Answers 5

Problem 1
1942/7 = 277.428571...   0.428571 × 7 = 3
1942/13 = 149.384615...   0.384615 × 13 = 5

Problem 2
The smallest number divisible by both 7 and 13 is 7 × 13 = 91

Problem 3

Numbers with a mod 7 of 1	Numbers with a mod 13 of 6
1	6
8	19
15	32
22	45
29	58
36	**71**
43	
50	
57	
64	
71	

So 71 mod 7 = 1, and 71 mod 13 = 6.
Similarly, it's also true that 162 mod 7 = 1, and 162 mod 13 = 6, but I'm probably not 162.

Problem 4
1836542 mod 9 = 2. 315734 mod 9 = 5.

Problem 5
1942 mod 10 = 2. 1942 mod 100 = 42.

Problem 6
$1942 = a\times7^3 + b\times7^2 + c\times7^1 + d\times7^0 = a\times343 + b\times91 + c\times7 + d\times1$, where *a, b, c,* and *d* are all 6 or less.
1942/343 = 5.661807... so a = **5**. 1942 – 5×343 = 227.
227/91 = 2.494505... so b = **2**.   227 – 2×91 = 45.
45/7 = 6.428571... so c = **6**.   45 – 6×7 = 3.
3/1 = 3, so d = **3**.
Then $1942_{10} = 5263_7$. The last “digit” is 3, which agrees with 1942 mod 7 = 3 in Problem 1.

Problem 7
$X = a\times n + x$, and let $Y = b\times n + y$
$X \bmod n = x$, and $Y \bmod \mathrm{n} = y$
$X \times Y = (a\times n + x)(b\times n + y) = a\times b\times n\times n + a\times y\times n + \mathrm{b}\times x\times n + \mathrm{x}\times y = (a\times b\times n + a\times y + \mathrm{b}\times x)\times n + x\times y$
$[X \times Y] \bmod n = [(a\times b\times n + a\times y + \mathrm{b}\times x)\times n + x\times y] \bmod n = [x\times y] \bmod n = [X \bmod n \times Y \bmod \mathrm{n}] \bmod n$

Problem 8

1942	1942 mod 9 = 7	7	
×385	385 mod 9 = 7	×7	
747670	747670 mod 9 = **4**	49	49 mod 9 = **4**