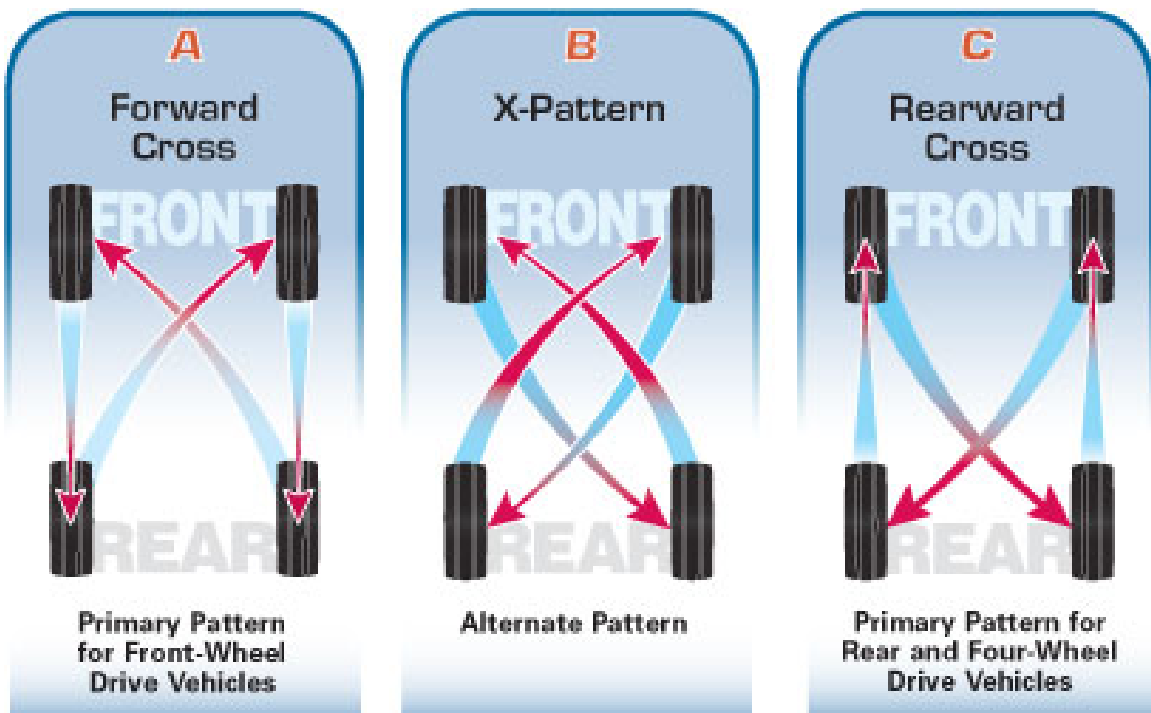


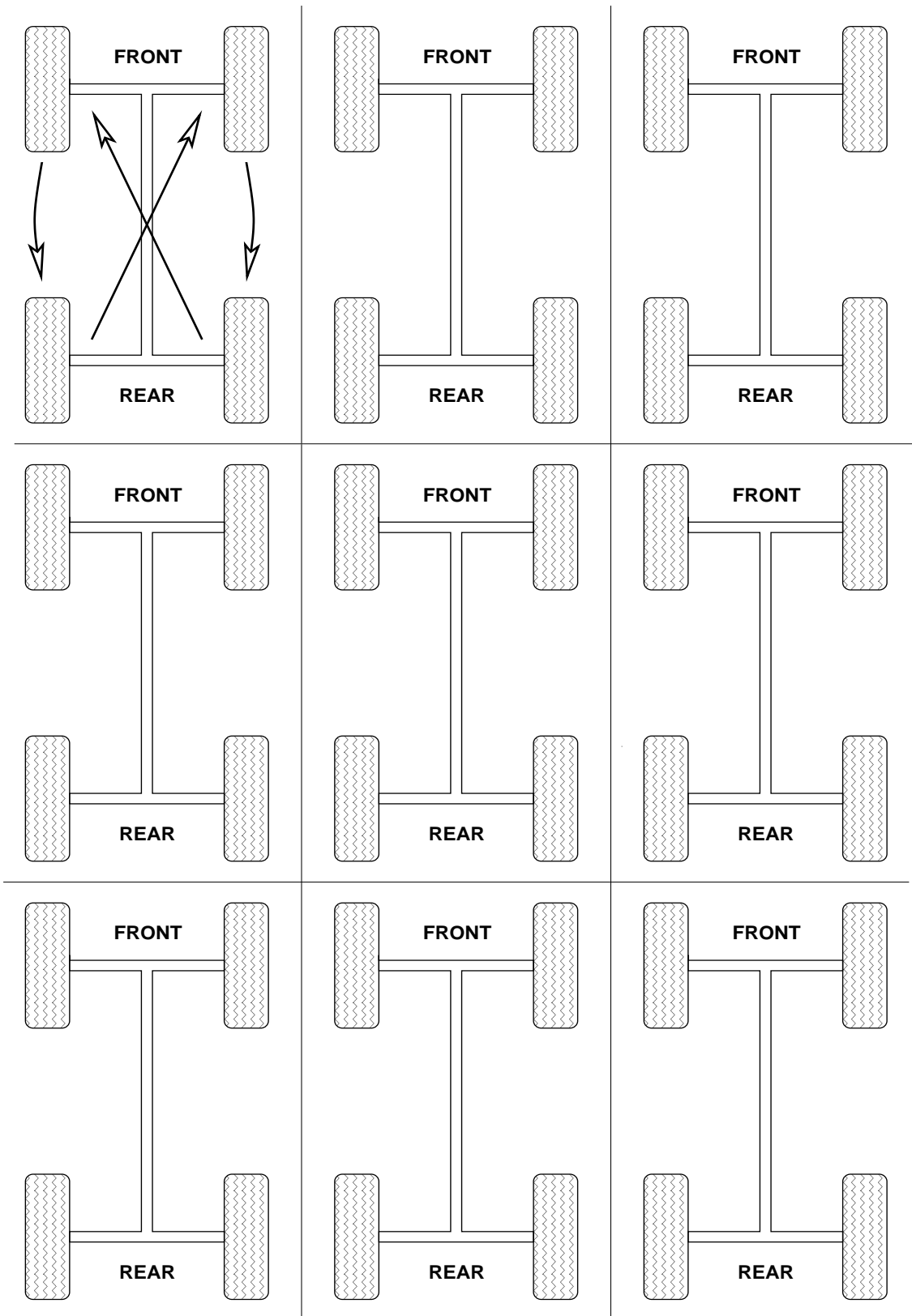
Name: _____

¶ 1. **Tire Rotation.** Even if you don't own a car, you probably know that tire manufactures recommend rotating your car tires every certain number of miles, with the purpose that they wear evenly. Actually, tire rotation must be performed so that every tire visits all four possible position in the car, and that front tires and back tires are never mixed after their original installation.

If you do a quick Internet search for "car tire rotation," you find quite a few diagrams illustrating a tire-rotation procedure, like this one:



Look at the diagram A on the left, for example. It gives you a single procedure, and we would like to know what happens when we repeat this move over and over on our car tires. Does each tire visit each of the four possible positions (front-right, front-left, rear-right, rear-left)?



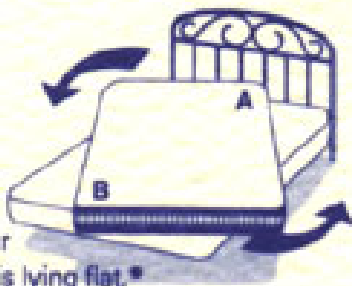
Name: _____

¶ 2. **Mattress Rotation.**


Car tires are not the only thing that we rotate around the house. Mattress manufacturers recommend that you rotate your mattress on a regular basis (about once a month) to prolong its life. Again, an Internet search for “mattress rotation” results in a multitude of sites with directions and illustrations. Here is a typical example:

It's easy to turn your mattress properly!
Turn it over and end -to- end.

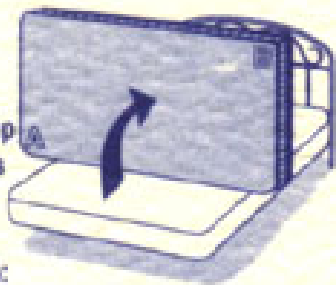
1. Push at opposite corners A and B while your mattress is lying flat.*




