2024-Spring

대학 수학 (1 주차)

오리엔테이션

성결대학교 미디어소프트웨어과

김성동 교수

교재: 매주마다 강의자료 배부

참고교재: 소개

왜 수학(Mathemathic) 을 배워야 할까요 ??

1. 논리적 사고력을 키울 수 있습니다.... 또 구조를 보는 시야를 기를 수 있으며 창의력을 만듭니다.

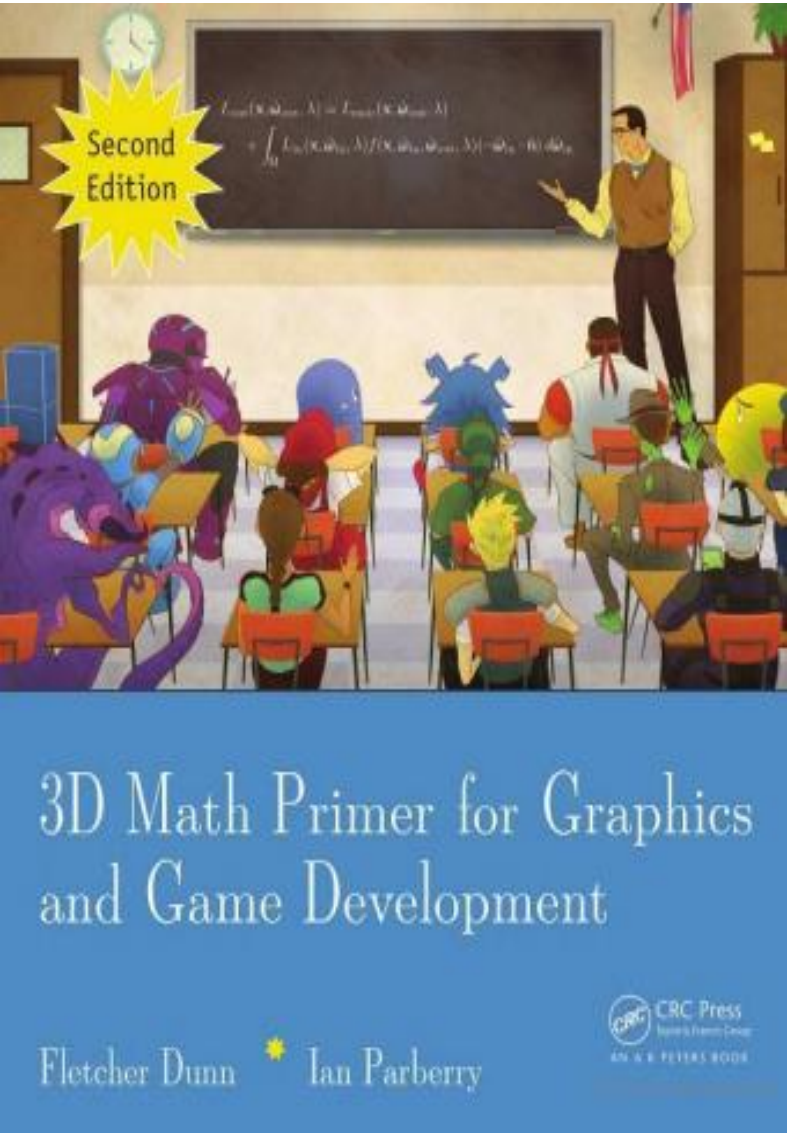
2. 현대 시대가 데이터를 원하고 있습니다.. 데이터를 보는 눈이 달라진다는 것입니다.

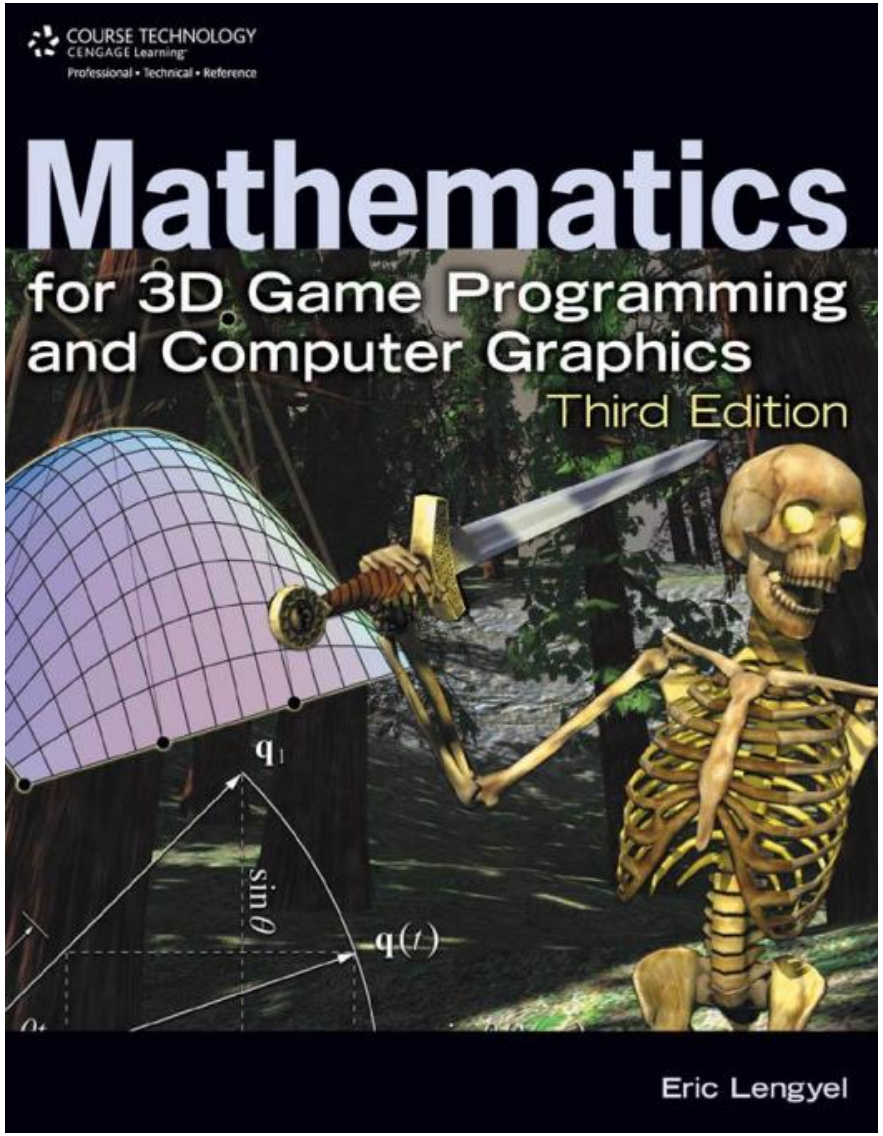
   - 사회 전반에 걸쳐서 모든 분야에 자료와 데이터를 보고, 그래프로 그려 낼 줄 아는 힘이 필요합니다

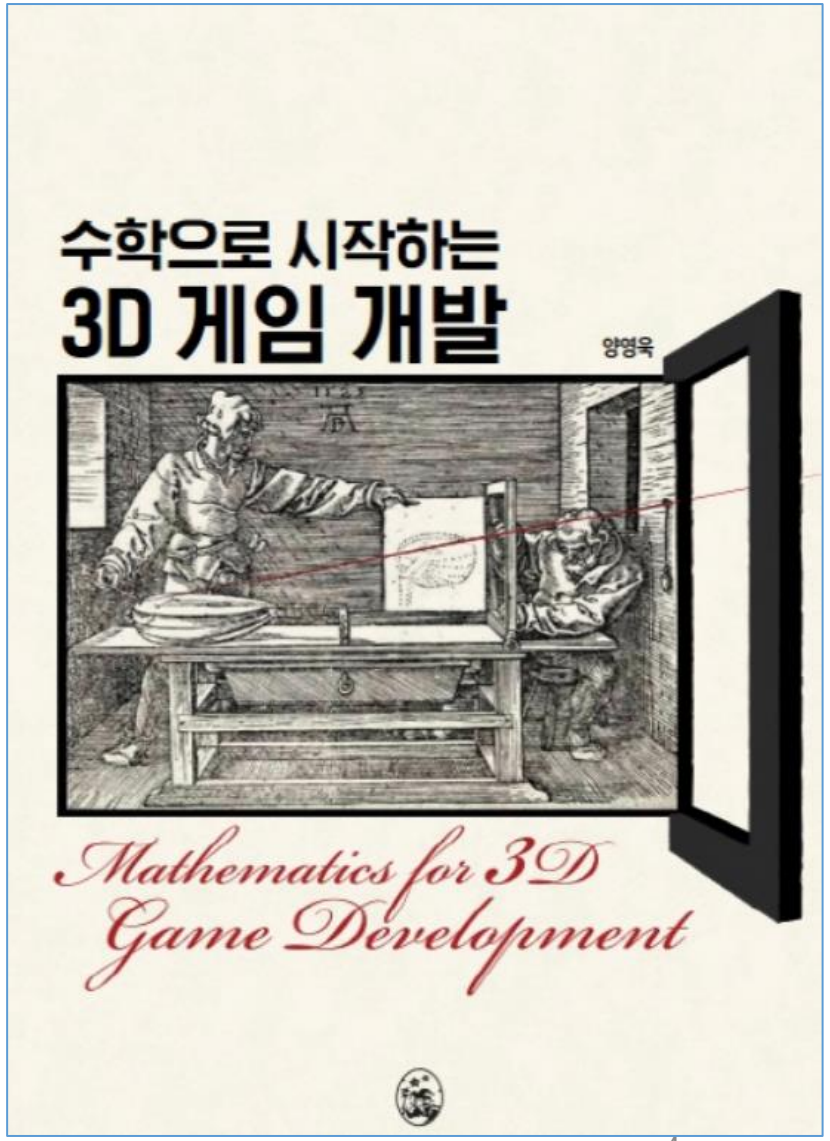
3. 이성적인 사람, 감정적인 사람, ...누가 빨리 결정할까요 ??

   - 적절한 제어 장치가 필요합니다.

참고 할 만한 교재들 소개


Second Edition
3D Math Primer for Graphics and Game Development
Fletcher Dunn
Ian Parberry
CRC Press


COURSE TECHNOLOGY
CENGAGE Learning
Professional • Technical • Reference
Mathematics
for 3D Game Programming and Computer Graphics
Third Edition
Eric Lengyel


수학으로 시작하는
3D 게임 개발
양영욱
Mathematics for 3D Game Development

성적처리 (Grading)

1. Quiz #1 15 %
2. Quiz #2 15 %

3. 출석평가 10 %
4. 중간평가 25 %
5. 기말평가 25 %

6. 과제평가 10 %

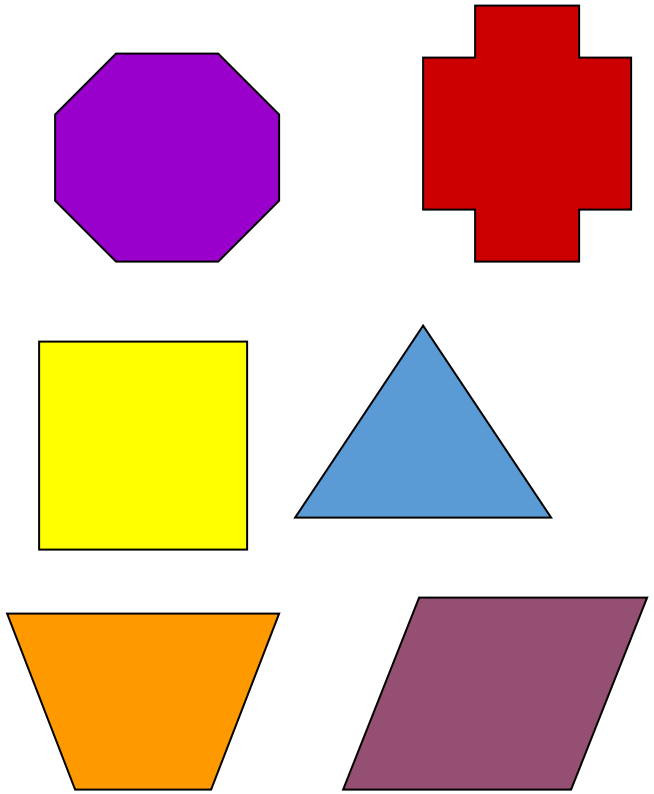
1)과제: 학번, 반, 이름 반드시 기재,

프로그램, 게임개발을 위한 사고력(thinking)수학 핵심내용

0. 용어

1. 벡터, 벡터공간 (vector space)
2. 행렬 (matrix)
3. 회전 (object rotation)
4. 방향변환, 크기변환 (transformation)
5. 투영(Projection)변환, 카메라 좌표계(camera view)
6. 충돌검사 (collision)
7. 곡선 (Curve)
8. 게임물리 (physics)

Two-dimensional Shapes (2D)

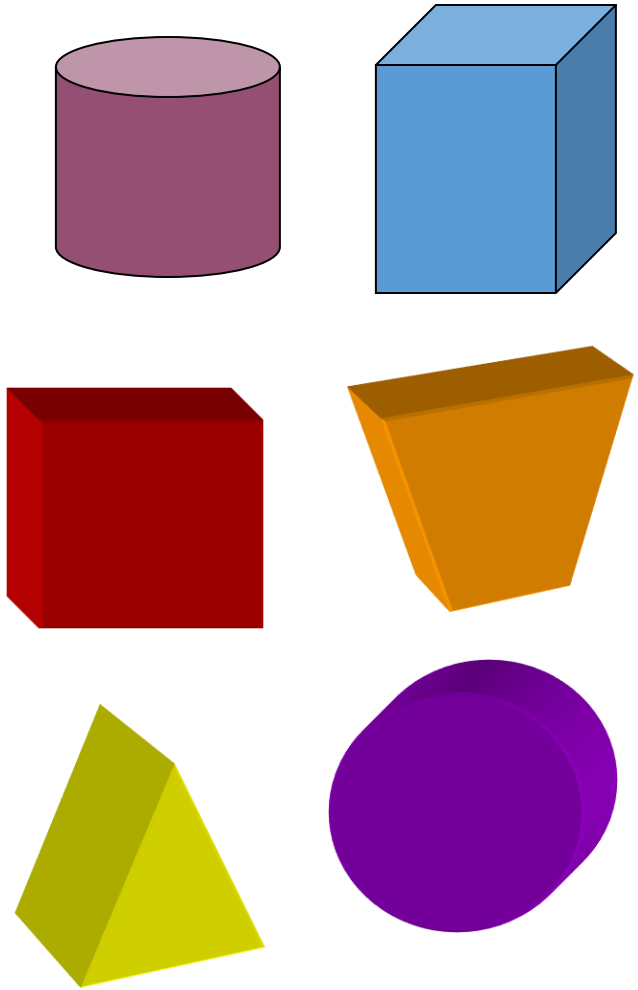


- These shapes are flat and can only be drawn on paper.
- They have two dimensions – length and width.
- They are sometimes called plane shapes.

