

(*c*) 84 × 999 (*d*) 84 × 9999

Sol. (*a*) $84 \times 9 = 84 \times (10 - 1) = 84 \times 10 - 84 \times 1$

$= 840 - 84 = 756$

(*b*) $84 \times 99 = 84 \times (100 - 1) = 84 \times 100 - 84 \times 1$

$= 8400 - 84 = 8316$

(*c*) $84 \times 999 = 84 \times (1000 - 1)$

$= 84 \times 1000 - 84 \times 1$

$= 84000 - 84 = 83916$

(*d*) $84 \times 9999 = 84 \times (10000 - 1)$

$= 84 \times 10000 - 84 \times 1$

$= 840000 - 84 = 839916$

Q23. Solve the following with suitable and short-cut method:

(*a*) 86 × 5 (*b*) 86 × 15

(*c*) 86 × 25 (*d*) 86 × 35

(*e*) 86 × 50 (*f*) 96 × 125

(*g*) 96 × 250 (*h*) 112 × 625

Sol. (*a*) $86 \times 5 = 86 \times \frac{10}{2} = 43 \times 10 = 430$

(*b*) $86 \times 15 = 86 \times \frac{30}{2} = 43 \times 30 = 43 \times (10 \times 3)$

$= 430 \times 3 = 1290$

(*c*) $86 \times 25 = 86 \times \frac{100}{4} = 43 \times 50 = 43 \times (10 \times 5)$

$= 430 \times 5 = 2150$

(*d*) $86 \times 35 = \frac{86 \times 70}{2} = 43 \times 70 = 43 \times (10 \times 7)$

$= 430 \times 7 = 3010$

(*e*) $86 \times 50 = 86 \times \frac{100}{2} = 43 \times 100 = 4300$

(*f*) $96 \times 125 = 96 \times \frac{1000}{8} = 12 \times 1000 = 12000$

(*g*) $96 \times 250 = 96 \times \frac{1000}{4} = 24 \times 1000 = 24000$

(*h*) $112 \times 625 = \frac{112 \times 10000}{16} = 7 \times 10000 = 70000$

Q24. Ramesh buys 10 containers of juice from one shop and 18 containers of the same juice from another shop. If the capacity of each container is same and the cost of each of the container is ₹ 150, find the total money spend by Ramesh.

Sol. Ramesh buys 10 containers from one shop

Cost of 1 container = ₹ 150

He buys 18 containers of the same capacity from another shop.

Cost of 1 container = ₹ 150

∴ Total money spent by Ramesh

= ₹ [10 × 150 + 18 × 150] = ₹150 × (10 + 18)

= ₹150 × 28 = ₹4200

Q25. Fill in the blanks.

(*a*) The smallest whole number is ..... .

(*b*) The smallest natural number is ..... .

(*c*) Difference between 5-digit smallest number and 4-digit largest number is ..... .

(*d*) Any number divided by 0 is not ..... .

(*e*) The property used in 84 × 25 = 25 × 84 is ..... .

(*f*) The property used in 80 × (60 + 3) = 80 × 60 + 80 × 3 is ..... .

(*g*) The smallest number which can be shown by two doted rectangles is ..... .

(*h*) Every whole number except ..... is a natural number.

(*i*) When any counting number is multiplied by zero, the product is .....

(*j*) When zero is divided by any non-zero whole number, the quotient is .....

Sol. (*a*) The smallest whole number is **0**.

(*b*) The smallest natural number is **1**.

(*c*) Difference between 5-digit smallest number and 4-digit largest number is **1**.

(*d*) Any number divided by 0 is not **defined**.

(*e*) The property used in 84 × 25 = 25 × 84 is **commutative property**.

(*f*) The property used in 80 × (60 + 3) = 80 × 60 + 80 × 3 is **distributive property**.

(*g*) The smallest number which can be shown by two doted rectangles is **6**.

(*h*) Every whole number except **0** is a natural number.

(*i*) When any counting number is multiplied by zero, the product is **0**.

(*j*) When zero is divided by any non-zero whole number, the product is **0**.

Q26. Which of the following statements are true (**T**) and which are false (**F**)?

(*a*) The sum of two whole numbers is always less than their product.

(*b*) There is only one whole number n such that $n \times n = n$

(c) For two non-zero whole numbers a and b, $a \div b = b \div a$.

(d) The sum of two odd whole numbers is an even number.

(e) There does not exist any whole number m for which $m \div m = m$.

(f) $(16 \div 4) \div 2 = 16 \div (4 \div 2)$

(g) $7 - 8$ = whole number

(h) If 1 is added to a number, we get its successor.

(i) The whole number 15 lies between 14 and 21.

(j) $84 \times (10 + 5) = 84 \times 10 + 84 \times 5$ represents distributive property.

Sol. (a) False statement (b) False statement
(c) False statement (d) True statement
(e) False statement (f) False statement
(g) False statement (h) True statement
(i) True statement (j) True statement.

