School of Mechanical and Manufacturing Engineering

MMAN2130 Design and Manufacturing

Week 2: Concept Sketching

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Reminder: CAD labs start this week

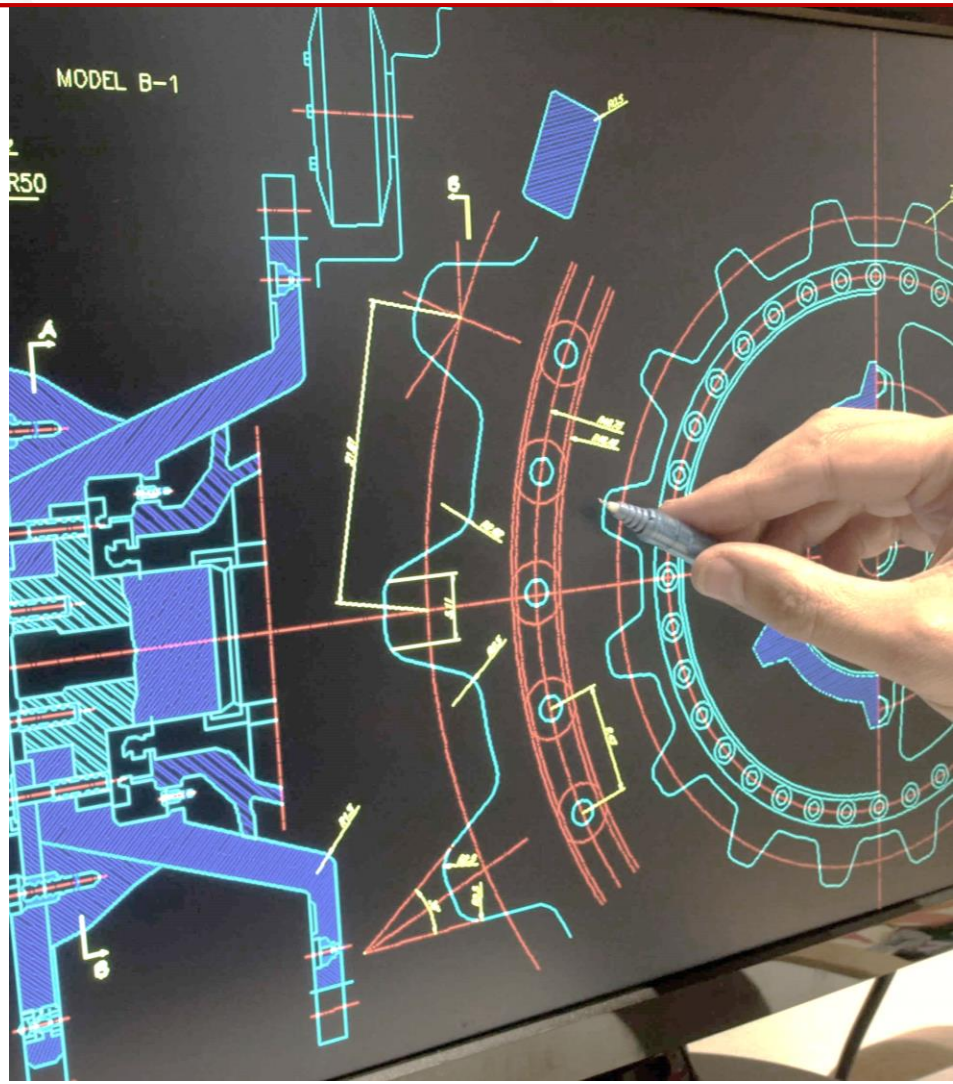
T2 2019 CAD Labs

Weeks 2 to 10 | Room 203, 204

Check which is your enrolled session

NO SWAPPING

Wednesday	1:00pm – 2.30pm OR
Wednesday	2:30pm – 4:00pm

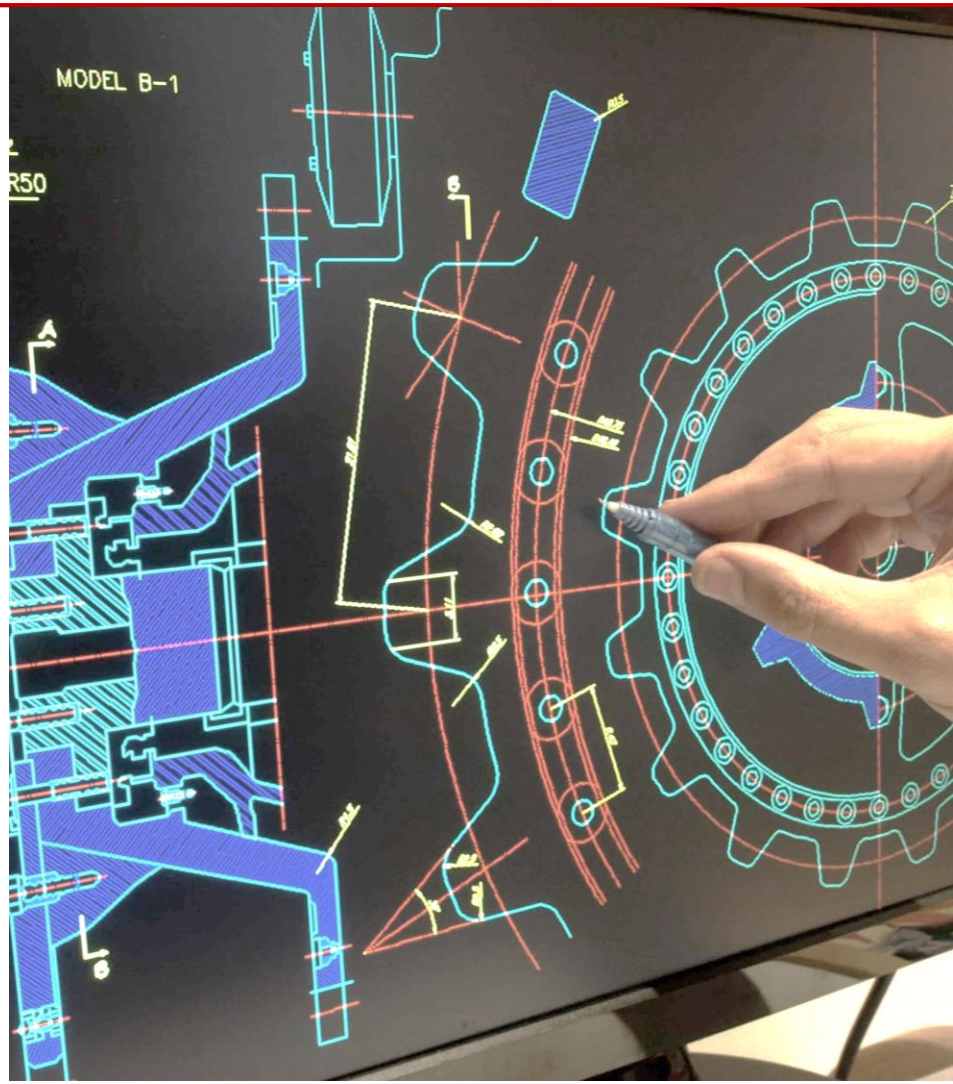


Reminder: CAD labs start this week

