

Drone webinar

Step by step instruction

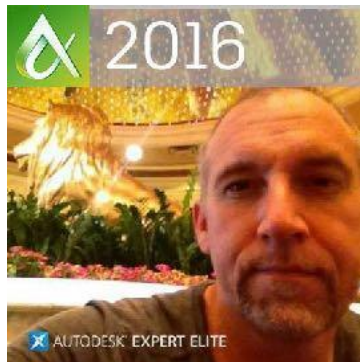
Creating racing drones in Fusion 360



Racing-Drone Design Fundamentals with Fusion 360

Authors: ELI DElia - Eagle Eye| Taylor Stein – Autodesk| Fabiola Clayton - Autodesk

LEVEL OF EXPERTISE:
All Levels



About the Designer:

Commercial Drone Designer, Fusion360 Expert Elite.

Founder of Game of Drones and Aerial Sports League. Owner [Hooligan FPV](#) Pro Racing Drones. [Eagle Eye Metrics](#), Aerial Agronomy & Services.

Eli has a number of sports drones in the market. Has been involved with fringe robotics since 1996. Now exclusively in the commercial drone industry as a designer, engineer and certified FAA Pilot in Command.



About the Speaker:

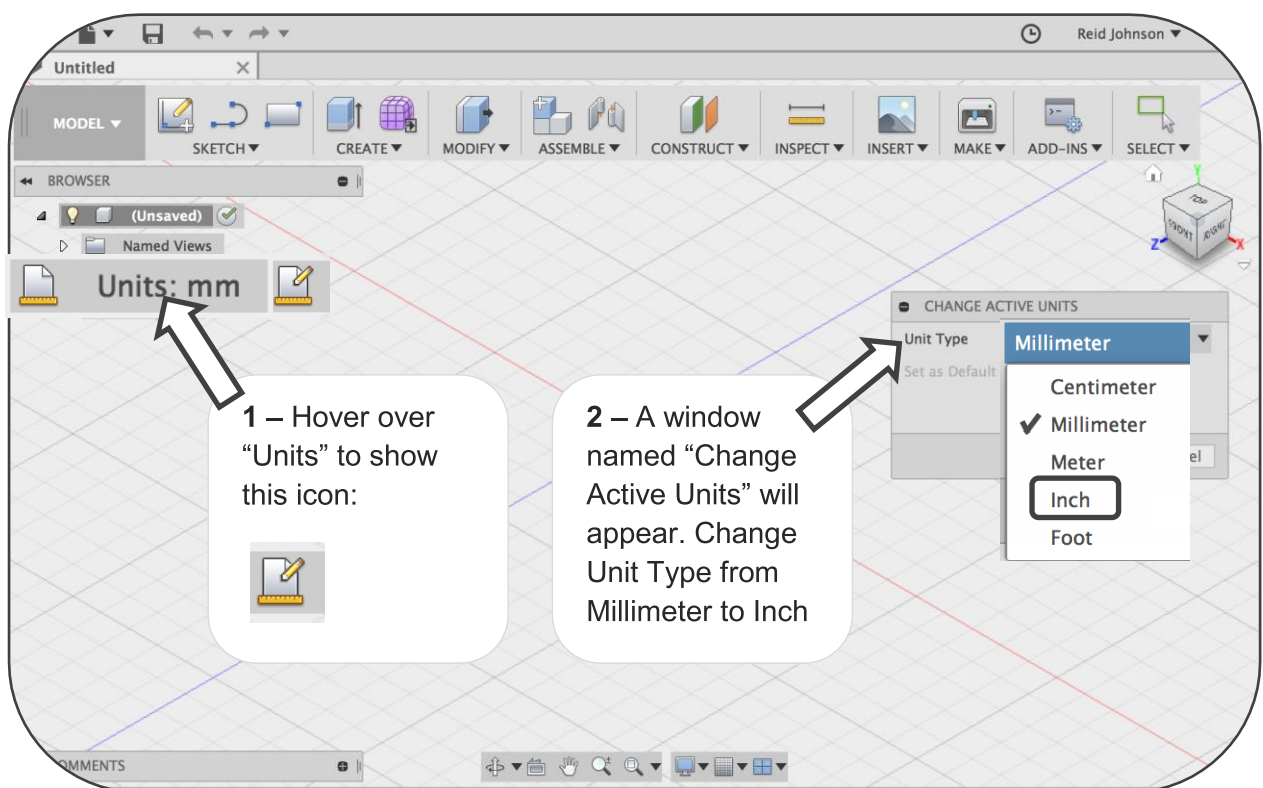
Education Program Manager at Autodesk, Certified Fusion 360 User, Certified AutoCAD Professional and User.

“Fab” has more than 20 years of experience in Higher Education having worked as Instructor, Chair and Dean. She has a specialization in Pedagogy and her Master’s degree dissertation explored the influence of space in learn

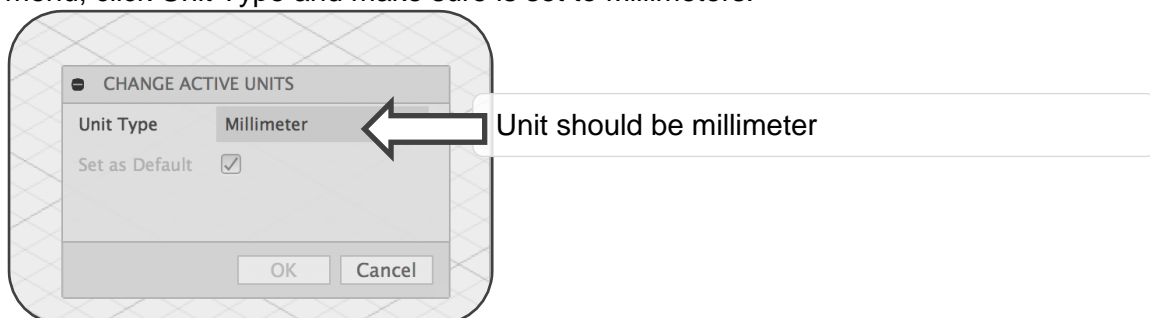
Section 1 - Modeling A Basic Airframe

1. Start Fusion 360.
2. On the left upper corner of the screen, in the Fusion 360 Browser, click on Units to open the Units option.

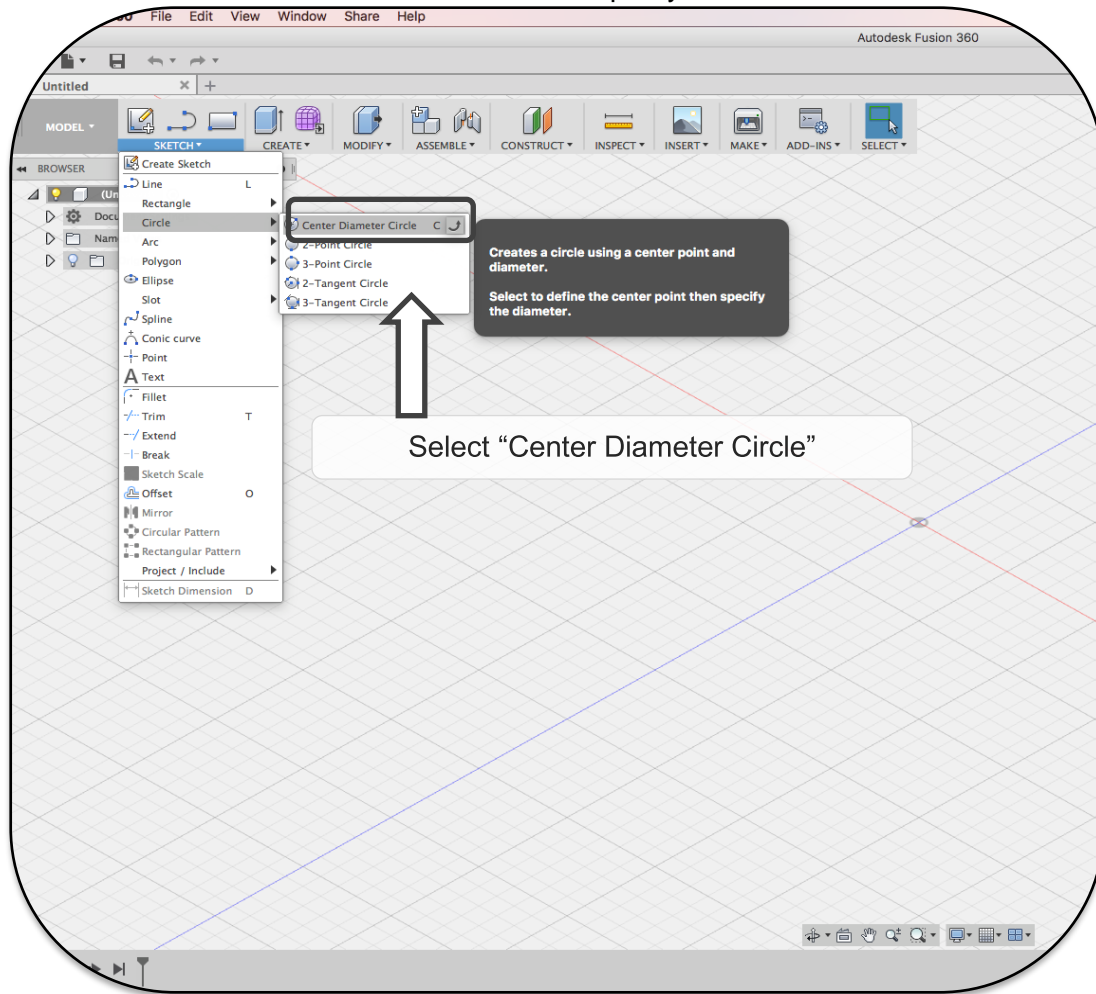
Notice that a dialogue box entitled CHANGE ACTIVE UNITS will open. You can move this dialogue box by holding the left button of your mouse and dragging it to a location of your choice.



3. From inside the CHANGE ACTIVE UNITS dialogue box, in Unit Type drop-down menu, click Unit Type and make sure is set to Millimeters.



4. Go to the SKETCH tab located at the top of your screen and hover on the circle icon.



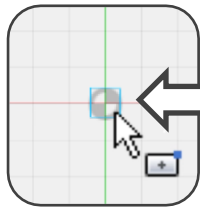
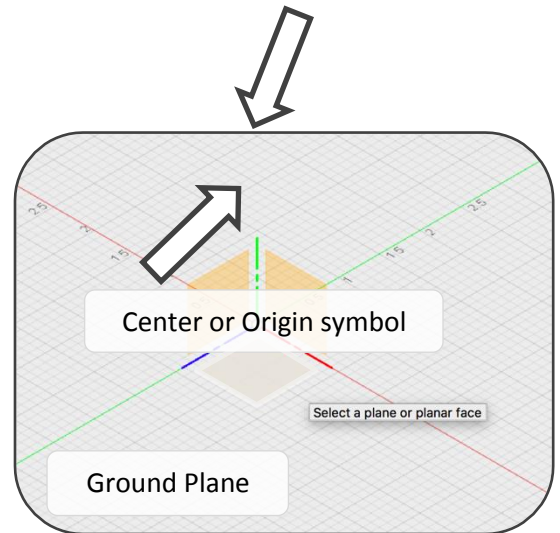
Please notice that there are five ways to sketch a circle: Center Diameter Circle, 2-Point Circle, 3-Point Circle, 2-Tangent Circle and 3-Tangent Circle. Select Center Diameter.

Once you have selected the Center Rectangle tool, the 3 origin planes will show in yellow on the center of your screen.

These are Fusion 360's built-in planes for creating your sketches and 3D models. There are two vertical planes and one horizontal plane.

5. As you move your mouse over each of the three planes, you will notice that they highlight. Hover over and then click the horizontal plane. Think of this as the ground plane. You will notice that your view will automatically re-orient to the Top view.

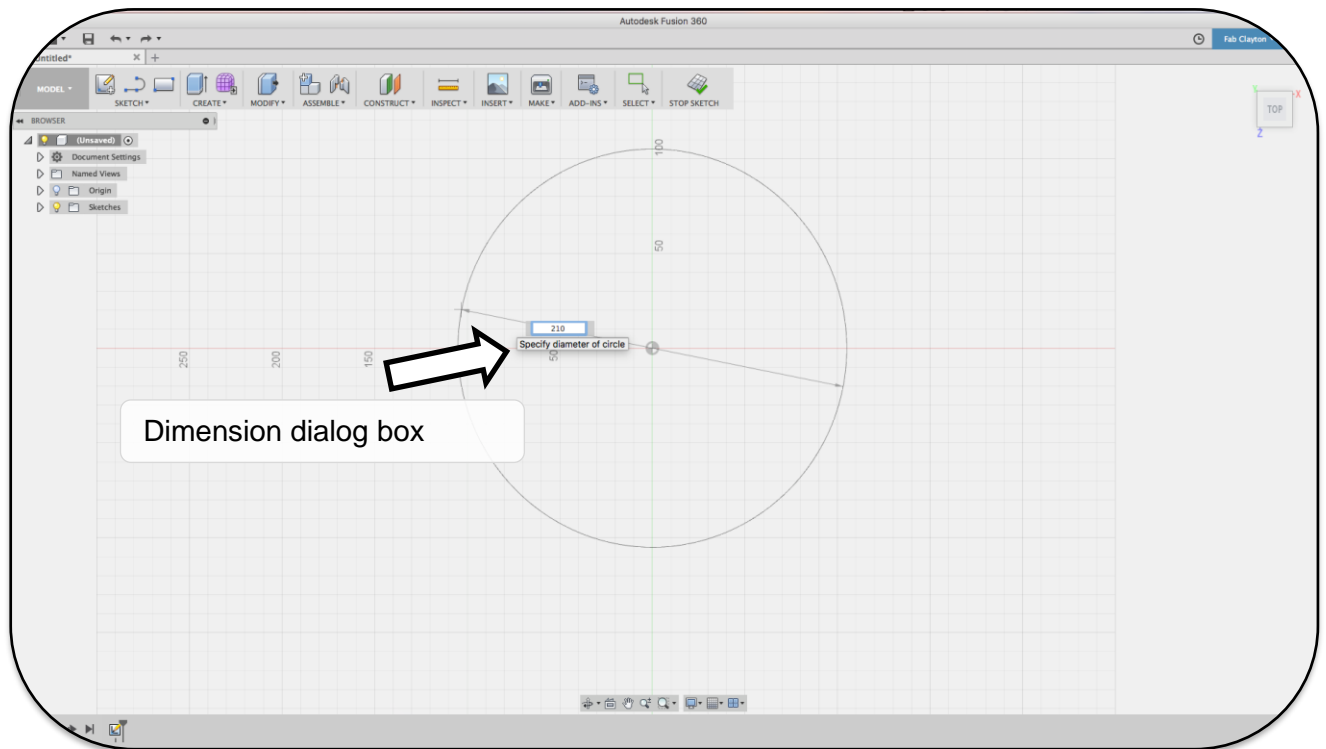
6. Using the left button of your mouse, click one time on the center point that is in the center of the drawing



