**Pearson
Edexcel Award**

Centre Number

Candidate Number

Algebra
**Level 3
Calculator NOT allowed**

Tuesday 8 May 2018 – Morning
Time: 2 hours

Paper Reference
AAL30/01

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 ▶

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

You must NOT use a calculator.

1 (a) Simplify $(9x^4)^{\frac{1}{2}}$

....

(1)

(b) Simplify $a^7 \div a^{-3}$

....

(1)

(c) Simplify $(x^{-2})^{-3}$

....

(1)

$\dfrac{(2q)^2 - q^{\frac{7}{2}}}{q^2}$ can be written in the form $d - q^f$

(d) Work out the value of d and the value of f.

$d =$ ....

$f =$ ....

(3)

(Total for Question 1 is 6 marks)

2 On the grid, construct the graph of $y^2 = 4 - x^2$
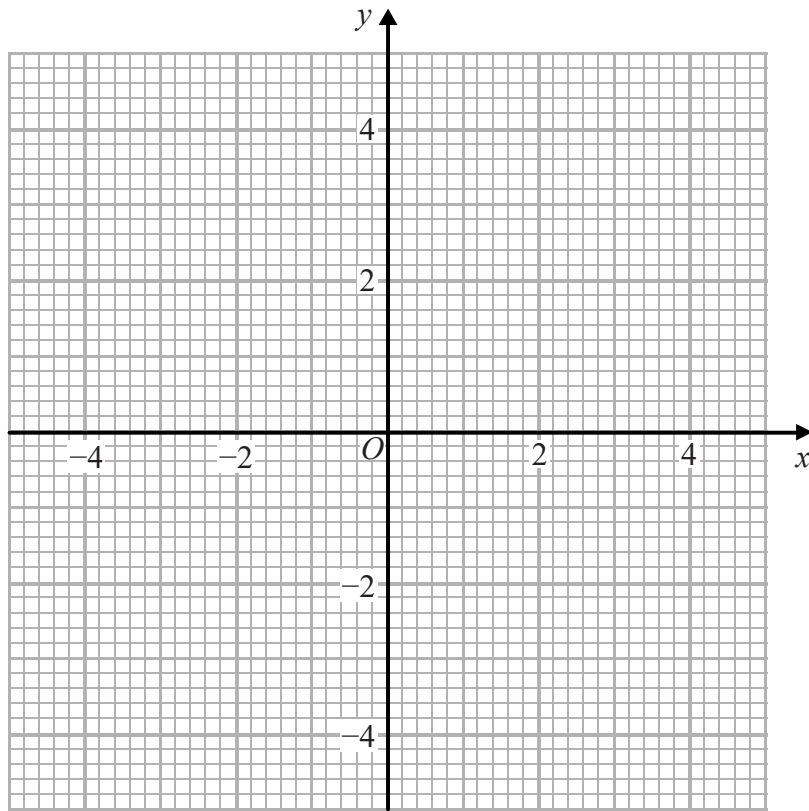
(Total for Question 2 is 2 marks)

3 $(x + 4)^2 + (x - 2)^2 = ax^2 + bx + c$ for all values of x.

Work out the value of a, the value of b and the value of c.

<div align="right">

$a = $ ....

$b = $ ....

$c = $ ....

</div>

(Total for Question 3 is 3 marks)

4 F is inversely proportional to the square of d.

When $d = 5$, $F = 8$

(a) Find a formula for F in terms of d.

....

(3)

(b) Calculate the value of F when $d = 20$

....

(1)

(c) On the axes below, sketch the graph of the relationship between F and d, for $d > 0$

