Candidate surname

Other names

**Pearson
Edexcel Award**

Centre Number

Candidate Number

Tuesday 7 May 2019

Morning (Time: 2 hours)

Paper Reference **AAL30/01**

Algebra

**Level 3
Calculator NOT allowed**

You must have: Ruler graduated in centimetres and millimetres, pair of compasses, pen, HB pencil, eraser.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators are not allowed.**

Information

- The total mark for this paper is 90
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

P 5 9 9 6 7 A 0 1 2 4

Pearson

1 (a) Factorise $24w^2y^3 - 8wy^2$

....

(2)

(b) Factorise $3ef - 3e + 2f - 2$

....

(2)

(c) Factorise $25 - 4x^2$

....

(1)

(Total for Question 1 is 5 marks)

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2 (a) Solve $\dfrac{4y-7}{3} < -2$

....
(2)

(b) Solve $2x^2 + 9x - 5 < 0$

....
(3)

(Total for Question 2 is 5 marks)

3 Here is a formula $P = \dfrac{4a^2b}{c^2}$

(a) Make b the subject of the formula.

....
(2)

(b) Make c the subject of the formula.

....
(2)

(Total for Question 3 is 4 marks)

4 (a) On the grid, construct the graph of $2x^2 + 2y^2 = 72$
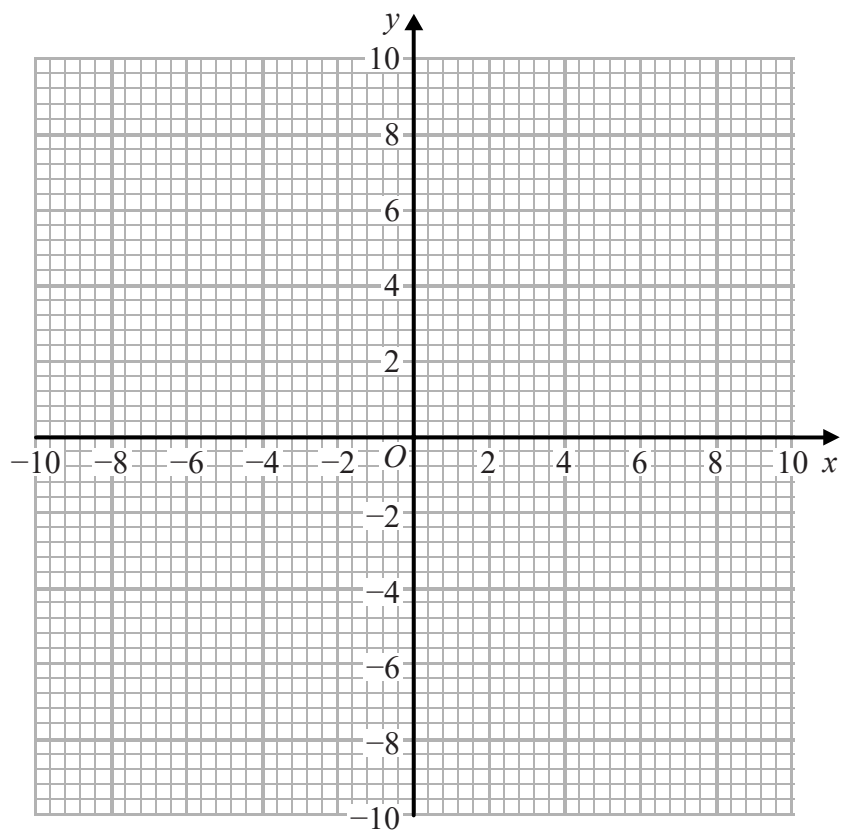
(2)

(b) (i) On the grid, draw the graph of $y = 2x - 4$ for $-2 \leqslant x \leqslant 6$

(1)

(ii) Use your graphs to find estimates for the solutions of the simultaneous equations

$$2x^2 + 2y^2 = 72$$
$$y = 2x - 4$$

....

(2)

(Total for Question 4 is 5 marks)

Turn over ▶

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

Give your answer in the form $\dfrac{p \pm \sqrt{q}}{9}$ 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)

7 (a) Expand and simplify $(2x + 1)(x - 4)$

....