This week in the CAD lab you'll be going through the first handout which is an Intro to Solidworks and **basic sketching in Solidworks**. The lab will run with one demonstrator demonstrating on the main computer which is displayed on the big screens and the other demonstrators helping individual students around the room.

Ask questions:

It will be very important for the next labs.



Reminder: CAD labs start this week

Week 2

Pre-seminar Activities

- Concept Generation and Sketching

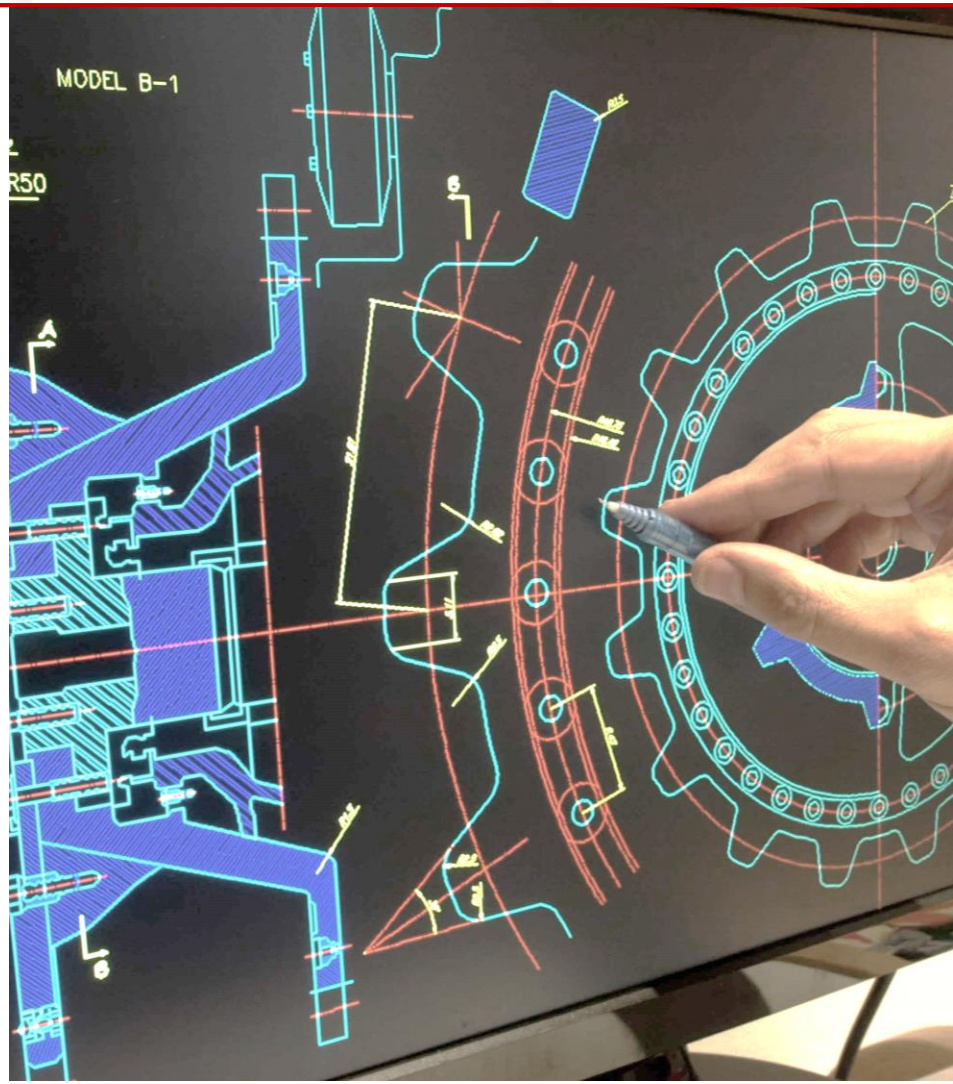
Seminar - "Design Conclave"

