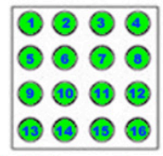
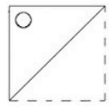
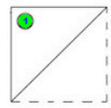
One thing I like to do with respect to hole punching is to mentally assign circle numbers based on a grid system. When you look at the original unfolded piece of paper, there can only EVER be 16 circles, and they are always arranged in 4 rows by 4 columns, right?



In some of my tutorials that follow, you'll see the green numbered circles in the grid above. Regardless of how many folds there are, the numbers in the grid above will always be in the exact same location as they are shown above. Let me clarify that if it is confusing anybody.

If given this...

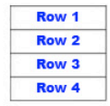




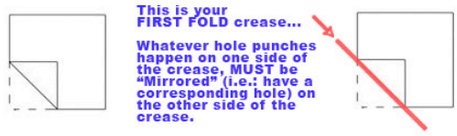
...I will assign the circle location of the hole punch as #1. Even though, if you think about the fold, you are technically looking at the back-side of circle location #16, for me to put the #16 in the #1 circle location would further confuse those who have trouble with this section.

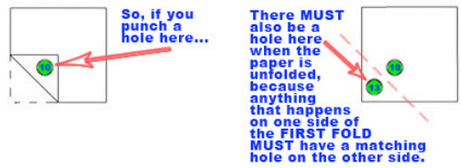
So, regardless of how many folds there are, I'll always use the circle location number from the grid above for any punches made to the paper.
If there is empty space (i.e.: the paper was folded in such a way that there is no longer paper over that circle when the punch is made), I'll still assign that position number, then address the "empty space" for that specific problem.

For the sake of simplifying the process even further, and to make it easier for me to refer to patterns that do have either horizontal or vertical folds, I'm going to visualize the standard piece of paper as having 4 COLUMNS (i.e.: up and down, or "vertical"), and 4 ROWS (i.e.: left to right, or "horizontal"). I'm making some of these early definitions very simple because for some of the students on this forum, English is not their first language...so I'm trying to make it as simple as possible in order to avoid confusion for those students.



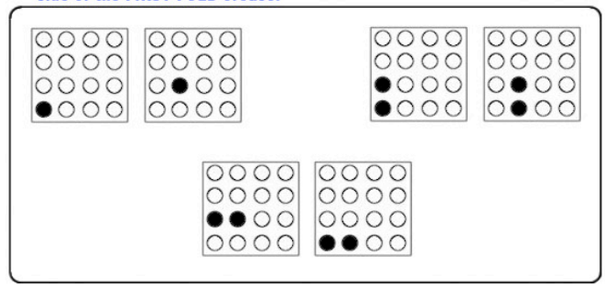
Also, a good way to quickly negate (or confirm) answer is to check for "Mirror Image" or "Plane of Symmetry" with respect to the very FIRST FOLD. When the first fold is made, whatever holes get punched on one side of the fold MUST also appear on the other side of the fold. For example:



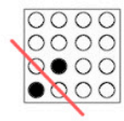


This "Plane of Symmetry across the fold" or "Mirror Image Holes" rule applies to most folds throughout a problem. However, it ALWAYS applies to the FIRST FOLD because the FIRST FOLD has to result in paper being folded on top of paper. There is NO possible way that the FIRST FOLD of this square of paper will result in the top layer being folded over "empty space". It just can't happen.
So, with respect to the FIRST FOLD, there MUST ALWAYS be symmetry across the FIRST FOLD crease.

Given the example above, ALL 6 of the answers below are incorrect, because there is no Plane of Symmetry or "Mirror Image" on either side of the FIRST FOLD crease.

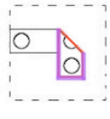


Only this figure below would be correct because it does have a Plane of Symmetry or "Mirror Image" hole punched on either side of the FIRST FOLD crease.



