



JUNE 2023 BRAIN TEASER & SOLUTION

Hourglass Head Spinning

Hourglass Head Spinning You are working in a lab that does very precisely timed chemical reactions to produce 36 different highly sensitive compounds. Suddenly there is a general blackout, and the plant manager rushes to you for help. You are asked to assist in continuing producing with only two hourglasses available, using these to precisely time the start and stop of each reaction. One hourglass is exactly 7 min. and the other is exactly 11 min.



All 36 compounds take exactly whole minutes of time to react, sequentially compound #1 takes 1 min, #2 takes 2 min, etc.... #36 takes 36 min. The plant manager is getting ready to prepare the chemical reactants but once prepared these will spoil if not reacted soon and the compounds will be off-spec and wasted if the reaction time is not precise. 1.) Plant manager's first compound is 15 min. How will you precisely time 15 min? 2.) Plant manager is impressed. Understands that some compounds are trivial like 7 min, 11 min and combos, but some are potentially not possible. In order to prepare reactants for only those compounds you can time precisely, you are asked to state which of the 36 compounds you cannot time precisely? In other words, which whole minute counts from 1 to 36 you cannot time with the two hourglasses? Note: Initially both hourglasses are at rest. The only action you can perform is to flip the hourglasses at precisely measured points in time, to advise the plant personnel when to start and stop a reaction. Hourglasses can only be in their upright positions, one way or the other; sideway pauses are not allowed. Consider the glass flips instantaneous; not impacting the timing precision. You can give the start order and start measuring time at any moment, but once started you cannot pause until the reaction is completed precisely on time.

The answer to the June 2023 Brain Teaser

Hourglass Head Spinning

Hourglass #1 – 7 Min Action / Time Remaining Min	Hourglass #2 – 11 Min Action / Time Remaining Min	Run Time Incr. Min	Off Ramp Min
Empty / Flip 7	Empty / Flip 11	7	
Empty / Flip 7	4	4	4
3	Empty / Flip 11	3	3
Empty / Flip 7	8	7	7 or 8
Empty / Flip 7	1	1	1
6	Empty / Flip 11	6	6
Empty / Flip 7	5	5	5
2	Empty / Flip 11	2	2
Empty / Flip 7	9	7	9
Empty / Flip 7	2	2	2
5	Empty / Flip 11	5	5
Empty / Flip 7	6	6	6
1	Empty / Flip 11	1	1
Empty / Flip 7	10	7	10
Empty / Flip 7	3	3	3
4	Empty / Flip 11	4	4
Empty / Flip 7	7	7	
Empty	Empty		

7 Min.

11 Min.



Notes:

- i) The above is constructed by only flipping the hourglass that is empty.**
- ii) There are more variations if when one hourglass is empty, both hourglasses are flipped, or**
- iii) a combo of i) and ii).**