1/2 × 1/2

	1 +1
+1/2 +1/2	1

	1 0	0 0
+1/2 −1/2	1/2	1/2
−1/2 +1/2	1/2	−1/2

	1 −1
−1/2 −1/2	1

1 × 1/2

	3/2 +3/2
+1 +1/2	1

	3/2 +1/2	1/2 +1/2
+1 −1/2	1/3	2/3
0 +1/2	2/3	−1/3

	3/2 −1/2	1/2 −1/2
0 −1/2	2/3	1/3
−1 +1/2	1/3	−2/3

	3/2 −3/2
−1 −1/2	1

2 × 1

	3 +3
+2 +1	1

	3 +2	2 +2
+2 0	1/3	2/3
+1 +1	2/3	−1/3

	3 +1	2 +1	1 +1
+2 −1	1/15	1/3	3/5
+1 0	8/15	1/6	−3/10
0 +1	6/15	−1/2	1/10

	3 0	2 0	1 0
+1 −1	1/5	1/2	3/10
0 0	3/5	0	−2/5
−1 +1	1/5	−1/2	3/10

	3 −1	2 −1	1 −1
0 −1	6/15	1/2	1/10
−1 0	8/15	−1/6	−3/10
−2 +1	1/15	−1/3	3/5

	3 −2	2 −2
−1 −1	2/3	1/3
−2 0	1/3	−2/3

	3 −3
−2 −1	1

1 × 1

	2 +2
+1 +1	1

	2 +1	1 +1
+1 0	1/2	1/2
0 +1	1/2	−1/2

	2 0	1 0	0 0
+1 −1	1/6	1/2	1/3
0 0	2/3	0	−1/3
−1 +1	1/6	−1/2	1/3

	2 −1	1 −1
0 −1	1/2	1/2
−1 0	1/2	−1/2

	2 −2
−1 −1	1

3/2 × 1

	5/2 +5/2
+3/2 +1	1

	5/2 +3/2	3/2 +3/2
+3/2 0	2/5	3/5
+1/2 +1	3/5	−2/5

	5/2 +1/2	3/2 +1/2	1/2 +1/2
+3/2 −1	1/10	2/5	1/2
+1/2 0	3/5	1/15	−1/3
−1/2 +1	3/10	−8/15	1/6

	5/2 −1/2	3/2 −1/2	1/2 −1/2
+1/2 −1	3/10	8/15	1/6
−1/2 0	3/5	−1/15	−1/3
−3/2 +1	1/10	−2/5	1/2

	5/2 −3/2	3/2 −3/2
−1/2 −1	3/5	2/5
−3/2 0	2/5	−3/5

	5/2 −5/2
−3/2 −1	1

2 × 1/2

	5/2 +5/2
+2 1/2	1

	5/2 3/2	3/2 +3/2
+2 −1/2	1/5	4/5
+1 +1/2	4/5	−1/5

	5/2 +1/2	3/2 +1/2
+1 −1/2	2/5	3/5
0 +1/2	3/5	−2/5

	5/2 −1/2	3/2 −1/2
0 −1/2	3/5	2/5
−1 +1/2	2/5	−3/5

	5/2 −3/2	3/2 −3/2
−1 −1/2	4/5	1/5
−2 +1/2	1/5	−4/5

	5/2 −5/2
−2 −1/2	1

3/2 × 1/2

	2 +2
+3/2 +1/2	1

	2 +1	1 +1
+3/2 −1/2	1/4	3/4
+1/2 +1/2	3/4	−1/4

	2 0	1 0
+1/2 −1/2	1/2	1/2
−1/2 +1/2	1/2	−1/2

	2 −1	1 −1
−1/2 −1/2	3/4	1/4
−3/2 +1/2	1/4	−3/4

	2 −2
−3/2 −1/2	1

$$\vec{J} = \vec{L} + \vec{S}$$

2p states of hydrogen:

$$l = 1$$
$$s = 1/2$$

$$|l = 1, s = 1/2; jm\rangle =$$

$$\sum_{m_1 m_2} \underbrace{\langle l = 1, s = 1/2; m_1 m_2 | l = 1, s = 1/2; jm\rangle}_{\text{Clebsch-Gordan Coefficients!}} |l = 1, s = 1/2; m_1 m_2\rangle$$

