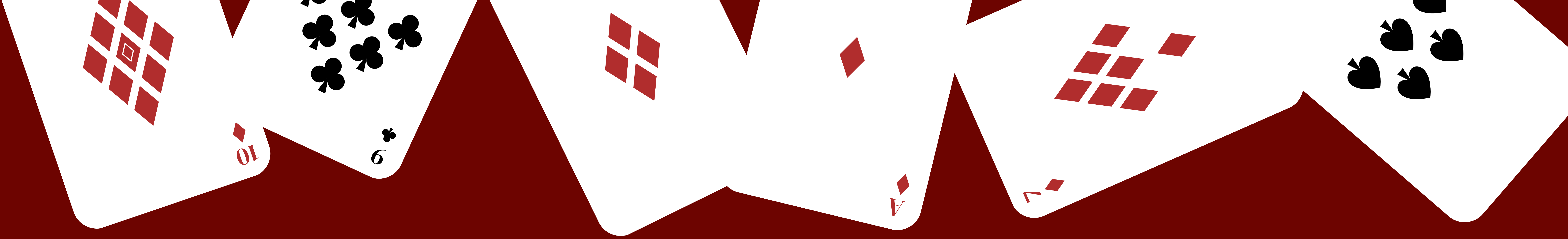
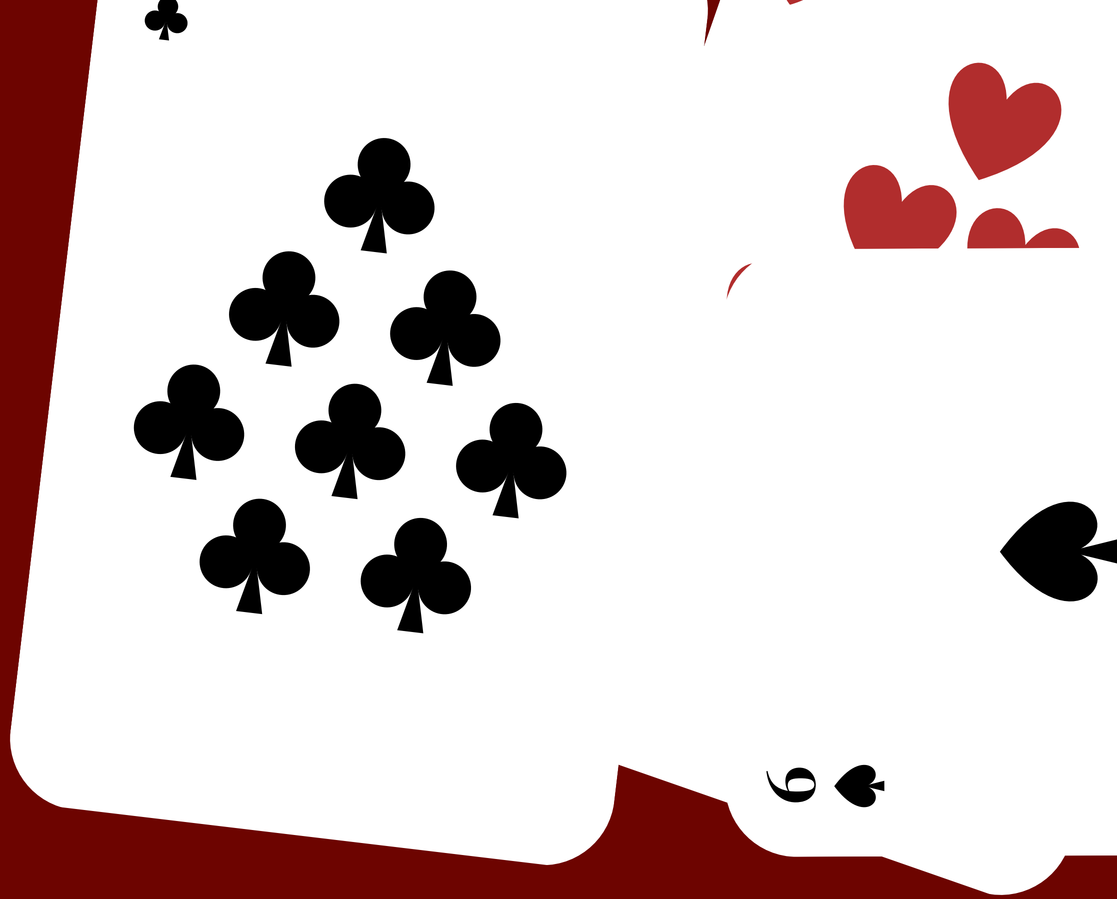
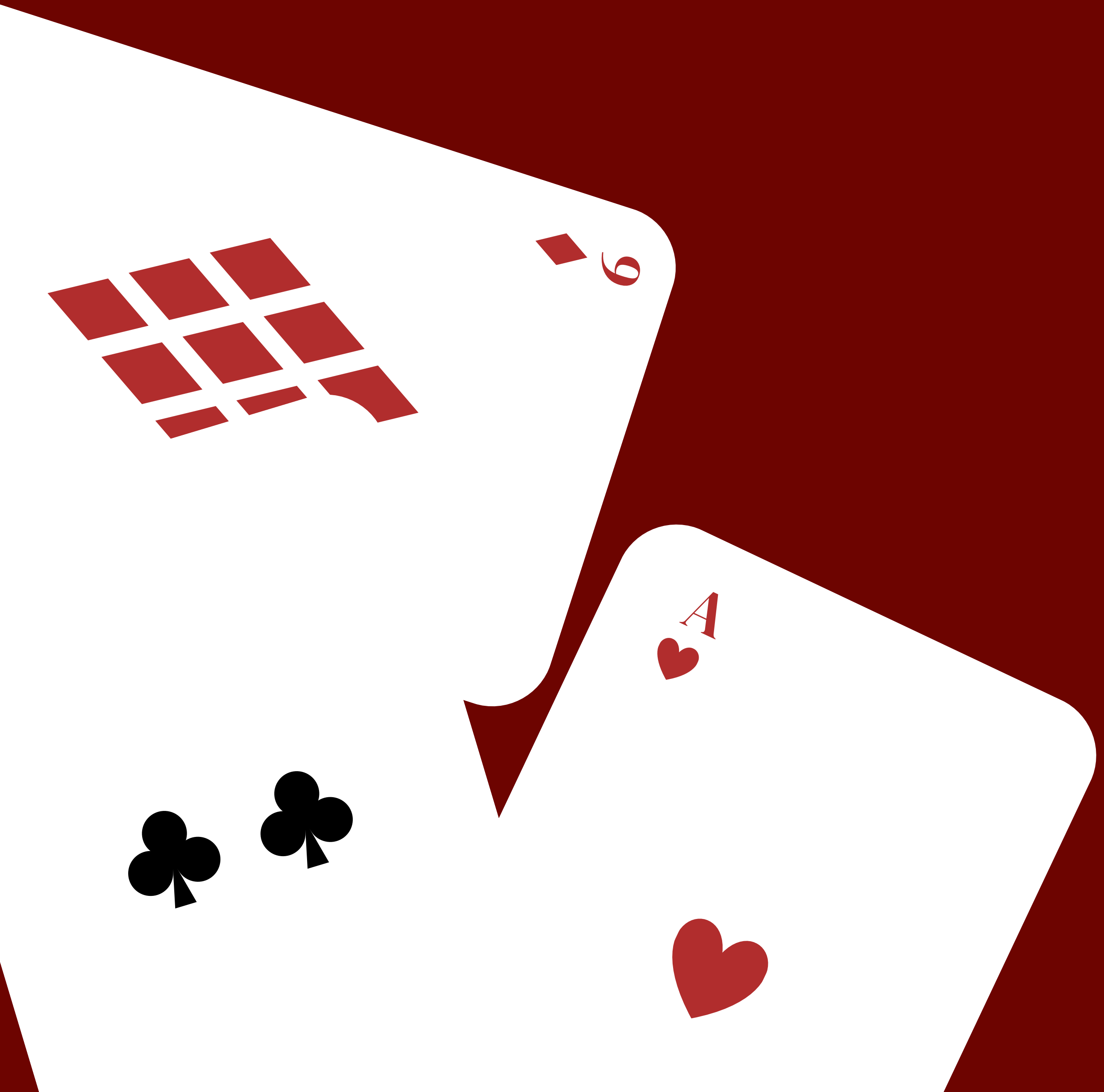


Probability with Decks of Cards



How many cards are in a deck of cards (excluding jokers)?



What is the denominator of probabilities involving decks of cards?

$$P = \frac{\text{\# of favourable outcomes}}{52}$$

A ♥

An event that counts in the probability being calculated

Favourable outcome

A ♥

An event that does not count in the probability being calculated

Unfavourable outcome

A ♥

Event that **cannot be chosen**, but the likelihood of certain outcomes can be expressed

Random Event

A ♥

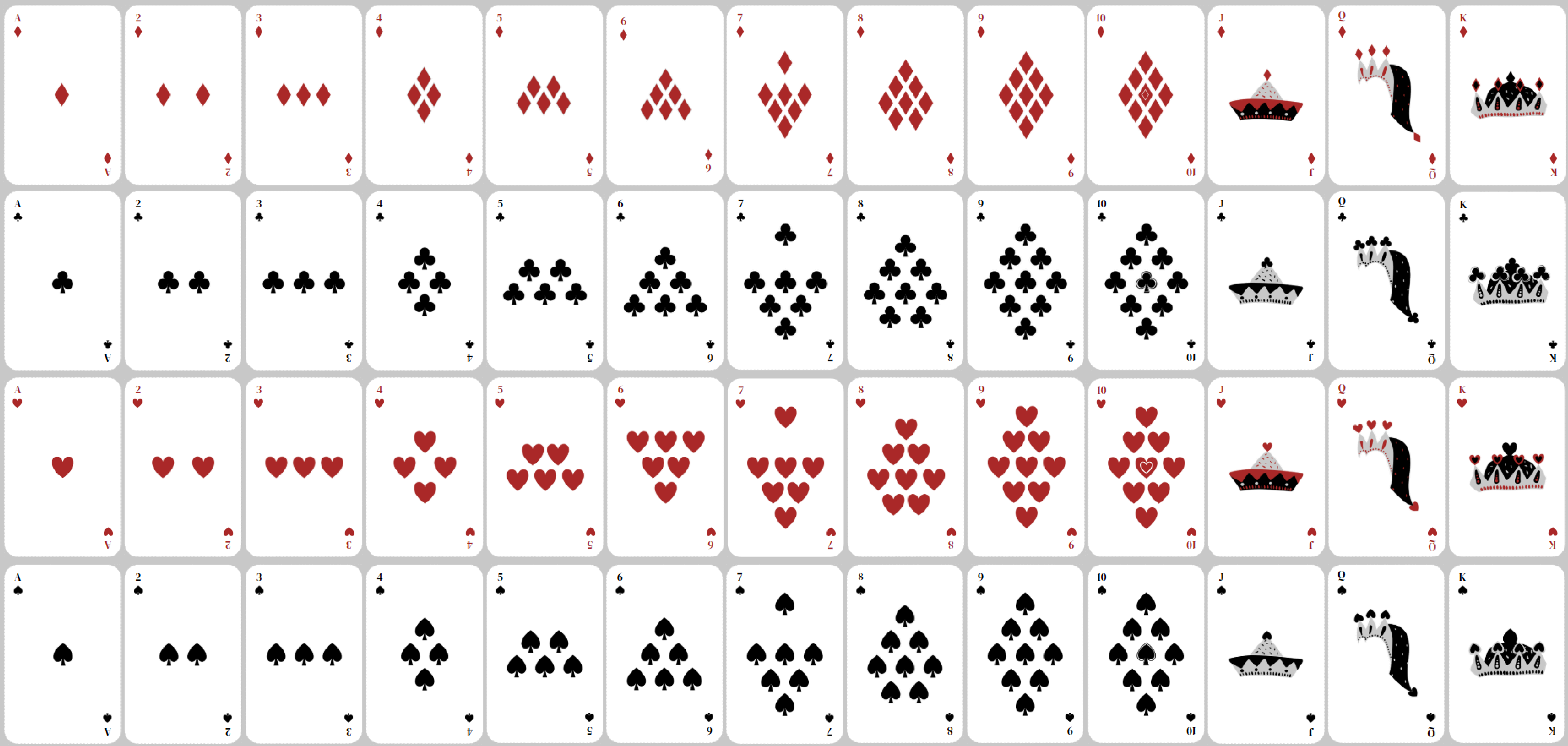
Event that is **chosen**, such as looking as you choose an object from a group

