Grade VI
MATHEMATICS
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INDEX

INDEX

Chapter No.	Name	
Chapter 1	Knowing our numbers	
Chapter 2	Whole numbers	
Chapter 3	Playing with numbers	
Chapter 4	Basic Geometrical ideas	
Chapter 5	Understanding Elementary Shapes	
Chapter 6	Integers	
Chapter 7	Fractions	
Chapter 8	Decimals	
Chapter 9	Data Handling	
Chapter 10	Mensuration	
Chapter 11	Algebra	
Chapter 12	Ratio And Proportion	
Chapter 13	Symmetry	
Chapter 14	Practical Geometry	

Chapter 1

Name : Knowing Our Numbers

Key Points to Remember

- Given two numbers, one with more digits is the greater number. If the number of digits in two given numbers is the same, that number is larger, which has a greater leftmost digit. If this digit also happens to be the same, we look at the next digit and so on.
- In forming numbers from given digits, we should be careful to see if the conditions under which the numbers are to be formed are satisfied. Thus, to form the greatest four-digit number from 7, 8, 3, 5 without repeating a single digit, we need to use all four digits, the greatest number can have only 8 as the leftmost digit.
- The smallest four-digit number is 1000 (one thousand). It follows the largest three digit number 999. Similarly, the smallest five digit number is 10,000. It is ten thousand and follows the largest four digit number 9999. Further, the smallest six digit number is 100,000. It is one lakh and follows the largest five-digit number 99,999. This carries on for higher digit numbers in a similar manner.
- Use of commas helps in reading and writing large numbers. In the Indian system of numeration we have commas after 3 digits starting from the right and thereafter every 2 digits. The commas after 3, 5 and 7 digits separate thousand, lakh and crore respectively. In the International system of numeration commas are placed after every 3 digits starting from the right. The commas after 3 and 6 digits separate thousand and million respectively.
- Large numbers are needed in many places in daily life. For example, for giving number of students in a school, number of people in a village or town, money paid or received in large transactions (paying and selling), in measuring large distances say between various cities in a country or in the world and so on.
- Remember kilo shows 1000 times larger, Centi shows 100 times smaller and milli shows 1000 times smaller, thus, 1 kilometre = 1000 metres, 1 metre = 100 centimetres or 1000 millimetres etc.
- There are a number of situations in which we do not need the exact quantity but need only a reasonable guess or an estimate. For example, while stating how many spectators watched a particular international hockey match, we state the approximate number, say 51,000, we do not need to state the exact number.
- Estimation involves approximating a quantity to an accuracy required. Thus, 4117 may be approximated to 4100 or to 4000, i.e. to the nearest hundred or to the nearest thousand depending on our need.
- In number of situations, we have to estimate the outcome of number operations. This is done by rounding off the numbers involved and getting a quick, rough answer.
- Estimating the outcome of number operations is useful in checking answers.
- Use of brackets allows us to avoid confusion in the problems where we need to carry out more than one number operation.
- We use the Hindu-Arabic system of numerals. Another system of writing numerals is the Roman system.

Question 1. Fill in the blanks:

(a) 1 lakh = _____ ten thousand

(b) 1 million = ____ hundred thousand

(c) 1 crore = _____ ten lakh

(d) 1 crore = _____ million

(e) 1 million = ____ lakh

Answer:
(a) 10
(b) 10
(c) 10
(d) 10
(e) 10

Very short answers

Question 2. Place commas correctly and write the numerals:

(a) Seventy three lakh seventy five thousand three hundred seven.

(b) Nine crore five lakh forty one.

(c) Seven crore fifty two lakh twenty one thousand three hundred two.

(d) Fifty eight million four hundred twenty three thousand two hundred two.

(e) Twenty three lakh thirty thousand ten.

Answer: (a) 73,75,307

(b) 9,05,00,041

(c) 7,52,21,302

(d) 58,423,202

(e) 23,30,010

Question 3. Insert commas suitably and write the names according to Indian system of numeration:

(a) 87595762:

(b) 8546283

(c) 99900046

(d) 98432701

Answer: (a) 8,75,95762 → Eight crore seventy five lakh ninety five thousand seven

hundred sixty two

(b) 85,46 ,283 → Eighty five lakh forty six thousand two hundred eighty three

(c) 9,99,00,046 → Nine crore ninety nine lakh forty six

(d) 9,84,32,701 → Nine crore eighty four lakh thirty two thousand seven hundred one

Question 4. Insert commas suitably and write the names according to International system of numeration:

(a) 78921092

(b) 7452283

(c) 99985102

(d) 48049831

Answer: (a) 78,921,092 → Seventy eight million nine hundred twenty one thousand ninetytwo

b) 7,452,283 → Seven million four hundred fifty two thousand two hundred eighty three

c) 99,985,10 → Ninety nine million nine hundred eighty five thousand one hundred two

d) 48,049,831 → Forty eight million forty-nine thousand eight hundred thirty one

Chaper 1
Name :Knowing our Numbers (Ex. 1.2)

Question 1. A book exhibition was held for four days in a school. The number of tickets sold at the counter on the first, second, third and final day was respectively 1094, 1812, 2050 and 2751. Find the total number of tickets sold on all the four days.

Answer: Number of tickets sold on first day = 1,094
Number of tickets sold on second day = 1,812
Number of tickets sold on third day = 2,050
Number of tickets sold on fourth day = 2,751
Total Number of tickets sold = 1094 + 1812 + 2050 + 2751 = 7,707 Therefore,

7,707 tickets were sold on all the four days.

Question 2. Shekhar is a famous cricket player. He has so far scored 6980 runs in testmatches. He wishes to complete 10,000 runs. How many more runs does he need?

Answer: Runs to achieve = 10,000
Runs scored = 6,980

Runs required = 10,000 - 6980 = 3,020
Therefore, Shekar needs 3,020 more runs.

Question 3. In an election, the successful candidate registered 5,77,500 votes and his nearest rival secured 3,48,700 votes. By what margin did the successful candidate win the election?

Answer: Number of votes secured by successful candidates = 5,77,500
Number of votes secured by his nearest rival = 3,48,700
Margin between them = 5,77,500 - 3,48,700 = 2,28,800

Therefore, the successful candidate won by a margin of 2,28,800 votes.

