CHAPTER – 3

PLAYING WITH NUMBERS

EXERCISE – 3.1

Q. 1 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

Answer:

Factors of a number are the numbers that can be multiplied by to get the original number.

To factor a number is to break it into smaller number.

a. 24

$1 \times 24 = 24$

$2 \times 12 = 24$

$3 \times 8 = 24$

$4 \times 6 = 24$

So,

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

b. 15

$1 \times 15 = 15$

$3 \times 5 = 15$

So,

1, 3, 5 and 15 are the factors of 15.

c. 21

$1 \times 21 = 21$

$3 \times 7 = 21$

So,

Factors of 21 are 1, 3, 7 and 21.

d. 27

$1 \times 27 = 27$

$3 \times 9 = 27$

So,

1, 3, 9 and 27 are the factors of 27.

e. 12

$1 \times 12 = 12$

$2 \times 6 = 12$

$3 \times 4 = 12$

So,

1, 2, 3, 4, 6 and 12 are the factors of 12.

f. 20

$1 \times 20 = 20$

$2 \times 10 = 20$

$4 \times 5 = 20$

So,

1, 2, 4, 5, 10 and 20 are the factors of 20.

g. 18

$1 \times 18 = 18$

$2 \times 9 = 18$

$3 \times 6 = 18$

So,

1, 2, 3, 6, 9, and 18 are the factors of 18.

h. 23

$1 \times 23 = 23$

So,

1 and 23 are the factors of 23.

i. 36

$1 \times 36 = 36$

$2 \times 18 = 36$

$3 \times 12 = 36$
$4 \times 9 = 36$
$6 \times 6 = 36$
So,
Factors of 36 are 1, 2, 3, 4, 6, 9, 12, 18 and 36.

Q. 2 Write first five multiplies of:

(a) 5

(b) 8

(c) 9

Answer:

A multiple is a number that can be obtained by multiplying a number by another number.

a. 5
First five multiplies of 5 are;
$1 \times 5 = 5$
$2 \times 5 = 10$
$3 \times 5 = 15$
$4 \times 5 = 20$
$5 \times 5 = 25$
So,
The first five multiplies are 5, 10, 15, 20 and 25.

b. 8
$1 \times 8 = 8$
$2 \times 8 = 16$
$3 \times 8 = 24$
$4 \times 8 = 32$
$5 \times 8 = 40$
So,

The first five multiplies of 8 are,
8, 16, 24, 32 and 40.

c. 9

$1 \times 9 = 9$

$2 \times 9 = 18$

$3 \times 9 = 27$

$4 \times 9 = 36$

$5 \times 9 = 45$

So,

First five multiplies are 9, 18, 27, 36 and 45.

Q. 3 Match the items in column 1 with the items in column 2:

Column 1	Column 2
(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

Answer:

Column 1	Column 2
(i) 35	(b) Multiple of 7
(ii) 15	(d) factor of 30
(iii) 16	(a) multiple of 8
(iv) 20	(f) factor of 20
(v) 25	(e) factor of 50
-	(c) Multiple of 70

Q. 4 Find all the multiples of 9 up to 100.

Answer:

$1 \times 9 = 9$

$2 \times 9 = 18$

$3 \times 9 = 27$

$4 \times 9 = 36$

$5 \times 9 = 45$

$6 \times 9 = 54$

$7 \times 9 = 63$

$8 \times 9 = 72$

$9 \times 9 = 81$

$10 \times 9 = 90$

$11 \times 9 = 99$

So,

The multiplies of 9 up to 100 will be,

9, 18, 27, 36, 45, 54, 63, 72, 81, 90 and 99.

EXERCISE – 3.2

Q. 1 What is the sum of any two

(a) Odd numbers? (b) Even numbers?

Answer:

Odd number is a number that cannot be divided by 2.

An even number is a number that can be divided by 2.

a. The sum of two odd numbers is even;
For example
3 + 5 = 8
7 + 11 = 18
13 + 19 = 32

b. The sum of two even numbers is even;
Example-
2 + 6 = 8
8 + 10 = 18
16 + 16 = 32

Q. 2 State whether the following statements are True or False:
(a) 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 the only even prime number.
(i) All even numbers are composite numbers.
(j) The product of two even numbers is always even.

Answer:

a. False.
For example- $1 + 3 + 5 = 9$, this is an odd number.

b. True.
Example- $1 + 3 + 4 = 8$, this is an even number.

c. True.
Example- $1 \times 3 \times 5 = 15$, it is an odd number.

d. False.
If an even number is divided by 2, the quotient is not always odd it can be even also.
For example-
$8 \div 2 = 4$, it is an even number.

e. False.
All prime numbers are not odd, 2 is a prime number and it is an even number.

f. False.
Prime numbers do have factors like 1 and the numbers itself are the factors of the numbers.

g. False.
Sum of two prime numbers is not always even.
Example- $2 + 3 = 5$ it is an odd number.

h. True.
2 is the only even prime number.

i. False.
All even numbers are not composite numbers, 2 is the prime number.

j. True.
The product of two even numbers is always even.
Example- $4 \times 6 = 24$, it is an even number.

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

Answer:

Prime numbers are the numbers that can be divided by 1 and by the number itself.

Such pairs of prime numbers are:

17 and 71

37 and 73

79 and 97

Q. 4 Write down separately the prime and composite numbers less than 20.

Answer:

Prime numbers are the numbers that has only two factors: 1 and number itself.

A composite number has more than two factors.

Prime numbers less than 20 are;

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.

Note: Every Number that is not a prime number is a composite number.

Q. 5 What is the greatest prime number between 1 and 10?

Answer:

First look for all the prime numbers between 1 and 10;

2, 3, 5, and 7.

Among these prime numbers 7 is the greatest.

Q. 6 Express the following as the sum of two odd primes:

(a) 44 (b) 36
(c) 24 (d) 18

Answer:

a. 44 = 39 + 5
b. 36 = 29 + 7
c. 24 = 17 + 7
d. 18 = 13 + 5

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

Answer:

Pairs of prime numbers whose difference is 2 are;

1) 5 and 7
   7 - 5 = 2
2) 21 and23
   23 - 21 = 2
3) 91 and 93
   93 - 91 = 2

Q. 8 Which of the following numbers are prime?
(a) 23 (b) 51
(c) 37 (d) 26

Answer:

a. 23 is a prime number;
$23 = 1 \times 23$
$23 = 23 \times 1$

Prime numbers are the numbers that can be divided by 1 and by number itself. So, 23 has two factors 1 and 23. It is a prime number.

b. 51 is a composite number,
$51 = 1 \times 51$
$51 = 3 \times 17$
$51 = 17 \times 3$
$51 = 51 \times 1$

So, it has four factors, 1, 3, 17, and 51. Therefore it is a composite number not a prime number.

c. 37 is a prime number,
$37 = 1 \times 37$
$37 = 37 \times 1$

Prime numbers are the numbers that can be divided by 1 and by number itself. 37 just have two factors 1 and 37. So it is a prime number.

d. 26
$26 = 1 \times 26$
$26 = 13 \times 2$
$26 = 2 \times 13$
$26 = 26 \times 1$

It has four factors 1, 2, 13 and 26,

So, it's not a prime number it is a composite number.

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

Answer:

Between 89 and 97, both of which are prime numbers, there are 7 composite numbers,

90 = 1, 2, 3, 5, 6, 9, 10, 15, 18, 30, 45, and 90

91 = 1, 7, 13, and 91

92 = 1, 2, 4, 23, 46, and 92

93 = 1, 3, 31 and 93

94 = 1, 2, 47, and 94

95 = 1, 5, 19 and 95

96 = 1, 2, 3, 4, 6, 8, 12, 16, 24, 32, 48 and 96

Hence, 90,91,92,93,94,95 and 96 are the composite numbers between 89 and 97.

Q. 10

Express each of the following numbers as the sum of three odd primes:

(a) 21 (b) 31

(c) 53 (d) 61

Answer:

a. 21 = 5 + 5 + 11

Clearly, 5 and 11 are prime numbers.

b. 31 = 5 + 7 + 19

Clearly, 3, 7 and 19 are prime numbers.

c. 53 = 5 + 17 + 31

Clearly, 5, 17 and 31 are prime numbers.

d. 61 = 13 + 17 + 31

Clearly, 13, 17 and 31 are prime numbers.

Q. 11 Write five pairs of prime numbers below 20 whose sum is divisible by 5.

Answer:

These are the pairs of prime numbers below 20 whose sum is divisible by 5;

$2 + 3 = 5$

$3 + 7 = 10$

$7 + 13 = 20$

$17 + 3 = 20$

$19 + 11 = 30$

Q. 12 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 ……....

Answer:

a. A number which has only two factors is called a Prime number
Explanation: A number which has only two whole number factors is called a prime number. It has only two whole number factors i.e. on the number itself and other Example: 2 is a prime number.

b. A number which has more than two factors is called a Composite number
Explanation: A number which has more than two factors is called a composite number.

Example: 4 is a prime number.

c. 1 is neither prime nor composite

Explanation: 1 is neither prime nor composite number. Because 1 has no other whole number factor other than itself. So, it's not prime and therefore not composite as well.

d. The smallest prime number is 2.

Explanation: The smallest prime number is 2 because, it has only two whole number factors, one the number itself and other 1.

e. The smallest composite number is 4

Explanation: The smallest composite number is 4 because, it has only three whole number factors i.e. 1, 2 and 4.

f. The smallest even number is 2

Explanation: The smallest even number is 2. Because an integer divisible by 2 is an even number.

EXERCISE – 3.3

Q. 1 Using divisibility tests, determine which of the following numbers are divisible by 2; by 3; by 5; by6; 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									
6689									
639210									
429714									
2856									
3060									
406839									

Answer:

In this question, we have to divide the numbers by the given numbers to see whether it is divisible or not.
To check this, we follow the divisibility rules:

(i) For divisible by 2; Any number that has 0, 2, 4, 6, or 8 in its one's place is divisible by 2.
(ii) For divisible by 3; If the sum of all the digits of the number is multiple of 3, then it is divisible by 3.
(iii) For divisible by 4; Any number whose last two digits (i.e. one's and ten's place digits) are divisible by 4 then, the number is divisible by 4.
(iv) For divisible by 5; Any number that has 0 or 5 in its one's place is divisible by 5.
(v) For divisible by 6; If a number a divisible by both 2 and 3, then it is divisible by 6.

(vi) For divisible by 8; Any number whose last three digits are divisible by 8 then, the number is divisible by 8.
(vii) For divisible by 9: If the sum of all the digits of the number is multiple is multiple of 9, then it is divisible by 9.
(viii) For divisible by 10; Any number that has 0 in its one's place is divisible by 10

For example-

990

= 990 ÷ 2 = 495 so yes it is divisible.

= 990 ÷ 3 = 330 so yes,

= 990 ÷ 4 = 247.5 which is not completely divisible so no its not divisible by 4,

= 990 ÷ 5 = 198 yes

= 990 ÷ 6 = 165 yes

= 990 ÷ 8 = 123.75 (N0)

= 990 ÷ 9 = 110 yes

= 990 ÷ 10 = 99 yes

= 990 ÷ 11 = 90 yes

Number	Divisible by								
	2	3	4	5	6	8	9	10	11
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
6689	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

Q. 2 Using divisibility tests, determine which of the following numbers are divisible by 4; by 8;

(a) 572
(b) 726352
(c) 5500
(d) 6000
(e) 12159
(f) 14560
(g) 21084
(h) 31795072
(i) 1700
(j) 2150

Answer:

a. 572

As per the divisibility rule for 4: if the last two digits of a whole number are divisible by 4, then the entire number is divisible by 4.
The last two digits of the given number are 72, since 72 is divisible by 4, the number is also divisible by 4.
According to the rule of divisibility for 8: if the last three digit of a whole number are divisible by 8, then the entire number is divisible by 8.
The last three digits are 572, as 572 is not divisible by 8, the given number is also not divisible by 8.

b. 726352

According to the rule of divisibility for 4 the last two digits of the given number are 52, since 52 is divisible by 4, the given number is also divisible by 4.
According to the rule of divisibility for 8 the last three digits are 352, as 352 is divisible by 8, the given number is also divisible by 8.

c. (5500

According to the rule of divisibility for 4 the last two digits of the given number are 00, the number is divisible by 4.

