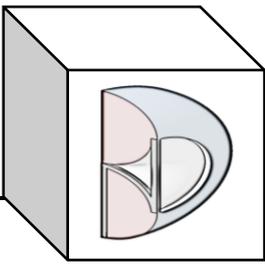


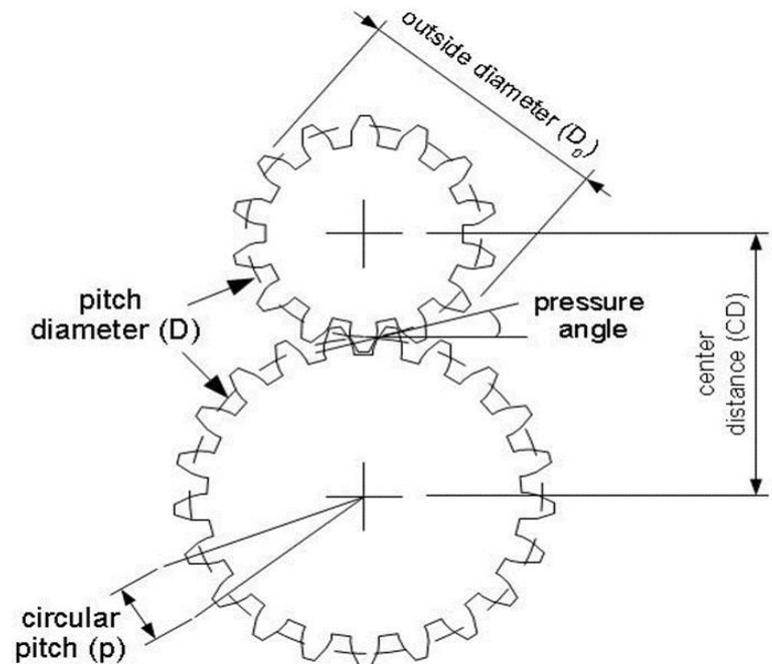
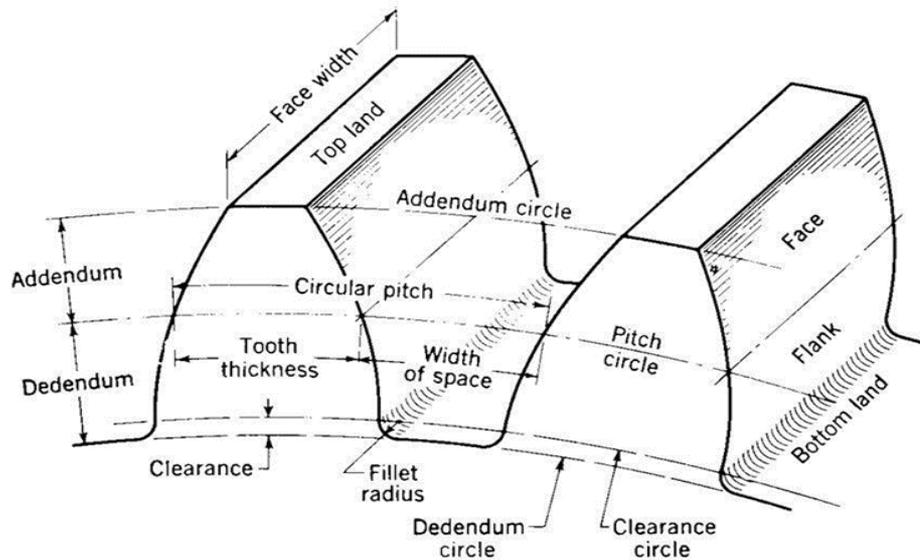
Designing Approximate Spur Gear in CATIA V5 (Method 1 of 4: manual input)

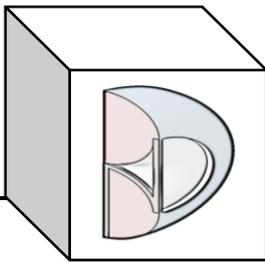




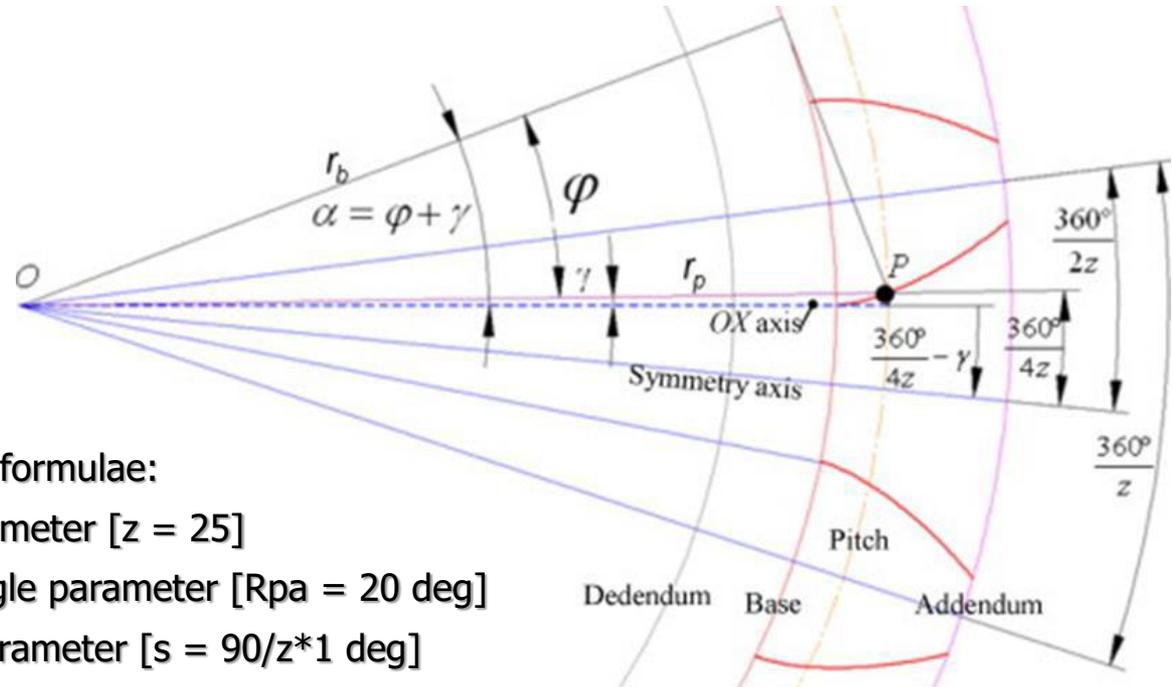
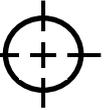
- This is step by step guide of how to create an *approximate* involute spur gear using CATIA V5.
- This document assumes that you know basic spur gear geometry.

GEAR NOMENCLATURE





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Some basic nomenclature and formulae:

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

R_{pa} -ref. pressure angle // angle parameter [$R_{pa} = 20 \text{ deg}$]

s -symmetry angle // angle parameter [$s = 90/z * 1 \text{ deg}$]

m -module // length parameter [$m = 3\text{mm}$]

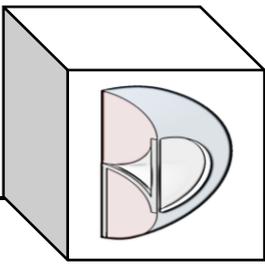
P_d -Pitch diameter // length parameter [$P_d = z * m$]

B_d -Base diameter // length parameter [$B_d = P_d * \cos(R_{pa}[\text{radians}])$]

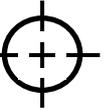
A_d -Addendum diameter // length parameter [$A_d = P_d + (2 * m)$]

D_d -Dedendum diameter // length parameter [$D_d = P_d - (2.5 * m)$]

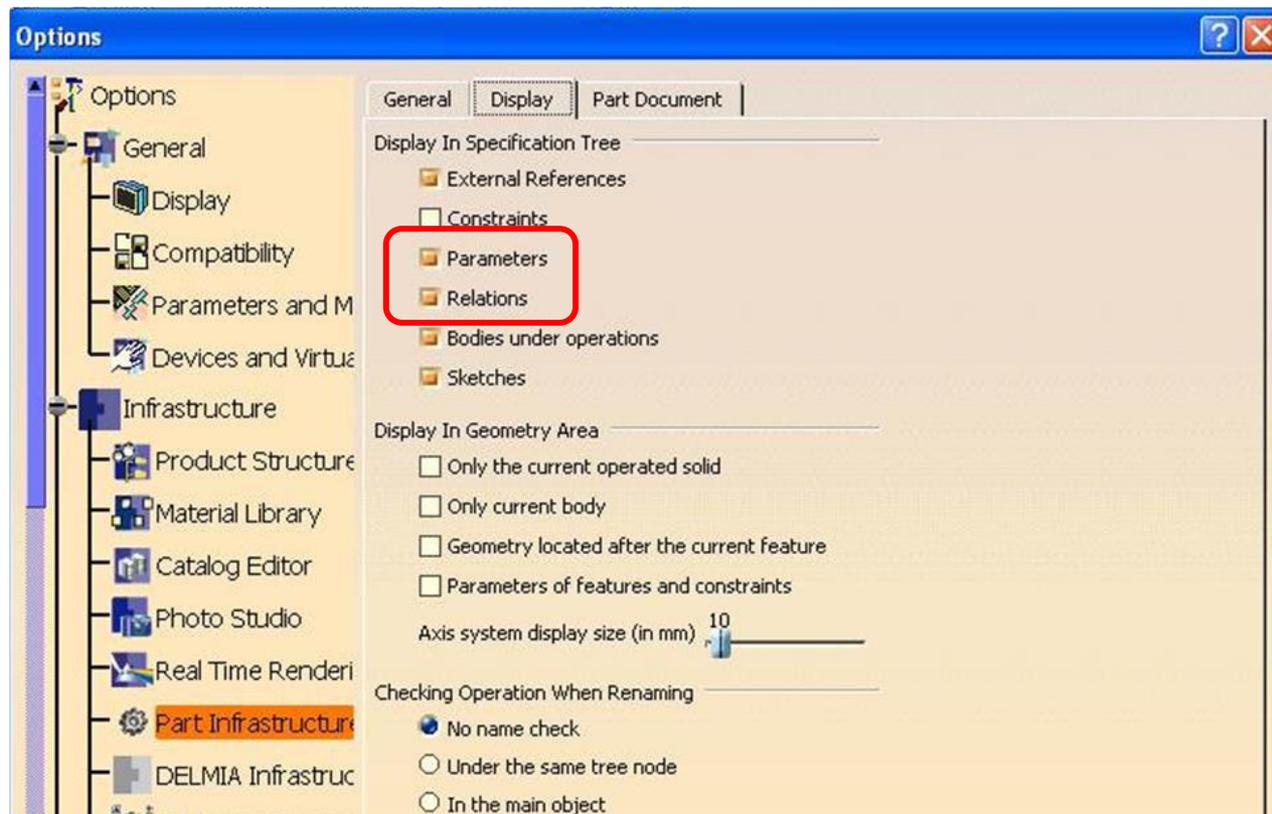
tr -tooth radius at dedendum circle // length parameter [$0.38 * m$]

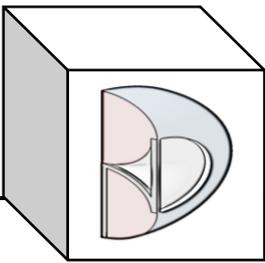


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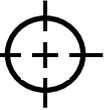


- When you start CATIA, go to TOOLS->OPTIONS->Infrastructure->
- Part Infrastructure and in Display select “Parameters” and “Relations”.

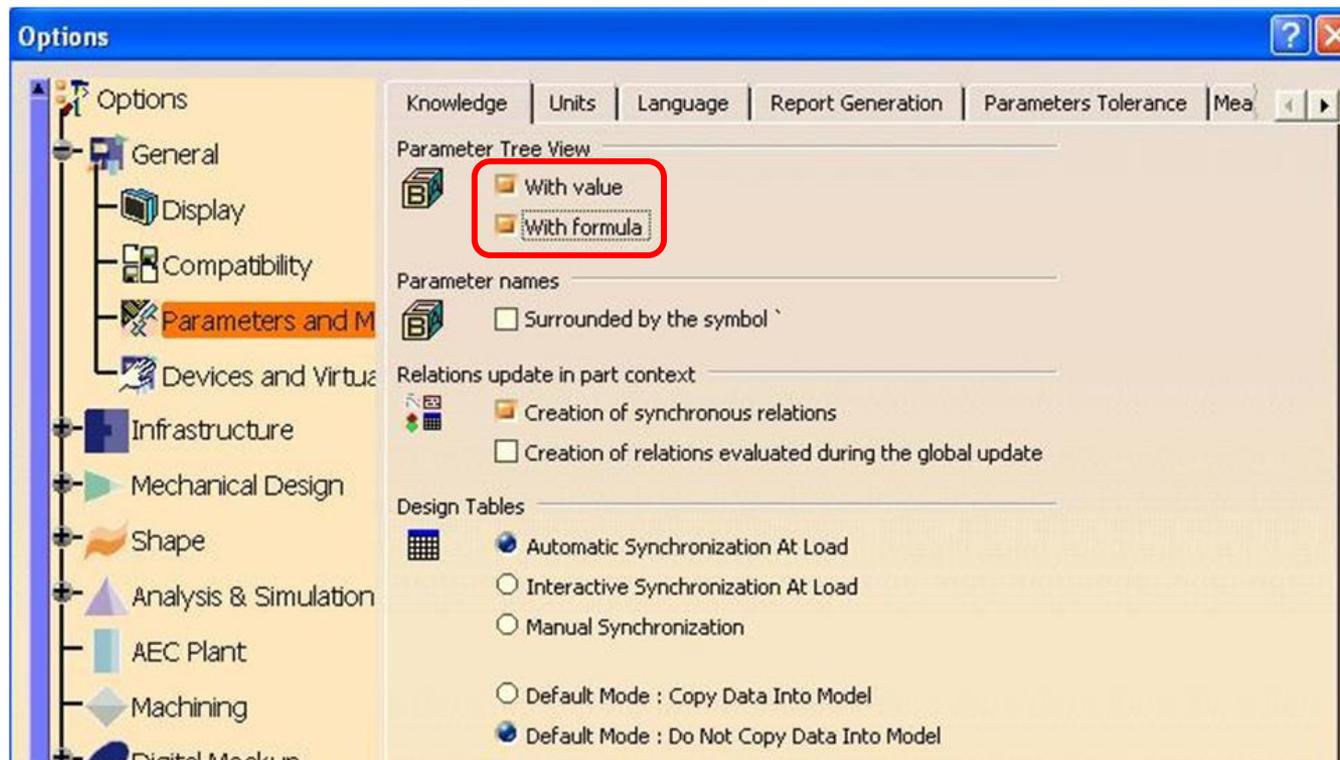


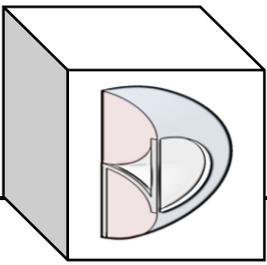


BND TechSource

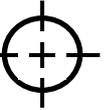


- Then in Options->General in Parameters and Measures select “With Value” and “With Formula” in Parameters Tree View.

