**Perspective Test**

CHURCH.

1. Start by drawing a triangle with the top side completely horizontal. This particular line will serve as the horizon line. The top left vertex will be the left vanishing point (LVP), the top right vertex will be the right vanishing point (RVP). The bottom vertex will be the bottom most point of your image. Call this point P.

2. Next, create the diagonal vanishing point (DVP) that will lie on the horizon line. Find the midpoint of the segment between the LVP and the RVP. Use this midpoint as the center of a circle that goes through both the LVP and the RVP. Create a Thales triangle with the LVP, the RVP, and a point on this semi circle above the horizon line. Then bisect the 90 degree angle of the Thales triangle and connect this bisector to the horizon line. Where this line meets the horizon is the DVP.

3. Since this church will be created in two point perspective, the third point will be ideal, meaning all lines that should be going through the third vanishing point will parallel and perpendicular to the horizon line. First, make a line perpendicular to the horizon through the LVP. Then create a line parallel to this new line through the RVP.
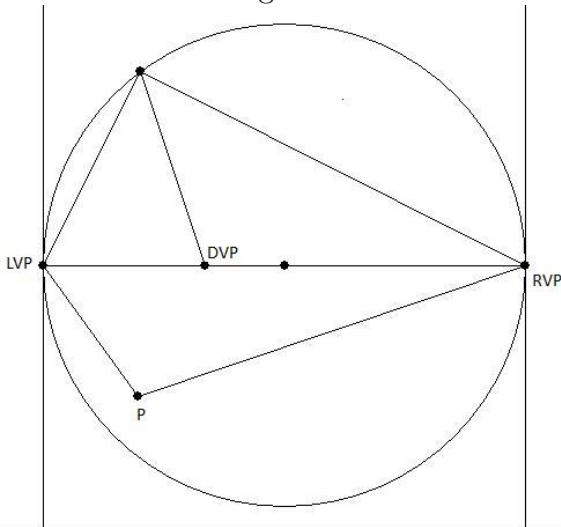

4. The left diagonal vanishing point ($LDVP$) can be found by moving down from the LVP the same distance from the LVP to the top vertex of the Thales triangle, along the vertical line through it. The right diagonal vanishing point can be found similarly, but it is not necessary to find and use to create the church.

5. Extend a line from P to the DVP.

6. Then choose a point a small distance from P along the line from P to the DVP.

7. Connect this new point to first to the DVP. Then connect it with the LVP. Where this particular line meets the line between P and the DVP, create a point at this intersection.
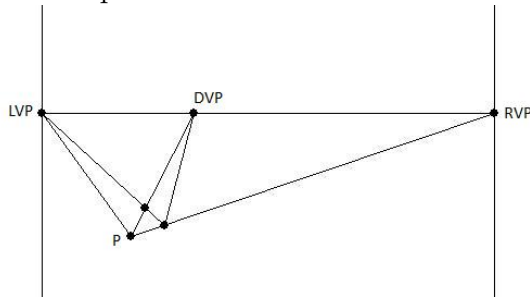

8. Draw a ray from the RVP through this new point and find where this ray intersects the line through P and the LVP. Draw a new point at this intersection.

9. At this point you have created one square as part of the base for the church. You can see in the picture that youve already created 2 points and a place for a third point for another square right next to the first.
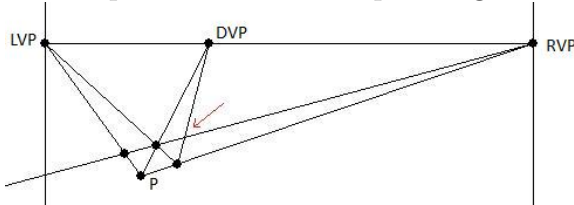

10. Create this third point, and then create a line from the LVP to this new point. Find where this line meets the line from P to the RVP, and put a point there to create all 4 vertices of the second square.
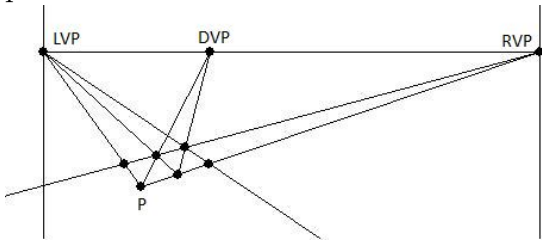
11. Do this similarly for 4 more squares to create a base for the church that is 2x3: two squares along P to the LVP, and two along P to the RVP.
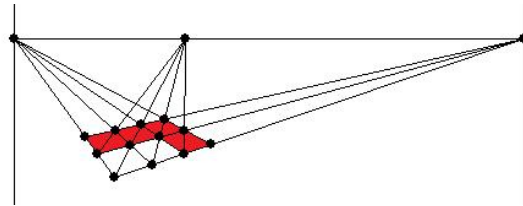
12. Since the church only covers the red squares shown above, hide the objects associated with the bottom two points as seen below.
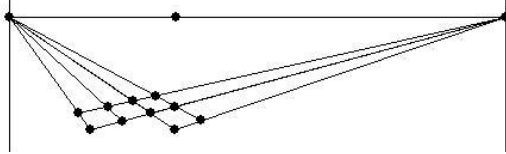

