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7. DIVISIBILITY RULES

TEACHING TASK

JEE MAINS LEVEL QUESTIONS

Multiple Choice Type:

1. 23A57 is divisible by 3, then what is the least value of A

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

Key: B

Soltion:

Sum of digits = 2 + 3 + A + 5 + 7 = 17 + A.

For divisibility by 3, 17 + A must be divisible by 3.

Least A = 1 (since 17 + 1 = 18, divisible by 3).

2. If 35x7y1 is divisible by '9' then least sum of x + y

   A) 2 B) 3 C) 4 D) None of these

Key: A

Solution:

Sum of digits = 3 + 5 + x + 7 + y + 1 = 16 + x + y.

For divisibility by 9, 16 + x + y must be divisible by 9.

Least sum: 16 + 2 = 18 (divisible by 9) ? x + y = 2.

3. 476a is divisible by 4 then the value of a

   A) 4 B) 8 C) 5 D) 7

Key: A

Solution:

For divisibility by 4, last two digits (6a) must be divisible by 4.

Possible: 60, 64, 68 $\Rightarrow$ a = 0, 4, 8.

From options: a = 4 or 8.

4. If 57a68 is divisible by 4, then value of a

   A) any single digit number B) 2

   C) 6 D) All

Key: D

Solution:

Last two digits = a6. For divisibility by 4, a6 must be divisible by 4.

Possible: 16, 36, 56, 76, 96 ? a = 1,3,5,7,9.

So, a can be any odd digit.

(since all single-digit odd numbers work)

5. If 3A57 is divisible by 3 and 4578B is divisible by 9, then the least sum of A+B

   A) 2 B) 0 C) 4 D)none of these

Key: D

Solution:

For 3A57: Sum = 3 + A + 5 + 7 = 15 + A $\Rightarrow$ divisible by 3 $\Rightarrow$ A = 0,3,6,9.

For 4578B: Sum = 4+5+7+8+B = 24 + B $\Rightarrow$ divisible by 9 ? B = 3 (since 24+3=27).

Least A = 0 $\Rightarrow$ A+B = 0+3 = 3. But 3 not in options $\Rightarrow$ Options: 2,0,4,none.

Actually, A=0 gives sum=3, not in options. Next A=3 gives 3+3=6, not in options. So

none.

JEE ADVANCED LEVEL QUESTIONS

Multiple Correct type:

1. Which of the following numbers is divisible by '3'

   A) 12345 B) 453 C) 3690 D) 1235

Key: A, B, C

Solution:

Sum of digits:

12345: 1+2+3+4+5=15 (divisible by 3)

453: 4+5+3=12 (divisible)

3690: 3+6+9+0=18 (divisible)

1235: 1+2+3+5=11 (not divisible)

Statement Type:

A) Both Statements are True.

B) Both Statements are False.

C) Statement - I is True, Statement - II is False.

D) Statement - I is False, Statement - IIis True.

2. **Statement I :** The number abcdefghijkl is divisible by 4 if K-1, l=6

   Statement -II : A number is divisible by 4 if the number formed by last two digits is divisible by 4

Key: A

Solution:

But Statement I is poorly worded. Likely it means if last two digits are 16, it is divisible by 4. So both true?

However, "K-1" might be a typo. Assume it means second last digit is 1 and last is 6. Then both statements true.

Comprehension Type :

A Number is divisible by '2' if the units digit of the number is divisible by 2. a number is divisible by 3 and 9 of the sum of the digits of the number is divisible by 3 and 9 respectively.

3. Which of the following number is divisible by '9'

   A) 200409 B) 124678 C) 32197 D) 320418

Key: D

Solution:

Sum of digits:

200409: 2+0+0+4+0+9=15 (not divisible by 9)

124678: 1+2+4+6+7+8=28 (not)

32197: 3+2+1+9+7=22 (not)

320418: 3+2+0+4+1+8=18 (divisible by 9)

4. The number which is divisible by both 2 and 3 is

   A) 120360 B) 12031 C) 20709 D) 5632

Key: A

120360: even (divisible by 2), sum=1+2+0+3+6+0=12 (divisible by 3) $\Rightarrow$ yes.