Question 4. Kirti Bookstore sold books worth 2,85,891 in the first week of June and books worth 4,00,768 in the second week of the month. How much was the sale for the two weeks together? In which week was the sale greater and by how much?

Answer: Books sold in first week = 2,85,891
Books sold in second week = 4,00,768
Total books sold = 2,85,891 + 4,00,768 = 6,86,659

Since, 4,00,768,> 2,85,891

Therefore sale of second week is greater than that of first week. Books sold in second week = 4,00,768
Books sold in first week = 2,85,891
More books sold in second week = 4,00,768 - 2,85,891 = 1,14,877
Therefore, sale in second week was larger than sale in first week by 1,14,877

Question 5. Find the difference between the greatest and the least number that can be written using the digits 6, 2, 7, 4, 3 each only once.

Answer: Greatest five-digit number using digits 6,2,7,4,3 = 76432
Smallest five-digit number using digits 6,2,7,4,3 = 23467
Difference = 76432 - 23467= 52965
Answer The difference is 52965.

Question 6. A machine, on an average, manufactures 2,825 screws a day. How many screws did it produce in the month of January 2006?

Answer: Number of screws manufactured in one day = 2,825
Number of days in the month of January (31 days) = 2,825 x 31

```
    2825
   × 31
  _____
    2825
+ 84750
  _____
  87575
```

Answer The machine produced 87,575 screws in the month of January.

Question 7. A merchant had 78,592 with her. She placed an order for purchasing 40 radio sets at

1,200 each. How much money will remain with her after the purchase?

Answer: Cost of one radio = 1200
Cost of 40 radios = 1200 x 40 = 48,000
Now, Total money with merchant = 78,592
Money spent by her = 48,000
Money left with her = 78,592 - 40,000 = 30,592

Answer ₹ 30,592 will remain with her after the purchase.

Question 8. A student multiplied 7236 by 65 instead of multiplying by 56. By how much was his answer greater than the correct answer?

Answer: Wrong answer = 7236 x 65

$$
\begin{array}{r}
7236 \\
\times 65 \\
\hline
36180 \\
434160 \\
\hline
470340
\end{array}
$$

Correct answer = 7236 x 56

$$
\begin{array}{r}
7236 \\
\times 56 \\
\hline
43416 \\
361800 \\
\hline
405216
\end{array}
$$

Difference in answers = 470340 – 405216 = 65,124

Question 9. To stitch a shirt 2 m 15 cm cloth is needed. Out of 40 m cloth, how many shirtscan be stitched and how much cloth will remain?

Answer: Cloth required to stitch one shirt = 2 m 15 cm
= 2 x 100 cm + 15 cm = 215 cm
Length of cloth = 40 m = 40 x 100 cm = 4000 cm
Number of shirts can be stitched = 4000 $\div$ 215

Therefore, 18 shirts can be stitched and 130 cm (1 m 30 cm) cloth will remain.

$$
\begin{array}{r}
18 \\
215\overline{)4000} \\
215 \\
\hline
1850 \\
1720 \\
\hline
130
\end{array}
$$

Question 10. Medicine is packed in boxes, each weighing 4 kg 500 g. How many such boxescan be

loaded in a can which cannot carry beyond 800 kg?

Answer: The weight of one box = 4 kg 500 g = 4 x 1000 g + 500 g = 4500 g

Maximum load can be loaded in van = 800 kg = 800 x 1000 g = 800000 g

Number of boxes = 800000 $\div$ 4500

```
          177
4500)800000(
     4500
     35000
     31500
      35000
      31500
       3500
```

Therefore, 177 boxes can be loaded.

Question 11. The distance between the school and the house of a student's house is 1 km 875 m. Everyday she walks both ways. Find the total distance covered by her in six days.

Answer: Distance between school and home = 1.875 kmDistance
between home and school = + 1.875 km
Total distance covered in one day = 3.750 km Distance
covered in six days = 3.750 x 6 = 22.500 km Therefore, 22
km 500 m distance covered in six days.

Question 12. A vessel has 4 liters and 500 ml of curd. In how many glasses each of 25 mlcapacity, can it be filled?

Answer: Capacity of curd in a vessel = 4 liters 500 ml = 4 x 1000 ml + 500 ml = 4500 mlCapacity of
one glass = 25 ml
Number of glasses can be filled = 4500 $\div$ 25

```
        180
25) 4500 (
    25
    200
    200
     00
```

Therefore, 180 glasses can be filled by curd.

Question 1. Estimate each of the following using general rule:

(a) 730 + 998

(b) 796 – 314

(c) 12,904 + 2,888

(d) 28,292 – 21,496

Answer: (a) 730 + 998

By rounding off to nearest hundreds, 730 rounds off to 700 and 998 rounds off to 1000

Estimated sum = 700 + 1000 = 1700

(b) 796 - 314

By rounding off to nearest hundreds, 796 rounds off to 800 and 314 rounds off to 300

Estimated difference = 800 - 300 = 500

(c) 12,904 + 2,888

By rounding off to nearest thousands, 12904 rounds off to 13000 and 2888 rounds off to 3000

Estimated sum = 13000 + 3000 = 16000

(d) 28,292 - 21,496

By rounding off to nearest thousands, 28292 rounds off to 28000 and 21496 rounds off to 21000

Estimated difference= 28000 - 21000 = 7000

Question 2. Give a rough estimate (by rounding off to nearest hundreds) and also a closer estimate (by rounding off to nearest tens):

(a) 439 + 334 + 4317

(b) 1,08,734 – 47,599

(c) 8325 – 491

(d) 4,89,348 – 48,365

Answer: (a) 439 + 334 + 4317

Rounding off to nearest hundreds 439, 334 and 4317 may be rounded off to 400, 300 and 4300 respectively.

  Estimated sum = 400 + 300 + 4300 = 5000

Rounding off to nearest tens, 439, 334 and 4317 may be rounded off to 440, 330 and 4320 respectively.

Estimated sum = 440 + 330 + 4320 = 5090

(b) 1,08,734 – 47,599

Rounding off to nearest hundreds 1,08,734 and 47,559 may be rounded off to 1,08,700 and 47,600 respectively.