According to the rule of divisibility for 8, the last three digits are 500, as 500 is not divisible by 8, the given number is also not divisible by 8.

d. 6000

According to the rule of divisibility for 4 the last two digits of the given number are 00, the number is divisible by 4.

According to the rule of divisibility for 4 the last three digits are 000, the given number is divisible by 8.

e. 12159

According to the rule of divisibility for 4 the last two digits of the given number are 59, since 59 is not divisible by 4, the number is also not divisible by 4.

According to the rule of divisibility for 8 the last three digits are 159, as 159 is not divisible by 8, the given number is also not divisible by 8.

f. 14560

According to the rule of divisibility for 4 the last two digits of the given number are 60, since 60 is divisible by 4, the number is also divisible by 4.

According to the rule of divisibility for 8 the last three digits are 560, as 560 is divisible by 8, the given number is also divisible by 8.

g. 21084

According to the rule of divisibility for 4 the last two digits of the given number are 84, since 84 is divisible by 4, the number is also divisible by 4.

According to the rule of divisibility for 8 the last three digits are 084, as 084 is not divisible by 8, the given number is also not divisible by 8.

h. 31795072

According to the rule of divisibility for 4 the last two digits of the given number are 72, since 72 is divisible by 4, the number is also divisible by 4.

According to the rule of divisibility for 8 the last three digits are 072, as 072 is divisible by 8, the given number is also divisible by 8.

i. 1700

According to the rule of divisibility for 4 the last two digits of the given number are 00, the number is also divisible by 4.

According to the rule of divisibility for 8 the last three digits are 700, as 700 is not divisible by 8, the given number is also not divisible by 8.

j. 2150

According to the rule of divisibility for 4 the last two digits of the given number are 50, since 50 is not divisible by 4, the number is also not divisible by 4.

According to the rule of divisibility for 8 the last three digits are 150, as 150 is not divisible by 8, the given number is also not divisible by 8.

Q. 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

Answer:

The prime factors of 6 are 2 and 3. So for the number to be divisible by 6, it must also be divisible by 2 and 3. Therefore, we need to check whether the number is divisible by 2 and then the sum of the digits should also be divisible by 3.

a. 297144
Since the last digit of the number is 4, it is divisible by 2, so, the given number is divisible by 2.
On adding all the digits of the number, the sum obtained is 27 since 27 is divisible by 3, the given number is also divisible by 3.
As per the divisibility rule of 6 the number is divisible by both 2 and 3, so, it is divisible by 6.

b. 1258
Since the last digit of the number is 8, it is divisible by 2, so, the given number is divisible by 2.
On adding all the digits of the number, the sum obtained is 16 since 16 is not divisible by 3, the given number is also not divisible by 3.
As per the divisibility rule of 6 the number should be divisible by 2 and 3 but the given number is not divisible by both 2 and 3, so, it's not divisible by 6.

c. 4335

Since the last digit of the number is 5, it is not divisible by 2, so, the given number is not divisible by 2

On adding all the digits of the number, the sum obtained is 15 since 15 is divisible by 3, the given number is also divisible by 3.

As per the divisibility rule of 6 the number should be divisible by both 2 and 3 the number but the given number is not divisible by both 2 and 3, so, it is not divisible by 6.

d. 61233

Since the last digit of the number is 3, it is not divisible by 2, so, the given number is not divisible by 2

On adding all the digits of the number, the sum obtained is 15 since 15 is divisible by 3, the given number is also divisible by 3.

As per the divisibility rule of 6 the number should be divisible by both 2 and 3 but the given number is not divisible by both 2 and 3, so, it is not divisible by 6.

e. 901352

Since the last digit of the number is 2, it is divisible by 2, so, the given number is divisible by 2

On adding all the digits of the number, the sum obtained is 20 since 20 is not divisible by 3, the given number is also not divisible by 3.

As per the divisibility rule of 6 the number should be divisible by both 2 and 3 but the given number is not divisible by both 2 and 3, so, it is not divisible by 6.

f. 438750

Since the last digit of the number is 0, it is divisible by 2, so, the given number is divisible by 2

On adding all the digits of the number, the sum obtained is 27 since 27 is divisible by 3, the given number is also divisible by 3.

As per the divisibility rule of 6 the number should be divisible by both 2 and 3, the given number is divisible by both 2 and 3, so, it is divisible by 6.

g. 1790184

Since the last digit of the number is 4, it is divisible by 2, so, the given number is divisible by 2

On adding all the digit's number, the sum obtained is 30 since 30 is divisible by 3, the given number is also divisible by 3.

As per the divisibility rule of 6 the number should be divisible by both 2 and 3 and the given number is divisible by both 2 and 3, so, it is divisible by 6.

h. 12583

Since the last digit of the number is 3, it is divisible by 2, so, the given number is not divisible by 2

On adding all the digits' number, the sum obtained is 19 since 19 is not divisible by 3, the given number is also not divisible by 3.

As per the divisibility rule of 6 the number should be divisible by both 2 and 3 but the given number is not divisible by both 2 and 3, so, it is not divisible by 6.

i. 639210

Since the last digit of the number is 0, it is divisible by 2, so, the given number is divisible by 2

On adding all the digit's number, the sum obtained is 21 since 21 is divisible by 3, the given number is also divisible by 3.

As per the divisibility rule of 6 the number should be divisible by both 2 & 3 and the given number is divisible by both 2 and 3, so, it is divisible by 6.

j. 17852

Since the last digit of the number is 2, it is divisible by 2, so, the given number is divisible by 2

On adding all the digit's number, the sum obtained is 23, since 23 is not divisible by 3, the given number is also not divisible by 3.

