

## CHAPTER 6

- 1) a) -1, -2    b) -1, 4    c) -5, 3
- 2) a) 0, -3    b) 0, 4    c) 2, -2
- 3) a) -1/2, 4/3    b) 0.5, 2.5
- 4) a) -5.30, -1.70    b) 1.07, -0.699    c) -1.20, 1.45    d) no solutions  
e) no solutions    f) no solutions

## CHALLENGE QUESTIONS

### Question 1

my number is 13

2m Gives the number as 13 and shows a complete correct method for solving algebraically

eg

$$\begin{aligned}(x - 25)^2 &= x^2 - 25 \\ x^2 - 50x + 625 &= x^2 - 25 \\ 50x &= 650 \\ x &= 13\end{aligned}$$

or

1m Shows a correct expression without brackets that is equivalent to  $(\text{unknown} - 25)^2$

eg

$$\begin{aligned}\bullet x^2 - 50x + 625 \\ \bullet n^2 - 25n - 25n + 625 \\ \bullet a \times a - 50 \times a + 25 \times 25\end{aligned}$$

or

Shows a correct equation

eg

$$\bullet (x - 25)^2 = x^2 - 25$$

### Question 2

$$x = 6$$

### Question 3

9

Let the two positive integers be  $m$  and  $n$ . Then  $mn = 2(m + n) = 6(m - n)$ .

So  $2m + 2n = 6m - 6n$ , that is  $8n = 4m$ . Therefore  $m = 2n$ . Substituting for  $m$  gives:  $(2n)n = 2(2n + n)$ . So  $2n^2 = 6n$ , that is  $2n(n - 3) = 0$ .

Therefore  $n = 0$  or  $3$ . However,  $n$  is positive so the only solution is  $n = 3$ .

Therefore  $m = 2 \times 3 = 6$  and  $m + n = 6 + 3 = 9$ .

### Question 4

7

The triangle is isosceles when one of the following three equations is true:

$$n^2 + n = 2n + 12; \quad (1)$$

$$n^2 + n = 3n + 3; \quad (2)$$

$$2n + 12 = 3n + 3. \quad (3)$$

When equation (1) is true, we have  $n^2 - n - 12 = 0$ , so that  $(n - 4)(n + 3) = 0$ .

Hence either  $n = 4$  or  $n = -3$ . However, when  $n = -3$  then  $3n + 3 < 0$ , so that no triangle can be formed. There is, though, an isosceles triangle when  $n = 4$ , as the sides of the triangle are then

### Question 5

$$x = 22.2 \text{ cm and } V = 14.8 \text{ litres}$$

### Question 6

$$2x^2 + 7x + 4 = 0$$

$$\frac{2x^2 + 7x + 4}{= 0}$$

3

M1 for finding a correct coefficient  
 M1 for a method to find  $a$  and  $c$  or  $b$  and  $c$   
 A1  $2x^2 + 7x + 4 = 0$  or  $a = 2, b = 7, c = 4$

### Question 7

$$x = 2.37 \text{ or } x = 0.63$$

$\frac{x-1}{(x-2)(x-1)} - \frac{x-2}{(x-2)(x-1)}$ <p>or <math>x - 1 - (x - 2)</math>                  or <math>2(x - 2)(x - 1)</math>                  or <math>x^2 - 2x - x + 2</math></p>	M1	oe
<p>their <math>[x - 1 - (x - 2)] = 2(x - 1)(x - 2)</math>                  or <math>x - 1 - x + 2</math>                  or <math>2(x^2 - 2x - x + 2)</math></p>	M1dep	oe
$2x^2 - 6x + 3 (= 0)$	A1	oe Must be three terms
$\frac{-6 \pm \sqrt{(-6)^2 - (4 \times 2 \times 3)}}{2 \times 2}$ <p>or <math>\frac{6 \pm \sqrt{12}}{4}</math></p>	M1	oe Allow one error, ft their quadratic
$\frac{-6 \pm \sqrt{(-6)^2 - (4 \times 2 \times 3)}}{2 \times 2}$ <p>or <math>\frac{6 \pm \sqrt{12}}{4}</math></p>	A1ft	ft their quadratic, fully correct oe 2.366(...) and 0.633(...)
2.37 and 0.63	A1ft	SC2 for one correct answer to 2 dp SC1 for one correct answer to 3 dp or more

### Question 8

$$r = 12$$

$\frac{5\pi r}{2} (3r + 4) = 1200\pi$	M1	oe Allow $1200\pi \rightarrow 1200$
Correct equation or 3 term expression with no unexpanded brackets e.g.1 $3r^2 + 4r - 480 (= 0)$ e.g.2 $15r^2 + 20r = 2400$ e.g.3 $\frac{15\pi}{2} r^2 + 10\pi r = 1200\pi$	A1	oe
Attempt to factorise their 3 term quadratic e.g. for $3r^2 + 4r - 480$ $(3r + a)(r + b)$ where $ab = \pm 480$ or $3b + a = \pm 4$ or Attempt to substitute in the formula for their 3 term quadratic (allow one sign error) e.g. for $3r^2 + 4r - 480$ $\frac{-4 \pm \sqrt{4^2 - 4 \times 3 \times -480}}{2 \times 3}$ or $\frac{4 \pm \sqrt{4^2 - 4 \times 3 \times -480}}{2 \times 3}$ (1 sign error)	M1dep	oe Attempt to complete the square for their 3 term quadratic e.g. for $3r^2 + 4r - 480$ $(3) [(r + \frac{2}{3})^2 \dots\dots]$

<p>Correctly factorises their 3 term quadratic  e.g. for <math>3r^2 + 4r - 480 (= 0)</math>  <math>(3r + 40)(r - 12) (= 0)</math>  or  Correct substitution in formula for their 3 term quadratic  e.g. for <math>3r^2 + 4r - 480 (= 0)</math>  <math display="block">\frac{-4 \pm \sqrt{4^2 - 4 \times 3 \times -480}}{2 \times 3}</math></p>	<p>A1ft</p>	<p>ft M1 A0 M1dep  oe  Correct completion of square for their 3 term quadratic  e.g. for <math>3r^2 + 4r - 480</math>  (3) <math>[(r + \frac{2}{3})^2 - (\frac{2}{3})^2 - 160]</math> oe</p>
<p>12</p>	<p>A1</p>	<p>Do not award if negative solution also included</p>