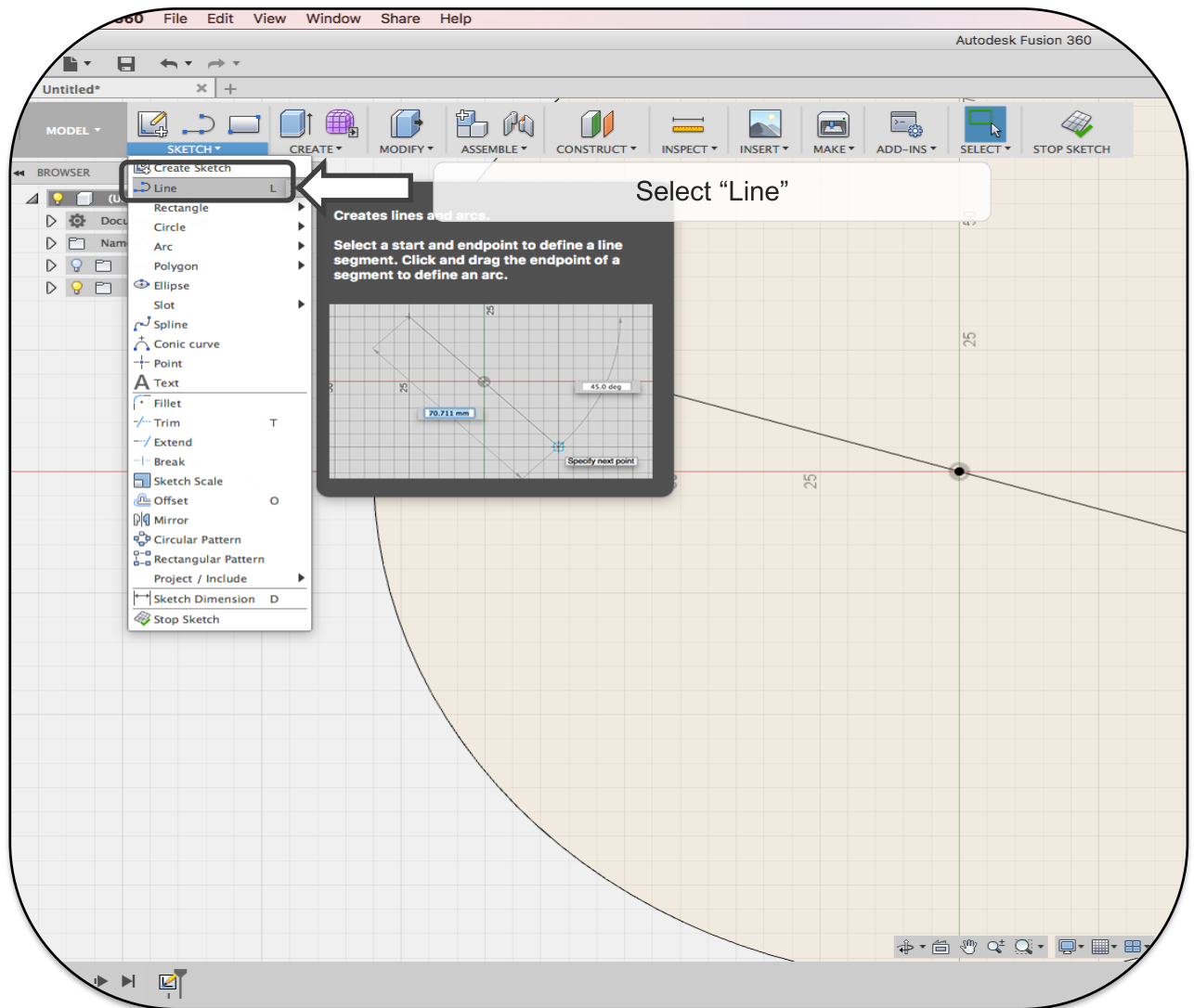
Hover over the center point. A light blue square will appear when you are exactly over the center point. When you see the blue square, click one time to set the center point of the rectangle.

7. Move your mouse to sketch your circle. Notice that the circle will stretch based on the position of your cursor.

You will also notice that a smaller dialogue window containing dimensions appear next to your circle.

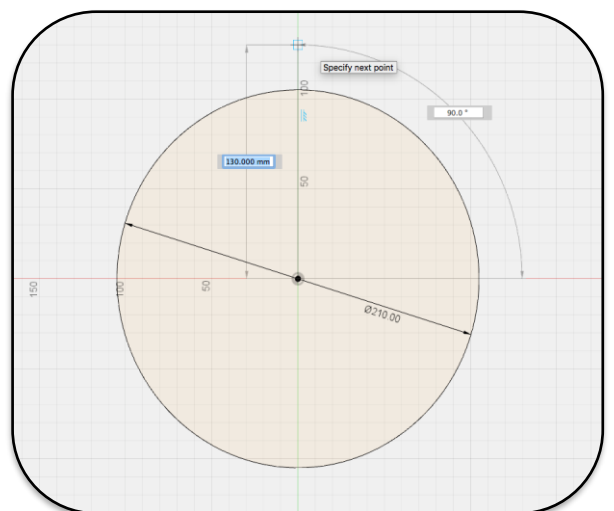


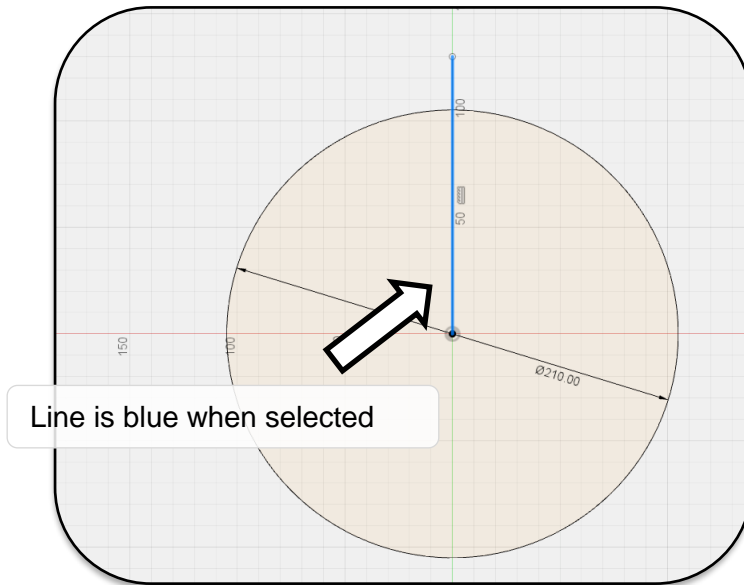
- 8.** Enter 210mm in the dimension dialogue box.
- 9.** Press enter to complete the circle
- 10.** Under Sketch, select the Line command.



