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Designing Approximate Spur Gear in CATIA V5

(Method 3 of 4: import data from .xls(x) or .txt file)

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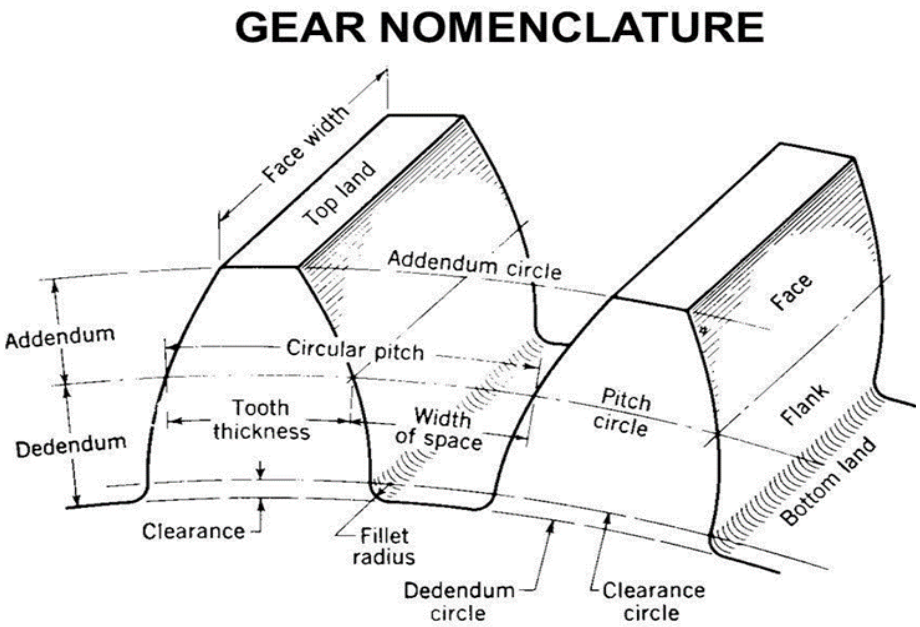
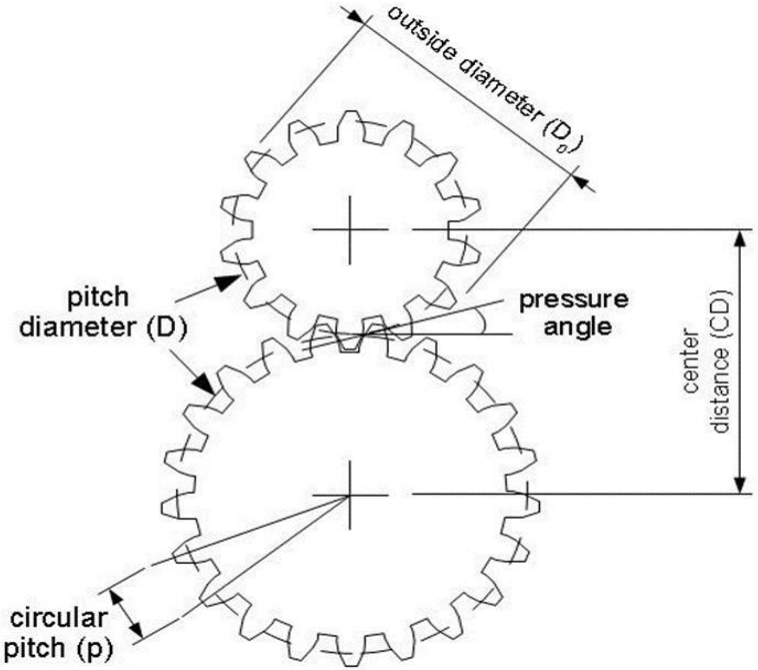
- This is step by step guide of how to create an *approximate* involute spur gear using CATIA V5.
- This document assumes that you know basic spur gear geometry.





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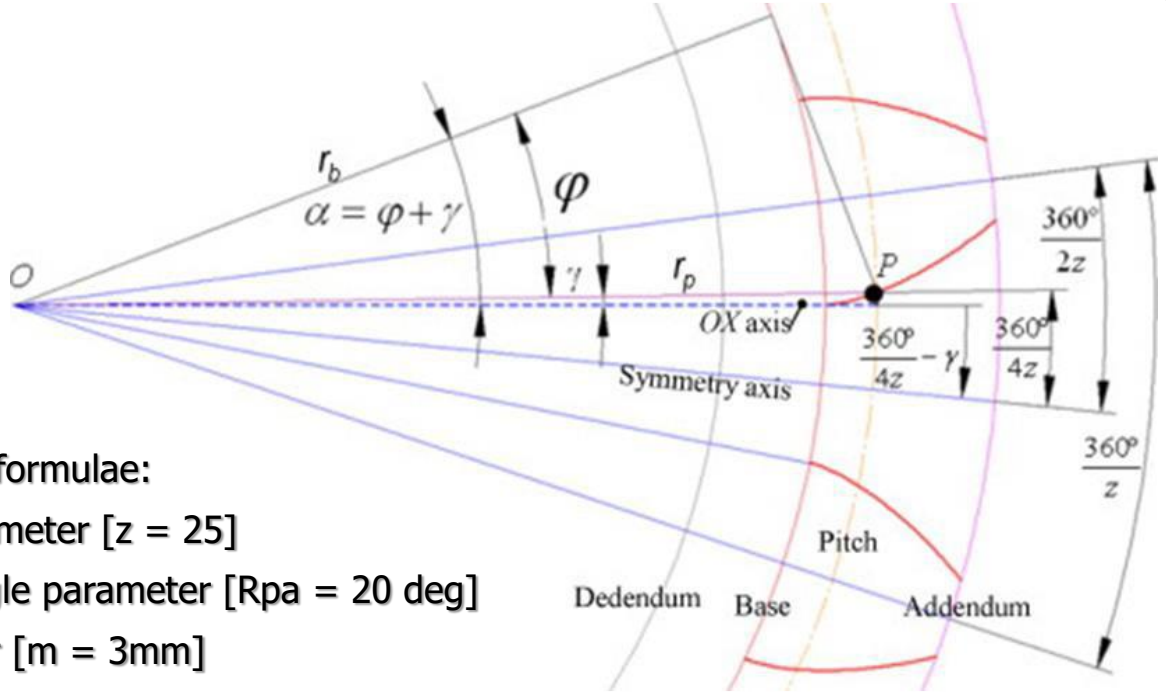

Some basic nomenclature and formulae:

z -number of teeth // real parameter [z = 25]

Rpa –ref. pressure angle // angle parameter [Rpa = 20 deg]

m -module // length parameter [m = 3mm]

Rp -Pitch circle radius // length parameter [Rp = (z*m)/2]

Rb -Base cylinder radius // length parameter [Rb = 0.94*Rp]

Ra -Addendum circle radius // length parameter [Ra = Rp+m]

Rd -Dedendum circle radius // length parameter [Rd = Rp-1.25*m]

s –symmetry angle // sketch constraint [s = 90/z*1 deg]

tr –tooth radius at dedendum circle // sketch constraint [0.38*m]

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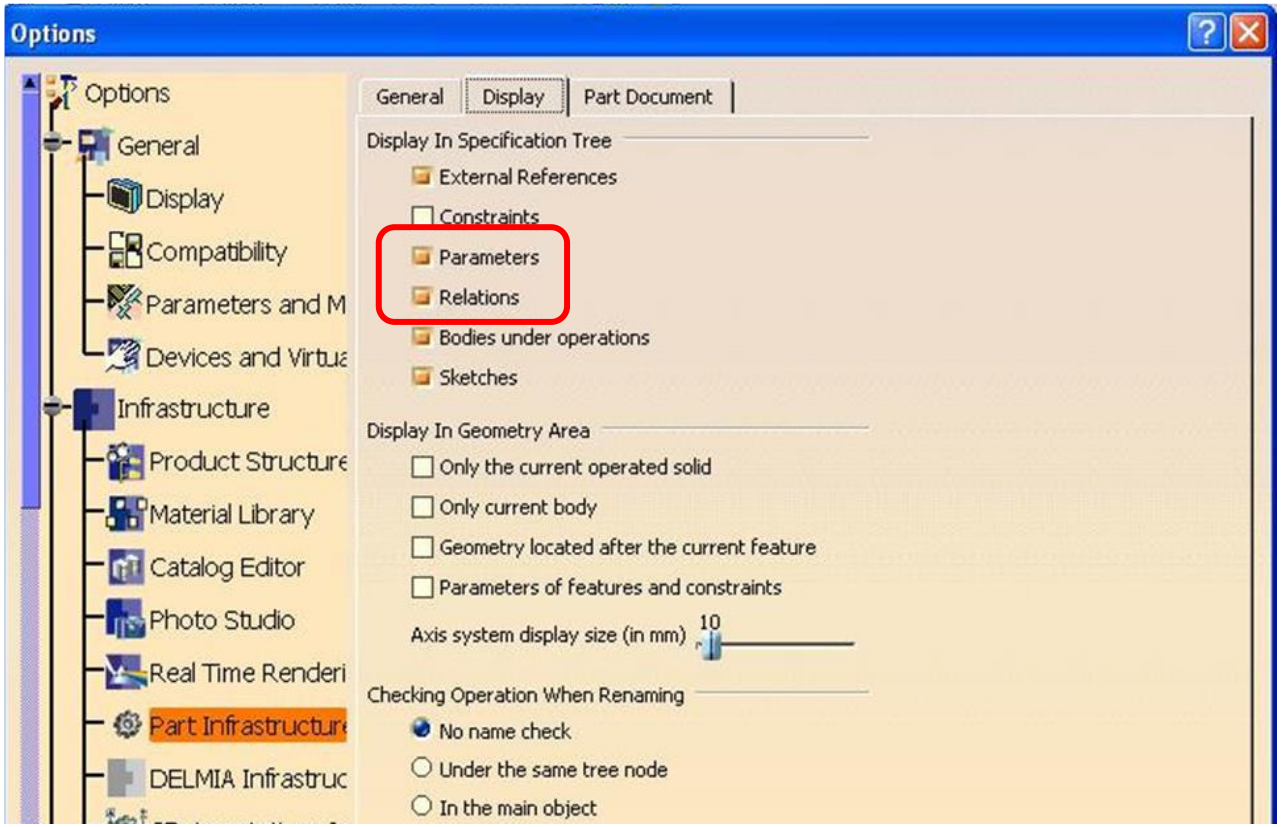
- When you start CATIA, go to TOOLS->OPTIONS->Infrastructure->
- Part Infrastructure and in Display select “Parameters” and “Relations”.



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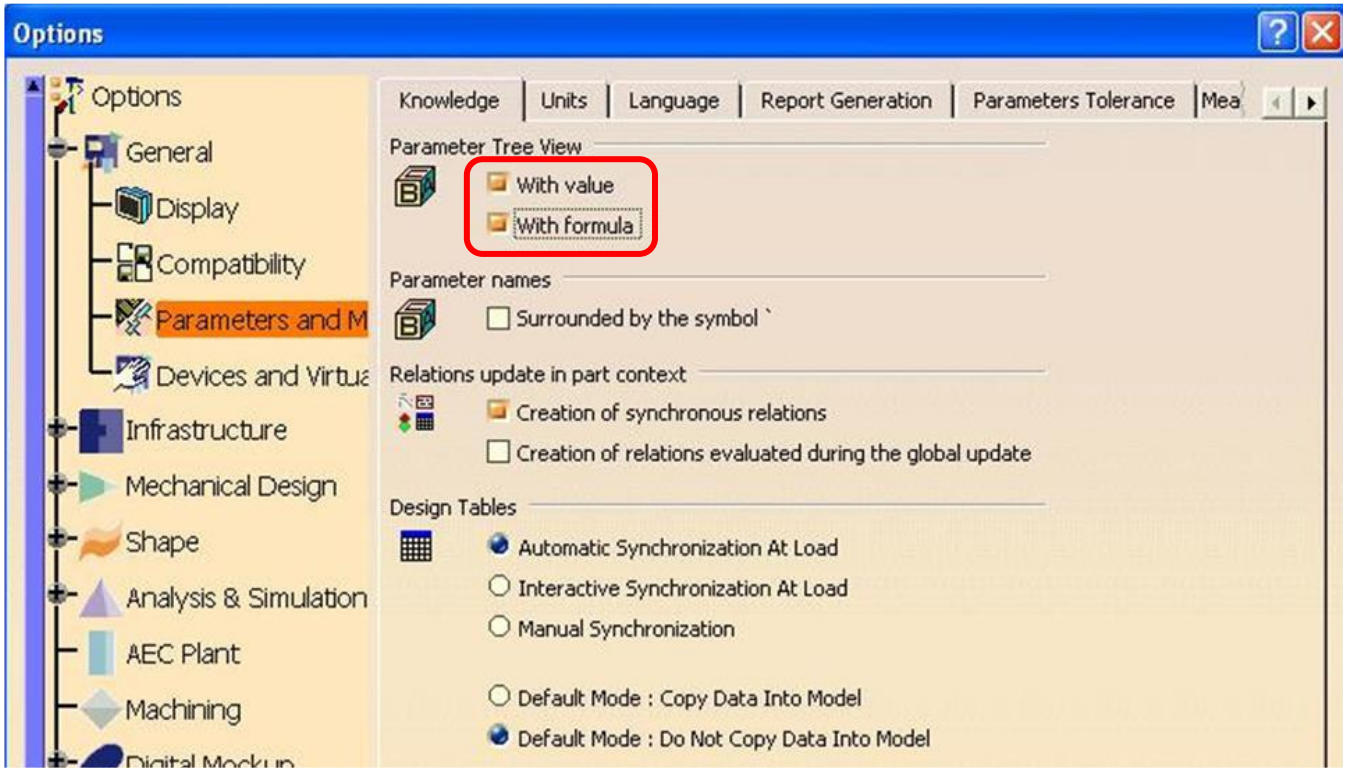
- Then in Options->General in Parameters and Measures select “With Value” and “With Formula” in Parameters Tree View.



Approach 1: Modify the existing Spur Gear template by importing data from .xls(x) or .txt file

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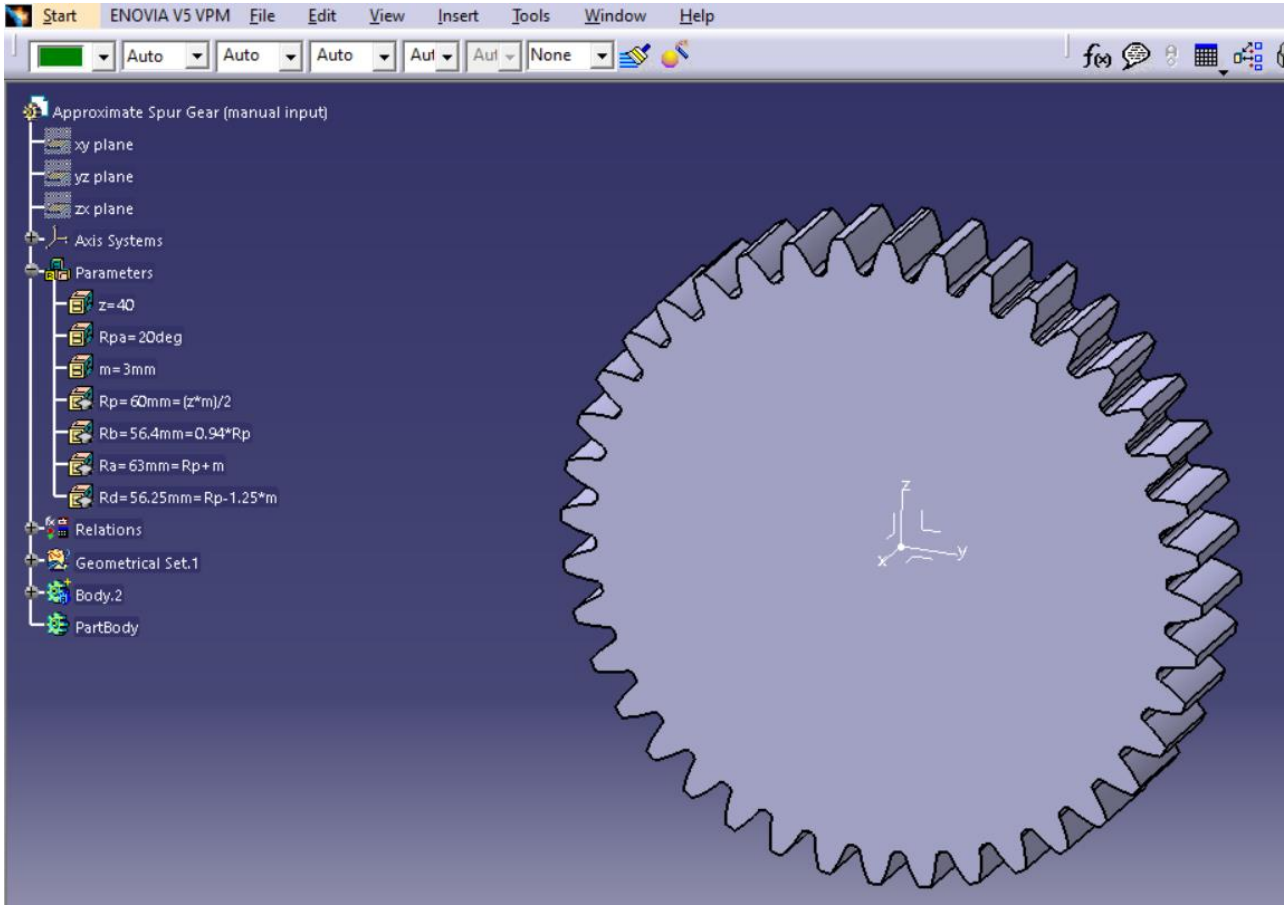
- Open the existing Spur Gear template.



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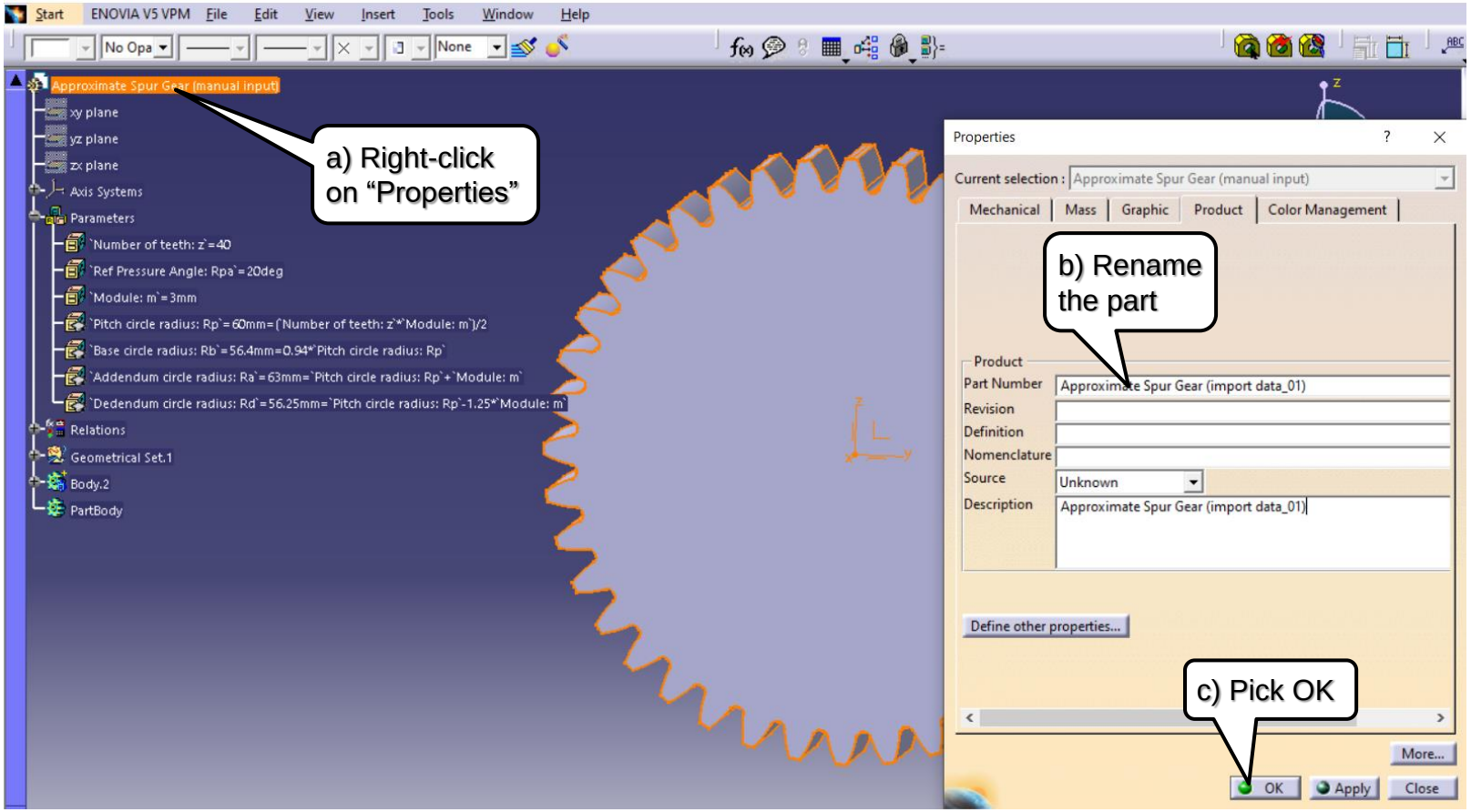
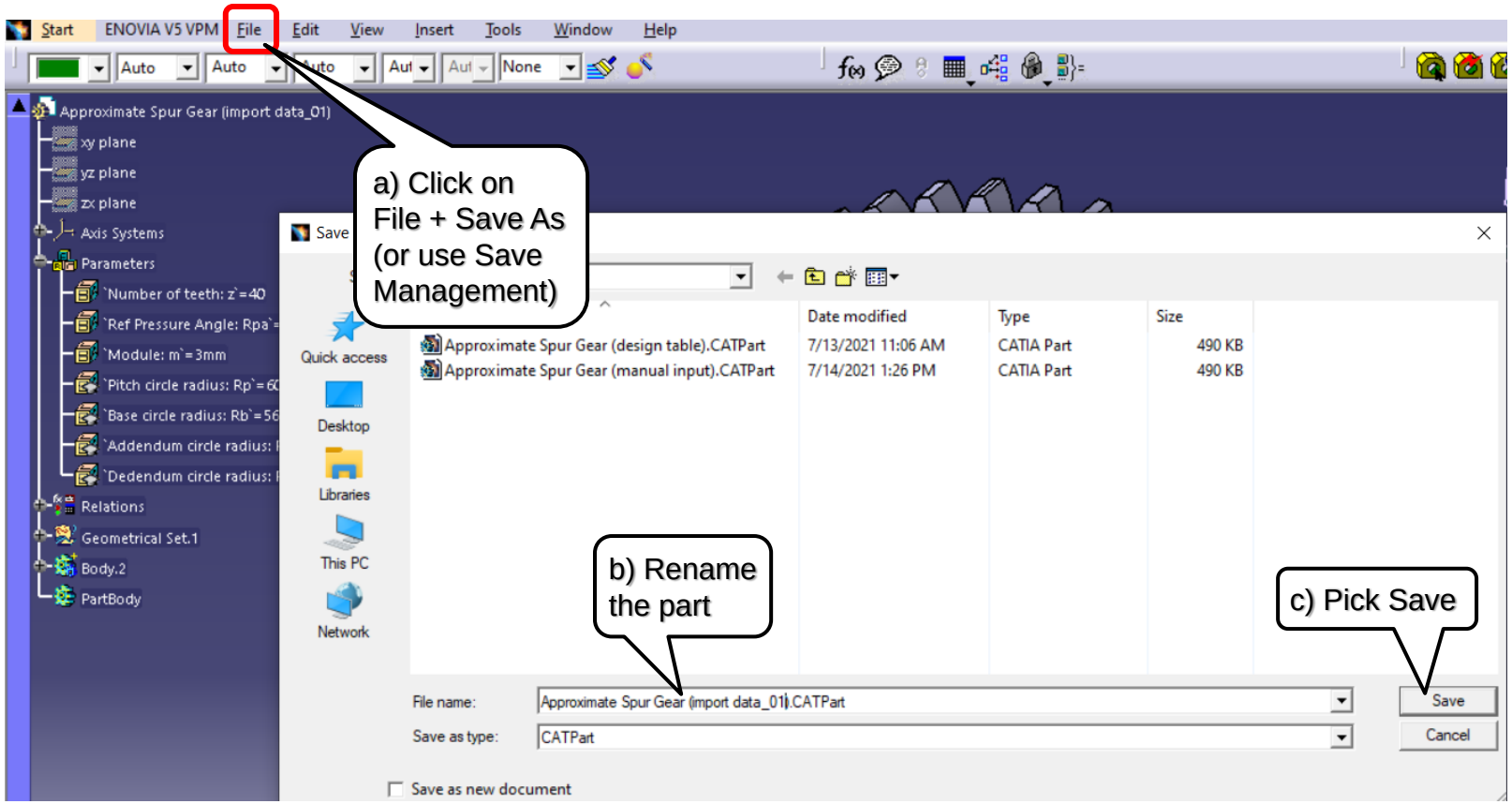
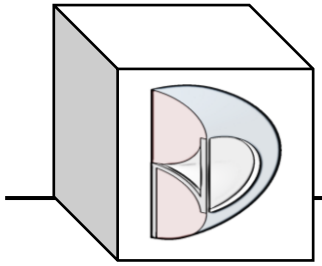
- Rename the Spur Gear template so as to not overwrite it.



