Breeding value BV_{11} for parent S with genotype ⑤

G_1G_1:

$$BV_{11} = 2\left(p \cdot a + qd - [(p-q)a + 2pqd]\right)$$

$$= 2\left(pa + qd - (p-q)a - 2pqd\right)$$

$$= 2\left(pa + qd - pa + qa - 2pqd\right)$$

$$= 2\left(qd + qa - 2pqd\right)$$

$$= 2\left(qa + qd - 2pqd\right)$$

$$= 2q\left(a + d - 2pd\right)$$

$$= 2q\left(a + (1 - 2p)d\right) \quad ; \quad 1 = p + q$$

$$= 2q\left(a + (p + q - 2p)d\right)$$

$$= 2q\underbrace{\left(a + (q - p)d\right)}_{= \alpha} = 2q\alpha$$