Practical Grids for Dollar Bills

By Wensdy Whitehead

U.S. dollar bill is 6.14 x 2.61” (about 156.0 x 66.3 mm). Simpler ratios provide commonly used practical estimates: 3:7, 5:12 and 8:19. The latter two directly yield practical grids. 7:16 also works for many purposes. 3:7 is a bit off and low-resolution, even once doubled, but distributing the error produces a workable 6x14 grid. These are not as straight forward as squares divided into powers of two, yet powers of two are bound to get involved in generating them. For those who would rather not re-invent the wheel, here are some methods of producing various grids of squares aligned to the edges of a U.S. dollar bill.

8/19 = 0.421052631578947368421052631578 95
5/12 = 0.41666666666666666666666666666667
7/16 = 0.4375
3/7 = 6/14 = 0.428571428571428571428571428571 43

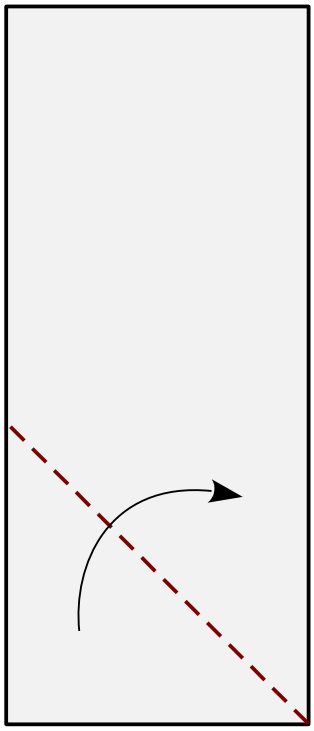
12/29 = 0.413793103448275862068965517241 38
14/33 = 0.42424242424242424242424242424242

2.61/6.14 = 0.425081433224755700325732899022 8

8x19 – An Intuitive Approach

This method measures off two squares – a 1:2 rectangle – for an 8:16 grid whose sixteenths are copied for the remaining length of the bill. This is a fairly intuitive and easy to understand method, but small inaccuracies often result in an undersized final division. This method can be used with extreme precision on a real bill, but the next section presents a more accurate folding order for a real bill. This method is useful to measure off practice paper from longer rectangles.

1.



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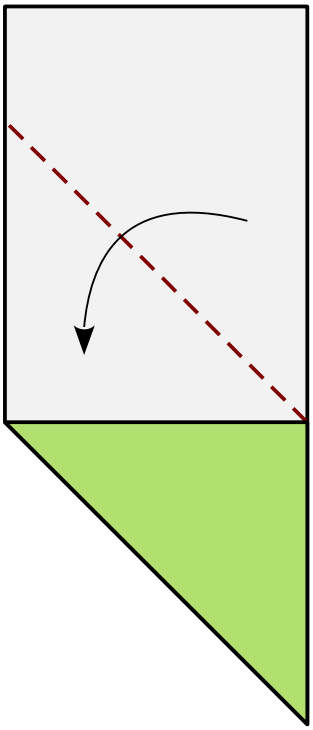

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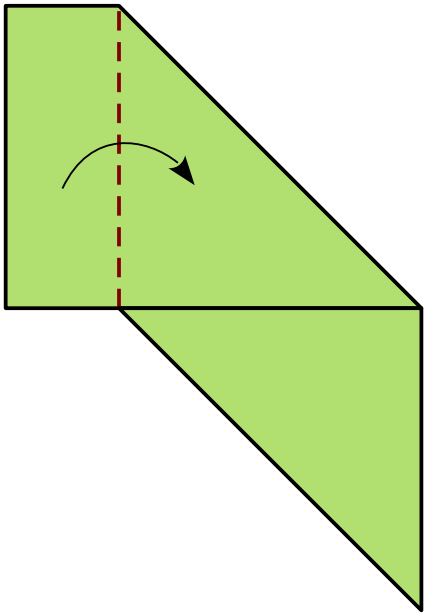

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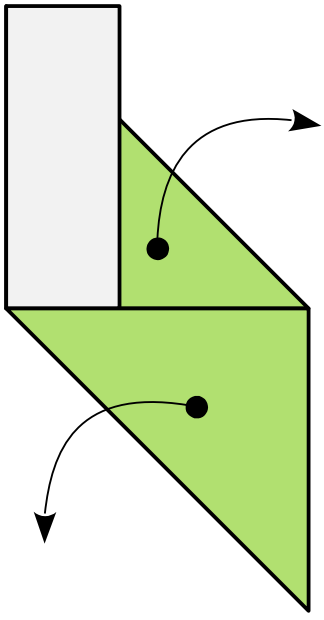
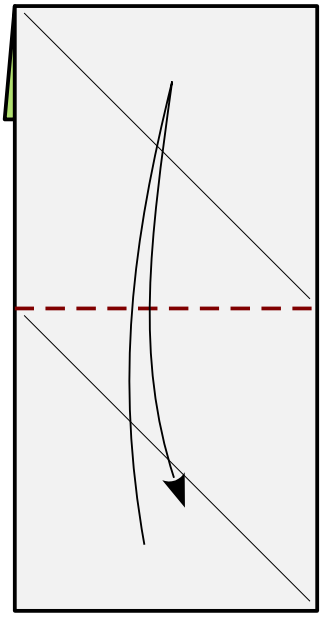


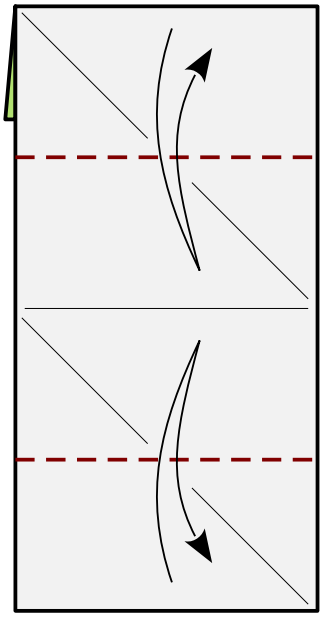
Unfold the diagonals (the folds from steps 1 and 2 but not step 3).

5.



The 1:2 has been measured off and is easier to deal with for a while.

6.