BND TechSource

- Rename the Spur Gear template so as to not overwrite it.





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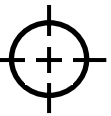

Understanding the .xls(x) and .txt files

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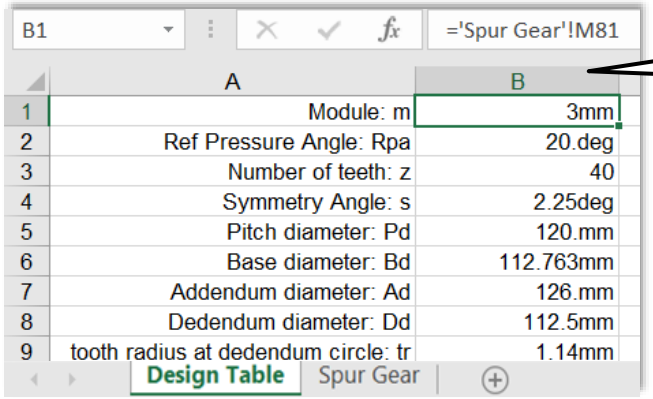
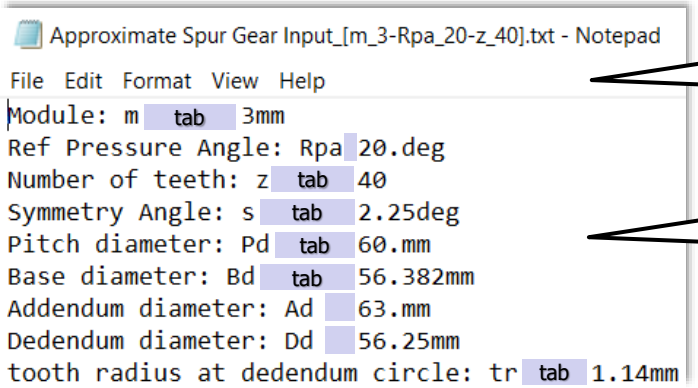
- Open the MS Excel Spur Gear spreadsheet to the Design Table worksheet.



	A	B
1	Module: m	3mm
2	Ref Pressure Angle: Rpa	20.deg
3	Number of teeth: z	40
4	Symmetry Angle: s	2.25deg
5	Pitch diameter: Pd	120.mm
6	Base diameter: Bd	112.763mm
7	Addendum diameter: Ad	126.mm
8	Dedendum diameter: Dd	112.5mm
9	tooth radius at dedendum circle: tr	1.14mm

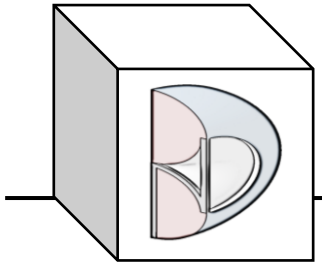
This is the .xlsx file we will import.

- Copy and paste this data into a .txt file (i.e. using Notepad).



This is the .txt file we will import.

Notice there **must** be a tab between data.



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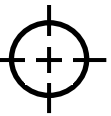

Import the .xls(x) or .txt file to the CATPart

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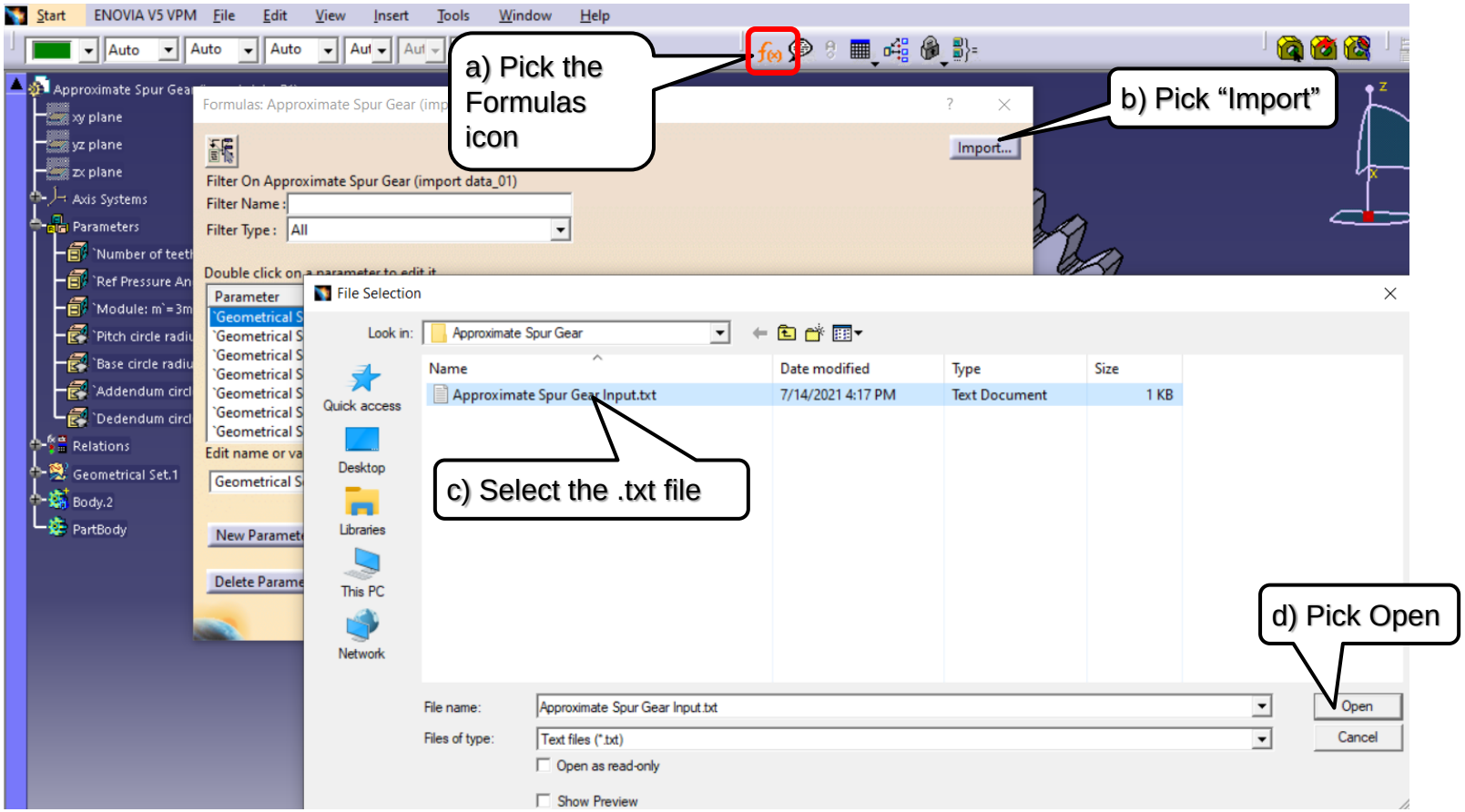
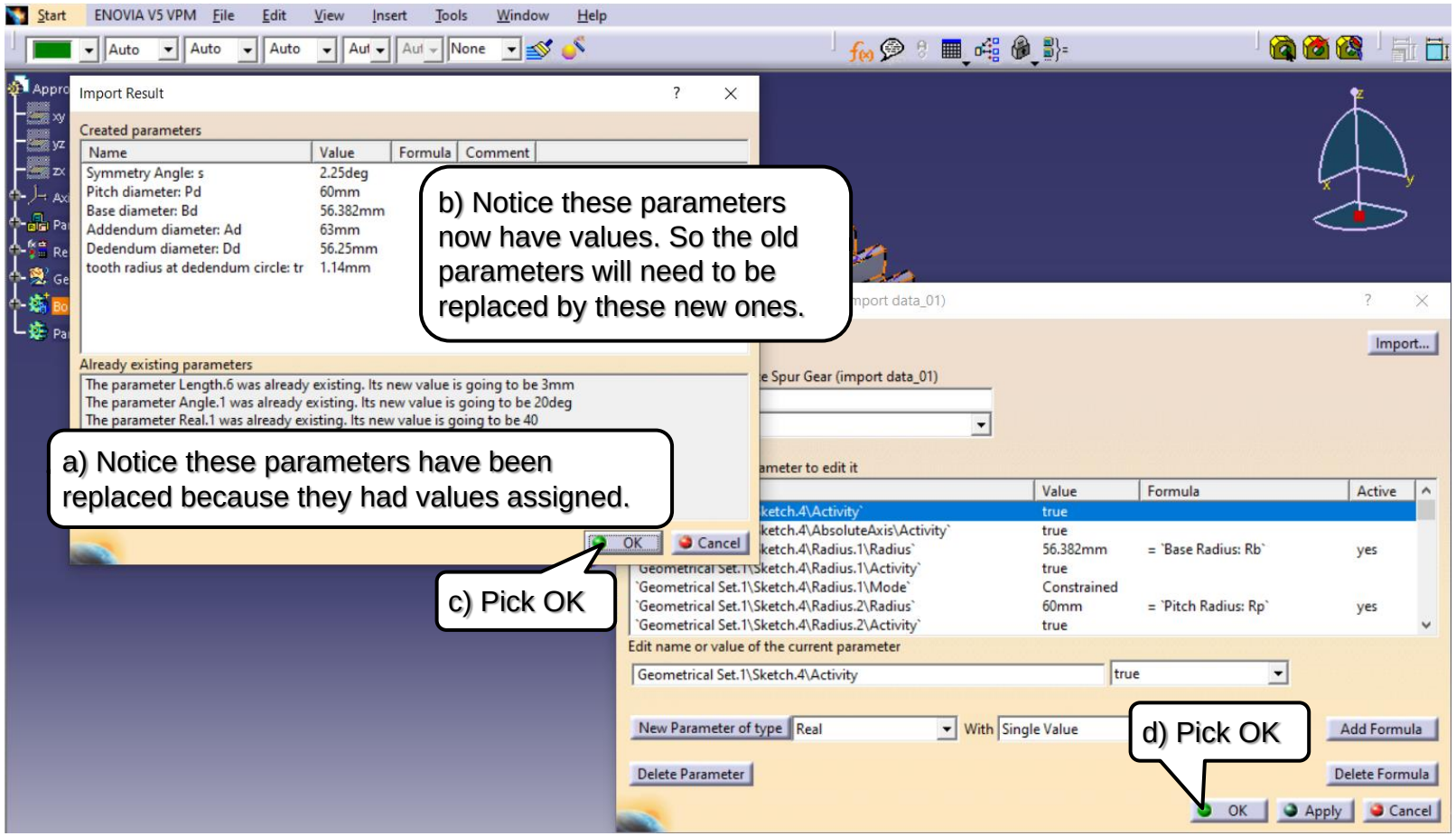
- Connect the .xls(x) or .txt file to the CATPart.



BND TechSource

- Connect the .xls(x) or .txt file to the CATPart.



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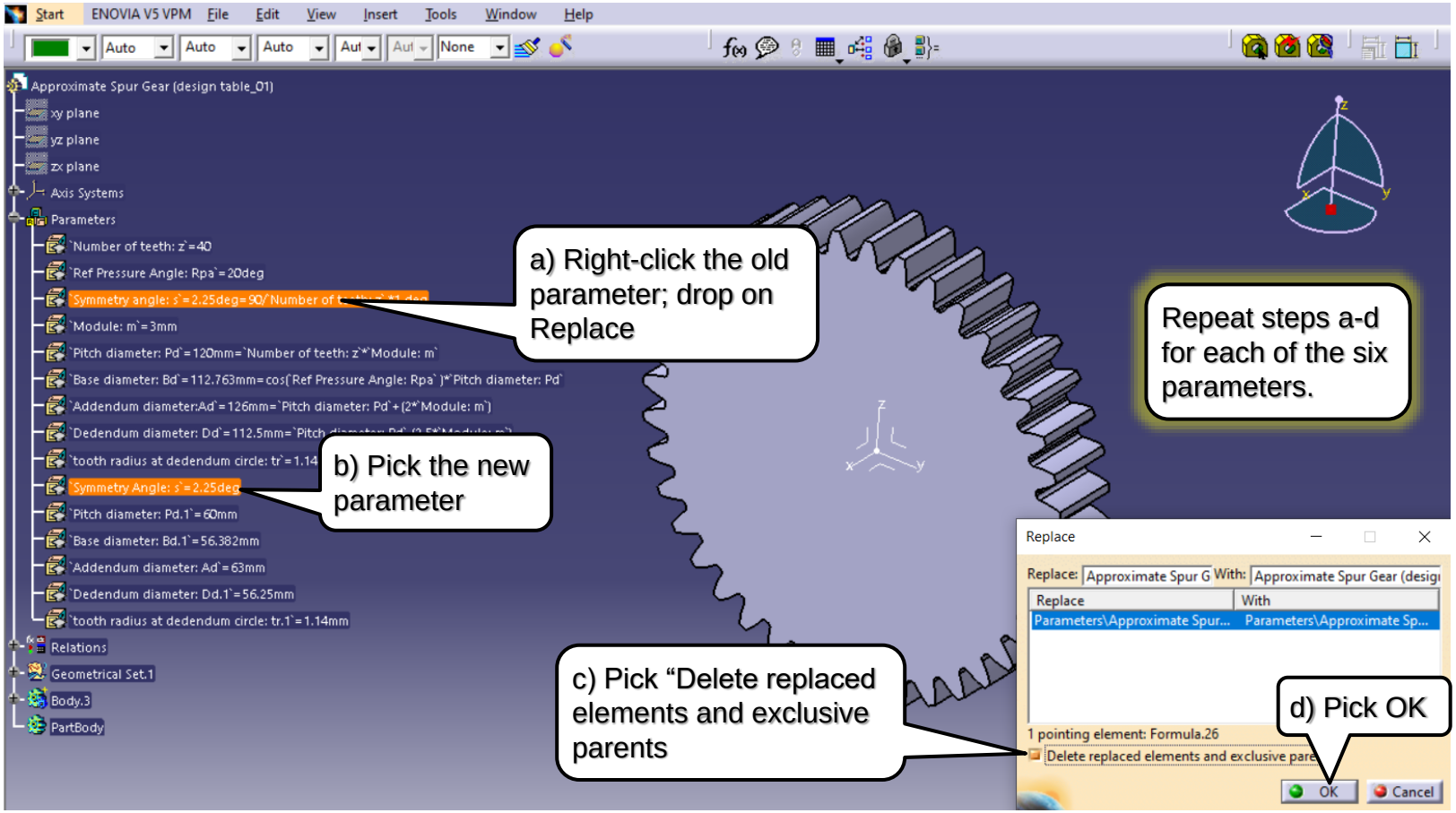
- Replace (and delete original) all the old parameters with the new ones.



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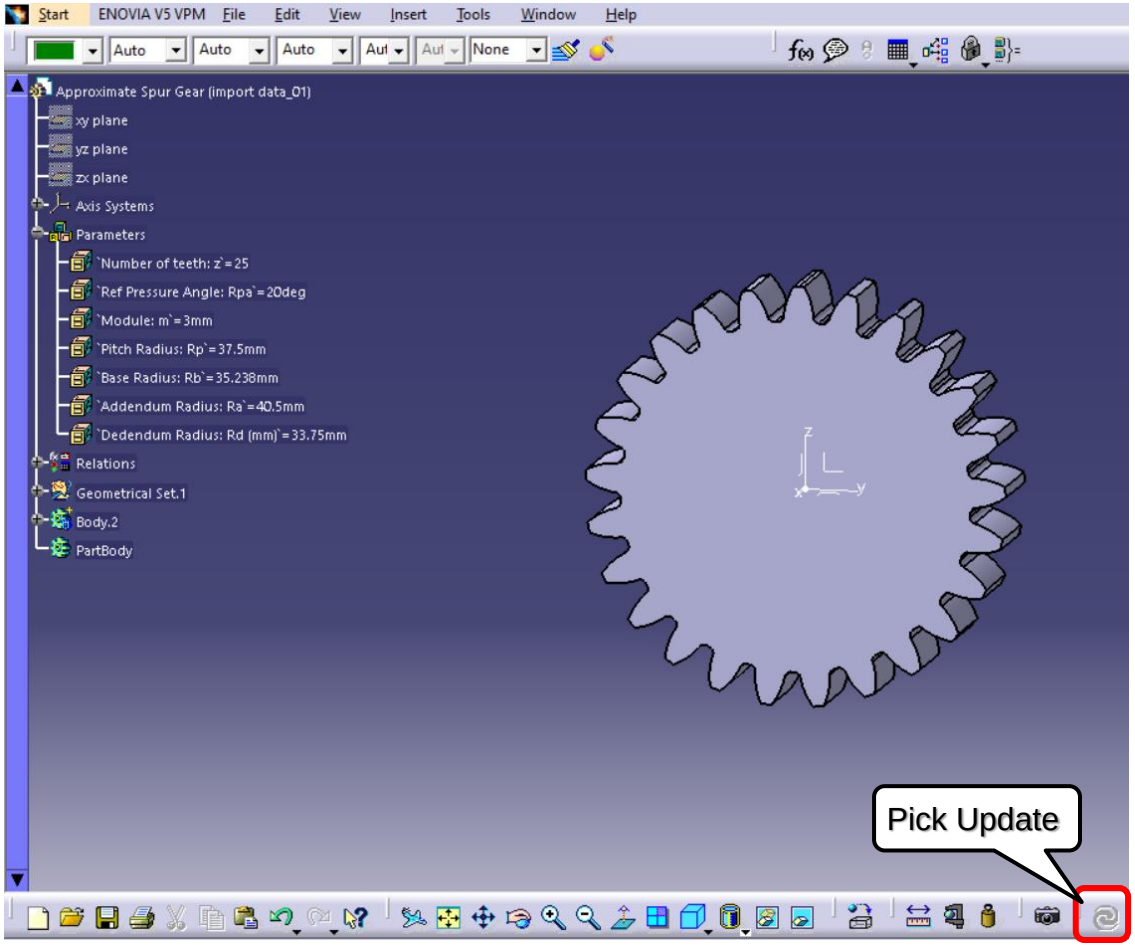
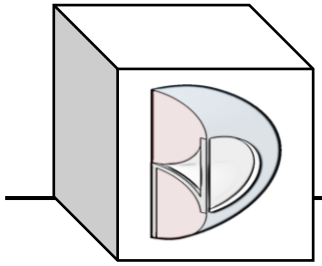
- Update the part.





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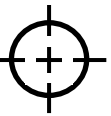

Modify the .xls(x) or .txt file and re-import the data to the CATPart

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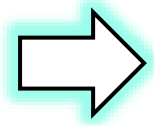
- Change the .xls(x) or txt file and re-import it.

Approximate Spur Gear Input_[m_3-Rpa_20-z_40].txt - Notepad

File Edit Format View Help

```
Module: m        3mm
Ref Pressure Angle: Rpa 20.deg
Number of teeth: z       40
Symmetry Angle: s        2.25deg
Pitch diameter: Pd       120.mm
Base diameter: Bd        112.763mm
Addendum diameter: Ad    126.mm
Dedendum diameter: Dd    112.5mm
tooth radius at dedendum circle: tr      1.14mm
```



Approximate Spur Gear Input_[m_3-Rpa_20-z_25].txt - Notepad

File Edit Format View Help

```
Module: m        3mm
Ref Pressure Angle: Rpa 20.deg
Number of teeth: z       25
Symmetry Angle: s        3.6deg
Pitch diameter: Pd       75.mm
Base diameter: Bd        70.477mm
Addendum diameter: Ad    81.mm
Dedendum diameter: Dd    67.5mm
tooth radius at dedendum circle: tr      1.14mm
```

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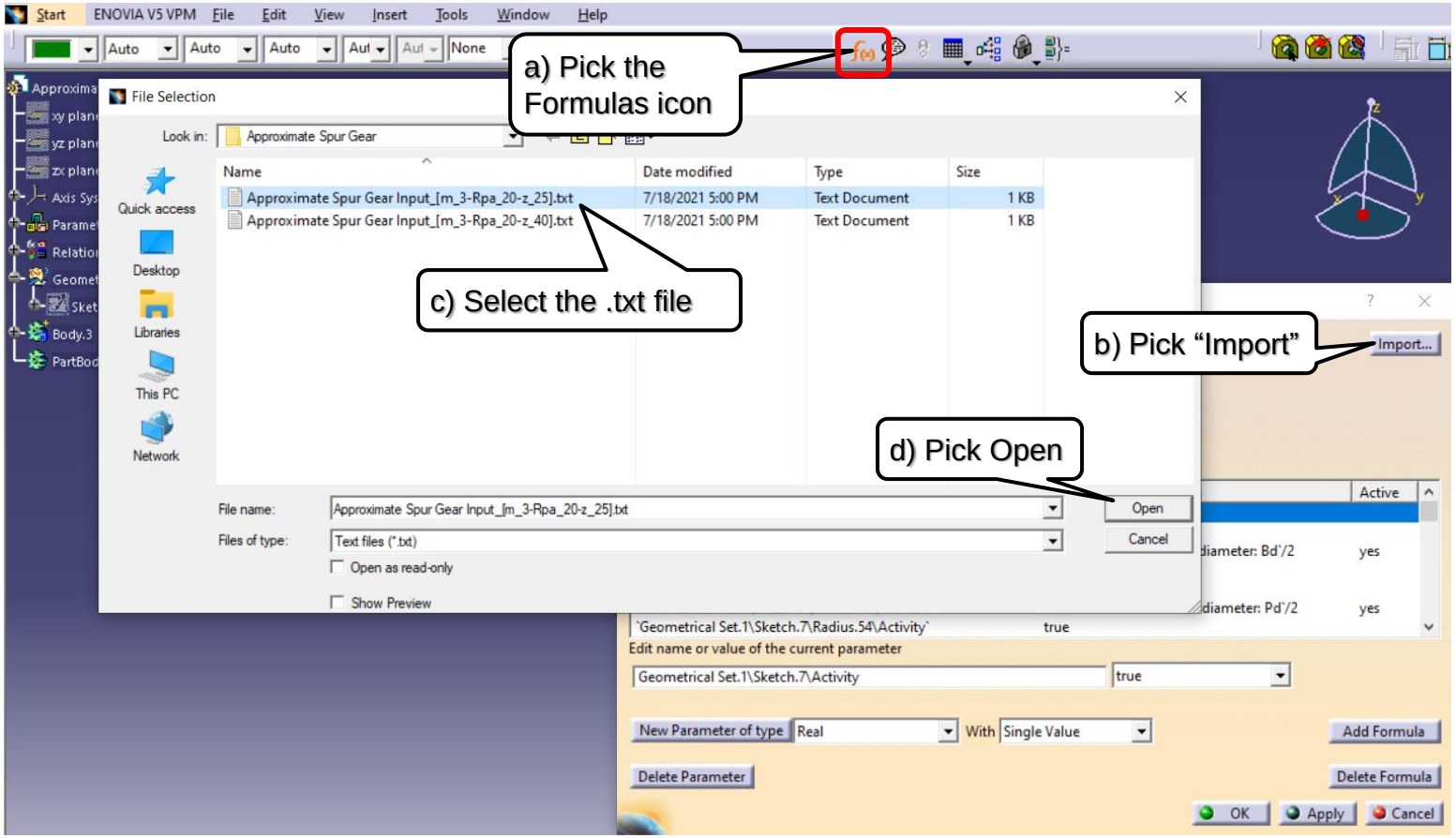
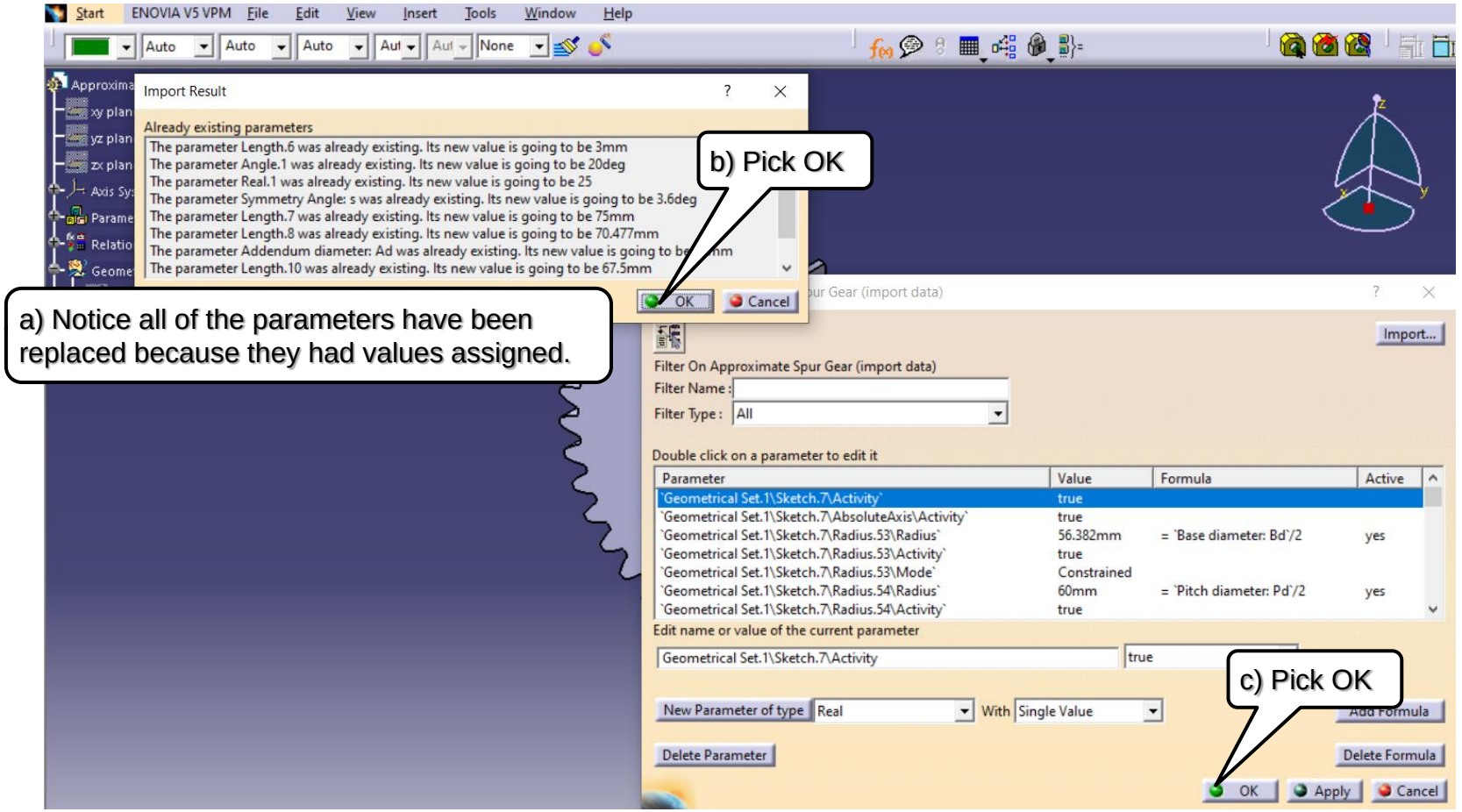
- Re-import the .xls(x) or .txt file to the CATPart.



BND TechSource

- Re-import the .xls(x) or .txt file to the CATPart.



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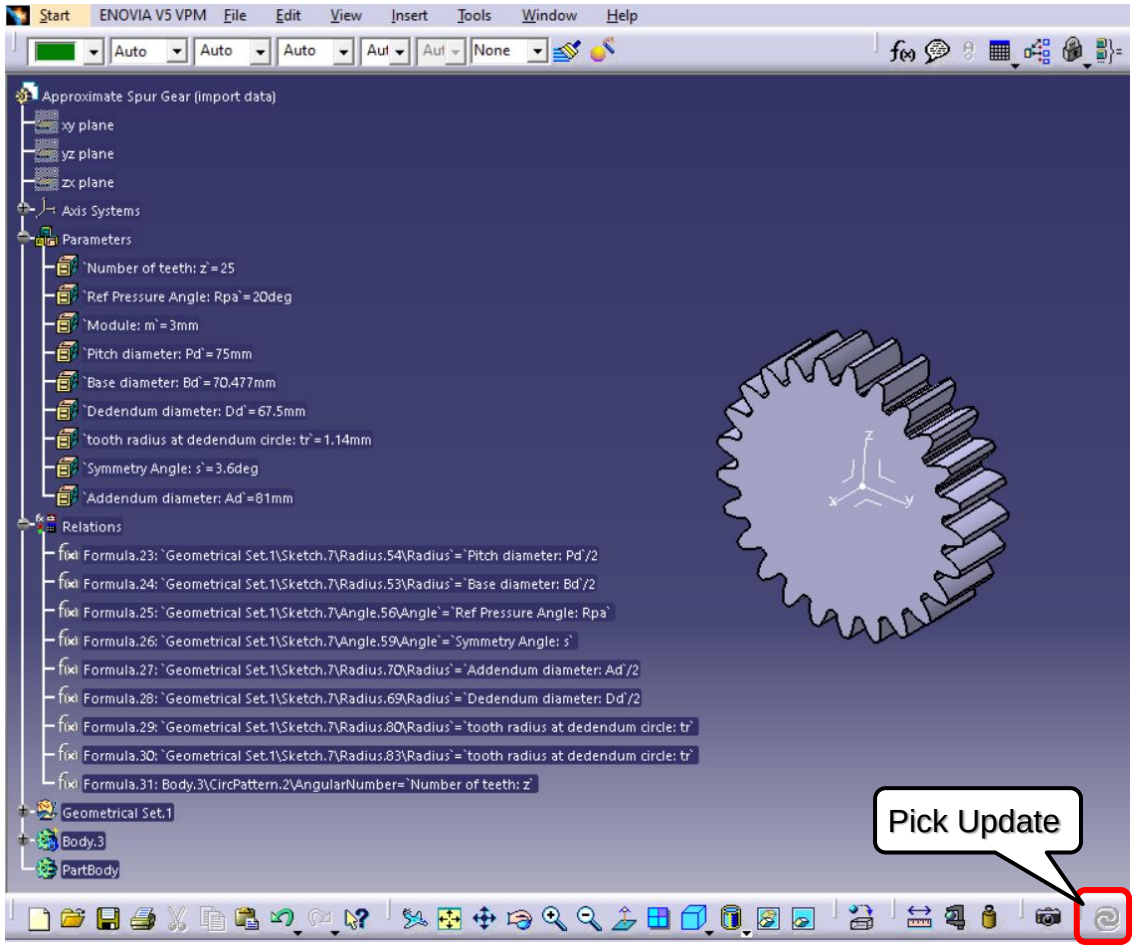
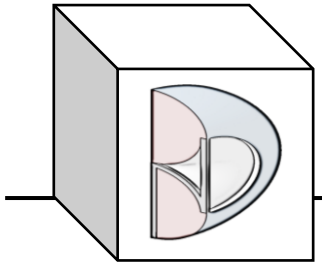
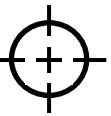
- Update the part.







Approach 2: Create a New Part and Import the .xls(x) or .txt file from the start

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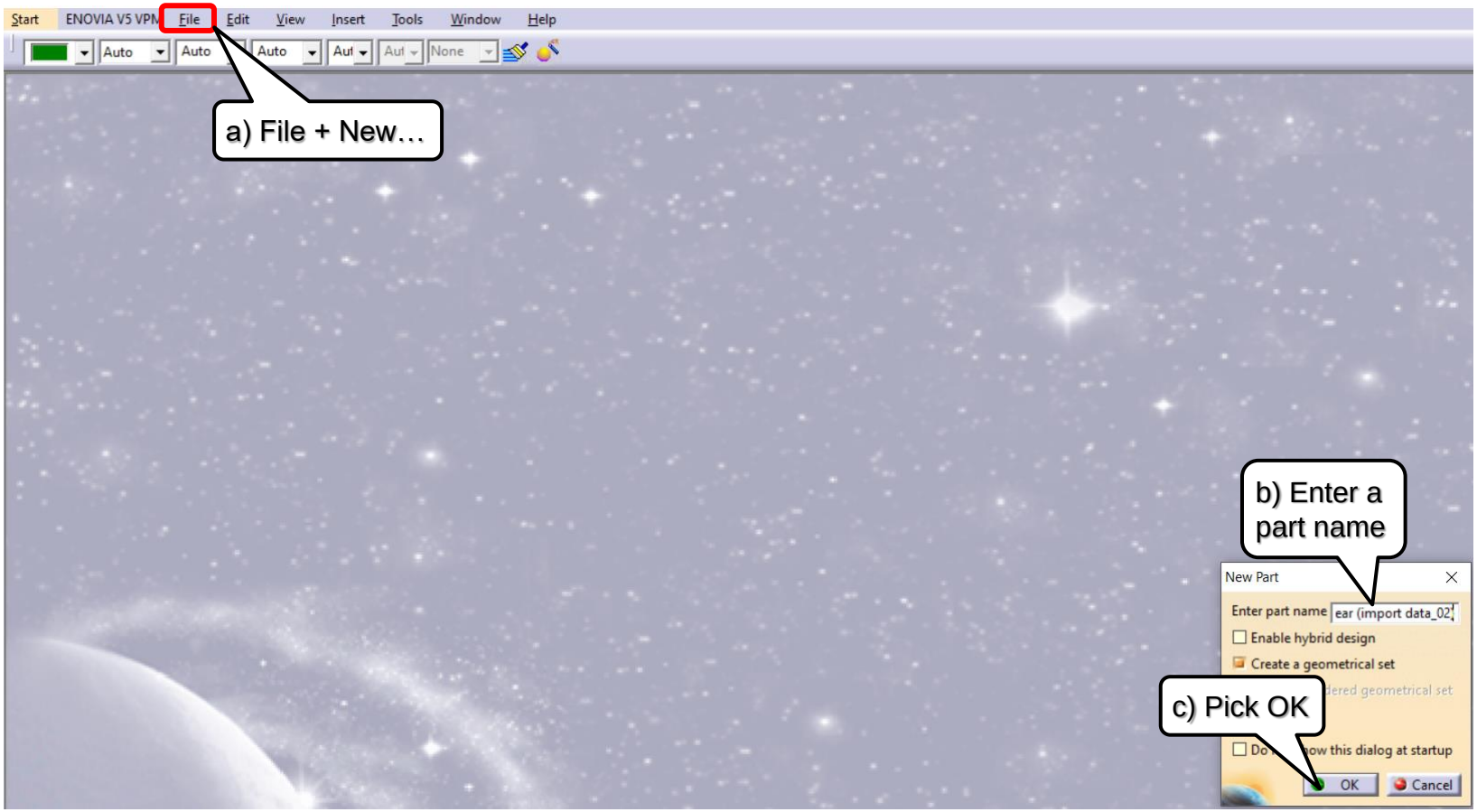
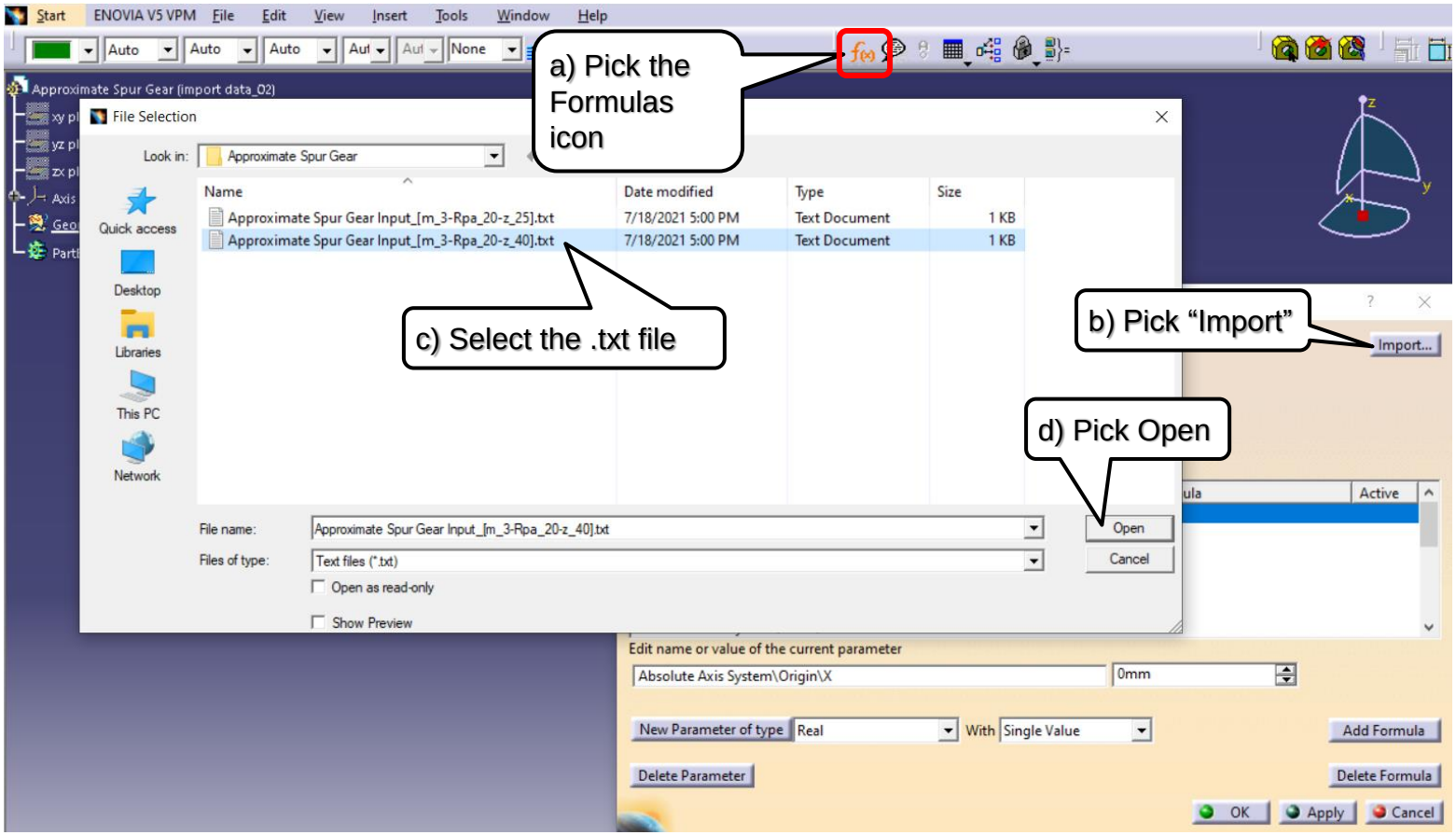
- Create a new CATPart.



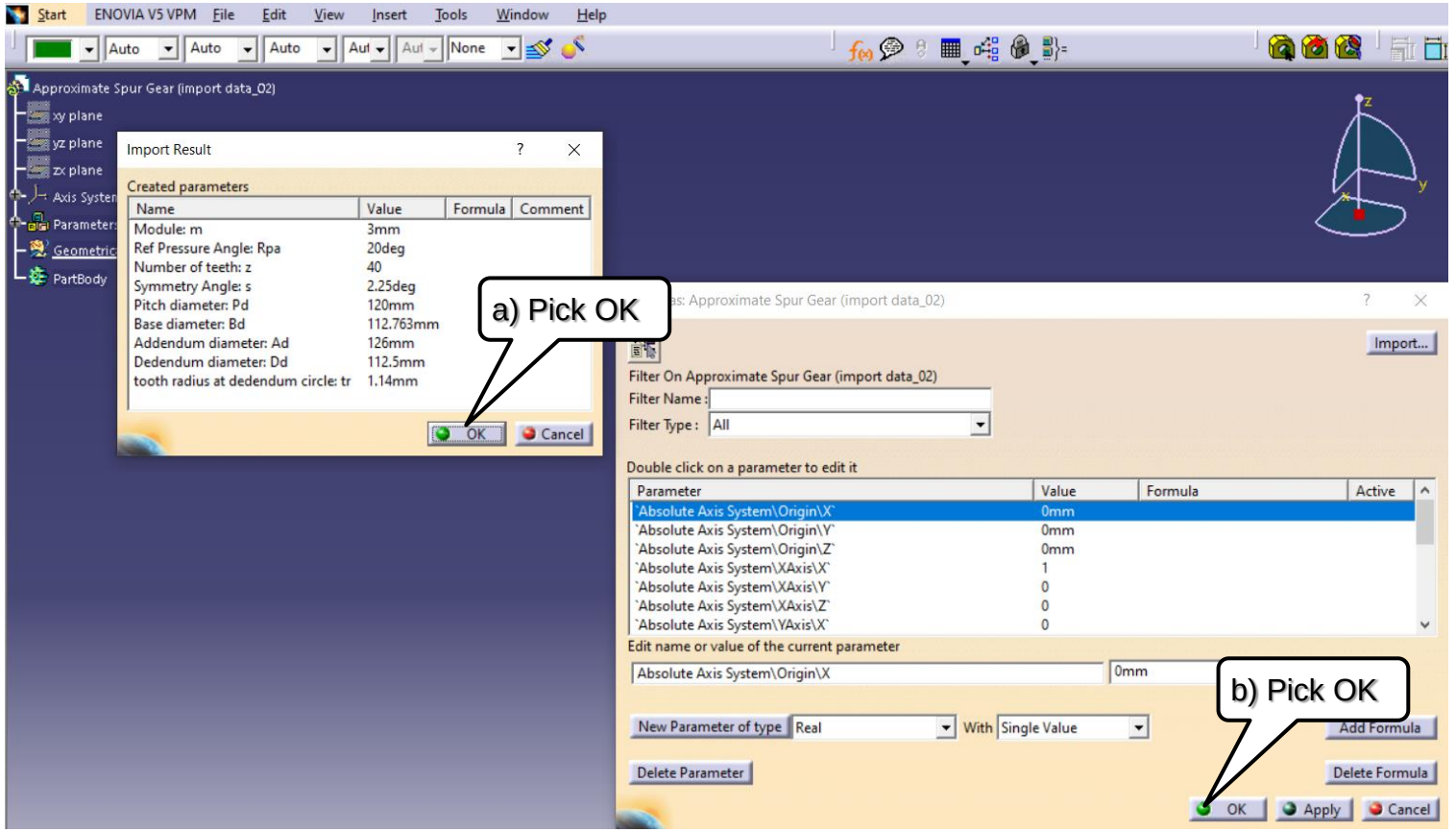
BND TechSource

- Connect the .xls(x) or .txt file to the CATPart.



BND TechSource

- Connect the .xls(x) or .txt file to the CATPart.



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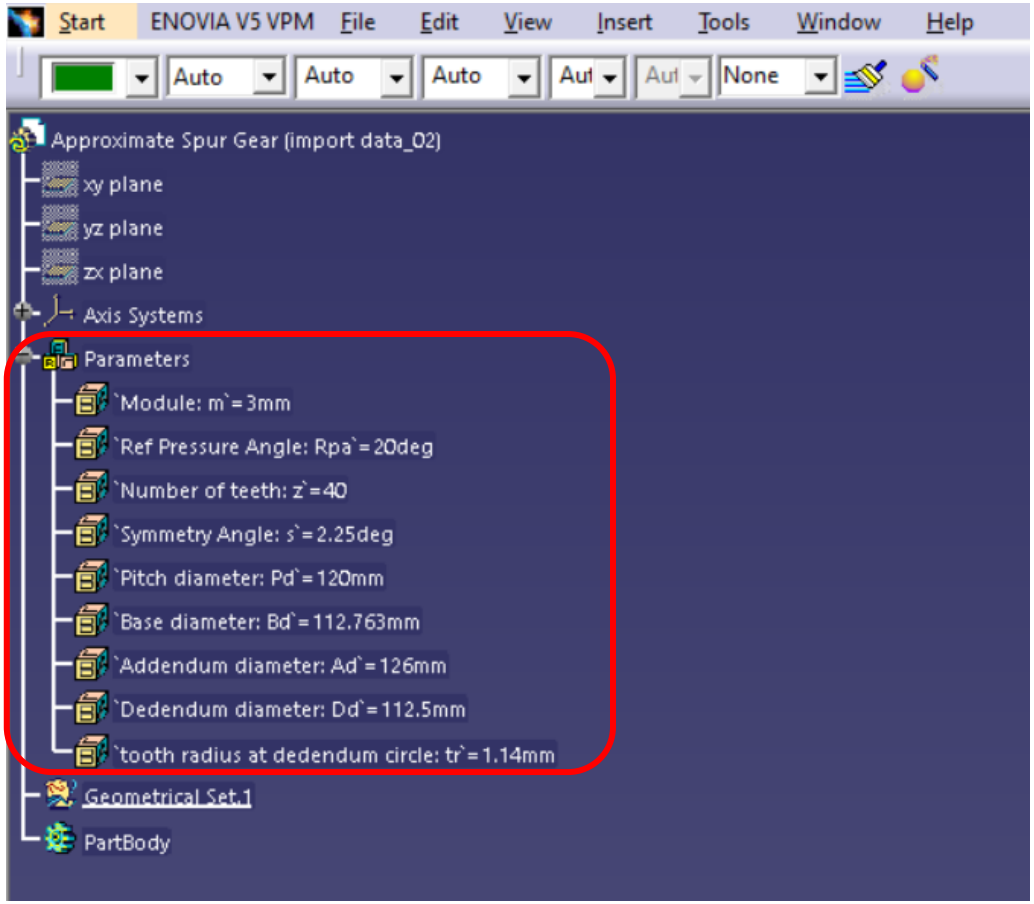
- Notice all the parameters are created and ready to use.



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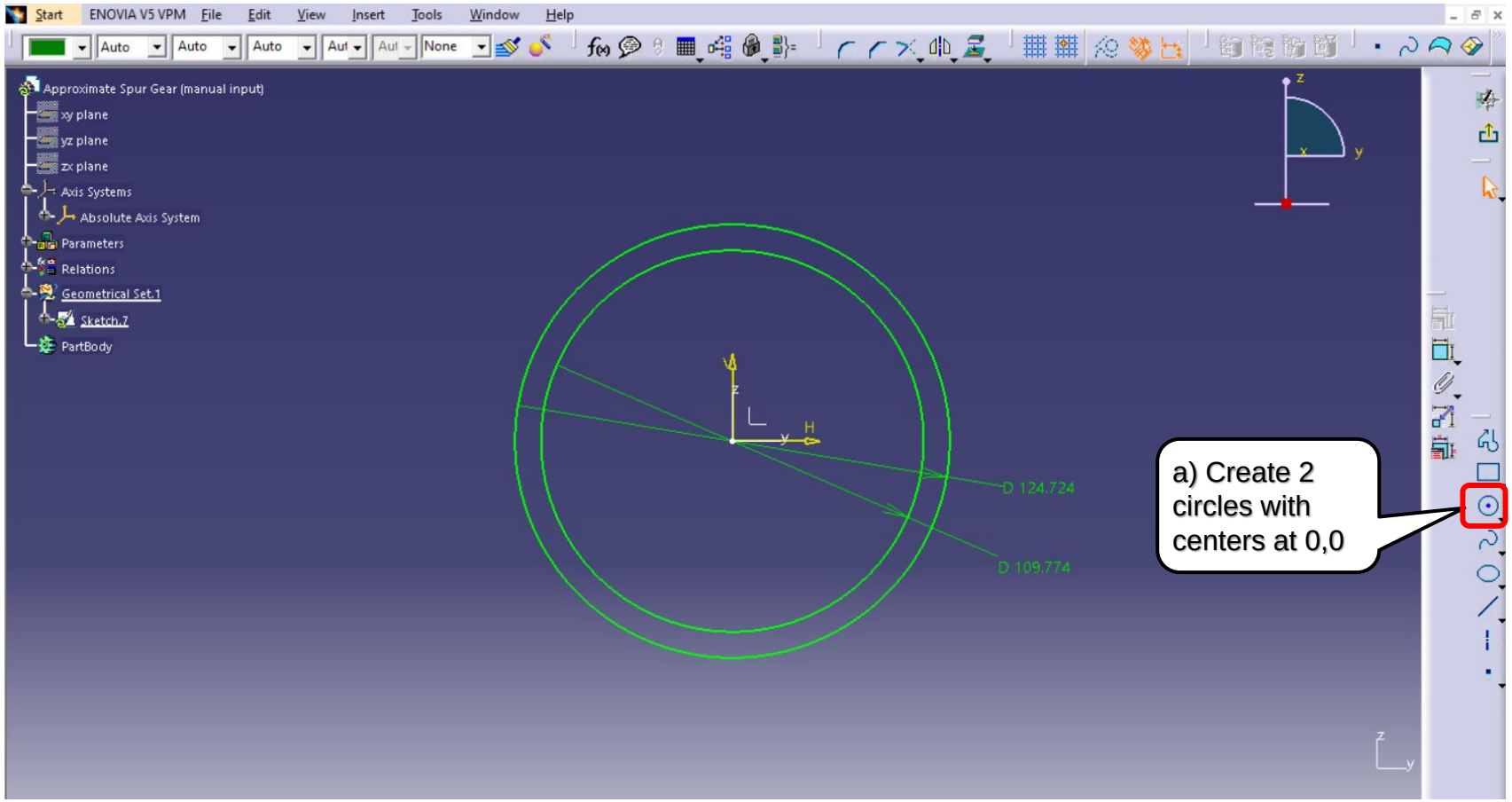
- Create the pitch and base circles in a sketch.



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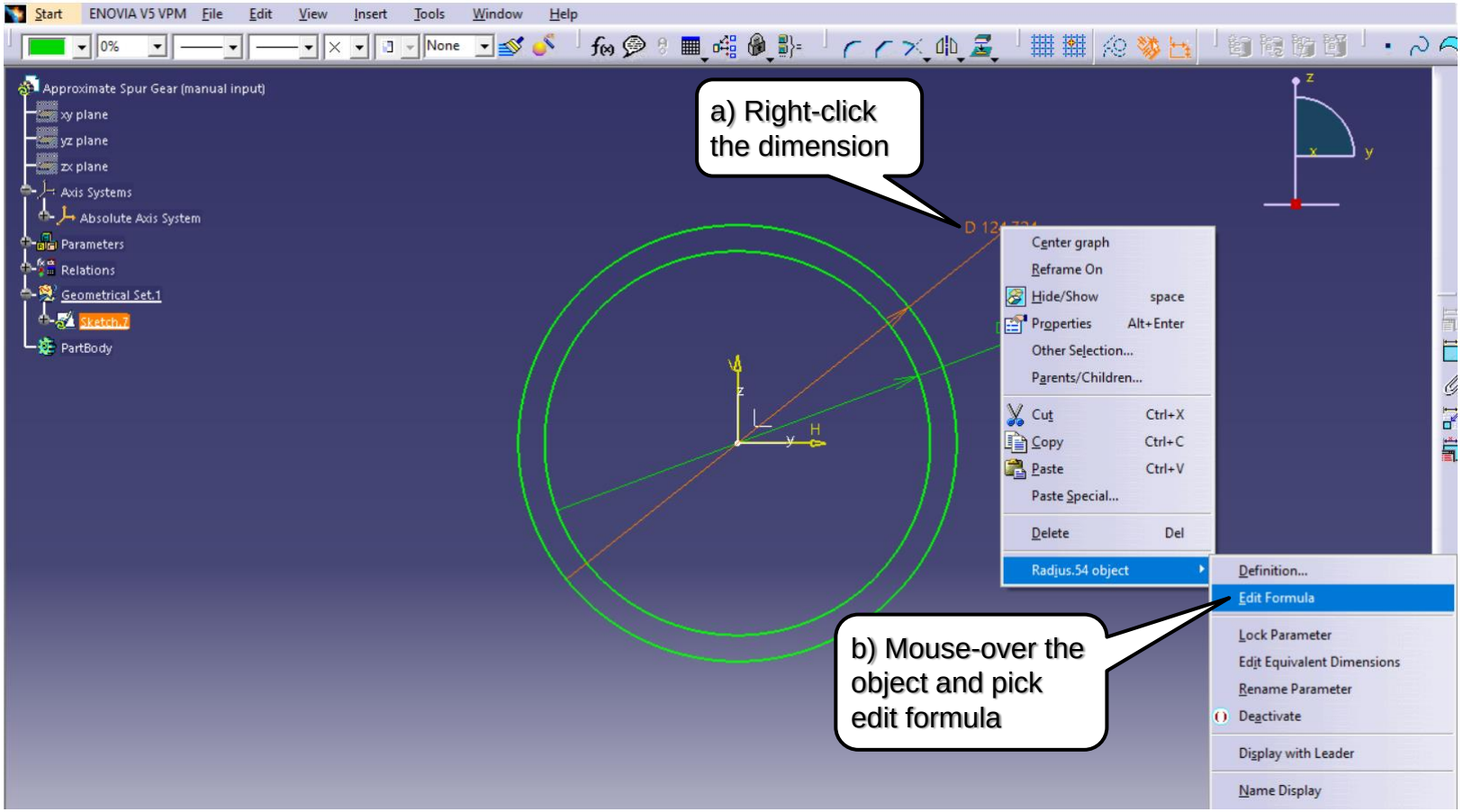
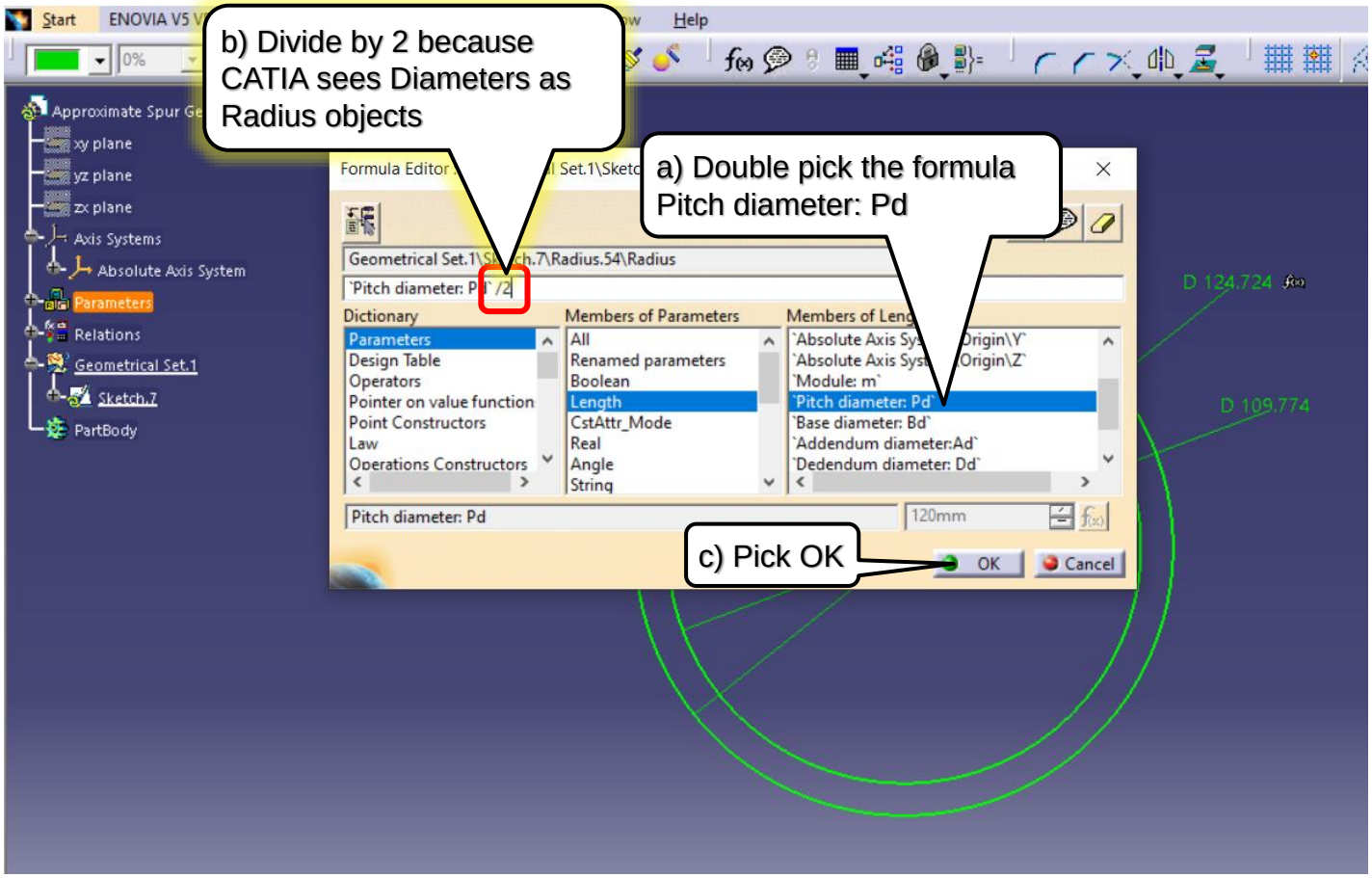
- Apply the formula (Pitch diameter: Pd) to the pitch circle.



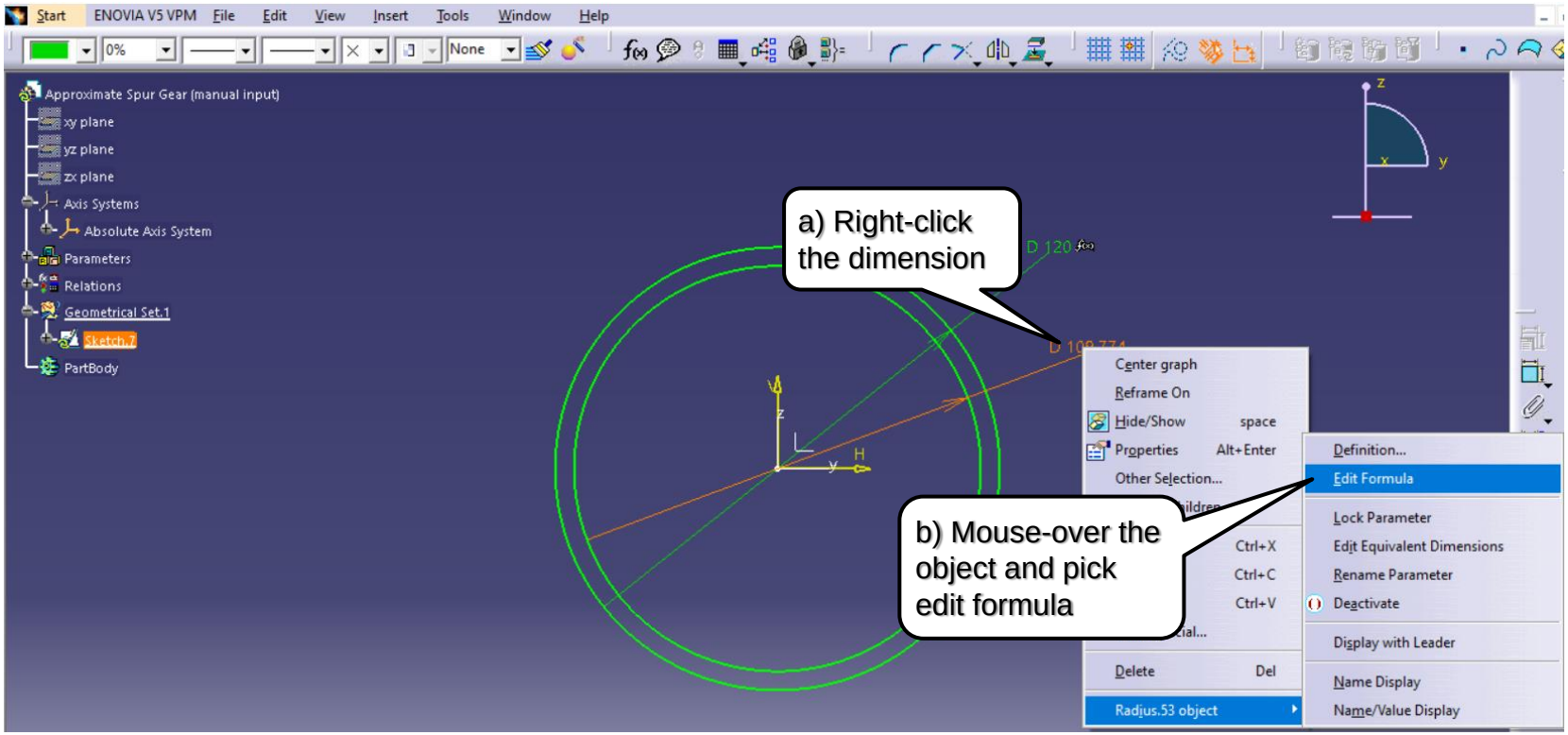
BND TechSource

- Apply the formula (Pitch diameter: Pd) to the pitch circle.



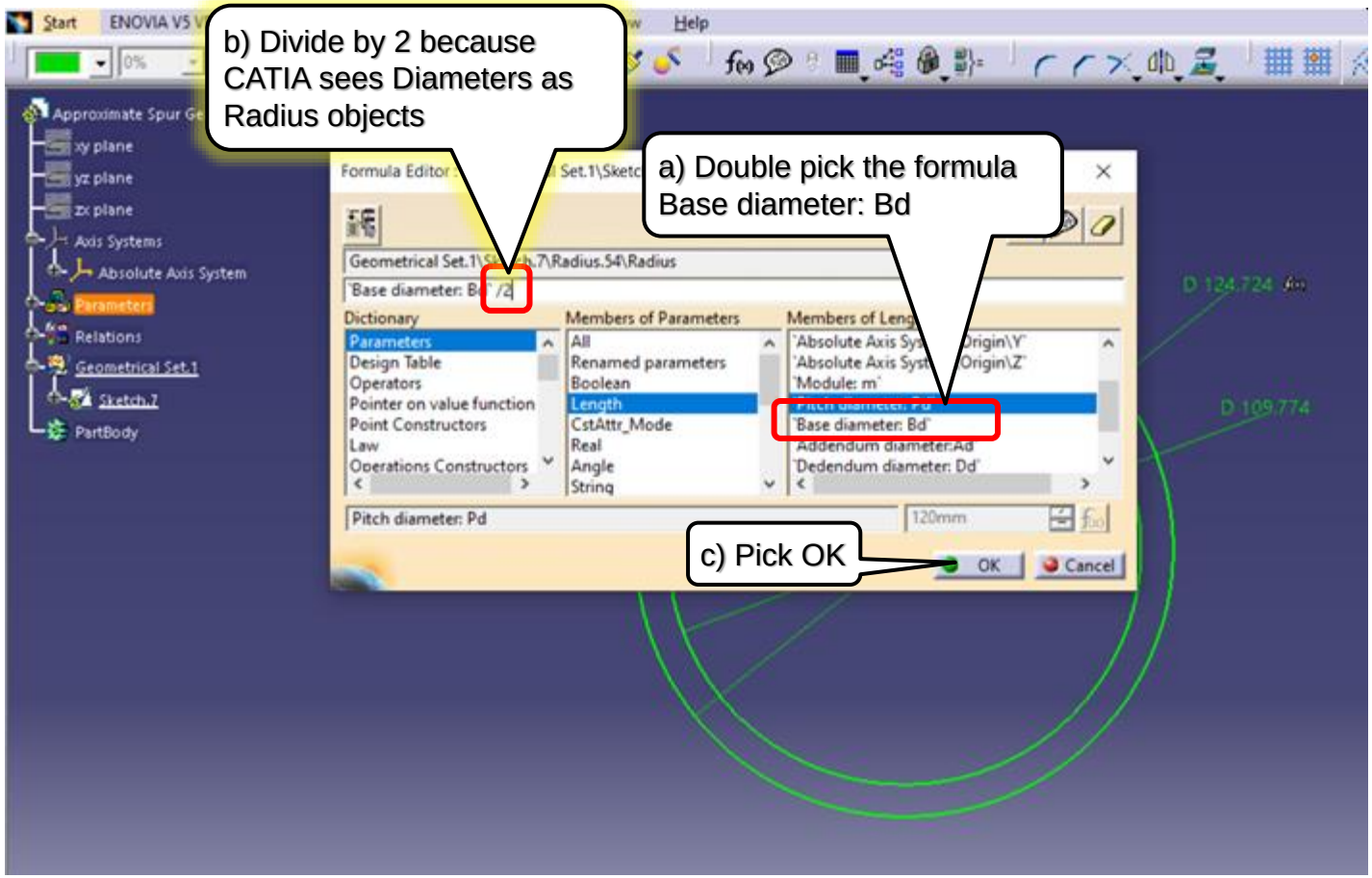
BND TechSource

- Apply the formula (Base diameter: Bd) to the base circle.



BND TechSource

- Apply the formula (Base diameter: Bd) to the base circle.



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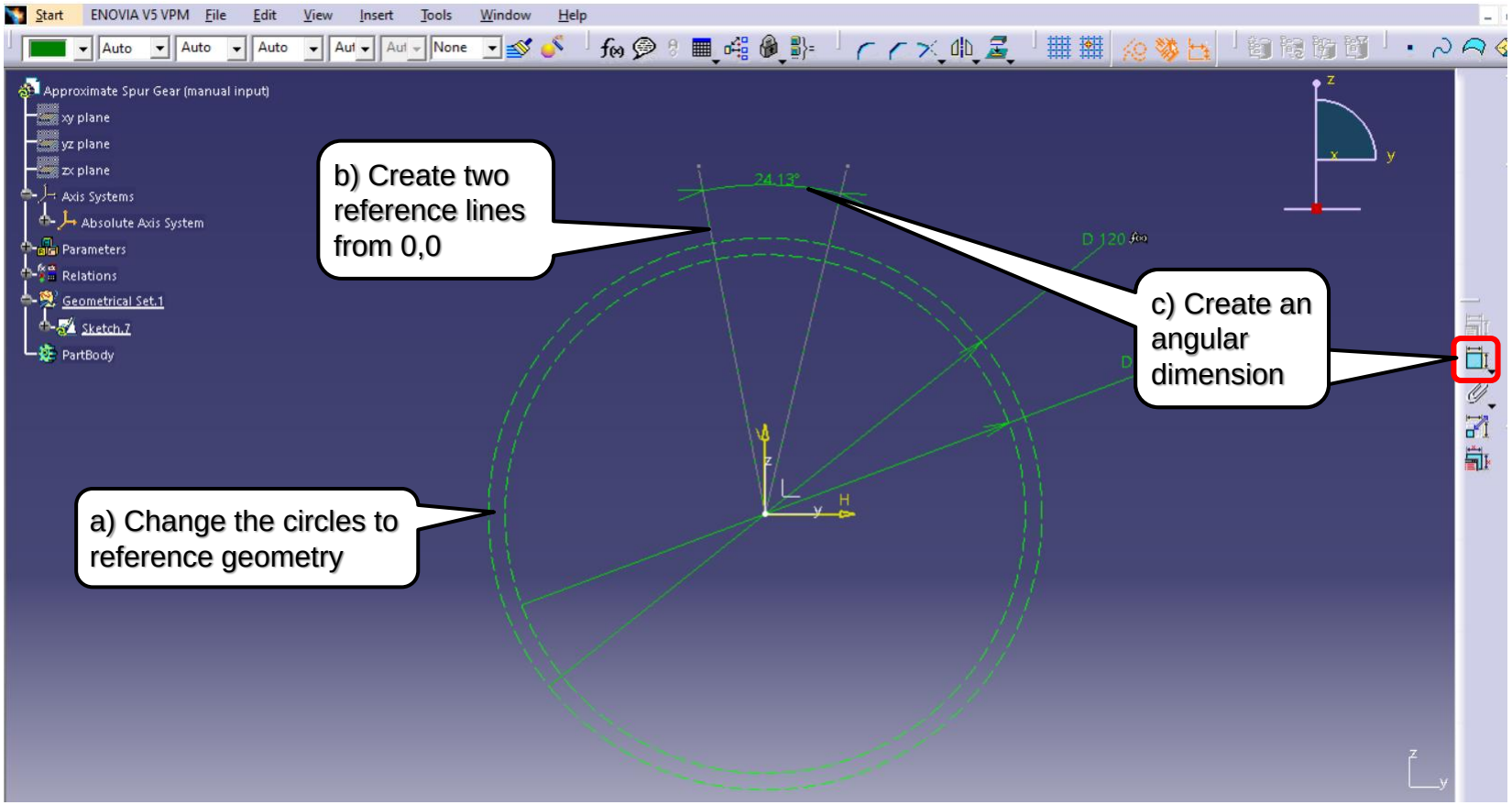
- Create tooth geometry reference lines.



