

Eduqas GCSE Mathematics Higher Tier

Algebra Revision Booklet

The questions included in this booklet have been taken from past examination papers used in previous Eduqas examinations.



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Please note that any questions labelled as “Calculator” have been taken from an exam paper where the use of a calculator was allowed. This does not necessarily mean that a calculator is required to answer the question.

Simplifying Terms: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	2	
#3	3	
Total	7	

#1

(c) Simplify $\frac{(x^4)^3}{x^2}$.

[2]

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Question taken from Eduqas examination paper 530003, November 2023

#2

(a) Simplify $\frac{x^2 \times x^7}{x^3}$.

[2]

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Question taken from Eduqas examination paper 530003, November 2020

#3

(a) Simplify each of the following.

(i) $\frac{x^9}{2x^5}$

[1]

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(ii) $\left(\frac{x}{\sqrt{5}}\right)^{-2}$

[2]

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Question taken from Eduqas examination paper 530003, November 2022

Simplifying Terms: Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	2	
#3	2	
#4	3	
Total	8	

#1

Simplify $\frac{2(y-7)^5}{(y-7)^{-3}}$.

[1]

Question taken from Eduqas examination paper 530004, November 2024

#2

(a) Simplify $4x^3y^5 \times 7x^2y$.

[2]

Question taken from Eduqas examination paper 530004, November 2024

#3

(b) Simplify $(3h^2)^3$.

[2]

Question taken from Eduqas examination paper 530004, June 2024

#4

Simplify $\frac{(5x^2y)^5}{y^6}$.

[3]

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Question taken from Eduqas examination paper 530004, June 2022

Substitution: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	2	
#3	2	
#4	2	
Total	8	

#1

- (b) The n th term of a different sequence is $2n^3 + 3$.
Write down the first 3 terms of this sequence.

[2]

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Question taken from Eduqas examination paper 530003, June 2018

#2

- (b) The n th term of a sequence is $(10\sqrt{5})^n$.

Calculate the 4th term of this sequence.
You must simplify your answer.

[2]

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4th term =

Question taken from Eduqas examination paper 530003, November 2023

#3

The n th term of a sequence is given by $2n + 9$.

- (a) Work out the difference between consecutive terms.

[2]

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Question taken from Eduqas examination paper 530003, May 2023

#4

(b) The n th term of a sequence is $(2\sqrt{3})^n$.

Find and simplify the 3rd term of this sequence.

[2]

Question taken from Eduqas examination paper 530003, November 2020

Substitution: Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	3	
#3	4	
Total	8	

#1

(c) Calculate the 105th term of a sequence with an n th term of $3n^2 - n$.

[1]

Question taken from Eduqas examination paper 530004, November 2018

#2

When a ball is thrown upwards on the Moon, the maximum height, h metres, it reaches is given by the formula $h = \frac{U^2}{2a}$.

In a particular case, $U = 4.2$ and $a = 1.6$, both correct to 2 significant figures.

Calculate the greatest possible value of h .

[3]

Question taken from Eduqas examination paper 530004, November 2020

#3

(e) You are given that:

- $y = x^2 + bx + c$
- $y = 16$ when $x = 0$
- $y = 0$ when $x = -2$

Find the values of b and c .

[4]

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Question taken from Eduqas examination paper 530004, June 2019

Expanding Brackets: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	3	
#3	3	
Total	9	

[3]

[2]

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[3]

13

Expanding Brackets: Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	3	
#3	3	
#4	3	
Total	11	

#1

(a) Expand and simplify $(x+3)(x+7)$.

[2]

Question taken from Eduqas examination paper 530004, November 2023

#2

(a) Expand and simplify $(x-6)(7x+5)$.

[3]

Question taken from Eduqas examination paper 530004, November 2021

#3

(a) Expand and simplify $(2x-7)(3x-8)$.

[3]

Question taken from Eduqas examination paper 530004, November 2019

#4

(a) Expand and simplify $(x+6y)(3x+5y)$.

[3]

Question taken from Eduqas examination paper 530004, June 2019

Factorising: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
Total	3	

#1

Factorise $3xy^2 + 6x^2y$

[3]

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Question taken from Eduqas examination paper 5300003, November 2023

Factorising: Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
Total	2	

#1

(b) Factorise $y^2 + 2y - 8$.

[2]

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Question taken from Eduqas examination paper 530004, November 2021

Forming an expression: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	3	
Total	5	

#1

- (ii) The first four terms of a different Fibonacci-type sequence have been expressed algebraically.

$$c, \quad d, \quad c + d, \quad c + 2d, \quad \dots$$

Write the expression for the 7th term of this sequence.
Give your answer in its simplest form.

[2]

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Question taken from Eduqas examination paper 530003, November 2024

#2

- (b) x chefs earn a total of £ m for 5 hours' work.
You may assume that all the chefs earn the same amount each hour.

- (i) Find an algebraic expression for a chef's hourly rate of pay.

[1]

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- (ii) The chefs get a pay increase of £ y per hour.

Find an expression for the amount earned by a chef who works for 7 hours at this new pay rate.

[2]

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Question taken from Eduqas examination paper 530003, June 2018

Forming an expression: Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	5	
Total	9	

#1

A square lawn has a side of length 8 m.
A builder is asked to make a path around the outside edge of the square lawn.

- (a) The plan was for a path of width y metres with all the edges of the path being straight.

Find an expression for the area of this path in terms of y .
Give your answer in its simplest form.

[4]

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Question taken from Eduqas examination paper 530004, November 2019

#2

The diagram shows a shape made from a cone and a hemisphere. The cone has height 5 cm and base radius $(x + 1)$ cm.

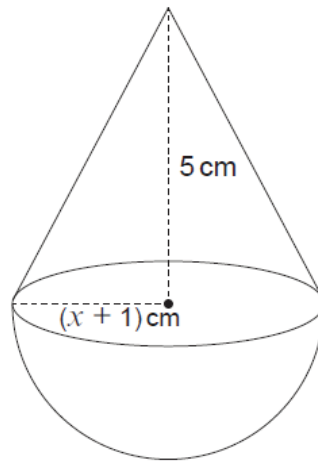


Diagram not drawn to scale

The volume of the shape is $24\pi \text{ cm}^3$.

(a) Show that $2x^3 + 11x^2 + 16x = 65$.

[5]

Question taken from Edugas examination paper 530004, November 2024

Solving an equation: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	3	
#3	5	
#4	5	
Total	15	

#1

(a) Solve $5x - 1 = 3x + 4$.

[2]

Question taken from Eduqas examination paper 530003, November 2019

#2

(a) Solve $10(x - 1) - (7x + 9) = x$.

[3]

Question taken from Eduqas examination paper 530003, November 2020

#3

(a) Solve $19 - 4x = 11$. [2]

(b) Solve $\frac{2x-3}{4} = 3x$. [3]

Question taken from Eduqas examination paper 530003, June 2019

#4

(a) Solve $12x - 9 = 6 + 7x$. [2]

(b) Solve $10(x + 2) - (2x - 9) = 30$. [3]

Question taken from Eduqas examination paper 530003, June 2018

Solving an equation: Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	2	
#3	2	
#4	2	
#5	2	
#6	4	
#7	5	
Total	19	

#1

(b) Solve $7x + 6 = 4x + 7$.

[2]

Question taken from Eduqas examination paper 530004, November 2023

#2

(a) Solve $7x - 5 = 2x + 3$.

[2]

Question taken from Eduqas examination paper 530004, June 2023

#3

(c) Solve $\frac{d}{5} + 2 = 12$.

[2]

Question taken from Eduqas examination paper 530004, June 2018

#4

(a) Solve $6x - 1 = 5 + x$.

[2]

Question taken from Eduqas examination paper 530004, November 2021

#5

(a) Solve $5x + 4 = 2x + 6$.

[2]

Question taken from Eduqas examination paper 530004, November 2022

#6

Solve $\frac{4x+5}{2} - \frac{x+1}{3} = \frac{5}{6}$.

You must show all your working.

[4]

Question taken from Eduqas examination paper 530004, June 2024

#7

(a) Solve $2x + 5 = 11 + 5x$.

[2]

(b) Solve $8x - (3x + 1) = 2$.

Give your answer as a fraction.

[3]

Question taken from Eduqas examination paper 530004, June 2022

Forming and solving an equation: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	5	
Total	5	

#1

- (b) Show that the triangle below is **not** isosceles.
You must use an algebraic method and not trial and improvement.

[5]

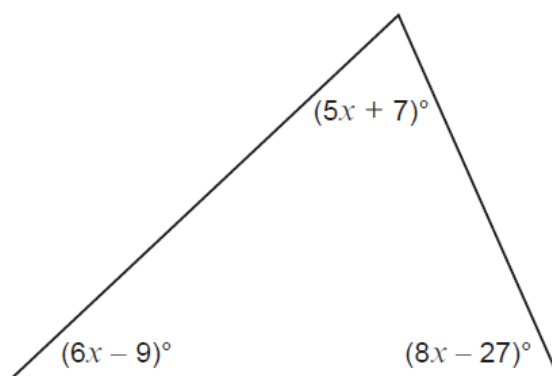


Diagram not drawn to scale

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Question taken from Eduqas examination paper 530003, November 2024

Forming and solving an equation: Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	3	
#3	4	
#4	4	
#5	4	
#6	5	
#7	6	
Total	29	

#1

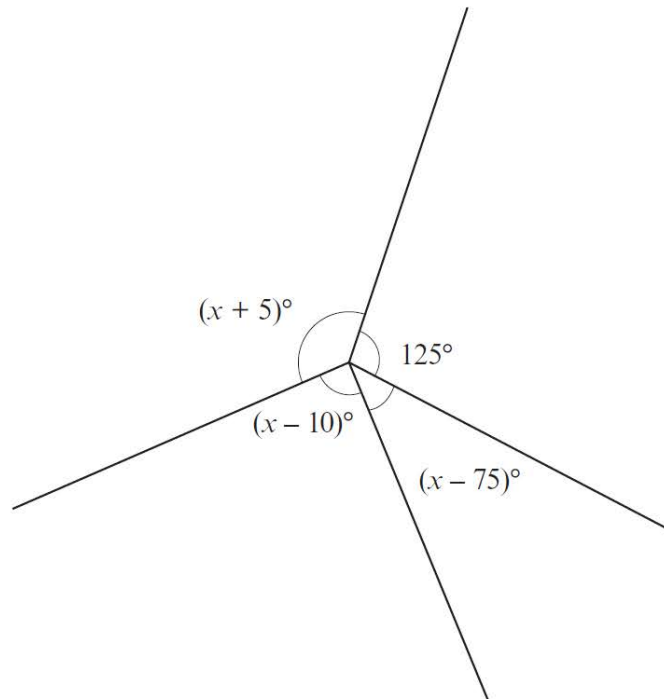


Diagram not drawn to scale

Write an equation in terms of x and solve it.
You must show all your working.

[3]

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$x =$

Question taken from Eduqas examination paper 530004, November 2019

#2

(b) Abby, Ben and Ceri are solving a puzzle.

Abby takes x seconds.

Ben takes 5 seconds more than Abby.

Ceri takes twice as long as Ben.

Ceri takes 116 seconds to solve the puzzle.

Use an algebraic method to find how long Abby takes to solve the puzzle.

You must show all your working.

[3]

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Abby takes seconds

Question taken from Eduqas examination paper 530004, November 2021

#3

(c) Ali walks slowly from home through a forest and back home again.

He walks a total distance of $(3x + 1)$ km in a time of $(\frac{x}{2} + 6)$ hours.
Ali's average speed is 2 km/h.
He left home at 9 a.m.

At what time did Ali return home?

[4]

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Ali returned home at

Question taken from Eduqas examination paper 530004, November 2019

#4

(b) Roza is buying bananas and apples.

She buys x bananas which cost 30 pence each.

She buys 2 more apples than the number of bananas she buys.

Her apples cost 25 pence each.

She pays a total of £5.45.

Use an algebraic method to find the number of bananas Roza buys.

[4]

Question taken from Eduqas examination paper 530004, June 2023

#5

Filbert rides his bike at x km/h for 15 minutes.
He then rides at $(x + 2)$ km/h for half an hour.
The last section of his ride takes a further 15 minutes at $(x - 4)$ km/h.

Show that the total distance of Filbert's bike ride is x km.
You must show all your working.

[4]

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Question taken from Eduqas examination paper 530004, June 2018

#6

The **perimeter** of the rectangle shown below is 232.8 cm.

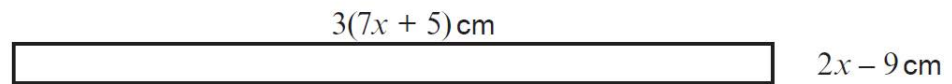


Diagram not drawn to scale

Form an equation in terms of x and solve it.
Hence find the dimensions of the rectangle.

[5]

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Length of the rectangle is cm

Width of the rectangle is cm

Question taken from Eduqas examination paper 530004, November 2018

#7

Ben draws an irregular pentagon.
The interior angles of the pentagon he has drawn are all less than 180° .

Ben attempts to express the interior angles of his pentagon using algebra.
His expressions are

$$x^\circ, \quad (x + 40)^\circ, \quad (2x - 30)^\circ, \quad 3(x - 40)^\circ \quad \text{and} \quad 3x^\circ.$$

Show that Ben is incorrect.

[6]

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Ben is incorrect because

Question taken from Eduqas examination paper 5300004, June 2019

Factorising (Quadratic): Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	2	
#3	3	
Total	7	

#1

(a) Factorise $5x^2 + 13x + 6$.

[2]

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Question taken from Eduqas examination paper 530003, November 2023

#2

(b) (i) Factorise $x^2 - 10x + 21$.

[2]

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Question taken from Eduqas examination paper 530003, May 2022

#3

(a) Factorise $x^2 + 2x - 15$.

[2]

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(b) Write down the solutions of the equation $x^2 + 2x - 15 = 0$.

[1]

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Question taken from Eduqas examination paper 530003, November 2018

Factorising (Quadratic): Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	2	
#3	2	
#4	2	
#5	3	
#6	3	
Total	14	

#1

(a) Factorise $x^2 - 5x - 24$.

[2]

Question taken from Eduqas examination paper 5300004, June 2024

#2

(c) Factorise $x^2 + 5x + 4$.

[2]

Question taken from Eduqas examination paper 5300004, June 2023

#3

(a) Factorise $a^2 + 5a - 14$.

[2]

Question taken from Eduqas examination paper 5300004, June 2018

#4

(b) Factorise $x^2 - 13x + 36$.

[2]

Question taken from Eduqas examination paper 530004, June 2019

#5

(a) Factorise and hence solve the following equation.

[3]

$$4x^2 + 16x + 15 = 0$$

Question taken from Eduqas examination paper 530004, November 2019

#6

(a) Factorise and hence solve the following equation.

[3]

$$6x^2 - x - 2 = 0$$

Question taken from Eduqas examination paper 530004, November 2018

Solving a quadratic equation: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	3	
#3	3	
#4	6	
#5	6	
Total	19	

#1

- (d) Gracie is trying to solve the equation $x^2 - 5x + 6 = 0$.

Here is her work.

$x^2 - 5x + 6 = 0$
$(x - 3)(x - 2) = 0$
$x - 3 \quad x - 2$
$x = -3, \quad x = -2$

Is Gracie's work correct?

Yes

☐

No

☐

Show clearly how you decide.

[1]

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Question taken from Eduqas examination paper 530003, June 2018

#2

- (b) (i) Factorise $x^2 - 10x + 21$.

[2]

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- (ii) Use your answer to part (b)(i) to write down the solutions of the equation $x^2 - 10x + 21 = 0$.

[1]

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$x =$ or $x =$

Question taken from Eduqas examination paper 530003, May 2022

(b) Factorise and hence solve $x^2 + 3x - 18 = 0$.

[3]

[illegible]

(b) Use factorisation to solve the following equation.

[6]

$$\frac{4}{x-1} = 3 + \frac{2}{x}$$

#5

Solve the equation

$$\frac{4}{2x-3} + \frac{12}{x+2} = 7.$$

[6]

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Question taken from Eduqas examination paper 530003, June 2018

Solving a quadratic equation: Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	3	
#3	3	
#4	10	
Total	19	

#1

(b) Solve $w^2 + 8w - 33 = 0$.

[3]

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Question taken from Eduqas examination paper 530004, November 2019

#2

(c) Solve $w^2 + 7w - 18 = 0$.

[3]

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Question taken from Eduqas examination paper 530004, June 2019

#3

The diagram below shows a composite shape made by joining two rectangles.

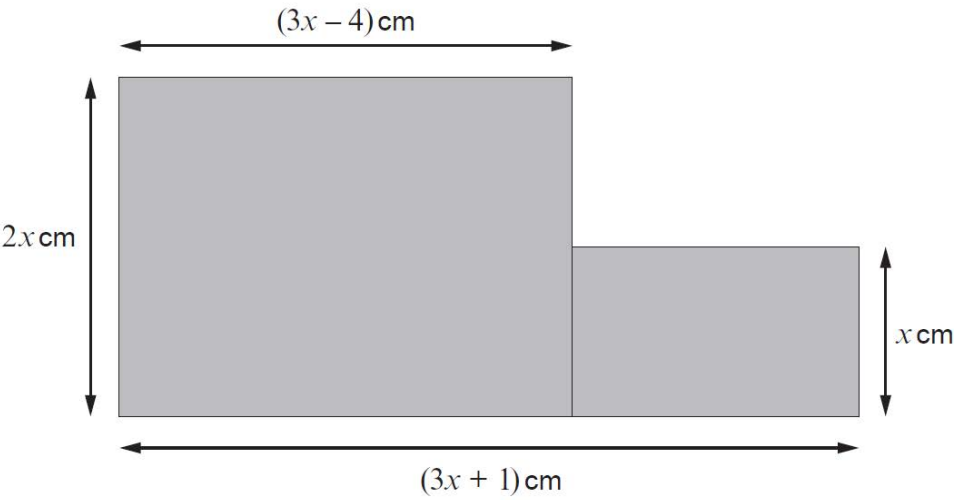


Diagram not drawn to scale

- (a) The total area of the composite shape is 47 cm^2 .
Show that $6x^2 - 3x - 47 = 0$.
- [3]

Question taken from Eduqas examination paper 530004, June 2018

#4

Debra buys a total of 4 kg of flour and butter at a market.
She pays £7 for her flour and £9 for her butter.

She buys x kg of flour.

- (a) Complete this table.
- [1]

	Total cost (£)	Number of kg bought	Cost per kg (£)
Flour	7	x	$\frac{7}{x}$
Butter	9	$4 - x$	

- (b) The cost per kilogram of her butter is £5 more than the cost per kilogram of her flour.

Use this information and the table in part (a) to show that

$$5x^2 - 4x - 28 = 0. \quad [5]$$

- (c) Use an algebraic method to find the cost of a kilogram of her flour.
You must show all your working. [4]

Question taken from Eduqas examination paper 530004, June 2022

Completing the Square: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	5	
Total	9	

#1

Use the method of completing the square to find the coordinates of the turning point of the curve $y = x^2 + 14x + 70$. [4]

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Coordinates of the turning point (..... ,)

Question taken from Eduqas examination paper 5300003, May 2024

#2

(a) Write the expression $x^2 + 8x + 18$ in the form $(x + a)^2 + b$, where a and b are integers. [3]

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(b) Write down the coordinates of the turning point of the curve $y = x^2 + 8x$. [2]

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Turning point = (..... ,)

Question taken from Eduqas examination paper 5300003, November 2020

Completing the Square: Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	3	
#3	4	
#4	6	
Total	16	

#1

- (d) The expression $x^2 + 18x + 2$ has a minimum value.
By **completing the square**, complete the statements below.
You must show all your working.

[3]

'The minimum value of $x^2 + 18x + 2$ occurs when $x =$

'The minimum value of $x^2 + 18x + 2$ is

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Question taken from Eduqas examination paper 530004, November 2019

#2

- (d) The expression $x^2 + 14x + 25$ has a minimum value.
By **completing the square**, complete the statements below.
You must show all your working.

[3]

'The minimum value of $x^2 + 14x + 25$ occurs when $x =$

'The minimum value of $x^2 + 14x + 25$ is

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Question taken from Eduqas examination paper 530004, November 2018

#3

Use the method of completing the square to find the coordinates of the turning point of the curve $y = x^2 + 12x + 57$. [4]

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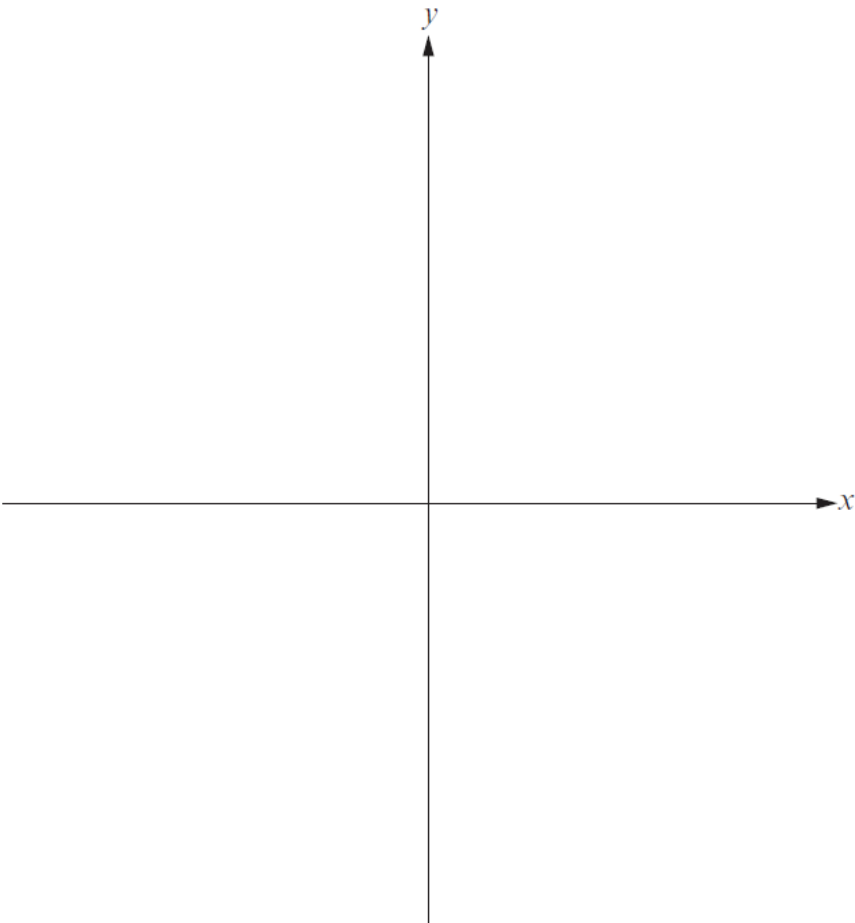
Coordinates of the turning point (..... ,)

Question taken from Eduqas examination paper 530004, June 2018

#4

By first completing the square, draw a sketch of $y = 4x^2 - 16x - 6$.
You must clearly indicate the coordinates of any stationary points and the intercept with the y -axis.

[6]



Question taken from Eduqas examination paper 530004, November 2024

Difference between two squares: Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	1	
#3	1	
#4	1	
#5	5	
Total	9	

#1

(c) Factorise $y^2 - 400$.

[1]

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Question taken from Eduqas examination paper 530004, November 2023

#2

(c) Factorise $b^2 - 144$.

[1]

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Question taken from Eduqas examination paper 530004, November 2019

#3

(b) Factorise $b^2 - 25$.

[1]

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Question taken from Eduqas examination paper 530004, June 2018

#4

(d) Factorise $y^2 - 121$.

[1]

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Question taken from Eduqas examination paper 530004, June 2019

#5

(a) Solve $x^2 - 36 \leq 0$.

[3]

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(b) On the axes below, sketch the part of the graph $y = x^2 - 36$ that represents the solution to the inequality $x^2 - 36 \leq 0$.
Mark any intercepts with the x -axis on your sketch.

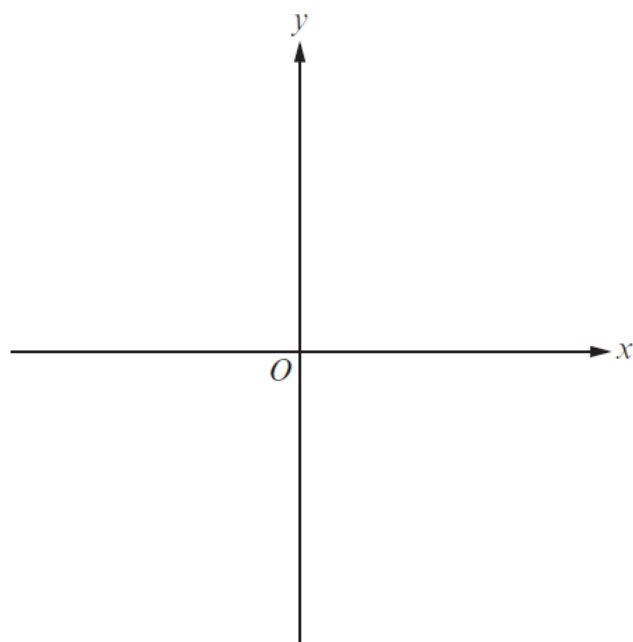
[2]

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Question taken from Eduqas examination paper 5300004, June 2023

Solving a Quadratic Equation (Quadratic Formula): Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	3	
Total	6	

[3]

[3]

65

Solving a Quadratic Equation (Quadratic Formula): Calculator

Question	Maximum Mark	Mark Awarded
#1	6	
#2	7	
#3	7	
Total	20	

#1

The diagram below shows a composite shape made by joining two rectangles.

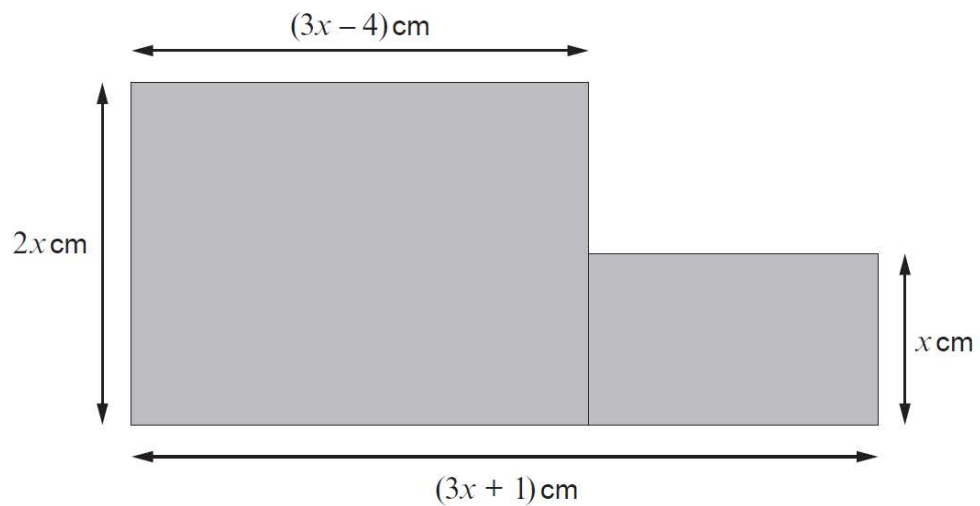


Diagram not drawn to scale

- (b) Use the quadratic formula to solve $6x^2 - 3x - 47 = 0$.
Give **both** of your answers correct to 2 decimal places.