2. Position mattress across bed so it hangs over a foot or more.




3. Raise mattress up on edge as indicated in this illustration:




4. Let mattress fall gently towards head of bed as shown here:



5. Push alternately on corners A and B to position mattress on bed.

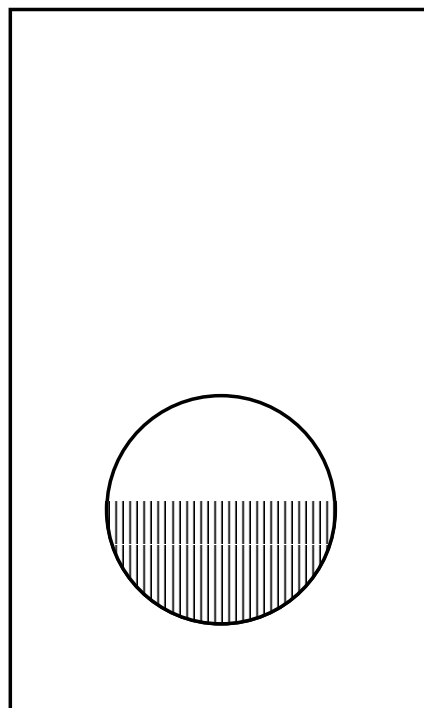
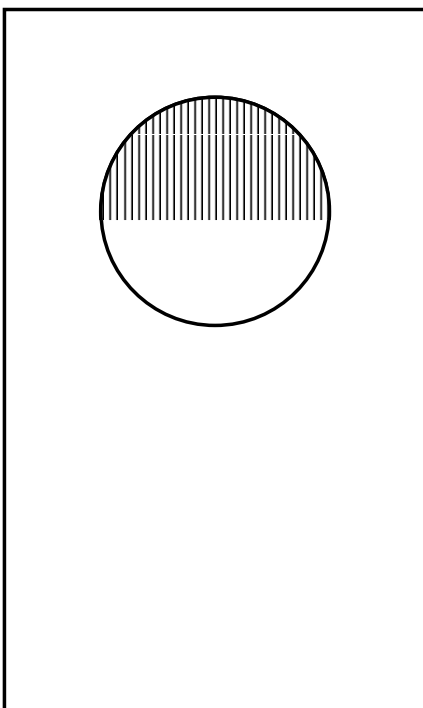
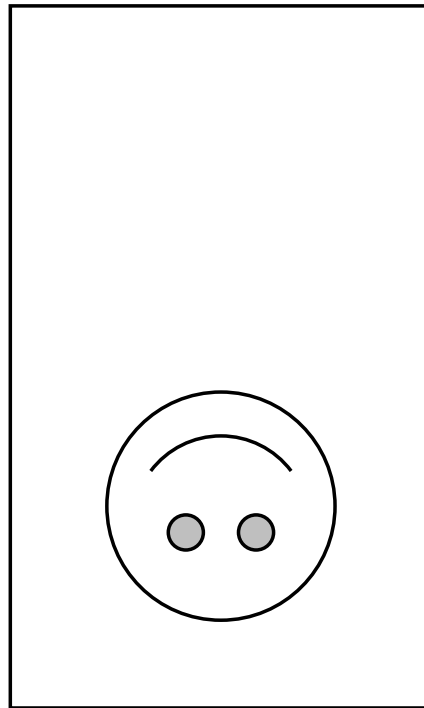
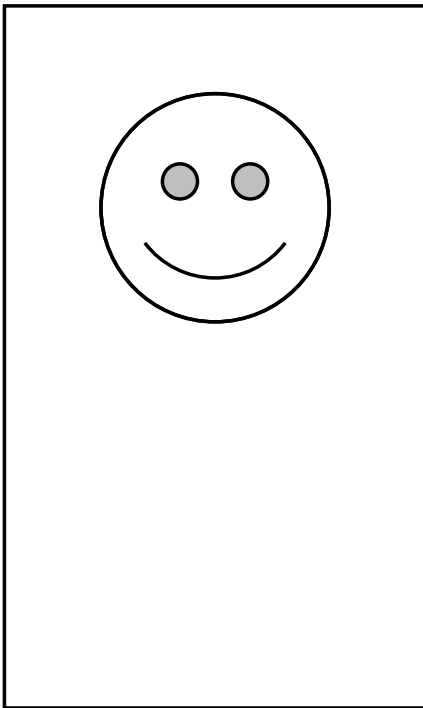


