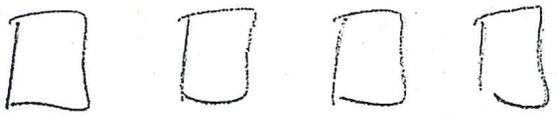
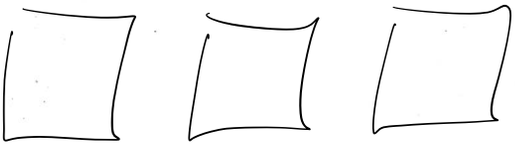
6.9



$4 \cdot 3 \cdot 2 \cdot 1 = 24$

6.10



$3 \cdot 2 \cdot 1 = 6$

6.11

$9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$

On a 362 880 possibilités.

Nombre de secondes: $362\,880 \cdot 5 = 1\,814\,400$ s

$= 504$ h

$\Rightarrow$ Il faudrait 3 semaines

6.12

a) $2.^{!} = 2 \cdot 1 = 2$

b) $3.^{!} = 3 \cdot 2 \cdot 1 = 6$

c) $10.^{!} = 10 \cdot 9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 3\,628\,800$

d) $2.^{!} \cdot 3.^{!} = 2 \cdot 6 = 12$

e) $5.^{!} = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 20 \cdot 6 = 120$

f) $50.^{!} = 30\,414\,093\,201\,713\,378\,043\,612\,608$
$166\,064\,768\,844\,377\,641\,568\,960$
$512\,000\,000\,000\,000$

g) $6.^{!} = 6 \cdot 5.^{!} = 6 \cdot 120 = 720$

h) $100.^{!} \simeq 9,33262154439441527 \cdot 10^{157}$

i) $1000.^{!} \simeq 4,0238726 \cdot 10^{2567}$

6.13

a) $\frac{12!}{9!} = \frac{12 \cdot 11 \cdot 10 \cdot 9!}{9!} = 12 \cdot 11 \cdot 10 = 1320$

b) $\frac{11!}{3!2!4!} = \frac{11 \cdot 10 \cdot 9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4!}{3! \cdot 2 \cdot 1 \cdot 2 \cdot 1 \cdot 4!} = 11 \cdot 10 \cdot 3 \cdot 2 \cdot 7 \cdot 6 \cdot 5$

$= 138\,600$

c) $\frac{12!}{8! \cdot 4!} = \frac{12 \cdot 11 \cdot 10 \cdot 9 \cdot 8!}{8! \cdot 4 \cdot 3 \cdot 2 \cdot 1} = 3 \cdot 11 \cdot 5 \cdot 3$

$= 495$

d) $\frac{100!}{98!\,5!} = \frac{100 \cdot 99 \cdot 98!}{98! \cdot 5!} = \frac{100 \cdot 99}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1} = \frac{165}{2}$

e) $\frac{n!}{(n-2)!} = \frac{n \cdot (n-1) \cdot (n-2)!}{(n-2)!} = n(n-1) = n^2 - n$

f) $\frac{(n+2)(n+1)(n)(n-1)!}{(n-1)!} = n \cdot (n+1)(n+2)$

$= n^3 + 3n^2 + 2n$