Non-Random Event

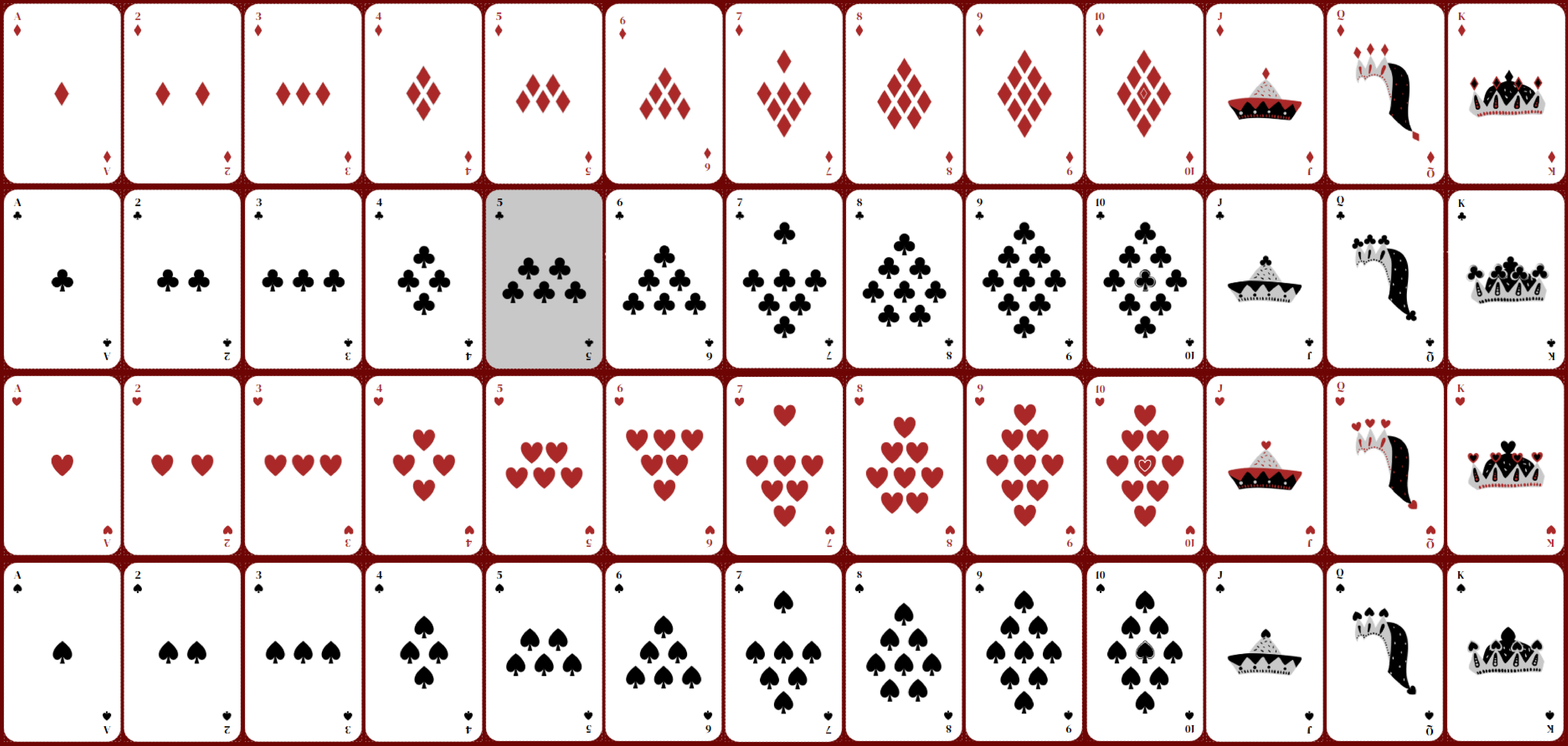
Simple Probability

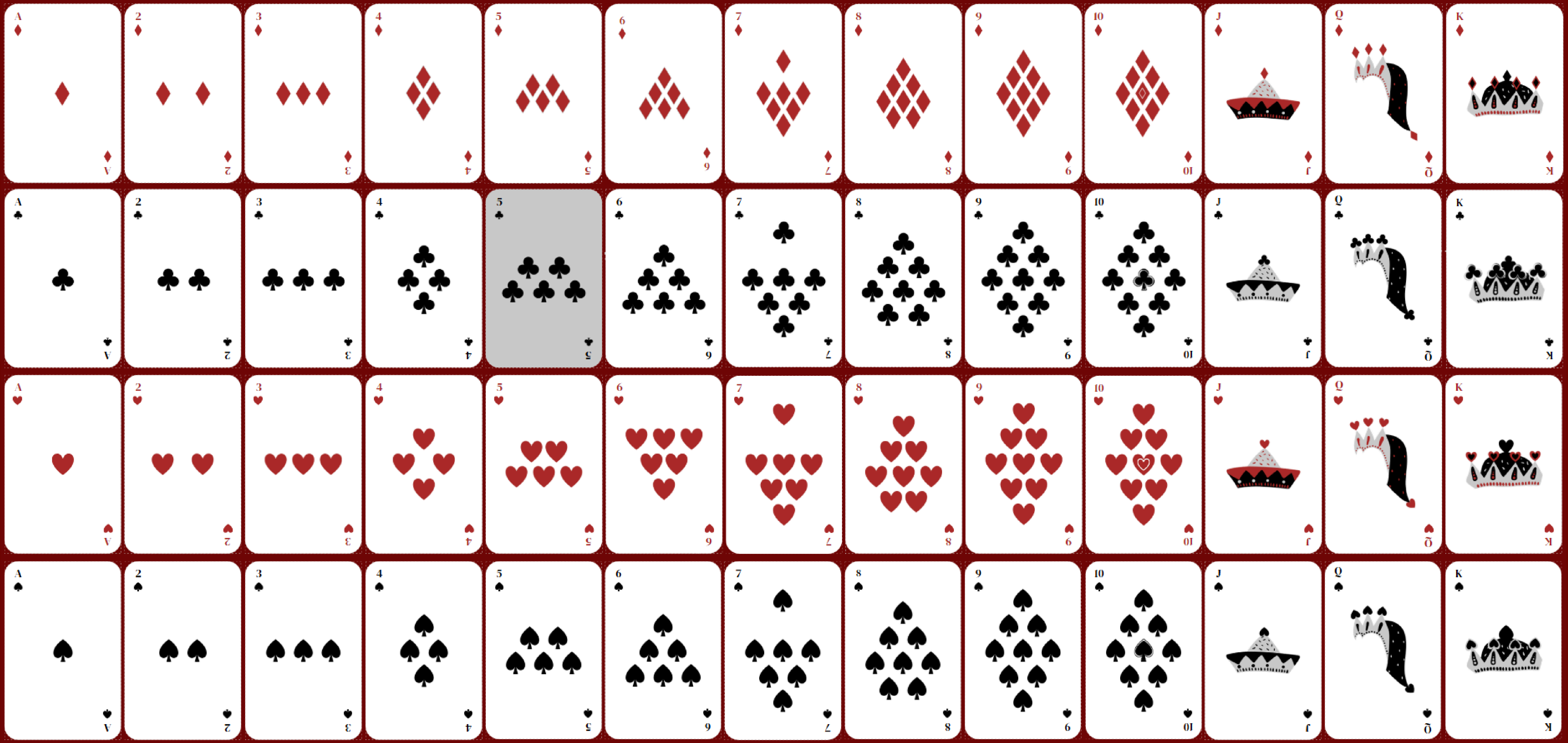
The probability of one event occurring.

Examples?

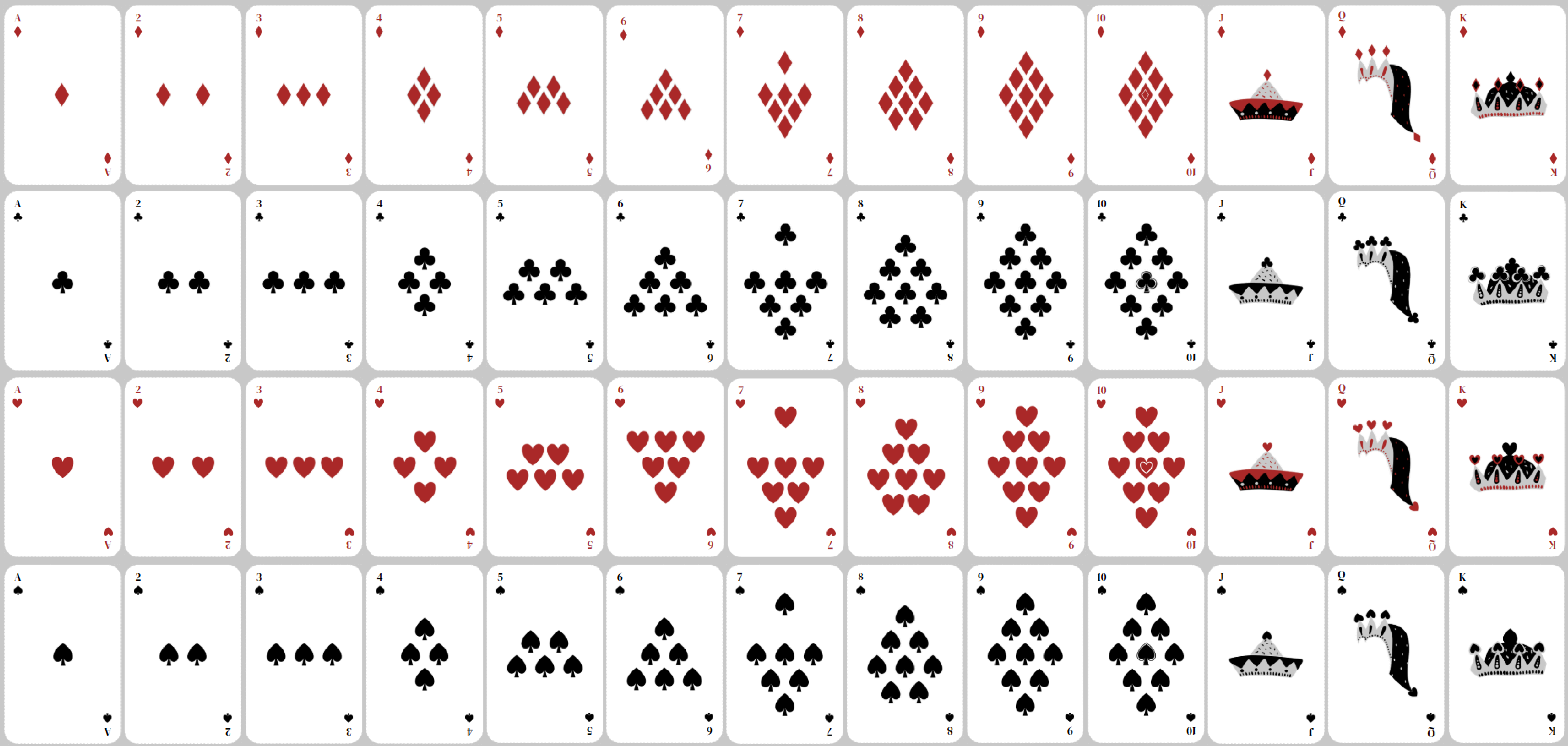


What is the theoretical probability of picking a **5 of clubs**?

