

Solve quadratic equations by factorization, completing the square and by use of the formula.

1) Solve giving answer in exact form [P2]

a)  $(x - 7)(x + 4) = 0$ . [1]

b)  $(y + 1)^2 = 4$  [2]

c)  $(x - 3)^2 = 5$  [2]

d)  $\frac{5}{x} - \frac{8}{x+1} = 1$  [4]

e)  $\frac{2x+3}{x-4} + \frac{x+40}{x^2-16} = 2$  [4]

f)  $\frac{2(t+3)}{t} - \frac{t}{t+3} = 1$  [5]



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2) Solve giving your answer in 3 significant figures [P4]

a)  $\frac{1}{x} - \frac{2}{x+1} = 3$  [7]

b)  $\frac{3}{m+4} - \frac{4}{m} = 6$  [7]

c)  $\frac{2}{2x+11} - \frac{1}{x-4} = \frac{1}{2}$  [8]



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3) Solve by factorising.

a)  $3x^2 - 7x - 20 = 0$  [3]

b)  $3x^2 + 2x - 8 = 0$ . [3]

c)  $5x^2 + 17x - 12 = 0$  [3]

d)  $5x^2 + x - 18 = 0$  [3]

e)  $x^2 - 7x + 6 = 0$  [3]

f)  $10r^2 - 23r + 9 = 0$  [3]



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4) Solve the equations.

Show all your working and give your answers correct to 2 decimal places. [P4]



a)  $2x^2 + 7x - 3 = 0$  [4]

b)  $3x^2 + 7x - 11 = 0$  [4]

c)  $3x^2 - 2x - 2 = 0$  [4]

d)  $5x^2 + 10x + 2 = 0$  [4]

e)  $3x^2 - 11x + 4 = 0$  [4]

f)  $x^3 + 4x^2 - 17x = x^3 - 9$  [5]

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5) Find the value of  $a$  and the value of  $b$ .

a)  $x^2 + 4x - 9 = (x + a)^2 + b$  [3]

b)  $x^2 + 4x - 6 = (x + a)^2 + b$  [3]

c)  $x^2 + 12x - 7 = (x + p)^2 - q$  [3]

d)  $x^2 + 7x - 5 = (x + a)^2 + b$  [3]

e)  $x^2 - 9x + 12 = (x - p)^2 - q$  [3]

f)  $x^2 - 12x + a = (x + b)^2$  [3]

g)  $x^2 - 16x + a = (x + b)^2$  [3]

h)  $2x^2 + 5x - 3 = 2(x + a)^2 + b$  [3]

(i)  $(x + a)^2 = x^2 + 22x + b$  [2]

(j)  $x^3 - 4x^2 + 4x = x(x - a)^2$  [3]

(k)  $18 - 3x - x^2 = b - (a + x)^2$  [3]



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- 6) (i) Write  $x^2 + 4x + 1$  in the form  $(x + p)^2 + q$ . [2]  
(ii) Use your answer to part (b)(i) to solve the equation  $x^2 + 4x + 1 = 0$ , give answer in 3 Significant figures [2]  
(iii) Use your answer to part (b)(i) to write down the coordinates of the minimum point on the graph of  $y = x^2 + 4x + 1$ . [2]

0580/43/M/J/21 Q7)



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**Do not use calculator in the remaining questions**

- 7) (a) Write  $x^2 - 18x - 27$  in the form  $(x + k)^2 + h$  [2]  
(b) Use your answer to **part (a)** to solve the equation  $x^2 - 18x - 27 = 0$ , give answer in simplified surd form [2]

0580/23/M/J/20 Q18



8) (a) (i) Write  $x^2 + 8x - 9$  in the form  $(x + k)^2 + h$  [2]

(ii) Use your answer to **part (a)(i)** to solve the equation  $x^2 + 8x - 9 = 0$  [2]

(b) The solutions of the equation  $x^2 + bx + c = 0$

are  $\frac{-7 + \sqrt{61}}{2}$  and  $\frac{-7 - \sqrt{61}}{2}$

Find the value of  $b$  and the value of  $c$ . [2]

0580/42/M/J/20 Q9



9) (a) Write  $x^2 - 7x + 5$  in the form  $(x - a)^2 - b$  [2]

(b) Hence write down the minimum value of

$x^2 - 7x + 5$  [1]

4024/12/M/J/19 Q14)



10) (a)  $x^2 - 9x + 12 = (x - p)^2 - q$ . Find the value of  $p$  and the value of  $q$ . [3]

(b) Write down the minimum value of  $x^2 - 9x + 12$  [1]

(c) Write down the equation of the line of symmetry of the graph of  $y = x^2 - 9x + 12$  [1]

**0580/41/O/N/14 Q4(d)**

11) The expression  $5 + 12x - 2x^2$  can be written in the form  $q - 2(x + p)^2$ .

(i) Find the value of  $p$  and the value of  $q$ . [3]

(ii) Write down the coordinates of the maximum point of the curve  $y = 5 + 12x - 2x^2$ . [1]

**0580/42/O/N/21 Q6 (d)**





12) Find the turning point of  $y = x^2 + 4x - 3$

by completing the square [4]

0580/02/SP/20 Q25)

### Answers

Q1) (a) 7 and -4 (b) 1 and -3 (c) $3 \pm \sqrt{5}$ (d) -5 and 1 (e) -7 (f) -2	Q7) (a) $(x - 9)^2 - 108$ (b) $9 \pm 6\sqrt{3}$
Q2) (a) -1.55 and 0.215 (b) -0.79 and -3.38 (c) -2.64 and 1.14	Q8) (a)(i) $(x + 4)^2 - 25$ (ii) $x + 4 = \pm 5$ leading to $x = 1$ and $-9$ (b) $b = 7$ and $c = -3$
Q3) (a) 4 and $-5/3$ (b) $1\frac{1}{3}$ and -2 (c) $3/5$ and -4 (d) $1\frac{4}{5}$ and -2 (e) 1 and 6 (f) $1\frac{4}{5}$ and $\frac{1}{2}$	Q9) $(x - 7/2)^2 - 29/4$ (b) $-29/4$
Q4) (a) 0.39 and -3.89 (b) -3.41 and 1.08 (c) -0.55 and 1.22 (d) -0.23, -1.77 (e) 0.41 and 3.26 (f) 0.62 and 3.63	Q10) (a) $p = 4.5$ , $q = 8.25$ (b) - 8.25 (c) $x = 4.5$
Q5) (a) 2, -13 (b) 2, -10 (c) 6, 43 (d) 3.5, -17.25 (e) 4.5, 8.25 (f) 36, -6 (g) 64, -8 (h) $1\frac{1}{4}$ , $-6\frac{1}{8}$ (i) 11, 121 (j) 2 (k) 1.5, 20.25	Q11) (i) $p = -3$ and $q = 23$ (d)(ii) (3,23)
Q6)(i) $(x + 2)^2 - 3$ (ii) -3.37, -0.268 (iii) (-2,-3)	Q12) $(x + 2)^2 - 7$ leading to (-2,-7)