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NUMBER SYSTEM

Divisibility Rule:

Divisibility rules of whole numbers are very useful because they help us to quickly determine if a number can be divided by 2, 3, 4, 5, 9, and 10 without doing long division. When the numbers are large, use the following divisibility rules:

Rule #1: Divisibility by 2
A number is divisible by 2 if its last digit is 0, 2, 4, 6, or 8.

Rule # 2: Divisibility by 3
A number is divisible by 3 if the sum of its digits is divisible by 3.

Rule # 3: Divisibility by 4
A number is divisible by 4 if the number represented by its last two digits is divisible by 4.

Divisibility Rule:

Rule #4: Divisibility by 5
A number is divisible by 5 if its last digit is 0 ot 5.

Rule # 5: Divisibility by 6
A number is divisible by 6 if it is divisible by 2 and 3. Be careful! it is not one or the other. The number must be divisible by both 2 and 3 before you can conclude that it is divisible by 6.

Rule # 6: Divisibility by 7
To check divisibility rules for 7, study carefully the following two examples: Is 348 divisible by 7? Remove the last digit, which is 8. The number becomes 34. Then, Double 8 to get 16 and subtract 16 from 34. 34 − 16 = 18 and 18 is not divisible by 7. Therefore, 348 is not divisible by 7

Divisibility Rule:

Rule #7: Divisibility by 8
A number is divisible by 8 if the number represented by its last three digits is divisible by 8.

Rule #8: Divisibility by 9
A number is divisible by 9 if the sum of its digits is divisible by 9.

Rule # 9: Divisibility by 10
A number is divisible by 10 if its last digits is 0

Divisibility rules

Dividing by 11:

Find the sum of the digits in the even places and the sum of the digits in the odd places.

If the differences between the two sums is 0 or a multiple of 11, then the given number would be divisible by 11

For example, 72545.

Digits in odd places - 7,5,5. Sum of these digits is 17

Digits in even places - 2,4. Sum of these 2 digits is 6.

Difference between both the sums = 17 - 6 = 11.

Thus sum is divisible by ,Hence 72545 would be divisible by 11.

Divisibility rules

Dividing by 12:

The number is divisible by 4 & 3,it is also divisible by 12

Dividing by 13

Divisibility of 13 is similar to the method 2 mentioned in divisibility of 7. Assume a number abcdefghij. In this method, the number is divided into blocks of 3 digits each beginning from the right, i.e. a | bcd | efg | hij and alternate blocks are added to give two number N1 = a + efg and N2 = bcd + hij. If the difference of the numbers N1 and N2, i.e. N1 - N2 is divisible by 13, then the number abcdefghij is divisible by 13 too.

For example, 6517739020 → 6 | 517 | 739 | 020 → N1 = 745 and N2 = 537 → N1 - N2 = 208 which is divisible by 13.

Divisibility rules

Dividing 14:

The number is divisible by 7 & 2,it is also divisible by 14

Dividing by 15:

The number is divisible by 5 & 3,it is also divisible by 15

Dividing by 16:

If the last 4 digits are divisible by 16, so is the entire number is divisible by 16.

Digital Root – method

The digital root (DR) concept is the idea that any number greater than 9 can be reduced to a single digit by adding the component digits of the number in one or more steps.

How to find the DR

Simply, add the individual digits of the number in one or more steps until you obtain a single digit (1, 2, 3… or 9) and that is the digital root of that number. For example:

i. 42- -> 4+2 = 6

ii. 84 -->8+4 = 12 1+2=3

iii. 737 -->7+3+7 = 171+7=8

Digital Root – method

Shortcuts to finding the DR

1. The digital root of any number containing only 9s (such as 99 or 999 or 9999) is 9.

2. If there is one or more 9s in a number simply ignore them and add the remaining digits.

3. Look for digits that you can quickly add to 9, or to multiples of 9; ignore them and add the remaining digits.

For example:

i. 19=1+~~9~~ =1

ii . 998=9+9+8=2+6=8

Digital Root – method

Subtraction (A – B = C)

Note: In subtracting the DR of B from the DR of A it is possible that we may end up with 0 or a negative value. If we do get such a value we need to find the complement digital root value – all we need to do is add 9 to it.

Example:

[99=(9+9)=1+8=9]-[26=2+6=8]=9-8=1

133-52=81-->1+3+3-5+2=7-7=0---> **since it is 0 w e find its complement by adding 9, i.e.**

0 + 9 =9

9 81=8+1=9->hence lhs=rhs

Digital Root – method

Multiplication (A x B = C) ;

example=15*14=210

--->1+6=6*1+4=6*5=30=3=LHS

-->210=2+1+0=3 RHS

LHS=RHS

Question: 01

Which of the following numbers is divisible by 3?

A. 51412

B. 86221

C. 63693

D. 23456

Answer:C

Explanation:

For, 51412 (5+1+4+1+2) = 13, which is NOT divisible by 3. Hence 51412 is not divisible by 3.

For, 86221 (8+6+2+2+1) = 19, which is NOT divisible by 3. Hence 86221 is not divisible by 3.