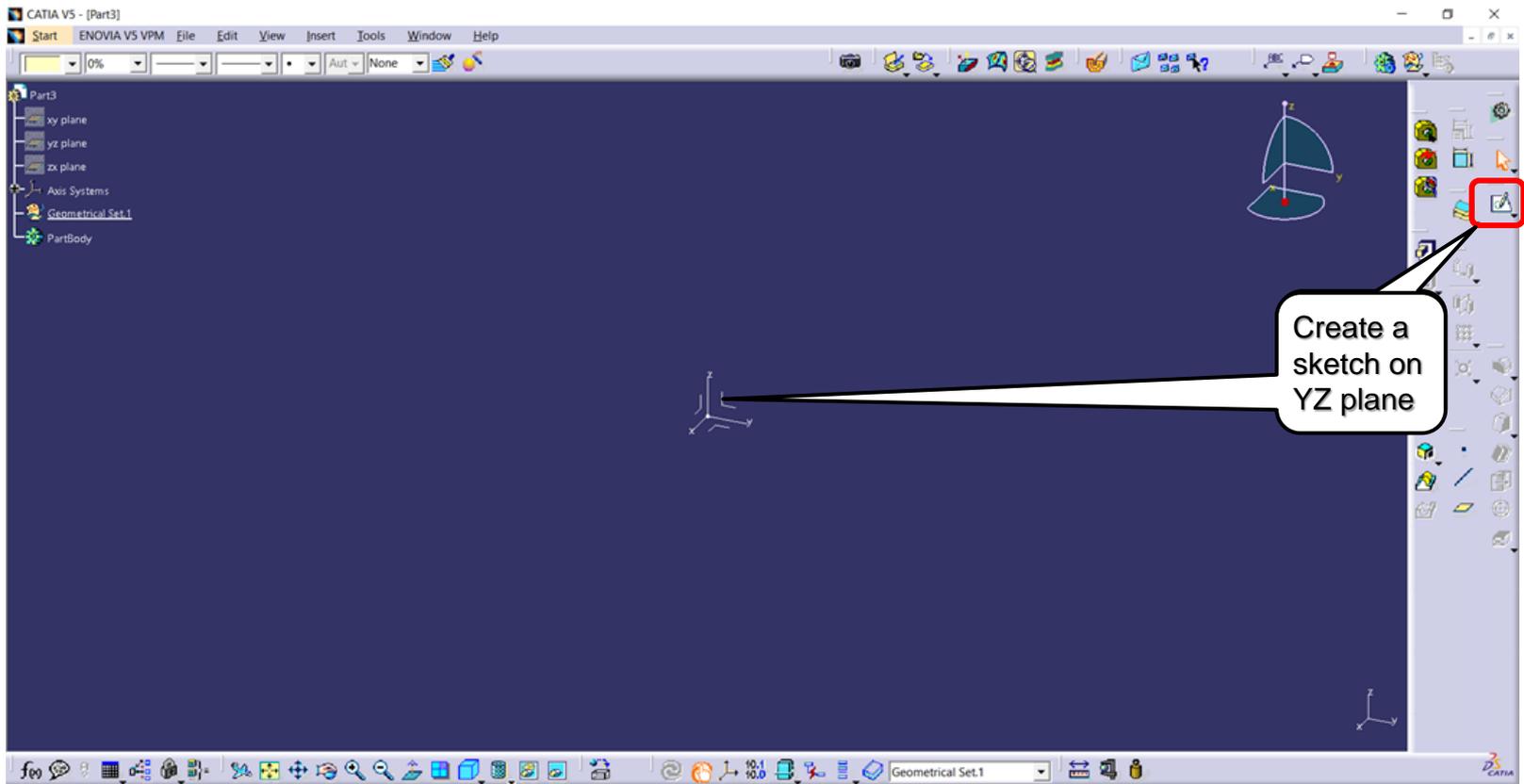


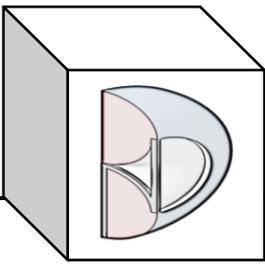


BND TechSource

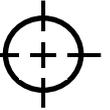


- Open a new CATPart.



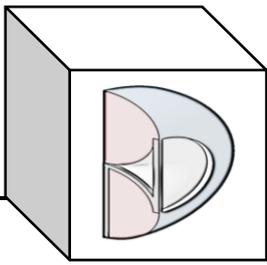


BND TechSource

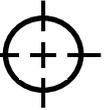


- Create the following Nine formulae:
- Known:
 - z // real parameter [**Number of teeth: $z = 25$**]
 - Rpa // angle parameter [**Ref Pressure Angle: $Rpa = 20$ deg**]
 - m // length parameter [**Module: $m = 3$ mm**]
- Resultant:
 - s // angle parameter [**Symmetry angle: $s = 90/z*1$ deg**]
 - Pd // length parameter [**Pitch diameter: $Pd = z*m$**]
 - Bd // length parameter [**Base diameter: $Bd = Pd * \cos(Rpa[\text{radians}])$**]
 - Ad // length parameter [**Addendum diameter: $Ad = Pd+(2*m)$**]
 - Dd // length parameter [**Dedendum diameter: $Dd = Pd-(2.5*m)$**]
 - tr // length parameter [**tooth radius at dedendum circle: $tr = 0.38*m$**]

CATIA sees a diametral dimension as a radius. Even though the dimension displays as a diameter.



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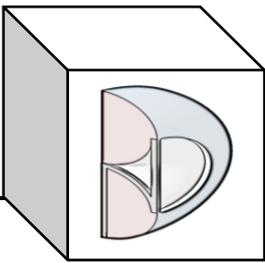
- Open the Formulas window

Pick "Real" for the first formula

Pick the Function icon

Pick "OK"

Open the drop-down list



1) z // real parameter [Number of teeth: z = 25]

Formulas: Approximate Spur Gear

Filter On Approximate Spur Gear

Filter Name :

Filter Type : All

Double click on a parameter to edit it

Parameter	Value	Formula	Active
'Absolute Axis System\Activity'	true		
'Approximate Spur Gear\Part Number'	Approximat...		
'Approximate Spur Gear\Nomenclature'			
'Approximate Spur Gear\Revision'			
'Approximate Spur Gear\Product Description'			
'Approximate Spur Gear\Definition'			
'Number of teeth: z'	25		

Edit name or value of the current parameter

Number of teeth: z 25

New Parameter of type Real With Single Value

Delete Parameter

Add Formula

Delete Formula

OK Apply Cancel

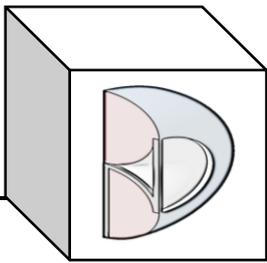
1

a) Pick New Parameter

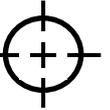
b) Type "Number of teeth: z" for the name

c) Set 25 for the number of teeth

d) Pick OK



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- Open the Formulas window

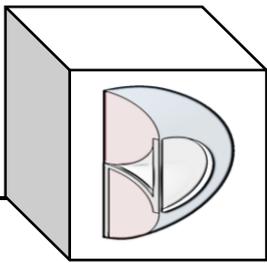
The screenshot shows the ENOVIA V5 VPM software interface. The 'Formulas' window is open, displaying a list of units and a dropdown menu. The 'Angle' unit is selected in the list, and the 'OK' button is highlighted. Callouts provide instructions: 'Pick "Angle" for this formula', 'Pick the Function icon', and 'Pick "OK"'. A dropdown list is also shown with 'Angle' selected.

Pick "Angle" for this formula

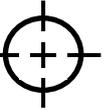
Pick the Function icon

Pick "OK"

Open the drop-down list



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2) Rpa // angle parameter [Ref Pressure Angle: Rpa = 20 deg]

Formulas: Approximate Spur Gear

Filter On Approximate Spur Gear
Filter Name:
Filter Type: All

Double click on a parameter to edit it

Parameter	Value	Formula	Active
'Number of teeth: z'	25		
'Approximate Spur Gear\Part Number'	Approximat...		
'Approximate Spur Gear\Nomenclature'			
'Approximate Spur Gear\Revision'			
'Approximate Spur Gear\Product Description'			
'Approximate Spur Gear\Definition'			
'Ref Pressure Angle: Rpa'	20deg		

Edit name or value of the current parameter

Ref Pressure Angle: Rpa 20deg

New Parameter of type Angle With Single Value

Delete Parameter Add Formula Delete Formula

OK Apply Cancel

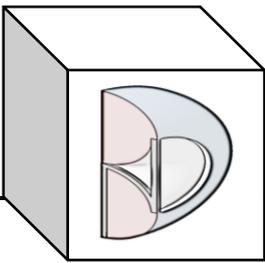
2

a) Pick New Parameter

b) Type "Ref Pressure Angle: Rpa" for the name

c) Set 20 for the Ref Pressure Angle

d) Pick OK



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3) s // angle parameter [**Symmetry angle: s = 90/z * 1 deg**]

d) Type 90/Number of teeth: z * 1 deg

e) Pick OK

b) Type "Symmetry angle: s" for the name

c) Pick Add Formula

f) Pick Apply

a) Pick New Parameter

3

Formula Editor: 'Geometrical Set.1\Sketch.4\Activity'

Geometrical Set.1\Sketch.4\Activity =

90/'Number of teeth: z' * 1 deg

Dictionary	Members of Parameters	Members of Real
Parameters	Boolean	'Absolute Axis System\XAxis\Z'
Design Table	Length	'Absolute Axis System\YAxis\X'
Operators	CstAttr_Mode	'Absolute Axis System\YAxis\Y'
Pointer on value function	Angle	'Absolute Axis System\YAxis\Z'
Point Constructors	Integer	'Absolute Axis System\ZAxis\X'
Law	Real	'Absolute Axis System\ZAxis\Y'
Operations Constructors	String	'Absolute Axis System\ZAxis\Z'
<	Feature	'Number of teeth: z'

Number of teeth: z 40

OK Cancel

Relations\Formula.17\Activity

'Approximate Spur Gear (manual input)\Nomenclature'

'Approximate Spur Gear (manual input)\Revision'

'Approximate Spur Gear (manual input)\Product Description' Approximat...

'Approximate Spur Gear (manual input)\Definition'

'Symmetry angle: s' 0deg

Edit name or value of the current parameter

Symmetry angle: s 0deg

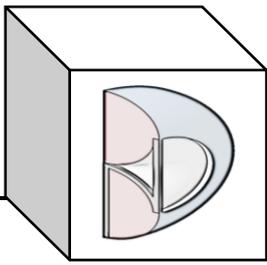
New Parameter of type Angle With Single Value

Delete Parameter

Add Formula

Delete Formula

OK Apply Cancel



BND TechSource

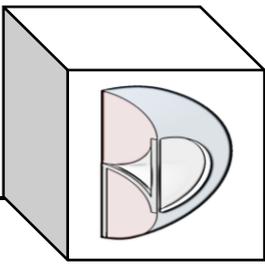


- The next Six Parameters will be Length type.

Pick "Length" for the next five formulae

Pick the Function icon

Pick "OK"



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4) m // length parameter [**Module: m = 3mm**]

Start ENOVIA V5 VPM File Edit View Insert Tools Window Help

Auto Auto Auto Auto None

Approximate Spur Gear

xy plane
yz plane
zx plane
Axis Systems
Geometrical Set.1
Sketch.1
PartBody

Formulas: Approximate Spur Gear

Filter On Approximate Spur Gear
Filter Name:
Filter Type: All

Double click on a parameter to edit it

Parameter	Value	Formula	Active
'Ref Pressure Angle: Rpa'	20deg		
'Approximate Spur Gear\Part Number'	Approximat...		
'Approximate Spur Gear\Nomenclature'			
'Approximate Spur Gear\Revision'			
'Approximate Spur Gear\Product Description'			
'Approximate Spur Gear\Definition'			
'Module: m'	3mm		

Edit name or value of the current parameter

Module: m 3mm

New Parameter of type Length With Single Value

Delete Parameter

Add Formula

Delete Formula

OK Apply Cancel

4

a) Pick New Parameter

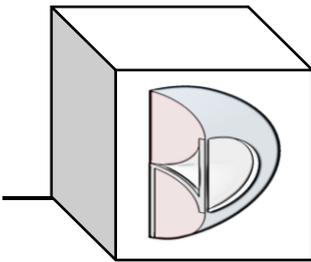
b) Type "Module: m" for the name

c) Set 3mm for the module

d) Pick OK

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5) Pd // length parameter [**Pitch diameter: Pd = z*m**]



The screenshot shows the ENOVIA software interface. On the left is a tree view with 'Parameters' selected. The main area shows the 'Parameters' dialog box with a list of parameters. The 'Pitch diameter: Pd' parameter is selected, showing a value of 120mm. The 'Formula Editor' window is open, showing the formula $Pd = z * m$. Annotations with callout boxes provide instructions:

- a) Pick New Parameter (points to the 'New Parameter of type' button)
- b) Type "Pitch diameter: Pd" for the name (points to the 'Edit name or value of the current parameter' field)
- c) Pick Add Formula (points to the 'Add Formula' button)
- d) Type Number of teeth: z *Module: m (points to the formula input field)
- e) Pick OK (points to the 'OK' button in the Formula Editor)
- f) Pick Apply (points to the 'Apply' button in the Parameters dialog)

5

6) Bd // length parameter [**Base diameter: $Bd = Pd \cdot \cos(Rpa[\text{radians}])$**]

The screenshot shows the ENOVIA V5 VPM interface. The Formula Editor window is open, displaying the formula for Base diameter: $Bd = Pd \cdot \cos(\text{Ref Pressure Angle: Rpa})$. The Parameter dialog box is also open, showing the parameter name 'Base diameter: Bd' and its value '112.763mm'. The dialog box has several buttons: 'New Parameter of type', 'Delete Parameter', 'Add Formula', and 'Delete Formula'. The 'New Parameter of type' dropdown is set to 'Length' and 'With' is set to 'Single Value'. The 'Add Formula' button is highlighted.

