

**Mafia is a popular party game that requires one to think, manipulate, and deceive others in order to win**



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## **Rules of the game**

### **Plot**

There is a village of  $N$  players. A player can be either a commoner, a detective, a healer, or a mafia. A commoner only knows that he is a commoner. A detective knows all the other detectives. A mafia knows all the other Mafia players. A healer knows all other healers in the game.

## Objectives

The objective for the mafias is to kill or eliminate all the non-mafias such that the ratio of the alive mafias to all others is 1:1

- A player can be eliminated in two ways
  1. By being killed by the Mafia
  2. Be eliminated in a vote out.
- Once a player is eliminated, they cannot be brought back to life.
- Mafias cannot kill themselves.
- The objective for all other players(except the mafias) is to eliminate the mafias through a vote out (as the Mafias cannot be killed).
- Therefore, by using special powers of detectives and healers, they are required to save themselves and vote out the Mafias.

## Role of different type of players

- **Mafia**

To kill all other players to achieve a 1:1 ratio.

- **Detective**

They can randomly test one of the players (except detective) to test whether the player is mafia or not. If they correctly identify a mafia, the caught mafia will be voted out in that round by default.

- **Healer**

They randomly select a player from the game to give him a boost of 500 HP (All players, including mafias and healers themselves).

- **Commoner**

They don't have any special role. Furthermore, they only take part in the voting process.

## End of Game

The game ends when either all mafias are voted out or the ratio of mafias to others becomes 1:1. The Mafia wins in the latter case and loses in the former.

## Numbers of each player type

For n player game there are

$n/5$  Mafias,  $n/5$  Detectives,  $\max\{1, n/10\}$  healers, remaining commoner

# Gameplay

**The game will run in rounds. In each round, there will be fixed steps that are followed**

- Firstly the Mafias choose to kill a person (other than mafias). If the user is a mafia player, then he/she will be asked to choose the target.
- Then the detective will test a person to know whether he is mafia or not. If the user is a detective player, then he/she will be asked who they want to test.
- Then the healer will heal a person by giving him an HP boost as defined in HP rules. If the user is a healer player, then he/she will be asked who they want to heal.
- If after healing, the HP of the person killed by the Mafia reaches 0, the player dies.
- After this, there is a voting round where each player votes randomly, and the user (if alive) votes for whomever he/she wants to vote for. The person with the highest votes is kicked out of the game.
- However, if the detective tests positive on a mafia, there will be no voting, and the caught mafia will be voted out by default. Once a player is out of the game, they can not re-enter the game.
- If there are no detectives left, there will be no test and/or if there are no healers left, there will be no HP boost. The game will keep on moving until we arrive at an end of game condition.
- If there are multiple mafias then they vote collectively i.e. they decide one player to kill. In the same way, all detectives choose one player to test and healers choose one player to heal. At no point in time mafias can kill multiple players in a single round, or detectives can test multiple players, and/or healers can heal multiple players. Although when taking the vote, each player votes independently to protect his/her identity.
- In each round, there is fresh voting that takes place. Votes from previous rounds are not counted. Only one player is voted out in each round.
- In case the votes are tied, the voting process is repeated until there is no tie.

# HP Rules

- All commoners start with an HP of 1000 each.
- All mafias will start with 2500 HP each.
- All Detectives and Healers start with an HP of 800 each.
- In each Round, Healers can increase any players HP by 500.
- When the mafias choose a target, if their combined HP is equal to or more than that target's current HP, the target's HP becomes 0. However, if their combined HP is less than that target's current HP, the target's HP reduces by the combined HP of the mafias.
- Further, as damage, each mafia's HP will be reduced by  $X/Y$ , where  $X$  is the initial HP of the target (before being killed), and  $Y$  is the number of alive mafias whose HP is greater than 0. If the target's HP falls below or equal to 0, the target dies.

