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Aptitude Made Simple

Numbers – Divisibility Test

What is Divisibility Test?

When you look at any number whether it is 2 digit or 4 digit or 10 digit number, without actually dividing that number with 2, 3, 4 (any number) if you can tell that number is divisible by 4 completely that is nothing but divisibility Test.

Let us take sample example to understand it and we will go through divisibility tests for 2 to 11.

Sample example

Write your mobile on piece of paper. I have written mine below:

9096754428 Now looking at number tell if this number is completely divisible by 9 or not?

- ➔ You will now try to divide complete number by 9 and check what remainder is. If remainder is 0 means completely divisible. Correct?
- ➔ Now just do simple thing: Add all digits of given number
- ➔ Here: $9 + 0 + 9 + 6 + 7 + 5 + 4 + 4 + 2 + 8 = 54$
- ➔ Now check if 54 is completely divisible by 9 or not.
- ➔ Yes 54 is divisible by 9

So, The number 9096754428 is also completely divisible by 9

(This is nothing but divisibility test of 9 and each number has different divisible test)

Why Divisibility Test?

It simplifies your calculation. It also changes the way we look at numbers. When you do regular practice of divisibility test (2 to 11 numbers) and you look at any number you will think whether it is divisible by 2, 3, 4 ... 11 etc and will make your calculations quick and short.

You will see lot of benefits of this in all different topics while solving in it.

Benefits of Divisibility Tests:

HCF and LCM	Simplification
Work and Time	Average
Pipes and Cistern	Series
Quick calculation and any topic where quick calculations are required	

Divisibility Test for 2:

Rightmost digit number should be divisible by 2.

All even numbers are completely divisible by 2.

In simple words, if rightmost last digit of any number is 0 or 2 or 4 or 6 or 8 then that number is completely divisible by 2

Look at below numbers and observe:

Number	Observation [right most digit]	Divisible by 2 or not
35	Rightmost Last digit is 5 and 5 is not divisible by 2	Number is not divisible by 2
70	Rightmost Last digit is 0 and 0 is divisible by 2	Number is divisible by 2
269	Rightmost Last digit is 9 and 9 is not divisible by 2	Number is not divisible by 2
1002	Rightmost Last digit is 2 and 2 is divisible by 2	Number is divisible by 2

Problem 1:

Number 3789* is completely divisible by 2. What number could be there in place of * ?

Solution :

As per divisibility test for 2, any number whose rightmost digit is 0 or 2 or 4 or 6 or 8 is completely divisible by 2.

So in place of * there could be below values:

2, 4, 6, 8, 0

Answer is 2, 4, 6, 8, 0

Problem 2 :

Which of the following numbers are completely divisible by 2 ?

1236665, 888886, 9999995, 9876543

Solution :

As per divisibility test for 2, any number whose rightmost digit is divisible by 2 is completely divisible by 2.

So let us look at **right most number** and decide if number is divisible by 2 or not.

Number	Observation	Divisible by 2 or not
1236665	Rightmost Last digit is 5 and 5 is not divisible by 2	Number is not divisible by 2
888886	Rightmost Last digit is 6 and 6 is divisible by 2	Number is divisible by 2
9999995	Rightmost Last digit is 5 and 5 is not divisible by 2	Number is not divisible by 2
9876543	Rightmost Last digit is 3 and 3 is not divisible by 2	Number is not divisible by 2

Answer is 888886 is completely divisible by 2

Divisibility Test for 3 :

If sum of all digits of the number is divisible by 3 then that number is completely divisible by 3.

Look at below numbers and observe:

Number	Observation [sum of all digits]	Divisible by 3 or not
123	Sum of all digits ($1 + 2 + 3 = 6$) 6 is divisible by 3	Number is divisible by 3
396	Sum of all digits ($3 + 9 + 6 = 18$) 18 -> Sum of digits ($1 + 8 = 9$) 9 is divisible by 3	Number is divisible by 3
775	Sum of all digits ($7 + 7 + 5 = 19$) 19 -> Sum of digits ($1 + 9 = 10$) 10 is not divisible by 3	Number is not divisible by 3
8679	Sum of all digits ($8 + 6 + 7 + 9 = 30$) 30 -> Sum of digits ($3 + 0 = 3$) 3 is completely divisible by 3	Number is divisible by 3

Note:

When you do sum of all digits and you get answer which is big number. Then continue doing same process till you get single digit sum

Example: 9999968

Sum of digits ($9 + 9 + 9 + 9 + 9 + 6 + 8 = 59$)

So some of students may not be able to conclude by looking at number 59 if it is divisible by 3 or not.