11. Draft a vertical line from center of the circle to just past the top of the circle perimeter and hit “enter”

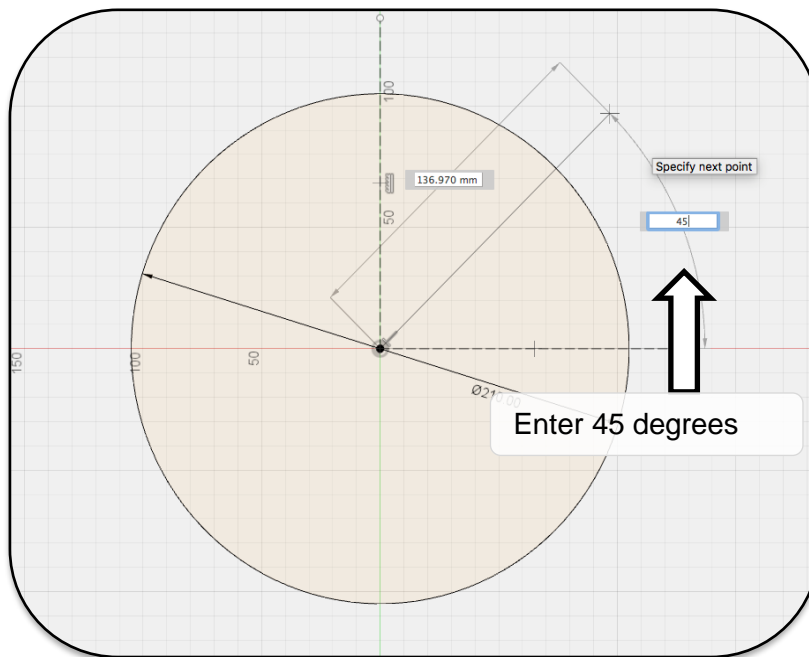
12. Select the line by clicking on it with the left button of your mouse. The line will turn blue. Hit “X” on your keyboard to convert the line to a construction line. The line will become dashed.





13. Repeat the steps above but this time, draw a horizontal line from center to just past the right of the circle perimeter and hit “X” on your keyboard to convert the line to a construction line.

14. Draw a line create a 45 degree angle with the horizontal line. You will notice that two dimension dialogue boxes appear. One for the length of the line and one for the angle. You can toggle between the dialogue boxes by pressing Tab.



15. Transform this line into a construction line by selecting it and pressing “X”.

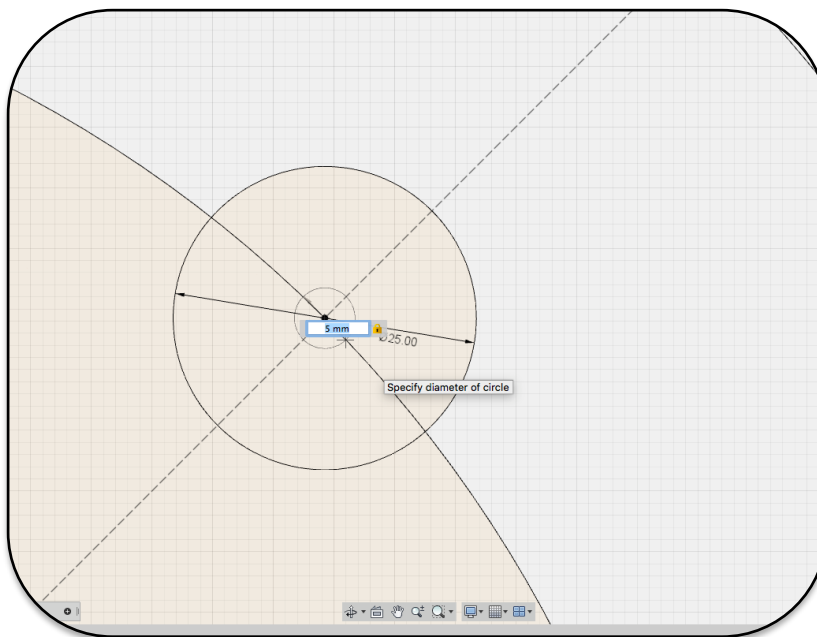
16. Select the Circle and hit “X” on your keyboard to convert the line to a construction circle.

17. Create the motor mount, by drawing a 25mm circle on the intersection of the diagonal line and the large circle.

18. Use the 25mm dimension line as a guide, adjust so it is perfectly vertical.

19. Create a 5mm center

circle inside the smaller circle you have just drawn, which will become a hole to allow the

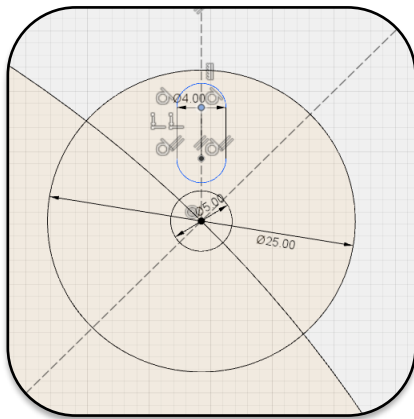


motor's drive shaft to spin freely.

20. Under Sketch, select the Slot command. Draw draft a slot just vertical and aligned with the center circle (you can draw a vertical construction line passing the center of the smaller circle to assist

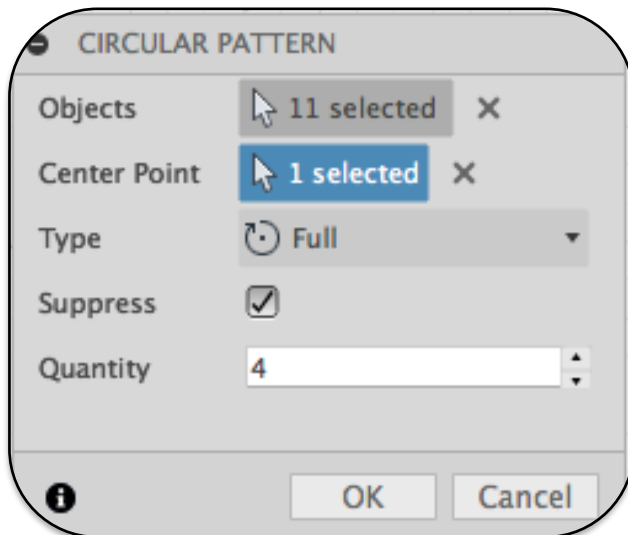
you.

21. The length is variable so you can use any dimension. Type in 4mm in width.



selected.

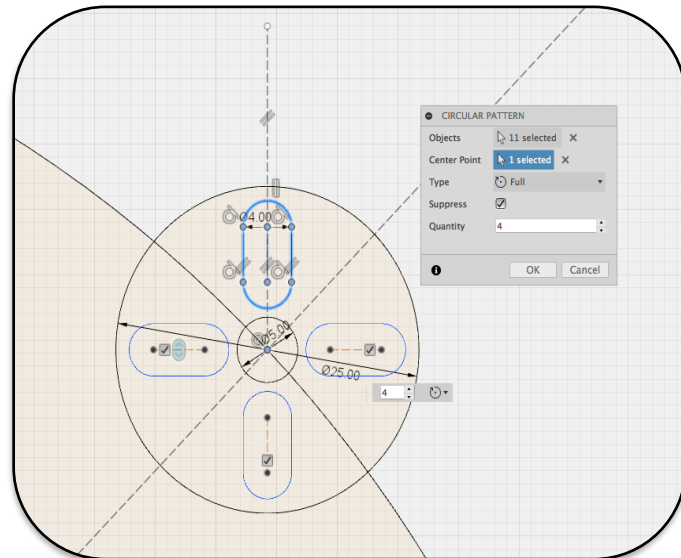
25. Click on center point and select the motor mount circle center point.



22. Adjust the top and bottom arcs to allow distance from the top circle perimeter and the cent circle diameter.

23. Right drag select the motor mount slot.

24. From the tool's dialogue box check to be sure all 11 elements of the slot tool are



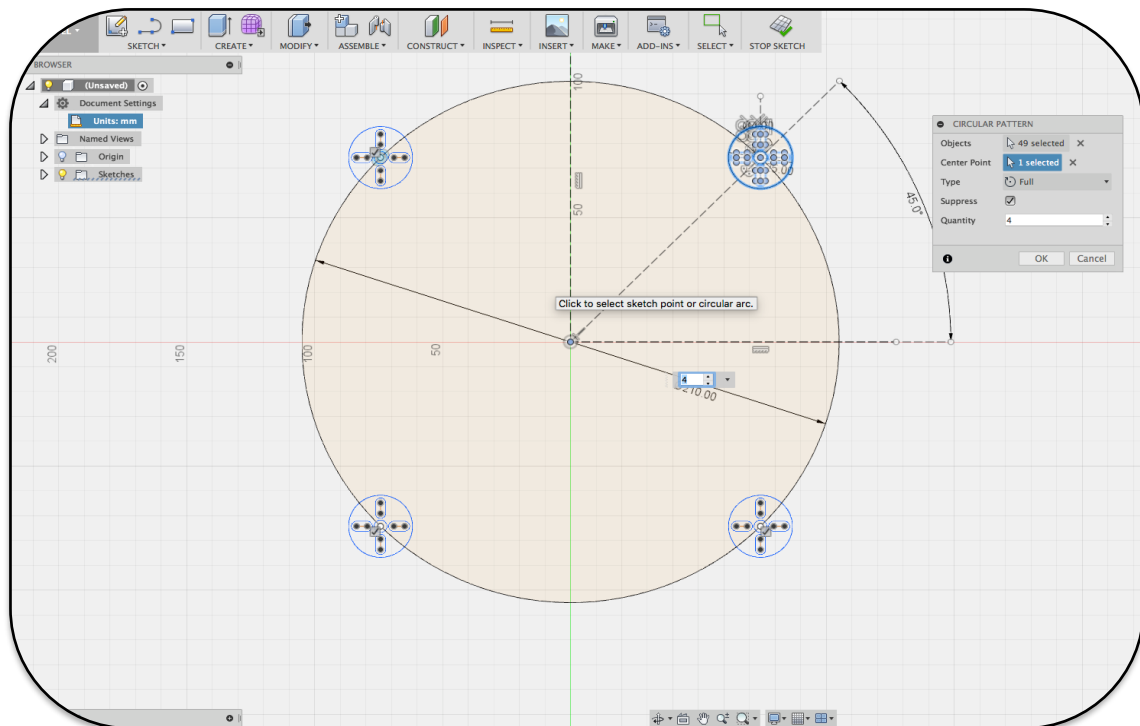
26. Change the default setting from 3 to 4 and click ok.

27. The 1st motor mount is now complete with a motor screw layout to

allow good wire flow from the motors to drone center where they will connect to the Power Distribution Board (PDB).

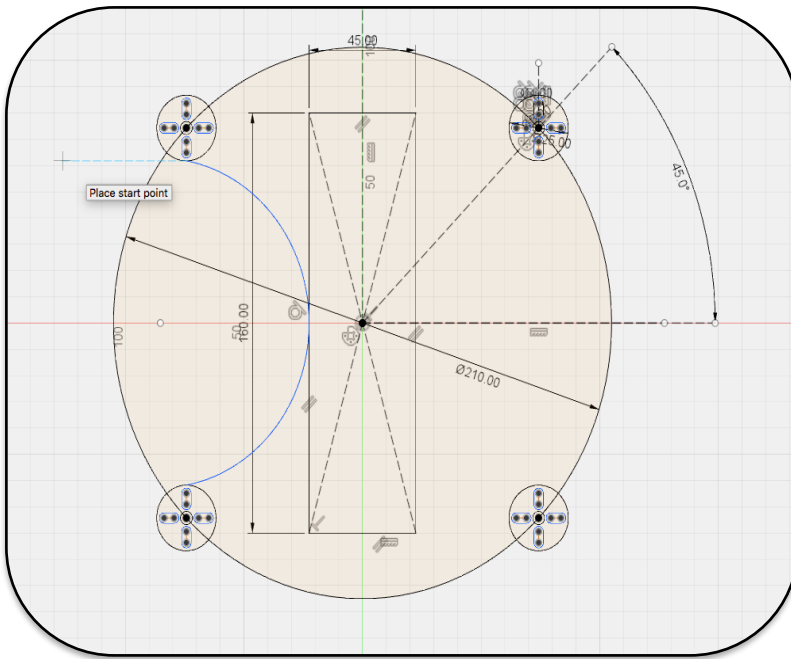
28. Right drag select the complete motor mount. From the tool's dialogue box check to be sure that at least 48 elements are selected.

