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Topic Name

DIVISIBILITY SHORTCUT /DIGITAL ROOT METHOD

Dividing by 2:

1. All even numbers are divisible by 2. E.g., all numbers ending in 0, 2, 4, 6, or 8

Dividing by 3

1. Add up all the digits in the number.
2. Find out what the sum is. If the sum is divisible by 3, so is the number.
3. For example: 12123 (1+2+1+2+3=9) 9 is divisible by 3, therefore 12123 is too!

Divisibility rules

<u>Dividing by 4</u>

1. Are the last two digits in your number divisible by 4?
2. If so, the number is too!
3. For **example**: 358912 ends in 12 which is divisible by 4, and so is 358912.

<u>Dividing by 5</u>

1. Numbers ending in 5 or 0 are always divisible by 5.

Dividing by 6

1. If the number is divisible by 2 and 3, it is also divisible by 6

Divisibility rules

Dividing by 7

First method:

1. Take the last digit in a number.
2. Double and subtract the last digit in your number from the rest of the digits.
3. Repeat the process for larger numbers.
4. **Example**: Take 357. Double the 7 to get 14. Subtract 14 from 35 to get 21, which is divisible by 7, and we can now say that 357 is divisible by 7.

Divisibility rules

Second method:

1. Take the number and multiply each digit beginning on the right-hand side (ones) by 1, 3, 2, 6, 4, 5. Repeat this sequence as necessary.
2. Add the products.
3. If the sum is divisible by 7, so is your number.
4. **Example:** Is 2016 divisible by 7?
5. 6(1) + 1(3) + 0(2) + 2(6) = 21
6. 21 is divisible by 7, and we can now say that 2016 is also divisible by 7.

Dividing by 8

1. If the last 3 digits are divisible by 8, so is the entire number is divisble by 8.
2. **Example**: 6008. The last 3 digits are divisible by 8, meaning 6008 is as well

Divisibility rules

Dividing by 9

1. Almost the same rule and dividing by 3. Add up all the digits in the number.
2. Find out what the sum is. If the sum is divisible by 9, so is the number.
3. For example: 43785 (4+3+7+8+5=27) 27 is divisible by 9, therefore 43785 is too!

Dividing by 10

1. If the number ends in a 0, it is divisible by 10.

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=7*5=30=3=LHS

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

LHS=RHS

Digital Root – method

Division (A/B=C + Remainder)

To use the digital root (DR) concept to check your divisions we follow a slightly different rule i.e. the DR of A must be the same as the DR(B) multiplied by the DR(C) plus the DR(R) (R is the remainder in whole number, if any)

A=480,B=20

EXAMPLE: 480%20=. C-->24 =6 R-->0

4+8+0=3%2=C--6 R=0(B*C+R),--,-->2*6+0=12=3==A=3

Question: 01

If the product 3252 * 9P2 is divisible by 12, the value of P is:

A. 8

B. 5

C. 2

D. 1

Answer:D

Explanation:

split 12 into co-primes

i.e. 12 = 3 x 4, 3 & 4 are co-primes

the number should be divisible by both 3 & 4. Clearly the number 3252 is divisible by 4

so 9P2 must be divisible by 3

so (9 + P + 2) = 11 + P, least value of P is 1

the number 12 is divisible by 3

i.e. value of P = 1

Question: 02

476XY0 is divisible by both 3 & 11. The non-zero digits in the hundred's and ten's places are respectively:

A. 7 & 4

B. 5 & 7

C. 8 & 5

D. None of these

Answer:C

Explanation:

Resolve the given number as the product of prime factors and take the product of prime factors, choosing one out of three of the same prime factors. Resolving 2744 as the product of prime factors, we get: 2744 =2^3.7^3.

√(3&2744) = 2 x 7 = 14.

Question: 03

The sum of three consecutive natural numbers each divisible by 3 is 72. What is the largest among them?

A. 21

B. 24

C. 27

D. 30

Answer:C

Explanation:

Let us take three consecutive numbers which are divisible by 3 are, x, x+3 and x+6.

21+6=27

The largest of them= 27.

Question: 04

Which of the following numbers is not divisible by 14?

