

Level 3 Algebra - Quadratic Equations

June 2013 - Question 4

Jan 2014 - Question 5

Jan 2014 - Question 21

Jan 2015 - Question 15

June 2015 - Question 12

Jan 2016 - Question 2

June 2016 - Question 9

June 2016 - Question 17

Jan 2017 - Question 4

June 2017 - Question 10

Jan 2018 - Question 4

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June 2022 - Question 3

June 2022 - Question 21

Jan 2023 - Question 13

June 2023 - Question 2

June 2023 - Question 4

Jan 2024 - Question 3

Jan 2024 - Question 22

4 $x^2 - 8x = (x + p)^2 + q$ for all values of x .

(a) Find the value of p and the value of q .

$p =$

$q =$

(2)

(b) Solve the equation $4(x^2 - 8x) + 63 = 0$

.....

(3)

(Total for Question 4 is 5 marks)



5 Use the quadratic formula to solve the equation $4x^2 - 6x + 1 = 0$

Give your answer in the form $\frac{p \pm \sqrt{q}}{r}$ where p , q and r are integers.

.....
(Total for Question 5 is 3 marks)



21 Solve

$$\frac{9}{10-x} + \frac{9}{10+x} = 5$$

(Total for Question 21 is 4 marks)

TOTAL FOR PAPER IS 90 MARKS



15 Solve

$$\frac{1}{x} - \frac{1}{x+1} = 2$$

Give your solutions in the form $a + b\sqrt{3}$ where a and b are fractions.

.....
(Total for Question 15 is 5 marks)



12 (a) (i) Write the quadratic expression $x^2 + 6x + 7$ in the form $(x + a)^2 + b$ where a and b are integers.

.....
(ii) Hence solve the equation $x^2 + 6x + 7 = 0$
Give your answer in the form $p \pm \sqrt{q}$ where p and q are integers.

.....
(4)

(b) Sketch the graph of $y = x^2 + 6x + 7$
You must label, with coordinates, the points of intersection with the axes and any turning points.

(3)

(Total for Question 12 is 7 marks)



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2 (a) Use the quadratic formula to solve the equation $4x^2 - x - 2 = 0$

Give your solutions in the form $\frac{p \pm \sqrt{q}}{r}$ where p , q and r are integers.

.....
(2)

(b) Write down the solutions of the equation $8x^2 - 2x - 4 = 0$

.....
(1)

(Total for Question 2 is 3 marks)



9 Use the quadratic formula to solve the equation $3x^2 + 4x - 5 = 0$

Give your solutions in the form $\frac{p \pm \sqrt{q}}{r}$ where p , q and r are integers.

.....
(Total for Question 9 is 2 marks)

10 (a) Solve $8 - 3y < 11$

.....
(2)

(b) Solve $x^2 + 3x - 4 < 0$

.....
(3)

(Total for Question 10 is 5 marks)



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17 $x^2 + 4x + 1 = (x + p)^2 + q$ for all values of x .

(a) Find the value of p and the value of q .

$p =$

$q =$

(2)

(b) Solve the equation $2x^2 - 5x - 3 = 0$

.....
(2)

(Total for Question 17 is 4 marks)



4 (a) Solve the equation $4x(x - 3) = 7$

.....
(3)

(b) Use the quadratic formula to solve the equation $3x^2 = 1 - 8x$

Give your answer in the form $\frac{p \pm \sqrt{q}}{3}$ where p and q are integers.

.....
(3)

(Total for Question 4 is 6 marks)



10 Here is an identity.

$$2x^2 + 8x - 35 = a(x + b)^2 + c \quad \text{where } a, b \text{ and } c \text{ are integers.}$$

(a) (i) Find the values of a , b and c .

$$a = \dots\dots\dots$$

$$b = \dots\dots\dots$$

$$c = \dots\dots\dots$$

(ii) Hence solve the equation $2x^2 + 8x - 35 = 0$

Give your answer in the form $p \pm \sqrt{\frac{q}{r}}$ where p , q and r are integers.

.....
(5)

The graph of $y = 2x^2 + 8x - 35$ has a turning point at the point A .

(b) Write down the coordinates of A .

.....
(1)

(Total for Question 10 is 6 marks)



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3 Solve $6(2 - 3x) < 5(x + 1)$

.....
(Total for Question 3 is 3 marks)

4 Use the quadratic formula to solve the equation $5x^2 + 2x - 1 = 0$

Give your answer in the form $\frac{p \pm \sqrt{q}}{5}$ where p and q are integers.