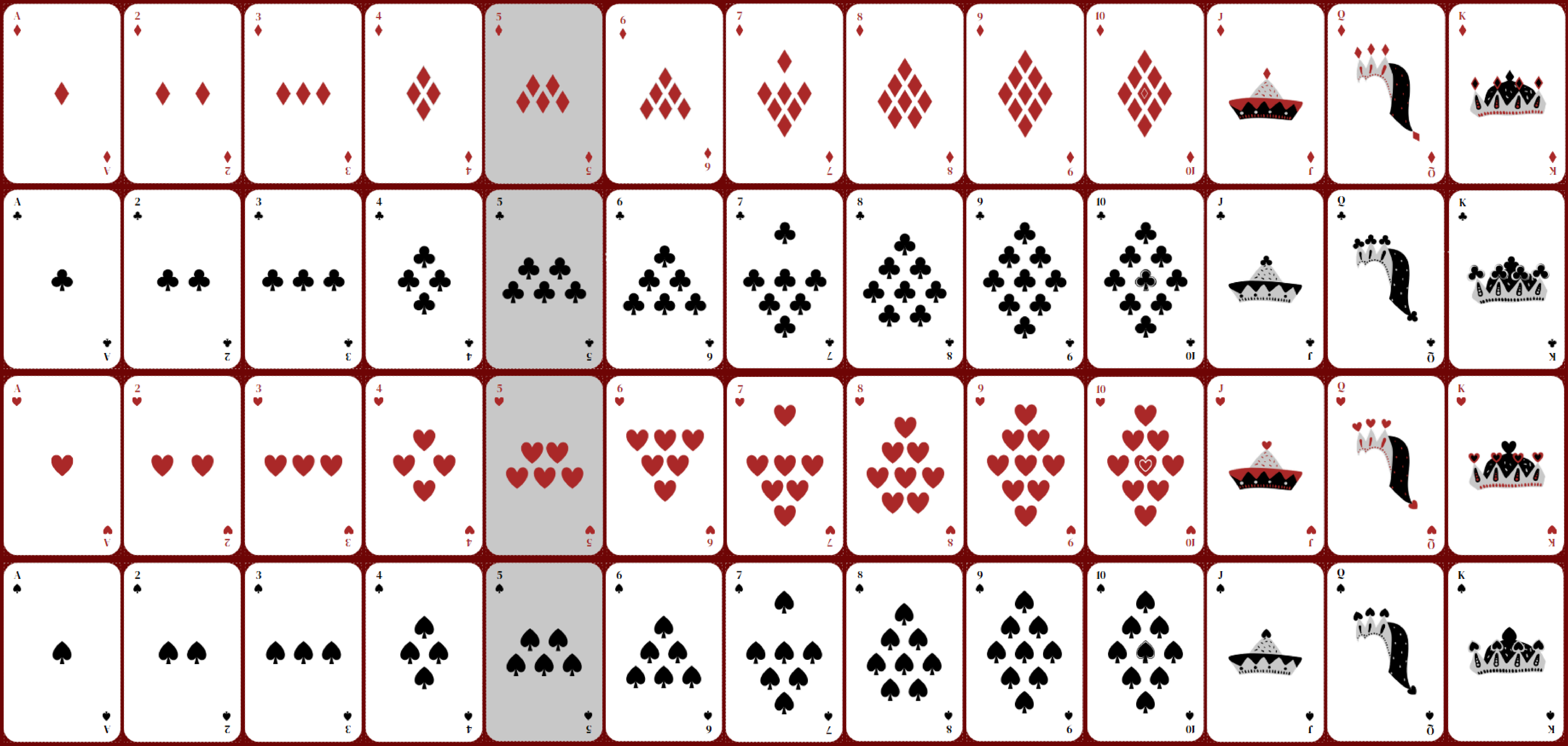

A 2 3 4 5 6 7 8 9 10 J Q K
A 2 3 4 5 6 7 8 9 10 J Q K
A 2 3 4 5 6 7 8 9 10 J Q K
A 2 3 4 5 6 7 8 9 10 J Q K

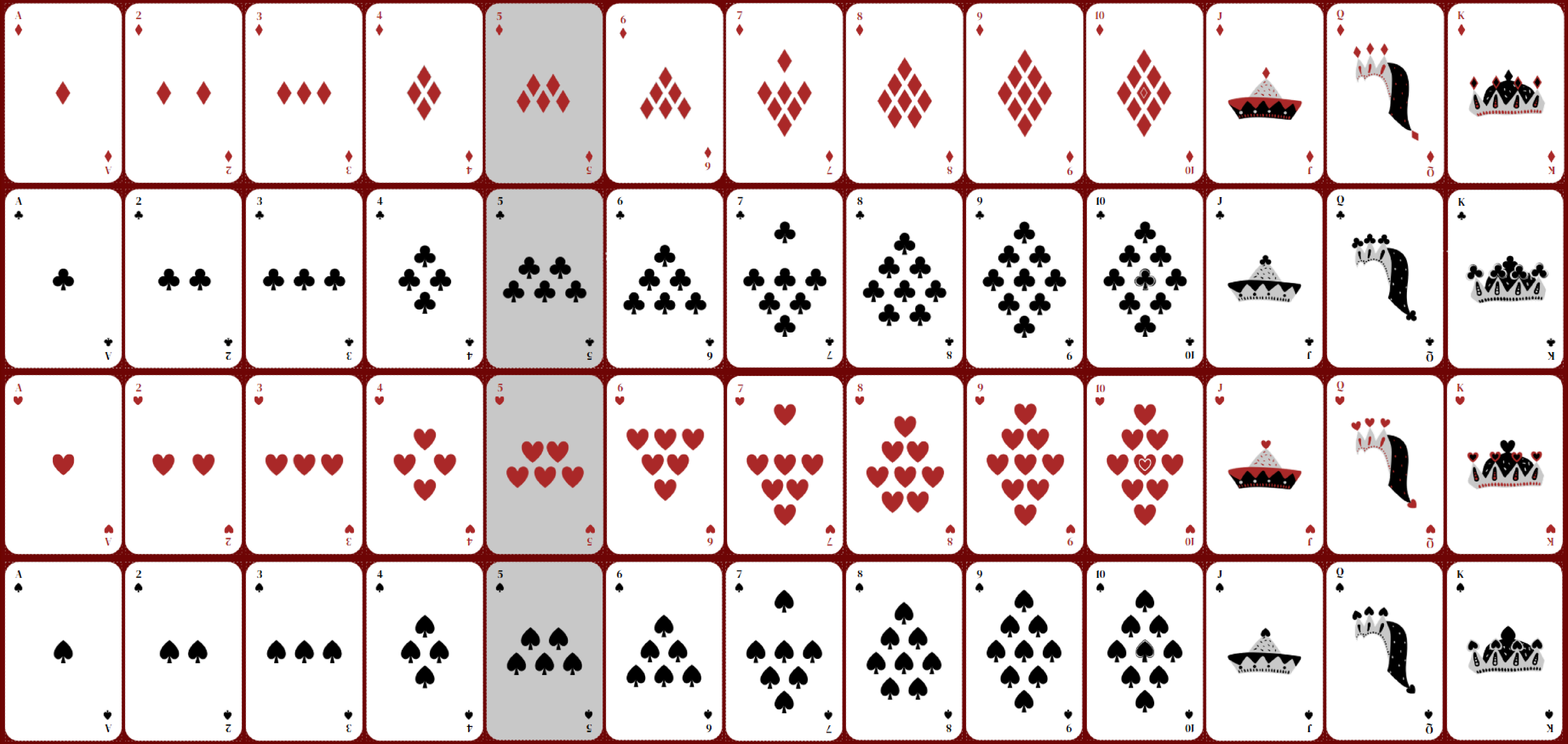


$$P(\text{5 of clubs}) = \frac{\text{\# of 5 of clubs}}{52} = \frac{1}{52} = 0.019 = 1.9\%$$

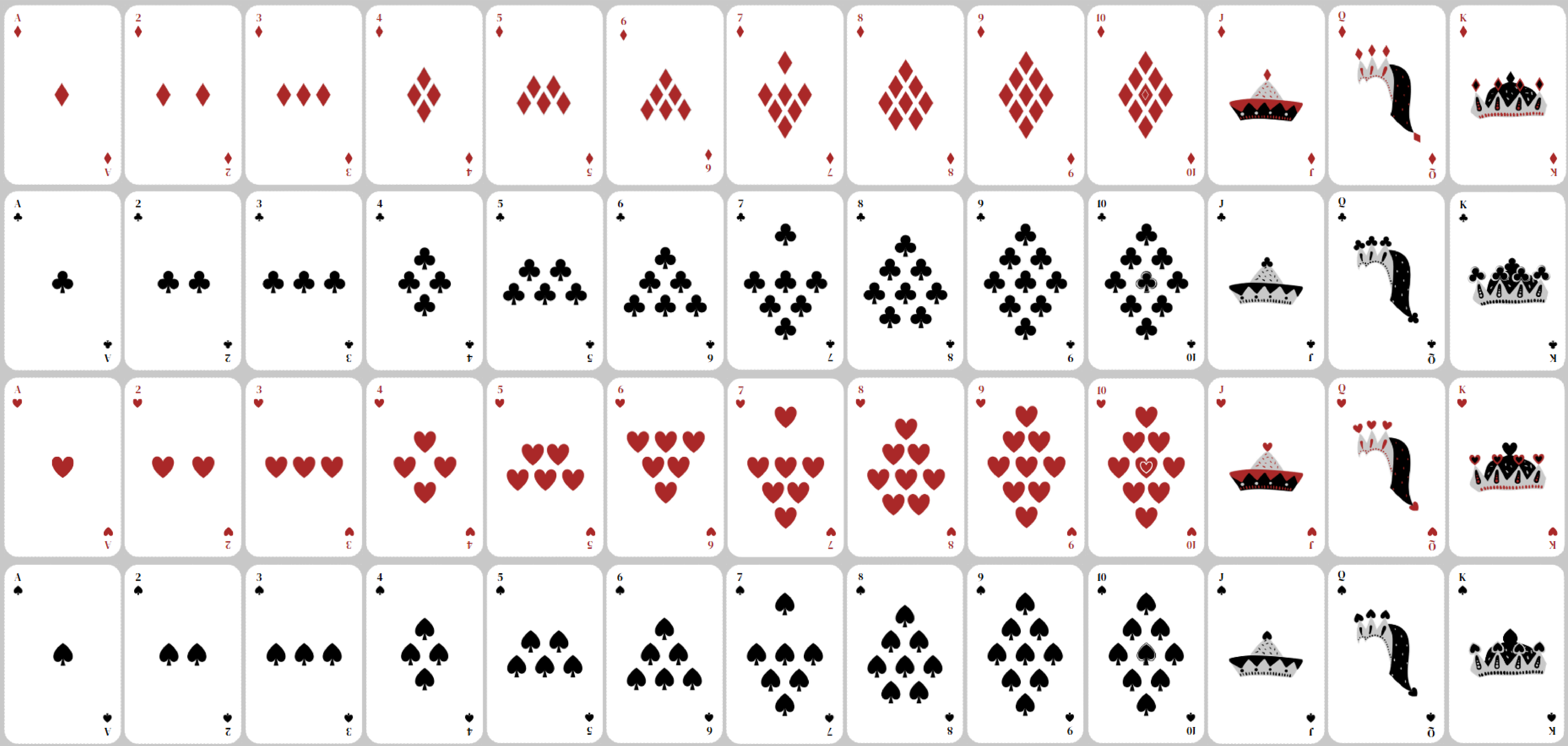


What is the theoretical probability of picking a **5**?