29. Click on the Center Point of the largest circle and change the default setting from 3 to 4 and click ok.



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- Technical drawing of a circular mechanical part. The drawing includes the following dimensions and features:
- Outer diameter: $\varnothing 210.00$
 - Inner rectangular hole dimensions: 160.00 (width) and 45.00 (height).
 - Corner holes: Four circular holes, each with a diameter of $\varnothing 25.00$.
 - Angle: A 45.00° angle is indicated between a dashed line and the horizontal centerline.
 - Reference lines: A horizontal red line is labeled 150 and a vertical green line is labeled 100 .
 - Center: The center of the part is marked with a black dot.
 - Section lines: Hatching is used to indicate different materials or sections.

- 2.** Sketch / 3 Point Arc tool. From upper left Motor Mount, in line center with the bottom slot tool, draft a 3-point arc down to the bottom left motor mount, in line center with it's top slot tool, click and drag the arc to just touch the center component plate rectangle.
- 3.** Repeat the process for the right side (you can also use the Mirror command as demonstrated in the webinar).



4. For top and bottom arcs use the circle construction line as a guide. Draft a new arc from top left motor mount to the correspond position of the top right motor mount and drag the arc in to the center rectangle as illustrated.

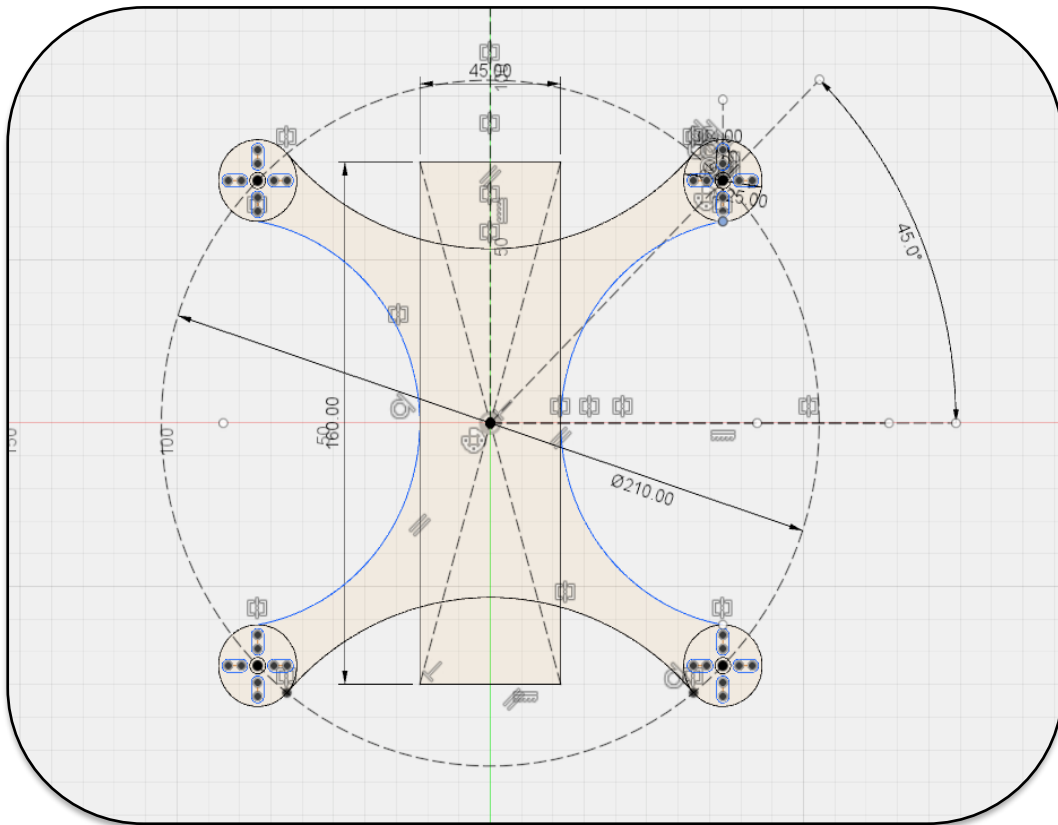
5. Repeat the process for the bottom arc to complete the

motor boom layout.

6. To add more control over your design it is good practice to now Tangent Constrain the arc tool points to their motor mounts.

7. Select an arc tool, from the Sketch Pallet click on Tangent Constraint and select a motor mount. Repeat the process for all remaining arcs by re-selecting the arc / tangent constraint, select the corresponding motor mount.

8. You may have to adjust your arc. Click the arc and drag it to the original position. Tangent Constraint allows the center to move independently of the top and bottom arc po



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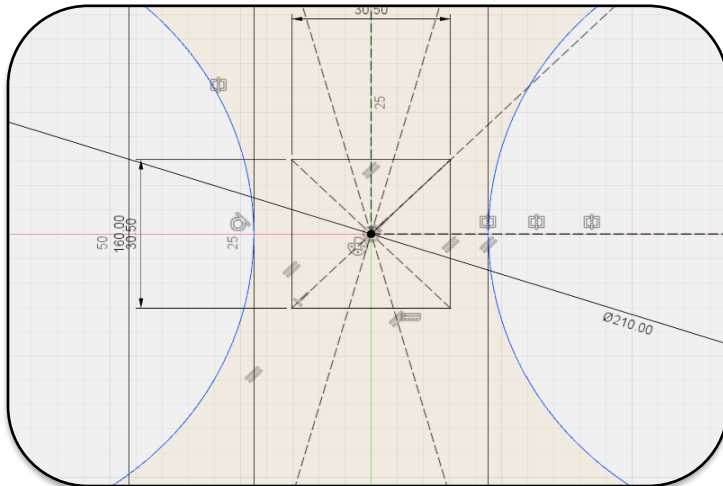
resulting in more fidelity of your design.

- 9.** As a rule the motor booms width should not be much smaller than the propellers, for a racer of this size that equals 12mm.

Step 3: Creating The Motor Component Plate - and Stand Off Hardware holes:

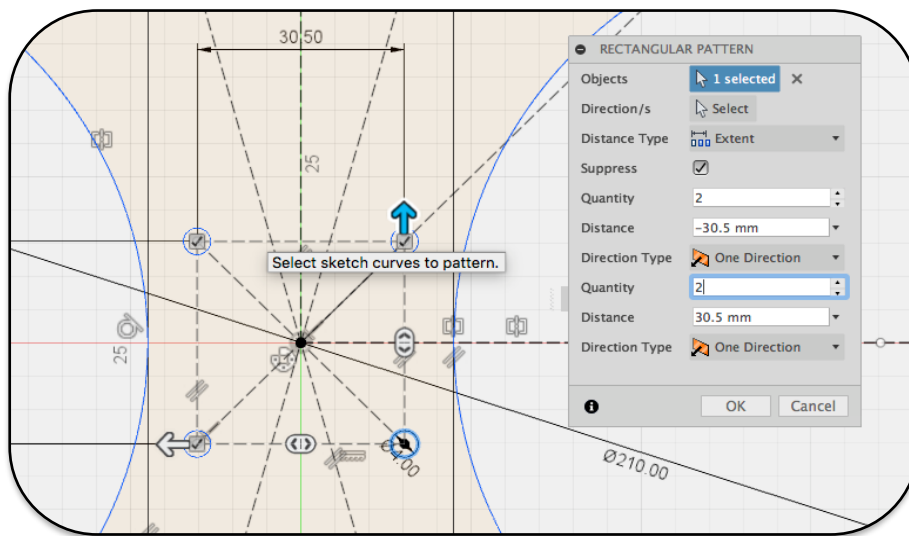
Drafting the Power Distribution Board hardware holes:

1. Sketch / Center Rectangle Tool. From drone center draft out a square and type in the values 30.5mm x 30.5mm, click ok.