PART 1

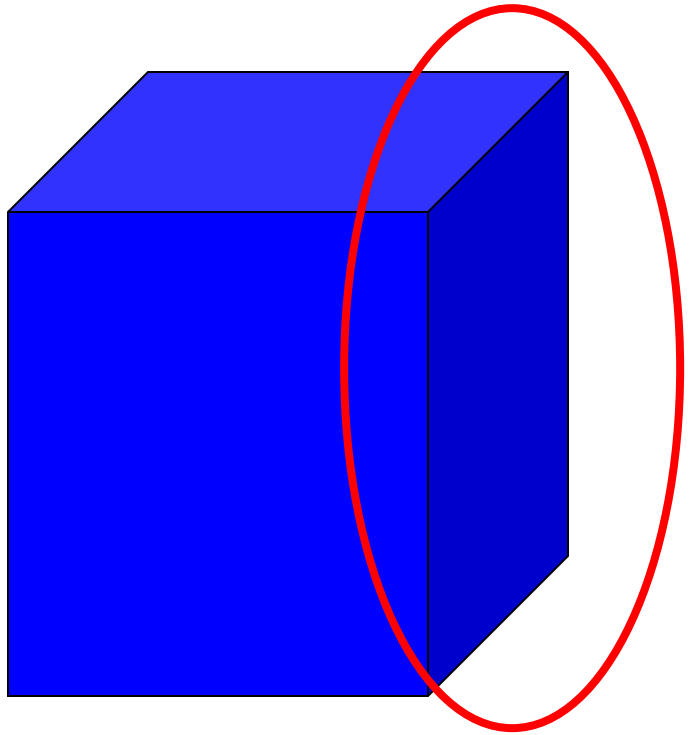
3D SHAPES

Three-dimensional Shapes (3D)



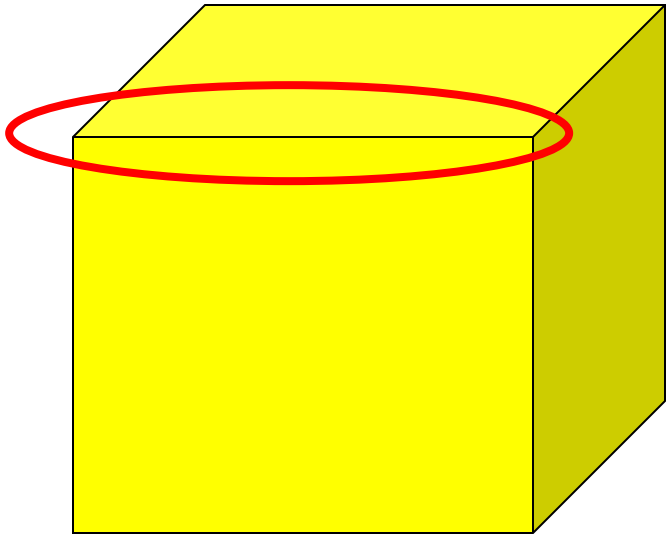
- These shapes are **solid or hollow.**
- They have three dimensions (3D) – **length, width and height.**

Face



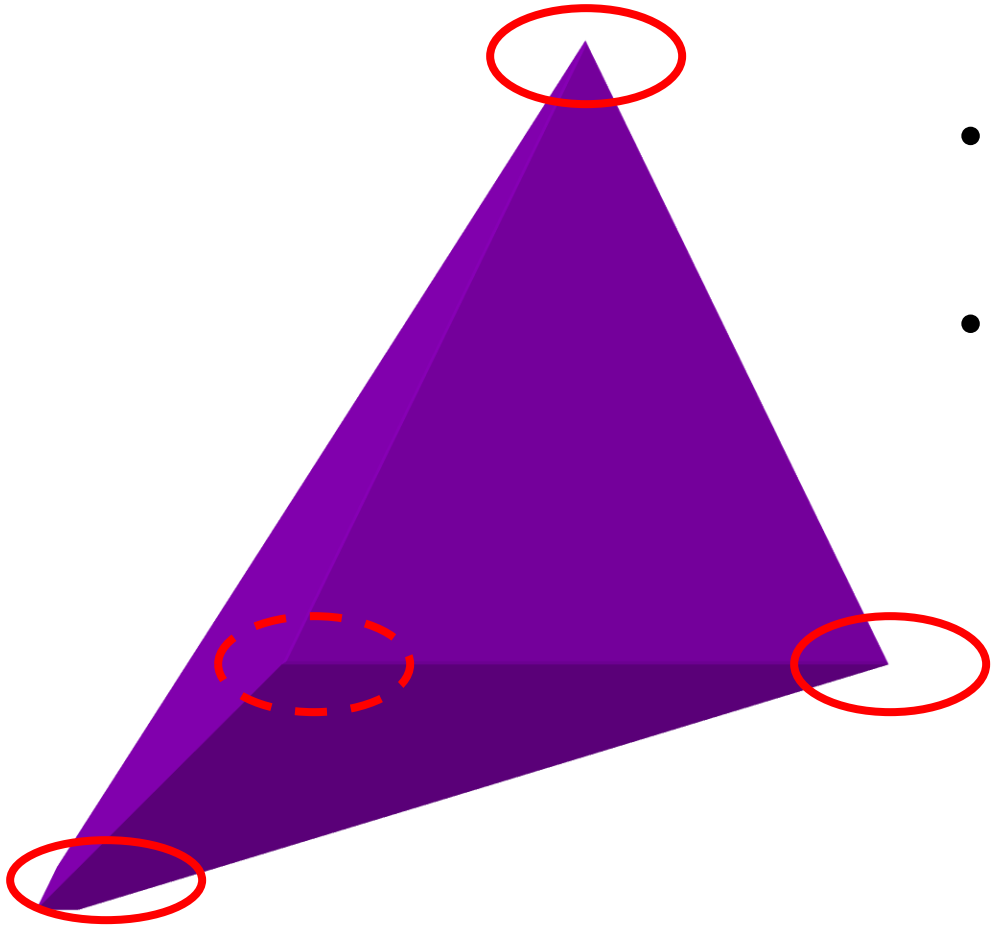
- Part of a shape that is flat. (Or curved)
- E.g. A cube has 6 of these.

Edge



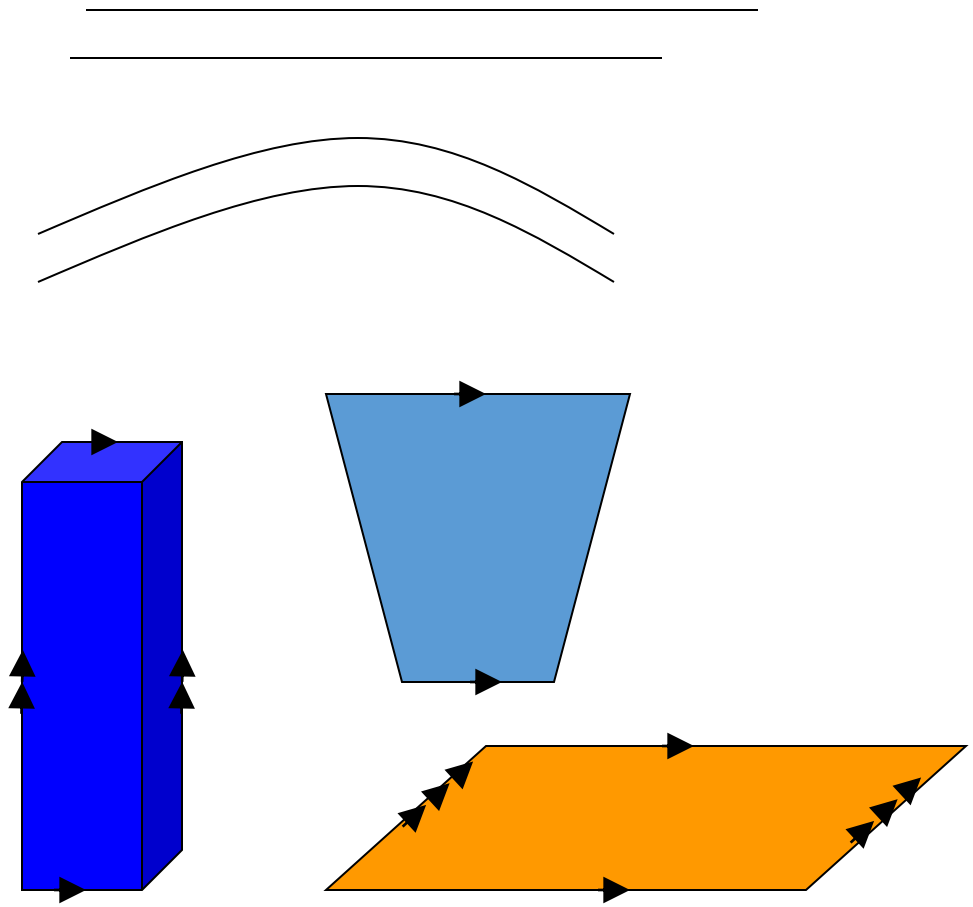
- The line where two faces meet.
- E.g. A cube has 12 of these.

Vertex (Vertices)



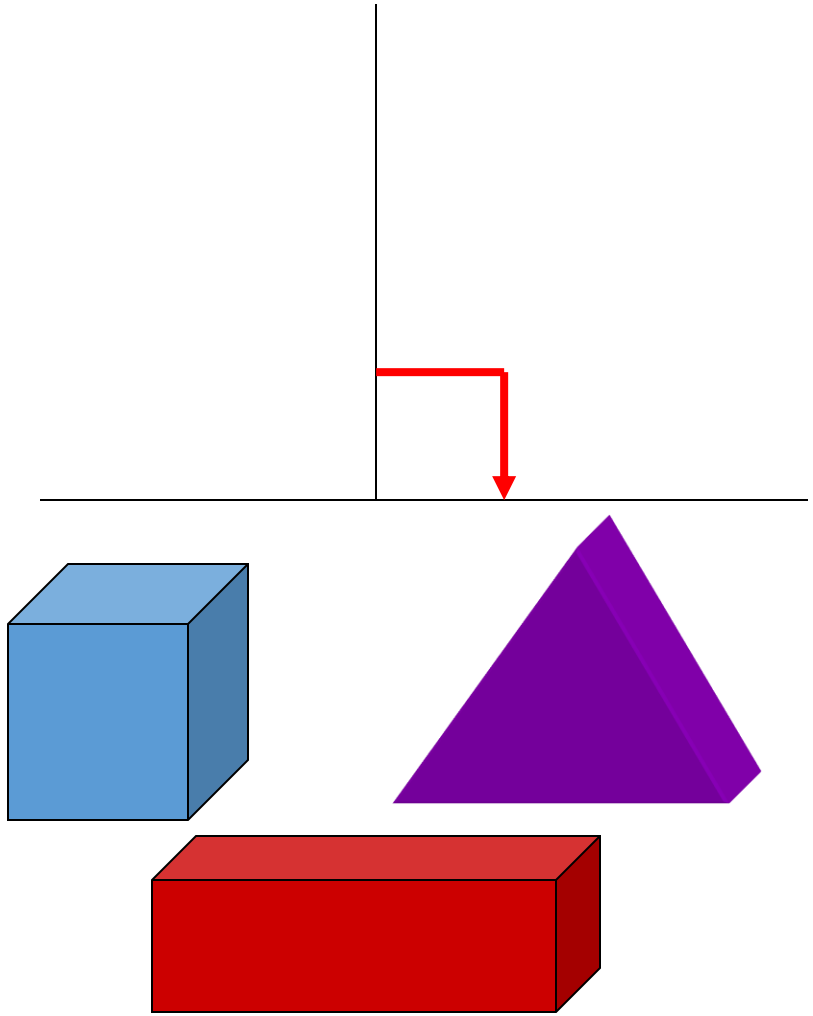
- The place where three or more edges meet.
- This pyramid has 4 of these.

Parallel



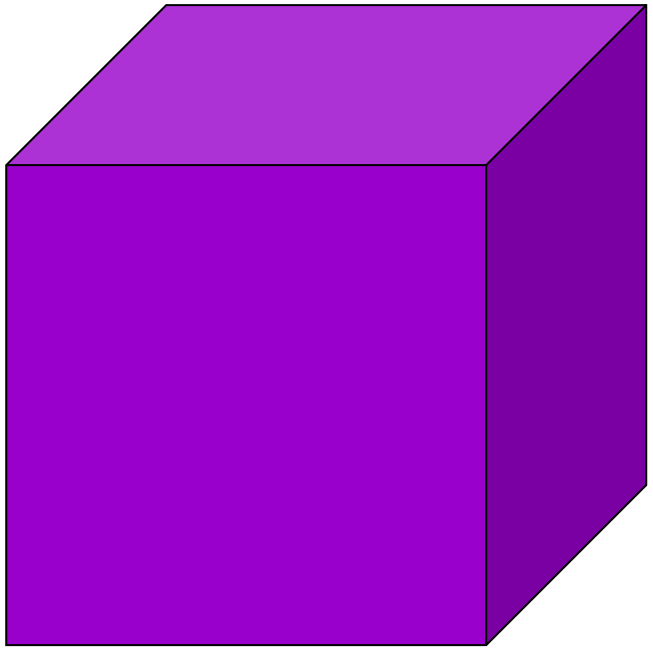
- These type of lines stay the same distance apart for their whole length.
- They do not need to be straight or the same length.

Perpendicular



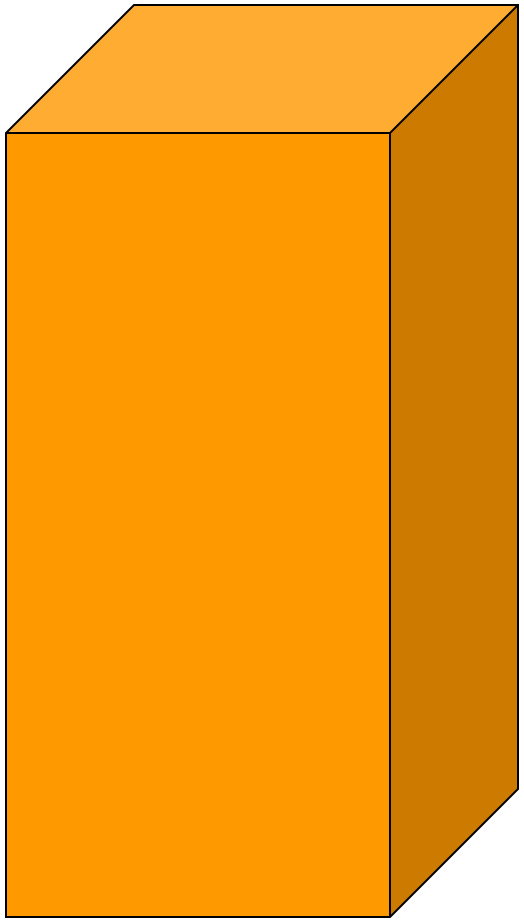
- A line that is drawn in a right angle to another line .
- In solid shapes edges could be at a right angle to one another.
- Faces could also be at right angles to one another.