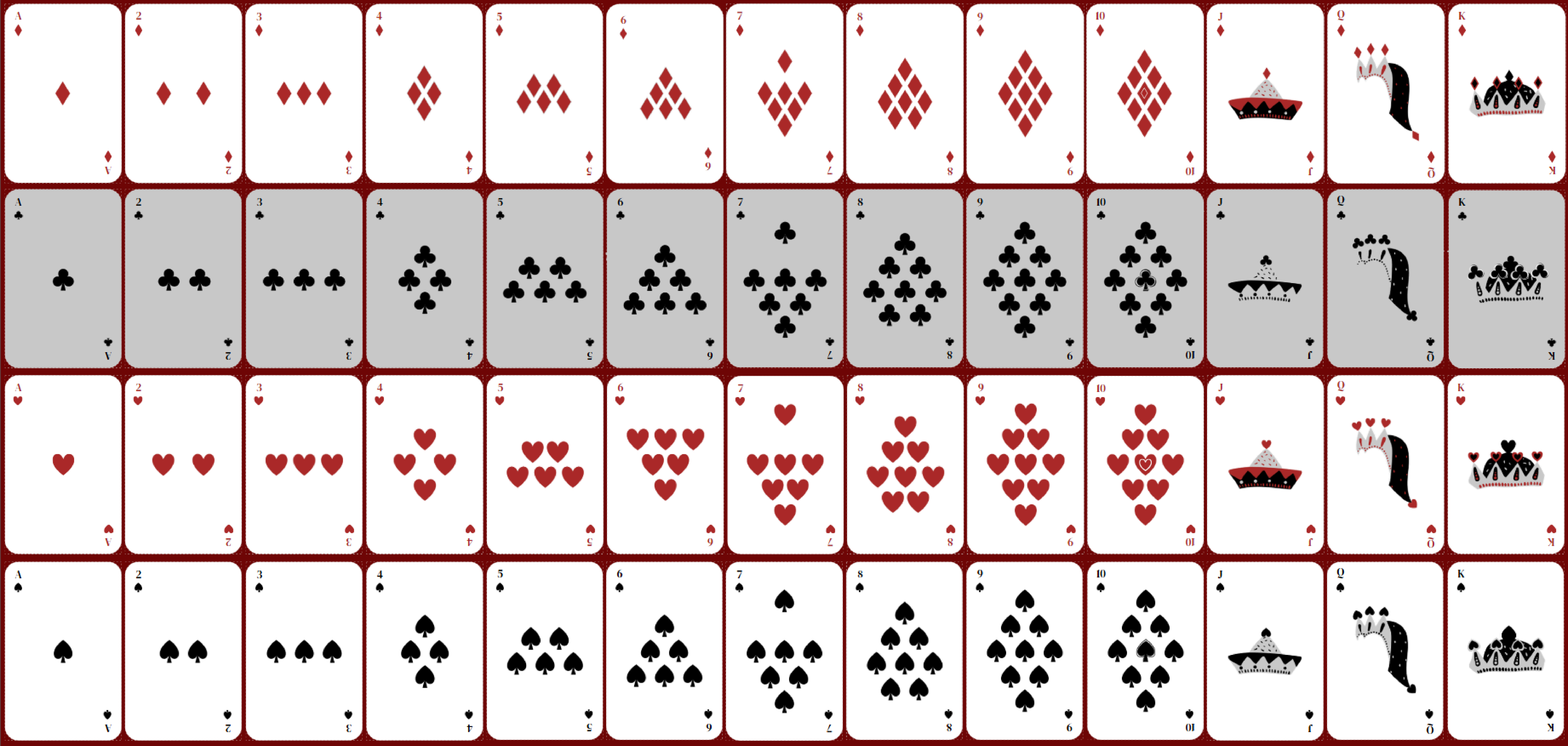

A 2 3 4 5 6 7 8 9 10 J Q K
A 2 3 4 5 6 7 8 9 10 J Q K
A 2 3 4 5 6 7 8 9 10 J Q K
A 2 3 4 5 6 7 8 9 10 J Q K

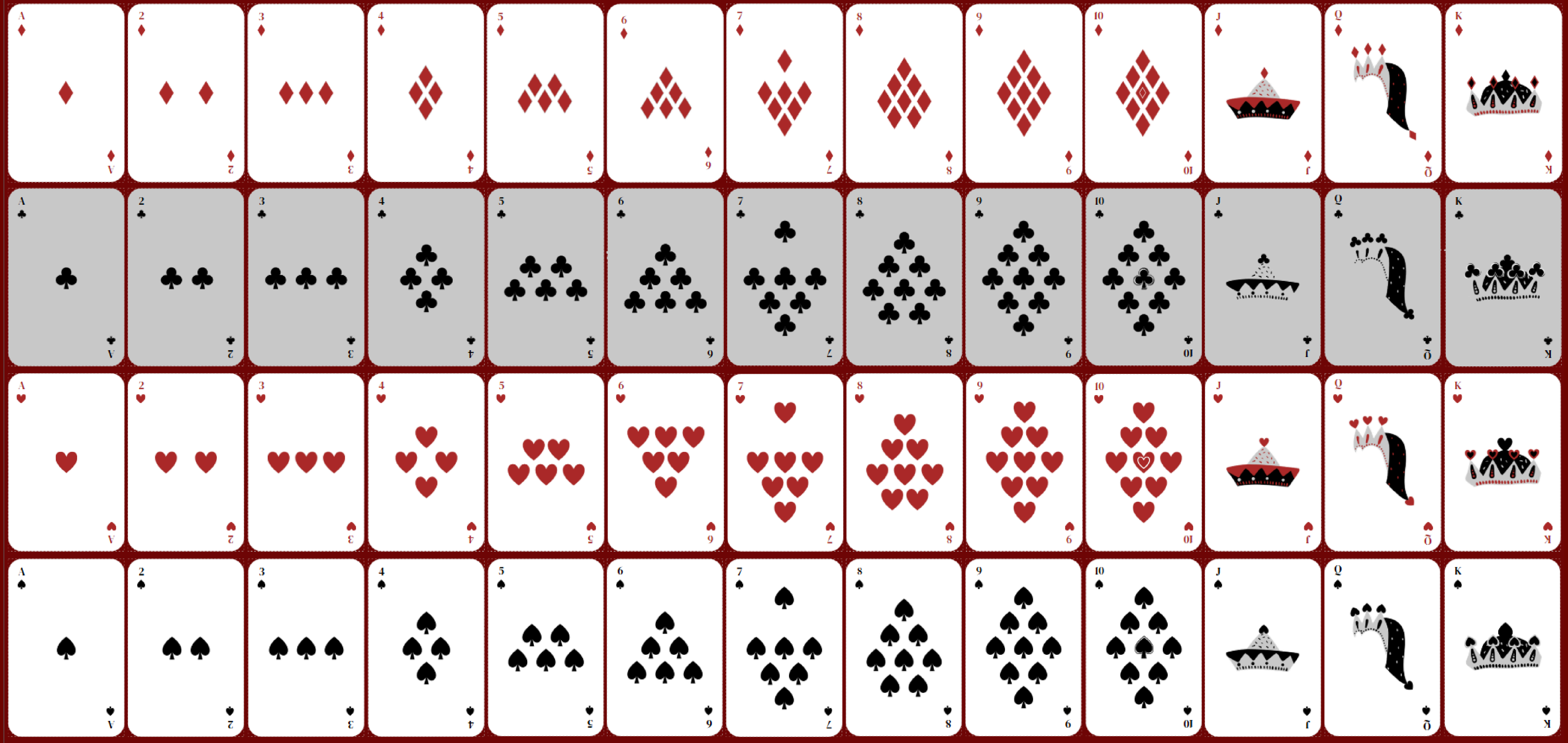


$$P(5) = \frac{\#\text{ of 5s}}{52} = \frac{4}{52} = \frac{1}{13} = 0.077 = 7.7\%$$

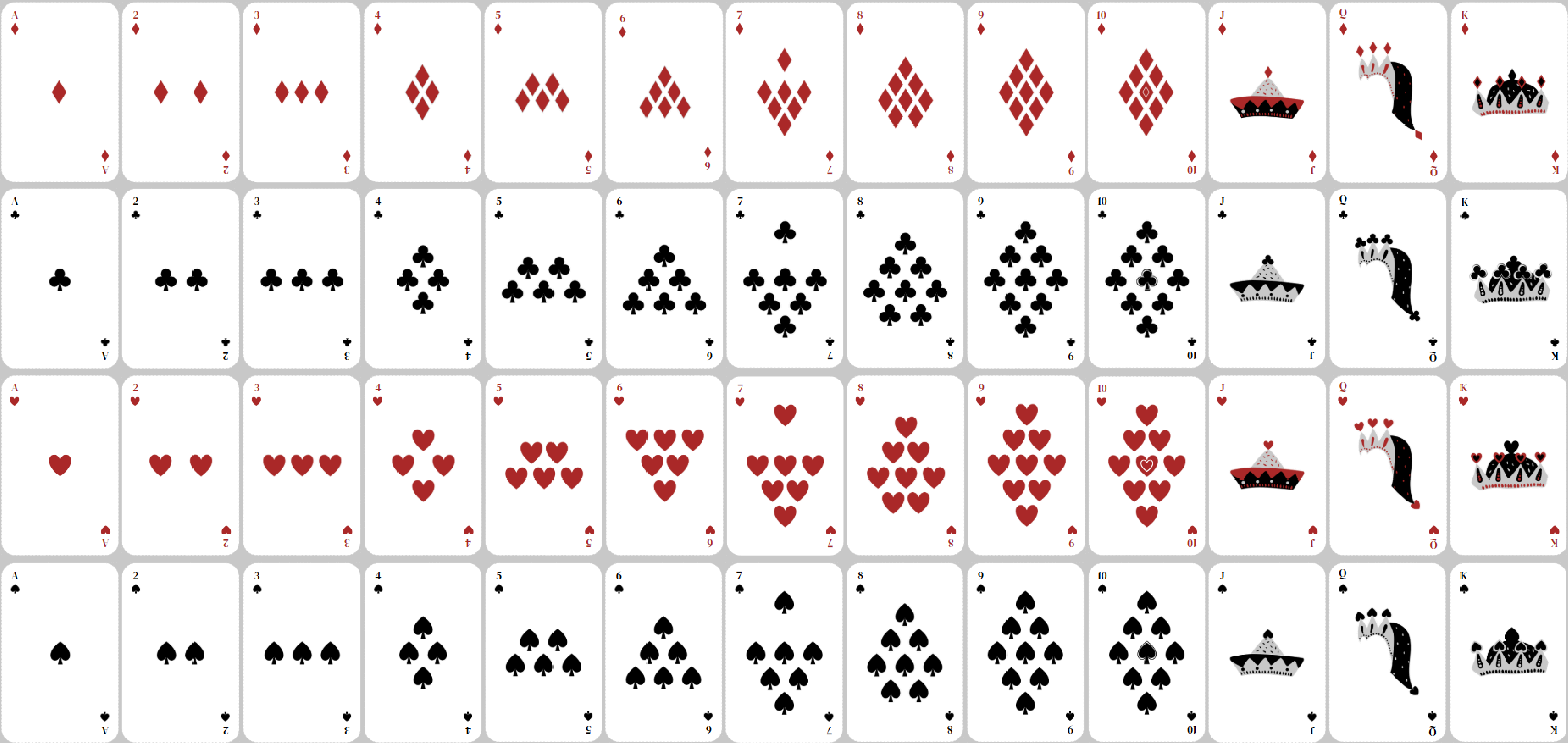


What is the theoretical probability of picking a card of **clubs**?

