Math 141

Homework 5.3.50

There are **100** ingots total per bin, **99** good/real and 1 bad/fake.

$$\Pr(detect\ theft\ in\ at\ least\ one\ bin)$$
$$= 1 - \Pr(won't\ detect\ theft\ in\ any\ of\ the\ bins)$$
$$= 1 - [\Pr(won't\ detect\ theft\ in\ one\ bin)]^{number\ of\ bins}$$

Bins checked	Ingots checked per bin	Probability we won't detect theft in one bin	Probability we won't detect in any bins
100	1	$\frac{C(99,1)}{C(100,1)} = \frac{99}{100} = .99$	$1 - (.99)^{100} \approx .6340$
50	2	$\frac{C(99,2)}{C(100,2)} = \frac{98}{100} = .98$	$1 - (.98)^{50} \approx .6358$
25	4	$\frac{C(99,4)}{C(100,4)} = \frac{96}{100} = .96$	$1 - (.96)^{25} \approx .6396$
10	10	$\frac{C(99,10)}{C(100,10)} = \frac{90}{100} = .90$	$1 - (.90)^{10} \approx .6513$
1	100	0	$1 - (\ 0\ )^1 = 1.000$

25 bins, 4 per bin case:

$$\frac{C(99,4)}{C(100,4)} = \frac{\frac{99 \cdot 98 \cdot 97 \cdot 96}{4 \cdot 3 \cdot 2 \cdot 1}}{\frac{100 \cdot 99 \cdot 98 \cdot 97}{4 \cdot 3 \cdot 2 \cdot 1}} = \frac{99 \cdot 98 \cdot 97 \cdot 96}{100 \cdot 99 \cdot 98 \cdot 97} = \frac{96}{100} = .96$$