Cube



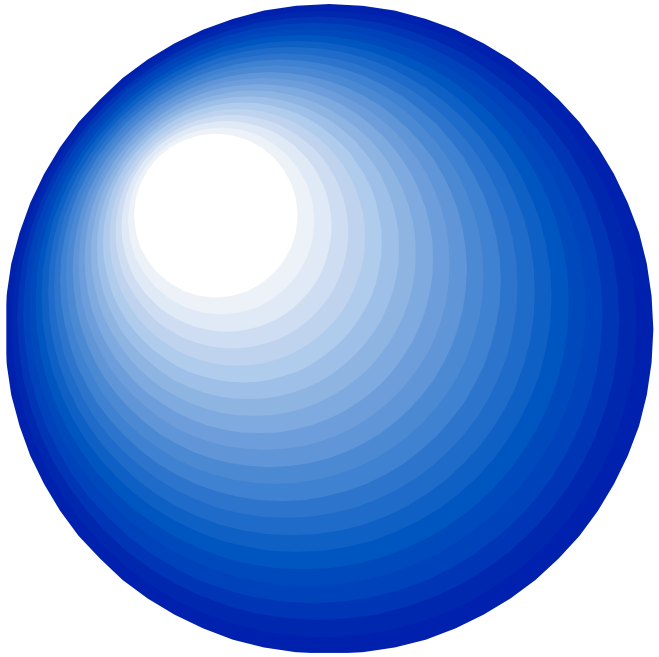
- A three-dimensional shape which has **6 square faces all the same size.**

Cuboid



- A three-dimensional shape which has 6 rectangular faces.

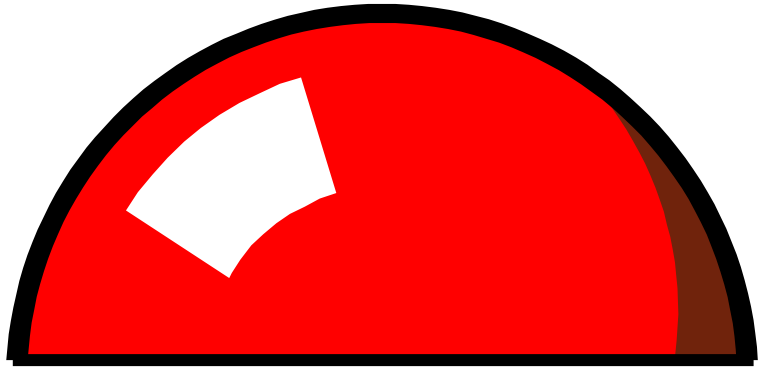
Sphere



- A perfectly round three-dimensional shape, like a ball. It has only one curved face.

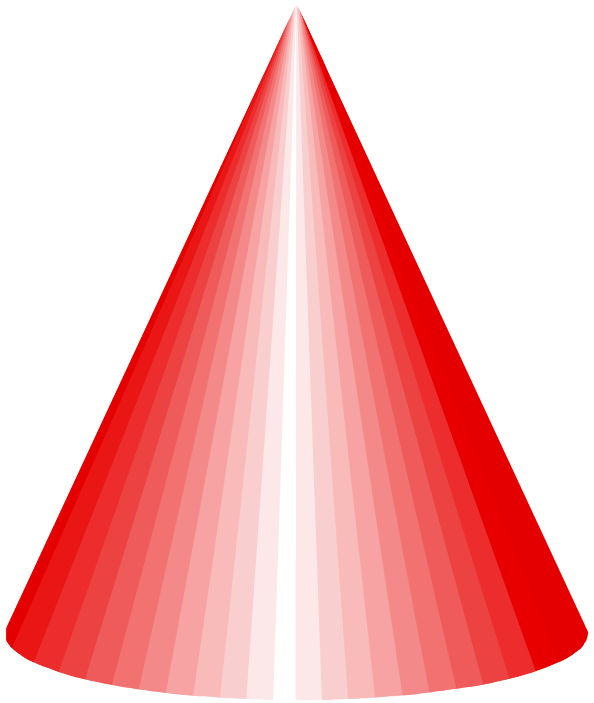
- No parallel faces or edges
- No perpendicular faces or edges

Hemisphere



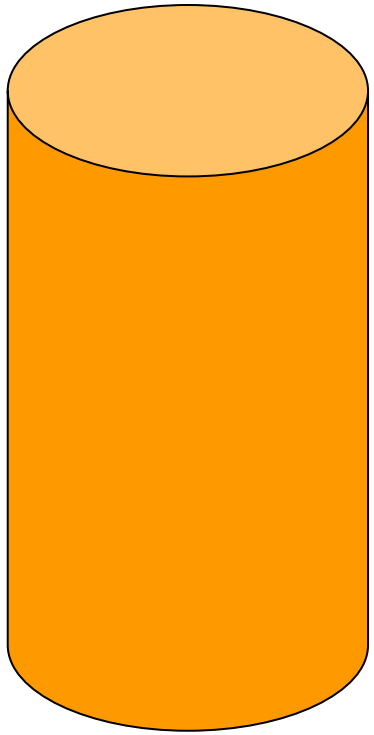
- A three-dimensional shape that is half a sphere.

Cone



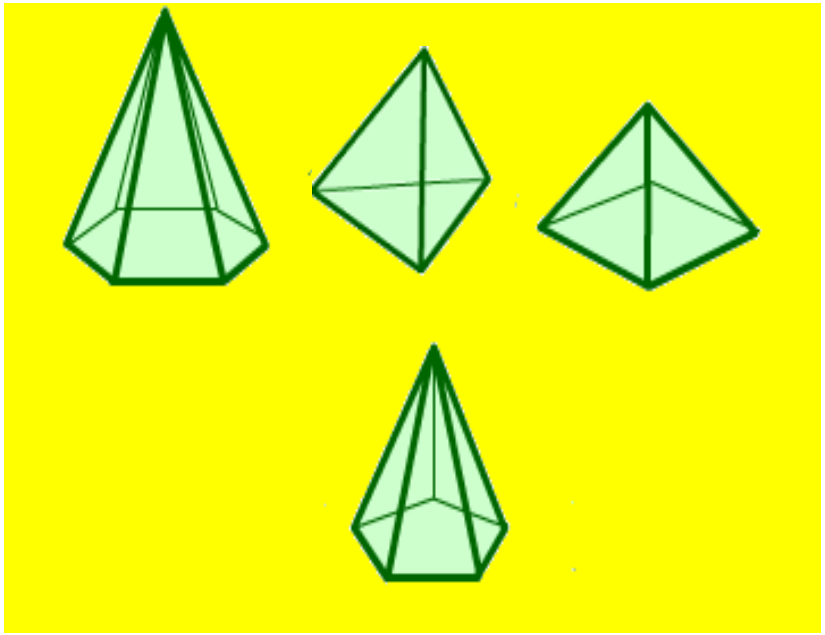
- A three dimensional shape with a **circle at its base and a pointed vertex.**

Cylinder



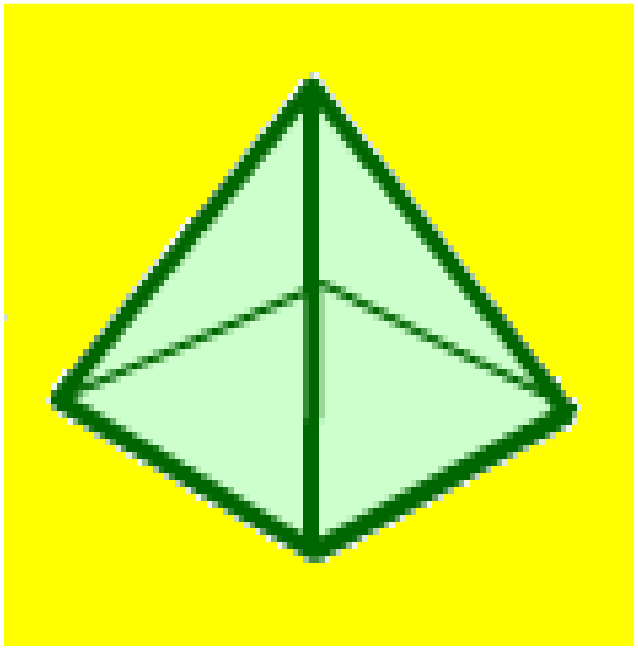
- A three-dimensional shape with **circular ends of equal size.**

Pyramid



- A three-dimensional shape which has a polygon for **its base and triangular faces which meet at one vertex.**

Square base pyramid



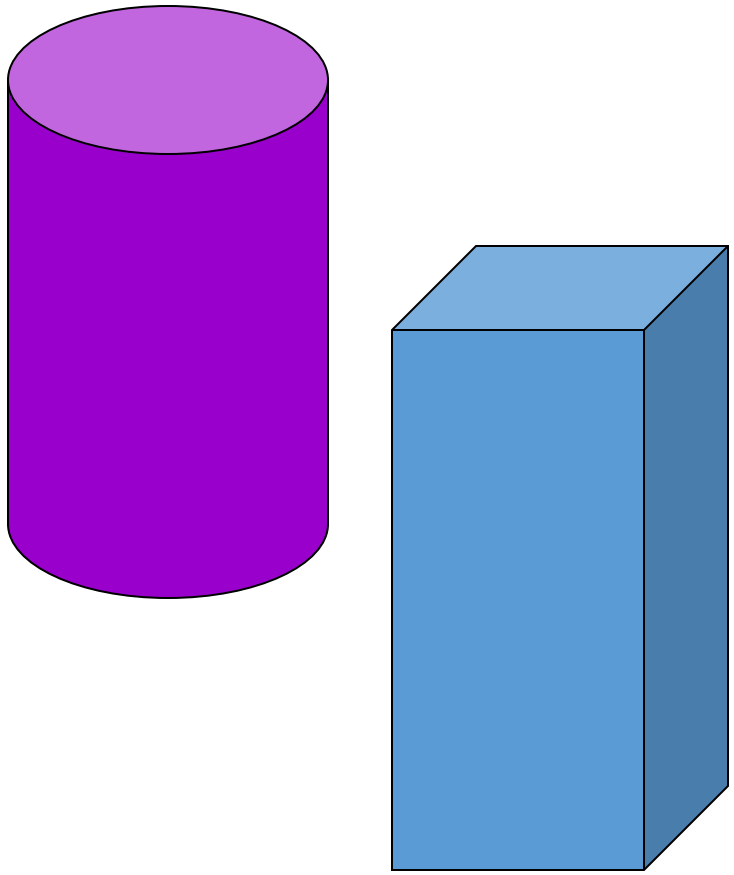
No faces parallel

Some edges parallel

No faces perpendicular

Some edges perpendicular

Prism (입방체)

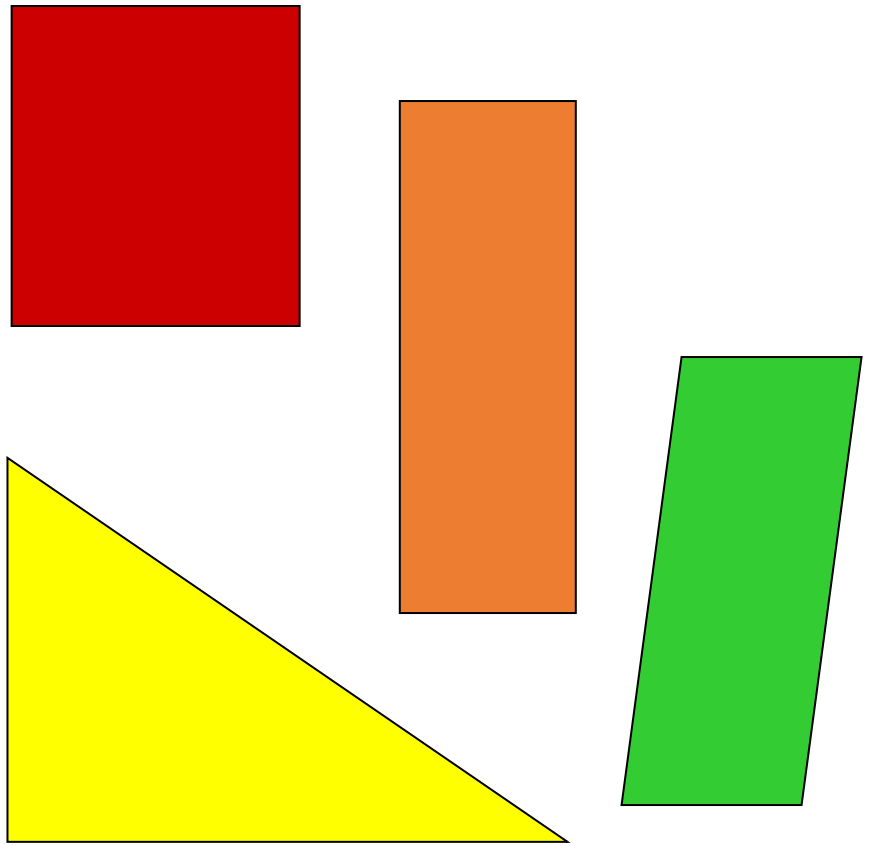


- A three dimensional shape that has the **same cross-section all along its length**.

PART 2

PLANE SHAPES

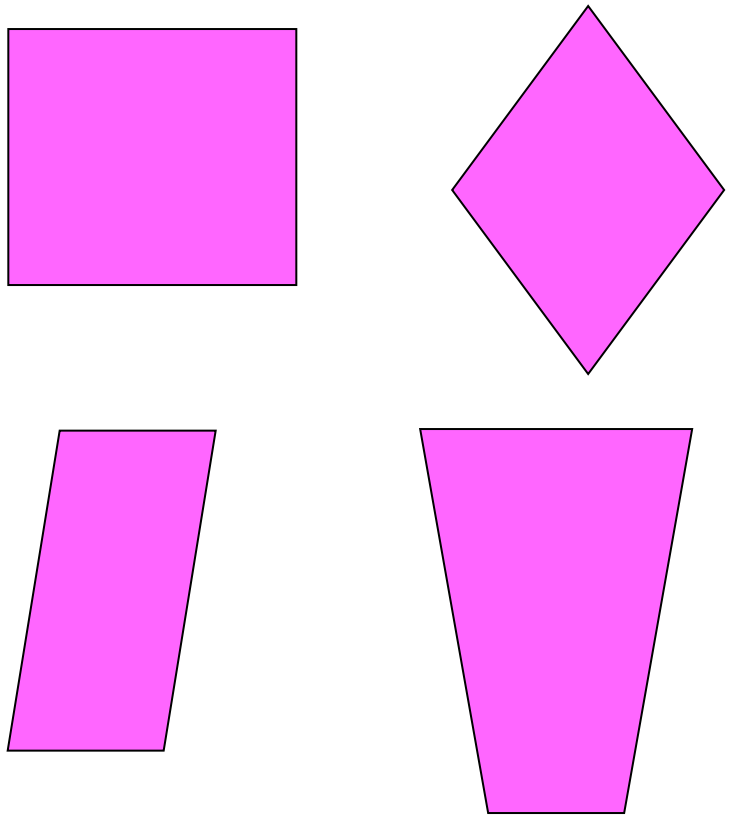
Polygons (다각형)



