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12 October 2015

Problem Set 2

4b.

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| Students = 37 |  | 20-4-6-5 = 5 |
| Cars = 20 |  | 12-4-2-6 = 0 |
| Bike = 12 |  | 16-4-2-5= 5 |
| Bus = 16 |  | 10+4+2+6+5 = 27 |

37-27 = 10

5. 3 has 1, 4 has 1, 5 has 2, 6 has 1, 7 has 3, 8 has 2.

Interval that is coprime to our n.

If we divide all of these numbers by 2 we get the answer we are looking for. We divide by 2 since taking the path from front to back or back to front results in the same shape.

In order to create the shapes, we have to pick intervals that allow us to create shapes under the guidelines provided. In order to do this, we must visualize the shapes as points that we need to connect, and if we overshoot then we treat the number line as a closed system and continue again from 1 (so if we are drawing an 8 sided shape) we can start at point 1, then draw a line to point 2, 3, etc. until we close our shape. Or we can take the exact opposite approach and link our point 8 to point 7 by adding 7 to 8 (this is where the closed system kicks in, so we count 1 after 8 and then continue until we reach 7, then we add 7 and count until we reach 6, essentially creating a shape exactly the same as if we used an interval of 1 but created in the opposite direction if we were to draw it on paper). This takes care of drawing straight edge shapes, but we have to consider star like shapes that begin to happen once we hit more than 5 sides. To showcase this, we look at a shape with 5 sides and we see that an interval of 2 or 4 allow us to create a shape that conforms to the guidelines. Looking at this pattern we can see that by looking for intervals that are coprime to our n we can obtain the number of ways we can create different shapes with n edges given our guidelines. Since every shape can be created twice (since they are mirror images of each other) we divide this by 2 to obtain.

Therefore our formula is: