Introduction à l’informatique CM6

Antonio E. Porreca
aeporreca.org/introinfo

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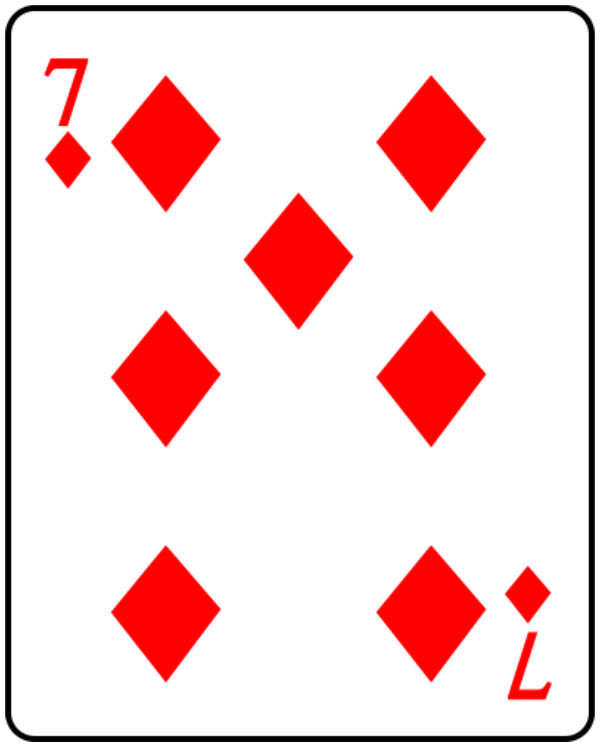

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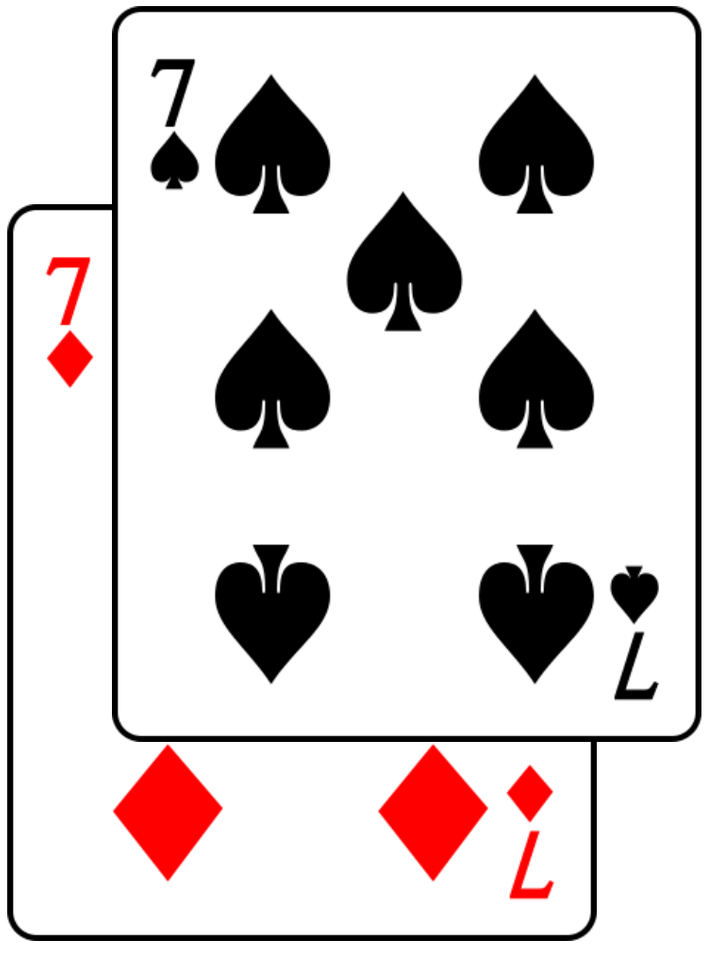

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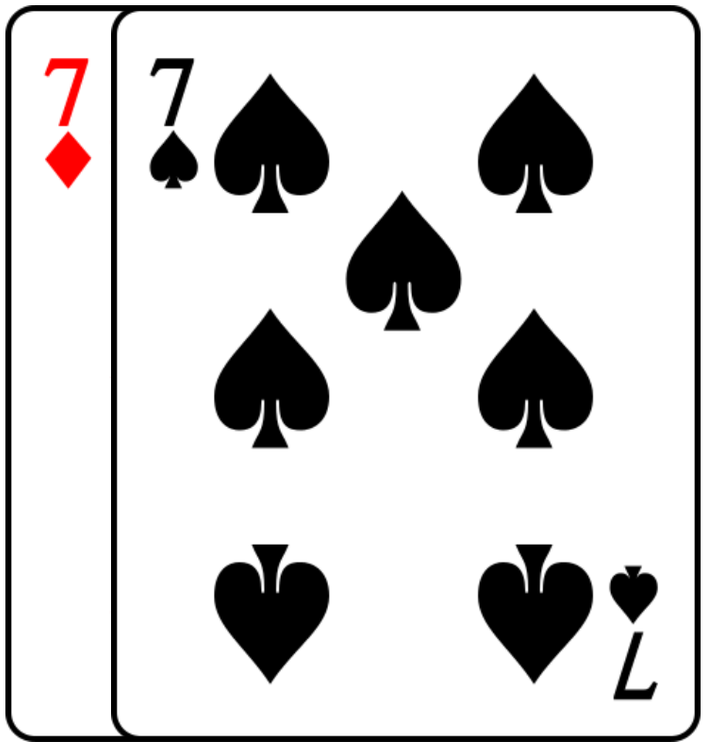

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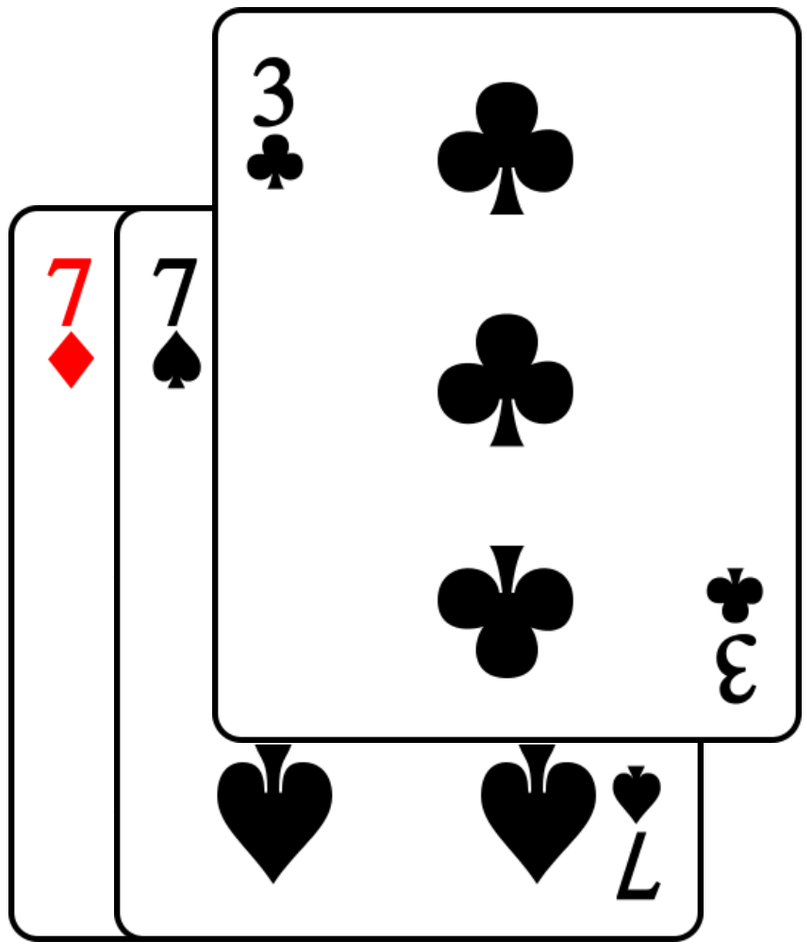

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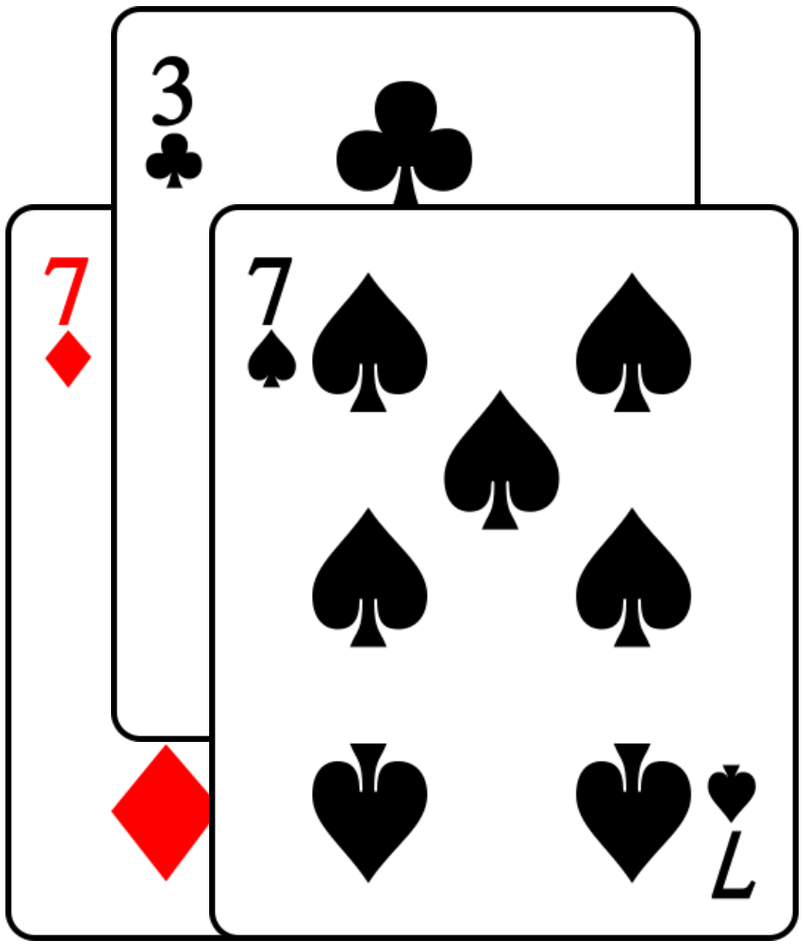

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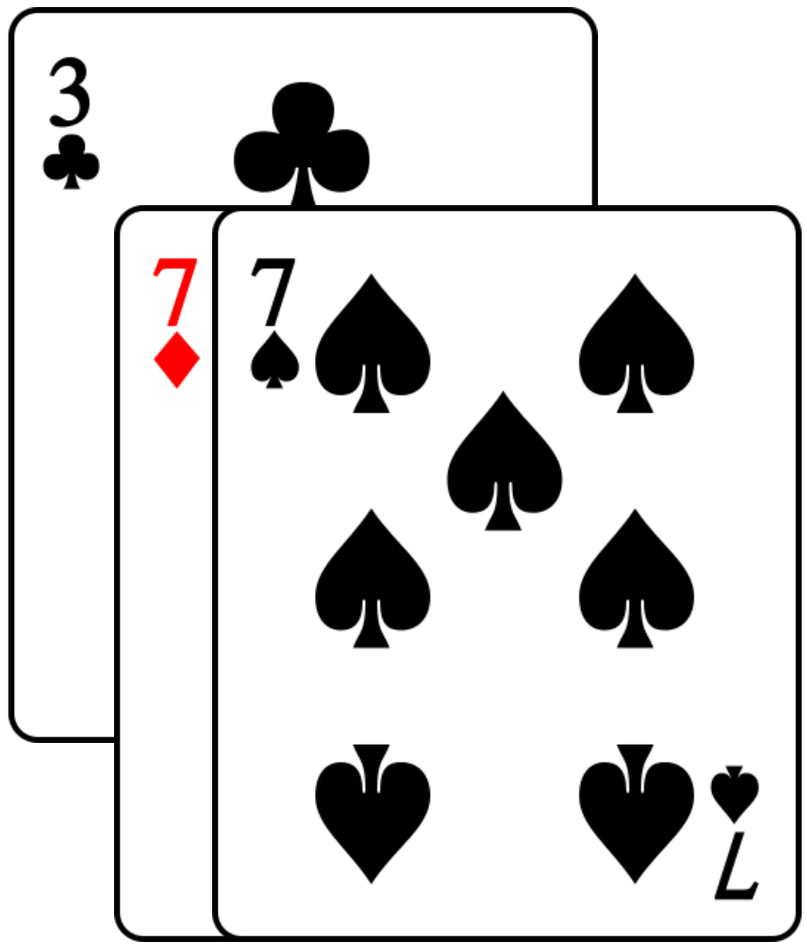

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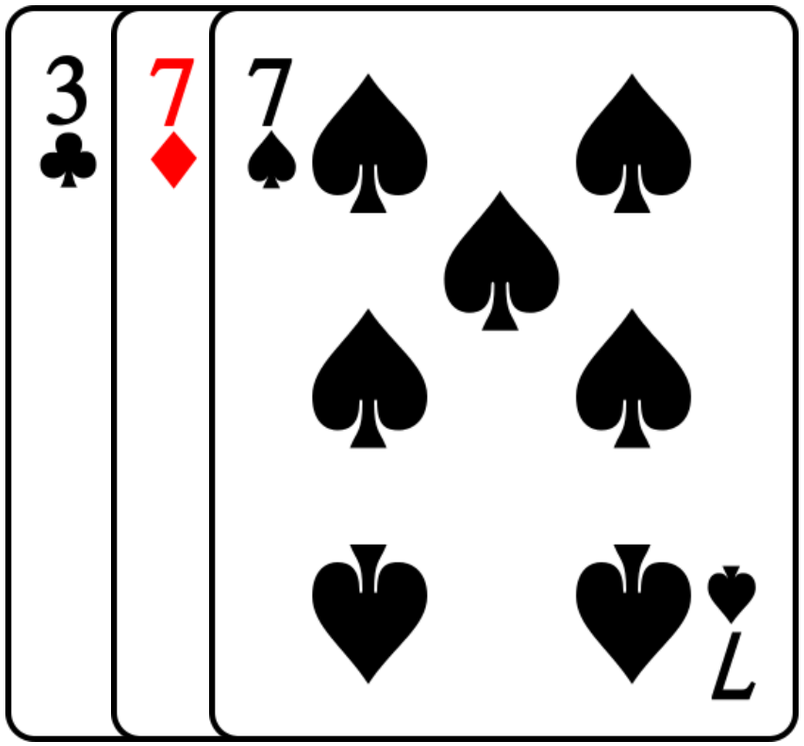

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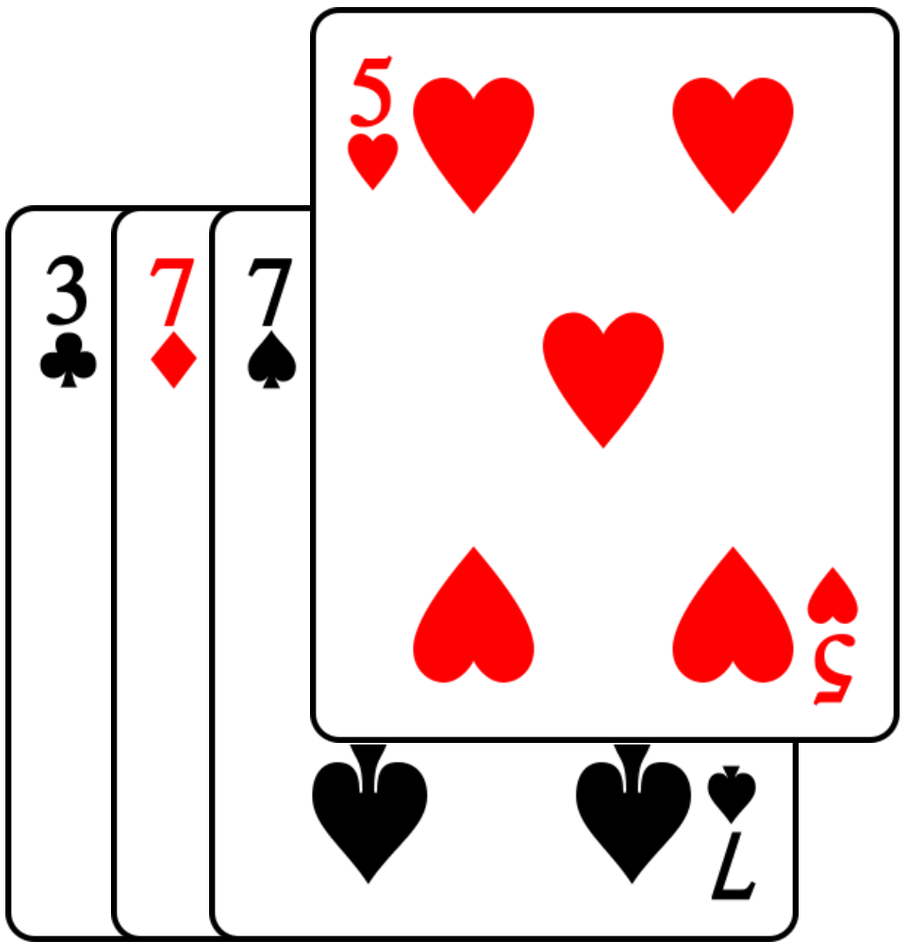

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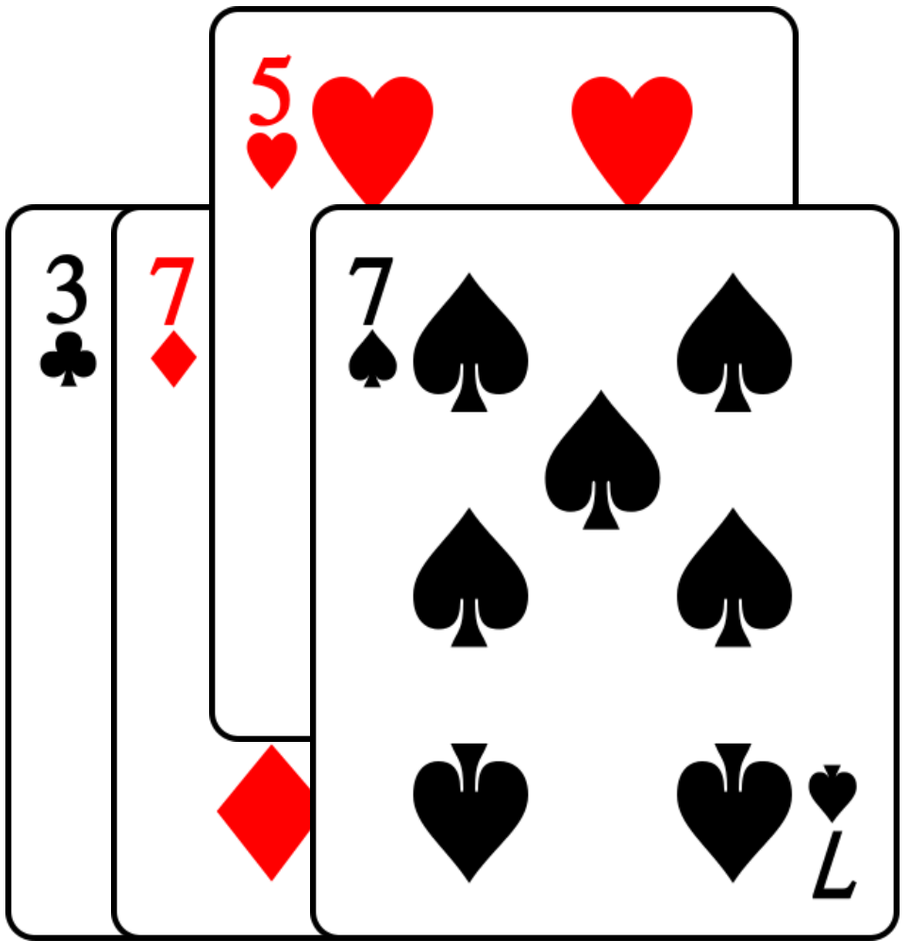

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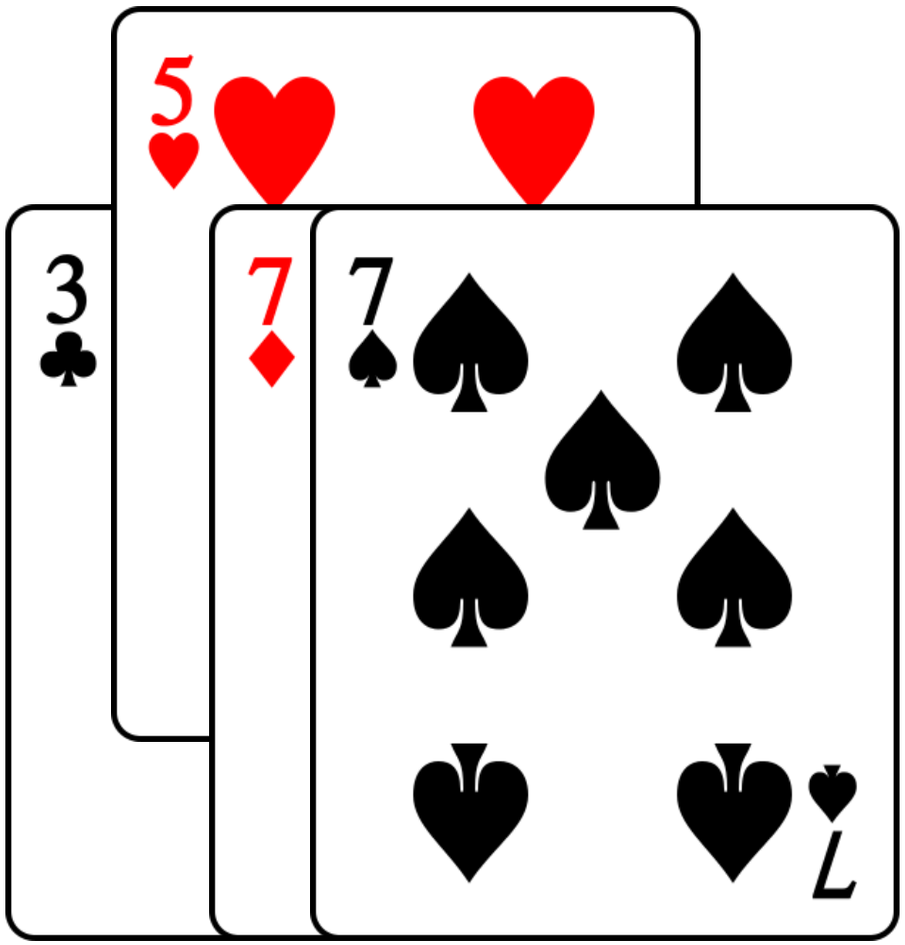

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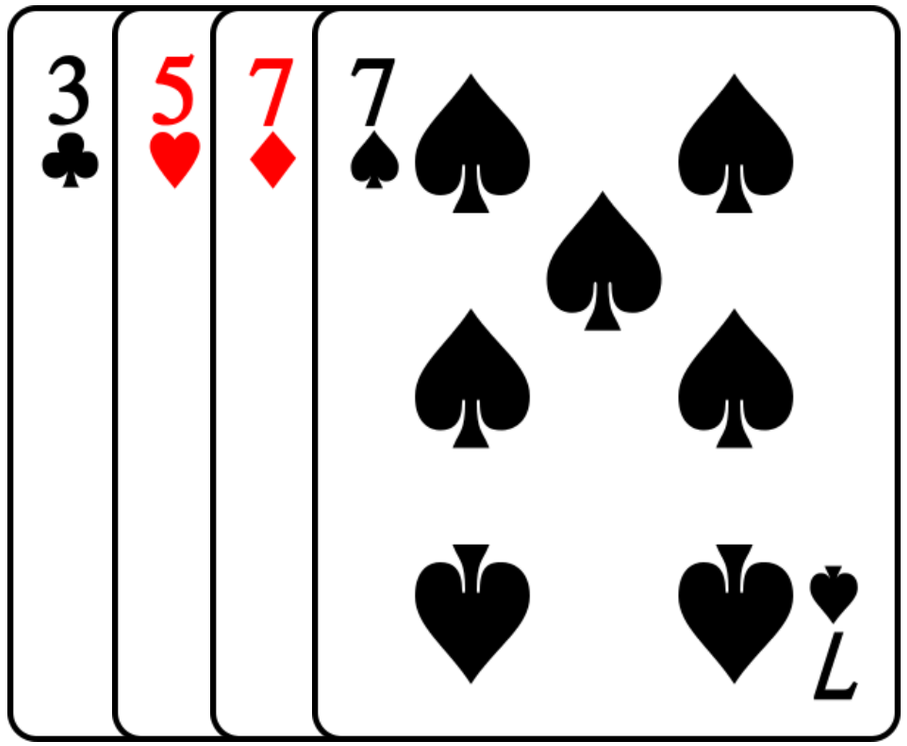

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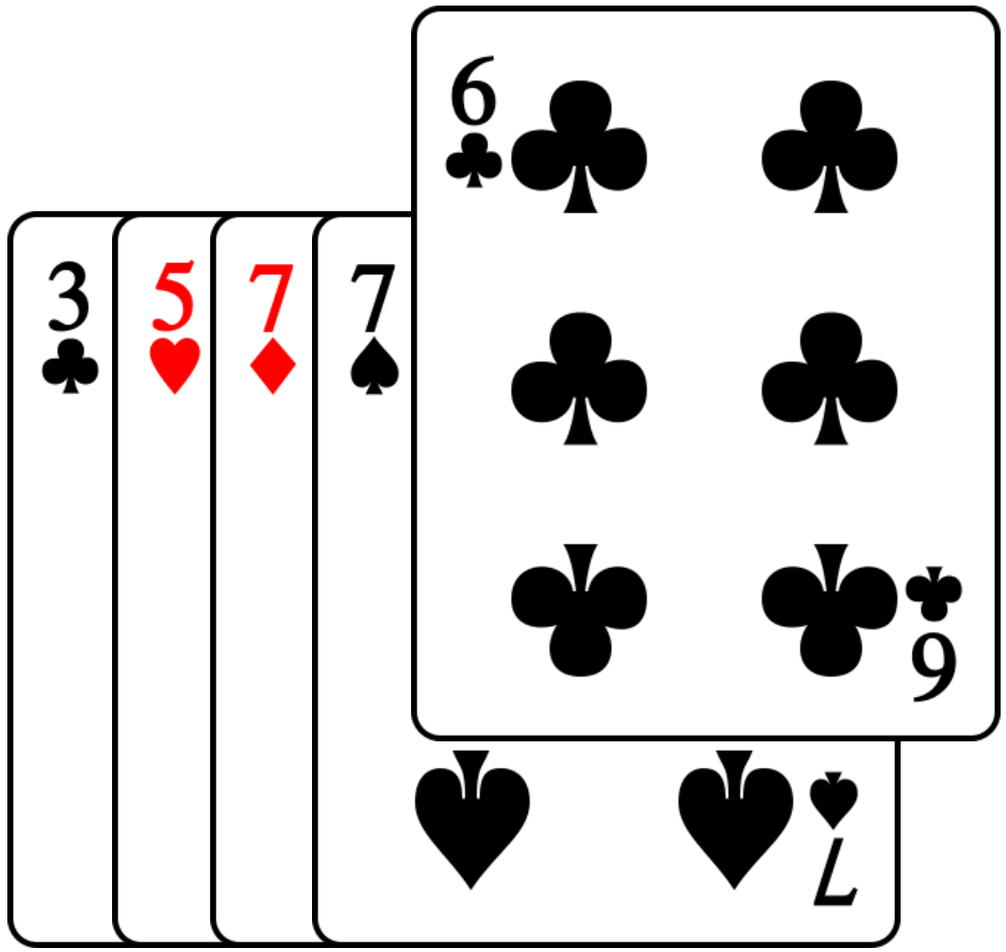

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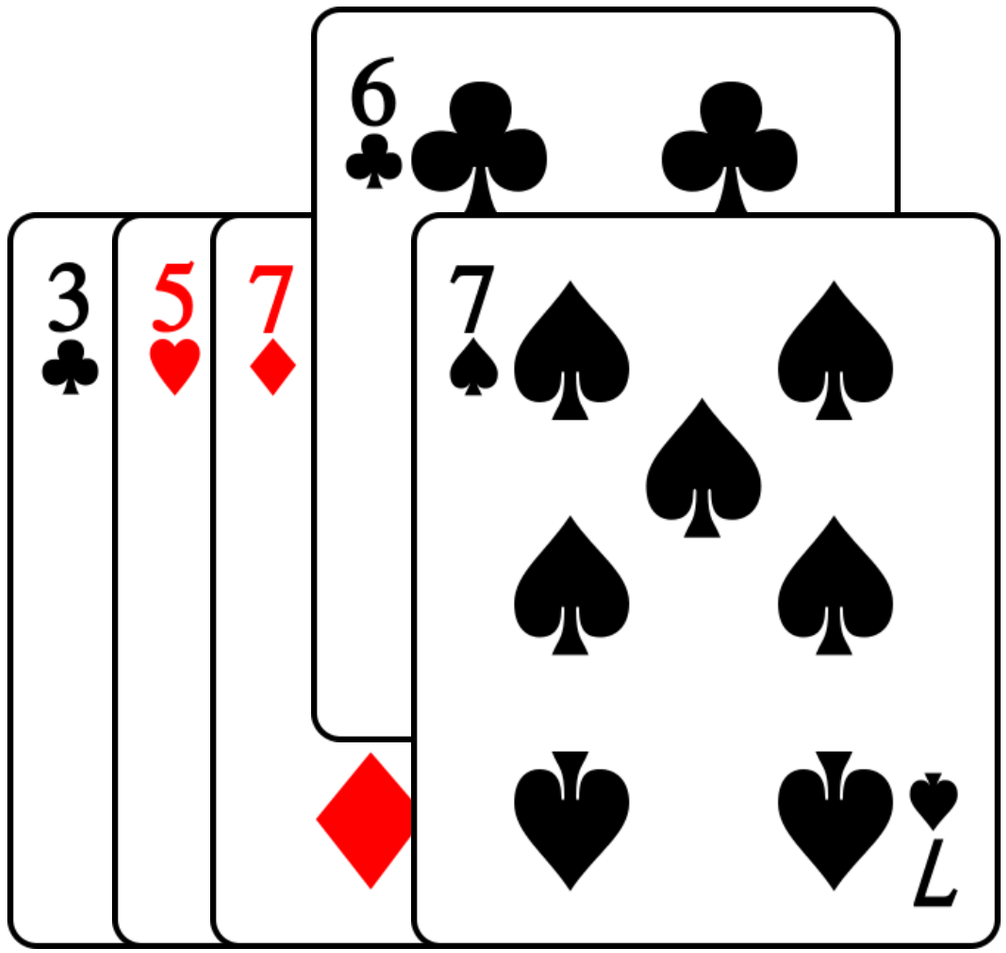