Then repeat sum of digit process till you get single digit number

$59 \rightarrow 5 + 9 = 14$

$14 \rightarrow 1 + 4 = 5$

5 is not divisible by 3.

So number 9999968 is not divisible by 3

Problem 1:

Number 5^*985 is completely divisible by 3. What number could be there in place of * ?

Solution :

As per divisibility test for 3, if sum of all digits of number is divisible by 3 then that number is also divisible by 3

Let us take sum of all digits of number 5^*985

$\text{Sum} = 5 + 9 + 8 + 5 + * = 27 + *$

Digit sum of $27 = 2 + 7 = 9$ which is divisible by 3 already

In order to have number 5^*985 completely divisible sum has of digits should be also divisible by 3.

As Sum without * is already divisible by 3, we need to have such number in place of * which will be divisible by 3 and 3, 6, 9, 0 these numbers are completely divisible by 3.

So answer is 3, 6, 9, 0

Problem 2:

Number $5*699*6$ is completely divisible by 3. There is same number in place of both *. What number could be there in place of *?

A) 1 B) 0 C) 7 D) 2

Solution :

As per divisibility test for 3, if sum of all digits of number is divisible by 3 then that number is also divisible by 3

Let us take sum of all digits of number $5*985$

Sum = $5 + 6 + 9 + 9 + 6 + * + * = 35 + 2*$. Sum of 35 $\rightarrow 3 + 5 = 8$

To find number in place of * we need to make sure:

$8 + 2*$ should be completely divisible by 3.

If we put 1 at * : $8 + (2*1) = 10$ not divisible by 3

If we put 2 at * : $8 + (2*2) = 12$ divisible by 3. Like this we need to check for 0 to 9 and then conclude.

However if we have options given it is best way to use options to solve such questions.

Options	Observation [sum of all digits as per divisibility test of 3]	Answer valid/ Not
A (* = 1) 5169916	Sum of all digits ($5 + 1 + 6 + 9 + 9 + 1 + 6 = 37$) $37 \rightarrow$ Sum of digits ($3 + 7 = 10$) 10 is not divisible by 3	Option A is not the answer
A (* = 0) 5069906	Sum of all digits ($5 + 0 + 6 + 9 + 9 + 0 + 6 = 35$) $35 \rightarrow$ Sum of digits ($3 + 5 = 8$) 8 is not divisible by 3	Option B is not the answer
A (* = 7) 5769976	Sum of all digits ($5 + 7 + 6 + 9 + 9 + 7 + 6 = 49$) $49 \rightarrow$ Sum of digits ($4 + 9 = 13$) $13 \rightarrow$ Sum of digits ($1 + 3 = 4$) 4 is not divisible by 3	Option C is not the answer
A (* = 2) 5269926	Sum of all digits ($5 + 2 + 6 + 9 + 9 + 2 + 6 = 39$) $39 \rightarrow$ Sum of digits ($3 + 9 = 12$) $\rightarrow 1 + 2 = 3$ 3 is completely divisible by 3	Option D is correct answer

Divisibility Test for 4 :

If last 2 digits part of number is divisible by 4 then that number is completely divisible by 4.

So look at number and just focus on right side last 2 digit number

Number	Observation [last 2 digits]	Divisible by 4 or not
12366 64	Rightmost Last 2 digits : 64 64 is divisible by 4	Number is divisible by 4
88888 60	Rightmost Last 2 digits : 60 60 is divisible by 4	Number is divisible by 4
13999 99	Rightmost Last 2 digits : 99 99 is not divisible by 4	Number is not divisible by 4
93765 44	Rightmost Last 2 digits : 44 44 is completely divisible by 4	Number is divisible by 4
9000	Rightmost Last 2 digits : 00 00 is completely divisible by 4	Number is divisible by 4

Problem 1:

Number 665998*0 is completely divisible by 4. What number can be there in place of *?