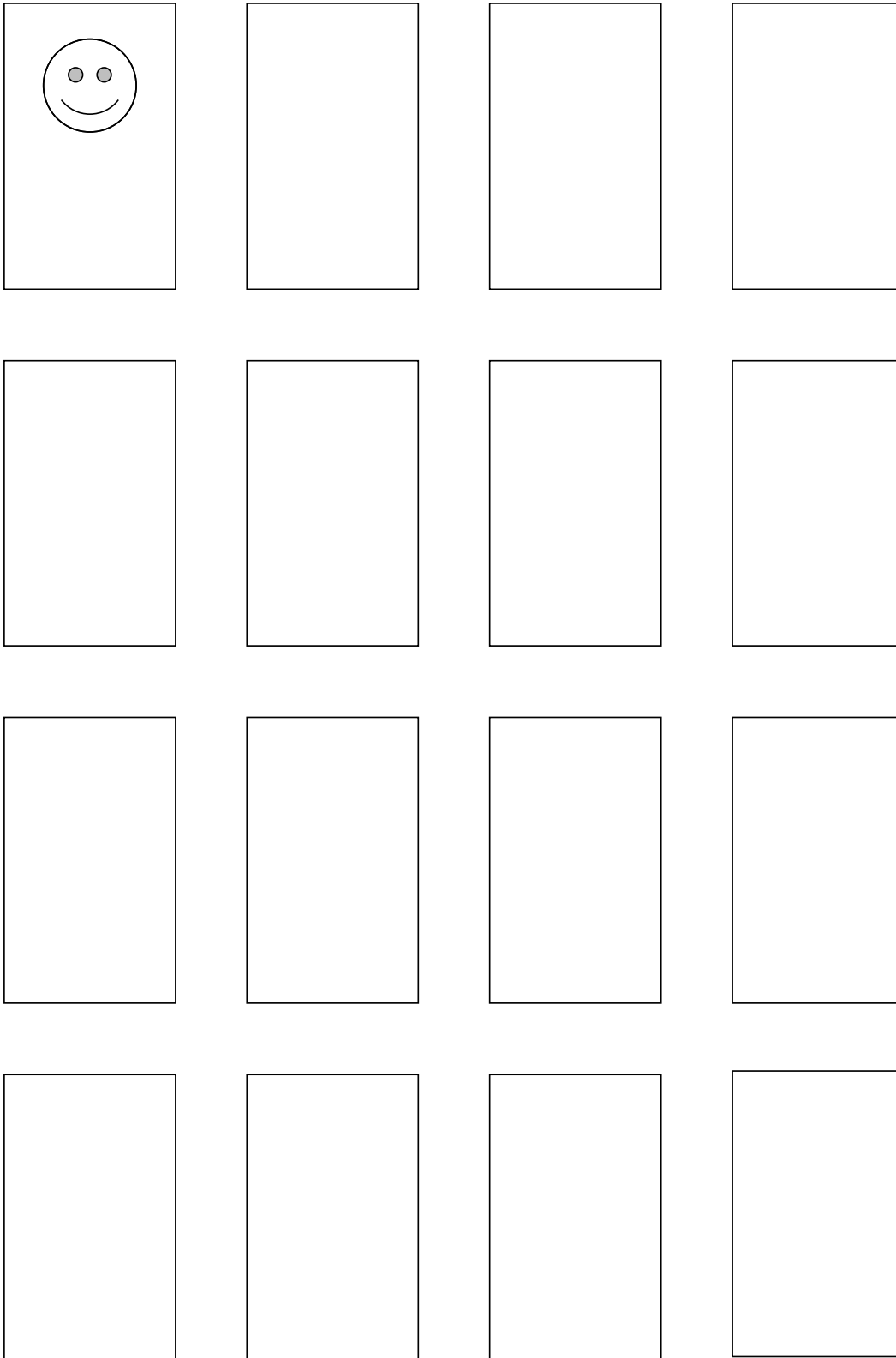
**AND THERE YOU ARE...
Turned Over and End to End as well!**



