

Please check the examination details below before entering your candidate information

Candidate surname

Other names

**Pearson
Edexcel Award**

Centre Number

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Candidate Number

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Thursday 9 January 2020

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 ►

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P 6 3 0 4 5 R A 0 1 2 4



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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) Expand and simplify $(x - y)(x + 2y)$

.....
(2)

(b) Factorise $12u^2t^2 + 18ut^3$

.....
(2)

(Total for Question 1 is 4 marks)

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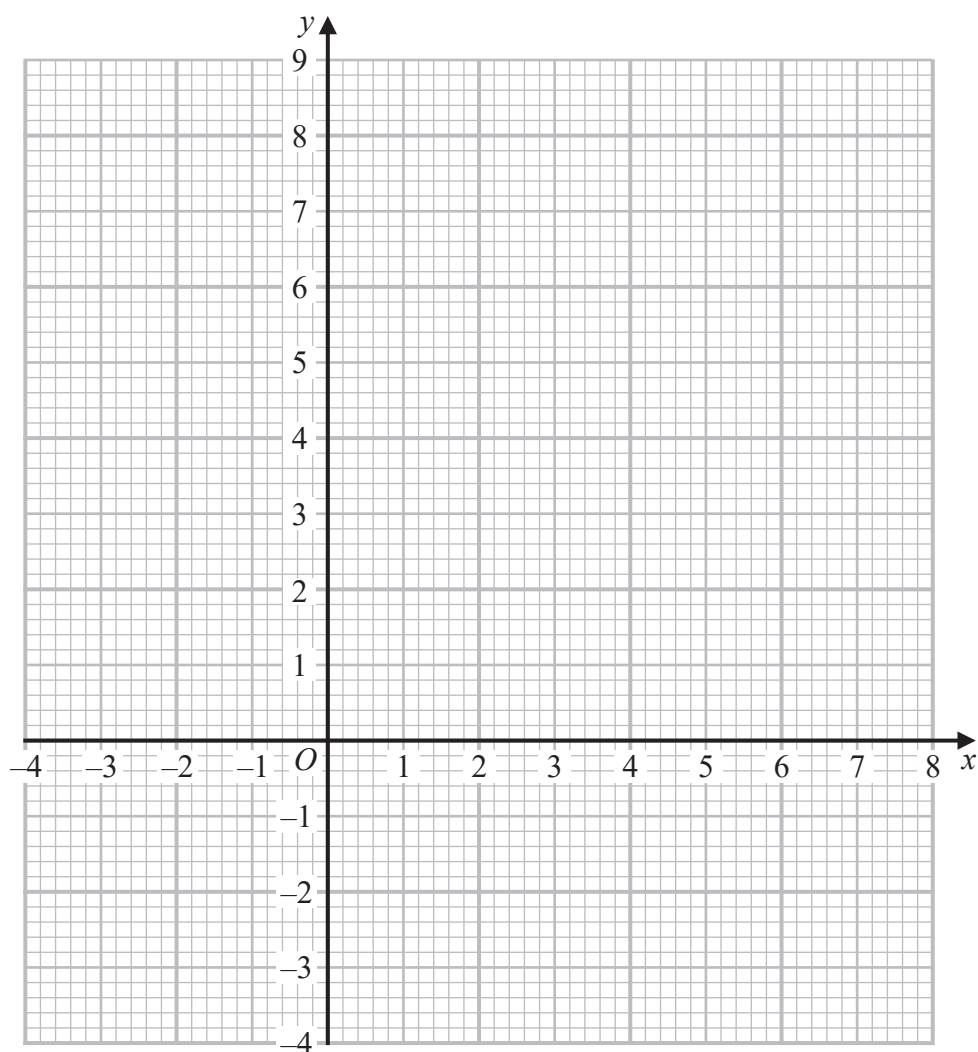
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- 2 (a) On the grid, shade the region that satisfies all these inequalities.

$$x < 3 \quad y - x < 5 \quad 7x + 5y > 35$$

Label the region **R**



(5)