.....
(Total for Question 4 is 3 marks)



5 Use the quadratic formula to solve the equation $2 + 4x - 9x^2 = 0$

Give your answer in the form $\frac{p \pm \sqrt{q}}{9}$ where p and q are integers.

.....
(Total for Question 5 is 3 marks)

6 Find the range of values of k such that the equation $3x^2 + kx + 3 = 0$ has real roots.

.....
(Total for Question 6 is 3 marks)

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10 (a) (i) Write the equation $\frac{x^2}{2} = \frac{x}{3} + \frac{1}{4}$ in the form $ax^2 + bx + c = 0$ where a , b , and c are integers.

.....
(1)

(ii) Hence use the quadratic formula to solve the equation $\frac{x^2}{2} = \frac{x}{3} + \frac{1}{4}$
Give your answer in the form $\frac{p \pm \sqrt{q}}{6}$ where p and q are integers.

.....
(3)

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(b) Solve the equation $(x + 3)^2 = (x + 3)$

.....
(3)

(c) Write the quadratic expression $x^2 - 8x + 3$ in the form $(x + m)^2 + n$ where m and n are integers.

.....
(2)

(Total for Question 10 is 9 marks)

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- 6 (a) Write the quadratic expression $2x^2 - 12x + 13$ in the form $a(x + m)^2 + n$ where a , m and n are integers.

.....
(3)

- (b) Hence solve the equation $2x^2 - 12x + 13 = 0$

Give your answer in the form $p \pm \sqrt{\frac{q}{r}}$ where p , q and r are integers.

.....
(2)

(Total for Question 6 is 5 marks)



5 Solve $\frac{2x}{x-4} = \frac{x}{x+2}$

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.....
(Total for Question 5 is 3 marks)



15 (a) (i) Write the equation $\frac{(x-5)^2}{2} = x$ in the form $ax^2 + bx + c = 0$ where a , b and c are integers.

.....
(2)

(ii) Hence solve the equation $\frac{(x-5)^2}{2} = x$

Give your answer in the form $p \pm \sqrt{q}$ where p and q are integers.

.....
(3)

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(b) (i) Write $x^2 - 6x - 16$ in the form $(x + m)^2 + n$ where m and n are integers.

.....
(2)

(ii) Hence, using your answer to part (b)(i), solve the equation $x^2 - 6x - 16 = 0$

.....
(2)

(Total for Question 15 is 9 marks)



2 Make x the subject of $w = \frac{3x^2 + 2}{x^2 + 1}$

.....
(Total for Question 2 is 3 marks)

3 Use the quadratic formula to solve the equation $3x^2 - 2x = 6$

Give your answer in the form $\frac{p \pm \sqrt{q}}{r}$ where p , q and r are integers.

.....
(Total for Question 3 is 2 marks)



- 21 (a) Express $\frac{3}{x+4} + \frac{1}{x-4}$ as a single fraction.
Give your answer in its simplest form.

.....
(3)

- (b) Hence, or otherwise, solve $\frac{3}{x+4} + \frac{1}{x-4} = \frac{4}{5}$

.....
(3)

(Total for Question 21 is 6 marks)



13 (a) Use the quadratic formula to solve the equation $3x^2 - 4x - 2 = 0$

Give your answer in the form $\frac{p \pm \sqrt{q}}{3}$ where p and q are integers.

.....
(3)

(b) (i) Write the quadratic expression $4x^2 - 12x + 10$ in the form $(ax + m)^2 + n$
where a , m and n are integers.

.....
(3)



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2 Solve $10y^2 + 9y + 2 = 0$

.....
(Total for Question 2 is 2 marks)



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4 (a) Use the quadratic formula to solve the equation $3x^2 - 4x - 5 = 0$

Give your answer in the form $\frac{p \pm \sqrt{q}}{3}$ where p and q are integers.

.....
(3)

$2x^2 - 6x + 5 = 2(x + p)^2 + q$ for all values of x .

(b) Find the value of p and the value of q .

$p =$
 $q =$
(3)

(c) Find the sum of the roots of the equation $4x^2 = 5 - 12x$

.....
(2)

(Total for Question 4 is 8 marks)



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2 Make m the subject of $d = 6 - \frac{3}{m^2}$

.....
(Total for Question 2 is 3 marks)

3 Use the quadratic formula to solve the equation $5x^2 = 3x + 2$

.....
(Total for Question 3 is 2 marks)



22 (a) Simplify $\frac{x^2 - 3x}{x^2 - 5x + 6}$

.....
(2)

(b) Solve $\frac{1}{x+1} + \frac{2}{x+2} = 2$

.....
(4)

(Total for Question 22 is 6 marks)

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