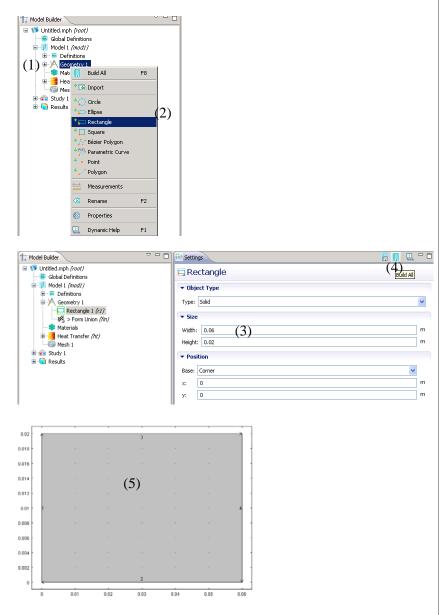
Specifiying the Problem Type

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		COM50L 4.1.0.88		
COMSOL 4.1.0.89	Model Wizard			
	Add Physics			
Add Physics	(4) ⊕ →≋ Fluid Flow ⊕ ∭ Heat Transfer Heat Transfer ₩ Heat Transfer Weat Transfer	in Solids (ht) in Fluids (ht) in Porous Media (ht) it Transfer (ht)	(6) _{best}	
Model Weard Add Physics Add P	Loude Heating Moreover Heat Structural Mechani Au Mathematics			

- Start COMSOL 4.1 and save file. Remember to save often to prevent losing work.
- (2) Select 2D under Select Space Dimension.
- (3) Click on blue arrow for "Next".
- (4) Under Add Physics, click on the icon left of "Heat Transfer" to expand options >> "Heat Transfer in Solids (ht)".
- (5) "Heat Transfer (ht)" should now appear in the **Selected Physics** window near the bottom of the screen.
- (6) Click on blue arrow Next arrow to continue.

🧐 Model Wizard	Graphics
Select Study Type	
- Studies	(8) Finish
Preset Studies Customary Stationary Marging Dependent Green Studies (7)	
- Selected physics	

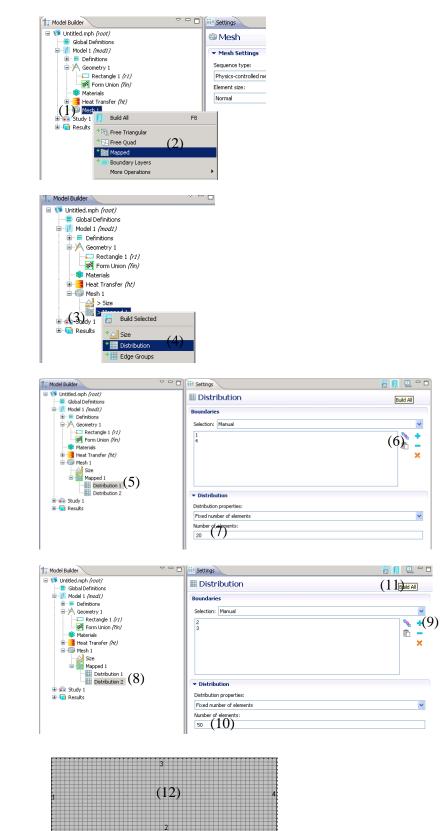
Creating the Geometry



- (7) Under Select Study Type, select "Time Dependent" to solve as a timedependent conduction problem.
- (8) Click on checkered flag to finish building desired physics.

- Under the Model Builder tab, Right click on "Geometry 1".
- (2) Select to add new "Rectangle" geometry.
- (3) In Settings window, set width of rectangle as
 0.06m and height as
 0.02m.
- (4) Click the blue "Build All" icon to create the specified rectangle.
- (5) Should result in the following geometry.

Meshing



- (1) Under **Model Builder**, right click on "Mesh 1".
- (2) Select "Mapped".
- (3) Under "Mesh1", right click on "Mapped 1" and select "Distribution".
- (4) Repeat step 3 to end up with 2 "Distribution" options.
- (5) Click on "Distribution 1".
- (6) Under Graphics, hold
 CTRL and click on
 boundary 1 and 4 (left
 and right boundaries) on
 the rectangle. Press +
 button to add.
- (7) In **Distribution**, input 20 for "Number of elements".
- (8) Select "Distribution 2".
- (9) Hold CTRL and click on boundary 2 and 3 (top and bottom boundaries) on rectangle. Press + button to add to distribution.
- (10)Input 50 for "number of elements".
- (11)Click blue "Build All" button to create a mapped mesh.
- (12) The following is the mesh that should have been obtained.

Defining Material Properties and Parameters

T Model Builder	Citie Settings	2
Model Builder Got Untitled.mph (root)		
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Thermal Insulation 1		
🖮 📟 Mesh 1		
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	▼ Thermodynamics	
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T Model Builder	Settings	2 - 0
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- In Model Builder, expand "Heat Transfer (ht)".
- (2) Click on "Heat Transfer in Solids 1".
- (3) Under Heat Conduction, select "User defined" for all properties (k, p, Cp).
- (4) Input 0.512 W/(mK) for thermal conductivity.
- (5) Input 1060 kg/m³ for density.
- (6) Input 3600 J/(kgK) for heat capacity.
- (7) Select "Initial Values 1" under "Heat Transfer (ht)".
- (8) Set initial temperature to 310K.
- (9) Right Click "Heat Transfer (*ht*)".
- (10)Select "Temperature" to add new constant temperature boundary condition.

