

Factors, Multiples and Primes: Quick Questions

Mini whiteboard questions, with solutions

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سب سے چھوٹا مشترک سے بڑھا مشترک عامل

عالم Factors

True or false?

7 is a ^{عامل}factor of 21

True or false?

7 is a ^{عامل} factor of 21

True. $21 = 7 \times 3$, so 21 divides exactly by 7.

True or false?

1 is a ^{عامل}factor of every whole number

True or false?

1 is a ^{عامل} factor of every whole number

True. Every number n can be written as $1 \times n$.

True or false?

6 is a ^{عامل}factor of 16

True or false?

6 is a ^{عامل} factor of 16

False. The ^{عامل} factors of 16 are 1, 2, 4, 8, 16;

$16 \div 6$ is not a whole number.

True or false?

Every number has an even number of ^{عائل} factors

True or false?

Every number has an even number of ^{عائل} factors

False. ^{عائل} Factors usually pair up, but 9 has just 1, 3, 9 — three ^{عائل} factors — because 3×3 uses the same ^{عائل} factor twice.

True or false?

If 4 is a ^{عامل}factor of a number,
then 8 must be a ^{عامل}factor of it too

True or false?

If 4 is a ^{عامل}factor of a number,
then 8 must be a ^{عامل}factor of it too

False. 4 is a ^{عامل}factor of 12, but 8 is not.

List all the ^{عوامل} factors of 12

List all the ^{عامل} factors of 12

1, 2, 3, 4, 6, 12

List all the ^{عوامل} factors of 20

List all the ^{عامل} factors of 20

1, 2, 4, 5, 10, 20

List all the ^{عوامل} factors of 36

List all the ^{عامل} factors of 36

1, 2, 3, 4, 6, 9, 12, 18, 36

How many ^{عوامل} factors does 16 have?

How many ^{عوامل} factors does 16 have?

1, 2, 4, 8, 16

Five ^{عوامل} factors.

سب سے بڑا مشترک عامل
Find the **highest common factor** of 12 and 18

سب سے بڑا مشترک عامل
Find the highest common factor of 12 and 18

عامل
Factors of 12: 1, 2, 3, 4, **6**, 12

عامل
Factors of 18: 1, 2, 3, **6**, 9, 18

$$\text{HCF} = 6$$

سب سے بڑا مشترک عامل
Find the **highest common factor** of 24 and 36

سب سے بڑا مشترک عامل
Find the **highest common factor** of 24 and 36

عامل
Factors of 24: 1, 2, 3, 4, 6, 8, **12**, 24

عامل
Factors of 36: 1, 2, 3, 4, 6, 9, **12**, 18, 36

$$\text{HCF} = 12$$

عوامل کا جوڑا
List all the factor pairs of 48

عوامل کا جوڑا
List all the **factor pairs** of 48

$$1 \times 48$$

$$2 \times 24$$

$$3 \times 16$$

$$4 \times 12$$

$$6 \times 8$$

Which whole number below 30 has the most ^{عوامل} factors?

Which whole number below 30 has the most ^{عائل} factors?

24, with eight ^{عائل} factors:

1, 2, 3, 4, 6, 8, 12, 24

n has exactly three ^{عوامل} factors.

Give a possible value of n .

n has exactly three ^{عائل} factors.

Give a possible value of n .

4 (1, 2, 4), 9 (1, 3, 9) or 25 (1, 5, 25).

Any ^{مفرد عدد} prime squared works.

Explain why ^{مربع عدد}square numbers have an odd number of ^{عوامل}factors

Explain why ^{مربع عدد} square numbers have an odd number of ^{عامل} factors

^{عامل} Factors come in pairs, one either side of the ^{جذر} square root.

In a ^{مربع عدد} square number the ^{جذر} square root pairs with itself, so one ^{عامل} factor is left unpaired.

مضاعف Multiples

True or false?

24 is a مضاعف multiple of 6

True or false?

24 is a مضاعف multiple of 6

True. $6 \times 4 = 24.$

True or false?

Every مضاعف multiple of 10 is also a مضاعف multiple of 5

True or false?

Every مضاعف multiple of 10 is also a مضاعف multiple of 5

True. $10 = 5 \times 2$, so every مضاعف multiple of 10 already contains a عامل factor of 5.

True or false?

35 is a مضاعف multiple of 4

True or false?

35 is a مضاعف multiple of 4

False. $4 \times 8 = 32$ and $4 \times 9 = 36$, so 35 is stepped over.

True or false?

Every مضاعف multiple of 3 is also a مضاعف multiple of 9

True or false?

Every مضاعف multiple of 3 is also a مضاعف multiple of 9

False. مضاعف 6 is a multiple of 3 but not of 9.

The other way round *is* true.

True or false?

سب سے چھوٹا مشترک مضاعف

The **lowest common multiple** of two numbers is always found by multiplying them together

True or false?

سب سے چھوٹا مشترک مضاعف
The **lowest common multiple** of two numbers is always found
by multiplying them together

False. $4 \times 6 = 24$, but the **LCM** of 4 and 6 is
12.

عامل
Multiplying only works when the numbers share no **factors**.

Write down the first five مضاعف multiples of 4

Write down the first five مضاعف multiples of 4

4, 8, 12, 16, 20

Write down the first five مضاعف multiples of 7

Write down the first five مضاعف multiples of 7

7, 14, 21, 28, 35

Write down the مضاعف multiples of 6 between 20 and 50

Write down the مضاعف multiples of 6 between 20 and 50

24, 30, 36, 42, 48

Is 126 a مضاعف multiple of 9?

Is 126 a مضاعف multiple of 9?

Yes. $1 + 2 + 6 = 9$, and $9 \times 14 = 126$.

سب سے چھوٹا مشترک مضاعف
Find the **lowest common multiple** of 4 and 6

سب سے چھوٹا مشترک مضاعف
Find the **lowest common multiple** of 4 and 6

4, 8, **12**, 16, ...

6, **12**, 18, ...

LCM = 12

سب سے چھوٹا مشترک مضاعف
Find the **lowest common multiple** of 8 and 12

سب سے چھوٹا مشترک مضاعف
Find the **lowest common multiple** of 8 and 12

8, 16, **24**, 32, ...

12, **24**, 36, ...

LCM = 24

سب سے چھوٹا مشترک مضاعف
Find the **lowest common multiple** of 5, 6 and 9

سب سے چھوٹا مشترک مضاعف
Find the **lowest common multiple** of 5, 6 and 9

سب سے چھوٹا مشترک مضاعف
LCM of 5 and 6 is 30.

سب سے چھوٹا مشترک مضاعف
LCM of 30 and 9 is 90.

$$\text{LCM} = 90$$

A number is a مضاعف multiple of both 4 and 10.
What is the smallest it could be?

A number is a مضاعف multiple of both 4 and 10.

What is the smallest it could be?

سب سے چھوٹا مشترک مضاعف
20, the lowest common multiple of 4 and 10.

Two lighthouses flash together now.
One flashes every 12 seconds, the other every 18 seconds.
When do they next flash together?

Two lighthouses flash together now.
One flashes every 12 seconds, the other every 18 seconds.
When do they next flash together?

$$\text{LCM}(12, 18) = 36$$

In 36 seconds.

Find the smallest number above 1 that leaves a remainder of 1 when divided by 4, by 5 and by 6

Find the smallest number above 1 that leaves a remainder of 1 when divided by 4, by 5 and by 6

The number must be one more than a common مضاعف multiple of 4, 5 and 6.

$\text{LCM}(4, 5, 6) = 60$, so the number is 61.

Primes

مفرد عدد

True or false?

1 is a ^{مفرد عدد} prime number

True or false?

1 is a ^{مفرد عدد} prime number

False. A ^{مفرد عدد} prime has exactly two ^{عائل} factors, but 1 has only one.

True or false?

2 is the only even ^{مفرد عدد} prime number

True or false?

2 is the only even ^{مفرد عدد} prime number

True. Every other even number has 2 as an extra ^{عامل} factor, so it
has more than two ^{عامل} factors.

True or false?

51 is a ^{مفرد عدد} prime number

True or false?

