

① Vertical  $\rightarrow 96$   
 si 7  $\rightarrow$  2 vides imp.

②  $20 < x < 30$  d

$$3d + (x-d)/2 = x$$

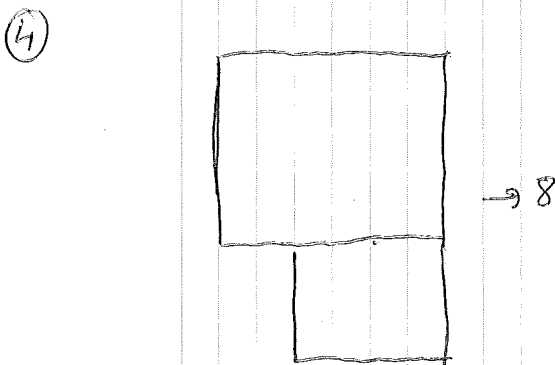
$$6d + x - d = 2x$$

$$x = 5d \rightarrow x = \underline{25}$$

③

11	14	35	56	77	98	119	77
1	2	3	4	5	6	7	8

$37 \equiv 1 \equiv 7 [3] \rightarrow \underline{119}$



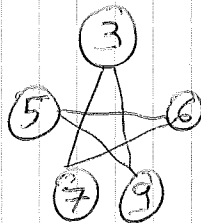
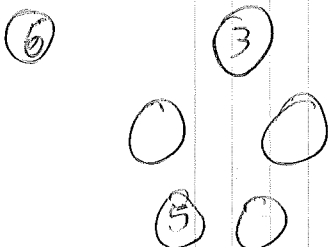
⑤ Sous les 2 chiffres à écrire:

- 1: 11
- 2: 2
- 3: 3
- 4: 2
- 5: 2
- 6: 2
- 7: 2
- 8: 2
- 9: 1
- 0: 1

chiffre A: mult. de 3,  $\geq 6$   
 $\hookrightarrow 1$

chiffre B:  $12/3 = 4 \rightarrow$  chiffre 3

1 et 3



8 à 12

imp: (9+...)

~~3+7~~  $3+7 = 10$   
~~3+9~~  $3+9 = 12$   
 $5+9 = 14$

$6+5 = 11$   
 $6+7 = 13$

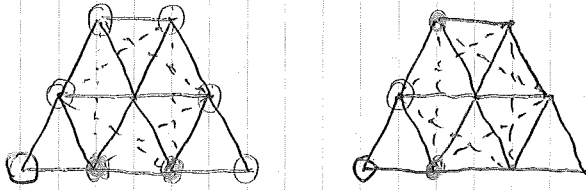
- 9+3
- 9+5
- 3+9
- 3+7

~~14~~  $14 \leq E$   
 $10 \geq E \rightarrow 10 \text{ à } 14$

⑦ Nb de 4: mult. de 3.