For example, if there are 2 mafias with HP 500 and 1000. Suppose the target has an HP of 1000. Then, since the combined HP of mafias (1500) is greater than the target's HP, the target dies. And the new HP of the mafias is 0 and 500, respectively. Note that mafias cannot be killed even if their HP falls to 0. They can only be voted out. Please note that HP can not fall below 0 for any player. In case, at the time of selection of target, one of the mafias has an HP less than  $X/Y$ , then this mafia will contribute to the damage by his total HP (making his HP to zero), and the remaining Damage will be equally divided. This process is continued until all damage is absorbed, or the HP of all mafias becomes 0. For example, if there are two mafias mafia1 and mafia2 with HP 100 and 200 respectively, and they kill a player with HP 250, then the final HP of mafias after the kill are 0 and 50.

- If the Healer chooses a person who was a target that died in that round itself, the target is revived, and the new HP of the target is 500. No one dies in such a situation. However, the mafias will still take the damage as explained earlier.

In other words, the target is chosen first, and then the mafias and target take their damages, after which the healer chooses to heal someone. However, the target dies if his HP becomes zero and is not chosen by the Healer to heal.

- The healer can choose any player (including mafia) for the HP boost that is currently, playing the game. Players that were killed/voted out in the previous rounds don't participate in any way and hence can't be chosen in any scenario.

# SOME GAMEPLAY TO UNDERSTAND

## Game from detective's perspective

Welcome to Mafia

Enter Number of players: 10

Choose a Character

- 1) Mafia
- 2) Detective
- 3) Healer
- 4) Commoner
- 5) Assign Randomly

**2**

You are Player6.

You are a detective. Other detectives are: [Player5]

Let's assume that Player1 and Player8 are mafia. Player5 and Player6[User] are Detectives. Player7 is Healer. Rest are Commoners.

### Round 1

10 players are remaining: Player1, Player2, Player3, Player4, Player5, Player6, Player7, Player8, Player9, Player10 are alive.

Mafias have chosen their target.

Choose a player to test: **5**

You cannot test a detective. Choose a player to test: **4**

Player4 is not a mafia.

Healers have chosen someone to heal.

--End of actions--

Player3 has died.

Select a person to vote out: **2**

Player4 has been voted out.

2--End of Round 1--

Now, the remaining members are Player1,2,5,6,7,8,9,10.

### Round 2

8 players are remaining: Player1, Player2, Player5, Player6, Player7, Player8, Player9, Player10 are alive.

Mafias have chosen their target.

Choose a player to test: **1**

Player1 is a mafia.

Healers have chosen someone to heal.

--End of actions--

No one died.

Mafias selected Player9; however, the Healer chose Player9 as well, therefore new HP for

Player9 is 500.

Player1 has been voted out.

Here, since the detective correctly caught the mafia, everyone voted for Player1 by default.

--End of Round 2--

### **Round 3**

7 players are remaining: Player2, Player5, Player6, Player7, Player8, Player9, Player10 are alive.

Mafias have chosen their target.

Choose a player to test: **2**

Player2 is not a mafia.

Healers have chosen someone to heal.

--End of actions--

Player2 has died.

Select a person to vote out: **8**

Player8 has been voted out.

--End of round 3--

Game Over.

The Mafias have lost.

Player1 and Player8 were mafia.

Player5 and Player6[User] were Detectives.

Player7 was Healer.

Player2, Player3, Player4, Player9, Player10 were Commoners.

## **Game from mafia's perspective**

Welcome to Mafia

Enter Number of players: 10

Choose a Character

1) Mafia

2) Detective

3) Healer

4) Commoner

5) Assign Randomly

**5**

You are Player9.

You are a mafia. Other mafias are: [Player1]

Let's assume that Player1 and Player9[User] are mafia. Player5 and Player6 are Detectives. Player7 is Healer. Rest are Commoners.

### Round 1

10 players are remaining: Player1, Player2, Player3, Player4, Player5, Player6, Player7, Player8, Player9, Player10 are alive.