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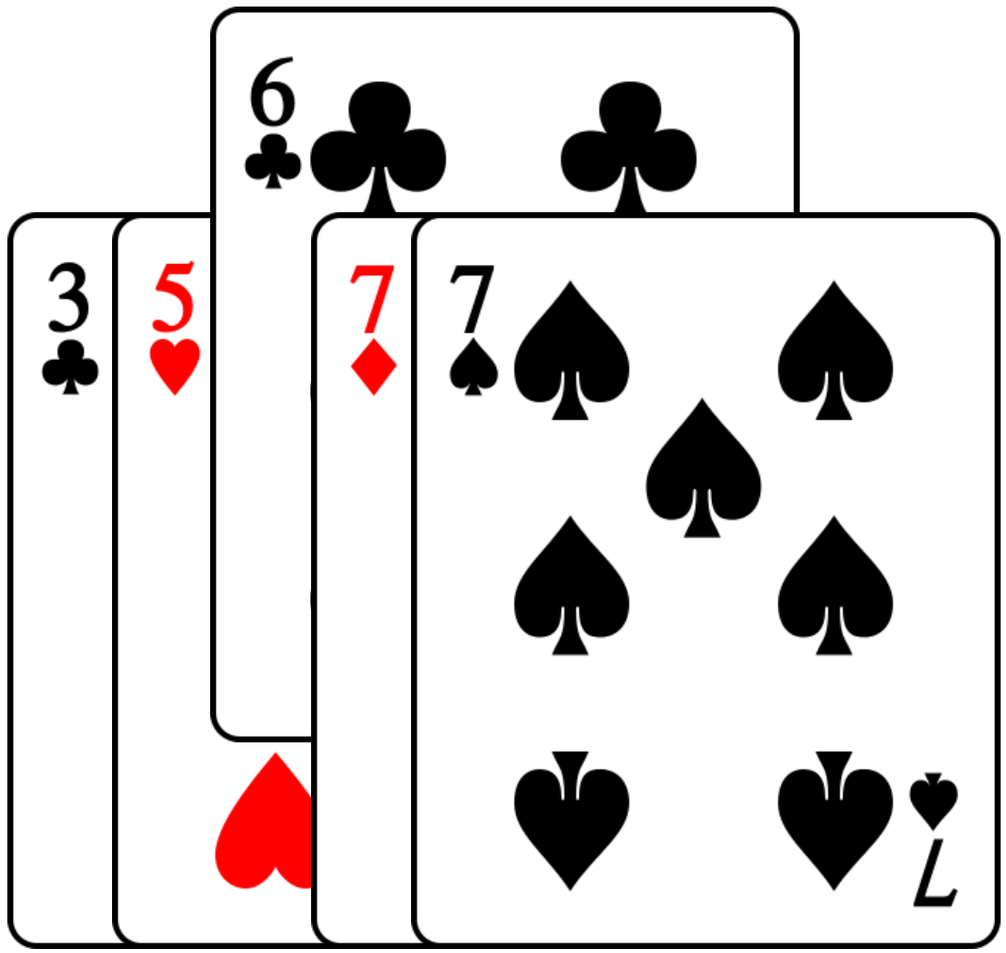

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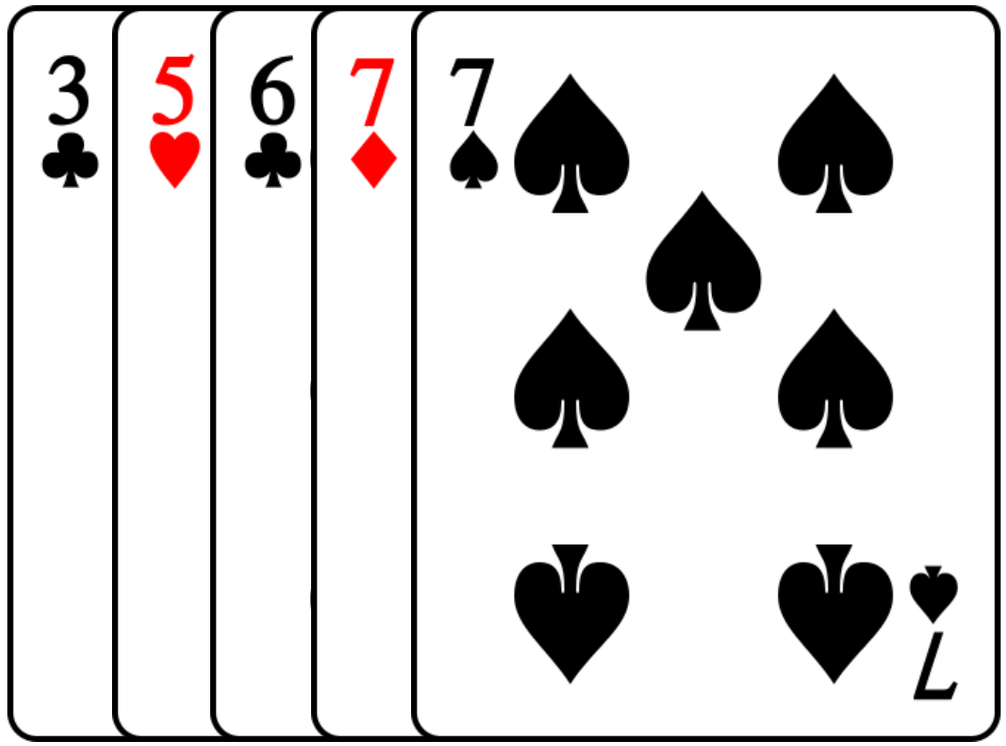
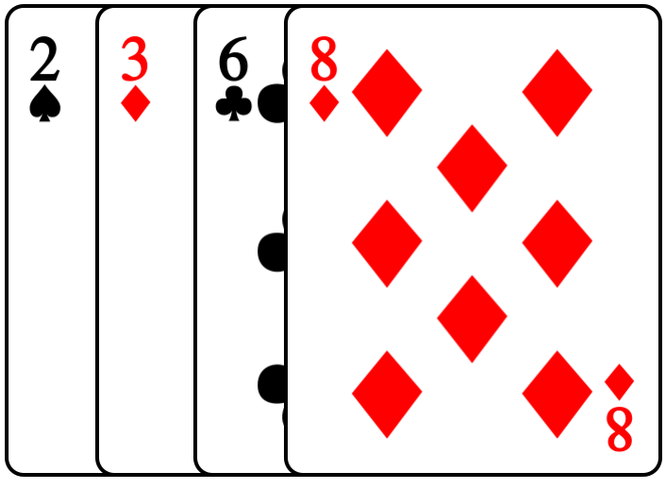
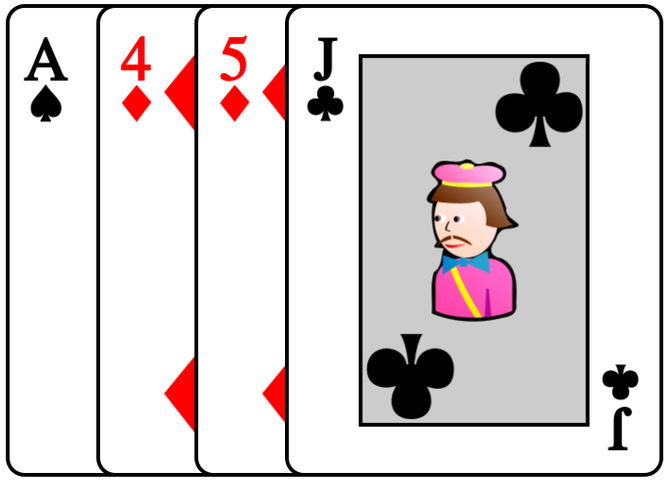


Est-ce qu’on peut faire mieux que ça ?

Fusion de tableaux triés





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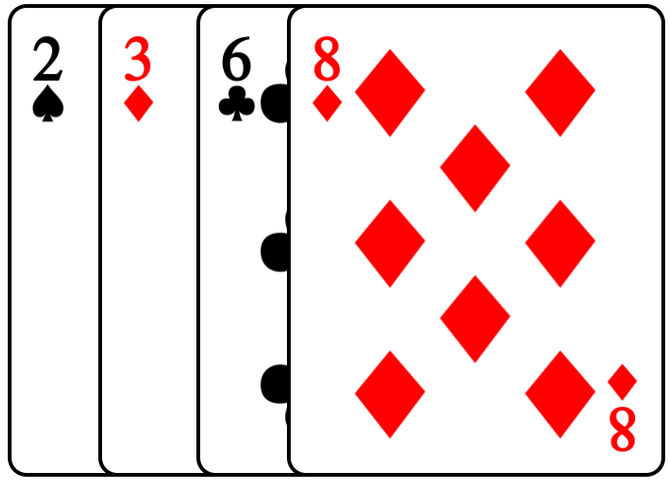

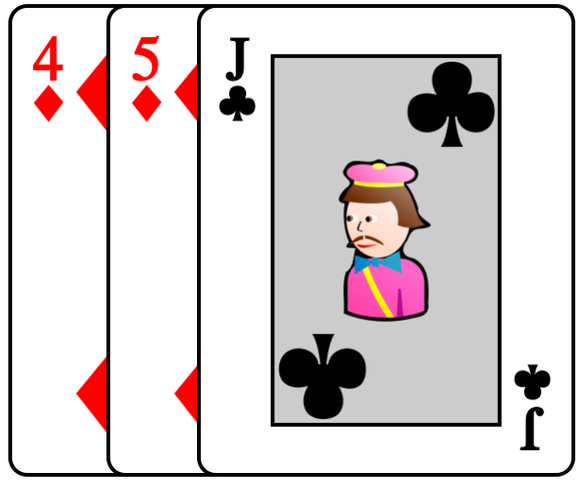

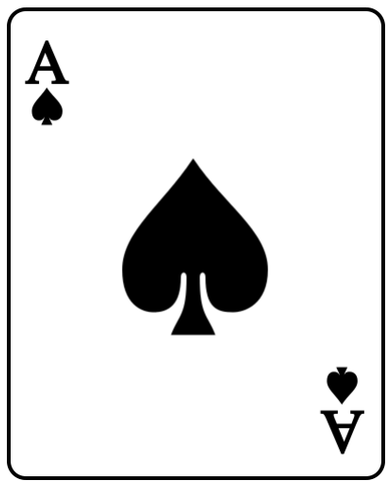

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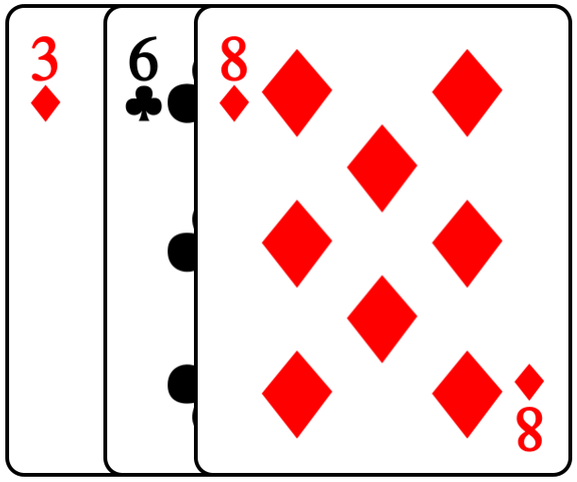

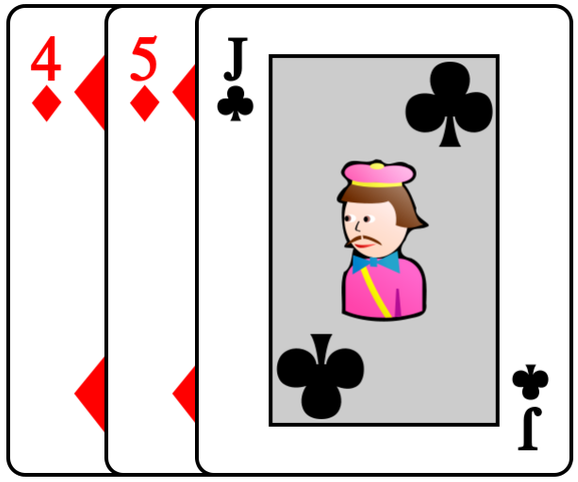

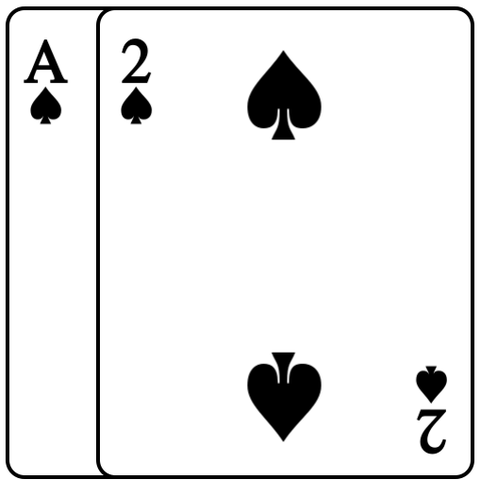

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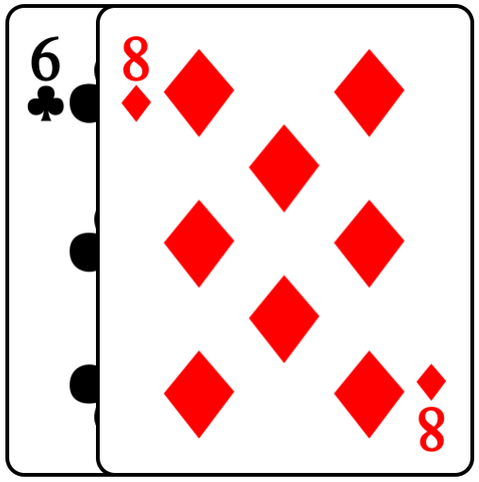

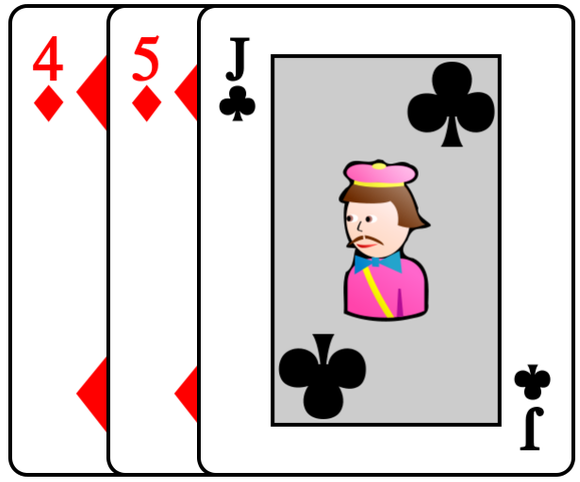

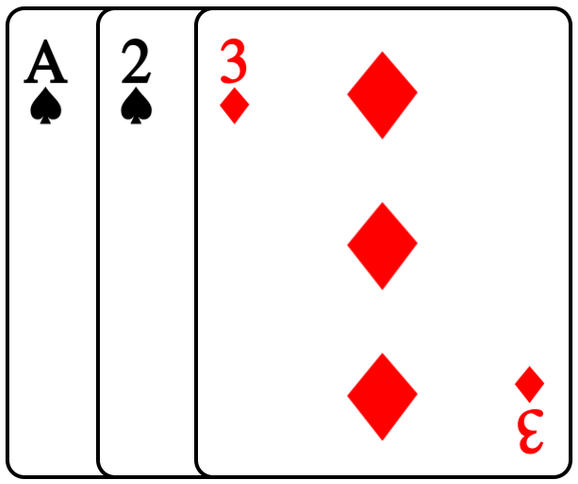

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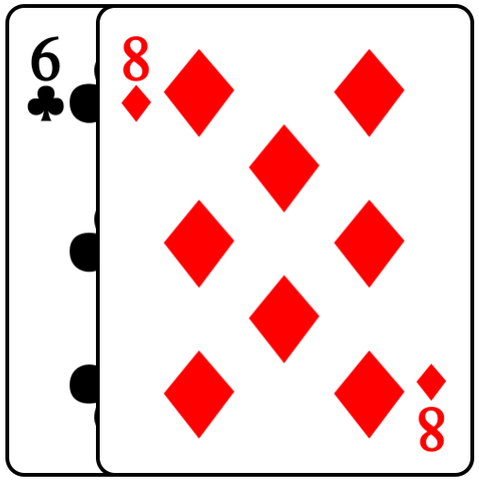

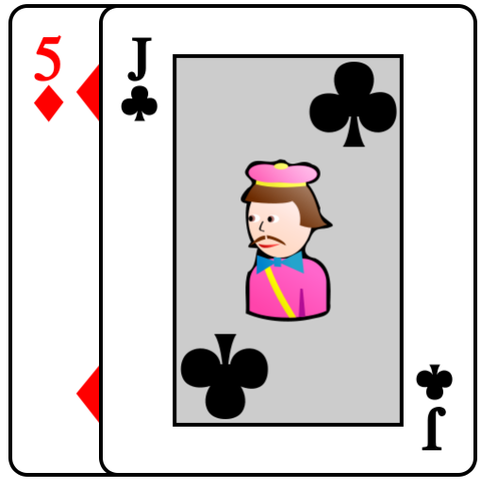

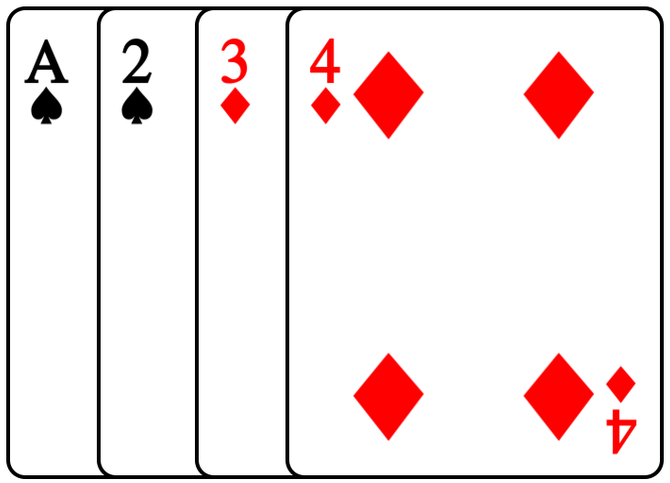

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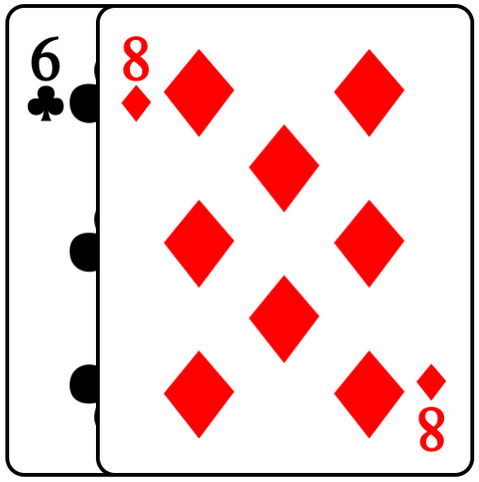

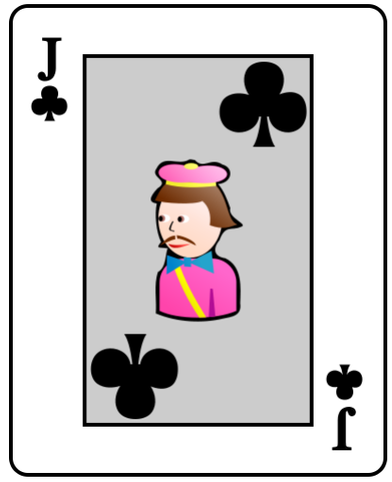

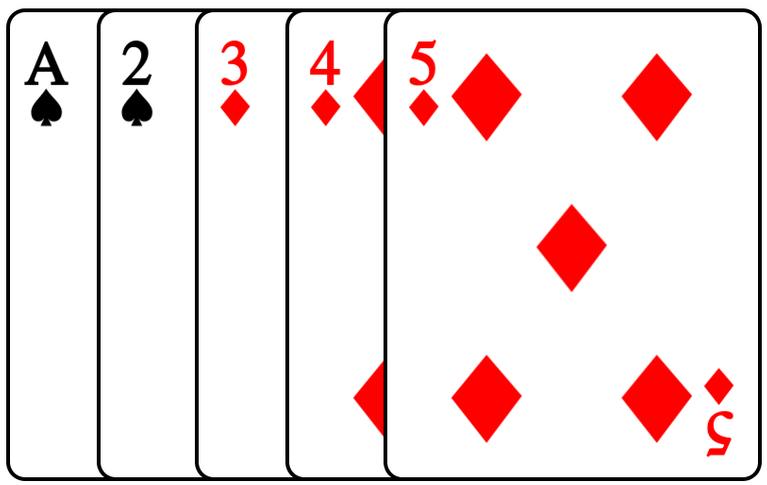

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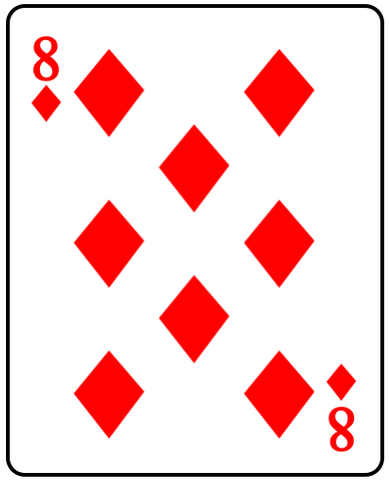

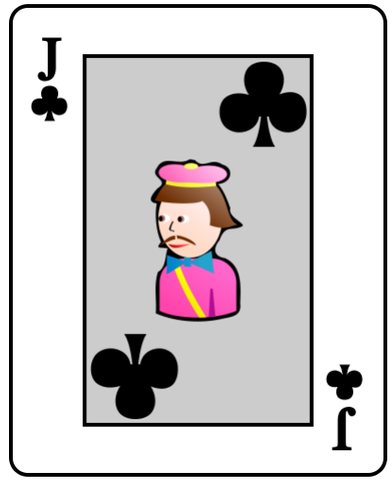

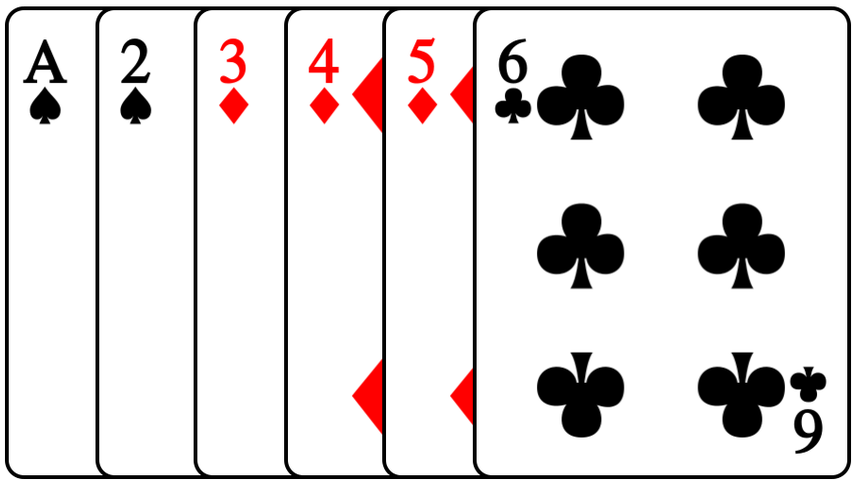

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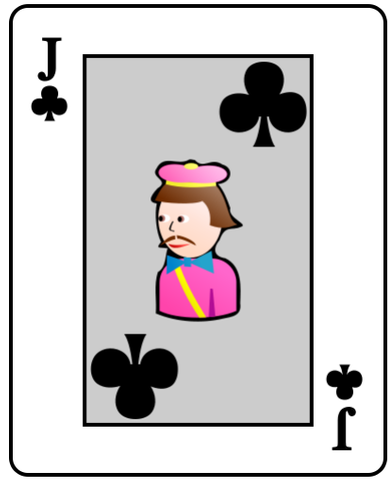

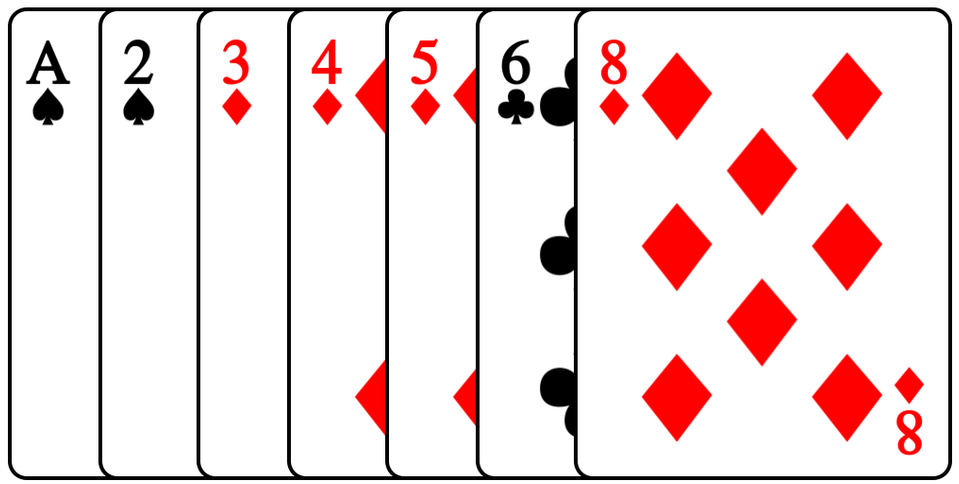

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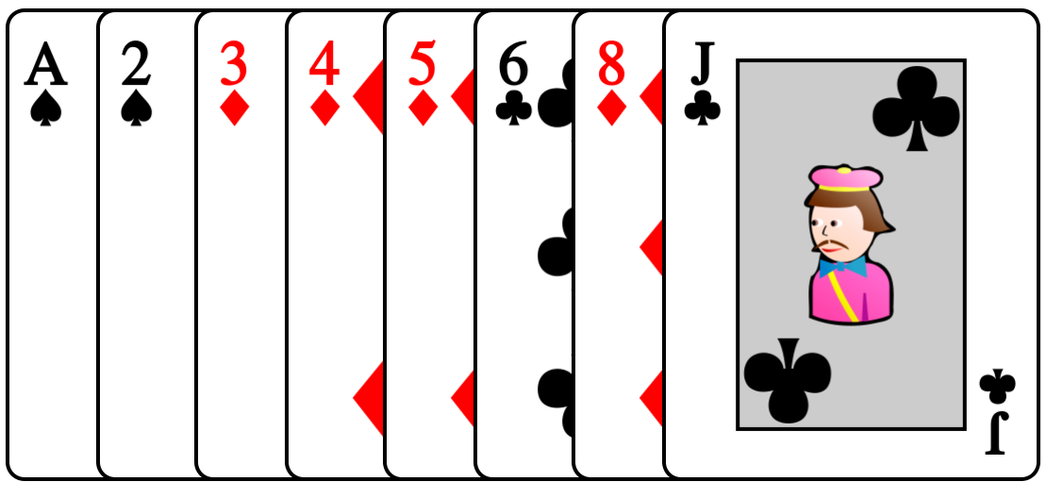

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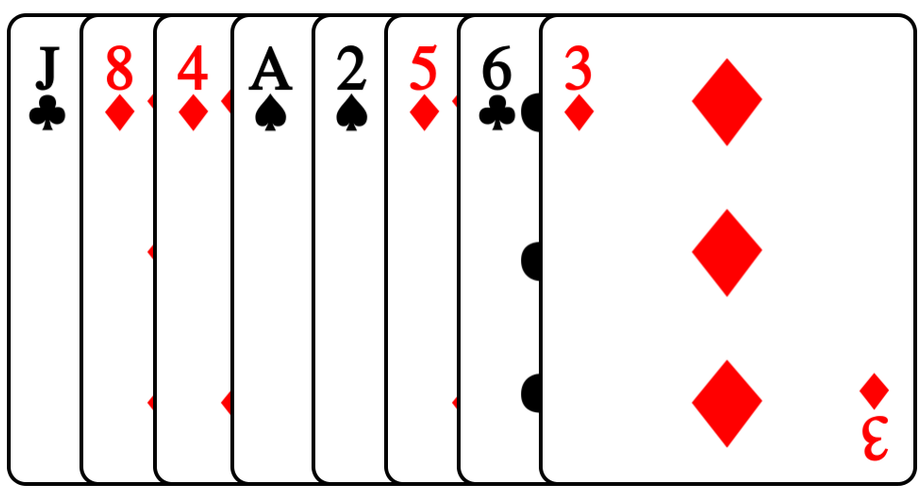