13. Now the squares need to be turned into cubes by building up. Create lines through the front most points that will be seen on the church parallel to the horizon line.

14. Draw a ray from the $LDVP$ through the point shown below and find where it intersects the first parallel line to the right to create a height of one cube.

15. Once you have this height, create a second row of squares as you did before. You will not need the whole squares, however - just create the points that will be seen on the exterior of this building from this angle. Start first by connecting your new point to the LVP and the RVP.
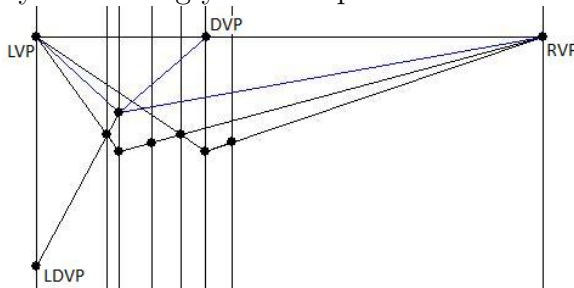

16. Your figure should look like this when the second row is complete. (note that many lines needed to draw these points were hidden):
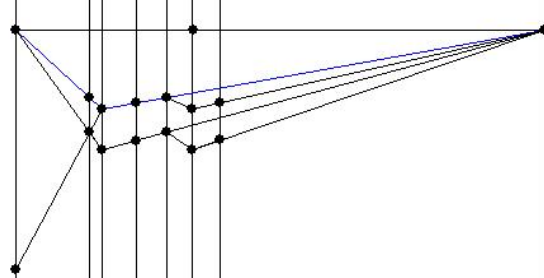

17. For the next row, start again by using the $LDVP$ and connecting it

through the point shown below. Connect this new point to the LVP and RVP (purple). Find where the line from the new point to the LVP hits the next parallel line and put a point. On the segment between these two points, find the midpoint. Connect this midpoint with the RVP. For the back row of 3 cubes of the church, you have now found the top roof line (blue).
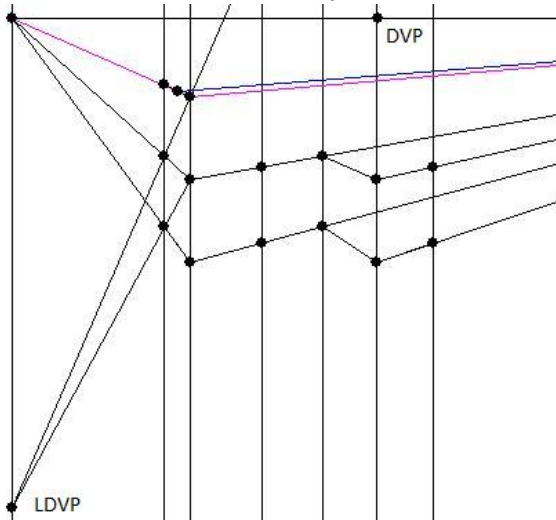

18. For the front cube, you will need another point to connect points of the third row in order to create a pointed roof. For this point, use the $LDVP$ through a point on the third row to create a point on the top row. This is not the point needed. Instead, you will need the direct center of this square. In order to do so, find the other two points visible from this angle. Then find the midpoints of these visible segments and connect them to the RVP and LVP so that they cross at the middle of the square. This intersection is the point needed.
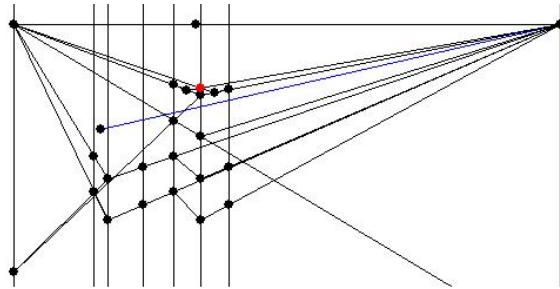
19. Hide all unnecessary objects.
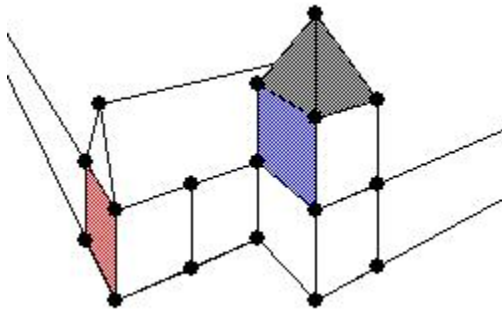
20. Create a door on the red shaded section. The door should be positioned on the square as shown below:
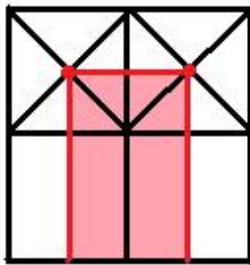