- (b) Write down the coordinates of each of the points, with integer coordinates, that satisfy

$$x < 3 \quad y - x < 5 \quad 7x + 5y > 35$$

(1)

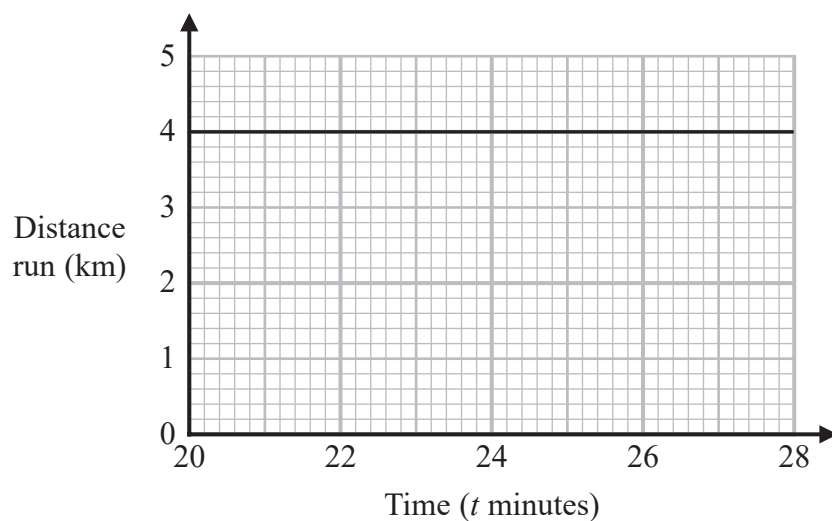
(Total for Question 2 is 6 marks)



3 Solve $3k^2 - 27 \geq 0$

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

- 4 John went for a run.
Here is part of his distance-time graph.



What does this graph show about John's speed for values of t between $t = 20$ and $t = 28$?

.....
(Total for Question 4 is 1 mark)



5 Here is a quadratic equation.

$$3x^2 - 7x + 5 = 0$$

(a) (i) Calculate the discriminant of this equation.

.....
(2)

(ii) State what your answer tells you about the roots of the equation $3x^2 - 7x + 5 = 0$

(1)