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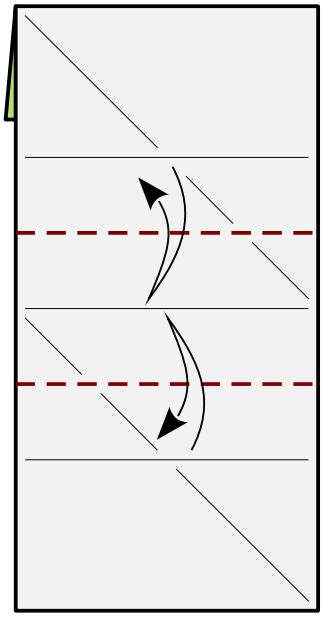
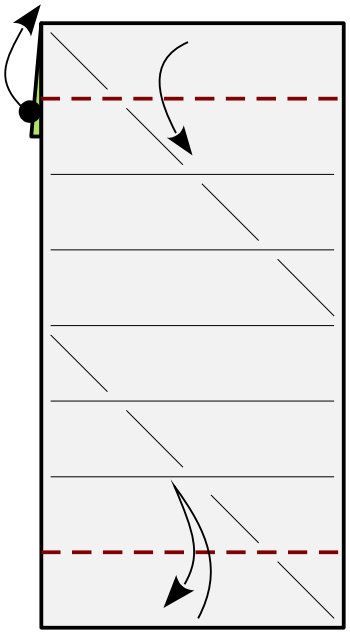


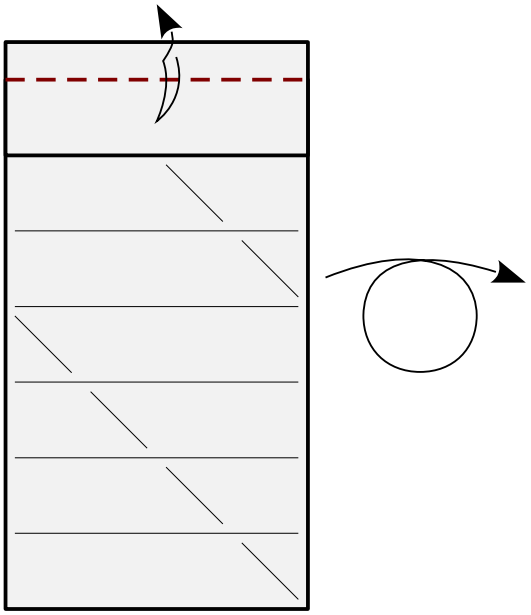
Fold each end to the furthest horizontal crease.

8.



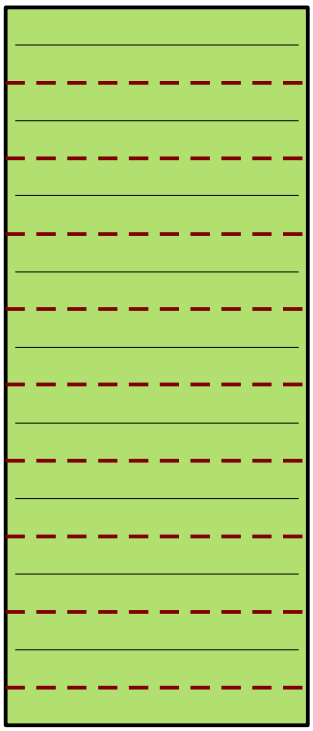
Flip fold at the top. (Allow the flap at the top to flip around forward as you fold one layer of paper.) Do not unfold. At the bottom, fold and unfold.

9.



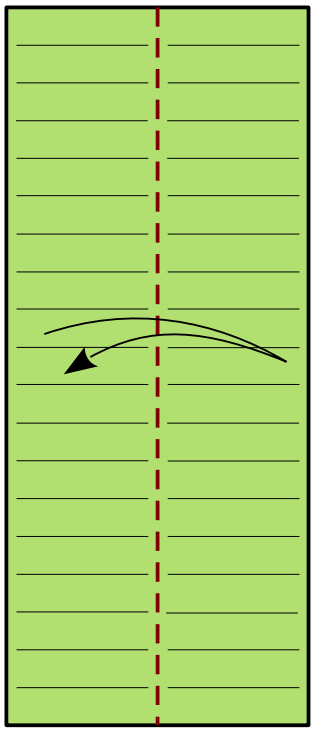
Fold even with the edge behind. Unfold completely.

10.



Pre-crease. Fold and unfold to divide each of the larger rectangles in half. Fan-folding works well here.

11.



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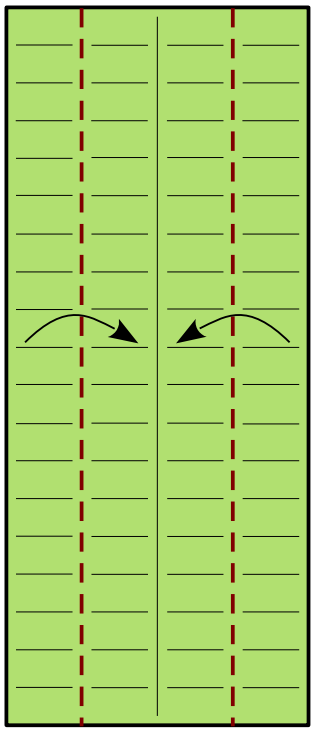
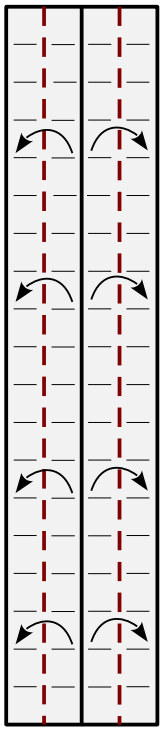
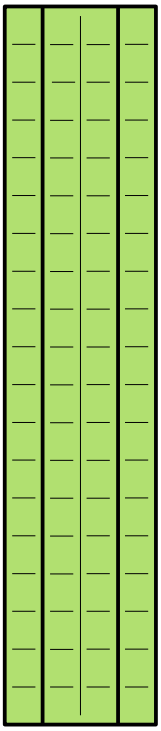
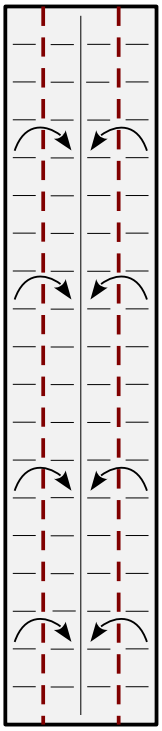


Cupboard fold.

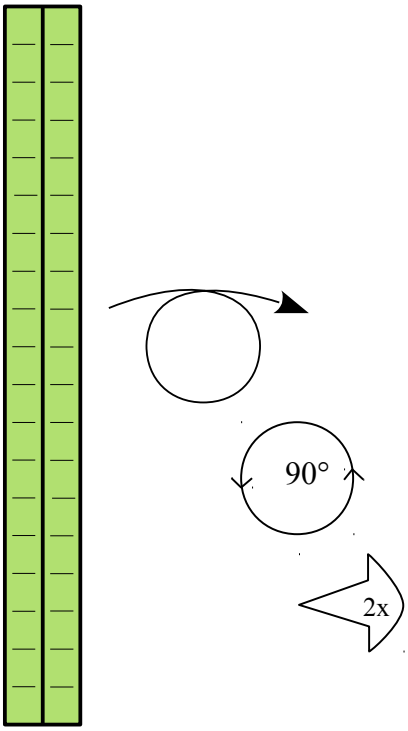
13. 

Valley fold the long raw edges lying in the center to the long folded edges.