[3]

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- (c) Calculate the perimeter of the composite shape.
You must give a reason for any decision that you make.

[3]

Decision:

Reason:

Working:

Perimeter is cm.

Question taken from Eduqas examination paper 530004, June 2018

#2

Solve the following equation.

$$\frac{7}{3x+1} + \frac{4}{x+2} = 1$$

Give your answers correct to 2 decimal places.

[7]

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Question taken from Eduqas examination paper 530004, November 2021

#3

A cone has a radius x cm, a perpendicular height $(x + 2)$ cm and a slant height 16.4 cm.

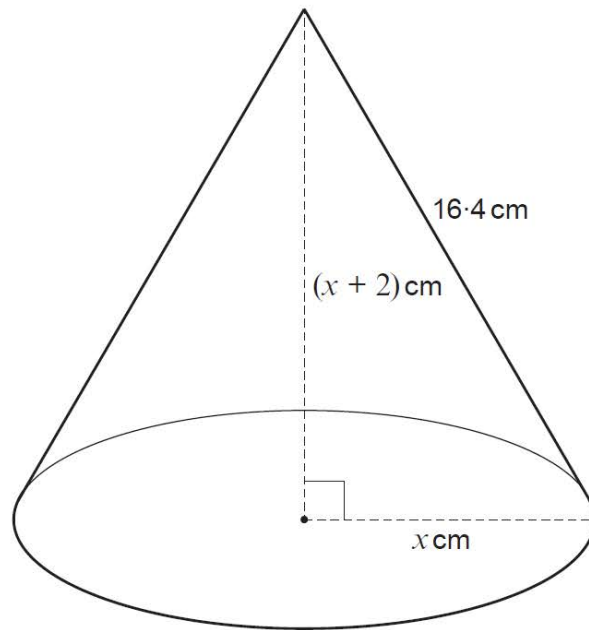


Diagram not drawn to scale

Show that x satisfies the equation $x^2 + 2x - 132.48 = 0$ and calculate the volume of the cone.
You must show all your working. [7]

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Question taken from Eduqas examination paper 530004, June 2019

Nth term (linear sequence): Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	2	
#3	2	
Total	6	

#1

(a) Find an expression for the n th term of this sequence.

[2]

3 11 19 27 35

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Question taken from Eduqas examination paper 530003, June 2018

#2

(b) Write down an expression for the n th term of the following sequence.

[2]

-3, 3, 9, 15, 21, ...

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Question taken from Eduqas examination paper 530003, November 2024

#3

(b) Find the n th term of the following sequence.

[2]

4, 9, 14, 19, 24,

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Question taken from Eduqas examination paper 530003, November 2022

Nth term (Quadratic sequence): Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	2	
#3	2	
#4	2	
Total	8	

#1

(c) Find the n th term of the sequence below.

[2]

3 15 35 63 99

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 n th term =

Question taken from Eduqas examination paper 530003, November 2023

#2

(b) Find the n th term of the following sequence.

[2]

-3 0 5 12 21

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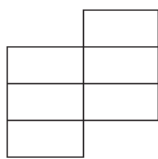
Question taken from Eduqas examination paper 530003, May 2023

#3

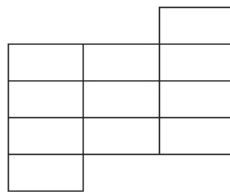
(b) The diagram shows four patterns made using rectangular tiles.



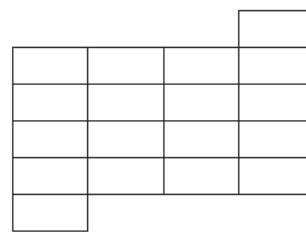
Pattern 1



Pattern 2



Pattern 3



Pattern 4

Find an expression for the number of rectangular tiles needed for the n th pattern. [2]

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Question taken from Eduqas examination paper 5300003, May 2024

#4

(c) Find the n th term of this sequence.

1·5, 3, 5·5, 9, 13·5, ...

[2]

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Question taken from Eduqas examination paper 5300003, November 2020

Nth term (Quadratic sequence): Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	2	
#3	2	
#4	2	
#5	2	
#6	2	
Total	12	

#1

Find the n th term of the following sequence.

[2]

 $-7, -4, 1, 8, 17, \dots$

Question taken from Eduqas examination paper 530004, June 2019

#2

Find the n th term of the following sequence.

[2]

 $3, 7, 13, 21, 31, 43, \dots$

Question taken from Eduqas examination paper 530004, June 2018

#3

(b) Find the n th term of the following sequence.

[2]

7, 10, 15, 22, 31, 42,

Question taken from Eduqas examination paper 530004, November 2019

#4

(b) Find the n th term of the following sequence.

[2]

4, 7, 12, 19, 28, 39,

Question taken from Eduqas examination paper 530004, November 2018

#5

(b) Find the n th term of the following sequence.

[2]

3, 9, 19, 33, 51,

Question taken from Eduqas examination paper 530004, June 2022

#6

(b) Find the n th term of the following sequence.

2, 6, 12, 20, 30, ...

[2]

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Question taken from Eduqas examination paper 530004, November 2021

Sequences (other): Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	2	
#3	3	
#4	3	
#5	3	
Total	12	

#1

(a) Find the next term of the following Fibonacci-type sequence.

[1]

2, 3, 5, 8, 13, 21, 34,

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Question taken from Eduqas examination paper 530003, November 2022

#2

(a) Find the next term of this sequence.

[2]

 $\frac{3}{2}, -\frac{9}{4}, \frac{27}{8}, -\frac{81}{16}, \dots$

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Question taken from Eduqas examination paper 530003, November 2020

#3

(a) (i) Find the next term in this sequence.

[2]

 $\frac{5}{2}, -\frac{25}{4}, \frac{125}{8}, -\frac{625}{16}, \dots$

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(ii) Find the next term in this Fibonacci-style sequence.

[1]

10 15 25 40 65

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Question taken from Eduqas examination paper 530003, November 2023

#4

- (a) Write down the next term in the following sequence.

[2]

$$-\frac{2}{a}, \frac{4}{3a}, -\frac{8}{5a}, \frac{16}{7a}, \dots$$

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- (c) (i) The first seven terms of a Fibonacci sequence are given by

$$1, 1, 2, 3, 5, 8, 13, \dots$$

Find the 11th term of this sequence.

[1]

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Question taken from Eduqas examination paper 530003, November 2024

#5

- (a) (i) Find the next term of the following Fibonacci-type sequence.

[1]

$$0 \quad 2 \quad 2 \quad 4 \quad 6 \quad \dots$$

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- (ii) Here are the first 4 terms of a sequence.

$$\sqrt{3} \quad 1 \quad \frac{1}{\sqrt{3}} \quad \frac{1}{3} \quad \dots \quad \dots$$

Find the 6th term of this sequence.
Simplify your answer.

[2]

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Question taken from Eduqas examination paper 530003, May 2023

Sequences (other): Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	2	
Total	3	

#1

(a) Find the next term of the following sequence.

[1]

0, 7, 26, 63, 124,

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Question taken from Eduqas examination paper 530004, June 2022

#2

(a) Find the next term of each of the following sequences.

(i) 2, 9, 11, 20, 31, 51, ...

[1]

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(ii) 1, $\sqrt{2}$, 2, $2\sqrt{2}$, 4, $4\sqrt{2}$, 8, ...

[1]

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Question taken from Eduqas examination paper 530004, November 2021

Solving Inequalities: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	3	
#3	3	
#4	3	
#5	3	
Total	13	

#1

- (b) Adrian is trying to solve $3 - 4x > 11$.
He writes the following:

$3 - 4x > 11$
$-4x > 8$
$x > \frac{8}{-4}$
$x > -2$


Adrian's method is incorrect. Explain why.

[1]

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Question taken from Eduqas examination paper 530003, November 2023

#2

- (c) (i) Solve $3x + 2 > 5$.

[2]

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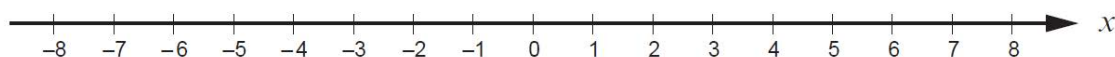
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- (ii) Represent your answer to part (c)(i) on the number line below.

[1]



Question taken from Eduqas examination paper 530003, June 2019

#3

- (c) (i) Solve the inequality
- $10x - 7 \leq 8$
- .

[2]

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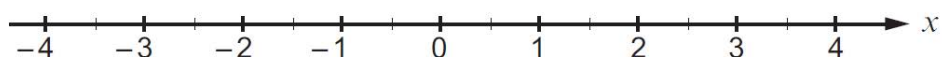
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- (ii) Represent your answer to part (c)(i) on the number line below.

[1]

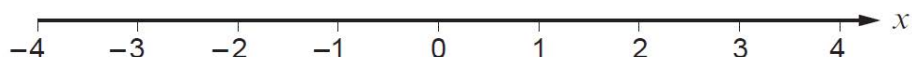


Question taken from Eduqas examination paper 530003, June 2018

#4

- (c) Represent the inequality
- $-2 \leq x \leq 3$
- on the number line below.

[1]



- (d) Solve
- $\frac{2x}{3} < 4$
- .

[2]

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Question taken from Eduqas examination paper 530003, November 2019

#5

The n th term of a sequence is given by $2n + 9$.(b) (i) Solve $2n + 9 < 99$.

[2]

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(ii) Write down the number of terms of this sequence that are less than 99.

[1]

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Number of terms =

Question taken from Eduqas examination paper 5300003, May 2023

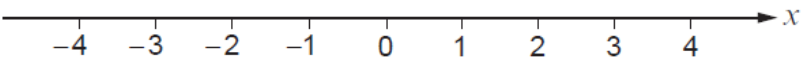
Solving Inequalities: Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	2	
#3	2	
#4	5	
Total	10	

#1

(c) Represent the inequality $-2 < x \leq 3$ on the number line below.

[1]



Question taken from Eduqas examination paper 530004, June 2024

#2

(c) Tansy is trying to solve $1 < x + 2 \leq 5$ where x is a whole number. Here is her work.

	$1 - 2 < x$ and $x \leq 5 - 2$
	$-1 < x$ and $x \leq 3$
	$-1 < x \leq 3$
	x is $-1, 0, 1, 2$ or 3 .

Ali says, "You have made an error."

Is Ali correct?

Yes ☐

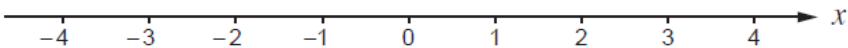
No ☐

Show clearly how you decide.

[1]

(d) Represent the inequality $x > -2$ on the number line below.

[1]



Question taken from Eduqas examination paper 530004, June 2022

#3

(b) Solve $4x - 3 > 17$. [2]

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Question taken from Eduqas examination paper 530004, November 2022

#4

(b) (i) Solve $n + 11 < 4n - 5$. [3]

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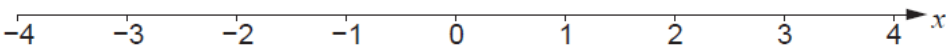
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(ii) n is an integer.
What is the least possible value of n ? [1]

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(d) Represent the inequality $-3 < x \leq 1$ on the number line below. [1]

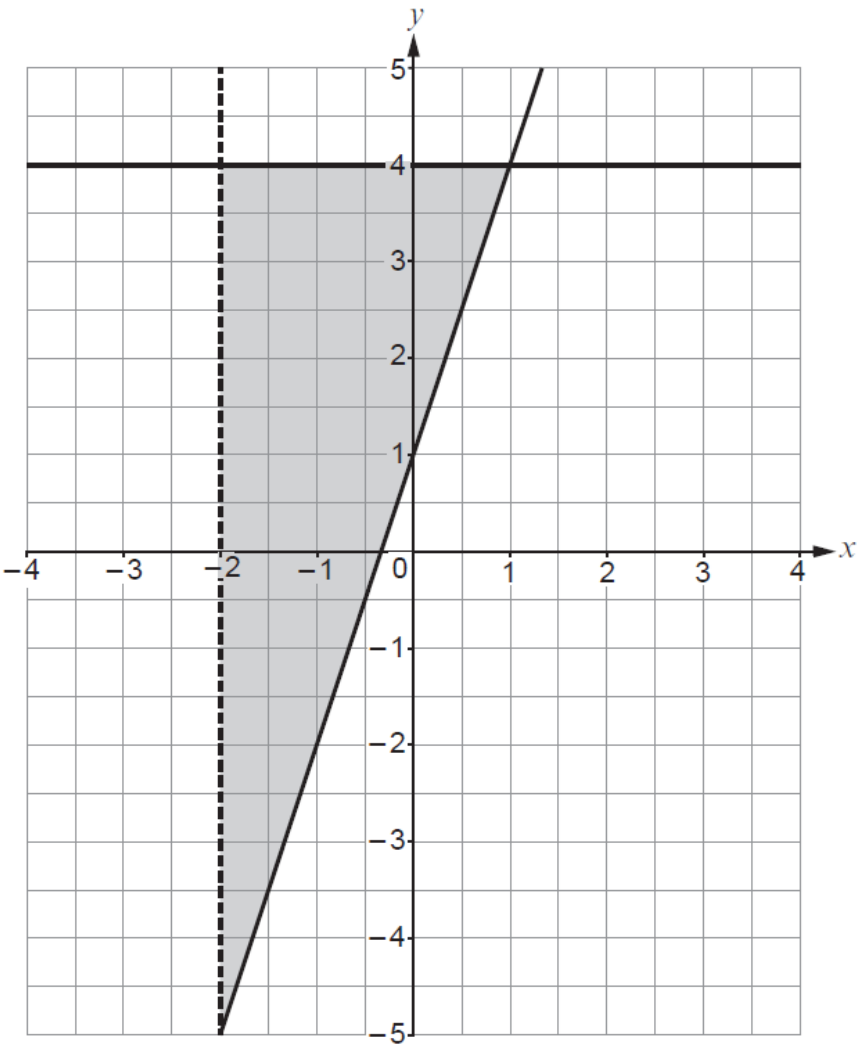


Question taken from Eduqas examination paper 530004, November 2024

Inequalities (Graphs): Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
Total	3	

#1



(a) Complete the following table to show the inequalities that describe the shaded region above. [3]

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$y \leq 4$

Question taken from Eduqas examination paper 530004, November 2023

Changing the subject: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	5	
#3	3	
Total	12	

#1

Rearrange this formula to make a the subject.

[4]

$$\frac{a^3b}{7} + 5 = c$$

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Question taken from Eduqas examination paper 530003, May 2022

#2

Rearrange $x + y = \sqrt{2(xy + w)}$ to make x the subject.

[5]

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Question taken from Eduqas examination paper 530003, June 2018

#3

Rearrange $6(x + y) = 8x - 5$ to make x the subject.

[3]

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Question taken from Eduqas examination paper 5300003, June 2019

Changing the subject: Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	2	
#3	2	
#4	2	
#5	4	
#6	4	
Total	15	

#1

(c) Make x the subject of the formula.

[1]

$$\frac{a}{x} = b$$

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Question taken from Eduqas examination paper 530004, November 2024

#2

(d) Rearrange the following to make e the subject.
Simplify your answer.

$$9e^2 = t^4$$

[2]

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Question taken from Eduqas examination paper 530004, November 2019

#3

Make R the subject of the formula $P = \sqrt[3]{RQ}$.

[2]

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Question taken from Eduqas examination paper 530004, June 2024

#4

Make e the subject of the formula.

[2]

$$g = 4e - 3f$$

Question taken from Eduqas examination paper 530004, November 2023

#5

Rearrange this formula to make y the subject.

$$a = 7(x + y^5) + 2$$

[4]

Question taken from Eduqas examination paper 530004, June 2023

#6

Rearrange each of the following to make w the subject of the formula.

$$(a) \quad \frac{7}{w} = e$$

[1]

$$(b) \quad 3(w + 5) - f = g$$

[3]

Question taken from Eduqas examination paper 530004, November 2018

Changing the Subject (when the subject appears more than once): Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	5	
#3	4	
Total	13	

#1

Rearrange $4x = \sqrt[3]{7y + xy}$ to make y the subject.
Give your answer in its simplest form.

[4]

Question taken from Eduqas examination paper 530003, November 2022

#2

Make e the subject of the following formula.

[5]

$$3e = \sqrt{7 - de^2}$$

Question taken from Eduqas examination paper 530003, November 2023

#3

Make y the subject of this formula.

[4]

$$x + y = \frac{wy + 7}{3}$$

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Question taken from Eduqas examination paper 530003, November 2021

Simplifying Algebraic Fractions: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	5	
Total	5	

#1

(b) Simplify $\frac{4x^2 - 1}{6x^2 - 13x + 5}$.

[5]

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Question taken from Eduqas examination paper 530003, November 2021

Simplifying Algebraic Fractions: Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
Total	4	

#1

Simplify $\frac{4x^2 - 25}{6x^2 - 15x}$.

[4]

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Question taken from Eduqas examination paper 530004, June 2024

Straight-line Graphs: Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
Total	3	

#1

- (a) A straight line passes through the points (0, 7) and (3, 19).

Find the equation of the straight line.

Give your answer in the form $y = mx + c$.

[3]

Question taken from Eduqas examination paper 530004, November 2018

Parallel and Perpendicular gradients: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	2	
#3	3	
#4	4	
#5	6	
#6	7	
Total	23	

#1

A line L has equation $y = 12 - 4x$.

Write down the equation of a different line that is parallel to L .

[1]

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Question taken from Eduqas examination paper 530003, November 2020

#2

(ii) Circle the equation that represents a line parallel to $y = 3x - 1$.

[1]

$y = 3 - x$

$3y = x - 1$

$y = 3x + 2$

$\frac{3}{y} = x$

$\frac{x}{3} = y$

.....

.....

(b) Circle the equation where y is directly proportional to x .

[1]

$y = \frac{5}{x}$

$x + y = 1$

$7 = xy$

$y = 3x^2$

$y = 4x$

Question taken from Eduqas examination paper 530003, November 2021

#3

(a) Show that the lines

$$3y - 12x = 9 \text{ and } 2y = 8x - 13$$

are parallel to each other.

[3]

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Question taken from Eduqas examination paper 530003, November 2023

#4

- (a) Circle the equation of a line parallel to the line $y = 4x + 5$. [1]

$y = -\frac{1}{4}x + 5$

$y = 4x - 5$

$y = -4x + 5$

$y = \frac{1}{4}x - 5$

$4y = x + 5$

- (b) The gradient of the line which passes through the points $(a, 3)$ and $(2a, 9)$ is $\frac{3}{4}$.

Find the value of a .

[3]

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Question taken from Eduqas examination paper 5300003, May 2023

#5 The diagram shows the points $P(-5,16)$ and $Q(5,-4)$, joined by a straight line.

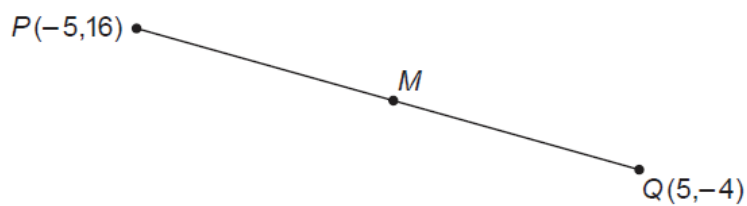


Diagram not drawn to scale

M is the midpoint of PQ .

By finding the gradient of PQ and the coordinates of M , show that the equation of the perpendicular bisector of PQ is $2y = x + 12$.

You must show all your working.

[6]

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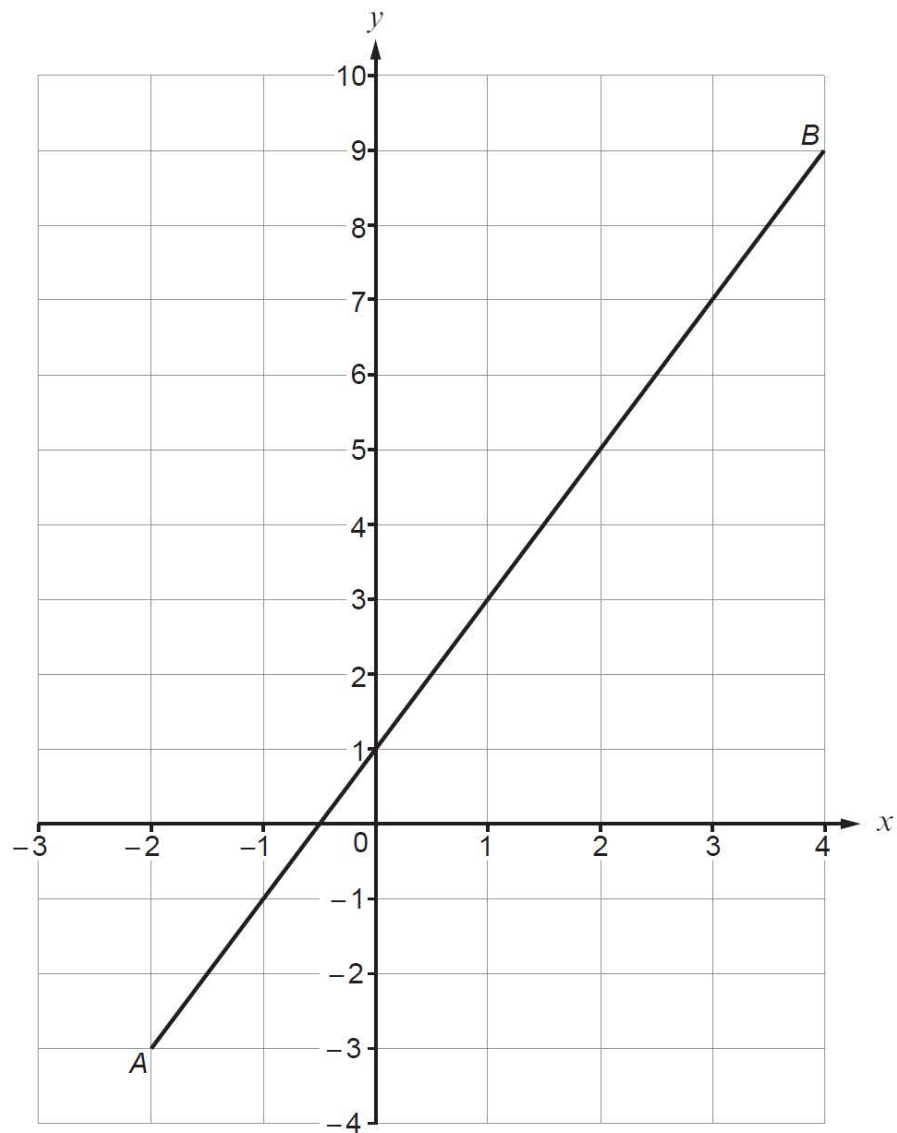
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Question taken from Eduqas examination paper 530003, November 2021

#6



The diagram shows the graph of a straight line, AB .

- (a) Find the equation of this line.
Give your answer in the form $y = mx + c$.

[3]

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$y =$

(b) Find the equation of the perpendicular bisector of the line AB .

[4]

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Question taken from Eduqas examination paper 530003, November 2019

Parallel and Perpendicular gradients: Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	3	
#3	5	
#4	6	
Total	16	

#1

- (b) Which two of the following equations represent a straight line that is parallel to $y = 8x - 3$?
Circle your answers. [2]

$y = -3x + 3$

$y = 8x + 3$

$y = -8x + 3$

$y = -8x - 8$

$8x + y + 3 = 0$

$y - 8x - 8 = 0$

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Question taken from Eduqas examination paper 530004, November 2018

#2

- A line, L , passes through the point $(-1, 5)$ and is perpendicular to $y = \frac{1}{2}x + 5$.
Find the equation of the line L .
Give your answer in the form $ax + by + c = 0$. [3]

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Question taken from Eduqas examination paper 530004, June 2024

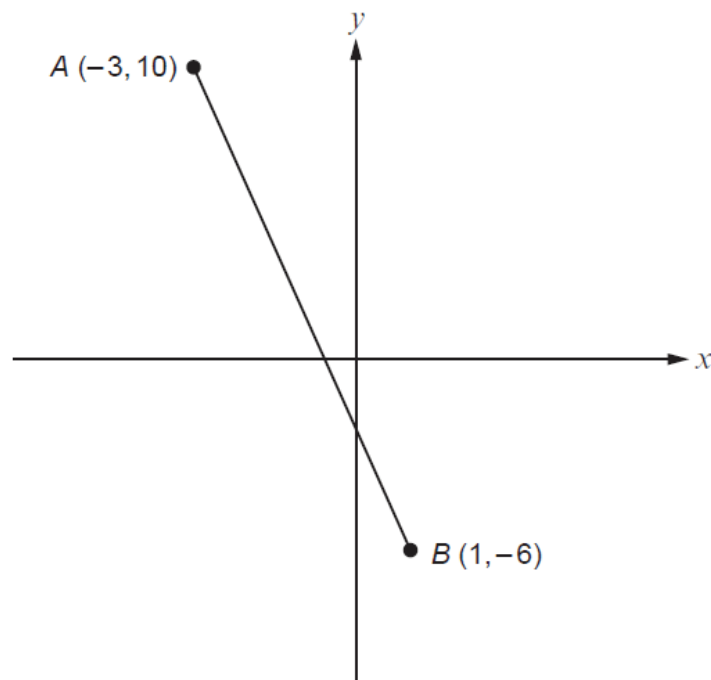
#3

- (a) Find the equation of the line parallel to $4x = 5 - y$ which passes through the point $(1, -1)$.
Give your answer in the form $y = mx + c$. [3]

- (b) Find the equation of the line perpendicular to $y = 1 - \frac{x}{5}$ which passes through the point $(0, 7)$. [2]

Question taken from Eduqas examination paper 530004, June 2022

#4

(b) The line AB is shown on the diagram.*Diagram not drawn to scale*

Show that the equation of the perpendicular bisector of the line AB is $4y = x + 9$. [6]

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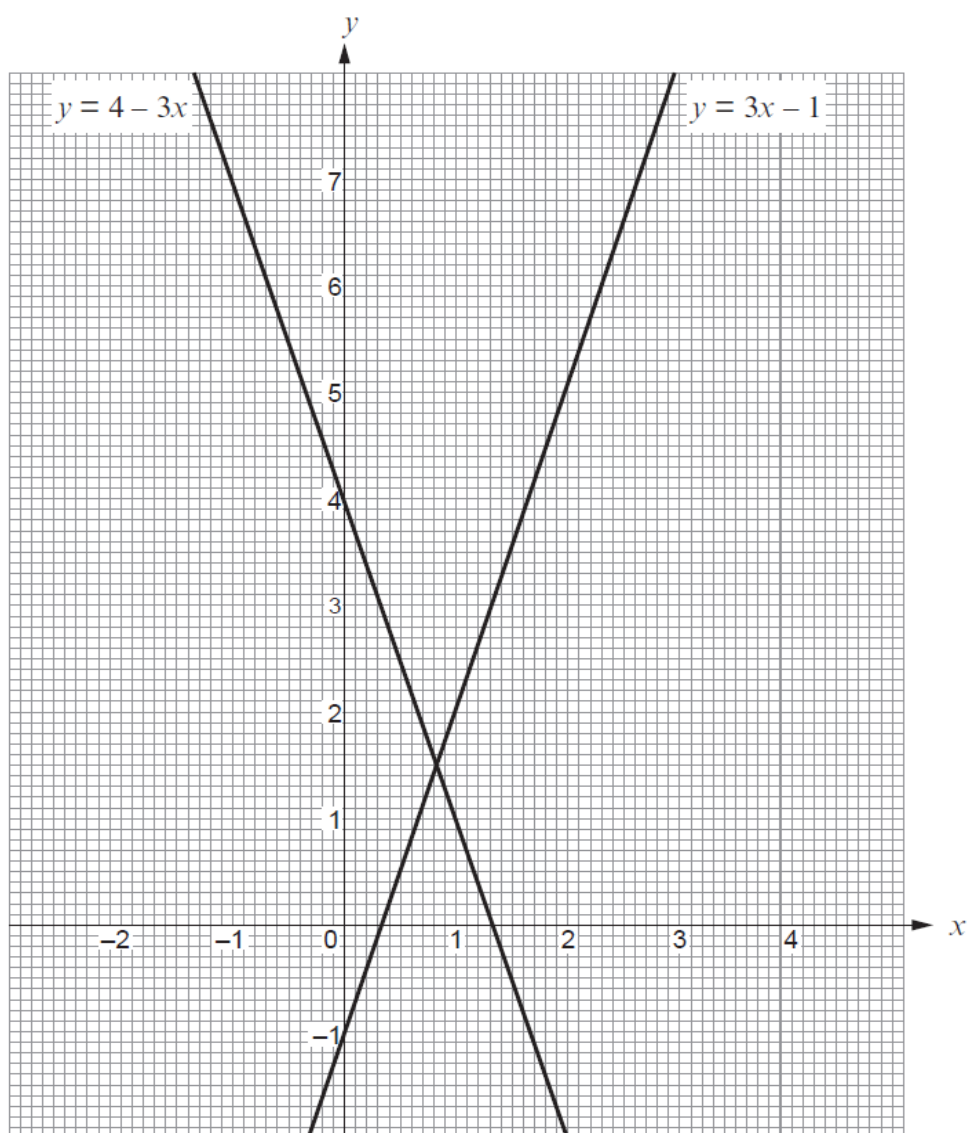
Question taken from Eduqas examination paper 530004, November 2023

Simultaneous Equations (Graphically): Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	2	
#3	2	
Total	5	

#1

- (a) The diagram shows the graphs of $y = 3x - 1$ and $y = 4 - 3x$.