(b) Find the sum and the product of the roots of the equation $10x^2 = 3 - 5x$

sum =

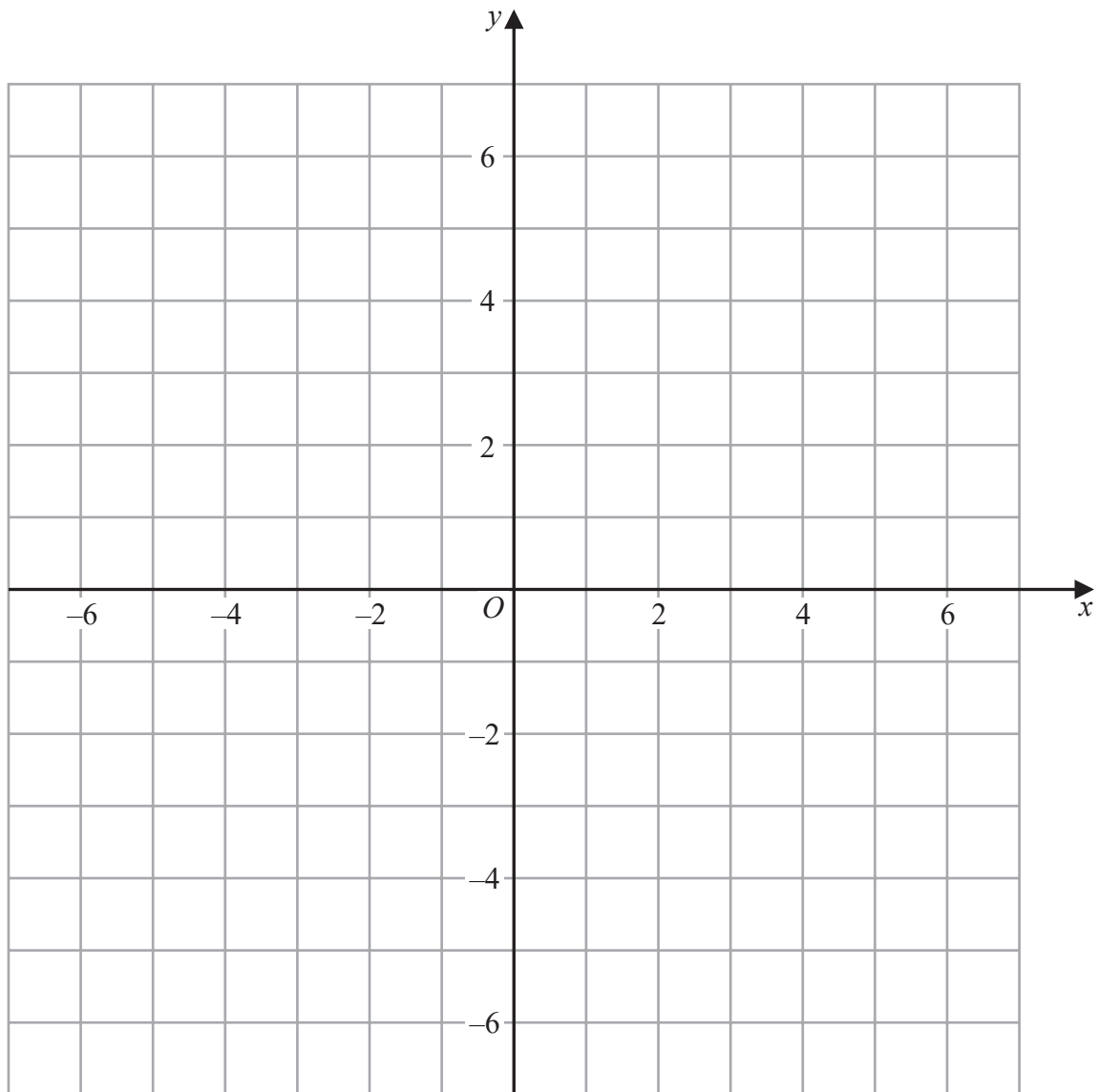
product =

(3)

(Total for Question 5 is 6 marks)



- 6 On the grid of centimetre squares, construct the locus of points that are 4 cm from the point $(-2, 1)$



(Total for Question 6 is 2 marks)

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7 (a) Simplify $(p^{-2})^{-4}$

.....
(1)

(b) Simplify $(16t^2)^{\frac{3}{2}}$

.....
(2)

(c) Simplify fully $\frac{x^2 - 9}{(x - 3)^2(x + 3)^2}$

.....
(2)

(Total for Question 7 is 5 marks)



8 The straight line L_1 has equation $y = \frac{1}{2}x - 1$

(a) Write the equation of L_1 in the form $ax + by = c$ where a , b and c are integers.

.....
(1)

The straight line L_2 is parallel to L_1 and passes through the point with coordinates $(-2, -6)$

(b) Find an equation for L_2 in the form $y = mx + c$

.....
(3)

(Total for Question 8 is 4 marks)



9 $t = \frac{n}{5 - 2n}$

(a) Find the value of t when $n = \frac{1}{2}$

.....
(1)

(b) Find the value of t when $n = \sqrt{5}$
Give your answer in the form $c + \sqrt{d}$ where c and d are integers.

.....
(4)

(c) Make n the subject of the formula $t = \frac{n}{5 - 2n}$

.....
(3)

(Total for Question 9 is 8 marks)



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)



11 Here are the first five terms of an arithmetic series.

25 35 45 55 65

(a) Find the sum of the first 120 terms of this series.

.....
(2)

The p th term of this series is the first term to be greater than 1000

(b) Find the value of p .

.....
(3)

(Total for Question 11 is 5 marks)

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12 The equation of the straight line **L** is $4x + 3y + 2 = 0$

(a) Find the gradient of **L**

.....
(2)

The straight line **L** is the normal to a curve at the point $A(1, -2)$

(b) Find an equation of the tangent to this curve at A .