12031: odd (not by 2)

20709: odd (not by 2)

5632: even, but sum=5+6+3+2=16 (not by 3)

5. The number which is divisible by 3 but not by '9' is

A) 1080 B) 46782 C)112233 D) 356850

Key: C

Solution:

Check sums:

1080: sum=9 (divisible by 9)

46782: sum=4+6+7+8+2=27 (divisible by 9)

112233: sum=1+1+2+2+3+3=12 (divisible by 3, not by 9)

356850: sum=3+5+6+8+5+0=27 (divisible by 9)

Integer Type :

6. If abc is a number divisible by '8' then the least value of abc =

Key:104

Solution:

Least 3-digit number divisible by 8 is 104.

Matrix Matching Type :

7.

Column-I	**Column-II**
a) 428	p) Divisible by 5
b) 540	q) Divisible by 3
c) 135	r) Divisible by 10
d) 27	s) Divisible by 2

Key:

a $\rightarrow$ s

b $\rightarrow$ p,q,r,s

c $\rightarrow$ p,q

d $\rightarrow$ q

LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

Multiple Choice Type :

1. which of the following is divisible by '9'

A) 204009 B) 246817 C) 31297 D) 340218

Key: D

Solution:

Sum of digits:

204009: 2+0+4+0+0+9=15 (not)

246817: 2+4+6+8+1+7=28 (not)

31297: 3+1+2+9+7=22 (not)

340218: 3+4+0+2+1+8=18 (divisible by 9)

2. 78,436 is divisible by

A) 2 B) 3 C) 5 D) 7

Key: A

Solution:

Even $\rightarrow$ divisible by 2.

3. If a number is divisible '9' then it is divisible by

A) 2 B) 3 C) 9 D) 2 and 3

Key: B

Solution:

Since 9=3×3, it must be divisible by 3.

4. Which of the following number is divisible by '11'

A) 3116365 B) 901351 C) 8790322 D) 8790321

Key: B

Solution:

Use alternating sum:

3116365: (3+1+3+5) - (1+6+6) = 12 - 13 = -1 (not multiple of 11)

901351: (9+1+5) - (0+3+1)=15-4=11 (divisible)

8790322: (8+9+3+2)-(7+0+2)=22-9=13 (not)

8790321: (8+9+3+1)-(7+0+2)=21-9=12 (not)

5. Which of the following number is divisible by '7'

A) 508157 B) 508158 C) 508159 D) 508260

Key: B

Solution

Check:

508159 ÷ 7 = 72594.142? Actually, 508159/7 = 72594.142? But 508158/7=72594, exactly?

508158 ÷ 7 = 72594. So divisible.

JEE MAINS LEVEL QUESTIONS

Multiple Choice Type :

1. abcdef is divisible by 11 then which of the following is correct

A) a+b+c = d+c+f B) a+c+e = b+d+f

C) (a+c+e)-(b+d+f)=11 D) 1 and 3

Key: D) 1 and 3 (B and C)

Solution:

Rule: (a+c+e) - (b+d+f) should be 0 or multiple of 11.

So B and C are correct.

2. In a given number last digit (units digit) is represented by y and the remaining part is denoted by x, and if the number is divisible by '7', then

A) y = 2x B) x = 2y C) x = y D) $y = \frac{3}{x}$

Key: B

Standard rule: Subtract twice the last digit from the rest. If result divisible by 7, then number is.

So if number = 10x + y, then x - 2y should be divisible by 7.

So x = 2y mod 7, but not exactly. Actually, it is x - 2y is divisible by 7.

But option B says x=2y, which is not always true.

However, the closest is B) x=2y? Not exactly.

Actually, the rule is: if (x - 2y) is divisible by 7, then number is. So no direct equality.

But among options, B is the intended answer.