- (i) Use the graphs to write down an **approximate** solution of the equation $3x - 1 = 4 - 3x$.

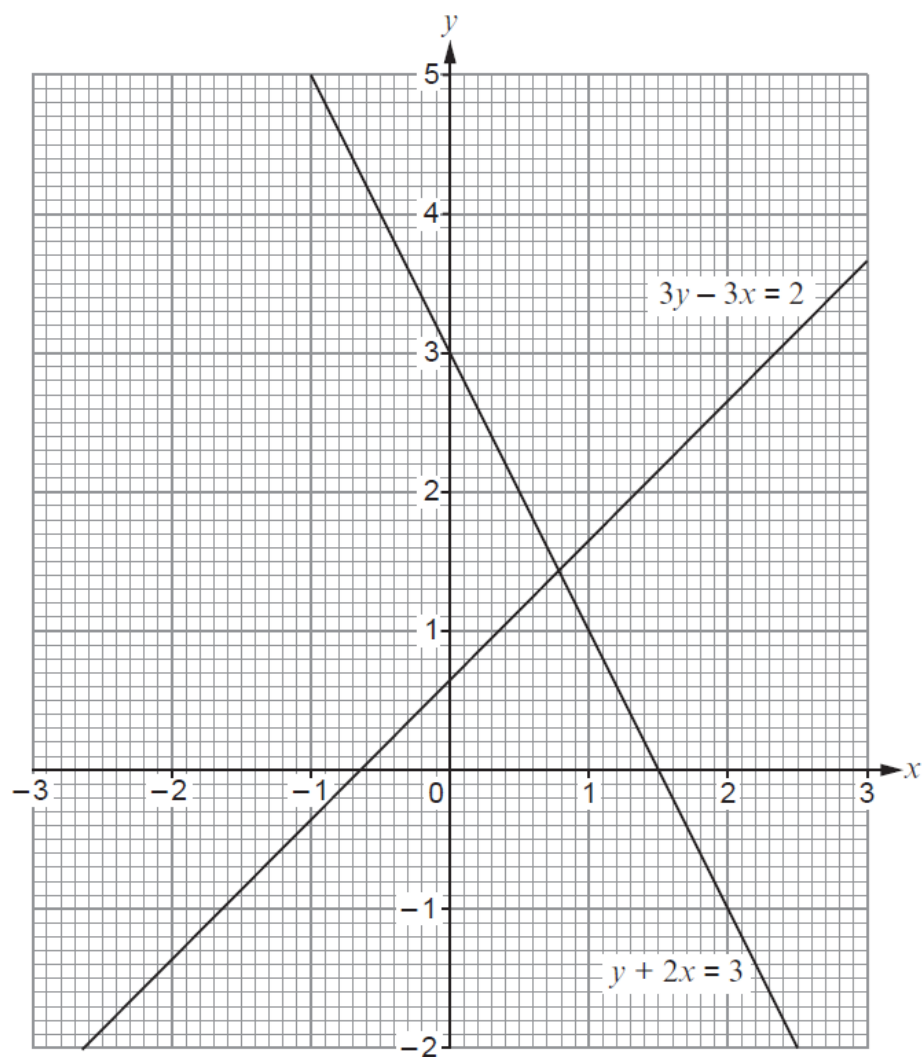
[1]

.....
 $x =$

Question taken from Eduqas examination paper 530003, November 2021

#2

(a)



Use the diagram to solve the following simultaneous equations.

$$3y - 3x = 2$$

$$y + 2x = 3$$

Give your answers correct to 1 decimal place.

[2]

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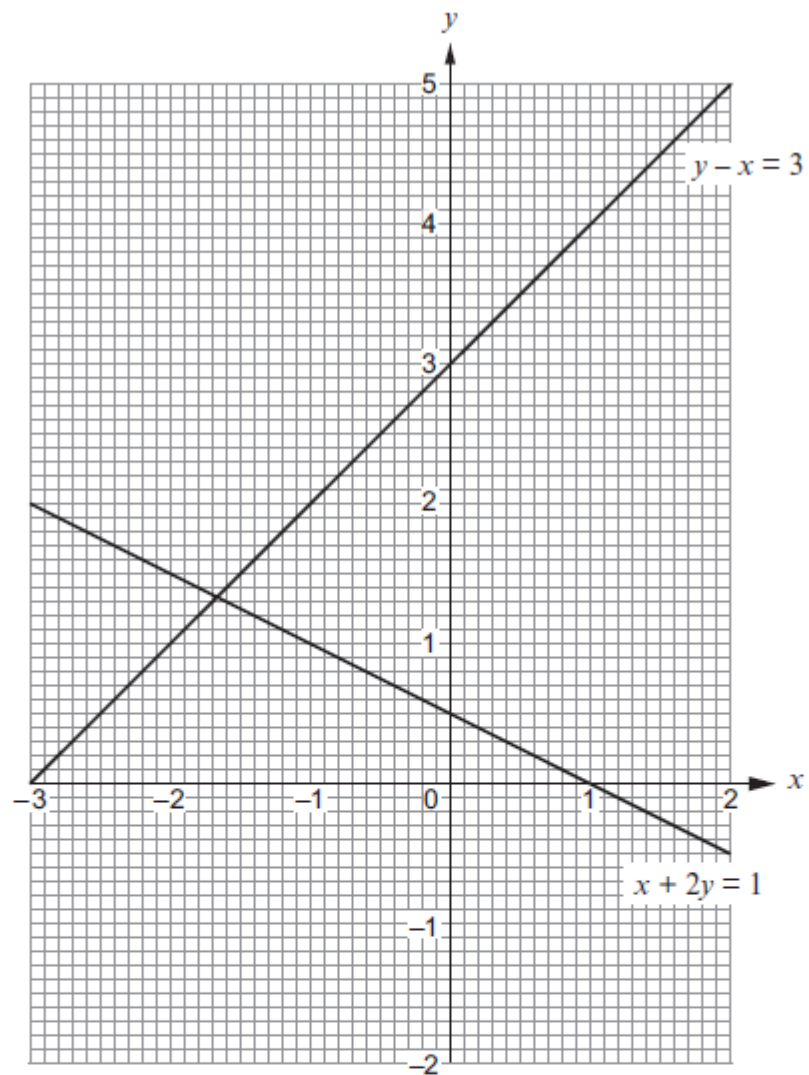
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$x =$ $y =$

Question taken from Eduqas examination paper 530003, May 2023

#3

(a)



Use the diagram to solve the simultaneous equations

$$y - x = 3,$$

$$x + 2y = 1.$$

Give your answers correct to 1 decimal place.

[2]

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Question taken from Eduqas examination paper 530003, November 2018

Simultaneous Equations (algebraic): Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
Total	2	

#1

(b) Solve the following simultaneous equations.

[2]

$$\begin{aligned}2x + y &= 8 \\ x - y &= 1\end{aligned}$$

Question taken from Eduqas examination paper 530003, November 2019

Simultaneous Equations (algebraic): Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	3	
Total	6	

#1

(d) Solve the following simultaneous equations.

[3]

$$7x - 3y = 26$$

$$x + y = 3$$

You must show all your working.

$$x = \text{.....} \quad y = \text{.....}$$

Question taken from Eduqas examination paper 530004, November 2023

#2

(c) Solve the following simultaneous equations. Use an algebraic (not graphical) method.

$$5x - 2y = 16$$

$$x - y = 5$$

You must show all your working.

[3]

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Question taken from Eduqas examination paper 530004, November 2022

Simultaneous Equations (forming and solving): Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	5	
Total	5	

#1

(b) A theme park sells entrance tickets.

2 adult tickets and 3 child tickets would cost a total of £72.

3 adult tickets and 1 child ticket would cost a total of £66.

A family ticket costs £45 and allows entry for 2 adults and 2 children.

How much cheaper is it to buy a family ticket than it would be to buy 2 adult and 2 child tickets? [5]

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It is £ cheaper to buy a family ticket.

Question taken from Eduqas examination paper 530003, November 2018

Simultaneous Equations (forming and solving): Calculator

Question	Maximum Mark	Mark Awarded
#1	5	
#2	6	
Total	11	



[5]

133

Alpha Bathrooms sells only one size of shower curtain and one size of rail.

You must use an algebraic method.

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Sunita's change from £40 would be

Question taken from Eduqas examination paper 530004, June 2018

Simultaneous Equations (one quadratic and one linear): Calculator

Question	Maximum Mark	Mark Awarded
#1	6	
#2	6	
#3	7	
Total	19	

#1

Solve the following simultaneous equations.

$$\begin{aligned}y &= 3x^2 + 4x - 7 \\ y &= 2x + 5\end{aligned}$$

Use an algebraic method and give your answers correct to 2 decimal places.

[6]

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Question taken from Eduqas examination paper 530004, November 2019

#2

Solve the following simultaneous equations.

$$\begin{aligned} y &= 4x^2 + 5x - 7 \\ y &= 3x + 2 \end{aligned}$$

Use an algebraic method and give your answers correct to 2 decimal places.

[6]

[illegible]

Question taken from Edugas examination paper 530004, November 2018

[7]

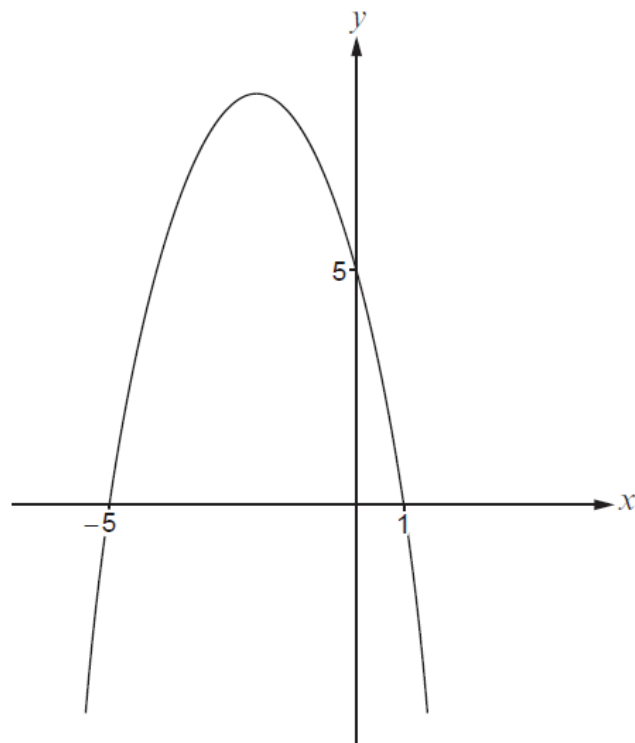
139

Quadratic Graphs: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	3	
#3	4	
#4	5	
#5	7	
Total	21	

#1

(b) The diagram shows the curve $y = 5 - 4x - x^2$.



Calculate the coordinates of the turning point of the curve.

[2]

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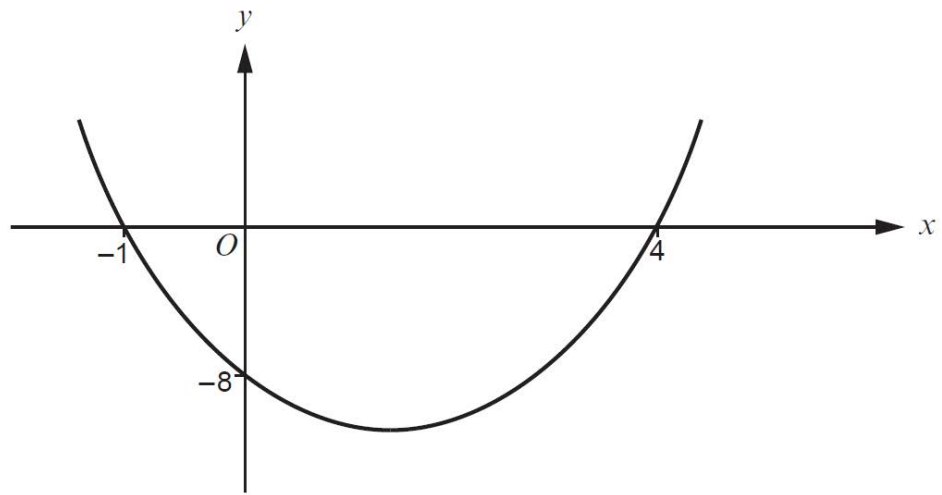
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(..... ,)

Question taken from Eduqas examination paper 530003, November 2023

#2

(a)



The diagram shows a sketch graph of a quadratic function.

Find the equation of this curve.

[3]

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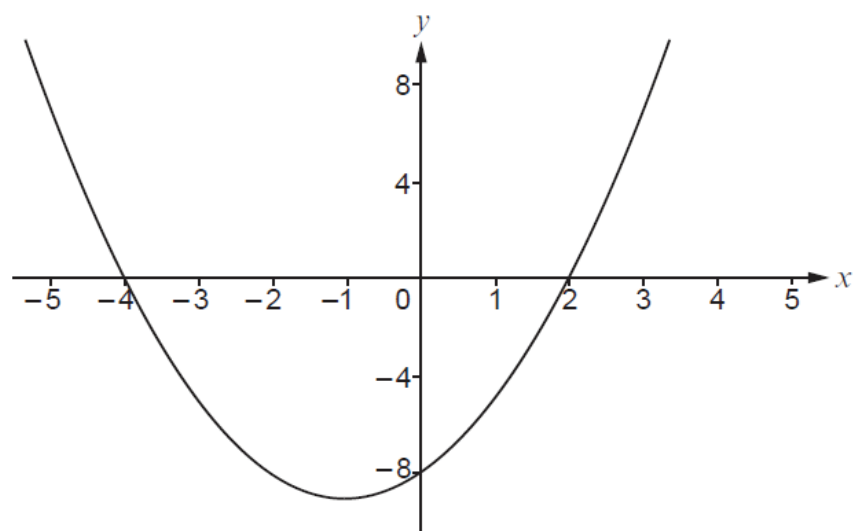
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$y =$

Question taken from Eduqas examination paper 530003, November 2019

#3

(b) The diagram shows the curve $y = x^2 + 2x - 8$.



(i) Write down the y -intercept of the curve. [1]

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(ii) Find the coordinates of the turning point of the curve. [2]

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(..... ,)

(iii) Use the diagram to solve $x^2 + 2x - 8 = 0$. [1]

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$x = \dots\dots\dots$ or $x = \dots\dots\dots$

Question taken from Eduqas examination paper 5300003, May 2023

#4

- (a) A curve has equation $y = 4 - (x - 3)^2$.

Circle the correct description of the point (3, 4) on this curve.

[1]

y-intercept

maximum point

minimum point

root

x-intercept

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- (b) The diagram shows a sketch of the curve $y = (x - 5)^2 + a$

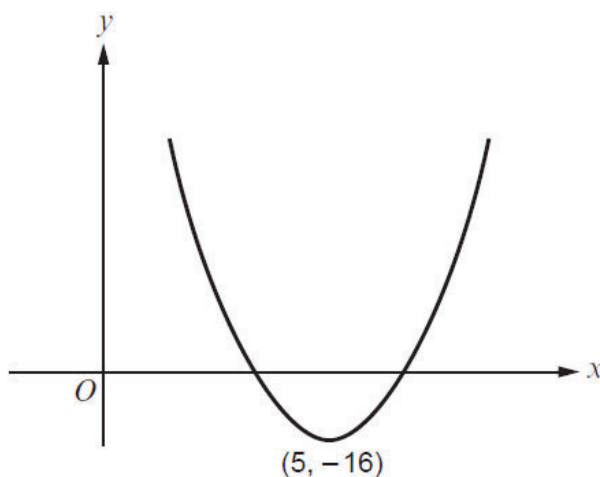


Diagram not
drawn to scale

The minimum point of the curve is (5, -16).

Find the x-coordinates of the points where the curve cuts the x-axis.
You must show all your working.

[4]

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Question taken from Eduqas examination paper 530003, November 2022

#5

The table shows some of the values of $y = x^2 + x - 1$ for $-2 \leq x \leq 1$.

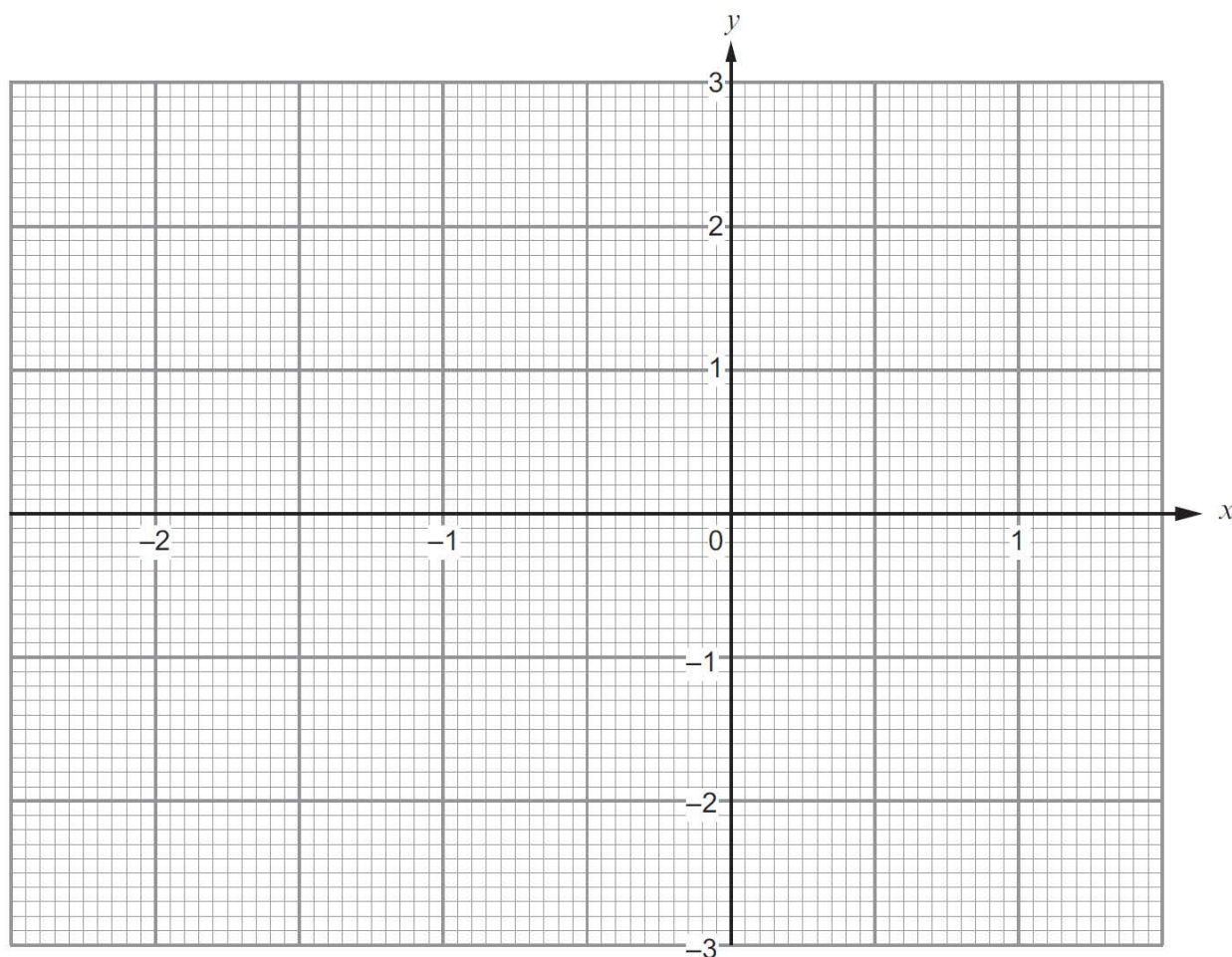
x	-2	-1	-0.5	0	1
$y = x^2 + x - 1$		-1	-1.25		

- (a) Complete the table above. [2]

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- (b) On the graph paper below, draw the graph of $y = x^2 + x - 1$ for $-2 \leq x \leq 1$. [2]



- (c) State the equation of the line of symmetry of the curve $y = x^2 + x - 1$. [1]

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- (d) Use your graph to solve $x^2 + x - 1 = 0$. [2]

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Question taken from Eduqas examination paper 5300003, June 2019

Quadratic Graphs: Calculator

Question	Maximum Mark	Mark Awarded
#1	7	
#2	6	
#3	3	
Total	16	

#1

The table shows some of the values of $y = x^2 - 2x - 3$ for $-2 \leq x \leq 4$.

x	-2	-1	0	1	2	3	4
$y = x^2 - 2x - 3$	5	0	-3		-3	0	5

(a) Complete the table above.

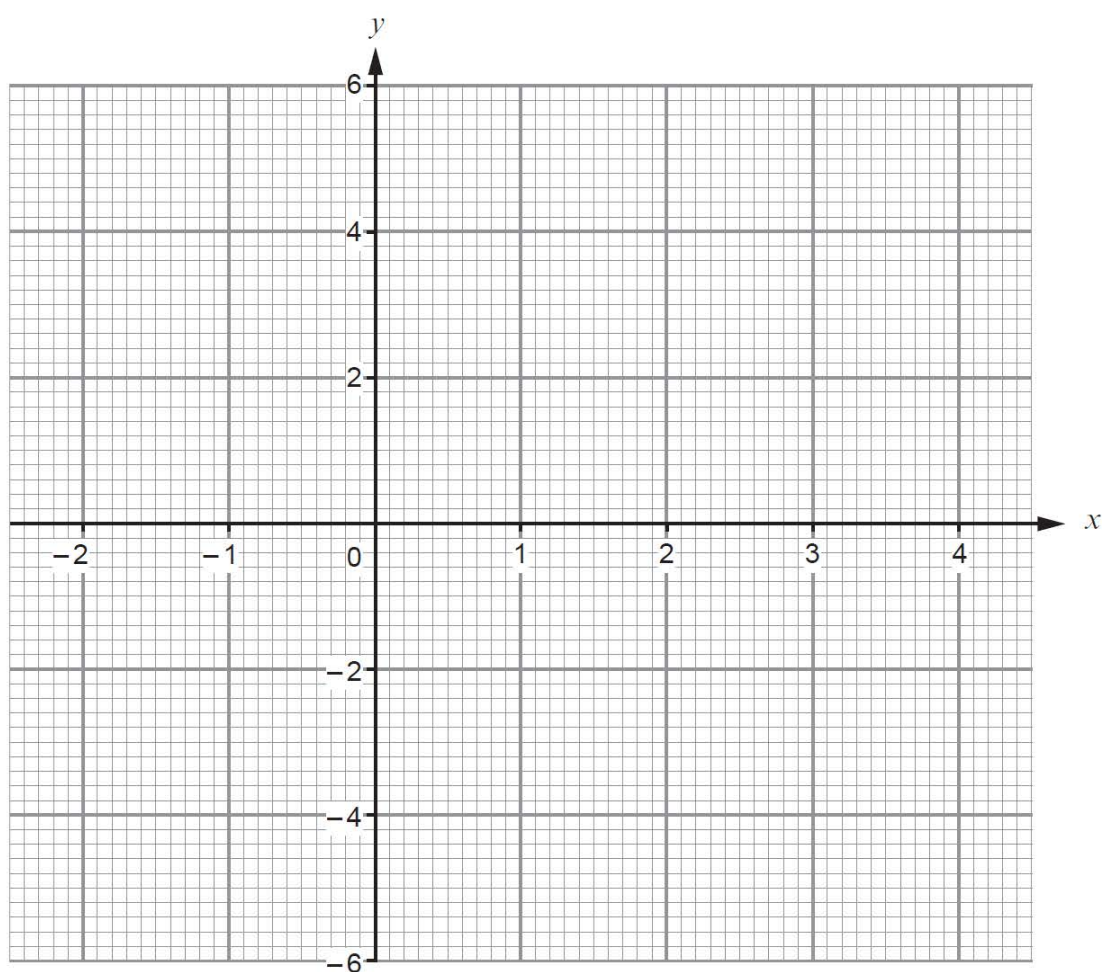
[1]

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(b) On the graph paper below, draw the graph of $y = x^2 - 2x - 3$ for $-2 \leq x \leq 4$.