As per the divisibility rule of 6 the number should be divisible by both 2 and 3 but the given number is not divisible by both 2 and 3, so, it is not divisible by 6.

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

(a) 5445
(b) 10824
(c) 7138965
(d) 70169308
(e) 10000001
(f) 901153

Answer:

Divisibility rule of 11 says that if the difference, of the sum of the digits at odd place and the sum of the digits at even place in the given number, is divisible by 11 then the number is also divisible by 11.

a. 5445
Calculate the sum of the digits at odd places = 5 + 4 = 9
Calculate the sum of the digits at even places = 4 + 5 = 9
Difference = 9 - 9 = 0
As per the divisibility rule of 11 the difference between the sum of the digits at odd places and the sum of the digits at even places is 0, hence, 5445 is divisible by 11.

b. 10824
Calculate the sum of the digits at odd places = 4+ 8 + 1 = 13
Calculate the sum of the digits at even places = 2 + 0 = 2
Difference = 13 - 2 = 11
As per the divisibility rule of 11 the difference between the sum of the digits at good places and the sum of the digits at even places is 11, which is divisible by 11, therefore 10824 is divisible by 11.

c. 7138965

Calculate the sum of the digits at odd places = 5 + 9 + 3 + 7 = 24

Calculate the sum of the digits at even places = 6 + 8 + 1 = 15

Difference = 24 - 15 = 9

As the difference between the sum of the digits at old places and the sum of the digits at even places is 9, which is not divisible by 11, therefore, given number is also not divisible by 11.

d. 70169308

Calculate the sum of the digits at odd places = 8 + 3 + 6 + 0 = 17

Calculate the sum of the digits at even places = 0 + 9 + 1 + 7 = 17

Difference = 17 – 17 = 0

As per the divisibility rule of 11 the difference between the sum of the digits at odd places and the sum of the digits at even places is 0, hence, 70169308 is divisible by 11.

e. 10000001

Calculate the sum of the digits at odd places = 1

Calculate the sum of the digits at even places = 1

Difference = 1 – 1 = 0

As per the divisibility rule of 11 the difference between the sum of the digits at odd places and the sum of the digits at even places is 0, hence, 10000001 is divisible by 11.

f. 901153

Calculate the sum of the digits at odd places = 3 + 1 + 0 = 4

Calculate the sum of the digits at even places = 5 + 1 + 9 = 15

Difference = 15 – 4 = 11

As per the divisibility rule of 11 the difference between the sum of the digits at odd places and the sum of the digits at even places is 11, which is divible by 11, therefore, 901153 is divisible by 11.

Q. 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:

(a) ……. 6724
(b) 4765 ……2

Answer:

a. ____6724

Add the remaining digits = 6+7+2+4 = 19

To make the number divisible by 3, the sum of its digits should be divisible by 3.

The smallest multiplier of 3 which comes after 19 is 21.

Therefore, smallest number = 21 – 19 = 2

if we add 8 then the digit is divisible by 3 (19 + 8 = 27)8 is the largest digit 26724 = 8 + 6 + 7 + 2 + 4 = 36

Therefore, the largest number is 8.

b. 4765____2

Add the remaining digits = 4 + 7 + 6 + 5 + 2 = 24

To make the number divisible by 3, the sum of its digits should be divisible by 3. As we can see 24 is already divisible by 3,

the smallest number that can be placed here is 0.

if we add 9 then the digit is divisible by 3 (2 + 9 = 33) 9 is the largest digit 4765 ____2 = 4 + 7 + 6 + 5 + 9 + 2 = 33

Therefore, the largest number is 9.

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

(a) 92 ……389 (b) 8 ……9484

Answer:

a. Let suppose missing digit = x

Calculate the sum of the digits at odd places = 9 + 3 + 2 = 14

Calculate the sum of the digits at even places = 8+ x + 9 = 17 + x

Difference = 17 + x – 14 = 3 + x

For a number to be divisible by 11, this difference should be 0 or a multiplier of 11.

If 3 + x = 0, then

x = -3

But the number cannot be negative.

The closest multiplier of 11, which is near to 3 is taken. This is 11 itself.

3 + x = 11

x = 8

Therefore, the required digit is 8.

b. Let suppose missing digit = x

Calculate the sum of the digits at odd places = 4 + 4 + x = 8 + x

Calculate the sum of the digits at even places = 8 + 9 + 8 = 25

Difference = 25 – (8 + x) = 17 – x

For a number to be divisible by 11, this difference should be 0 or a multiplier of 11.

If 17 - x = 0, then

x = 17

But this is not possible.

The closest multiplier of 11 is taken, taking 11 itself we get,

17 - x = 11

x = 6

Therefore, the required digit is 6.

EXERCISE – 3.4

Q. 1 Find the common factors of:

(a) 20 and 28 (b) 15 and 25

(c) 35 and 50 (d) 56 and 120

Answer:

When we find the factors of two or more numbers, then some factors may be found in both the numbers, these are called common factors.

a. 20 and 28
Factors of 20 = 1, 2, 4, 5, 10 and 20
Factors of 28 = 1, 2, 4, 7, 14 and 28
Common factors = 1, 2, 4

b. 15 and 25
Factors of 15 = 1, 3, 5, 15
Factors of 25 = 1, 5, 25
Common factors = 1 and 5

c. 35 and 50
Factors of 35 = 1, 5, 7, 35
Factors of 50 = 1, 2, 5, 10, 25, 50
Common factors = 1 and 5

d. 56 and 120
Factors of 56 = 1, 2, 4, 7, 8, 14, 28 and 56
Factors of 120 = 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 20, 24, 30, 40, 60, 120
Common factors = 1, 2, 4 and 8

Q. 2 Find the common factors of:
(a) 4, 8 and 12 (b) 5, 15 and 25

Answer:

a. 4, 8 and 12

Factors of 4 = 1, 2 and 4
Factors of 8 = 1, 2, 4 and 8
Factors of 12 = 1, 2, 3, 4, 6 and 12
Common factors = 1, 2, and 4

b. 5, 15 and 25
Factors of 5 = 1, 5
Factors of 15 = 1, 3, 5 and 15
Factors of 25 = 1, 5 and 25
Common factors = 1 and 5.