CAD Lab

- Handout 1 3.2MB PDF document
- Introduction to SolidWorks - Video
- Handout 2 2.3MB PDF document
- 2D Sketching (Concepts) - Video
- 2D Sketching (Example) - Video

Weekly Feedback

- Give us some feedback for this week's activities



Reminders for TAFE

- **Hair net or beret**

  if hair cannot be restrained

- **Beards**

  Cut short otherwise excluded!

- **Safety glasses**

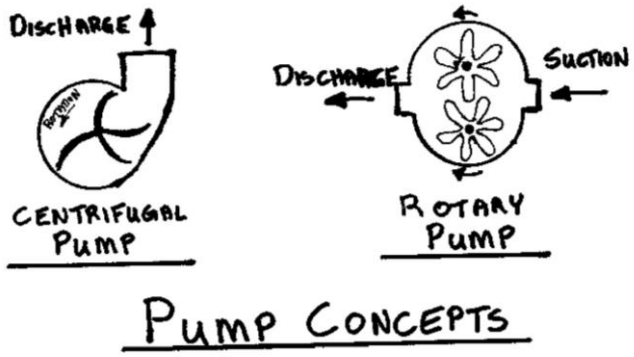
  conforming to Australian Standard AS1337

- **Enclosed leather upper boots/shoes, with steel toe cap** to Australian Standard AS 2210 part 1 – 2010

Concept Generation and Sketching

Aim:

Convey a lot of information in a very small amount of time.



Concept Generation and Sketching

- An outline of possible solution based on Product Design/Functional Specification (PDS)
  - Splits the problem up into smaller categories
- Two stages:
  - **Idea generation**
  - **Concept sketching**

Concept Generation | PDS Evaluation Matrix

- Which ones are important for representing PDS?

Feature Categories	Product Features	Concept 1	Concept 2	Concept 3
Performance	▪Lower a load of 2.5 tonnes ▪Draw in a cable at a rate of 0.25 m/s			
Dimensions	▪Envelop dimensions (H, W)			
Cost	▪End user cost < $5000 ▪Manufacturing cost < $2500			
Standards	▪AS5000 part 99 Motor performance ▪AS6105 for insulation			
Product Life	▪On the market for 10 years ▪Spare parts for further 5 years			

Use a suitable Concept Sketching Technique

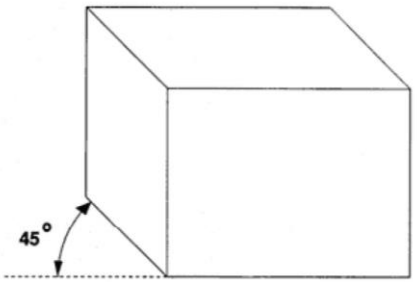
- Is 2D sketch enough?
- Do you need 3D sketch?
- Do you need auxiliary views?
  - E.g. sectional views

Use a suitable Concept Sketching Technique

- Oblique
- Isometric
- Axonometric
- Perspective
  - 1, 2, 3 Point

Concept Sketching Techniques: Oblique

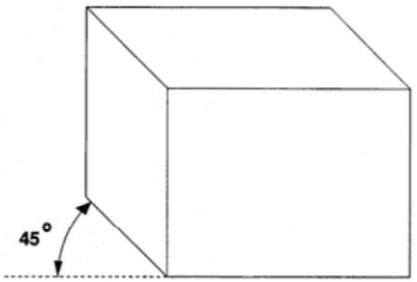
- Drawn in two dimensions, i.e. flat.
- The other sides are drawn in at 45 degrees.
- Instead of drawing the sides full size they are only drawn with half the depth.
- Creates ‘forced depth’ adding an element object.



