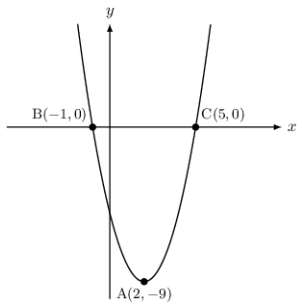
[Maximum mark: 6]
Let $f(x) = x^2 - 2x - 8$, for $x \in \mathbb{R}$.

1. Write down the y-intercept of the graph of $y = f(x)$. [1]
2. Solve the equation $f(x) = 0$. [3]
3. Find the equation of the axis of symmetry of the graph of $y = f(x)$. [2]

[Maximum mark: 6]
The following diagram shows part of the graph of a quadratic function f.



The vertex is at point A and the x-intercepts are at points B and C.
The function f can be written in the form $f(x) = (x - h)^2 + k$.

1. Write down the values of h and k. [2]

The function f can also be written in the form $f(x) = (x + p)(x - q)$.

1. Write down the values of p and q. [2]
2. Find the y-intercept of the graph of f. [2]

[Maximum mark: 7]
Let $f(x) = (x - 3)(x + 1)$, for $x \in \mathbb{R}$.
For the graph of f, find:

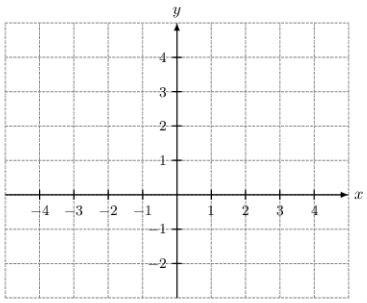
1. the y-intercept; [2]
2. the x-intercepts; [2]
3. the coordinates of the vertex. [3]

[Maximum mark: 7]
Let $f(x) = x^2 - 4x + 3$, for $x \in \mathbb{R}$.

1.
For the graph of $y = f(x)$, find:
   1.
   the y-intercept;
   2.
   the x-intercepts. [3]

2.
The function f can be expressed in the form $f(x) = (x - h)^2 + k$. Find the value of h and the value of k. [2]

3.
Sketch the graph of $y = f(x)$ on the grid below. Clearly label the intercepts with the axes, and the vertex. [2]



[Maximum mark: 5]
The equation $x^2 + kx + 4 = 0$ has two equal roots.
Find the possible values of k.

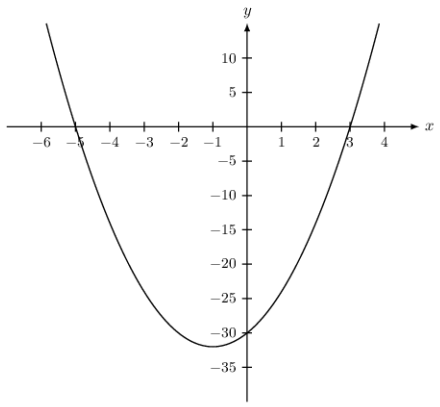
[Maximum mark: 5]
Let $f(x) = a(x-h)^2 + k$, for $x \in \mathbb{R}$.
The vertex of the graph of f is at P$(3, 4)$ and the graph passes through Q$(1, -4)$.

1.
Write down the values of h and k. [2]
2.
Find the value of a. [3]

[Maximum mark: 5]
The equation $x^2 - kx + 1 = 0$ has two distinct real roots.
Find the possible values of k.

[Maximum mark: 6]

The diagram below shows the graph of a quadratic function $f(x) = 2x^2 + bx + c$.



1.
Write down the value of c. [1]

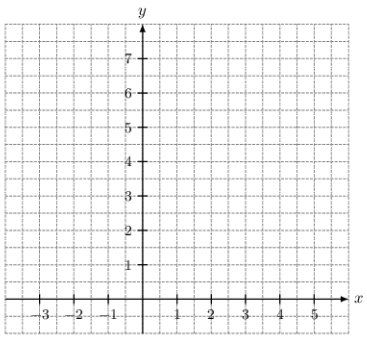
2.
Find the value of b and write down $f(x)$. [3]

3.
Calculate the coordinates of the vertex of the graph of f. [2]

[Maximum mark: 6]

The axis of symmetry of the graph of a quadratic function has equation $x = \frac{3}{2}$.

1.
Draw the axis of symmetry on the grid below. [1]



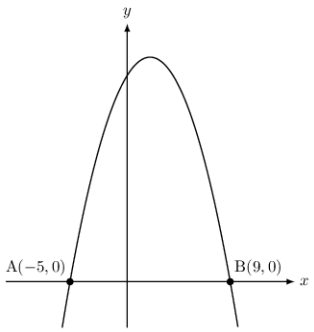
The graph of the quadratic function intersects the x-axis at the point P$(-1, 0)$. There is a second point, Q , at which the graph of the quadratic function intersects the x-axis.

1.
Mark and label P and Q on the grid above. [1]

The graph of the quadratic function has equation $y = -x^2 + bx + c$, where $b, c \in \mathbb{Z}$.

1.
    1.
    Find the value of b and the value of c.
    2.
    Find the coordinates of the vertex, M.
    3.
    Draw the graph of the quadratic function on the grid above. [4]

[Maximum mark: 6]
The graph shows the curve of a quadratic function of the form $f(x) = ax^2 + bx + 90$.



1.
Write down the equation for the axis of symmetry of the curve. [2]

2.
Hence, or otherwise, find the value of a and the value of b. [3]

3.
Find the y-coordinate of the vertex of the curve. [1]

[Maximum mark: 5]

1.
Express $2x^2 - 8x + 9$ in the form $a(x + b)^2 + c$ where $a, b, c \in \mathbb{Z}$. [2]

2.
Given that $f(x) = x - 2$ and $(g \circ f)(x) = 2x^2 - 8x + 9$, find $g(x)$. [3]

[Maximum mark: 6]

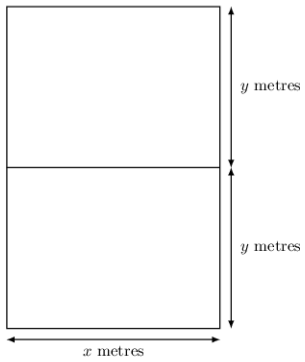
Consider $f(x) = x^2 + bx + c$, for $x \in \mathbb{R}$, where $b, c \in \mathbb{Z}$. The graph of f has a local minimum at $x = 2.5$. The distance between the two x-intercepts of the graph of f is 7.

1.
Find the coordinates of the two x-intercepts. [2]

2.
Find the value of b and the value of c. [4]

[Maximum mark: 5]
The equation $x^2 + (k-3)x - 3k = 0$ has two distinct real solutions.
Find the possible values of k.

[Maximum mark: 6]
A farmer is going to fence two equal adjacent parcels of land. These parcels share one side (which also requires fencing) as shown in the following diagram. The farmer has only 80 metres of fence.



1.
Write down the equation for the total length of the fence, 80 m, in terms of x and y. [1]

2.
Write down the total area of both parcels of land in terms of x. [2]

3.
Find the maximum area, in m^2, of one parcel of land. [3]

[Maximum mark: 6]

The graph of a quadratic function has a y-intercept at A$(0, 24)$ and **one** of its x-intercepts is B$(2, 0)$.

The x-coordinate of the vertex of the graph is 4.

The equation of the quadratic function is in the form $y = ax^2 + bx + c$.

1. Write down the value of c. [1]
2. Find the value of a and the value of b. [4]
3. Write down the coordinates of the second x-intercept of the function. [1]

[Maximum mark: 5]

1. Express $3x^2 + 18x + 20$ in the form $a(x + b)^2 + c$ where $a, b, c \in \mathbb{Z}$. [2]
2. Given that $f(x) = x + 3$ and $(g \circ f)(x) = 3x^2 + 18x + 20$, find $g(x)$. [3]

[Maximum mark: 18]

A cannonball is fired from the top of a tower. The rate of change of the height, h, of the cannonball above the ground is modelled by

$$h'(t) = -4t + 20, \quad t \geq 0,$$

where h is in metres and t is the time, in seconds, since the moment the cannonball was fired.

[2]

1. Determine the time t at which the cannonball reached its maximum height.

After one second, the cannonball is 26 metres above the ground.

1.
    1.
    Find an expression for $h(t)$, the height of the cannonball above the ground at time t.
    2.
    Hence, determine the maximum height reached by the cannonball. [5]
2.
Write down the height of the tower. [1]
3.
Calculate the height of the cannonball 4 seconds after it was fired. [2]

The cannonball hits its target on the ground n seconds after it was fired.

1.
Find the value of n. [2]
2.
Determine the total time the cannonball was above the height of the tower. [3]

A second cannonball is fired from exactly halfway up the tower, with the same projectile motion as the first cannonball.

[3]

1. Given that both cannonballs land at the same time, determine the length of time between the first cannonball and the second cannonball being fired.

[Maximum mark: 7]
Let $f(x) = ax^2 - 24x + c$, for $x \in \mathbb{R}$, where $a, c \in \mathbb{Z}$.

1.
A horizontal line, L, intersects the graph of $y = f(x)$ at $x = 1$ and $x = 7$.
    1.
    Find the equation of the axis of symmetry of the graph of $y = f(x)$.
    2.
    Hence show that $a = 3$. [4]
2.
The equation of L is $y = 6$. Find the value of c. [3]

[Maximum mark: 7]
Let $f(x) = -6x^2 + bx + c$, for $x \in \mathbb{R}$, where $b, c \in \mathbb{Z}$.

1.
A horizontal line, L, intersects the graph of $y = f(x)$ at $(-1, h)$ and $(5, h)$, where $h \in \mathbb{R}$.
    1.
    Find the equation of the axis of symmetry of the graph of $y = f(x)$.
    2.
    Hence show that $b = 24$. [4]
2.
Given $h = -8$, find the value of c. [3]

[Maximum mark: 6]
Let $f(x) = x^2 + kx$ and $g(x) = x + k$, for $x \in \mathbb{R}$, where k is a constant.
The graphs of $y = f(x)$ and $y = g(x)$ intersect at two distinct points.
Find the possible values of k.

[Maximum mark: 5]
The line $y = x + 1$ touches the graph of the function $g(x) = 2x^2 + kx + 3$ at one point. Find the possible values of k.

[Maximum mark: 6]
Let $f(x) = p - \frac{16}{x}$, for $x \neq 0$, where p is a constant.
The line $y = x - p$ intersects the graph of $y = f(x)$ at two distinct points.
Find the possible values of p.

[Maximum mark: 15]
Let $f(x) = 3x^2 + 12x + 9$, for $x \in \mathbb{R}$.

1. For the graph of f, find:
    1. the y-intercept;
    2. the x-intercepts. [4]

The function f can be written in the form $f(x) = a(x - h)^2 + k$.

1. Find the values of a, h and k. [5]
2. For the graph of f, write down:
    1. the coordinates of the vertex;
    2. the equation of the axis of symmetry. [2]

The graph of a function g is obtained from the graph of f by a reflection in the x-axis, followed by a translation by the vector $\begin{pmatrix} 0 \\ 4 \end{pmatrix}$. [4]

1. Find $g(x)$, giving your answer in the form $g(x) = px^2 + qx + r$.

[Maximum mark: 15]
Let $f(x) = 2x^2 + 4x + p$, for $x \in \mathbb{R}$, where $p \in \mathbb{Z}$.

1.
The equation $f(x) = 0$ has two equal roots.
    1.
    Write down the value of the discriminant of f.
    2.
    Show that $p = 2$. [3]
2.
For the graph of f, find:
    1.
    the equation of the axis of symmetry.
    2.
    the coordinates of the vertex; [4]
3.
Write down the solution to the equation $f(x) = 0$. [1]
4.
The function f can be written in the form $f(x) = a(x - h)^2 + k$. Find the values of a, h and k. [5]
5.
The graph of a function g is obtained from the graph of f by a reflection in the x-axis. Find the coordinates of the vertex of the graph of g. [2]

[Maximum mark: 15]
Let $f(x) = 2x^2 - 8x + 6$, for $x \in \mathbb{R}$.

1. Write down the value of $f(0)$. [1]
2. Solve the equation $f(x) = 0$. [3]

The function f can be written in the form $f(x) = a(x - h)^2 + k$.

