

## Substitution

1. When  $x = 2$   $y = 4$ , find:

a)  $x + y = 6$

b)  $5x = 5 \times 2 = 10$

c)  $y^2 = 4^2 = 16$

d)  $9y = 9 \times 4 = 36$

e)  $5x - 2y = (5 \times 2) - (2 \times 4) = 10 - 8 = 2$

(6 marks)

2. When  $a = 9$   $b = 5$ , find:

a)  $b - a = 5 - 9 = -4$

b)  $ab = 9 \times 5 = 45$

c)  $a^2 + 2 = 9^2 + 2 = 81 + 2 = 83$

d)  $9ab = 9 \times 9 \times 5 = 405$

e)  $7a - b^2 = (7 \times 9) - 5^2 = 63 - 25 = 38$

(6 marks)

## Substitution

3. When  $r = 4$   $s = -2$   $t = 5$ , find:

a)  $r + s = 4 - 2 = 2$

b)  $st = -2 \times 5 = -10$

c)  $s^2 = (-2)^2 = 4$

d)  $rst = 4 \times -2 \times 5 = -40$

e)  $6r - 2s = (6 \times 4) - (2 \times -2) = 24 + 4 = 28$

(6 mark)

4. When  $c = 8$   $d = -3$   $e = \frac{1}{2}$ , find:

a)  $ce = 8 \times \frac{1}{2} = 4$

b)  $e^2 = \frac{1^2}{2} = \frac{1}{4}$

c)  $\frac{cd}{e} = \frac{8 \times -3}{\frac{1}{2}} = -48$

d)  $-4d^2 = -4 \times (-3)^2 = -4 \times 9 = -36$

e)  $5c - 2d - 4e = (5 \times 8) - (2 \times -3) - \left(4 \times \frac{1}{2}\right) = 44$

(8 marks)

## Substitution

5.  $a^2 + b^2 = c^2$

a) Find  $c$  when  $a = 6$  and  $b = 8$

$$6^2 + 8^2 = c^2$$

$$c^2 = 100$$

$$c = \pm 10$$

b) Find  $a$  when  $b = 5$  and  $c = 13$

$$a^2 + 5^2 = 13^2$$

$$a^2 = 144$$

$$a = \pm 12$$

(4 marks)

6. The area of a trapezium can be worked out using the formula

$$A = \left( \frac{a + b}{2} \right) h$$

a) Find  $A$  when  $a = 8$ ,  $b = 4$  and  $h = 6$

$$A = \left( \frac{8 + 4}{2} \right) 6$$

$$A = 36$$

b) Find  $a$  when  $A = 88$ ,  $b = 9$  and  $h = 11$

$$88 = \left( \frac{a + 9}{2} \right) 11$$

$$a = 7$$

(4 marks)

## Substitution

7.  $v^2 = u^2 + 2as$

a) Find  $v$  when  $u = 6$ ,  $a = 2$  and  $s = 5$

$$v^2 = 6^2 + 2(2)(5)$$

$$v = \sqrt{56} = 7.5 \text{ (1dp)}$$

b) Find  $a$  when  $v = 12$ ,  $u = 8$  and  $s = 6$

$$12^2 = 8^2 + 2(6)a$$

$$a = 6.\dot{6}$$

(4 marks)

8. The cost,  $C$  in £s, of a taxi fare is calculated using

$$C = 2 + 1.2m$$

Where  $m$  is the amount of miles travelled

a) Find the cost of the taxi fare for a 6-mile journey

$$C = 2 + 1.2(6)$$

$$C = \text{£}9.20$$

b) How many miles have been travelled if the taxi fare cost £15.20?

$$15.20 = 2 + 1.2m$$

$$m = 11 \text{ miles}$$

(4 marks)

## Substitution

9. Below is a Fibonacci style sequence  
In a Fibonacci sequence the two previous terms add together to make the next term.

$$a, b, a + b, a + 2b, 2a + 3b, \dots$$

Find the next term in the sequence when  
 $a = 3$  and  $b = 5$

$$3, 5, 3 + 5, 3 + 2(5), 2(3) + 3(5), \dots$$

$$3, 5, 8, 13, 21, \dots$$

*Next term:  $13 + 21 = 34$*

(3 marks)

10. The cost,  $C$  in £s, of hiring a car is calculated using

$$C = 20 + 45d$$

Where  $d$  is the amount of days the car is hired for

- c) Find the total cost when hiring the car for 7 days

$$C = 20 + 45(7)$$

$$C = £335$$

- d) How many days has the car been hired for if the total cost is £695?

$$695 = 20 + 45d$$

$$d = 15 \text{ days}$$

(4 marks)