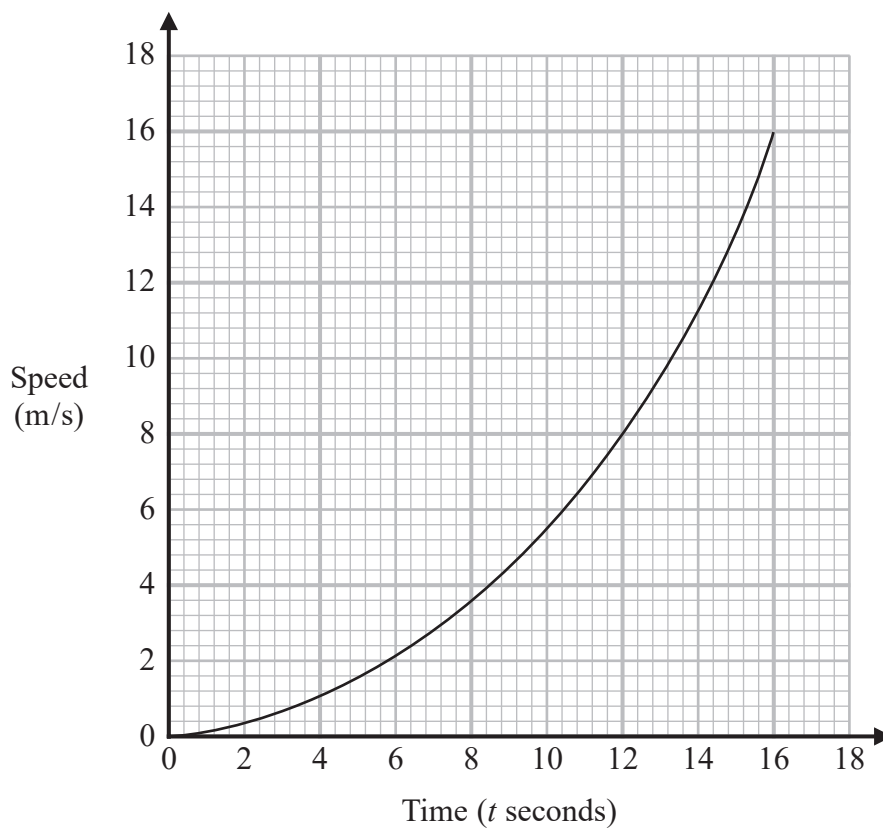
Give your answer in the form $px + qy + r = 0$ where p , q and r are integers.

.....
(3)

(Total for Question 12 is 5 marks)



13 Here is a speed-time graph for a particle moving in a straight line.



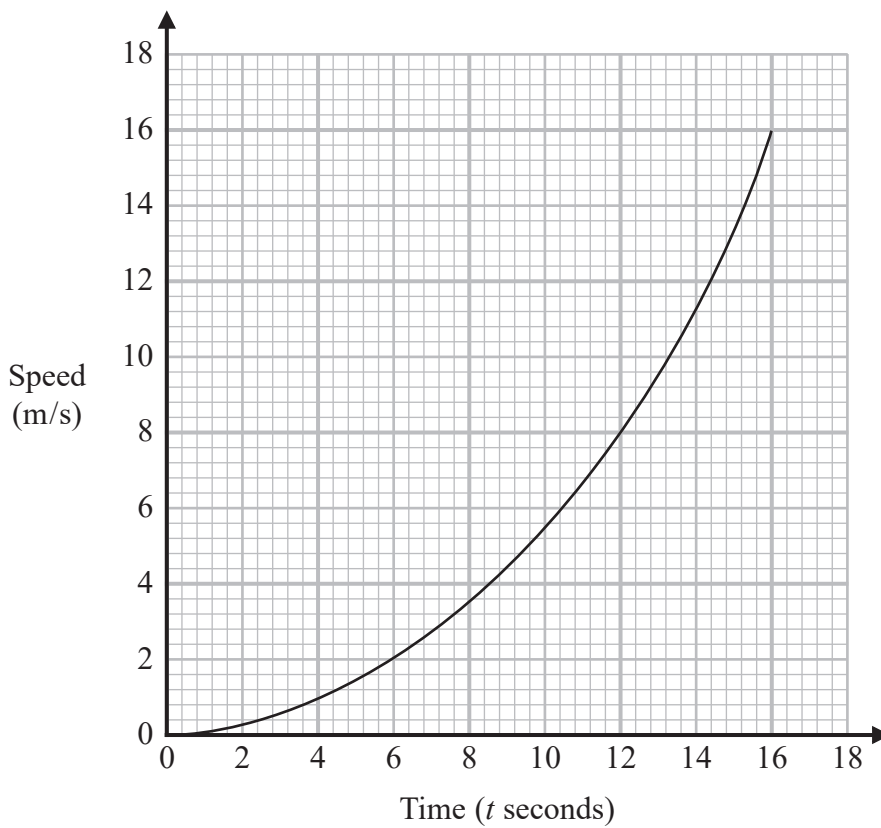
- (a) (i) Use the trapezium rule to find an estimate for the area of the region under the curve between $t = 0$, $t = 16$ and the time axis.
Use 4 strips of equal width.

