BIZARRE BEASTS

CRAZY

CRITTERS

and

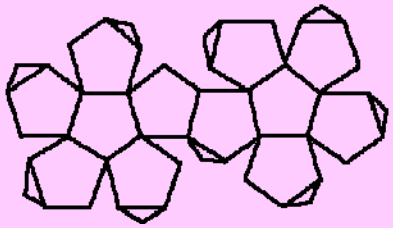
'Mazing

MONSTERS

The Task

Construct a family of 3, mother, father and child, varying in size so that ratio is part of the project. The ratio of the sizes of the family must be indicated.

- At least 5 different solids need to be used
- Platonic solids, Archimedean solids, Prisms
- Copies of nets must be included



- Creatures to be named using a made–up biological classification
- Ask your Natural Science teacher for ideas

His name?

- It helps if your creatures have some distinguishing feature
- E.g. a large nose, or a uniquely shaped head which you can ‘hang’ your name onto

Some useful Latin Words

Avis = Bird
Piscis = Fish
Hyrax, Hyracis = Rabbit
Bos, Bovis = Ox-Like Animal
Canis = Dog
Cornus = Beak, Tusk, Horn

Otherwise try the following website

http://ablemedia.com/ctcweb/showcase/wordsonline.html

You also need to supply a written presentation involving three aspects

1

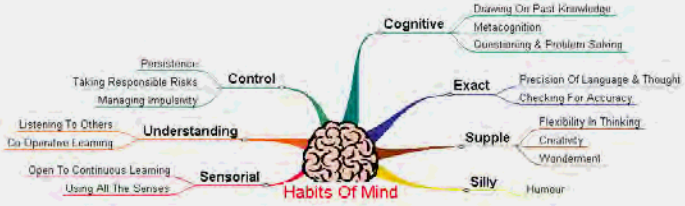
A written account of the successes, as well as the trials and tribulations you experienced while building your family

and

a discussion about how the idea arose, what you learnt, difficulties encountered, and the effectiveness of working in a group

2

An analysis of which of the Habits of Mind you used, and why.



THE S.U.C.C.E.S.S OF HABITS OF MIND

3

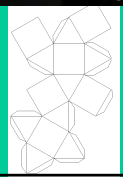
Some further information about your family

For example:

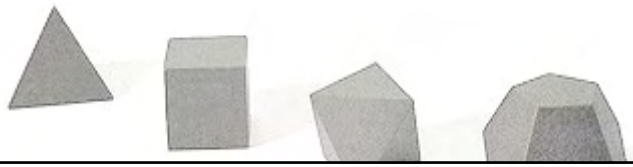
Their natural habitat, how they came into existence, how they live, an amusing incident that happened to your family…

Preliminary Activities

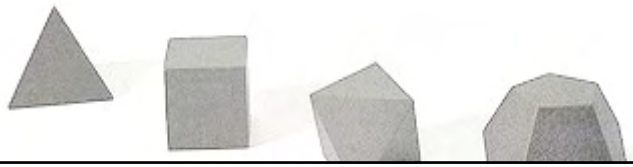
- Definitions
- Jelly Tots and Toothpicks
- Nets
- Calendars
- Geogenius
- A little bit of history
- Art Costa's Habits of Mind



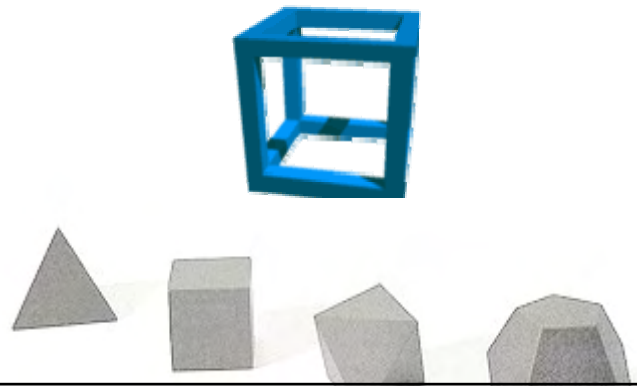
The Platonic Solids



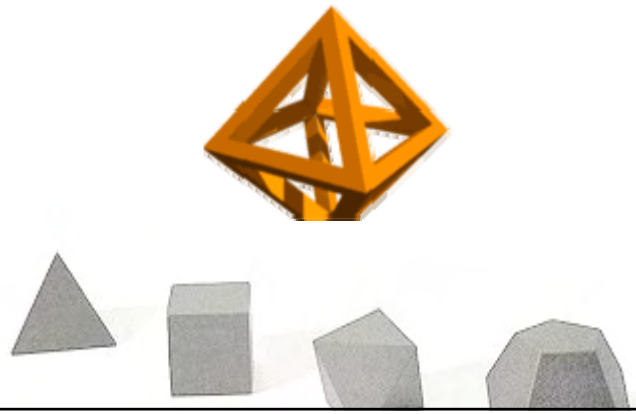
Tetrahedron



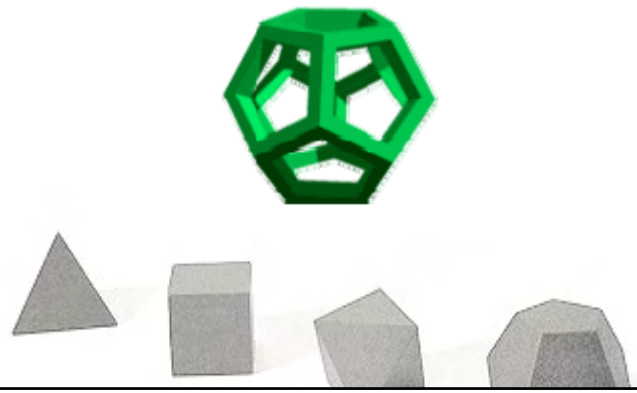
Cube (Hexahedron)