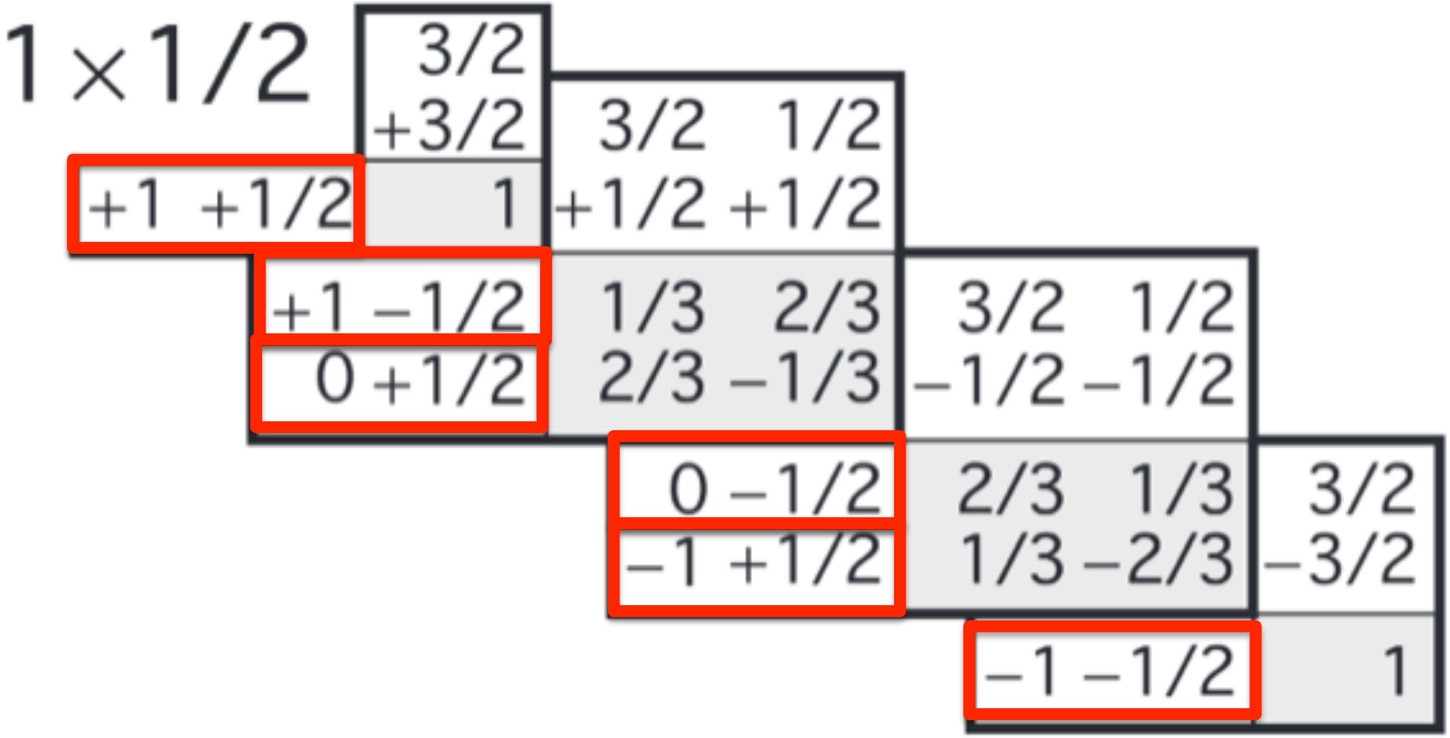
$1 \times 1/2$

		3/2
		+3/2
+1	+1/2	1