51 is a ^{مفرد عدد} prime number

False. $51 = 3 \times 17$.

Its digits add to 6, so it divides by 3.

True or false?

There are infinitely many ^{مفرد عدد}prime numbers

True or false?

There are infinitely many ^{مفرد عدد}prime numbers

True. The ^{مفرد عدد}primes never run out, although they do thin out as the numbers get larger.

True or false?

If a number ends in 3, it must be ^{مفرد عدد}prime

True or false?

If a number ends in 3, it must be ^{مفرد عدد}prime

False. $33 = 3 \times 11$ and $63 = 7 \times 9$.

Write down all the ^{مفرد عدد}prime numbers between 1 and 10

Write down all the ^{مفرد عدد}prime numbers between 1 and 10

2, 3, 5, 7

Write down all the ^{مفرد عدد}prime numbers between 10 and 20

Write down all the ^{مفرد عدد}prime numbers between 10 and 20

11, 13, 17, 19

Is 27 a ^{مفرد عدد}prime number?

Explain your answer.

Is 27 a ^{مفرد عدد} prime number?

Explain your answer.

No. $27 = 3 \times 9$, so it has more than two ^{عامل} factors.

Write down the first ^{مفرد عدد}prime number greater than 30

Write down the first ^{مفرد عدد}prime number greater than 30

31

Is 91 a ^{مفرد عدد}prime number?

Is 91 a ^{مفرد عدد} prime number?

No. $91 = 7 \times 13$.

How many ^{مفرد عدد}prime numbers are there between 20 and 40?

How many ^{مفرد عدد}prime numbers are there between 20 and 40?

23, 29, 31, 37

Four of them.

Is 143 a ^{مفرد عدد} prime number?

Is 143 a ^{مفرد عدد}prime number?

No. $143 = 11 \times 13$.

Find two ^{مفرد عدد}prime numbers that add up to 24

Find two ^{مفرد عدد}prime numbers that add up to 24

$$5 + 19 \quad 7 + 17 \quad 11 + 13$$

To test whether 211 is ^{مفرد عدد}prime,
which numbers do you need to divide by?

Is it ^{مفرد عدد}prime?

To test whether 211 is مفرد عدد prime,
which numbers do you need to divide by?

Is it مفرد عدد prime?

Only the مفرد عدد primes up to $\sqrt{211} \approx 14.5$:

2, 3, 5, 7, 11, 13

None of them divides 211, so 211 is مفرد عدد prime.

Explain why $n^2 - 1$ can never be ^{مفرد عدد} prime when $n > 2$

Explain why $n^2 - 1$ can never be ^{مفرد عدد} prime when $n > 2$

$$n^2 - 1 = (n - 1)(n + 1)$$

When $n > 2$ both brackets are bigger than 1, so the number

always has more than two ^{عوامل} factors.

Is it ^{مفرد}prime?

1

1

Factors of 1: 1

1 has only one ^{عامل} factor. A ^{مفرد عدد} prime number has exactly two different ^{عامل} factors, 1 and itself, and for 1 those would be the same ^{عامل} factor, so 1 is not a ^{مفرد عدد} prime number.

2

2

Factors of 2: 1, 2

2 has exactly two ^{عامل} factors, 1 and itself, so 2 is a ^{مفرد عدد} prime number. It is the only even ^{مفرد عدد} prime number, because every other even number has 2 as a ^{عامل} third factor.

3

3

Factors of 3: 1, 3

3 has exactly two ^{عامل} factors, 1 and itself, so 3 is a ^{مفرد عدد} prime number.

4

4

Factors of 4: 1, 2, 4

4 has three ^{عوامل} factors, not two, so 4 is not a ^{مفرد عدد} prime number.

5

5

Factors of 5: 1, 5

5 has exactly two ^{عامل} factors, 1 and itself, so 5 is a ^{مفرد عدد} prime number.

We only need to test 2 as a ^{عامل} factor, because $3 \times 3 = 9$ is bigger than 5.

6

6

Factors of 6: 1, 2, 3, 6

6 has four ^{عائل} factors, not two, so 6 is not a ^{مفرد عدد} prime number.

7

7

Factors of 7: 1, 7

7 has exactly two ^{عامل} factors, 1 and itself, so 7 is a ^{مفرد عدد} prime number.

We only need to test 2 as a ^{عامل} factor, because $3 \times 3 = 9$ is bigger than 7.

8

8

Factors of 8: 1, 2, 4, 8

8 has four ^{عائل} factors, not two, so 8 is not a ^{مفرد عدد} prime number.

9

9

Factors of 9: 1, 3, 9

9 has three ^{عوامل} factors, not two, so 9 is not a ^{مفرد عدد} prime number.

10

10

Factors of 10: 1, 2, 5, 10

10 has four ^{عائل} factors, not two, so 10 is not a ^{مفرد عدد} prime number.

11

11

Factors of 11: 1, 11

11 has exactly two ^{عامل} factors, 1 and itself, so 11 is a ^{مفرد عدد} prime number.

We only need to test 2 and 3 as ^{عامل} factors, because $5 \times 5 = 25$ is bigger than 11.

12

12

Factors of 12: 1, 2, 3, 4, 6, 12

12 has six ^{عائل} factors, not two, so 12 is not a ^{مفرد عدد} prime number.

13

13

Factors of 13: 1, 13

13 has exactly two ^{عائل} factors, 1 and itself, so 13 is a ^{مفرد عدد} prime number.

We only need to test 2 and 3 as ^{عائل} factors, because $5 \times 5 = 25$ is bigger than 13.

14

14

Factors of 14: 1, 2, 7, 14

عامل
14 has four factors, not two, so 14 is not a مفرد عدد prime number.

15

15

Factors of 15: 1, 3, 5, 15

15 has four ^{عائل} factors, not two, so 15 is not a ^{مفرد عدد} prime number.

16

16

Factors of 16: 1, 2, 4, 8, 16

16 has five ^{عوامل} factors, not two, so 16 is not a ^{مفرد عدد} prime number.

17

17

Factors of 17: 1, 17

17 has exactly two ^{عامل} factors, 1 and itself, so 17 is a ^{مفرد عدد} prime number.

We only need to test 2 and 3 as ^{عامل} factors, because $5 \times 5 = 25$ is bigger than 17.

18

18

Factors of 18: 1, 2, 3, 6, 9, 18

18 has six ^{عوامل} factors, not two, so 18 is not a ^{مفرد عدد} prime number.

19

19

Factors of 19: 1, 19

19 has exactly two ^{عائل} factors, 1 and itself, so 19 is a ^{مفرد عدد} prime number.

We only need to test 2 and 3 as ^{عائل} factors, because $5 \times 5 = 25$ is bigger than 19.

20

20

Factors of 20: 1, 2, 4, 5, 10, 20

20 has six ^{عامل} factors, not two, so 20 is not a ^{مفرد عدد} prime number.

21

21

Factors of 21: 1, 3, 7, 21

عامل
21 has four factors, not two, so 21 is not a مفرد عدد prime number.

22

22

Factors of 22: 1, 2, 11, 22

عائل
22 has four factors, not two, so 22 is not a مفرد عدد prime number.

23

23

Factors of 23: 1, 23

23 has exactly two ^{عائل} factors, 1 and itself, so 23 is a ^{مفرد عدد} prime number.

We only need to test 2 and 3 as ^{عائل} factors, because $5 \times 5 = 25$ is bigger than 23.

24

24

Factors of 24: 1, 2, 3, 4, 6, 8, 12, 24

24 has eight ^{عائل} factors, not two, so 24 is not a ^{مفرد عدد} prime number.

25

25

Factors of 25: 1, 5, 25

25 has three ^{عامل} factors, not two, so 25 is not a ^{مفرد عدد} prime number.

26

26

Factors of 26: 1, 2, 13, 26

26 has four ^{عائل} factors, not two, so 26 is not a ^{مفرد عدد} prime number.

27

27

Factors of 27: 1, 3, 9, 27

27 has four ^{عائل} factors, not two, so 27 is not a ^{مفرد عدد} prime number.

