1 Question 1

1.1 (a) Prove $a + d = p + q$

Assume $x = \overline{AE} = \overline{EB}$
Make a point G on $\overline{AB}$ which $\overline{GF} \perp \overline{AB}$

$$\because a + d = \frac{1}{2} * x * \overline{GF} \text{ and } p + q = \frac{1}{2} * x * \overline{GF} \tag{1}$$

$$\therefore a + d = p + q \tag{2}$$

1.2 (b) Prove $a + r = c + p$

Assume $y = \overline{DF} = \overline{FC}$
Make a point H on $\overline{DC}$ which $\overline{HE} \perp \overline{DC}$

$$\because c + d = \frac{1}{2} * y * \overline{HE} \text{ and } r + q = \frac{1}{2} * y * \overline{HE} \tag{3}$$

$$\therefore c + d = q + r \tag{4}$$

We can use Equation (2) - Equation (4), we get:

$$a + d - c - d = p + q - q - r \tag{5}$$

$$a - c = p - r \tag{6}$$

$$a + r = p + c \tag{7}$$