Estimated difference = 1,08,700 - 47,600 = 61100

Rounding off to nearest tens 1,08,734 and 47,559 may be rounded off to 1,08,730 and 47,600 respectively.

Estimated difference = 1,08,730 - 47,600 = 61130

(c) 8325 – 491

Rounding off to nearest hundreds 8325 and 491 may be rounded off to 8300 and 500 respectively.

Estimated difference = 8300 - 500 = 7800

Rounding off to nearest tens 8325 and 491 may be rounded off to 8330 and 490 respectively.

Estimated difference = 8330 - 490 = 7840

(d) 4,89,348 – 48,365

Rounding off to nearest hundreds 4,89,348 and 48,365 may be rounded off to 4,89,300 and 48,400 respectively.

Estimated difference = 489300 - 448400 = 440900

Rounding off to nearest tens 4,89,348 and 48,365 may be rounded off to 4,89,350 and 48,370 respectively.

Estimated difference = 489350 - 48370 = 440980

Question 3. **Estimate the following products using general**

rule:(a) 578 x 161

(b) 5281 x 3491

(c) 1291 x 592

(d) 9250 x 29

Answer: (a) 578 x 161

Rounding off by general rule, 578 and 161 may be rounded off to 600 and 200 respectivelyThe

estimated product = 600 x 200 = 1,20,000

(b) 5281 x 3491

Rounding off by general rule, 5281 and 3491 may be rounded off to 5300 and 3500 respectively

The estimated product = 5,300 x 3,500 = 1,85,50,000

(c) 1291 x 592

Rounding off by general rule, 1291 and 592 may be rounded off to 1300 and 600 respectively

The estimated product = 1300 x 600 = 7,80,000

(d) 9250 x 29

Rounding off by general rule, 9250 and 29 may be rounded off to 9300 and 30 respectivelyThe

estimated product = 9,300 x 30 = 2,79,000

2,79,000 may be rounded off to 3,00,000

Chaper 2 Whole Numbers

Key Points:
1) **Natural Numbers** Counting numbers are called natural numbers.
2) **Whole numbers** : All natural numbers together with '0' are called whole numbers.
   Thus 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11,…… are whole numbers
   Clearly, every natural number is a whole number but 0 is not a whole number.
3) **Successor of a whole number**: If we add 1 to a whole number, we get the next whole number, called its successor.
   Thus, the successor of 0 is 1, the successor of 1 is 2, the successor of 11 is 12, and so on.
   Every whole number has its successor.
4) **Predecessor of a Whole number** : One less than a given whole number(other than 0), is called its predecessor.
   Thus, the predecessor of 1 is 0, the predecessor of 2 is 1, the predecessor of 10 is 9, and so on.
   The whole number 0 does not have its predecessor.
   Every whole number other than 0 has its predecessor.
5) Example : Write the successor and predecessor of :
   (i)   1000   (ii)   1005399   (iii)   999999
   Solution   (i) The successor of 1000 = (1000 + 1) = 1001
       The predecessor of 1000 = (1000 − 1) = 999
      (ii) The successor of 1005399 = (1005399 + 1) = 1005400
        The predecessor of 1005399= (1005399 − 1) = 1005398
      (iii)The successor of 999999 = (999999 + 1) = 1000000
        The predecessor of 999999 = (999999 − 1) = 999998

EXERCISE 2.1 **Question 1. Write the next three natural numbers after 10999.**

Answer: 10,999 + 1 = 11,000
        11,000 + 1 = 11,001
        11,001 + 1 = 11,002

Question 2. Write the three whole numbers occurring just before 10001.

Answer: 10,001 − 1 = 10,000
        10,000 − 1 = 9,999
         9,999 − 1 = 9,998

Question 3. Which is the smallest whole number?

Answer: '0' (zero) is the smallest whole number.

Question 4. How many whole numbers are there between 32 and 53?

Answer: 53 − 32 − 1 = 20
        There are 20 whole numbers between 32 and 53.

Question 5. Write the successor of:

(a) 2440701
(b) 100199
(c) 1099999
(d) 2345670

Answer: (a) Successor of 2440701 is 2440701 + 1 = 2440702
(b) Successor of 100199 is 100199 + 1 = 100200
(c) Successor of 1099999 is 1099999 + 1 = 1100000
(d) Successor of 2345670 is 2345670 + 1 = 2345671

Question 6. Write the predecessor of:

(a)   94

(b) 10000

(c) 208090

(d) 7654321

Answer: (a) The predecessor of 94 is 94 – 1 = 93

(b) The predecessor of 10000 is 10000 – 1 = 9999

(c) The predecessor of 208090 is 208090 – 1 = 208089

(d) The predecessor of 7654321 is 7654321 – 1 = 7654320

Question 7. 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

Answer: (a) 530 > 503; So 503 appears on left side of 530 on number line.

(b) 370 > 307; So 307 appears on left side of 370 on number line.8765 > 56789; So 56789 appears on left side of 98765 on number line.

(c) 9830415 < 10023001; So 9830415 appears on left side of 10023001 on number line.

Question 8. 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.

Answer: (a) False, 0 is not a natural number

(b) False, as predecessor of 399 is 398 (399 -1 = 398)

(c) True

(d) True, as 599 + 1 = 600

(e) True

(f) False, as 0 is a whole number but it is not a natural number

(g) False, as predecessor of 10 is 9

(h) False, 0 is the smallest whole number

(i) True, as 0 is the predecessor of 1 but it is not a natural number

(j) False, as 0 is a predecessor of 1 and it is a whole number

(k) False, 13 does not lie between 11 and 12

(l) True, predecessor of 0 is -1 which is not a whole number

(m) False, as successor of 99 is 100

Chaper 2
 Name   : Whole Numbers (Ex. 2.2)

Question 1. Find the sum by suitable rearrangement:

(a) 837 + 208 + 363

(b) 1962 + 453 + 1538 + 647

Answer: (a) 837 + 208 + 363

= (837 + 363) + 208

= 1200 + 208

= 1408

(b) 1962 + 453 + 1538 + 647

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

= 3500 + 1100

= 4600

Question 2. Find the product by suitable arrangement:

(a) 2 x 1768 x 50

(b) 4 x 166 x 25

(c) 8 x 291 x 125

(d) 625 x 279 x 16

(e) 285 x 5 x 60

(f) 125 x 40 x 8 x 25

Answer: (a) 2 x 1768 x 50

= (2 x 50) x 1768

= 100 x 1768

= 176800

(b) 4 x 166 x 25

= (4 x 25) x 166

= 100 x 166

= 16600

(c) 8 x 291 x 125

= (8 x 125) x 291

= 1000 x 291

= 291000

(d) 625 x 279 x 16

= (625 x 16) x 279

= 10000 x 279

= 2790000

(e) 285 x 5 x 60

= 285 x (5 x 60)

= 285 x 300

= 85500

(f) 125 x 40 x 8 x 25

= (125 x 8) x (40 x 25)

= 1000 x 1000

= 1000000

Question 3. Find the value of the following:

(a) 297 x 17 + 297 x 3

(b) 54279 x 92 + 8 x 54279

(c) 81265 x 169 – 81265 x 69

(d) 3845 x 5 x 782 + 769 x 25 x 218

Answer: (a) 297 x 17 + 297 x 3

= 297 x (17 + 3)

= 297 x 20

= 5940

(b) 54279 x 92 + 8 x 54279

= 54279 x (92 + 8)

= 54279 x 100

= 5427900

(c) 81265 x 169 – 81265 x 69

= 81265 x (169 – 69)

= 81265 x 100

= 8126500

(d) 3845 x 5 x 782 + 769 x 25 x 218

= 3845 x 5 x 782 + 769 x 5 x 5 x 218

= 3845 x 5 x 782 + 3845 x 5 x 218

= 3845 x 5 x (782 + 218)

= 3845 x 5 x 1000

= 19225000

Question 4. **Find the product using suitable properties:**

(a) 738 x 103

(b) 854 x 102

(c) 258 x 1008

(d) 1005 x 168

Answer: (a) 738 x 103

= 738 x (100 + 3)

= 738 x 100 + 738 x 3

= 73800 + 2214

= 76014

(b) 854 x 102

= 854 x (100 + 2)

= 854 x 100 + 854 x 2

= 85400 + 1708

= 87108

(c) 258 x 1008

= 258 x (1000 + 8)

= 258 x 1000 + 258 x 8

= 258000 + 2064

= 260064

(d) 1005 x 168

= (1000 + 5) x 168

= 1000 x 168 + 5 x 168

= 168000 + 840

= 168840

Question 5. **A taxi-driver, filled his car petrol tank with 40 litres of petrol on Monday. The next day, he filled the tank with 50 litres of petrol. If the petrol costs Rs.44 per litre, how much did he spend in all on petrol?**

Answer: Quantity of Petrol filled on Monday = 40 litres

Quantity of Petrol filled on next day = 50 litres

Total Quantity of petrol filled = 90 litresNow,

Cost of 1 litre petrol = Rs.44

Cost of 90 litres of petrol = 44 x 90

= 44 x (100 – 10)

= 44 x 100 – 44 x 10

= 4400 – 440

= Rs.3960

Therefore, he spent Rs.3960 on petrol.

Question 6. 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 Rs.15 per litre, how much money is due to the vendor perday?

Answer: Quantity of milk supplied in the morning = 32 litresQuantity

of milk supplied in the evening = 68 litres

Total supply = 32 + 68 = 100 litresNow

Cost of 1 litre milk = Rs.15

Cost of 100 litres milk = 15 x 100 = Rs.1500 Therefore,

Rs.1500 is due to the vendor per day.

Question 7. Match the following:

(i) 425 x 136 = 425 x (6 + 30 + 100)   (a) Commutativity under multiplication

(ii) 2 x 49 x 50 = 2 x 50 x 49   (b) Commutativity under addition

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

Answer: (i) 425 x 136 = 425 x (6 + 30 + 100) (c) Distributivity of multiplication over addition

(ii) 2 x 49 x 50 = 2 x 50 x 49   (a) Commutativity under multiplication

(iii) 80 + 2005 + 20 = 80 + 20 + 2005   (b) Commutativity under addition.

Chaper 2
Name   : Whole Numbers (Ex. 2.3)

Question 1. Which of the following will not represent zero:

(a) 1 + 0

(b) 0 x 0(c)

(d) $\dfrac{0}{2}$

  $\dfrac{10-10}{2}$

Answer: (a) 1 + 0 is equal to 1 it does not represent zero

(b) 0 x 0 = 0 It represents zero

(c) $\dfrac{0}{2}$ = 0. It represents zero

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

Question 2. If the product of two whole numbers is zero, can we say that one or both of them will be zero? Justify through examples.

Answer: Yes, if we multiply any 2 whole numbers with zero the resultant product will be zero.

Example: 2 x 0 = 0, 5 x 0 = 0, 9 x 0 = 0

If the product of two whole numbers is zero, then both of them may be zero.0

x 0 = 0

Question 3. If the product of two whole number is 1, can we say that one or both of them will be 1? Justify through examples.

Answer: If only one number be 1 then the product cannot be 1.Examples:

5 x 1 = 5, 4 x 1 = 4, 8 x 1 = 8

If both number are 1, then the product is 11

x 1 = 1

Question 4. Find using distributive property:(a)

728 x 101

(b) 5437 x 1001

(c) 824 x 25

(d) 4275 x 125

(e) 504 x 35

Answer: (a) 728 x 101

= 728 x (100 + 1)

= 728 x 100 + 728 x 1

= 72800 + 728

= 73528

(b) 5437 x 1001

= 5437 x (1000 + 1)

= 5437 x 1000 + 5437 x 1

= 5437000 + 5437

= 5442437

(c) 824 x 25

= 824 x (20 + 5)

= 824 x 20 + 824 x 5

= 16480 + 4120

= 20600

(d) 4275 x 125

= 4275 x (100 + 20 + 5)

= 4275 x 100 + 4275 x 20 + 4275 x 5

= 427500 + 85500 + 21375

= 534375

(e) 504 x 35

= (500 + 4) x 35

= 500 x 35 + 4 x 35

= 17500 + 140

= 17640

Question 5. Study the pattern:

1 x 8 + 1 = 9;

12 x 8 + 2 = 98;

123 x 8 + 3 = 987

1234 x 8 + 4 = 9876;

12345 x 8 + 5 = 98765

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

Answer: 123456 x 8 + 6 = 987654

1234567 x 8 + 7 = 9876543

Pattern works

like this:1 x 8

+ 1 = 9

12 x 8 + 2 = 98

123 x 8 + 3 = 987

1234 x 8 + 4 = 9876

12345 x 8 + 5 = 98765

123456 x 8 + 6 = 987654

1234567 x 8 + 7 = 9875643

CHAPTER 3
PLAYING WITH NUMBERS

KEY POINTS TO REMEMBER

1 Factors and Multiples
A factor of a number is an exact divisor of that number. In turn, a number is a multiple of each of its factors. Some interesting facts about factors and multiples are as follows:

- 1 is a factor of every number.
- Every number is a factor of itself.
- Every factor of a number is an exact divisor of that number.
- Every factor of a number is less than or equal to that number.
- The factors of a given number are finite in number.
- Every multiple of a number is greater than or equal to that number.
- The multiples of a given number are infinite in number.
- Every number is a multiple of itself.

2, Perfect number: If the sum of all the factors of a number is equal to twice the number, then that number is called a perfect number.
<u>For example</u>: 28 is a perfect number because all the factors of 28 are 1,2,4,7,14 and 28 whose sum = $1 + 2 + 4 + 7 + 14 + 28 = 56 = 2 \times 28$, whereas 10 is not a perfect number because all the factors of 10 are 1, 2, 5 and 10 whose sum = $1 + 2 + 5 + 10 = 18 \neq 2 \times 10$.

3.Prime and Composite Numbers
Prime numbers: The numbers having exactly two factors 1 and the number itself are called prime numbers.
For example, 2, 3, 5, 7, 11, etc. are prime numbers.

4 Composite numbers: The numbers having more than two factors are called composite numbers.
For example 4, 6, 8, 9, 10. etc. are composite numbers.
Note: The number 1 is neither prime nor composite.

5. Even number: A number which is a multiple of 2 is called an even number.
For example: 2, 4, 6, 8, 10,….

6 Odd number: A number which is not a multiple of 2 is called an odd number.
For example: 1, 3, 5, 7, 9,…

7.A number with 0, 2, 4, 6, 8 at the unit's place is an even number.
So, 250, 2732, 29354, 34596 are even numbers.
Obviously, the numbers 257, 3249, 7321 are odd numbers.

2 is the smallest prime number which is even.

Every prime number except 2 is odd.

Tests for Divisibility of Numbers
a) A number is divisible by 10 if it has 0 in its units place.

b) A number is divisible by 5 if it has either 0 or 5 in its units place.

c) A number is divisible by 2 if it has any of the digits 0, 2, 4, 6 or 8 in its units place

d) A number is divisible by 3 if the sum of its digits is a multiple of 3.

e) A number is divisible by 6 if it is divisible by 2 and 3 both.

f) A number with 3 or more digits is divisible by 4 if the number formed by its last two digits (i.e., units and tens) is divisible by 4.

g) A number with 4 or more digits is divisible by 8 if the number formed by its last three digits is divisible by 8.

h) A number is divisible by 9 if the sum of all the digits of the number is divisible by 9.

i) A number is divisible by 11 if the difference between the sum of the digits at odd places (from the right) and the sum of the digits at even places (from the right) of the number is either 0 or divisible by 11

1. **Match A with B**

Column I	Column II
(i) 35	(a) Multiple of 8
(ii) 15	(b) Multiple of 7
(iii) 16	(c) Multiple of 70
(iv) 20	(d) Factor of 30
(v) 25	(e) Factor of 50
	(f) Factor of 20

Solution:
(i) ↔ (b) [∵ 7 x 5 = 35]
(ii) ↔ (d) [∵ 15 x 2 = 30]
(iii) ↔ (a) [∵ 8 x 2 = 16]
(iv) ↔ (f) [∵ 20 x 1 = 20]
(v) ↔ (e) [∵ 25 x 2 = 50]

2 Very short answers

Write first five multiples of:
(a) 5 (b) 8 (c) 9

(a) First five multiples of 5 are:
5 x 1 = 5;
5 x 2 = 10;
5 x 3 = 15;
5 x 4 = 20;
5 x 5 = 25
Hence, the required multiples of 5 are: 5, 10, 15, 20 and 25.

(b) First five multiples of 8 are:

8 x 1 = 8;

8 x 2 = 16;

8 x 3 = 24;

8×4 = 32;

8 x 5 = 40

Hence, the required multiples of 8 are: 8, 16, 24, 32 and 40.

(c) First five multiples of 9 are:

9 x 1 = 9;

9 x 2 = 18;

9 x 3 = 27;

9 x 4 = 36;

9 x 5 = 45

Hence, the required multiples of 9 are: 9,18, 27, 36 and 45.

3 Write all the factors of the following numbers:

(a) 24 (b) 15 (c) 21

(d) 27 (e) 12 (f) 20

(g) 18 (h) 23 (i) 36

Solution

(a) Factors of 24 are:

24 = 1 x 24;

24 = 2 x 12;

24 = 3 x 8;

24 = 4 x 6

Hence, all the factors of 24 are: 1, 2, 3, 4, 6, 8, 12 and 24.

(b) Factors of 15 are:

15 = 1 x 15;

15 = 3 x 5

Hence, all the factors of 15 are: 1, 3, 5 and 15.

c) Factors of 21 are:

21 = 1 x 21;

21 = 3 x 7

Hence, all the factors of 21 are: 1, 3, 7 and 21.

(d) Factors of 27 are:

27 = 1 x 27;

27 = 3 x 9.

Hence, all the factors of 27 are: 1, 3, 9 and 27

(e) Factors of 12 are:

12 = 1 x 12;

12 = 2 x 6;

12 = 3 x 4
Hence, all the factors of 12 are: 1, 2, 3, 4, 6 and 12.