Q27. The value of $27 \div (9 \div 3)$ is
(a) 3 (b) 6 (c) 9 (d) 27

Sol. $27 \div (9 \div 3) = 27 \div \left(\frac{9}{3}\right) = 27 \div 3 = 9$

Hence, the correct option is (c).

Q28. The whole number 7 can be arranged as,
(a) line (b) square
(c) rectangle (d) triangle

Sol. 7 can be arranged as line.
Hence, the correct option is (a).

VI. Higher Order Thinking Skills (HOTS) Questions

Q29. A housing complex built by DLF consists of 25 large buildings and 40 small buildings. Each large building has 15 floors with 4 apartments on each floor and each small building has 9 floors with 3 apartments on each floor. How many apartments are there in all?

Sol. Number of large buildings = 25
Number of floors = 15
Number of apartments on each floor = 4
$\therefore$ Total number of apartments in large buildings = $25 \times 15 \times 4$
Number of small building = 40
Number of floors = 9
Number of apartments on each floor = 3
$\therefore$ Total number of apartments in small buildings = $40 \times 9 \times 3$
Hence, the number of apartments in all = $25 \times 15 \times 4 + 40 \times 9 \times 3 = 1500 + 1080 = 2580$.

Q30. A school principal places orders for 85 chairs and 25 tables with a dealer. Each chair cost ₹180 and each table cost ₹140. If the principal has given ₹ 2500 to the dealer as an advance money, then what amount to be given to the dealer now?

Sol. Number of chairs = 85
Cost of one chair = ₹ 180
Cost of 85 chairs = ₹ (85×180)
Number of tables = 25
Cost of one table = ₹ 140
Cost of 25 tables = ₹ (25×140)
$\therefore$ Total cost of all chairs and tables
= ₹$(85 \times 180 + 25 \times 140)$
= ₹ $(15300 + 3500)$ = ₹ 18800
Money given in advance = ₹ 2500
$\therefore$ Balance money to be paid to the dealer
= ₹ 18800 – ₹ 2500 = ₹ 16300

Test Yourself

I. Very Short Answer (VSA) Questions

1. Write down the property used in $25 + 31 = 31 + 25$.
2. What is the predecessor of three digit smallest number?
3. What is the successor of the 5-digit greatest number?
4. Is there any whole number which when multiplied by itself gives the same number? If so, find it.
5. Write the whole number which when added to a non-zero whole number, gives the same number.
6. For what value(s) of n, $n \times n = n$ is true?
7. $0 \div 5$. Is it defined?
8. Write down any two whole numbers which can be shown as dotted line.
9. What is the additive identity for whole numbers?
10. What is the multiplicative identity for whole numbers?

II. Short Answer (SA) Questions

11. Using the distributive properties, simplify each of the following:
(a) 108×65
(b) $975 \times 6 + 975 \times 3 + 975$

12. Using the combination of commutativity and associativity, simplify the following:
(*a*) 267 + 83 + 33 (*b*) 8 × 93 × 25
13. An express train moves at a uniform speed of 98 km/hour. Find the distance it will cover in 45 hours.
14. Using suitable properties, simplify the following:
(*a*) 17 × 103 (*b*) 691 × 98
15. Represent the following on number line:
(*a*) 5 – 2 (*b*) 5 × 2
16. Write two numbers which can be shown as rectangles. Also represent by dotted rectangles.
17. Study the pattern and write next two steps:

$1 + 2 + 3 = 2 \times 3 = 6$
$2 + 3 + 4 = 3 \times 3 = 9$
$3 + 4 + 5 = 4 \times 3 = 12$

18. Taking $a = 7, b = 3$ and $c = 1$, verify the following:
(*i*) $a + (b + c) = (a + b) + c$
(*ii*) $a \times (b + c) = a \times b + a \times c$
19. In a class, there are 23 boys and 17 girls. How many students are there in such 8 classes? Write the mathematical statement.
20. Replace each * by a digit to get the correct answer.

(*i*)
$$\begin{array}{r} 9\ 7\ 3 \\ -\ *\ *\ 1 \\ \hline 5\ 3\ * \end{array}$$

(*ii*)
$$\begin{array}{r} 5\ 3\ 7\ 6 \\ -\ *\ *\ 5\ 9 \\ \hline 2\ 5\ *\ * \end{array}$$

III. Long Answer (LA) Questions

21. There are 5 sections in class X in a public school and there are 43 students in each section. If the monthly bus charges from each student be ₹ 345; find the total collection of bus fees from class X.
22. Observe the following pattern and extend them by two more terms:

$121 \times (1 + 2 + 1) = 22 \times 22$
$12321 \times (1 + 2 + 3 + 2 + 1) = 333 \times 333$
$1234321 \times (1 + 2 + 3 + 4 + 3 + 2 + 1) = 4444 \times 4444$

23. Fill in the blanks.
(*a*) 31 × 10 = ... × 31
(*b*) 115 × 0 = ...
(*c*) 89 + (45 + 75) = (89 + 45) + ...
(*d*) 0 ÷ *k* = ...
(*e*) ..... × 11 = 11 × 85
(*f*) 85 × 45 = 85 × 5 (40 + ...)
(*g*) The difference between the smallest whole number and the smallest natural number is ..... .
(*h*) Whole number 16 can be shown as .....
(*i*) 0 is called the ..... identity for whole numbers.
(*j*) The sum of two odd numbers is ..... number.

