Explorer l'espace avec des cubes

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Tipaza, août 2013

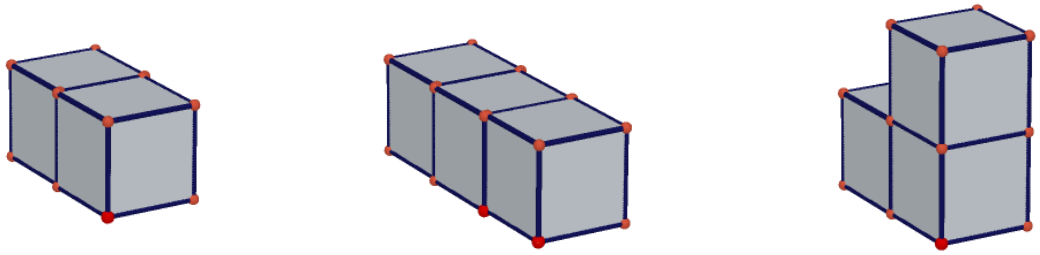
Introduction

- Choix du thème
- Eventail d'activités
- Prolongements possibles

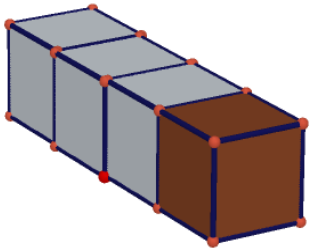
1. Solides utilisés

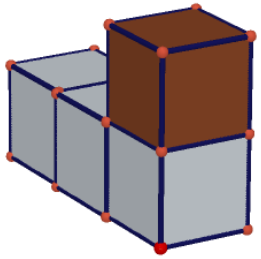
- Simples agencements de cubes dans l'espace à créer ou reproduire

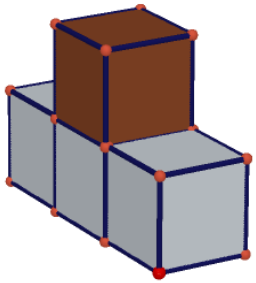
- Recherche de polycubes, agencement structuré de cubes
  (Matériel possible : formacubes, cubes à emboîter)

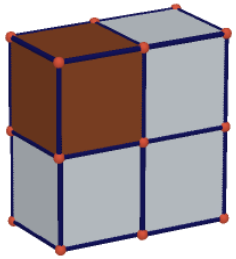


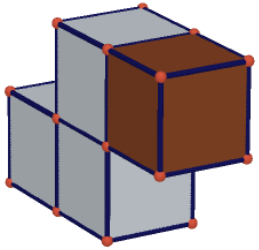
- Tétracubes

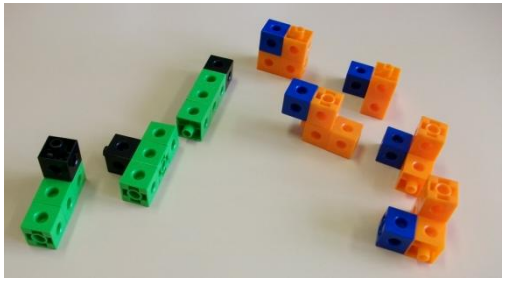




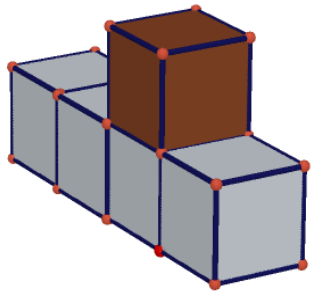


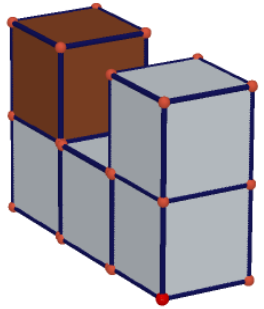


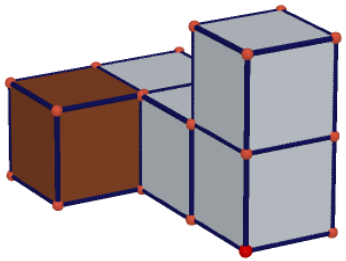


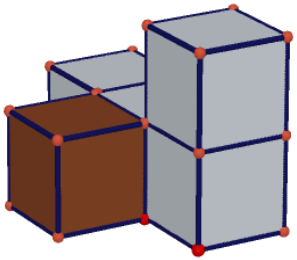


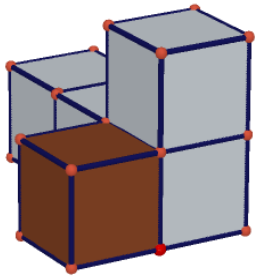
- Pentacubes

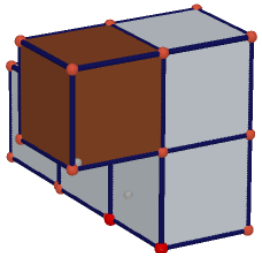


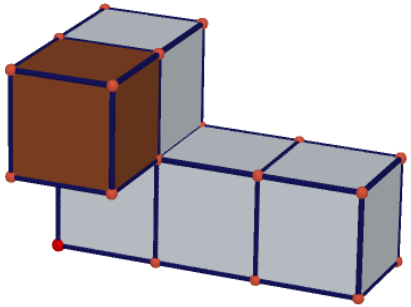


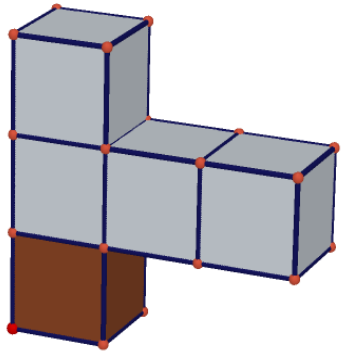


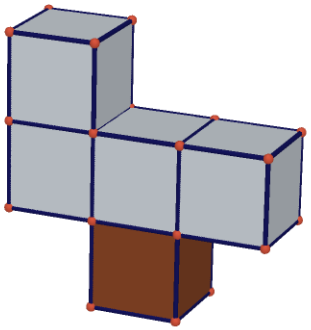
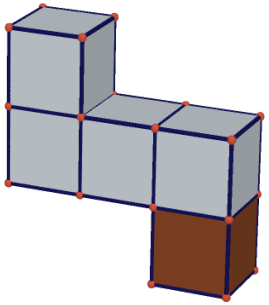
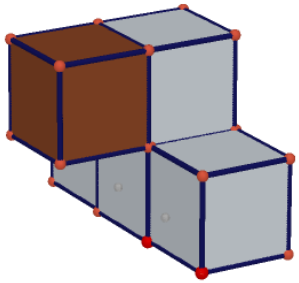
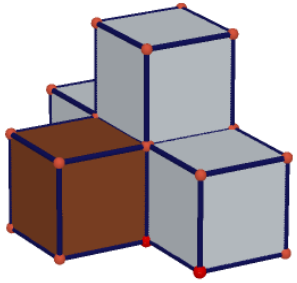
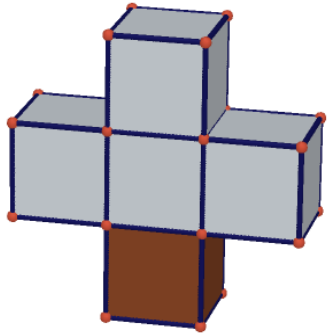
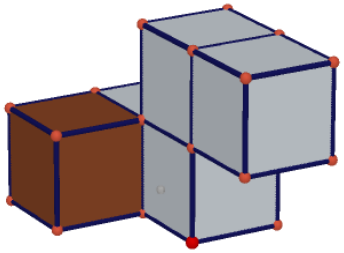
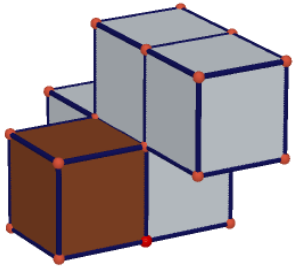
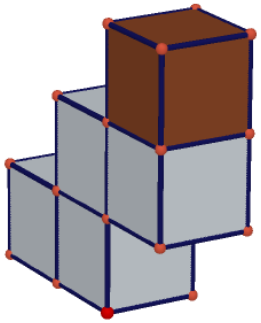
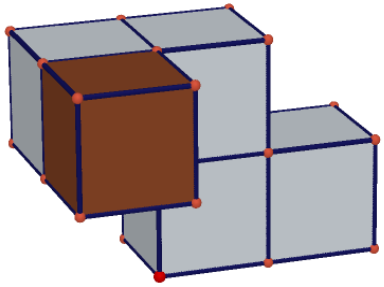
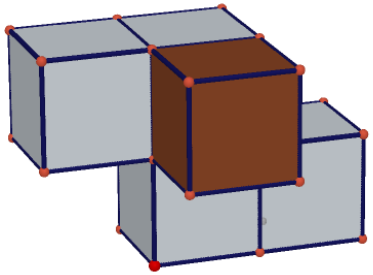
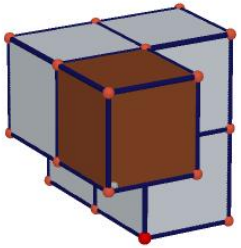
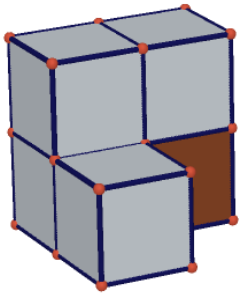
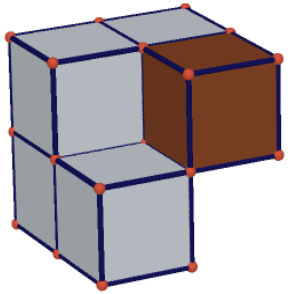
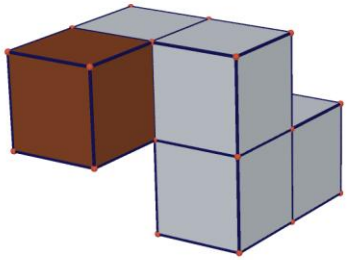








