1. $248^{321}+7$ is it divisible by 5?

$LD(248^{321})+7$

$= LD(8^{321})+7$

$= LD(8^{32(\times 4)})+7$

$= LD(8^{1})+7$

$= LD(8+7)$

$= 5$

So $(248^{321})+7$ is divisible by 5.

2. Is $1357^{1002}+1$ divisible by 2?

$LD(1357^{1002})+1$

$= LD(7^{1002})+1$

$= LD(7^{1002 \backslash\backslash 4})+1$

$= LD(7^{2})+1$

$= LD(49+1)$

$= 0$

So, it is divisible by 2.

3. $123^{45} + 789^{10}$ what's the last digit?

$LD(123^{45}) + LD(789^{10})$

$= LD(3^{45}) + LD(9^{10})$

$= LD(3^{45 \% 4}) + LD(9^{10 \% 4})$

$= LD(3^{1}) + LD(9^{2})$

$= LD(3+1)$

$= 4$

So, the last digit of $(123^{45}) + (789^{10})$ is 4.

4. $672^{55}+8$ is it divisible by 10?

$LD(672^{55})+8$

$= LD(2^{55})+8$

$= LD(2^{55 \div 4})+8$

$= LD(2^{3})+8$

$= LD(8+8)$

$= 6$

so, $(672^{55})+8 = 6$, which is not divisible by 10

5. $987^{63} - 456^{21}$ what's the last digit?

$LD(987^{63} - 456^{21})$

$= LD(7^{63} - 6^{21})$

$= LD(7^{63:4} - 6^{21:4})$

$= LD(7^{3} - 6^{1})$

$= LD(3 - 6)$

$= LD(-3)$

$= -3$

the last digit is -3

CAI says the answer is 7. ✓

Which answer is correct?

Here, we know $987^{63} - 456^{21} > 0$
(Since base is bigger & power is also bigger for the minuend).

$$\begin{array}{r} \ldots 3 \\ - \ \ldots 6 \\ \hline \ldots 7 \end{array} \qquad \begin{array}{r} 13 \\ 6 \\ \hline = 7 \end{array}$$

(Borrow '1' from 10's place)

6. $111^{99}+4$ is divisible by 5 because, 111^{99}'s last digit is 1 ($1^{\text{anything}}=1$) and $1+4=5$

7. $543^{77} + 222^{33}$ is it an even, or odd number?

$= LD(3^{77} + 2^{33})$

$= LD(3^{77:4} + 2^{33:4})$

$= LD(3^{1} + 2^{3})$

$= LD(3+8)$

$= LD(11)$

$= 1$

the number is an odd number.

$LD(3^{1} + 2^{1})$

$= 5$

8. $12^{20} \times 24^{30}$ What's the last digit?

$LD(12^{20} \times 24^{30})$

$= LD(2^{20} \times 4^{30})$

$= LD(2^{20 \div 4} \times 4^{30 \div 4})$

$= LD(2^{0} \times 4^{2})$ $= LD(2^{4} \times 4^{2})$

$= LD(1 \times 6)$ $= LD(6 \times 6)$

$= LD(6)$ $= 6$

$= 6$

the last digit is 8.

Do 7^{44}, 8^{44}, 9^{44}, all end with 1?

$\therefore$ not $\therefore$

9. $777^{77} + 23$ is it divisible by 10?

$$LD(777^{77} + 23)$$
$$= LD(7^{77} + 23)$$
$$= LD(7^{77:4} + 23)$$
$$= LD(7^{1} + 23)$$
$$= LD(7 + 23)$$
$$= LD(30)$$
$$= 0$$

it is divisible by 10.