(2)

(b) Expand and simplify $(3x - 5y)^2$

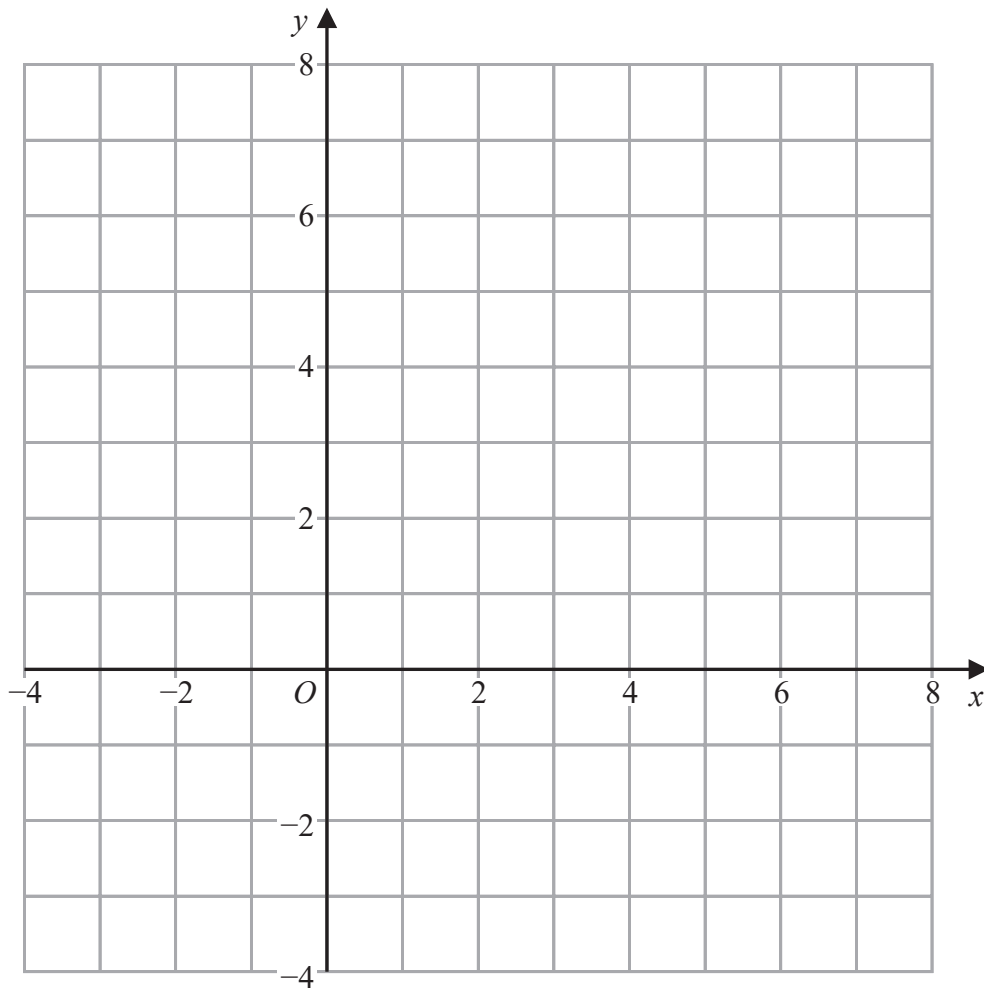...

(2)

(Total for Question 7 is 4 marks)

8 On the grid, shade the region that satisfies all these inequalities.

$$x > -1 \qquad 2x + y < 6 \qquad y < 4 - x$$

Label the region **R**.

9 h is directly proportional to the cube of x.

When $x = 3$, $h = 108$

(a) Find a formula for h in terms of x.

....

(3)

(b) Calculate the value of x when $h = -32$

....

(2)

(c) Using the axes below, sketch the graph of h against x.
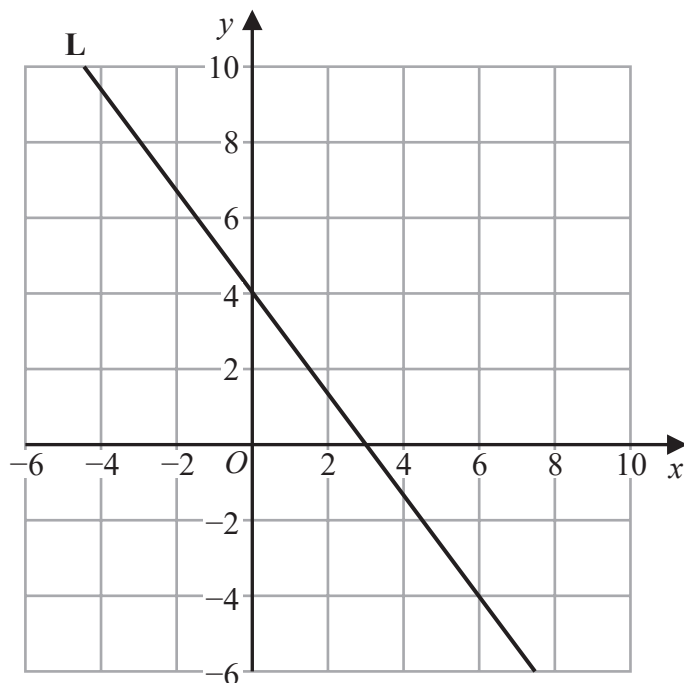