- Two-dimensional shapes that **have sides made from straight lines.**

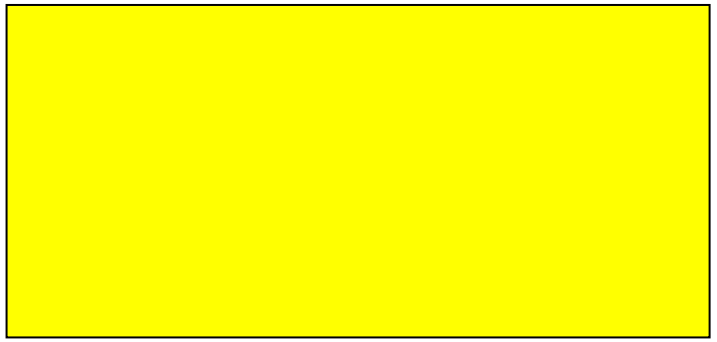
- E.g. triangles
  squares
  hexagons

Quadrilaterals (다변형)



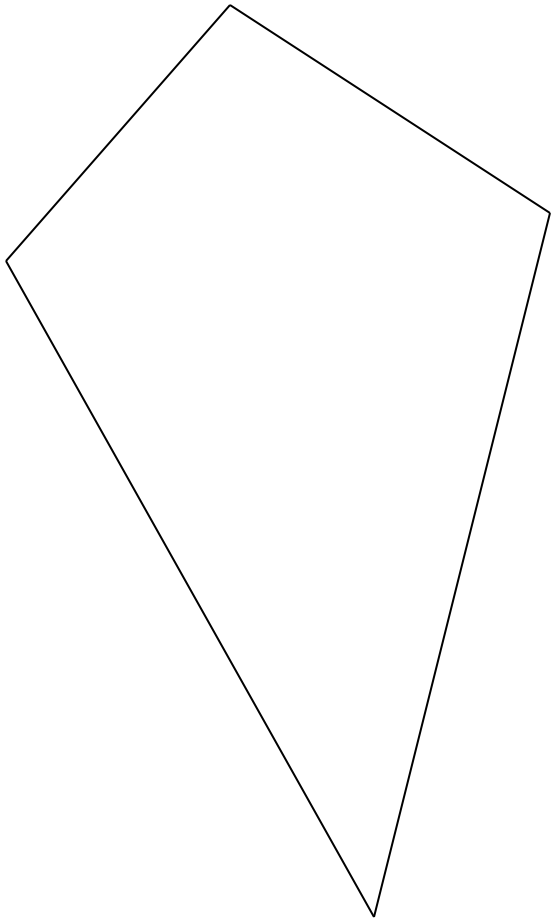
- Any two-dimensional shapes with **four straight sides.**
- E.g. square
  rhombus
  rectangle
  trapezium
  kite

Rectangle



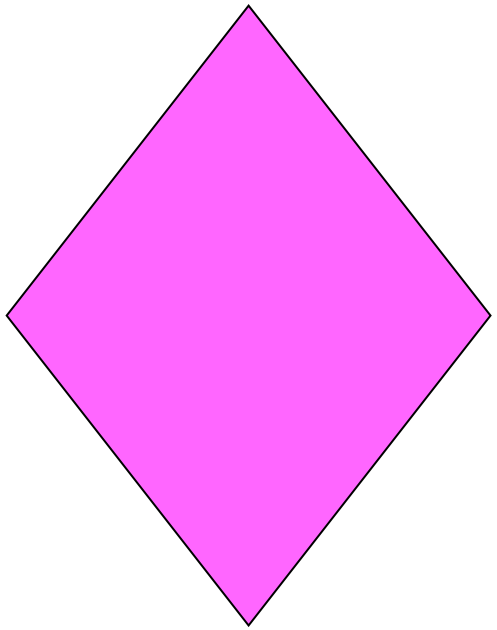
- A four sided two-dimensional shape with **two pairs of parallel sides that meet at right angles.**

Kite



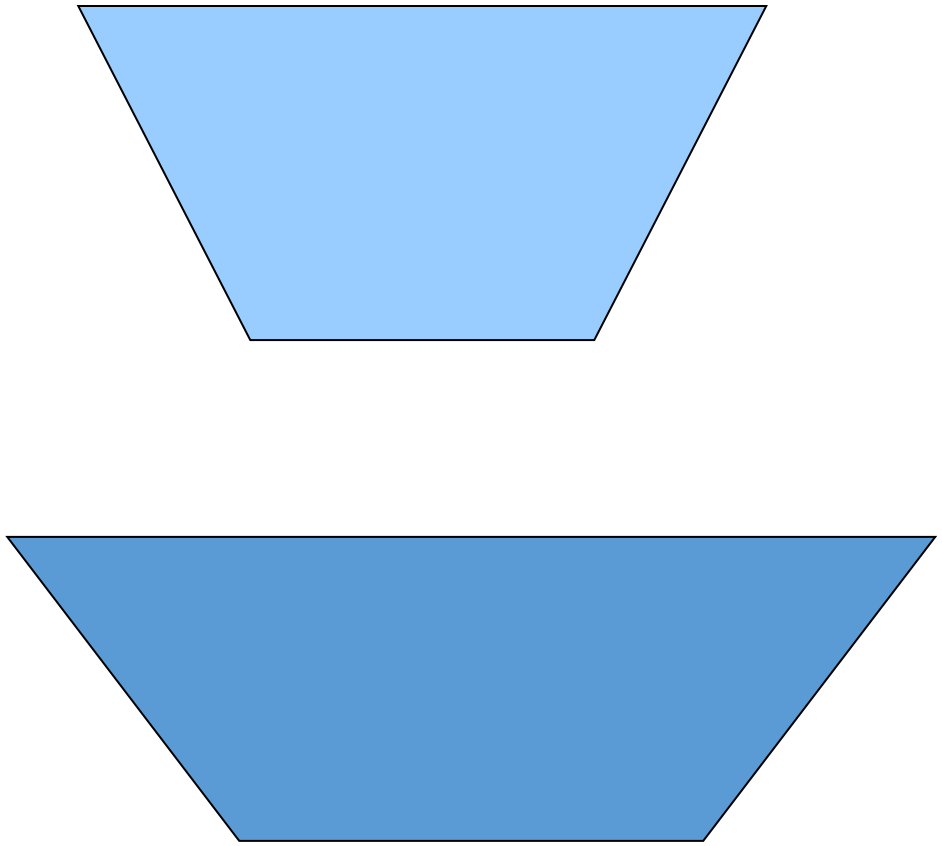
- A two-dimensional shape with two **shorter sides of equal length and two longer sides of equal length.**

Rhombus



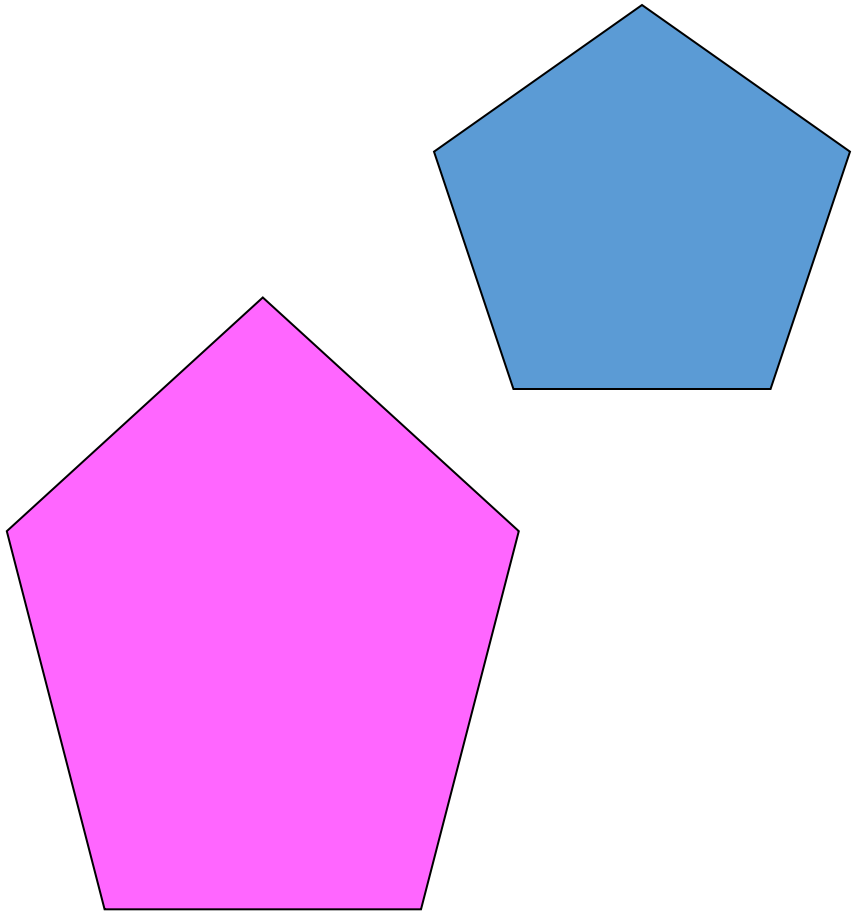
- A two-dimensional four sided shape with opposite sides that are **parallel and all the sides are the same length**.

Trapezium



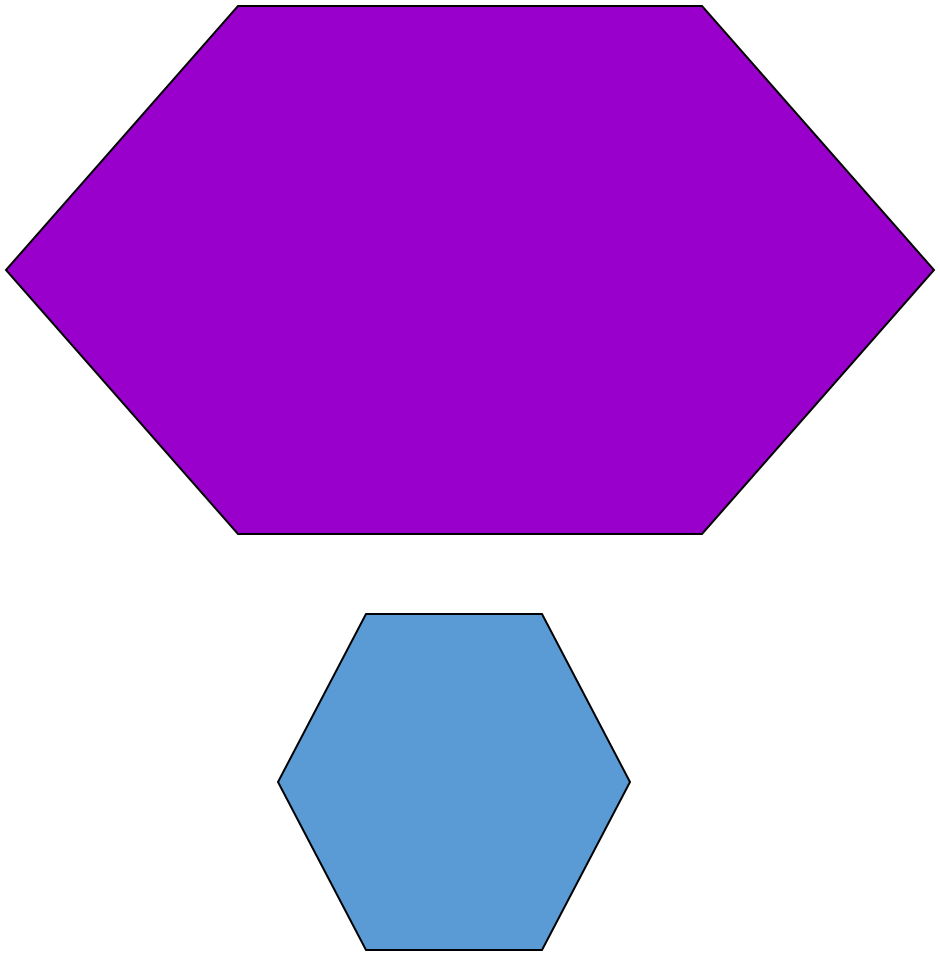
- A two-dimensional shape with four sides.
- One pair of sides is **parallel with one side longer than the other**.

Pentagon



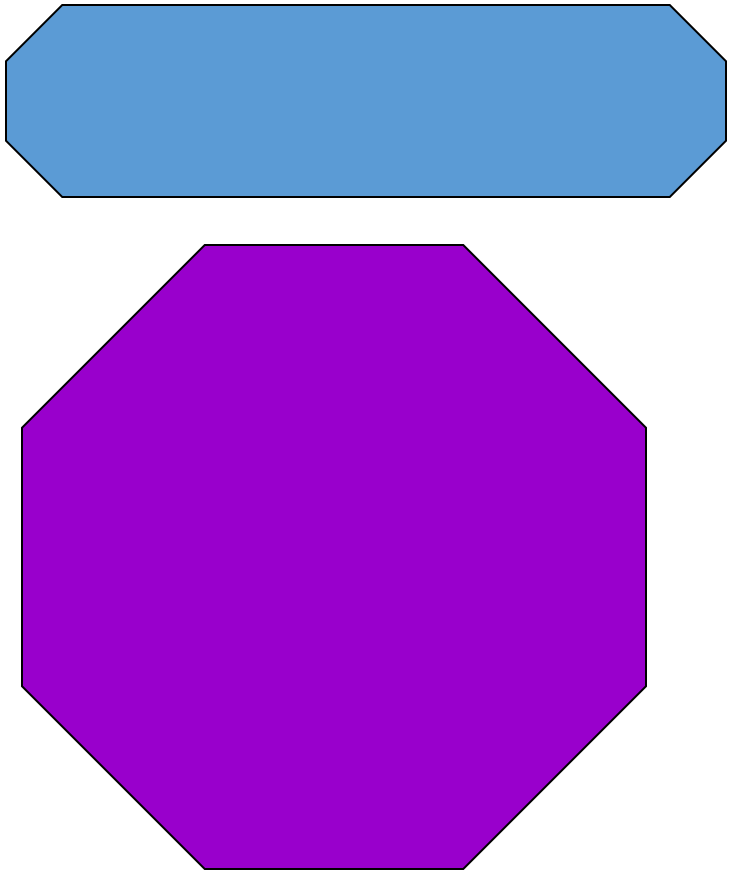
- A two-dimensional shape **with five straight sides and five angles.**

Hexagon



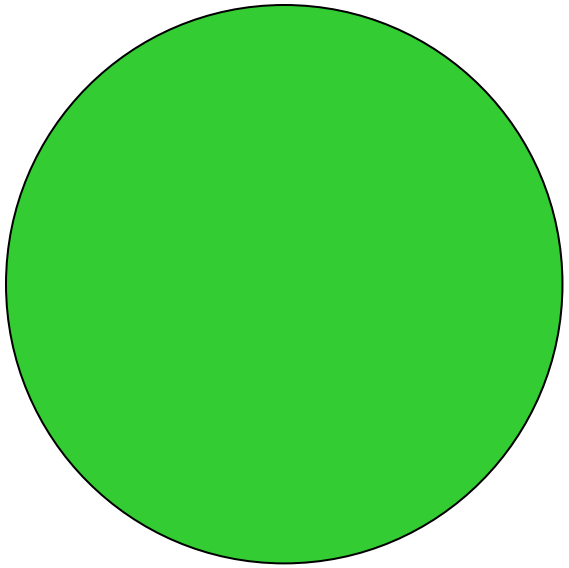
- A two-dimensional shape with **6 straight sides and 6 angles.**

Octagon



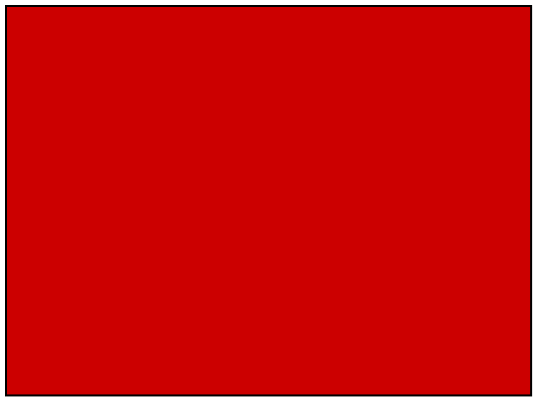
- A two-dimensional shape with **8 straight sides and 8 angles.**

Circle



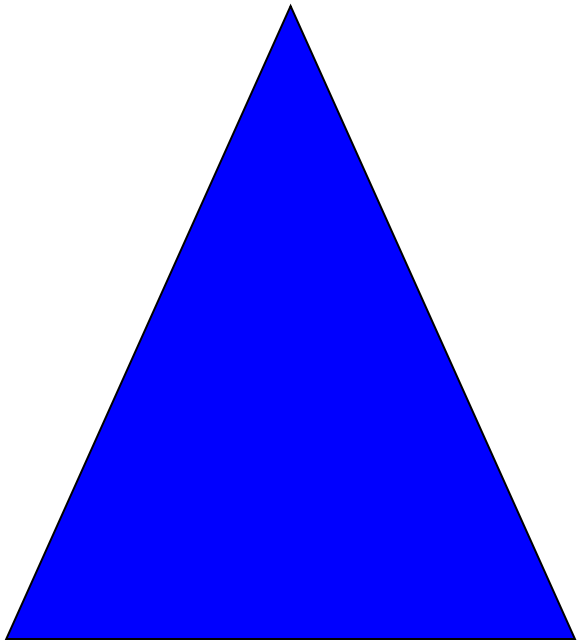
- A round flat two-dimensional shape.

Square



- Two dimensional shape with 4 sides of the same length and 4 90° angles.

Triangle



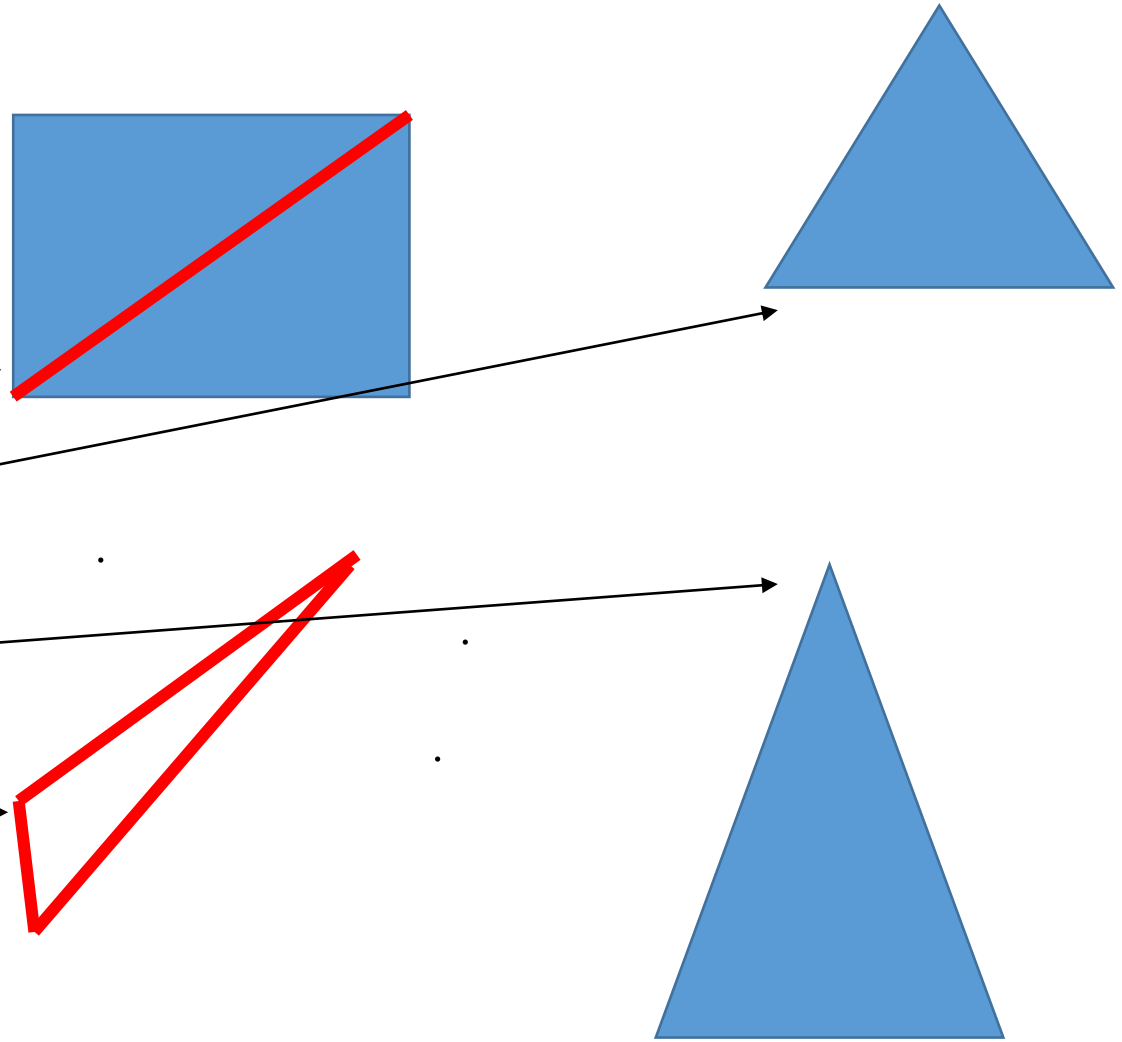
- **Two-dimensional shape with three straight sides and three angles.**

- **Can you name 4 different kinds?**

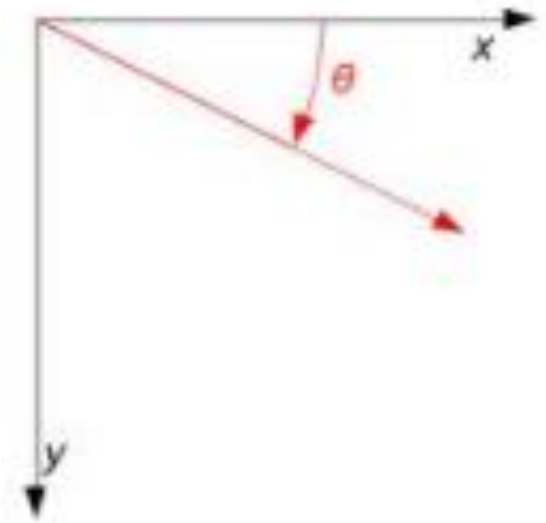
- an equilateral triangle
  a right triangle
  an isosceles triangle
  an inequality triangle

Solution

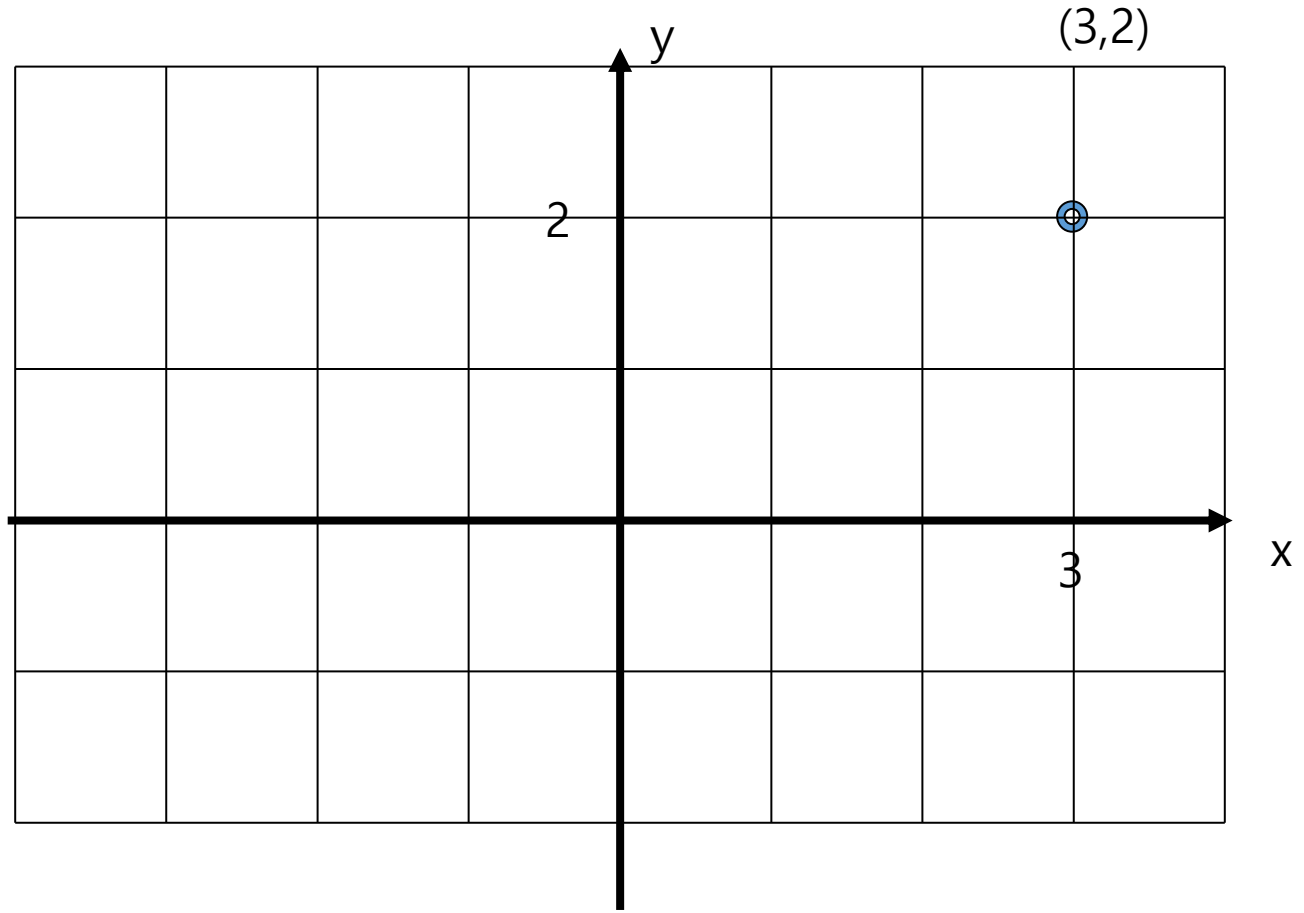
- 1) an equilateral triangle
  2) a right triangle
  3) an isosceles triangle
  4) an inequality triangle