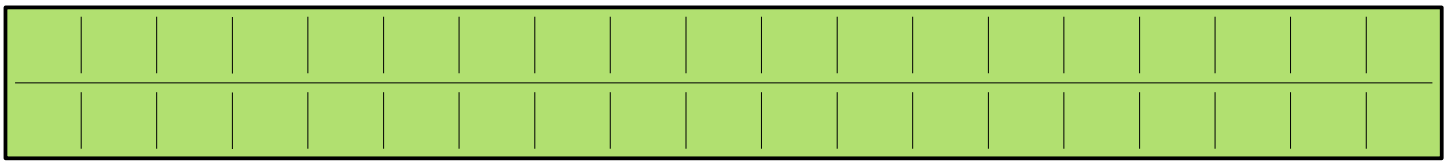
14. 

15. 

Cupboard fold.

16. 

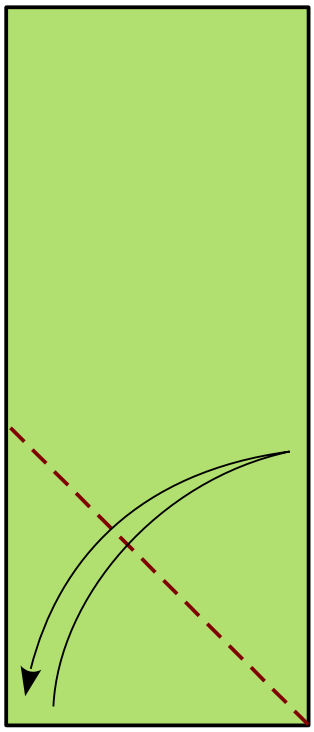
17. Pre-crease.



8x19 – Greater Accuracy

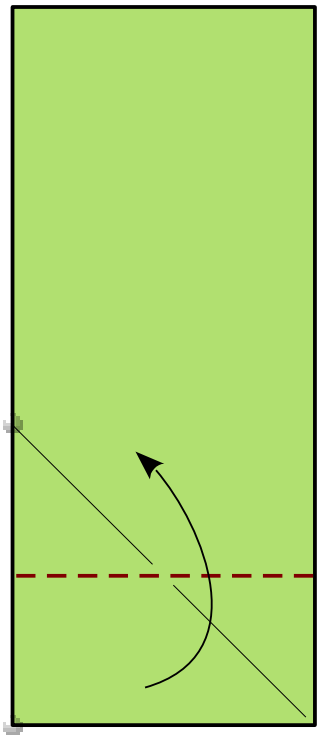
The previous, more intuitive method accumulated tiny inaccuracies until they became very evident in the 19th division. This second method inverts the previous one. It starts by generating four of the 19th divisions. Three are needed, not four, but the fourth was a practical necessity. Once three are known, the remaining length can be treated as a 1:2 rectangle and divided into sixteenths. Any inaccuracy in dividing the length into a 1:2 rectangle and the rest now is in the 1:2 rectangle and will be divided among the sixteenths and should be so imperceptible that the fact that one of those sixteenths was folded with the other end will not matter.

1.



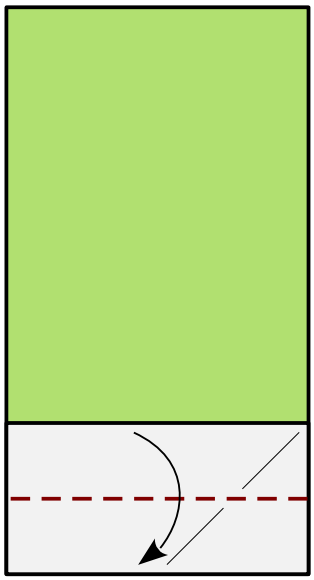
A pinch would suffice, but a complete diagonal is harmless and usually more accurate.

2.



Folding to the pinch creates the 4/19ths line -- or the 15/19ths counting from the other end.

3.



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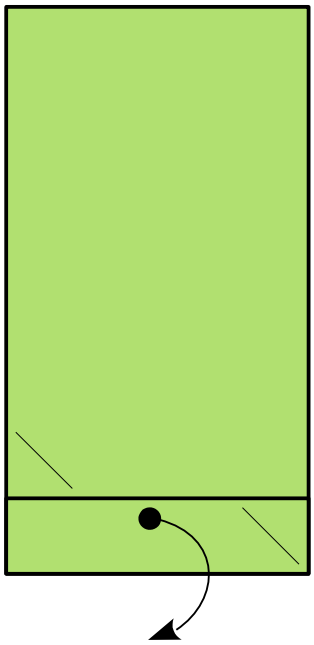
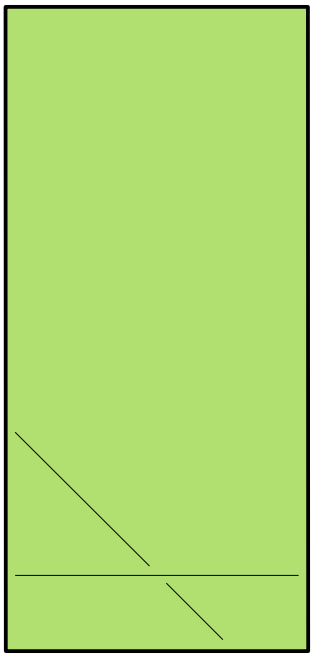


Unfold the first horizontal crease (step 2) but not the second (step 3).

5.



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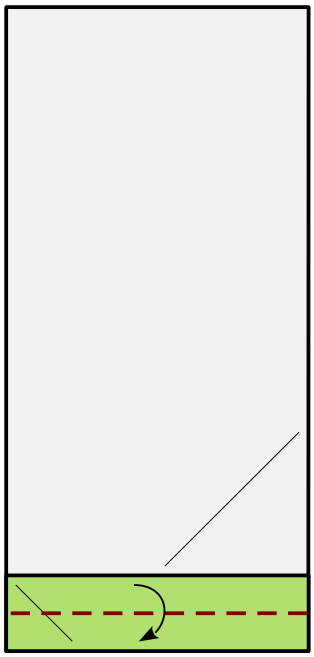

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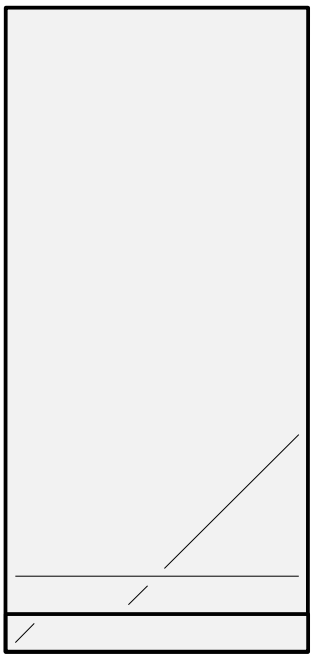

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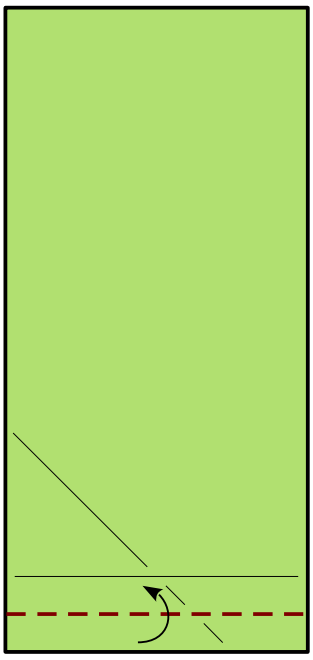