Annotations:

- a) Pick New Parameter
- b) Type "Base diameter: Bd" for the name
- c) Pick Add Formula
- d) Type Pitch diameter: Pd *cos(Ref Pressure Angle: Rpa)
- e) Pick OK
- f) Pick Apply

Note: Ref Pressure Angle: Rpa is read as radians.

Parameter	Value	Formula
'Absolute Axis System\Origin\X'		
'Absolute Axis System\Origin\Y'		
'Absolute Axis System\Origin\Z'		
'Module: m'		
'Pitch diameter: Pd'	120mm	= 'Number of teeth: z'*Modu...
'Base diameter: Bd'	112.763mm	= cos('Ref Pressure Angle: Rpa...)

7) Ad // length parameter [Addendum diameter: $Ad = Pd + (2 * m)$]

The screenshot shows the ENOVIA V5 Formula Editor interface. The main window displays the formula for 'Addendum diameter: Ad' as $Pd + (2 * Module: m)$. The interface includes a parameter list on the left, a formula editor in the center, and a dictionary of parameters on the right. Callouts a-f guide the user through the steps:

- a) Pick New Parameter
- b) Type "Addendum diameter: Ad" for the name
- c) Pick Add Formula
- d) Type Pitch diameter: Pd + (2 * Module: m)
- e) Pick OK
- f) Pick Apply

7

8) Dd // length parameter [Dedendum diameter: $Dd = Pd - (2.5 * m)$]

The screenshot shows the ENOVIA V5 software interface. On the left, a tree view shows the 'Parameters' folder. The main area displays a list of parameters, with 'Dedendum diameter: Dd' selected. The 'Formula Editor' window is open, showing the formula $Dd = Pd - (2.5 * Module: m)$. The 'Parameters' list includes:

Parameter	Value	Formula
'Absolute Axis System\Origin\Y'		
'Absolute Axis System\Origin\Z'		
'Module: m'		
'Pitch diameter: Pd'		
'Base diameter: Bd'	112.763mm	= cos(Ref Pressure Angle: Kp...
'Addendum diameter: Ad'	126mm	= 'Pitch diameter: Pd' + (2 * M...
'Dedendum diameter: Dd'	112.5mm	= 'Pitch diameter: Pd' - (2.5 * M...

Callouts and steps:

- a) Pick New Parameter
- b) Type "Dedendum diameter: Dd" for the name
- c) Pick Add Formula
- d) Type Pitch diameter: Pd - (2.5 * Module: m)
- e) Pick OK
- f) Pick Apply

8

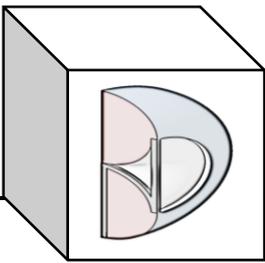
9) tr // length parameter [tooth radius at dedendum circle: $tr = 0.38 * m$]

The screenshot shows the SolidWorks software interface with the following elements and callouts:

- Callout a:** Points to the 'New Parameter' button in the bottom right of the parameter list.
- Callout b:** Points to the text input field where the name 'tooth radius at dedendum circle: tr' is entered.
- Callout c:** Points to the 'Add Formula' button in the bottom right of the dialog.
- Callout d:** Points to the formula input field containing '0.38 * Module: m'.
- Callout e:** Points to the 'OK' button in the bottom right of the dialog.
- Callout f:** Points to the 'Apply' button in the bottom right of the dialog.

The 'New Parameter' dialog box shows the following details:

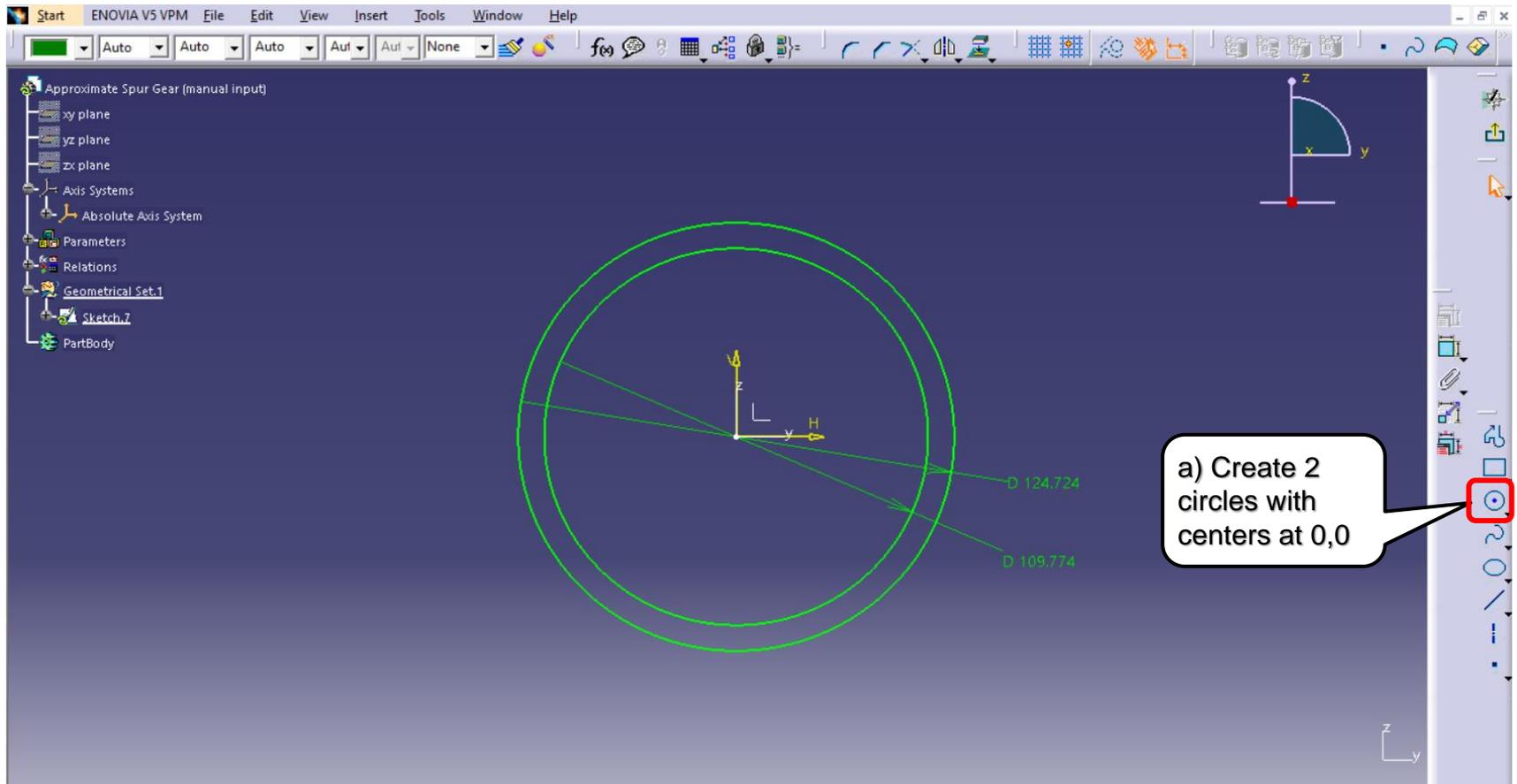
- Name:** tooth radius at dedendum circle: tr
- Value:** 0mm
- Dictionary:** Parameters
- Members of Parameters:** All, Renamed parameters, Boolean, Length (selected), CstAttr_Mode, Angle, Integer, Real
- Members of Length:** 'Module: m' (selected), 'Pitch circle radius: Rp', 'Base circle radius: Rb', 'Addendum circle radius: Ra', 'Dedendum circle radius: Rd', 'tooth radius at dedendum circle: tr'
- Unit:** 3mm

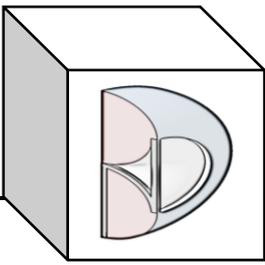


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- Create the pitch and base circles in a sketch.





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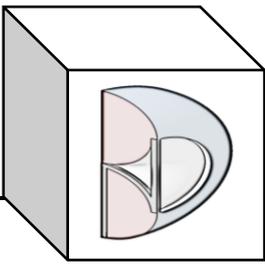


- Apply the formula (Pitch diameter: Pd) to the pitch circle.

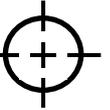
The screenshot shows the ENOVIA V5 VPM software interface. The main workspace displays a 3D model of a gear with a pitch circle highlighted in green. A dimension line is drawn across the pitch circle, labeled 'D 121.734'. A context menu is open over the dimension, with the following options:

- Center graph
- Reframe On
- Hide/Show space
- Properties Alt+Enter
- Other Selection...
- Parents/Children...
- Cut Ctrl+X
- Copy Ctrl+C
- Paste Ctrl+V
- Paste Special...
- Delete Del
- Radius.54 object
 - Definition...
 - Edit Formula**
 - Lock Parameter
 - Edit Equivalent Dimensions
 - Rename Parameter
 - Deactivate
 - Display with Leader
 - Name Display

Callout box a) Right-click the dimension points to the context menu. Callout box b) Mouse-over the object and pick edit formula points to the 'Edit Formula' option in the sub-menu.



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

b) Divide by 2 because CATIA sees Diameters as Radius objects

a) Double pick the formula Pitch diameter: Pd

c) Pick OK

Geometrical Set.1\Sketch.7\Radius,54\Radius

'Pitch diameter: Pd' / 2

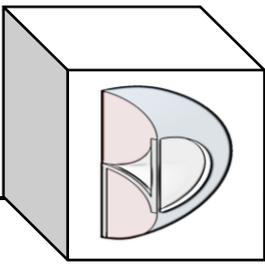
Dictionary	Members of Parameters	Members of Length
Parameters	All	'Absolute Axis System\Origin\Y'
Design Table	Renamed parameters	'Absolute Axis System\Origin\Z'
Operators	Boolean	'Module: m'
Pointer on value function	Length	'Pitch diameter: Pd'
Point Constructors	CstAttr_Mode	'Base diameter: Bd'
Law	Real	'Addendum diameter: Ad'
Operations Constructors	Angle	'Dedendum diameter: Dd'
	String	

Pitch diameter: Pd 120mm

OK Cancel

D 124.724

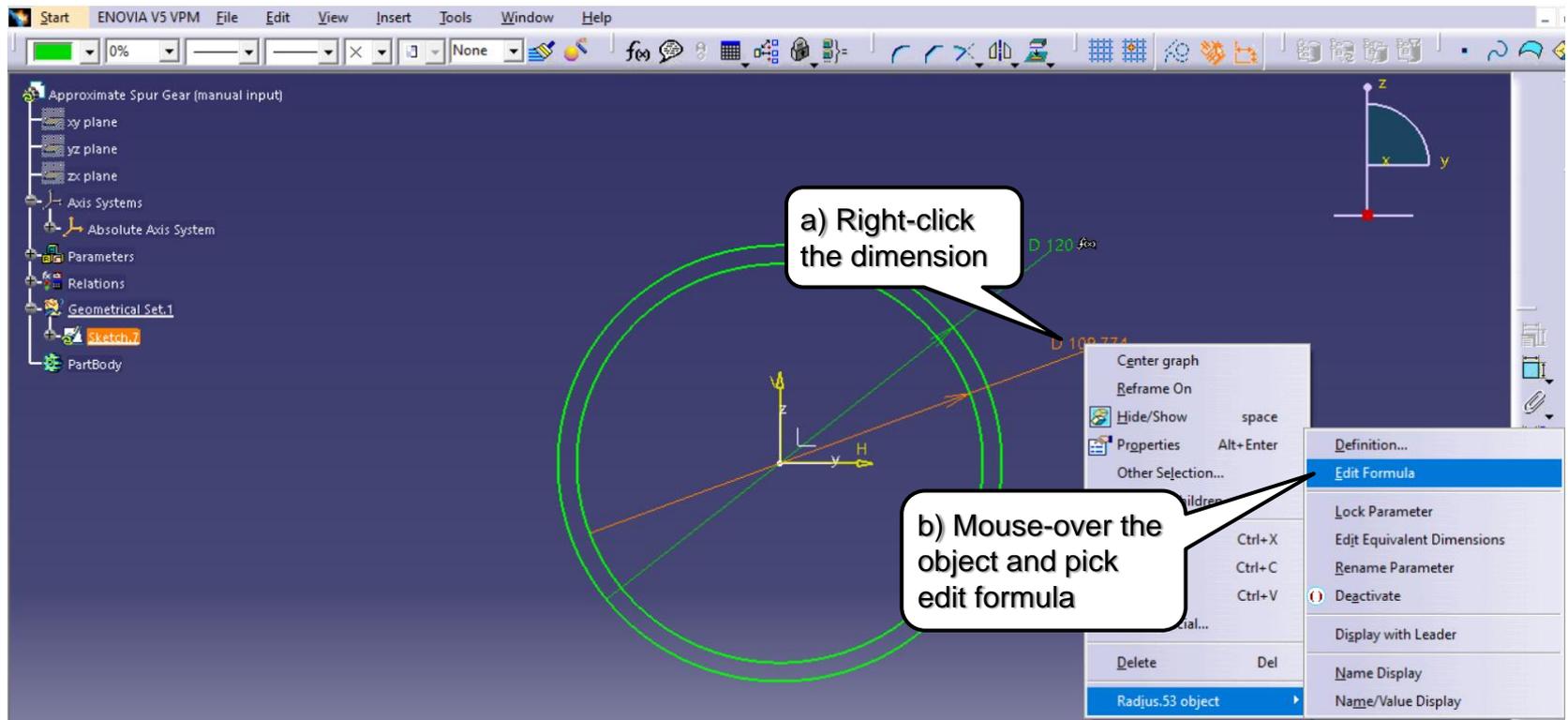
D 109.774

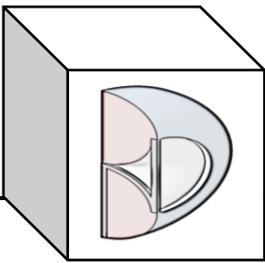


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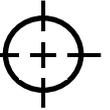


- Apply the formula (Base diameter: B_d) to the base circle.