2. Select the lines of the square and hit X on your keyboard to make a construction square. (you can press Shift to select more than one object at a time).

3. Sketch / Center Diameter Circle Tool. From the corner of the construction square, draft out a 3.5 mm circle. Click ok. right drag select the new circle.



4. Select the Sketch / Rectangle Pattern Tool.

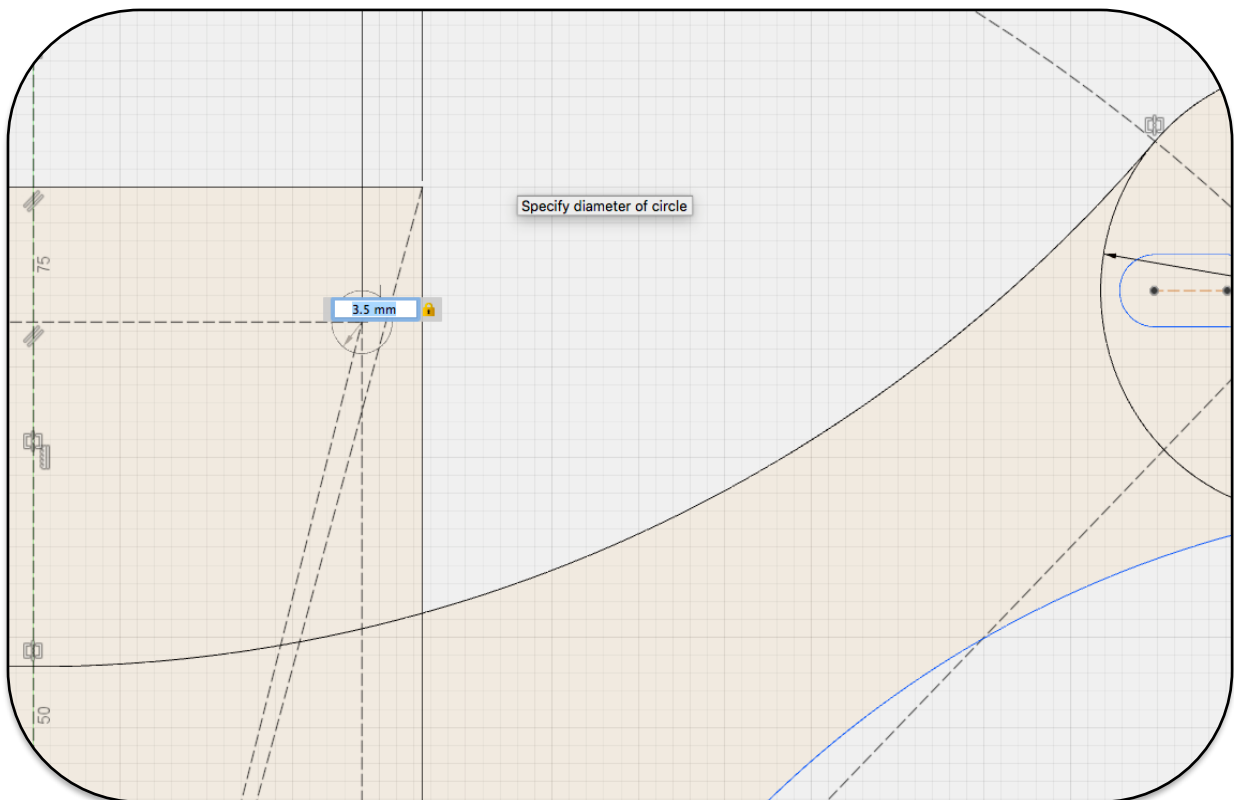
5. Select the horizontal arrow handle and type in a value of -30.5mm.

Set the quantity

value to 2. Select the vertical arrow handle and input a value of 30.5mm x a quantity of 2. Hit return to complete the process.

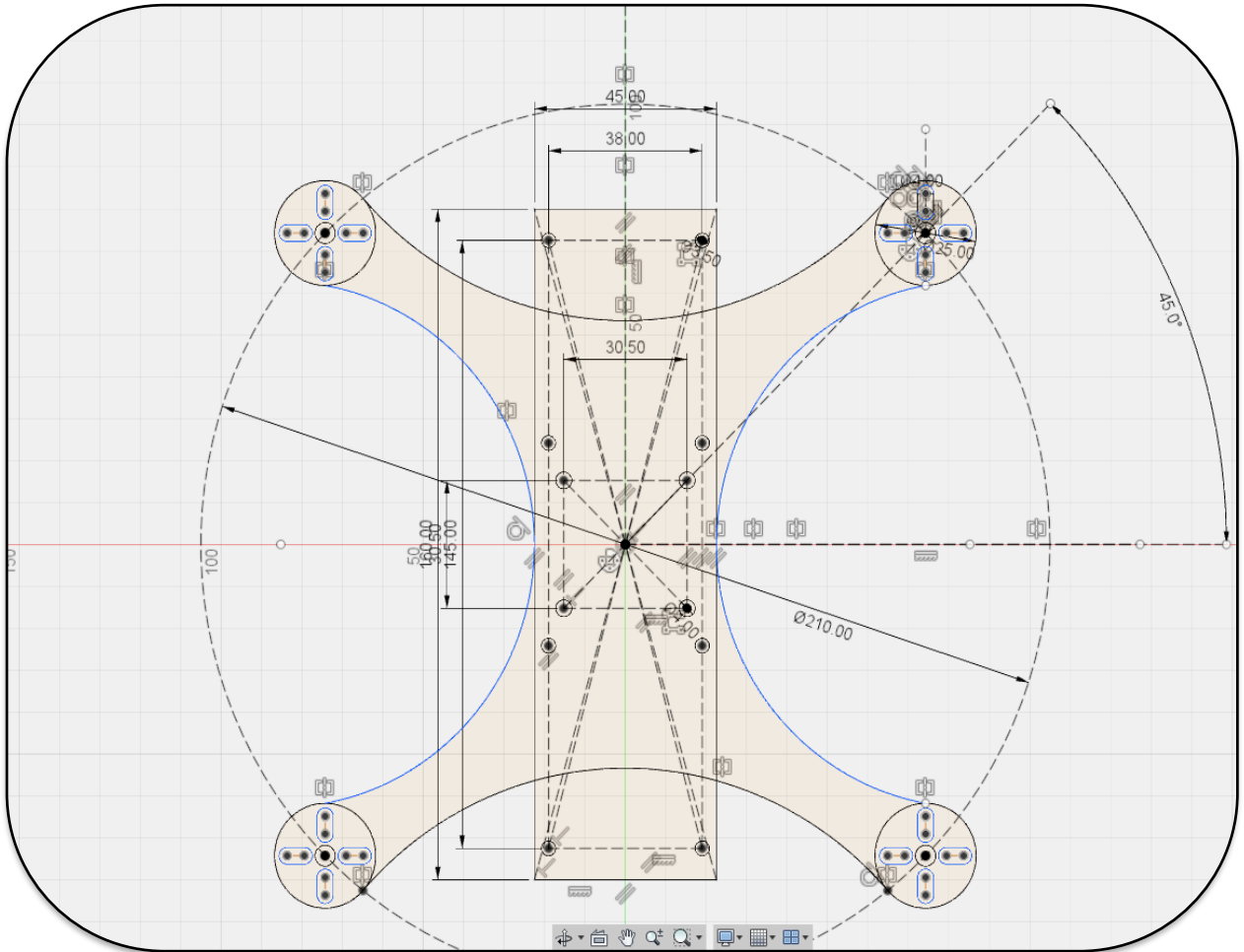
6. Repeat the process for the stand off hardware holes.

