

Simultaneous equations inquiry

Mathematical notes

$$5x + 7y = 9$$

$$3x + 7y = 11$$

$$(A) \quad ax + (a + c)y = a + 2c$$

$$(B) \quad bx + (b + d)y = b + 2d$$

Solving the simultaneous equations by elimination:

Multiply (A) by
(b + d)

$$ax(b + d) + (a + c)(b + d)y = (a + 2c)(b + d)$$

Multiply (B) by
(a + c)

$$bx(a + c) + (b + d)(a + c)y = (b + 2d)(a + c)$$

(A) – (B)

$$ax(b + d) - bx(a + c) = (a + 2c)(b + d) - (b + 2d)(a + c)$$

$$abx + adx - abx - bcx = ab + ad + 2bc + 2cd - ab - bc - 2ad - 2cd$$

$$adx - bcx = bc - ad$$

$$(ad - bc)x = -1(ad - bc)$$

$$\mathbf{x = -1}$$

Substitute the
value of x into
equation (A):

$$ax + (a + c)y = a + 2c$$

$$-a + (a + c)y = a + 2c$$

$$(a + c)y = 2a + 2c$$

$$(a + c)y = 2(a + c)$$

$$\mathbf{y = 2}$$

Check using
equation (B)

$$bx + (b + d)y = -b + 2(b + d)$$

$$= b + 2d \text{ (as required)}$$