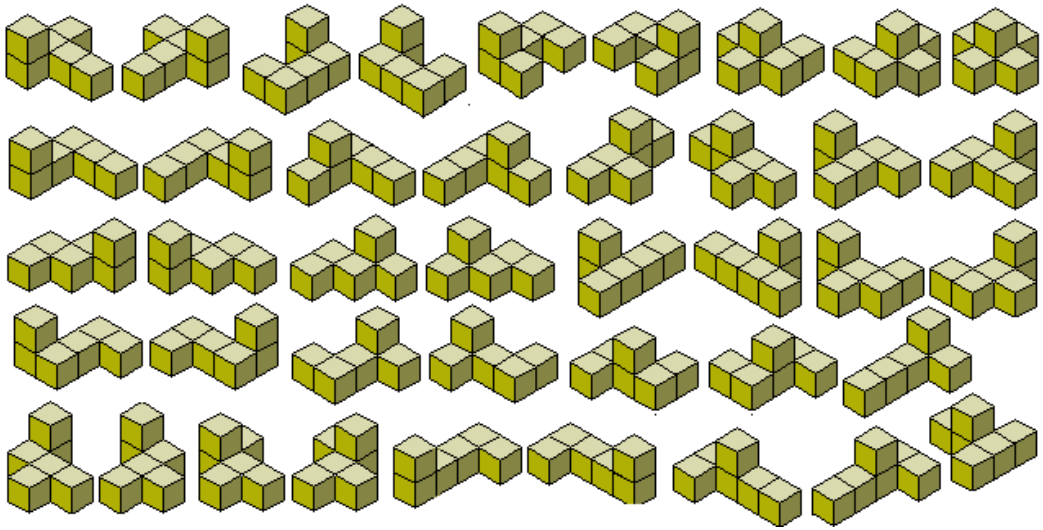


Noms dérivés de ceux donnés aux pentaminos :

I,L,Y,S,V,P,U,L1,L2,L3,L4,J4,J2,J1,T,F,Z,T2,T1,X,S1,S2,W,N1,N2,V2,Q,A,V1,V2.

- Hexacubes



…

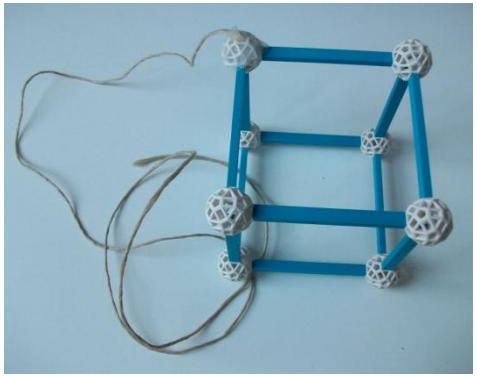
- Prolongement : pentaminos et autres assemblages de figures isométriques (http://www.jeuxmathematiquesbruxelles.be/wp-content/uploads/2013/02/7JeuxPentominos2013mars.pdf)

2. Une approche tactile des solides

- Retrouver les paires ou associer (solides simples, polycubes)
- Reconstituer une image (exemple : Line exercice cube)
- Construire ou faire construire le même ou le symétrique.

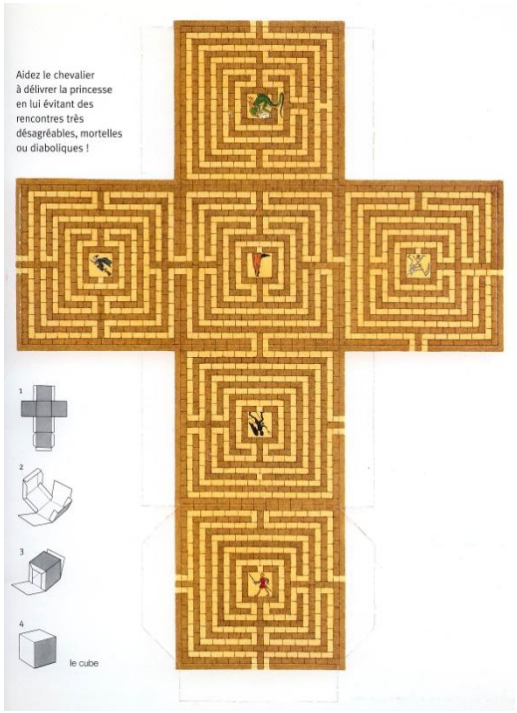
- Construction (éventuellement symétrique) sous la dictée (Visionary)

- Dessiner un assemblage de cubes



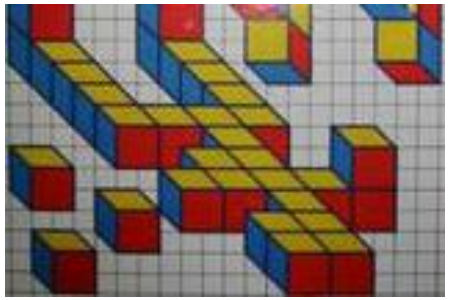
- Chemins sur le cube
  (cycle hamiltonien, par chaque sommet,
  cycle eulérien, par chaque arête)

- Labyrinthe sur le cube
  (Philippe Mignon)

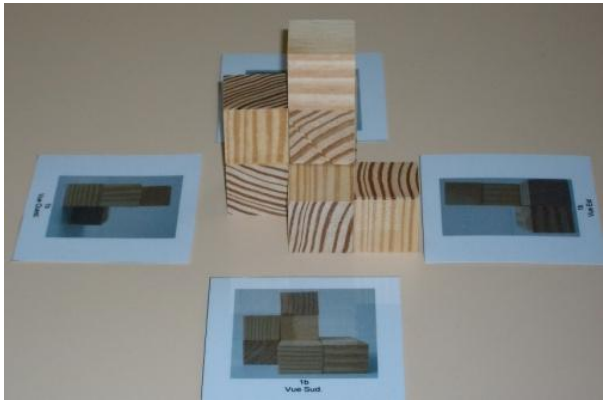


3. Différents points de vue

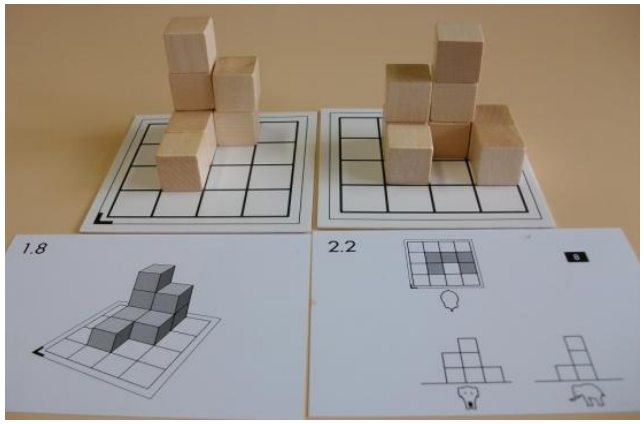
- Début de perspective (Structuro)

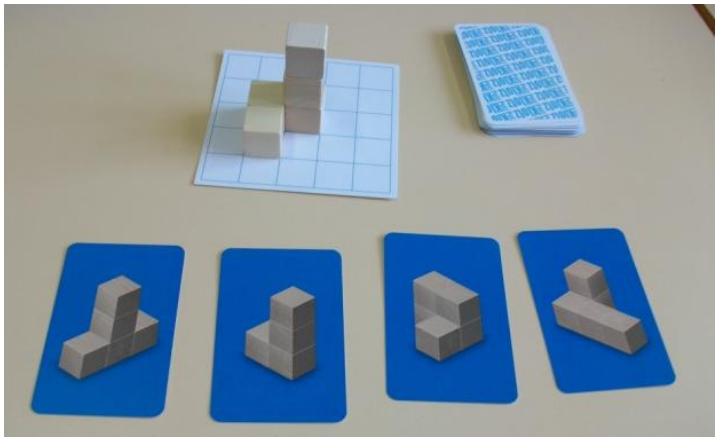


- Sensibilisation (photographe, vues à replacer)

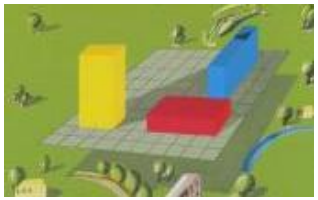


- Construction d'un assemblage de cubes à l'aide d'un dessin en perspective (jeux : Cubo, Potzklotz,)