.....
(3)

- (ii) What does this area represent?

.....
.....
(1)





(b) (i) On the grid above, draw the tangent to the curve at $t = 12$

(1)

(ii) Calculate the gradient of this tangent.

.....
(2)

(c) What does the gradient of the curve at the point where $t = 12$ represent?

.....
.....
(1)

(Total for Question 13 is 8 marks)



14 (a) Simplify $\frac{1}{\sqrt{2}} + \frac{1}{(\sqrt{2})^3} + \frac{1}{(\sqrt{2})^5}$

Give your answer in the form $\frac{a}{b\sqrt{c}}$ where a , b and c are integers.

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.....
(3)

(b) Simplify $\frac{\sqrt{20} + \sqrt{5}}{\sqrt{20} - \sqrt{5}}$

.....
(3)

(Total for Question 14 is 6 marks)



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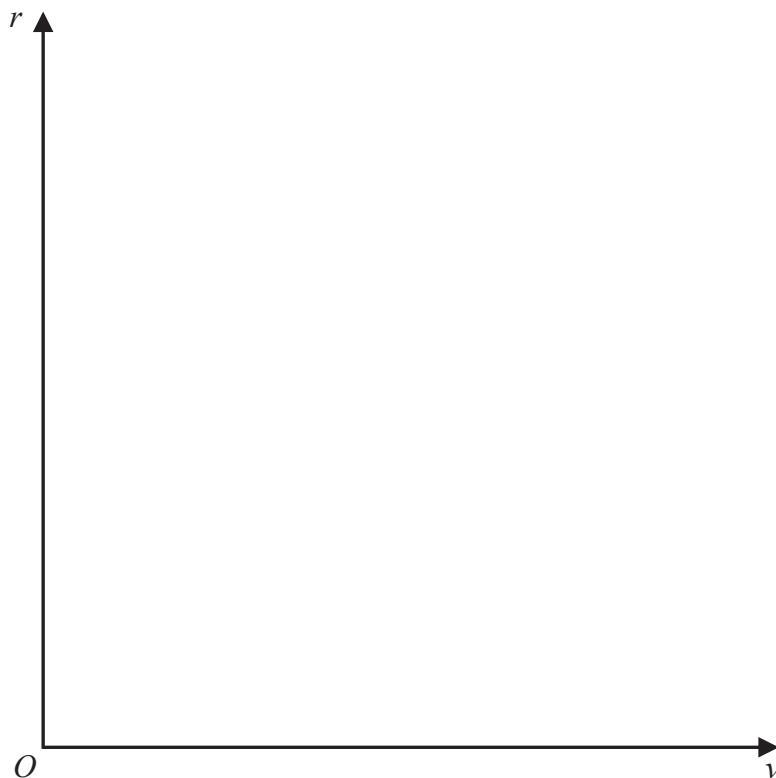
15 r is proportional to the cube root of v .

$$r = 15 \text{ when } v = 27$$

(a) Find a formula for r in terms of v .