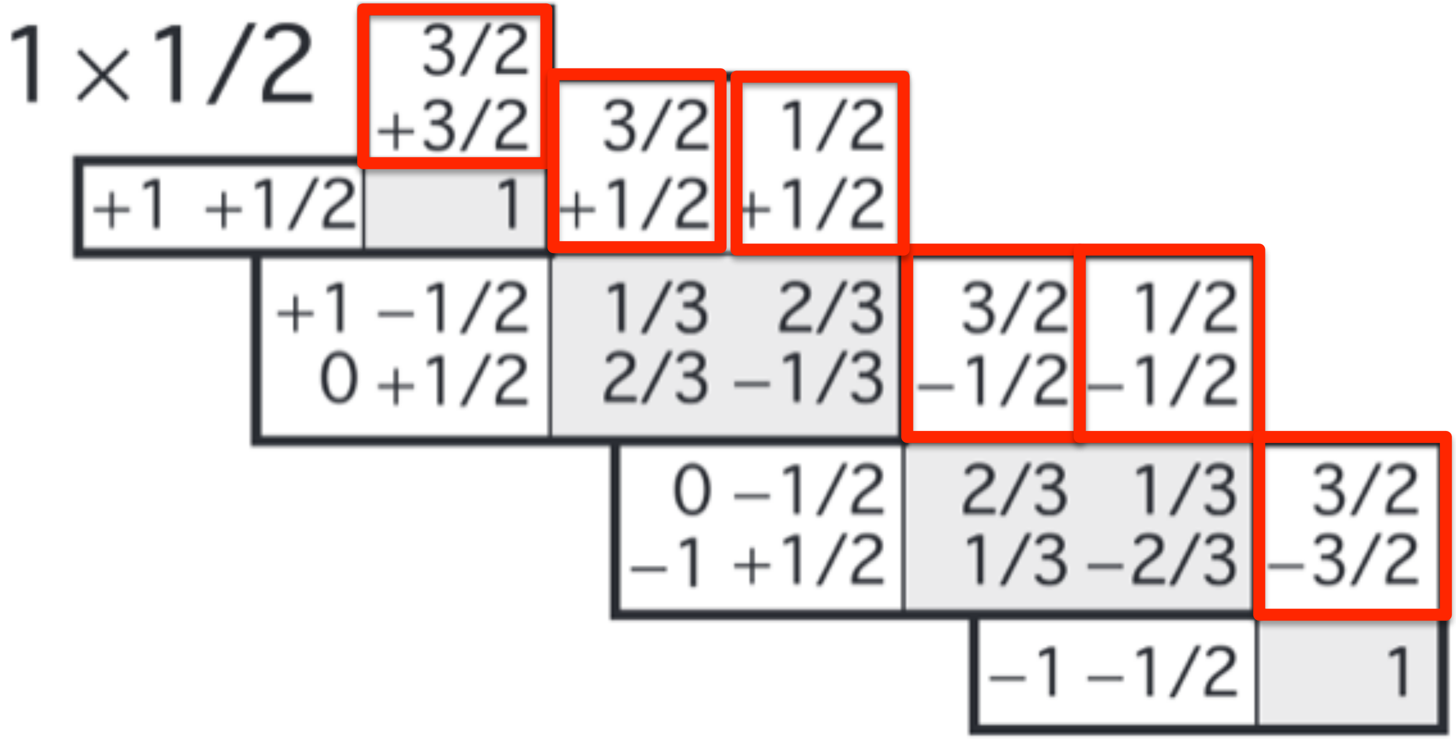
		3/2	1/2
		+1/2	+1/2
+1	−1/2	1/3	2/3
0	+1/2	2/3	−1/3