(1)
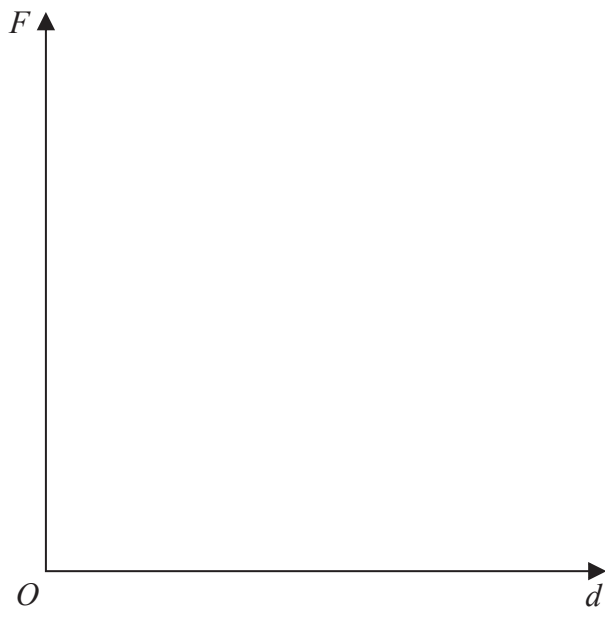
(Total for Question 4 is 5 marks)

5 The straight line **L** has equation $3y + 4x - 5 = 0$

(a) Find the gradient of any straight line that is parallel to **L**.

....

(2)

(b) Find an equation of the straight line that is perpendicular to **L** and passes through the point (12, 2)

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

....

(3)

(Total for Question 5 is 5 marks)

6 Expand and simplify $(4x - 3)(3x + 1)$

....
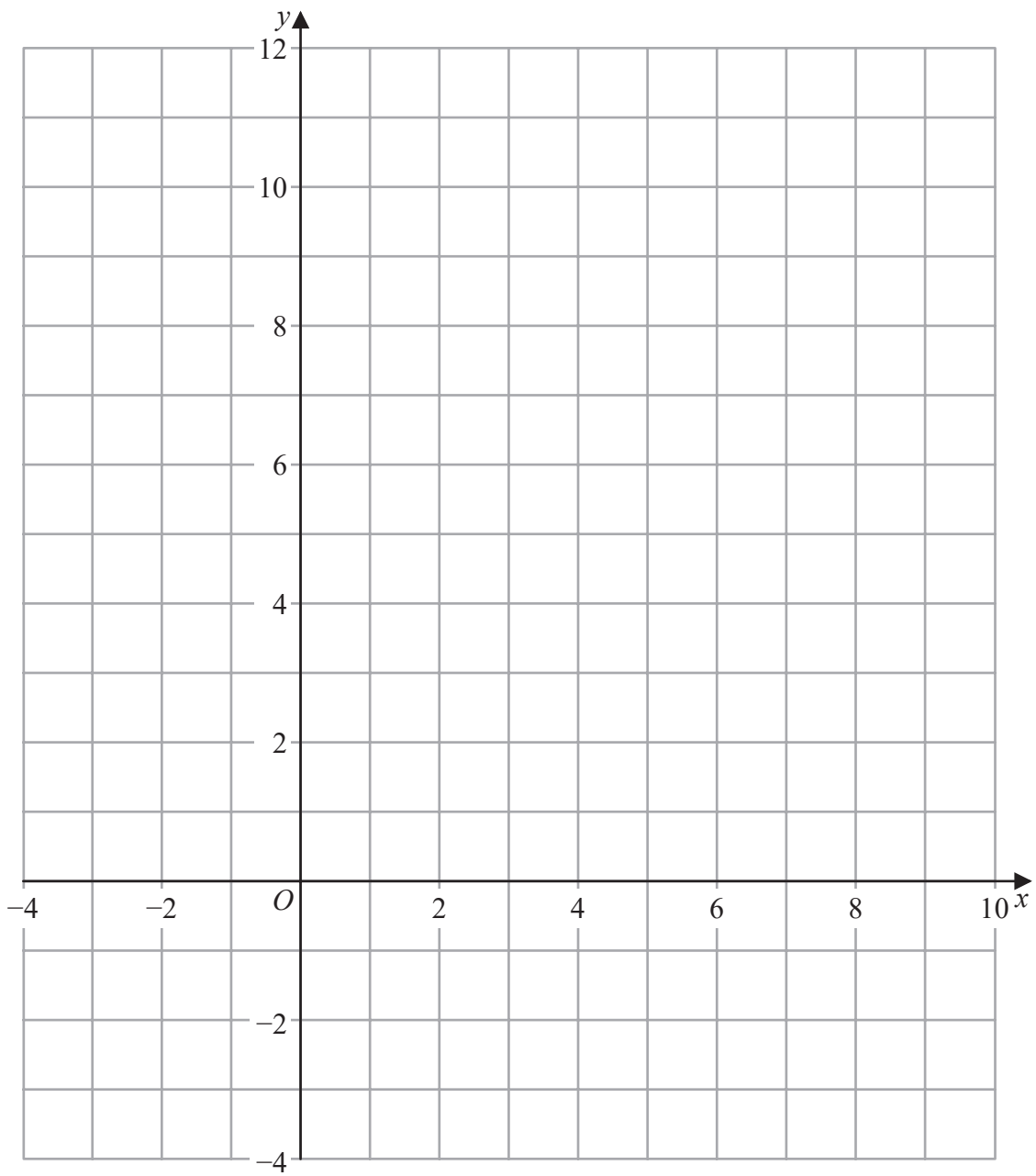
(Total for Question 6 is 2 marks)