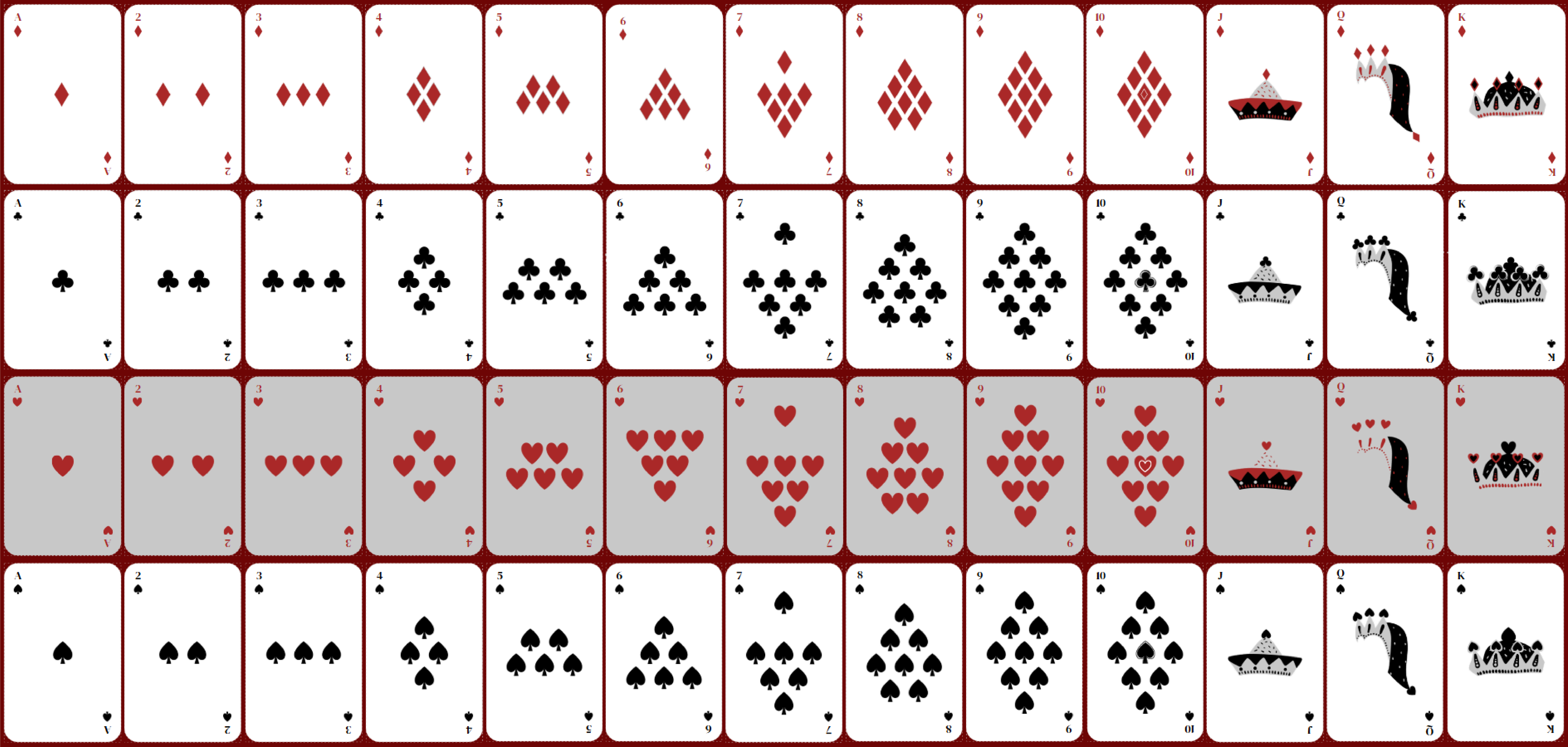


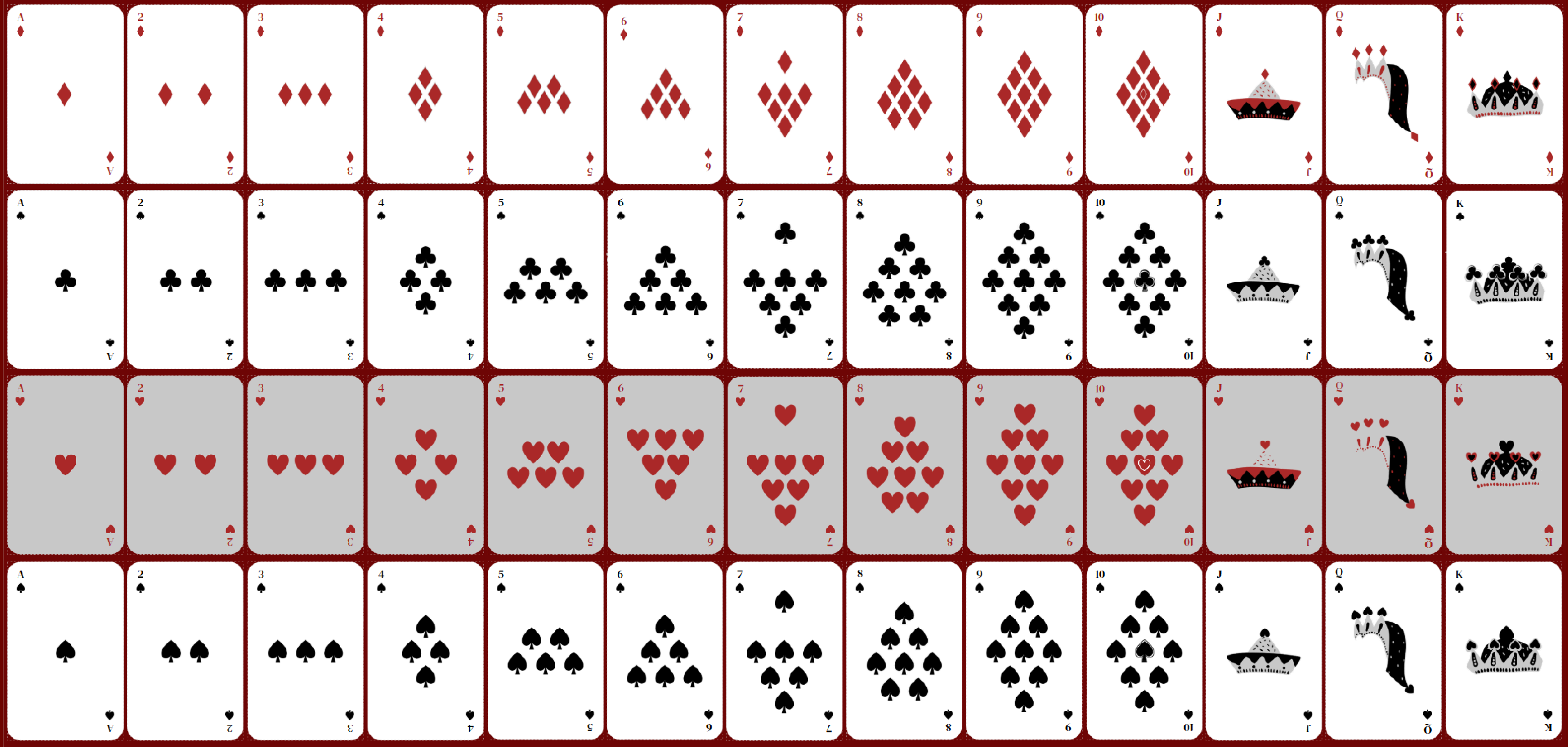


$$P(\text{clubs}) = \frac{\#\text{ of clubs}}{52} = \frac{13}{52} = \frac{1}{4} = 0.25 = 25\%$$

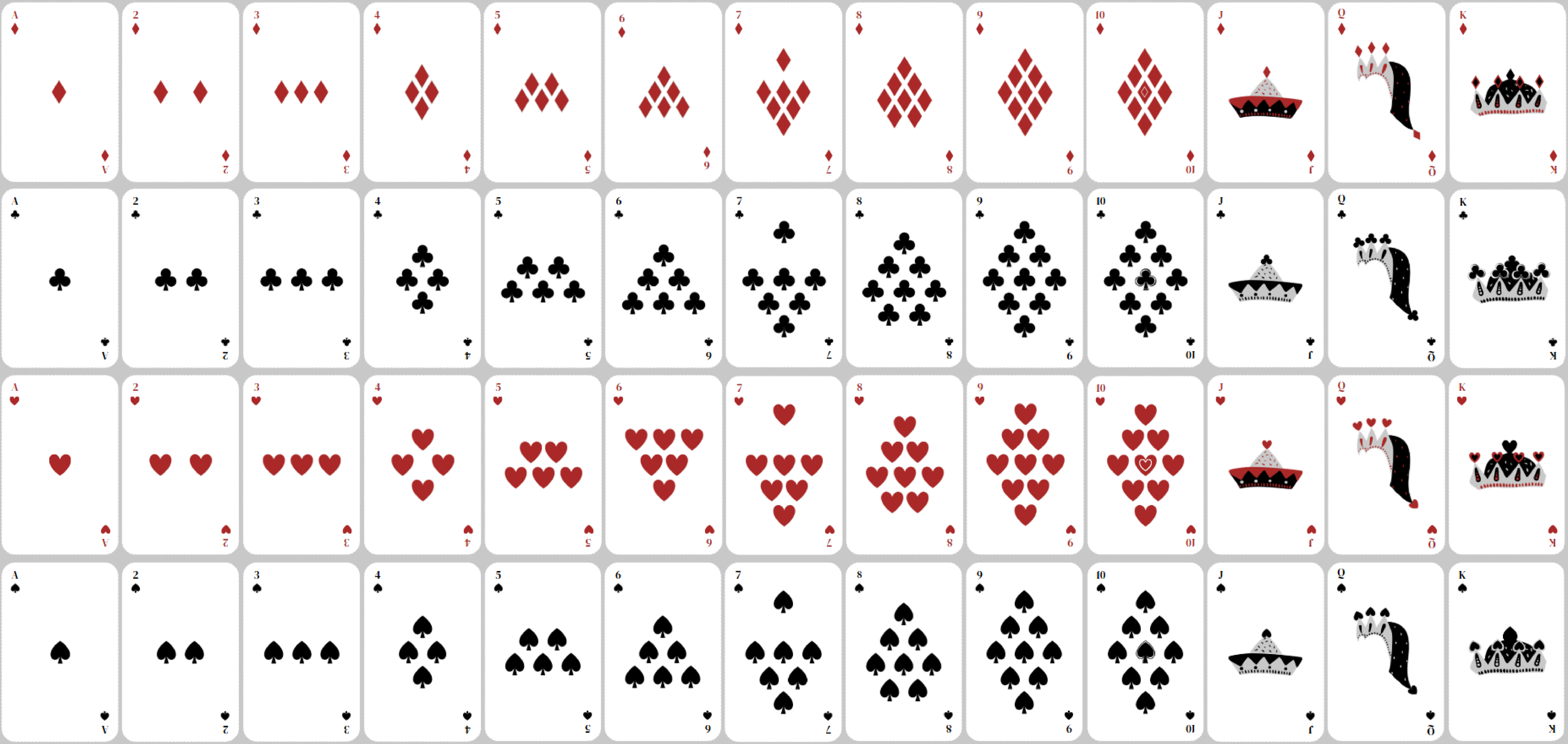


What is the theoretical probability of picking a card of **hearts**?

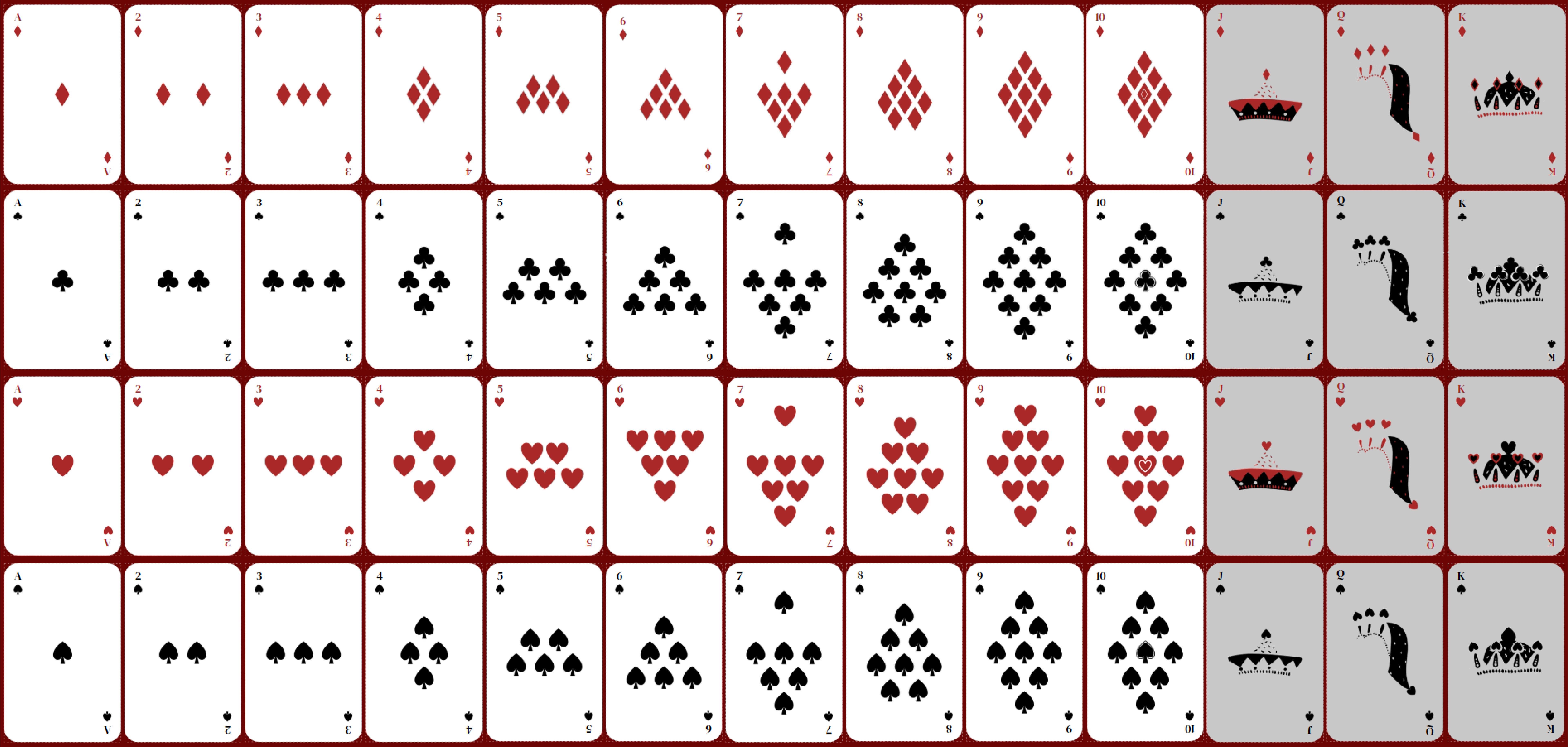

A 2 3 4 5 6 7 8 9 10 J Q K
A 2 3 4 5 6 7 8 9 10 J Q K
A 2 3 4 5 6 7 8 9 10 J Q K
A 2 3 4 5 6 7 8 9 10 J Q K

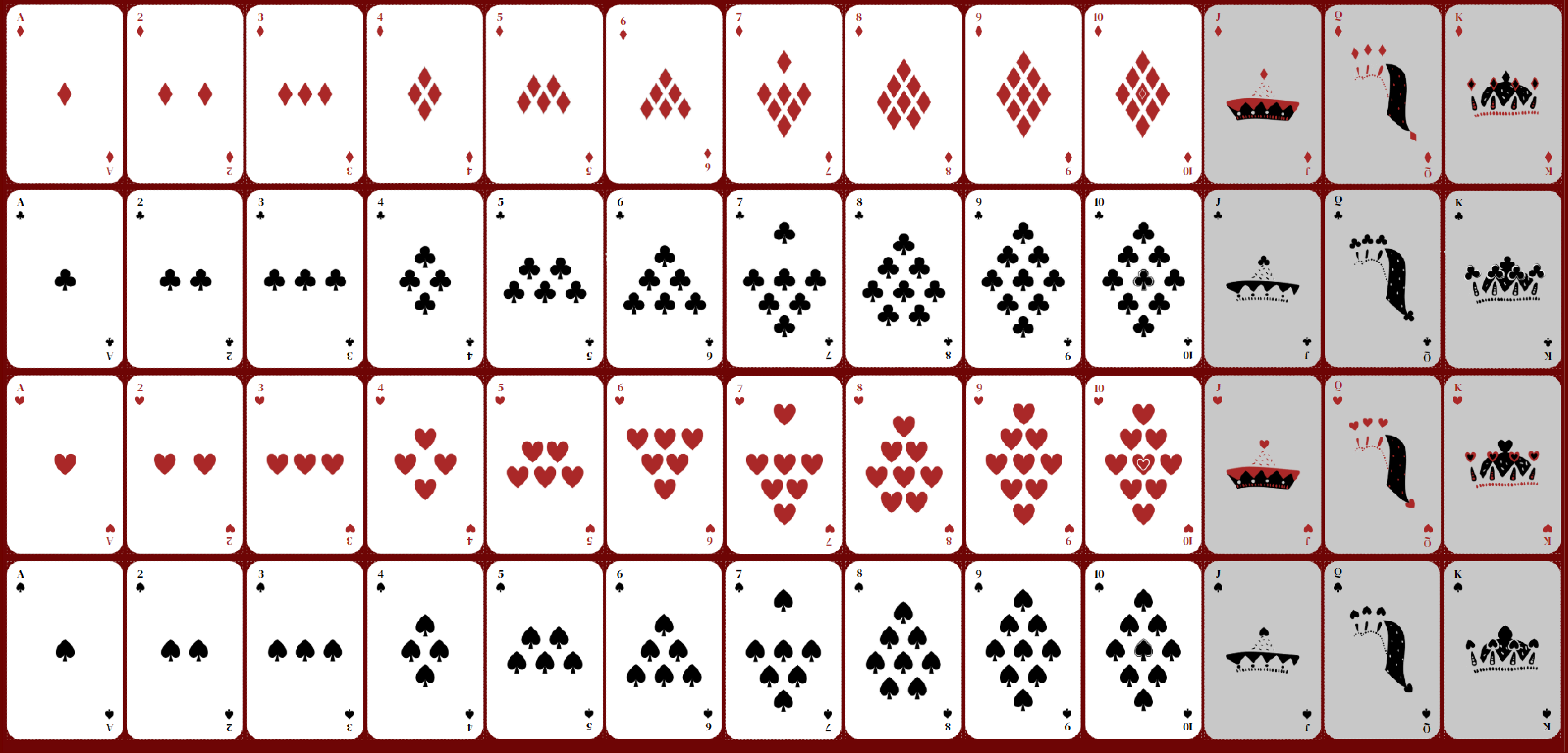


$$P(\text{hearts}) = \frac{\#\text{ of hearts}}{52} = \frac{13}{52} = \frac{1}{4} = 0.25 = 25\%$$