Q. 3 Find first three common multiples of:
(a) 6 and 8 (b) 12 and 18

Answer:

a. 6 and 8
Multiples of 6 = 6, 12, 18, 24, 30, 36, 42, 48, 54, 60, 66, 72, 78
Multiples of 8 = 8, 16, 24, 32, 40, 48, 56, 64, 72, 80
So,
First three common multiples are = 24, 48 and 72

b. 12 and 18
Multiples of 12 = 12, 24, 36, 48, 60, 72, 84, 96, 108, 120
Multiples of 18 = 18, 36, 54, 72, 90, 108, 126
First three common multiples = 36, 72 and 108

Q. 4 Write all the numbers less than 100 which are common multiples of 3 and 4.

Answer:

Multiples of 3 less than 100 are;

= 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60, 63, 66, 69, 81, 84, 87, 90, 93, 96, 99.

Multiples of 4 less than 100 are;

= 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, 64, 68, 72, 76, 80, 84, 88, 92, 96.

Common multiples are;

= 12, 24, 36, 48, 60, 72, 84 and 96

Q. 5 Which of the following numbers are co-prime?
(a) 18 and 35 (b) 15 and 37
(c) 30 and 415 (d) 17 and 68
(e) 216 and 215 (f) 81 and 16

Answer:

Two numbers are said to be co-prime if they don't have any common factor other than 1

a. 18 and 35
Factors of 18 = 1, 2, 3, 6, 9, and 18
Factors of 35 = 1, 5, 7 and 35
Common factor = 1
Therefore, the given two numbers are co-prime.

b. 15 and 37
Factors of 15 = 1, 3, 5, and 15
Factors of 37 = 1, and 37
Common factor = 1
Therefore, the given two numbers are co-prime.

c. 30 and 415
Factors of 30 = 1, 2, 3, 5, 6, 10, 15, and 30
Factors of 415 = 1, 5, 83 and 415
Common factor = 1 and 5
These two numbers have a factor other than 1, therefore, the given two numbers are not co-prime.

d. 17 and 68
Factors of 17 = 1, and 17
Factors of 68 = 1, 2, 4, 17, 34 and 68
Common factor = 1, and 17
These two numbers have a factor other than 1, therefore, the given two numbers are not co-prime.

e. 216 and 215
Factors of 216 = 1, 3, 4, 6, 8, 9, 12, 18, 24, 27, 36, 54, 72, 108 and 216
Factors of 215 = 1, 5, 43 and 215
Common factor = 1
Therefore, the given two numbers are co-prime.

f. 81 and 16
Factors of 81 = 1, 3, 9, 27 and 81
Factors of 16 = 1, 2, 4, 8 and 16
Common factor = 1
Therefore, the given two numbers are co-prime.

Q. 6 A number is divisible by both 5 and 12. By which other number will that number be always divisible?

Answer:

The no. will always be divisible by their LCM which is 60.
It can be shown. Let the number be *p*.

p = 12 × q [Given: p is divisible by 12]Also, p is divisible by 5, but 12 is not divisible by 5, and do not have any factor common So, q is divisible by 5.p = 12 × (5 × r)p= (12 × 5) r p= 60rSo the number is divisible by 60.

Q. 7 A number is divisible by 12. By what other numbers will that number be divisible?

Answer:

As the number is divisible by 12,

So, it will also be divisible by its factors;

That is,

1, 2, 3, 4, 6 and 12.

Therefore,

1, 2, 3, 4 and 6 are the numbers other than 12 by which this number is also divisible.

EXERCISE – 3.5

Q. 1 Which of the following statements are true?

(a) If a number is divisible by 3, it must be divisible by 9.
(b) If a number is d divisible by 9, it must be divisible by 3.
(c) A number is divisible by 18, if it is divisible by both 3 and 6.
(d) If a number is divisible by 9 and 10 both, then it must be divisible by 90.
(e) If two numbers are co-prime, at least one of them must be prime.
(f) All numbers which are divisible by 4 must also be divisible by 8.
(g) All numbers which are divisible by 8 must also be divisible by 4.
(h) If a number exactly divides two numbers separately, it must exactly divide their su,
(i) If a number exactly divides the sum of two numbers, it must exactly divide the two numbers separately.

Answer:

a. False.
For example – 6 is divisible by 3, but it is not divisible by 9.

b. True.
Example- 18, is divisible by 3 as well as 9 so, yes, If a number is divisible by 9, it must be divisible by 3.

c. False.
If a number is divisible by 3 and 6, it is not necessary that it is also divisible by 18.
Example – 42 it is divisible by 6 and 3 but not by 18.

d. True.
As $9 \times 10 = 90$ So, if a number is divisible by 9 and 10 both, then it must be divisible by 90.

e. False.
Example – 15 and 32 are co-prime and composite.

f. False.

Example – 20 is divisible by 4 but not by 8. So, it's not necessary that all numbers which are divisible by 4 must also be divisible by 8.

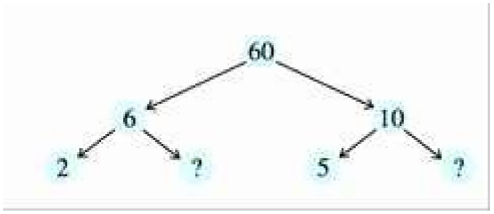
g. True.
As we know $8 = 2 \times 4$ so all numbers which are divisible by 8 must also be divisible by 2 and 4.

h. True.
Example – 3 divides 6 and 9 separately and 15, which is the sum of 9 and 6. So, if a number exactly divides two numbers separately, it must exactly divide their sum.