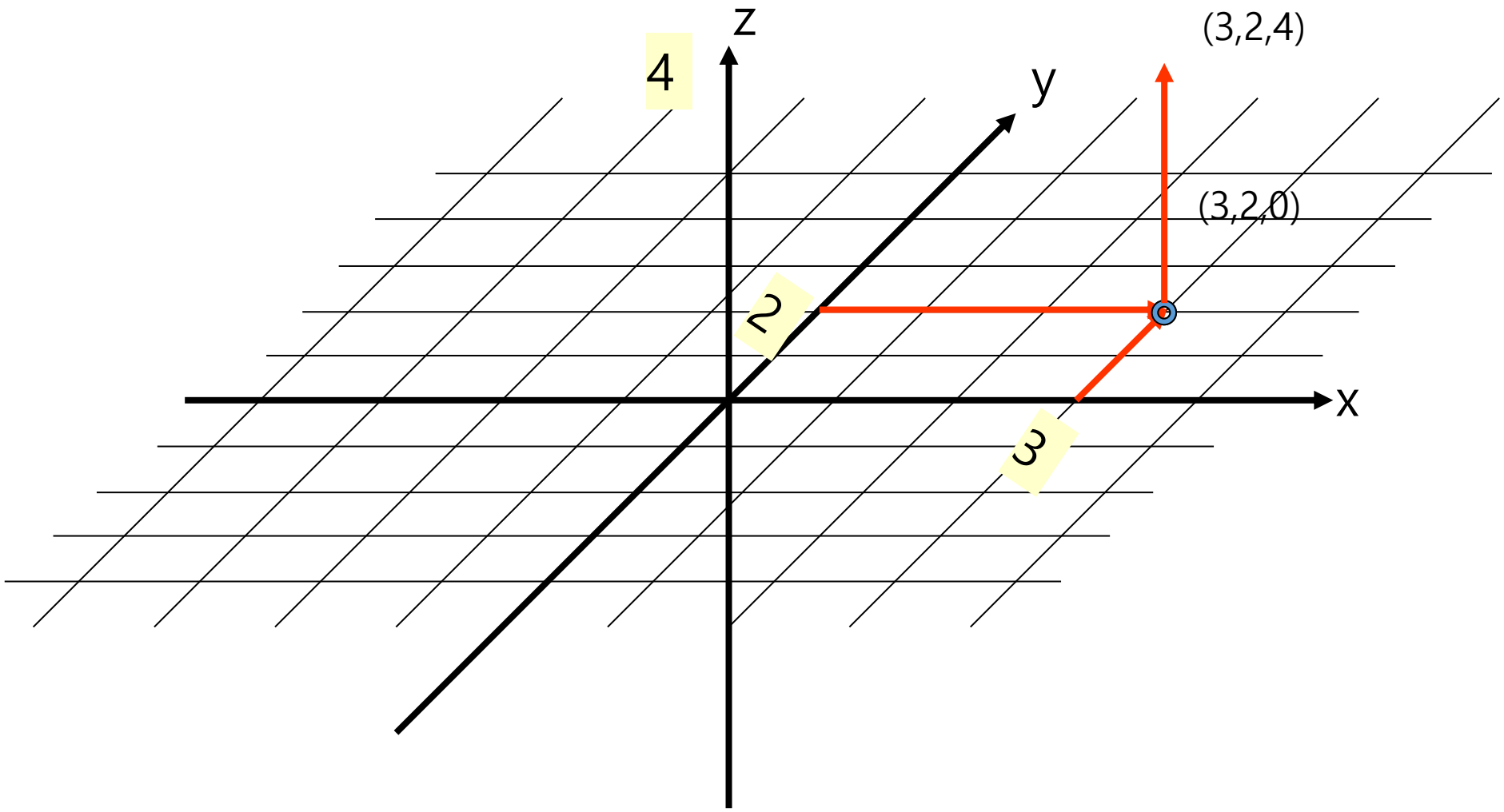
Applications

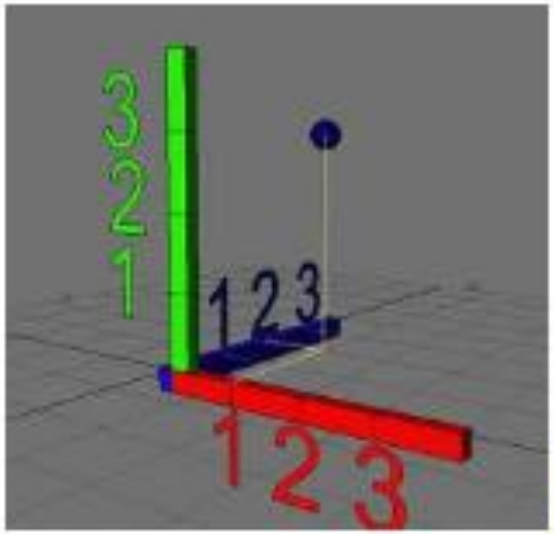


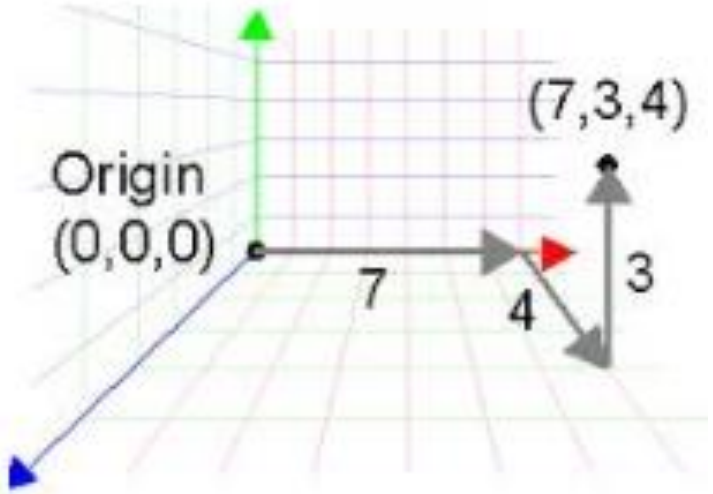
Coordinates in 2 Dimensions

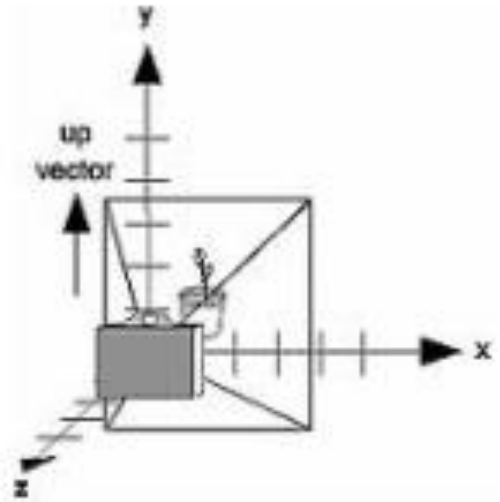


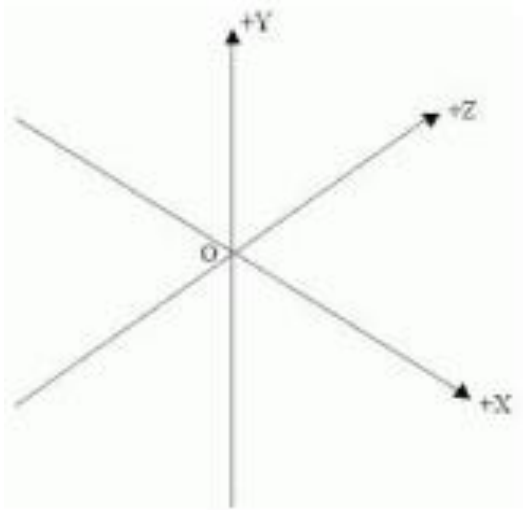
3 Dimension

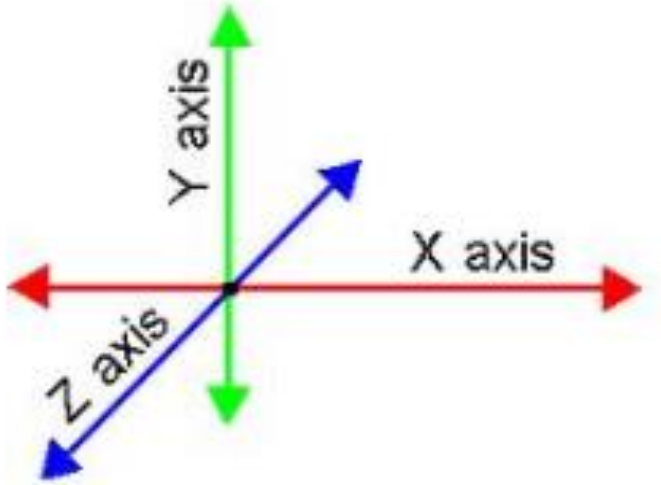


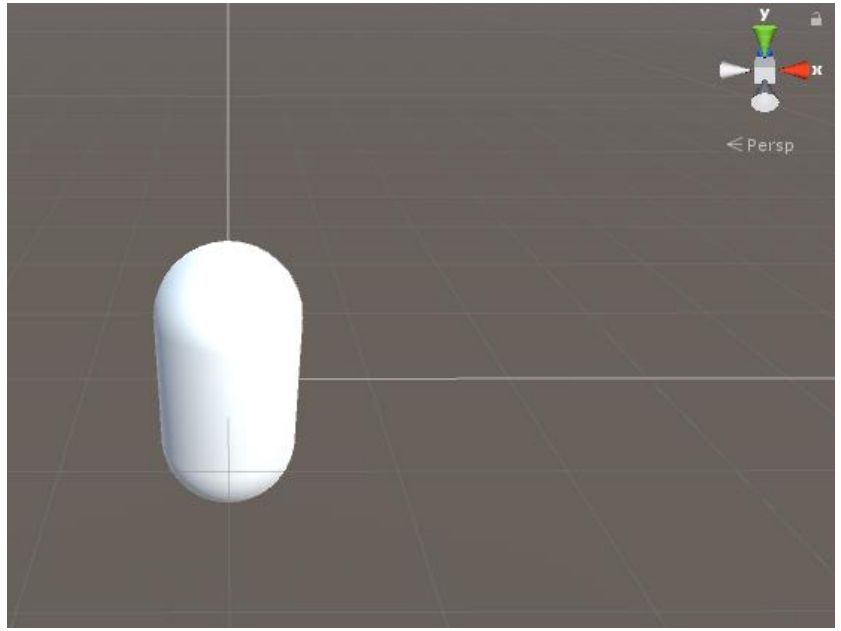

1 2 3
1 2 3
1 2 3


Origin
(0,0,0)
(7,3,4)
7
4
3


y
up
vector
x
z







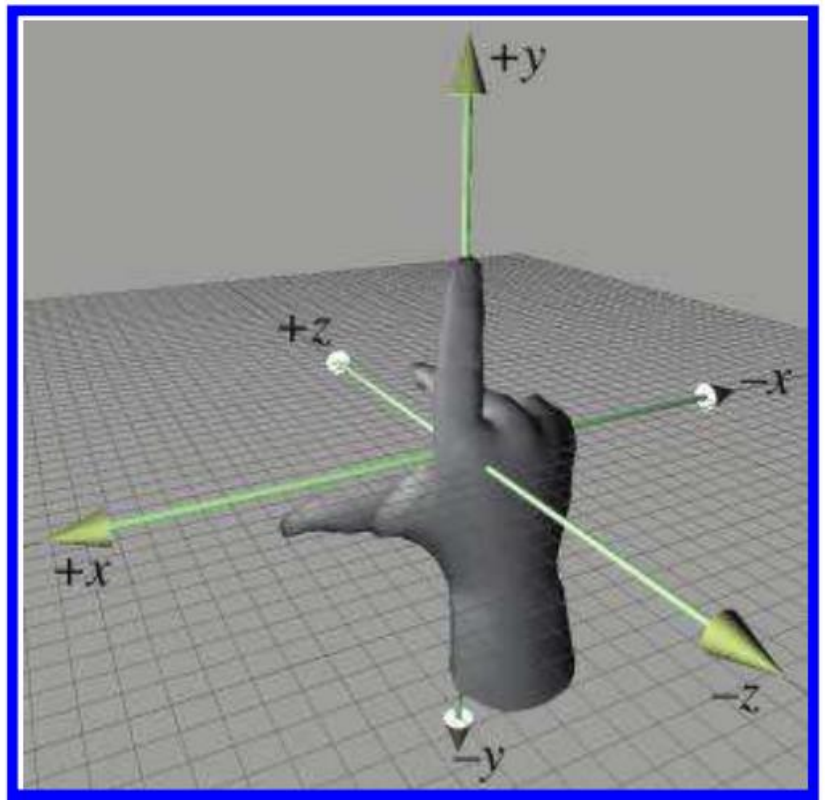
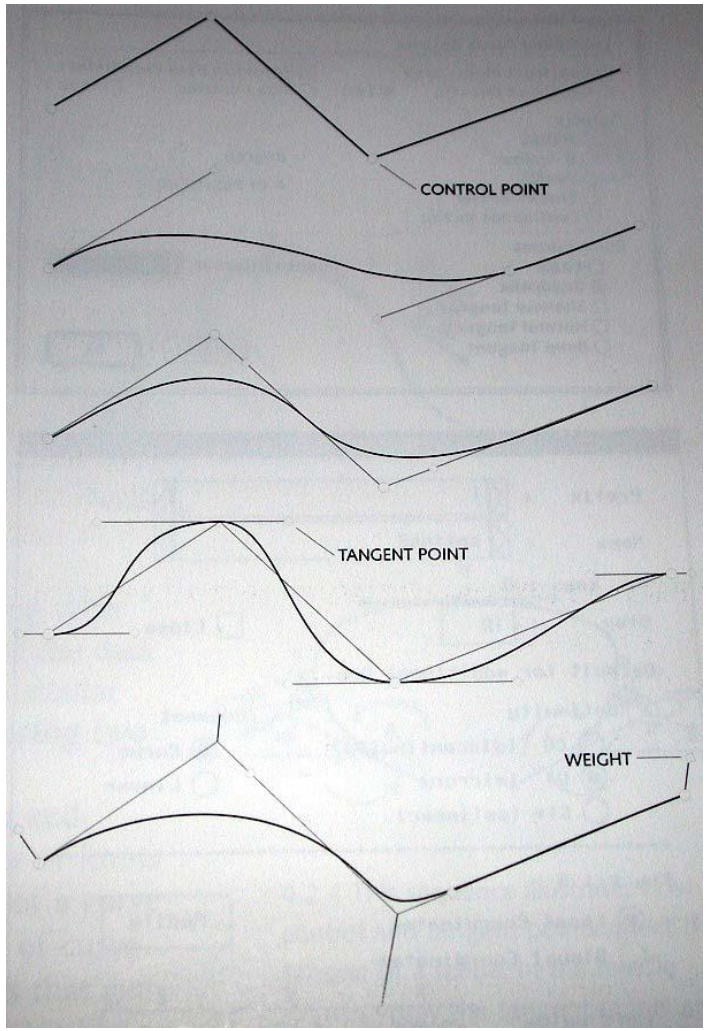


Figure 1.13
Right-handed coordinate space

- **Modeling**
- **Animation**
- **Data structures for interactive graphics**

Spline Curves

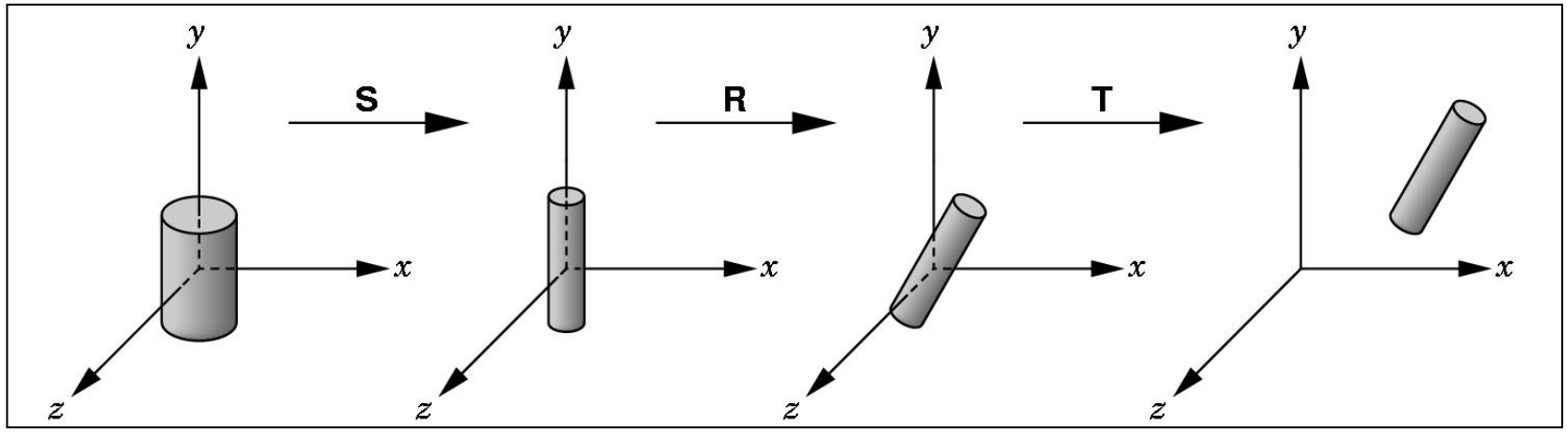
- Linear spline
- Cardinal spline
- B-spline
- Bezier curve
- NURBS (non-uniform rational b-spline)

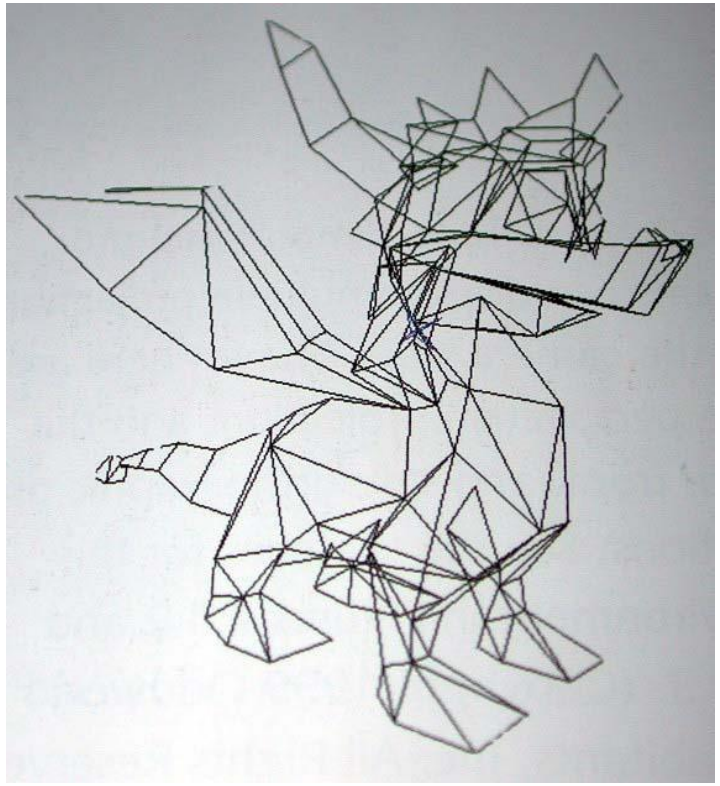


Representing objects

- Objects represented as symbols
- Defined in model coordinates; transformed into world coordinates (M = TRS)