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

$$4x + 3y < 24 \qquad x > -2 \qquad 3y > 9 - x$$

Label the region **R**.

8 (a) Factorise $63x^2d + 9xd^2$

....
(2)

(b) Factorise $4ab - 8b + 2a - 4$

....
(3)

(c) Factorise $x^2 - 9t^2$

....
(1)

(Total for Question 8 is 6 marks)

9 $3x^2 + 10x + 6 = 0$ is a quadratic equation.

For this quadratic equation, write down the sum of its roots and the product of its roots.

sum of roots ....

product of roots ....

(Total for Question 9 is 2 marks)

10 $t = 7x^3 + \sqrt{(25 - k^2)}$

(a) Work out the value of t when $k = 4$ and $x = 3$

....

(2)

$$w = \frac{4(a + b)}{(a - b)}$$

(b) Make a the subject of the formula.

....

(3)

(Total for Question 10 is 5 marks)

11 Solve, algebraically, the simultaneous equations

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

....

(Total for Question 11 is 5 marks)

12 (a) Solve $4y - \dfrac{3y - 15}{2} < 7$

....
(3)

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

....
(2)

(Total for Question 12 is 5 marks)

13 (a) On the grid below, draw the graph of $y = \dfrac{1}{x} + 3$ for values of x from -4 to 4, $x \neq 0$

Show clearly any asymptotes.
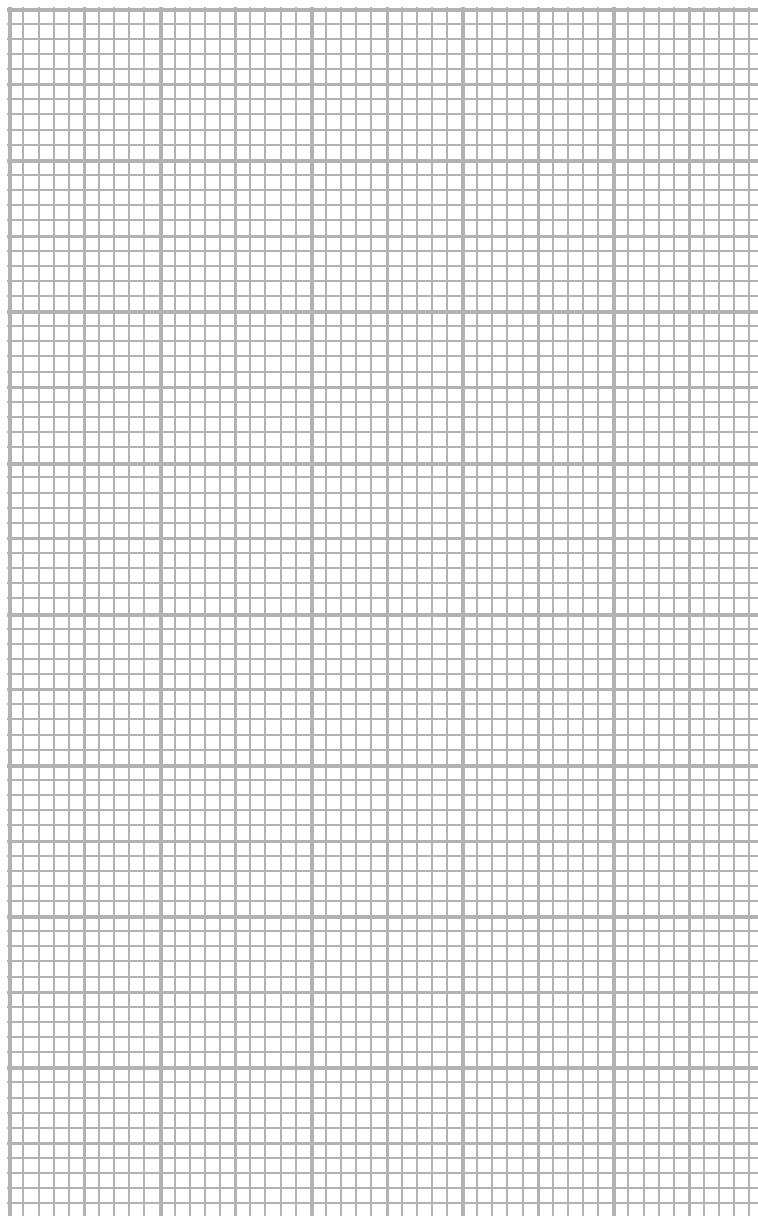
(4)

(b) Use your graph to find an estimate for the solution of $3.6 - \dfrac{1}{x} = 3$

....

(1)

(Total for Question 13 is 5 marks)

14 (a) Use the quadratic formula to solve the equation $5x^2 + 7x - 2 = 0$

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

....

(2)

Here is a quadratic equation.

$$4x^2 + 4x + 9 = 0$$

(b) Use the discriminant to determine the number of real roots of this equation.

(2)

(Total for Question 14 is 4 marks)

15 The 15th term of an arithmetic series is 338
The 25th term of the same series is 208

(a) Work out the common difference of the series and the first term of the series.

common difference ....

first term ....

(4)

(b) Find the sum of the first 25 terms of this series.

....

(2)

(Total for Question 15 is 6 marks)

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16 (a) Write $\dfrac{8}{5x+5y} - \dfrac{x}{x^2-y^2}$ as a single fraction.

Give your answer in its simplest form.

....

(4)

The integer p is not a square number.

(b) Rationalise the denominator of $\dfrac{3p-\sqrt{p}}{2\sqrt{p}}$

Give your answer in its simplest form.

....

(3)

(Total for Question 16 is 7 marks)

Turn over ▶

17 The graph gives information about the speed of a car as it travelled between two road junctions.
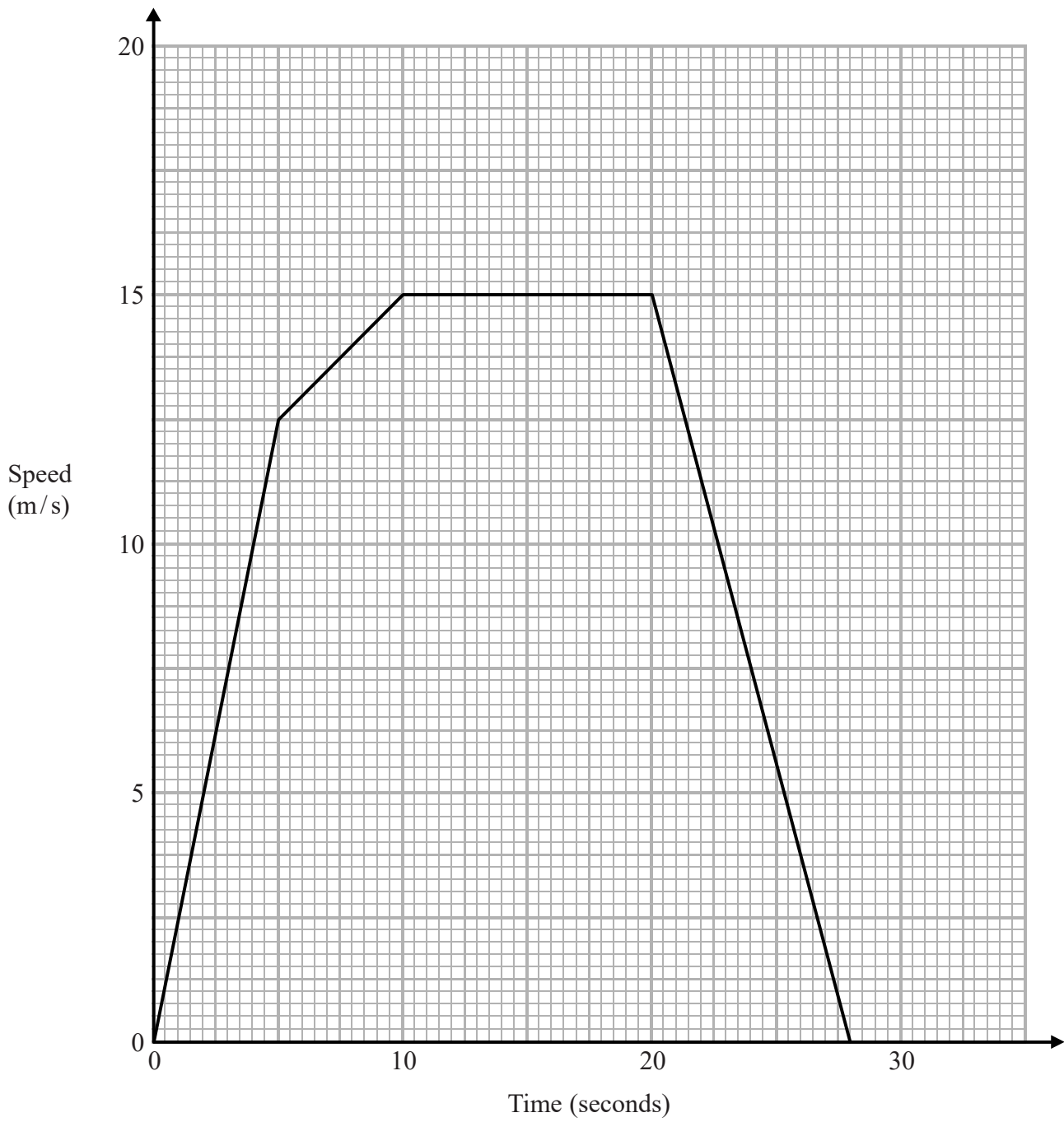
(a) Calculate the acceleration of the car during the first 5 seconds of the journey.

.... m/s^2

(2)

(b) Calculate the distance between the two road junctions.

.... m

(3)

(c) For how long did the car decelerate?

.... s

(1)

(Total for Question 17 is 6 marks)