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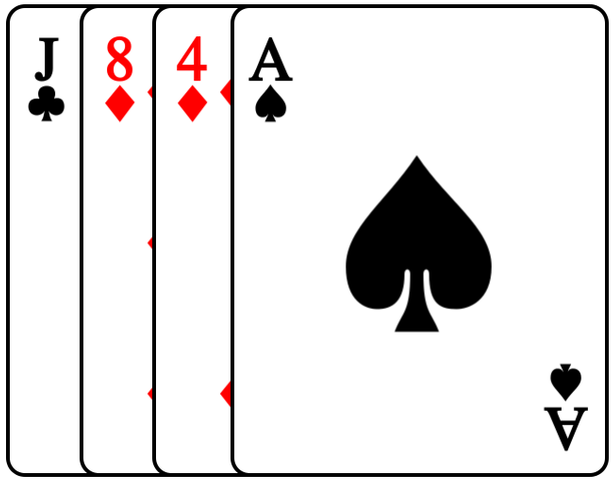

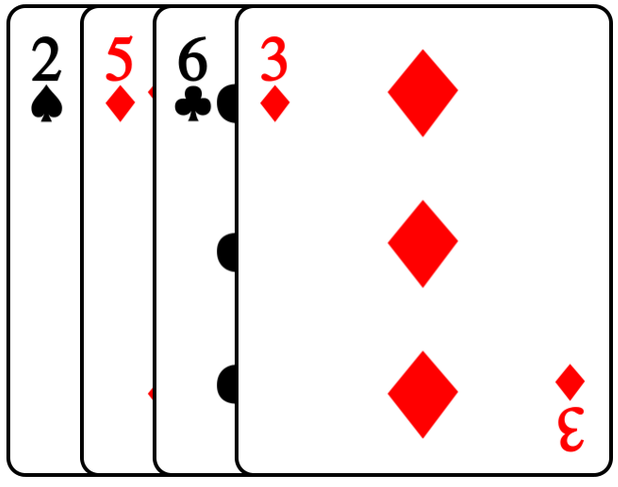

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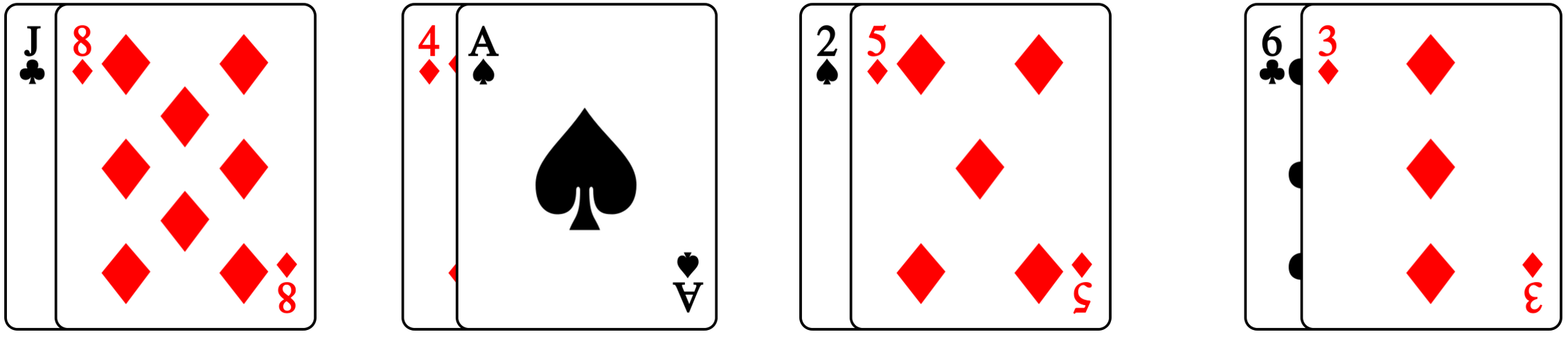

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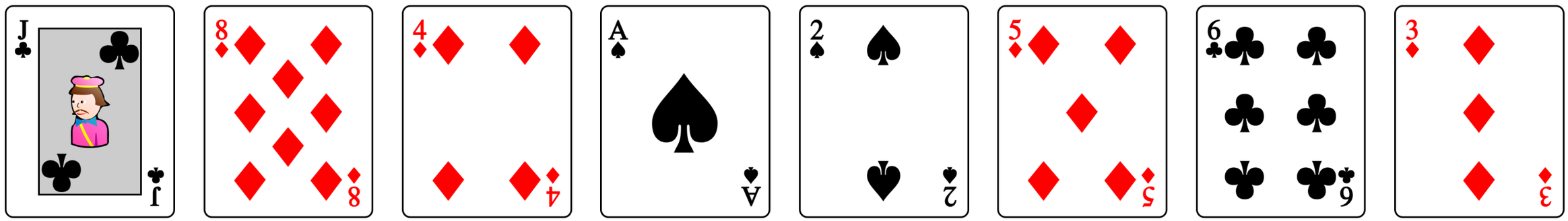

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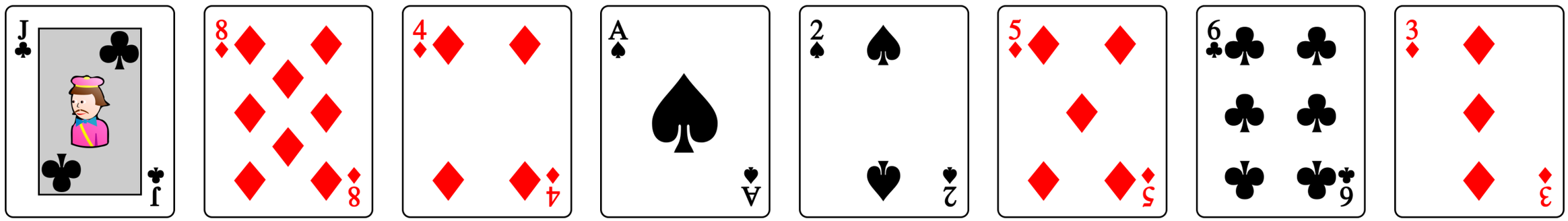

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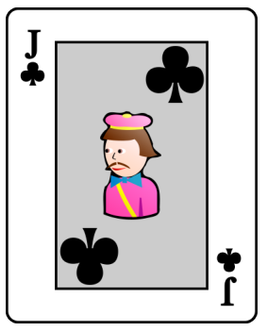
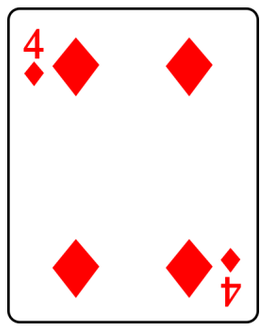
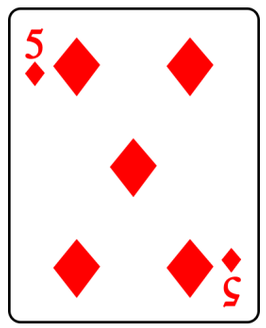
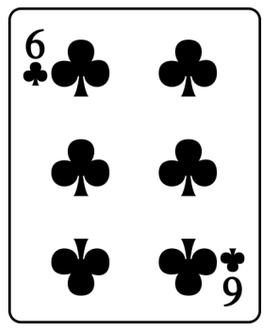
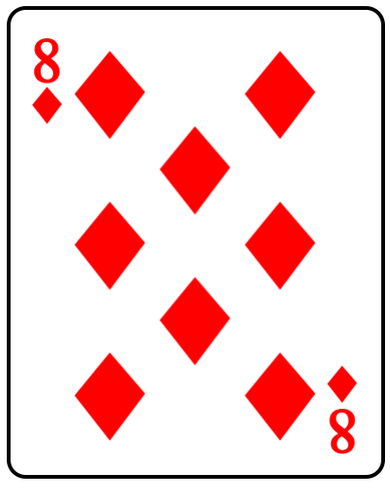
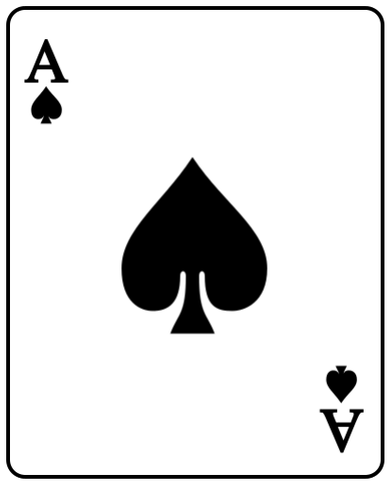
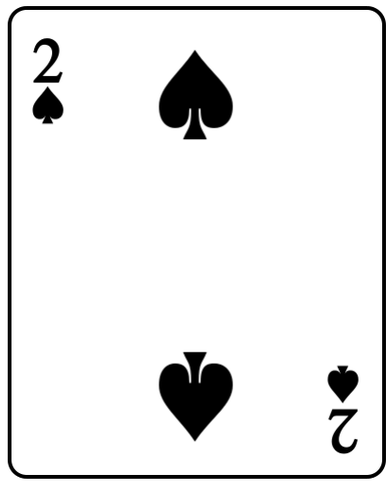
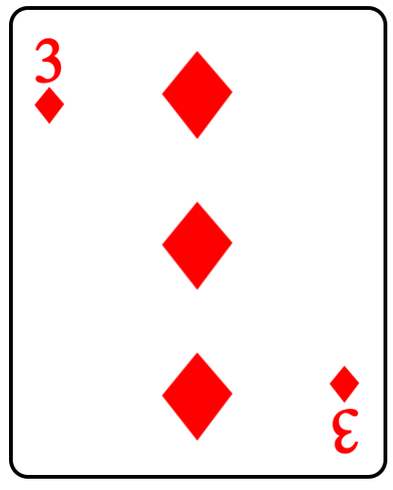

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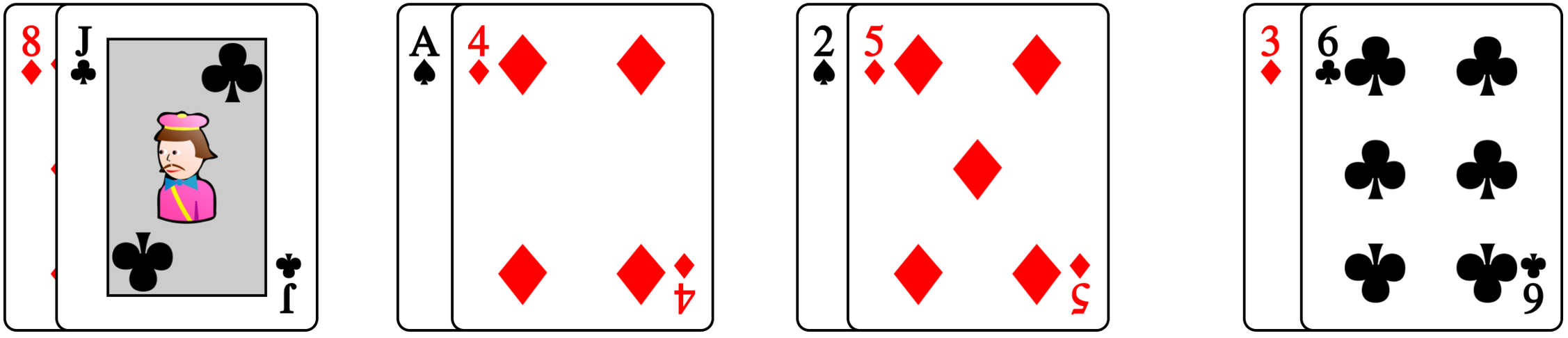

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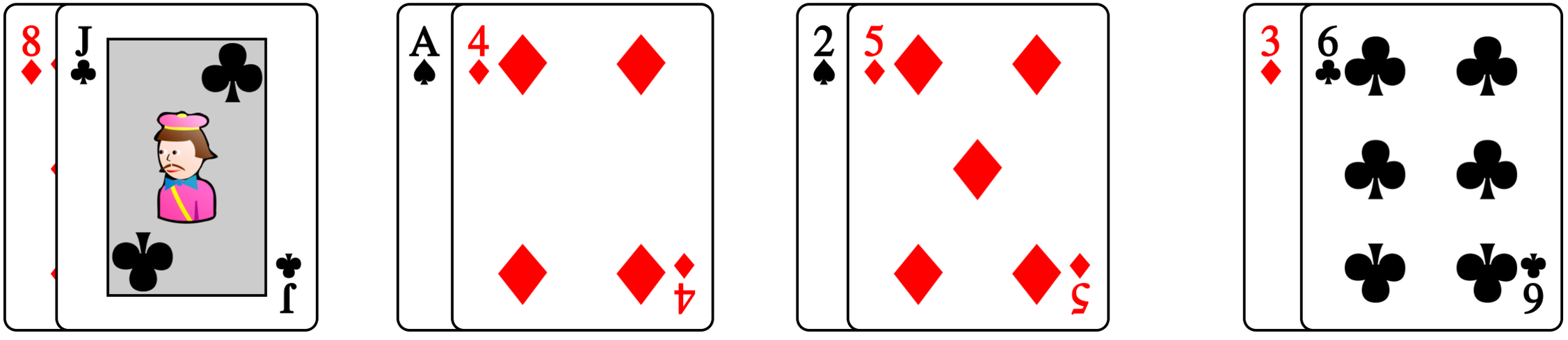

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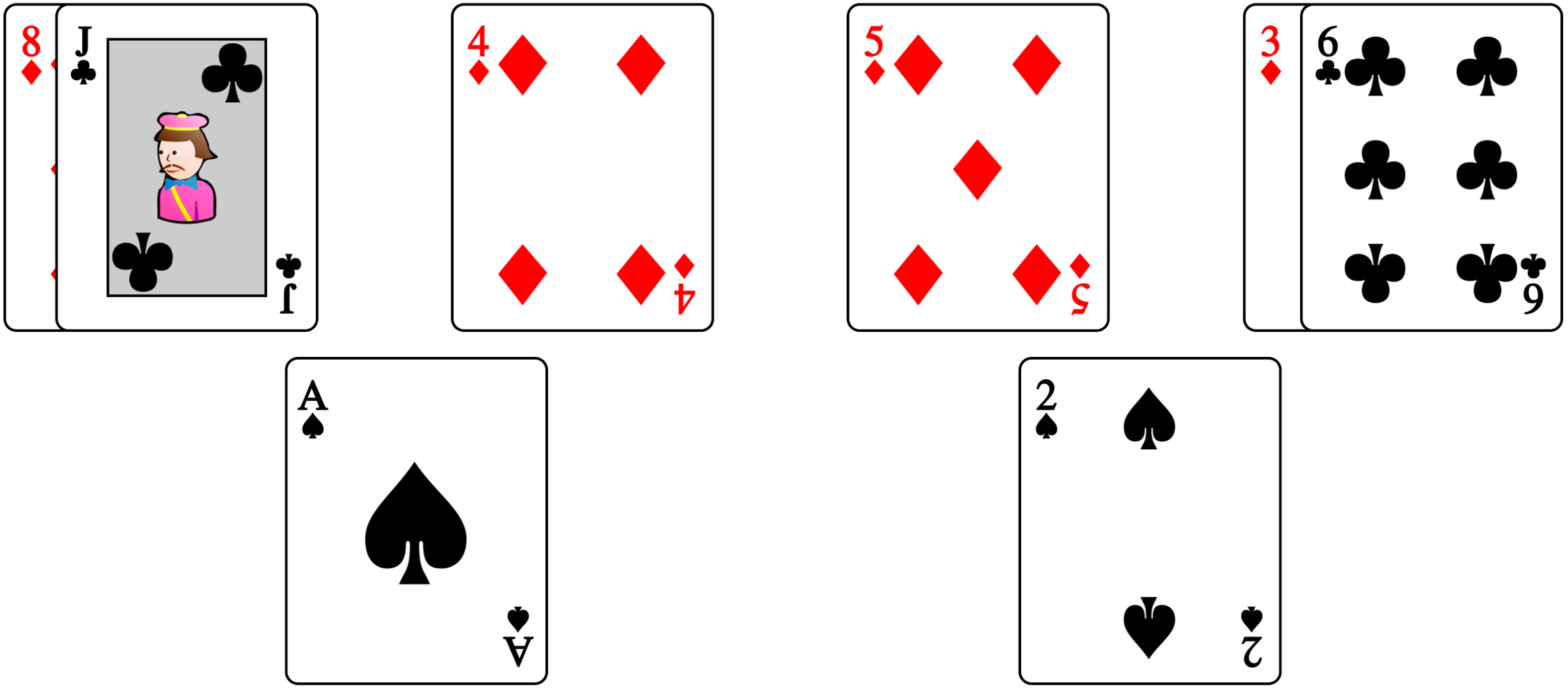