For, 63693 (6+3+6+9+3) = 27, which IS divisible by 3. Hence 63693 is divisible by 3.

For, 23456 (2+3+4+5+6) = 20,which is NOT divisible by 3. Hence 86221 is not divisible by 3.

Question: 02

Which one of the following numbers is divisible by 8 and 11?

A. 12496

B. 414206

C. 999000

D. 38400

Answer:A

Explanation:

For a number to be divisible by 8, the new number formed by its last 3 digits has to be divisible by 8. So 1st we check divisibility by 8 :

12496 → 496 is divisible by 8, hence 12496 is also divisible by 8.

414206 → 206 is not divisible by 8, hence 414206 will also be not divisible by 8.

999000 → 000 is divisible by 8, hence 999000 will also be divisible by 8.

38400 → 400 is divisible by 8, hence 38400 will also be divisible by 8. So option2 can be eliminated.

For divisibility by 11, the difference between the sum of even digits and the sum of odd digits of the number, should be divisible by 11.

12496→ (6+4+1) – (9+2) = 0 (which is divisible by 11, so the number will be divisible by 11.)
Hence the correct answer is option 1.

Question: 03

If an integer n is divisible by 3, 5 and 12, what is the next larger integer divisible by all these numbers?

A. n + 3

B. n + 5

C. n + 12

D. n + 60

Answer:D

Explanation:

If n is divisible by 3, 5 and 12 it must a multiple of the lcm of 3, 5 and 12 which is 60.

$n = 60\ k$

$n + 60$ is also divisible by 60 since

$n + 60 = 60\ k + 60 = 60(k + 1)$

The answer is D.

Question: 04

What is the smallest integer that is multiple of 5, 7 and 20?

A. 70

B. 35

C. 200

D. 140

Answer:D

Explanation:

It is the lcm of 5, 7 and 20 which is 140.

The answer is D

Question: 05

Which of these numbers is not divisible by 3?

A. 339

B. 342

C. 552

D. 1111

Answer:D

Explanation:

One may answer this question using a calculator and test for divisibility by 3. However we can also test for divisibilty by adding the digits and if the result is divisible by3 then the number is divisible by 3.

3 + 3 + 9 = 15 , divisible by 3.
3 + 4 + 2 = 9 , divisible by 3.
5 + 5 + 2 = 12 , divisible by 3.
1 + 1 + 1 + 1 = 4 , not divisible by 3.
The number 1111 is not divisible by 3 the answer is D.

Question: 06

What least number must be added to 1056, so that the sum is completely divisible by 23 ?

A. 2
B. 3
C. 18
D. 21

Answer:A

Explanation:

23) 1056 (45
92

136
115

21

Required number = (23 - 21)
= 2.

Question: 07

The largest 4 digit number exactly divisible by 88 is:

A. 9944
B. 9968
C. 9978
D. 8888

Answer:A

Explanation: 07

Largest 4-digit number = 9999

88) 9999 (113

88

119

88

319

264

55

Required number = (9999 - 55)

= 9944.

Question: 08

If the number 517*324 is completely divisible by 3, then the smallest whole number in the place of * will be:

A. 0
B. 1
C. 2
D. 3

Answer:C

Explanation: 08

Sum of digits = (5 + 1 + 7 + x + 3 + 2 + 4) = (22 + x), which must be divisible by 3.

x = 2.

Question: 09

Which one of the following numbers is exactly divisible by 11?

A. 235641
B. 245642
C. 315624
D. 415624

Answer:D

Explanation:

(4 + 5 + 2) - (1 + 6 + 3) = 1, not divisible by 11.

(2 + 6 + 4) - (4 + 5 + 2) = 1, not divisible by 11.

(4 + 6 + 1) - (2 + 5 + 3) = 1, not divisible by 11.

(4 + 6 + 1) - (2 + 5 + 4) = 0, So, 415624 is divisible by 11.

Question: 10

Which of the following number is divisible by 24 ?

A. 35718
B. 63810
C. 537804
D. 3125736

Answer:D

Explanation:

24 = 3 x8, where 3 and 8 co-prime.

Clearly, 35718 is not divisible by 8, as 718 is not divisible by 8.

Similarly, 63810 is not divisible by 8 and 537804 is not divisible by 8.

Consider option (D),

Sum of digits = (3 + 1 + 2 + 5 + 7 + 3 + 6) = 27, which is divisible by 3.

Also, 736 is divisible by 8.

3125736 is divisible by (3 x 8), *i.e.,* 24.

Question: 11

How many 3-digit numbers are completely divisible 6 ?

A. 140
B. 150
C. 151
D. 166

Answer:B

Explanation:

3-digit number divisible by 6 are: 102, 108, 114,... , 996

This is an A.P. in which a = 102, d = 6 and l = 996

Let the number of terms be n. Then t_n = 996.

a + (n - 1)d = 996

102 + (n - 1) x 6 = 996

6 x (n - 1) = 894

(n - 1) = 149

n = 150

Number of terms = 150.

Question: 12

How many natural numbers are there between 23 and 100 which are exactly divisible by 6 ?