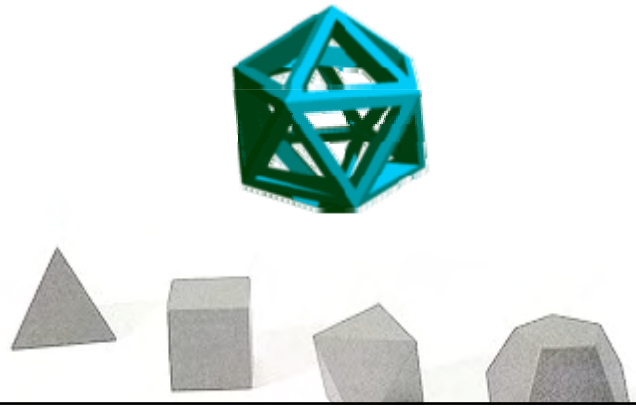
Octahedron



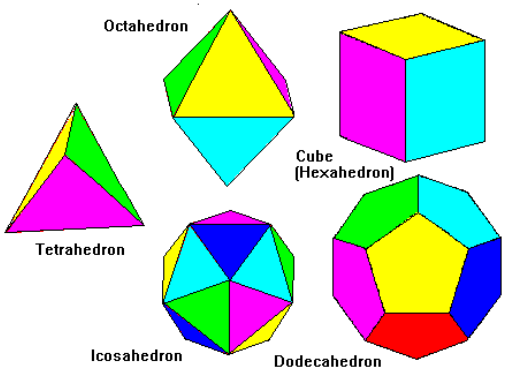
Dodecahedron



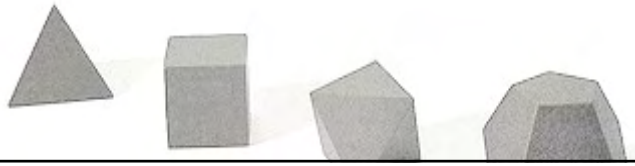
Icosahedron



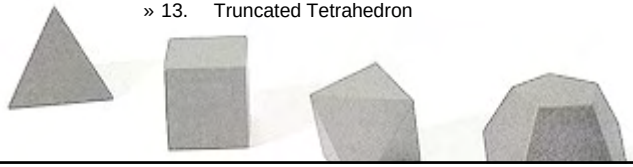
In Glorious Technicolour:



ARCHIMEDEAN Solids



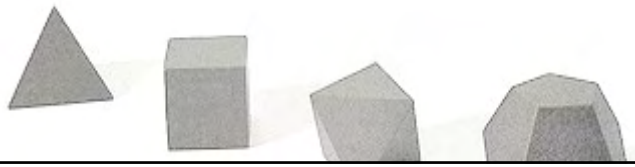
- » 1. Truncated Cube
- » 2. Cuboctahedron
- » 3. Truncated Octahedron
- » 4. Great Rhombicuboctahedron
- » 5. Lesser Rhombicuboctahedron
- » 6. Truncated Dodecahedron
- » 7. Icosidodecahedron
- » 8. Truncated Icosahedron
- » 9. Great Rhombicosidodecahedron
- » 10. Lesser Rhombicosidodecahedron
- » 11. Snub Cube
- » 12. Snub Dodecahedron
- » 13. Truncated Tetrahedron



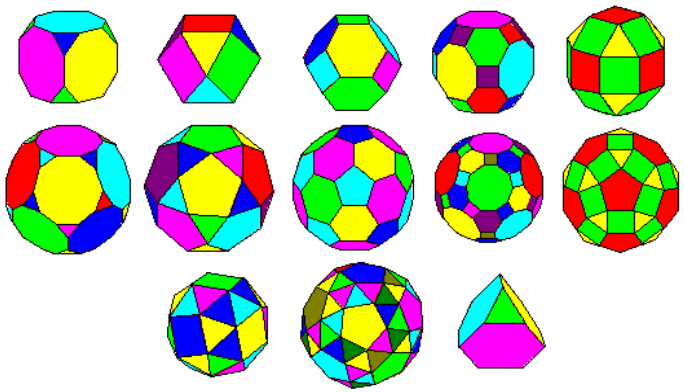
Investigate Archimedean solids further by visiting the following interactive site

http://www.scienceu.com/geometry/facts/solids/handson.html

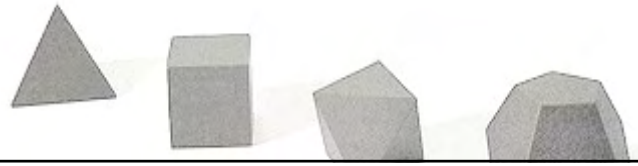
Let's try it



And here they are:



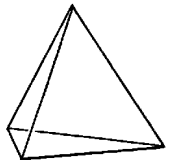
Jelly Tots Construction

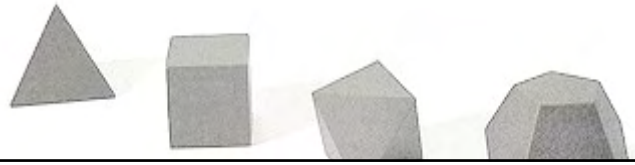


Tetrahedron

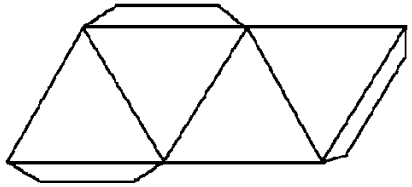
- Construct a triangle out of 3 toothpicks and 3 jelly tots.
- Set the triangle on the desk. Stick an additional toothpick into each jelly tot so that the opposite ends of the toothpicks meet above the centre of the triangle, forming what looks like a pyramid or a tent.
- Stick the fourth jelly tot onto the ends.

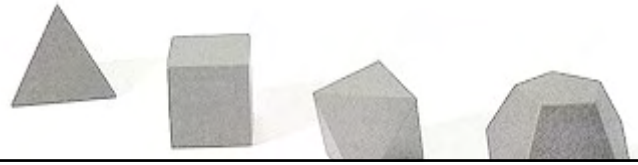
4 Triangular Faces
4 Vertices
6 Edges





The Net

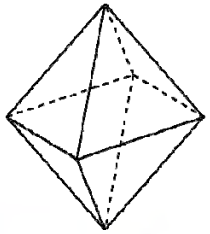




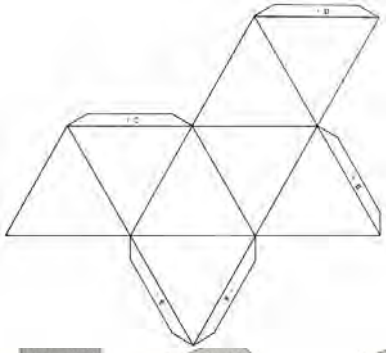
- Begin by sticking four toothpicks and four jelly tots together to form a square.
- Take four more toothpicks and one more jelly tot. Build a pyramid on the square by sticking a toothpick into each jelly tot and joining the ends with the new jelly tot.
- Turn the pyramid upside down. Take four more toothpicks and another jelly tot. Build another pyramid on the other side of the square.

octahedron

8 Triangular Faces
6 Vertices
12 Edges



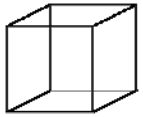
The net



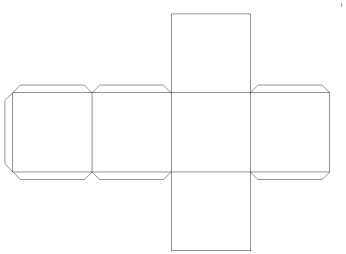
- Take four toothpicks and four jelly tots. Stick them together to make a square.
- With four more toothpicks and four more jelly tots make another square.
- Take four toothpicks. Place one square on the desk. Stick one toothpick into each of the jelly tots in the square so that the toothpicks are vertical.
- Stick the other square on top

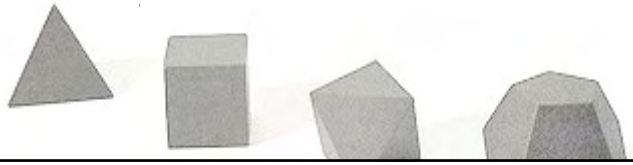
cube

6 Square Faces
8 Vertices
12 Edges



The net





icosahedron

- Begin by taking five toothpicks and five jelly tots and sticking them together to make a pentagon.
- Take five more toothpicks and one more jelly tot. Build a pyramid on the pentagon by sticking a toothpick into each of its jelly tots so that the ends of the toothpicks meet above the centre of the pentagon. The resulting shape resembles a funny hat.

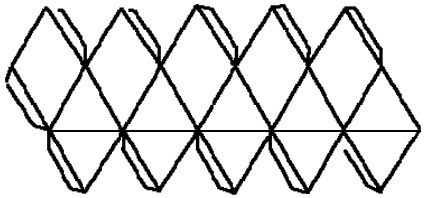
  Repeat the first two steps to make another pyramid like the first.

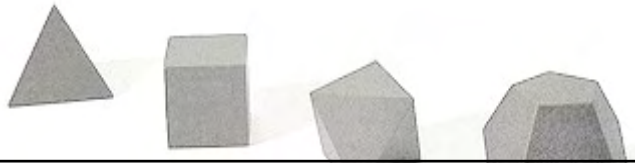
  Take 10 toothpicks. Pick up one of the pyramids and hold it upside down. Stick two toothpicks into each of the jelly tots in the pentagon so that pairs of toothpicks form a V pointing straight up. Tips of the toothpicks should meet neighbouring toothpicks to form triangles.

  Take the other pyramid and stick the jelly tots of the pentagon onto the tops of the triangles. The finished icosahedron should be made entirely of triangles. Each jelly tot should have five toothpicks sticking out of it.

20 Triangular Faces
12 Vertices
30 Edges

The net

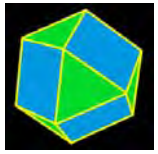




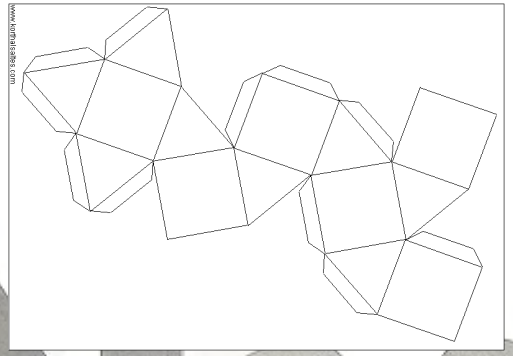
Cuboctahedron

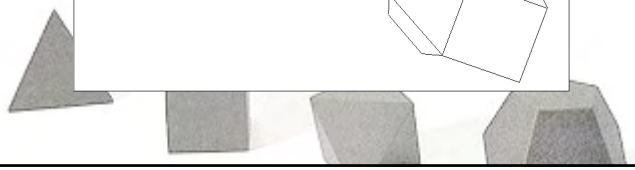
- Take six toothpicks and six jelly tots. Stick them together to make a hexagon.
- Place the hexagon on the desk. Take 6 toothpicks and 3 jelly tots. Stick a toothpick into each of the jelly tots in the hexagon. Join pairs of toothpicks at the top with the three jelly tots to form three triangles sticking up. It looks like a broken crown, or like teeth.
- Take three toothpicks. Join the three jelly tots at the top of the triangles. You should now have a dome made of four triangles and three squares.
- Turn the dome over and build an identical dome on the other side, making sure to build triangles next to squares, and squares next to triangles. In the finished solid, each triangle shares its edges with three squares, and each square shares its edges with four triangles. Each jelly tot has four toothpicks sticking out of it.