(f) Factors of 20 are:
20 = 1 x 20;
20 = 2 x 10;
20 = 4 x 5
Hence, all the factors of 20 are: 1, 2, 4, 5, 10 and 20.

(g) Factors of 18 are:
18 = 1 x 18;
18 = 2 x 9;
18 = 3 x 6
Hence, all the factors of 18 are: 1, 2, 3, 6, 9 and 18.

h) Factors of 23 are:
23 = 1 x 23
Hence, all the factors of prime number 23 are: 1 and 23.

(i) Factors of 36 are:
36 = 1 x 36;
36 = 2 x 18;
36 = 3 x 12;
36 = 4 x 9;
36 = 6 x 6
Hence, all the factors of 36 are: 1, 2, 3, 4, 6, 9, 12, 18 and 36.

EXERCISE 3.2

1 State whether the following statements are True or False.

The sum of three odd numbers is even.
(b) The sum of two odd numbers and one even number is even.
(c) The product of three odd numbers is odd.
(d) If an even number is divided by 2, the quotient is always odd.
(e) All prime numbers are odd.
(f) Prime numbers do not have any factors.
(g) Sum of two prime numbers is always even.
(h) 2 is only the even prime number.
(i) All even numbers are composite numbers.
(j) The product of any two even numbers is always even.
Solution:
a) False [∵ 3 + 5 + 7 = 15 (odd)]
(b) True [∵ 3 + 5 + 6 = 14 (even)]
(c) True [∵ 5 x 7 x 9 = 315 (odd)]
(d) False [∵ 6 + 2 = 3 (odd)]
(e) False [∵ 2 is a prime number but it is even]
(f) False [∵ 3 is a prime number having 1 and 3 as its factors]

(g) False [∵ 7 + 2 = 9 (odd)]
(h) True [∵ 2 is even and the lowest prime number]
(i) False [∵ 2 is even but not composite number]
(j) True [∵ 4 x 6 = 24 (even)]

2 Fill in the blanks.

(a) A number which has only two factors is called a ………… .
(b) A number which has more than two factors is called a ………… .
(c) 1 is neither ………… nor ………… .
(d) The smallest prime number is ………… .
(e) The smallest composite number is ………… .
(f) The smallest even number is ………… .

Solution
(a) prime number
(b) composite number
(c) prime, composite
(d) 2
(e) 4
(f) 2

Very short answers
1.   What is the sum of any two:
(a) Odd numbers?
(b) Even numbers?
Solution
(a) The sum of any two odd numbers is even.
   (b) The sum of any two even numbers is even.

3 The numbers 13 and 31 are prime numbers. Both these numbers have same digits 1 and 3. Find such pairs of prime numbers up to 100.
 Solution

The required pair of prime numbers having same digits are:
(17 and 71), (37 and 73), (79 and 97).

4 Write down separately the prime and composite numbers less than 20.
Prime numbers less than 20 are:
Solution
2, 3, 5, 7, 11, 13, 17 and 19
Composite numbers less than 20 are:
4, 6, 8, 9, 10, 12, 14, 15, 16 and 18

5. What is the greatest prime number between 1 and 10?
Solution:
The greatest prime number between 1 and 10 is 7.
6 Express the following as the sum of two odd primes.
(a) 44
(b) 36
(c) 24
(d) 18

Solution

   (a) 44 = 13 + 31
      (b) 36 = 17 + 19
      (c) 24 = 7 + 17
      (d) 18 = 7 + 11

7 Give three pairs of prime numbers whose difference is 2.

[Remark: Two prime numbers whose difference is 2 are called twin primes]
Solution

Required pairs are: (3 and 5), (5 and 7) and (11 and 13)

8 Which of the following numbers are prime?

  (a) 23
    (b) 51
    (c) 37
    (d) 26
    Solution:
    (a) 23 is a prime number [$\because$ 23 = 1 x 23]
    (b) 51 is not a prime number [$\because$ 51 = 1 x 3 x 17]
    (c) 37 is a prime number [$\because$ 37 = 1 x 37]
    (d) 26 is not a prime number [$\because$ 26 = 1 x 2 x 13]

9 Write seven consecutive composite numbers less than 100 so that there is no prime number between them.

Solution:
Required seven consecutive composite numbers are:
90, 91, 92, 93, 94, 95 and 96

10 Express each of the following numbers as the sum of three odd primes.
(a) 21
(b) 31
(c) 53
(d) 61
Solution
(a) 21 can be expressed as 3 + 5 + 13
(b) 31 can be expressed as 5 + 7 + 19
(c) 53 can be expressed as 13 + 17 + 23
(d) 61 can be expressed as 11 + 13 + 37

11 Write five pairs of prime numbers less than 20 whose sum is divisible by 5.

(Hint: 3 + 7 = 10)**1**
Solution

   Required pairs of prime numbers less than 20 are:
   (i) 2 + 3 = 5
   (ii) 2 + 13 = 15
   (iii) 11 + 9 = 20
   (iv) 17 + 3 = 20
   (v) 7 + 13 = 20

EXERCISE 3.3

1 Fill in the blanks

Using divisibility tests, determine which of the following numbers are divisible by 2, by 3, by 4, by 5, by 6, by 8, by 9, by 10, by 11 (Say, Yes or No)

Number	Divisible by								
	2	3	4	5	6	8	9	10	11
128	Yes	No	Yes	No	No	Yes	No	No	No
990	—	—	—	—	—	—	—	—	—
1586	—	—	—	—	—	—	—	—	—
275	—	—	—	—	—	—	—	—	—
6686	—	—	—	—	—	—	—	—	—
639210	—	—	—	—	—	—	—	—	—
429714	—	—	—	—	—	—	—	—	—
2856	—	—	—	—	—	—	—	—	—
3060	—	—	—	—	—	—	—	—	—
406839	—	—	—	—	—	—	—	—	—

Solution:

Number	Divisible by								
	2	3	4	5	6	8	9	10	11
128	Yes	No	Yes	No	No	Yes	No	No	No
990	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes
1586	Yes	No	No	No	No	No	No	No	No
275	No	No	No	Yes	No	No	No	No	Yes
6686	Yes	No	No	No	No	No	No	No	No
639210	Yes	Yes	No	Yes	Yes	No	No	Yes	Yes
429714	Yes	Yes	No	No	Yes	No	Yes	No	No
2856	Yes	Yes	Yes	No	Yes	Yes	No	No	No
3060	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No
406839	No	Yes	No	No	No	No	No	No	No

2.Using divisibility tests, determine which of following numbers are divisible by 4; by 8.
(a) 572
(b) 726352
(c) 5500
(d) 6000
(e) 12159
(f) 14560
(g) 21084
(j) 2150
(h) 31795072

(i) 1700
Solution:

a) Given number = 572
(i) Divisibility by 4
Here, the number formed by the last two digits of the given number is 72.