		3/2	1/2
		−1/2	−1/2
0	−1/2	2/3	1/3
−1	+1/2	1/3	−2/3

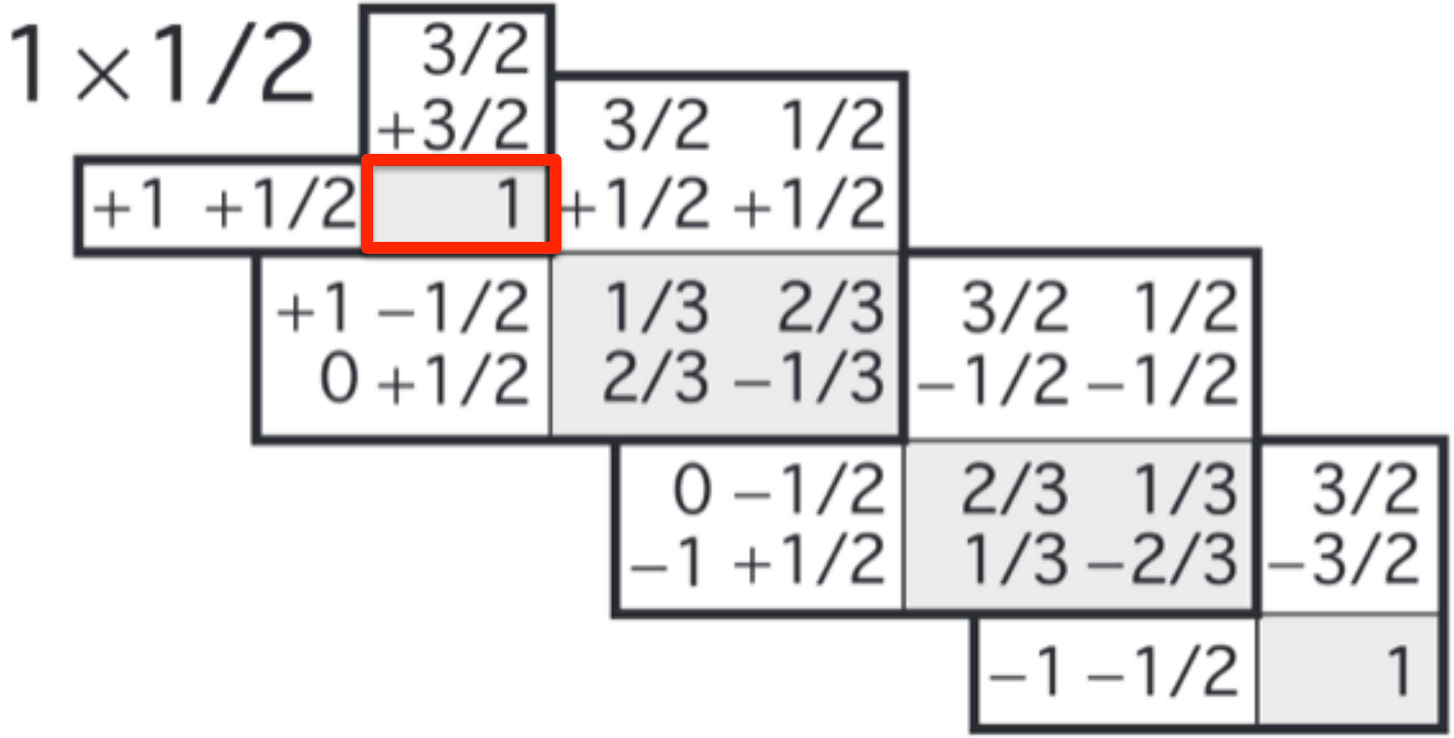
		3/2
		−3/2
−1	−1/2	1