Solution :

As per divisibility test for 4, if last 2 digit number is divisible by 4 then that number is divisible by 4

Let us try to check all combination and then find required number: **Focus last 2 digits only**

Possibility in place of *	Last 2 digits (when value put for *)	Possible answer(Yes/No)
0	00 -> Divisible by 4	Yes
1	10 -> Not divisible by 4	No
2	20 -> Divisible by 4	Yes
3	30 -> Not divisible by 4	No
4	40 -> Divisible by 4	Yes
5	50 -> Not divisible by 4	No
6	60 -> Divisible by 4	Yes
7	70 -> Not divisible by 4	No
8	80 -> Divisible by 4	Yes
9	90 -> Not divisible by 4	No

Answer is 0, 2, 4, 6, 8

Note:

Most of the time options are given and we can directly refer option to solve this.

Let us do next problem with option:

Problem 2:

Number 6977** is completely divisible by 4. What number could be there in place of * ?

A) 7 B) 9 C) 5 D) 4

Solution :

Let us put all options values at place of * 1 by 1 and check for divisibility test of 4

Options	Observation [Last 2 digits as per divisibility test of 4]	Answer valid/ Not
A (* = 7) 697777	77 -> Not Divisible by 4	Option A is not the answer
B (* = 9) 697799	99 -> Not Divisible by 4	Option B is not the answer
C (* = 5) 697755	55 -> Not Divisible by 4	Option C is not the answer
D (* = 4) 697744	44 -> Divisible by 4	Option D is correct answer

Divisibility Test for 5 :

If Rightmost digit number is 0 or 5 then number is completely divisible by 5.

Look at below numbers and observe:

Number	Observation [right most digit 0 or 5]	Divisible by 5 or not
35	Rightmost Last digit is 5	Number is divisible by 5
70	Rightmost Last digit is 0	Number is divisible by 5
269	Rightmost Last digit is 9	Number is not divisible by 5
1000	Rightmost Last digit is 5	Number is divisible by 5

Problem 1:

Number 3789* is completely divisible by 5. What number could be there in place of * ?

Solution :

As per divisibility test for 5, any number whose rightmost digit is 0 or 5 is completely divisible by 5.

So in place of * there could be below values:

0 or 5

Answer is 0, 5

Problem 2:

Which of the following numbers are completely divisible by 5 ?

1236665, 888886, 9999995, 9876543

Solution :

As per divisibility test for 5, any number whose rightmost digit is 0 or 5 is divisible by 5.

So let us look at **right most number** and decide if number is divisible by 5 or not.

Number	Observation [Rightmost digit 0 or 5]	Divisible by 5 or not
123666 5	Rightmost Last digit is 5	Number is divisible by 5
88888 6	Rightmost Last digit is 6	Number is not divisible by 5
999999 5	Rightmost Last digit is 5	Number is divisible by 5
987654 3	Rightmost Last digit is 3	Number is not divisible by 5

Answer is 1236665, 9999995 are completely divisible by 5

Divisibility Test for 6 :

If number is divisible by 2 and 3 then it is completely divisible by 6

Number	Divisible by 2	Divisible by 3	Divisible by 6 or not
360	Rightmost digit 0 -> Yes	Sum of digit $3 + 6 = 9$ 9 is divisible by 3	Number is divisible 6
375	Rightmost digit 5 -> No	Not required	Number is not divisible 6
4800	Rightmost digit 0 -> Yes	Sum of digit $4 + 8 = 12$ $12 \rightarrow 1 + 2 = 3$ 3 is divisible by 3	Number is divisible 6
2436	Rightmost digit 6 -> Yes	Sum of digits $2 + 4 + 3 + 6 = 15$ $15 \rightarrow 1 + 5 = 6$ 6 is divisible by 3	Number is divisible 6

Divisibility Test for 8 :

If last 3 digits part of number is divisible by 8 then that number is completely divisible by 8.

So look at number and just focus on right side last 3 digit number

Number	Observation [last 3 digits]	Divisible by 8 or not
1236 064	Rightmost Last 3 digits : 064 64 is divisible by 8	Number is divisible by 8
8888 160	Rightmost Last 3 digits : 160 60 is divisible by 8	Number is divisible by 8
1399 999	Rightmost Last 3 digits : 999 99 is not divisible by 8	Number is not divisible by 8
9376 144	Rightmost Last 3 digits : 144 144 is completely divisible by 4	Number is divisible by 8
9000	Rightmost Last 2 digits : 00 00 is completely divisible by 4	Number is divisible by 8

Problem 1:

Number 665998*0 is completely divisible by 8. What number can be there in place of *?