.....
(3)

(b) Sketch the graph of r against v for $v \geq 0$

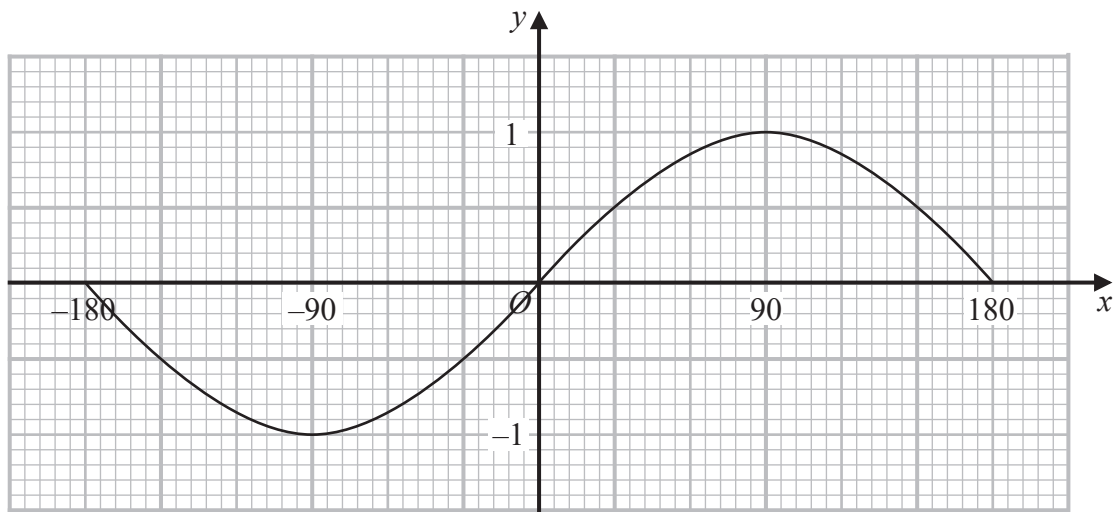


(1)

(Total for Question 15 is 4 marks)



16 Here is the graph of $y = \sin x^\circ$ for $-180 \leq x \leq 180$



(a) Use the graph above to find an estimate for each of the solutions of the equation

$$5 \sin x^\circ = 2 \quad \text{for } -180 \leq x \leq 180$$

.....
(2)

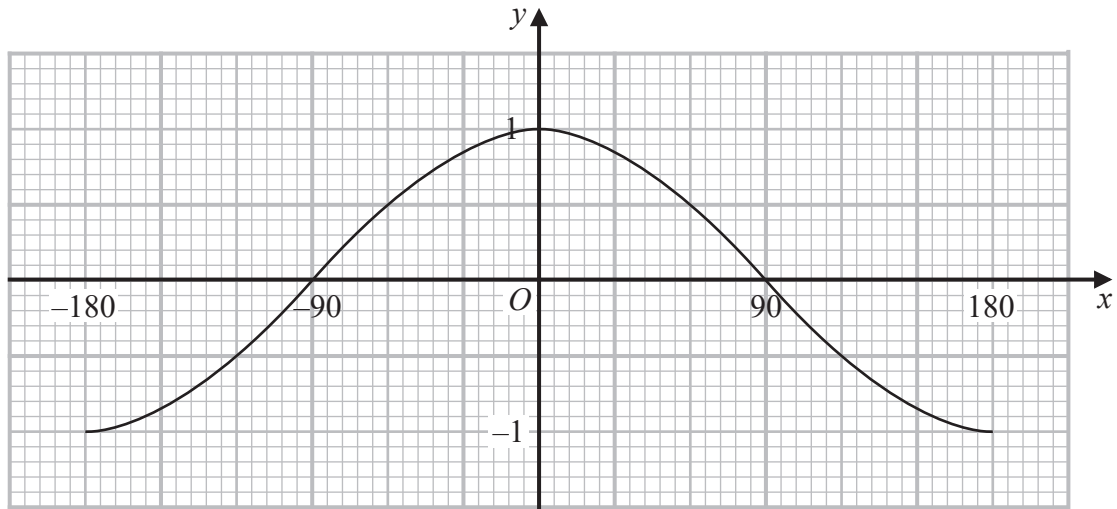
(b) Use the graph above to find an estimate for each of the solutions of the equation

$$\sin(x + 20)^\circ = 0.7 \quad \text{for } -180 \leq x \leq 180$$

.....
(2)