21. Create a 12 pt. circled on the blue shaded section. The circle should be made out of the 12 points shown below:

22. Finally, 3 windows need to be made around the corner from the door (green). In order to do this, one must create a perspective ruler and a focal point. Choose a focal point on a line parallel to the vertical line through the RVP. Create the ruler on the vertical line through the RVP. On the ruler, place two points close to each other and choose this length as a vector (Choose vector option. Hit the translate button 6 times. You should now have 7 equal sections on your ruler.
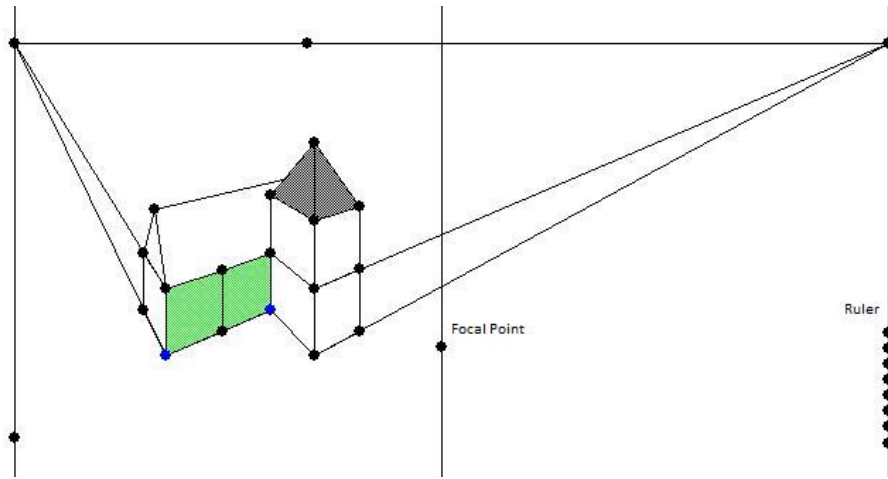
23. Create rays from the bottom most point and the top most point on the ruler through the focal point. Wiggle the focal point and the points on the ruler to make these two rays go through the blue points shown above. Once you get this lined up, add all the other rays from the points on the ruler through the focal point. Find the points of intersection of these rays through the segment joining the two blue points.
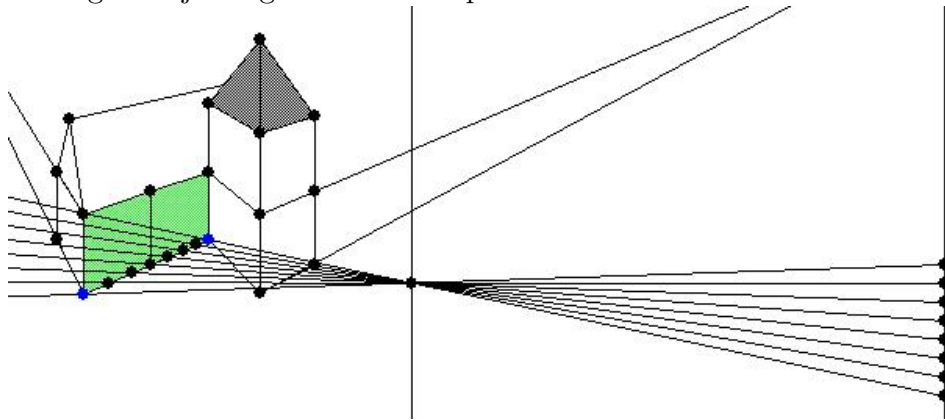
24. Hide the rays that created these points and use the following diagram to create windows on the green section of the building:
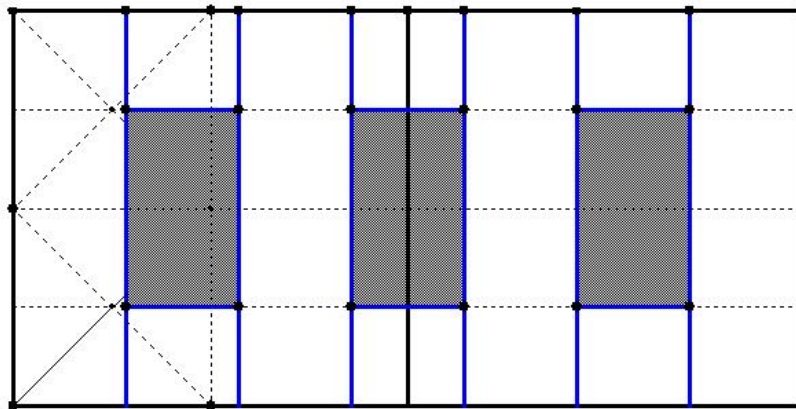
25. When complete, your church should look like this:
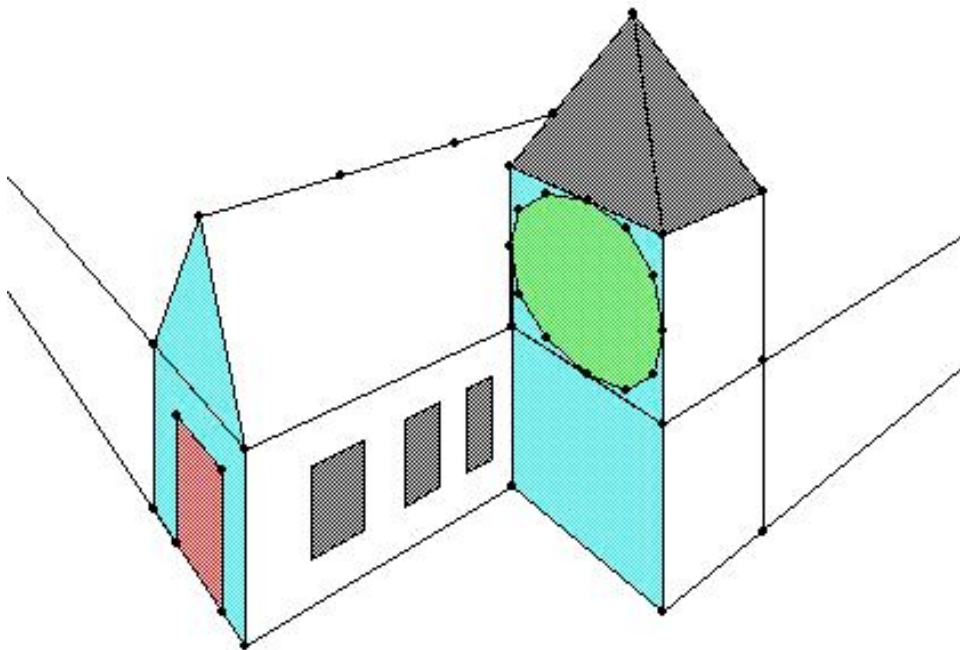
MYSTERY BUILDING: Sears (Willis) Tower.