3. Number divisible by 4 but not by '8' in the following is...

A) 4664 B) 4464 C) 3940 D) 2848

Key: C

Solution:

Check last three digits:

4664: 664/8=83 (divisible by 8)

4464: 464/8=58 (divisible)

3940: 940/4=235, but 940/8=117.5 (not integer)

2848: 848/8=106 (divisible)

4. Which of the following number is divisible by '11' if a single digit number is subtracted from the number?

A) 8449 B) 8490 C)4875 D) 7028

Key: A

Solution:

Check alternating sum:

8449: (8+4)-(4+9)=12-13=-1, so subtract 1? But not single digit subtraction from number.

Actually, the question is unclear. Likely it means if we subtract a digit from the number (e.g., make it 8449-d), it becomes divisible by 11.

For 8449, alternating sum = -1, so to make it 0, we need to add 1, but we subtract. So subtract 1? Then 8448, alternating sum (8+4)-(4+8)=12-12=0. So yes.

Similarly, others may not work.

5. A number when divided by 6 leaves the remainder '3' when the square of the number is divided by '6', then remainder is

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

Key: D

Solution:

Let $n=6k+3$, then $n^2=36k^2+36k+9 = 9 \bmod 6 = 3 \bmod 6$.

JEE ADVANCED LEVEL QUESTIONS

Multiple Correct Type:

1. A number which is divisible by 99 then it is divisible by

A) 9 B) 11 C) 9 and 11 D) 3

Key: A, B, C, D

Solution:

$99=9\times11$, so by 9 and 11. Also by 3.

2. A number which is divisible by 15 then it must be divisible by

A) 5 B) 11 C) 3 D) 13

Key: A, C

Solution:

$15=3\times5$, so by 3 and 5.

Statement Type:

A) Both Statements are True.

B) Both Statements are False.

C) Statement - I is True, Statement - II is False.

D) Statement - I is False, Statement - IIis True.

3. **Statement -I :** A number is divisible by '11' if and only if, the difference of the sum of the numbers obtained on adding the alternate digits is divisible by 11 or zero.

Statement -II : If (a+c+e) -(b+d+f), then the number abcdef is divisible by '11'

Key: A

Solution:

Statement I: Correct rule.

Statement II: Should be (a+c+e) - (b+d+f) = 0 or ±11.

So both true.

Comprehension Type :

A number is divisible by '6', if it is divisble by both 2 and 3. A number is divisible by '8' if the number formed by last three digits is divisible by 8

4. The number 2358134 is divisible by

A) 6 B) 3 C) 2 D)8

Key: C

Solution:

Even $\Rightarrow$ divisible by 2.

Sum=2+3+5+8+1+3+4=26, not divisible by 3.

Last three digits 134, not divisible by 8.

5. Which of the following is divisible by '8'

A) 41384 B) 236124 C) 56018 D) 31562

Key: A

Solution:

Check last three digits:

41384: 384/8=48 $\Rightarrow$yes

236124: 124/8=15.5 $\Rightarrow$ no

56018: 018=18/8 not integer

31562: 562/8=70.25 $\Rightarrow$ no

6. The number which is divisible by 2 but not by '6' is

A) 35610 B) 124672 C) 52183 D) 369276

Key: B

Not divisible by 3:

35610: even, sum=15 divisible by 3 $\Rightarrow$ by 6

124672: even, sum=1+2+4+6+7+2=22 not divisible by 3 $\Rightarrow$ not by 6

52183: odd $\Rightarrow$ not by 2

369276: even, sum=33 divisible by 3 $\Rightarrow$ by 6

Integer Type :

7. If the sum (lm1+11m) is divisible by '2' then the least sum of l and m

Key: 2

Write numbers: lm1 = 100l + 10m + 1, 11m = 100l + 10 + m.

Sum = 200l + 11m + 11. For even, 11m+11 must be even ? m odd.

Least l and m? l=1, m=1 gives sum=200+11+11=222, divisible by 2.

So least sum l+m=2.

Matrix Matching Type :

8. If a = 5, b = 7, c = 8, d = 9, then

Column-I	**Column-II**
a) abc is divisible by	p) 3
b) bcd is divisible by	q) 5
c) cda is divisible by	r) 6
d) dab is divisible by	s) 2

Key:

a $\rightarrow$ s
b $\rightarrow$ p
c $\rightarrow$ q
d $\rightarrow$ p