Here is the graph of $y = \cos x^\circ$ for $-180 \leq x \leq 180$



(c) On the grid above, sketch the graph of $y = \cos \frac{1}{2}x^\circ$ for $-180 \leq x \leq 180$

(2)

(Total for Question 16 is 6 marks)



17 Solve, algebraically, the simultaneous equations

$$4x^2 + 4y^2 = 125$$

$$2y = 2x - 5$$

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.....
(Total for Question 17 is 5 marks)



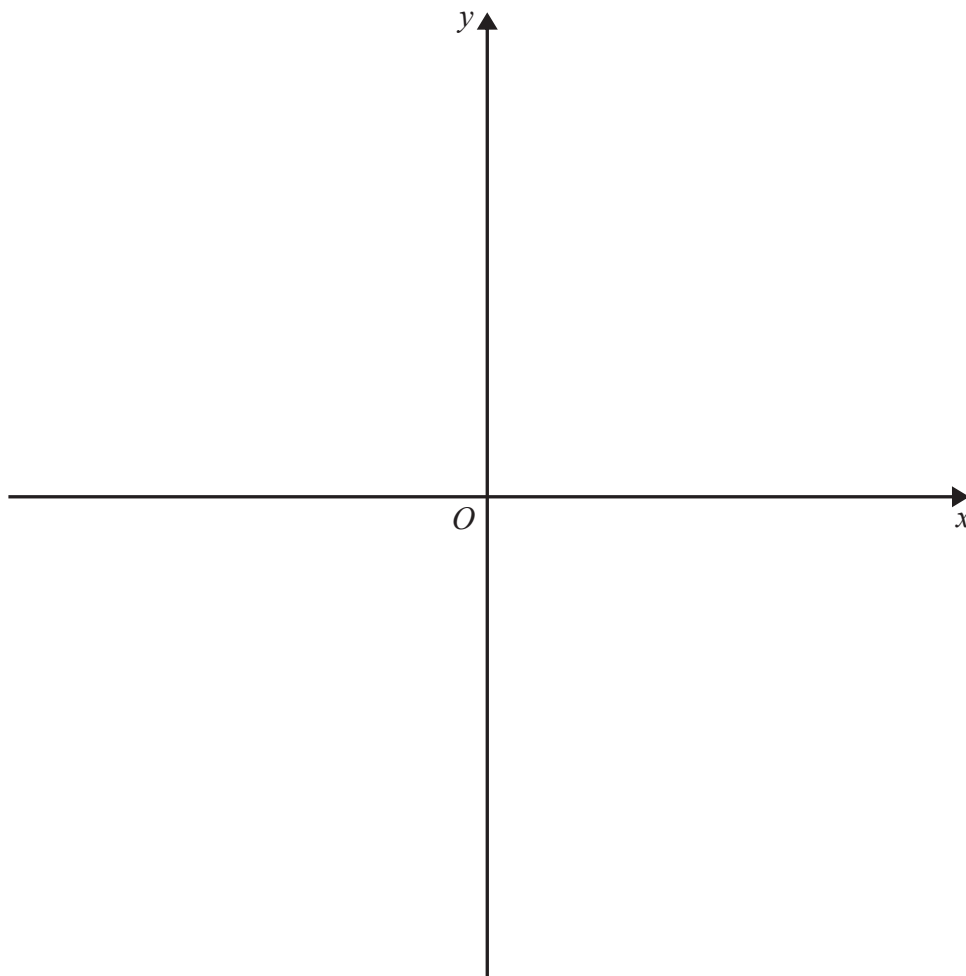
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18 Sketch the graph of $y = \frac{1}{2-x}$

Show clearly any asymptotes and the coordinates of any points of intersection of the graph with the axes.



(Total for Question 18 is 4 marks)

TOTAL FOR PAPER IS 90 MARKS



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