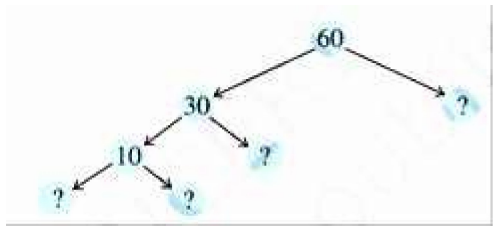
i. False.
Example- 2 divide 12 but it doesn't divide 3 and 9. So, if a number exactly divides the sum of two numbers, it's not necessary that it also divide the two numbers separately.

Q. 2 Here are two different factor trees for 60. Write the missing numbers.

(a)



(b)



Answer:

a. Let's take 'a' be the missing number,
So, we have,
$2 \times a = 6$

$a = 6/2 = 3$

$a = 3$

So,

$2 \times 3 = 6$

And

$5 \times a = 10$

$a = 10/5 = 2$

$5 \times 2 = 10$

Missing numbers are 3 and 2

b. As we know $60 = 30 \times 2$

$30 = 10 \times 3$

$10 = 5 \times 2$

Missing numbers are, 2, 5, 3 and 2.

Q. 3 Which factors are not included in the prime factorisation of a composite number?

Answer:

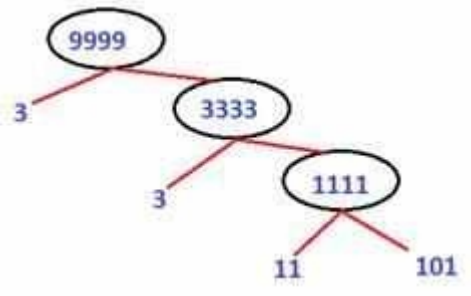
1 and the number itself are not included in the prime factorisation of a composite number.

Q. 4 Write the greatest 4-digit number and express it in terms of its prime factors.

Answer:

Greatest four-digit number = 9999

Let's draw the factor tree-



So the prime factors are;

$9999 = 3 \times 3 \times 11 \times 101$

Q. 5 Write the smallest 5-digit number and express it in the form of its prime factors.

Answer:

2	10000
2	5000
2	2500
2	1250
5	625
5	125
5	25
5	5
	1

Smallest 5-digit number = 10,000

Draw the factor tree,

So the factors are;

$10000 = 2 \times 2 \times 2 \times 2 \times 5 \times 5 \times 5 \times 5$

Q. 6

Find all the prime factors of 1729 and arrange them in ascending order. Now state the relation, if any; between two consecutive prime factors.

Answer:

Calculate the factors first;

7	1729
13	247
19	19
	1

So we have;

$1729 = 7 \times 13 \times 19$

$13 - 7 = 6$

$19 - 13 = 6$

Difference of two consecutive prime factors is 6.

Q. 7 The product of three consecutive numbers is always divisible by 6. Verify this statement with the help of some examples.

Answer:

Let's take,

$2 \times 3 \times 4 = 24$, this is divisible by 6

$9 \times 10 \times 11 = 990$, this is divisible by 6

$20 \times 21 \times 22 = 9240$, this is divisible by 6

$31 \times 32 \times 33 = 32, 736$, this is divisible by 6

So, the product of three consecutive numbers is always divisible by 6.

Q. 8 The sum of two consecutive odd numbers is divisible by 4. Verify this statement with the help of some examples.

Answer:

5 + 7 = 12, it is divisible by 4,

15 + 17 = 32, divisible by 4,

17 + 19 = 36, divisible by 4,

21 + 23 = 44, divisible by 4.

Therefore, the sum of two consecutive odd numbers is divisible by 4.

Q. 9 In which of the following expressions, prime factorisation has been done?

(a) 24 = 2 × 3 × 4
(b) 56 = 7 × 2 × 2 × 2
(c) 70 = 2 × 5 × 7
(d) 54 = 2 × 3 × 9

Answer:

Prime factorization is finding the factors of a number that are all prime.

a. 24 = 2 × 3 × 4
As we can see in this factorization 4 is a composite number, so prime factorization has not been done.

b. 56 = 7 × 2 × 2 × 2
Since all the factors are prime factors so, prime factorization has been done.

c. 70 = 2 × 5 × 7

Since all the factors are prime factors so, prime factorization has been done.

d. $54 = 2 \times 3 \times 9$

As we can see in this factorization 9 is a composite number, so prime factorization has not been done.

Q. 10 Determine if 25110 is divisible by 45.

Answer:

According to the divisibility rule of 45 if the last digit of a number is divisible by 5 and the sum of the digits is divisible by 9, then the number is divisible by 45.

$45 = 5 \times 9$

Factors of 5 = 1 and 5

Factors of 9 = 1, 3 and 9

Therefore, 5 and 9 are co-prime numbers,

As the last digit of the number is 0 so it is divisible by 5.

Sum of the all digits = 2+5+1+1+0 = 9

As the sum of the digits is divisible by 9 so this number is also divisible by 9.

So, the number is divisible by 5 and 9, it is also divisible by 45.

Q.11 18 is divisible by both 2 and 3. It is also divisible by $2 \times 3 = 6$. Similarly, a number is divisible by both 4 and 6. Can we say that the number must also be divisible by $4 \times 6 = 24$? If not, give an example to justify your answer.

Answer:

No, it is not necessary because 12 and 36 are divisible by 4 and 6 both but are not divisible by 24.

