Number System Examples

Q 1 - Which of the following is a prime number?

A - 187

B - 811

C - 341

D - 437

Answer - B

Explanation

Step 1. Find a whole number k such that k^2 > n for each number.
14^2 > 187.
30^2 > 811.
19^2 > 341.
21^2 > 437.

Step 2. Get all prime numbers which are < k
14 - 2 , 3, 5, 7, 11, 13
30 - 2 , 3, 5, 7, 11, 13, 17, 19, 23, 29
19 - 2 , 3, 5, 7, 11, 13, 17
21 - 2 , 3, 5, 7, 11, 13, 17, 19

Step 3. Check divisiblity of each number

```
with prime numbers which are < k.
187 is divisible by 11.
811 is not divisible by any prime number.
341 is divisible by 11.
437 is divisible by 19.

Result: 811 is the prime number.
```

Q 2 - Which of the following is the output of 6894 x 99 ?

A - 685506

B - 682506

C - 683506

D - 684506

Answer - B

Explanation

```
6894 x 99
= 6894 x (100 - 1)
= 6894 x 100 - 6894 x 1
= 689400 - 6894
= 682506
```

Q 3 - Which of the following is the output of 685798 x 125 ?

A - 8224750

B - 8225750

C - 8225950

D - 8224760

Answer - A

Explanation

$$
\begin{aligned}
&685798 \times 125 \\
&= 685798 \times 5^3 \\
&= 685798 \times (10/2)^3 \\
&= (685798 \times 10^3) / 2^3 \\
&= 685798000 / 8 \\
&= 85724750
\end{aligned}
$$

Q 4 - Which of the following is the output of 43986 x 625 ?

A - 27491450

B - 27491350

C - 27491250

D - 27491750

Answer - C

Explanation

$$
\begin{aligned}
&43986 \times 625 \\
&= 43986 \times 5^4 \\
&= 43986 \times (10/2)^4 \\
&= (43986 \times 10^4) / 2^4 \\
&= 439860000 / 16 \\
&= 27491250
\end{aligned}
$$

Q 5 - Which of the following is the output of 869 x 738 + 869 x 262 ?

A - 262000

B - 738000

C - 969000

D - 869000

Answer - D

Explanation

```
869 x 738 + 869 x 262
= 869 x (738 + 262)
= 869 x 1000
= 869000
```

Q 6 - Which of the following is the output of 936 x 587 - 936 x 487 ?

A - 93600

B - 58700

C - 48700

D - 100

Answer - A

Explanation

```
936 x 587 - 936 x 487
= 936 x (587 - 487)
= 936 x 100
= 93600
```

Q 7 - Which of the following is the output of 1496 x 1496 ?

A - 3338016

B - 2238016

C - 2248016

D - 2258016

Answer - B

Explanation

$$
\begin{aligned}
&1496 \times 1496 \\
&= 1496^2 \\
&= (1500-4)^2 \\
&= 1500^2 + 4^2 - 2 \times 1500 \times 4 \\
&= 2250000 + 16 - 12000 \\
&= 2238016
\end{aligned}
$$

We've used following formula here:

$$(a-b)^2 = a^2 + b^2 - 2ab.$$

Q 8 - Which of the following is the output of 1607 x 1607 ?

A - 2581449

B - 2583449

C - 2582449

D - 2584449

Answer - C

Explanation

$$
\begin{aligned}
&1607 \times 1607 \\
&= 1607^2 \\
&= (1600+7)^2 \\
&= 1600^2 + 7^2 + 2 \times 1600 \times 7 \\
&= 2560000 + 49 + 22400 \\
&= 2582449
\end{aligned}
$$

We've used following formula here:

$$(a+b)^2 = a^2 + b^2 + 2ab.$$

Q 9 - Which of the following is the output of 596 x 596 - 104 x 104 ?

A - 377700

B - 366600

C - 355500

D - 344400

Answer - D

Explanation

$$596 \times 596 - 104 \times 104$$
$$= 596^2 - 104^2$$
$$= (596 + 104) \times (596 - 104)$$
$$= 700 \times 492$$
$$= 344400$$

We've used following formula here:

$$a^2 - b^2 = (a + b)(a - b).$$

Q 10 - Which of the following is the output of 57 x 57 + 43 x 43 + 2 x 57 x 43 ?

A - 10000

B - 5700

C - 4300

D - 1000

Answer - A

Explanation

$$57 \times 57 + 43 \times 43 + 2 \times 57 \times 43$$
$$= (57 + 43)^2$$
$$= (100)^2$$
$$= 10000$$

We've used following formula here:

$$(a + b)^2 = a^2 + b^2 + 2ab.$$

Q 11 - Which of the following is the output of 93 x 93 + 73 x 73 - 2 x 93 x 73 ?

A - 200

B - 400

C - 300

D - 100

Answer - B

Explanation

$$93 \times 93 + 73 \times 73 - 2 \times 93 \times 73$$
$$= (93 - 73)^2$$
$$= (20)^2$$
$$= 400$$

We've used following formula here:

$$(a - b)^2 = a^2 + b^2 - 2ab.$$

Q 12 - Which of the following is the output of (578 x 578 x 578 + 432 x 432 x 432) / (578 x 578 - 578 x 432 + 432 x 432) ?

A - 2000

B - 4000

C - 3000

D - 1000

Answer - D

Explanation

```
(578 x 578 x 578 + 432 x 432 x 432) / (578 x 578 - 578 x 432 + 432 x 432)
Let's have a = 578, b = 432


Now expression is (a^3 + b^3) / (a^2 - ab + b^2)
= a + b
= 578 + 432
= 1000
```

We've used following formula here:

$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$.

