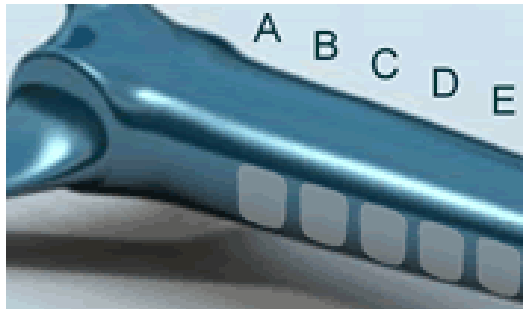# India 500

The India 500 is the most prestigious space race of them all. The spacegirls and spaceboys jump-jet in Madras, India at 12:00 midnight January 1st each year, vector through the stratosphere, and end on January 31st somewhere far far away. (Girls and boys are used rather than adults because they are lighter.)

Spacegirl Shannon has designed a revolutionary new probability drive that needs careful tuning. Basically, the tuning mechanism requires Shannon feeding a scoop of fertilizer into one of 5 different compartments in the hull.

Each day in the race one compartment is triggered:

- Compartment A is triggered on 16 days in the month.
- Compartment B is triggered on 8 days in the month.
- Compartment C is triggered on 4 days in the month.
- Compartment D is triggered on 2 days in the month.
- Compartment E is triggered on 1 day in the month.

When compartment E is triggered, a scoop of fertilizer materializes in compartment D. Amazingly, this doesn't deplete the fertilizer in compartment E! The same happens with the triggering of compartments B (adds fertilizer to compartment A), C (adds to B), and D (adds to C).

For example, one day compartment C is triggered when the compartments hold the following number of scoops:

A   B   C   D   E

3   4   1   0   0

By the end of the day, one more scoop will appear in compartment B:

A   B   C   D   E

3   5   1   0   0

If the next day triggers compartment E, then nothing will happen:

A   B   C   D   E

3   5   1   0   0

If the next day triggers compartment B, then by the end of the day:

A   B   C   D   E

8   5   1   0   0

Whenever compartment A is triggered, Shannon's spaceship does a probability jump of a million kilometers for each scoop in compartment A.

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Remember, to tune her spaceship, Spacegirl Shannon adds one scoop of fertilizer to one of the compartments. What is the best way for Shannon to tune her spaceship? (Define best)

To test your tuning, write the letter A on 16 cards; B on 8 cards, C on 4 cards, D on 2 cards and E on 1 card. Shuffle them. Draw the cards one at a time... updating the number of scoops in each compartment.

Extensions:

Maybe Spacegirl Shannon can try competing with Spaceboy Bob (who stole the design for her spaceship, but after spying on Shannon, chooses to tune his ship differently from hers).

What is the greatest distance that Shannon could travel? How should she tune her ship to do this? What is her probability of achieving this maximum distance?

What happens if Spaceboy Bob secretly plants a scoop of anti-matter fertilizer into Spacegirl Shannon's Spaceship. Example:

The Math in This Problem:

In this investigation, students will use strategic thinking to develop a well-sought answer. Integrating the probability notion of randomness, this experiment will allow for students to search for strategic and reasonable predictions in order to come up with a precise solution.