1. Start by drawing a triangle with the top side completely horizontal. This particular line will serve as the horizon line. The top left vertex will be the left vanishing point (LVP), and the top right vertex will be the right vanishing point (RVP). The bottom vertex will be the Zenith point (Z).

2. Next, create the diagonal vanishing point (DVP) that will lie on the horizon line. Find the midpoint of the segment between the LVP and the RVP. Use this midpoint as the center of a circle that goes through both the LVP and the RVP. Extend the altitude of the triangle from Z and find where it meets this circle above the horizon line. Create a Thales triangle with the LVP, the RVP, and this point created by the altitude from Z. Bisect the 90 degree angle of the Thales triangle and connect this bisector to the horizon line. Where this line meets the horizon is the DVP.

3. The left diagonal vanishing point ($LDVP$) on the line between the LVP and Z, and the right diagonal vanishing point ($RDVP$) on the line between the RVP and Z can be found similarly (Step 2). Again, the $RDVP$ will probably not need to be used.

4. Choose a point P inside the initial triangle to be one of the bottom-most point of your building. Connect P to the LVP, DVP, and RVP. Choose another point along the line towards the RVP that will be the length of one square. Connect this new point to the LVP. Where this line crosses the line between P and the DVP, create another point. This point will be the third point of the first square. Now create a ray from the RVP through the third point. Where this point crosses the line between P and the LVP is the fourth and final point of the first square.