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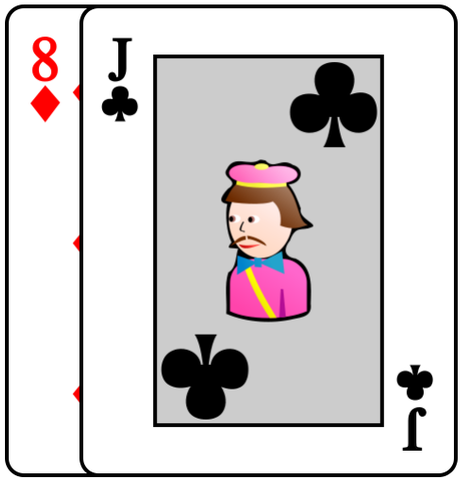
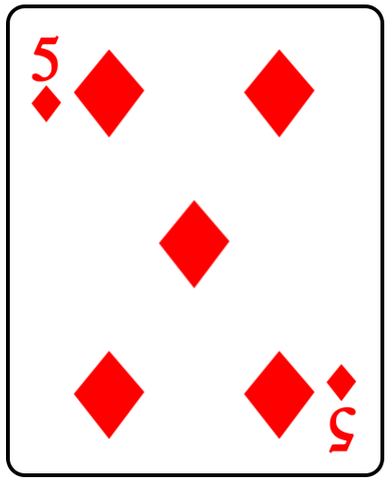
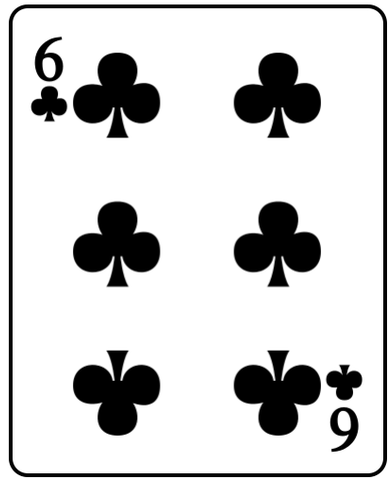
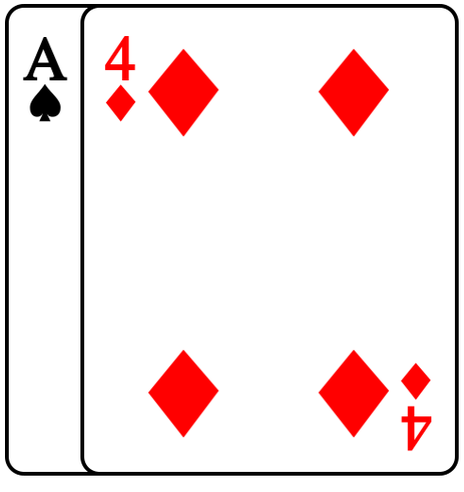
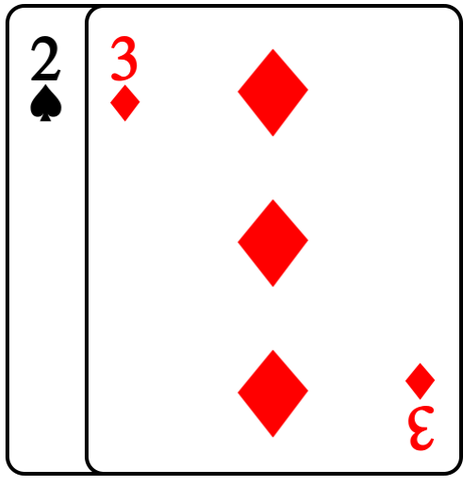


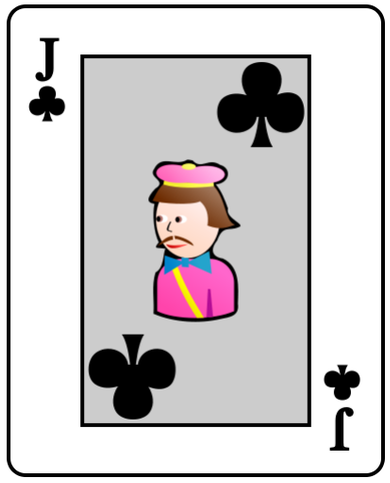


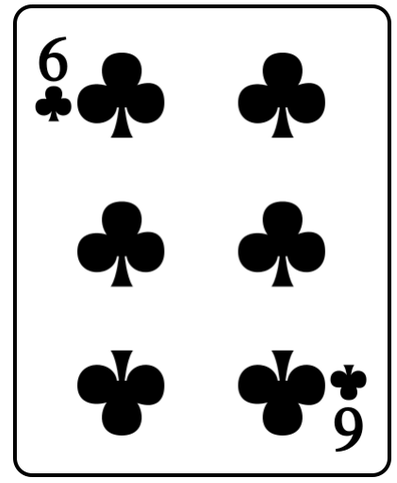


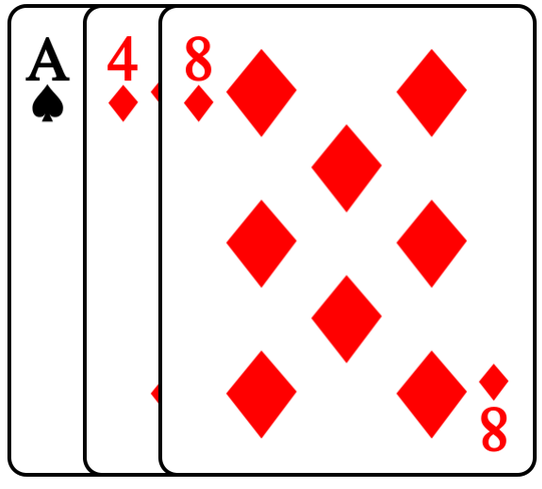


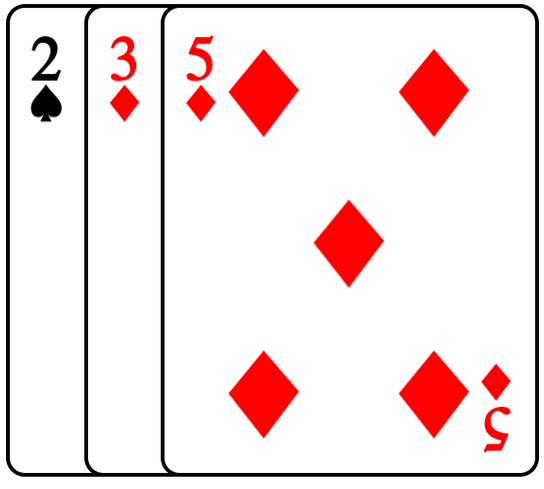


Fusionner

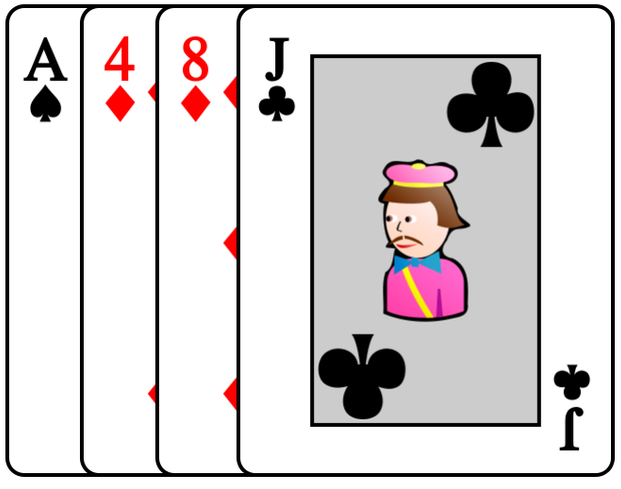


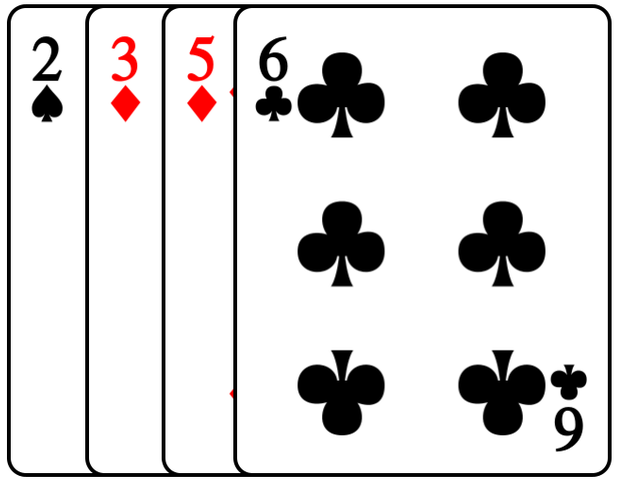




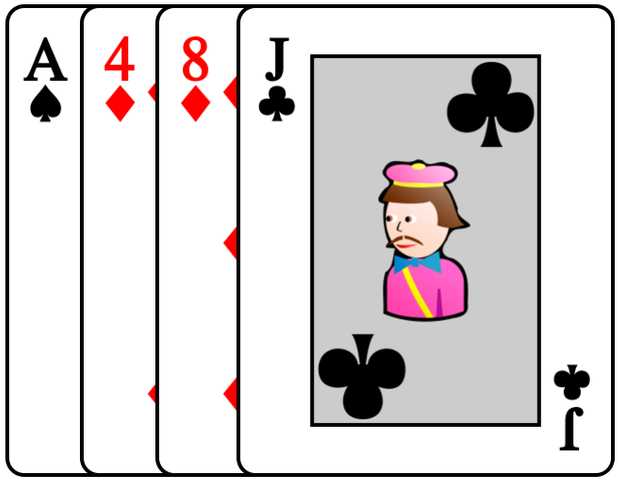


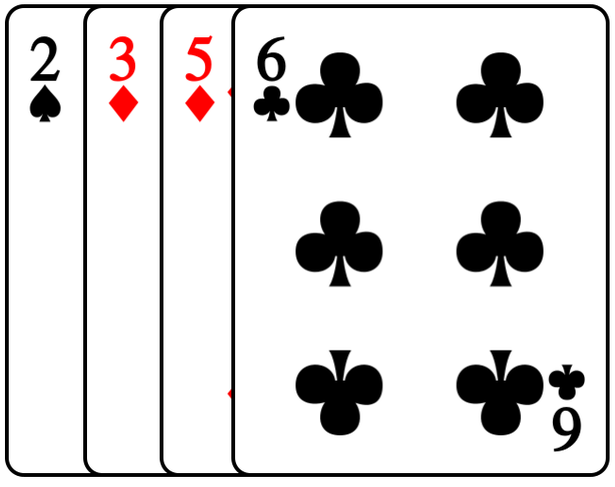
Fusionner





Tous les jeux sont triés !





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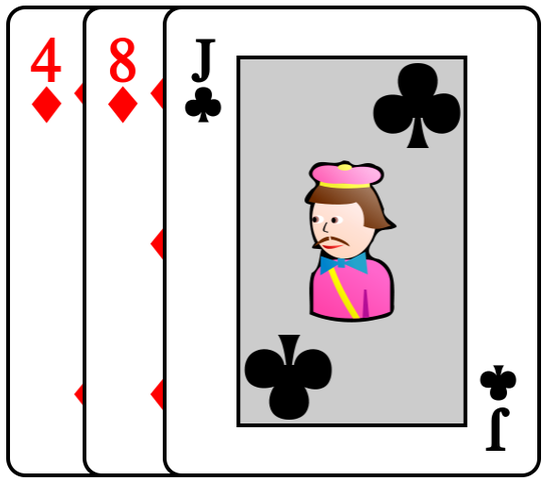

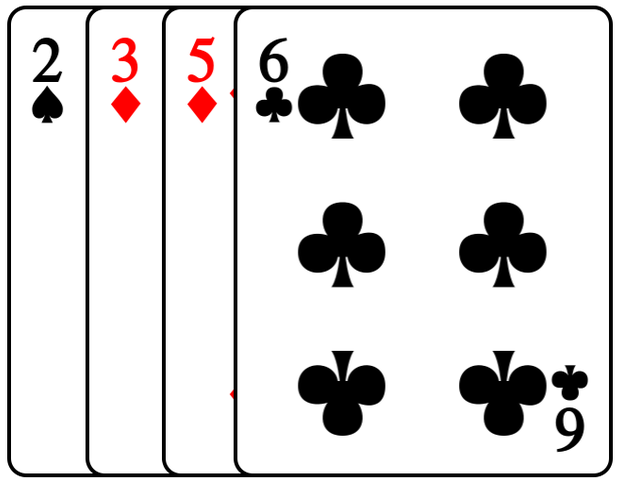

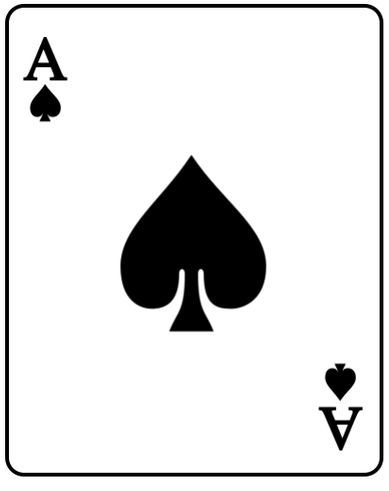

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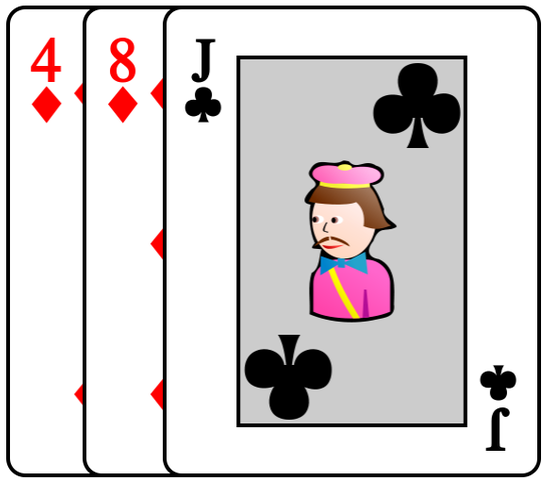