28

28

Factors of 28: 1, 2, 4, 7, 14, 28

28 has six ^{عائل} factors, not two, so 28 is not a ^{مفرد عدد} prime number.

29

29

Factors of 29: 1, 29

29 has exactly two ^{عائل} factors, 1 and itself, so 29 is a ^{مفرد عدد} prime number.

We only need to test 2, 3 and 5 as ^{عائل} factors, because $7 \times 7 = 49$ is bigger than 29.

30

30

Factors of 30: 1, 2, 3, 5, 6, 10, 15, 30

30 has eight ^{عائل} factors, not two, so 30 is not a ^{مفرد عدد} prime number.

31

31

Factors of 31: 1, 31

31 has exactly two ^{عائل} factors, 1 and itself, so 31 is a ^{مفرد عدد} prime number.

We only need to test 2, 3 and 5 as ^{عائل} factors, because $7 \times 7 = 49$ is bigger than 31.

32

32

Factors of 32: 1, 2, 4, 8, 16, 32

32 has six ^{عامل} factors, not two, so 32 is not a ^{مفرد عدد} prime number.

33

33

Factors of 33: 1, 3, 11, 33

33 has four ^{عائل} factors, not two, so 33 is not a ^{مفرد عدد} prime number.

34

34

Factors of 34: 1, 2, 17, 34

34 has four ^{عائل} factors, not two, so 34 is not a ^{مفرد عدد} prime number.

35

35

Factors of 35: 1, 5, 7, 35

35 has four ^{عائل} factors, not two, so 35 is not a ^{مفرد عدد} prime number.

36

36

Factors of 36: 1, 2, 3, 4, 6, 9, 12, 18, 36

36 has nine ^{عائل} factors, not two, so 36 is not a ^{مفرد عدد} prime number.

37

37

Factors of 37: 1, 37

37 has exactly two ^{عائل} factors, 1 and itself, so 37 is a ^{مفرد عدد} prime number.

We only need to test 2, 3 and 5 as ^{عائل} factors, because $7 \times 7 = 49$ is bigger than 37.

38

38

Factors of 38: 1, 2, 19, 38

38 has four ^{عائل} factors, not two, so 38 is not a ^{مفرد عدد} prime number.

39

39

Factors of 39: 1, 3, 13, 39

39 has four ^{عائل} factors, not two, so 39 is not a ^{مفرد عدد} prime number.

40

40

Factors of 40: 1, 2, 4, 5, 8, 10, 20, 40

40 has eight ^{عائل} factors, not two, so 40 is not a ^{مفرد عدد} prime number.

41

41

Factors of 41: 1, 41

41 has exactly two ^{عامل} factors, 1 and itself, so 41 is a ^{مفرد عدد} prime number.

We only need to test 2, 3 and 5 as ^{عامل} factors, because $7 \times 7 = 49$ is bigger than 41.

42

42

Factors of 42: 1, 2, 3, 6, 7, 14, 21, 42

42 has eight ^{عائل} factors, not two, so 42 is not a ^{مفرد عدد} prime number.

43

43

Factors of 43: 1, 43

43 has exactly two ^{عائل} factors, 1 and itself, so 43 is a ^{مفرد عدد} prime number.

We only need to test 2, 3 and 5 as ^{عائل} factors, because $7 \times 7 = 49$ is bigger than 43.

44

44

Factors of 44: 1, 2, 4, 11, 22, 44

44 has six ^{عامل} factors, not two, so 44 is not a ^{مفرد عدد} prime number.

45

45

Factors of 45: 1, 3, 5, 9, 15, 45

45 has six ^{عائل} factors, not two, so 45 is not a ^{مفرد عدد} prime number.

46

46

Factors of 46: 1, 2, 23, 46

46 has four ^{عائل} factors, not two, so 46 is not a ^{مفرد عدد} prime number.

47

47

Factors of 47: 1, 47

47 has exactly two ^{عائل} factors, 1 and itself, so 47 is a ^{مفرد عدد} prime number.

We only need to test 2, 3 and 5 as ^{عائل} factors, because $7 \times 7 = 49$ is bigger than 47.

48

48

Factors of 48: 1, 2, 3, 4, 6, 8, 12, 16, 24, 48

48 has ten ^{عائل} factors, not two, so 48 is not a ^{مفرد عدد} prime number.

49

49

Factors of 49: 1, 7, 49

49 has three ^{عامل} factors, not two, so 49 is not a ^{مفرد عدد} prime number.

50

50

Factors of 50: 1, 2, 5, 10, 25, 50

50 has six ^{عامل} factors, not two, so 50 is not a ^{مفرد عدد} prime number.

51

51

Factors of 51: 1, 3, 17, 51

51 has four ^{عائل} factors, not two, so 51 is not a ^{مفرد عدد} prime number.

52

52

Factors of 52: 1, 2, 4, 13, 26, 52

52 has six ^{عامل} factors, not two, so 52 is not a ^{مفرد عدد} prime number.

53

53

Factors of 53: 1, 53

53 has exactly two ^{عائل} factors, 1 and itself, so 53 is a ^{مفرد عدد} prime number.

We only need to test 2, 3, 5 and 7 as ^{عائل} factors, because $11 \times 11 = 121$ is bigger than 53.

54

54

Factors of 54: 1, 2, 3, 6, 9, 18, 27, 54

54 has eight ^{عائل} factors, not two, so 54 is not a ^{مفرد عدد} prime number.

55

55

Factors of 55: 1, 5, 11, 55

عامل مفرد عدد
55 has four factors, not two, so 55 is not a prime number.

56

56

Factors of 56: 1, 2, 4, 7, 8, 14, 28, 56

56 has eight ^{عائل} factors, not two, so 56 is not a ^{مفرد عدد} prime number.

57

57

Factors of 57: 1, 3, 19, 57

عوامل 57 has four factors, not two, so 57 is not a مفرد عدد prime number.

58

58

Factors of 58: 1, 2, 29, 58

58 has four ^{عائل} factors, not two, so 58 is not a ^{مفرد عدد} prime number.

59

59

Factors of 59: 1, 59

59 has exactly two ^{عائل} factors, 1 and itself, so 59 is a ^{مفرد عدد} prime number.

We only need to test 2, 3, 5 and 7 as ^{عائل} factors, because $11 \times 11 = 121$ is bigger than 59.

60

60

Factors of 60: 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60

60 has twelve ^{عائل} factors, not two, so 60 is not a ^{مفرد عدد} prime number.

61

61

Factors of 61: 1, 61

61 has exactly two ^{عائل} factors, 1 and itself, so 61 is a ^{مفرد عدد} prime number.

We only need to test 2, 3, 5 and 7 as ^{عائل} factors, because $11 \times 11 = 121$ is bigger than 61.

62

62

Factors of 62: 1, 2, 31, 62

62 has four ^{عائل} factors, not two, so 62 is not a ^{مفرد عدد} prime number.

63

63

Factors of 63: 1, 3, 7, 9, 21, 63

63 has six ^{عامل} factors, not two, so 63 is not a ^{مفرد عدد} prime number.

64

64

Factors of 64: 1, 2, 4, 8, 16, 32, 64

64 has seven ^{عائل} factors, not two, so 64 is not a ^{مفرد عدد} prime number.

65

65

Factors of 65: 1, 5, 13, 65

65 has four ^{عائل} factors, not two, so 65 is not a ^{مفرد عدد} prime number.

66

66

Factors of 66: 1, 2, 3, 6, 11, 22, 33, 66

66 has eight ^{عائل} factors, not two, so 66 is not a ^{مفرد عدد} prime number.

67

67

Factors of 67: 1, 67

67 has exactly two ^{عائل} factors, 1 and itself, so 67 is a ^{مفرد عدد} prime number.

We only need to test 2, 3, 5 and 7 as ^{عائل} factors, because $11 \times 11 = 121$ is bigger than 67.

68

68

Factors of 68: 1, 2, 4, 17, 34, 68

68 has six ^{عامل} factors, not two, so 68 is not a ^{مفرد عدد} prime number.

69

69

Factors of 69: 1, 3, 23, 69

69 has four ^{عائل} factors, not two, so 69 is not a ^{مفرد عدد} prime number.