Solution :

As per divisibility test for 8, if last 3 digit number is divisible by 8 then that number is divisible by 8

Let us try to check all combination and then find required number: **Focus last 3 digits only**

Possibility in place of *	Last 3 digits (when value put for *)	Possible answer(Yes/No)
0	800 -> Divisible by 8	Yes
1	810 -> Not divisible by 8	No
2	820 -> Not divisible by 8	No
3	830 -> Not divisible by 8	No
4	840 -> Divisible by 8	Yes
5	850 -> Not divisible by 8	No
6	860 -> Not divisible by 8	No
7	870 -> Not divisible by 8	No
8	880 -> Divisible by 8	Yes
9	890 -> Not divisible by 8	No

Answer is 0, 4, 8

Note:

Most of the time options are given and we can directly refer option to solve this.

Let us do next problem with option:

Problem 2:

Number 69777* is completely divisible by 8. What number could be there in place of * ?

A) 5 B) 4 C) 6 D) 0

Solution :

Let us put all options values at place of * 1 by 1 and check for divisibility test of 4

Options	Observation [Last 3 digits as per divisibility test of 8]	Answer valid/ Not
A (* = 5) 697775	775 -> Not Divisible by 8	Option A is not the answer
B (* = 4) 697774	774 -> Not Divisible by 8	Option B is not the answer
C (* = 6) 697776	776 -> Divisible by 8	Option C is correct answer
D (* = 0) 697770	770 -> Not divisible by 8	Option D is not the answer

Once we get answer we don't need to check next options [just written for reference and understanding]

Divisibility Test for 9 :

If sum of all digits of the number is divisible by 9 then that number is completely divisible by 9.

Look at below numbers and observe:

Number	Observation [sum of all digits]	Divisible by 9 or not
123	Sum of all digits ($1 + 2 + 3 = 6$) 6 is not divisible by 9	Number is divisible by 9
396	Sum of all digits ($3 + 9 + 6 = 18$) 18 -> Sum of digits ($1 + 8 = 9$) 9 is completely divisible by 9	Number is divisible by 9
775	Sum of all digits ($7 + 7 + 5 = 19$) 19 -> Sum of digits ($1 + 9 = 10$) 10 is not divisible by 9	Number is not divisible by 9
8676	Sum of all digits ($8 + 6 + 7 + 6 = 27$) 27 -> Sum of digits ($2 + 7 = 9$) 9 is completely divisible by 9	Number is divisible by 9

Problem 1:

Number 5*985 is completely divisible by 9. What number could be there in place of * ?

Solution :

As per divisibility test for 9, if sum of all digits of number is divisible by 9 then that number is also divisible by 9

Let us take sum of all digits of number 5*985

$$\text{Sum} = 5 + 9 + 8 + 5 + * = 27 + *$$

Digit sum of $27 = 2 + 7 = 9$ which is divisible by 9 already

In order to have number 5*985 completely divisible sum has of digits should be also divisible by 3.

As Sum without * is already divisible by 9, we need to have such number in place of * which will be divisible by 9.

9, 0 these numbers are completely divisible by 9.

So Answer is 9, 0

Problem 2:

Number $5*699*6$ is completely divisible by 9. There is same number in place of both *. What number could be there in place of *?

A) 1 B) 0 C) 7 D) 2

Solution :

As per divisibility test for 9, if sum of all digits of number is divisible by 9 then that number is also divisible by 9

Let us take sum of all digits of number $5*699*6$

$$\text{Sum} = 5 + 6 + 9 + 9 + 6 + * + * = 35 + 2*$$

$$\text{Sum of } 35 \rightarrow 3 + 5 = 8$$

To find number in place of * we need to make sure:

$8 + 2*$ should be completely divisible by 9.

If we put 1 at *: $8 + (2*1) = 10$ not divisible by 9

If we put 2 at *: $8 + (2*2) = 12$ not divisible by 9

Like this we need to check for 0 to 9 and then conclude.

However if we have options given it is best way to use options to solve such questions.