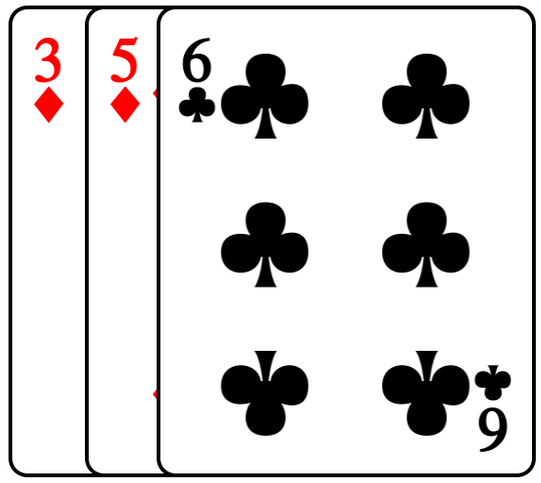

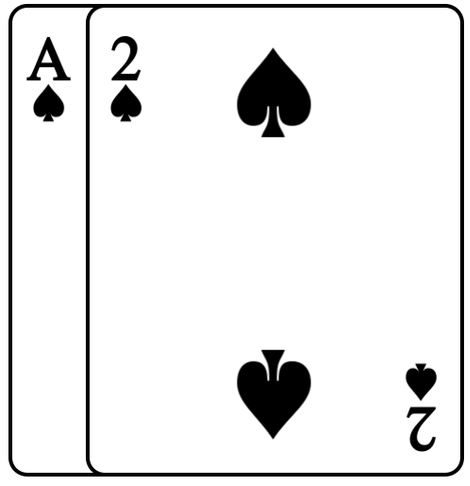

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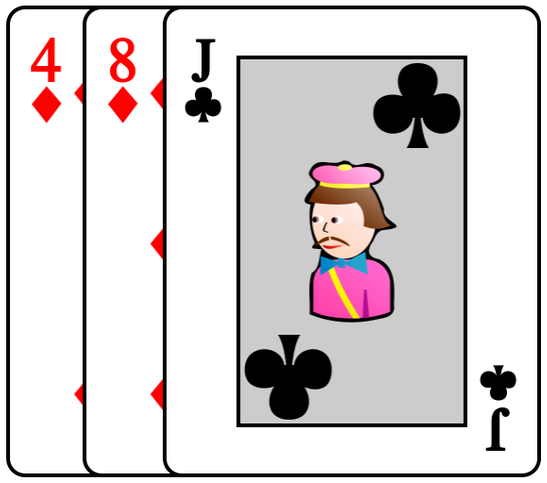

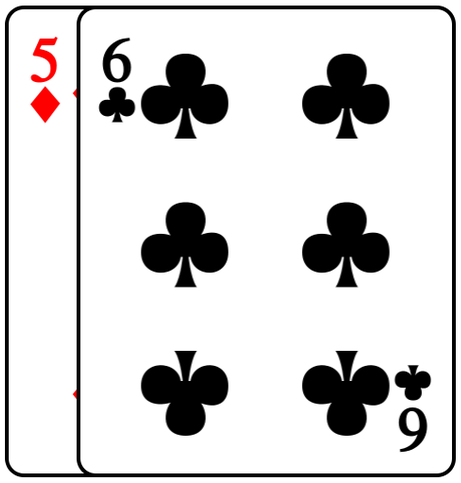

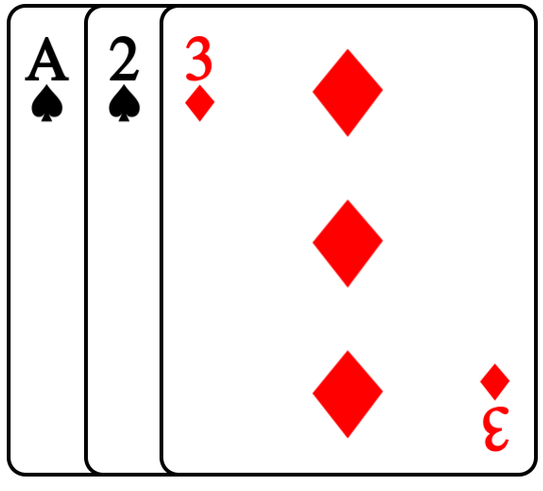

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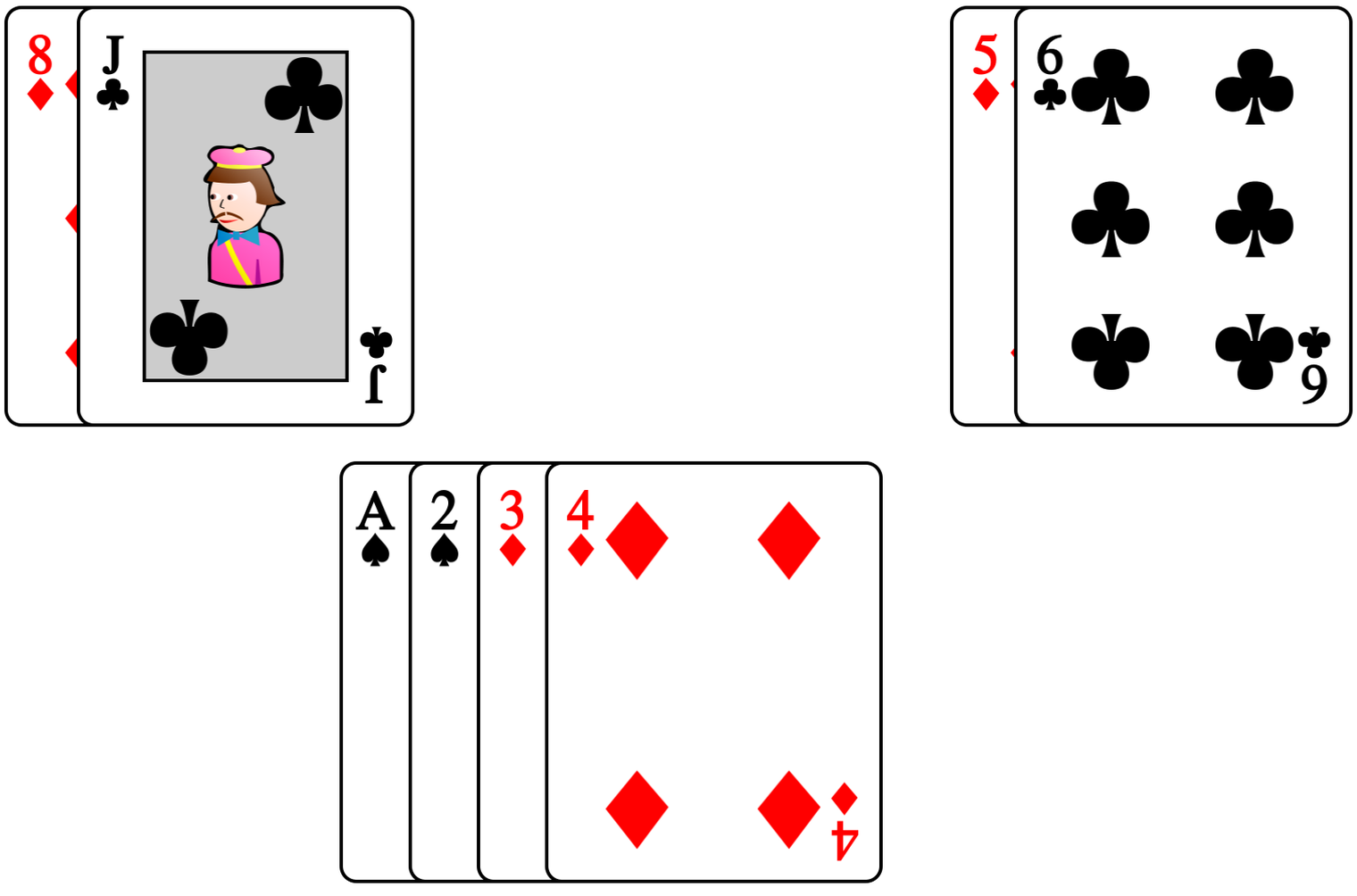

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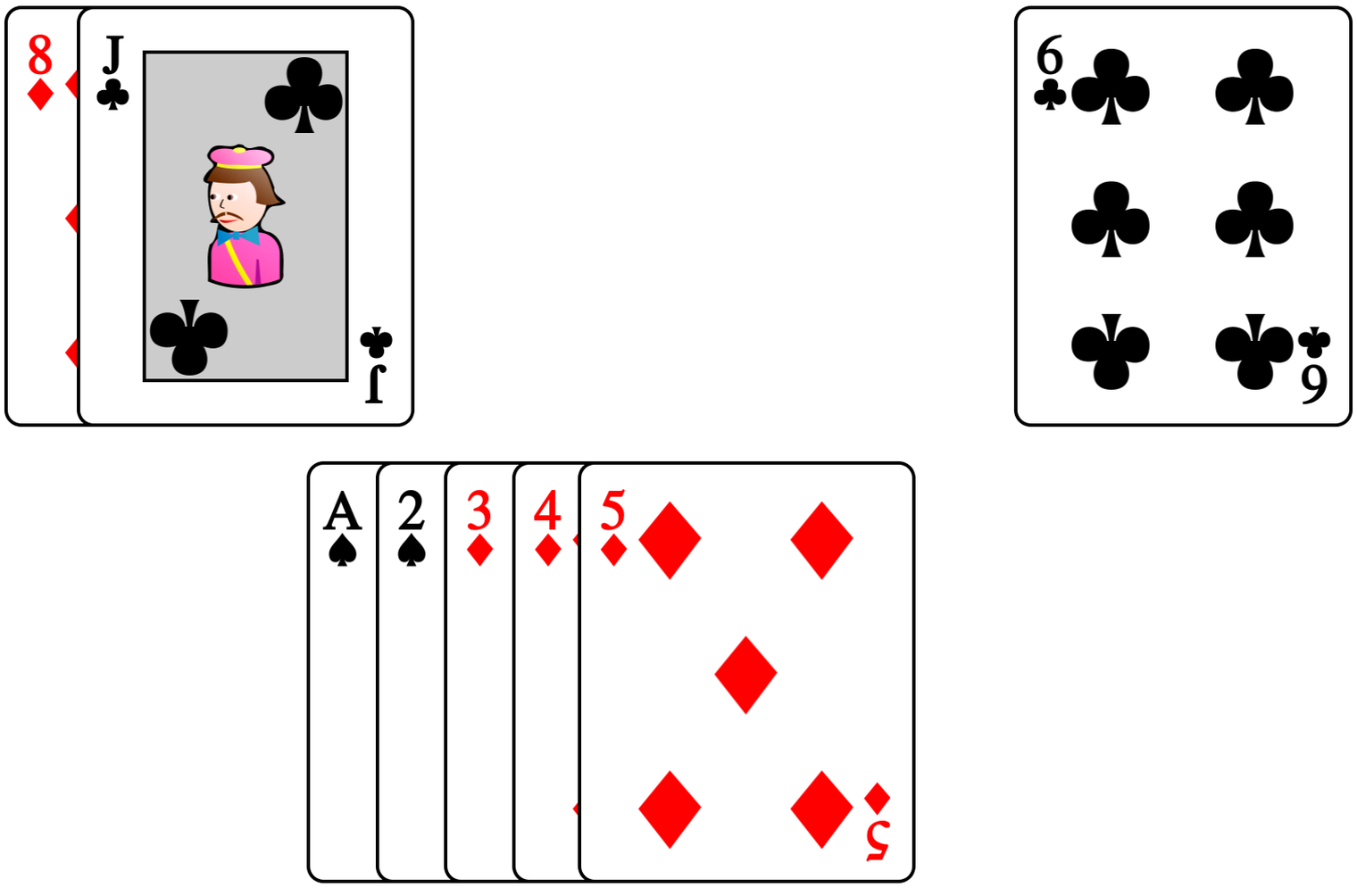

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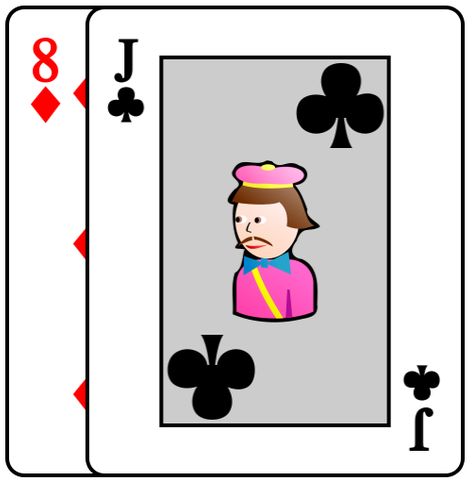
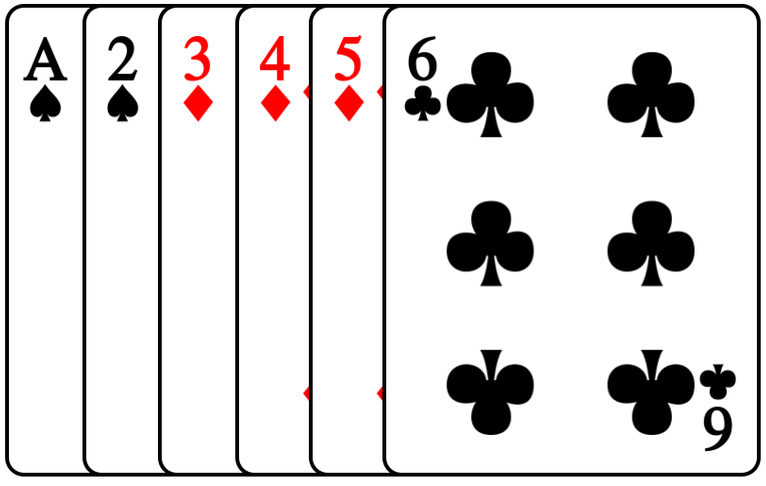
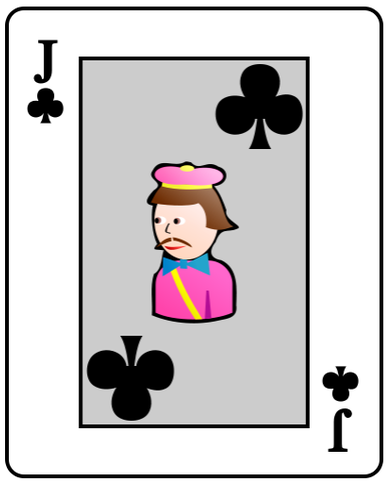
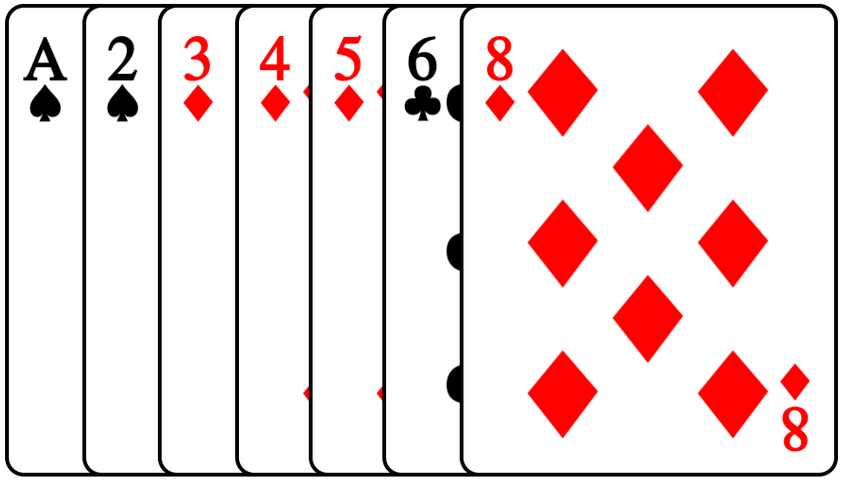