70

70

Factors of 70: 1, 2, 5, 7, 10, 14, 35, 70

70 has eight ^{عائل} factors, not two, so 70 is not a ^{مفرد عدد} prime number.

71

71

Factors of 71: 1, 71

71 has exactly two ^{عائل} factors, 1 and itself, so 71 is a ^{مفرد عدد} prime number.

We only need to test 2, 3, 5 and 7 as ^{عائل} factors, because $11 \times 11 = 121$ is bigger than 71.

72

72

Factors of 72: 1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, 72

72 has twelve ^{عائل} factors, not two, so 72 is not a ^{مفرد عدد} prime number.

73

73

Factors of 73: 1, 73

73 has exactly two ^{عائل} factors, 1 and itself, so 73 is a ^{مفرد عدد} prime number.

We only need to test 2, 3, 5 and 7 as ^{عائل} factors, because $11 \times 11 = 121$ is bigger than 73.

74

74

Factors of 74: 1, 2, 37, 74

74 has four ^{عائل} factors, not two, so 74 is not a ^{مفرد عدد} prime number.

75

75

Factors of 75: 1, 3, 5, 15, 25, 75

75 has six ^{عائل} factors, not two, so 75 is not a ^{مفرد عدد} prime number.

76

76

Factors of 76: 1, 2, 4, 19, 38, 76

76 has six ^{عامل} factors, not two, so 76 is not a ^{مفرد عدد} prime number.

77

77

Factors of 77: 1, 7, 11, 77

77 has four ^{عائل} factors, not two, so 77 is not a ^{مفرد عدد} prime number.

78

78

Factors of 78: 1, 2, 3, 6, 13, 26, 39, 78

78 has eight ^{عائل} factors, not two, so 78 is not a ^{مفرد عدد} prime number.

79

79

Factors of 79: 1, 79

79 has exactly two ^{عائل} factors, 1 and itself, so 79 is a ^{مفرد عدد} prime number.

We only need to test 2, 3, 5 and 7 as ^{عائل} factors, because $11 \times 11 = 121$ is bigger than 79.

80

80

Factors of 80: 1, 2, 4, 5, 8, 10, 16, 20, 40, 80

80 has ten ^{عائل} factors, not two, so 80 is not a ^{مفرد عدد} prime number.

81

81

Factors of 81: 1, 3, 9, 27, 81

81 has five ^{عامل} factors, not two, so 81 is not a ^{مفرد عدد} prime number.

82

82

Factors of 82: 1, 2, 41, 82

82 has four ^{عائل} factors, not two, so 82 is not a ^{مفرد عدد} prime number.

83

83

Factors of 83: 1, 83

83 has exactly two ^{عائل} factors, 1 and itself, so 83 is a ^{مفرد عدد} prime number.

We only need to test 2, 3, 5 and 7 as ^{عائل} factors, because $11 \times 11 = 121$ is bigger than 83.

84

84

Factors of 84: 1, 2, 3, 4, 6, 7, 12, 14, 21, 28, 42, 84

84 has twelve ^{عائل} factors, not two, so 84 is not a ^{مفرد عدد} prime number.

85

85

Factors of 85: 1, 5, 17, 85

85 has four ^{عائل} factors, not two, so 85 is not a ^{مفرد عدد} prime number.

86

86

Factors of 86: 1, 2, 43, 86

86 has four ^{عائل} factors, not two, so 86 is not a ^{مفرد عدد} prime number.

87

87

Factors of 87: 1, 3, 29, 87

87 has four ^{عائل} factors, not two, so 87 is not a ^{مفرد عدد} prime number.

88

88

Factors of 88: 1, 2, 4, 8, 11, 22, 44, 88

88 has eight ^{عائل} factors, not two, so 88 is not a ^{مفرد عدد} prime number.

89

89

Factors of 89: 1, 89

89 has exactly two ^{عائل} factors, 1 and itself, so 89 is a ^{مفرد عدد} prime number.

We only need to test 2, 3, 5 and 7 as ^{عائل} factors, because $11 \times 11 = 121$ is bigger than 89.

90

90

Factors of 90: 1, 2, 3, 5, 6, 9, 10, 15, 18, 30, 45, 90

90 has twelve ^{عائل} factors, not two, so 90 is not a ^{مفرد عدد} prime number.

91

91

Factors of 91: 1, 7, 13, 91

91 has four ^{عائل} factors, not two, so 91 is not a ^{مفرد عدد} prime number.

92

92

Factors of 92: 1, 2, 4, 23, 46, 92

92 has six ^{عامل} factors, not two, so 92 is not a ^{مفرد عدد} prime number.

93

93

Factors of 93: 1, 3, 31, 93

93 has four ^{عائل} factors, not two, so 93 is not a ^{مفرد عدد} prime number.

94

94

Factors of 94: 1, 2, 47, 94

94 has four ^{عائل} factors, not two, so 94 is not a ^{مفرد عدد} prime number.

95

95

Factors of 95: 1, 5, 19, 95

95 has four ^{عائل} factors, not two, so 95 is not a ^{مفرد عدد} prime number.

96

96

Factors of 96: 1, 2, 3, 4, 6, 8, 12, 16, 24, 32, 48, 96

96 has twelve ^{عائل} factors, not two, so 96 is not a ^{مفرد عدد} prime number.

97

97

Factors of 97: 1, 97

97 has exactly two ^{عائل} factors, 1 and itself, so 97 is a ^{مفرد عدد} prime number.

We only need to test 2, 3, 5 and 7 as ^{عائل} factors, because $11 \times 11 = 121$ is bigger than 97.

98

98

Factors of 98: 1, 2, 7, 14, 49, 98

98 has six ^{عامل} factors, not two, so 98 is not a ^{مفرد عدد} prime number.

99

99

Factors of 99: 1, 3, 9, 11, 33, 99

99 has six ^{عامل} factors, not two, so 99 is not a ^{مفرد عدد} prime number.

100

100

Factors of 100: 1, 2, 4, 5, 10, 20, 25, 50, 100

100 has nine ^{عائل} factors, not two, so 100 is not a ^{مفرد عدد} prime number.

Prime factor decomposition

مفرد عوامل میں تحلیل

True or false?

12 = 2² × 3 is the ^{مفرد عوامل میں تحلیل}prime factor decomposition of 12

True or false?

12 = 2² × 3 is the ^{مفرد عوامل میں تحلیل} prime factor decomposition of 12

True. 2 and 3 are both ^{مفرد عدد} prime, and 4 × 3 = 12.

True or false?

مفرد عوامل میں تحلیل
 $2 \times 3 \times 4$ is the prime factor decomposition of 24

True or false?

مفرد عوامل میں تحلیل
 $2 \times 3 \times 4$ is the prime factor decomposition of 24

مفرد عدد
False. 4 is not prime.

$$24 = 2^3 \times 3$$

True or false?

Every whole number greater than 1 can be written as a

مفرد عدد حاصل ضرب
product of primes

True or false?

Every whole number greater than 1 can be written as a

مفرد عدد حاصل ضرب
product of primes

True. A مفرد عدد prime is its own decomposition, and any other number keeps splitting until only مفرد عدد primes are left.

True or false?

A number can have two different مفرد عوامل میں تحلیل prime factor decompositions

True or false?

A number can have two different مفرد عوامل میں تحلیل prime factor decompositions

False. Apart from the order you write them in, every number has exactly one decomposition.