Q. 12 I am the smallest number, having four different prime factors. Can you find me?

Answer:

As it is the smallest number, it will be the product of 4 smallest prime numbers;

EXECRISE – 3.6

Q. 1 Find the HCF of the following numbers:

(a) 18, 48 (b) 30, 42

(c) 18, 60 (d) 27, 63

(e) 36, 84 (f) 34, 102

(g) 70, 105, 175

(h) 91, 112, 49 (i) 18, 54, 81

(j) 12, 45, 75

Answer:

HCF – Highest common factor

The highest common factor of two or more numbers is the largest number that divides separately both the numbers.

a. 18 and 48,

2	18
3	9
3	3
	1

2	48
2	24
2	12
2	6
3	3
	1

$18 = 2 \times 3 \times 3$

$48 = 2 \times 2 \times 2 \times 2 \times 3$

$HCF = 2 \times 3 = 6$

b. 30, 42

2	30
3	15
5	5
	1

2	42
3	21
7	7
	1

$30 = 2 \times 3 \times 5$

$42 = 2 \times 3 \times 7$

HCF $= 2 \times 3 = 6$

c. 18, 60

2	18
3	9
3	3
	1

2	60
2	30
3	15
5	5
	1

$18 = 2 \times 3 \times 3$

$60 = 2 \times 2 \times 3 \times 5$

HCF $= 2 \times 3 = 6$

d. 27, 63

3	27
3	9
3	3
	1

3	63
3	21
7	7
	1

$27 = 3 \times 3 \times 3$

$63 = 3 \times 3 \times 7$

$HCF = 3 \times 3 = 9$

e. 36, 84

2	36
2	18
3	9
3	3
	1

2	84
2	42
3	21
7	7
	1

$36 = 2 \times 2 \times 3 \times 3$

$84 = 2 \times 2 \times 3 \times 7$

$HCF = 2 \times 2 \times 3 = 12$

f. 34, 102

2	34
17	17
	1

2	102
3	51
17	17
	1

$34 = 2 \times 17$

$102 = 2 \times 3 \times 17$

$HCF = 2 \times 17 = 34$

g. 70, 105, 175

2	70
5	35
7	7
	1

3	105
5	35
7	7
	1

5	175
5	35
7	7
	1

$70 = 2 \times 5 \times 7$

$105 = 3 \times 5 \times 7$

$175 = 5 \times 5 \times 7$

$HCF = 5 \times 7 = 35$

h. 91, 112, 49

7	91
13	13
	1

2	112
2	56
2	28
2	14
7	7
	1

7	49
7	7
	1

$91 = 7 \times 13$

$112 = 2 \times 2 \times 2 \times 2 \times 7$

$49 = 7 \times 7$

HCF = 7

i. 18, 54, 81

2	18
3	9
3	3
	1

2	54
3	27
3	9
3	3
	1

3	81
3	27
3	9
3	3
	1

$18 = 2 \times 3 \times 3$

$54 = 2 \times 3 \times 3 \times 3$

$81 = 3 \times 3 \times 3 \times 3$

$HCF = 3 \times 3 = 9$

j. 12, 45, 75

2	12
2	6
3	3
	1

3	45
3	15
5	5
	1

3	75
5	45
5	5
	1

$12 = 2 \times 2 \times 3$

$45 = 3 \times 3 \times 5$

$75 = 3 \times 5 \times 5$

$HCF = 3$

Q. 2 What is the HCF of two consecutive-
(a) numbers?
(b) even numbers?
(c) odd numbers?

Answer:

a. Consecutive numbers
Example- 2 and 3
HCF = 1

b. Even number
Example – 2 and 4
HCF = 2

c. Odd numbers
Example – 3 and 5
HCF = 1

Q. 3 HCF of co-prime numbers 4 and 15 was found as follows by factorization: $4 = 2 \times 2$ and $15 = 3 \times 5$ since there is no common prime factor. So, HCF of 4 and 15 is 0. Is the answer correct? If not, what is the correct HCF?

Answer:

No, the answer is not correct. 1 will be the correct HCF.

Explanation: The factorization of 4 and 15 is given as:

4: $1 \times 2 \times 2$

15: $1 \times 3 \times 5$

Here, the highest common factor is 1.

EXERCISE – 3.7

Q. 1

Renu purchases two bags of fertiliser of weights 75 kg and 69 kg. Find the maximum value of weight which can measure the weight of the fertiliser exact number of times.

Answer:

Weight of the two bags = 75 kg and 69 kg

Maximum weight = HCF (75, 69)

3	75
5	45
5	5
	1

3	69
23	23
	1

$75 = 3 \times 5 \times 5$

$69 = 3 \times 23$

HCF = 3

Therefore, the maximum value of weight, which can measure the weight of the fertilizer exact number of time, is 3 kg.

Q. 2 Three boys step off together from the same spot. Their steps measure 63 cm, 70 cm and 77 cm respectively. What is the minimum distance each should cover so that all can cover the distance in complete steps?

Answer:

Step measure of first boy = 63 cm

Step measure of second boy = 70 cm

Step measure of third boy = 77cm

Now calculate the LCM of 63, 70 and 77

2	63, 70, 77
3	63, 35, 77
3	21, 35, 77
5	7, 35, 77
7	7, 7, 77
11	1, 1, 11
	1, 1, 1

LCM = 2 × 3 × 3 × 5 × 7 × 11 = 6930

Therefore,

The maximum distance each should cover so that all can cover the distance in complete steps is 6930 cm.

Q. 3 The length, breadth, and height of a room are 825 cm, 675 cm, and 450 cm respectively. Find the longest tape which can measure the three dimensions of the room exactly.

Answer:

Length of the room = 825 cm

Breadth of the room = 675 cm

Height of the room = 450 cm

Longest tape = HCF of 825, 675 and 450

$825 = 3 \times 5 \times 5 \times 11$

$675 = 3 \times 3 \times 3 \times 5 \times 5$

$450 = 2 \times 3 \times 3 \times 5 \times 5$

HCF = Product of common factors $= 3 \times 5 \times 5 = 75$ cm

Therefore, the longest tape = 75 cm

Q. 4 Determine the smallest 3-digit number which is exactly divisible by 6, 8 and 12.

Answer:

Smallest 3-digit number = LCM of 6, 8 and 12

2	6, 8, 12
2	3, 4, 6
2	3, 2, 3
3	3, 1, 3
	1, 1, 1

$LCM = 2 \times 2 \times 2 \times 3 = 24$

LCM of these 3 numbers is 24 so to find out 3-digit number we have to calculate the multiples of 24,

$24 \times 1 = 24$

$24 \times 2 = 48$

$24 \times 3 = 72$

$24 \times 4 = 96$

$24 \times 5 = 120$

$24 \times 6 = 144$

It can be seen that, 120 is the smallest 3-digit multiple of 24 so, the smallest 3-digit number which is exactly divisible by 6, 8 and 12 is 120.