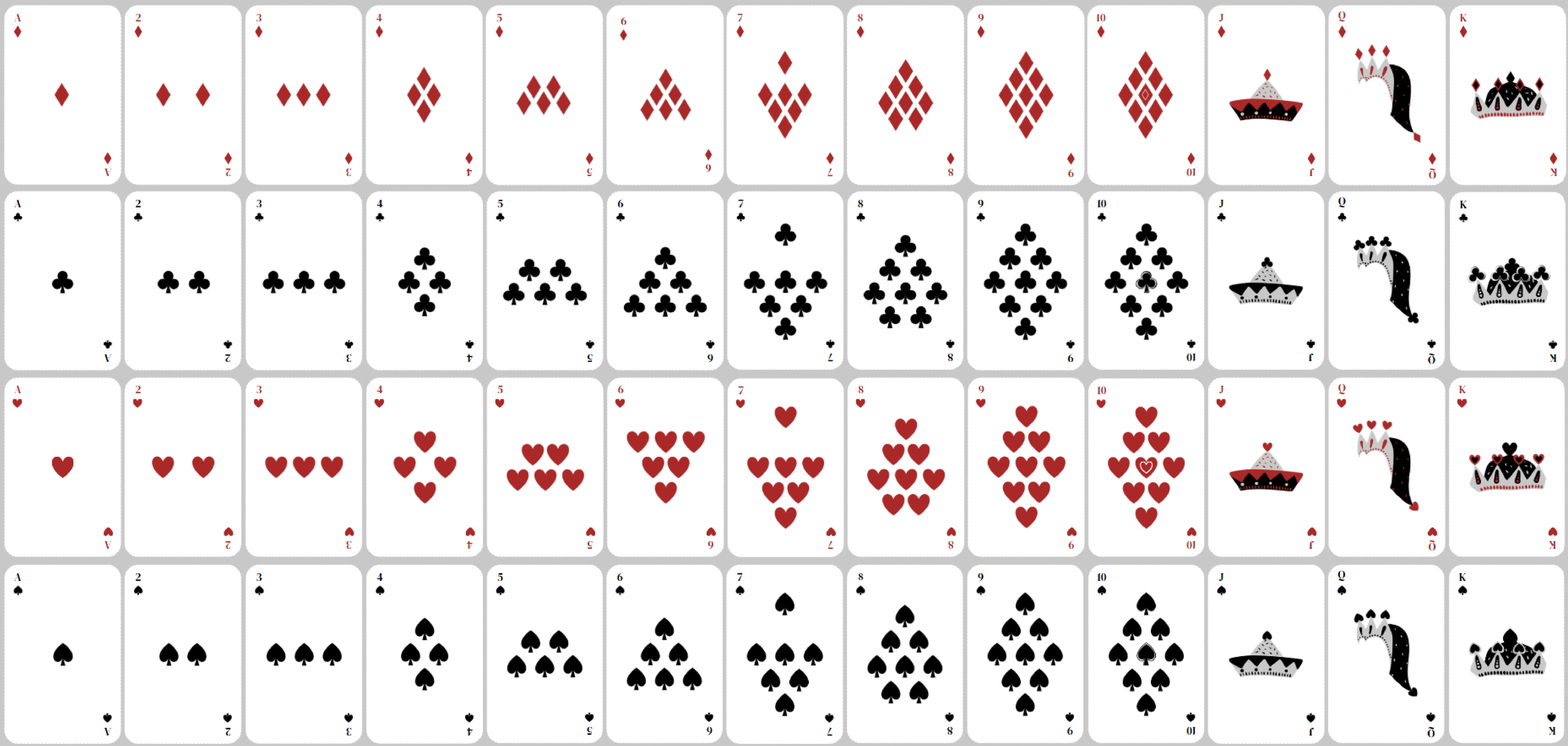


What is the theoretical probability of picking a **royal card**?

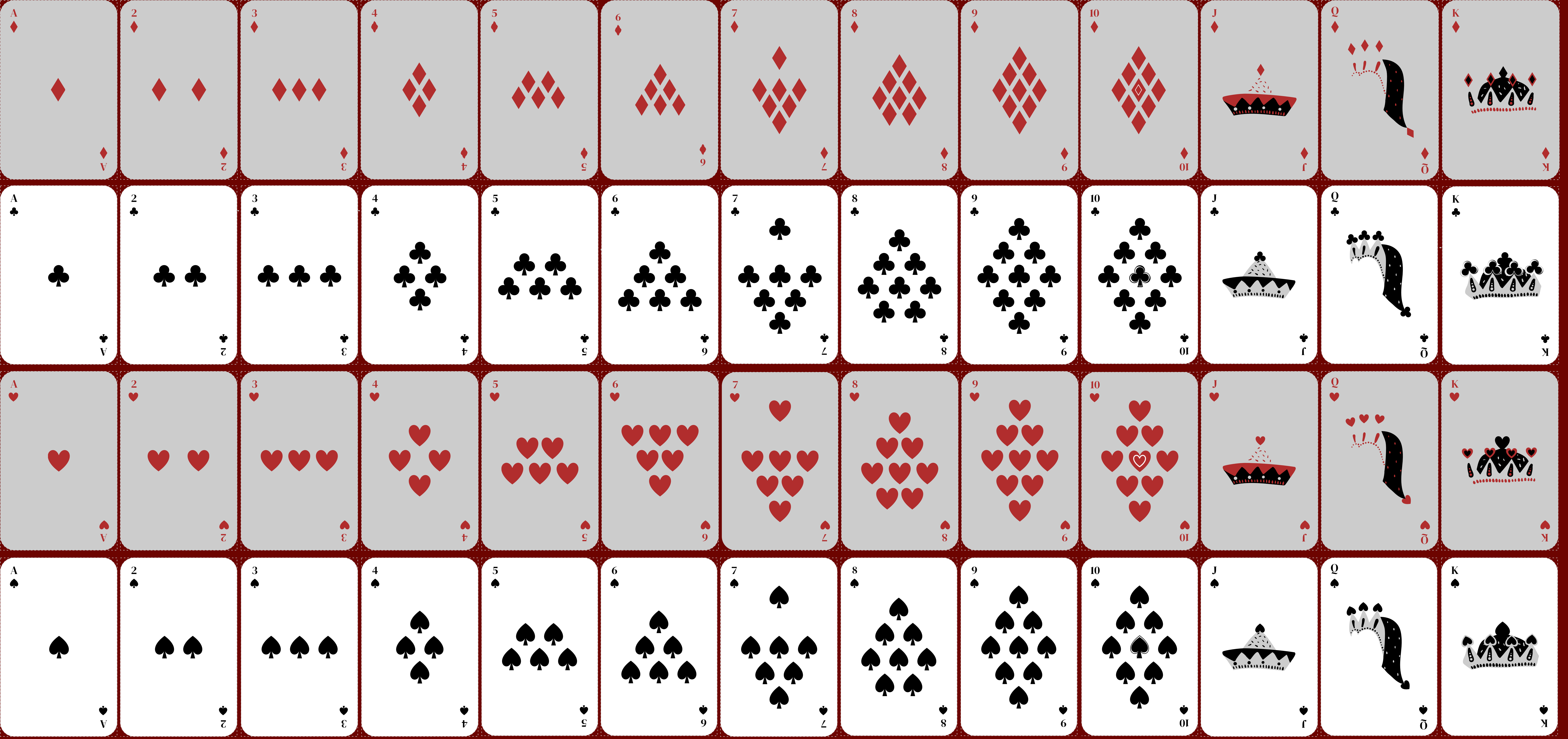

A 2 3 4 5 6 7 8 9 10 J Q K
A 2 3 4 5 6 7 8 9 10 J Q K
A 2 3 4 5 6 7 8 9 10 J Q K
A 2 3 4 5 6 7 8 9 10 J Q K

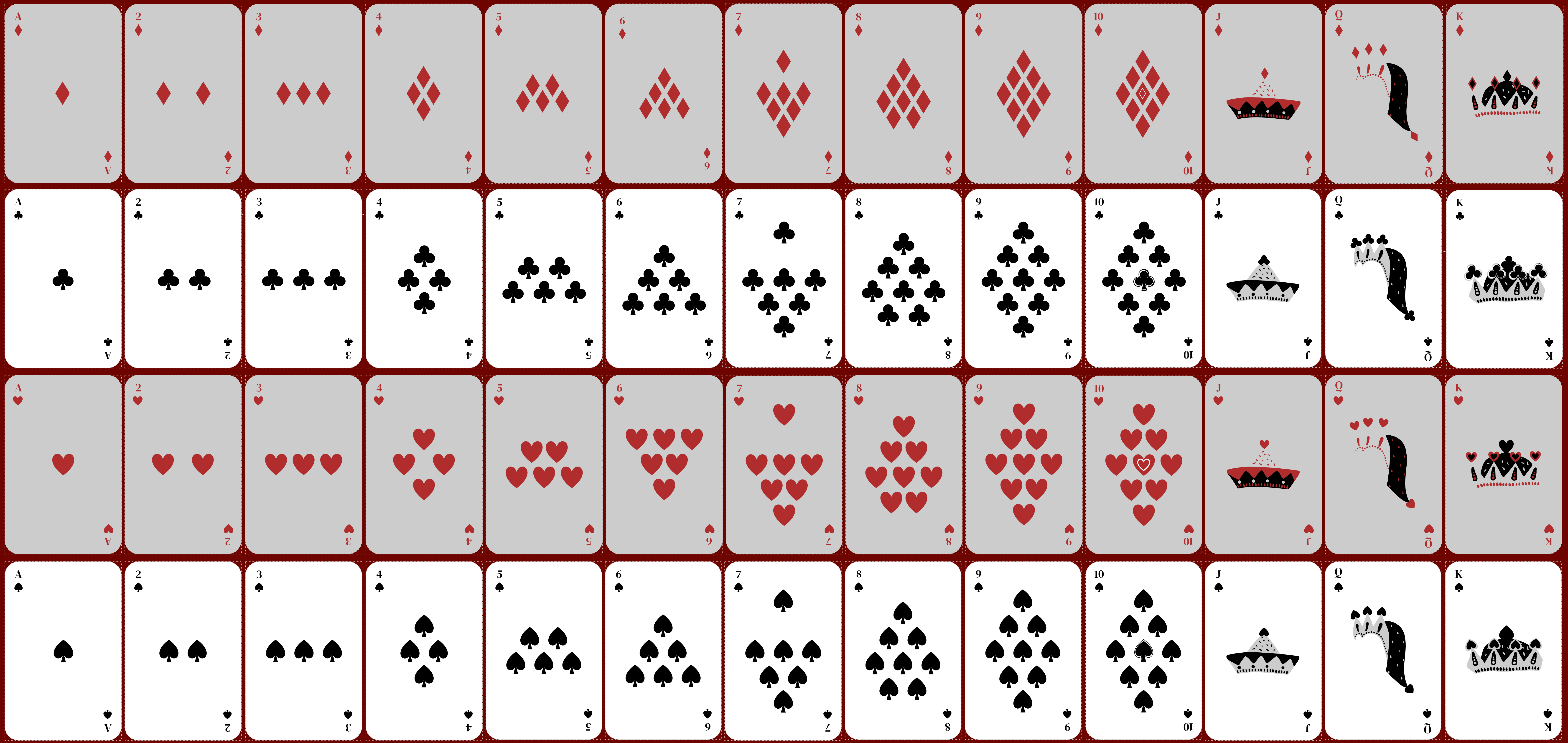


$$P(\text{royal}) = \frac{\text{\# of royals}}{52} = \frac{12}{52} = \frac{3}{13} = 0.23 = 23\%$$