18 Here is the graph of $y = f(x)$
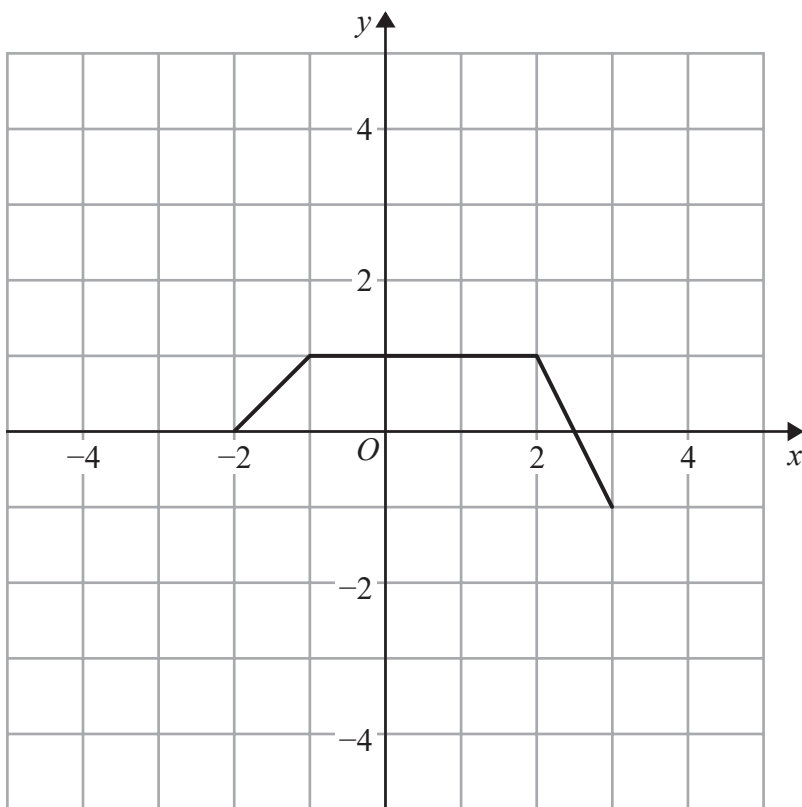
(a) On the grid below, sketch the graph of $y = -2f(x)$
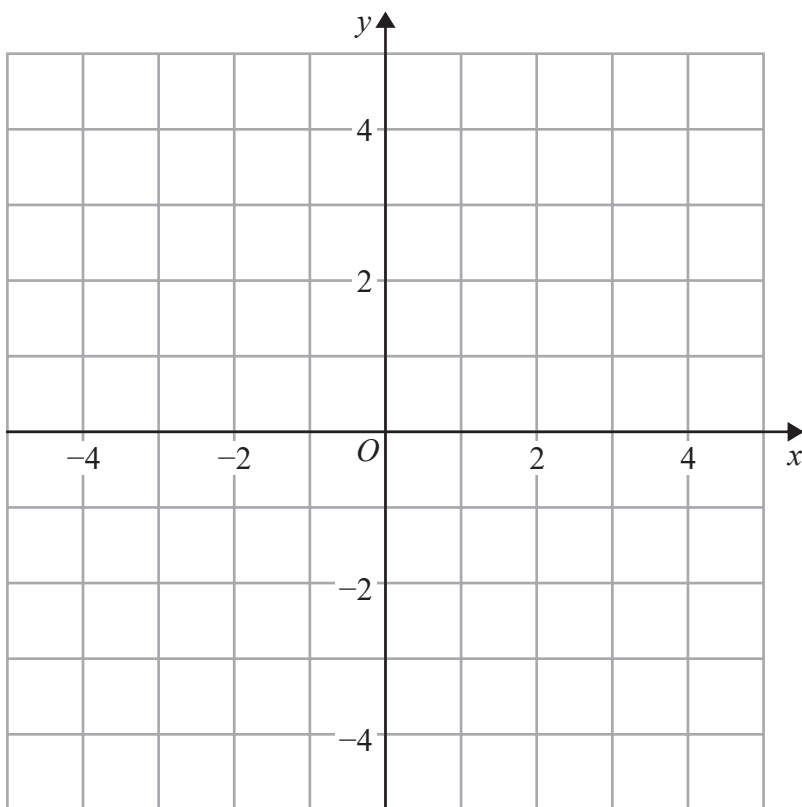
(2)

A different graph has equation $y = g(x)$

Point A has coordinates (2, 5) and lies on the graph of $y = g(x)$

Point A is transformed to point B on the graph of $y = g(x + 6)$