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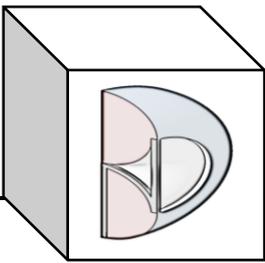
- Apply the formula (Base diameter: Bd) to the base circle.

b) Divide by 2 because CATIA sees Diameters as Radius objects

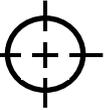
a) Double pick the formula Base diameter: Bd

c) Pick OK

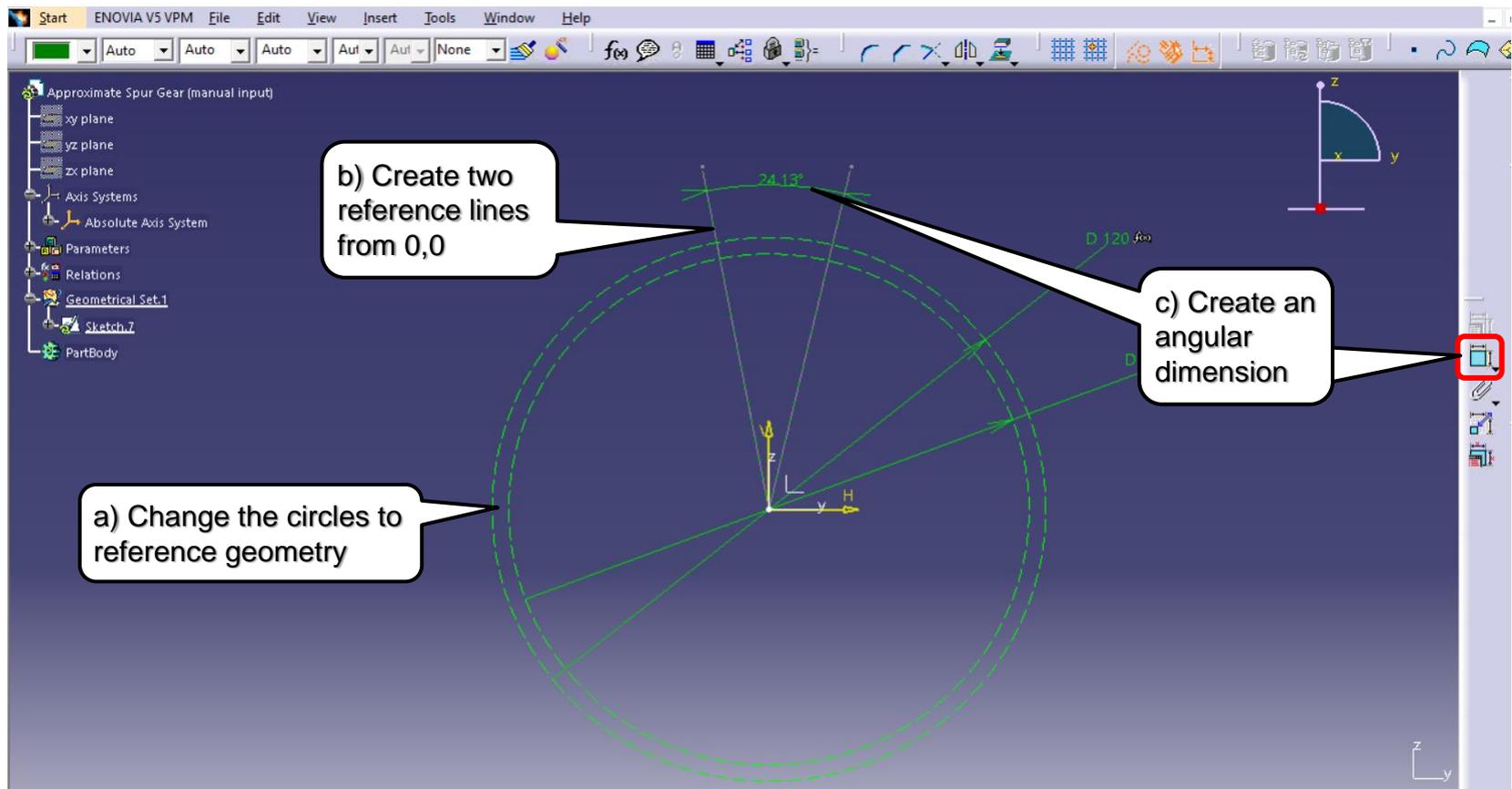
Dictionary	Members of Parameters	Members of Length
Parameters	All	'Absolute Axis System' Origin\Y'
Design Table	Renamed parameters	'Absolute Axis System' Origin\Z'
Operators	Boolean	'Module: m'
Pointer on value function	Length	'Pitch diameter: Pd'
Point Constructors	CstAttr_Mode	'Base diameter: Bd'
Law	Real	'Addendum diameter: Ad'
Operations Constructors	Angle	'Dedendum diameter: Dd'
	String	

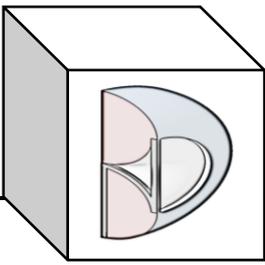


BND TechSource



- Create tooth geometry reference lines.





BND TechSource

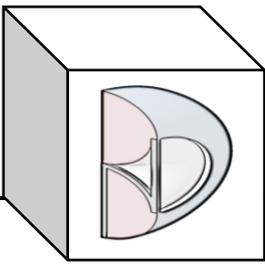


- Apply Ref Pressure Angle: Rpa.

The screenshot displays the ENOVIA V5 VPM software interface. The main workspace shows a gear sketch with several dimension constraints. A dimension of 24.13° is highlighted, and a context menu is open over it. The menu options include: Edit formula..., Edit..., Add tolerance..., Change step, Measure Between..., Measure Item..., Add Multiple Values..., Add Range..., Edit Comment..., and Lock. The 'Constraint Definition' dialog box is also visible, showing the value 24.13deg and the unit Angular. The left-hand tree view shows the model structure, including 'Approximate Spur Gear (manual input)', 'xy plane', 'yz plane', 'zx plane', 'Axis Systems', 'Absolute Axis System', 'Parameters', 'Relations', 'Geometrical Set.1', 'Sketch.7', and 'PartBody'. The top menu bar includes 'Start', 'ENOVIA V5 VPM', 'File', 'Edit', 'View', 'Insert', 'Tools', 'Window', and 'Help'. The top toolbar contains various icons for file operations, editing, and viewing.

a) Double pick the dimension

b) Right mouse and pick edit formula



BND TechSource

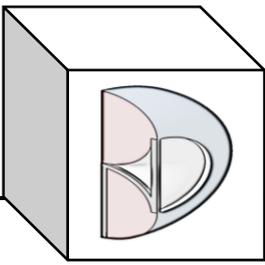


- Apply Ref Pressure Angle: Rpa.

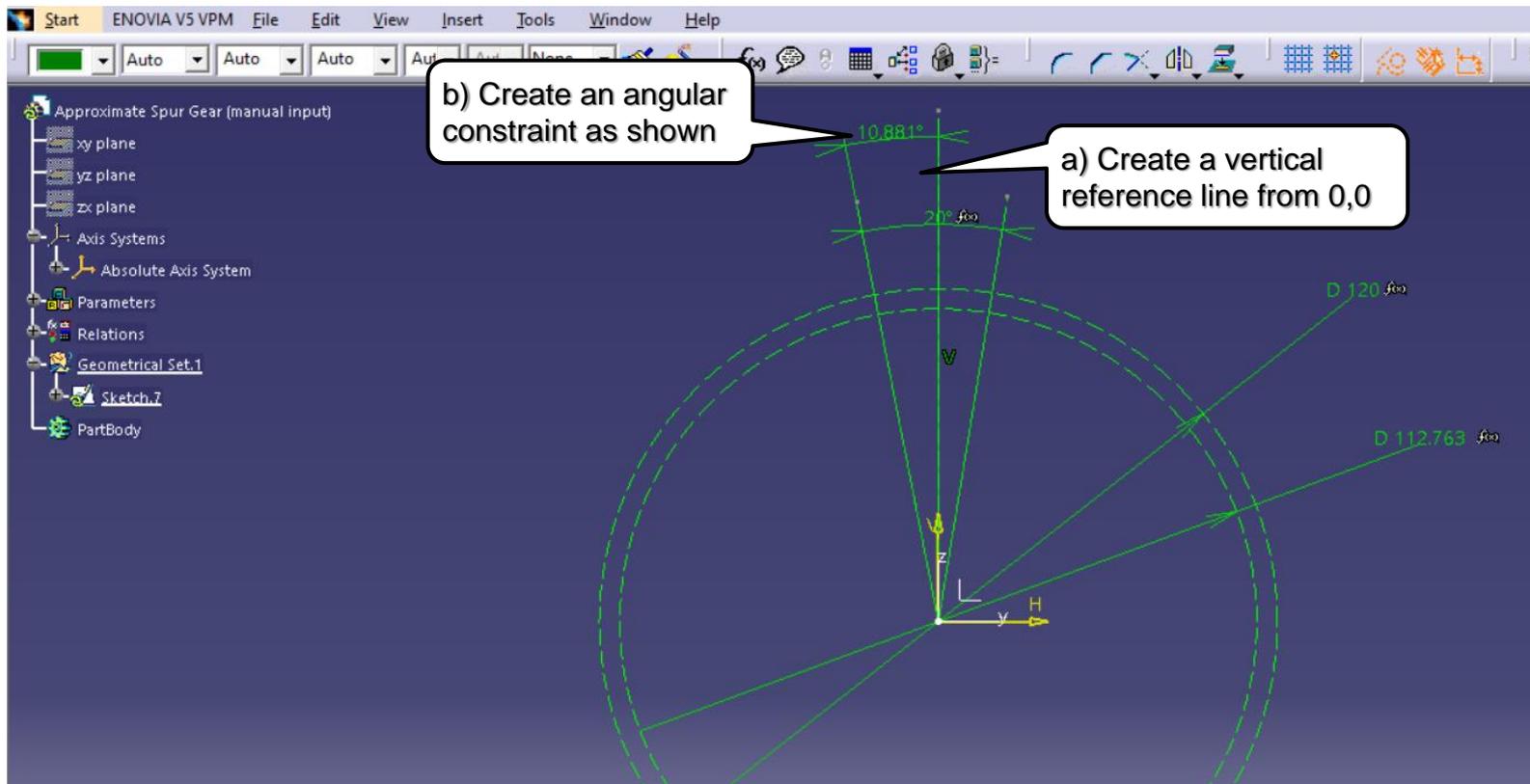
The screenshot shows the CAD software interface with the Formula Editor open. The main window displays a sketch of a gear with a green angle dimension of 24.13°. The Formula Editor window is titled "Formula Editor: 'Geometrical Set.1\Ske..." and shows the formula for the "Ref Pressure Angle: Rpa" parameter. The formula is set to "20deg". The "Dictionary" pane on the left shows the "Parameters" category selected. The "Members of Parameters" pane shows "Angle" selected. The "Members of Angle" pane shows "Ref Pressure Angle: Rpa" selected. A callout box labeled "a) Double pick the formula Ref Pressure Angle: Rpa" points to the "Ref Pressure Angle: Rpa" entry in the "Members of Angle" pane. Another callout box labeled "b) Pick OK" points to the "OK" button at the bottom of the Formula Editor window.

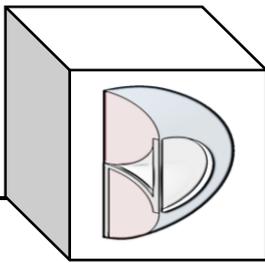
a) Double pick the formula
Ref Pressure Angle: Rpa

b) Pick OK



- Create tooth geometry reference lines.