Q 13 - Which of the following is the output of (141 x 141 x 141 - 58 x 58 x 58) / (141 x 141 + 141 x 58 + 58 x 58) ?

A - 83

B - 100

C - 90

D - 73

Answer - A

Explanation

```
(141 x 141 x 141 - 58 x 58 x 58) / (141 x 141 + 141 x 58 + 58 x 58)
Let's have a = 141, b = 58
Now expression is (a^3 - b^3) / (a^2 + ab + b^2)
= a - b
```

```
= 141 - 58
= 83
```

We've used following formula here:

$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$.

Q 14 - Which of the following is the output of 213 x 213 + 187 x 187 ?

A - 50338

B - 80338

C - 90338

D - 70338

Answer - B

Explanation

```
213 x 213 + 187 x 187
Let's have a = 213, b = 187
Now expression is a^2 + b^2
Using following formula, (a + b)^2 + (a - b)^2 = 2 x (a^2 + b^2)
2 x ( 213 x 213 + 187 x 187) = (213 + 187)^2 + (213 - 187)^2
2 x ( 213 x 213 + 187 x 187) = 400^2 + 26^2
2 x ( 213 x 213 + 187 x 187) = 160000 + 676
213 x 213 + 187 x 187 = 160676 / 2
= 80338
```

Q 15 - Which of the following is the output of $((637 + 478)^2 - (637 - 478)^2) /(637 \times 478)$?

A - 4

B - 6

C - 8

D - 24

Answer - C

Explanation

$((637 + 478)^2 - (637 - 478)^2)/(637 \times 478)$
Let's have a = 637, b = 478
Now expression is $((a + b)^2 - (a - b)^2) / ab$
$= (a^2 + b^2 + 2ab - (a^2 + b^2 - 2ab)) / ab$
$= (a^2 + b^2 + 2ab - a^2 - b^2 + 2ab) / ab$
$= 4ab / ab$
$= 4$

We've used following formulae here:

$(a + b)^2 = a^2 + b^2 + 2ab.$
$(a - b)^2 = a^2 + b^2 - 2ab.$

Q 16 - Which of the following is the output of $((964 + 578)^2 + (964 - 578)^2) /(964 \times 964 + 578 \times 578)$?

A - 4

B - 6

C - 8

D - 2

Answer - D

Explanation

$((964 + 578)^2 + (964 - 578)^2) /(964 \times 964 + 578 \times 578)$
Let's have a = 964, b = 578
Now expression is $((a + b)^2 + (a - b)^2) / (a^2 + b^2)$
$= (a^2 + b^2 + 2ab + (a^2 + b^2 - 2ab)) / (a^2 + b^2)$
$= (a^2 + b^2 + 2ab + a^2 + b^2 - 2ab) / (a^2 + b^2)$
$= 2(a^2 + b^2) / (a^2 + b^2)$
$= 2$

We've used following formulae here:

$(a + b)^2 = a^2 + b^2 + 2ab.$
$(a - b)^2 = a^2 + b^2 - 2ab.$

Q 17 - On dividing a number by 342, 47 is the remainder. What will be remainder if same number is divided by 18?

A - 11

B - 6

C - 8

D - 2

Answer - A

Explanation

Let's quotient is a and given number be b.
$b = 342a + 47$
$= (18 \times 19)a + 36 + 11$
$= (18 \times 19)a + (18 \times 2) + 11$

```
= 18 x (19a + 2) + 11
Thus, if same number is divided by 18, remainder will be 11.
```

We've used following formulae here:

```
Dividend = (Divisor x Quotient) + Reminder
```

Q 18 - What will be unit digit in $(3157)^{754}$?

A - 8

B - 9

C - 7

D - 6

Answer - B

Explanation

```
unit digit in (3157)^754
= unit digit in (7)^754
= unit digit in (7^4)^188 x 7^2
= unit digit in (1 x 49)
= 9
Thus Unit digit in (3157)^754 is 9.
```

We've used following formulae here:

```
Unit digit in 7^1 = 7
Unit digit in 7^2 = 9
Unit digit in 7^3 = 3
Unit digit in 7^4 = 1
```

Unit digit in 7^5 = 7
Unit digit in 7^6 = 9
Unit digit in 7^7 = 3
Unit digit in 7^8 = 1

So pattern is 7-9-3-1. This pattern works for all numbers. So Unit digit in $((7)^4)^n$) will be 1.

Q 19 - What will be unit digit in 658 x 539 x 436 x 312?

A - 8

B - 9

C - 4

D - 6

Answer - C

Explanation

Multiply unit digits of each number.
Unit digit in 658 x 539 x 436 x 312
= Unit digit in 8 x 9 x 6 x 2.
= Unit digit in 864.
= 4.

Q 20 - What will be unit digit in 3^{57} x 6^{41} x 7^{63}?

A - 8

B - 9

C - 4

D - 6

Answer - C

Explanation

$3^{57} = (3^4)^{14} \times 3$
So Unit digit in 3^{57}
= Unit digit in 1 x 3
= 3

$6^{41} = (6^4)^{10} \times 6$
So Unit digit in 6^{41}
= Unit digit in 6 x 6
= 6

$7^{63} = (7^4)^{15} \times 7^3$
So Unit digit in 7^{61}
= Unit digit in 1 x 343
= 3

So Unit digit in $3^{57} \times 6^{41} \times 7^{63}$
= Unit digit in 3 x 6 x 3
= 4

We've used following formulae here:

Unit digit in $3^4 = 1$
Unit digit in $6^4 = 6$
Unit digit in $7^4 = 1$

So Unit digit
- in $((3)^4)^n$) will be 1.

- in $((6)^4)^n$) will be 6.
- in $((7)^4)^n$) will be 1.