[2]



(c) Write down the roots of $x^2 - 2x - 3 = 0$.

[1]

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(d) Use your graph to solve the simultaneous equations

$$y = x^2 - 2x - 3,$$

$$y = 1.$$

[3]

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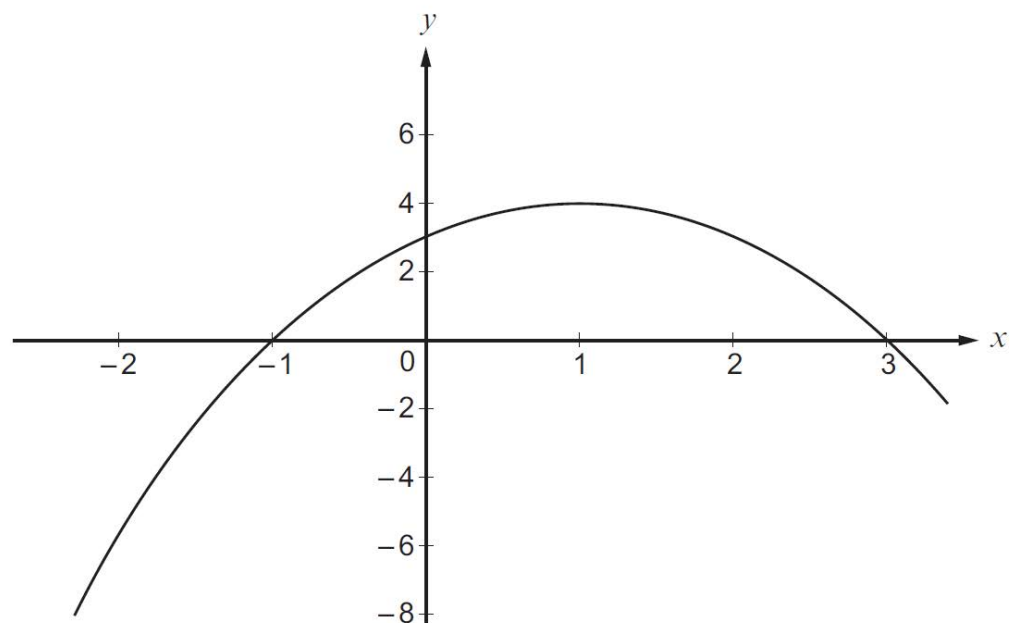
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Question taken from Eduqas examination paper 5300004, November 2021

#2

A sketch of a graph representing the equation $y = 3 + 2x - x^2$ is shown below.



(a) Find the y -coordinate when $x = 0$.

[1]

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(b) Find the y -coordinate when $x = -3$.

[1]

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- (c) Give the coordinates of the point where the sketch shows a gradient of zero. [1]

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 (..... ,)

- (d) Find the coordinates of all points for which $3 + 2x - x^2 = 0$. [2]

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- (e) Does the point with coordinates $(8.2, -47.84)$ lie on $y = 3 + 2x - x^2$?

Yes ☐ No ☐

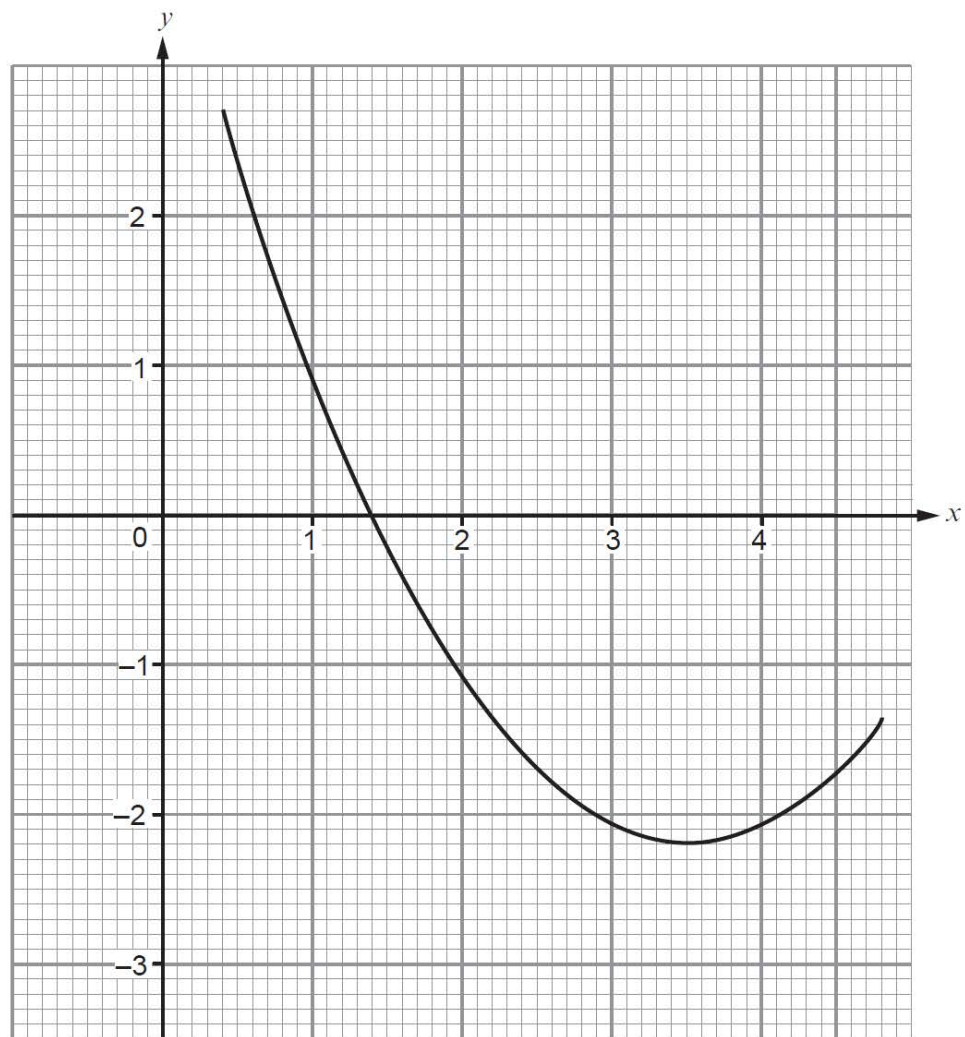
You must show all your working to support your answer. [1]

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Question taken from Eduqas examination paper 530004, November 2018

#3

The graph shows part of a quadratic curve.



- (a) Use the graph to write down the minimum value of y . [1]

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- (b) The curve cuts the x -axis at $(1.4, 0)$ and $(a, 0)$.
Calculate the value of a . [2]

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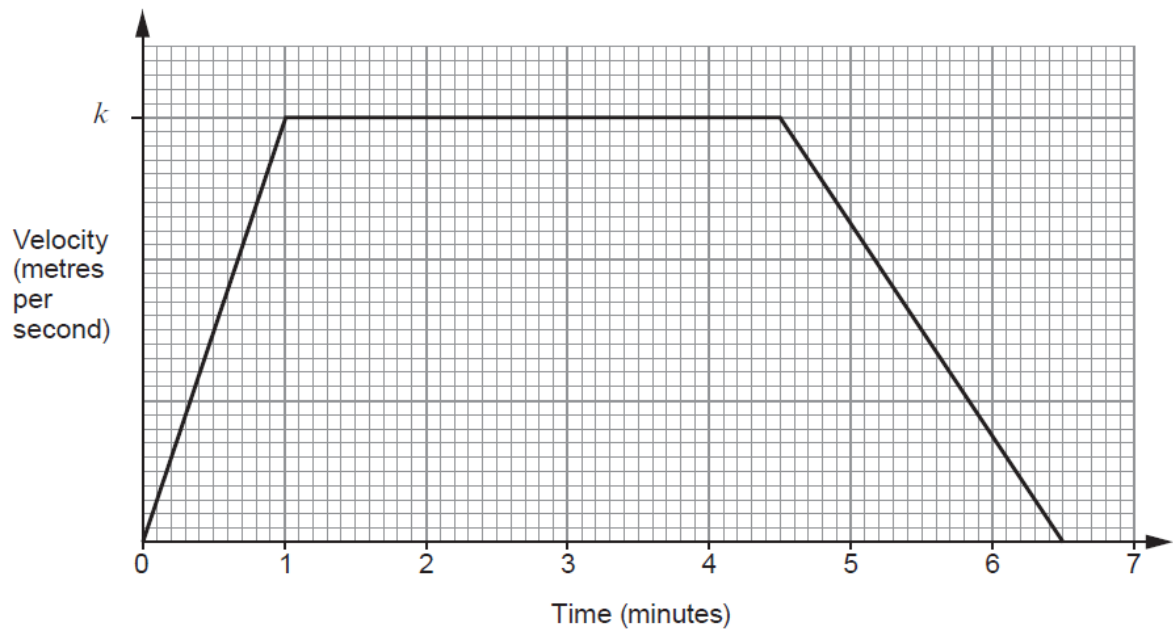
Question taken from Eduqas examination paper 530004, November 2020

Velocity-Time Graphs (linear): Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
Total	4	

#1

The diagram shows the velocity-time graph for the journey of a local train between Grangebrook station and Eastown station.



The train leaves Grangebrook station. It increases its speed for 1 minute until it reaches a speed of k metres per second.

It continues at this speed for 3.5 minutes and then slows down until it stops, 2 minutes later, at Eastown station.

(a) Write down what the gradient of the graph represents.

[1]

(b) The distance between Grangebrook station and Eastown station is 2400 metres.

Find the value of k .

[3]

$k =$ metres per second

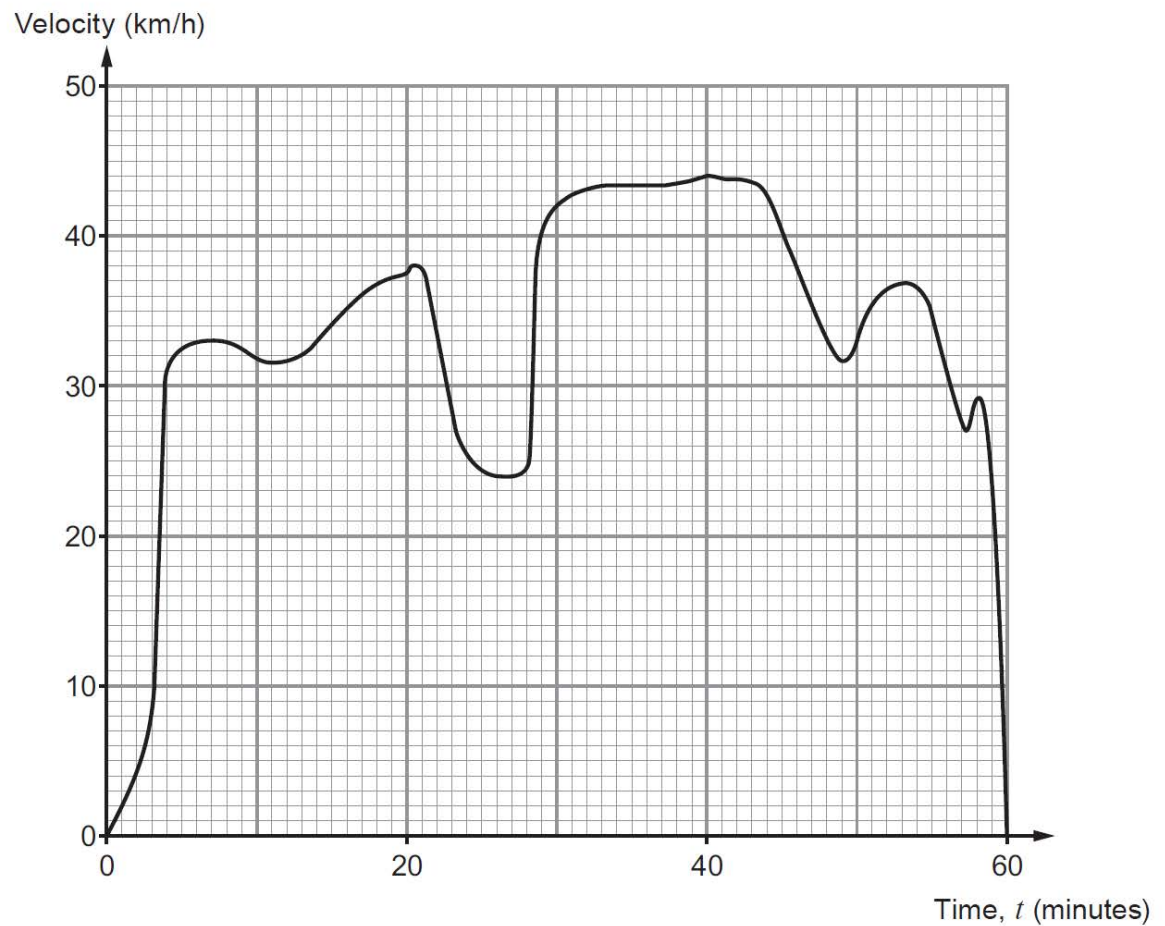
Question taken from Eduqas examination paper 530003, November 2021

Velocity-Time Graphs (non-linear): Calculator

Question	Maximum Mark	Mark Awarded
#1	6	
#2	9	
Total	15	

#1

The graph shows the velocity of a car during the first hour of a journey.



(a) At $t = 4$, find the velocity of the car in **km/min**.

[1]

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- (b) Calculate the acceleration of the car when $t = 17$.
Give your answer in **km/min²**.

[3]

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- (c) Calculate the average acceleration of the car between $t = 40$ and $t = 50$.
Give your answer in **km/h²**.

[2]

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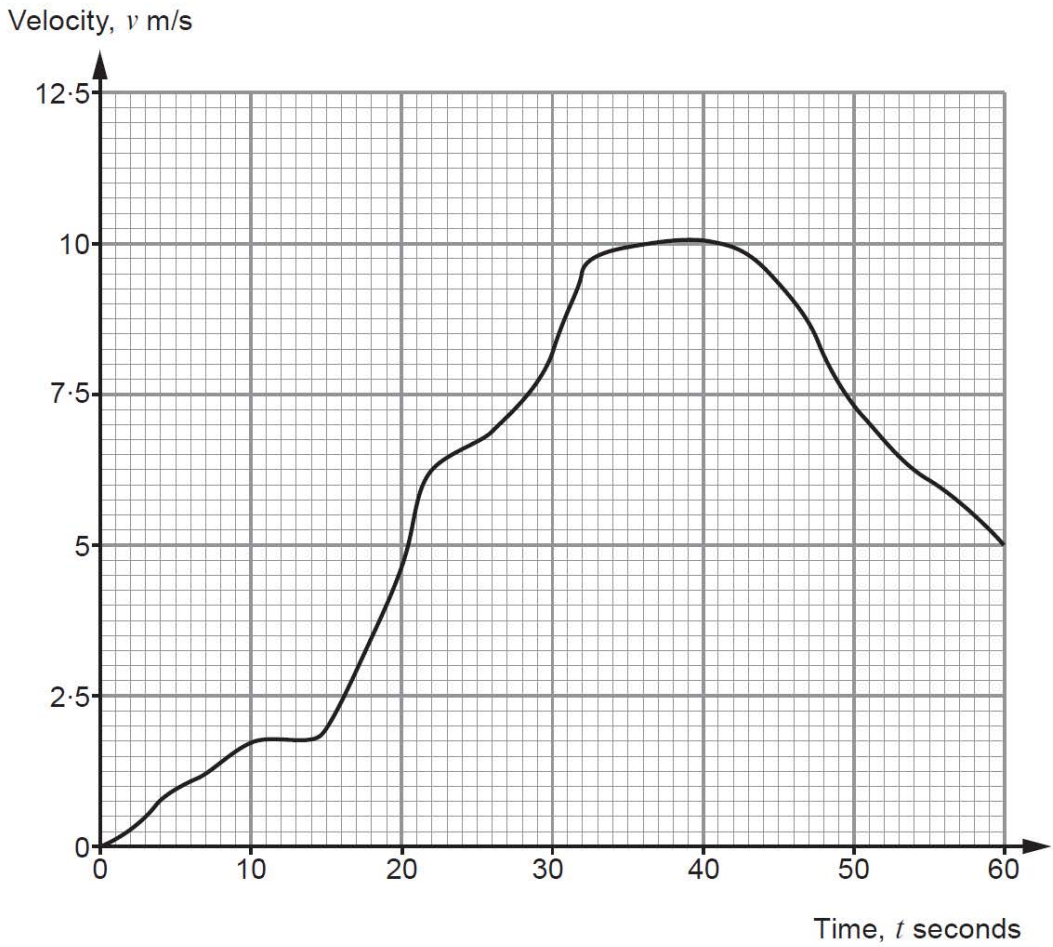
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Question taken from Eduqas examination paper 530004, November 2018

#2

The velocity-time graph below shows the first 60 seconds of a car’s journey.



(a) After how many seconds was the velocity of the car 9 km/h? [4]

After seconds

- (b) Harriet argues that the acceleration at $t = 22$ represents the typical acceleration of the car during the first 32 seconds of this period.

Explain why Harriet's argument is correct.

[1]

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- (c) Over the same 60 seconds, the velocity, v m/s, at time, t seconds, of another car is given by the following equation.

$$v = 7 + \frac{t^2}{1000}$$

Find two times for which the difference in the two cars' velocities was 2.5 m/s.

Give these times correct to the nearest second.

You must show all your working.

[4]

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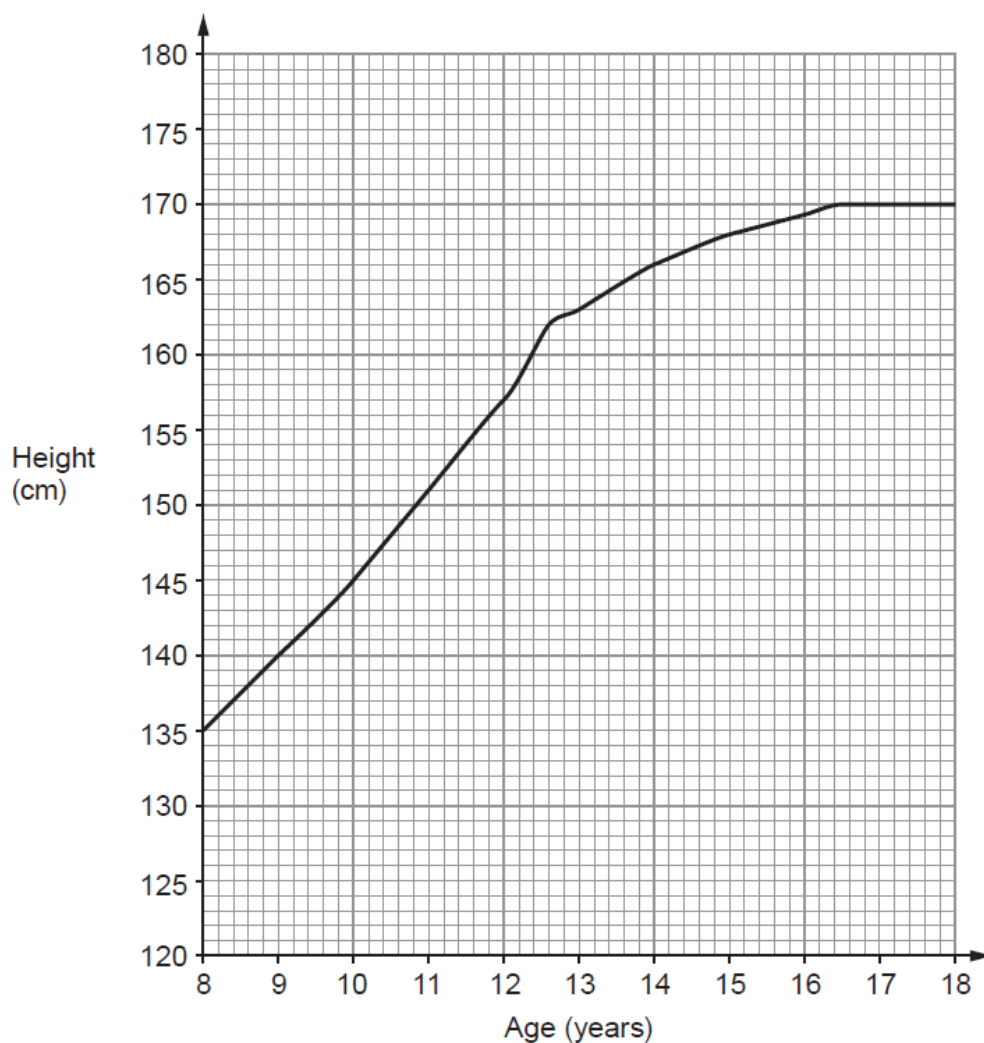
Question taken from Eduqas examination paper 530004, November 2019

Rate of Change Graphs: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	7	
Total	11	

#1

The diagram shows Zac's height from 8 to 18 years of age.



- (a) Find Zac's rate of growth on his 17th birthday. [1]

..... cm per year

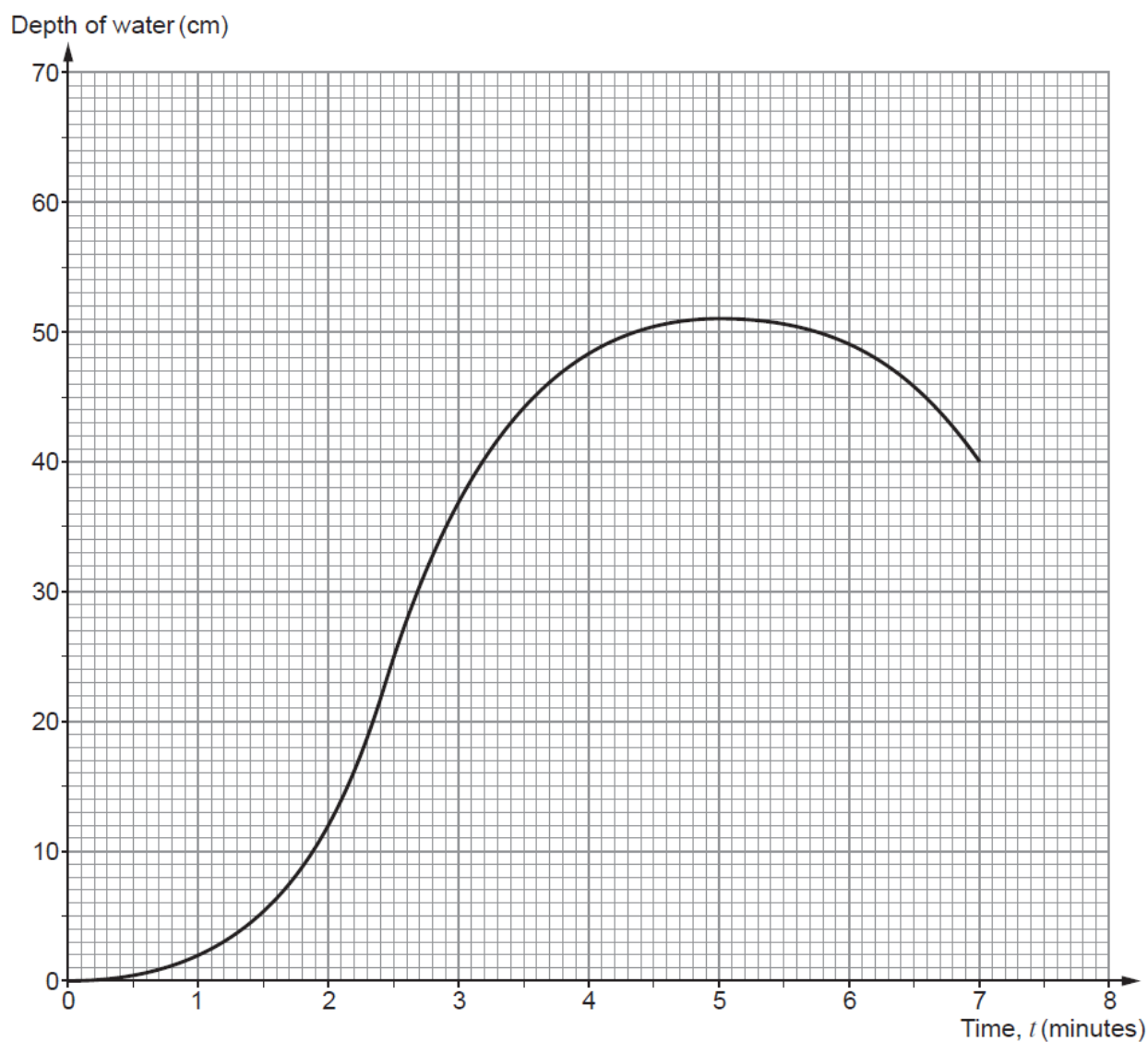
- (b) What is Zac's average rate of growth per year between his 10th and 15th birthdays? You must show all your working. [3]

..... cm per year

Question taken from Eduqas examination paper 530004, November 2021

#2

The graph shows the depth of water in a container over a period of 7 minutes.



- (a) Calculate an estimate of the rate at which the water level is changing at $t = 6$.
Simplify your answer as far as possible.

[3]

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- (b) Calculate the average rate at which the water level is changing between $t = 1$ and $t = 3$.

[2]

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- (c) From time $t = 7$ minutes, the rest of the water flows out of the container until it is empty.
During this time the depth of water decreases at a constant rate of $\frac{5}{6}$ cm per second.
Complete the graph. [2]

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Question taken from Eduqas examination paper 530003, November 2024

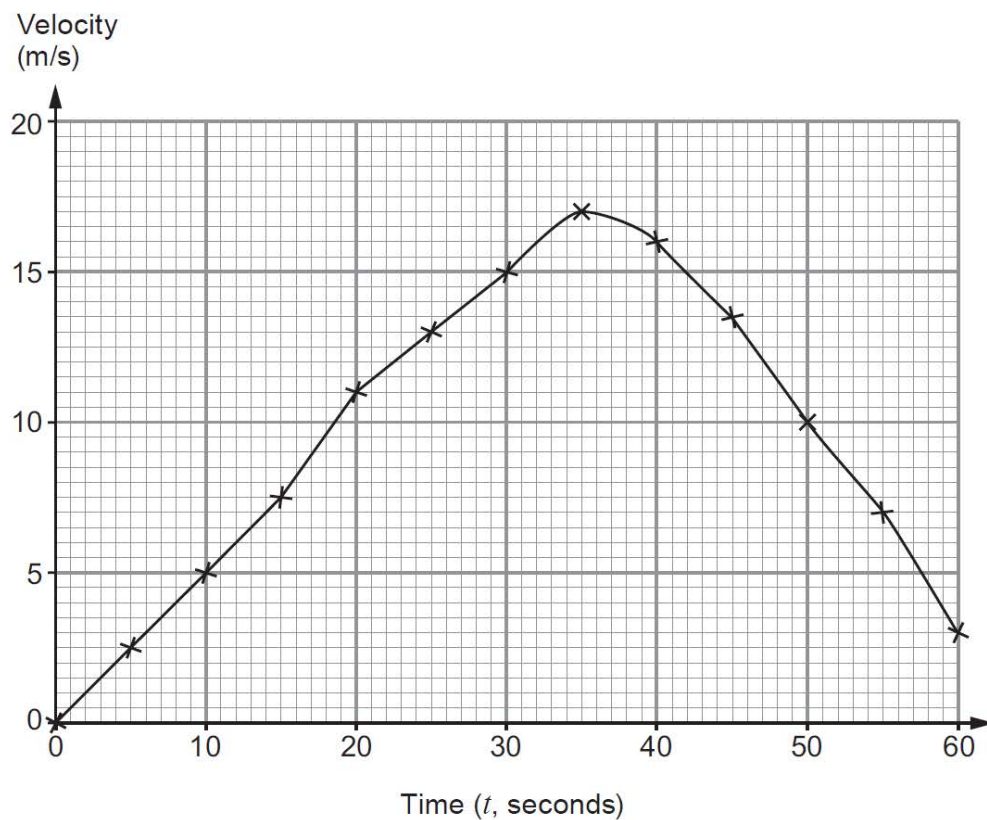
Trapezium Rule: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	5	
#3	8	
Total	16	

#1

An engineer collects data about the velocity of a vehicle to check its performance.