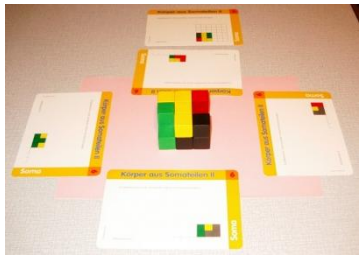




- Construction à l'aide de plusieurs vues



  - *Regarder et construire* (3 bâtiments)
  - Agencements de cubes à retrouver (une ou plusieurs solutions, optimisation)

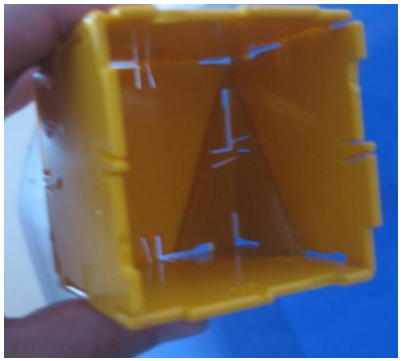


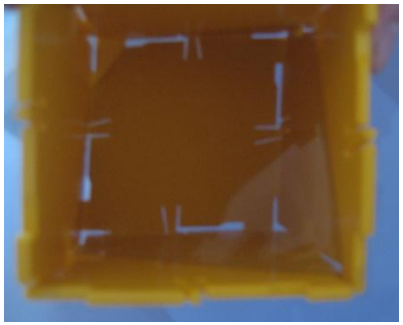
  - *Constructions avec les pièces du cube Soma*,
  - Jeu des gratte-ciels

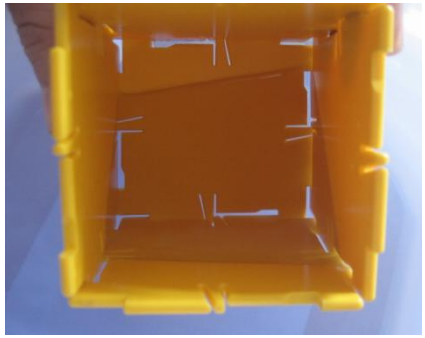
4. Retour au plan

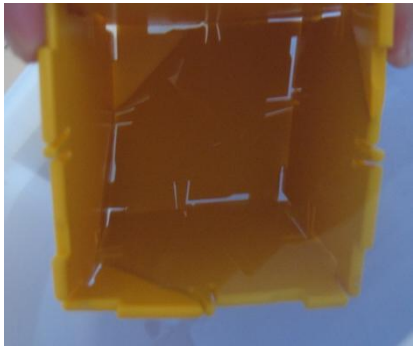
- Recherche de sections planes du cube
  a. Recherche avec un cube transparent et de l'eau
  b. Recherche sur Cabri 3D
  c. Constructions classiques de sections de cube

a. Recherche avec un cube ouvert ou transparent
(Matériel : polydron, cube ouvert en plastique, Zoom Tools)

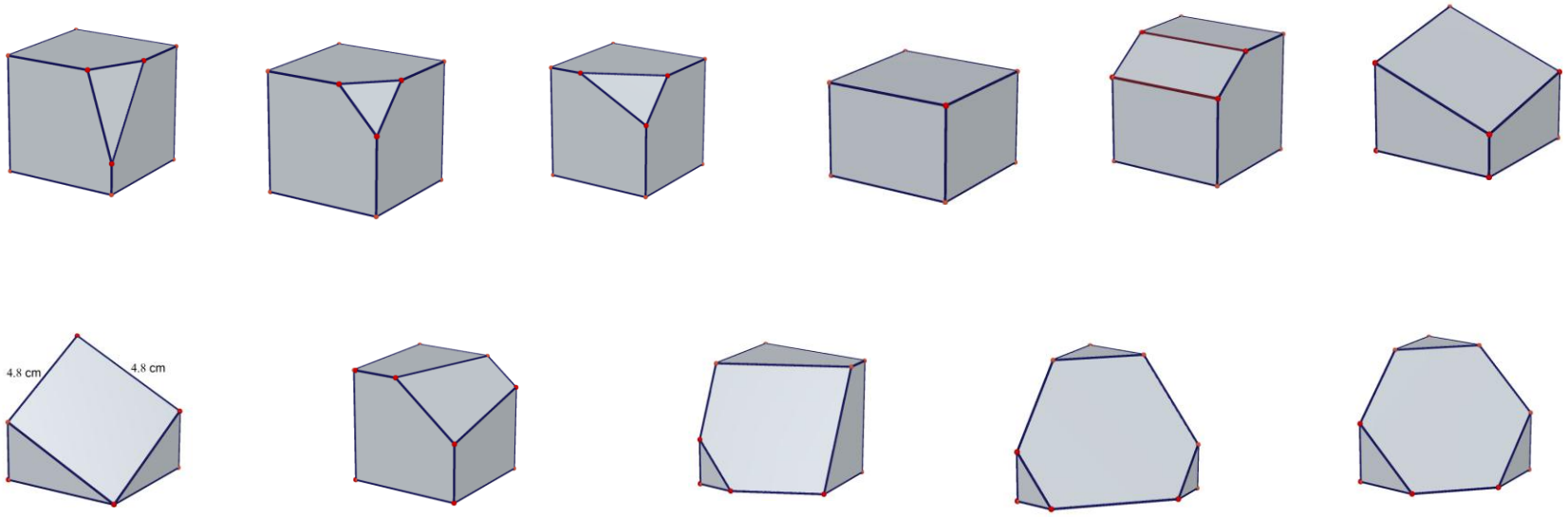








b. Recherche avec Cabri 3D



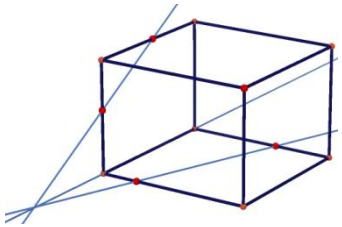
c. Construction classique

Propriétés utilisées :

1. Si un segment est inclus dans un plan, son prolongement l'est aussi.

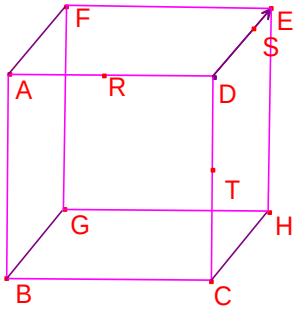
2. Un plan sécant avec deux plans parallèles les coupe selon deux droites parallèles.

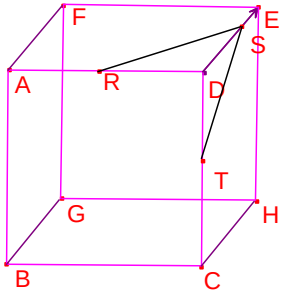
3. Les arêtes sont les intersections de deux faces, et leurs prolongements comprennent les points de percée d'une droite du plan d'une face dans le plan déterminé par l'autre face.

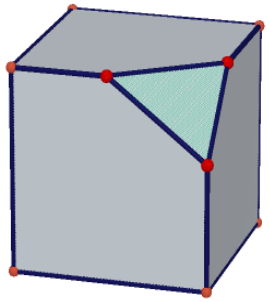


Exemples

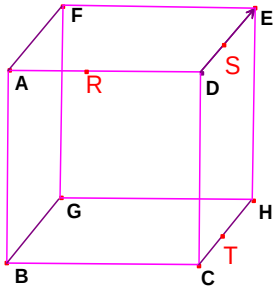
a) R, S, T appartiennent à 3 arêtes concourantes

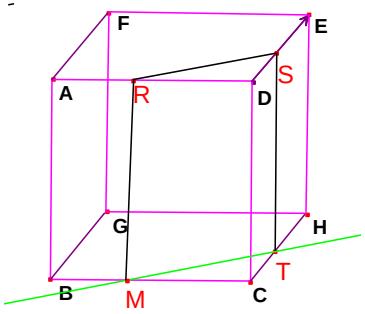


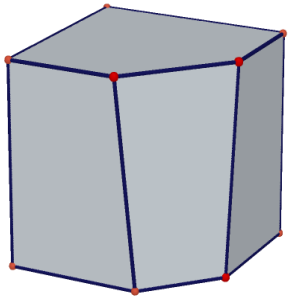




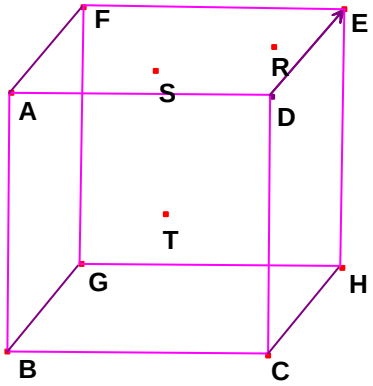
b) R et S appartiennent à deux arêtes d'une même face, T est sur une arête de la face opposée, et sur une face commune avec S.

