

Practice Quiz 2, M203E

Instructions: The quiz is open book (any books) and open notes (any notes or written material). Each problem is worth 12 points (you get two points free for a total of 50).

[1] (a) What is the remainder if you divide 323^{11} by 9? Show your work or explain how you get your answer.

It's easier when typing to use ^ to denote an exponent, so $323^{11} = 323^{11}$.

Now $323 = 8 = -1 \pmod{9}$ so $323^{11} = -1^{11} = -1 = 8 \pmod{9}$.

Alternative solution:

$323 = 8 \pmod{9}$ so $323^{11} = 8^{11} \pmod{9}$, now look for a pattern in the powers of 8 mod 9: $8^1 = 8$, $8^2 = 64 = 10 = 1 \pmod{9}$, so $8^{11} = 8 \cdot 8^{10} = 8 \cdot (8^2)^5 = 8 \cdot 1^5 = 8 \pmod{9}$.

(b) What is the remainder if you divide 323^{11} by 10? Show your work or explain how you get your answer.

$323^{11} = 3^{11} \pmod{10}$, but $3^4 = 1 \pmod{10}$, so $3^{11} = 3^3 \cdot (3^4)^2 = 27 \cdot 1^2 = 27 = 7 \pmod{10}$.

[2] (a) What month will it be 4321 months from now? Explain how you get your answer.

$4321/12 = 360.083333$ so the remainder when you divide 4321 by 12 is

$4321 - 360 \cdot 12 = 1$ (which we can also estimate by $12 \cdot .083333 = 0.999996$).

Thus it will be 360 years and 1 month after this month, hence March.

(b) What day will it be 4321 weeks from today, assuming today is Monday? Explain how you get your answer.

$4321/7 = 617.28571$ and $4321 - 617 \cdot 7 = 2$, so it will be 617 weeks and 2 days after today, hence Wednesday.

[3] (a) Find the postnet check digit for the math department zip code: 68588 0130.

Adding up the digits gives 39 so the check digit is 1, to get an even multiple of 10.

(b) Given that the postnet check digit is 4, fill in the following zip code's missing digit: 12574 3_11.

The known digits plus the check digit add up to 28 so the missing digit is 2 in order for the sum of all of the digits to be an even multiple of 10.

[4] (a) Find the check digit (denoted here by x) for the following UPC code:

0 53000 15108 x.

Then $3(0+3+0+1+1+8) + (5+0+0+5+0+x)$

$= 39 + 10 + x = 49 + x$ so x must be 1 to get an even multiple of 10.

(b) Find the missing digit in the following UPC code:

0 15838 _0001 5.

Write x for the unknown digit. Then $3(0+5+3+x+0+1) + (1+8+8+0+0+5)$

$= 27+3x+22 = 49 + 3x$ so $x = 7$ to get an even multiple of 10.