(1)
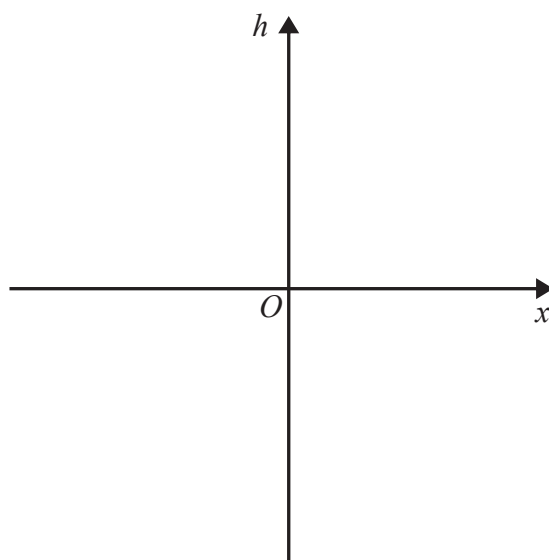
(Total for Question 9 is 6 marks)

10 The straight line **L** is drawn on the grid.

(a) Find an equation for **L**

Give your answer in the form $ax + by + c = 0$ where a, b and c are integers.

....

(3)

The straight line L_1 is parallel to **L**

(b) Find the gradient of L_1

....

(1)

(Total for Question 10 is 4 marks)

11 Here is a quadratic equation.

$$5x^2 + 6x - 8 = 0$$

(a) (i) Write down the sum of the roots of this equation.

....

(1)

(ii) Write down the product of the roots of this equation.

....

(1)

(b) Write $x^2 - 8x + 7$ in the form $(x + p)^2 + q$ where p and q are constants.

....

(2)

(Total for Question 11 is 4 marks)

12 Here is a speed-time graph for a toy car.
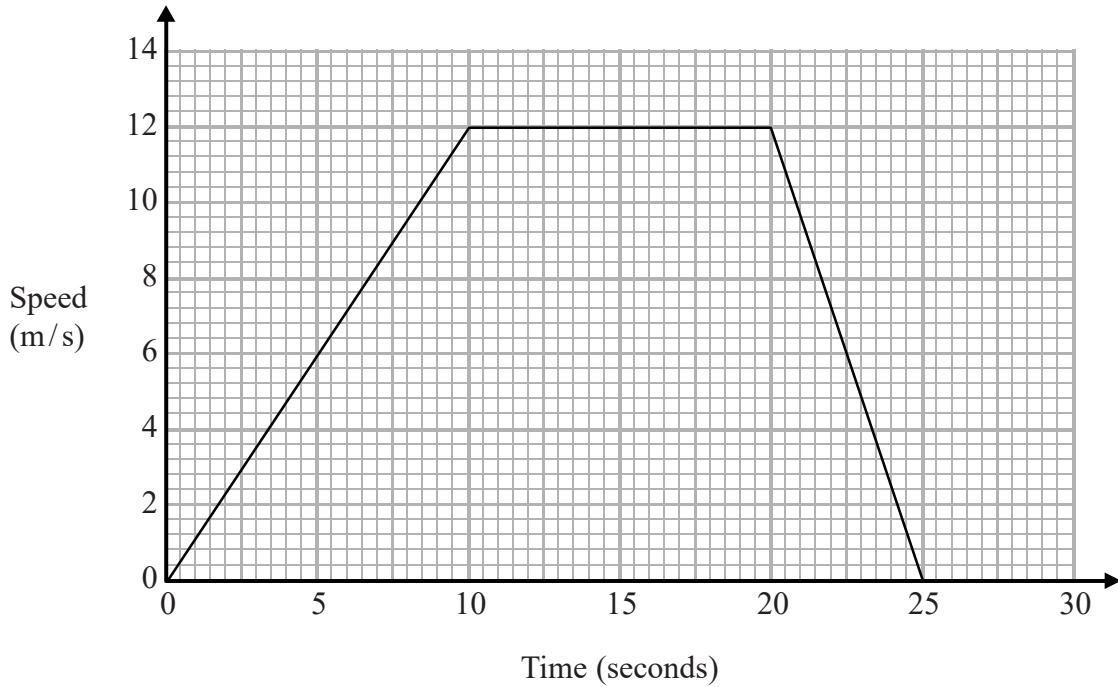
(a) Write down the acceleration of the car at time 15 seconds.