(b) Write down the coordinates of point B.

....
(2)

(Total for Question 18 is 4 marks)

19 (a) Write the quadratic expression $5 - x^2 - 4x$ in the form $a - (x + b)^2$ where a and b are integers.
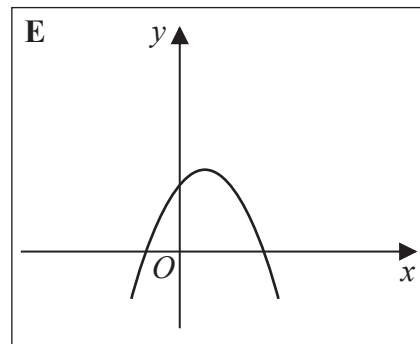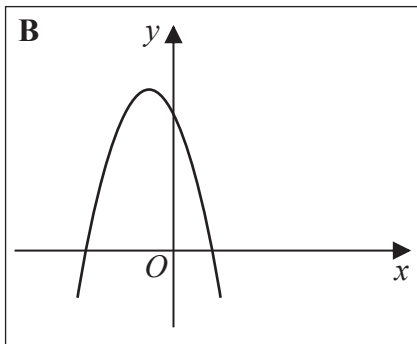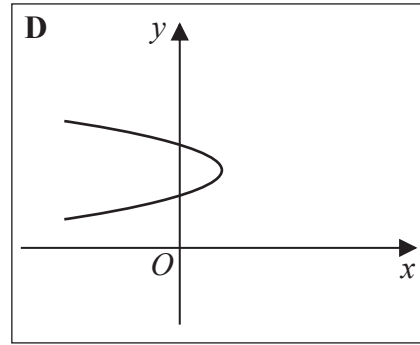
....