14 Faces *
12 Vertices
24 Edges



The net





And a bit of history

Leonard Euler, a Swiss mathematician who lived from 1707 to 1783, was probably the most prolific mathematician ever.

Even after he went blind, he continued to produce one mathematical paper a week, with the aid of a scribe, and relying on his amazing photographic memory. Two of his students once disagreed about the fiftieth decimal place in the sum of a complicated infinite series, and the story goes that he settled the argument by recomputing the sum in his head.

One of his many observations had to do with the relationship between edges, faces and vertices.

What did he notice?

	No of faces	No of vertices	No of edges
Cube	6	8	12
Tetrahedron	4	4	6
Octahedron	8	6	12
Icosahedron	20	12	30
Cuboctahedron *	14	12	24
Dodecahedron	12		

What do you notice?

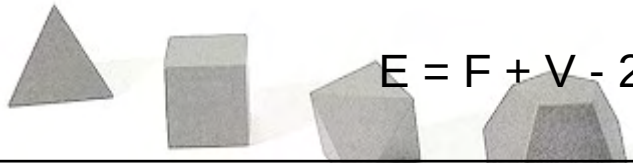
conjecture

Hypothesis

All or nothing

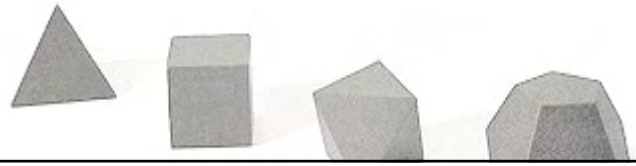
Proof

$E = F + V - 2$

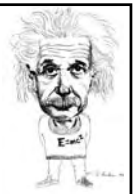


ART COSTA'S 16 HABITS OF MIND

1. Persistence
2. Managing one's impulsivity
3. Listening with empathy and understanding
4. Thinking flexibly
5. Metacognition

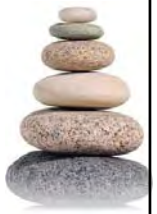


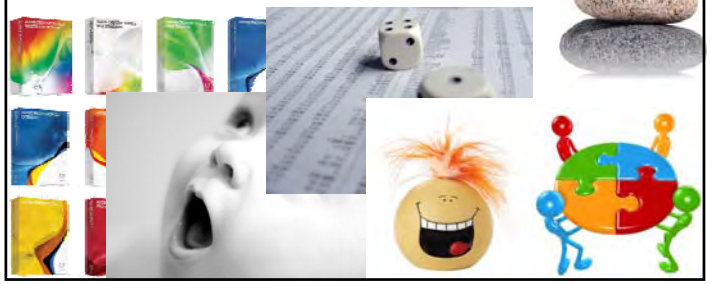
6. Questioning and posing problems
7. Applying past knowledge to new situations
8. Thinking, communicating with clarity precision
9. Striving for accuracy and precision
10. Gathering data with all the senses



Measure a thousand times and cut once

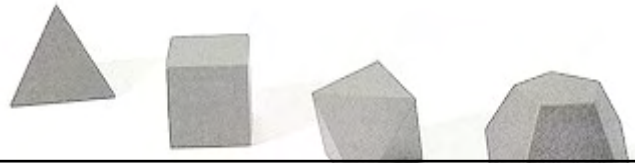
11. Creating, imagining and innovating
12. Responding with wonderment and awe
13. Taking responsible risks
14. Finding humour
15. Working interdependently
16. Remaining open to continuous learning