$$(2\times 1+1)\left(2\times\frac{1}{2}+1\right)=6$$

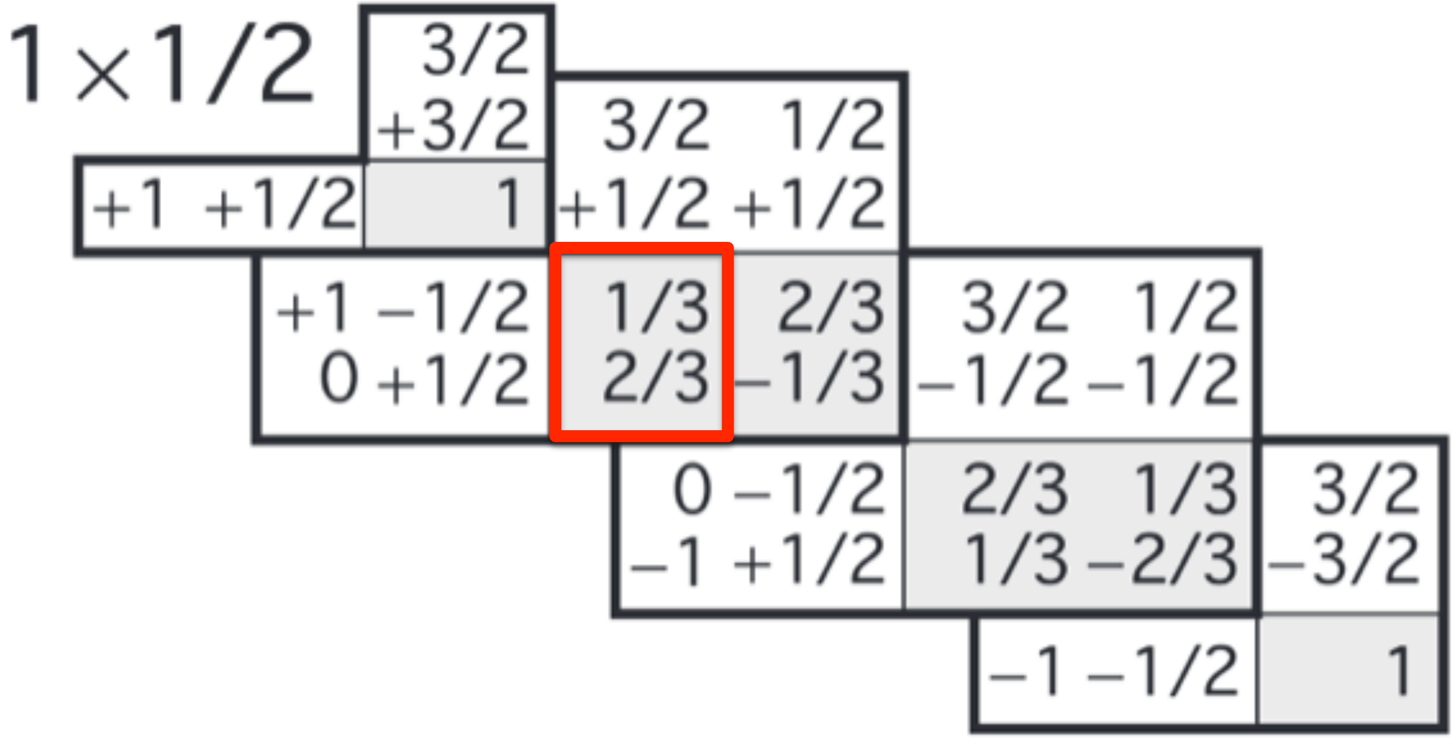


$$\left(2\times\frac{3}{2}+1\right)+\left(2\times\frac