- 7.** Sketch / Center Rectangle Tool. From drone center draft out a rectangle and type in the values 145mm x 38mm, click ok.
- 8.** Select the lines of the rectangle and hit X on your keyboard to make a construction square.
- 9.** Sketch / Center Diameter Circle Tool. From the corner of the construction square, draft out a 3.5mm circle. Click ok.



- 10.** Right drag select the new circle.
- 11.** Select Sketch / Rectangle Pattern Tool.

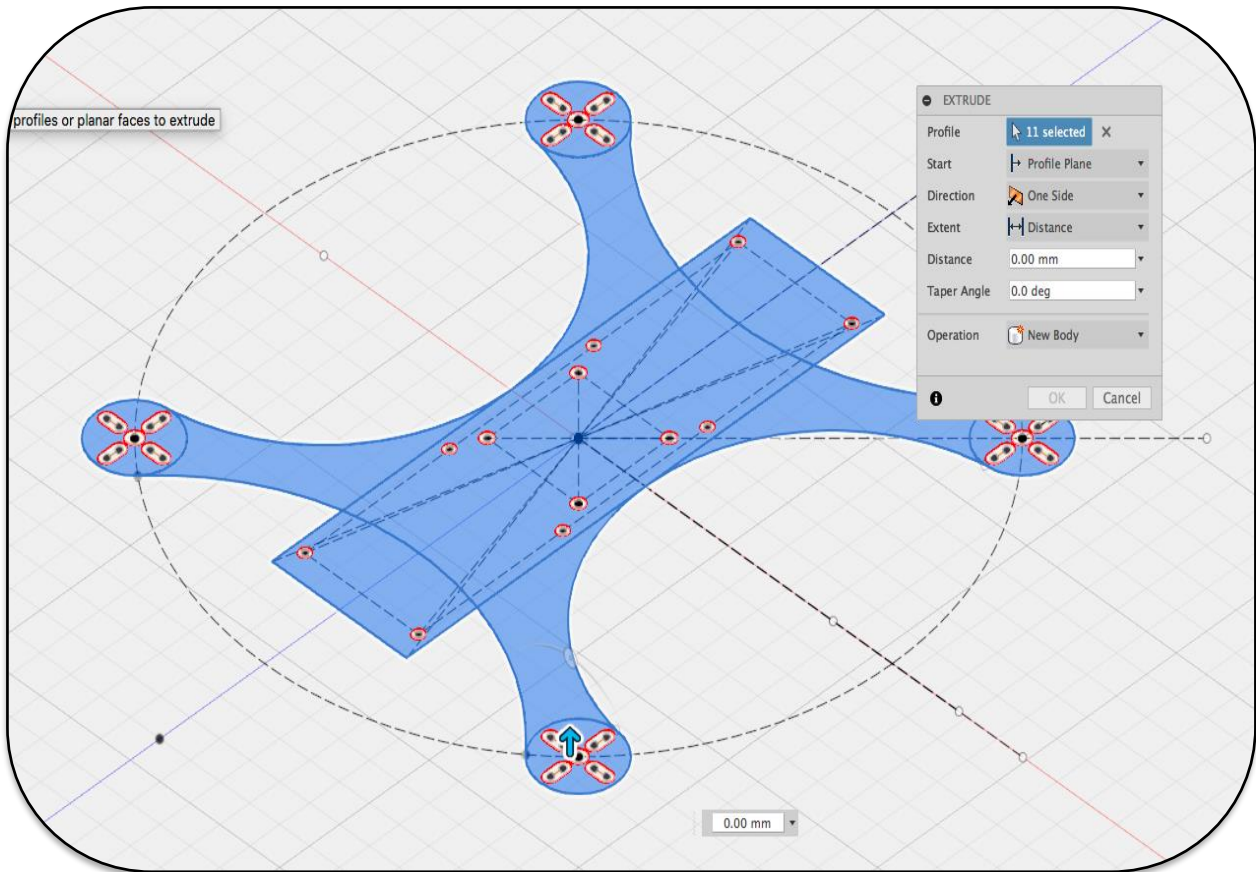
12. Select the horizontal arrow handle and type in a value of -38mm. Set the quantity value to 2. Select the vertical arrow handle and input a value of 145mm x a quantity of 4. hit return to complete the process.



13. This completes the basic sketch for the Motor Component plate.

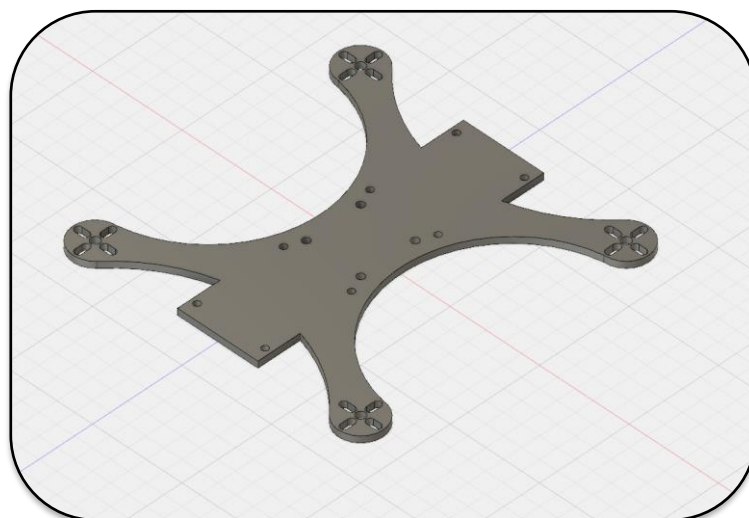
14. Next extrude the plate to create geometry. Adjust the view by click and dragging the View Cube.

15. Modify / Press Pull Tool. Or Q on your keyboard.



16. Select the Motor component plate. The selected elements will turn blue. Avoid selecting any hardware holes.

17. In the Press Pull Dialogue box enter a value of 3mm, click ok.



This finalizes the Motor component Plate