Concept Sketching Techniques: Oblique

Pros:

- Given a flat elevation we can easily create volume quickly.
- Functional (quick & easy), easy to learn, shows one face in detail.
- Helps during very early stages of concept thought p
- Good for dimensioning.



Cons:

- Crude, looks very unconvincing to the eye.
- Not really a ‘3D’ system but a 2 dimensional view of an object with forced depth.
- Only shows one face in an sort of detail.

Concept Sketching Techniques: Oblique

Do it yourself exercise:

1. Draw flat 2D shape
2. Extrude lines at 45 deg
3. Connect the lines parallel
4. Shade & ground

Concept Sketching Techniques: Oblique

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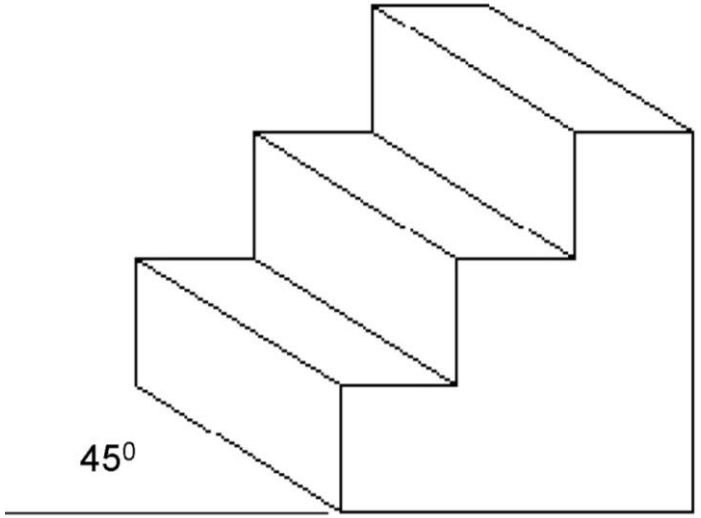
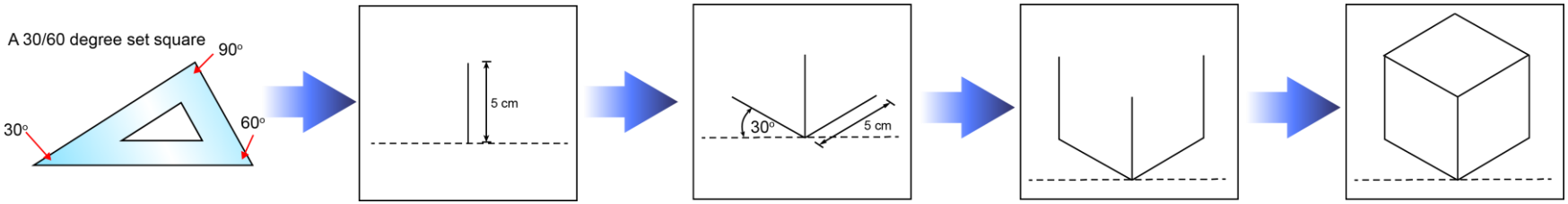


Concept Sketching Techniques: Isometric

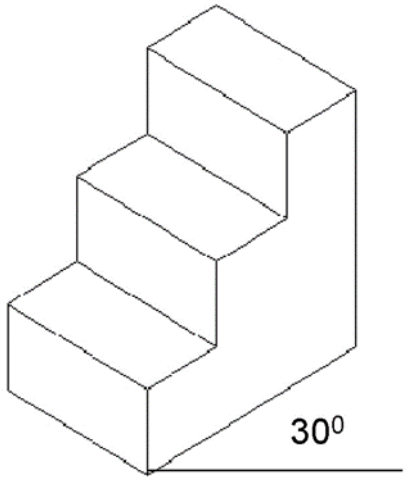
- Constructing a 3 dimensional object without using perspective.
- All lengths drawn at 30 degrees using their true length.



Concept Sketching Techniques: Isometric

Pros

- Quick and easy
- Can use grid paper to make it easier
- Shows two faces in great detail.