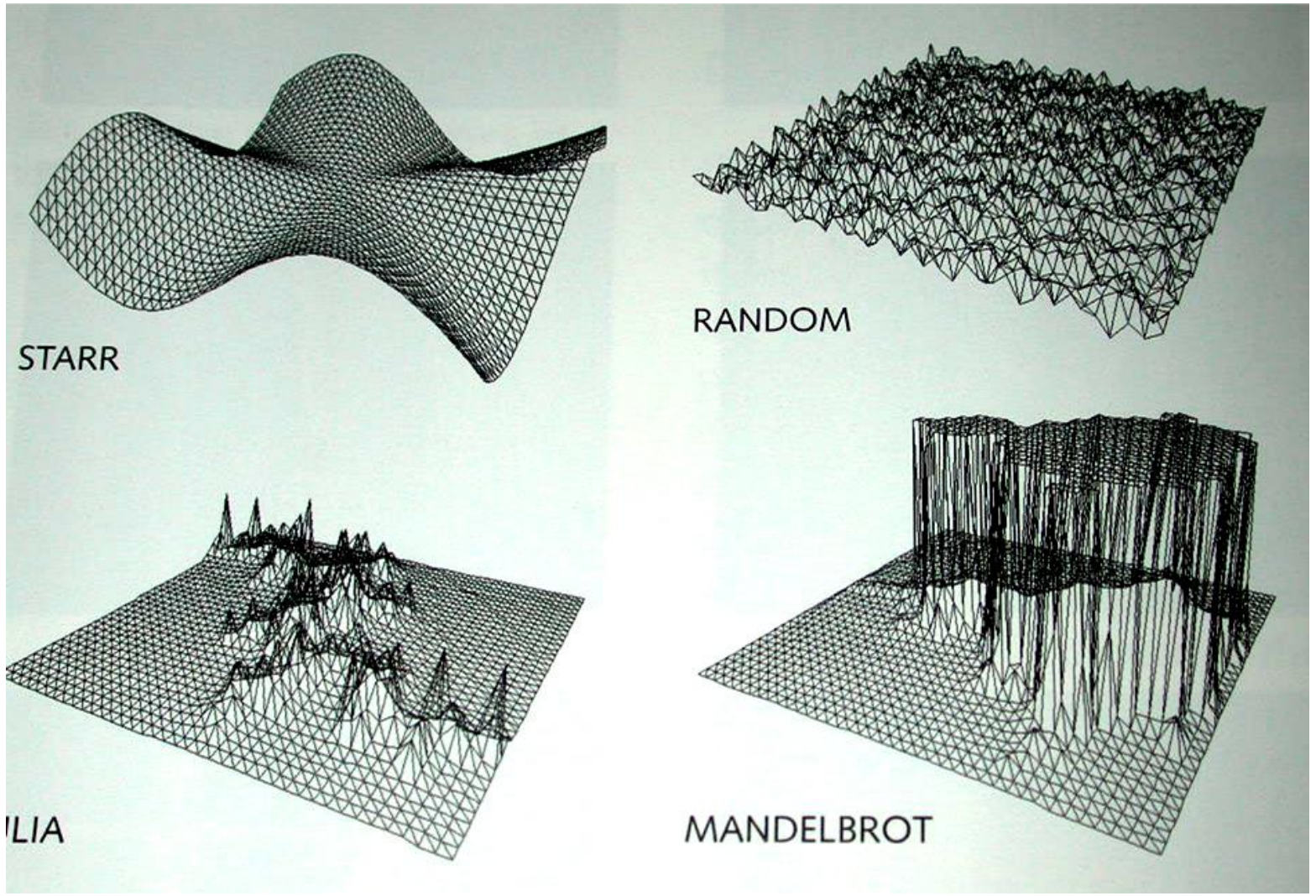
```
glMatrixMode(GL_MODELVIEW);
glLoadIdentity(); glTranslatef(…);
glRotatef(…); glScalef(…);
glutSolidCylinder(…);
```





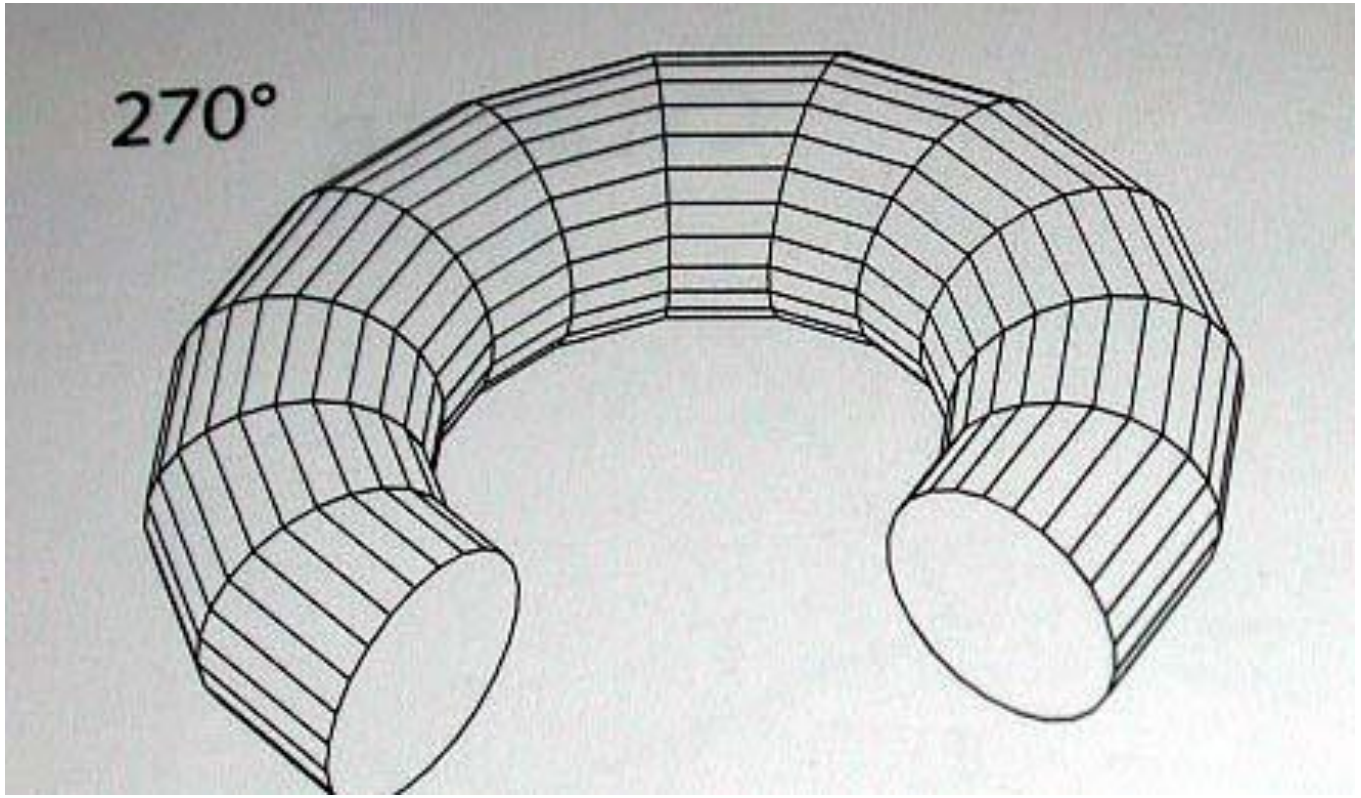
Mesh

Mesh deformations



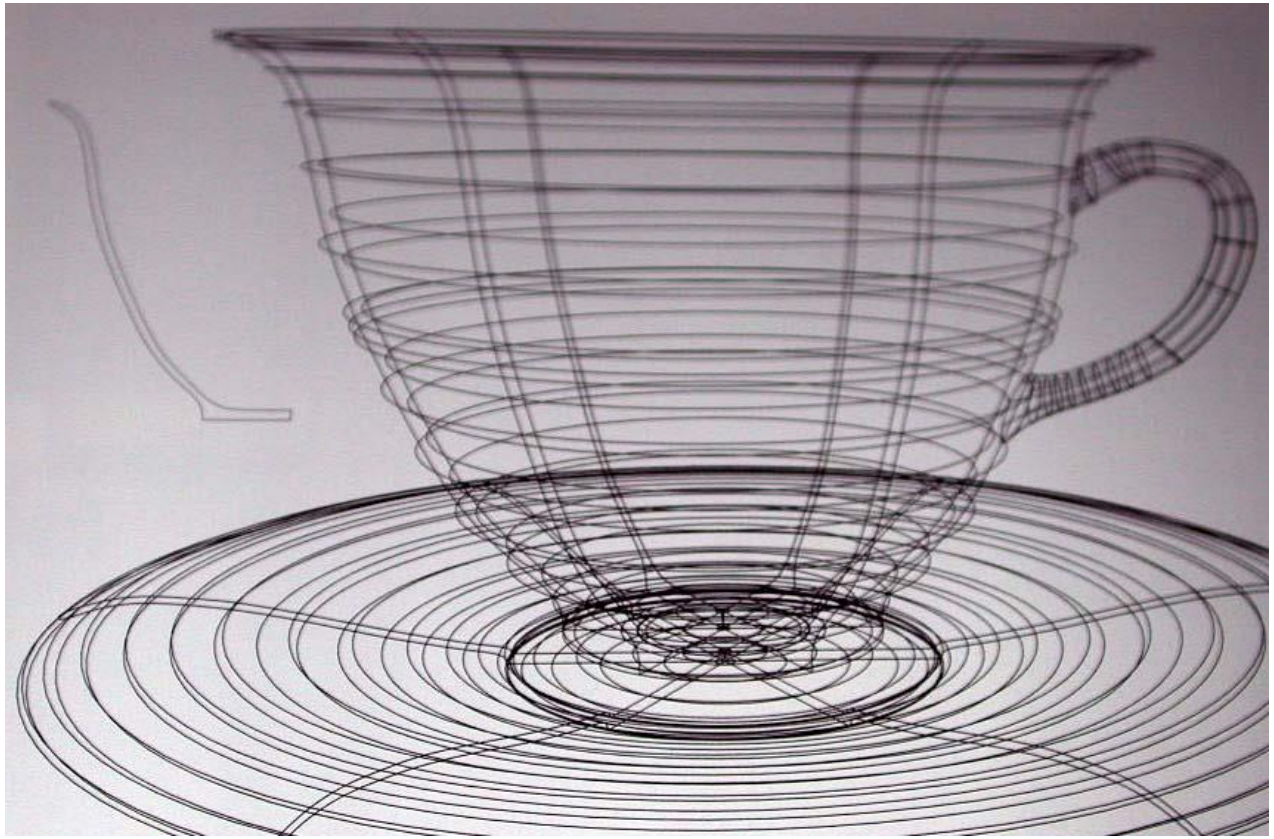
Sweep

- Sweep a shape over a path to form a generalized cylinder



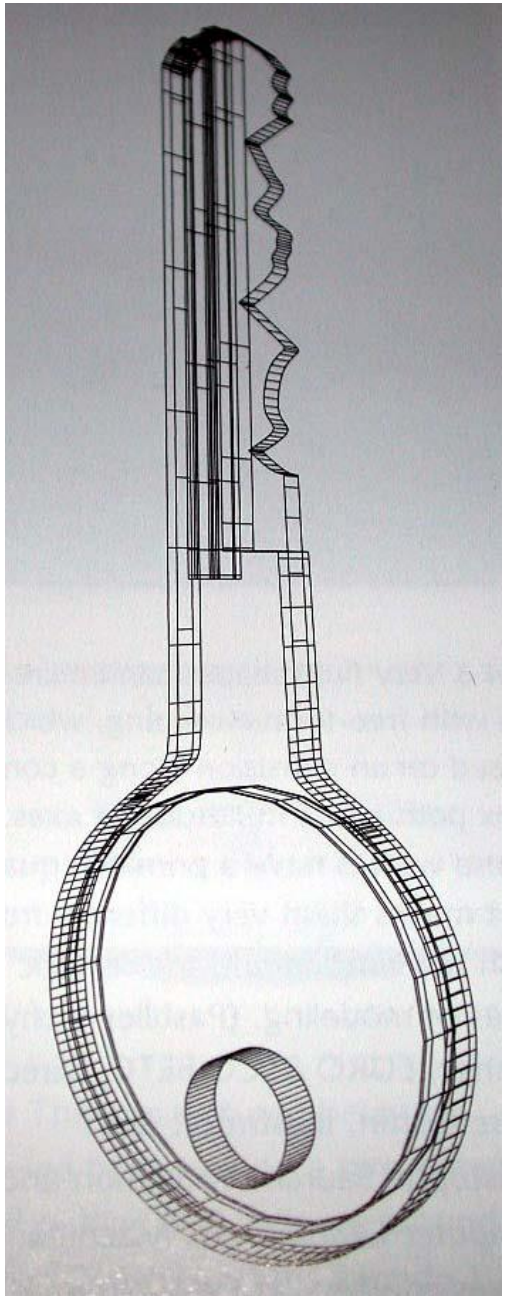
Revolution

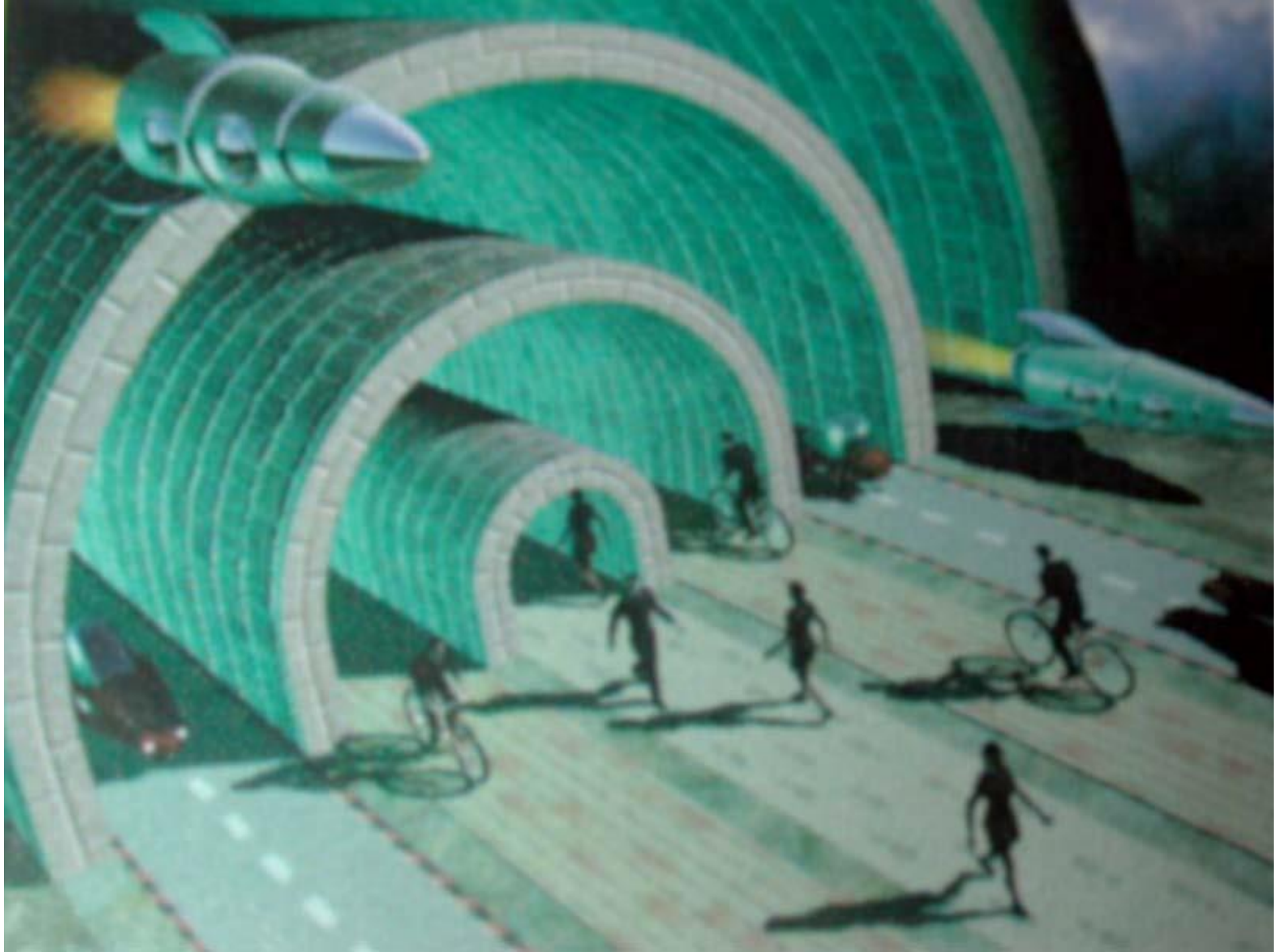
- Revolve a shape around an axis to create an object with rotational symmetry



