

8	13	7
12	10	5
3	1	14
15	6	11

Counting in Poker 2 Pair



8	13	7
12	10	5
3	1	14
15	6	11

counting 2-pair poker hands

a 2-pair hand has

- 2 cards of some rank
- 2 cards of a second rank
- 1 card of still a third rank



8	13	7
12	10	5
3	1	14
15	6	11

counting 2-pair poker hands

a 2-pair hand:

$K\spadesuit, K\heartsuit, A\diamondsuit, A\spadesuit, 3\clubsuit$



8	13	7
12	10	5
3	1	14
15	6	11

counting 2-pair poker hands

to count, **choose**:

- 1st pair rank (13 ranks)
- 2nd pair rank (12 ranks left)
- last card rank (11 ranks left)





counting 2-pair poker hands
then choose:

- 1st pair suits $\binom{4}{2}$ sets of 2 suits
- 2nd pair suits $\binom{4}{2}$ sets of 2 suits
- last card suit (4 suits)



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counting 2-pair poker hands
example: choosing
K, A, 3, {♦, ♥}, {♦, ♠}, ♣
specifies 2-pair hand:
K♦, K♥, A♦, A♠, 3♣



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counting 2-pair poker hands
so # 2-pair hands is


13 · 12 · 11 · ~~$\binom{4}{2}!$~~ · $\binom{4}{2}$ · 4



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counting 2-pair poker hands
this method counts 6-tuples
[1st card ranks] × [2nd card ranks]
× [last card rank] ×
[1st card suits] × [2nd card suits]
× [last card suit]
correctly



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 counting 2-pair poker hands
 but the correspondence to
 2-pair hands is **not a bijection**:





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 counting 2-pair poker hands
 to count, choose: **the bug**


- 1st pair rank (13 ranks)
- 2nd pair rank (12 ranks left)
- last card rank (11 ranks left)


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 counting 2-pair poker hands
 to count, choose: **the bug**

- 1st pair rank (13 ranks)
- 2nd pair rank (12 ranks left)
- last card rank (11 ranks left)

either pair might be 1st


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 counting 2-pair poker hands
 map from 6-tuples
 (K, A, 3, {diamond, heart}, {diamond, spade}, club)
 to 2-pair hands
 K♦, K♥, A♦, A♠, 3♣
 is **2-to-1**


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counting 2-pair poker hands
so # 2-pair hands is

$$13 \cdot 12 \cdot 11 \cdot \binom{4}{2} \cdot \binom{4}{2} \cdot 4$$


NO!



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counting 2-pair poker hands
so # 2-pair hands is *really*

$$\frac{1}{2} \cdot 13 \cdot 12 \cdot 11 \cdot \binom{4}{2} \cdot \binom{4}{2} \cdot 4$$


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