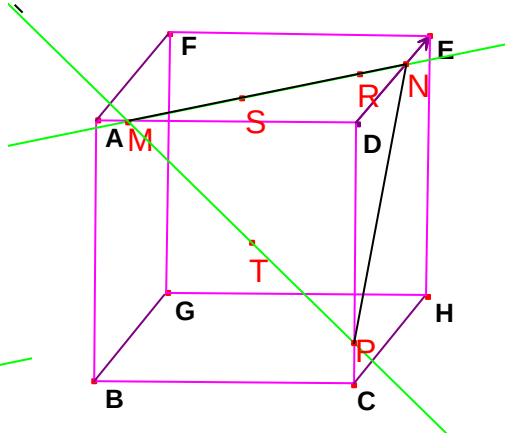


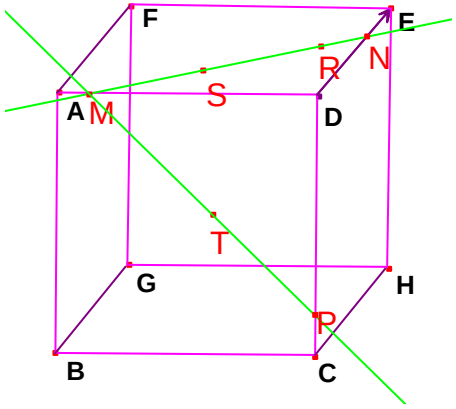


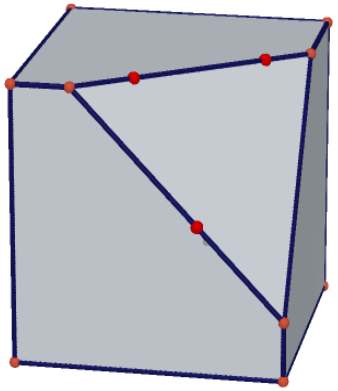


c) R et S sont à l'intérieur d'une face (ADEF), T à l'intérieur d'une face adjacente (ABCD).

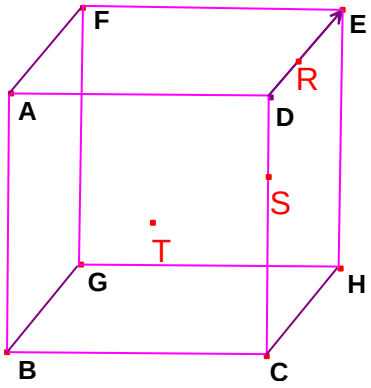


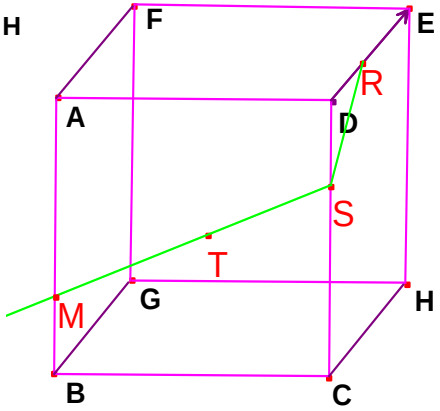


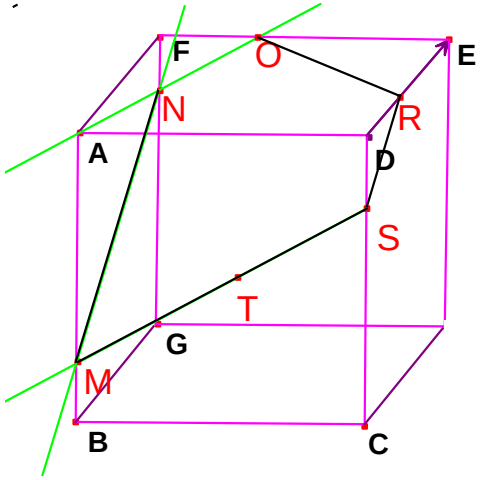


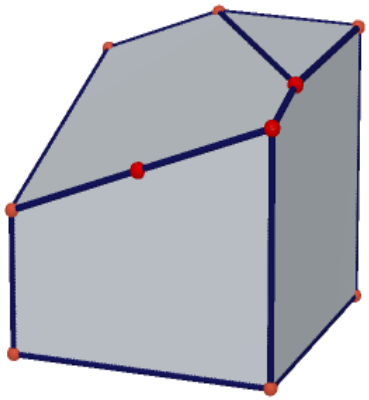


d) R et S appartiennent à deux arêtes d'une même face DCHE, T est à l'intérieur d'une face adjacente ABCD commune avec S.

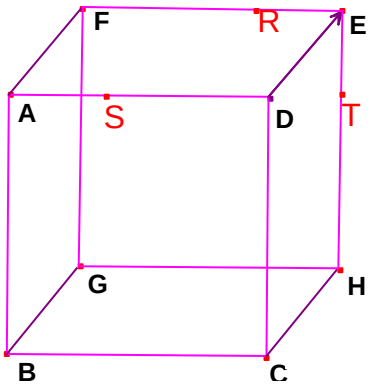


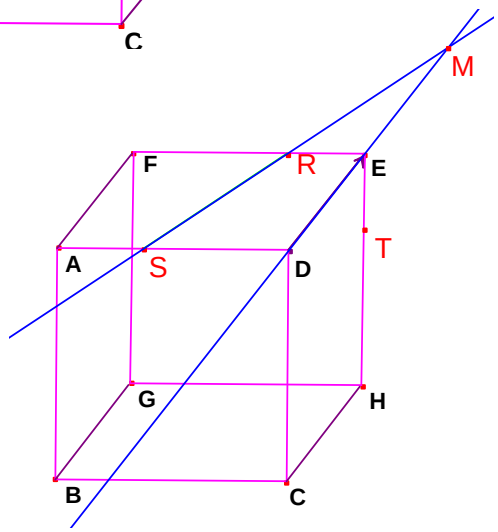


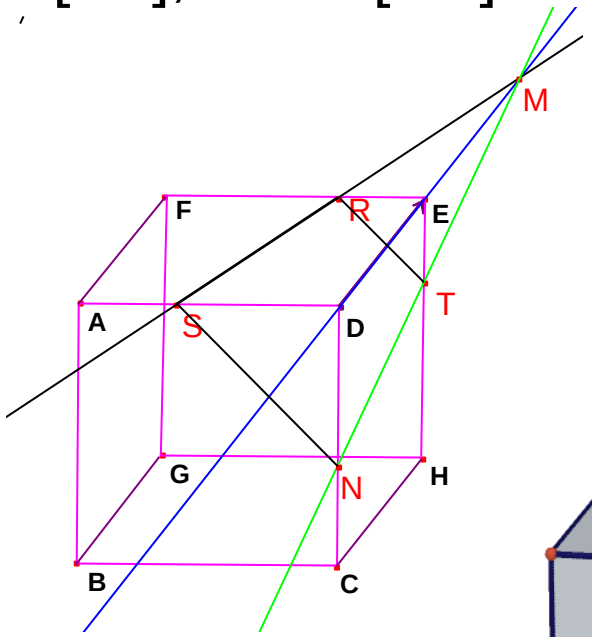


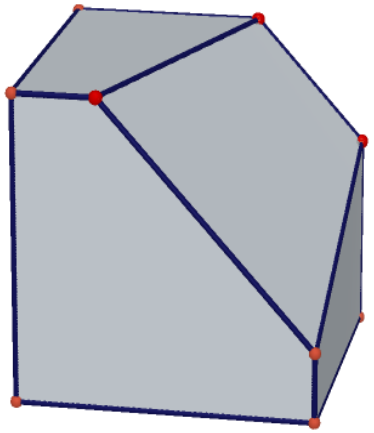


e) R est sur l'arête [FE], S sur [AD] et T sur [EH].