Now,
```
        18
    4 ) 72
        4
        32
        32
        0
```

Remainder 0. Hence, 572 is divisible by 4.

b) Given number = 726352
(i) Divisibility by 4
Here, the number formed by the last two digits of the given number = 52.
Remainder = 0.
Hence, 726352 is divisible by 4.

(ii) Divisibility by 8

Now,
```
        13
    4 ) 52
        4
        12
        12
        0
```

Remainder = 0.
Hence, 726352 is divisible by

   (b) **Given number = 5500**
       (i) Divisibility by 4
       Here the last two digits of the given number are 0. Hence, 5500 is divisible by 4.
       (ii) Divisibility by 8
       Here, the number formed by the last three digits of the given number = 500

Now,
```
        62
    8 ) 500
        48
        20
        16
        4
```

       Remainder = 4. Hence, 5500 is not divisible by

   (c) Remainder = 4. Hence, 5500 is not divisible by 8.

(d) d) Given number = 6000
(i) Divisibility by 4
Here, the last two digits of the given number are 0.
Hence, 6000 is divisible by 4.

(e) (ii) Divisibility by 8
Here, the last three digits of the given number are 0.
Hence, 6000 is divisible by 8.

(Given number = 12159
(i) Divisibility by 4
Here, the number formed by last two digits of the given number = 59

Now,
```
         1 4
    4 / 5 9
        4
        1 9
        1 6
          3
```

Remainder = 3.
Hence, 12159 is divisible by 4.

(ii) Divisibility by 8
Here, the number formed by the last three digits of the given number = 159

Now,
```
          1 9
    8 / 1 5 9
         8
         7 9
         7 2
           7
```

Remainder = 7.
Hence, 12159 is not divisible by 8.

(f) Given number = 14560
(i) Divisibility by 4

Now,
```
          1 5
    4 / 6 0
        4
        2 0
        2 0
          0
```

(g) Here , the number formed by the last two digits of the given number = 60.

Remainder = 0.
Hence, 14560 is divisible by 8.

(g) Given number = 21084
(i) Divisibility by 4
Here, the number formed by the last two digits of the given number = 84.

14

```
              2 1
Now,      4 / 8 4
              8
              ‾‾‾
              4
              4
             ‾‾‾
              0
```

Remainder = 0. Hence, 21084 is divisible by 4.

(ii) Divisibility by 8
Here, the number formed by the last three digits of the given number = 084.

```
              1 0
Now,      8 / 0 8 4
              8
             ‾‾‾
              4
```

Remainder = 4.
Hence, 21084 is not divisible by 8.

h) Given number = 31795072
(i) Divisibility by 4
Here, the number formed by the last two digits of the given number = 72.

```
              1 8
Now,      4 / 7 2
              4
             ‾‾‾
              3 2
              3 2
             ‾‾‾‾
              0
```

Rema (ii) Divisibility by 8
Here, the number formed by the last three digits of the given number = 072.

```
              9
Now,      8 / 0 7 2
              7 2
             ‾‾‾‾
              0
```

Remainder = 0. Hence, 31795072 is divisible by 8.
(i) Given number = 1700
Reminder = 0. Hence, 31795072 is divisible by 4.
   i)   Divisibility by 4
           Here, the last two digits of the given number is 0. Hence, 1700 is divisible by 4.
           (ii) Divisibility by 8
           Here, the number formed by the last three digits of the given number = 700

```
                      8 7
Now,      8 / 7 0 0
                      6 4
                     ‾‾‾‾
                      6 0
                      5 6
                     ‾‾‾‾
                      4
```

   ii)

Remainder = 4. Hence, 1700 is not divisible by 8.
(j) Given number = 2150
(i) Divisibility by 4
Here, the number formed by the last two digits of the given number = 50.

```
                12
Now,      4 ) 5 0
                4
              ─────
              1 0
                8
              ─────
                2
```

Remainder = 2. Hence, 2150 is not divisible by 4.

(ii) Divisibility by 8
Here, the number formed by the last three digits of the given number = 150

```
                 1 8
Now,      8 ) 1 5 0
                 8
              ─────
                7 0
                6 4
              ─────
                  6
```

Remainder = 6. Hence, 2150 is not divisible by 8.

3. Using divisibility tests, determine which of the following numbers are divisible by 6:

(a) 297144
(b) 1258
(c) 4335
(d) 61233
(e) 901352
(f) 438750
(g) 1790184
(h) 12583
(i) 639210
(j) 17852

Solution:
We know that a number is divisible by 6 if it is also divisible by both 2 and 3.
(a) Given number = 297144
The given number 297144 has even digit at its ones place.
So, it is divisible by 2.
The sum of all the digits of 297144 = 2 + 9 + 7 + 1 + 4 + 4 = 27
which is divisible by 3.
Hence, the given number 297144 is divisible by 6.

(b) Given number = 1258
The given number 1258 has even digit i.e., 8 at its ones place.

So, it is divisible by 2.

The sum of all digits of $1258 = 1 + 2 + 5 + 8 = 16$ which is not divisible by 3.

Hence, the given number 1258 is not divisible by 6.

(c)) Given number = 4335

The digit at ones place of the given number is not even.

So, it is not divisible by 2.

The sum of all the digits of $4335 = 4 + 3 + 3 + 5 = 15$ which is divisible by 3.

Since the given number 4335 is not divisible by both 2 and 3 therefore, it is not divisible by 6.

d) Given number = 61233

The digit at ones place of the given number is not even.

So, it is not divisible by 2.

The sum of the digits of the given number $61233 = 6 + 1 + 2 + 3 + 3 = 15$ which is divisible by 3.

Since, the given number is not divisible by both 2 and 3, it is not divisible by 6.

e) Given number = 901352

The digit at ones place of the given number is even.

So, it is divisible by 2.

The sum of all the digits of the given number $901352 = 9 + 0 + 1 + 3 + 5 + 2 = 20$ which is not divisible by 3.

Since, the given number is not divisible by both 2 and 3 hence, it is not divisible by 6.

(f) Given number = 438750

The digit at ones place of the given number is 0. So, it is divisible by 2.

The sum of all the digits of the given number 438750

$= 4 + 3 + 8 + 7 + 5 + 0 = 27$ which is divisible by 3.

Hence, the given number is divisible by 6.

g) Given number = 1790184

The digit at ones place of the given number is even.

So, it is divisible by 2.

The sum of all the digits of the given number 1790184

$= 1 + 7 + 9 + 0 + 1 + 8 + 4 = 30$ which is divisible by 3.

Hence, the given number is divisible by 6.

(h) Given number = 12583

The digit to ones place of the given number is odd.

So, it is not divisible by 2.

Sum of all the digits of the given number 12583

$= 1 + 2 + 5 + 8 + 3 = 19$

which is not divisible by 3.

Hence, the given number is not divisible by 6.

i) Given number = 639210

The digit at ones place of the given number is 0.

So, it is divisible by 2.
The sum of all the digits of the given number 639210
= 6 + 3 + 9 + 2 + 1 + 0 = 21 which is divisible by 3.
Hence, the given number is divisible by 6.

(j) Given number = 17852
The digit at ones place of the given number is even.
So, it is divisible by 2.
The sum of all the digits of the given number 17852
= 1 + 7 + 8 + 5 + 2 = 23 which is not divisible by 3.
Hence, the given number is not divisible by 6.

4 Using divisibility tests, determine which of the following numbers are divisible by 11:

(a)5445
(b) 10824
(c) 7138965
(d) 70169308
(e) 10000001

Solution

We know that a number is divisible by 11 if the difference between the sum of the digits at odd places (from the right) and the sum of the digits at even places (from the right) of the number is either 0 or divisible by 11.

(a) Given number = 5445
Sum of the digits at odd places = 5 + 4 = 9
Sum of the digits at even places = 4 + 5 = 9
Difference = 9 – 9 = 0
Hence, the given number is divisible by 11.

(b) Given number = 10824
Sum of the digits at odd places = 4 + 8 + 1 = 13
Sum of the digits at even places = 2 + 0 = 2
Difference = 13 – 2 = 11
which is divisible by 11.
Hence, the given number is divisible by 11.

(c) Given number = 7138965
Sum of the digits at odd places = 5 + 9 + 3 + 7 = 24
Sum of the digits at even places = 6 + 8 + 1 = 15
Difference = 24 – 15 = 9
which is not divisible by 11.
Hence, the given number is not divisible by 11.

(d) Given number = 70169308
Sum of all the digits at odd places = 8 + 3 + 6 + 0 = 17
Sum of all the digits at even places = 0 + 9 + 1 + 7 = 17
Difference = 17-17 = 0
Hence, the given number is divisible by 11.

e) Given number = 10000001
Sum of all the digits at odd places = 1 + 0 + 0 + 0 = 1

Sum of all the digits at even places = 0 + 0 + 0 + 1 = 1
Difference = 1 − 1 = 0
Hence, the given number is divisible by 11.

5 Write the smallest digit and the greatest digit in the blank space of each of the following numbers so that the number formed is divisible by 3.
___ 6724
(b) 4765 ___ 2

We know that number is divisible by 3 if the sum of all the digits of the number is also divisible by 3.
(a) ___ 6724
Sum of the digits = 4 + 2 + 7 + 6 = 19
The smallest digit to be placed is blank space = 2
Then the sum = 19 + 2 = 21 which is divisible by 3.
The greatest digit to be placed in blank space = 8
Then, the sum = 19 + 8 = 27 which is divisible by 3
Hence, the required digits are 2 and 8.

(b)4765 ___ 2.
Sum of digits = 2 + 5 + 6 + 7 + 4 = 24
The smallest digits to be place in blank space = 0
Then, sum = 24 + 0 = 24
which is divisible by 3.
The greatest digit to be placed in blank space = 9.
Then, the sum = 24 + 9 = 33 which is divisible by 3.
Hence, the required digits are 0 and 9.

6. **Write a digit in the blank space of each of the following numbers so that the numbers formed is divisible by 11.**

a) 92 ___ 389   (b) 8 ___ 9484

Solution

92 ___ 389
Sum of the digits at odd places = 9 + 3 + 2 = 14
Sum of the digits at even places = 8 + ( ) + 9 = 17
Difference = 17 + ( ) − 14 = () + 3
For the given number to be divisible by 11
( ) + 3 = 11
∴ ( ) = 11 − 3 = 8
So, the missing digit = 8
Hence, the required number is 928389.

(c) 8 ___ 9484
Sum of the digits at odd places = 4 + 4 + ( ) = 8 + ( )
Sum of the digits at even places = 8 + 9 + 8 = 25
∴ Difference = 25 − [8 + ( )]

$= 25 - 8 - ( ) = 17 - ( )$

For the given number to be divisible by 11

$17 - 0 = 11$

$\therefore 17 - 11 = 6$

So, the missing digit = 6

Hence, the required number = 869484.

Hence, the required number is 928389.

EXERCISE 3.4

1. **Find the common factors of:**

(a) 20 and 28
    (b) 15 and 25
    (c) 35 and 50
    (d) 56 and 120

    (a) Given numbers are : 20 and 28
       Factors of 20 are 1, 2, 4, 5, 10, 20
       Factors of 28 are 1, 2, 4, 7, 28
       Hence, the common factors are 1, 2 and 4.

    (b) Given numbers are: 15 and 25
       Factors of 15 are 1, 3, 5, 15
       Factors of 25 are 1, 5, 25
       Hence, the common factors are 1 and 5.

2.