A. 8
B. 11
C. 12
D. 13

Answer:D

Explanation:

Required numbers are 24, 30, 36, 42, ..., 96

This is an A.P. in which a = 24, d = 6 and l = 96

Let the number of terms in it be n.

Then $t_n = 96$

$a + (n - 1)d = 96$

$24 + (n - 1) \times 6 = 96$

$(n - 1) \times 6 = 72$

$(n - 1) = 12$

$n = 13$

Required number of numbers = 13.

Question: 13

If the number 97215 * 6 is completely divisible by 11, then the smallest whole number in place of * will be:

A. 3
B. 2
C. 1
D. 5

Answer:A

Explanation:

Given number = 97215*x*6

(6 + 5 + 2 + 9) - (*x* + 1 + 7) = (14 - x), which must be divisible by 11.

x = 3

Question: 14

If the number 5 * 2 is divisible by 6, then * = ?

A. 3
B. 2
C. 6
D. 7

Answer:B

Explanation:

6 = 3 x 2. Clearly, 5 * 2 is divisible by 2. Replace * by x.

Then, (5 + x + 2) must be divisible by 3. So, x = 2.

Question: 15

what should come in place of question mark (?) in the following questions: –(digital root method)

1777 – 2349 – 1345 + 6523 = ?

A. 4706
B. 4606
C. 4976
D. 5276

Answer: B

Explanation:

Lets solve by DR Method (Digital Root)

Let (1+7+7+7) - (2+3+4+9) - (1+3+4+5) + (6+5+2+3) = x

now (22) - (18) - (13) + (16) = x

now again Digital Root to Single Root

4 - 9 - 4 + 7 = x

so, 9+7 = x (U can see, There is no value for 9 in digital root)

7 = x (Digital Root of above Equation is 7)

Now Check the Options

A) 4+7+0+6 = 17 = 8 (not match)

B) 4+6+0+6 = 16 = 7 (Match with digital root of x)

C) 3+9+7+6 = 17 = 8 (Not match , D) 5+2+7+6 = 20 = 2 (Not Match) So, B) is the right Answer

Question: 16

5016 x 1001 - 333x77+22 = ? x 11 (Digital Root Method)

A. 435570

B. 454127

C. 527240

D. 366531

Answer: B

Explanation:

Now according to Digital Root Method

The Digital Root of above Equation is

6 - 9 + 4 = x * 2

1 = x * 2 (Just Neglect 9)

Now we have to Make LHS = RHS, by suitable "x" value putting from 1 to 9)

So, If we Substitute X = 5

We get 1 = 5 * 2

1 = 10

1 = 1

SO, Clearly the Digital Root of above Equation is 5 (as X = 5)

Now Find out the digital root of given options

A) 4+3+5+5+7+0 = 24 = 6

B) 4+5+4+1+2+7 = 5 (Match)

C) 5+2+7+2+4+0 = 20 = 2

D) 3+6+6+5+3+1 = 6

E) 5+1+1+9+9+0 = 7

Question: 17

96*1.96 + 1.04*1.04 – 2.08*1.96 = ?(Digital Root Method)

A. 0.7464

B. 0.8464

C. 0.9464

D. 0.8262

Answer: B

Explanation:

Now Lets Do it Without Pen / Paper

the Digital Root of Above Equation is as follows

(Note : Wherever the "9" comes in Digital Root just neglect it)

Now, 7*7 + 5*5 - 1*7 = 49 + 25 - 7 = 4 + 7 - 7 = X, now final Digital Root x = 4

Match with Options

(neglect the Decimal Points)

A) 7+4+6+4 = 21 = 3 (Not Match)

B) 8+4+6+4 = 22 = 4 (Match)

C) 9+4+6+4 = 23 = 5 (Not Match)

D) 8+2+6+2 = 18 = 9 (not Match)

So, B) is the Right Choice

Question: 18

2387 – 123 + 980 = ? – 145 + 945 (Digital Root Method)

A. 2244

B. 2434

C. 2444

D. 2354

Answer: C

Explanation:

2+3+8+7 - 1+2+3 + 9+8+0 = ? - 1+4+5 + 9+4+5

2 - 6 +8 = ? - 1 + 9

4 = ? +8

4 -8 = ?

-4 = ?

(If your final Digital is in Negative Add "9" to it to make it positive)

So, 9-4 = ?

5 = ?

Now Find out the Digital Root of All the Options, if any option whose digital root is exactly "7" that is the Answer

A) 2+2+4+4 = 12 = 3

B) 2+4+3+4 = 13 = 4

C) 2+4+4+4 = 14 = 5 (Match) Exactly

D) 2+5+4+4 = 15 = 6

Question: 19

Which natural number is nearest to 8485, which is completely divisible by 75 ?

A. 8475
B. 8500
C. 8550
D. 8525

Answer:A

Explanation:

On dividing, we get

```
75) 8485 (113
     75
    ---
     98
     75
     ----
      235
      225
      ---
       10
      ---
```

Required number = (8485 - 10) // Because 10 < (75 - 10)

= 8475.

THANK YOU