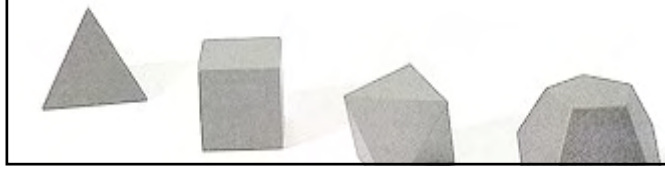


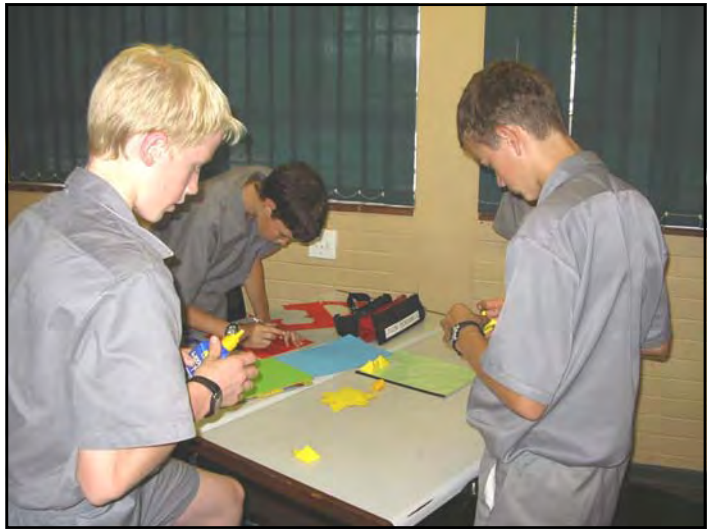
The Process

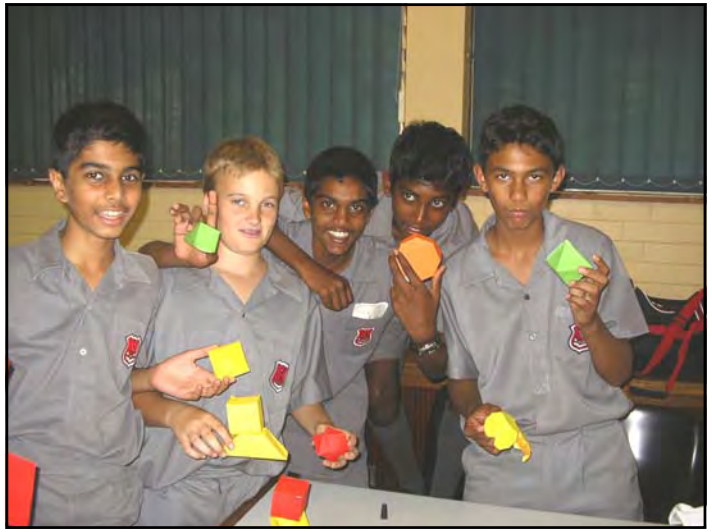
Form 2B
Maritzburg College



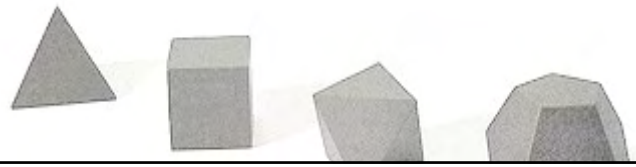
Experimenting with Solids

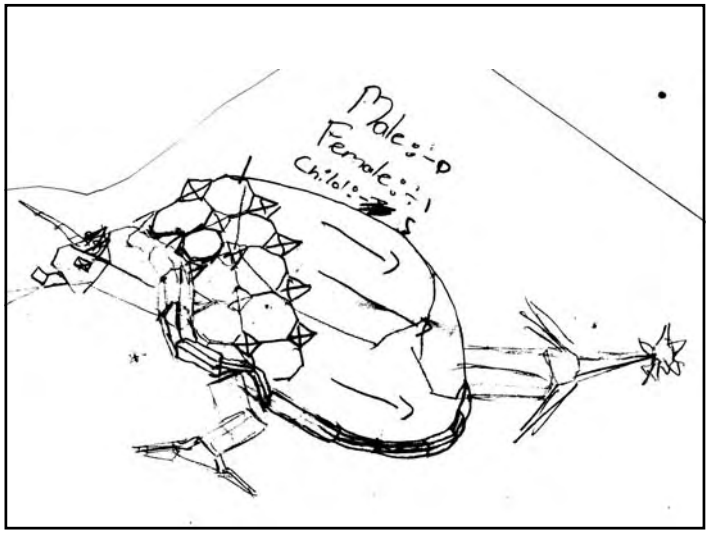






The Design Plans

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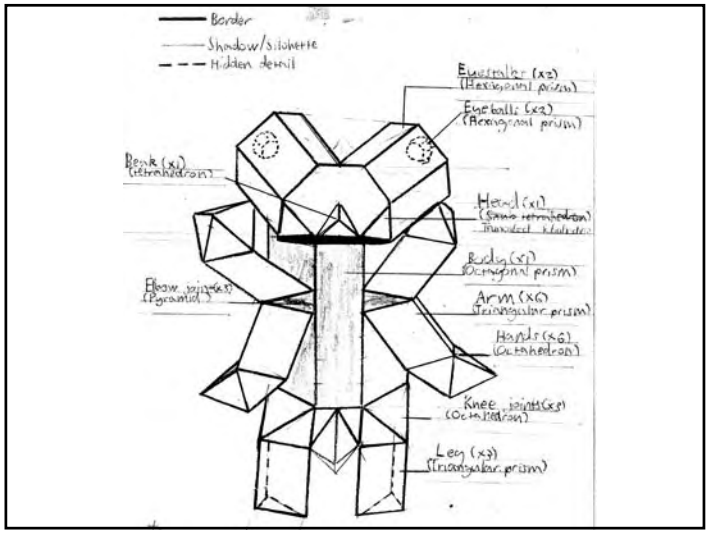
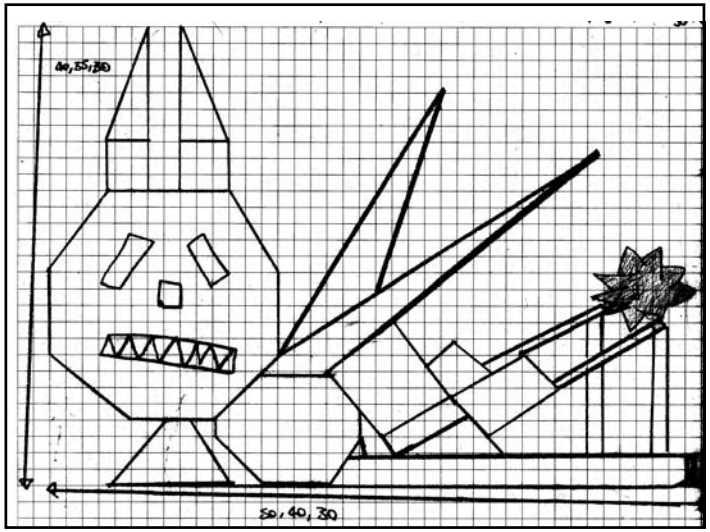
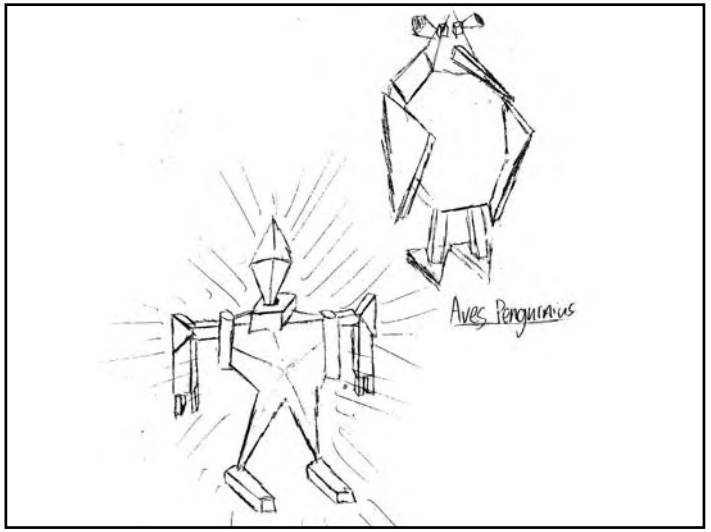
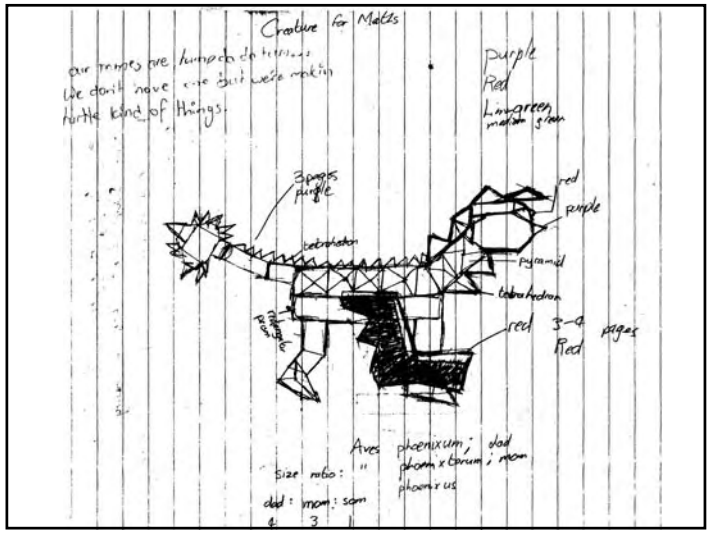
Female:-1
Child:-5