.... m/s^2

(1)

(b) What does the area under the graph represent?

....

(1)

(c) When does the car begin to decelerate?

.... seconds

(1)

(Total for Question 12 is 3 marks)

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13 The straight line **M** has equation $y = -\dfrac{2}{5}x + 3$

The point A has coordinates $(3, 4)$

(a) Find an equation of the straight line which passes through A and is parallel to **M**.
Give your answer in the form $y = mx + c$

....

(3)

(b) Find an equation of the straight line which passes through A and is perpendicular to **M**.

....

(2)

(Total for Question 13 is 5 marks)

14 (a) Simplify $\sqrt[3]{(8x)^6}$

....

(2)

$(2y^3)^{-3}$ can be written in the form ay^b

(b) Find the value of a and the value of b

$a = $ ....

$b = $ ....

(2)

(Total for Question 14 is 4 marks)

15 Solve, algebraically, the simultaneous equations

$$2x + y = 7$$
$$4x^2 + 3y^2 = 43$$

....

(Total for Question 15 is 5 marks)

16 Express $\dfrac{x + 3}{2x - 3} + \dfrac{4 - x}{2x + 3}$ as a single fraction.

Give your answer in its simplest form.

....

(Total for Question 16 is 3 marks)

17 Sketch the graph of $y = x^2 - 4x$

Mark, on your sketch, the coordinates of the turning point of the graph and the coordinates of the points where the graph intersects the *x*-axis.
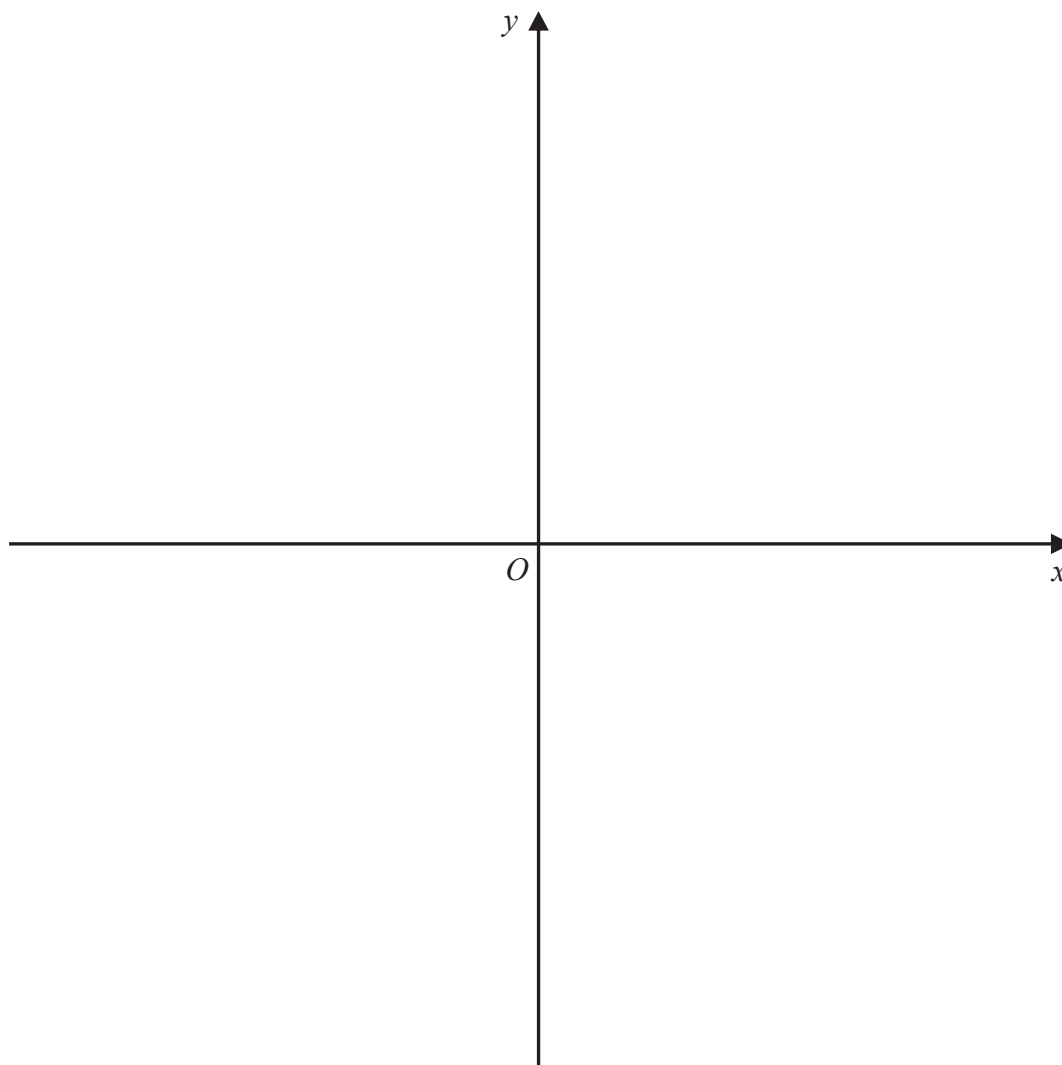
(Total for Question 17 is 3 marks)