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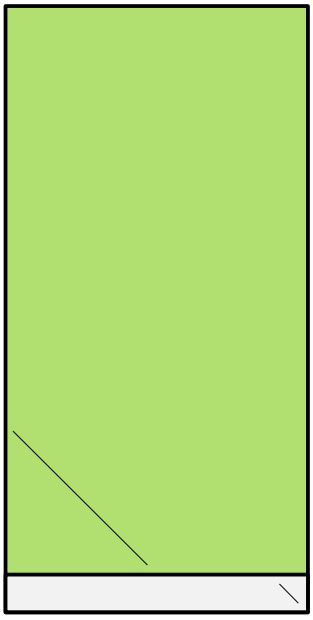

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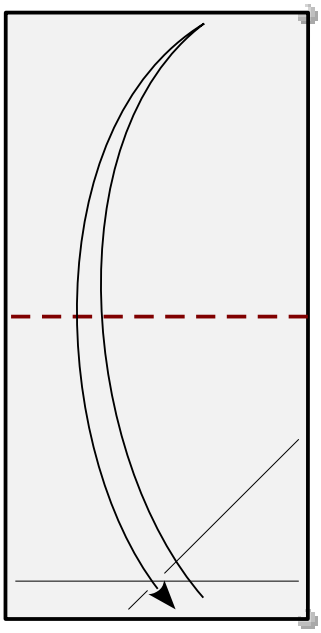

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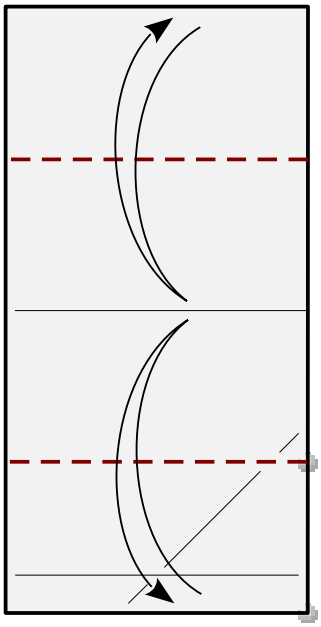

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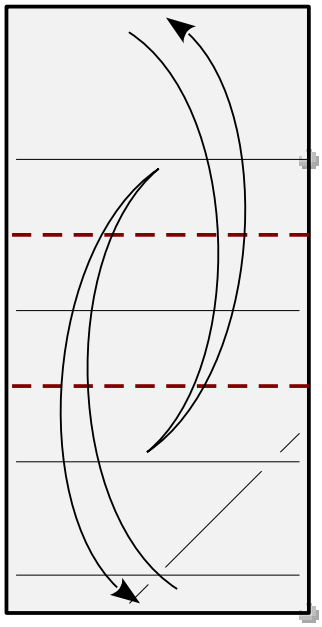

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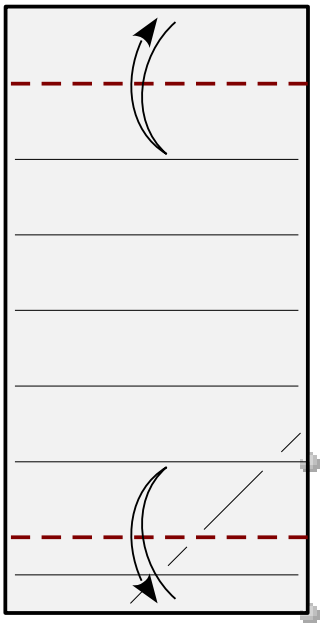
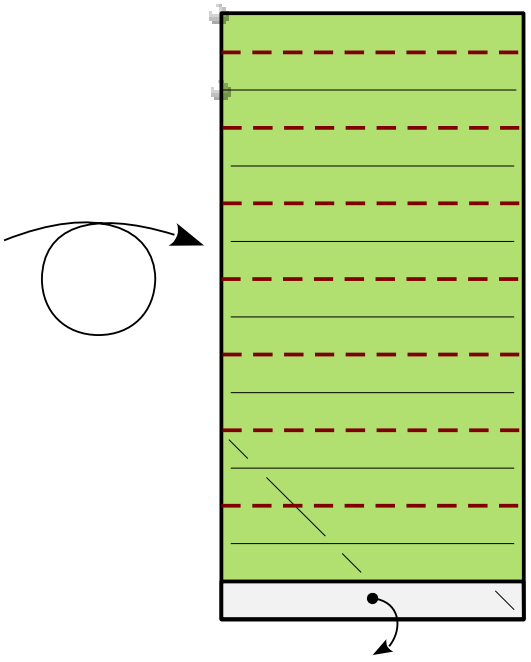


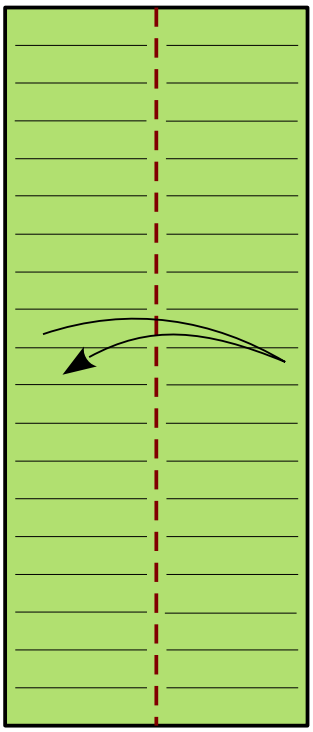
The visible rectangle is 1:2, with the first three (3) 19ths folded behind.

14.



For the remaining divisions, it is best to fan-fold. Unfold completely.

15.

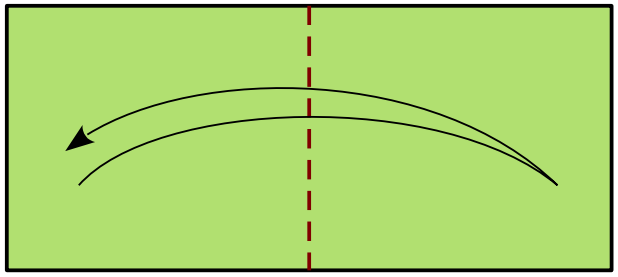


Continue from step 11 of the intuitive 8x19 grid.

7x16

With real bills, usually the fold-to landmark will work, spreading the tiny bit of error out over multiple pleats such that it becomes negligible. If fold-to and fold-through landmarks disagree more significantly (as it will for most play dollar bills) or a slightly narrower division on one side is desired, use the fold-through landmarks. An unneeded division can then be tucked under to avoid the color-change from an odd number of divisions. This 7x16 grid can be handy for adaptation from 1:2 designs with an 8x16 grid if the width wasn't used efficiently (which many letters don't).

1.



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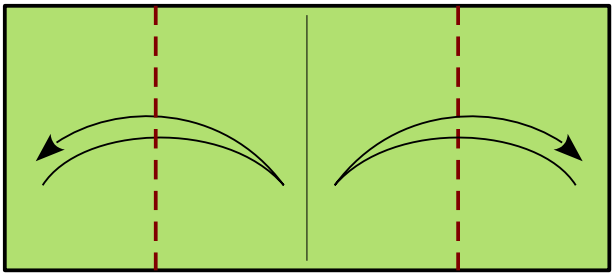

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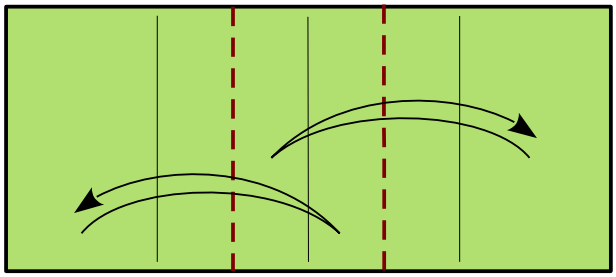

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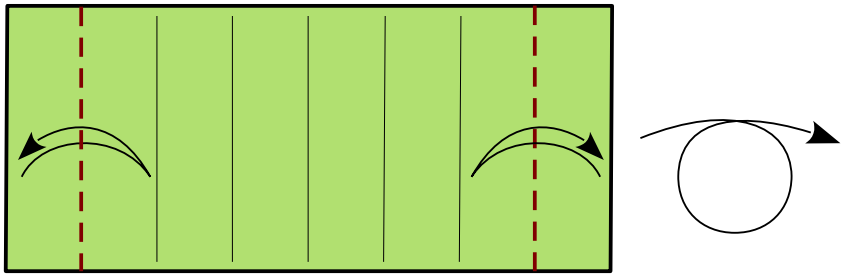

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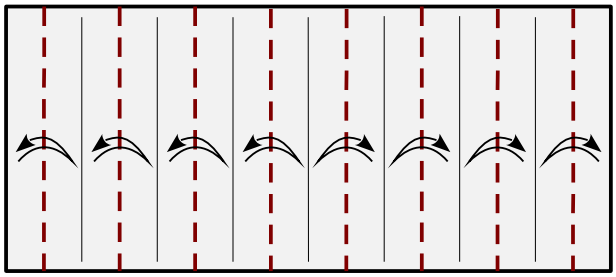

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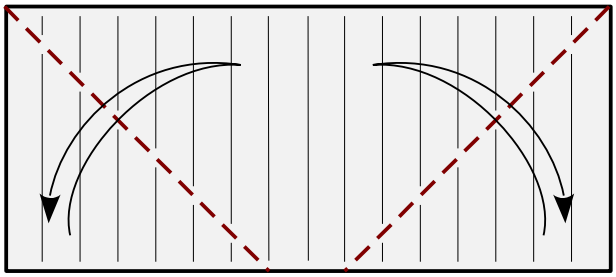

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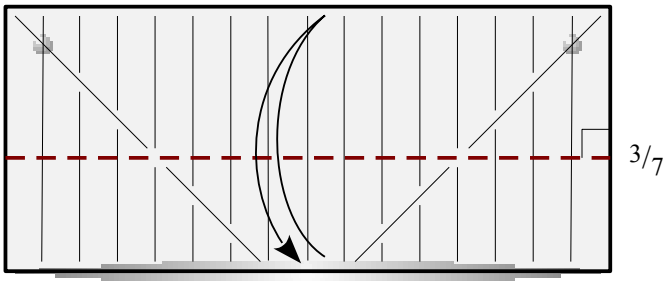

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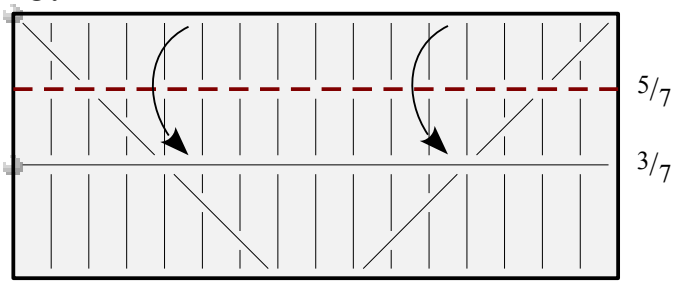

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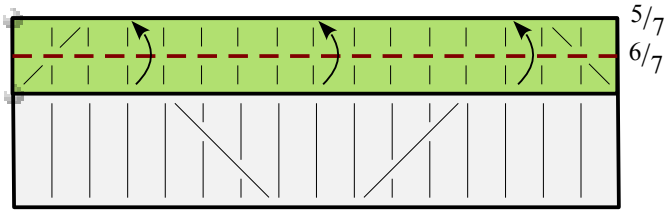

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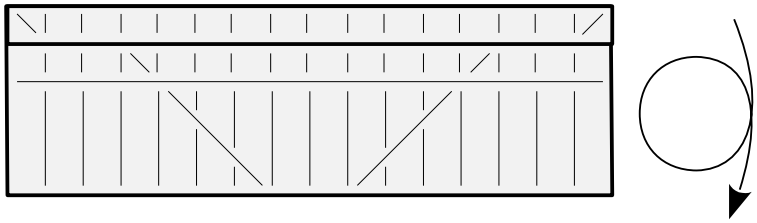

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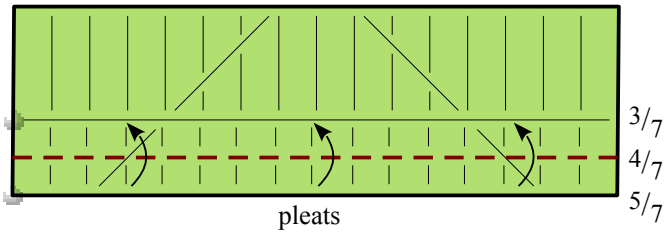
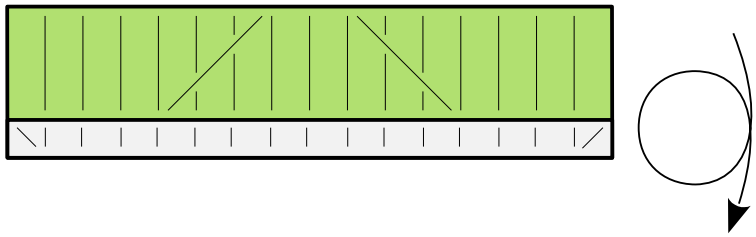


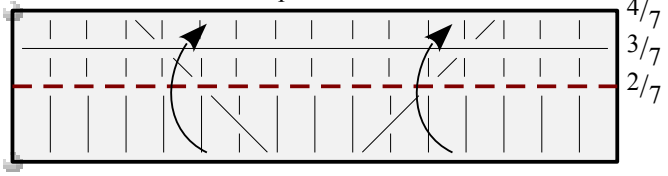
pleats

12.



13.

pleats



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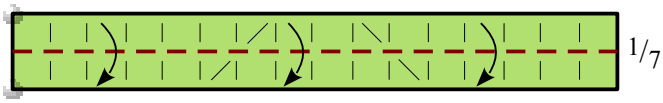

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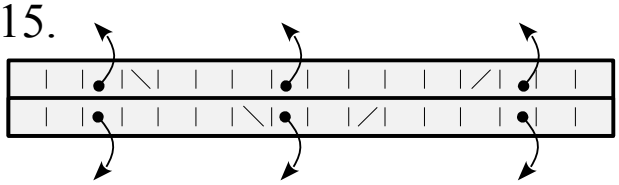
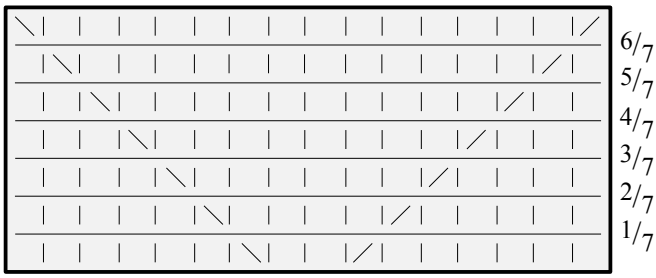


Unfold completely.

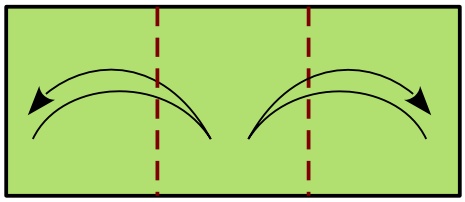
16.



10x24 and 5x12

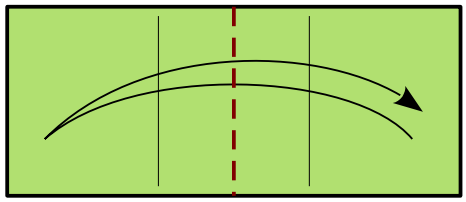
5x12 would be quite low-resolution. 10x24 is more generally useful. However, if 5x12 is needed the same gridding method can be stopped short a level.

1.



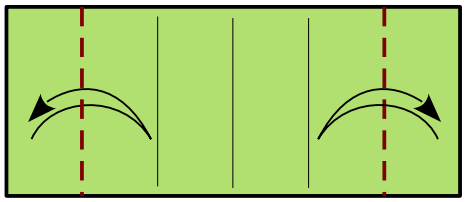
Start with thirds using your favorite method such as the 'S' method. Mountain/valley isn't terribly important here. If gridding many bills, a jig speeds this along.

2.



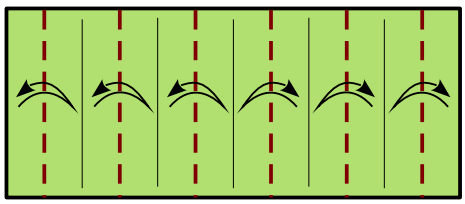
Half. Notice that the 3/6==1/2.

3.



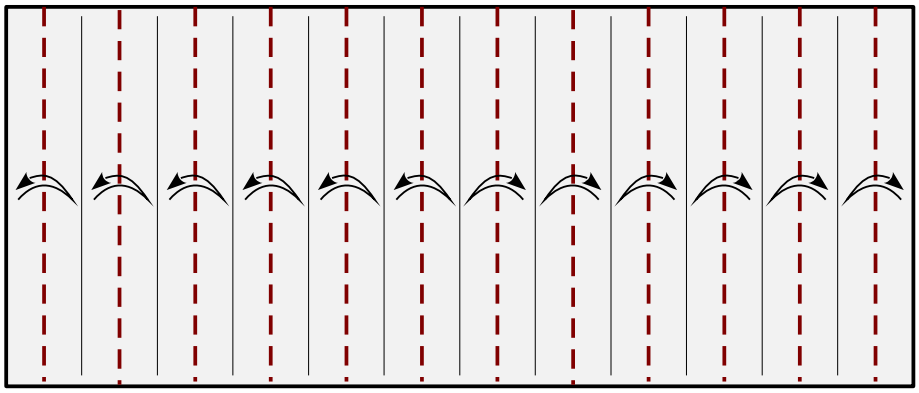
1/6 and 5/6..

4.



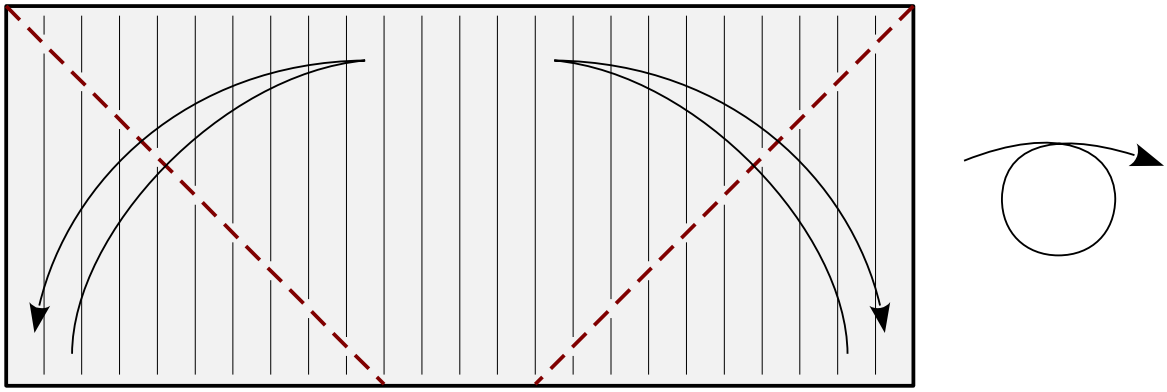
Twelfths.

5.

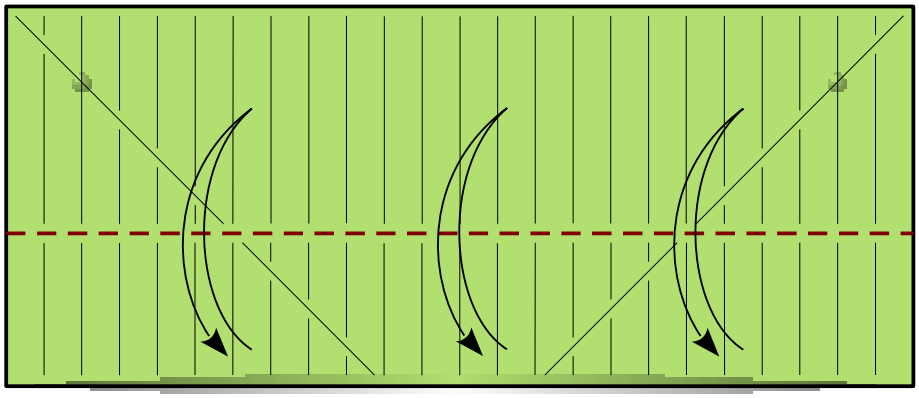


Twenty-fourths.

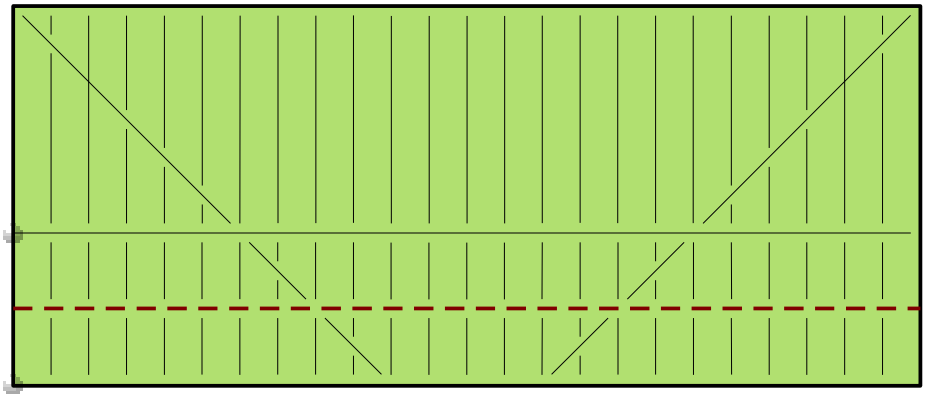
6.



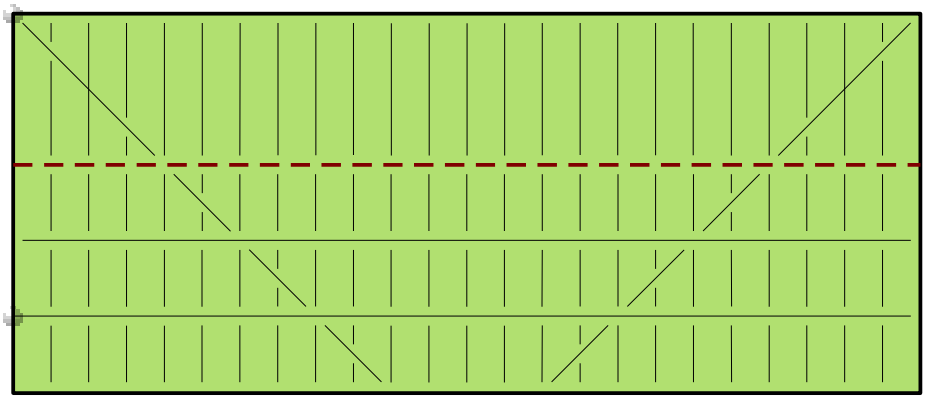
7.



8.



9.



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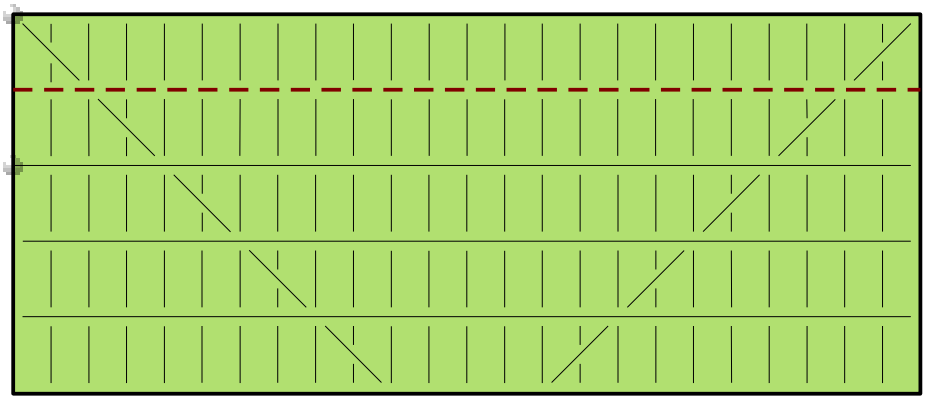
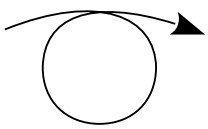
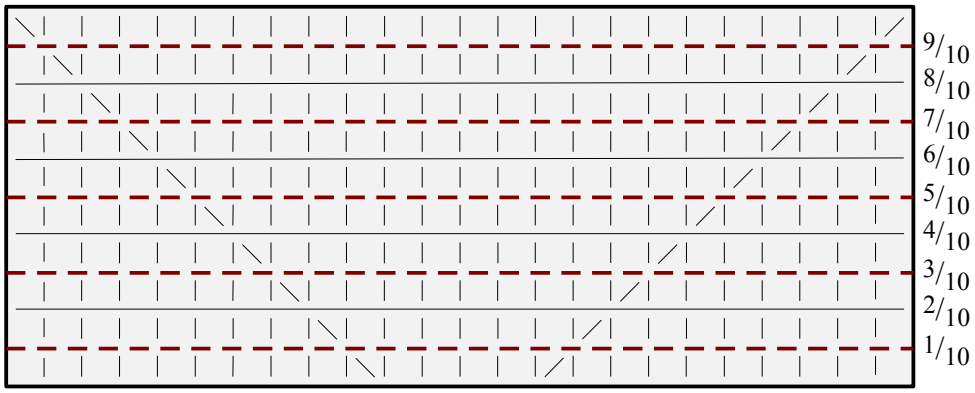
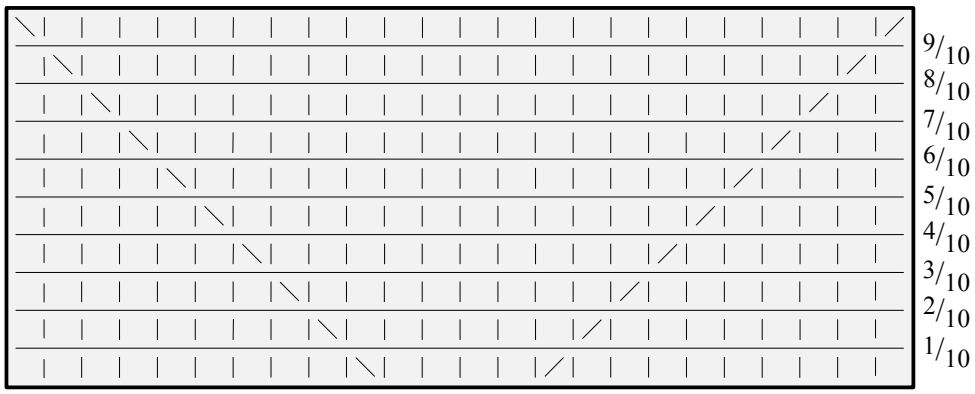




11.


9/10
8/10
7/10
6/10
5/10
4/10
3/10
2/10
1/10

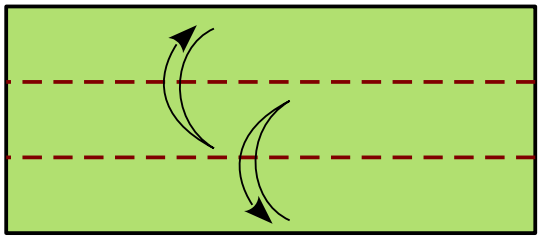
12.


9/10
8/10
7/10
6/10
5/10
4/10
3/10
2/10
1/10

6x14

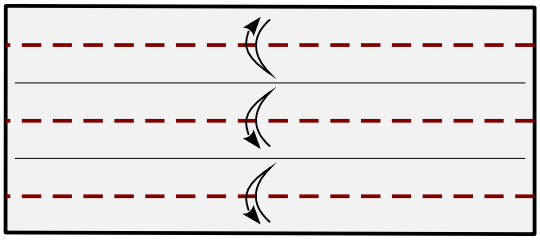
This uses the 3:7 estimate which is a bit off, but with this folding method the extra half grid square or so of length will be distributed among the fourteen divisions rendering it negligible. Alternatively, grid accurately from each end and put an extra space between letters or other elements where it will be useful. Subdivide for 12x28 or use another folding method for a more accurate 12x29.

1.



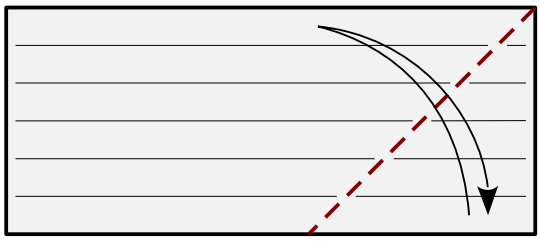
Start with thirds using your favorite method such as the 'S' method. Reverse a crease afterward as needed because usually two valleys will be more convenient here than a mountain and a valley. If gridding many bills, a jig speeds this along.

2.

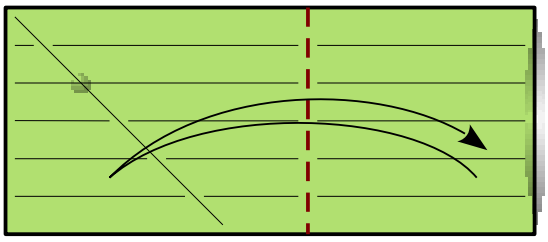


Sixths.

3.

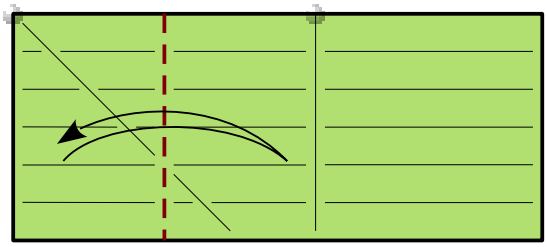


4.



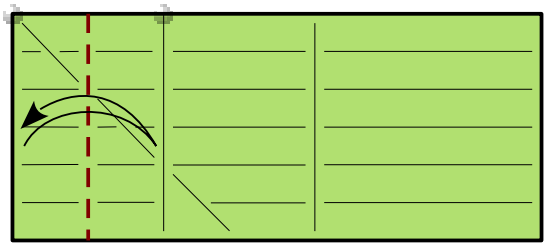
$^{8}/_{14}$

5.



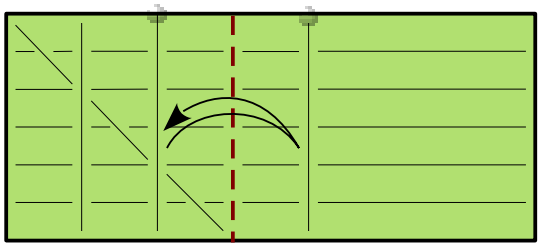
$^{4}/_{14}$ $^{8}/_{14}$

6.



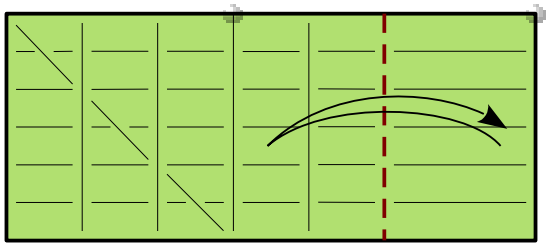
$^{2}/_{14}$ $^{4}/_{14}$ $^{8}/_{14}$

7.



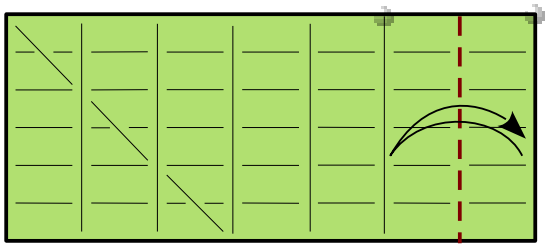
$^{2}/_{14}$ $^{4}/_{14}$ $^{6}/_{14}$ $^{8}/_{14}$

8.



$^{2}/_{14}$ $^{4}/_{14}$ $^{6}/_{14}$ $^{8}/_{14}$ $^{10}/_{14}$

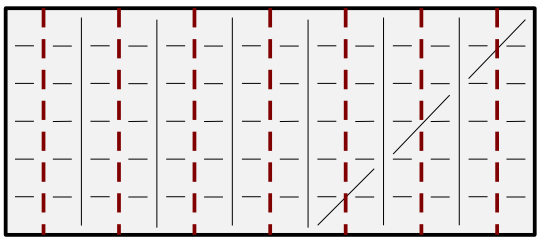
9.



$\frac{2}{14}$ $\frac{4}{14}$ $\frac{6}{14}$ $\frac{8}{14}$ $\frac{10}{14}$ $\frac{12}{14}$

10.

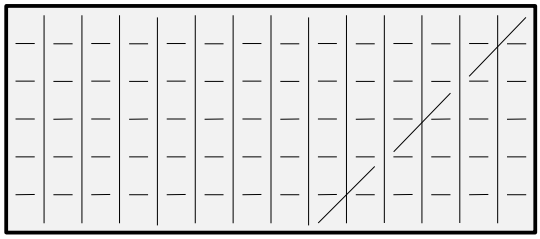
$\frac{1}{14}$ $\frac{3}{14}$ $\frac{5}{14}$ $\frac{7}{14}$ $\frac{9}{14}$ $\frac{11}{14}$ $\frac{13}{14}$



$\frac{2}{14}$ $\frac{4}{14}$ $\frac{6}{14}$ $\frac{8}{14}$ $\frac{10}{14}$ $\frac{12}{14}$

11.

$\frac{1}{14}$ $\frac{3}{14}$ $\frac{5}{14}$ $\frac{7}{14}$ $\frac{9}{14}$ $\frac{11}{14}$ $\frac{13}{14}$



$\frac{2}{14}$ $\frac{4}{14}$ $\frac{6}{14}$ $\frac{8}{14}$ $\frac{10}{14}$ $\frac{12}{14}$