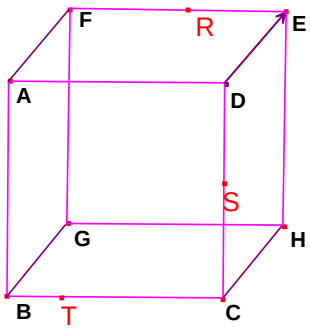


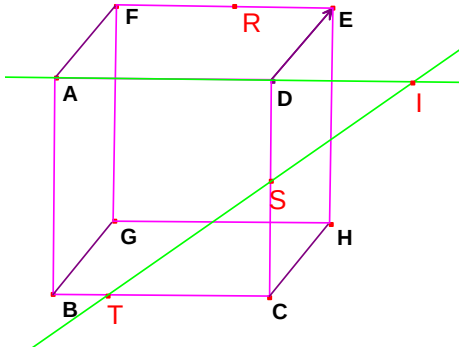


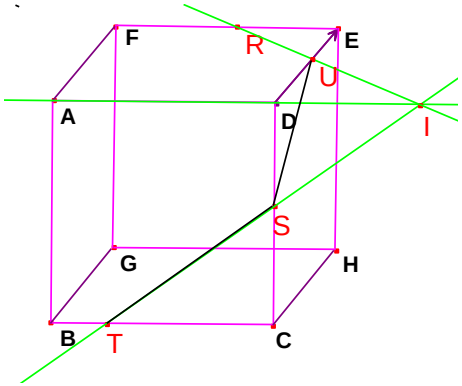


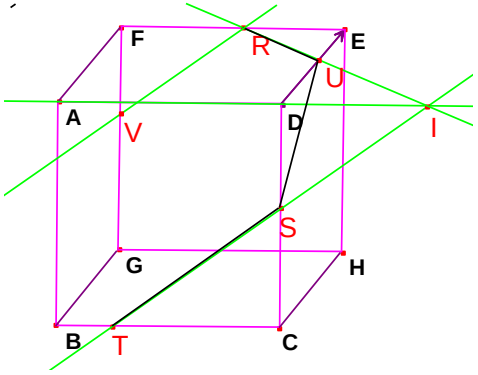


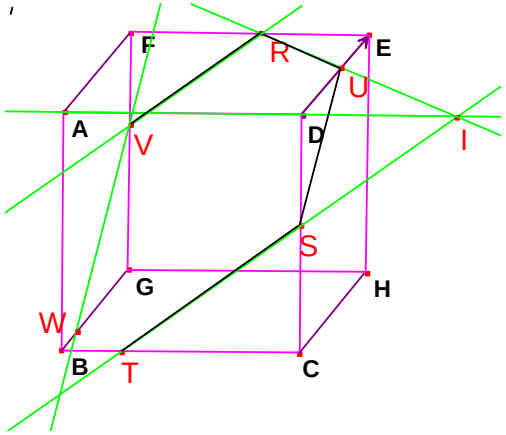
f) R est sur l'arête [FE], S sur [DC] et T sur [BC].

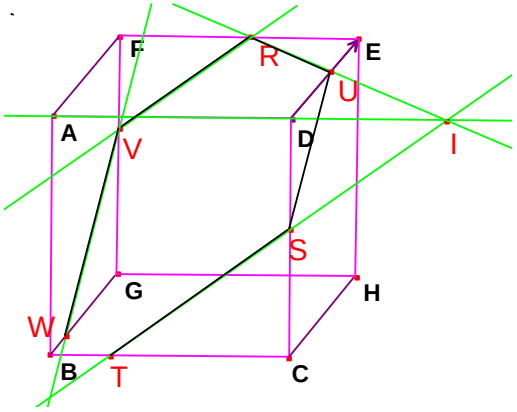


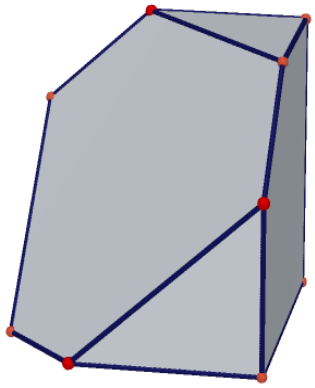


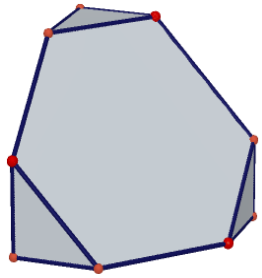




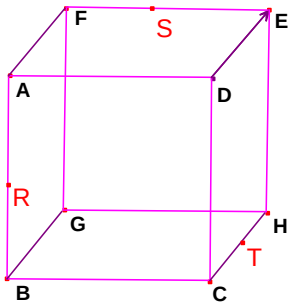


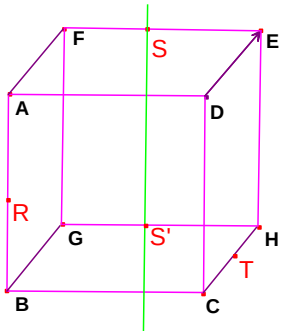


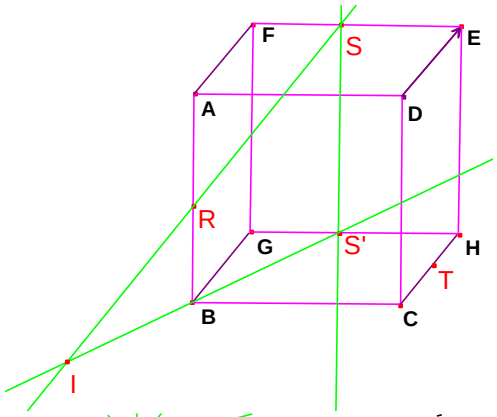


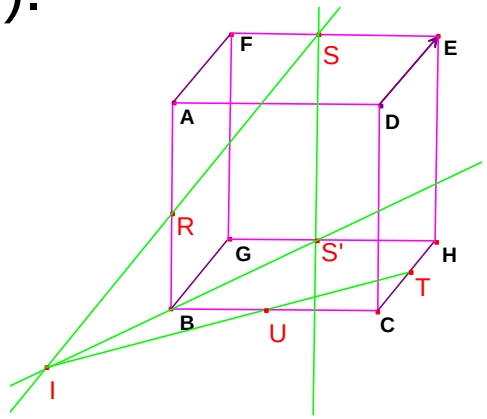


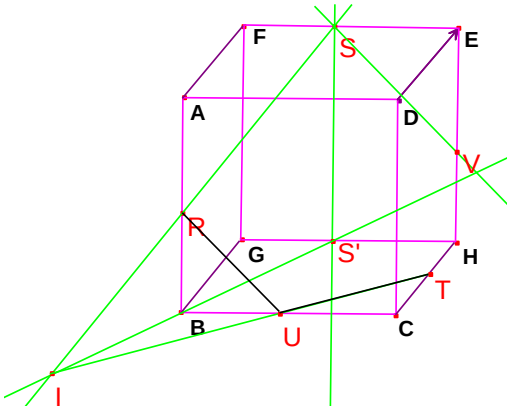
g) Les 3 points R, S, T sont sur des arêtes gauches 2 à 2 (resp. AB, FE et CH).

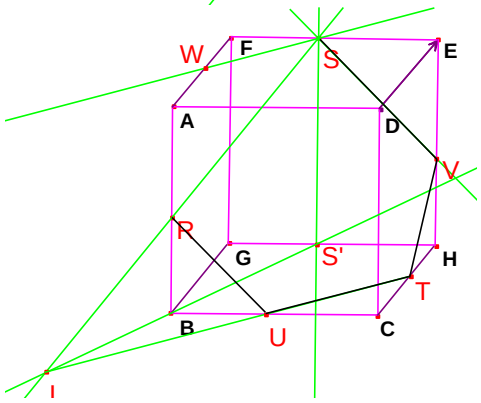


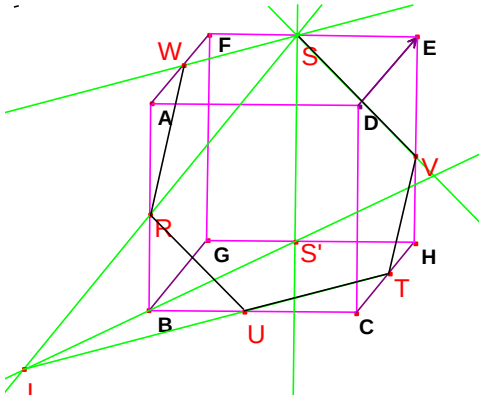




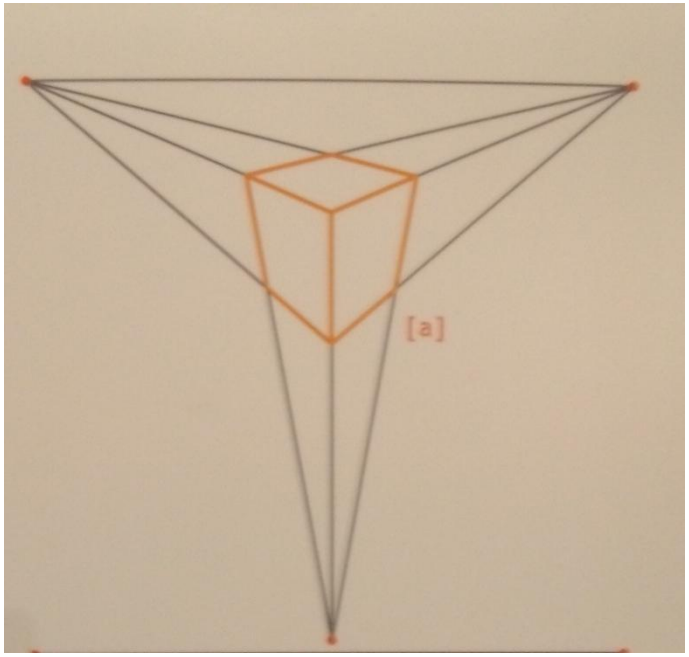


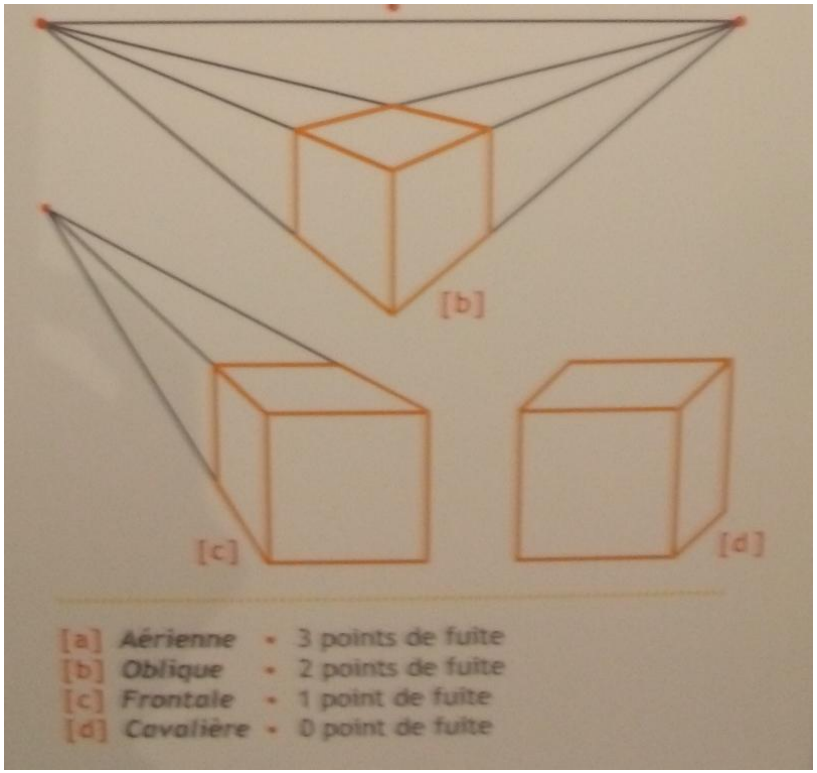




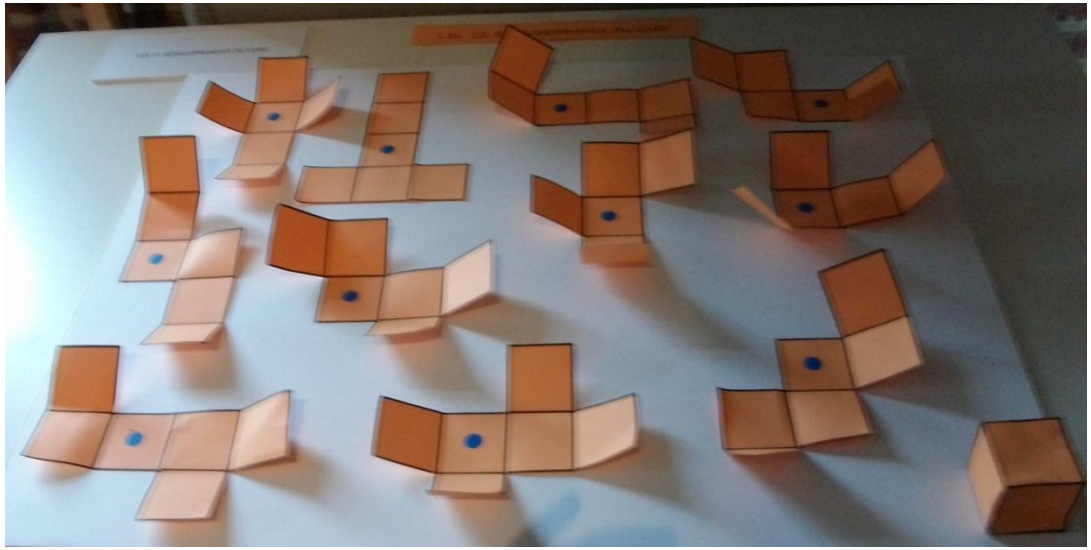


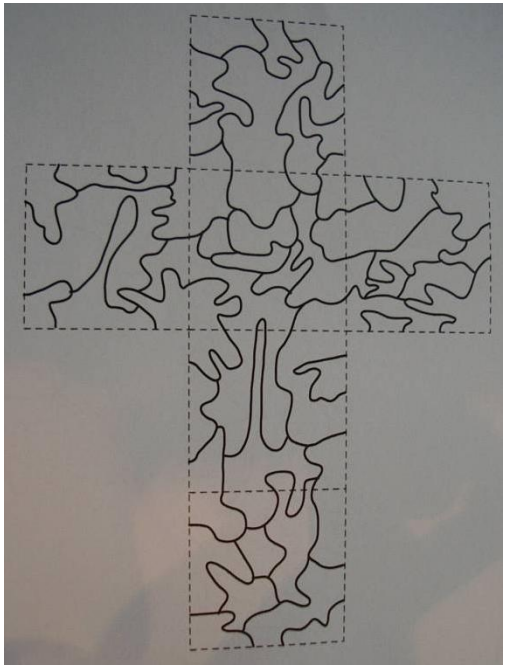
- Cubes et types de perspective.



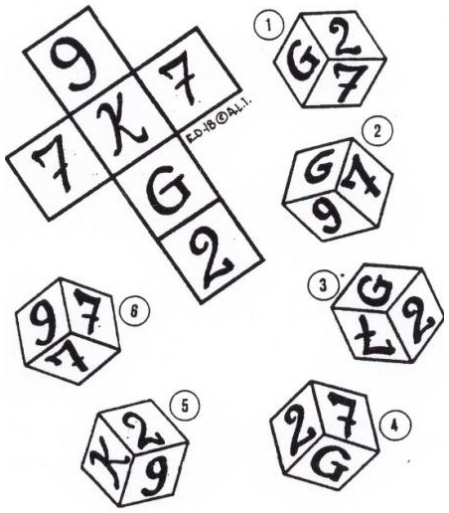


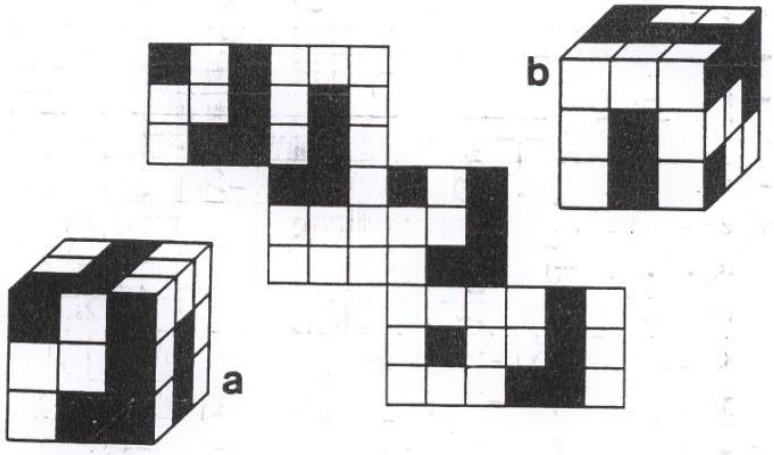
- Recherche de développements (patrons) (cube, tricube, …), coloriage.



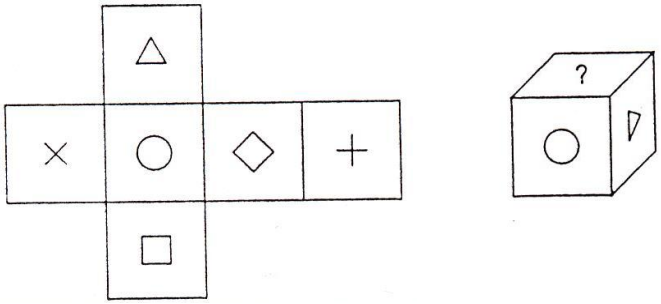


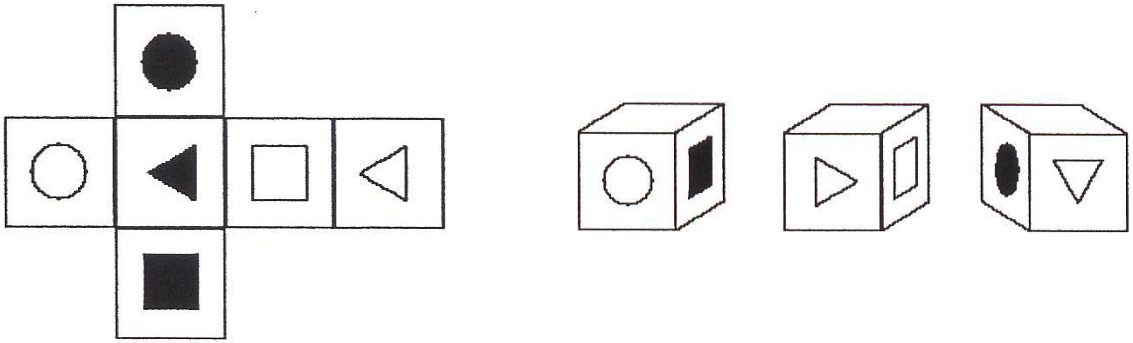
- Reconnaissance de développements (patrons) corrects ou incorrects.





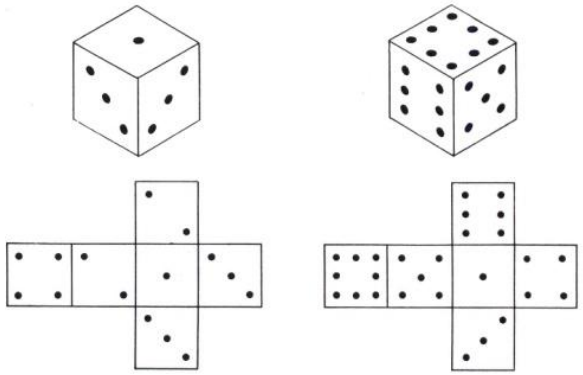
- Détermination du dessin de chaque face cachée d'un cube à l'aide d'informations.



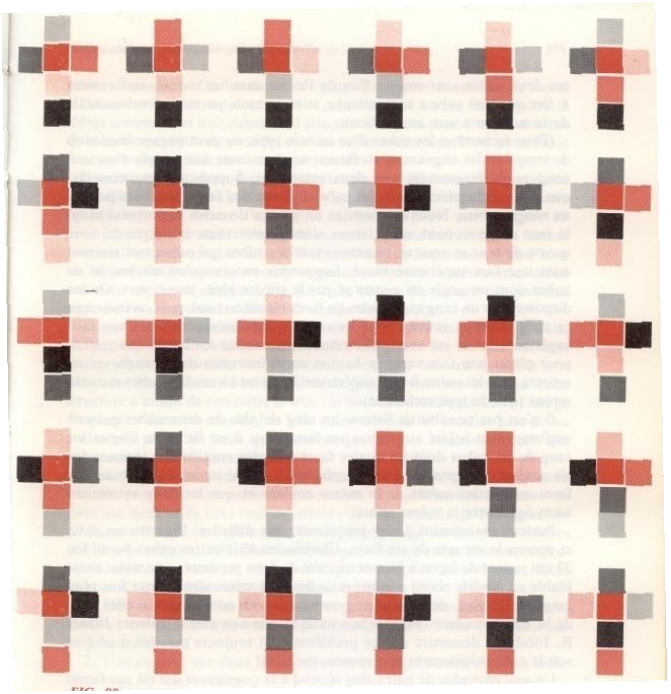


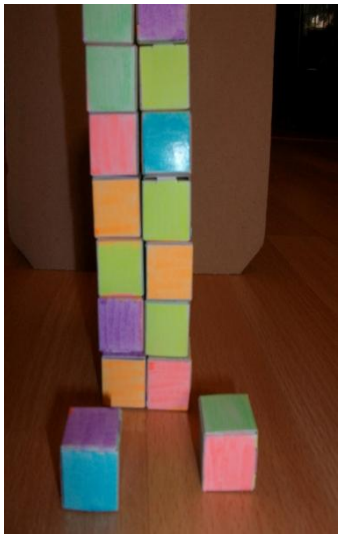
- Construction modulaire d'un cube en origami.

- Curiosités :
  - Construction d'un cube à l'aide d'une enveloppe.
  - Cubes dateurs
  - Dés de Sicherman



- Cubes de Mac Mahon



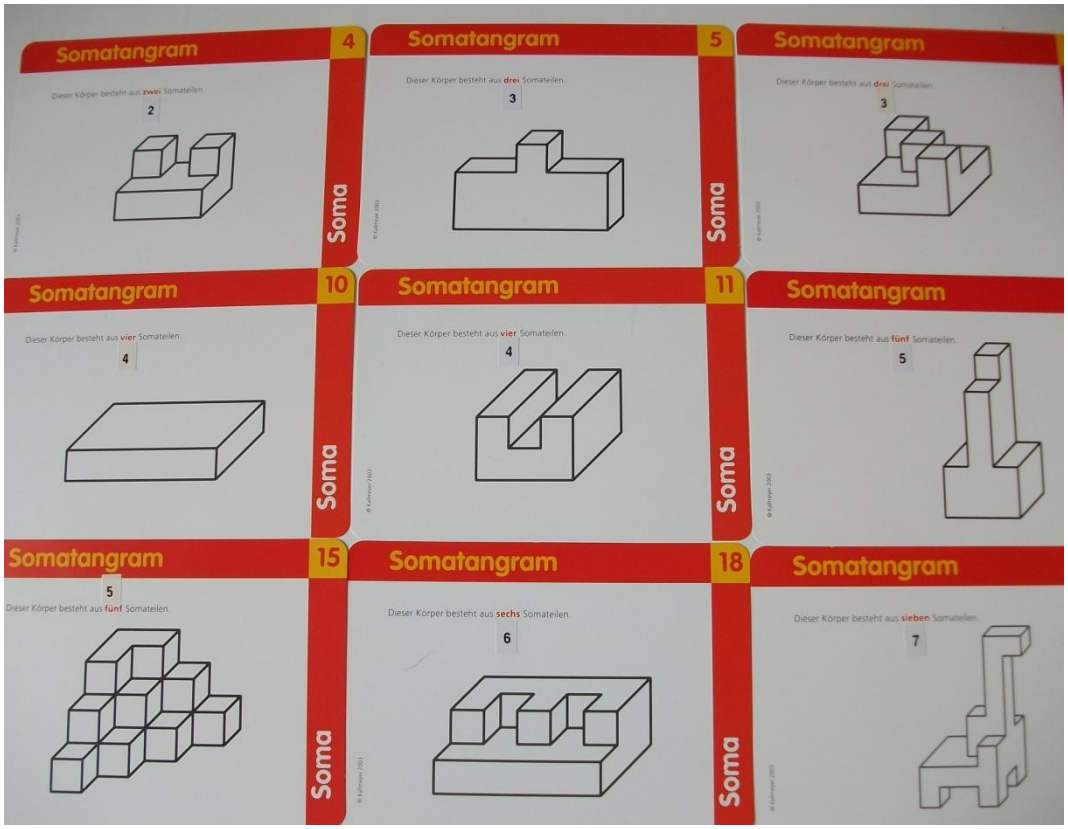


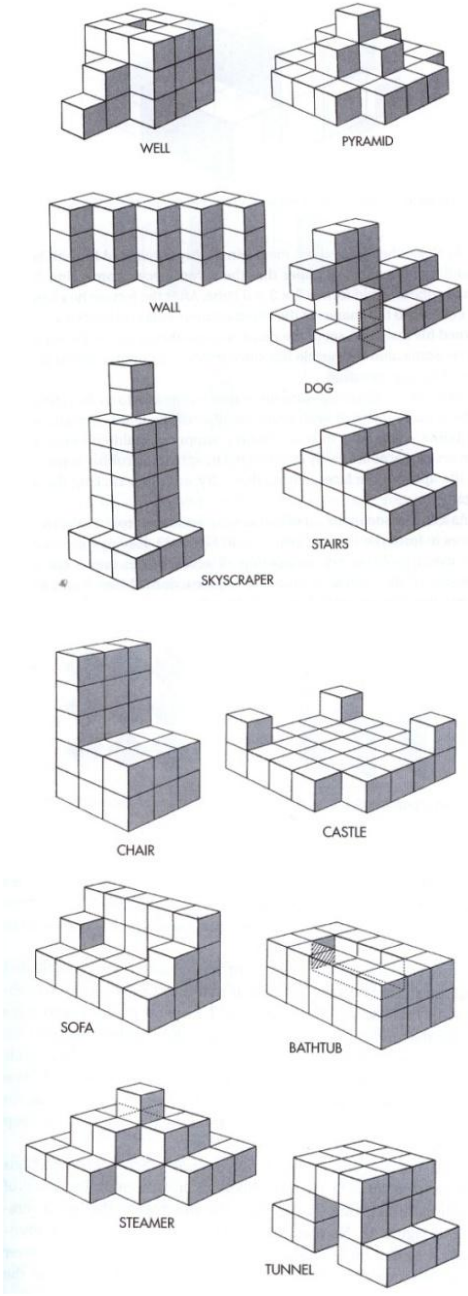
5. Puzzles et cubes

- Puzzles simples
  - Cube modulaire

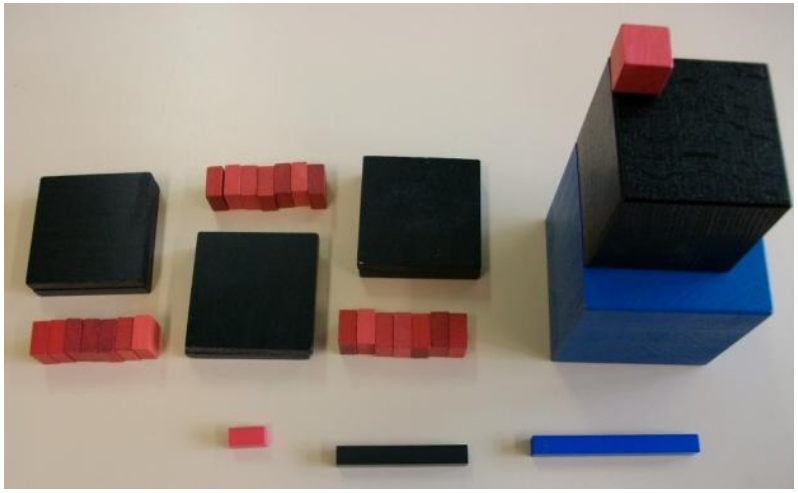
  - Jeux Katamino, Kataboom, GTP

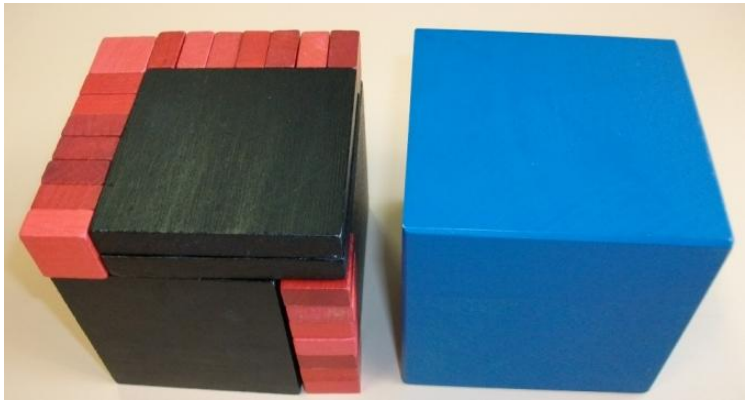
- pièces du cube Soma
  en nombre croissant



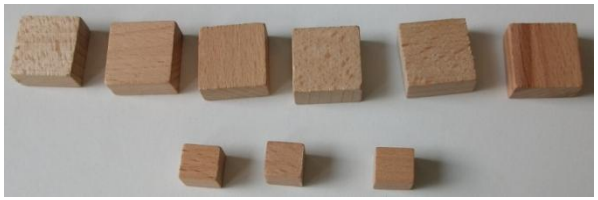


- Cube d'une somme à l'aide de réglettes Cuisenaire (variante : cube de Cardan)

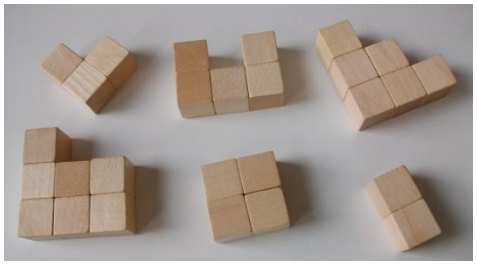




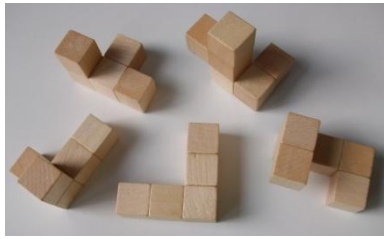
- Puzzle de Slothouber-Graatsma,

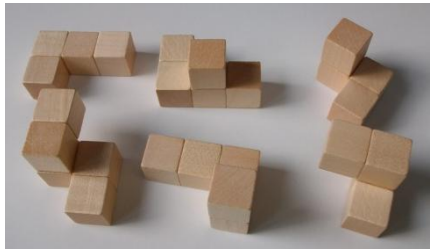


- Cube diabolique,



- Puzzles complexes
  (cubes en 5 pièces, en 6 pièces (Steiner, Coffin) ou plus, *serpent perfide*)



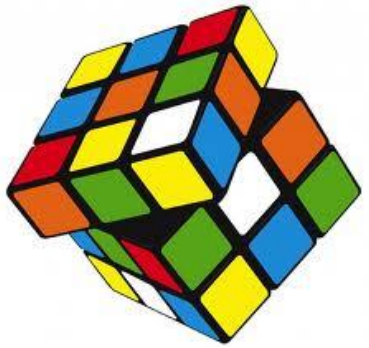


- Dé à reconstituer

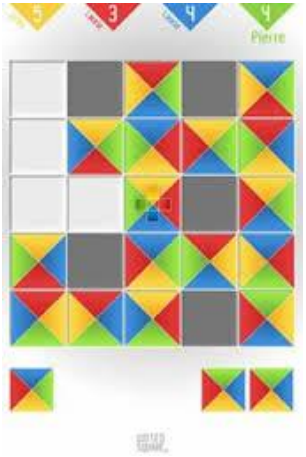
- Nonabarre

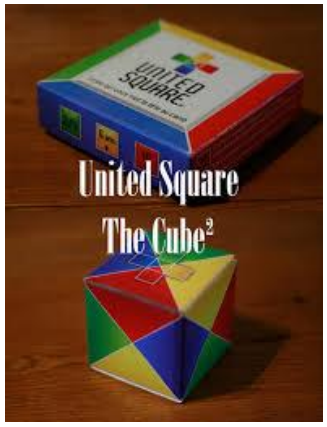
6. Jeux dans l'espace

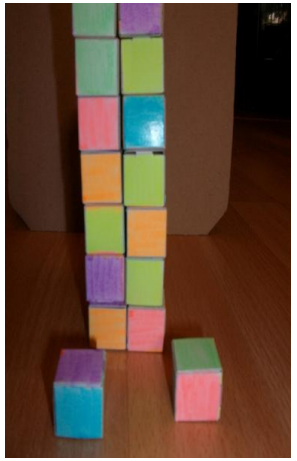
- Jeux de mouvements (Flexicube, Elasticube, cube de Rubick, …)



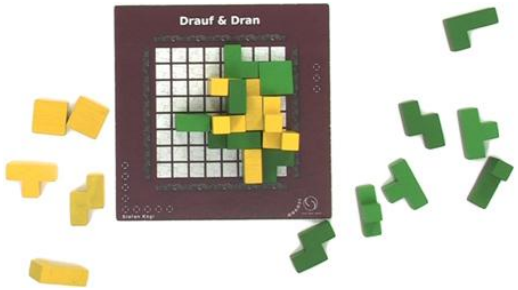
- Jeux de placements
  - avec des cubes
    (*Babel pico*, *United square*,*Tour colorée*,*)*

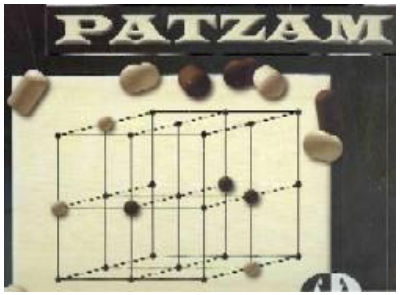




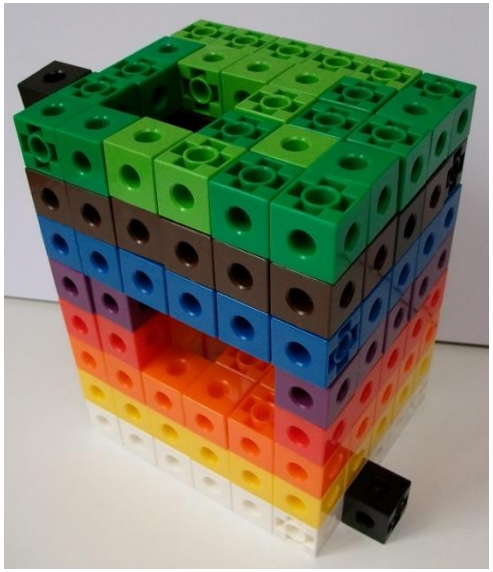


- avec des assemblages de cubes (*Rumis*, *Caminos*, Patzam)

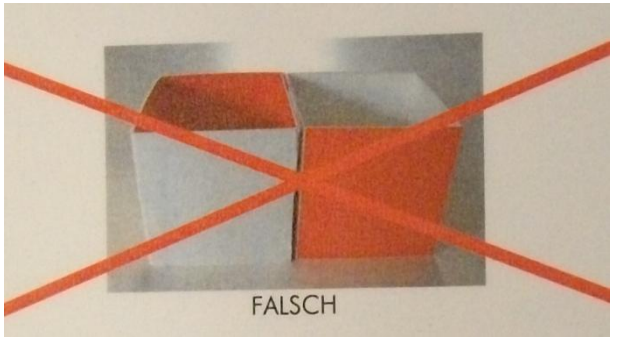


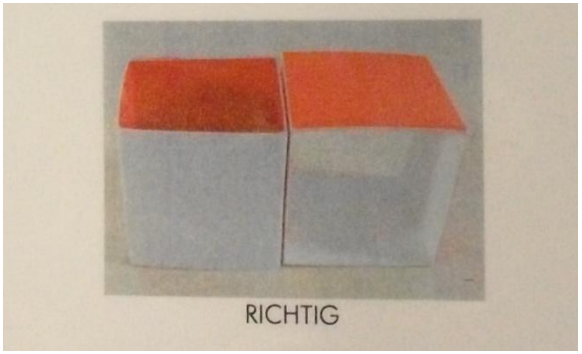


Analyse de constructions
(question du rallye 2012, cube magique)



- Pavages
  (Mathematikum de Giessen)





Références et prolongements

- Diaporama sur le site http://www.jeuxmathematiquesbruxelles.be/ressource/exposes/
- Fiches jeux (orientation, puzzles) sur le site http://www.jeuxmathematiquesbruxelles.be/wp-content/uploads/2013/02/3JeuxOrientation2013fev.pdf et

  http://www.jeuxmathematiquesbruxelles.be/wp-content/uploads/2013/02/4JeuxPuzzles2013fev.pdf
- Expocubes (Poitiers, Lille) : site http://apmep.poitiers.free.fr/spip.php?article17

Conclusion

- Importance de la géométrie dans l'espace

- Généralisations possibles
  - à d'autres solides : prismes, pyramides, …
  - à d'autres types de défis : alignements, déplacements, …

Merci pour votre attention.

Et maintenant : à vous de jouer !

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