18 (a) Find the value of $\dfrac{4x + 7}{16 - 3\sqrt{x}}$ when $x = 4$

....

(2)

(b) Rationalise the denominator of $\dfrac{12 - \sqrt{7}}{6 - \sqrt{7}}$

Give your answer in the form $\dfrac{p + q\sqrt{7}}{r}$ where p, q and r are integers.

....

(3)

(Total for Question 18 is 5 marks)
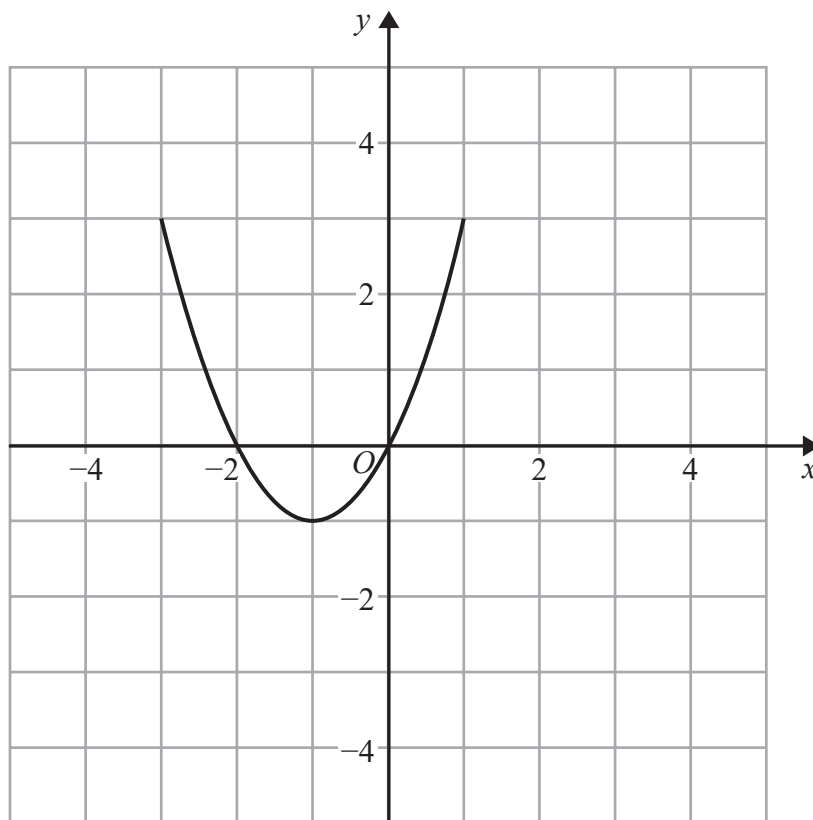
19 Here is a graph for values of x from 0 to 200
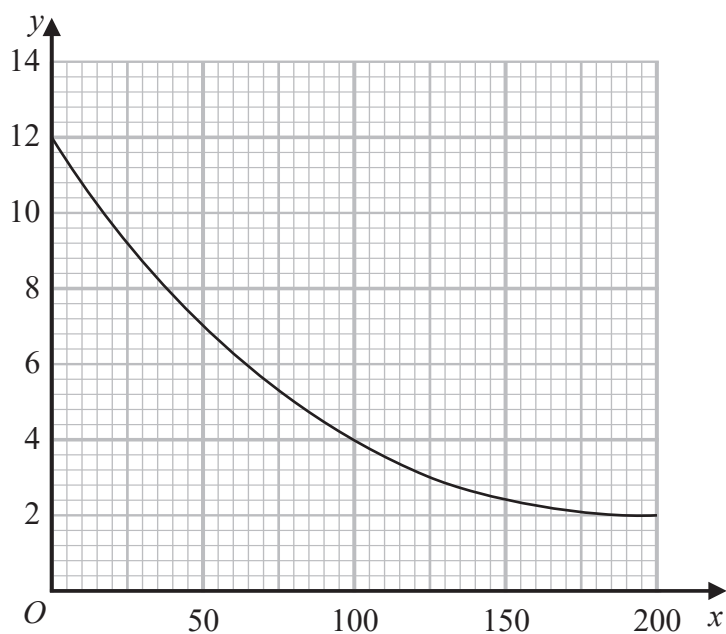
Use the trapezium rule to find an estimate of the area of the region under the curve and between $x = 0$, $x = 200$ and the x-axis.

