# Abstract Maths Cheat Sheet

## 1 Ket-vector Axioms

1. The sum of any two ket-vectors is also a ket-vector:
$$|A\rangle + |B\rangle = |C\rangle \tag{1.1}$$
2. Vector addition is commutative:
$$|A\rangle + |B\rangle = |B\rangle + |A\rangle \tag{1.2}$$
3. Vector addition is associative:
$$(|A\rangle + |B\rangle) + |C\rangle = |A\rangle + (|B\rangle + |C\rangle) \tag{1.3}$$
4. There is a unique vector 0 such that when you add it to any ket, it gives the same ket back:
$$|A\rangle + 0 = |A\rangle \tag{1.4}$$
5. Given any ket $|A\rangle$, there is a unique ket $-|A\rangle$ such that
$$|A\rangle + (-|A\rangle) \tag{1.5}$$
6. Given any $|A\rangle$ and any complex number $z$, you can multiply them to get a new ket. Also, multiplication by a scalar is linear:
$$|zA\rangle = z\,|A\rangle = |B\rangle \tag{1.6}$$
7. The distributive property holds:
$$z\,(|A\rangle + |B\rangle) = z\,|A\rangle + z\,|B\rangle \tag{1.7}$$
$$(z + w)\,|A\rangle = z\,|A\rangle + w\,|A\rangle \tag{1.8}$$

## 2 Bra-vector Axioms

1. The sum of any two bra-vectors is also a bra-vector:
$$\langle A| + \langle B| = \langle C| \tag{2.1}$$
2. Vector addition is commutative:
$$\langle A| + \langle B| = \langle B| + \langle A| \tag{2.2}$$
3. Vector addition is associative:
$$(\langle A| + \langle B|) + \langle C| = \langle A| + (\langle B| + \langle C|) \tag{2.3}$$
4. There is a unique vector 0 such that when you add it to any bra, it gives the same bra back:
$$\langle A| + 0 = \langle A| \tag{2.4}$$
5. Given any bra $\langle A|$, there is a unique bra $-\langle A|$ such that
$$\langle A| + (-\langle A|) \tag{2.5}$$
6. Given any $\langle A|$ and any complex number $z$, you can multiply them to get a new bra. Also, multiplication by a scalar is linear:
$$\langle zA| = z\,\langle A| = \langle B| \tag{2.6}$$
7. The distributive property holds:
$$z\,(\langle A| + \langle B|) = z\,\langle A| + z\,\langle B| \tag{2.7}$$
$$(z + w)\,\langle A| = z\,\langle A| + w\,\langle A| \tag{2.8}$$