True or false?

$$2^3 \times 5 = 30$$

True or false?

$$2^3 \times 5 = 30$$

False. $2^3 \times 5 = 8 \times 5 = 40.$

$$30 = 2 \times 3 \times 5$$

Write 12 as a حاصل ضرب product of its مفرد عامل prime factors

Write 12 as a حاصل ضرب product of its مفرد عامل prime factors

$$12 = 2 \times 2 \times 3 = 2^2 \times 3$$

Write 18 as a ^{حاصل ضرب}product of its ^{مفرد عامل}prime factors

Write 18 as a حاصل ضرب product of its مفرد عامل prime factors

$$18 = 2 \times 3 \times 3 = 2 \times 3^2$$

Write 60 as a ^{حاصل ضرب}product of its ^{مفرد عامل}prime factors

Write 60 as a حاصل ضرب product of its مفرد عامل prime factors

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

Write 84 as a ^{حاصل ضرب}product of its ^{مفرد عامل}prime factors

Write 84 as a حاصل ضرب product of its مفرد عامل prime factors

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

Write 200 as a حاصل ضرب product of its مفرد عامل prime factors

Write 200 as a ^{حاصل ضرب}product of its ^{مفرد عامل}prime factors

$$200 = 2 \times 2 \times 2 \times 5 \times 5 = 2^3 \times 5^2$$

Write 360 as a ^{حاصل ضرب}product of its ^{مفرد عامل}prime factors

Write 360 as a حاصل ضرب product of its مفرد عامل prime factors

$$360 = 2^3 \times 3^2 \times 5$$

Write 1001 as a حاصل ضرب product of its مفرد عامل prime factors

Write 1001 as a حاصل ضرب product of its مفرد عامل prime factors

$$1001 = 7 \times 143 = 7 \times 11 \times 13$$

Work out $2^3 \times 3 \times 5^2$ as an ordinary number

Work out $2^3 \times 3 \times 5^2$ as an ordinary number

$$8 \times 3 \times 25 = 600$$

$$n = 2^3 \times 3 \times 5.$$

Write $2n$ as a حاصل ضرب مفرد عامل product of prime factors.

$$n = 2^3 \times 3 \times 5.$$

Write $2n$ as a ^{مفرد عامل}product of ^{حاصل ضرب}prime factors.

Doubling adds one more ^{عامل}factor of 2:

$$2n = 2^4 \times 3 \times 5$$

$$720 = 2^4 \times 3^2 \times 5.$$

How many ^{عوامل} factors does 720 have?

$$720 = 2^4 \times 3^2 \times 5.$$

How many ^{عائل} factors does 720 have?

Each ^{عائل} factor uses 0 to 4 twos, 0 to 2 threes and 0 or 1 five:

$$5 \times 3 \times 2 = 30 \text{ ^{عائل} factors}$$

سب سے بڑا مشترک عامل **HCF** and سب سے چھوٹا مشترک مضاعف **LCM** from lists

Find the HCF and LCM of 4 and 6.

Find the HCF and LCM of 4 and 6.

Factors of 4:

1, 2, 4

Factors of 6:

1, 2, 3, 6

Find the HCF and LCM of 4 and 6.

Factors of 4:

1, 2, 4

Factors of 6:

1, 2, 3, 6

Multiples of 4:

4, 8, 12, 16, 20,

24, 28, 32, 36, 40

Multiples of 6:

6, 12, 18, 24, 30,

36, 42, 48, 54, 60

Find the HCF and LCM of 4 and 6.

Factors of 4:

1, ②, 4

Factors of 6:

1, ②, 3, 6

Multiples of 4:

4, 8, 12, 16, 20,

24, 28, 32, 36, 40

Multiples of 6:

6, 12, 18, 24, 30,

36, 42, 48, 54, 60

Find the HCF and LCM of 4 and 6.

Factors of 4:

1, ②, 4

Factors of 6:

1, ②, 3, 6

Multiples of 4:

4, 8, ①②, 16, 20,

24, 28, 32, 36, 40

Multiples of 6:

6, ①②, 18, 24, 30,

36, 42, 48, 54, 60

Find the HCF and LCM of 6 and 8.

Find the HCF and LCM of 6 and 8.

Factors of 6:

1, 2, 3, 6

Factors of 8:

1, 2, 4, 8

Find the HCF and LCM of 6 and 8.

Factors of 6:

1, 2, 3, 6

Factors of 8:

1, 2, 4, 8

Multiples of 6:

6, 12, 18, 24, 30,

36, 42, 48, 54, 60

Multiples of 8:

8, 16, 24, 32, 40,

48, 56, 64, 72, 80

Find the HCF and LCM of 6 and 8.

Factors of 6:

1, ②, 3, 6

Factors of 8:

1, ②, 4, 8

Multiples of 6:

6, 12, 18, 24, 30,

36, 42, 48, 54, 60

Multiples of 8:

8, 16, 24, 32, 40,

48, 56, 64, 72, 80

Find the HCF and LCM of 6 and 8.

Factors of 6:

1, ②, 3, 6

Factors of 8:

1, ②, 4, 8

Multiples of 6:

6, 12, 18, ②4, 30,

36, 42, 48, 54, 60

Multiples of 8:

8, 16, ②4, 32, 40,

48, 56, 64, 72, 80

Find the HCF and LCM of 6 and 9.

Find the HCF and LCM of 6 and 9.

Factors of 6:

1, 2, 3, 6

Factors of 9:

1, 3, 9

Find the HCF and LCM of 6 and 9.

Factors of 6:

1, 2, 3, 6

Factors of 9:

1, 3, 9

Multiples of 6:

6, 12, 18, 24, 30,

36, 42, 48, 54, 60

Multiples of 9:

9, 18, 27, 36, 45,

54, 63, 72, 81, 90

Find the HCF and LCM of 6 and 9.

Factors of 6:

1, 2, ③, 6

Factors of 9:

1, ③, 9

Multiples of 6:

6, 12, 18, 24, 30,

36, 42, 48, 54, 60

Multiples of 9:

9, 18, 27, 36, 45,

54, 63, 72, 81, 90

Find the HCF and LCM of 6 and 9.

Factors of 6:

1, 2, ③, 6

Factors of 9:

1, ③, 9

Multiples of 6:

6, 12, ①8, 24, 30,

36, 42, 48, 54, 60

Multiples of 9:

9, ①8, 27, 36, 45,

54, 63, 72, 81, 90

Find the HCF and LCM of 8 and 12.

Find the HCF and LCM of 8 and 12.

Factors of 8:

1, 2, 4, 8

Factors of 12:

1, 2, 3, 4, 6, 12

Find the HCF and LCM of 8 and 12.

Factors of 8:

1, 2, 4, 8

Factors of 12:

1, 2, 3, 4, 6, 12

Multiples of 8:

8, 16, 24, 32, 40,

48, 56, 64, 72, 80

Multiples of 12:

12, 24, 36, 48, 60,

72, 84, 96, 108, 120

Find the HCF and LCM of 8 and 12.

Factors of 8:

1, 2, ④, 8

Factors of 12:

1, 2, 3, ④, 6, 12

Multiples of 8:

8, 16, 24, 32, 40,

48, 56, 64, 72, 80

Multiples of 12:

12, 24, 36, 48, 60,

72, 84, 96, 108, 120

Find the HCF and LCM of 8 and 12.

Factors of 8:

1, 2, ④, 8

Factors of 12:

1, 2, 3, ④, 6, 12

Multiples of 8:

8, 16, ②④, 32, 40,

48, 56, 64, 72, 80

Multiples of 12:

12, ②④, 36, 48, 60,

72, 84, 96, 108, 120

Find the HCF and LCM of 10 and 15.

Find the HCF and LCM of 10 and 15.

Factors of 10:

1, 2, 5, 10

Factors of 15:

1, 3, 5, 15

Find the HCF and LCM of 10 and 15.

Factors of 10:

1, 2, 5, 10

Factors of 15:

1, 3, 5, 15

Multiples of 10:

10, 20, 30, 40, 50,

60, 70, 80, 90, 100

Multiples of 15:

15, 30, 45, 60, 75,

90, 105, 120, 135, 150

Find the HCF and LCM of 10 and 15.

Factors of 10:

1, 2, 5, 10

Factors of 15:

1, 3, 5, 15

Multiples of 10:

10, 20, 30, 40, 50,

60, 70, 80, 90, 100

Multiples of 15:

15, 30, 45, 60, 75,

90, 105, 120, 135, 150

Find the HCF and LCM of 10 and 15.

Factors of 10:

1, 2, 5, 10

Factors of 15:

1, 3, 5, 15

Multiples of 10:

10, 20, 30, 40, 50,
60, 70, 80, 90, 100

Multiples of 15:

15, 30, 45, 60, 75,
90, 105, 120, 135, 150

Find the HCF and LCM of 9 and 12.