A) 3542

B) 2086

C) 1998

D) 2996

Answer: C

Explanation:

$21952 = 2^3\times2^3\times7^3$

$\therefore \sqrt[3]{21952} = \sqrt[3]{2^3\times2^3\times7^3} = 2\times2\times7 = 28$

The required units digit is 8

Question: 05

A 3-digit number 4p3 is added to another 3-digit number 984 to give the four-digit number 13q7, which is divisible by 11. Then, (p + q) is :

A.10

B. 11

C. 12

D. 13

Answer:A

Explanation:

4P3+984=13Q7

(1+Q)-(7+3)=0/11

Q-9=0/11

Q=9:Q=9+11=20

Subsitute 9, 20 in P+8=Q

Question: 06

If the number **46490#** is exactly divisible by 72,then the minimum value of # is?

A. 8

B. 7

C. 1

D. 4

Answer: D

Explanation:

split 72 into co-primes

i.e. 72 = 8 x 9, **8** & **9** are co-primes

the number is divisible by both 8 & 9

(4 + 6 + 4 + 9 + 0 + #) = 23 + #, least number of # is 4, 27 divisible by 9

last three digit now becomes 904 which is divisible by 8

so that value of **# = 4**

Question: 07

If the product 3252 * 9**P**2 is divisible by 12, the value of **P** is:

A. 8

B. 5

C. 2

D. 1

Answer: D

Explanation:

split 12 into co-primes

i.e. 12 = 3 x 4, **3** & **4** are co-primes

the number should be divisible by both 3 & 4. Clearly the number 3252 is divisible by 4

so 9P2 must be divisible by 3

so (9 + P + 2) = 11 + P, least value of P is 1

the number 12 is divisible by 3

i.e. value of **P = 1**

Question: 08

1965+2053+654+232=?

A.3954

B.4904

C.3636

D.2336

Answer: B

Explanation:

$$1\ \cancel{9}\ 6\ 5 \quad + 2\ 0\ 5\ 3 \quad + \cancel{6\ 5}\ 4 + 2\ 3\ 2$$

$$1+2 \quad + \quad 1+0 \quad + \quad 6 \quad + 7$$

$$3 \quad + \quad 1 \quad + \quad 4 = 8$$

B. $4+\cancel{9}+0+4=8$

Question: 09

(86)^2=?

A.6386

B.7396

C.8366

D.7356

Answer:B

Explanation:

8+6 * 8+6

1+4 * 1+4

5 * 5 = 2 + 5=7

B. $7+\cancel{3}+\cancel{9}+\cancel{6}$

Question: 10

(62)^2=?

A.3844

B.4294

C.5628

D.4215

Answer:A

Explanation:

6 2 * 6 2

8 * 8 = 6 + 4 = 1 + 0 = 1

A. 3+8+4+4=1
B. 4+2+9+4=1

Here we are getting two same answer. Go to the last digit in question is 2.

Check for the square numbers ends with 2 and check the last & previous digit of the answer.

Ex: 2^2= 4

12^2= 144 last digit is 4 & previous digit is even so 62^2 last previous digit is even

22^2= 484

Question: 11

40% of 60% of 3 / 5 of 2750=?

A.372

B.384

C.396

D.412

Answer:C

Explanation:

40/100 * 60/100 * 3/5   * 2750

4   * 6   * 3/5 * 5

4   * 6   * 3 = 7+2 = 9

C. 3+9+6=9

Question: 12

8.4*6.5+4.6*11.5=?/4

A.410

B.420

C.430

D.440

Answer:C

Explanation:

8+4*6+5 + 4+6*1+1+5 = ?/4

1+2*1+1 + 1+0* 7= ?/4

3*2+1*7 = ?/4

6+7=4 ==> ?/4

4=X/4

X=1+6=7

C. 4+3+0=7

Question: 13

Sq.root of x + 416=(160%920) -110

A.676

B.576

C.794

D.1024

Answer:A

Explanation:

Sq.root of x + 416=(160%920) -110

Sq.root of x + 2 = (6*2)-2

Sq.root of x + 2 = (1+2 - 2)=3

Sq.root of x =-1

x=1

A. 6+7+6 = 1

Question: 14

748 / 17 =? % of 110

A.25

B.40

C.50

D.73

Answer: B

Explanation:

748 / 17 =? % of 110

1/8 = x * 2

X = 1/16 =6.25=4

B. 4+0=4

Question: 15

The largest 4 digit number exactly divisible by 5, 6 and 7 is:

A.9980

B.9870

C.9540

D.9640

Answer: B

Explanation:

The required number must be divisible by L.C.M. of 5,6 and 7.

L.C.M. of 5, 6 and 7 = 5 x 6 x 7 = 210

Let us divide 9999 by 210.

210) 9999 (47

840

1599

1470

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129   Required number = 9999 – 129 = 9870

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