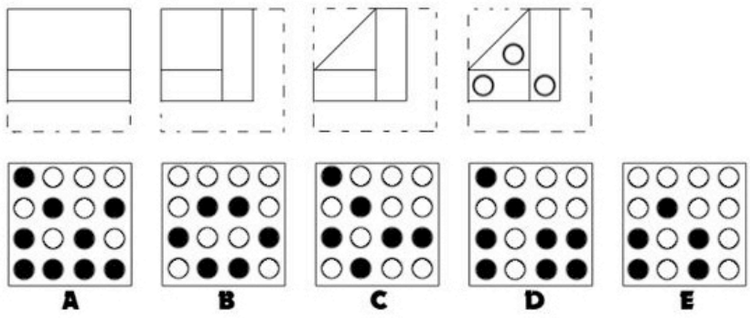
Lastly, in some of my tutorials you'll see my use of "red" lines and "purple" lines.
Red lines are used to denote a fold (and/or a line of symmetry).
Purple lines are used to denote a flap of the piece of paper that can be grasped by the viewer and folded back into position using the red line (or fold) as the "hinge".

Here is an example:



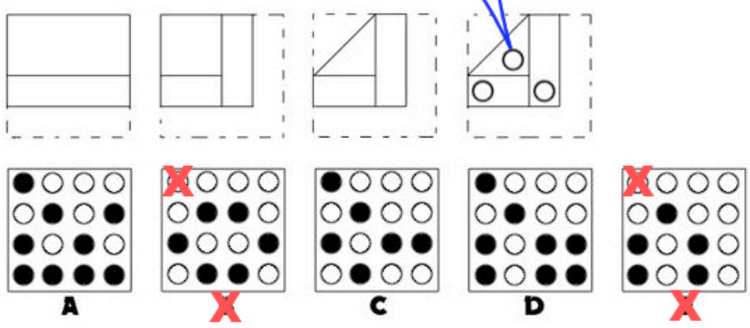
The purple outlined portion of the paper is the flap that can be grasped by the viewer.

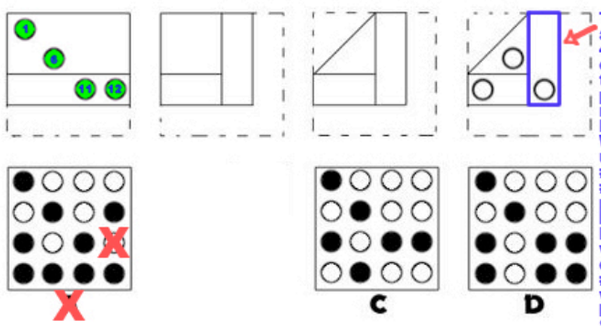
The red line is the fold.



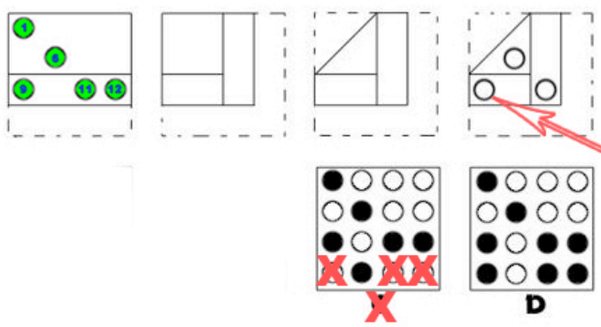
This hole is "technically" hole #1. I don't mean that in the sense that it is hole #1 in a series of 3 holes punched. I mean that when the paper is unfolded, the location of the hole is in the #1 hole position out of 16 possible hole positions.

So, you know that you have a hole at position #1. Because choices "B" and "E" do not have holes punched at hole #1, you know that they are wrong, and can negate them.

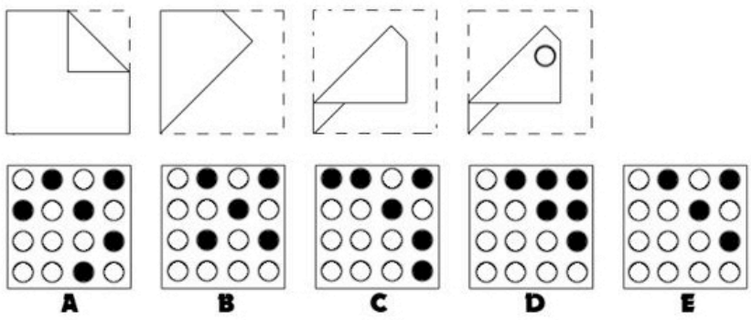




This box is actually Column 4 folded over onto Column 3, then the hole punch was made in circle location #11. When this is unfolded, circle #11 and circle #12 will be punched because circle location #12 was on top of circle location #11, so both were affected by the punch. Since choice "A" doesn't have circle number 12 punched, you can rule it out.