Find the HCF and LCM of 9 and 12.

Factors of 9:

1, 3, 9

Factors of 12:

1, 2, 3, 4, 6, 12

Find the HCF and LCM of 9 and 12.

Factors of 9:

1, 3, 9

Factors of 12:

1, 2, 3, 4, 6, 12

Multiples of 9:

9, 18, 27, 36, 45,

54, 63, 72, 81, 90

Multiples of 12:

12, 24, 36, 48, 60,

72, 84, 96, 108, 120

Find the HCF and LCM of 9 and 12.

Factors of 9:

1, ③, 9

Factors of 12:

1, 2, ③, 4, 6, 12

Multiples of 9:

9, 18, 27, 36, 45,

54, 63, 72, 81, 90

Multiples of 12:

12, 24, 36, 48, 60,

72, 84, 96, 108, 120

Find the HCF and LCM of 9 and 12.

Factors of 9:

1, ③, 9

Factors of 12:

1, 2, ③, 4, 6, 12

Multiples of 9:

9, 18, 27, ③6, 45,

54, 63, 72, 81, 90

Multiples of 12:

12, 24, ③6, 48, 60,

72, 84, 96, 108, 120

Find the HCF and LCM of 12 and 18.

Find the HCF and LCM of 12 and 18.

Factors of 12:

1, 2, 3, 4, 6, 12

Factors of 18:

1, 2, 3, 6, 9, 18

Find the HCF and LCM of 12 and 18.

Factors of 12:

1, 2, 3, 4, 6, 12

Factors of 18:

1, 2, 3, 6, 9, 18

Multiples of 12:

12, 24, 36, 48, 60,

72, 84, 96, 108, 120

Multiples of 18:

18, 36, 54, 72, 90,

108, 126, 144, 162, 180

Find the HCF and LCM of 12 and 18.

Factors of 12:

1, 2, 3, 4, ⑥, 12

Factors of 18:

1, 2, 3, ⑥, 9, 18

Multiples of 12:

12, 24, 36, 48, 60,

72, 84, 96, 108, 120

Multiples of 18:

18, 36, 54, 72, 90,

108, 126, 144, 162, 180

Find the HCF and LCM of 12 and 18.

Factors of 12:

1, 2, 3, 4, ⑥, 12

Factors of 18:

1, 2, 3, ⑥, 9, 18

Multiples of 12:

12, 24, ③⑥, 48, 60,

72, 84, 96, 108, 120

Multiples of 18:

18, ③⑥, 54, 72, 90,

108, 126, 144, 162, 180

Find the HCF and LCM of 14 and 21.

Find the HCF and LCM of 14 and 21.

Factors of 14:

1, 2, 7, 14

Factors of 21:

1, 3, 7, 21

Find the HCF and LCM of 14 and 21.

Factors of 14:

1, 2, 7, 14

Factors of 21:

1, 3, 7, 21

Multiples of 14:

14, 28, 42, 56, 70,

84, 98, 112, 126, 140

Multiples of 21:

21, 42, 63, 84, 105,

126, 147, 168, 189, 210

Find the HCF and LCM of 14 and 21.

Factors of 14:

1, 2, 7, 14

Factors of 21:

1, 3, 7, 21

Multiples of 14:

14, 28, 42, 56, 70,

84, 98, 112, 126, 140

Multiples of 21:

21, 42, 63, 84, 105,

126, 147, 168, 189, 210

Find the HCF and LCM of 14 and 21.

Factors of 14:

1, 2, 7, 14

Factors of 21:

1, 3, 7, 21

Multiples of 14:

14, 28, 42, 56, 70,

84, 98, 112, 126, 140

Multiples of 21:

21, 42, 63, 84, 105,

126, 147, 168, 189, 210

Find the HCF and LCM of 15 and 20.

Find the HCF and LCM of 15 and 20.

Factors of 15:

1, 3, 5, 15

Factors of 20:

1, 2, 4, 5, 10, 20

Find the HCF and LCM of 15 and 20.

Factors of 15:

1, 3, 5, 15

Factors of 20:

1, 2, 4, 5, 10, 20

Multiples of 15:

15, 30, 45, 60, 75,

90, 105, 120, 135, 150

Multiples of 20:

20, 40, 60, 80, 100,

120, 140, 160, 180, 200

Find the HCF and LCM of 15 and 20.

Factors of 15:

1, 3, 5, 15

Factors of 20:

1, 2, 4, 5, 10, 20

Multiples of 15:

15, 30, 45, 60, 75,

90, 105, 120, 135, 150

Multiples of 20:

20, 40, 60, 80, 100,

120, 140, 160, 180, 200

Find the HCF and LCM of 15 and 20.

Factors of 15:

1, 3, 5, 15

Factors of 20:

1, 2, 4, 5, 10, 20

Multiples of 15:

15, 30, 45, 60, 75,

90, 105, 120, 135, 150

Multiples of 20:

20, 40, 60, 80, 100,

120, 140, 160, 180, 200

Find the HCF and LCM of 8 and 9.

Find the HCF and LCM of 8 and 9.

Factors of 8:

1, 2, 4, 8

Factors of 9:

1, 3, 9

Find the HCF and LCM of 8 and 9.

Factors of 8:

1, 2, 4, 8

Factors of 9:

1, 3, 9

Multiples of 8:

8, 16, 24, 32, 40,
48, 56, 64, 72, 80

Multiples of 9:

9, 18, 27, 36, 45,
54, 63, 72, 81, 90

Find the HCF and LCM of 8 and 9.

Factors of 8:

①, 2, 4, 8

Factors of 9:

①, 3, 9

Multiples of 8:

8, 16, 24, 32, 40,

48, 56, 64, 72, 80

Multiples of 9:

9, 18, 27, 36, 45,

54, 63, 72, 81, 90

Find the HCF and LCM of 8 and 9.

Factors of 8:

①, 2, 4, 8

Factors of 9:

①, 3, 9

Multiples of 8:

8, 16, 24, 32, 40,

48, 56, 64, ⑦2 80

Multiples of 9:

9, 18, 27, 36, 45,

54, 63, ⑦2 81, 90

HCF and LCM by prime factor decomposition

سب سے بڑا مشترک عامل
سب سے چھوٹا مشترک مضاعف
مفرد عوامل میں تحلیل

True or false?

The HCF of two numbers is always smaller than both of them

سب سے بڑا مشترک عامل

True or false?

The HCF of two numbers is always smaller than both of them

False. The HCF of 6 and 12 is 6, which is one of the numbers itself.

True or false?

The ^{سب سے چھوٹا مشترک مضاعف} LCM of two numbers is always a ^{مضاعف} multiple of both of them

True or false?

The ^{سب سے چھوٹا مشترک مضاعف} LCM of two numbers is always a ^{مضاعف} multiple of both of them

True. That is exactly what a common ^{مضاعف} multiple is; the ^{سب سے چھوٹا مشترک مضاعف} LCM is the smallest one.

True or false?

If $a = 2^2 \times 3$ and $b = 2 \times 3^2$,

then the سب سے بڑا مشترک عامل
HCF of a and b is 2×3

True or false?

If $a = 2^2 \times 3$ and $b = 2 \times 3^2$,

then the ^{سب سے بڑا مشترک عامل} **HCF** of a and b is 2×3

True. Take the ^{مفرد عدد} *lowest* ^{قوت} **power** of each **prime** that appears in

both: $2^1 \times 3^1 = 6$.

True or false?

HCF $\times$ LCM gives the حاصل ضرب product of the two numbers

True or false?

HCF $\times$ LCM gives the حاصل ضرب product of the two numbers

True. Every مفرد عدد prime is counted once at its lowest قوت power and once at its highest, which is the same as counting both numbers.

True or false?

سب سے چھوٹا مشترک مضاعف

The lowest common multiple of 6 and 8 is 48

True or false?