Extrusion

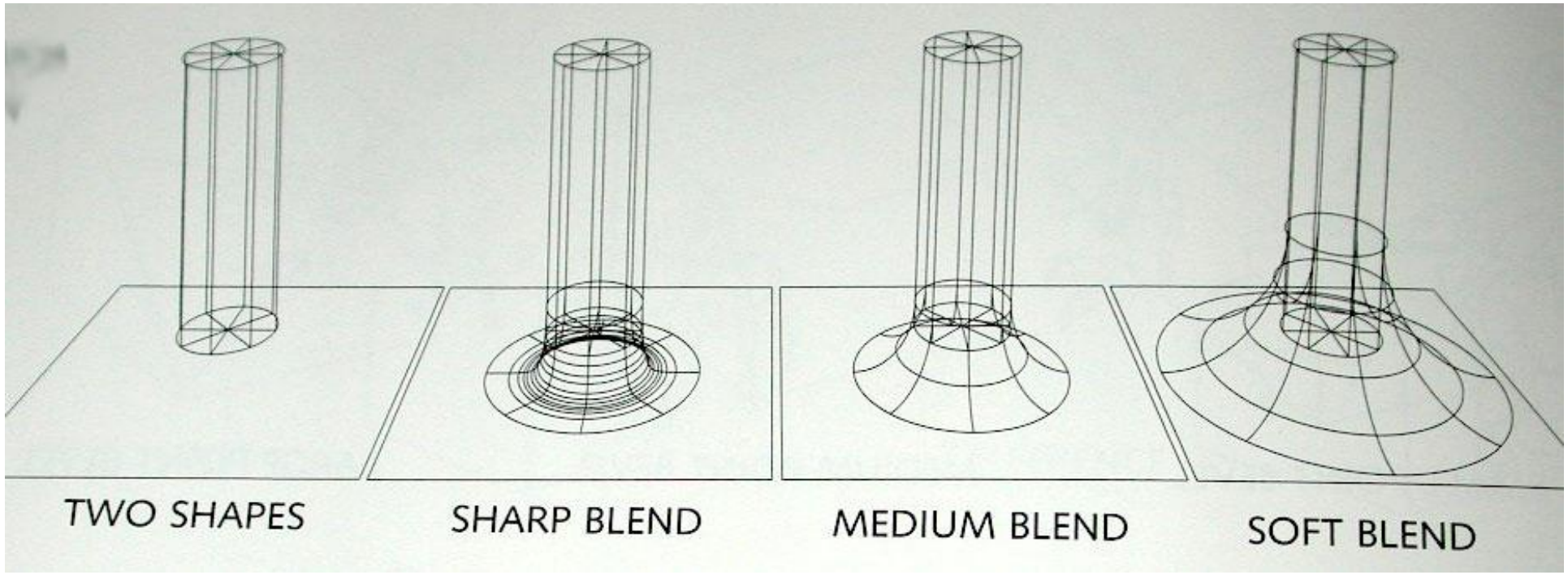
- Extrude: grow a 2D shape in the third dimension
- Shape is created with a (1D) b-spline curves
- Hole was created by subtracting a cylinder





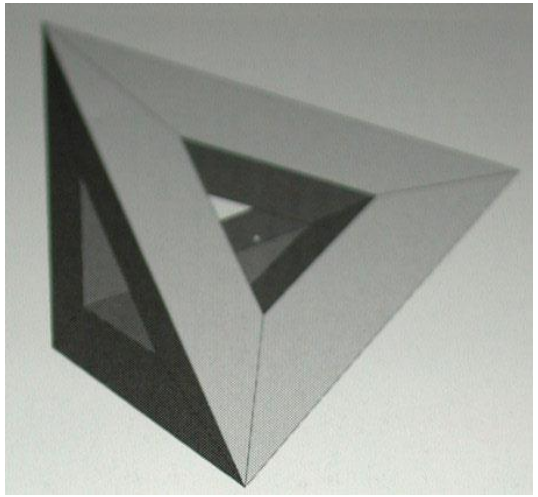
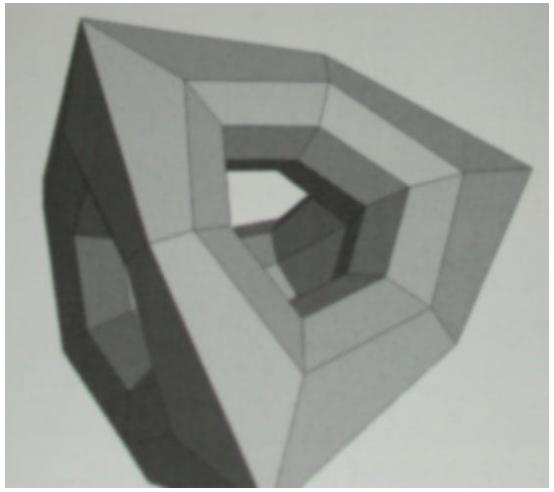
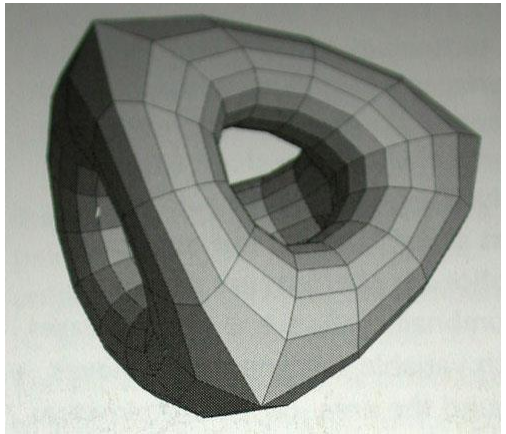
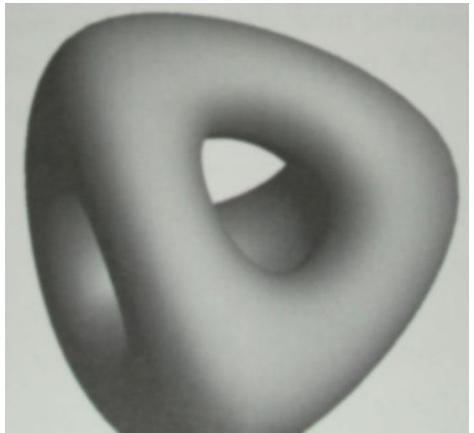
Joining Primitives

- Stitching, blending

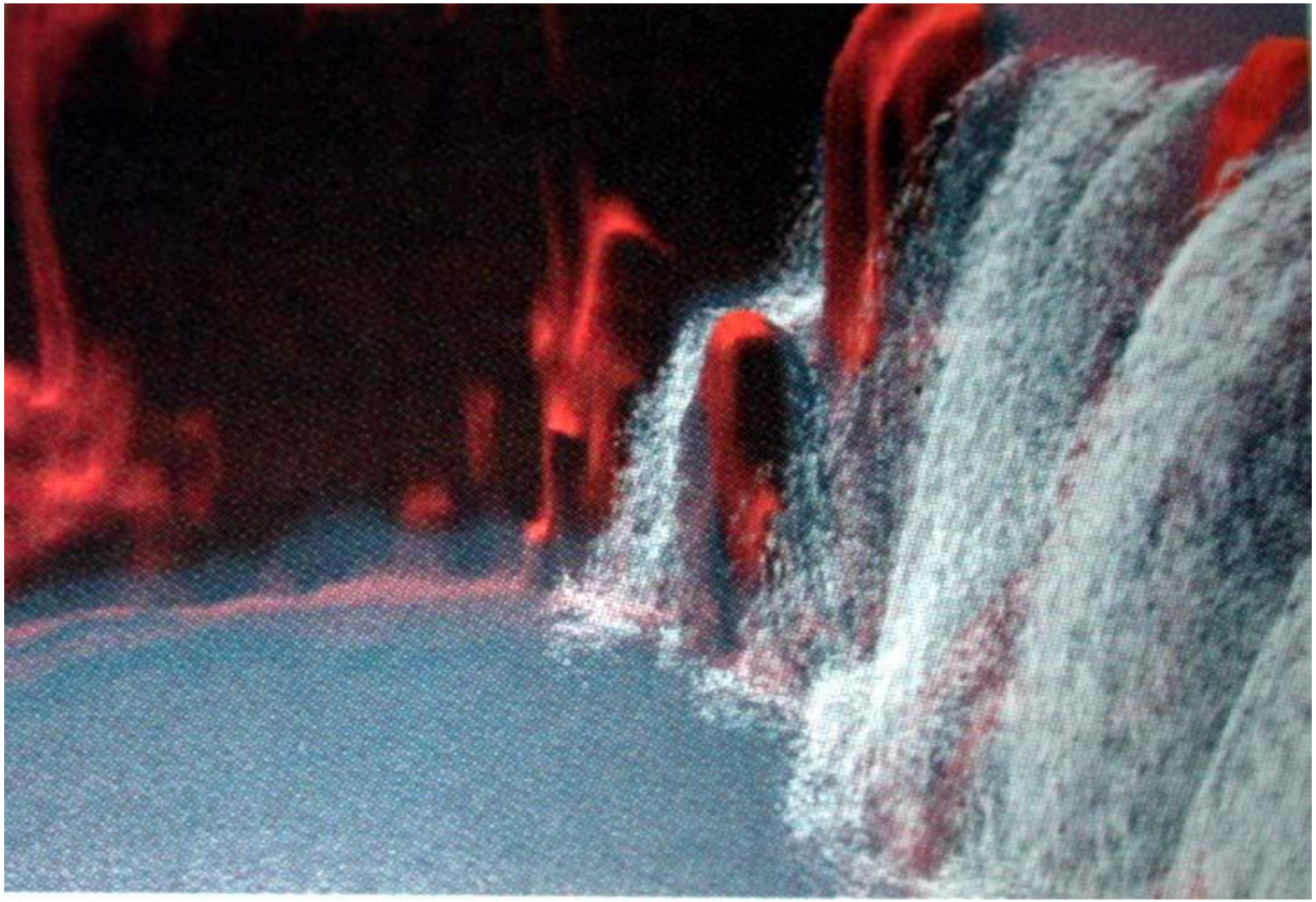


Subdivision Surfaces

- Can set level of polygon subdivision

Particles



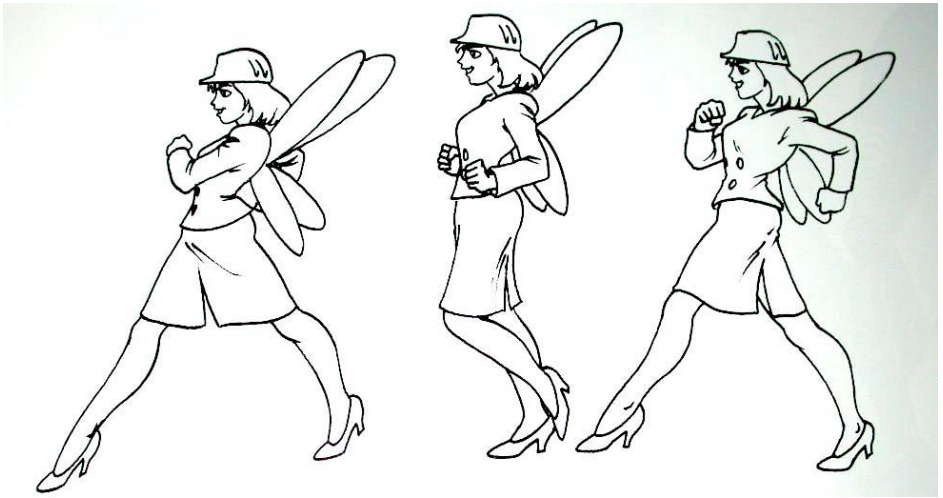
Motivation

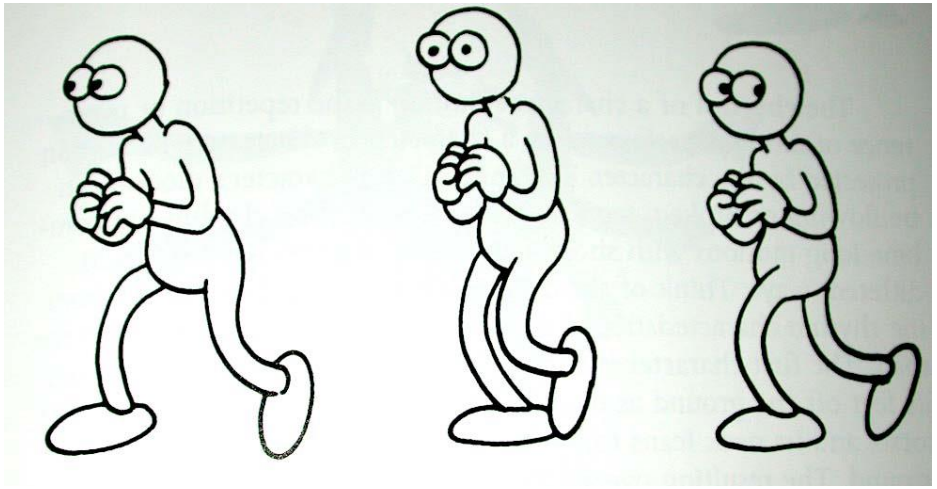
Source: XL games

Motivation

Source: Blizzard game, overwatch

Personality through Pose, Expression, Motion, Timing





유용한 사이트

1. https://www.youtube.com/watch?v=c4b9lCfSDQM

2. https://www.youtube.com/watch?v=sKCF8A3XGxQ&list=PLW3Zl3wyJwWOpdhYedlD-yCB7WQoHf-My