24. Match the following:

(*a*) 95 × 1 = 95	(*i*) Associative property of addition
(*b*) 3 × 47 × 50 = 3 × 50 × 47	(*ii*) Distributive property
(*c*) 231 + (375 + 17) = (231 + 375) + 17	(*iii*) Commutative property
(*d*) 71 × (32 – 2) = (71 × 32) – (71 × 2)	(*iv*) Multiplicative identity
(*e*) 317 × 115 = 115 × 317	(*v*) Commutative and associative property

ANSWERS

1. Commutative
2. 99
3. 100000
4. 0 and 1
5. 0
6. $n = 0$ and $n = 1$
7. Yes
8. 5 and 7
9. 0
10. 1
11. (*a*) 7020 (*b*) 9750
12. (*a*) 383 (*b*) 18600
13. 4410 km
14. (*a*) 1751 (*b*) 67718
16. 6 and 8 or 8 and 12
17. 4 + 5 + 6 = 5 × 3 = 15, 5 + 6 + 7 = 6 × 3 = 18
19. 320
20. (*a*)
$$\begin{array}{r} 9\ 7\ 3 \\ -\ 4\ 4\ 1 \\ \hline 5\ 3\ 2 \end{array}$$
(*b*)
$$\begin{array}{r} 5\ 3\ 7\ 6 \\ -\ 2\ 8\ 5\ 9 \\ \hline 2\ 5\ 1\ 7 \end{array}$$

21. ₹ 74175

22. $123454321 \times (1 + 2 + 3 + 4 + 5 + 4 + 3 + 2 + 1)$
$= 55555 \times 55555$
$12345654321 \times (1 + 2 + 3 + 4 + 5 + 6 + 5 + 4 + 3 + 2 + 1)$
$= 666666 \times 666666$

23. (*a*) 10 (*b*) 0 (*c*) 75
(*d*) 0 (*e*) 85 (*f*) 5
(*g*) 1 (*h*) square (*i*) additive
(*j*) even

24. (*a*) ↔ (*iv*) (*b*) ↔ (*v*) (*c*) ↔ (*i*)
(*d*) ↔ (*ii*) (*e*) ↔ (*iii*)

Internal Assessment

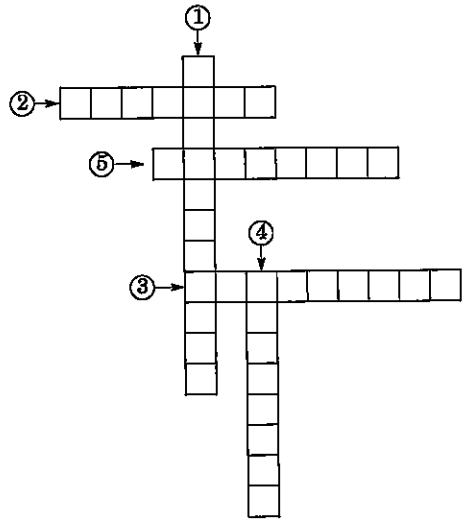
Q1. A magic square is an array of numbers having the same rows (horizontal lines) and vertical columns (vertical lines and the sum of number is each row, column or diagram is same. Fill in the blank small squares of the magic as given.

22	29	6		20
28			19	
	11	18	25	27
15	17	24	26	8
	23	30	7	

Q2. Write four steps satisfying the given pattern
$n + (n + 1) + (n + 2) = (n + 1) \times 3$

Q3. Answer in one word or in one line:
(*a*) Are all natural numbers whole number?
(*b*) Are all whole numbers natural number?
(*c*) Name two numbers which can be represented as triangle.
(*d*) Can whole numbers be negative?
(*e*) Is it possible for distant non-zero numbers that $a \div b = b \div a$?

Q4. Complete the following crossword puzzle:
(1) 99 is the ..... of the smallest 3-digit number.
(2) Counting numbers are called ..... numbers.
(3) 100 is the ..... of 99.
(4) Natural numbers are also called ..... numbers.
(5) Zero is ..... identity.



ANSWERS

1.

22	29	6	**13**	20
28	**10**	**12**	19	**21**
9	11	18	25	27
15	**17**	24	26	8
16	23	30	7	**14**

2. (*i*) $1 + (1 + 1) + (1 + 2) = (1 + 1)\ 3 = 6$
(*ii*) $2 + (2 + 1) + (2 + 2) = (2 + 1)\ 3 = 9$
(*iii*) $3 + (3 + 1) + (3 + 2) = (3 + 1)\ 3 = 12$
(*iv*) $4 + (4 + 1) + (4 + 2) = (4 + 1)\ 3 = 15$

3. (*a*) Yes (*b*) No (*c*) 3, 6
(*d*) No (*e*) No

4. (1) Predecessor (2) Natural
(3) Successor (4) Counting
(5) Additive