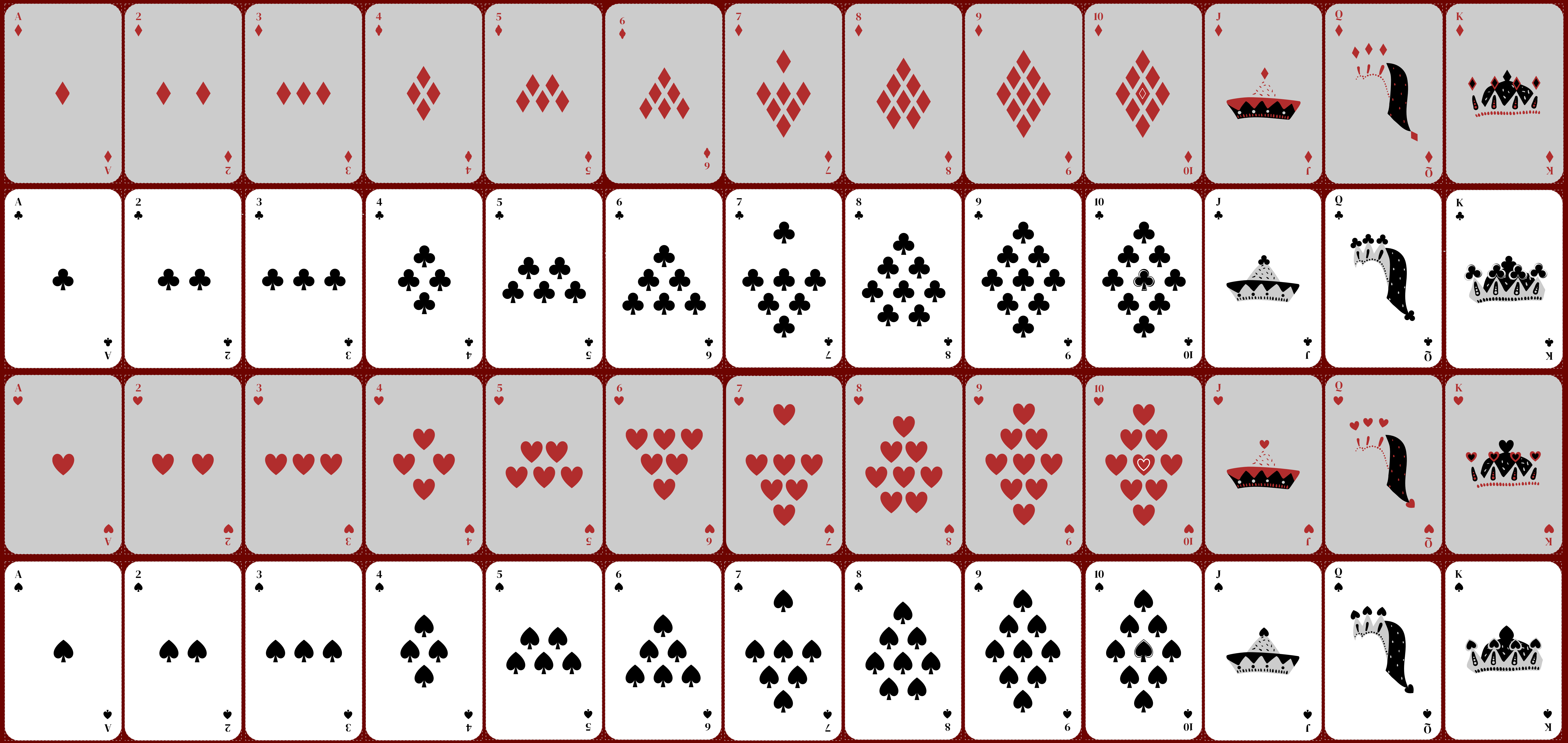
Is it more likely to pick a red card or a black card?


A 2 3 4 5 6 7 8 9 10 J Q K
A 2 3 4 5 6 7 8 9 10 J Q K
A 2 3 4 5 6 7 8 9 10 J Q K
A 2 3 4 5 6 7 8 9 10 J Q K



$$P(\text{red}) = \frac{1}{2} = 0.50 = 50\%$$

$$P(\text{black}) = \frac{1}{2} = 0.50 = 50\%$$



Therefore, it is **equally likely** to pick a red card as it is to pick a black card!

Compound Probability

The probability of a combination of events occurring.

Examples?

What is the theoretical probability of picking a 4, putting it back, and then picking a royal card?

What is the theoretical probability of picking a 4, taking it out, then picking a royal card?

What is the theoretical probability of picking a 4 or a royal card?

What is the theoretical probability of picking a 7 or a red card?

Q ♥

What is the theoretical probability of picking a 4, **putting it back**, and then picking a royal card?

Q ♥

Q ♥

What is the theoretical probability of picking a 4, **taking it out**, then picking a royal card?

Q ♥

Q ♥

What is the theoretical probability of picking a 4 **or** a royal card?

Q ♥

Q ♥

What is the theoretical probability of picking a 7 **or** a red card?

Q ♥

J ♠

Independent events

P(A and B) =
P(A) x P(B)

J ♠

J ♠

Dependent events

P(A and B) =
P(A) x P(B after A)

J ♠

J ♠

Mutually exclusive events

P(A or B) =
P(A) + P(B)

J ♠

J ♠

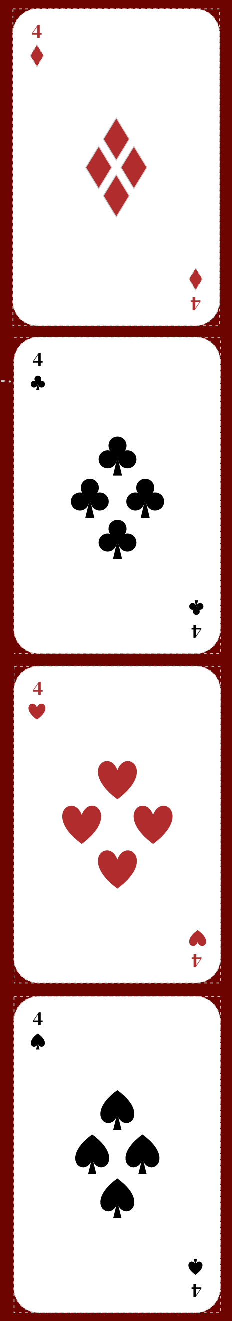
Inclusive events

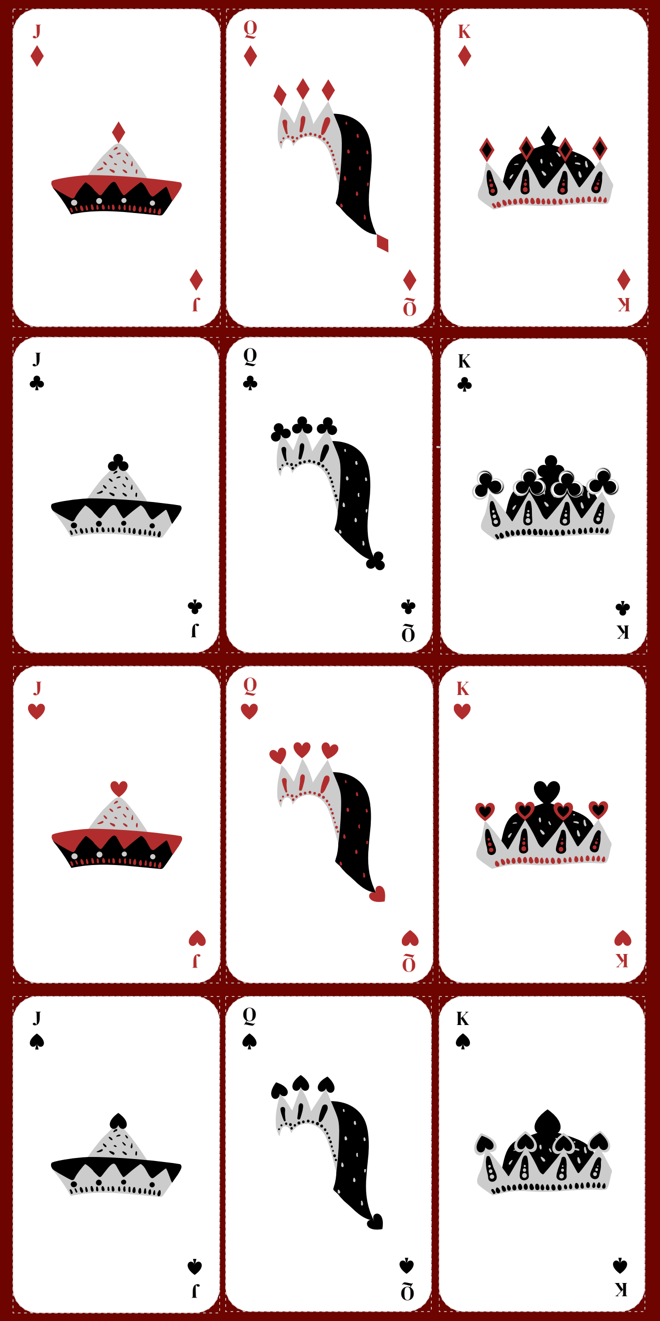
P(A or B) =
P(A) + P(B) - P(A and B)

J ♠

Theoretical probability of picking a 4, putting it back, and then picking a royal card (independent events)

$$P(A \text{ and } B) = P(A) \times P(B)$$



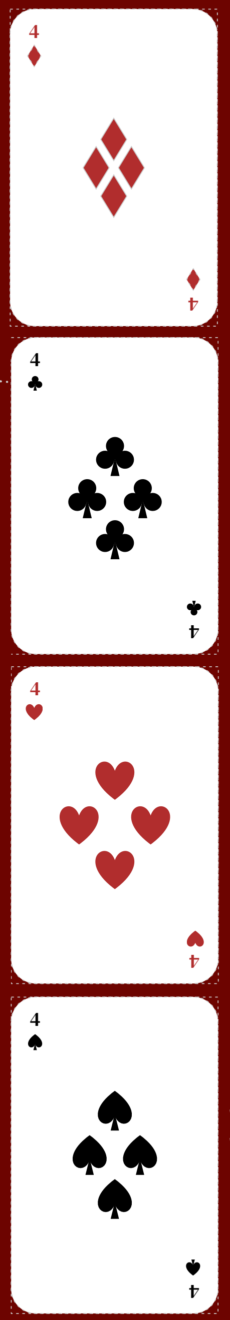


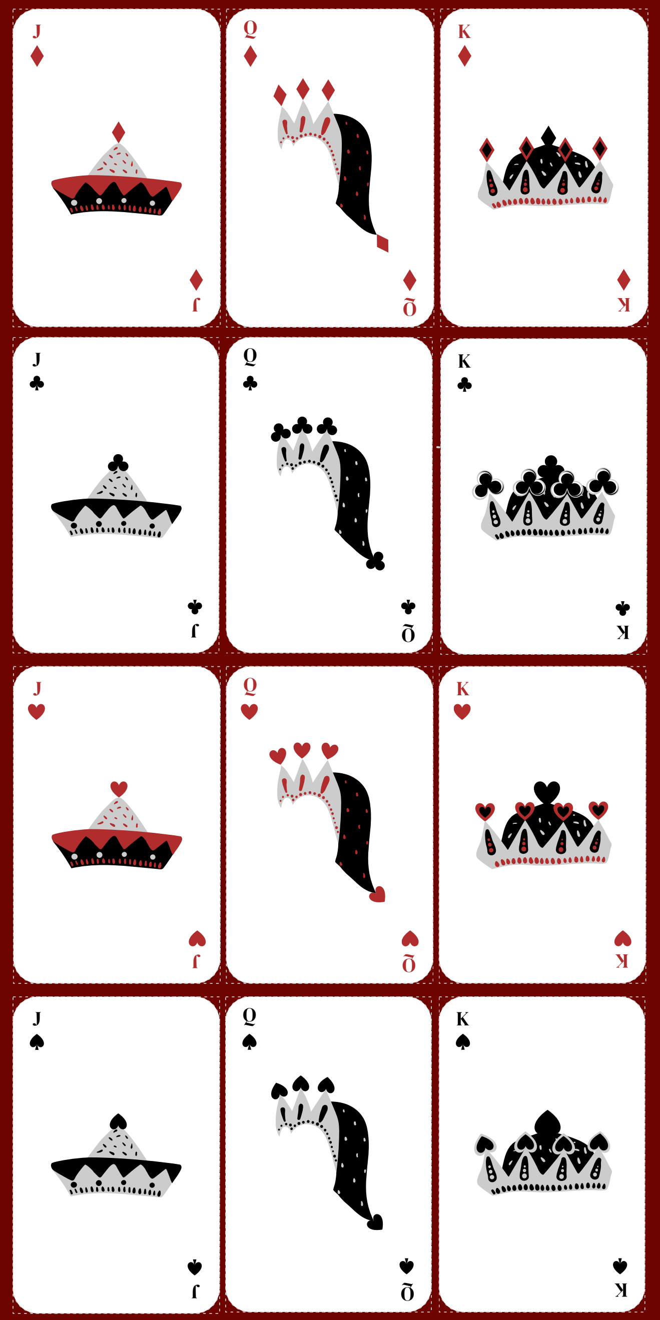
Theoretical probability of picking a 4, putting it back, and then picking a royal card (independent events)

$$
\begin{aligned}
P(A \text{ and } B) &= P(A) \times P(B) \\
&= P(4) \times P(\text{royal}) \\
&= \frac{4}{52} \times \frac{12}{52} \\
&= \frac{1}{13} \times \frac{3}{13} \\
&= \frac{3}{169} \\
&= 0.018 \\
&= 1.8\%
\end{aligned}
$$