Q. 5 Determine the greatest 3-digit number exactly divisible by 8, 10 and 12.

Answer:

Let's take the LCM of 8, 10 and 12

2	8, 10, 12
2	4, 5, 6
2	2, 5, 3
3	1, 5, 3
5	1, 5, 1
	1, 1, 1

LCM = 2 × 2 × 2 × 3 × 5 = 120

Now to get greatest 3-digit number we have to calculate the multiples of 120

120 × 1 = 120

120 × 2 = 240

120 × 3 = 360

120 × 4 = 480

120 × 5 = 600

120 × 6 = 720

120 × 7 = 840

120 × 8 = 960

120 × 9 = 1080

$120 \times 10 = 1200$

Hence the greatest 3-digit number exactly divisible by 8, 10 and 12 is 960.

Q. 6 The traffic lights at three different road crossings change after every 48 seconds, 72 seconds and 108 seconds respectively. If they change simultaneously at 7 a.m., at what time will they change simultaneously again?

Answer:

Time-period after which these lights will change = LCM of 48, 72 and 108

LCM is the lowest common multiple. LCM of two numbers It is the smallest number that is divisible by both of them.

2	48, 72, 108
2	24, 36, 54
2	12, 18, 27
2	6, 9, 27
3	3, 9, 27
3	1, 3, 9
3	1, 3, 3
	1, 1, 1

$LCM = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 = 432$

The lights will change together after every 432 seconds.

60 seconds = 1 minute

432 seconds = 432/60 min

$$
\begin{array}{r}
\quad 7 \\
60\overline{)432} \\
-\,420 \\
\hline
\quad 12
\end{array}
$$

= 7 minutes and 12 seconds Total time will be 7 am + 7 min + 12 sec.

Hence these lights will change simultaneously again at 7:07:12 am.

Q. 7 Three tankers contain 403 litres, 434 litres and 465 litres of diesel respectively. Find the maximum capacity of a container that can measure the diesel of the three containers exact number of times.

Answer:

Maximum capacity of the required tanker = HCF of 403, 434 and 465

13	403
31	31
	1

2	434
7	217
31	31
	1

3	465
5	155
31	31
	1

$403 = 13 \times 31$

$434 = 2 \times 7 \times 31$

$465 = 3 \times 5 \times 31$

HCF = 31

So, the container of capacity 31 litres can measure the diesel of 3 containers exact number of times.

Q. 8 Find the least number which when divided by 6, 15 and 18 leave remainder 5 in each case.

Answer:

To find the required number we have to calculate LCM of 6, 15 and 18 because LCM is the least number divided by all 6, 15 and 18

2	6, 15, 18
2	3, 15, 9
3	1, 5, 3
5	1, 5, 1
	1, 1, 1

LCM = $2 \times 3 \times 3 \times 5 = 90$

Since the number required always leaves remainder 5

Required number = 90 + 5 = 95

Q. 9 Find the smallest 4-digit number which is divisible by 18, 24 and 32.

Answer:

LCM 0f 18, 24 and 32

2	18, 24, 32
2	9, 12, 16
2	9, 6, 8
2	9, 3, 4
2	9, 3, 2
3	9, 3, 1
3	3, 1, 1
	1, 1, 1

LCM = 2 × 2 × 2 × 2 × 2 × 3 × 3 = 288

As, 288 is the smallest number divisible by 18, 24 and 32 and we have to find the smallest 4-digit multiple of 288 therefore we have to find the smallest 4-digit multiple of 288.

It can be observed that

288 × 3 = 864 and

288 × 4 = 1152

1152 is the smallest 4-digit multiple of 288.

Therefore, the smallest 4-digit number which is divisible by 18, 24 and 32 is 1152.

Q. 10 Find the LCM of the following numbers:
(a) 9 and 4 (b) 12 and 5
(c) 6 and 5 (d) 15 and 4
Observe a common property in the obtained LCMs. Is LCM the product of two numbers in each case?

Answer:

LCM – Least common multiple

The LCM of two numbers is the smallest number that is a multiple of both the numbers.

a. 9 and 4

2	9, 4
2	9, 2
3	9, 1
3	3, 1
	1, 1

LCM = 2 × 2 × 3 × 3 = 36

b. 12 and 5

2	12, 5
2	6, 5
3	3, 5
5	1, 5
	1, 1

LCM = 2 × 2 × 3 × 5 = 60

c. 6 and 5

2	6, 5
3	3, 5
5	1, 5
	1, 1

LCM = 2 × 3 × 5 = 30

d. 15 and 4

2	15, 4
2	15, 2
3	15, 1
5	5, 1
	1, 1

LCM = 2 × 2 × 3 × 5 = 60

Yes, it can be seen that in each case, LCM of given numbers is the product of these numbers. When two numbers are co-prime, their LCM is the product of those numbers. Also, in each case, LCM is a multiple of 3.

Q. 11 Find the LCM of the following numbers in which one number is the factor of the other:

(a) 5, 20 (b) 6, 18
(c) 12, 48 (d) 9, 45
What do you observe in the results obtained?

Answer:

a. 5, 20

2	5, 20
2	5, 10
5	5, 5
	1, 1

LCM = 2 × 2 × 5 = 20

b. 6, 18

2	6, 18
3	3, 9
3	1, 3
	1, 1

LCM = 2 × 3 × 3 = 18

c. 12, 48

2	12, 48
2	6, 24
2	3, 12
2	3, 6
3	3, 3
	1, 1

LCM = 2 × 2 × 2 × 2 × 3 = 48

d. 9, 45

3	9, 45
3	3, 15
5	1, 5
	1, 1

LCM = 3 × 3 × 5 = 45

Yes, it can be seen that in each case the LCM of the given number is the larger number. When one number is a factor of the other, their LCM will be the larger number.