{1}{2}+1\right)=6$$



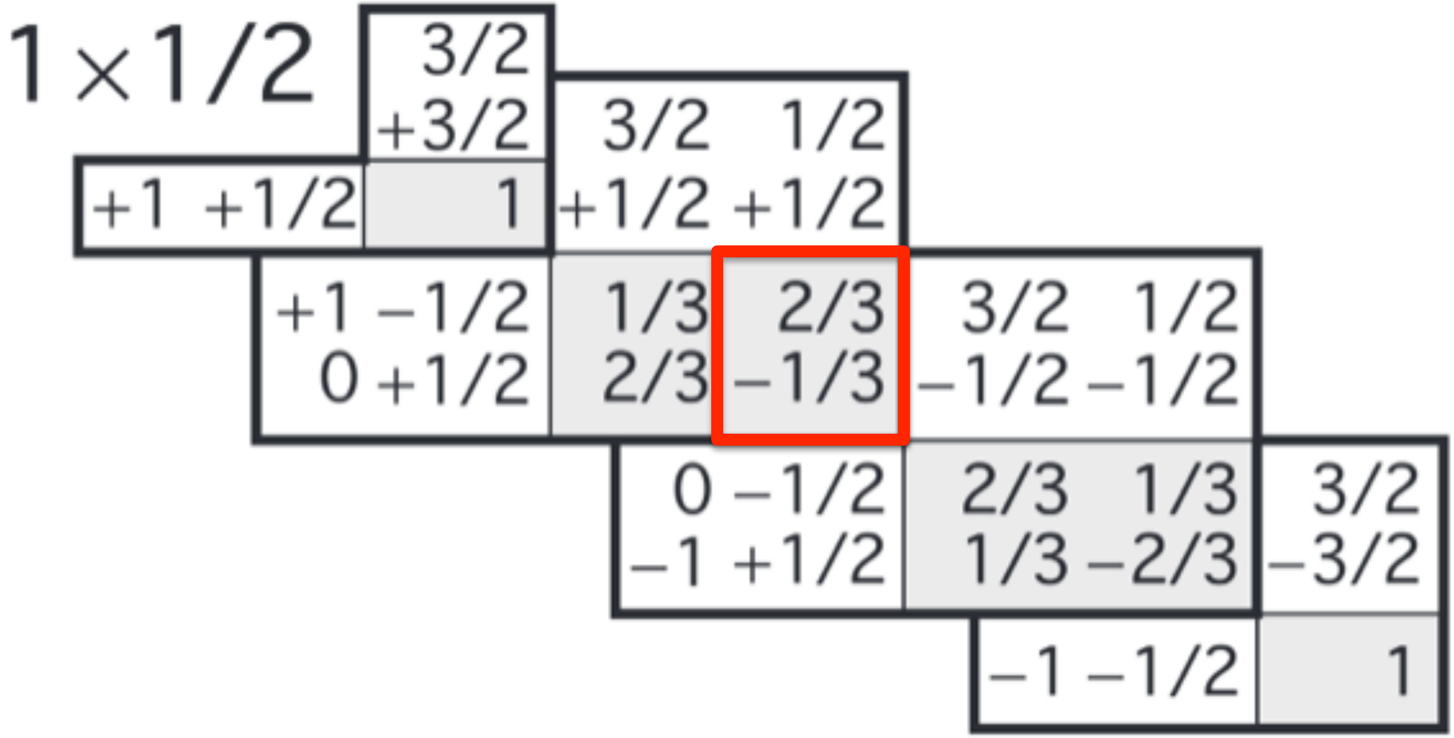
$$\langle m_l = +1, m_s = +1/2 | j = 3/2, m = +3/2\rangle = \sqrt{1}$$

$$|j = 3/2, m = +3/2\rangle = \sqrt{1} \times |m_l = +1, m_s = +1/2\rangle$$



$$|j = 3/2, m = +1/2\rangle =$$

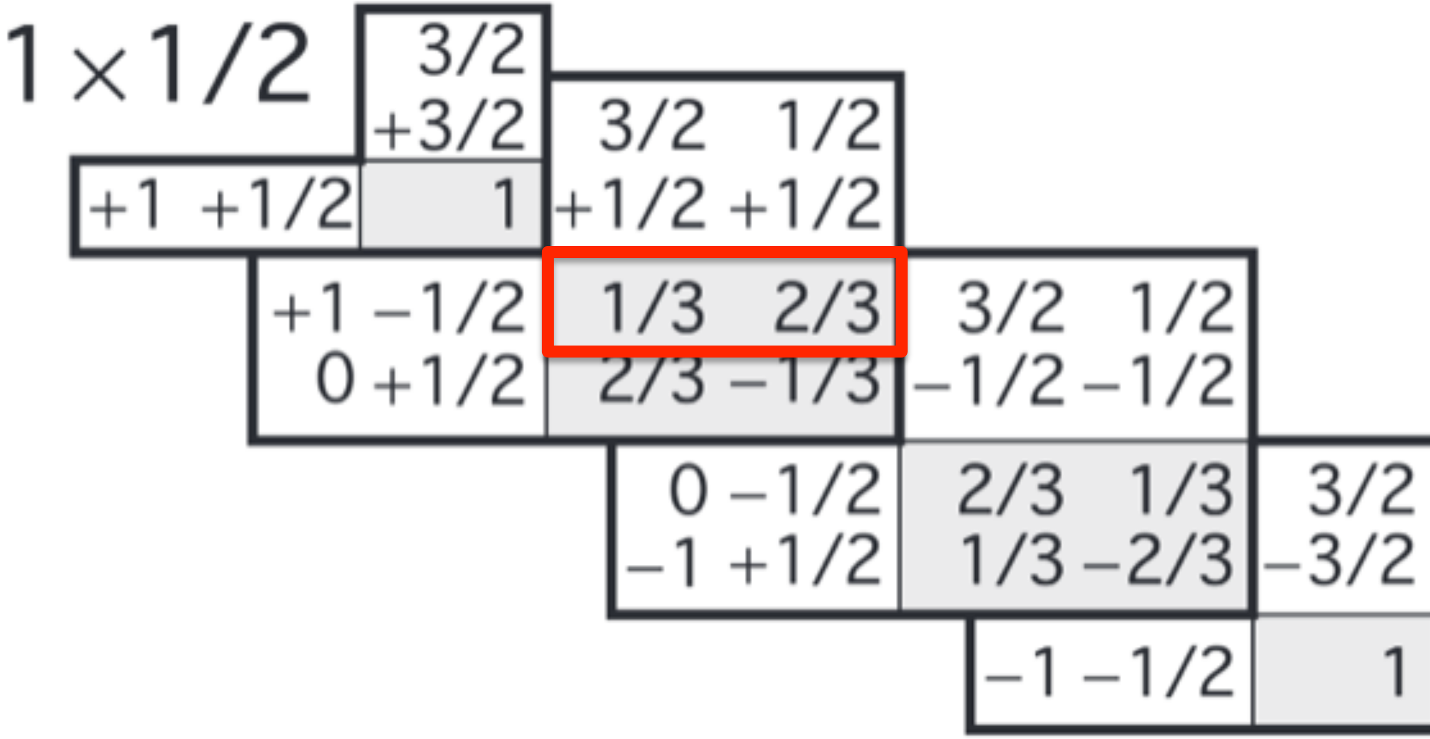
$$\sqrt{\frac{1}{3}}\,|m_l = +1, m_s = -1/2\rangle + \sqrt{\frac{2}{3}}\,|m_l = 0, m_s = +1/2\rangle$$



$$|j = 1/2, m = +1/2\rangle =$$

$$\sqrt{\frac{2}{3}}\,|m_l = +1, m_s = -1/2\rangle - \sqrt{\frac{1}{3}}\,|m_l = 0, m_s = +1/2\rangle$$

Can also run it backwards!



$$|m_l = 1, m_s = -1/2\rangle =$$

$$\sqrt{\frac{1}{3}}\,|j = 3/2, m = +1/2\rangle + \sqrt{\frac{2}{3}}\,|j = 1/2, m = +1/2\rangle$$