EDU[**CAD**]TION **STUDY GUIDE**

How to Add and Subtract 3D Features in CAD

Chapter 1, Lesson 10

SendCutSend

Sketching on a Surface

• Instead of starting on an origin plane, you can create sketches directly on the surface of an existing body. This allows you to add or subtract features exactly where they are needed.

• As with all sketches, it's important to fully define your geometry with constraints and dimensions until it turns black (robust sketch).

• In the example, two circles were drawn and constrained with equal, angle, and diameter rules (12 mm) (see Figure 1.1).

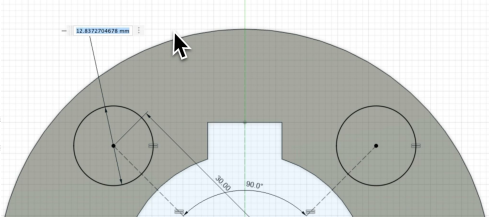

Figure 1.1

Join Operation

- The '**Join**' option in the extrude menu '**Adds**' material to an existing body.

- After finishing a sketch,select a profile, apply dimension (e.g., 5 mm), and choose '**Join**' (see Figure 1.2) The new feature merges seamlessly with the original body.

- In the browser tree, the entire object highlights as one body, confirming it has not created a separate part (see Figure 1.3) This is useful for pins, bosses, or added thickness.

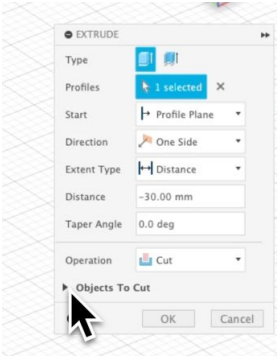

Figure 1.2

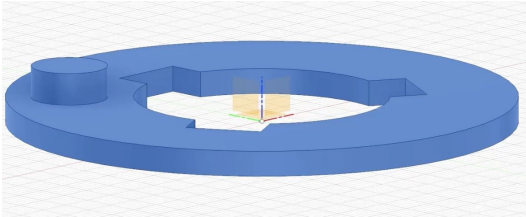

Figure 1.3

Cut Operation

• The '**Cut**' option '**Subtracts**' material from an existing body. By extruding a sketch through the part in the negative direction, the profile turns red to indicate material removal (see Figure 1.4). Instead of selecting 'Join', you'll select 'Cut' in the extrude window (see Figure 1.5)

• If multiple bodies exist, you can apply cuts selectively by choosing which '**Body**' to cut in the extrude window (see Figure 1.5).

• In the example, the second circle from the sketch was extruded downward to create a hole. This transforms the flat washer into a more complex, functional part.

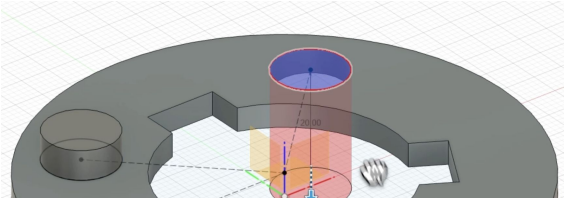

Figure 1.4

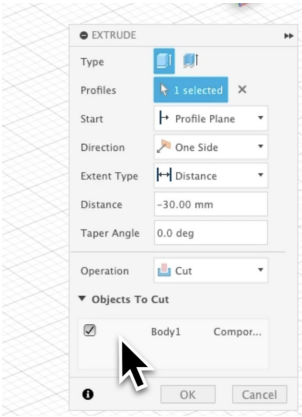

Figure 1.5

Summary

Adding dimension in CAD moves your designs beyond flat sketches into functional 3D parts. By creating sketches directly on surfaces and using the Join and Cut options in the extrude tool, you can either add or remove material as needed. **Join** merges new features into an existing body, while **Cut** removes material to create holes or pockets. Together, these tools give you the ability to build more complex, realistic parts that are ready for real-world applications.

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