5. Connect the second and fourth points to the DVP and you will find the diagonal lines of two new squares. Continue creating squares until you have a 3x3 grid. The picture below shows the grid you should now have (with many lines hidden you will probably have more) and corresponding numbers that shows the amount of cubes that must be stacked over the individual squares. The colored dots will be explained later. The red numbers are stacks that will not be visible from this point of view.
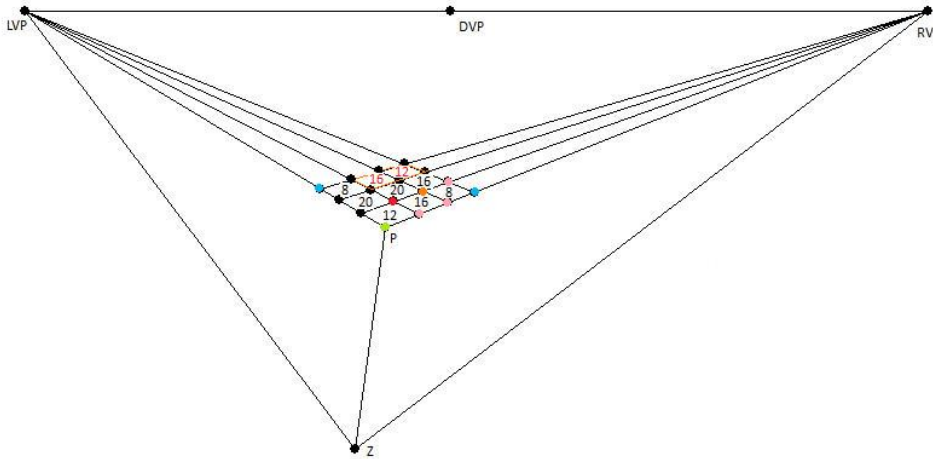
6. Once you have the first nine squares complete, use rays to connect Z to the 7 points closest to you (the points on the lines to the LVP and RVP from point P). Leave the other points alone temporarily. You will need them later to complete the top of the building.

7. Next, create a ray from the $LDVP$ through the point to the left of P on the outer-most edge. Find the point where this line crosses the ray from Z to P. This will be the point P for the second row of squares, which will also serve as the upper edge of the cubes created by this row of squares and the ones below.


9
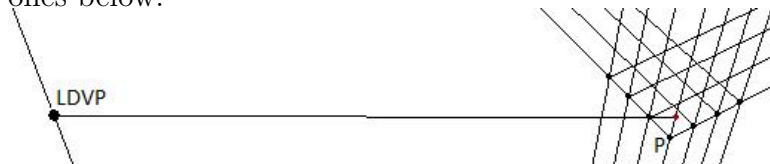
8. Connect this new point above P to the LVP and the RVP. Create points along these two new lines wherever they intersect the rays coming from Z. You will now have the seven outer points of the second row.


9. As we only aim to see the outer edges of this building, you will only need these outer points as you work your way up. Create a total of 9 of these rows of points (to create a total of 8 floors).

10. Based on the picture shown above, the two stacks with 8 on the right and left will be visible, so do not create any more points above the blue dots.
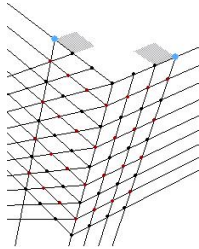

11. Continue creating rows above the remaining 5 dots for an additional 4 rows creating an additional 4 floors.

12. Again, the nearest stack of 12 is now finished, so do not create any more points above the corresponding green point. Now, however, the points above the red point will be visible. Extend a ray from Z through the red point, and find where it meets on your current level. Continue with these 5 points for another 4 levels.
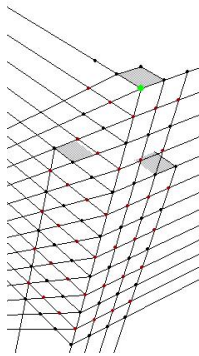
13. When youve reached this point, the two stacks of 16 will now be visible. Stop creating points above the 3 pink points. Be sure to add the two blue points shown below:
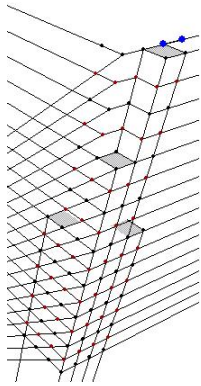
14. Finish the two stacks of 20 for another 4 rows. Note now that you must include the orange point, for a total of 4 points per row. Remember, this fourth point can be created by putting in a ray from Z through the orange point and finding a corresponding point above it at the needed level.

15. Your finished product with shaded sides should look something like this: