

Answers to Problem Set 1

1. 24 divides into 113 four times with 17 left over. That is, $113 = 4 \times 24 + 17 = 96 + 17$
What time is 17 hours later than 3 p.m.? 12 hours later is 3 a.m. the next day, and 5 hours more is 8 a.m.
We're now in the fifth day since we talked to our friend.
2. $10,000,000,000,000 = 17 \times 588235294117 + 11 = 9,999,999,999,989 + 11$
3. 11
4. $1/17 = 0.0588235294117\dots$ (13 places) with a remainder of 11.
 $11/17 = 0.64705882352941176470588235294118$, which are the next places starting with the 14th.
 $1/17 = 0.0588235294117\ 64705882352941176470588235294118\dots$
5. $1/47 = 0.02127659574468085106382978723404\dots$ (answer to 32 places)
Throw away the last two bits (which are in doubt), truncating to 30 places.
 $0.021276595744680851063829787234$
Multiply by 47 (undo the /47) and see how close to 1.
 $0.021276595744680851063829787234 \times 47 = 0.99999999999999999999999999999998$
The difference from 1 shows the remainder for stopping at 30 places.
 $1 - 0.99999999999999999999999999999998 = 0.00000000000000000000000000000002$
So the remainder after 30 places is 2. To find the digits starting with the 31st place:
 $2/47 = 0.04255319148936170212765957446809\dots$
So $1/47 = 0.02127659574468085106382978723404255319148936170212765957446809\dots$
We see the patten repeating with the 0212 pattern. So the repeating pattern is 46-long:
0212765957446808510638297872340425531914893617

