

# Letting Excel Help with the Perspective Formulas

- ▶ Begin with a blank Excel spreadsheet.
- ▶ Each rectangle is a *cell*, where you can store data and/or perform calculations. You refer to each cell by giving its column (A, B, C, ...) and its row (1, 2, 3, ...). For example, I15 is the rightmost and lowest cell shown.

	A	B	C	D	E	F	G	H	I
1									
2									
3									
4									
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11									
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15									

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- ▶ Before entering the given information, label what information you're going to put in each column and row, so that you know how to read the table easily. Thus label the columns  $x$ ,  $y$ ,  $z$ ,  $d$ ,  $x'$ , and  $y'$ . Also, name the points and enter those names on the rows.
- ▶ To add borders and shading, open the formatting palette (*View - Formatting Palette* and then using the options under *Borders and Shading*).
- ▶ Then enter the given information for each point in the appropriate cell. In our first example (of the square), point  $A$  has coordinates  $(10, 15, 30)$  and  $d = 20$ .

	A	B	C	D	E	F	G	H	I
1	Points	x	y	z	d	x'	y'		
2	A	10	15	30	20				
3	B	15	15	30	20				
4	C	15	15	35	20				
5	D	10	15	35	20				
6									
7									
8									
9									

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- ▶ To enter the formula for  $x'$  into cell F2, you first have to tell Excel that what you're entering *is* a formula rather than just text, so begin the line with =.
- ▶ Next, you need to tell Excel which cells to take the information from. For point A,  $x$  is in cell B2,  $y$  is in cell C2,  $z$  is in cell D2, and  $d$  is in cell E2. Thus for the formula  $x' = \frac{dx}{d+z}$ , we would type in = E2 \* B2 / (E2 + D2)[return].

	A	B	C	D	E	F	G	H	I
1	Points	x	y	z	d	$x'$	$y'$		
2	A	10	15	30	20	=E2*B2/(E2+D2)			
3	B	15	15	30	20				
4	C	15	15	35	20				
5	D	10	15	35	20				
6									
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15									

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- ▶ When we hit return on a formula, Excel returns the value: thus we know the  $x$  coordinate of the perspective image of  $A'$  in the picture plane is 4. But we also need the  $y$ -coordinate, of course.
- ▶ We proceed the exact same way: for the formula  $y' = \frac{dy}{d+z}$ , we would type in  $= E2 * C2 / (E2 + D2)$ [return].
- ▶ **Note:** You do **not** want to copy from the formula for  $x'$  and copy it, because since you're entering the formula one cell to the right of the last one, Excel will automatically change every column in the *formula* to the one to the right.

	A	B	C	D	E	F	G	H	I
1	Points	x	y	z	d	$x'$	$y'$		
2	A	10	15	30	20	4	$=E2*C2/(E2+D2)$		
3	B	15	15	30	20				
4	C	15	15	35	20				
5	D	10	15	35	20				
6									
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9									
10									

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- ▶ Once again, when we hit return, Excel returns the value of that calculation, giving us that for the point A, the y-coordinate of its perspective image,  $y'$ , is 6.
- ▶ Next we want to calculate the remaining 6 coordinates. Rather than typing in each formula 3 more times, use the power of Excel. If you click on cell F2, containing the formula for  $x'$ , copy it, and paste it to cells F3, F4 and F5, it will adjust the formula to the appropriate row. Same for clicking on cell G3 and copy-and-pasting to the 3 cells below.

	A	B	C	D	E	F	G	H	I
1	Points	x	y	z	d	$x'$	$y'$		
2	A	10	15	30	20	4	6		
3	B	15	15	30	20				
4	C	15	15	35	20				
5	D	10	15	35	20				
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12									

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- ▶ Even more efficient, you can highlight and copy both cells F2 and G2 at the same time, then highlight all the cells below where you want the formulas copied, as shown below. When you paste into those cells, the formulas will all go into the right places.

	A	B	C	D	E	F	G	H	I
1	Points	x	y	z	d	x'	y'		
2	A	10	15	30	20	4	6		
3	B	15	15	30	20				
4	C	15	15	35	20				
5	D	10	15	35	20				
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