Math Bomb VI

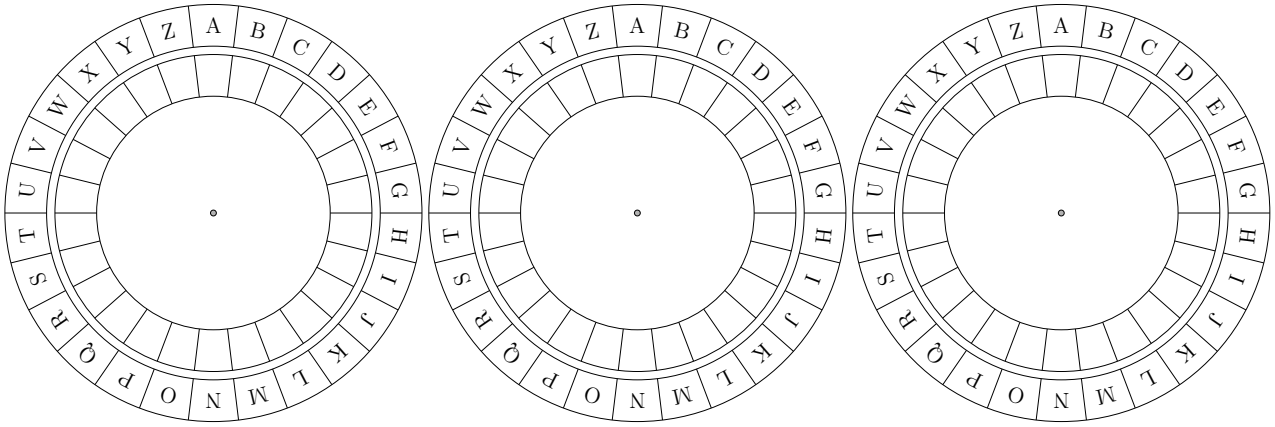
Contents

Welcome to MATH BOMB. This is a fun, interactive mathematics experience where students defuse a bomb. This package includes 4 components:

1. Bomb Video: The bomb video can be found at this link. The timer is set at 40 minutes. The activity can take shorter or longer depending on the group of students you are working with.
2. Answer Sheets: Has prompts to guide students through the bomb defuse.
3. Manual: Printable instructions to defuse the bomb.
4. Solutions: A filled in answer sheet for reference.

This bomb is intended for grade 10+ students and has a large emphasis on probability. It is a lovely 'post AP Statistics Exam' activity. Below is a brief description of some mathematics concepts that are required to defuse this bomb:

- Probability.
- Conditional Probability
- The Binomial and Geometric Distributions
- Logic and Reasoning.



Write the Codes You Enter

1.

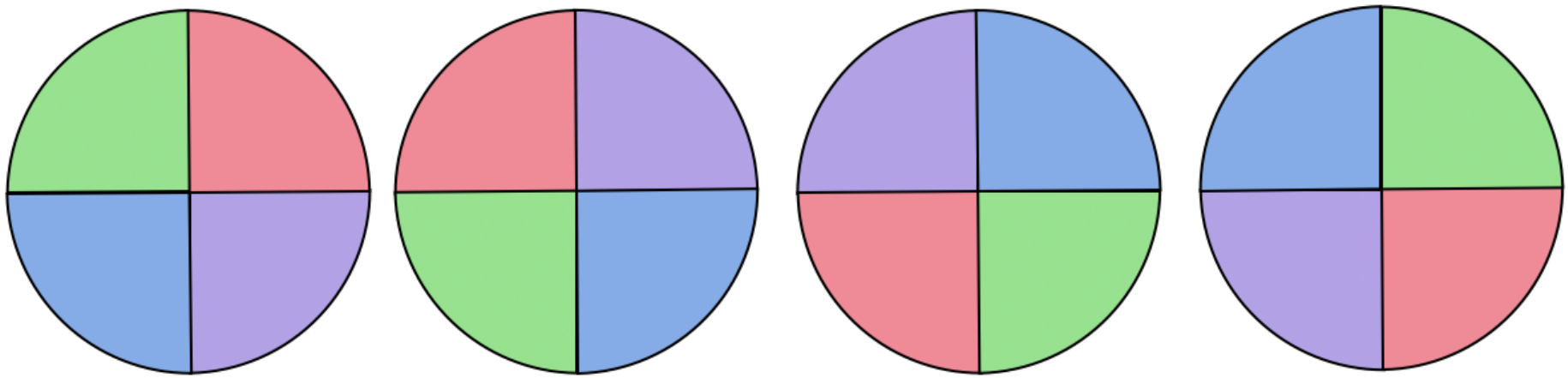
2.

3.

Fill In The Proper Values

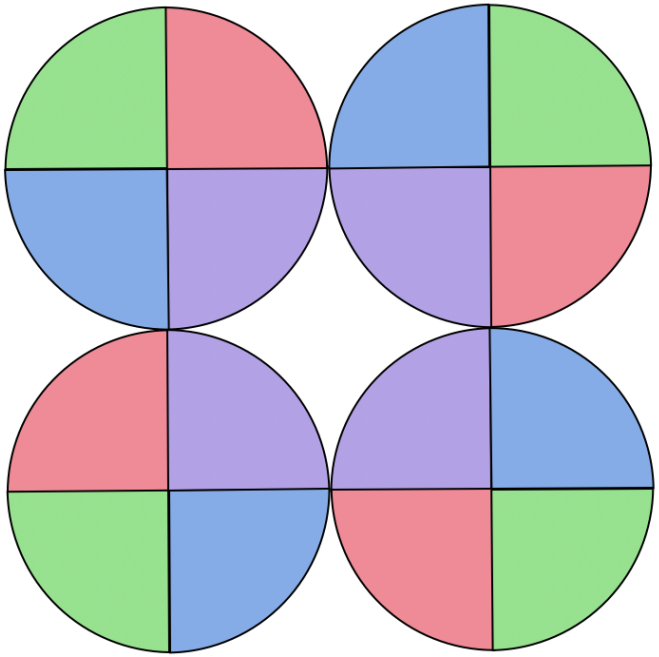
Shade The Buttons That You Press

There are some colourful dials each broken up into 4 sections on the bomb. Each dial is randomized into one of the four orientations below every ten seconds.

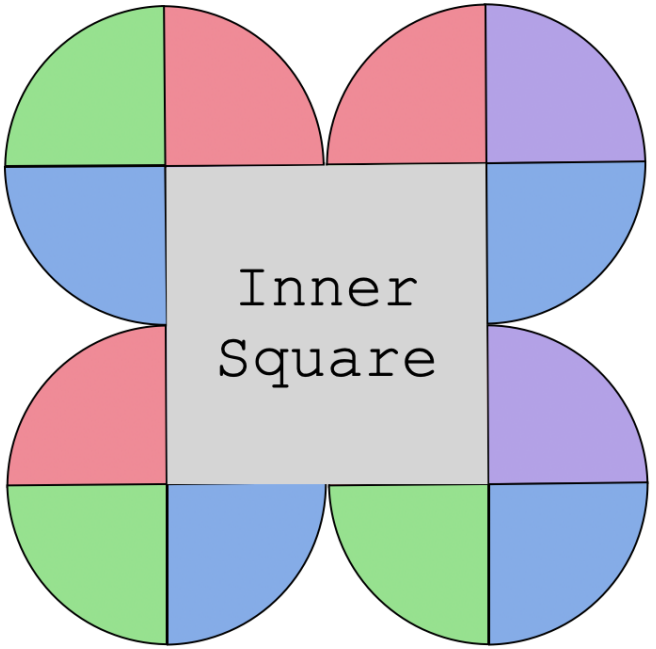


All dials are entirely independent.

The bomb is *primed* when four of the sections on either of the inner squares all share the same colour.



Primed Bomb



Inner Square

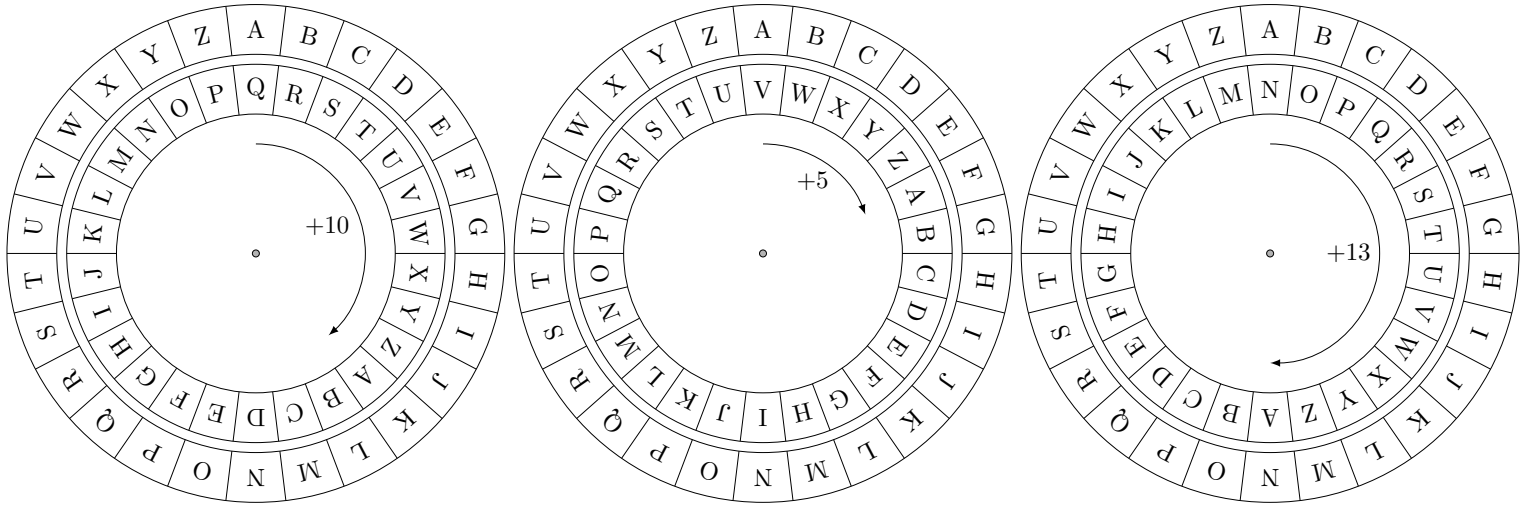
The probability that the bomb is *primed* can be written in lowest terms as $\dfrac{a}{b^c}$.

There is a blue numeric keypad where three disarm codes must be entered into on the bomb. Rounded to the nearest thousandth, the probability that the bomb is *primed* between 0 and 3 times (exclusive) over a 61 second interval can be written in lowest terms as $\frac{h}{1000}$. The first code is h.

There are some colourful buttons lining the edge of the bomb. For a randomly chosen button $P\left(\text{Red} \cup \text{Green} | \text{Composite}\right) = \frac{i}{j}$. The third code is $i + j$.

There is a 5×5 purple grid on the bomb. Each row/column/cage in the grid needs to contain the numbers 1-5 exactly once.

There is a Vigenére cipher on the bomb. This type of cipher uses a ‘key’ that refers to the amount of ‘shifts’ each letter has undergone. ‘+10’, ‘+5’, and ‘+13’ shift are shown below.



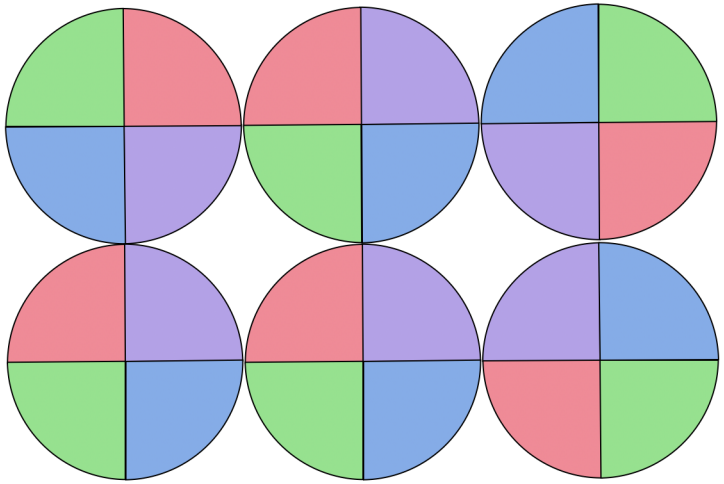
The ‘key’ repeats itself over the entire encoded message. For example, a cipher with the key ‘+10, +5, +13’ would encode ‘hello world’ as ‘xzybj jemytx’. The cipher on the bomb has a key of ‘+a, +b, +c’.

There are 5 large red buttons on the bomb, each with a unique value. The values correspond to the following.

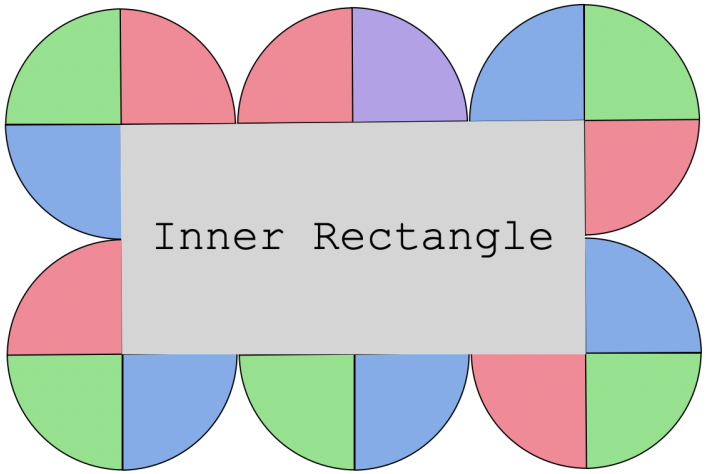
1. Botton I: The value is the expected number of minutes before the bomb is *primed* (rounded to the nearest minute).
2. Botton II: Has the value a
3. Botton III: Has the value b
4. Botton IV: Has the value d
5. Botton V: $P\,(\text{Bomb } \textit{Primed} \,|\, \text{Bomb } \textit{5/8 Primed})$ written in lowest terms is $\frac{f}{g}$. Button V has value is $f + g$.

A red button is a *deactivator* if when it's value is removed the remaining 4 buttons have a non integer mean. Press all the *deactivators*.

The bomb is *5/8 Primed* if *exactly* 5 of the 8 dials have the same colour on the inner rectangle.

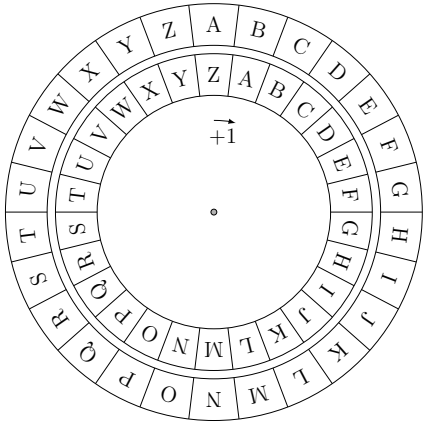


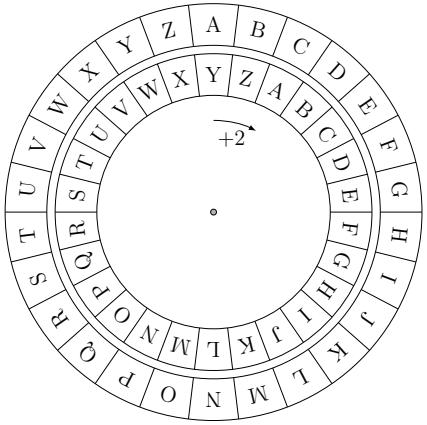
5/8 Primed Bomb

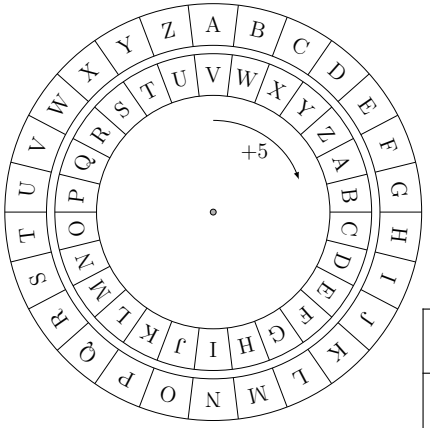


Inner Rectangle

The probability that the bomb is *5/8 Primed* can be written in lowest terms as $\frac{d}{e}$.







Fill In The Proper Values

5	2	3	4	1
4	3	1	5	2
2	4	5	1	3
1	5	2	3	4
3	1	4	2	5

Write the Codes You Enter

1. 173
2. 7(Current Year). Fourteen thousand one hundred and sixty eight for 2024.
3. 12

Shade The Buttons That You Press

5 1 2 7 17