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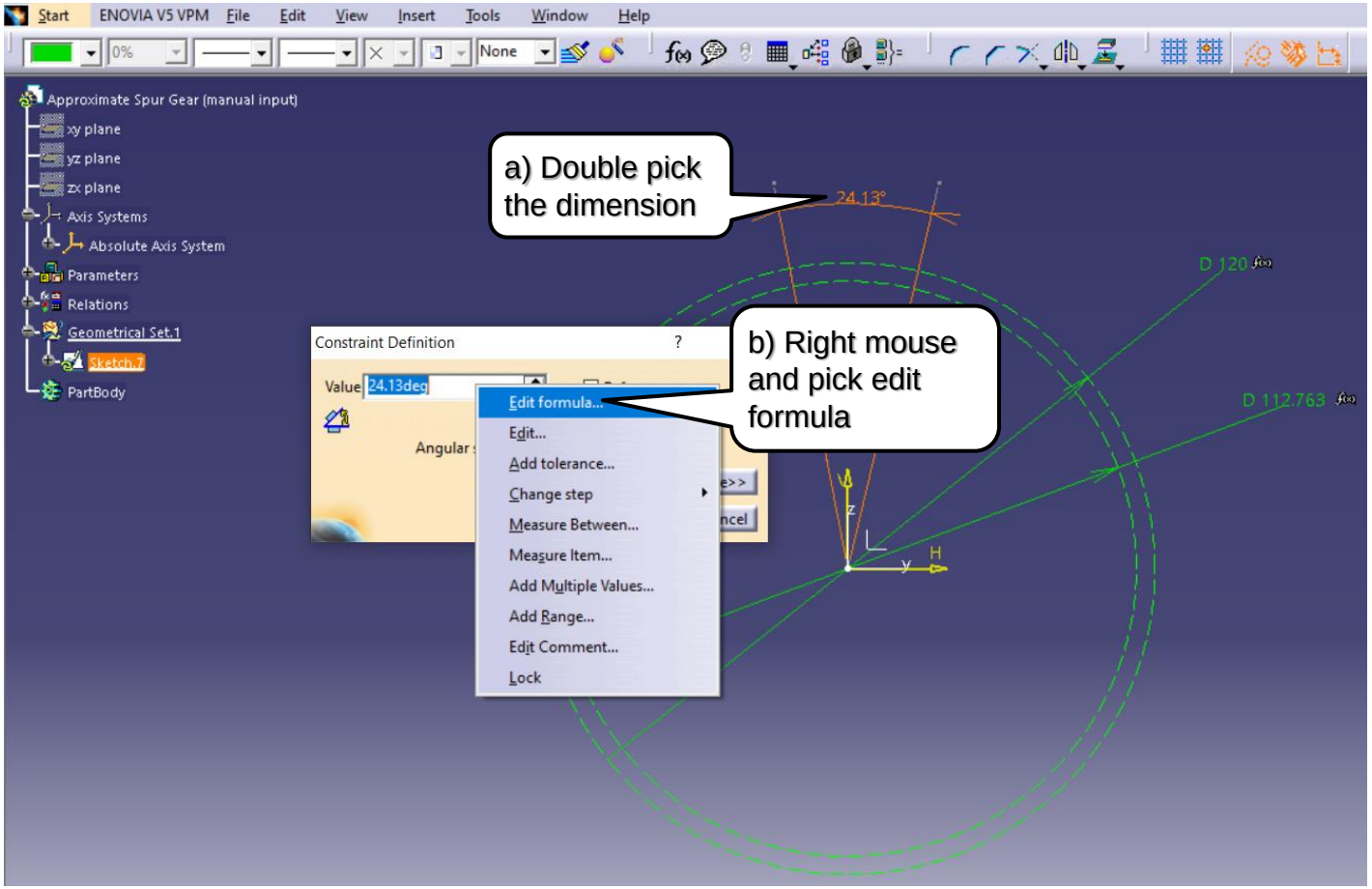
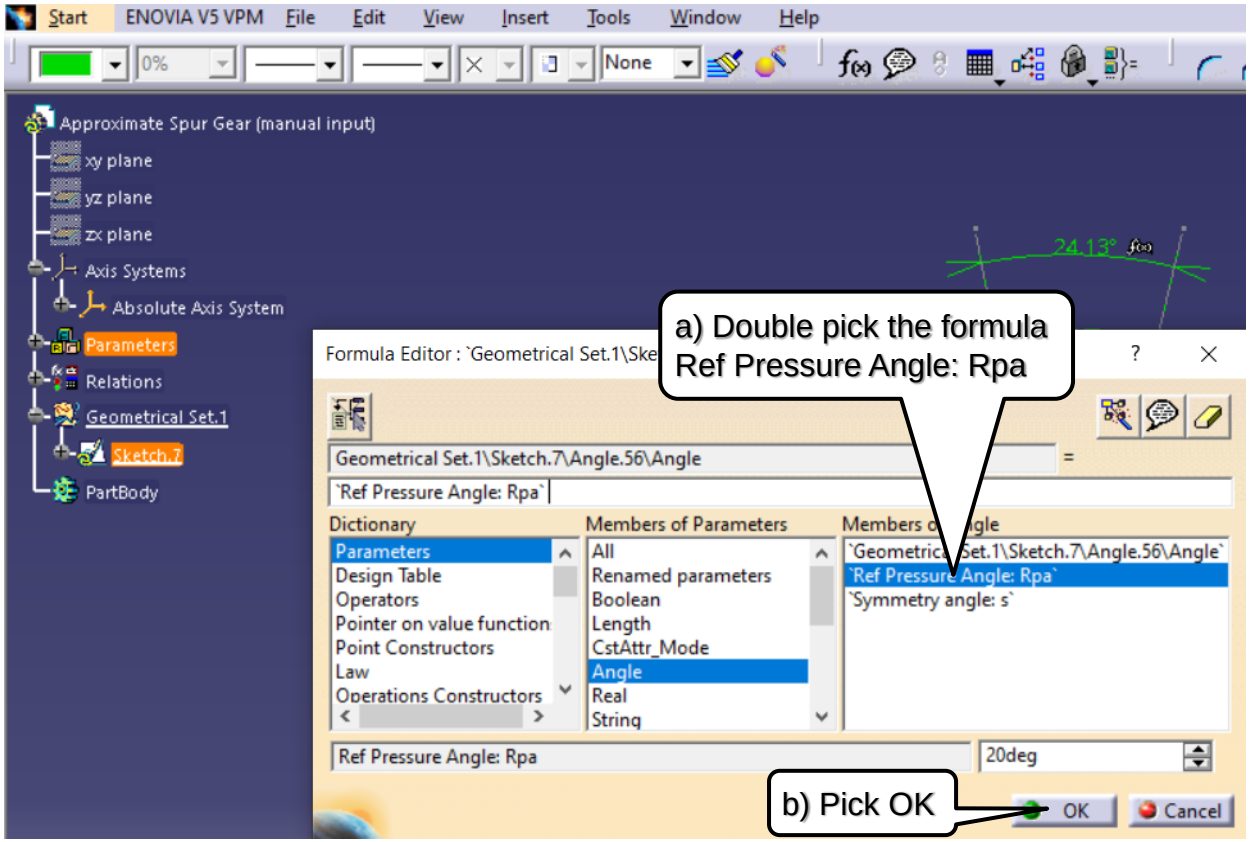
- Apply Ref Pressure Angle: Rpa.



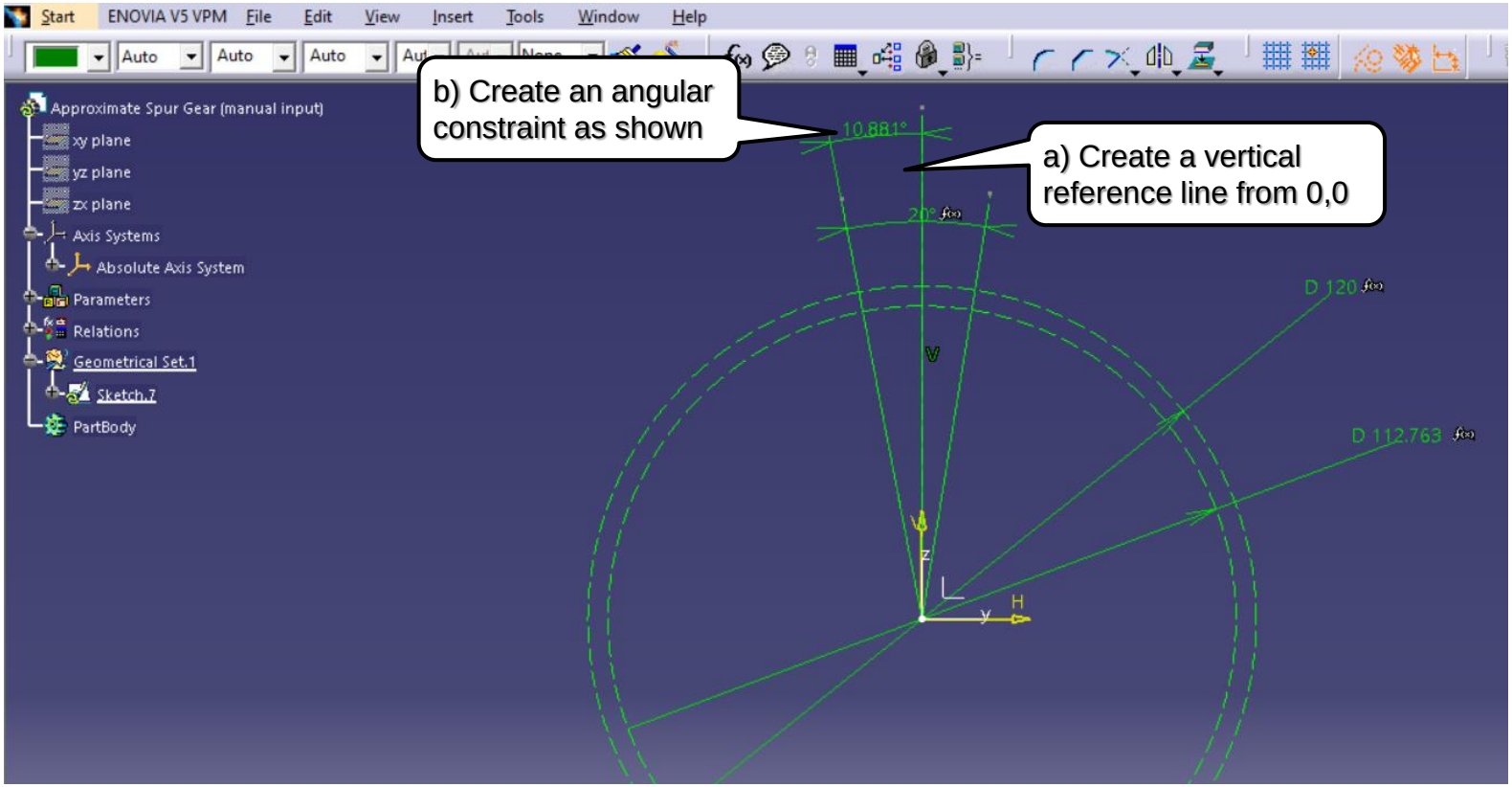
BND TechSource

- Apply Ref Pressure Angle: Rpa.



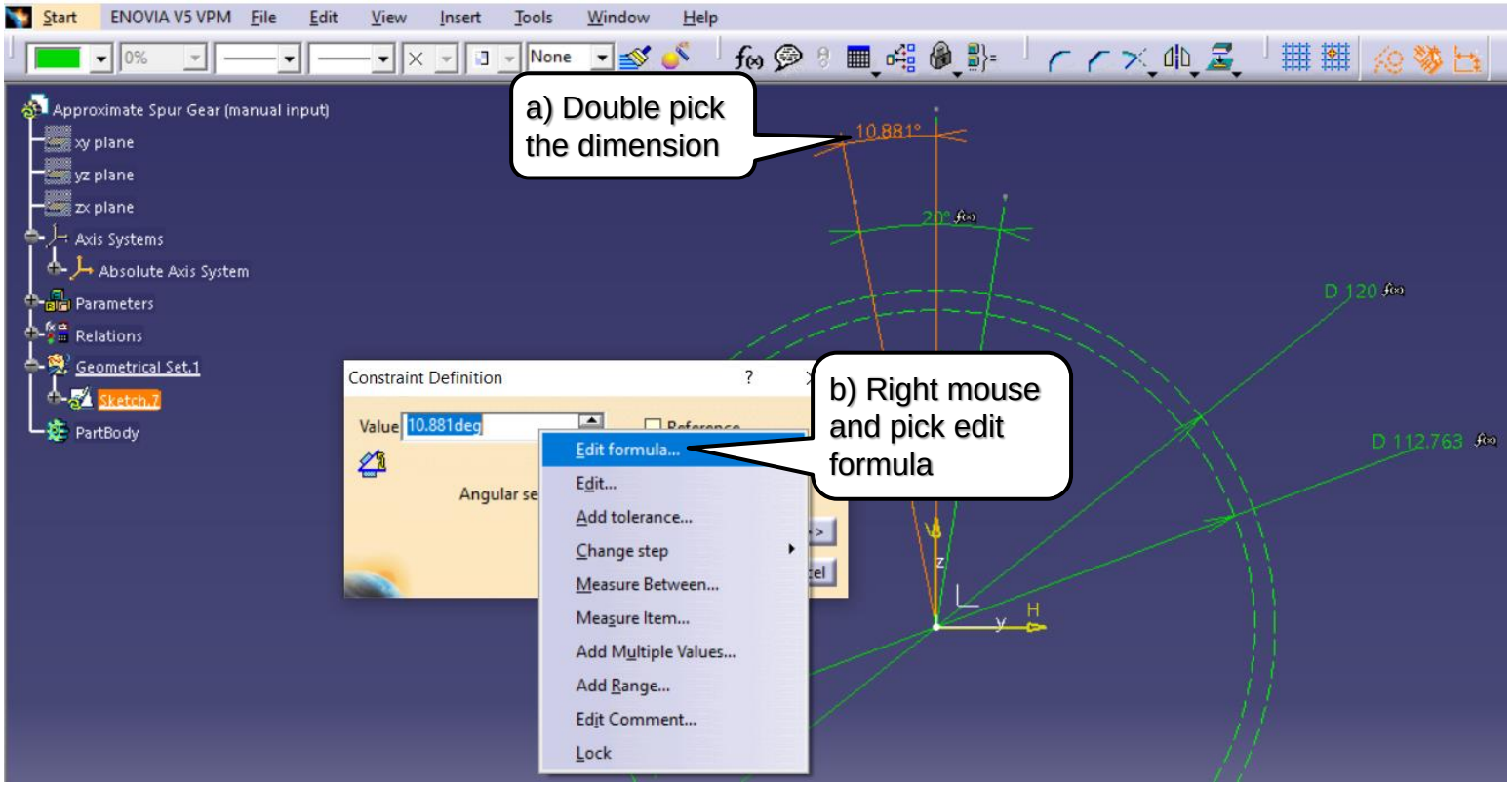
BND TechSource

- Create tooth geometry reference lines.



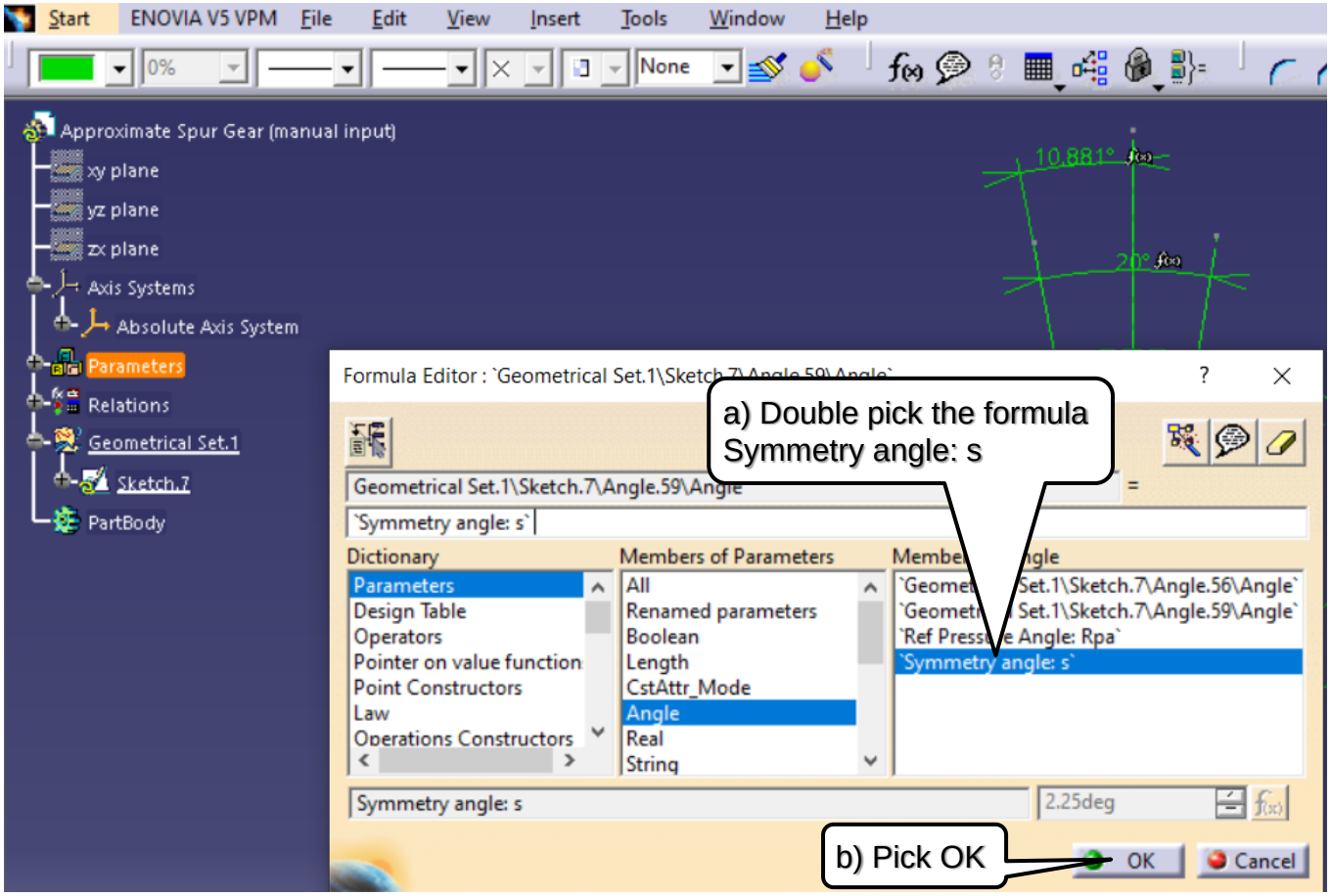
BND TechSource

- Apply Symmetry angle: s



BND TechSource

- Apply Symmetry angle: s



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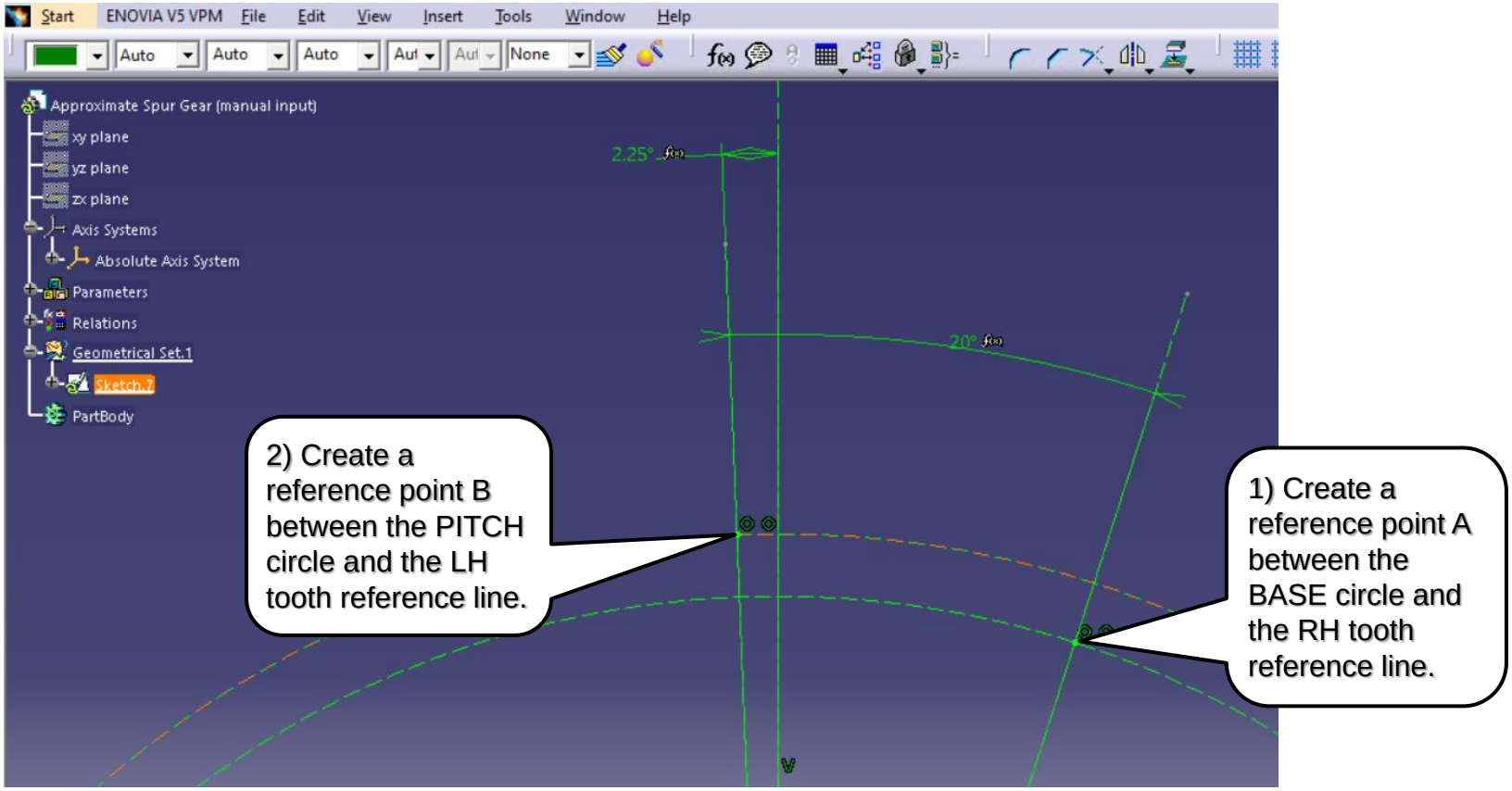
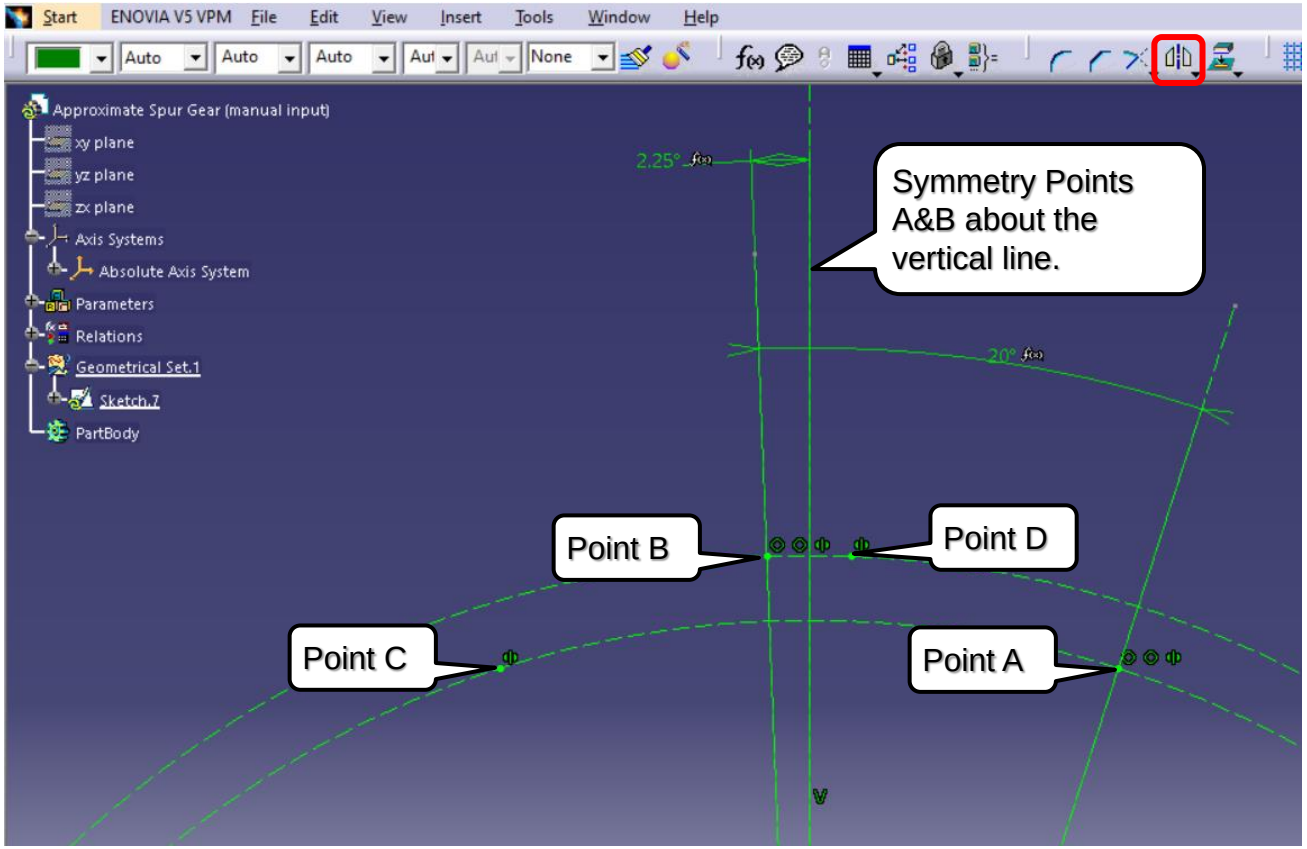
- Create reference points A & B for the construction of the approximated tooth profile.



BND TechSource

- Create symmetrical reference points C & D for the construction of the approximated tooth profile.



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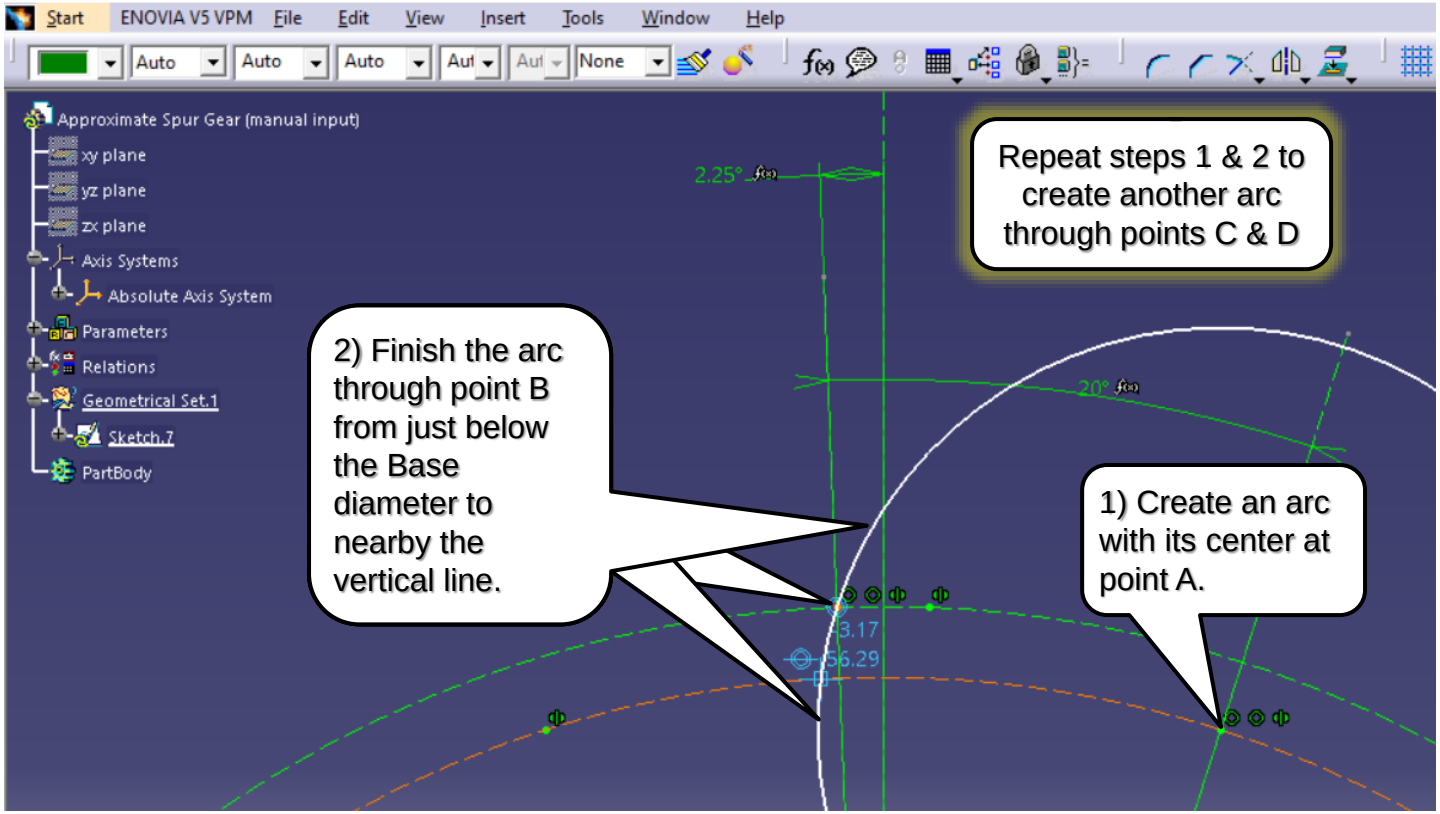
- Create the approximated (circular) tooth profile. *Actual* tooth profile would be an *involute* curve.



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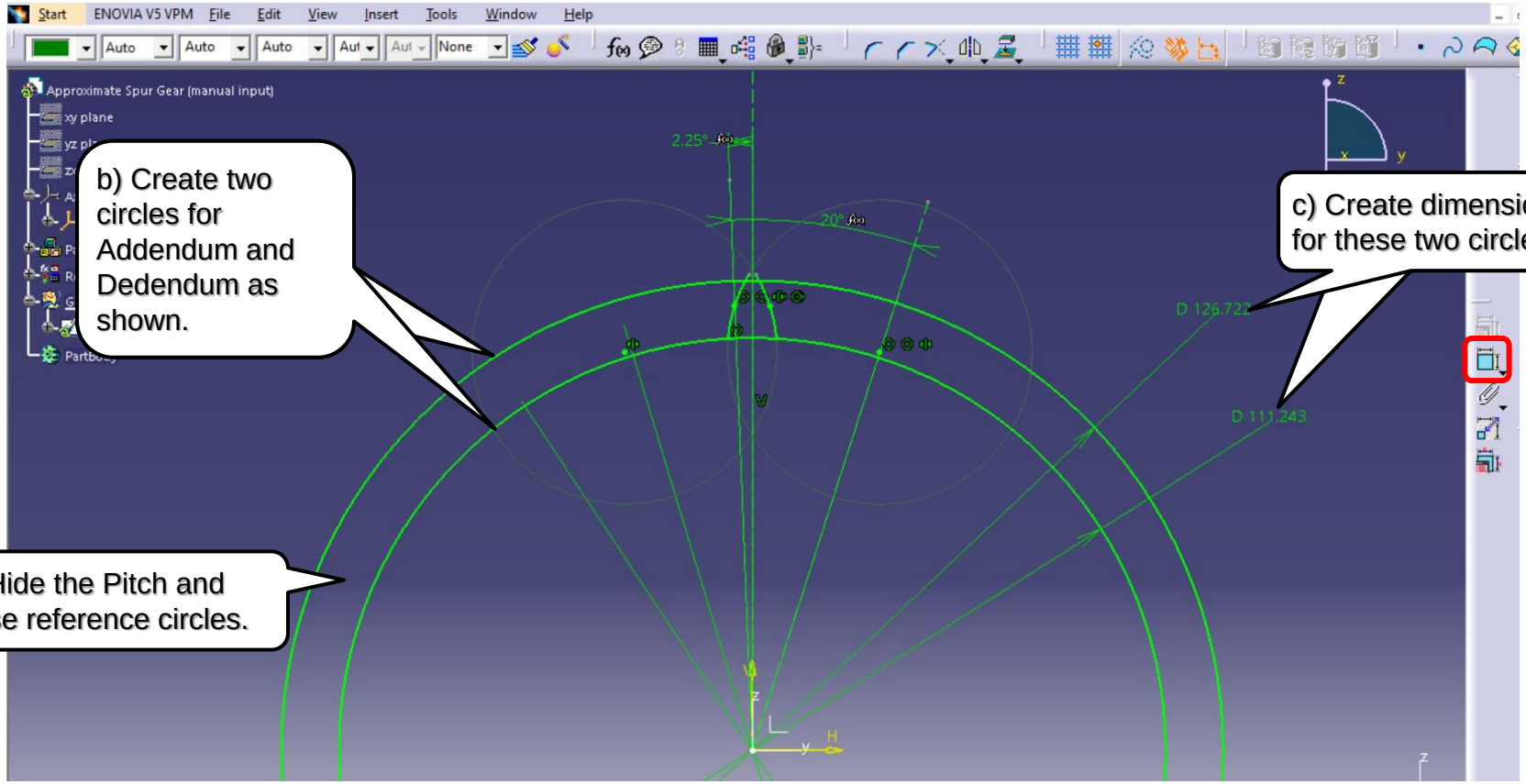
- Create the Addendum and Dedendum construction circles.



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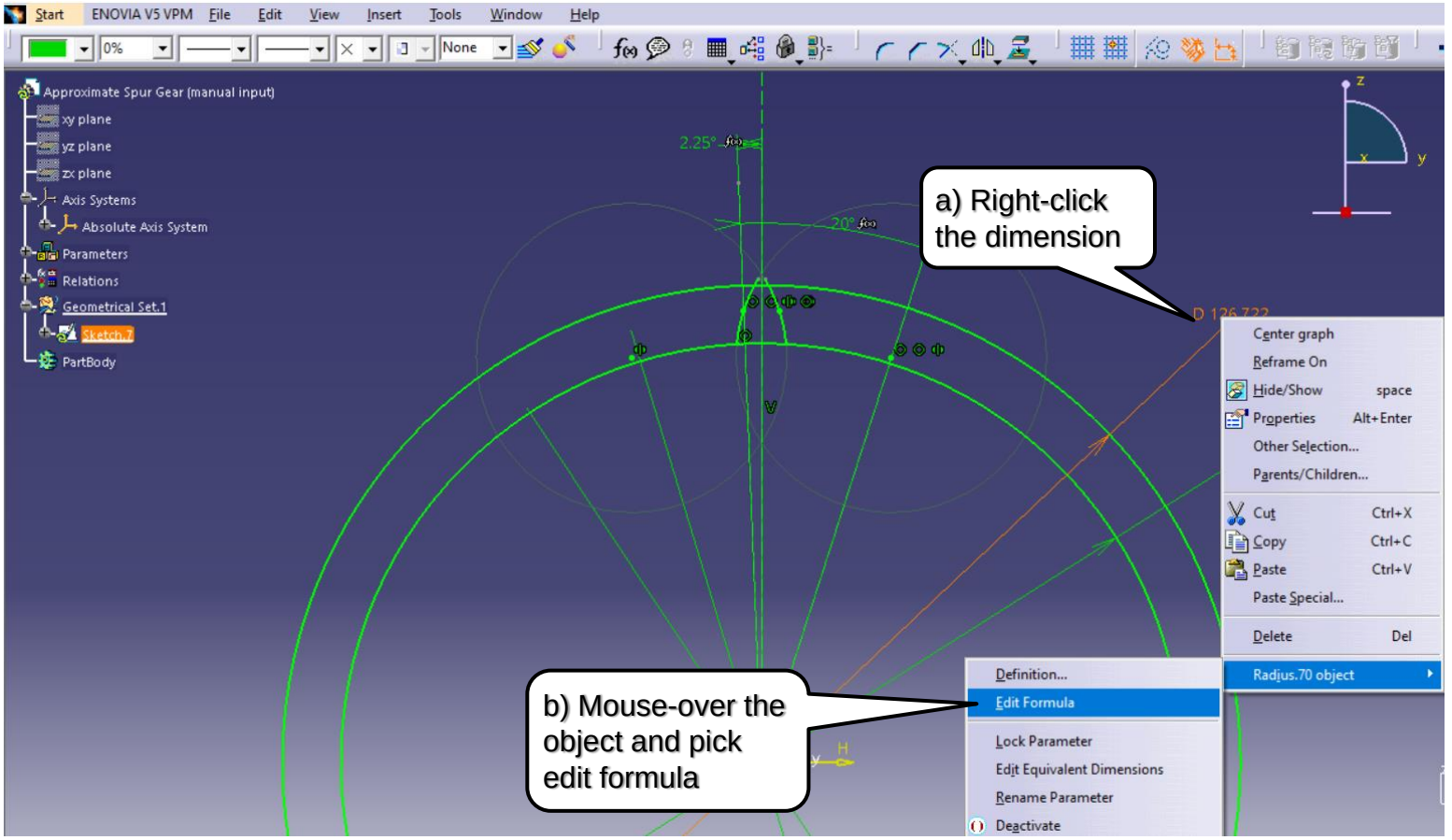
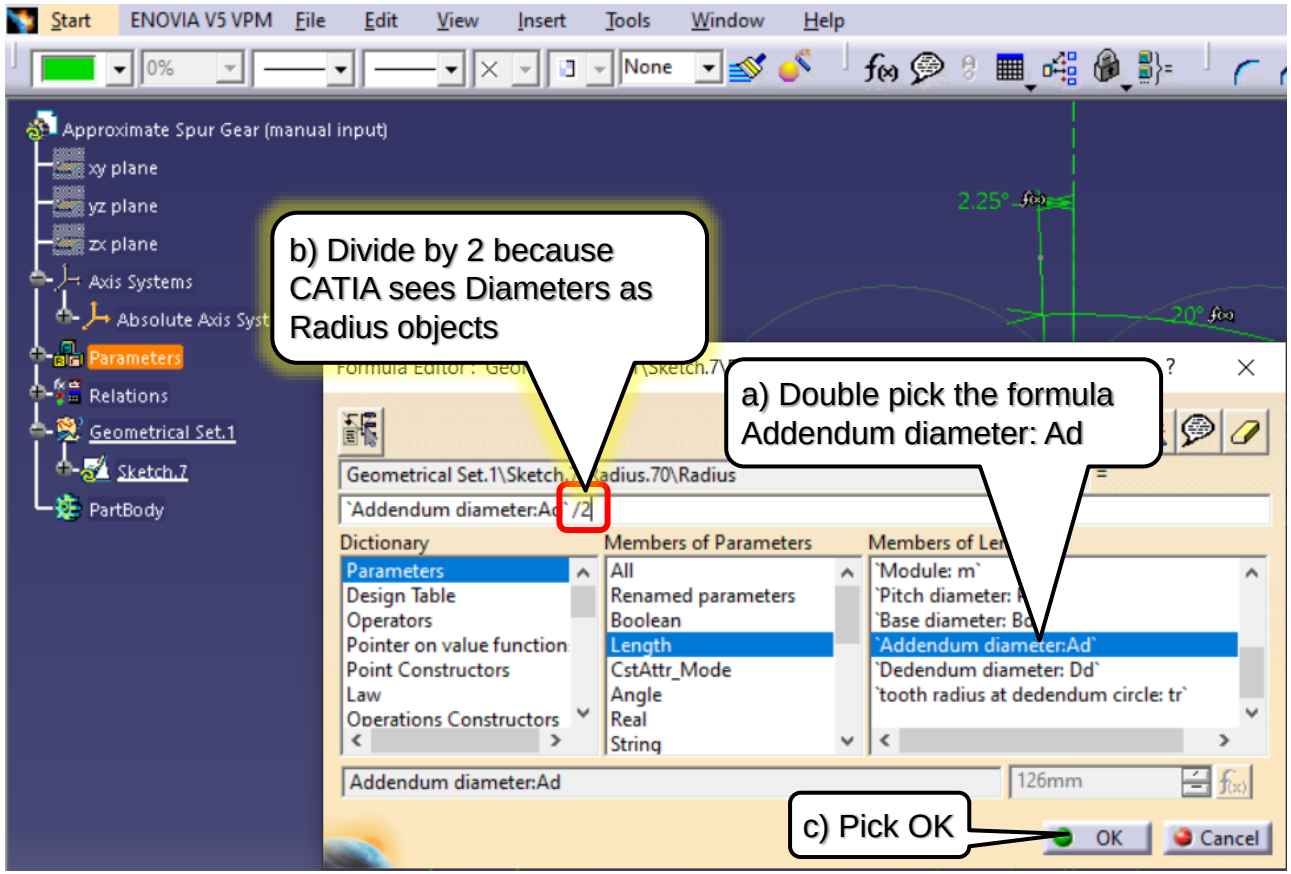
- Apply the formula (Addendum diameter: Ad) to the addendum circle.



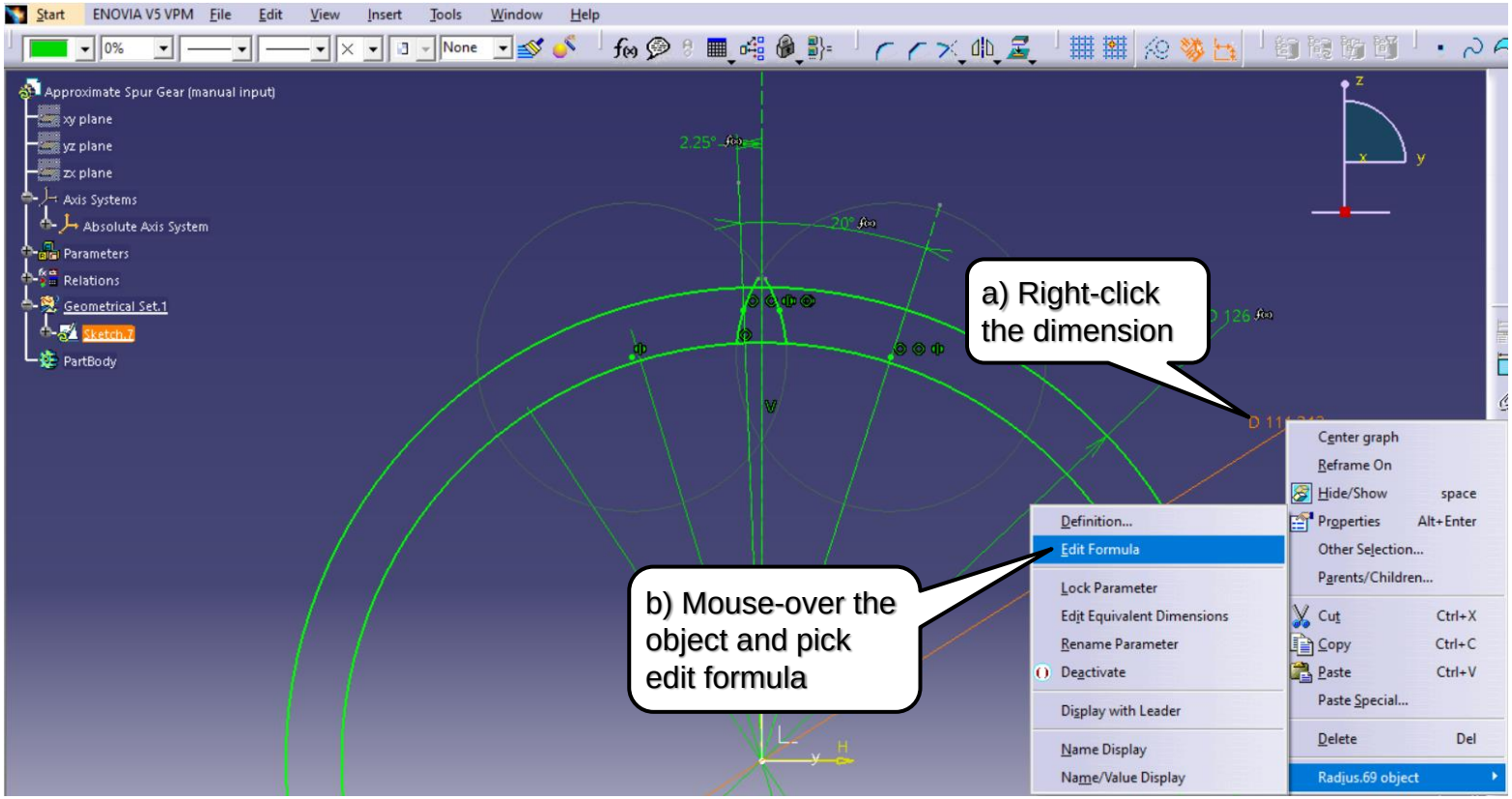
BND TechSource

- Apply the formula (Addendum diameter: Ad) to the addendum circle.



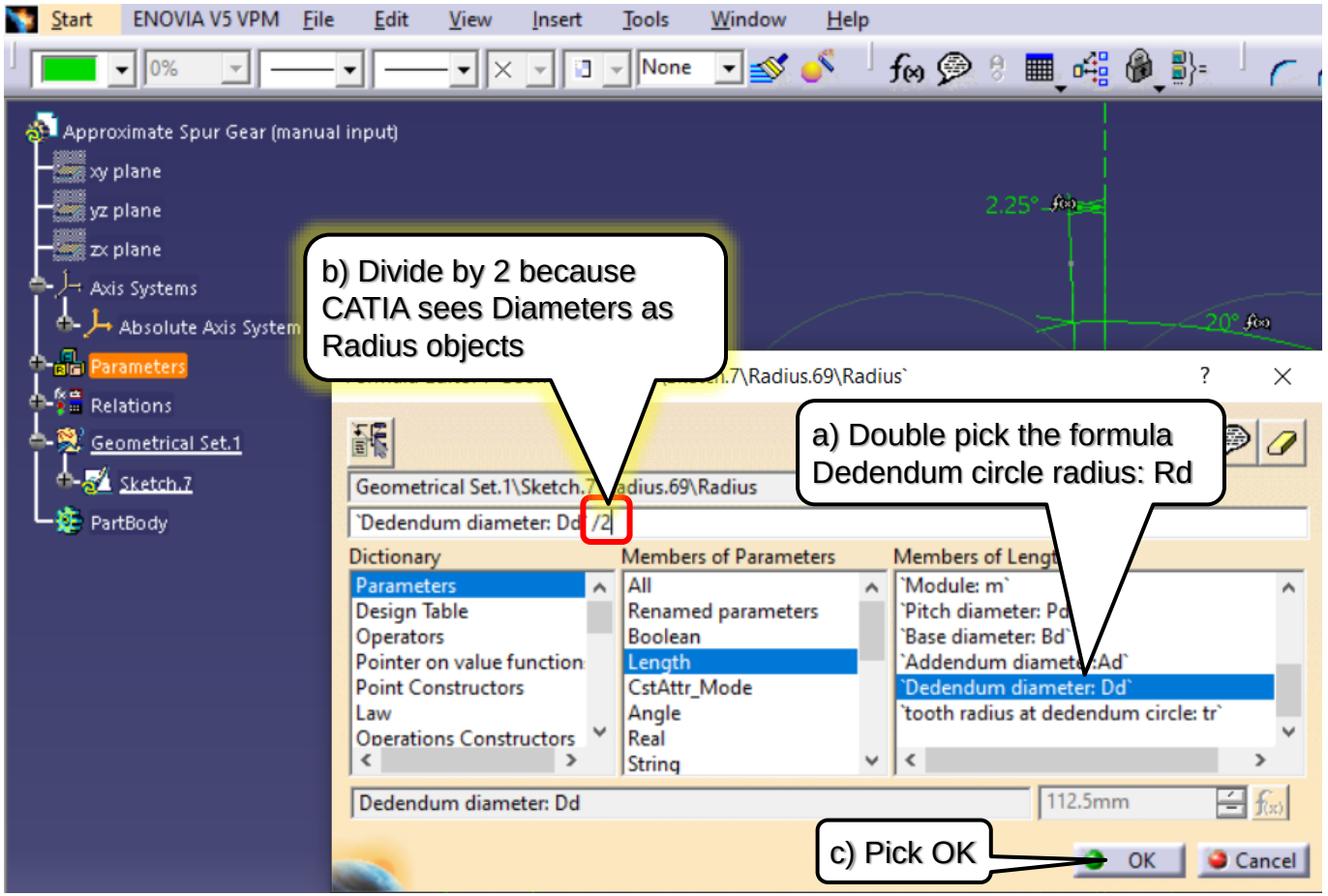
BND TechSource

- Apply the formula (Dedendum diameter: Dd) to the dedendum circle.



BND TechSource

- Apply the formula (Dedendum diameter: Dd) to the dedendum circle.



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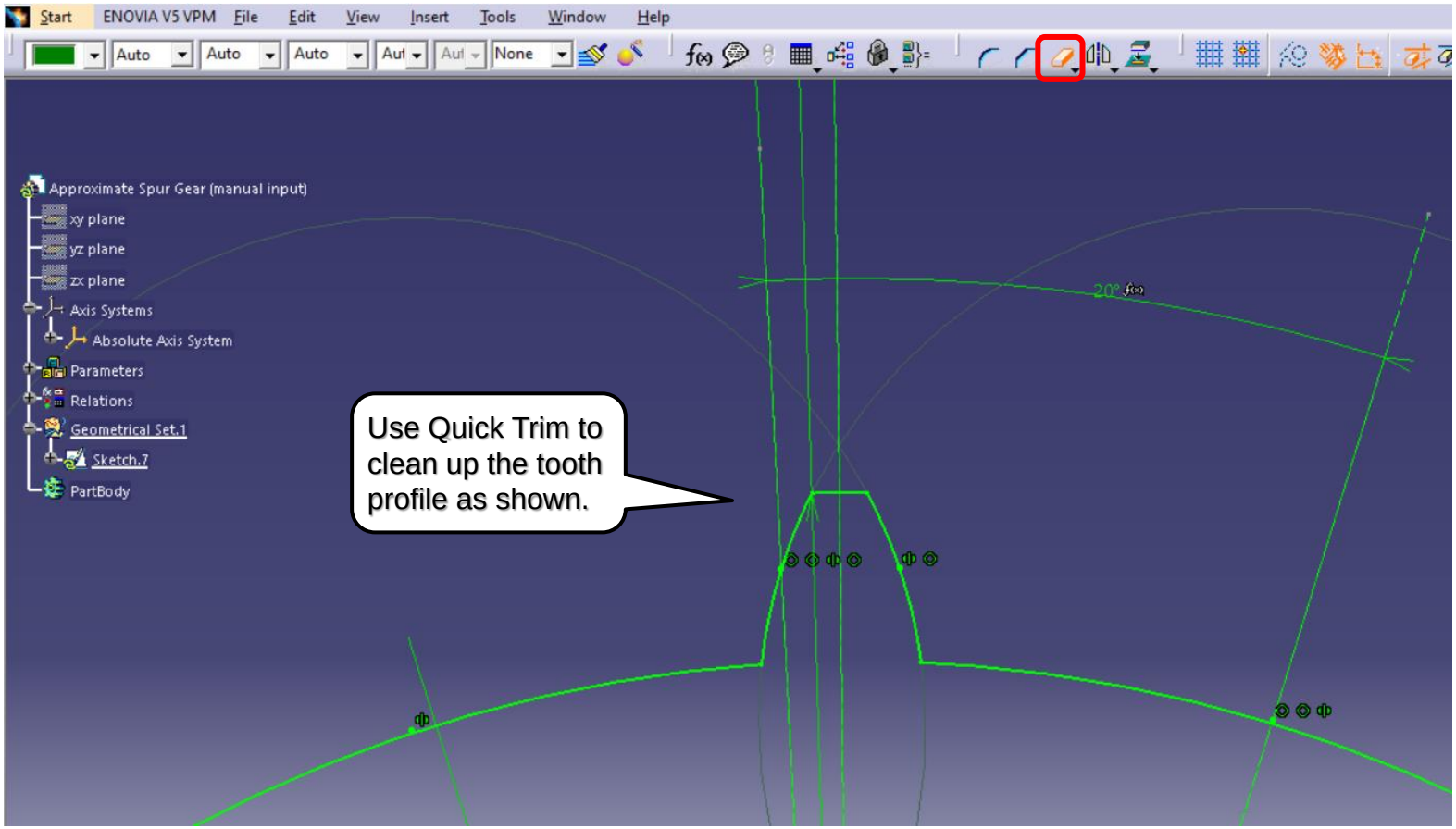
- Clean up the tooth profile.



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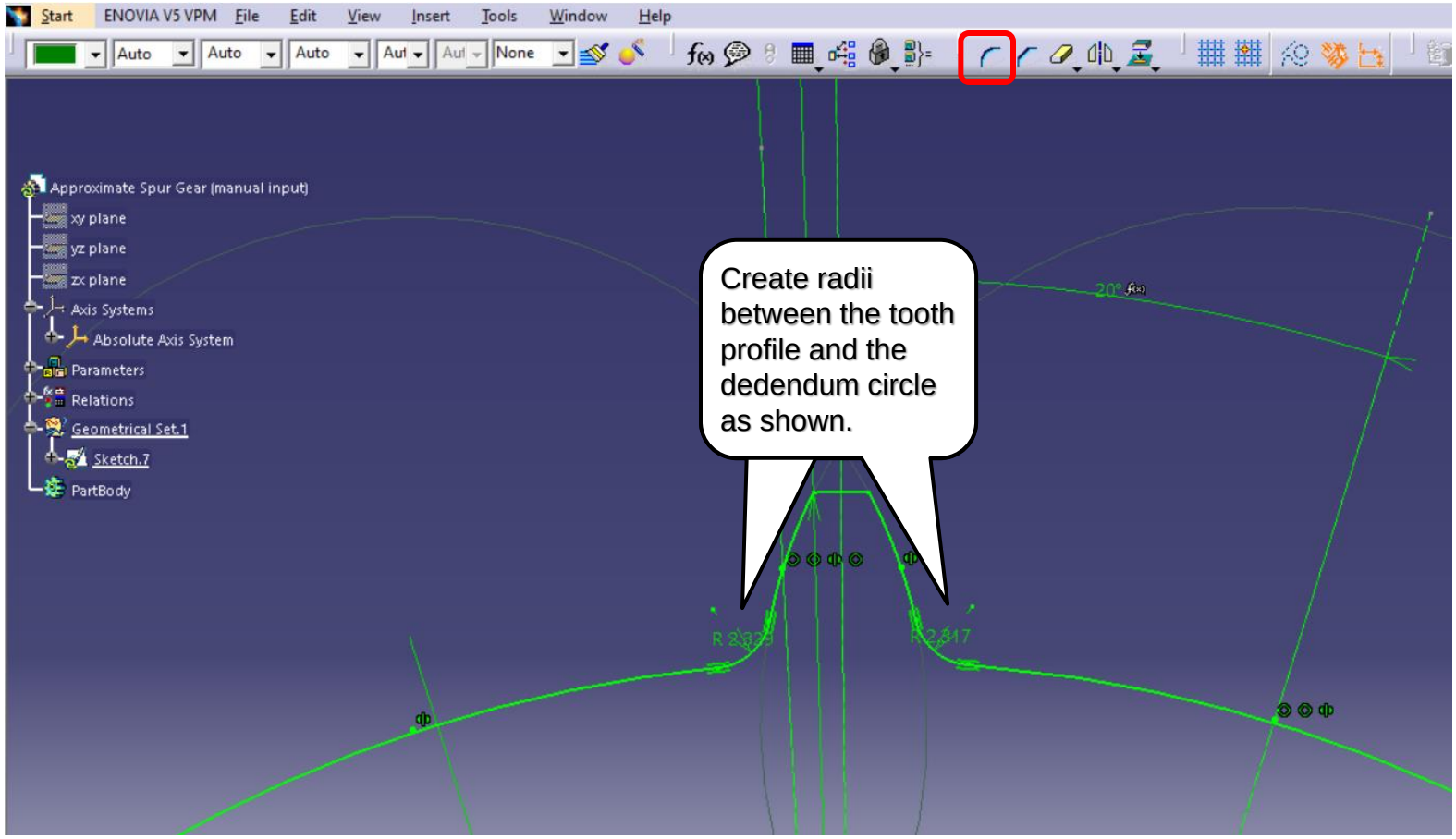
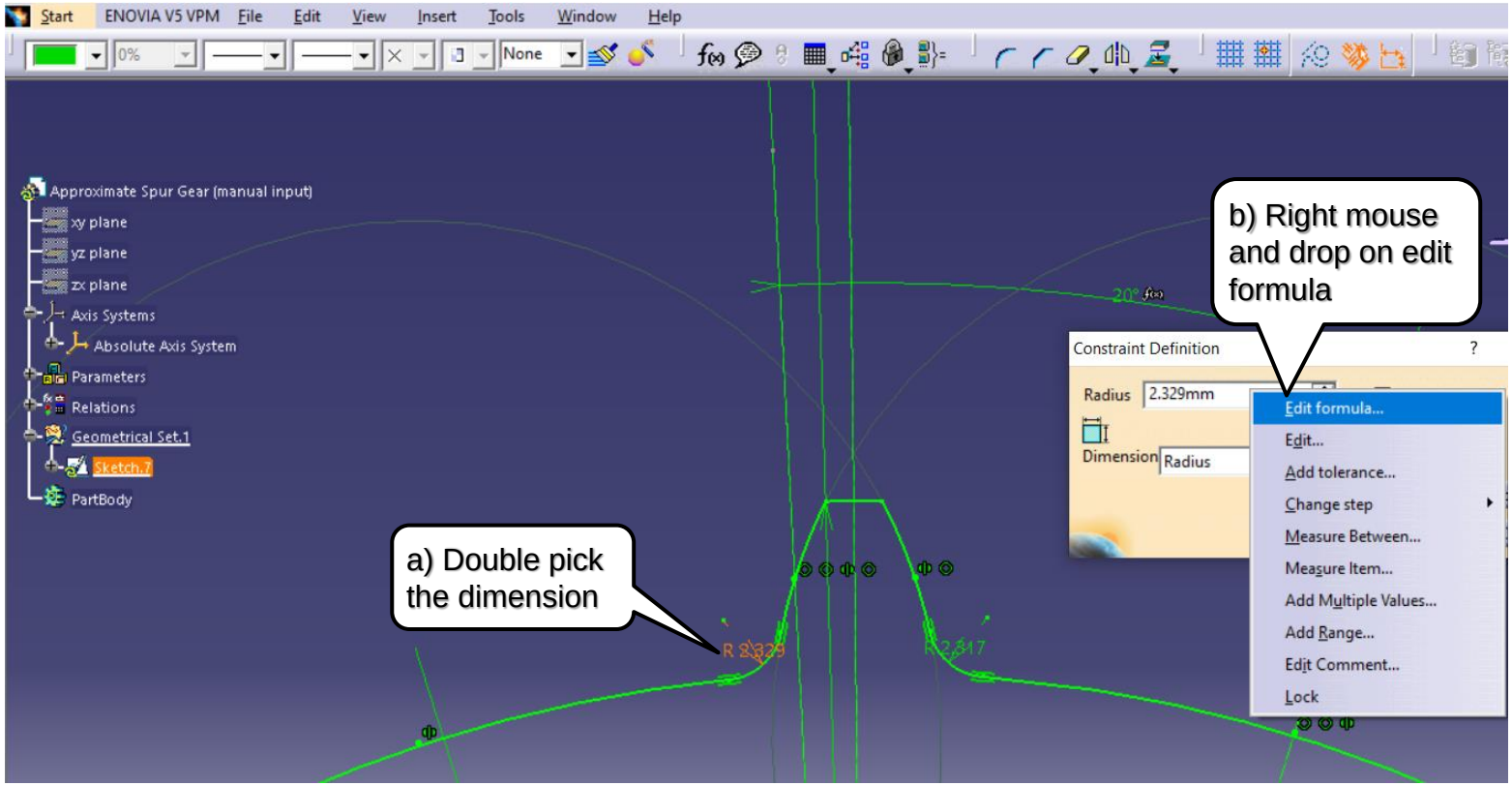
- Create the radius between the tooth profile and the dedendum circle.



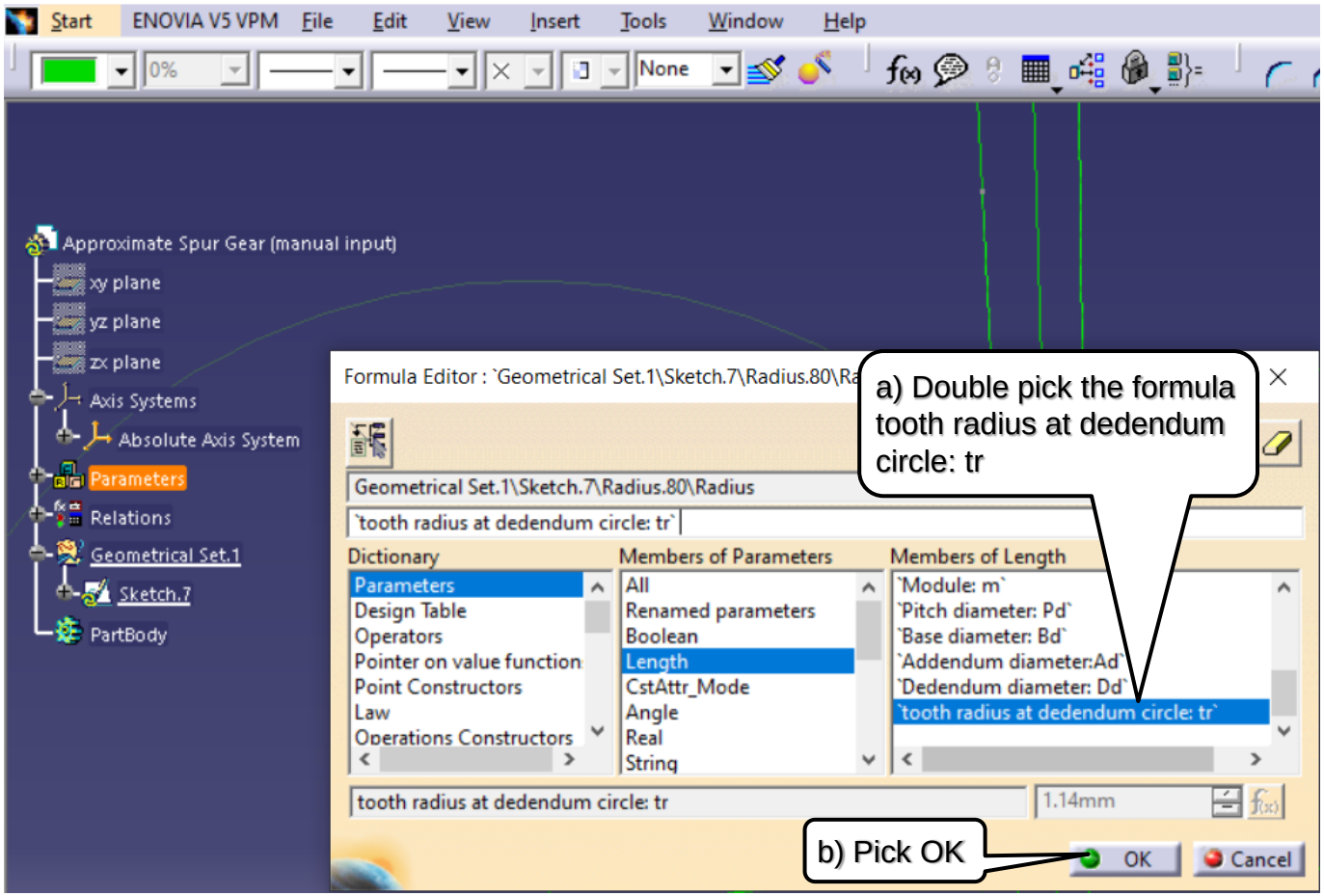
BND TechSource

- Apply tooth radius at dedendum circle: tr to both radii.



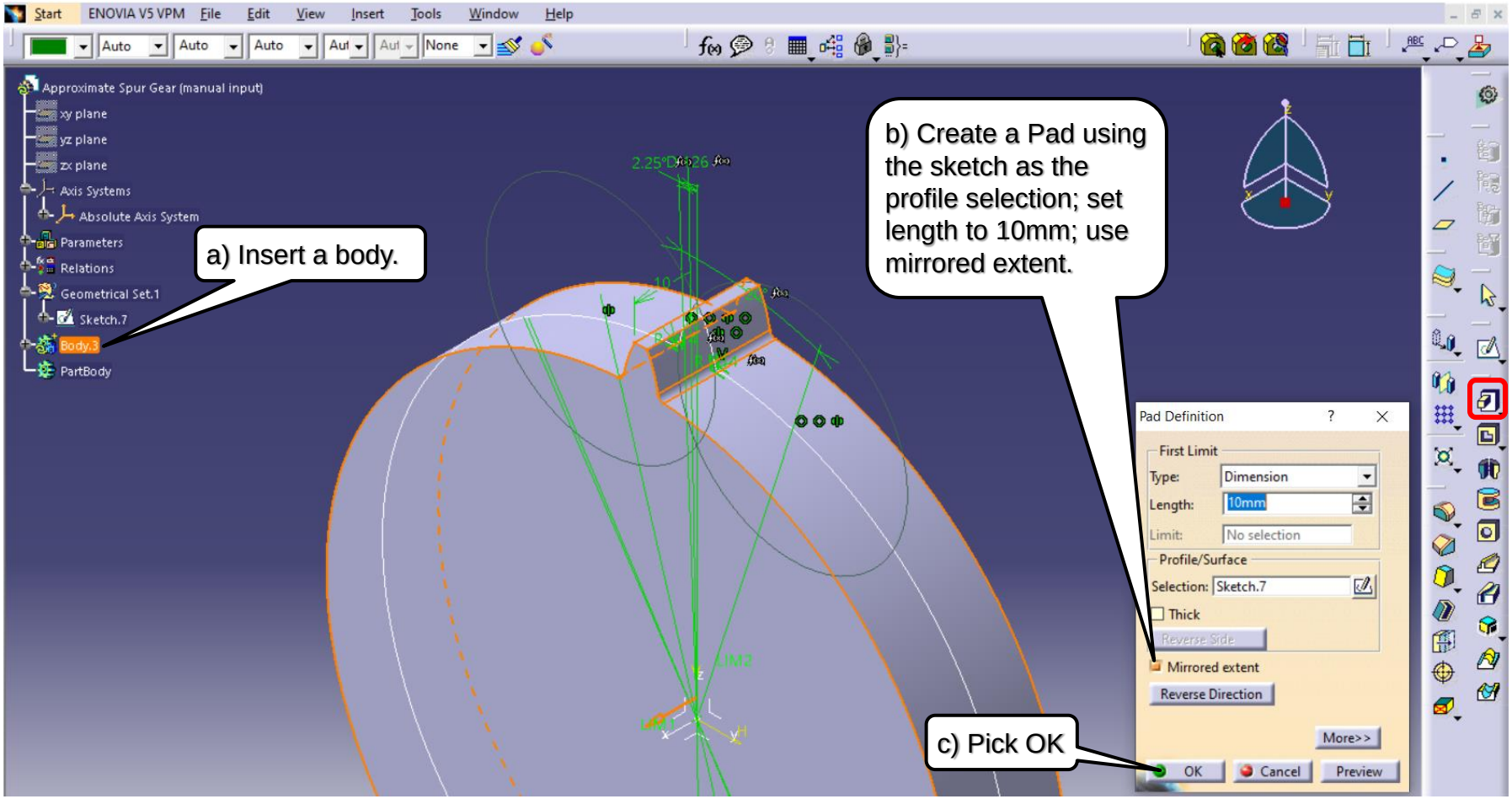
BND TechSource

- Apply tooth radius at dedendum circle: tr to both radii.



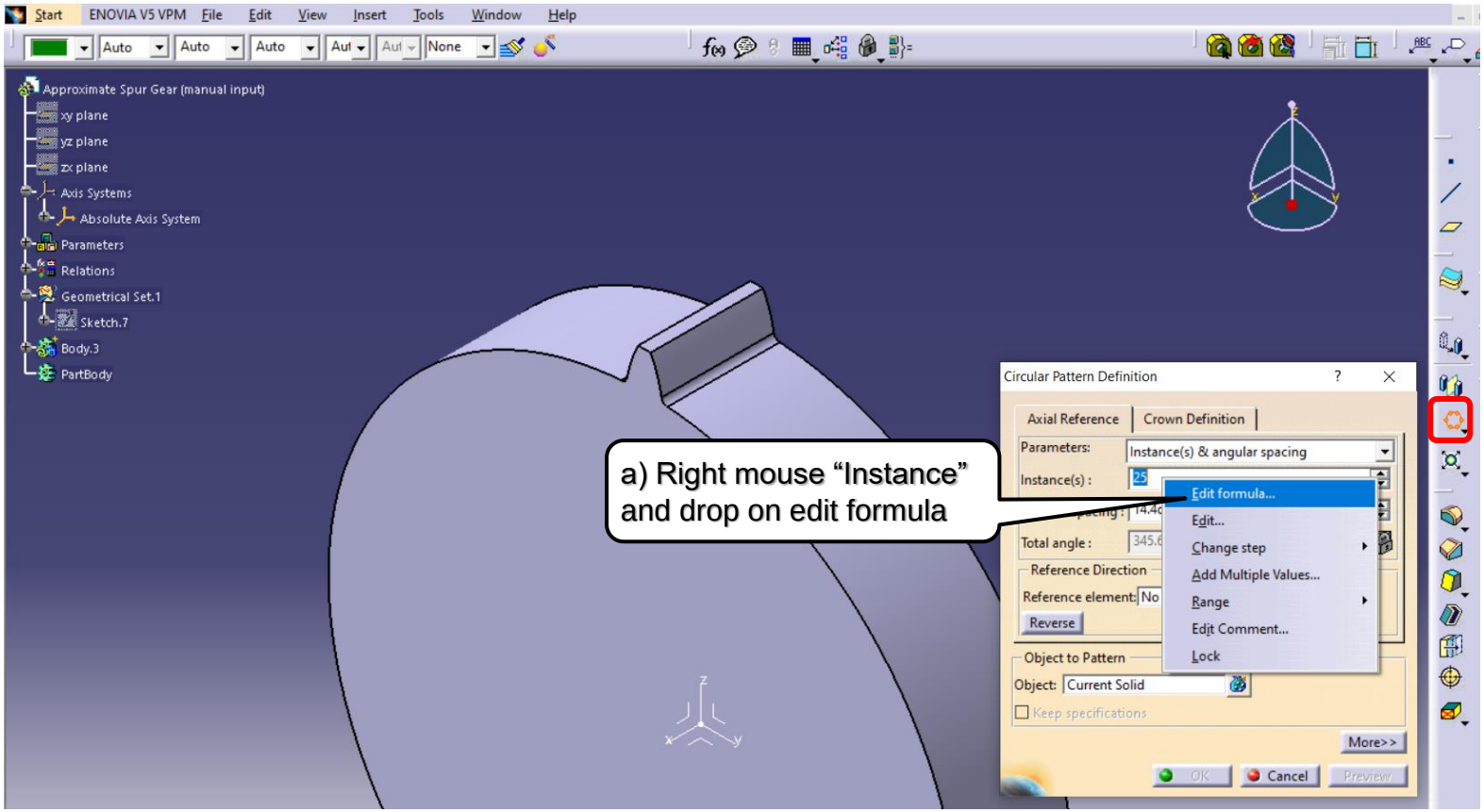
BND TechSource

- Create a solid pad using the sketch.



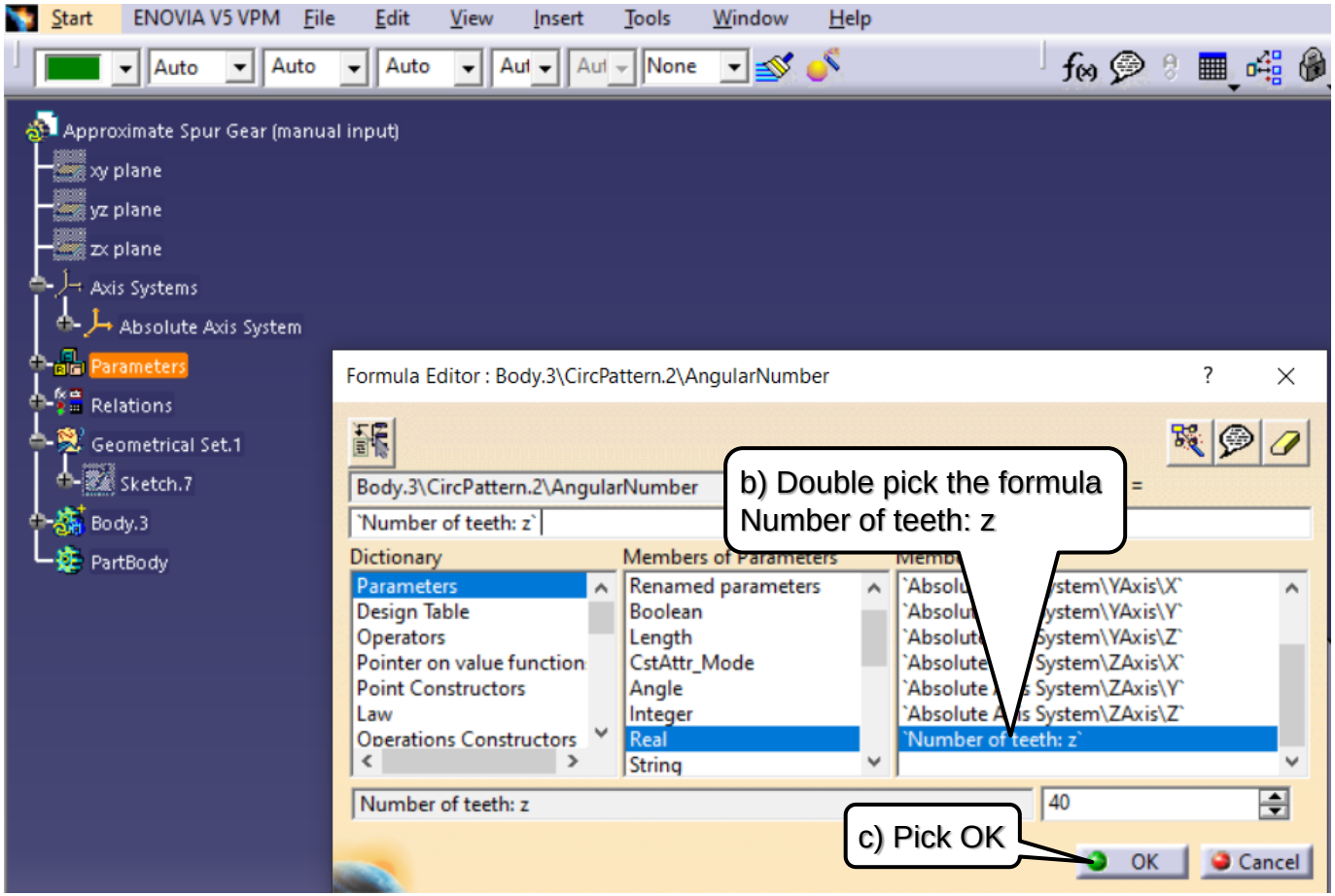
BND TechSource

- Create the pattern for the number of teeth.