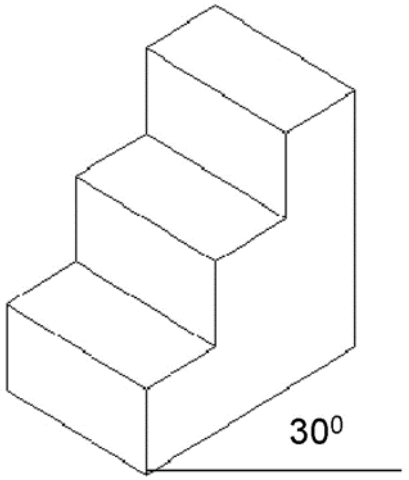
Cons

- Looks unrealistic

Concept Sketching Techniques: Isometric

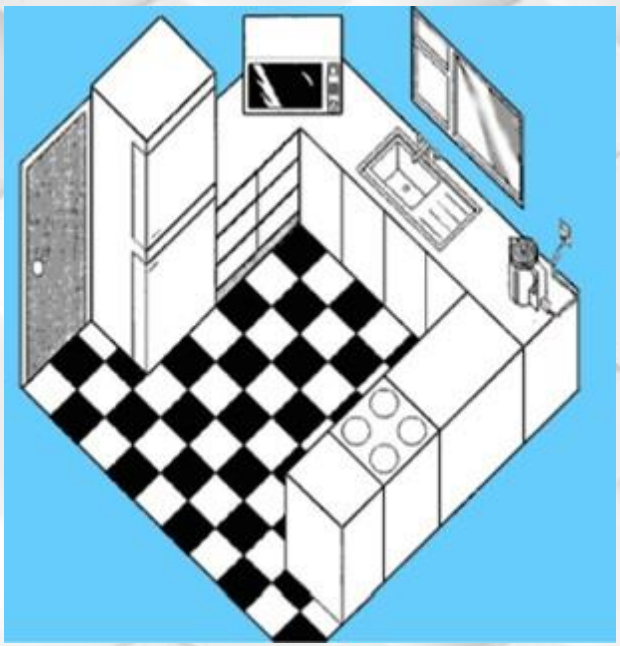
Do it yourself exercise:

1. Draw vertical lines
2. Connect them at 30 degrees
3. Shade & ground



Concept Sketching Techniques: Axonometric

- Take a plan (top down) view and turn it 45^{o}
- Add depth vertically



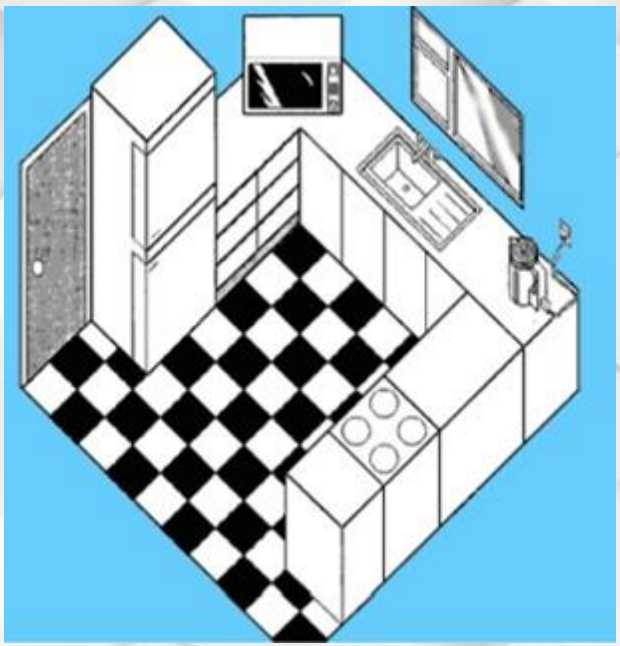
Concept Sketching Techniques: Axonometric

Pros:

- Can create 3D from 2D plans via vertical extrusion.
- Dimensionally correct (can build from this sketch).

Cons:

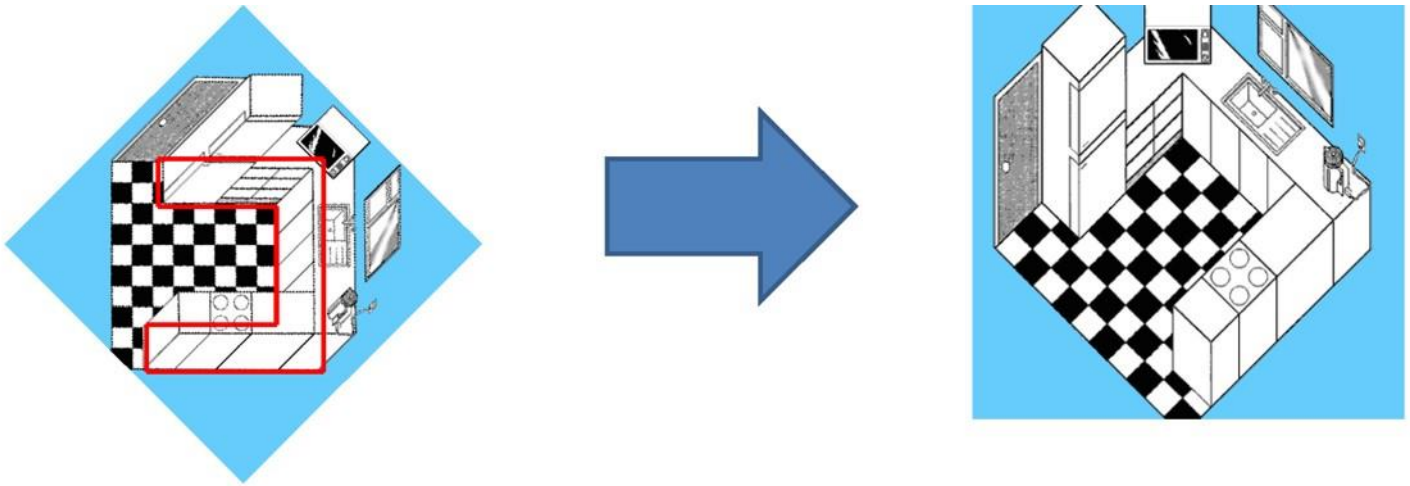
- Appears warped/visually confusing.
- Not aesthetically pleasing.