(2)

The graph of $y = 5 - x^2 - 4x$ has a turning point at the point P.

(b) Write down the coordinates of P.

....

(1)

Here are some sketch graphs.

A

B

C

D

E
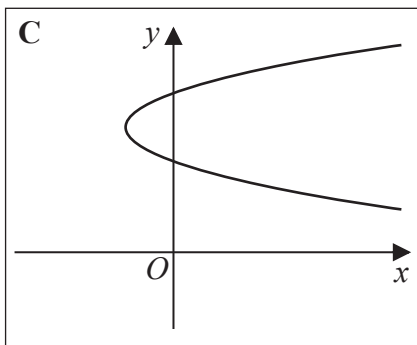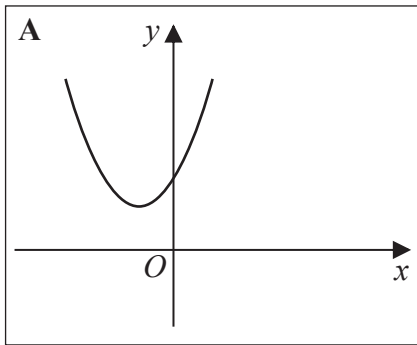
The equation for one of these sketch graphs is $y = 5 - x^2 - 4x$

(c) Write down the letter of this sketch.

....

(1)

(Total for Question 19 is 4 marks)

20 Here is a graph for values of x from 0 to 30
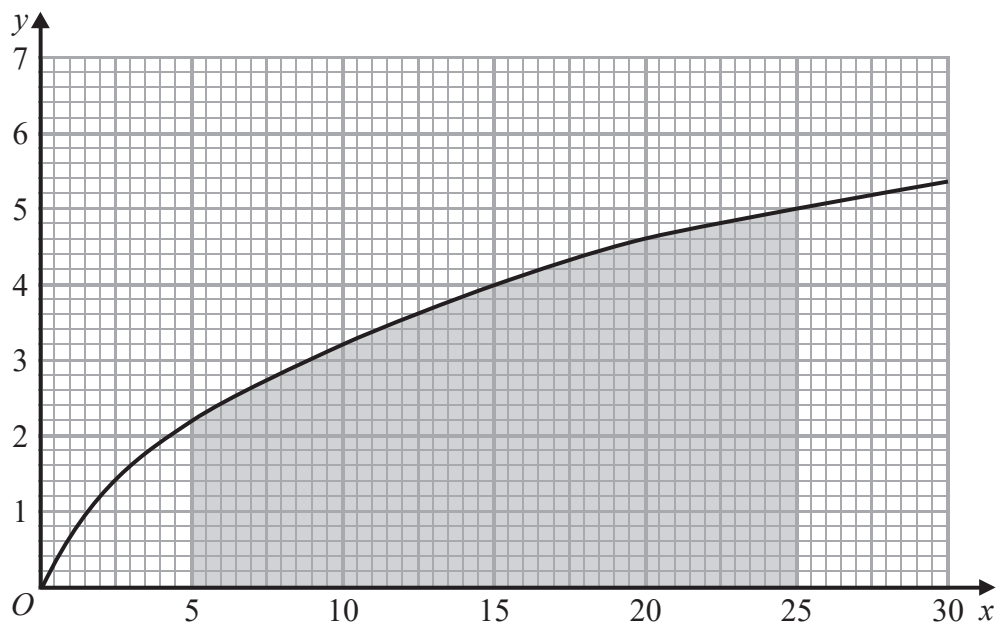
Use the trapezium rule to find an estimate for the area of the shaded region.

Use 4 strips of equal width.

....

(Total for Question 20 is 3 marks)

TOTAL FOR PAPER IS 90 MARKS