Use 4 strips of equal width.

....

(Total for Question 19 is 3 marks)

Turn over ▶

20 Here is the graph of $y = g(x)$

(a) (i) On the grid above, draw the graph of $y = -g(x)$

(2)

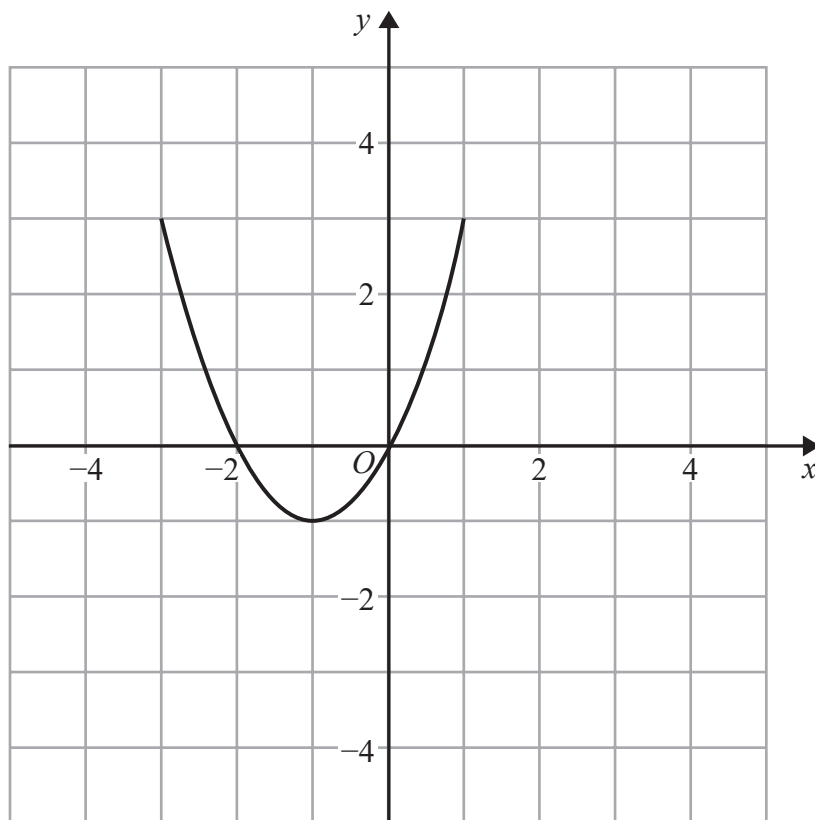(ii) Write down the coordinates of the turning point of the graph $y = -g(x)$

....

(1)

Here is the graph of $y = g(x)$

(b) On the grid above, draw the graph of $y = g(x + 1)$

(2)

(Total for Question 20 is 5 marks)

21 (a) Here are the first two terms of an arithmetic sequence

$$7 - k \qquad 10 + k$$

where k is a constant.

Find an expression, in terms of k, for the 10th term of this sequence.
Give your answer in the form $ak + b$ where a and b are integers.

....
(3)

(b) Calculate the sum of all the even numbers from 4 to 102

....
(3)

(Total for Question 21 is 6 marks)

TOTAL FOR PAPER IS 90 MARKS

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