Concept Sketching Techniques: Axonometric

Do it yourself exercise:

1. Draw top down plan
2. Turn page 45 deg
3. Extrude parts vertically by y



Concept Sketching Techniques: Perspective

Pros:

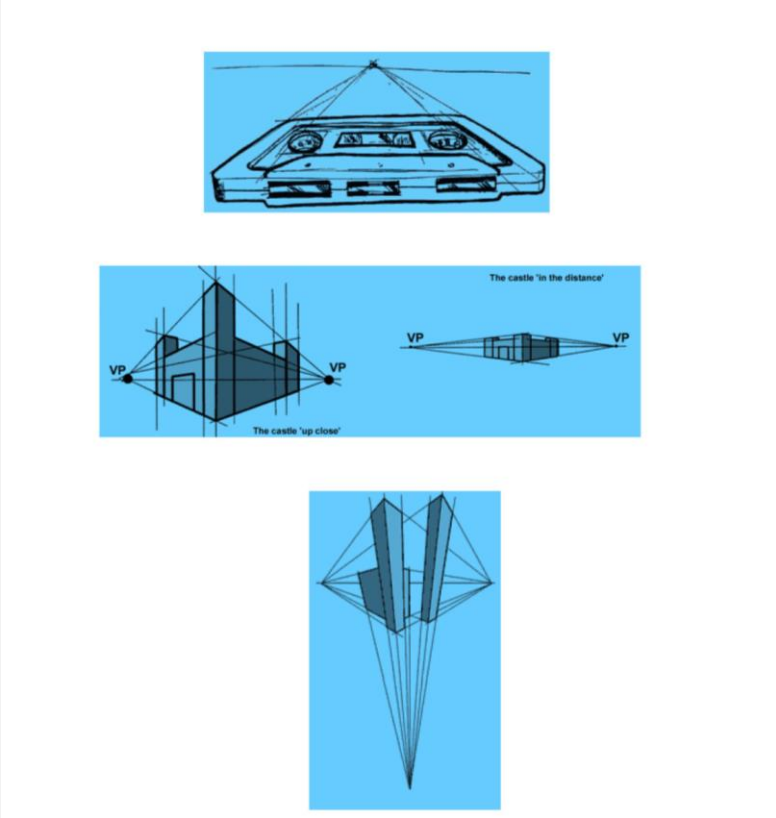
- Super realistic
- Great for paintings and portraits
- Creating realistic environments

Cons:

- Can be complex to setup
- Usally good for complex environments
- Not typically dimensionally correct

Notes:

- Futurstic feel
- One point: to focus on a realistic object
- Two point: to focus on a scene
- Three point: for above or below shots

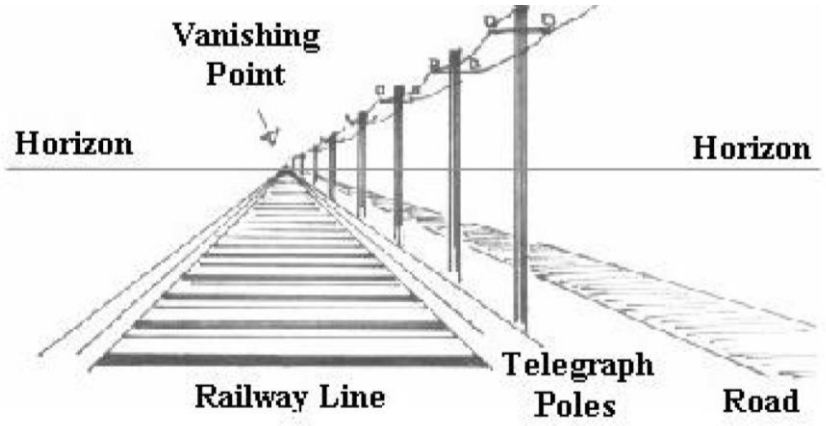


Concept Sketching Techniques: Perspective

Single Point Perspective

Do it yourself exercise:

1. Draw Horizon
2. Pick vanishing point
3. Draw lines of railway & road
4. Draw vertical telegraph pole lines
5. Fill in the goodness



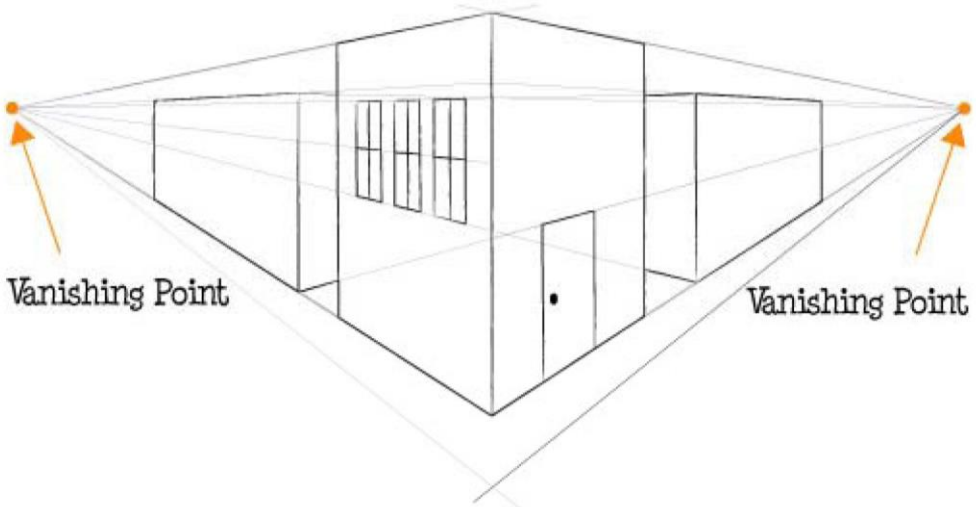
Concept Sketching Techniques: Perspective

Two Point Perspective

Concept Sketching Techniques: Perspective

Two Point Perspective

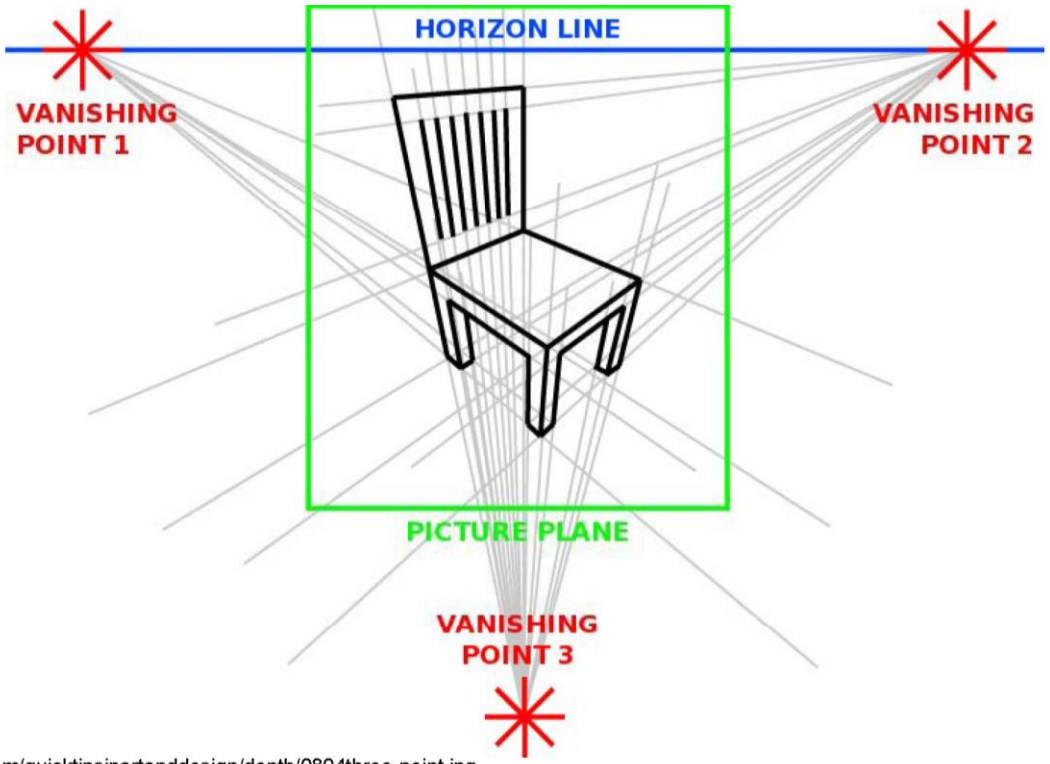
Do it yourself exercise:



http://makingartfun.com/images/two-point-perspective1.jpg

Concept Sketching Techniques: Perspective

Three Point Perspective

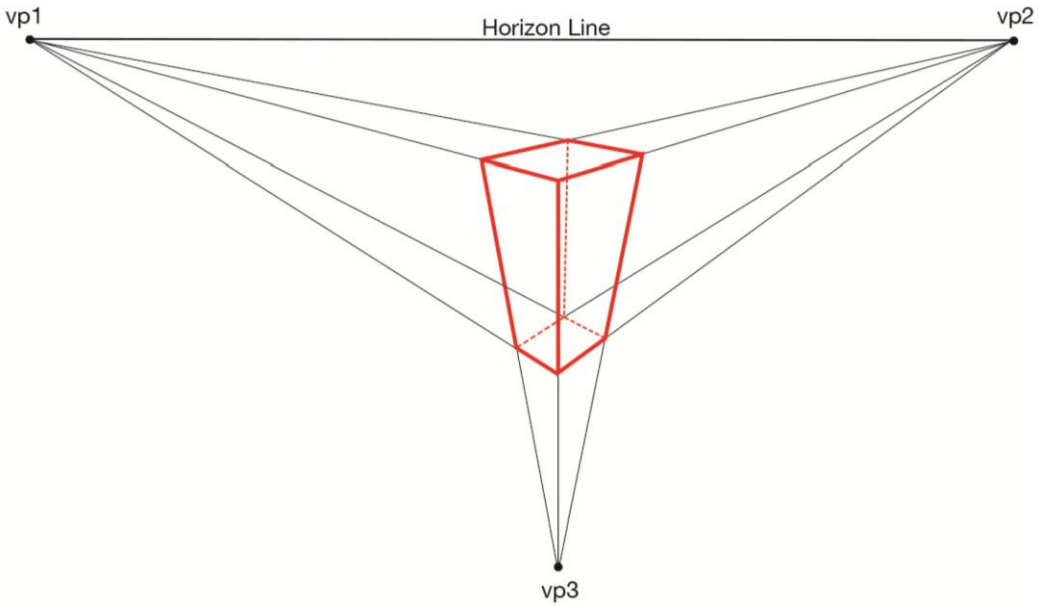


http://articles.katorlegaz.com/quicktipsinartanddesign/depth/0804three-point.jpg

Concept Sketching Techniques: Perspective

Three Point Perspective

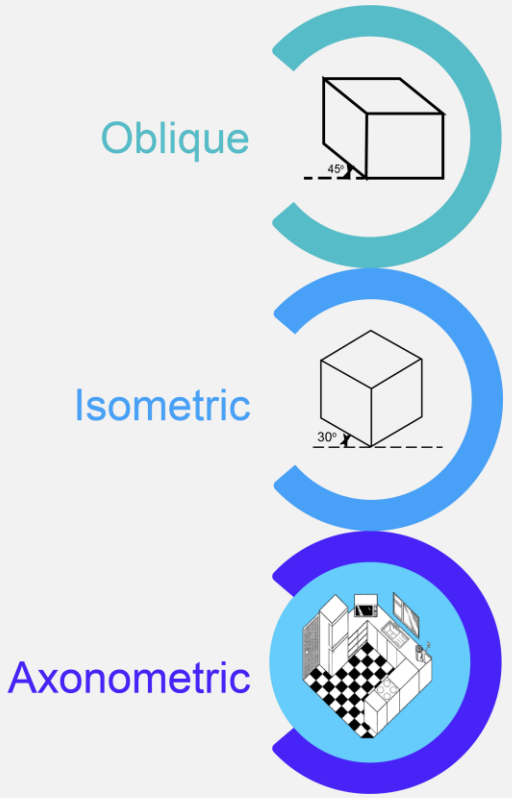
Do it yourself exercise:



Concept Sketching Techniques

When to use what?

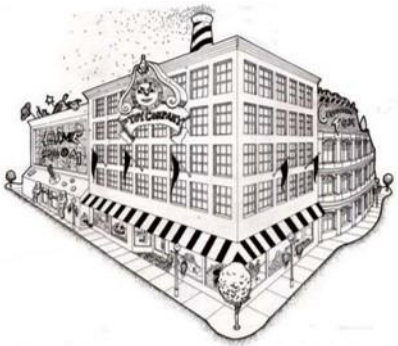
- If someone has to build it.
- Shows proper proportions.
- Oblique probably the easiest (bang for buck)
- Isometric if two faces are of interest/unique.
- Axonometric if you have a plan to go off.



Concept Sketching Techniques: Perspective

When to use what?

- Artworks (portraits and scenes)
- Good for noisy/complex environments.



Putting Things Together