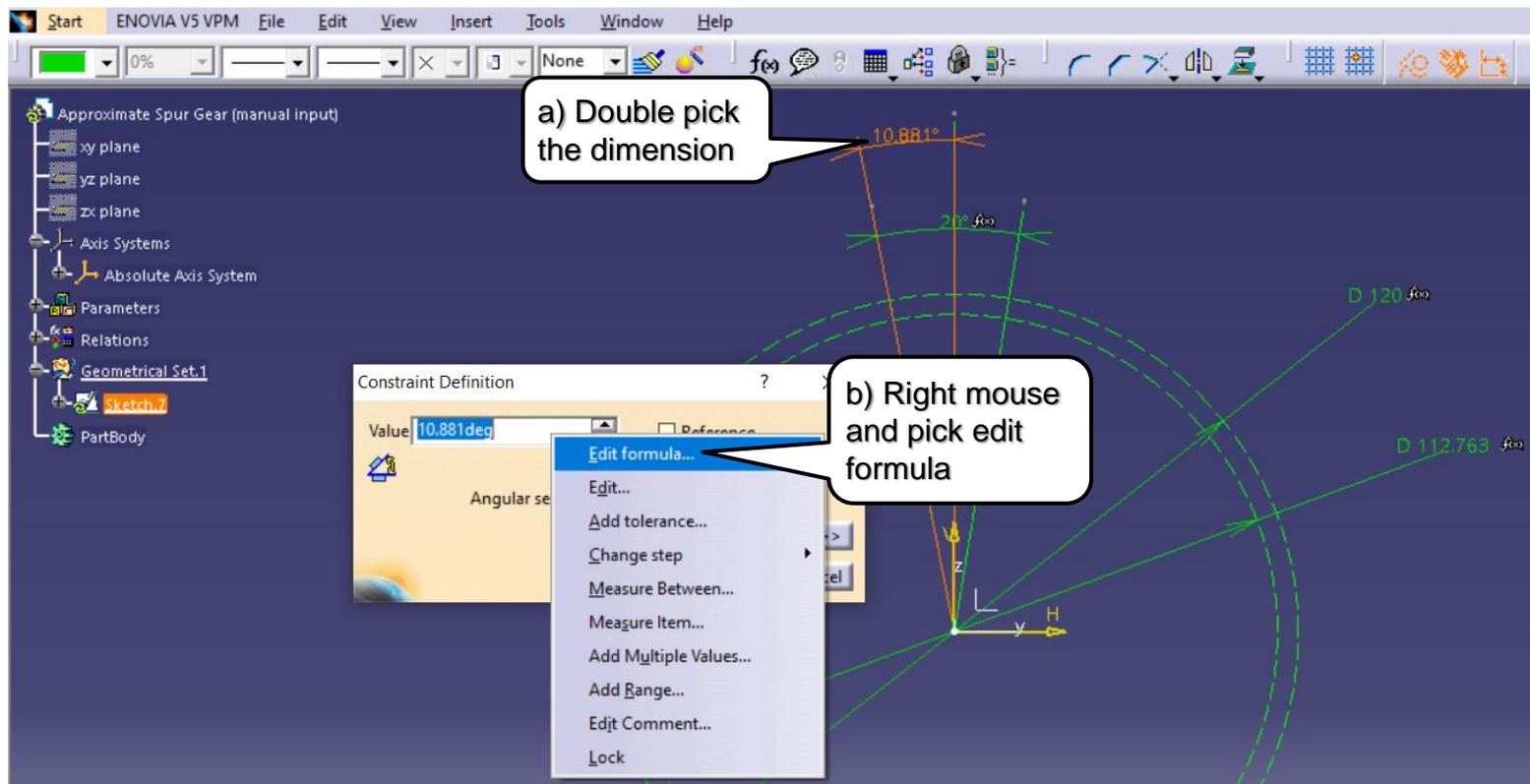


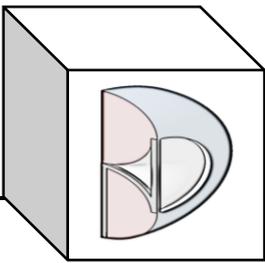


BND TechSource

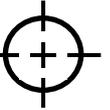


- Apply Symmetry angle: s





BND TechSource



- Apply Symmetry angle: s

Formula Editor: "Geometrical Set.1\Sketch.7\Angle.59\Angle"

Geometrical Set.1\Sketch.7\Angle.59\Angle =

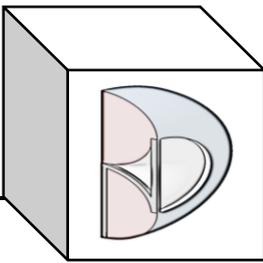
"Symmetry angle: s"

Dictionary	Members of Parameters	Members of Angle
Parameters	All	"Geometrical Set.1\Sketch.7\Angle.56\Angle"
Design Table	Renamed parameters	"Geometrical Set.1\Sketch.7\Angle.59\Angle"
Operators	Boolean	"Ref Pressure Angle: Rpa"
Pointer on value function	Length	"Symmetry angle: s"
Point Constructors	CstAttr_Mode	
Law	Angle	
Operations Constructors	Real	
	String	

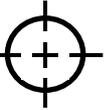
Symmetry angle: s 2.25deg

a) Double pick the formula
Symmetry angle: s

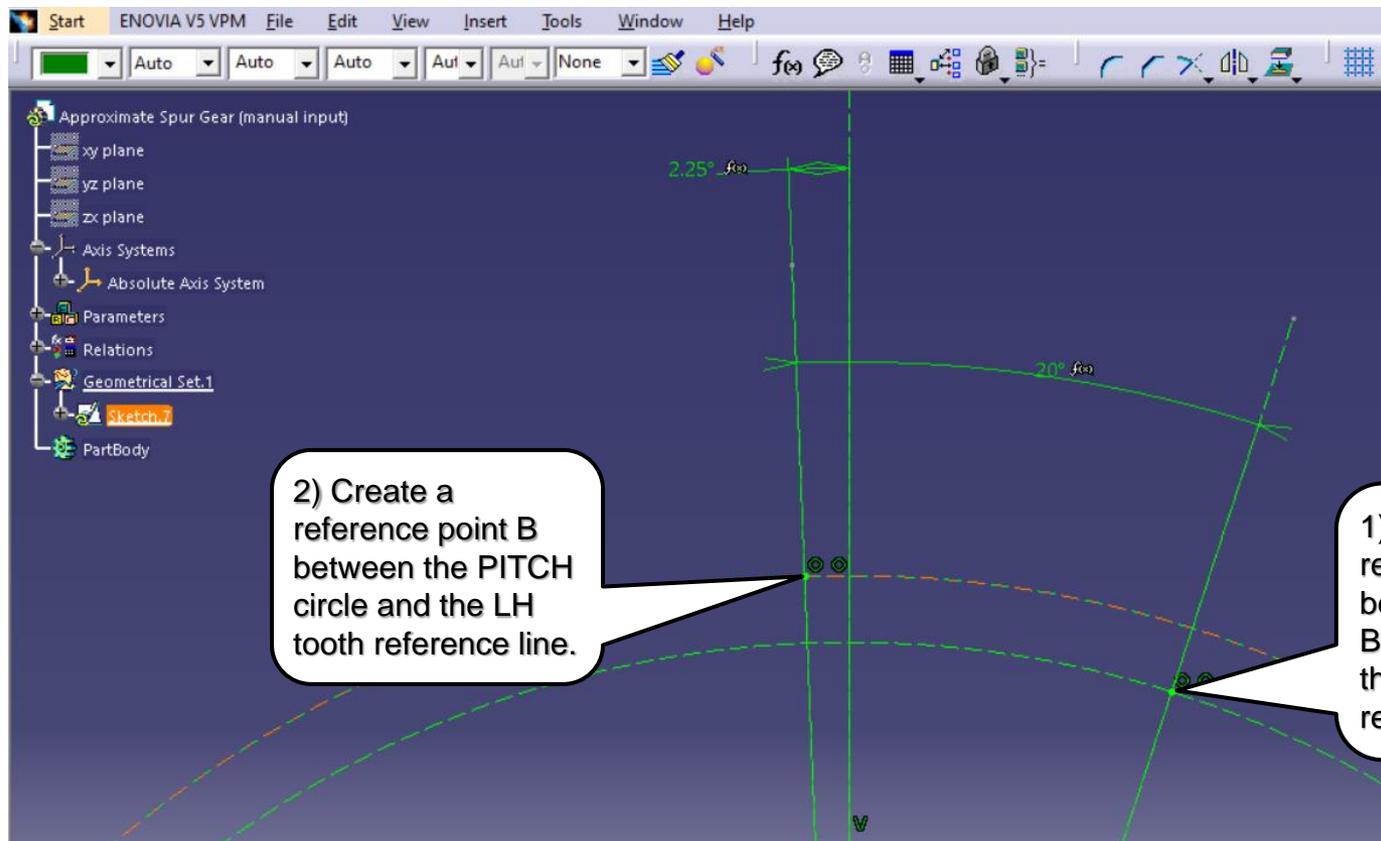
b) Pick OK

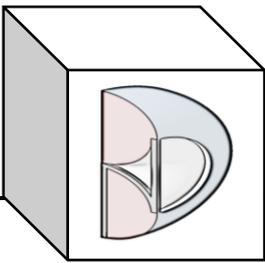


BND TechSource

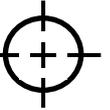


- Create reference points A & B for the construction of the approximated tooth profile.

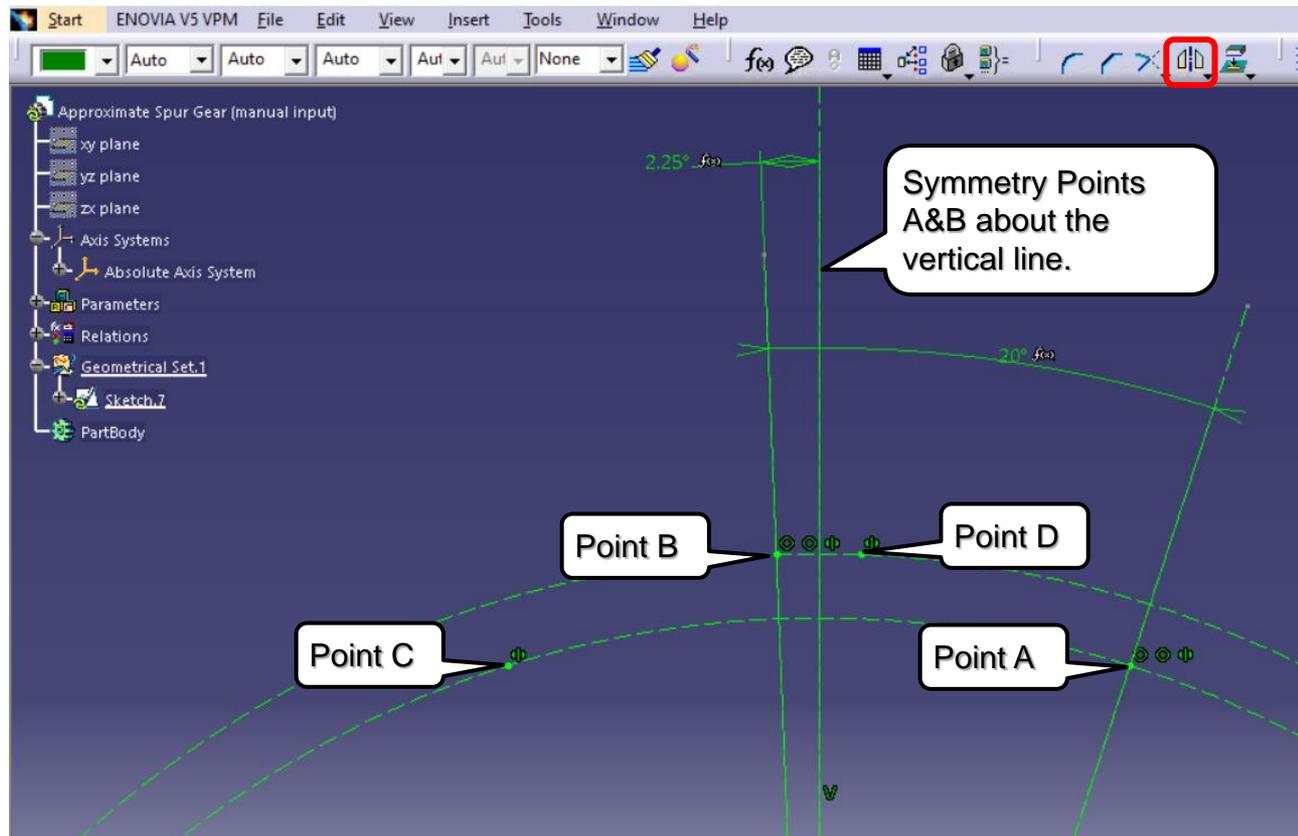


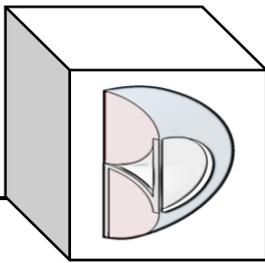


BND TechSource



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

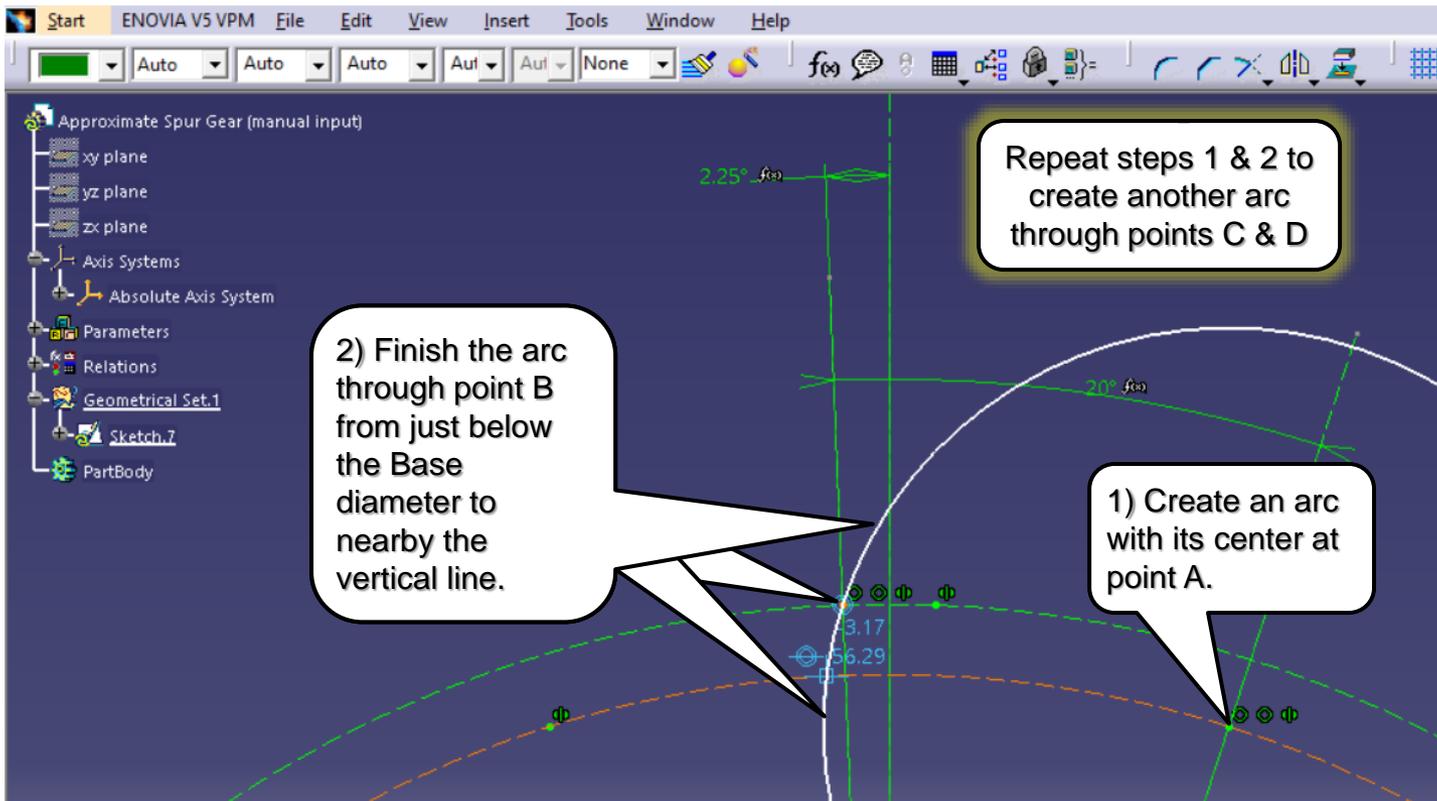


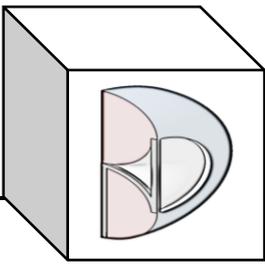


BND TechSource



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

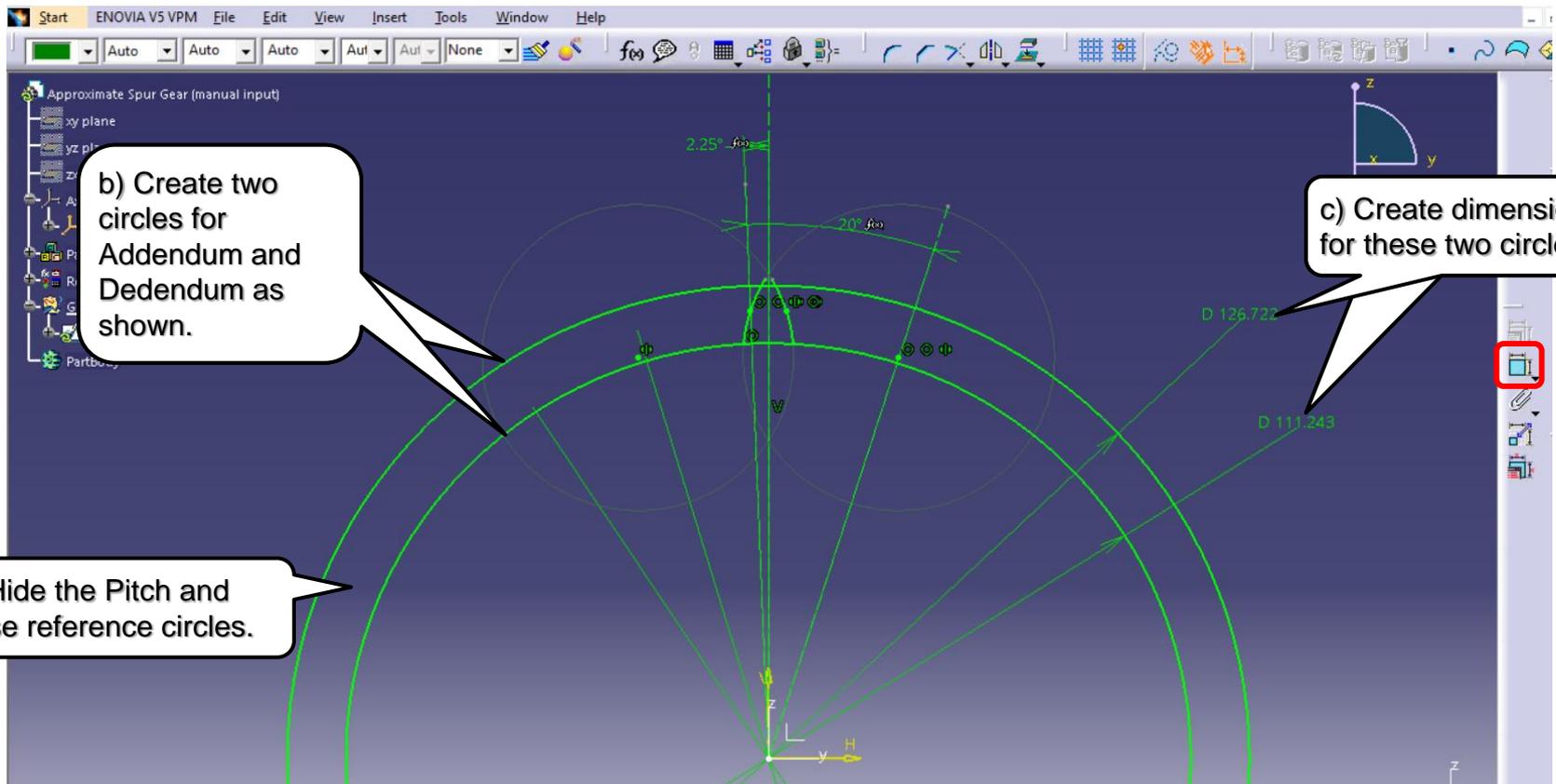


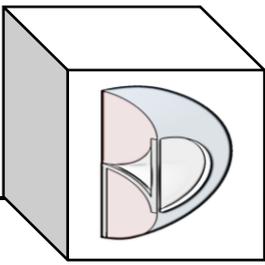


BND TechSource



- Create the Addendum and Dedendum construction circles.





BND TechSource



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

The screenshot displays the ENOVIA V5 VPM software interface. The main workspace shows a gear sketch with several dimension lines. A dimension of 2.25° is shown for a small angle, and a dimension of 20° is shown for a larger angle. A dimension line for the addendum circle is labeled $D 126.722$. A context menu is open over this dimension, with the 'Edit Formula' option highlighted. Another context menu is open over the addendum circle, with the 'Edit Formula' option also highlighted. Two callout boxes provide instructions: 'a) Right-click the dimension' and 'b) Mouse-over the object and pick edit formula'.

a) Right-click the dimension

b) Mouse-over the object and pick edit formula

BND TechSource

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

b) Divide by 2 because CATIA sees Diameters as Radius objects

a) Double pick the formula Addendum diameter: Ad

c) Pick OK

Formula Editor: Geometrical Set.1\Sketch.7\Radius

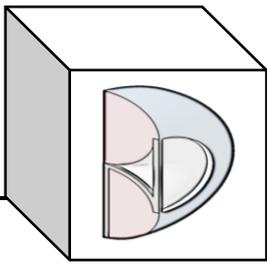
Geometrical Set.1\Sketch.7\Radius

'Addendum diameter:Ad' / 2

Dictionary	Members of Parameters	Members of Let
Parameters	All	'Module: m'
Design Table	Renamed parameters	'Pitch diameter: P'
Operators	Boolean	'Base diameter: Bd'
Pointer on value function	Length	'Addendum diameter: Ad'
Point Constructors	CstAttr_Mode	'Dedendum diameter: Dd'
Law	Angle	'tooth radius at dedendum circle: tr'
Operations Constructors	Real	
<	String	

Addendum diameter:Ad 126mm

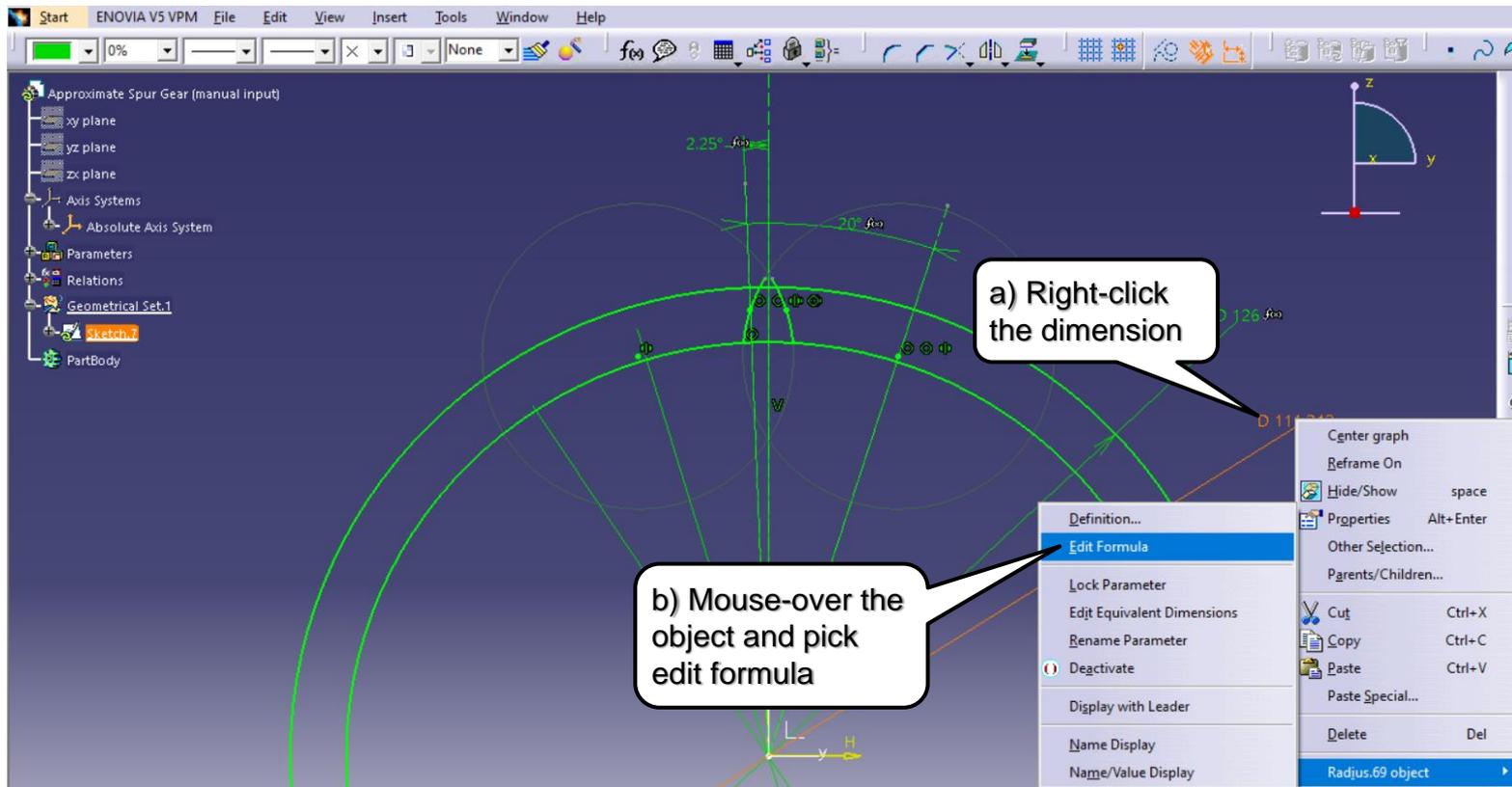
OK Cancel

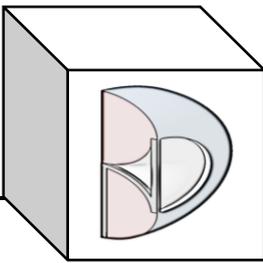


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- Apply the formula (Dedendum diameter: D_d) to the dedendum circle.