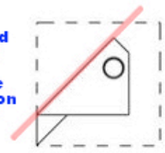


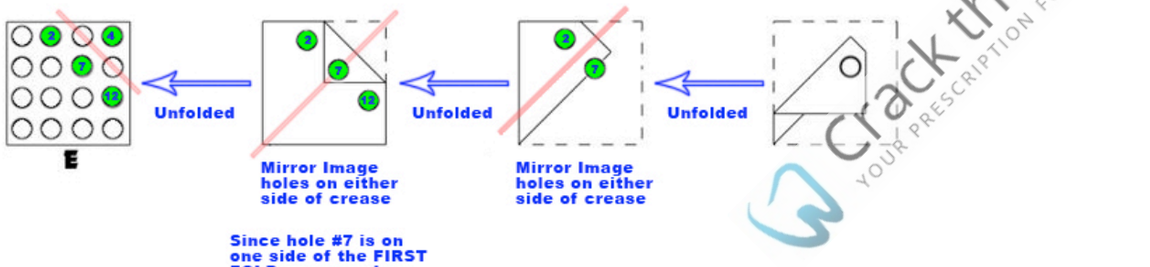
So, up to this point of unfolding, we've determined that we have holes punched at circle locations, 1, 6, 11, 12. Looking at the last folded pattern, we also have a hole punched at circle location #9. Now, look at the very first folded pattern. Notice that ROW 4 has been folded up on top of ROW 3. So, because ROW 4 is on top of ROW 3, anything that gets punched on that horizontal row will affect both rows.
So, if there are holes punched at circle locations 9, 11, and 12, when ROW 4 is folded back down, there will also be corresponding holes at circle locations 13, 15 and 16. Since "C" doesn't have hole punches at circle locations 13, 15 and 16, it is out. Another way to rule out "C" very quickly at this point is to remember what I said earlier about the correct answer ALWAYS having a "mirror image" or "plane of symmetry" about the FIRST FOLD. Since "C" doesn't have symmetry on both sides of the FIRST FOLD crease, it is not correct.



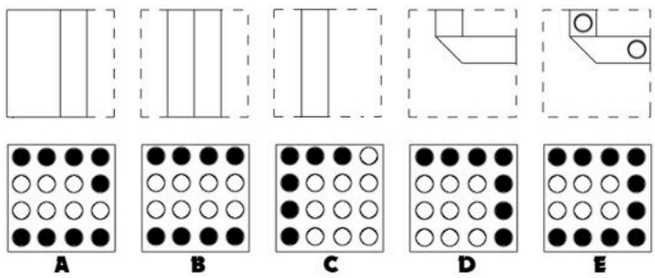
The easiest way to do this particular problem is to just unfold it step-by-step, keeping in mind mirror image symmetry on either side of any fold.

Let's look at the Last Fold first and just unfold step-by-step, keeping in mind that the crease of each individual fold mandates symmetry (i.e.: any hole(s) that get punched on one side of the fold, must have corresponding hole(s) on the other side of the fold...with the exclusion of holes punched over empty space).

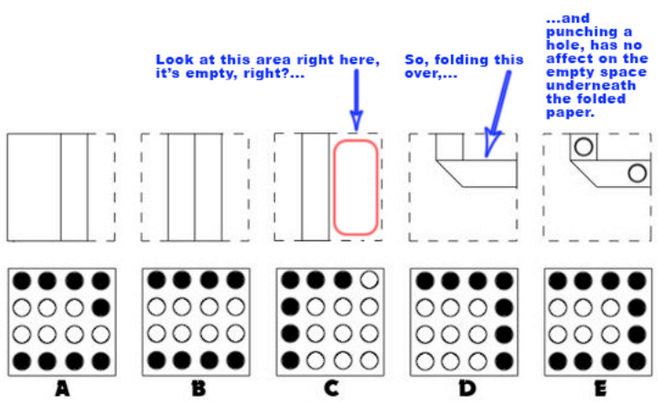


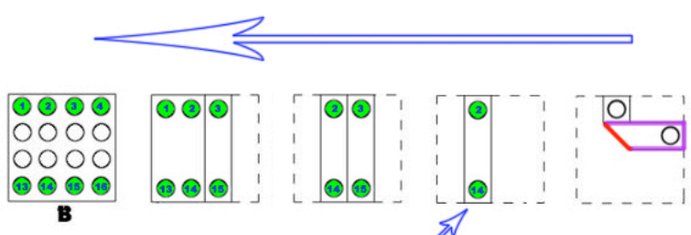


Since hole #7 is on one side of the FIRST FOLD crease, when that FIRST FOLD is unfolded there must be a hole at circle location #4 in order to be symmetrical across the crease.

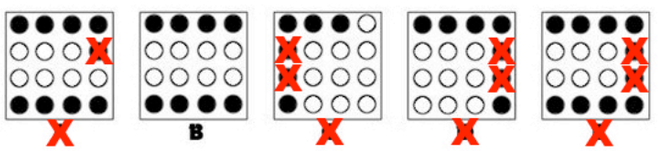


I chose to include this one because some people forget that a hole punched over "empty space" doesn't result in a hole beneath the folded layer.



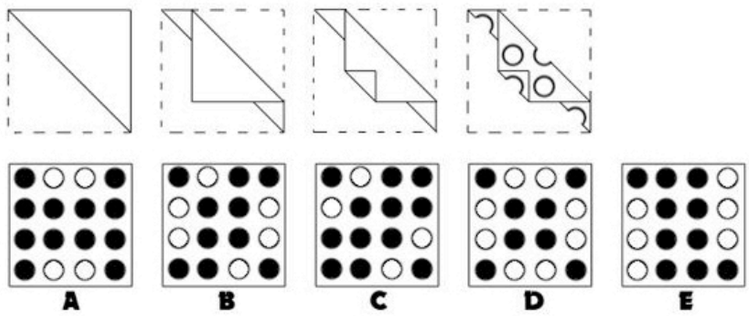


Now at this point,
there are two easy ways to negate all the wrong answers.
You can think to yourself, "Well if I only have holes punched in the top ROW (ROW 1) and the bottom ROW (ROW 4), and all the folds are columnar or vertical, when I unfold this like I'm unfolding a map, then there can't possibly be any holes punched in ROWS 2 & 3, as shown in choices, "A", "C", "D" or "E".

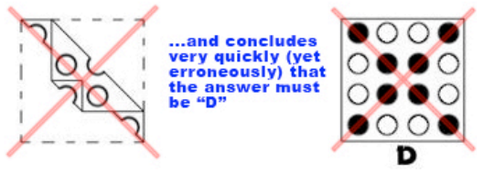


Combine this with the following logic:
"Since I have holes punched in ROWS 1 & 4, and since all 4 possible VERTICAL folds are on top of each other (over ROW 2 in this example), the holes go through all layers and therefore when I unfold all of these vertical folds, I must have 4 holes across the top ROW (ROW 1), and 4 holes across the bottom ROW (ROW 4).

Therefore...
If I can't have holes punched anywhere in ROWS 2 & 3, *and*
I MUST have 4 holes across the top ROW and 4 holes across the bottom ROW,
then 'B' is the only possible answer".



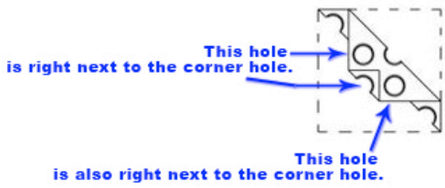
This one is harder than it looks, and concurrently easier than it looks. Let's just say that in its folded state, you might immediately jump to answer "D" because our mind's eye looks at the apparent symmetry about the 2 diagonal axes...

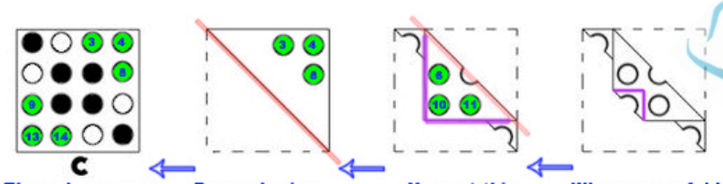


Furthermore, the fact that they put answer "D" right under the final folded pattern, makes the mind jump to this conclusion even quicker and more easily. You're thinking to yourself, "Oh, this one is easy...it's 'D'...let's quickly move on to the next problem now that I've gained some extra time on this one." Don't fall into this trap.

While choice "D" does, in fact, have holes punched in the right places, it's missing some holes.

My mind see's the solution from 3 different trains of logic, but 2 of the 3 require a lot of explanation and it would not only be time consuming on my part, but might also confuse people who don't understand this too well to begin with. So, I'll just explain the quickest way that I know to pinpoint the answer to this particular question.



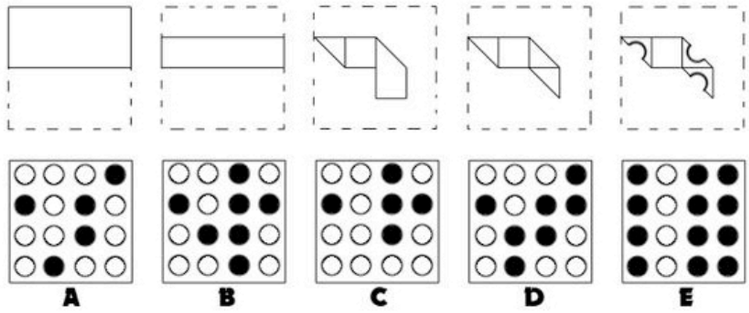


When you unfold this corner...

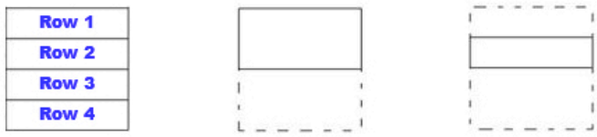
...You get this. When you unfold this triangle back into its original corner position, holes 6, 10 & 11 are actually 3, 4 & 8, respectively.

Remembering that you have to have symmetry or mirror image holes across the fold, holes 3, 4 and 8 would warrant 3 holes in the mirror configuration on the other side of the fold. I chose not include any of the other holes in this figure just to keep any confusion to a minimum.

The only answer that has holes punched at 3, 4 and 8, as well as 9, 13 and 14, is answer "C".



This one is actually a lot simpler than it looks.
Remember at the beginning of this Hole-Punching tutorial series when I said that it's sometimes easier to visualize these squares in terms of ROWS and COLUMNS?
Well, this is a perfect example.

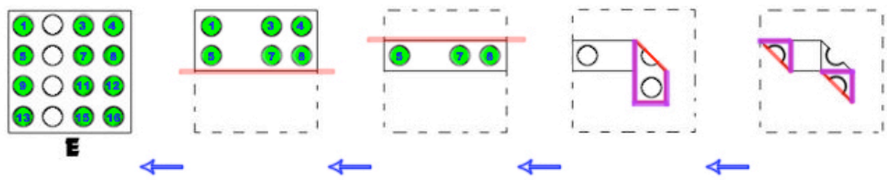


If this represents an unfolded piece of paper with 4 possible ROWS...

..then this would represent ROWS 3 & 4 folded up on top of ROWS 1 & 2...

...and this would represent ROWS 1, 3 & 4 all on top of ROW 2.

So, since all 4 possible ROWS are now in one horizontal stack (in this case where ROW 2 is), any holes that get punched in the paper will affect ALL the ROWS identically.

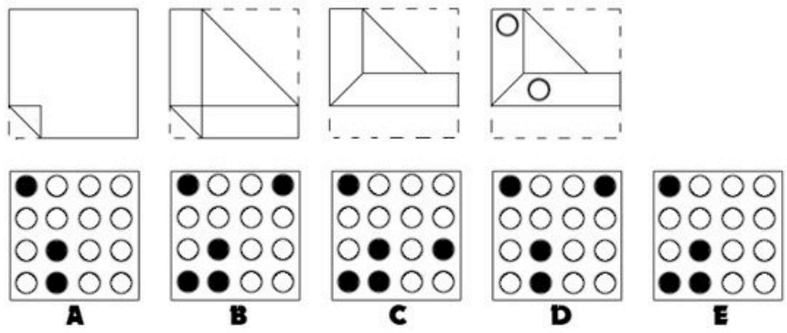


Once again, you have to have symmetry across the fold. So, the holes on the top half of the fold yield mirror image holes on the bottom half of the fold.

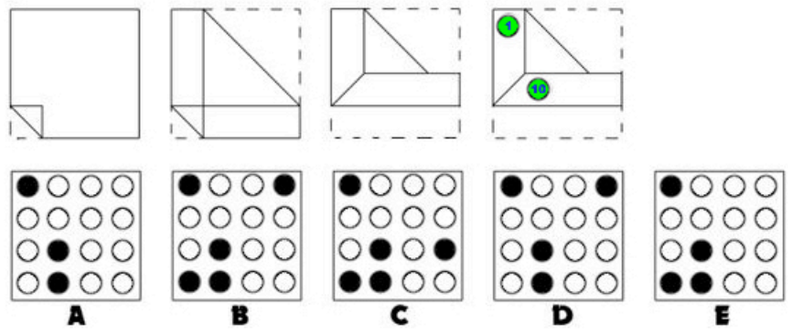
...You get this. When this gets unfolded, you have to have symmetry across the fold, so holes 5, 7 & 8 yield holes 1, 3 & 4.

...You get this. When this gets unfolded...

When these two triangle folds get unfolded...



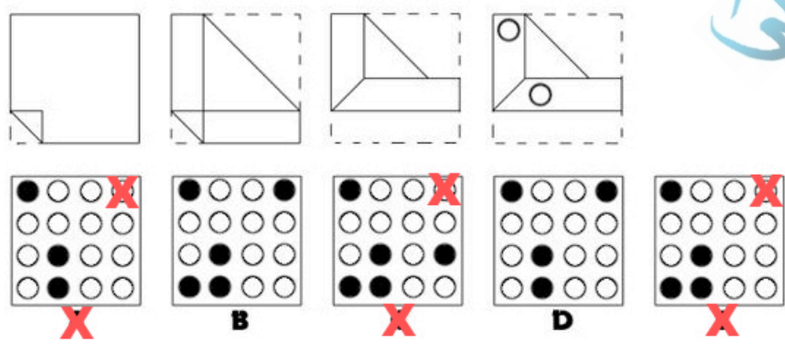
Remember at the beginning of this Hole-Punching tutorial series I mentioned the "FIRST FOLD Plane of Symmetry" rule (a.k.a. "Mirror Image" rule). Well, here is an example where that rule doesn't apply. Because the first fold is so small (i.e.: it only occupies the space of one circle or hole punch, you have to figure out other ways to negate/confirm answers.

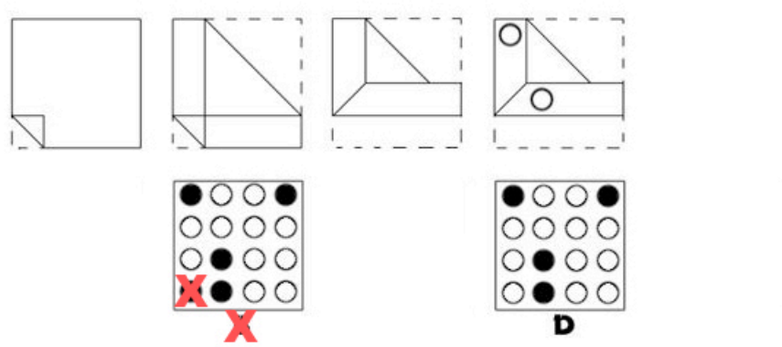


The hole punched at circle location #1 doesn't affect anything but circle location #1 because the paper hasn't been folded in that region (i.e.: it is only one layer of paper thick...the original layer). So, none of the answers can be ruled out based on that circle location #1 punch).

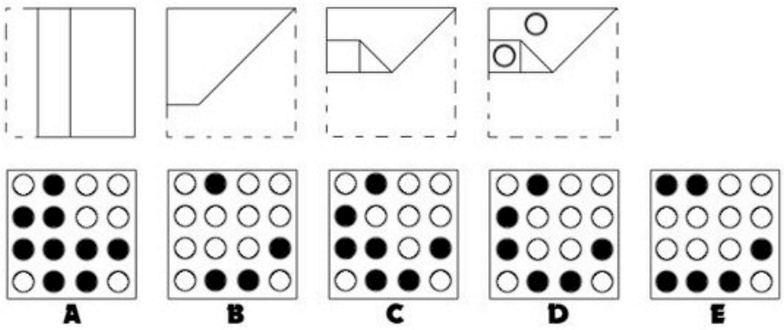
Now, look at the Second-Fold figure, the Third-Fold figure and the hole punches. In the Second-Fold figure, the top right corner is folded diagonally down to the left. In the Third-Fold figure, ROW 4 is folded up on top of ROW 3. So, now (in order from top to bottom), ROW 4 is on top of the folded-down triangle, is on top of ROW 3. So, when the hole is punched at circle location #10, the hole affects 3 different layers and results in holes at circle locations #14 (once ROW 4 is unfolded), #4 (once the folded-down triangle returns to it's original position in the upper righthand corner), and #10 (when the entire paper is unfolded).

Since choices "A", "C" and "E" don't have a #4 hole punched, they are out.



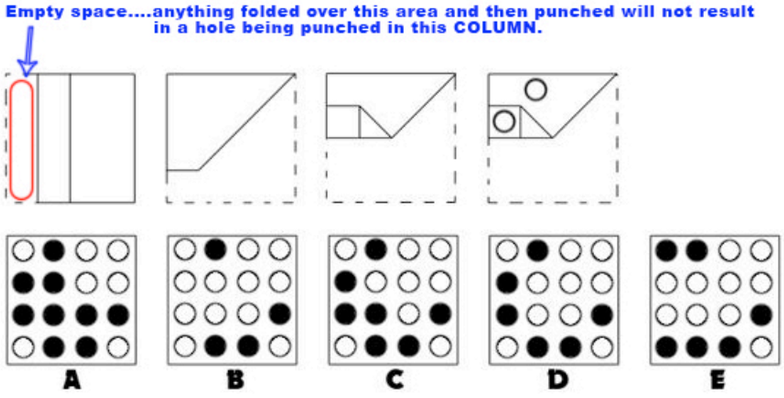


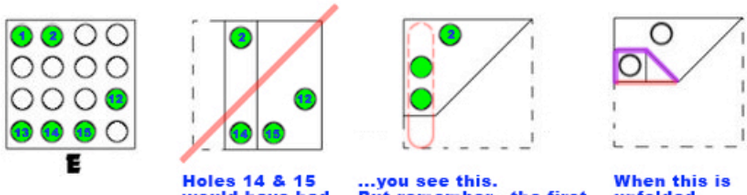
Since the original fold (or first fold) is only the size of one circle, and there isn't a hole punch there, choice "B" can be ruled out.



This one looks a little confusing, but if you keep in mind the "empty space" created when COLUMN 1 is folded over onto COLUMN 2 in the very first fold, with one simple unfolding you can immediately negate 3 of the 5 answers.

Empty space....anything folded over this area and then punched will not result in a hole being punched in this COLUMN.



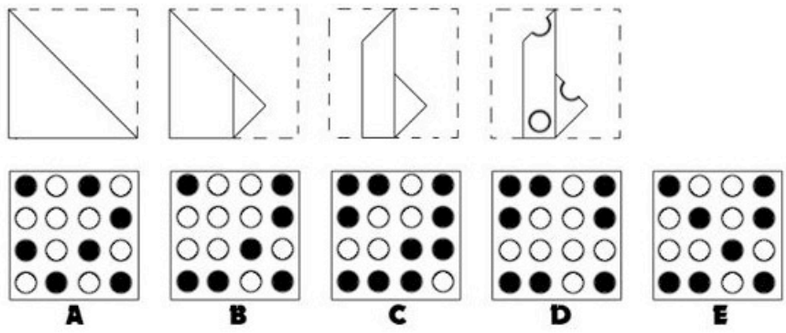


Holes 14 & 15 would have had mirror image holes at locations 5 & 9, but as I said previously, that was empty space when the holes were punched, therefore no holes there.

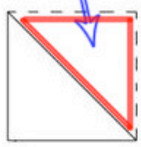
...you see this. But remember...the first column underneath this is empty because of the first fold, so circle locations #5 & #9 (underneath) are not really punched. However, the back-side of circle locations #14 & #15 are, as you see when we unfold this in the next figure to the left.

Since choices "A", "C" & "D" all have holes punched in the #5 & #9 locations, they can be ruled out.

When this is unfolded....

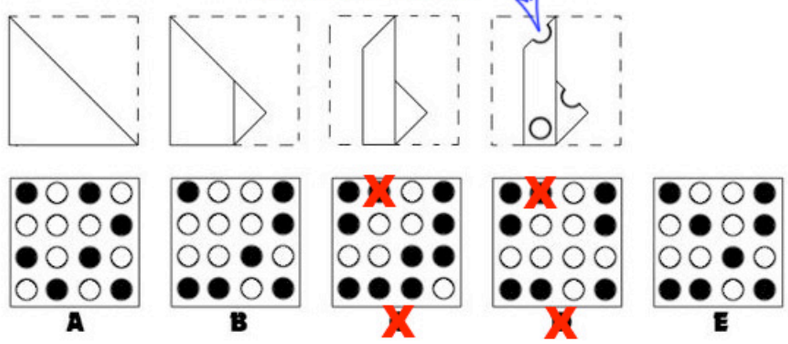


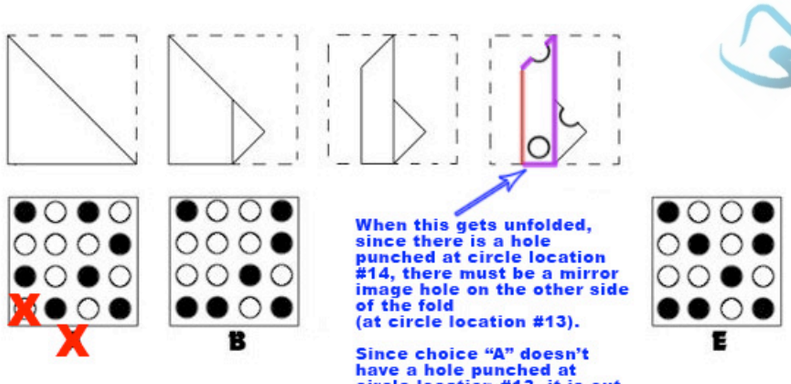
First take notice that the first fold creates all this empty space...



...any holes punched over this blank space will NOT result in holes within this outlined area.

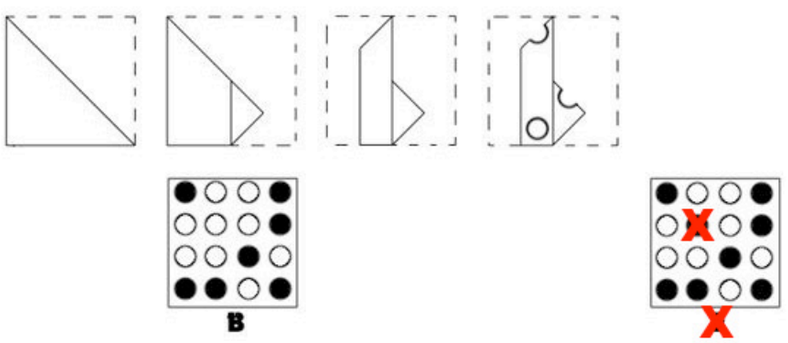
This hole punch was made over circle location #2, right? But we just determined that this is an area of empty space created by the first fold. So, since choices "C" and "D" both have holes punched at circle location #2, we know that they are out.





When this gets unfolded, since there is a hole punched at circle location #14, there must be a mirror image hole on the other side of the fold (at circle location #13).

Since choice "A" doesn't have a hole punched at circle location #13, it is out.



When you look at all of the figure folds, there was never a hole punched at circle location #6, therefore choice "E" is out.