1. Find the values of a, h and k. [5]
2. For the graph of f, write down:
    1. the coordinates of the vertex;
    2. the equation of the axis of symmetry. [2]

The graph of a function g is obtained from the graph of f by a reflection in the x-axis, followed by a translation by the vector $\begin{pmatrix} 1 \\ 3 \end{pmatrix}$. [4]

1. Find $g(x)$, giving your answer in the form $g(x) = px^2 + qx + r$.

[Maximum mark: 15]

Let $f(x) = 2(x-1)^2 - 8$, for $x \in \mathbb{R}$.

1. Show that $f(x) = 2x^2 - 4x - 6$. [2]
2. For the graph of f:
   1. write down the coordinates of the vertex;
   2. write down the y-intercept;
   3. find both x-intercepts. [7]
3. Hence sketch the graph of f. [3]

Let $g(x) = 6x^2$, for $x \in \mathbb{R}$.

The graph of f may be obtained from the graph of g using the following two transformations:

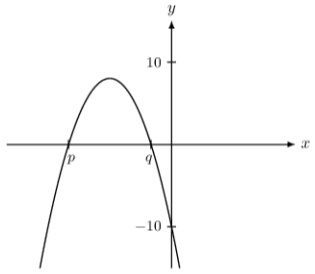
$$\text{a compression of scale factor } a \text{ in the } y\text{-direction, followed by}$$
$$\text{a translation of } \begin{pmatrix} h \\ k \end{pmatrix}.$$

[3]

1. Find the values of a, h and k.

[Maximum mark: 15]

Let $f(x) = a(x+1)(x+5)$, for $x \in \mathbb{R}$, where $a \in \mathbb{Z}$. The following diagram shows part of the graph of f.



The graph of f has x-intercepts at $(p, 0)$ and $(q, 0)$, and a y-intercept at $(0, -10)$.

1.
   1.
   Write down the value of p and the value of q.
   2.
   Find the value of a. [6]
2.
Find the equation of the axis of symmetry. [2]
3.
Find the coordinates of the vertex. [3]

The graph of a function g is obtained from the graph of f by a reflection in the y-axis, followed by a translation by the vector $\begin{pmatrix} 0 \\ 2 \end{pmatrix}$. The point P$(-2, 6)$ on the graph of f is mapped to point Q on the graph of g. [4]

1. Find the coordinates of Q.

[Maximum mark: 7]

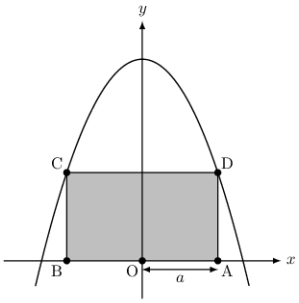
Consider $f(x) = \log_k(8x - 2x^2)$, for $0 < x < 4$, where $k > 0$.

The equation $f(x) = 3$ has exactly one solution. Find the value of k.

[Maximum mark: 15]
Let $f(x) = 16 - x^2$, for $x \in \mathbb{R}$.

1.
Find the x-intercepts of the graph of f. [2]

The following diagram shows part of the graph of f.



Rectangle ABCD is drawn with A & B on the x-axis and C & D on the graph of f.
Let $\mathrm{OA} = a$.

1.
Show that the area of ABCD is $32a - 2a^3$. [2]
2.
Hence find the value of $a > 0$ such that the area of ABCD is a maximum. [4]

Let $g(x) = (x - 4)^2 + k$, for $x \in \mathbb{R}$, where k is a constant.

1.
Show that when the graphs of f and g intersect, $2x^2 - 8x + k = 0$. [2]
2.
Given that the graphs of f and g intersect only once, find the value of k. [5]

[Maximum mark: 14]

A quadratic function f can be written in the form $f(x) = p(x-1)(x-q)$.

The graph of $y = f(x)$ has axis of symmetry $x = 2$ and y-intercept at $(0, -3)$.

1. Find the value of q. [3]

2. Find the value of p. [3]

The line $y = kx + 6$ is a tangent to the graph of $y = f(x)$. [8]

1. Find the possible values of k.

Markscheme

Sorry.. please check revisiontown for markschemes. It was really hard scraping each dialog box and scaling correctly. Couldnt figure it out...