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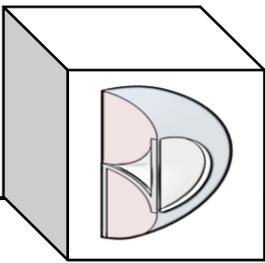
- Apply the formula (Dedendum diameter: Dd) to the dedendum circle.

b) Divide by 2 because CATIA sees Diameters as Radius objects

a) Double pick the formula Dedendum circle radius: Rd

c) Pick OK

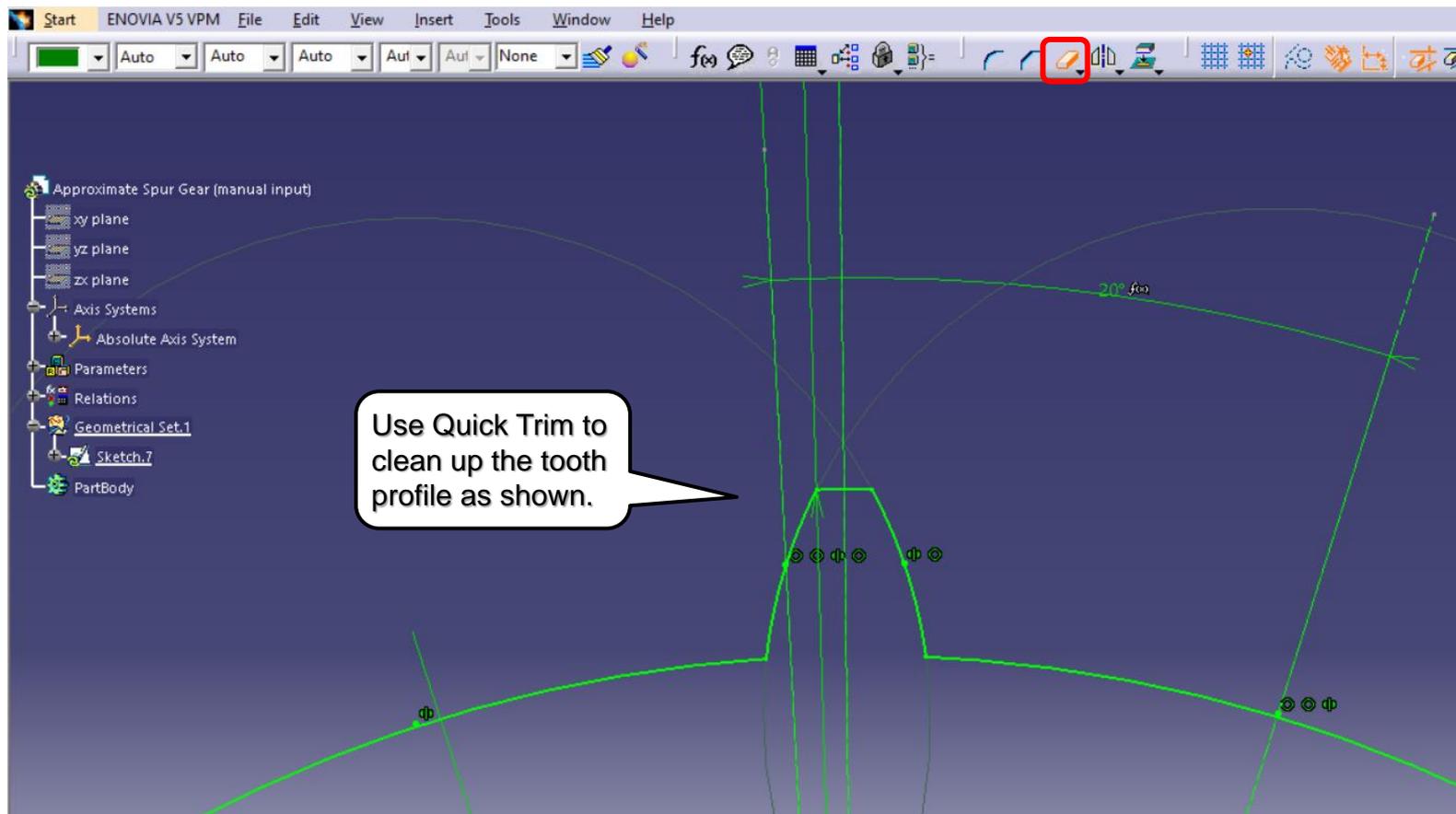
Dictionary	Members of Parameters	Members of Length
Parameters	All	'Module: m'
Design Table	Renamed parameters	'Pitch diameter: Pd'
Operators	Boolean	'Base diameter: Bd'
Pointer on value function	Length	'Addendum diameter: Ad'
Point Constructors	CstAttr_Mode	'Dedendum diameter: Dd'
Law	Angle	'tooth radius at dedendum circle: tr'
Operations Constructors	Real	
	String	

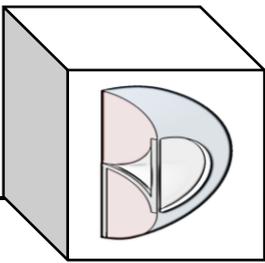


BND TechSource

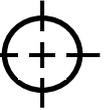


- Clean up the tooth profile.

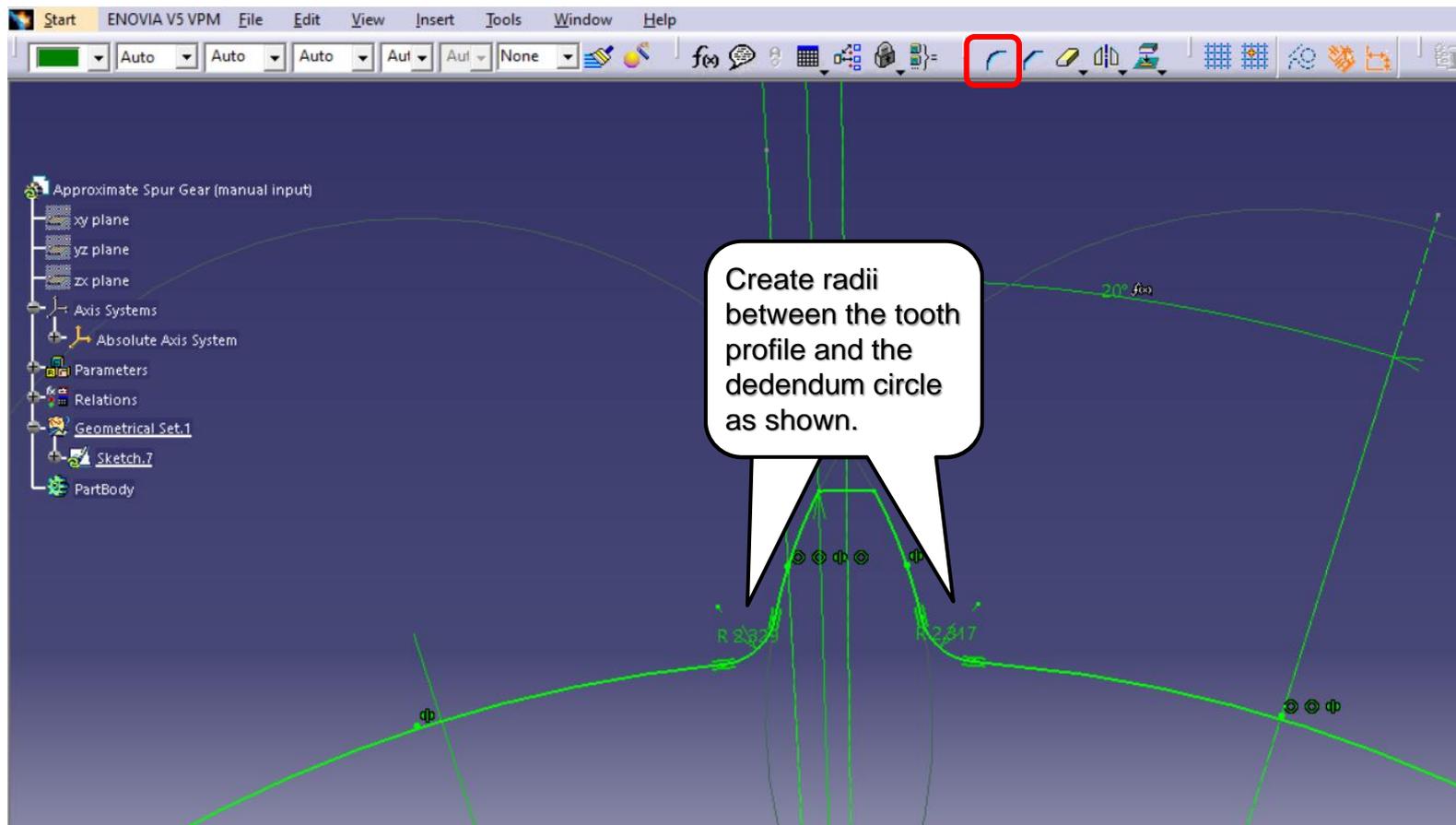


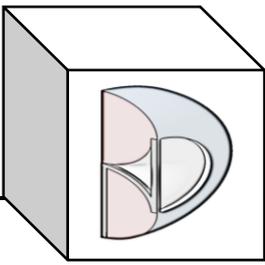


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- Create radii between the tooth profile and the dedendum circle.





BND TechSource



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

Start ENOVIA V5 VPM File Edit View Insert Tools Window Help

Approximate Spur Gear (manual input)

- xy plane
- yz plane
- zx plane
- Axis Systems
 - Absolute Axis System
- Parameters
- Relations
- Geometrical Set.1
- Sketch.7
- PartBody

Repeat steps a-b for the other radius

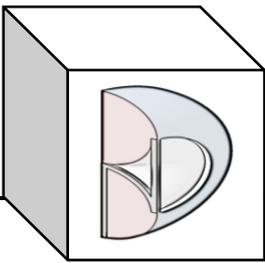
a) Double pick the dimension

b) Right mouse and drop on edit formula

Constraint Definition

Radius	2.329mm
Dimension	Radius

- Edit formula...
- Edit...
- Add tolerance...
- Change step
- Measure Between...
- Measure Item...
- Add Multiple Values...
- Add Range...
- Edit Comment...
- Lock



BND TechSource



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

Formula Editor: \Geometrical Set.1\Sketch.7\Radius.80\Radius

Geometrical Set.1\Sketch.7\Radius.80\Radius

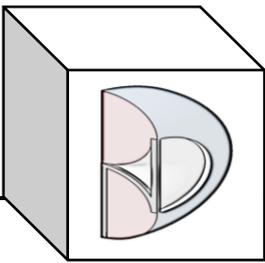
"tooth radius at dedendum circle: tr"

Dictionary	Members of Parameters	Members of Length
Parameters	All	'Module: m'
Design Table	Renamed parameters	'Pitch diameter: Pd'
Operators	Boolean	'Base diameter: Bd'
Pointer on value function	Length	'Addendum diameter: Ad'
Point Constructors	CstAttr_Mode	'Dedendum diameter: Dd'
Law	Angle	'tooth radius at dedendum circle: tr'
Operations Constructors	Real	
	String	

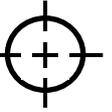
tooth radius at dedendum circle: tr 1.14mm

a) Double pick the formula tooth radius at dedendum circle: tr

b) Pick OK

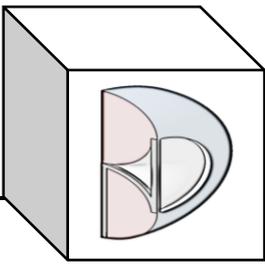


BND TechSource



- Create a solid pad using the sketch.

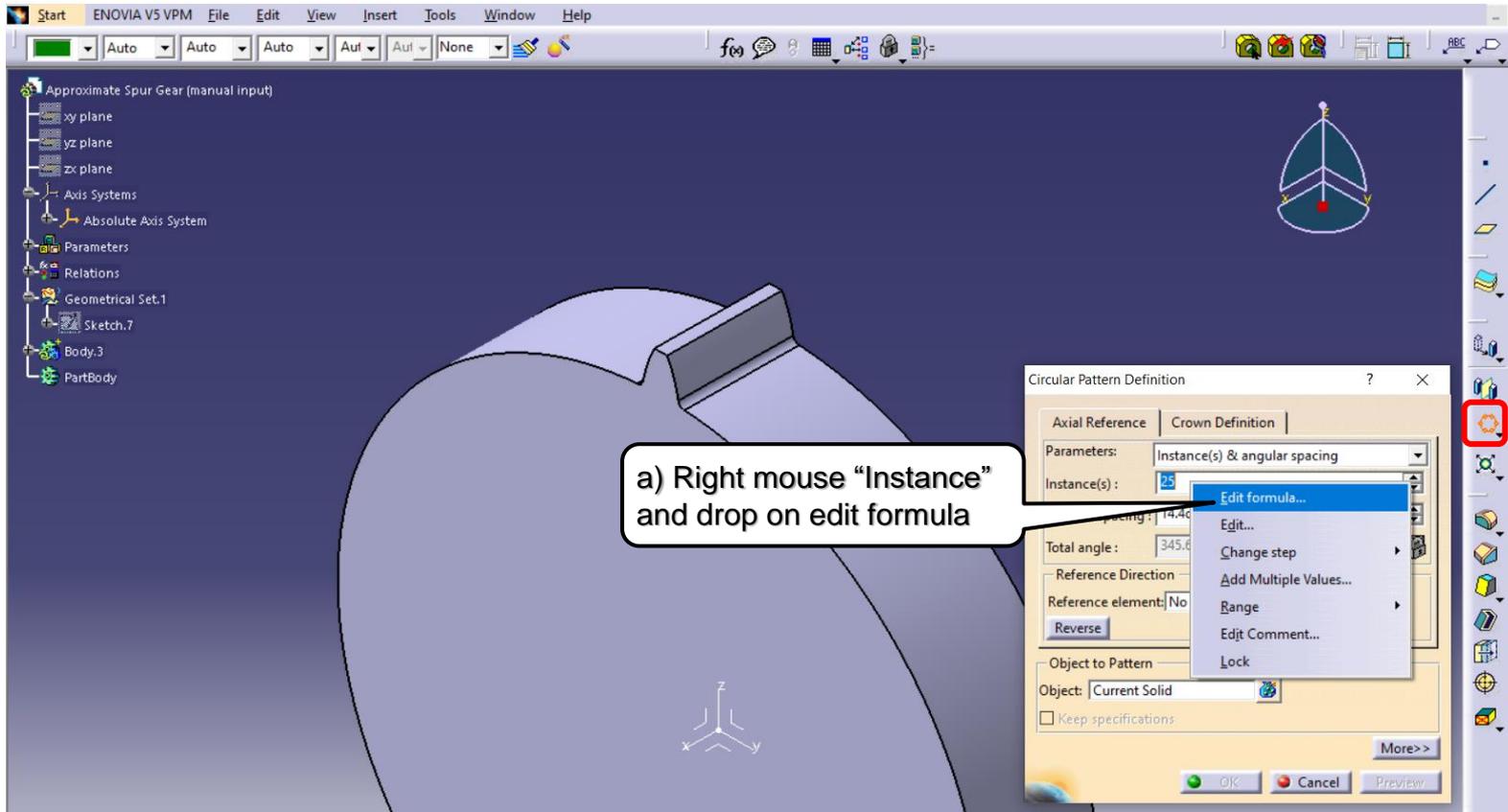
The screenshot displays the ENOVIA V5 VPM software interface. The main workspace shows a 3D model of a gear tooth with a sketch overlaid. A callout box labeled 'a) Insert a body.' points to the 'Body.3' entry in the left-hand tree view. Another callout box labeled 'b) Create a Pad using the sketch as the profile selection; set length to 10mm; use mirrored extent.' points to the 'Pad Definition' dialog box. The dialog box has the following settings: 'First Limit' Type: Dimension, Length: 10mm, Limit: No selection; 'Profile/Surface' Selection: Sketch.7; 'Thick' checkbox is unchecked; 'Mirrored extent' checkbox is checked. A third callout box labeled 'c) Pick OK' points to the 'OK' button at the bottom of the dialog box.



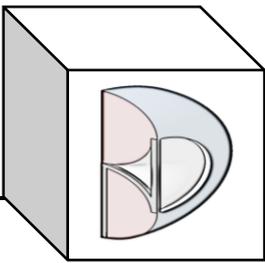
BND TechSource



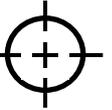
- Create the pattern for the number of teeth.



a) Right mouse "Instance" and drop on edit formula



BND TechSource



- Create the pattern for the number of teeth.

Formula Editor : Body.3\CircPattern.2\AngularNumber

Body.3\CircPattern.2\AngularNumber =

'Number of teeth: z'

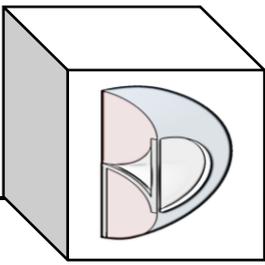
Dictionary	Members of Parameters	Members of Parameters
Parameters	Renamed parameters	'Absolute Axis System\YAxis\X'
Design Table	Boolean	'Absolute Axis System\YAxis\Y'
Operators	Length	'Absolute Axis System\YAxis\Z'
Pointer on value function	CstAttr_Mode	'Absolute Axis System\ZAxis\X'
Point Constructors	Angle	'Absolute Axis System\ZAxis\Y'
Law	Integer	'Absolute Axis System\ZAxis\Z'
Operations Constructors	Real	'Number of teeth: z'
	String	

Number of teeth: z 40

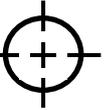
OK Cancel

b) Double pick the formula
Number of teeth: z

c) Pick OK

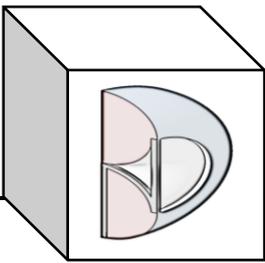


BND TechSource

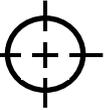


- Create the pattern for the number of teeth.

The screenshot displays the ENOVIA V5 VPM software interface. The main window shows a 3D model of a gear tooth. A 'Definition' dialog box is open, showing the 'Crown Definition' tab. The dialog includes fields for 'Angular spacing' (14.4), 'Total angle' (345.6), 'Reference Direction', and 'Reference element' (No). A context menu is open over the 'Reference element' field, with 'Edit formula...' selected. A red box highlights the 'Edit formula...' option in the context menu. A yellow box highlights the text 'b) See next slide'. A speech bubble points to the 'Reference element' field with the text 'd) Reference element; pick the X axis.' Another speech bubble points to the 'Edit formula...' option with the text 'a) Right mouse "Angular Spacing" and drop on edit formula'. The software interface includes a menu bar (Start, ENOVIA V5 VPM, File, Edit, View, Insert, Tools, Window, Help), a toolbar, and a tree view on the left showing the model's structure (Approximate Spur Gear, xy plane, yz plane, zx plane, Axis Systems, Parameters, Relations, Geometrical Set.1, Sketch.7, Body.3, PartBody).



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- Create the pattern for the number of teeth.

The screenshot shows the ENOVIA V5 VPM software interface. The main window displays a tree view on the left with the following items: Approximate Spur Gear (manual input), xy plane, yz plane, zx plane, Axis Systems, Absolute Axis System, Parameters, Relations, Geometrical Set.1, Sketch.7, Body.3, and PartBody. The 'Parameters' folder is expanded. A 'Formulas' dialog box is open, titled 'Formulas: Body.2\CircPattern.1\AngularSpacing'. The formula field contains the expression: $360 \text{ deg} / \text{Number of teeth: } z$. Below the formula field are three columns: 'Dictionary', 'Members of Parameters', and 'Members of All'. The 'Members of Parameters' column is currently empty. The 'Members of All' column contains a list of parameters, including 'Geometrical Set.1\Sketch.1\Activity', 'Geometrical Set.1\Sketch.1\AbsoluteAxis', 'Geometrical Set.1\Sketch.1\Radius.1\Radi', 'Geometrical Set.1\Sketch.1\Radius.1\Mod', 'Geometrical Set.1\Sketch.1\Radius.1\Activ', 'Geometrical Set.1\Sketch.1\Radius.2\Radi', and 'Geometrical Set.1\Sketch.1\Radius.2\Mod'. At the bottom of the dialog box, there are 'OK' and 'Cancel' buttons. Three callout boxes provide instructions: 'a) Type 360 deg/ Number of teeth: z' points to the formula field; 'd) See previous slide' points to the main window; and 'b) Pick OK' points to the OK button.

a) Type 360 deg/
Number of teeth: z

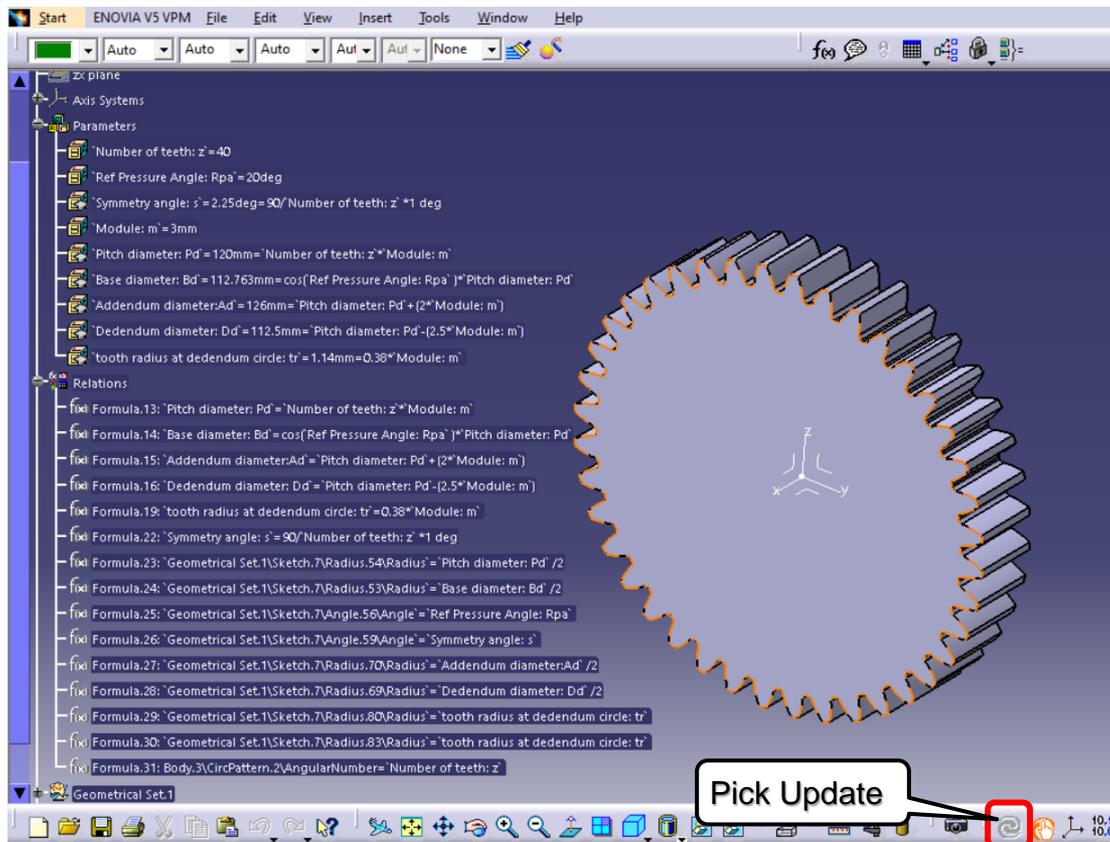
d) See previous slide

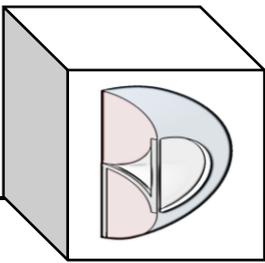
b) Pick OK

Dictionary	Members of Parameters	Members of All
Parameters	All	'Geometrical Set.1\Sketch.1\Activity'
Design Table	Renamed parameters	'Geometrical Set.1\Sketch.1\AbsoluteAxis\
Operators	Boolean	'Geometrical Set.1\Sketch.1\Radius.1\Radi
Pointer on value function	Length	'Geometrical Set.1\Sketch.1\Radius.1\Mod
Point Constructors	CstAttr_Mode	'Geometrical Set.1\Sketch.1\Radius.1\Activ
Law	Angle	'Geometrical Set.1\Sketch.1\Radius.2\Radi
Operations Constructors	Real	'Geometrical Set.1\Sketch.1\Radius.2\Mod
	Integer	

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- And there you have it!. An Approximated Spur Gear which is modifiable through parameters.

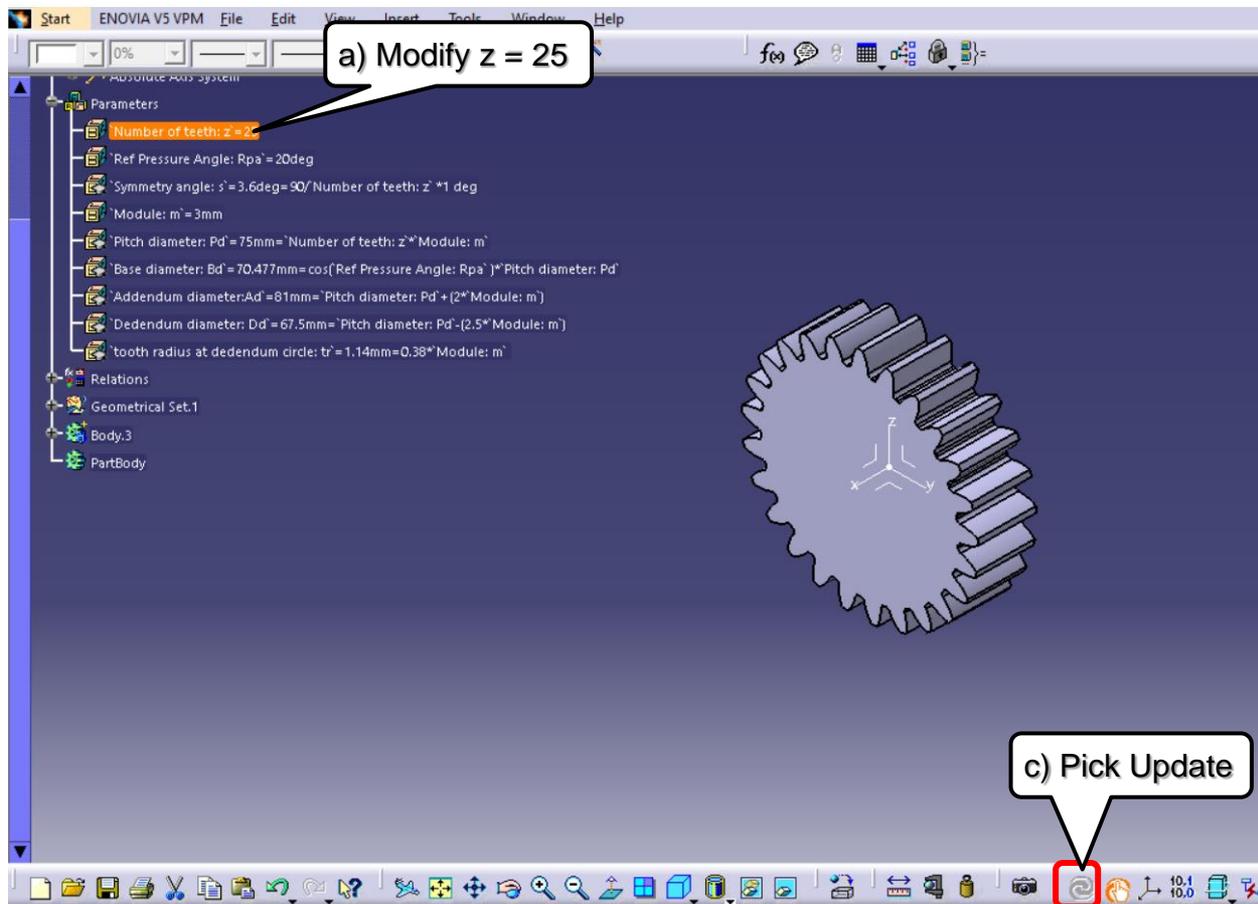


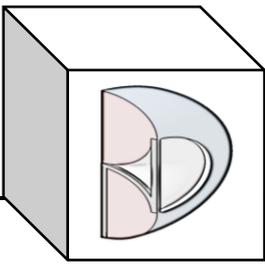


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- Modify parameters for tooth number (z) and/or pitch circle radius (Rp) and check results.

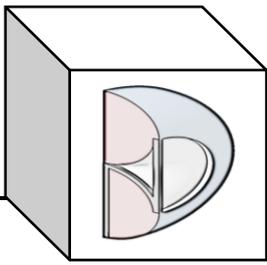




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- We now have a “template” part for our Spur gear.
- This part may be modified by simply changing the parameters of any/all of the following three formulae:
 1. z - number of teeth // real parameter [$z = \text{input}$]
 2. Rpa - Ref Pressure Angle // angle parameter [$Rpa = \text{input}$]
 3. m - module // length parameter [$m = \text{input}$]
- Next we will look at using Design Table (from MS Excel) to feed the parameter data and update the Spur Gear.



- Conclusion:

This is an example of Designing Approximate Spur Gear in CATIA V5 (Method 1: manual input).

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!