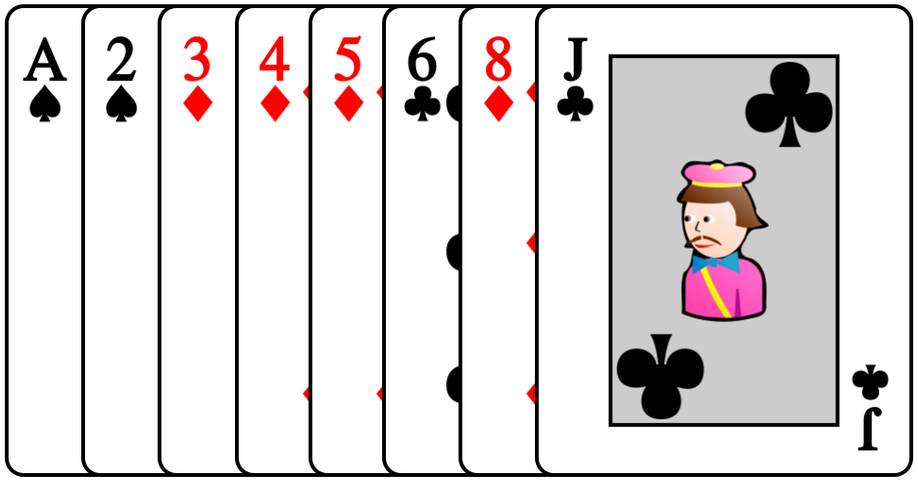


Fusionner

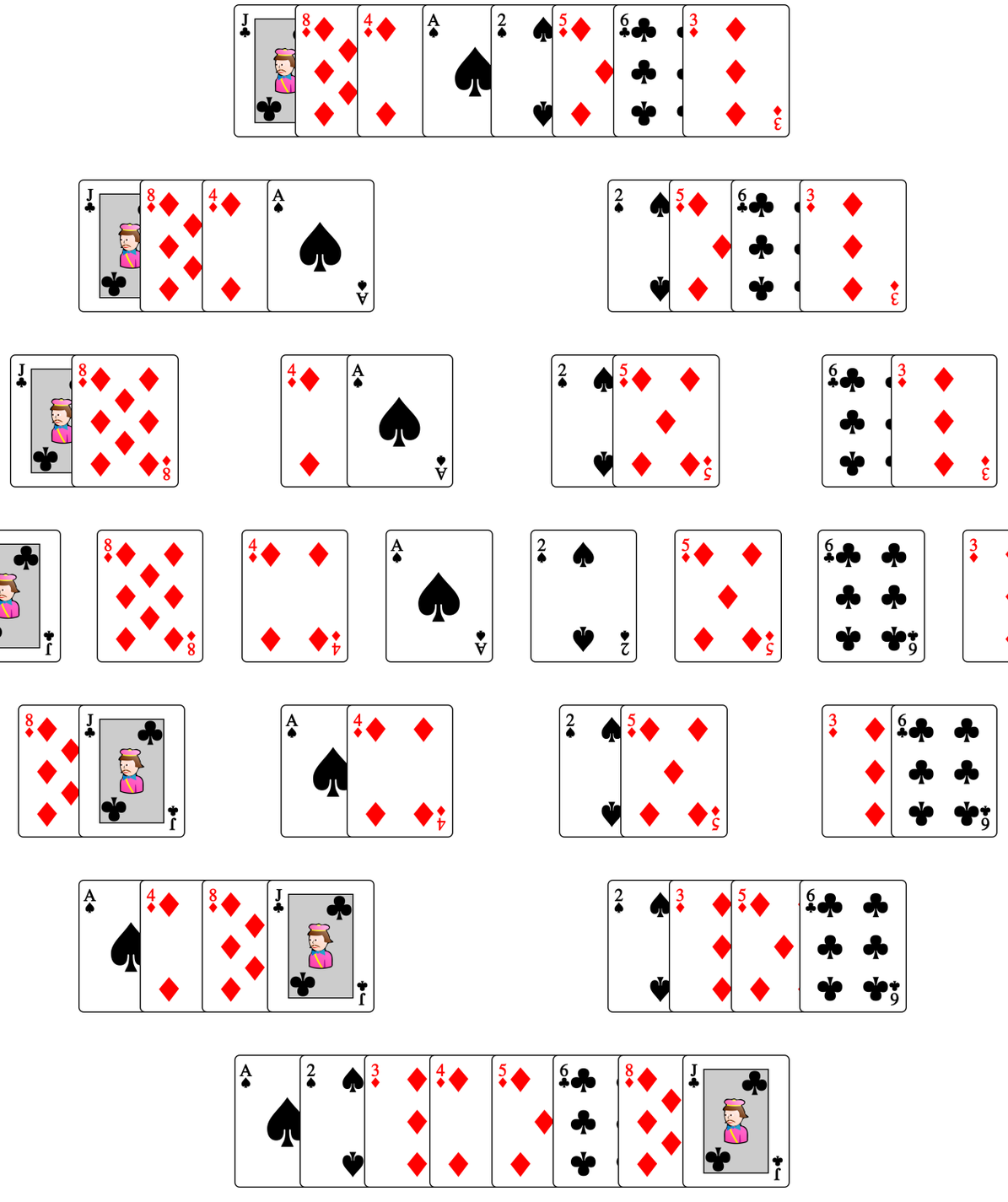




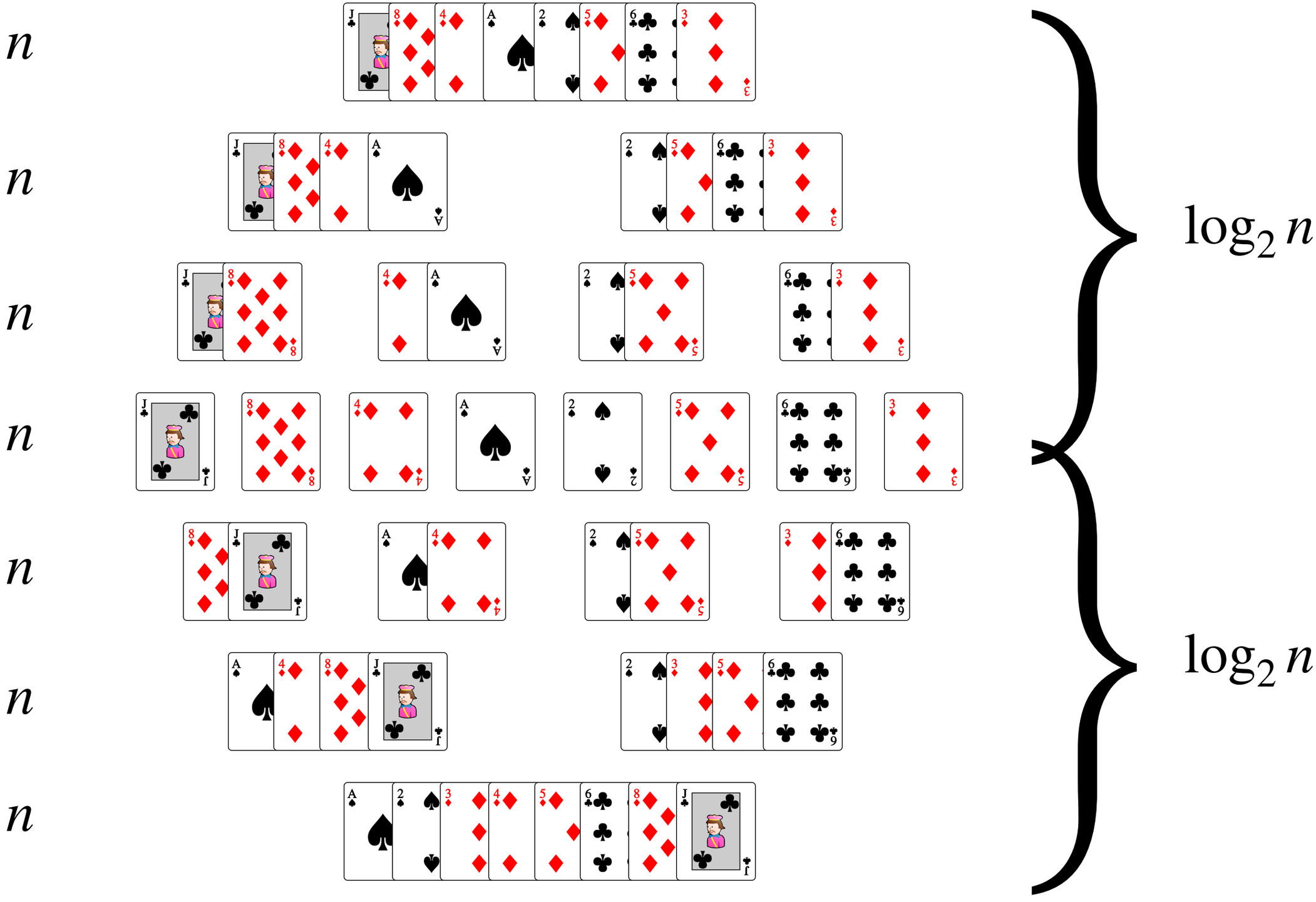
Le jeu est trié !



Efficacité du tri fusion



Efficacité du tri fusion



La complexité du tri fusion est

$$O(n \log_2 n)$$

Fusion

```
fonction fusionner(A, B)
    n ≔ longueur(A)
    m ≔ longueur(B)
    C ≔ tableau de longueur m + n
    i ≔ j ≔ k ≔ 0
    tant que i < n et j < m faire
        si A[i] < B[j] alors
            C[k] ≔ A[i]
            i ≔ i + 1
        sinon
            C[k] ≔ B[j]
            j ≔ j + 1
        fin si
        k ≔ k + 1
    fin tant que
    tant que i < n faire
        C[k] ≔ A[i]
        i ≔ i + 1
        k ≔ k + 1
    fin tant que
    tant que j < m faire
        C[k] ≔ B[j]
        j ≔ j + 1
        k ≔ k + 1
    fin tant que
    retourner C
fin fonction
```

encore d'éléments dans A et B

encore d'éléments dans A, mais B épuise

encore d'éléments dans B, mais A épuisé

A et B épuisés

Fusion

```
fonction fusionner(A, B)
    n ≔ longueur(A)
    m ≔ longueur(B)
    C ≔ tableau de longueur m + n
    i ≔ j ≔ k ≔ 0
    tant que i < n et j < m faire
        si A[i] < B[j] alors
            C[k] ≔ A[i]
            i ≔ i + 1
        sinon
            C[k] ≔ B[j]
            j ≔ j + 1
```

encore d'éléments dans A et B

Fusion

```
fonction fusionner(A, B)
    n ≔ longueur(A)
    m ≔ longueur(B)
    C ≔ tableau de longueur m + n
    i ≔ j ≔ k ≔ 0
    tant que i < n et j < m faire
        si A[i] < B[j] alors
            C[k] ≔ A[i]
            i ≔ i + 1
        sinon
            C[k] ≔ B[j]
            j ≔ j + 1
        fin si
        k ≔ k + 1
    fin tant que
    tant que i < n faire
        C[k] ≔ A[i]
        i ≔ i + 1
        k ≔ k + 1
    fin tant que
```

encore d'éléments dans A et B

encore d'éléments dans A, mais B épuise

```
        i ≔ i + 1
    sinon
        C[k] ≔ B[j]
        j ≔ j + 1
    fin si
    k ≔ k + 1
fin tant que
tant que i < n faire
    C[k] ≔ A[i]
    i ≔ i + 1
    k ≔ k + 1
fin tant que
tant que j < m faire
    C[k] ≔ B[j]
    j ≔ j + 1
    k ≔ k + 1
fin tant que
retourner C
fin fonction
```

encore d'éléments dans A et B

encore d'éléments dans A, mais B épuise

encore d'éléments dans B, mais A épuise

A et B épuisés

```
    k ≔ k + 1
fin tant que
tant que i < n faire
    C[k] ≔ A[i]
    i ≔ i + 1
    k ≔ k + 1
fin tant que
tant que j < m faire
    C[k] ≔ B[j]
    j ≔ j + 1
    k ≔ k + 1
fin tant que
retourner C
fin fonction
```

encore d'éléments dans A, mais B épuise

encore d'éléments dans B, mais A épuise

A et B épuisés

```
tant que i < n faire
    C[k] ≔ A[i]
    i ≔ i + 1
    k ≔ k + 1
fin tant que
tant que j < m faire
    C[k] ≔ B[j]
    j ≔ j + 1
    k ≔ k + 1
fin tant que
    retourner C
fin fonction
```

encore d'éléments dans A, mais B épuise

encore d'éléments dans A, mais B épuise

A et B épuisés

Fusion

```
fonction fusionner(A, B)
    n ≔ longueur(A)
    m ≔ longueur(B)
    i ≔ j ≔ k ≔ 0
    tant que i < n et j < m faire
        si A[i] < B[j] alors
            C[k] ≔ A[i]
            i ≔ i + 1
        sinon
            C[k] ≔ B[j]
            j ≔ j + 1
        fin si
        k ≔ k + 1
    fin tant que
    tant que i < n faire
        C[k] ≔ A[i]
        i ≔ i + 1
        k ≔ k + 1
    fin tant que
    tant que j < m faire
        C[k] ≔ B[j]
        j ≔ j + 1
        k ≔ k + 1
    fin tant que
    retourner C
fin fonction
```

encore d'éléments dans A et B

encore d'éléments dans A, mais B épuise

encore d'éléments dans B, mais A épuisé

A et B épuisés

Tri fusion

```
fonction tri-fusion(A)
    n ≔ longueur(A)
    si n > 1 alors
        m ≔ ⌊n ÷ 2⌋
        B ≔ A[0, …, m–1]
        C ≔ A[m, …, n–1]
        B’ ≔ tri-fusion(B)
        C’ ≔ tri-fusion(C)
        retourner fusionner(B’, C’)
    sinon
        retourner A
    fin si
fin fonction
```