Choose a target: **6**

Detectives have chosen a player to test.

Healers have chosen someone to heal.

--End of actions--

Player6 has died.

Select a person to vote out: **5**

Player5 has been voted out.

--End of Round 1--

Now, the remaining members are Player1,2,3,4,7,8,9,10.

### Round 2

8 players are remaining: Player1, Player2, Player3, Player4, Player7, Player8, Player9, Player10 are alive.

Choose a target: **8**

Detectives have chosen a player to test.

**\*\*Even though there are no detectives left, other players will not come to know about this\*\***

Healers have chosen someone to heal.

--End of actions--

Player 8 has died.

Select a person to vote out: **10**

Player9 has been voted out.

--End of Round 2--

**\*\*Now, even though the user is dead. The game simulates on its own. Without taking any inputs from the user\*\***

### Round 3

6 players are remaining: Player1, Player2, Player3, Player4, Player7, Player10 are alive.

Mafias have chosen their target.

Detectives have chosen a player to test.

Healers have chosen someone to heal.

--End of actions--

Player2 has died.

Player3 has been voted out.

--End of round 3--

#### Round 4

4 players are remaining: Player1, Player4, Player7, Player10 are alive.

Mafias have chosen their target.

Detectives have chosen a player to test.

Healers have chosen someone to heal.

--End of actions--

Player4 has died. Player7 has been voted out.

--End of round 4--

#### Game Over

The Mafias have won. Since the ratio of alive mafias to others is 1:1, Mafias win.

Player1 and Player9[User] were mafias.

Player5 and Player6 were Detectives.

Player7 was Healer.

Player2, Player3, Player4, Player8, Player10 were Commoners.

### Game from healer's perspective

Welcome to Mafia

Enter Number of players: 10

Choose a Character

- 1) Mafia
- 2) Detective
- 3) Healer
- 4) Commoner
- 5) Assign Randomly

**3**

You are Player7.

You are a healer. Other healers are: NONE

Let's assume that Player1 and Player9 are mafia. Player5 and Player6 are Detectives. Player7[User] is Healer. Rest are Commoners.

#### Round 1

10 players are remaining: Player1, Player2, Player3, Player4, Player5, Player6, Player7, Player8, Player9, Player10 are alive.

Mafias have chosen their target.

Detectives have chosen a player to test.

Choose a player to heal: **3**

--End of actions--



Player6 has died.

Select a person to vote out: **5**

Player5 has been voted out.

--End of Round 1--

Now, the remaining members are Player1,2,3,4,7,8,9,10.

## **Round 2**

8 players are remaining: Player1, Player2, Player3, Player4, Player7, Player8, Player9, Player10 are alive.

Mafias have chosen their target.

Detectives have chosen a player to test.

Even though there are no detectives left, other players will not come to know about this.

Choose a player to heal: **1**

--End of actions--

Player 8 has died.

Select a person to vote out: **10**

Player9 has been voted out.

--End of Round 2--

## **Round 3**

6 players are remaining: Player1, Player2, Player3, Player4, Player7, Player10 are alive.

Mafias have chosen their target.

Detectives have chosen a player to test.

Choose a player to heal: **9**

Player9 is not in the game.

Choose a player to heal: **7**

--End of actions--

Player2 has died.

Select a person to vote out: **3**

Player3 has been voted out.

--End of round 3--

## **Round 4**

4 players are remaining: Player1, Player4, Player7, Player10 are alive.

Mafias have chosen their target.

Detectives have chosen a player to test.

Choose a player to heal: **7**

--End of actions--

Player4 has died.

Select a person to vote out: **1**

Player7 has been voted out.

--End of round 4--

Game Over.

The Mafias have won. Since the ratio of alive mafias to others is 1:1, Mafias win.

Player1 and Player9 were mafia.

Player5 and Player6 were Detectives.

Player7 was Healer.

Player2, Player3, Player4, Player8, Player10 were Commoners.

--End of Sample Case--