

This challenge involves 4 games, each with different rulesets. The only constant is that there are always 101 rounds and the player always goes 2nd. This matters a lot, as we can use that to figure out an ideal strategy:

Game 1: 3 dice, 1 throw

All dice have an expected outcome of 3.5, so we need to look into matchups. This can be done either via simulations (with 10k throws to determine some accurate odds) or via probabilistic math. Personally, I came to the following conclusion:

Blue > Yellow > Red > Blue

Game 2: 3 dice, 2 throws

This is similar, but the quality of the dice becomes different. Personally, I came to the following conclusion:

Red > Yellow, Blue Yellow > Red

*This game seems to be the fairest, either that or there is a better strategy than the one I chose.

Game 3: 4 dice, 1 throw

The dice have no different expected outcomes, and we now have a dice which has a fixed outcome. Using this, the calculations become rather simple. Personally, I came to the following conclusion:

Green > Blue > Yellow > Red > Green

Game 4: 4 dice, 2 throws

For this one I tested to see who wins if the points are equal and found out the player wins, so the strategy becomes a no-brainer. Personally, I came to the following conclusion:

Blue > Red, Green, Yellow Red > Blue

Using this strategy, the code that recovered the flag looks like this:

```
from pwn import *
p = remote('35.198.127.202', 30738)
warnings.simplefilter("ignore", category=BytesWarning)

for _ in range(4):
    p.recvuntil("?")
    p.sendline()
opponent_wins = 0
your_wins = 0

for _ in range(101):
    message = p.recvuntil("!\n").decode()
    p.recvuntil(": ")
    if "red" in message.lower():
```

```

        p.sendline("yellow")
    elif "blue" in message.lower():
        p.sendline("red")
    elif "yellow" in message.lower():
        p.sendline("blue")

    result = p.recvuntil("win!\n").decode()
    if "I win" in result:
        opponent_wins += 1
    elif "You win" in result:
        your_wins += 1

log.info(f"Final score after 101 rounds: Opponent wins: {opponent_wins}, You win: {your_wins}")
p.recvuntil("wins.\n")
opponent_wins = 0
your_wins = 0

for _ in range(101):
    message = p.recvuntil("!\n").decode()
    p.recvuntil(": ")
    if "red" in message.lower():
        p.sendline("yellow")
    elif "blue" in message.lower():
        p.sendline("red")
    elif "yellow" in message.lower():
        p.sendline("red")

    result = p.recvuntil("win!\n").decode()
    if "I win" in result:
        opponent_wins += 1
    elif "You win" in result:
        your_wins += 1

log.info(f"Final score after 101 rounds: Opponent wins: {opponent_wins}, You win: {your_wins}")
for _ in range(4):
    p.recvuntil("Ok?")
    p.sendline()
opponent_wins = 0
your_wins = 0

for _ in range(101):
    message = p.recvuntil("!\n").decode()
    if "red" in message.lower():

```

```

        p.sendline("yellow")
    elif "blue" in message.lower():
        p.sendline("green")
    elif "yellow" in message.lower():
        p.sendline("blue")
    elif "green" in message.lower():
        p.sendline("red")

    result = p.recvuntil("win!\n").decode()
    if "I win" in result:
        opponent_wins += 1
    elif "You win" in result:
        your_wins += 1

log.info(f"Final score after 101 rounds: Opponent wins: {opponent_wins}, You win: {your_wins}")
opponent_wins = 0
your_wins = 0
p.recvuntil("flag!\n")

for _ in range(101):
    message = p.recvuntil("!\n").decode()
    if "red" in message.lower():
        p.sendline("blue")
    elif "blue" in message.lower():
        p.sendline("red")
    elif "yellow" in message.lower():
        p.sendline("blue")
    elif "green" in message.lower():
        p.sendline("blue")

    result = p.recvuntil("win!\n").decode()
    if "I win" in result:
        opponent_wins += 1
    elif "You win" in result:
        your_wins += 1

log.info(f"Final score after 101 rounds: Opponent wins: {opponent_wins}, You win: {your_wins}")
log.info(p.recvuntil("luck.\n").decode())
p.close()

```

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