4446 non  
4464 OK

⑧

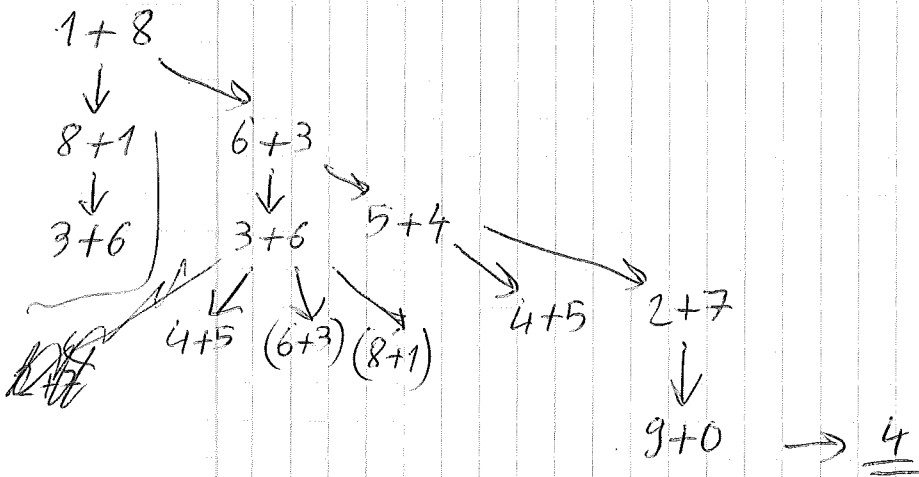


Si pas de libre: BNBBN sur hexagone  $\rightarrow$  imp

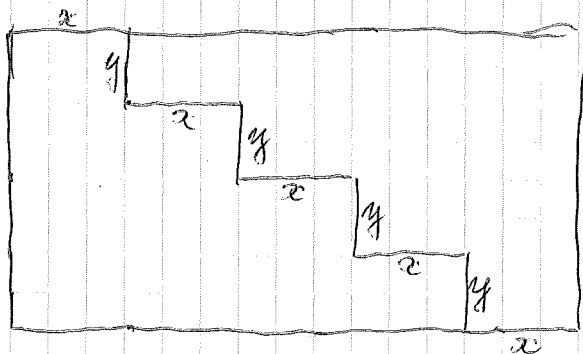
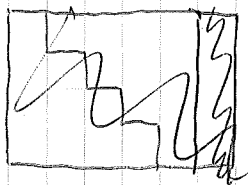
⑨ 8 sommets  
 12 ~~arêtes~~ arêtes (1 dé/arête)  
 6 centres  
 1 dé central

$$\begin{aligned} \rightarrow (1+2+3) \times 8 &= 48 \\ (1+2) \times 12 &= 36 \\ 1 \times 6 &= \underline{6} \\ &= \underline{\underline{90}} \end{aligned}$$

⑩

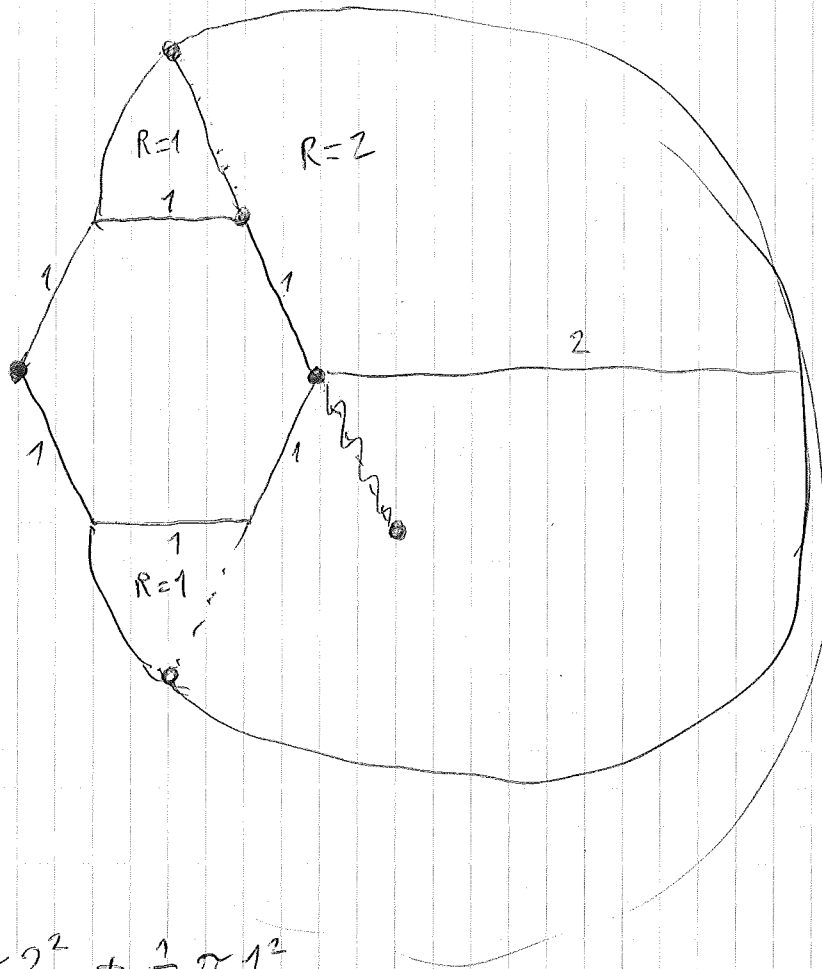


⑪



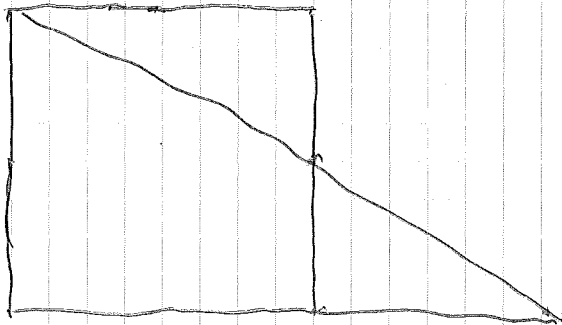
$$\left. \begin{aligned} 5y &= 4x \\ y &= 4, x = 5 \end{aligned} \right) 3x + 4y = \underline{\underline{31}}$$