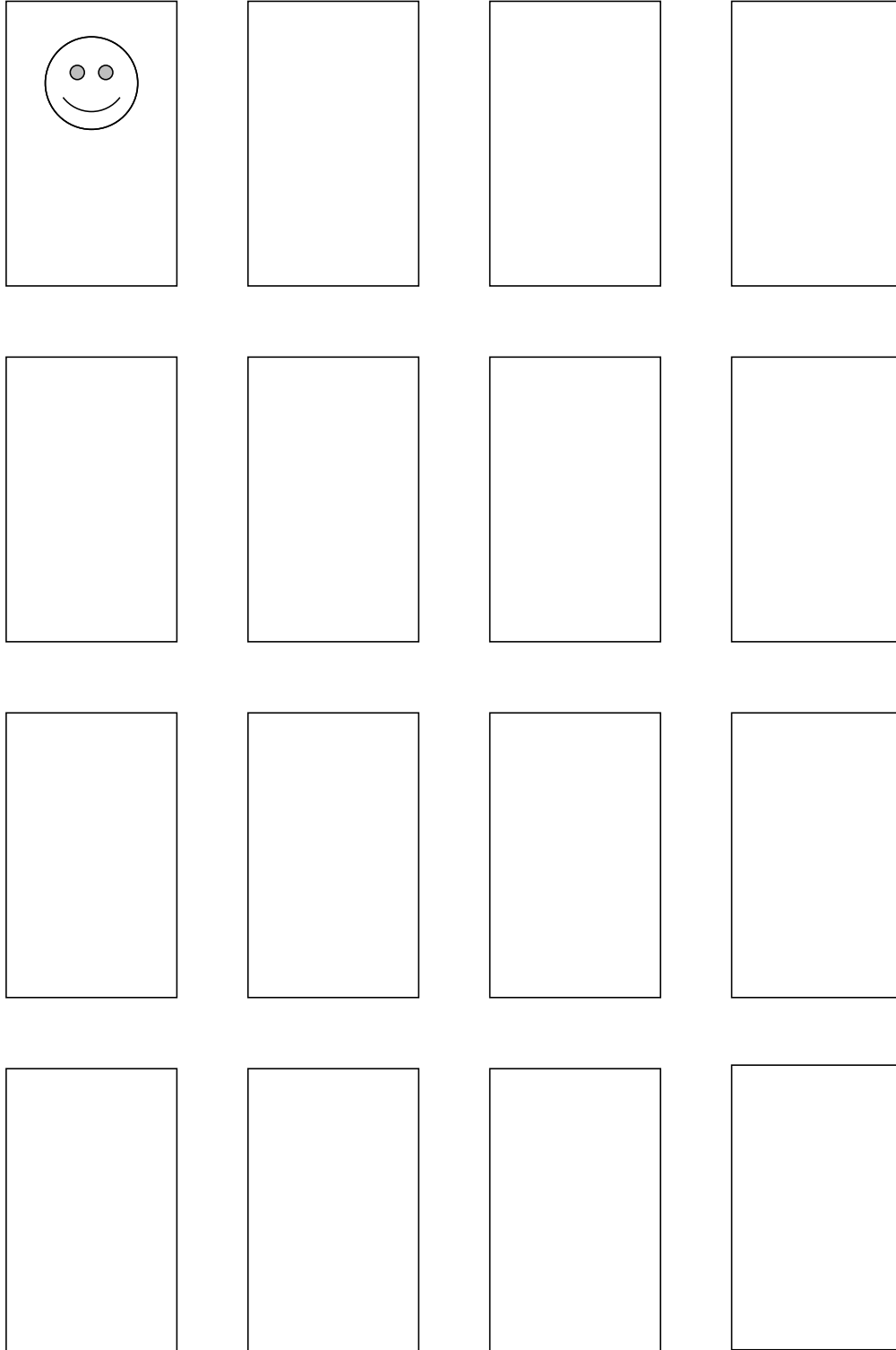
TURNING A MATTRESS IS A JOB FOR TWO PEOPLE
Don't risk damage to the mattress or personal injury by doing it yourself.

Does this move accomplish its claimed purpose? That is, if we repeat the operation in the illustration, will our mattress rotate through all four possible positions illustrated in the following sketch?





¶ 3. Do you think there is a golden rule for rotating your mattress like in the case of car tires? Try!



Name: _____

¶ 4. To fully understand the problem of finding the “magic flip” for a mattress, we have to do some abstract work. There are four basic flips for a mattress:

- (a) a roll (R): flipping it over, perpendicular to the boards,
- (b) a yawn (Y): rotating it 180 degrees so that head and toes switch positions
- (c) a pitch (P): flipping along the middle of the frame, parallel to the boards.
- (d) do nothing (I), the identity.

Any of these motions restore the mattress to position in which it is well aligned with the bed frame. Now we construct a table which shows the effect of combining any two of these basic moves.

		Second Move			
		I	P	R	Y
First Move	I				
	P				
	R				
	Y				

Literature

- [1] Brian Hayes, *Group Theory in the Bedroom*, Hill and Wang, New York, 2008.