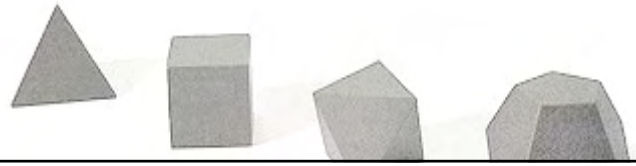

Border
Shadow/Silohette
Hidden detail
Eyestalks (x2)
(Hexagonal prism)
Eyeballs (x2)
(Hexagonal prism)
Beak (x1)
(tetrahedron)
Head (x1)
Body (x1)
(Octagonal prism)
Elbow joints(x2)
(Pyramid)
Arm (x6)
(Triangular prism)
Hands (x6)
(Octahedron)
Knee joints(x2)
(Octahedron)
Leg (x2)
(Triangular prism)


40,55,30
50,40,30

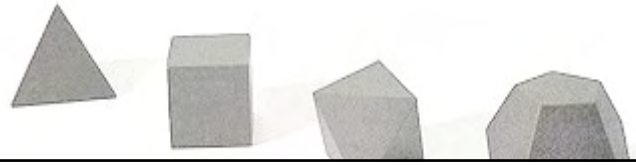

Aves Pengunnius



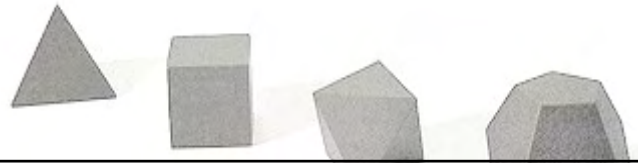
Delegating Tasks



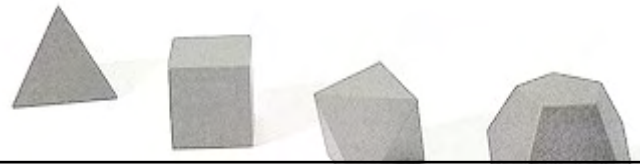
Work in Progress



But is it all work?



The Assistance



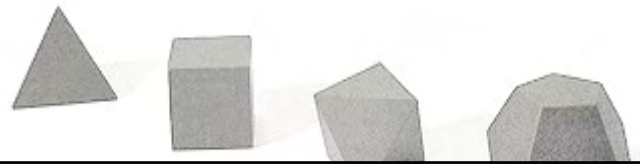
The Group Participation Questionnaire

Consider the following before allocating percentages to a particular member of your group

- His responsibilty
- His reliability
- The work he has produced
- The ideas he has suggested
- His ability to work effectively with the rest of the group

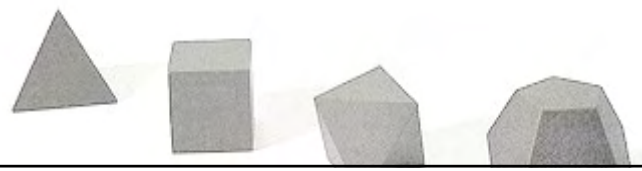
Member	% Contribution
Total	100%

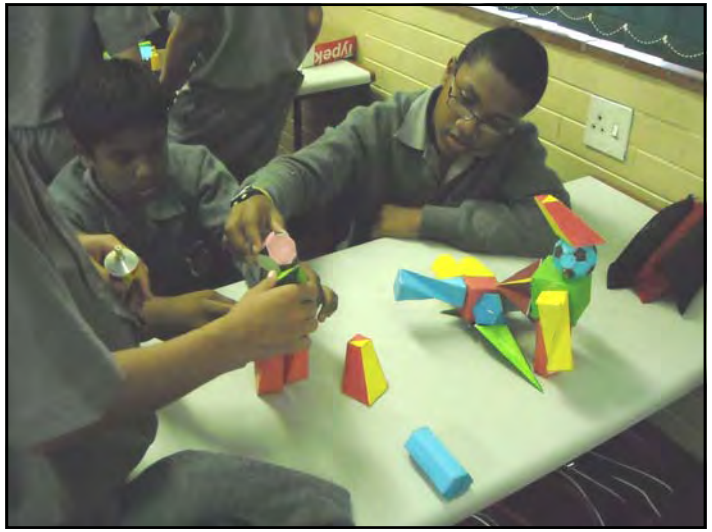
The Outcome



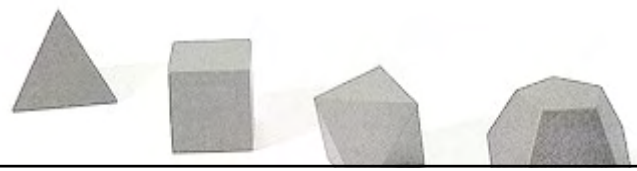
GROUP 1	Sewrathan	20	10	26	20	10		17
	Shankar Babu	25	20	18	20	20		21
	Padayachee	20	30	24	20	30		25
	Human	20	20	17	22	20		20
	Yeoman	15	20	15	18	20		18
GROUP 2	Dorling	25	25	25	25	25		25
	Woodgate	10	10	5	16	10		10
	Myburgh	20	20	25	19	25		22
	Wicks	20	20	20	20	20		20
	Wilson	25	25	25	20	20		23
GROUP 3	Burrows	25	20	20	20	20		21
	Dhavaraj	15	20	20	20	20		19
	Sewram	25	20	20	20	20		21
	van der Merwe	10	20	20	20	20		18
	Mahomed	25	20	20	20	20		21

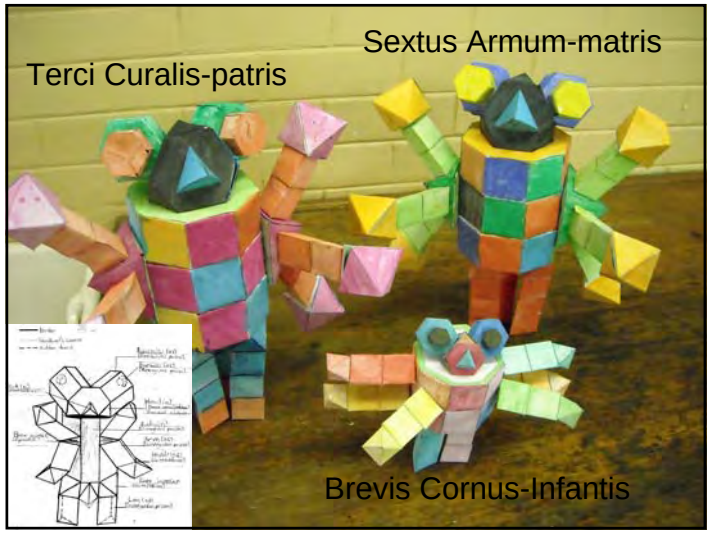
Last Minute Touch Ups

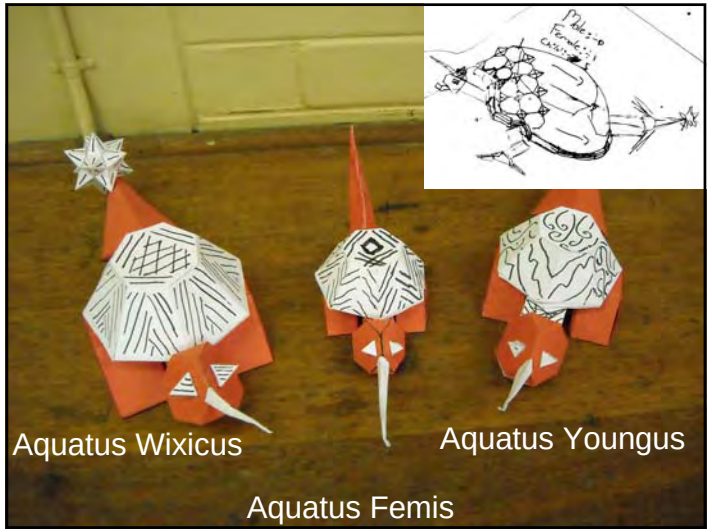


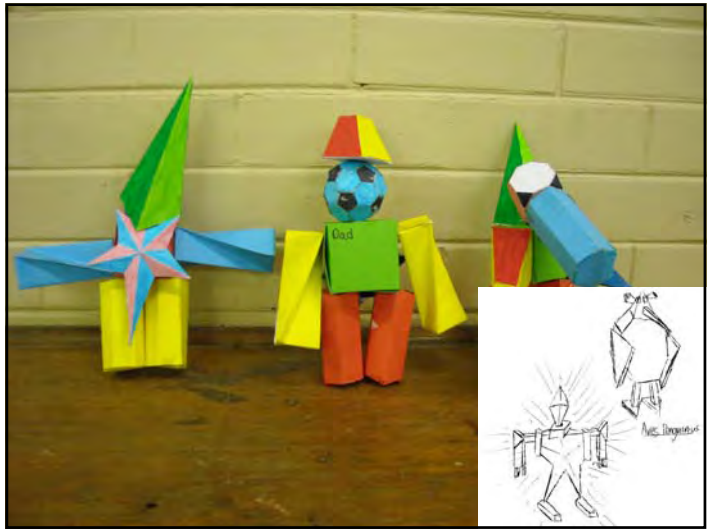


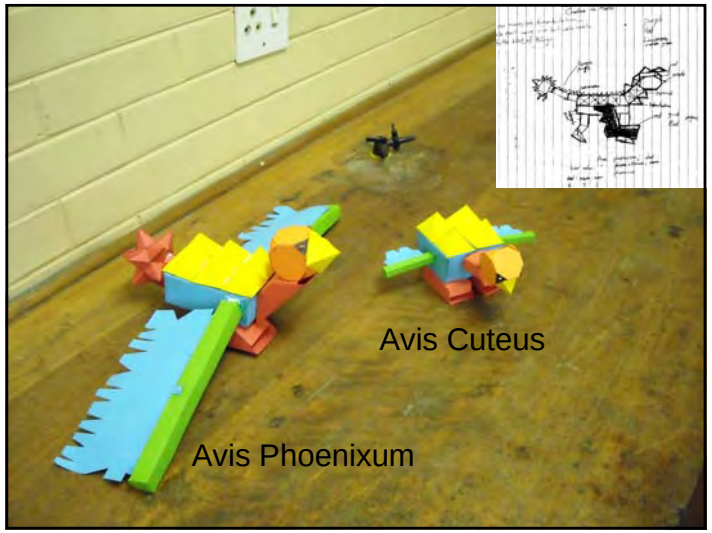
The Final Products

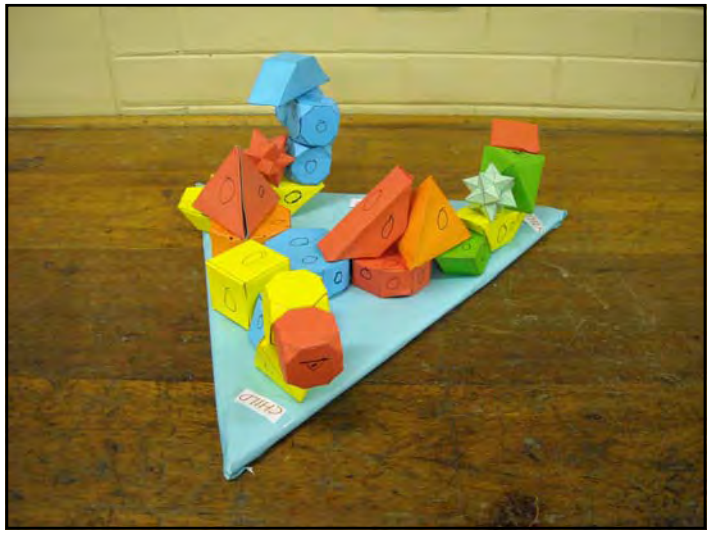


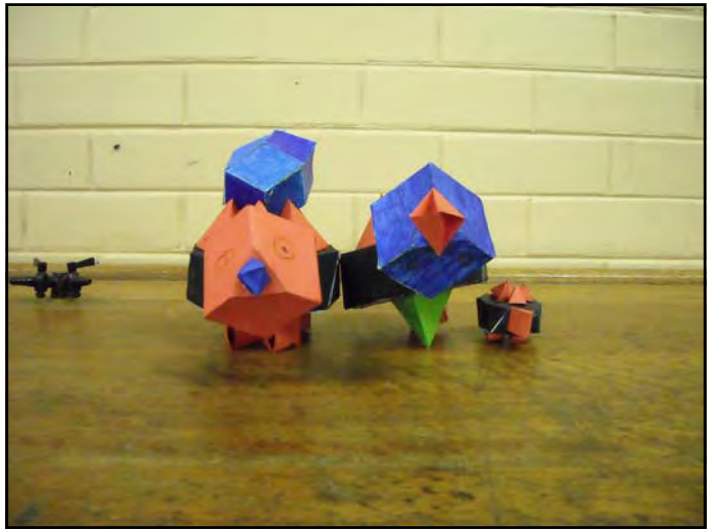




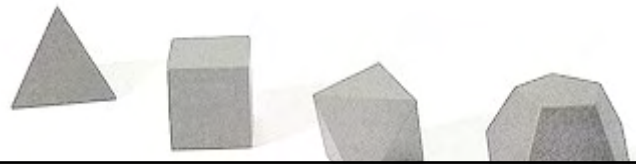








The Assessment



Name of Creatures		Balance	
Highly Appropriate Suitable Not really suitable	3 2 1	Creatures balance well Creatures balance reasonably Creatures do not balance	3 2 1
Family 'Fit' **Do they appear to belong together?**		**Use of Ratio**	
Very much so Reasonably so Not really	3 2 1	Clear Clear for most part Not really clear	3 2 1
Creativity		**Use of Colour**	
Outstanding Creativity Good Creativity Acceptable Creativity Little Creativity	4 3 2 1	Very Effective Effective Somewhat Effective Little use of colour	4 3 2 1
Use of Solids		**Variety in Solids**	
5 or more solids used 4 solids used 3 solids used 2 solids used 1 solid used	5 4 3 2 1	Huge variety in types of solids Large variety in types of solids Some variety in types of solids Little variety in types of solids No variety in types of solids	5 4 3 2 1

Neatness and Accuracy	
Neat, surfaces well met, glue not visible Mostly neat Acceptable level of neatness Not very neat Sloppy & Messy	5 4 3 2 1
Difficulty	
Outstanding Impressive Pleasing Average Poor	5 4 3 2 1
Nets	
All included and are neat & accurate All included but need attention Most included, neat and accurate Most included, need attention None or little included	5 4 3 2 1
Overall Impression	
Outstanding Impressive Pleasing Average Poor	5 4 3 2 1