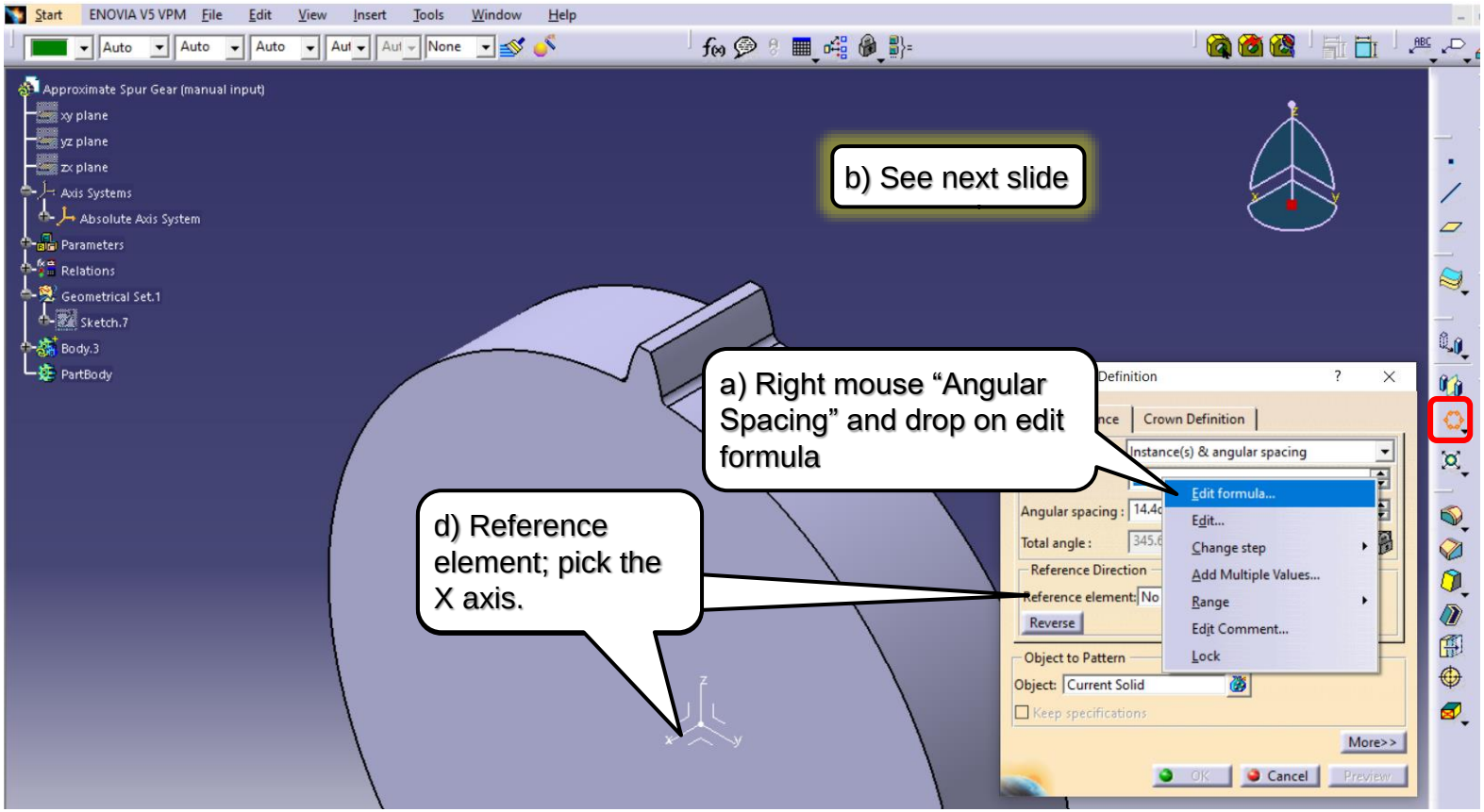
BND TechSource

- Create the pattern for the number of teeth.



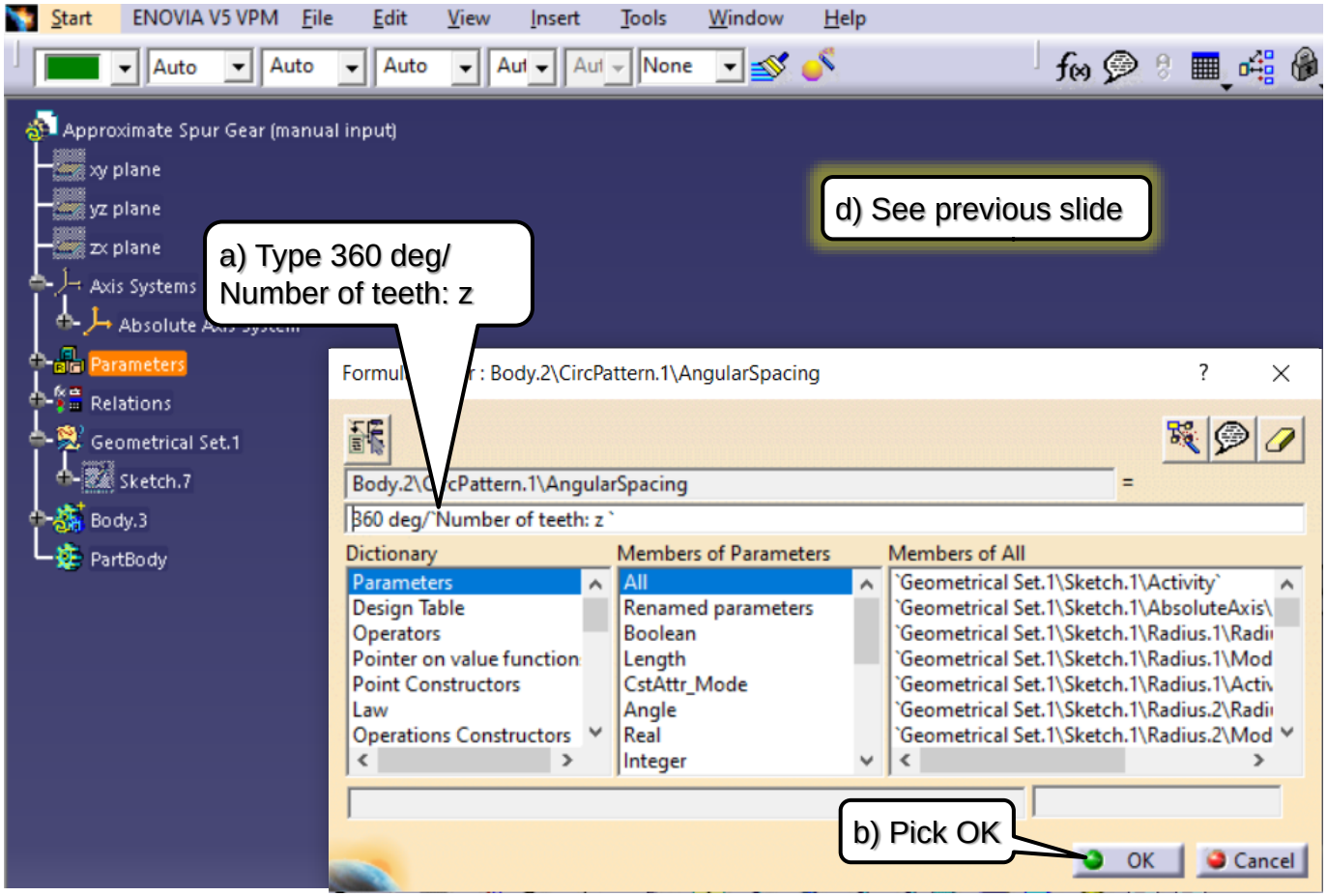
BND TechSource

- Create the pattern for the number of teeth.



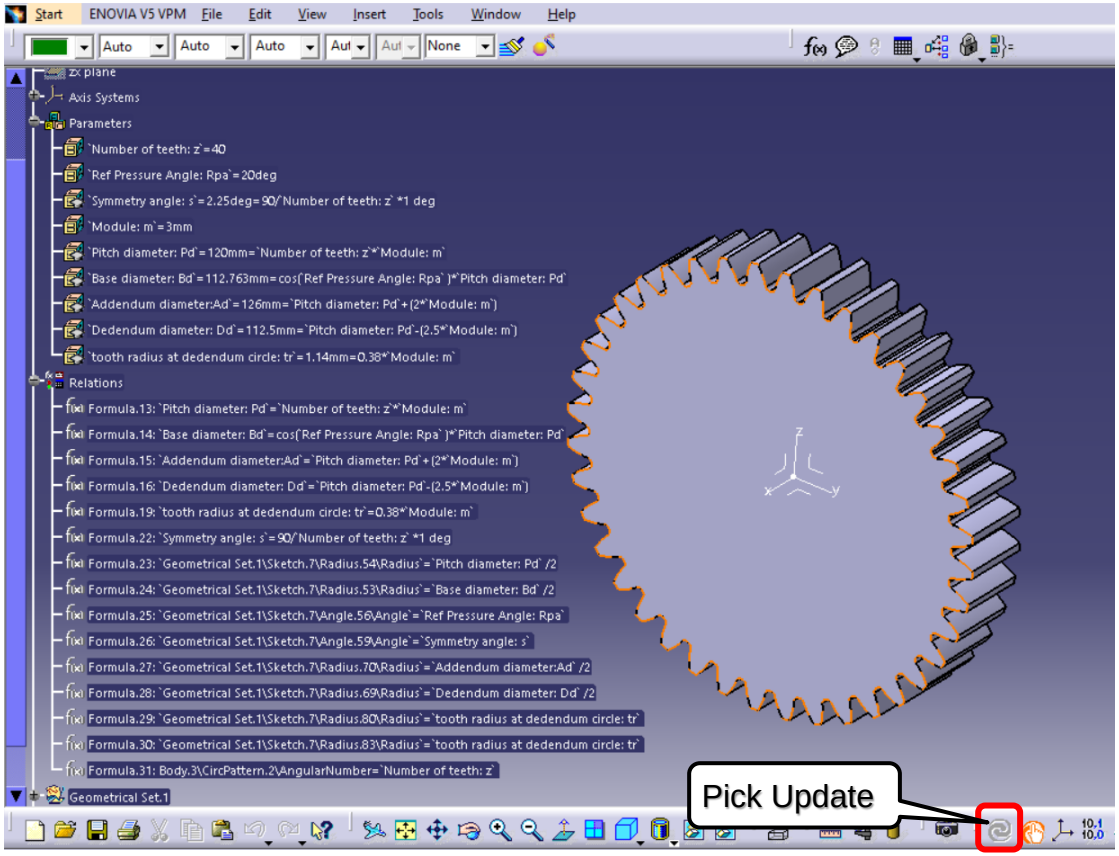
BND TechSource

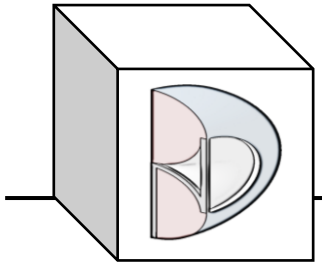
- Create the pattern for the number of teeth.



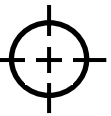
BND TechSource

- Update the part.





BND TechSource



Modify the .xls(x) or .txt file and re-import the data to the CATPart

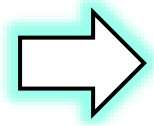
BND TechSource

- Change the .xls(x) or txt file and re-import it.

Approximate Spur Gear Input_[m_3-Rpa_20-z_40].txt - Notepad

File Edit Format View Help

```
Module: m        3mm
Ref Pressure Angle: Rpa 20.deg
Number of teeth: z       40
Symmetry Angle: s        2.25deg
Pitch diameter: Pd       120.mm
Base diameter: Bd        112.763mm
Addendum diameter: Ad    126.mm
Dedendum diameter: Dd    112.5mm
tooth radius at dedendum circle: tr      1.14mm
```



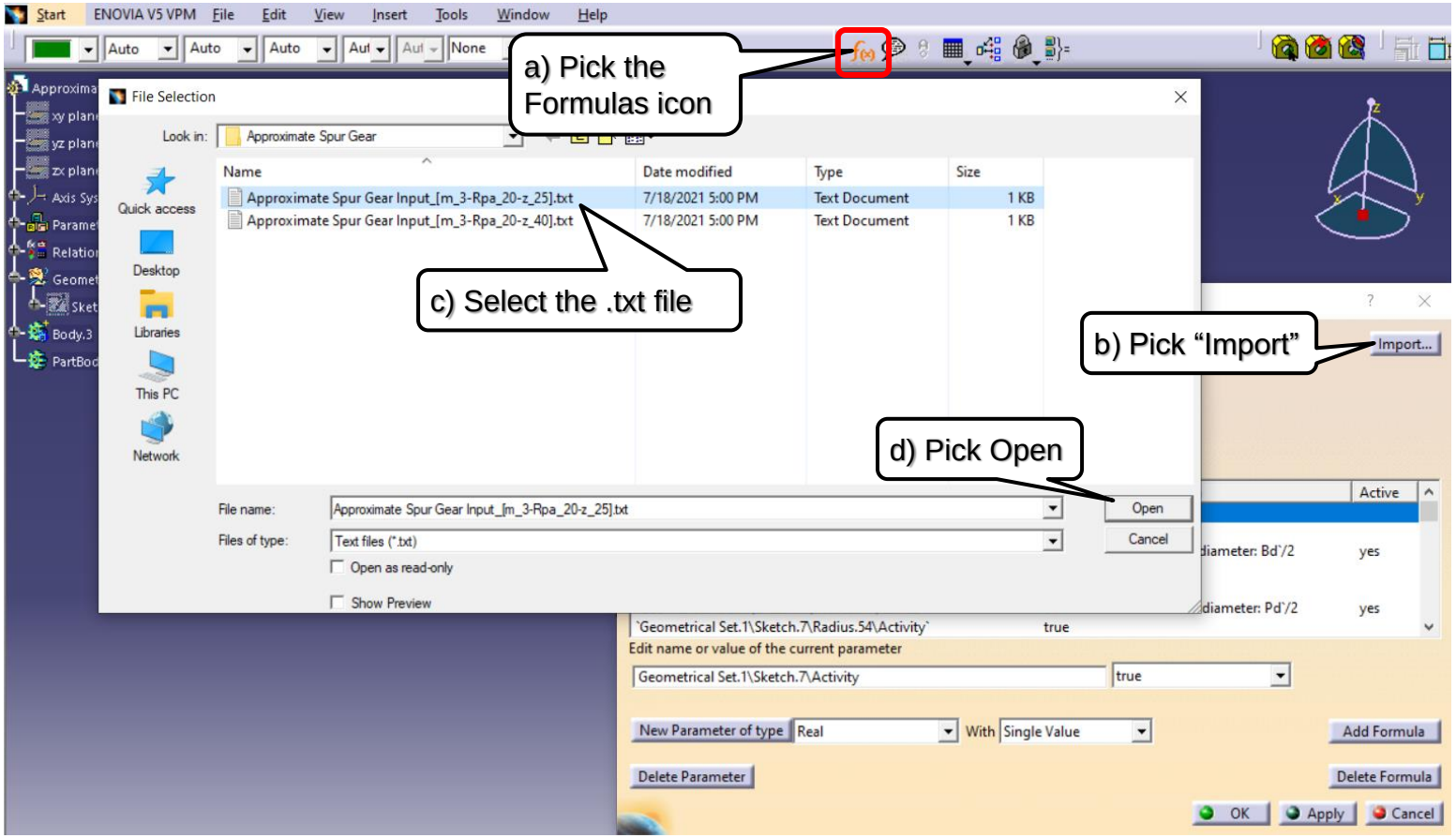
Approximate Spur Gear Input_[m_3-Rpa_20-z_25].txt - Notepad

File Edit Format View Help

```
Module: m        3mm
Ref Pressure Angle: Rpa 20.deg
Number of teeth: z       25
Symmetry Angle: s        3.6deg
Pitch diameter: Pd       75.mm
Base diameter: Bd        70.477mm
Addendum diameter: Ad    81.mm
Dedendum diameter: Dd    67.5mm
tooth radius at dedendum circle: tr      1.14mm
```

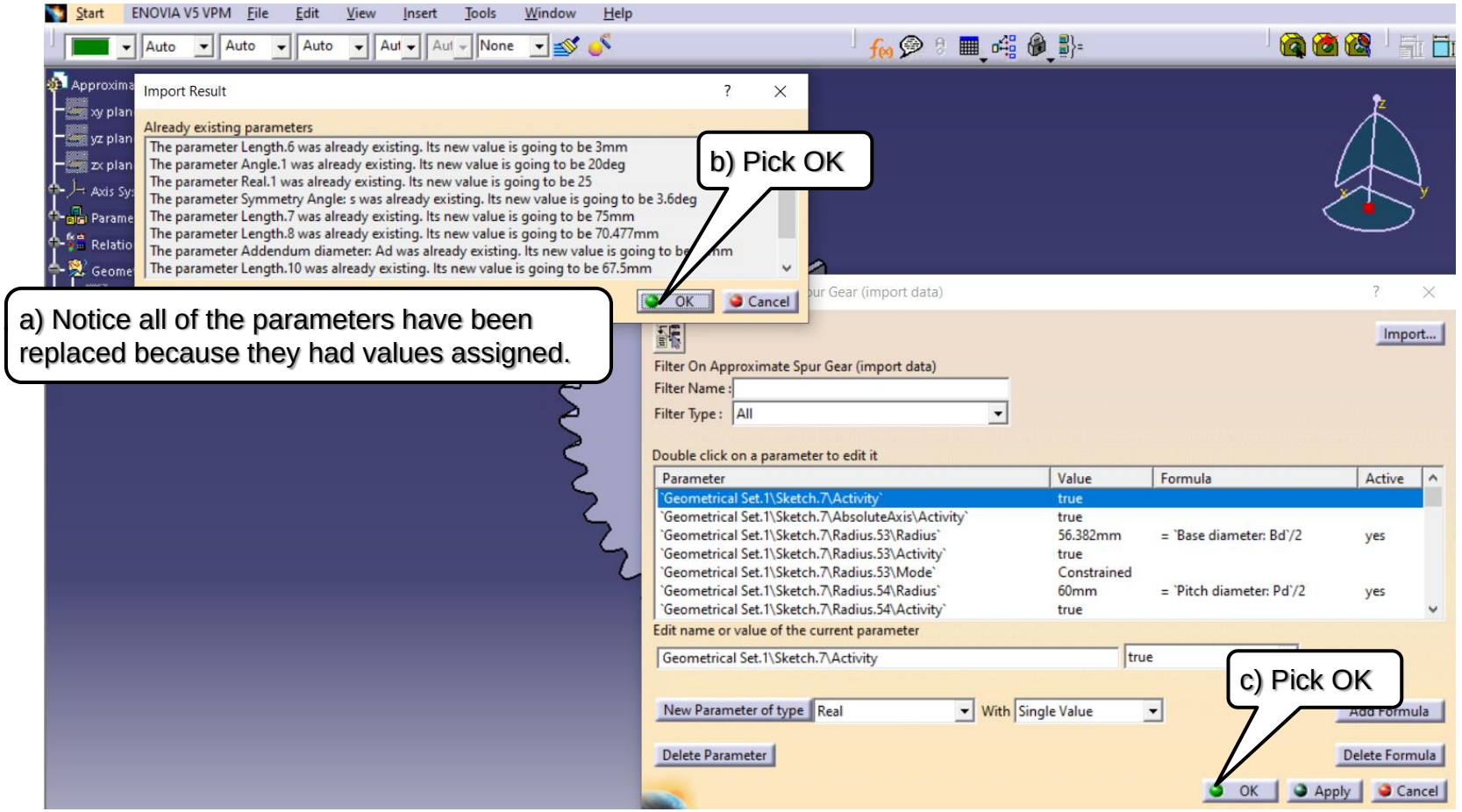
BND TechSource

- Re-import the .xls(x) or .txt file to the CATPart.



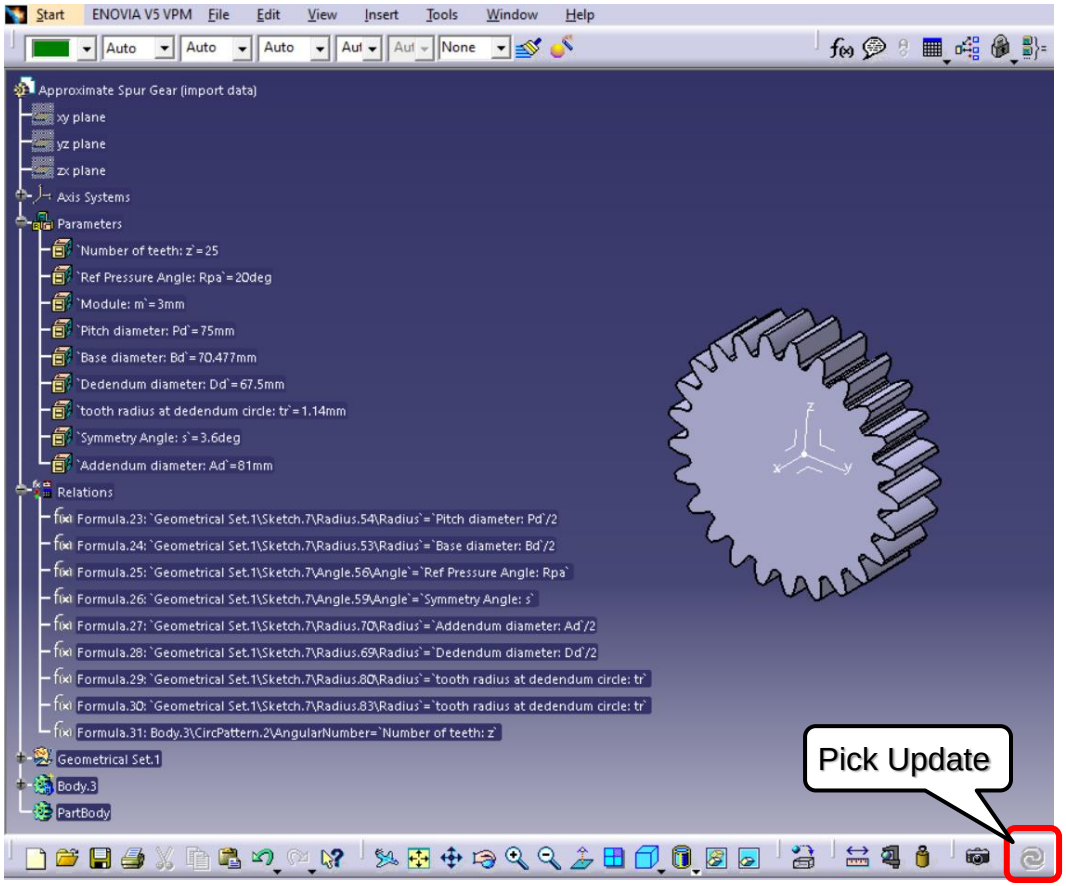
BND TechSource

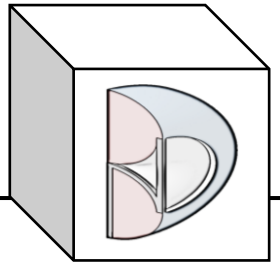
- Re-import the .xls(x) or .txt file to the CATPart.



BND TechSource

- And there you have it! An Approximated Spur Gear which is modifiable through imported data from .xls(x) or .txt file.





BND TechSource

- Again we have a “template” part for our Spur gear.
- The difference is; this template is based upon a one time feed of data via an .xls(x) or .txt file and must be re-imported for every modification.
- This part may be modified by simply changing the parameters of any/all of the following three formulae on the .xls(x) or .txt file:
  1. z - number of teeth // real parameter [z = input]
  2. Rpa - Ref Pressure Angle // angle parameter [Rpa = input]
  3. m - module // length parameter [m = input]
- Next we will look at using CATIA Macro + Import Parameters (from .xls(x) or.txt file) to feed the parameter data and update the Spur Gear.

BND TechSource

- Conclusion:

  This is an example of Designing Approximate Spur Gear in CATIA V5 (Method 3: importing data from .xls(x) or .txt file).

  We hope this will help those who need this type of simulation.

  As always, we are open to any discussions this may bring.

  Please ***subscribe*** to our YouTube channel!