10. $19^{51} + 28^{62} + 37^{73}$ what's the last digit?

because, 9's power have last digits as 9, 1, 9, 1 ... and 1 is the remainder when 2 divides 51.
So, the last digit is 9.

because 8's powers have last digits as 8, 4, 2, 6 and 2 is the remainder when 4 divides 62. So, last digit is 4.

because 7's powers have last digits as 7, 9, 3, 1 and when we divide 4 with 73, the reminder is 1, so last digit is 7, and 9+4+7=20

0

$LD(19^{51} + 28^{62} + 37^{73})$

$= LD(9^{51} + 8^{62} + 7^{73})$

$= LD(9^{51 \div 4} + 8^{62 \div 4} + 7^{73 \div 4})$

$= LD(9^{3} + 8^{2} + 7^{1})$

$= LD(9 + 4 + 7)$

$= LD(13 + 7)$

$= LD(20)$

$= 0$

the last digit is 0.

11. is $123456^{789}+1$ divisible by 2?

$LD(123456^{789}+1)$

$=LD(6^{789}+1)$

$=LD(6^{789 \div 4}+1)$

$=LD(6^{1}+1)$

$=LD(6+1)$

$=LD(7)$

$=7$

So, $123456^{789}+1$ is not divisible by 2.

12. $765^{432} + 321^{987}$ – Whats the last digit

$LD(765^{432} + 321^{987})$

$= LD(5^{432} + 1^{987})$

$= LD(5+1)$ [5^{anything} is 5, as same for 1]

$= LD(6)$

$= 6$

So, $765^{432} + 321^{987}$ last digit is 6

13. $987654^{32} - 9$ is it divisible by 5?

$LD(4^{32} - 9)$

$= LD(4^{32 \div 4} - 9)$

$= LD(4^{9} - 9)$ $= LD(4^4 - 9)$

$= LD(\cancel{4} - 9)$ $= LD(6 - 9) = LD(16 - 9) = 7$ ↳ not divisible by 5

$= -5$

(AI says the answer is 4)

987654^{32} is divisible by 5; AI says the opposite way;

14. What is the last digit of $23^{15} \times 47^{25} + 5$?

$LD(23^{15} \times 47^{25} + 5)$

$= LD(3^{15} \times 7^{25} + 5)$

$= LD(3^{15 \cdot 1 \cdot 4} \times 7^{25 \cdot 1 \cdot 4} + 5)$

$= LD(3^{3} \times 7^{1} + 5)$

$= LD(7 \times 7 + 5)$

$= LD(49 + 5)$

$= LD(54)$

$= 4$

Last digit is 4

15. is $101^{1001} + 99$ divisible by 10?

$$LD(101^{1001} + 99)$$

$$= LD(1^{1001} + 99)$$

$$= LD(1 + 99)$$

$$= LD(100)$$

$$= 0$$

Yes!

16. is $8642^{51} - 1357^{24}$ LD even or odd?

$LD(8642^{51} - 1357^{24})$

$= LD(2^{51} - 7^{24})$

$= LD(2^{51 \cdot 14} - 7^{24 \cdot 14})$ $= LD(2^{3} - 7^{4})$

$= LD(2^{3} - 0)$ $= LD(8 - 1)$

$= LD(3)$

$= 3$ $= 7$

the answer is odd.

17. What's the last digit of $11^{11} + 22^{22} + 33^{33}$?

$LD(11^{11} + 22^{22} + 33^{33})$

$= LD(1^{11} + 2^{22} + 3^{33})$

$= LD(1^{11} + 2^{22 \div 4} + 3^{33 \div 4})$

$= LD(1 + 2^{2} + 3^{1})$

$= LD(1 + 4 + 3)$

$= LD(5 + 3)$

$= LD(8)$

$= 8$

Last digit is 8

18. $456^{78} + 4$ is it divisible by 5 ?

$LD(456^{78} + 4)$

$= LD(6^{78} + 4)$

$= LD(6 + 4)$

$= LD(10)$

$= 0$

it is divisible by 5.

19. What's the last digit of $7^{2025} + 3^{2025}$

$LD(7^{2025 \div 4} + 3^{2025 \div 4})$

$= LD(7^1 + 3^1)$

$= LD(7+3)$

$= LD(10)$

$= 0$

20. is $99999^9 + 111$ is it divisible by 2 or 10?

$LD(99999^9 + 111)$

$= LD(9^9 + 111)$

$= LD(9 + 111)$

$= LD(120)$

$= 0$

so, it is divisible by 2, and 10.