1 Model Builder	🔃 Settings 📃 🗉 🖬
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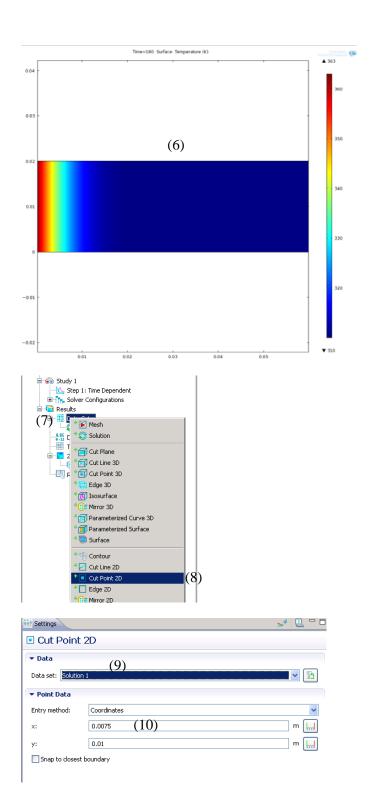
Computation and Analysis

Model Builder	Settings	2 - 0
🖃 Untitled.mph (root)	Ny Time Dependent	
Global Definitions		
	• Study Settings (3)	
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Rectangle 1 (r1) Form Union (fin)	Pelative tolerance: 0.01 range(start,step,stop)	
Materials	00.10.20.3	
🖃 📑 Heat Transfer (ht)	Results While Solving	
Heat Transfer in Solids 1	▼ Mesh Selection	
	Geometries:	
Temperature 1	Geometry 1	
🖻 🧐 Mesh 1		
Size		
Distribution 1		
III NULLY A	Mesh: Mesh 1	~
Results	▼ Physics Selection	
	Physics interfaces:	
	Heat transfer (ht)	
	Use in this study	
	Discretization: Physics settings	~
Untitled.mph (root) Global Definitions Global Definitio)	
* 122 Parametric Sweep		
Study Steps	1	

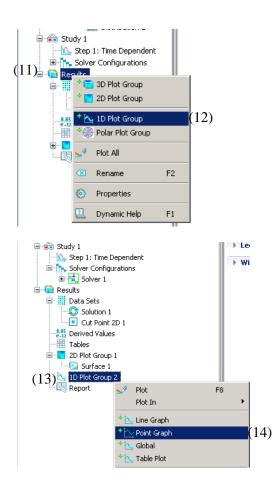
boundary 1 and click + button to add boundary. (12)Set boundary 1 temperature to 363K.

(11)Under Graphics, select

- (1) Expand "Study 1".
- (2) Select "Step 1: Time Dependent".
- (3) In Study Settings, under Times input range (0,1,180).
- (4) Right click on "Study 1".
- (5) Select "Compute".

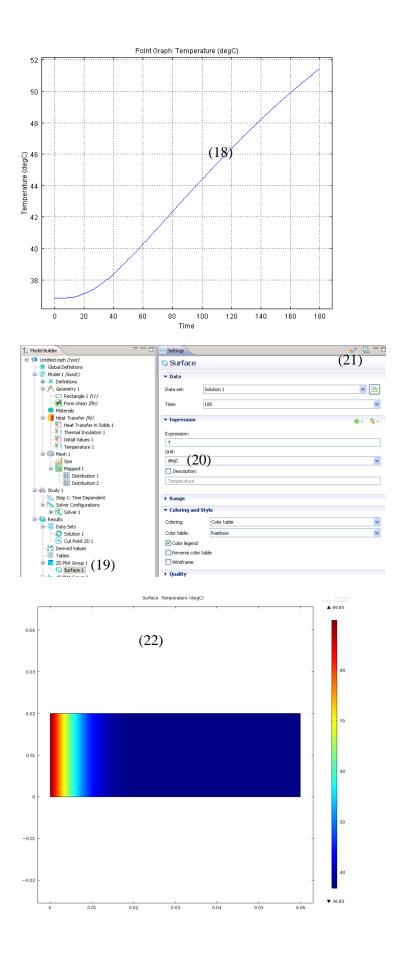


- (6) Should result in a surface map at 180s.
- (7) Right Click on "Data Sets" under Results
- (8) Select "Cut Point 2D" located towards the middle of the options column.
- (9) In the "Settings" window, select "Solution 1" under pull down option for "Data set".
 (10) In the set of the se
- (10)Input 0.0075m for the xcoordinate and 0.01m for y-coordinate.



👬 Settings		💉 🖳 🗖 🕻
🗠 Point Graph	า	(17)
▼ Data		
Data set:	Cut Point 2D 1(15)	 Image: A state of the state of
Time selection:	All	*
▼ Expression		+ - ►
Expression:		
т ^{Unit:} (16)		▼
Description:		
Temperature		

- (11)Under Model Builder tab, right click on "Results".
 (12)Select "1D Plot Group".
- (13)Right click on "1D Plot Group 2".
- (14)Select "Point Graph".
- (15)In Settings, select "Cut Point 2D 1" from pull down options for Data Set.
- (17)Click the Plot button.



- (18)Temperature profile at (0.0075,0.01).
- (19)Expand "2D Plot Group 1" and Click on "Surface 1".
- (20)Under **Expression**, select "degC" from drop down menu for "Unit".
- (21)Click on the rainbow "Plot all" icon.
- (22)Final surface plot in degree Celsius.

**Note: you can always return to the surface plot by clicking on "2D Plot Group 1"