(12)



$$\frac{2}{3} \pi 2^2 + \frac{1}{3} \pi 1^2$$
$$= \left( \frac{8}{3} + \frac{1}{3} \right) \pi = \underline{\underline{3\pi}}$$

(13)



14

$$\frac{n\Delta}{nt} \rightarrow \text{imp}$$

$$\frac{10n+\Delta}{10n+t} = \frac{\Delta}{t}$$

$$10nt = 10n\Delta \rightarrow \text{imp} \\ t = \Delta \text{ imp } (a < b)$$

$$\frac{n\Delta}{t\Delta} = \frac{10n+\Delta}{10t+\Delta}$$

$$= \frac{n}{t}$$

$$t\Delta = n\Delta \text{ imp.}$$

$$\frac{n\Delta}{\Delta t}$$

$$\frac{10n+\Delta}{10\Delta+t} = \frac{n}{t}$$

$$\frac{n}{\Delta} \approx \frac{n}{t}$$

$$\Delta = t \pm 1?$$

$$10n\Delta + nt = 10nt + t\Delta$$

$$10n\Delta - 9nt - t\Delta = 0$$

$$\bullet \Delta = t+1$$

$$10nt + 10n - 9nt - t^2 - t = 0$$

$$nt + 10n - t^2 - t = 0$$

$$n = \frac{t^2+t}{10+t} \quad t=5 \text{ ou } 8$$

$$- t=5: n=2 \text{ et } \Delta=6$$

$$26/65 = 2/5 \rightarrow \text{OK}$$

$$- t=8: n=4 \text{ et } \Delta=9$$

$$49/98 \text{ exemple.}$$

$$\bullet \Delta = t-1$$

$$10nt - 10n - 9nt - t^2 + t = 0$$

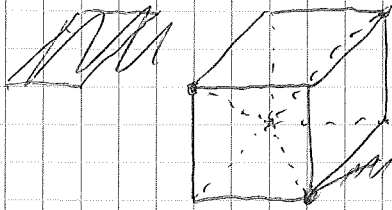
$$nt - 10n - t^2 + t = 0$$

$$n = \frac{t^2-t}{t-10} \text{ imp.}$$

$$(t=4, n=2) \Delta=3$$

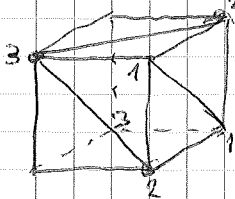
(15) 12 extrémités

- Cubes avec au moins 1 sommet d'ordre 3:



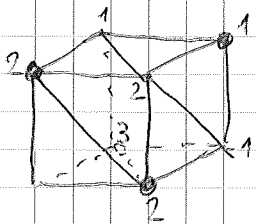
• 1 cube avec 4 sommets d'ordre 3.

• 1 " " " 2 " " 3 : ~~(12)~~  
relies 332211

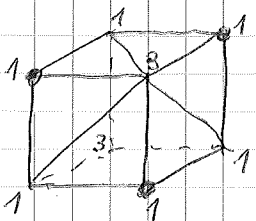


~~(12)~~ (symétrique)

• ~~11~~ Cubes avec 1 seul sommet d'ordre 3 ou 2 non reliés:



(sym.)



33111111

→ 4 cubes avec au moins 1 sommet d'ordre 3.

~~12~~ au moins 4 sommets d'ordre 2.

15) suite

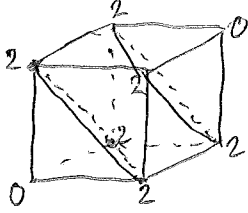
- Cubes sans sommet d'ordre 3.

⇒ au moins 4 sommets d'ordre 2.