سب سے چھوٹا مشترک مضاعف
The **lowest common multiple** of 6 and 8 is 48

False. $6 = 2 \times 3$ and $8 = 2^3$, so the **LCM** is

$$2^3 \times 3 = 24.$$

$$12 = 2^2 \times 3 \quad \text{and} \quad 18 = 2 \times 3^2$$

Find the *سب سے بڑا مشترک عامل* **HCF** of 12 and 18.

$$12 = 2^2 \times 3 \quad \text{and} \quad 18 = 2 \times 3^2$$

Find the سب سے بڑا مشترک عامل HCF of 12 and 18.

Lowest power of each shared prime: مفرد عدد قوت

$$\text{HCF} = 2 \times 3 = 6$$

$$12 = 2^2 \times 3 \quad \text{and} \quad 18 = 2 \times 3^2$$

Find the *سب سے چھوٹا مشترک مضاعف* **LCM** of 12 and 18.

$$12 = 2^2 \times 3 \quad \text{and} \quad 18 = 2 \times 3^2$$

Find the سب سے چھوٹا مشترک مضاعف LCM of 12 and 18.

Highest power of each prime: مفرد عدد قوت

$$\text{LCM} = 2^2 \times 3^2 = 36$$

$$24 = 2^3 \times 3 \quad \text{and} \quad 60 = 2^2 \times 3 \times 5$$

Find the سب سے بڑا مشترک عامل
HCF of 24 and 60.

$$24 = 2^3 \times 3 \quad \text{and} \quad 60 = 2^2 \times 3 \times 5$$

Find the سب سے بڑا مشترک عامل HCF of 24 and 60.

$$\text{HCF} = 2^2 \times 3 = 12$$

$$24 = 2^3 \times 3 \quad \text{and} \quad 60 = 2^2 \times 3 \times 5$$

Find the *سب سے چھوٹا مشترک مضاعف*
LCM of 24 and 60.

$$24 = 2^3 \times 3 \quad \text{and} \quad 60 = 2^2 \times 3 \times 5$$

Find the *سب سے چھوٹا مشترک مضاعف* **LCM** of 24 and 60.

$$\text{LCM} = 2^3 \times 3 \times 5 = 120$$

Find the HCF and the LCM of 84 and 120

سب سے بڑا مشترک عامل سب سے چھوٹا مشترک مضاعف

Find the $\overset{\text{سب سے بڑا مشترک عامل}}{\text{HCF}}$ and the $\overset{\text{سب سے چھوٹا مشترک مضاعف}}{\text{LCM}}$ of 84 and 120

$$84 = 2^2 \times 3 \times 7 \quad 120 = 2^3 \times 3 \times 5$$

$$\text{HCF} = 2^2 \times 3 = 12$$

$$\text{LCM} = 2^3 \times 3 \times 5 \times 7 = 840$$

Find the **HCF** and the **LCM** of 126 and 180

سب سے بڑا مشترک عامل سب سے چھوٹا مشترک مضاعف

Find the HCF and the LCM of 126 and 180

سب سے بڑا مشترک عامل سب سے چھوٹا مشترک مضاعف

$$126 = 2 \times 3^2 \times 7 \quad 180 = 2^2 \times 3^2 \times 5$$

$$\text{HCF} = 2 \times 3^2 = 18$$

$$\text{LCM} = 2^2 \times 3^2 \times 5 \times 7 = 1260$$

$$a = 2^3 \times 3^2 \times 5 \quad \text{and} \quad b = 2^2 \times 3 \times 5^2$$

Find the HCF and the LCM , in
 سب سے بڑا مشترک عامل سب سے چھوٹا مشترک مضاعف
 قوت نما شکل
 index form.

$$a = 2^3 \times 3^2 \times 5 \quad \text{and} \quad b = 2^2 \times 3 \times 5^2$$

Find the HCF and the LCM , in
سب سے بڑا مشترک عامل
سب سے چھوٹا مشترک مضاعف
قوت نما شکل
index form.

$$\text{HCF} = 2^2 \times 3 \times 5$$

$$\text{LCM} = 2^3 \times 3^2 \times 5^2$$

Two numbers have HCF 6 and LCM 72.

One of the numbers is 24. Find the other.

Two numbers have HCF 6 and LCM 72.
سب سے بڑا مشترک عامل سب سے چھوٹا مشترک مضاعف

One of the numbers is 24. Find the other.

$\text{HCF} \times \text{LCM} = 6 \times 72 = 432$, which is the product of the two numbers.
حاصل ضرب

$$432 \div 24 = 18$$

Find the HCF and the LCM of
 $2^5 \times 3^2 \times 11$ and $2^3 \times 3^4 \times 7$

Leave your answers in index form .

Find the HCF and the LCM of

$$2^5 \times 3^2 \times 11 \quad \text{and} \quad 2^3 \times 3^4 \times 7$$

Leave your answers in index form .

$$\text{HCF} = 2^3 \times 3^2$$

$$\text{LCM} = 2^5 \times 3^4 \times 7 \times 11$$

Two numbers have HCF 12 and LCM 180.

سب سے بڑا مشترک عامل
سب سے چھوٹا مشترک مضاعف

Find the numbers. Is there more than one answer?

Two numbers have HCF 12 and LCM 180.

سب سے بڑا مشترک عامل
سب سے چھوٹا مشترک مضاعف

Find the numbers. Is there more than one answer?

Their product is $12 \times 180 = 2160$, and both are multiples of 12.

حاصل ضرب
مضاعف

12 and 180 or 36 and 60

Both pairs work, so there is more than one answer.

Square numbers from prime factors

مربع عدد
مفرد عامل

True or false?

A number is square exactly when every ^{قوت}power in its
مفرد عوامل میں تحلیل
prime factor decomposition is even

True or false?

A number is square exactly when every ^{قوت}power in its
مفرد عوامل میں تحلیل
prime factor decomposition is even

True. Halving every even ^{قوت}power gives the ^{جذر}square root.

True or false?

$2^3 \times 3^2$ is a ^{مربع عدد} square number

True or false?

$2^3 \times 3^2$ is a ^{مربع عدد} square number

False. The ^{قوة} power of 2 is odd, so the number cannot be split
into two equal halves.

True or false?

$2^4 \times 5^6$ is a ^{مربع عدد} square number

True or false?

$2^4 \times 5^6$ is a ^{مربع عدد} square number

True. $2^4 \times 5^6 = (2^2 \times 5^3)^2$

True or false?

Every ^{مربع عدد} square number has an even number of ^{عوامل} factors

True or false?

Every ^{مربع عدد} square number has an even number of ^{عوامل} factors

False. ^{مربع عدد} Square numbers have an *odd* number of ^{عوامل} factors:

16 has 1, 2, 4, 8, 16.

True or false?

If n is a ^{مربع عدد} square number, then $4n$ is a ^{مربع عدد} square number too

True or false?

If n is a ^{مربع عدد} square number, then $4n$ is a ^{مربع عدد} square number too

True. Multiplying by $4 = 2^2$ keeps every ^{قوت} power even.

Use ^{مفرد عامل}prime factors to show that 36 is a ^{مربع عدد}square number

Use ^{مفرد عامل}prime factors to show that 36 is a ^{مربع عدد}square number

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

Both ^{قوت}powers are even, and $36 = (2 \times 3)^2 = 6^2$.

Is $2^2 \times 3^2 \times 5^2$ a ^{مربع عدد} square number?

If so, what is its ^{جذر} square root?

Is $2^2 \times 3^2 \times 5^2$ a ^{مربع عدد} square number?

If so, what is its ^{جذر} square root?

Yes — every ^{قوت} power is even.

$$\sqrt{2^2 \times 3^2 \times 5^2} = 2 \times 3 \times 5 = 30$$

Is $2^3 \times 3^2$ a ^{مربع عدد} square number?

Is $2^3 \times 3^2$ a ^{مربع عدد} square number?

No. Halving the ^{قوت} powers would need $2^{1.5}$,

so the ^{قوت} power of 2 must be even and it is not.

Work out $\sqrt{2^6 \times 3^4}$

Work out $\sqrt{2^6 \times 3^4}$

قوت
Halve each power:

$$2^3 \times 3^2 = 8 \times 9 = 72$$

Use ^{مفرد عامل}prime factors to decide whether 400 is a ^{مربع عدد}square number

Use ^{مفرد عامل}prime factors to decide whether 400 is a ^{مربع عدد}square number

$$400 = 2^4 \times 5^2$$

Both ^{قوت}powers are even, so $400 = (2^2 \times 5)^2 = 20^2$.