Options	Observation [sum of all digits as per divisibility test of 9]	Answer valid/ Not
A (* = 1) 5169916	Sum of all digits (5 + 1 + 6 + 9 + 9 + 1 + 6 = 37) 37 -> Sum of digits (3 + 7 = 10) 10 is not divisible by 9	Option A is not the answer
A (* = 0) 5069906	Sum of all digits (5 + 0 + 6 + 9 + 9 + 0 + 6 = 35) 35 -> Sum of digits (3 + 5 = 8) 8 is not divisible by 9	Option B is not the answer
A (* = 5) 5569956	Sum of all digits (5 + 5 + 6 + 9 + 9 + 5 + 6 = 45) 45 -> Sum of digits (4 + 5 = 9) 9 is divisible by 9	Option C is the correct answer
A (* = 2) 5269926	Sum of all digits (5 + 2 + 6 + 9 + 9 + 2 + 6 = 39) 39 -> Sum of digits (3 + 9 = 12) 12 -> Sum of digits (1 + 2 = 3) 3 is not divisible by 9	Option D is not the answer

Divisibility Test for 10:

If Rightmost digit of number is 0 then number is completely divisible by 10.

Look at below numbers and observe:

Number	Observation [right most digit 0]	Divisible by 10 or not
3000	Rightmost Last digit is 0	Number is divisible by 10
70	Rightmost Last digit is 0	Number is divisible by 10
269	Rightmost Last digit is 9	Number is not divisible by 10
1000	Rightmost Last digit is 0	Number is divisible by 10

Problem 1:

Number 3788869* is completely divisible by 10. What number could be there in place of * ?

Solution :

As per divisibility test for 10, any number whose rightmost digit is 0 is completely divisible by 10.

So in place of * there could be below values:

0

Answer is 0

Problem 2:

Which of the following numbers are completely divisible by 10 ?

12366650, 888886, 99999950, 9876543

Solution :

As per divisibility test for 10, any number whose rightmost digit is 0 is completely divisible by 2.

So let us look at **right most number** and decide if number is divisible by 10 or not.

Number	Observation [Rightmost digit 0]	Divisible by 5 or not
1236665	Rightmost Last digit is 5	Number is not divisible by 5
8888860	Rightmost Last digit is 0	Number is not divisible by 5
99999950	Rightmost Last digit is 0	Number is not divisible by 10
9876543	Rightmost Last digit is 3	Number is not divisible by 10

Answer is 8888860, 99999950 is completely divisible by 10

Divisibility Test for 11:

Calculate sum of digits at odd places (1, 3, 5...from left)

Calculate sum of digits at even places (2, 4, 6...from left)

Now get difference of both:

Sum of odd places digits – Sum of even places digits.

Sample Number: 278354

2	7	8	3	5	4
Odd place	Even place	Odd place	Even place	Odd place	Even place

Odd places sum = $2 + 8 + 5 = 15$

Even places sum = $7 + 3 + 4 = 14$

Difference = Odd place sum – Even places sum

$$= 15 - 14 = 1$$

As 1 is not divisible by 11 number 278354 is also not divisible by 11.

If this difference is divisible by 11 then number is divisible by 11 [irrespective sign of difference]

Let us look at some examples to understand:

Number	Sum of odd places digits	Sum of even places digits	Difference [Odd places sum – even place sum]	Divisible by 11 or not
451	$4 + 1 = 5$	5	$5 - 5 = 0$ 0 is divisible by 11	Divisible by 11
12133	$1 + 1 + 3 = 5$	$2 + 3 = 5$	$5 - 5 = 0$ 0 is divisible by 11	Divisible by 11
3916	$3 + 1 = 4$	$9 + 6 = 15$	$4 - 15 = -11$ -11 is divisible by 11	Divisible by 11
7586	$7 + 8 = 15$	$5 + 6 = 11$	$15 - 11 = 4$ 4 is not divisible by 11	Not divisible by 11

Summary of Divisibility Tests

Number	Divisibility test
2	Rightmost digit number should be divisible by 2 [0 ,2, 4, 6, 8 at rightmost]
3	Sum of all digits of the number should be divisible by 3
4	Last 2 digit number should be divisible by 4
5	Rightmost digit number should be 0 or 5
6	Number should be divisible by 2 and 3
8	Last 3 digit number should be divisible by 8
9	Sum of all digits of the number should be divisible by 9
10	Rightmost digit number should be 0
11	Sum of odd places digit – sum of even places digit should be divisible by 11