22222222

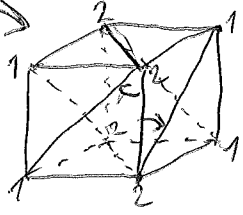
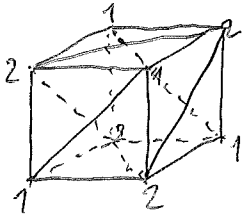
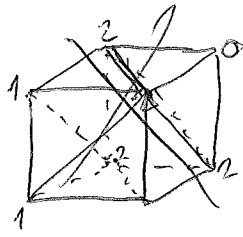
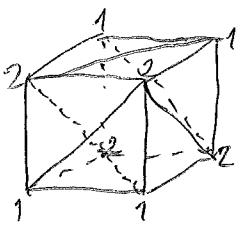
2 triangles:

(222 222 00)



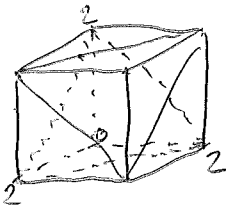
⇒ 1 cube

0 triangle:



→ 2 orientations possibles.  
⇒ 3 cubes

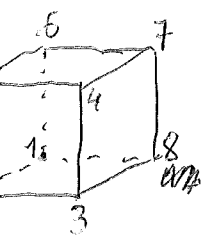
1 triangle:



imp.

⇒ 4 cubes sans sommet d'ordre 3.

→ 8 au total

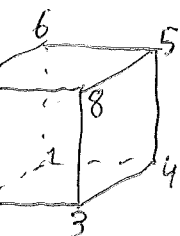


$$121 \rightarrow 1/3$$

$$123 \rightarrow 2/3$$

$$1234 \rightarrow 2/3$$

$$1 \dots 5 \rightarrow 2/27 \dots \rightarrow 2/729$$



$$1234 \rightarrow 2/9$$

$$12345 \rightarrow 2/27$$

$$123456 \rightarrow 4/81$$

$$\cancel{1234567} \rightarrow 4/243$$

$$1 \dots 8 \rightarrow 4/729$$

$$729 = 2/243$$

(18)  $2+3+\dots+16 = 8 \times 17 - 1 = 135$

~~3S + R = 135~~

through  $S \geq 2+3+$

~~3S \geq 2(2+3+4) + 5+6+\dots+13 = 18+81 = 99~~

$S \geq 33$

$S \leq 42$

$135 - 3R = 135 - 3(135 - 3S)$

$= 9S - 270$

→ les 6 du centre

$3S = 9S - 270 + A'+B'+C'$

$A'+B'+C' = 270 - 6S$

les 3 du centre:  $(9S - 270) - (270 - 6S)$

$= 15\Delta - 540$

$37 \leq \Delta \leq$

$\Delta = 37 \rightarrow 15$

$\Delta = 38 \rightarrow 30$

$\Delta = 39 \rightarrow 45$

$A'+B'+C'$

~~180~~ 48 → non

~~130~~ 42

36

R

~~111~~

21

18

~~$\Delta = 38$~~   $\Delta = 38?$

$42 = 13 + 14 + 15 \rightarrow$  non

$12 + 14 + 16 \rightarrow$  non

$11 + 15 + 16 \rightarrow$  non

~~118~~  $A+15$

$16+2+3 = 21$

$12+4+5 = 21$

$6+7+8 = 21$

~~19 = 11 + 12 + 13 + 14~~

~~118~~

$\Delta = 39$

$18 = 10 + 6 + 2$

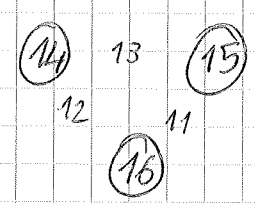
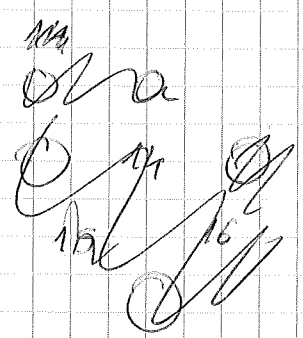
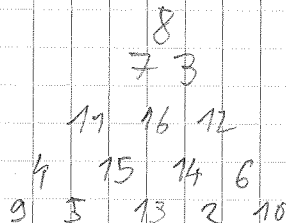
$8 = 5 + 3$

$9 + 5 + 4$

$3 = 7 + 2$

$8 + 7 + 3$

$10 = 6 + 4$



$6 \times 37 = 222$