Use ^{مفرد عامل}prime factors to decide whether 150 is a ^{مربع عدد}square number

Use ^{مفرد عامل}prime factors to decide whether 150 is a ^{مربع عدد}square number

$$150 = 2 \times 3 \times 5^2$$

^{قوت}The powers of 2 and 3 are odd, so 150 is not square.

Work out $\sqrt{2^8 \times 3^2 \times 5^4}$

Work out $\sqrt{2^8 \times 3^2 \times 5^4}$

قوت
Halve each power:

$$2^4 \times 3 \times 5^2 = 16 \times 3 \times 25 = 1200$$

$$n = 2^3 \times 3 \times 5^2$$

Find the smallest whole number k so that nk is a
مربع عدد
square number.

$$n = 2^3 \times 3 \times 5^2$$

Find the smallest whole number k so that nk is a square number.

قوت

The powers of 2 and 3 are odd, so each needs one more:

$$k = 2 \times 3 = 6, \text{ giving } nk = 2^4 \times 3^2 \times 5^2.$$

$$504 = 2^3 \times 3^2 \times 7$$

Find the smallest number 504 can be multiplied by to give a
مربع عدد
square number.

$$504 = 2^3 \times 3^2 \times 7$$

Find the smallest number 504 can be multiplied by to give a
مربع عدد
square number.

قوت
The powers of 2 and 7 are odd:

multiply by $2 \times 7 = 14$.

$$504 \times 14 = 7056 = 84^2$$

$$1080 = 2^3 \times 3^3 \times 5$$

Find the smallest number 1080 can be divided by to give a
مربع عدد
square number.

$$1080 = 2^3 \times 3^3 \times 5$$

Find the smallest number 1080 can be divided by to give a
مربع عدد
square number.

Remove one 2, one 3 and the 5:

divide by $2 \times 3 \times 5 = 30$.

$$1080 \div 30 = 36 = 6^2$$

Problem solving with **HCF** and **LCM**

سب سے بڑا مشترک عامل
سب سے چھوٹا مشترک مضاعف

True or false?

To find when two repeating events next happen together, you

use the سب سے چھوٹا مشترک مضاعف
LCM

True or false?

To find when two repeating events next happen together, you

use the سب سے چھوٹا مشترک مضاعف
LCM

True. You are looking for the first time that is a مضاعف multiple of
both gaps.

True or false?

To split two collections into the largest identical bags, you use

the سب سے چھوٹا مشترک مضاعف
LCM

True or false?

To split two collections into the largest identical bags, you use

the LCM سب سے چھوٹا مشترک مضاعف

False. Use the HCF سب سے بڑا مشترک عامل — the bag size has to be a

factor عامل of both amounts.

True or false?

Cutting two ropes into equal pieces, as long as possible with none left over, uses the

سب سے بڑا مشترک عامل
HCF

True or false?

Cutting two ropes into equal pieces, as long as possible with none left over, uses the

سب سے بڑا مشترک عامل
HCF

True. The piece length must be a ^{عامل}factor of both rope lengths.

True or false?

The سب سے چھوٹا مشترک مضاعف **LCM** of two numbers is never smaller than either of them

True or false?

The ^{سب سے چھوٹا مشترک مضاعف} LCM of two numbers is never smaller than either of them

True. ^{مضاعف} It is a multiple of each number, so it is at least as big as both.

True or false?

Two events repeat every 4 minutes and every 6 minutes,
so they coincide every 24 minutes

True or false?

Two events repeat every 4 minutes and every 6 minutes,
so they coincide every 24 minutes

False. They coincide every $\text{LCM}(4, 6) = 12$ minutes.

Two bells ring together now.
One rings every 4 minutes, the other every 6 minutes.
When do they next ring together?

Two bells ring together now.
One rings every 4 minutes, the other every 6 minutes.
When do they next ring together?

سب سے چھوٹا مشترک مضاعف
Common multiple, so use the LCM :

$$\text{LCM}(4, 6) = 12 \text{ — in 12 minutes.}$$

Two ribbons, 18 cm and 24 cm long, are cut into equal pieces,
as long as possible with none left over.

How long is each piece?

Two ribbons, 18 cm and 24 cm long, are cut into equal pieces,
as long as possible with none left over.

How long is each piece?

The length must be a ^{عامل}factor of both, so use the

سب سے بڑا مشترک عامل
HCF :

$HCF(18, 24) = 6$ — each piece is 6 cm.

36 pens and 48 pencils are shared into identical packs with nothing left over.

What is the greatest number of packs?

36 pens and 48 pencils are shared into identical packs with nothing left over.

What is the greatest number of packs?

$$36 = 2^2 \times 3^2 \qquad 48 = 2^4 \times 3$$

$$\text{HCF} = 2^2 \times 3 = 12 \text{ packs,}$$

each with 3 pens and 4 pencils.

Two lighthouses flash together at 8pm.
One flashes every 15 seconds, the other every 18 seconds.
When do they next flash together?

Two lighthouses flash together at 8pm.
One flashes every 15 seconds, the other every 18 seconds.
When do they next flash together?

$$\text{LCM}(15, 18) = 90 \text{ seconds}$$

At 8:01:30pm.

Rectangular tiles measure 12 cm by 18 cm.
What is the smallest square they can tile exactly?

Rectangular tiles measure 12 cm by 18 cm.

What is the smallest square they can tile exactly?

مضاعف
The side must be a multiple of both, so use the

سب سے چھوٹا مشترک مضاعف
LCM :

$$\text{LCM}(12, 18) = 36$$

A 36 cm by 36 cm square.

A bus leaves every 24 minutes and a tram every 36 minutes.
Both leave at 9:00. When do they next leave together?

A bus leaves every 24 minutes and a tram every 36 minutes.

Both leave at 9:00. When do they next leave together?

$$\text{LCM}(24, 36) = 72 \text{ minutes}$$

At 10:12.

Two cogs, with 18 and 24 teeth, start meshed at a marked tooth.

How many turns does each make before the marks meet again?

Two cogs, with 18 and 24 teeth, start meshed at a marked tooth.

How many turns does each make before the marks meet again?

$\text{LCM}(18, 24) = 72$ teeth must pass.

$72 \div 18 = 4$ turns of the small cog,

$72 \div 24 = 3$ turns of the large cog.

A floor measures 360 cm by 504 cm.
It is tiled with identical square tiles, as large as possible.
Find the tile size and the number of tiles.

A floor measures 360 cm by 504 cm.
It is tiled with identical square tiles, as large as possible.
Find the tile size and the number of tiles.

$$360 = 2^3 \times 3^2 \times 5 \qquad 504 = 2^3 \times 3^2 \times 7$$

$\text{HCF} = 2^3 \times 3^2 = 72$, so the tiles are 72 cm square.

$$5 \times 7 = 35 \text{ tiles.}$$

Three runners take 60 s, 72 s and 90 s per lap.
They start together. When are they next all at the start line?

Three runners take 60 s, 72 s and 90 s per lap.

They start together. When are they next all at the start line?

$$60 = 2^2 \times 3 \times 5 \quad 72 = 2^3 \times 3^2 \quad 90 = 2 \times 3^2 \times 5$$

$$\text{LCM} = 2^3 \times 3^2 \times 5 = 360 \text{ s}$$

After 6 minutes.

Hot dogs come in packs of 10, buns in packs of 8 and sauce sachets in packs of 12.

What is the smallest number of complete hot dogs Sam can make with nothing left over, and how many packs of each is that?

Hot dogs come in packs of 10, buns in packs of 8 and sauce sachets in packs of 12.

What is the smallest number of complete hot dogs Sam can make with nothing left over, and how many packs of each is that?

$$\text{LCM}(10, 8, 12) = 2^3 \times 3 \times 5 = 120$$

120 hot dogs: 12 packs of hot dogs,

15 packs of buns and 10 packs of sachets.