Theoretical probability of picking a 4, taking it out, then picking a royal card (dependent events)

$$P(A \text{ and } B) = P(A) \times P(B \text{ after } A)$$





Theoretical probability of picking a 4, taking it out, then picking a royal card (dependent events)

$$P(A \text{ and } B) = P(A) \times P(B \text{ after } A)$$

$$= P(4) \times P(\text{royal after picking a } 4)$$

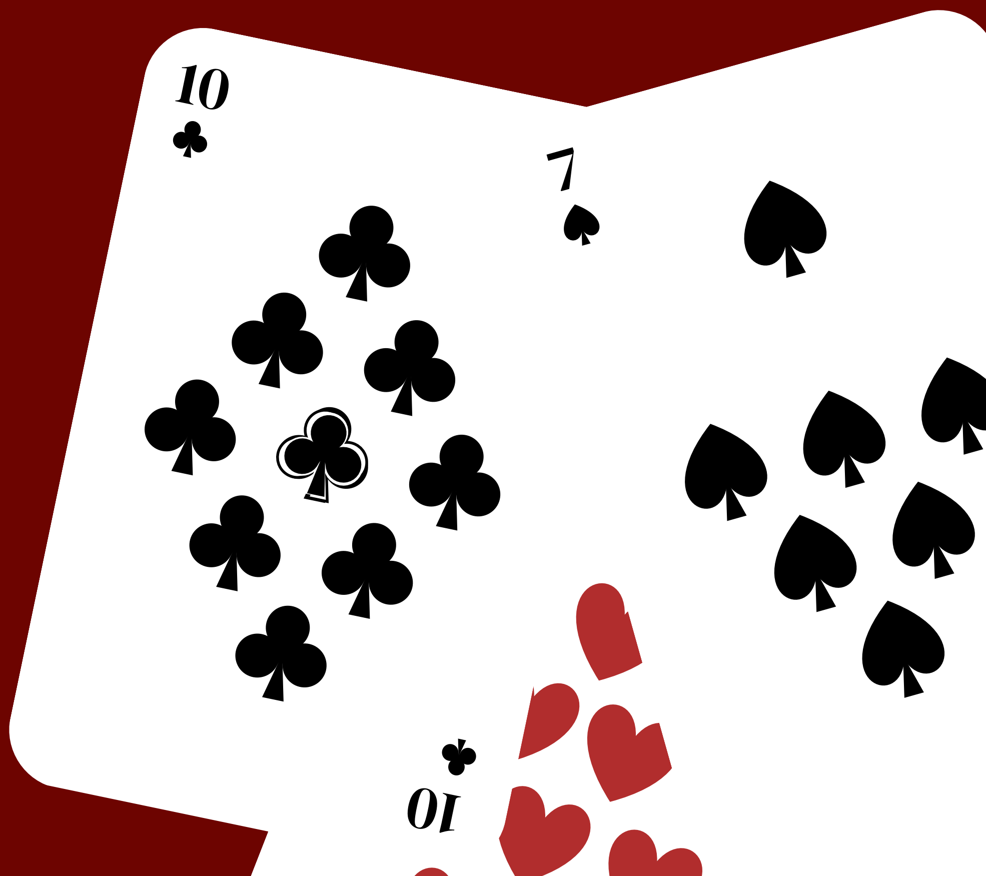
$$= \frac{4}{52} \times \frac{12}{51}$$

$$= \frac{1}{13} \times \frac{12}{51}$$

$$= \frac{12}{663}$$

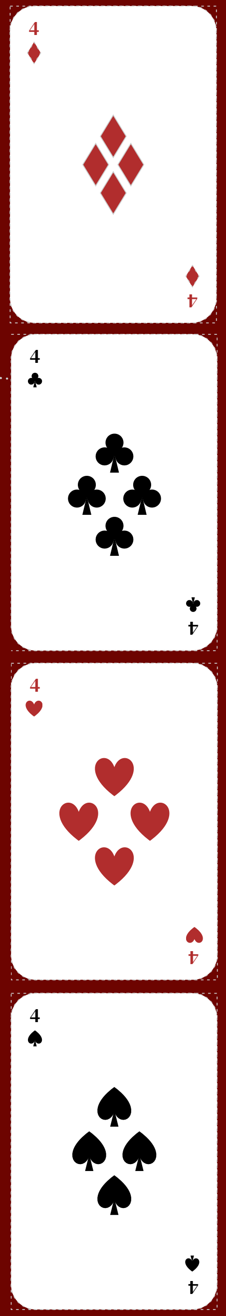
$$= 0.018$$

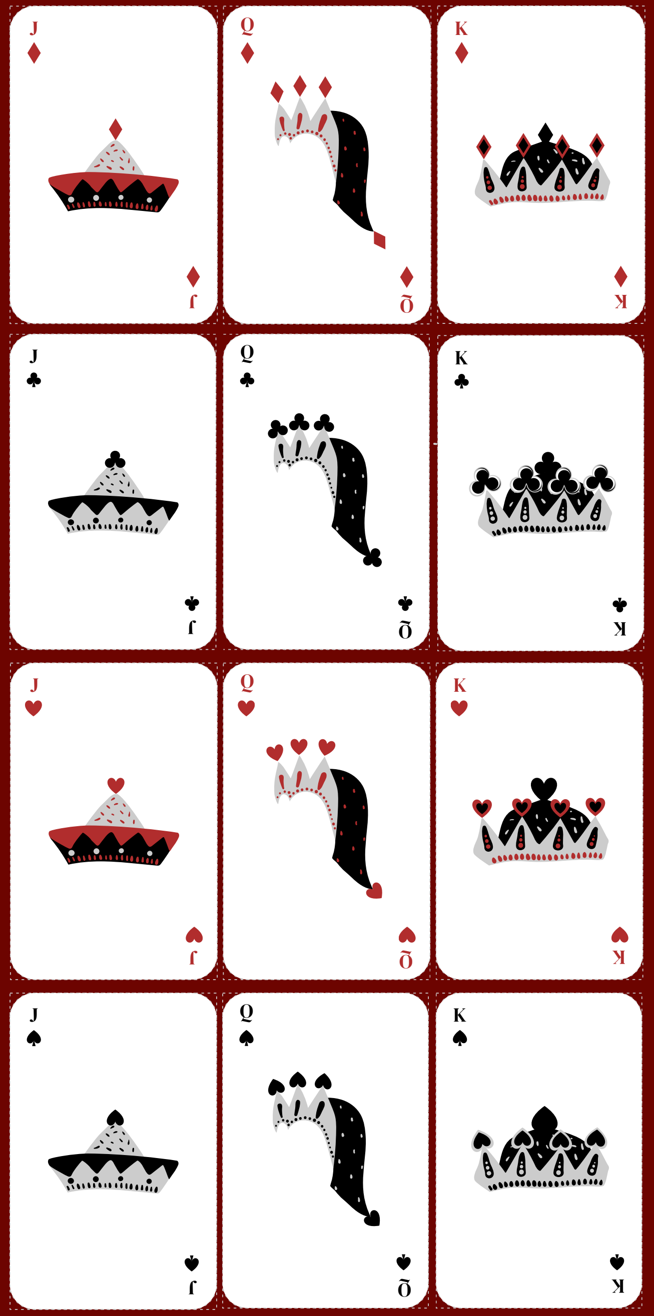
$$= 1.8\%$$



Theoretical probability of picking a 4 or a royal card (mutually exclusive events)

$$P(A \text{ or } B) = P(A) + P(B)$$



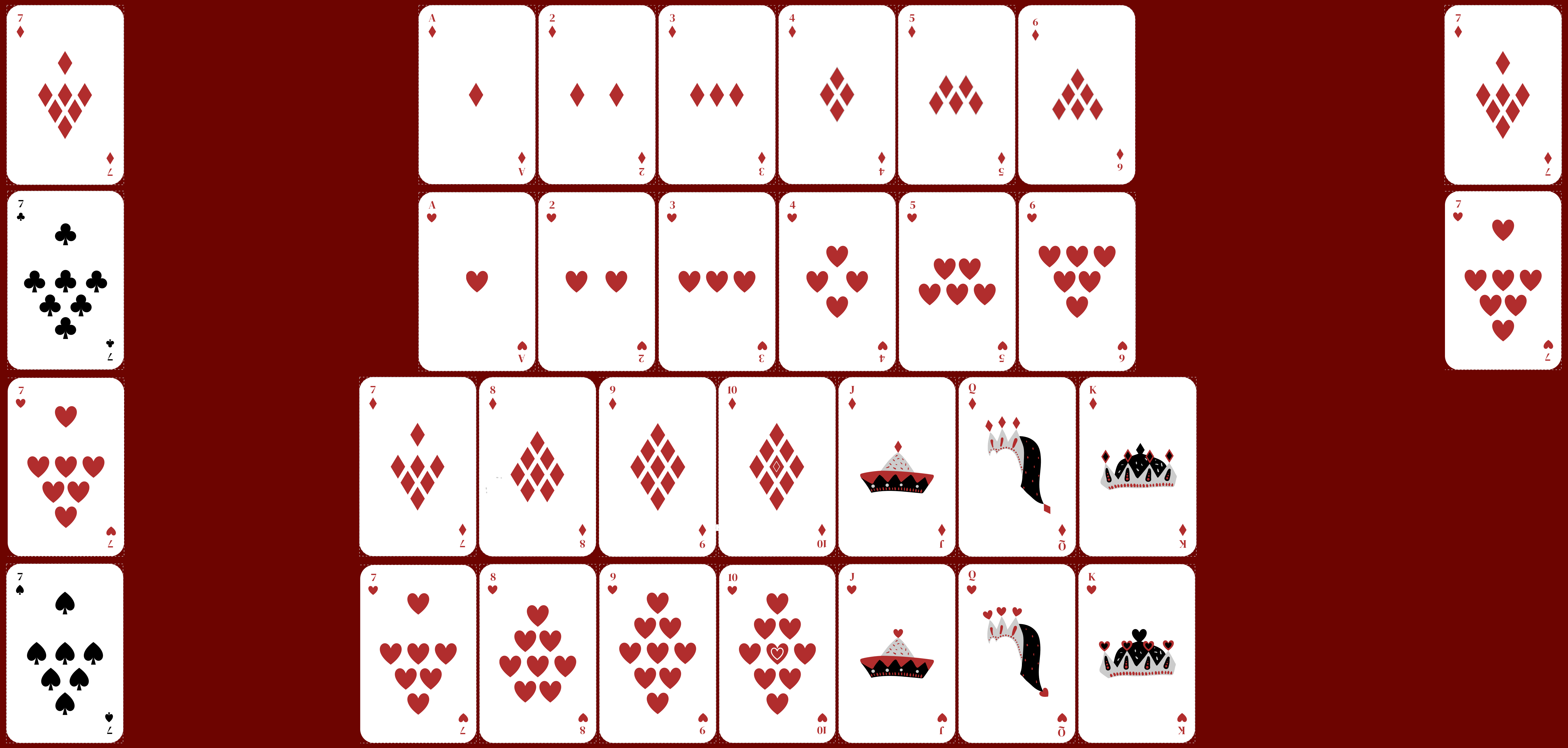


Theoretical probability of picking a 4 or a royal card (mutually exclusive events)

$$
\begin{aligned}
P(A \text{ or } B) &= P(A) + P(B) \\
&= P(4) + P(\text{royal}) \\
&= \frac{4}{52} + \frac{12}{52} \\
&= \frac{16}{52} \\
&= \frac{4}{13} \\
&= 0.31 \\
&= 31\%
\end{aligned}
$$

Theoretical probability of picking a 7 or a red card (inclusive events)

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$



Theoretical probability of picking a 7 or a red card (inclusive events)

$$
\begin{aligned}
P(A \text{ or } B) &= P(A) + P(B) - P(A \text{ and } B) \\
&= P(7) + P(\text{red}) - P(\text{red } 7) \\
&= \frac{4}{52} + \frac{26}{52} - \frac{2}{52} \\
&= \frac{28}{52} \\
&= \frac{7}{13} \\
&= 0.54 \\
&= 54\%
\end{aligned}
$$

Q ♥

What is the theoretical probability of picking a card of diamonds or an odd number?

J ♠

Independent events

P(A and B) = P(A) x P(B)

J ♠

Dependent events

P(A and B) = P(A) x P(B after A)

J ♠

Mutually exclusive events

P(A or B) = P(A) + P(B)

J ♠

Inclusive events

P(A or B) = P(A) + P(B) - P(A and B)

Q ♥

What is the theoretical probability of picking a card of diamonds or an odd number?

J ♠

Inclusive events

P(A or B) =
P(A) + P(B) - P(A and B)


PROBABILITY
BASIC PROBABILITY
PROBABILITY OF INDEPENDENT EVENTS
PROBABILITY OF COMPOUND EVENTS
Classical Probability
Theoretical vs Experimental Probability
Bill Nye : Probability
2+2=4
Handouts
Tree Diagrams
Deck of Cards
S K U N K
Chance - 20 Sider
Ch. #4 - pp 113-143
Plinko Board
10100
Law of High Numbers
Practice Test
Probability
PLINKO the probability is right
Plinko Probability
PROBABILITY FAIR
Prob. Fair 2.0
Full Deck
High / Low 2.0
Probability POND
Prob. Pond
A card is chosen at random from a pack of playing cards.
6 Challenges!
Probability
Study Jams
Roulette!
Yahtzee!
Dice Race
SNAIL 7 WINS !!!
Snail Race
Snail Race
Coin Race
Probability
Coins & Dice
A probability simulator...
Simulator
Odds Spinner
Full Deck
PROBABILITY FAIR