The engineer draws a graph to show the velocity of the vehicle, in metres per second, t seconds after it begins to move. Her graph is shown below.



(a) The engineer then

- draws a tangent to the curve at the point where $t = 40$
- finds the gradient of the tangent.

What information has she estimated by carrying out this process?

[1]

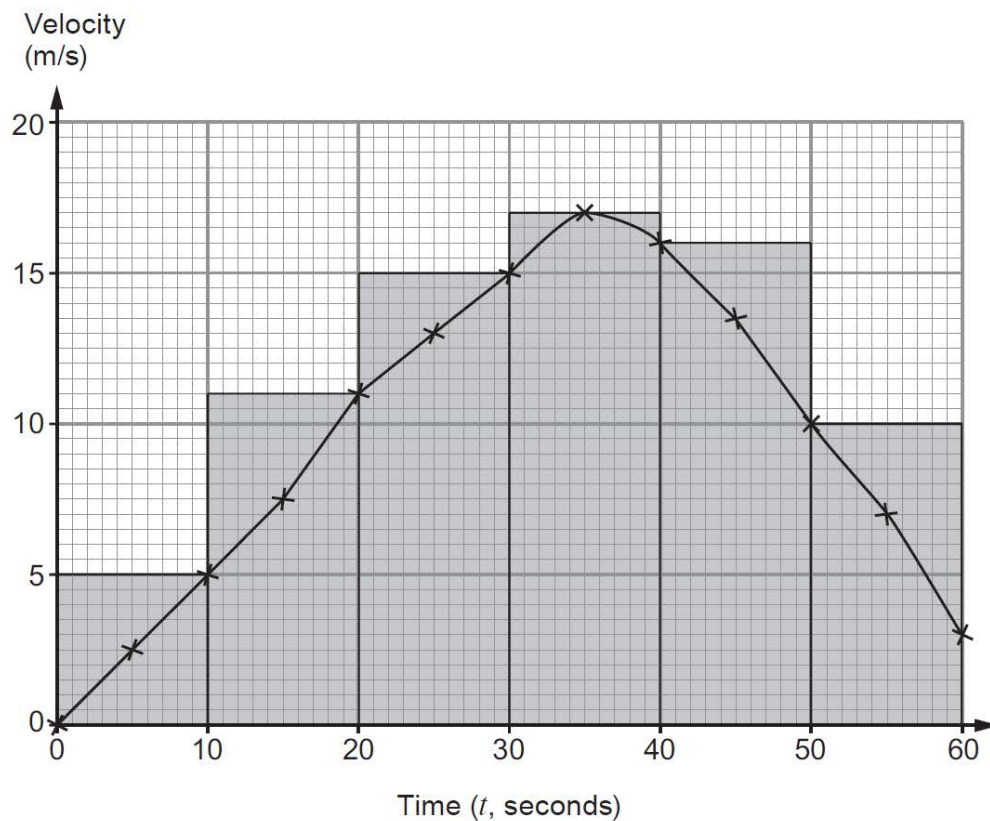
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- (b) She estimates the distance travelled by the vehicle by summing the areas of rectangles.

Her rectangles are shown on the graph and her answer is 740 metres.



- (i) Explain why her method does not give a very good estimate of the distance travelled. [1]

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- (ii) Suggest a change that she could make to her method to improve her answer. [1]

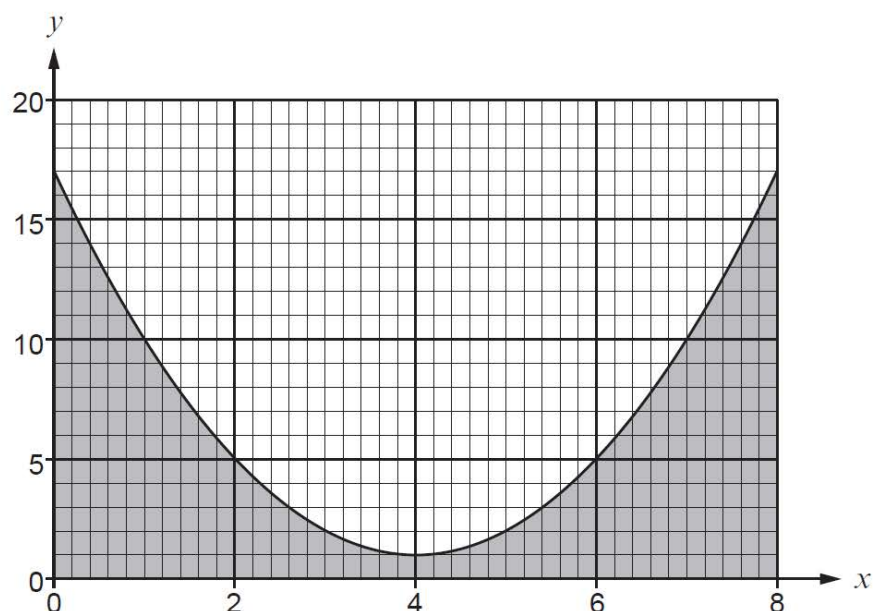
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Question taken from Eduqas examination paper 5300003, June 2018

#2



The diagram shows the graph of $y = (x - 4)^2 + 1$ for $0 \leq x \leq 8$.

- (a) Using four vertical strips of equal width, estimate the area of the shaded region. [4]

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- (b) Is your answer to part (a) an underestimate or an overestimate?

Underestimate ☐ Overestimate ☐

Explain how you decide. [1]

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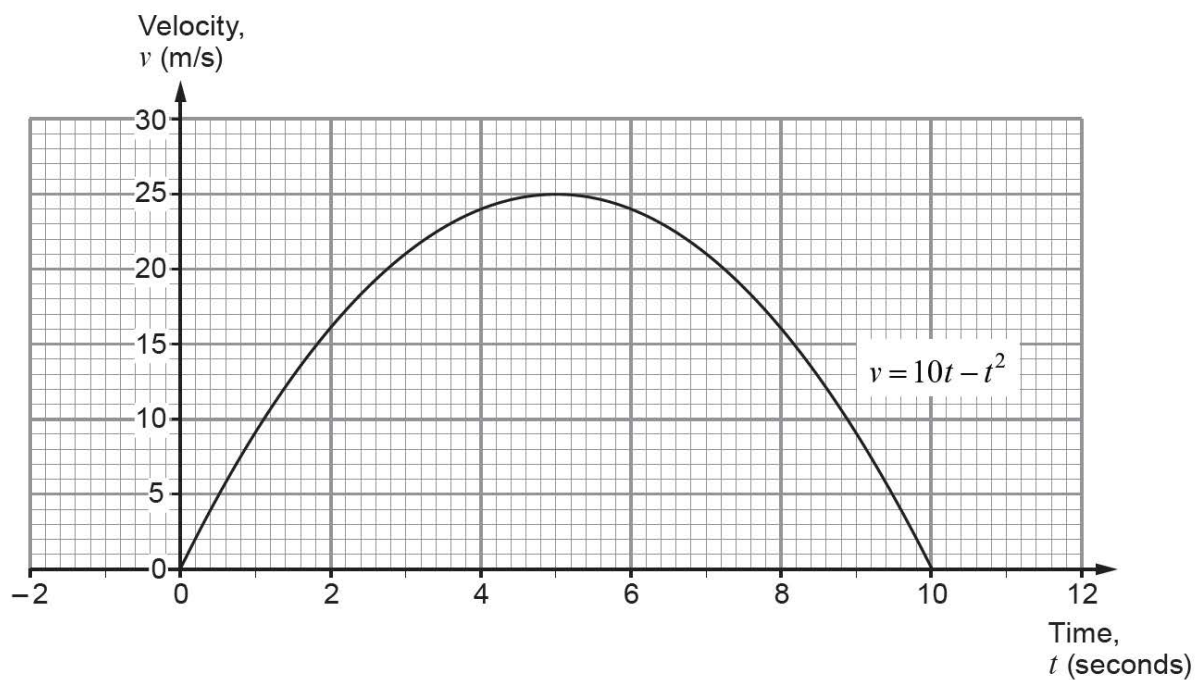
Question taken from Eduqas examination paper 530003, November 2019

#3

The velocity, v m/s of a particle, t seconds after it begins to move is given by

$$v = 10t - t^2 \text{ for } 0 \leq t \leq 10.$$

- (a) The diagram shows the graph of the velocity of this particle.



Find an estimate for the acceleration of the particle at $t = 6$.

[3]

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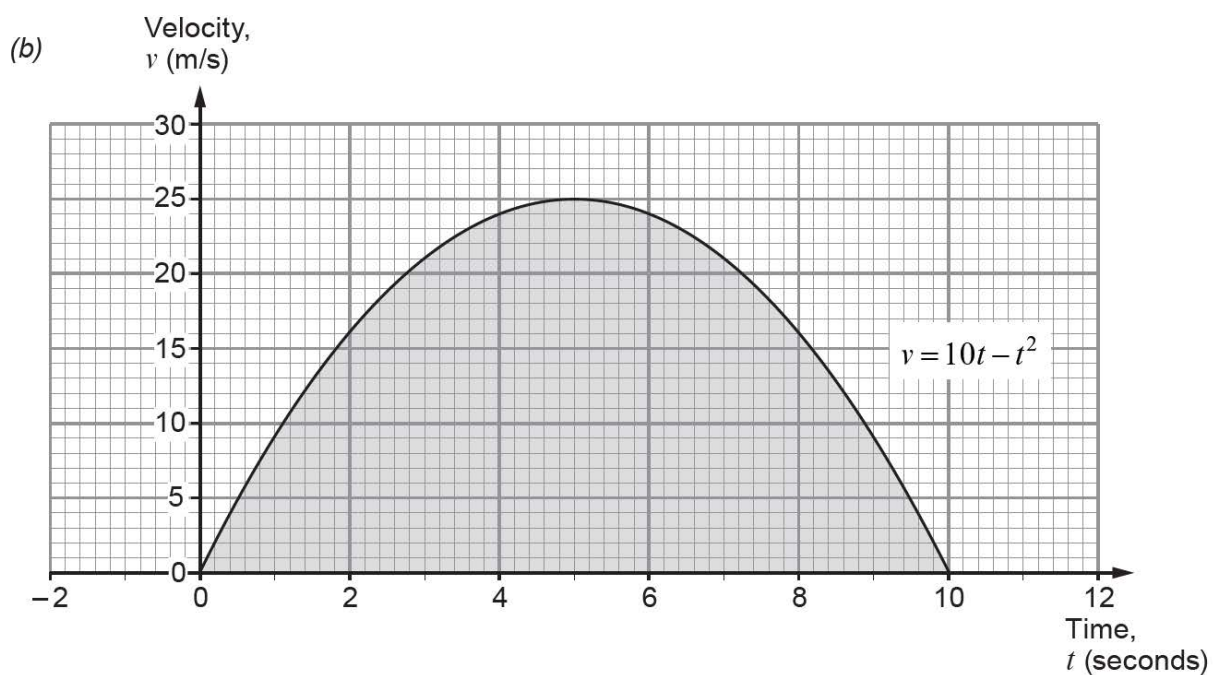
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- (i) Use five vertical strips of equal width to calculate an estimate of the area of the shaded region. [4]

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- (ii) What does this area represent? [1]

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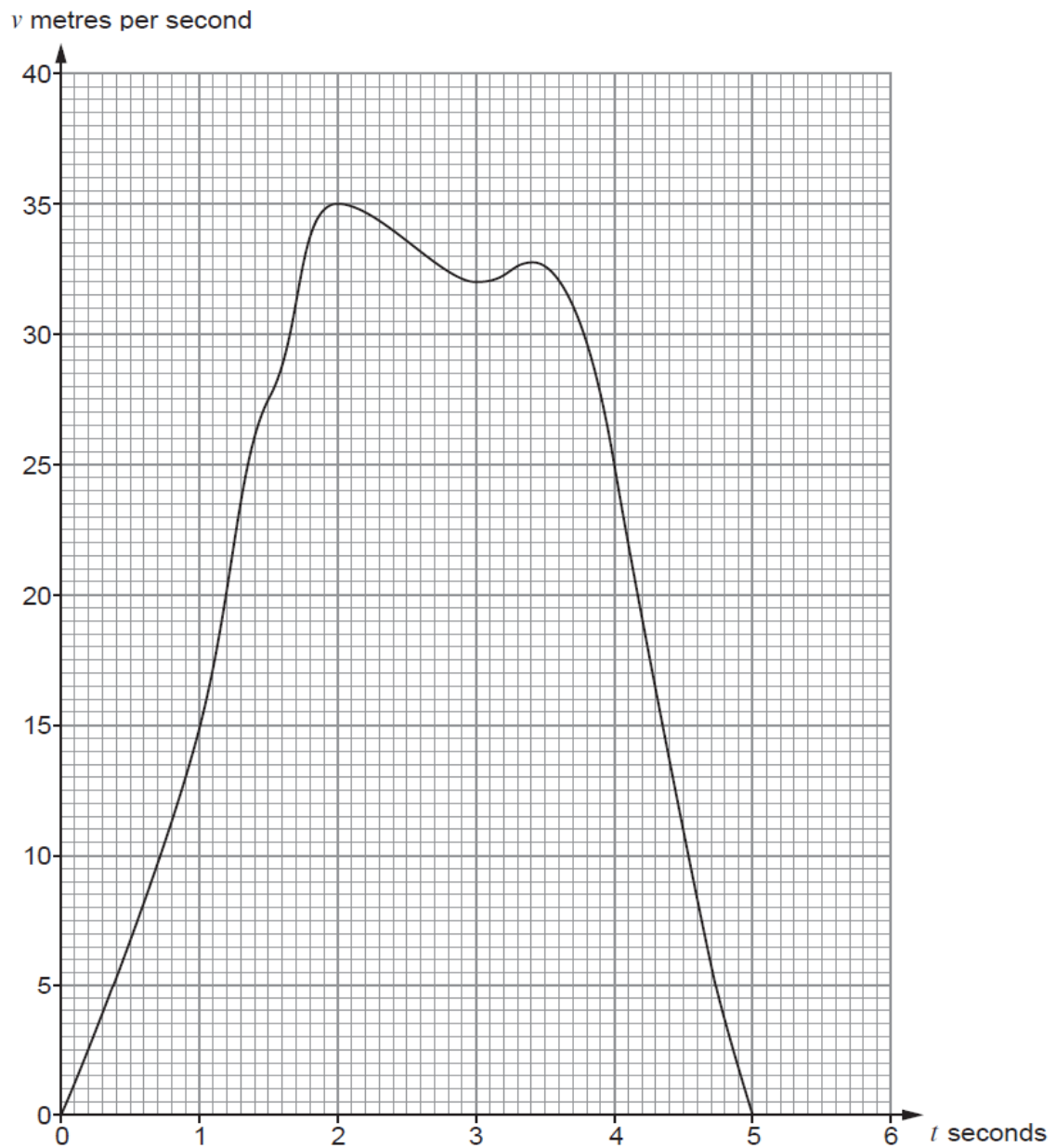
Question taken from Eduqas examination paper 530003, November 2020

Trapezium Rule: Calculator

Question	Maximum Mark	Mark Awarded
#1	7	
Total	7	

#1

The diagram shows the velocity, v metres per second, of a particle t seconds after it passes a fixed point.



- (a) Calculate an estimate of the acceleration of the particle when $t = 3.5$ seconds. [3]

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- (b) Use five vertical strips of equal width to estimate the distance travelled by the particle in the first 5 seconds after it passes the fixed point. [4]

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Question taken from Eduqas examination paper 530004, November 2022

Kinematics: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	3	
Total	6	

#1

A hummingbird flies at a speed of v metres per second for t seconds after it has finished feeding from a flower.



The diagram shows the speed of the hummingbird for $5 \leq t \leq 15$.

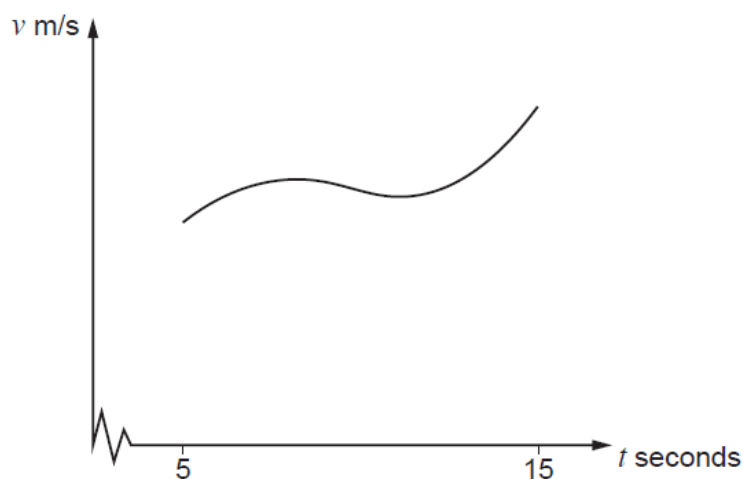


Diagram not drawn to scale

When $t = 5$, $v = 6$.

The average acceleration of the hummingbird for $5 \leq t \leq 15$ is 0.5 m/s^2 .

Calculate the speed of the hummingbird when $t = 15$.

You must show all your working.

[3]

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Question taken from Eduqas examination paper 530003, May 2022

#2



Sofia's dog is running through a field.
Its speed at t seconds is w metres per second.

The diagram below shows the speed of the dog for part of its run.

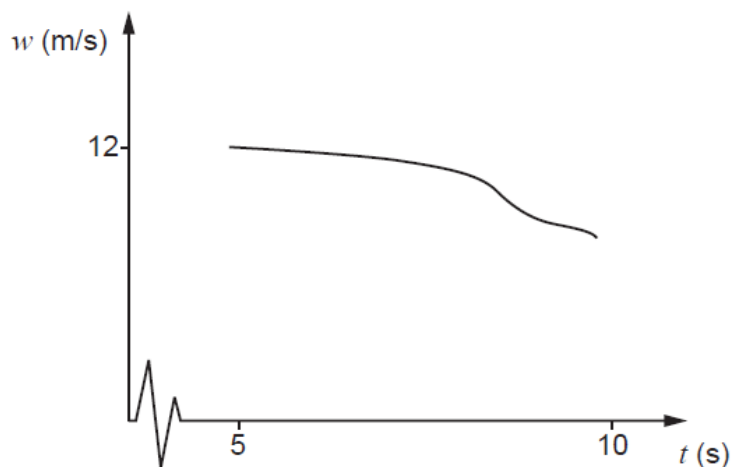


Diagram not drawn to scale

When $t = 5$, $w = 12$.

The average deceleration of the dog between 5 and 10 seconds is 1.5 m/s^2 .

Calculate the speed of Sofia's dog when $t = 10$.

You must show all your working.

[3]

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Speed when $t = 10$ is m/s

Question taken from Eduqas examination paper 530003, November 2023

Reciprocal Graphs: Non-Calculator

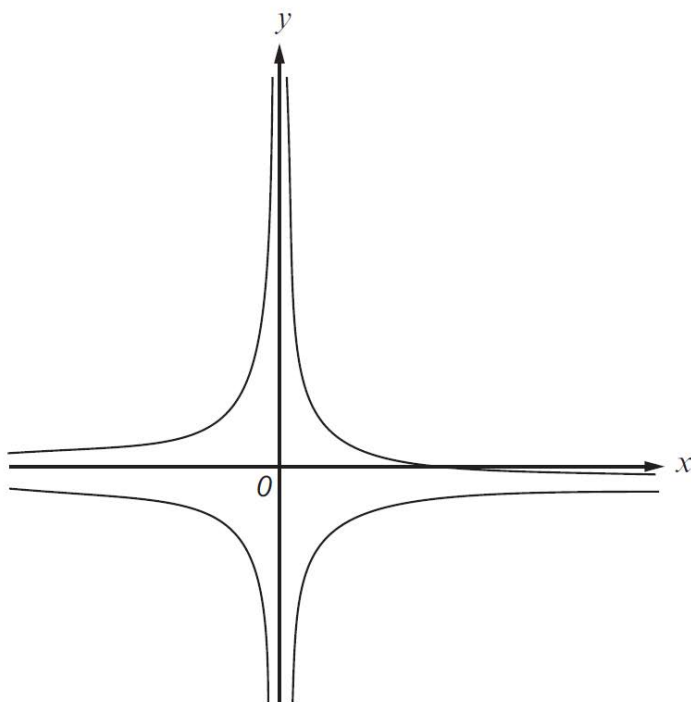
Question	Maximum Mark	Mark Awarded
#1	1	
#2	6	
Total	7	

#1

- (b) Yasmin wants to draw the graph of $y = f(x)$ and the graph of $y = -f(x)$

when $f(x) = \frac{1}{x}$.

Yasmin draws both of her graphs on this diagram.



Make one criticism of Yasmin's diagram.

[1]

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Question taken from Eduqas examination paper 530003, November 2018

#2

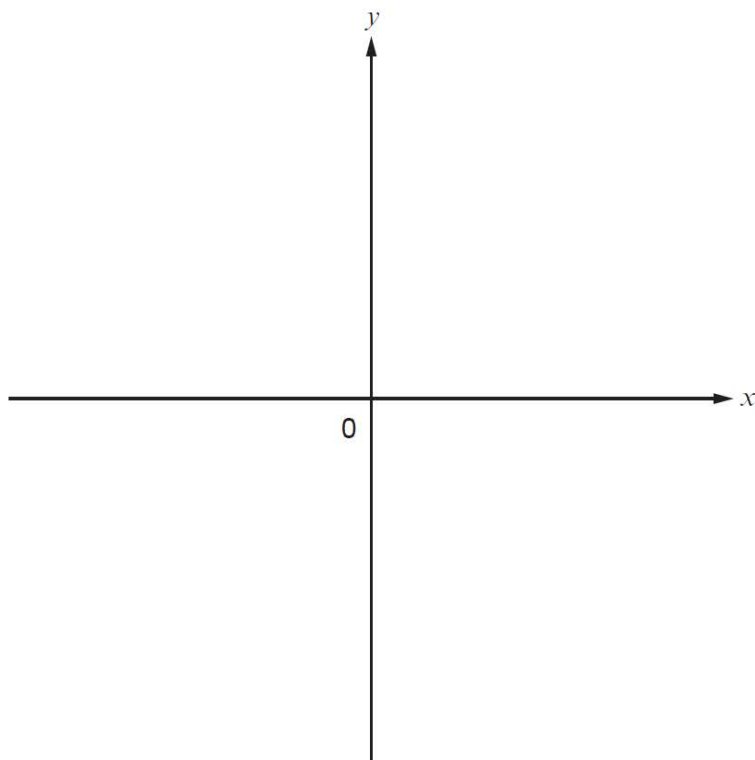
(a) (i) $xy = 1$

Explain why neither x nor y can be zero.

[1]

(ii) On the axes below, sketch the graph of $y = \frac{1}{x}$.

[2]



(iii) Complete this sentence about the graph you have drawn.

[1]

The graph shows ' y is proportional to x '.

(b) The variables V and p are connected by the equation $\frac{V}{p^2} = 5$.

Find the value of V when $p = 0.1$.

[2]

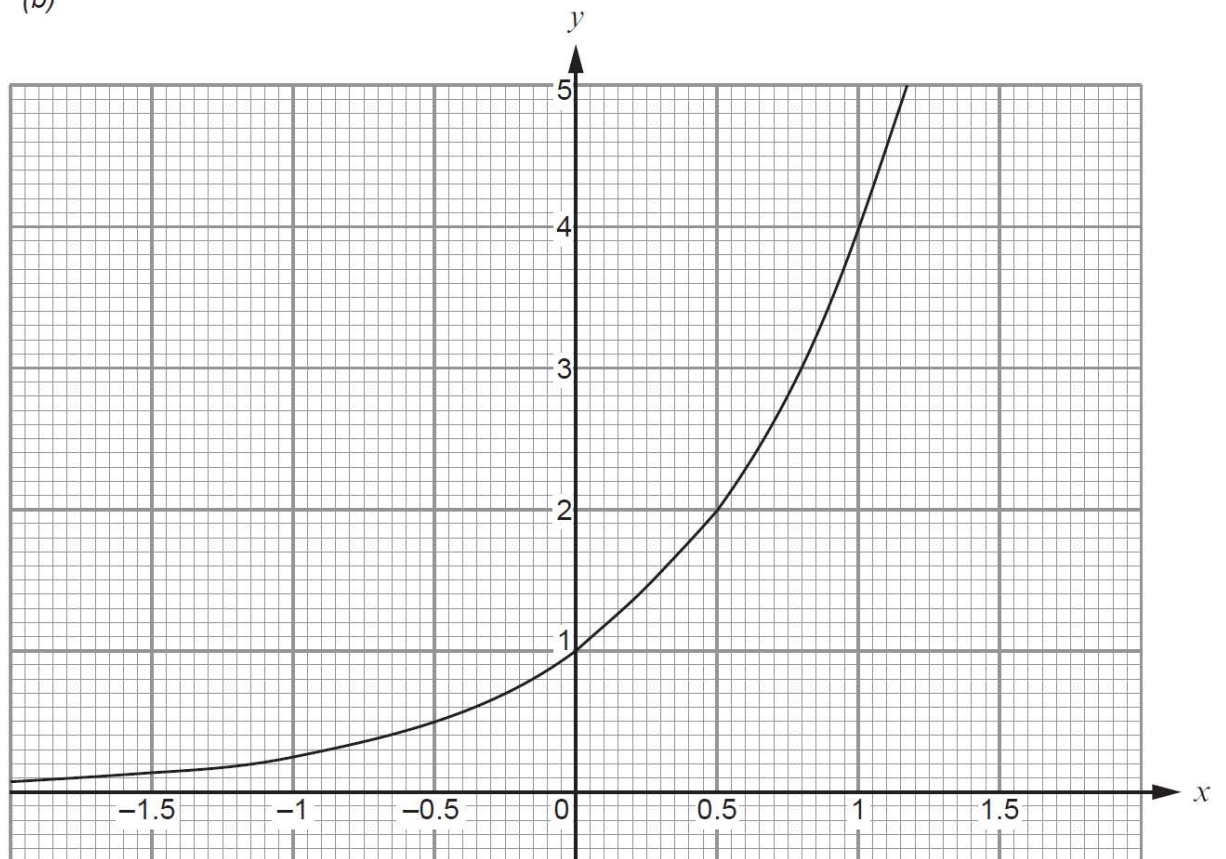
Question taken from Eduqas examination paper 530003, November 2020

Exponential Graphs: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
Total	2	

#1

(b)



The diagram shows the graph of the curve $y = k^x$.

Find the value of the positive integer k .

[2]

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$k =$

Question taken from Eduqas examination paper 530003, November 2019

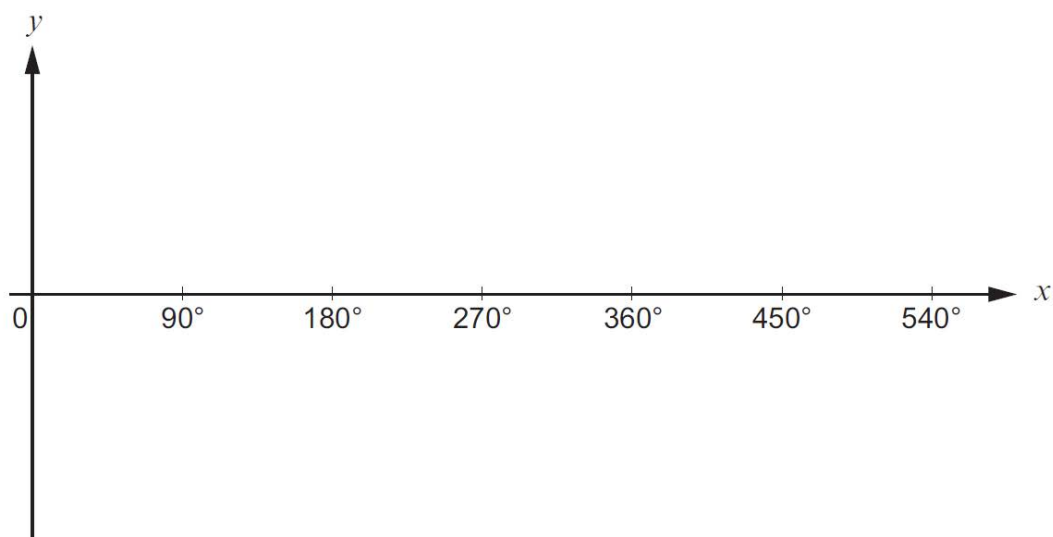
Trigonometric Graphs: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	4	
#3	4	
Total	11	

#1

On the axes below, sketch the graph of $y = \sin x$ for $0^\circ \leq x \leq 540^\circ$.

[2]



(b) Write down the number of solutions of the equation $\sin x = 0.25$ for $0^\circ \leq x \leq 540^\circ$. [1]

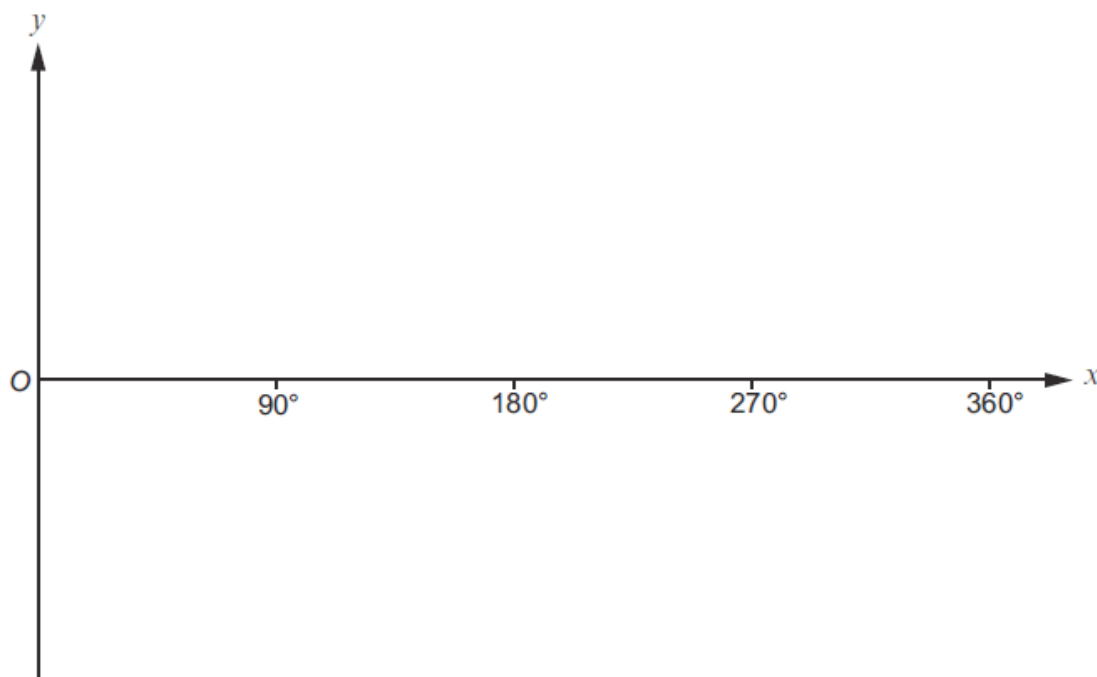
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Question taken from Eduqas examination paper 5300003, November 2018

#2

- (a) On the axes below, sketch the graph of $y = \tan x$ for $0^\circ \leq x \leq 360^\circ$. [2]



- (b) Find all solutions of the equation $\tan x = 1$ for $0^\circ \leq x \leq 360^\circ$. [2]

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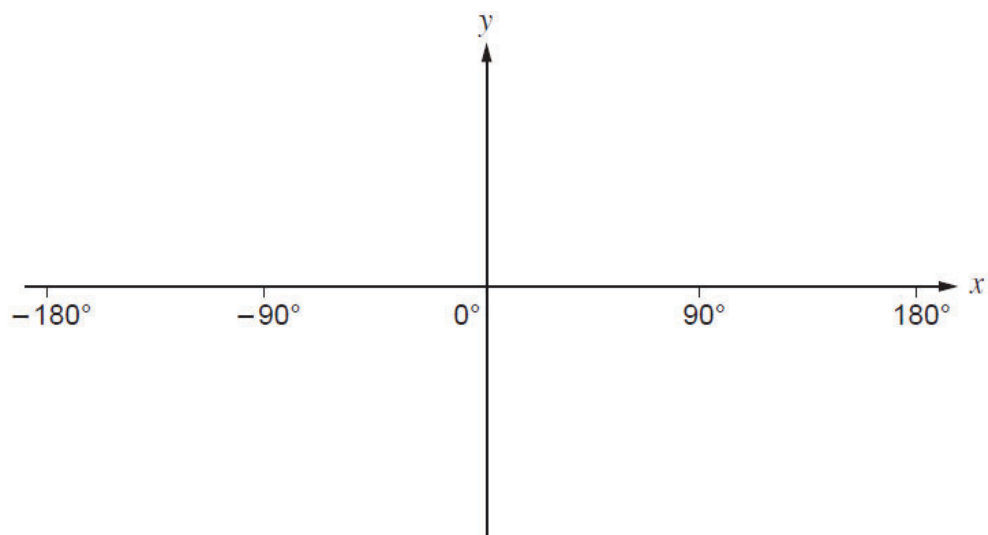
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Question taken from Eduqas examination paper 5300003, June 2018

#3

- (a) (i) On the axes below, sketch the graph of $y = \cos x$ for $-180^\circ \leq x \leq 180^\circ$. [2]



- (ii) Solve $\cos x = \frac{\sqrt{3}}{2}$ for $-180^\circ \leq x \leq 180^\circ$. [2]

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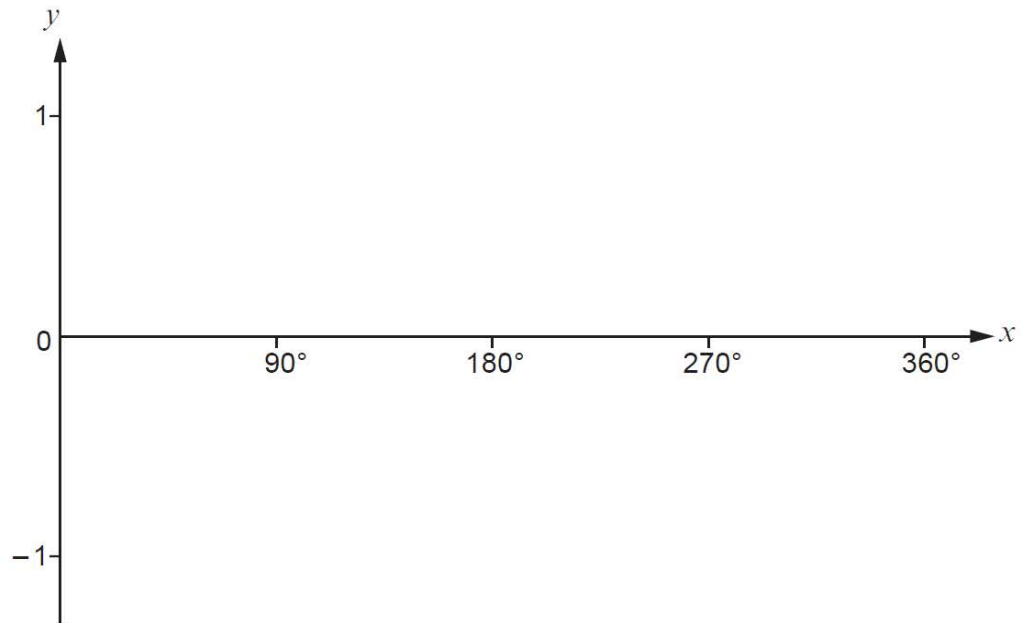
Question taken from Eduqas examination paper 530003, May 2022

Trigonometric Graphs: Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	4	
#3	4	
Total	11	

#1

- (a) Using the axes below, sketch a graph of $y = \sin x$ for values of x from 0° to 360° . [1]



- (b) Find all the solutions of the following equation in the range 0° to 360° . [2]

$$5 \sin x = 2$$

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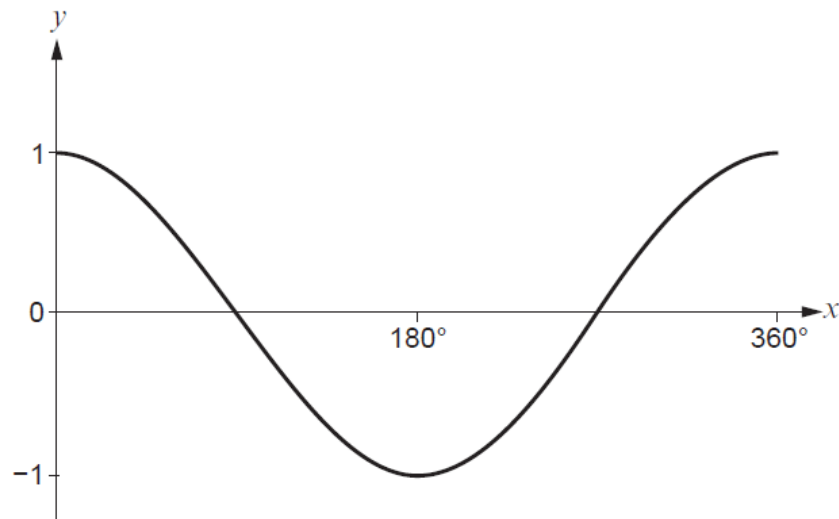
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Question taken from Eduqas examination paper 530004, June 2019

#2

The diagram shows a sketch of $y = \cos x$ for the values of x from 0° to 360° .



- (a) Solve the equation $\cos x = -0.731$ for all values of x from 0° to 360° . [2]

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- (b) Draw a sketch of $y = \cos x - 1$ for the values of x from 0° to 360° . You must indicate any important values on the axes. [2]

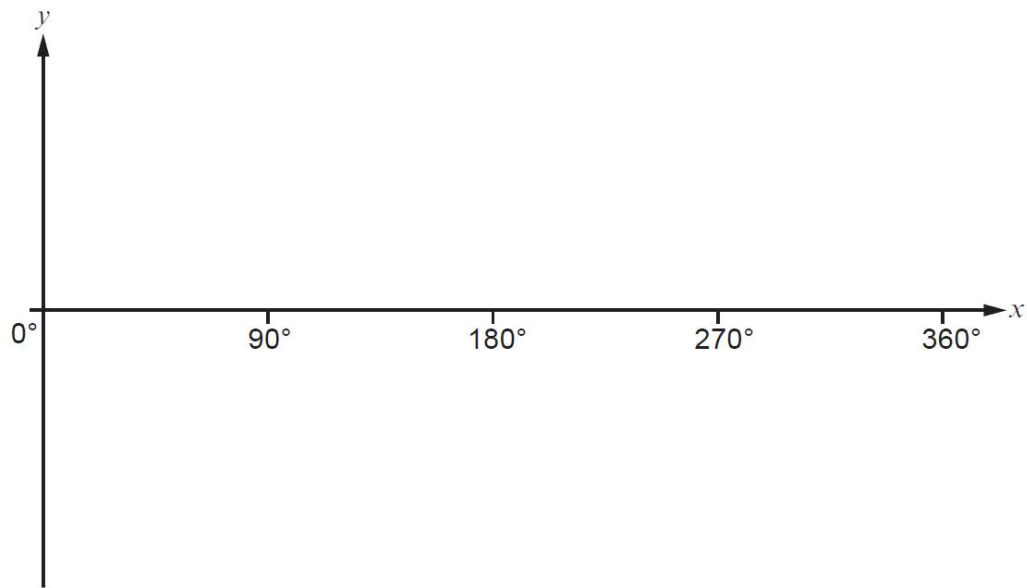


Question taken from Eduqas examination paper 530004, November 2024

#3

- (a) On the axes below, sketch the graph of $y = \tan x^\circ$ where $0^\circ \leq x \leq 360^\circ$.

[2]



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- (b) Solve the equation $\tan x = 0.8391$ in the range $0^\circ \leq x \leq 360^\circ$.

[2]

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Question taken from Eduqas examination paper 530004, November 2020

Translation of Graphs: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	2	
#3	2	
#4	4	
Total	9	

#1

- (a) Janesh wants to draw the graph of $y = f(x)$ and the graph of $y = -f(x)$.

Janesh says,

'To draw $y = -f(x)$ I must reflect the graph of $y = f(x)$ in the y -axis because the y -coordinates all change sign.'

Is Janesh correct?

Yes

☐

No

☐

Explain how you decide.

[1]

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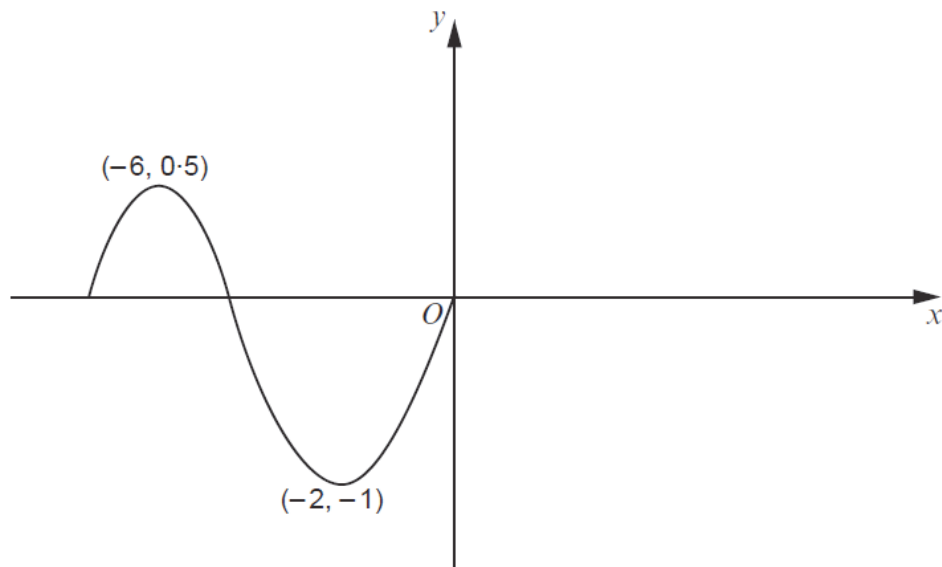
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Question taken from Eduqas examination paper 530003, November 2018

#2

- (b) The diagram shows a sketch of the graph of $y = h(x)$.



On the same diagram, sketch the graph of $y = -h(x)$.

Write down the coordinates of the maximum and minimum points of $y = -h(x)$.

[2]

Maximum (..... ,)

Minimum (..... ,)

Question taken from Eduqas examination paper 530003, November 2021

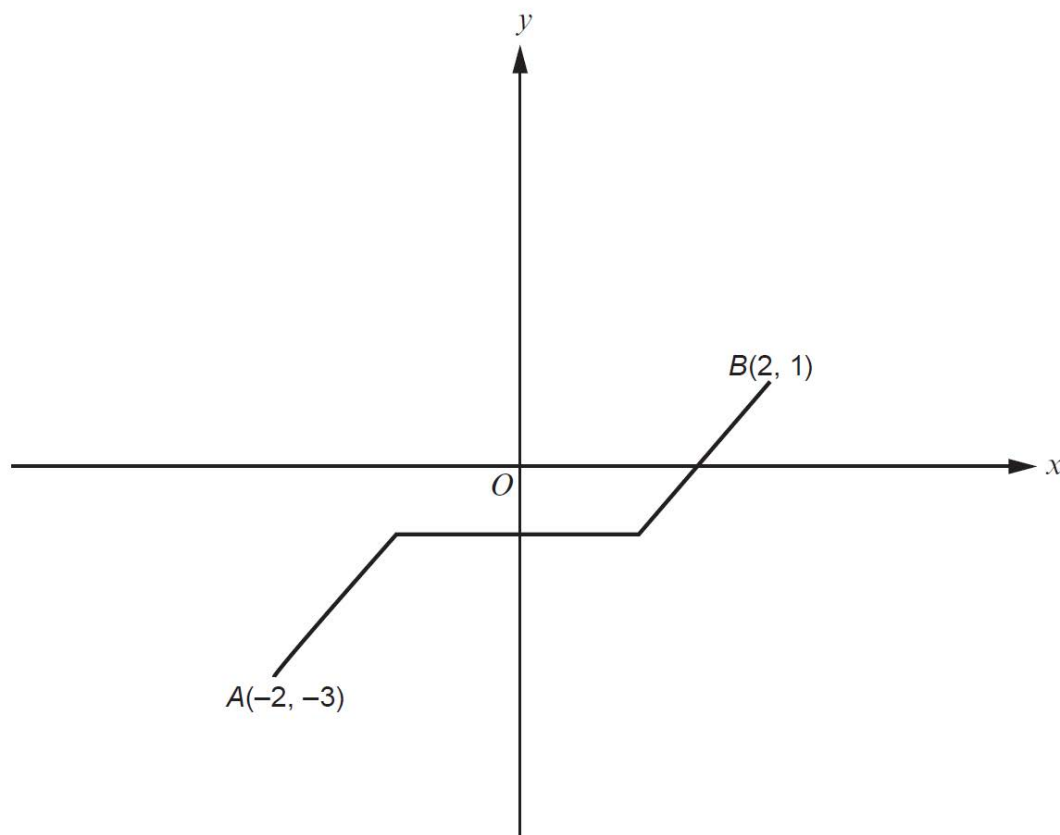
#3

- (b) The diagram shows a sketch of the graph of $y = h(x)$.
The point A has coordinates $(-2, -3)$ and the point B has coordinates $(2, 1)$.

On the same diagram, sketch the graph of $y = h(x) + 4$.

You must indicate the coordinates of the new positions of the points A and B .

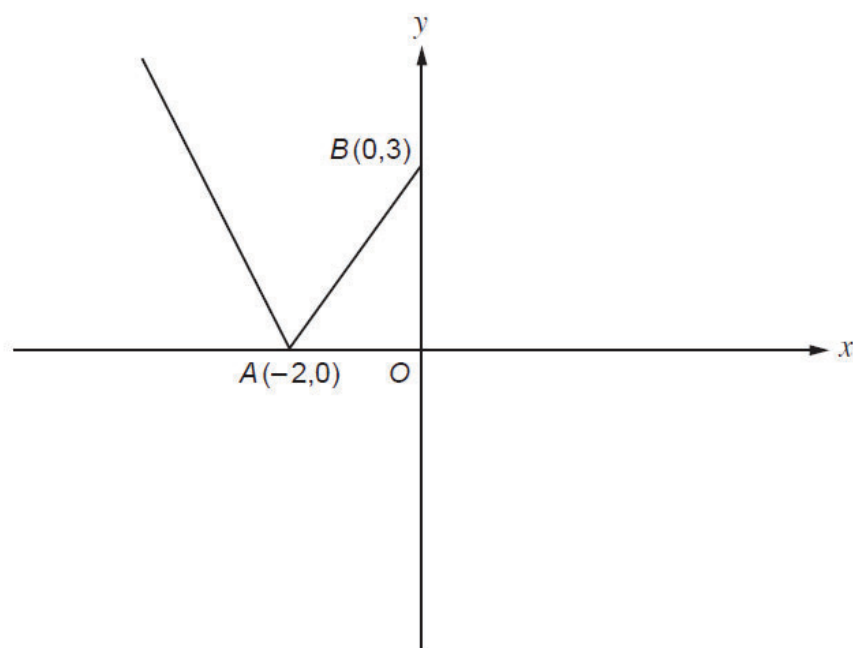
[2]



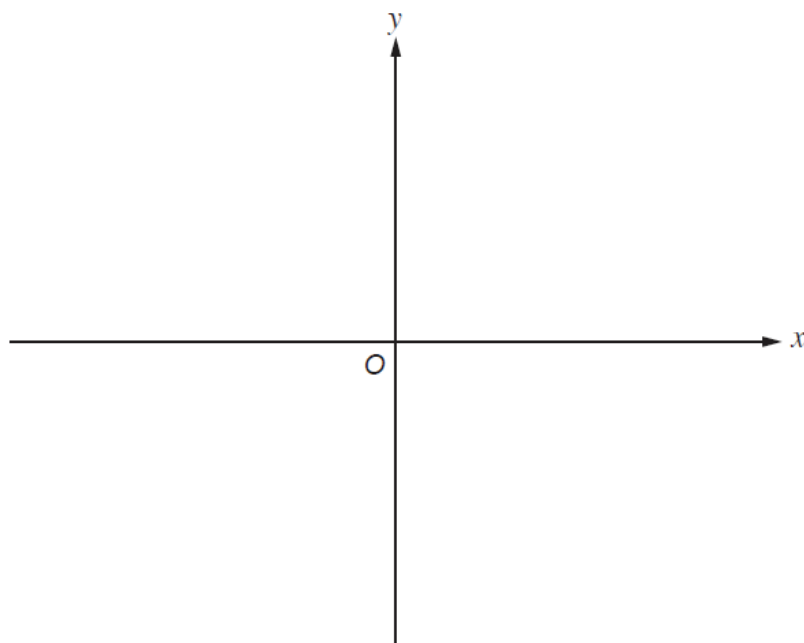
Question taken from Eduqas examination paper 530003, June 2018

#4

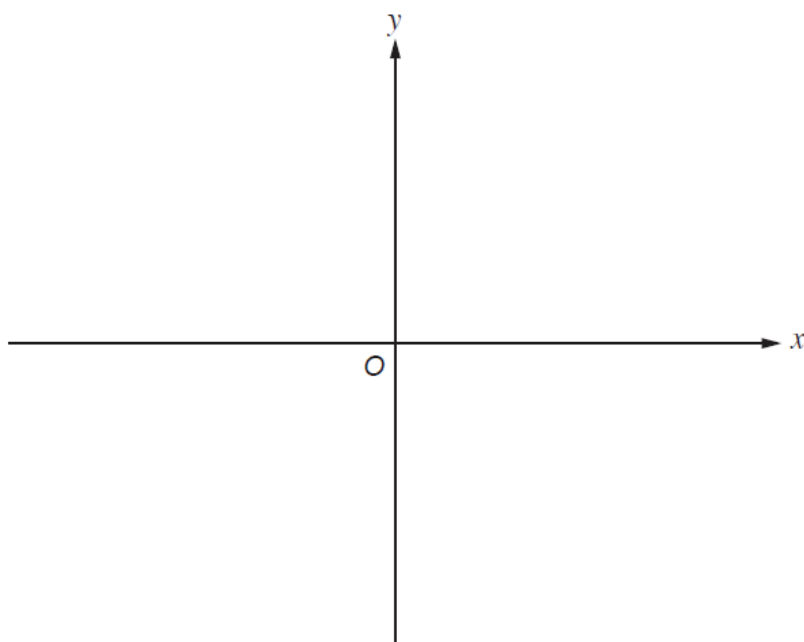
- (b) The diagram shows a sketch of the graph of $y = f(x)$.
The point A has coordinates $(-2, 0)$ and the point B has coordinates $(0, 3)$.



- (i) Sketch the graph of $y = f(x) - 1$ on the axes below.
You must indicate the coordinates of the new positions of the points A and B . [2]



- (ii) Sketch the graph of $y = f(x - 3)$ on the axes below.
You must indicate the coordinates of the new positions of the points A and B . [2]



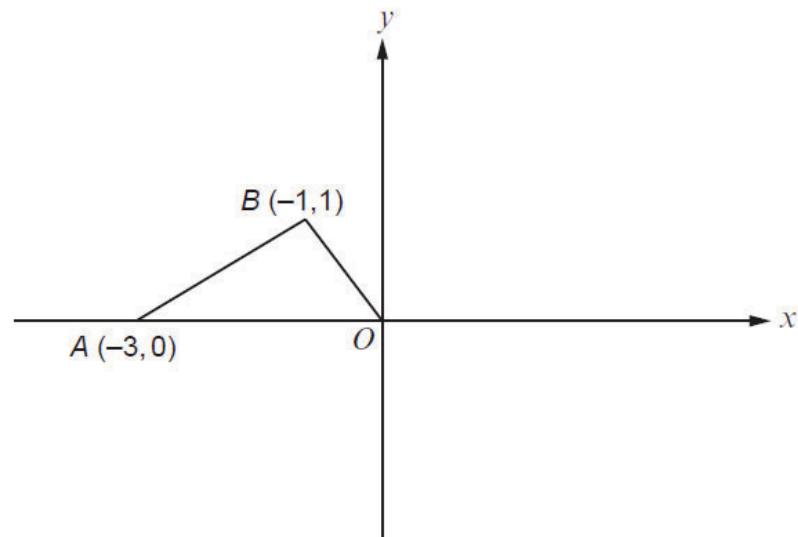
Question taken from Eduqas examination paper 5300003, May 2022

Translation of Graphs: Calculator

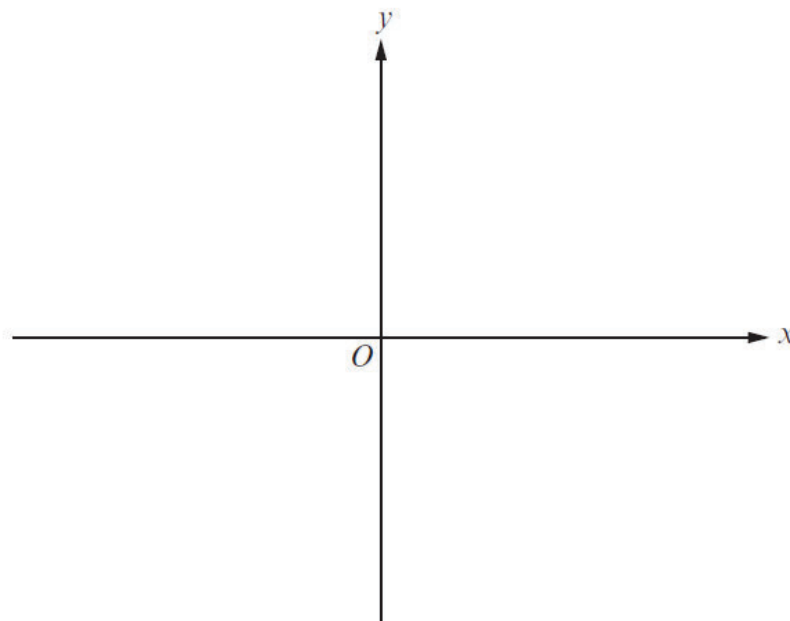
Question	Maximum Mark	Mark Awarded
#1	4	
#2	5	
Total	9	

#1

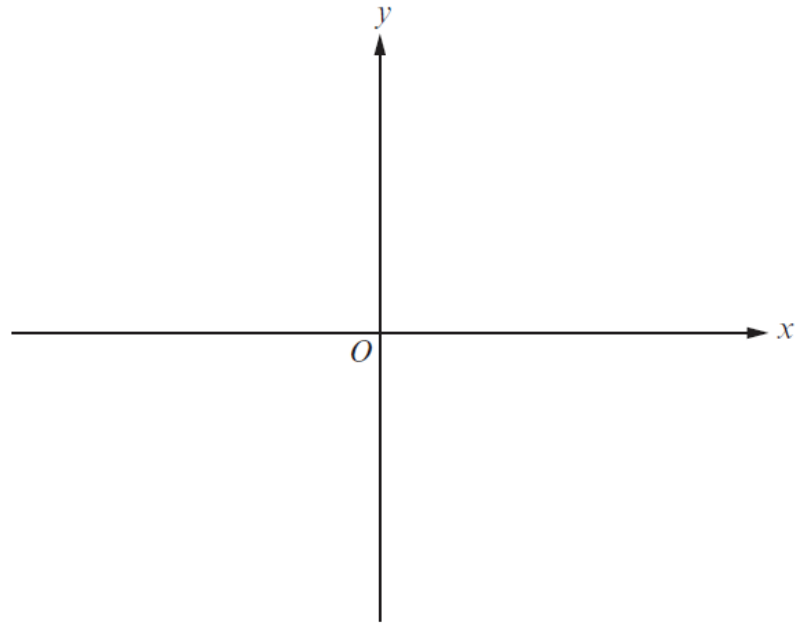
- (a) The diagram shows a sketch of the graph of $y = f(x)$.
The point A has coordinates $(-3, 0)$, the point B has coordinates $(-1, 1)$.



- (i) Sketch the graph of $y = f(-x)$ on the axes below.
You must indicate the coordinates of the new positions of the points A and B . [2]



- (ii) Sketch the graph of $y = f(x) + 2$ on the axes below.
You must indicate the coordinates of the new positions of the points A and B . [2]



Question taken from Eduqas examination paper 530004, November 2022

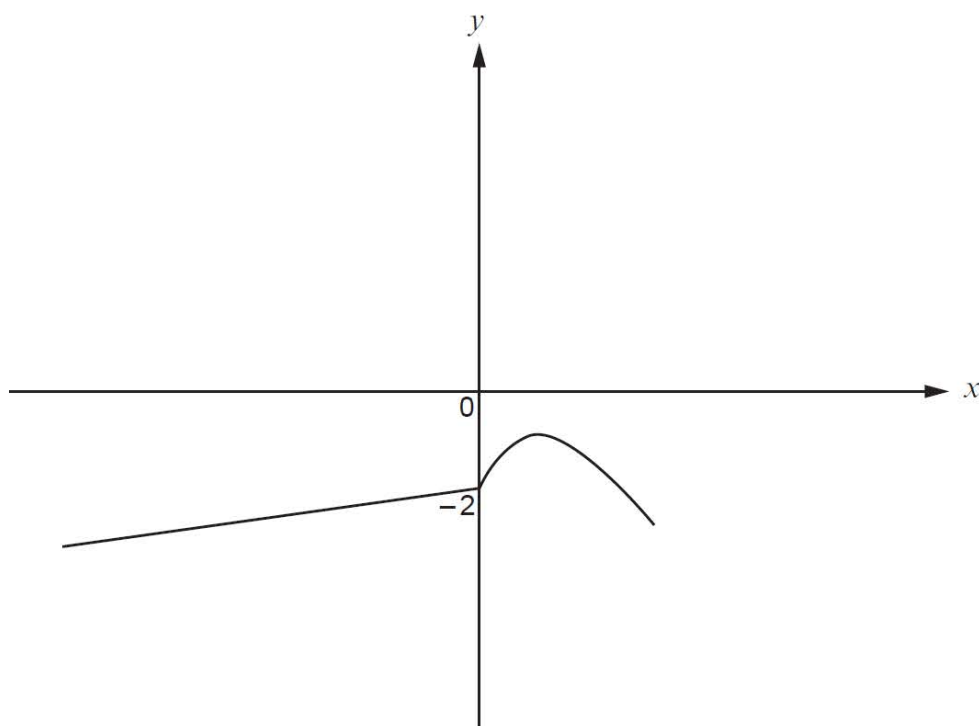
#2

- (a) The diagram shows a sketch of $y = f(x)$.

On the same diagram, sketch the curve $y = -f(x)$.

Mark clearly the coordinates of any point where this curve crosses an axis.

[2]

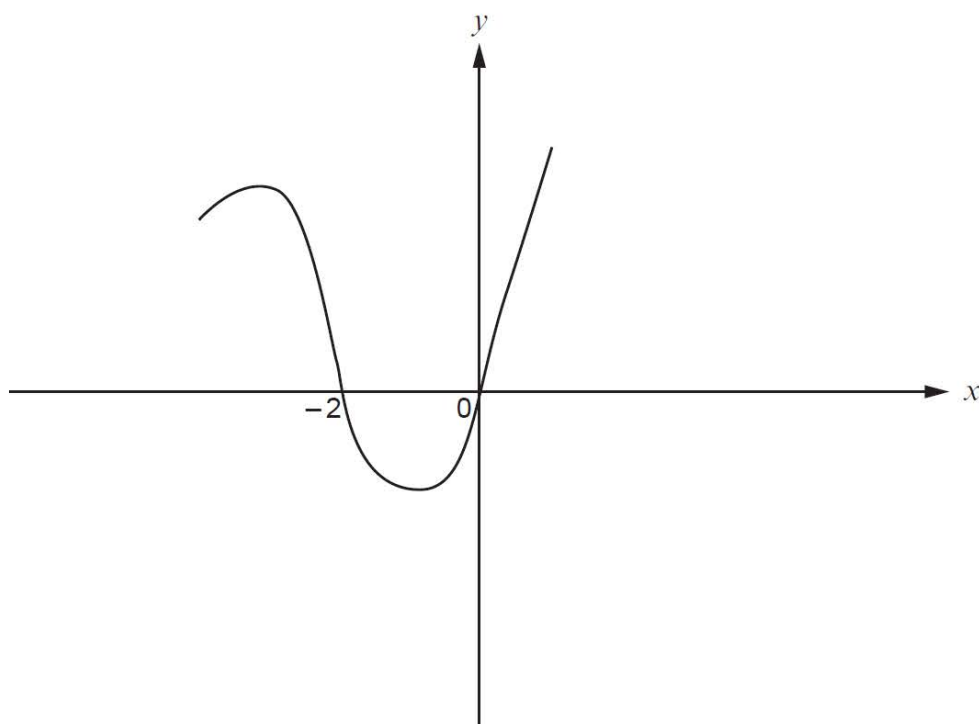


- (b) The diagram shows a sketch of $y = g(x + 2)$.

On the same diagram, sketch the curve $y = g(x - 1)$.

Mark clearly the coordinates of the points where this curve crosses the x -axis.

[3]



Identities: Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
Total	3	

#1

- (a) Show that $2x(7x - 8y) - 3y(x - 5y) \equiv 14x^2 - 19xy + 15y^2$. [2]

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- (b) In part (a) the identity symbol ($\equiv$) has been used.
Explain why this has been used and not an equal sign. [1]

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Question taken from Eduqas examination paper 530004, June 2024

Algebraic Proof: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
Total	2	

- #1
- (a) The n th term of a sequence is given by the expression $n^2 + 3n + 2$.
Prove that every term of the sequence is an even number.
Show all your working.

[2]

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Question taken from Eduqas examination paper 530003, May 2024

Algebraic proof: Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
Total	3	

#1

- (c) The numbers 4, 6, and 8 are three consecutive even integers.

Complete the following proof to show that the sum of **any** three consecutive even integers is a multiple of 6. [3]

Proof:

Every even number is a multiple of 2.

Let the smallest of the three even numbers be $2n$, where n is an integer.

The second of the three even numbers must be

and the third of the three even numbers must be

Therefore

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Question taken from Eduqas examination paper 530004, November 2021

Trial and Improvement / Iteration: Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	4	
#3	2	
#4	4	
#5	5	
#6	4	
Total	23	

A solution to the equation $2x^3 - 5x - 23 = 0$ lies between 2 and 3.
Use the method of trial and improvement to find the solution correct to 1 decimal place. [4]

202

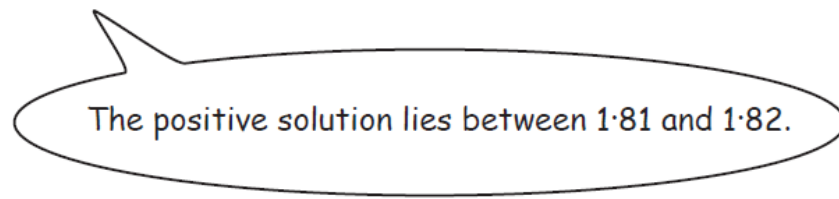
The equation $x^3 + x = 40$ has a solution between 3 and 4.

[4]

#3

The equation $2x^3 - 3x^2 - 2 = 0$ has only one positive solution.

Akriti says,



Is Akriti correct?

Yes

☐

No

☐

Show calculations and explain your decision.

[2]

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Question taken from Eduqas examination paper 530004, November 2023

#4

The equation $2x^3 + x^2 - 12 = 0$ has a solution between 1 and 2.

Use trial and improvement to find this solution correct to 1 decimal place.

[4]

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Question taken from Eduqas examination paper 5300004, November 2022

#5

- (a) The first 5 terms of a sequence are shown below.

5 8 11 14 17

Complete the term-to-term rule for this sequence.

[1]

$$t_1 = 5$$

$$t_{n+1} = t_n \dots\dots\dots, n \geq 1$$

- (b) (i) Show that $x^3 - 2x - 5 = 0$ can be rearranged as $x = \sqrt{\frac{2x+5}{x}}$.

[1]

- (ii) Use the iterative formula $x_{n+1} = \sqrt{\frac{2x_n + 5}{x_n}}$ with $x_1 = 2$

to find a solution of $x^3 - 2x - 5 = 0$ correct to 1 decimal place.

Write down all your values of x_{n+1} .

[3]

Question taken from Edugas examination paper 530004, June 2023

(b) A solution to the equation $2x^3 + 11x^2 + 16x = 65$ lies between 1.6 and 1.7. Use the method of trial and improvement to find the solution correct to two decimal places.

207

Composite / Inverse Functions: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	4	
#3	6	
#4	7	
#5	7	
#6	7	
#7	7	
#8	8	
Total	50	

#1

$$g(x) = \frac{x}{2}$$

$$h(x) = x^3$$

(a) Find $hg\left(\frac{1}{3}\right)$.

[2]

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(b) Solve $h^{-1}(x) = -2$.

[2]

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Question taken from Eduqas examination paper 5300003, May 2022

#2

- (a) The functions $f(x)$ and $g(x)$ are defined, for $x \geq 0$, by

$$f(x) = x^2,$$

$$g(x) = \frac{x+6}{5}.$$

- (i) Find the value of $gf(8)$.

[2]

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- (ii) Find an expression for $g^{-1}(x)$.

[2]

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Question taken from Eduqas examination paper 5300003, June 2018

#3

- (a) The functions $f(x)$ and $g(x)$ are defined by

$$f(x) = \sin x^\circ,$$

$$g(x) = x - 90.$$

Find the value of $fg(120)$.

[2]

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(c) The function $k(x)$ is defined by

$$k(x) = x^3 - 23.$$

Solve $k^{-1}(x) = 5$.

[4]

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Question taken from Eduqas examination paper 530003, November 2021

#4

(a) $h(x) = x^2 + 3.$

Show that $h^{-1}(x)$ has no solutions for $x < 3.$

[3]

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(b) $f(x) = x^2 + 5.$
 $g(x) = x - 4.$

Show that $fg(x) - gf(x) = 20 - 8x.$
You must show all your working.

[4]

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Question taken from Eduqas examination paper 530003, November 2023

The functions $g(x)$ and $h(x)$ are defined for all real x by

$$\begin{aligned} g(x) &= 4 - 3x, \\ h(x) &= x^2 + 5. \end{aligned}$$

[4]

[illegible]

[2]

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[1]

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Question taken from Edugas examination paper 530003, November 2018

#6

The functions $f(x)$ and $g(x)$ are defined for $x > 0$ by

$$f(x) = \frac{8}{x},$$

$$g(x) = x + 5.$$

(a) Find and simplify an expression for $ff(x)$.

[2]

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(b) Using your answer to part (a), or otherwise, explain the relationship between $f(x)$ and $f^{-1}(x)$.

[1]

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(c) Solve $g^{-1}f(x) = 11$.

[4]

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Question taken from Eduqas examination paper 530003, June 2019

#7

(a) $f(x) = \sqrt{x-1}$ for $x \geq 1$.

Show that $f^{-1}(x) < 1$ has no solutions.

[3]

(b) $g(x) = 5^x$

$$h(x) = x + 3$$

Solve $gh(x) = \frac{1}{25}$.

[4]

Question taken from Eduqas examination paper 530003, November 2020

#8

The function f is defined, for $x \neq 1$, by $f(x) = \frac{7}{x-1}$.

- (a) (i) Explain why $x \neq 1$ for this function. [1]

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- (ii) Show that $f^{-1}(x) = \frac{a}{x} + b$, where a and b are integers. [2]

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- (b) The functions g and h are defined for all real x by

$$g(x) = \sqrt[3]{x+1},$$

$$h(x) = 9x^3.$$

- Solve $hg(x) = f(x)$. [5]

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Question taken from Eduqas examination paper 530003, November 2019

Composite / Inverse Functions: Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	6	
Total	10	

#1

(a) $f(x) = x^3$

Find $f^{-1}(x)$.

[1]

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(b) $g(x) = (5x - 1)^3$

Expand and simplify $g(x)$.

[3]

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Question taken from Eduqas examination paper 530004, June 2023

#2

$$g(x) = 2x^2$$

$$h(x) = \frac{x+1}{4}$$

(a) Show algebraically that the x -coordinates of the points of intersection of

- the curve with equation $y = g(x)$, and
- the line with equation $y = h^{-1}(x)$,

are solutions of the equation

[3]

$$2x^2 - 4x + 1 = 0.$$

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(b) Use an algebraic method to find the x -coordinates of the points of intersection of

- the curve $y = g(x)$, and
- the line $y = h^{-1}(x)$.

Give your answers correct to 2 decimal places.
You must show all your working.

[3]

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Question taken from Eduqas examination paper 530004, November 2022

Equation of a circle / Tangent to a circle: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	7	
#3	3	
#4	3	
Total	17	

#1

In this question, all lengths are in centimetres.

A circle has equation $x^2 + y^2 = 49$.

Points A , B and C all lie on this circle.

Their co-ordinates are $A(a, 0)$, $B(b, 0)$ and $C(0, c)$, where $a < 0$, $b > 0$ and $c > 0$.

(a) Find the length of the line AB .

[2]

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$AB =$ cm

(b) The tangent to the circle at A and the tangent to the circle at C meet at the point T .

Find the coordinates of T .

[2]

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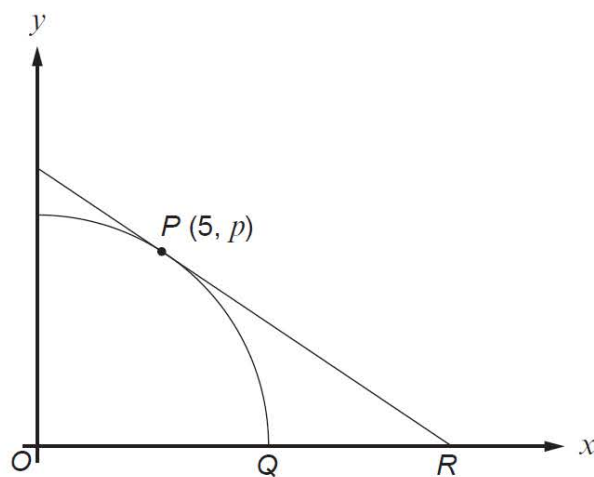
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$T($, $)$

Question taken from Eduqas examination paper 530003, November 2019

#2

*Diagram not drawn to scale*

The diagram shows an arc of a circle with centre O and equation $x^2 + y^2 = 50$.

$P(5, p)$ lies on the circle.

The arc meets the x -axis at Q .

The tangent to the circle at P meets the x -axis at R .

- (a) Find the value of p , the y -coordinate of P .

[1]

- (b) Show that the equation of the tangent to the circle at P is $y = mx + 10$, where m is a constant.

[4]

- (c) Find the exact length of QR .

[2]

Question taken from Eduqas examination paper 530003, June 2019

#3

In this question all dimensions are in centimetres.
The diagram shows a sketch of two circles, both with centre O .

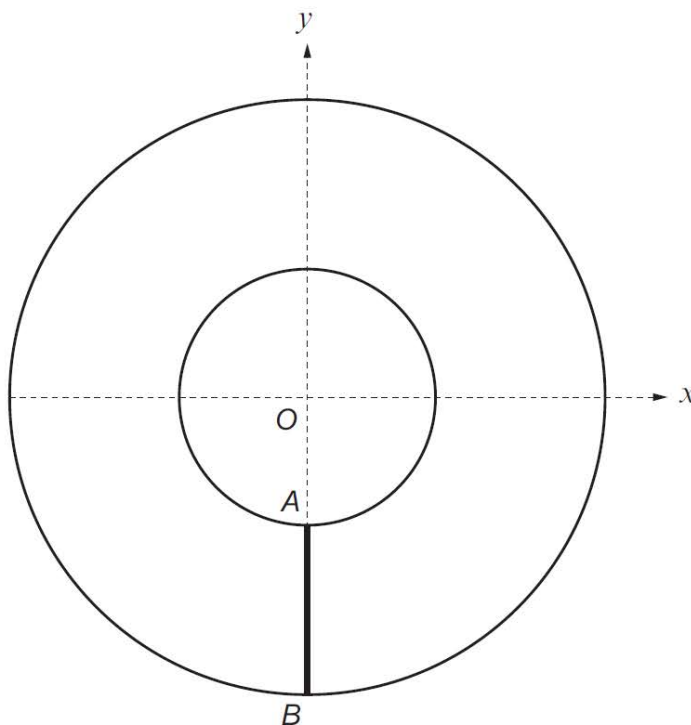


Diagram not drawn to scale

The equation of the inner circle is $x^2 + y^2 = 4$.

The equation of the outer circle is $x^2 + y^2 = 144$.

The points A and B lie on the inner circle and outer circle respectively.

OAB is a straight line.

- (a) Find the length of the line AB .
You must show all your working.

[2]

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- (b) Write down the equation of the tangent to the outer circle at the point B .

[1]

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Question taken from Eduqas examination paper 530003, November 2018

#4

A circle has equation $x^2 + y^2 = 400$.

- (a) Write down the length of the radius.

[1]

- (b) The points
- $A(12, -16)$
- and
- B
- lie on the circle.
-
- AB
- is a diameter of the circle.

Find the coordinates of B .

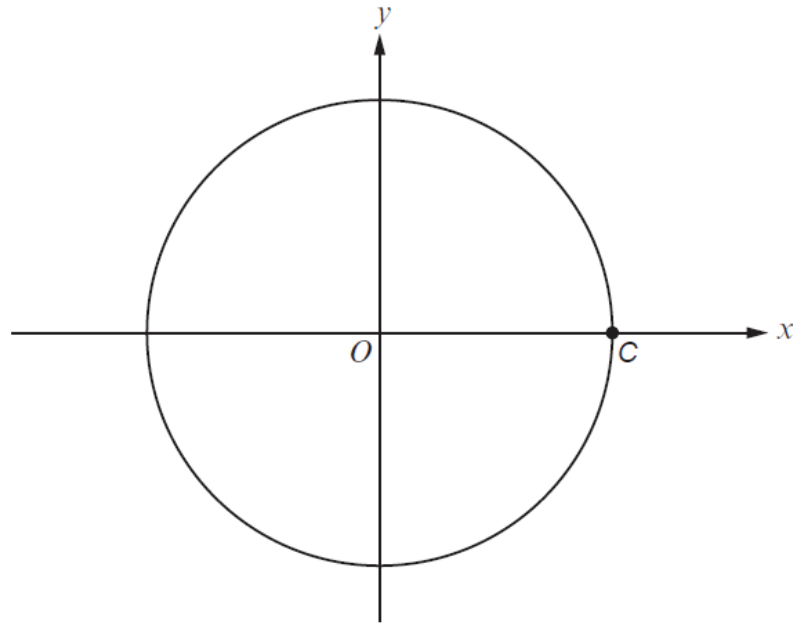
[2]

Question taken from Eduqas examination paper 5300003, May 2022

Equation of a circle / Tangent to a circle: Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	3	
#3	3	
Total	7	

- #1 (b) The diagram shows a sketch of the circle with equation $x^2 + y^2 = 289$.



Write down the coordinates of point C.

[1]

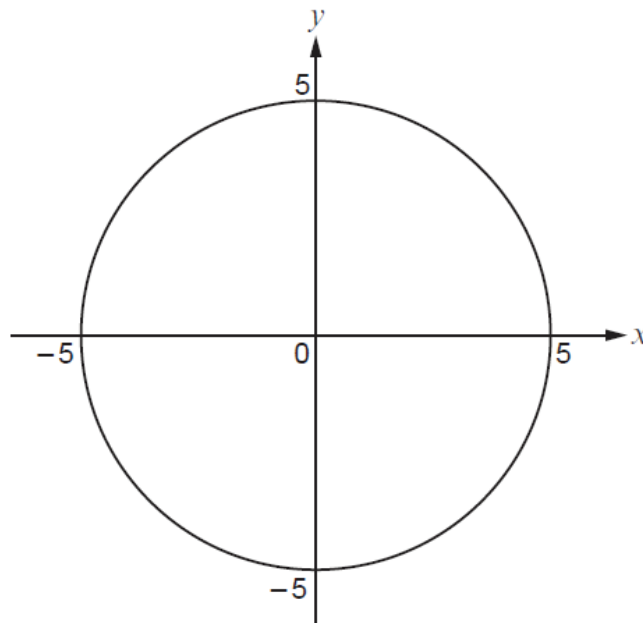
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Question taken from Eduqas examination paper 5300004, November 2022

#2

The graph below shows a circle centred at the origin.



- (a) Write down the equation of the circle shown on the graph above.

[1]

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- (b) Find the coordinates of the point of intersection of the tangent to the circle above at $(0,5)$ and the line $y = 2x + 3$.

[2]

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Question taken from Eduqas examination paper 530004, November 2023

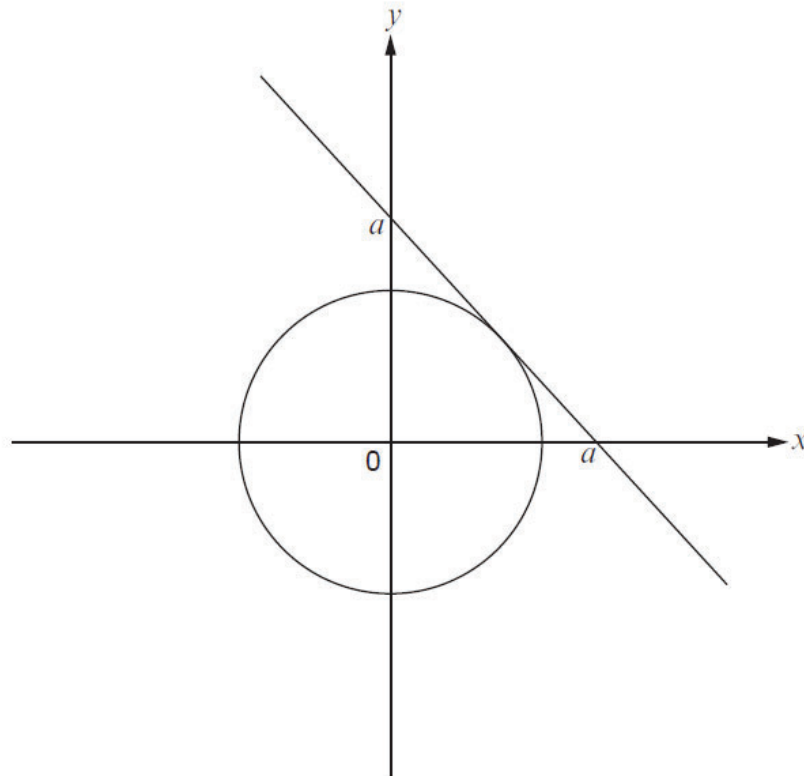
#3

The diagram shows:

- the circle with equation $x^2 + y^2 = 32$
- a tangent to the circle. The tangent passes through $(a, 0)$ and $(0, a)$.

Calculate the value of a .

[3]



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Question taken from Eduqas examination paper 530004, June 2024

Simplifying Terms: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	2	
#3	3	
Total	7	

Marking Scheme

#1

Component 1: Higher Tier	Mark	Comment
(c) x^{10}	B2	B1 for either: - sight of x^{12} - sight of $x^{\text{'their 12' - 2}}$

#2

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment
(a) x^6	B2	B1 for sight of $\frac{x^9}{x^3}$ or x^{2+7-3} attempted, may be in stages

#3

Component 1: Higher Tier	Mark	Comment
(a)(i) $\frac{x^4}{2}$ or $\frac{1}{2}x^4$ or $0.5x^4$	B1	Mark final answer
(a)(ii) $\frac{5}{x^2}$ or $5x^{-2}$	B2	Mark final answer B1 for sight of $\left(\frac{x^2}{5}\right)^{-1}$ or $\left(\frac{\sqrt{5}}{x}\right)^2$ oe

Simplifying Terms: Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	2	
#3	2	
#4	3	
Total	8	

Marking Scheme

#1

Component 2: Higher Tier	Mark	Comment
$2(y - 7)^8$	B1	Mark final answer
	(1)	

#2

Component 2: Higher Tier	Mark	Comment
(a) $28x^5y^6$	B2	B1 for one of the following: kx^5y^6 $k \neq 28$ or 0 $28x^ny^6$ $n \neq 5$ or 0 or $28x^5y^m$ $m \neq 6$ or 0 $28 \times x^5 \times y^6$ $28 x^5 \times y^6$ $28 \times x^5y^6$ Mark final answer. B1 if $28x^5y^6$ seen then spoiled.

#3

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(b) $27h^6$	B2	Mark final answer B1 for kh^6 or $27h^n$ where $k > 1$ and $n > 1$

#4

Component 2: Higher Tier	Mark	Comment
$3125x^{10}y^{-1}$ or $\frac{3125x^{10}}{y}$	B3	Mark final answer. Must be a single expression B2 for any one of: - any two elements of the product correct e.g. $5^5x^{10}y^{-1}$ or $\frac{3125x^{-4}}{y}$ - a correct answer seen then spoiled B1 for one of: - any one element of the product correct e.g. $25x^{10}y$ - sight of $5^5x^{10}y^5$ or $3125x^{10}y^5$ in working (from correct expansion of the bracket)
	(3)	

Substitution: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	2	
#3	2	
#4	2	
Total	8	

Marking Scheme

#1

(b) 5, 19, 57	B2	B1 for any two correct If no marks then SC1 for 3, 5, 19
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#2

Component 1: Higher Tier	Mark	Comment
(b) 250 000 oe ISW	B2	B1 for 25 x 10 000

#3

Component 1: Higher Tier	Mark	
(a) 2	B2	B1 for sight of two correct consecutive terms from the sequence 11, 13, 15, 17, ...

#4

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment
(b) $24\sqrt{3}$	B2	B1 for $2^3 \times (\sqrt{3})^3$ or better

Substitution: Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	3	
#3	4	
Total	8	

Marking Scheme

#1

Eduqas Autumn 2018 Component 2 Higher Tier	Marks	Comments
(c) 32970	B1	CAO

#2

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
$\frac{\text{greatest } U^2}{\text{smallest } 2a}$ $\frac{4.25^2}{2 \times 1.55} \text{ or } \frac{18.0625}{3.1}$ $5.8(2\dots) \text{ or } 5.83$	S1 M1 A1	Allow $4.2 < U \leq 4.25$ and $1.55 \leq a < 1.6$ Allow an answer of 6 from correct working only. If many attempts are offered without a method or answer being identified, then mark final attempt
	(3)	

#3

	Mark	Comment
(e) $c = 16$ $0 = (-2)^2 + b \times -2 + c$ $0 = (-2)^2 + b \times -2 + 16$ $b = 10$	B1 M1 M1 A1	Allow $-2^2 + b \times -2 + c$ FT 'their derived 16'. Do not allow $-2^2 + b \times -2 + 16$ unless -2^2 seen or implied later as 4

Expanding Brackets: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	3	
#3	3	
Total	9	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	
(a) $(3x+2)^3 = (3x+2)(3x+2)(3x+2)$ and attempting to multiply out one pair of brackets $27x^3 + 54x^2 + 36x + 8$ or simplified equivalent	S1 B2	$27x^3 + 8$ is S0 Mark final answer B1 for $(9x^2 + 6x + 6x + 4)(3x+2)$ or better or for a final answer with at most one incorrect coefficient NB: Correct unsimplified equivalent for B1 may be $27x^3 + 18x^2 + 18x^2 + 12x + 18x^2 + 12x + 12x + 8$

#2

Component 1: Higher Tier	Mark	Comment
(a) $8a + 22$ OR $2(4a + 11)$	B2	B1 for one of the following: $8a + k$ where $k \neq 0$ $ka + 22$ where $k \neq 0$ $15a - 6 - 7a + 28$ Mark final answer for B2 only -1 for incorrect further work

#3

Component 1: Higher Tier	Mark	
(a) $8x^2 - 4x + 10x - 5$	B2	B1 for any two terms correct; $nx^2 + 6x + m$ implies two terms correct if not from wrong working
$8x^2 + 6x - 5$	B1	Implies previous B2; FT for equivalent level of difficulty, providing a quadratic expression with 4 terms to consider and like terms in x to collect with opposite signs mark final answer except ignore '=0'

Expanding Brackets: Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	3	
#3	3	
#4	3	
Total	11	

Marking Scheme

#1

Component 2: Higher Tier	Mark	Comment
(a) $x^2 + 10x + 21$	B2	Mark final answer B1 for sight of. $x^2 + 3x + 7x + 21$ or a final answer of either $x^2 + kx + 21$, $k \neq 0$ or 10 $x^2 + 10x + c$, $c \neq 0$ or 21

#2

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(a) $7x^2 + 5x - 42x - 30$	B2	B1 for any three terms correct; $nx^2 - 37x + m$ implies two terms correct if not from wrong working
$7x^2 - 37x - 30$	B1	Implies previous B2. FT for equivalent level of difficulty, providing 4 terms to consider and like terms to collect

#3

(a)* $6x^2 - 16x - 21x + 56$ $6x^2 - 37x + 56$	B2 B1	B1 for any 2 terms correct FT for equivalent level of difficulty, providing at least 3 terms to consider and like terms to collect
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#4

(a) $3x^2 + 18xy + 5xy + 30y^2$ $3x^2 + 23xy + 30y^2$	B2 B1	B1 for any 2 terms correct FT for equivalent level of difficulty, providing at least 3 terms to consider and like terms to collect
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Factorising: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
Total	3	

Marking Scheme

#1

Component 1: Higher Tier	Mark	Comment
$3xy(y + 2x)$	B3	Mark final answer. B2 for any one of the following: • A correct answer seen then spoiled • $3x(y^2 + 2xy)$ • $3y(xy + 2x^2)$ • $xy(3y + 6x)$ • $3xy(y + mx)$ where $m \neq 0$ or $m \neq 2$ • $3xy(ny + 2x)$ where $n \neq 1$ or $n \neq 0$ B1 for any one of the following: • $3(xy^2 + 2x^2y)$ • $x(3y^2 + 6xy)$ • $y(3xy + 6x^2)$ • $3xy(y + \dots)$ • $3xy(\dots + 2x)$
	(3)	

Factorising: Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
Total	2	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(b) $(y - 2)(y + 4)$	B2	B1 for $(y \dots 2)(y \dots 4)$

Forming an expression: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	3	
Total	5	

Marking Scheme

#1

Component 1: Higher Tier	Mark	Comment
(c)(ii) $5c + 8d$	B2	Mark the final expression as the answer unless indicated otherwise. B1 for any one of the following: • An answer of $kc+8d$ or $5c + kd$ where $k \neq 0$ • An answer of $3c + 5d$ (the 6th term) • Sight of $5c + 8d$ (not given as the answer)

#2

(b)(i) (£ per hour =) $\frac{m}{5x}$	B1	Accept unsimplified e.g. $\frac{m \div 5}{x}$
(b)(ii) (£) $7\left(\frac{m}{5x} + y\right)$ or equivalent, ISW	B2	FT 'their (b)(i)' B1 for sight of 'their $\frac{m}{5x} + y$ '

Forming an expression: Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	5	
Total	9	

Marking Scheme

#1

(a) Initial strategy, e.g. sketch of concentric squares	S1	For intention, but some sections may be missed
Correct method to find area, e.g. subtraction of areas or composite shapes	M1	
$(8+2y)(8+2y) - 8 \times 8$ or $8y+8y+8y+8y+y^2+y^2+y^2+y^2$	A1	Or equivalent
$4y^2+32y$ or $4(y^2+8y)$ or $4y(y+8)$ or equivalent	A1	Mark final answer <i>If the path has been built inside then MR-1 and FT</i>

#2

Component 2: Higher Tier	Mark	Comment
(a) (Expression for total volume) $\frac{1}{2} \times \frac{4}{3} \times \pi \times (x+1)^3 + \frac{1}{3} \times \pi \times (x+1)^2 \times 5$	B1	Need not be equated to 24π for this mark
(Equate to 24π and expands brackets correctly) $2x^3 + 11x^2 + 16x + 7 = 72$ or $\frac{2\pi}{3}x^3 + \frac{11}{3}\pi x^2 + \frac{16}{3}\pi x + \frac{7}{3}\pi = \frac{72}{3}\pi (=24\pi)$ or $(2x^3+4x^2+2x+2x^2+4x+2)+(5x^2+10x+5)=72$	B3	FT provided of the form: $k\pi(x+1)^3 + 5m\pi(x+1)^2 (=24\pi)$ B2 for volume equated to 24π and both $(x+1)^3$ and $(x+1)^2$ expanded correctly e.g. $\frac{2}{3}\pi(x^3+2x^2+x+x^2+2x+1) + \frac{5}{3}\pi(x^2+2x+1) = 24\pi$ or $2(x^3+2x^2+x+x^2+2x+1) + 5(x^2+2x+1) = 72$ OR for $(x^2+2x+1)(2x+7) = 72$ B1 for one of the following: $2(x+1)^3 + 5(x+1)^2 = 72$ $(x+1)^2(2(x+1)+5) = 72$ $(x+1)^2(2x+7) = 72$
Convincingly leading to $2x^3 + 11x^2 + 16x = 65$	B1	CAO If no marks award SC1 for sight of: $\frac{1}{2} \times \frac{4}{3} \times \pi \times (x+1)^3$ AND $\frac{1}{3} \times \pi \times (x+1)^2 \times 5$ If no marks or B1 B0 B0 awarded, award SC1 for the correct expansion of $(x+1)^3$ $x^3 + x^2 + x^2 + x^2 + x + x + x + 1$ or better

Solving an equation: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	3	
#3	5	
#4	5	
Total	15	

#1

#2

#3

250

#4

(a) $12x - 7x = 6 + 9$ or $x = \frac{15}{5}$ or equivalent $x = 3$	B1 B1	Seen or implied FT until 2nd error Mark final answer; allow embedded answer for 2
(b) $10x + 20 - (2x - 9) = 30$ or $10(x + 2) - 2x + 9 = 30$ or better $10x - 2x = 30 - 9 - 20$ or better $x = \frac{1}{8}$ ISW	B1 B1 B1	FT until 2nd error Seen or implied For expanding at least one pair of brackets correctly FT For collecting terms FT; if FT the common error $8x = 19$, then the answer must be 2.375 or $\frac{19}{8}$, not rounded to e.g. 2.3

Solving an equation: Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	2	
#3	2	
#4	2	
#5	2	
#6	4	
#7	5	
Total	19	

Marking Scheme

#1

Component 2: Higher Tier	Mark	Comment
(b) $3x = 1$	B1	
$(x =) \frac{1}{3}$ oe, ISW	B1	Accept 0.33 or 0.3 but not 0.3. FT from $ax = 1$, $a \neq 1$ or $3x = b$ accept $\frac{1}{a}$ or $\frac{b}{3}$ but if on FT either simplifies to an integer the answer must be given as an integer. 'x =' can be omitted but must not be wrong if there. Correct answer implies first B1.

#2

Component 2: Higher Tier	Mark	Comments
(a) $5x = 8$	B1	
$x = 1.6$ or $\frac{8}{5}$ ISW	B1	FT from $ax = 8$, $a \neq 1$ or $5x = b$ Accept $\frac{8}{a}$ or $\frac{b}{5}$ but if on FT either simplifies to an integer the answer must be given as an integer. 'x =' can be omitted but must not be wrong if there. Correct answer implies first B1.

#3

(c) $d/5 = 12 - 2$ or $d/5 = 10$ or $d + 2 \times 5 = 12 \times 5$ or $d + 10 = 60$ $d = 50$	M1	
	A1	CAO. Accept embedded answers Mark final answer <i>If no marks award SC1 for an answer of $d = 70$ from $d/5 = 12 + 2$</i>

#4

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(a) $6x - x = 5 + 1$ oe $x = \frac{6}{5}$ oe, ISW	B1 B1	FT from $ax = b$, $a \neq 1$ or $5x = b$ accept $\frac{6}{a}$ or $\frac{b}{5}$ but if on FT either simplifies to an integer the answer must be given as an integer. 'x =' can be omitted but must not be wrong if there. Correct answer implies first B1. Final answer of $x = \frac{-6}{-5}$ is B0. Maximum of 1 mark if not fully correct

#5

Component 2: Higher Tier	Mark	Comment
(a) $5x - 2x = 6 - 4$ or $3x = 2$ oe $(x =) \frac{2}{3}$, ISW	B1 B1	Allow 0.67 or 0.666 but not 0.66 FT from $ax = 2$, $a \neq 1$ or $3x = b$ accept $\frac{2}{a}$ or $\frac{b}{3}$ but if on FT either simplifies to an integer the answer must be given as an integer. Correct answer implies first B1 unless incorrect working seen. Maximum of 1 mark if not fully correct

#6

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
Correct equation with fractions removed or over a common denominator e.g. $\frac{12x+15-2x-2}{(6)} = \frac{5}{(6)} \text{ or } \frac{10x+13}{(6)} = \frac{5}{(6)}$ $\frac{10x+17}{(6)} = \frac{5}{(6)}$ leads to $x = -1.2$ B1 B1 B1 $10x = -8$ oe $x = -0.8$ oe	B2 B1 for 1 error OR for one of the following: $\frac{3(4x+5)-2(x+1)}{(6)} = \frac{5}{(6)}$ $\frac{3(4x+5)}{(6)} - \frac{2(x+1)}{(6)} = \frac{5}{(6)}$ $\frac{12x+15}{(6)} - \frac{2x+2}{(6)} = \frac{5}{(6)}$ $\frac{6(4x+5)}{2} - \frac{6(x+1)}{3} = \frac{5}{6} \times 6$ oe $\frac{10x+13}{(6)}$ B1 B1	May be seen in stages. FT until 2nd error. If FT answer is a whole number, then it must be shown as an integer. If a FT answer is given as a decimal it must be correctly rounded, or truncated, to 2 dp <u>Note:</u> An unsupported answer of -0.8 is awarded no marks.
	(4)	

#7

Component 2: Higher Tier	Mark	Comment
(a) $5 - 11 = 5x - 2x$ or $2x - 5x = 11 - 5$ $x = -2$	B1 B1	FT from $ax = \pm b$, $a \neq 1$ or $\pm 3x = b$ accept $\frac{\pm b}{a}$ or $\frac{b}{\pm 3}$ but if on FT either simplifies to an integer the answer must be given as an integer. 'x =' can be omitted but must not be wrong if there. Correct answer implies first B1.
(b) $8x - 3x - 1 = 2$ or $8x = 2 + 3x + 1$ or better $5x = 2 + 1$ or better $x = \frac{3}{5}$ or equivalent fraction	B1 B1 B1	Expands the brackets Only FT from $8x - 3x + 1 = 2$ to obtain $5x = 2 - 1$ or better FT answer of $\frac{1}{5}$ or equivalent fraction only

Forming and solving an equation: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	5	
Total	5	

Marking Scheme

#1

Component 1: Higher Tier	Mark	Comment																								
(b) $5x + 7 + 6x - 9 + 8x - 27 = 180$ $19x = 209$ $x = 11$ Method to calculate all three angles e.g. $5 \times 11 + 7 \quad (= 62)$ $6 \times 11 - 9 \quad (= 57)$ $8 \times 11 - 27 \quad (= 61)$ OR calculates two angles by substitution and the third by subtracting sum from 180 All three angles correctly calculated: 62°, 57°, 61° (so not isosceles)	M1 A1 A1 M1 A1	May be seen in stages Allow M1 for $(180-7+9+27) \div (5+6+8)$ Implies M1 Allow $209 \div 19$ FT from $ax = b$ OR 'their 209' $\div$ 'their 19' provided M1 awarded For FT, accept answer written as a correctly simplified, improper fraction (unless it gives a whole number), mixed number or decimal. If answer is only given as a decimal, it must be correct to 1 decimal place – rounded or truncated. If $x \neq 11$ FT 'their x' provided $x \geq 4$ and M1 previously awarded. M1 implied if three angles correctly found (without working shown) from FT of 'their x' CAO If no marks, award: SC2 for $x = 11$, obtained with no working shown or trials used AND angles of 62°, 57°, 61° (so not isosceles) OR SC1 for $x = 11$ obtained with no working shown or trials used.																								
<u>Alternative method – showing that if two angles are equal, angle sum is not 180°</u> One pair of angles equated e.g. $6x - 9 = 5x + 7$ Correct value of x obtained e.g. $x = 16$ AND correct angle sum calculated e.g. 275° Both other pairs of angles equated e.g. $8x - 27 = 5x + 7$ AND $8x - 27 = 6x - 9$ Both equations solved correctly $x = 11\frac{1}{3}$ AND $x = 9$ AND correct angle sums calculated e.g. $186\frac{1}{3}^\circ$ and 142°	M1 A1 M1 A2	A1 for one correct value of x and the correct angle sum provided M1 awarded. <table><tr><td>$6x - 9 = 5x + 7$</td><td>$5 \times 16 + 7 = 87$</td></tr><tr><td>$x = 16$</td><td>$6 \times 16 - 9 = 87$</td></tr><tr><td></td><td>$8 \times 16 - 27 = 101$</td></tr><tr><td></td><td>Total = 275°</td></tr><tr><td>$8x - 27 = 5x + 7$</td><td>$5 \times 11\frac{1}{3} + 7 = 63\frac{2}{3}$</td></tr><tr><td>$3x = 34$</td><td>$6 \times 11\frac{1}{3} - 9 = 59$</td></tr><tr><td>$x = 11\frac{1}{3}$</td><td>$8 \times 11\frac{1}{3} - 27 = 63\frac{2}{3}$</td></tr><tr><td></td><td>Total = $186\frac{1}{3}^\circ$</td></tr><tr><td>$8x - 27 = 6x - 9$</td><td>$5 \times 9 + 7 = 52$</td></tr><tr><td>$2x = 18$</td><td>$6 \times 9 - 9 = 45$</td></tr><tr><td>$x = 9$</td><td>$8 \times 9 - 27 = 45$</td></tr><tr><td></td><td>Total = 142°</td></tr></table>	$6x - 9 = 5x + 7$	$5 \times 16 + 7 = 87$	$x = 16$	$6 \times 16 - 9 = 87$		$8 \times 16 - 27 = 101$		Total = 275°	$8x - 27 = 5x + 7$	$5 \times 11\frac{1}{3} + 7 = 63\frac{2}{3}$	$3x = 34$	$6 \times 11\frac{1}{3} - 9 = 59$	$x = 11\frac{1}{3}$	$8 \times 11\frac{1}{3} - 27 = 63\frac{2}{3}$		Total = $186\frac{1}{3}^\circ$	$8x - 27 = 6x - 9$	$5 \times 9 + 7 = 52$	$2x = 18$	$6 \times 9 - 9 = 45$	$x = 9$	$8 \times 9 - 27 = 45$		Total = 142°
$6x - 9 = 5x + 7$	$5 \times 16 + 7 = 87$																									
$x = 16$	$6 \times 16 - 9 = 87$																									
	$8 \times 16 - 27 = 101$																									
	Total = 275°																									
$8x - 27 = 5x + 7$	$5 \times 11\frac{1}{3} + 7 = 63\frac{2}{3}$																									
$3x = 34$	$6 \times 11\frac{1}{3} - 9 = 59$																									
$x = 11\frac{1}{3}$	$8 \times 11\frac{1}{3} - 27 = 63\frac{2}{3}$																									
	Total = $186\frac{1}{3}^\circ$																									
$8x - 27 = 6x - 9$	$5 \times 9 + 7 = 52$																									
$2x = 18$	$6 \times 9 - 9 = 45$																									
$x = 9$	$8 \times 9 - 27 = 45$																									
	Total = 142°																									

Forming and solving an equation: Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	3	
#3	4	
#4	4	
#5	4	
#6	5	
#7	6	
Total	29	

Marking Scheme

#1

Sight of $x + 5 + x - 10 + x - 75 (+125)$	B1	
$3x - 80 + 125 = 360$ or $3x - 80 = 360 - 125$ or $3x = 315$	B1	Implies previous B1 FT 'their $x + 5 + x - 10 + x - 75$ ' provided it contains at least 2 of the appropriate angle terms, simplified and correctly equated
$x = 105$	B1	CAO. An answer ' $x = 105$ ' without previous equation is awarded B0
	(3)	

#2

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(b) A correct equation e.g. $2x + 10 = 116$ $2(x + 5) = 116$ $x + 5 = 58$ $x = 116 \div 2 - 5$ 53	B2 B1	B1 for $2(x + 5)$ or $2x + 10$
		If no marks award: SC2 for $x = 55.5$ following $2x + 5 = 116$ SC1 for $2x + 5 = 116$

#3

(c) $x = 5.5$	B2	B1 for sight of any one of the following: $\frac{3x + 1}{2} = 2$ $\frac{3x + 1}{2} = x/2 + 6$ $3x + 1 = 2(x/2 + 6)$ $2x = 11$ - at least 2 correct trials
Total number of hours 8.75 (hours) 5(:)45 pm or 17(:)45	B1 B1	FT 'their number of hours' provided at least B1 previously awarded

#4

Component 2: Higher Tier	Mark	Comments
(b) (number of apples =) $x + 2$ si	B1	Not implied by use of numerical trials Note: do not award B1 for $x + 2 = 545$ oe
$30x + 25(x + 2) = 545$ oe	M1	FT 'their $x + 2$ ' providing binomial in x ; brackets may be omitted
$55x + 50 = 545$ oe $x = 9$	m1 A1	Expands the brackets and simplifies CAO (no FT as needs to be an integer answer) If M0A0 award either: SC2 for an answer of 9 if unsupported or from trials. SC1 if 9 only seen in embedded working.

#5

$x \times \frac{1}{4} + (x + 2) \times \frac{1}{2} + (x - 4) \times \frac{1}{4}$ or $x \times 0.25 + (x + 2) \times 0.5 + (x - 4) \times 0.25$	M2	M1 for any 2 terms correct (sum need not be shown), or for $x \times 15 + (x + 2) \times 30 + (x - 4) \times 15$ or for intention of the correct sum but missing brackets
(=) $x/4 + x/2 + 1 + x/4 - 1$ or equivalent using decimals	m1	FT from M1 previously awarded for 'their correct expansion'
(=) x (km)	A1	From convincing working
	(4)	

#6

$3(7x+5)+2x-9+3(7x+5)+2x-9=232.8$ $21x+15+2x-9+21x+15+2x-9= 232.8$	B1 B1	Or equivalent FT from ' $21x+15 + 2x - 9 = 232.8$ ' (semi perimeter)
$46x + 12 = 232.8$ or $46x = 220.8$ or $x = 220.8 \div 46$	B1	FT from 1 error (or repeated error) in multiplying out brackets
$x = 4.8$ (cm)	B1	FT from 'their $ax + b = 232.8$ ' provided $a \neq 0$ and $b \neq 0$ (FT from semi perimeter is 9.86... cm)
Length 115.8 (cm) AND Width 0.6 (cm)	B1	(FT from semi perimeter is 222.06 cm AND 10.72 cm) FT evaluations correct for 'their derived x '
	(5)	

#7

$x + x + 40 + 2x - 30 + 3x - 120 + 3x$	B1	$3(x - 40) = 3x - 120$ may be seen in later working
(Interior angle sum) $3 \times 180(^{\circ})$	M1	
or alternative FULL method	A1	
$540(^{\circ})$		
$10x - 110 = 540$ or $10x = 540 + 110$	M1	FT 'their $10x - 110$ ' = n where $n \geq 360$
or $10x = 650$	A1	CAO
$x = 65(^{\circ})$		
($65(^{\circ})$, $105(^{\circ})$, $100(^{\circ})$, $75(^{\circ})$,) $195(^{\circ})$	E1	FT provided similar outcome
(so this angle is greater than 180°)	(6)	

Factorising (Quadratic): Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	2	
#3	3	
Total	7	

Marking Scheme

#1

Component 1: Higher Tier	Mark	Comment
(a) $(5x + 3)(x + 2)$	B2	B1 for two brackets which multiply to give $5x^2 + 13x + k$ or $5x^2 + mx + 6$

#2

Component 1: Higher Tier	Mark	
(b)(i) $(x - 3)(x - 7)$ oe	B2	If not B2, award B1 for $(x \dots 3)(x \dots 7)$ or for $x(x - 7) - 3(x - 7)$ oe; ignore '= 0' If no marks, award SC1 for factors $x - 3$ and $x - 7$ stated but not as a product

#3

(a) $(x - 3)(x + 5)$	B2	B1 for $(x \dots 3)(x \dots 5)$
(b) 3, -5	B1	Correct or correct FT; FT 'their $(x \pm a)(x \pm b)$ ' from (a)
	(3)	

Factorising (Quadratic): Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	2	
#3	2	
#4	2	
#5	3	
#6	3	
Total	14	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(a) $(x - 8)(x + 3)$ ISW	B2	B1 for a pair of brackets (using integers only) that expand to give, $x^2 - 5x \pm \dots$ or $x^2 \pm \dots - 24$ e.g. $(x + 8)(x - 3)$ or $(x - 6)(x + 1)$

#2

Component 2: Higher Tier	Mark	Comments
(c) $(x + 1)(x + 4)$	B2	B1 for a pair of brackets that expand to give $x^2 + 5x \pm a$ OR $x^2 \pm bx + 4$

#3

(a) $(a - 2)(a + 7)$	B2	B1 for $(a \dots 2)(a \dots 7)$
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#4

(b) $(x - 9)(x - 4)$	B2	B1 for $(x \dots 9)(x \dots 4)$
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#5

(a) $(2x + 3)(2x + 5) (=0)$	B2	If not B2, award B1 for $(2x \pm 3)(2x \pm 5)$ or $(x + 5/2)(x + 3/2)$
$x = -3/2$ with $x = -5/2$ ISW	B1	Strict FT from 'their pair of brackets' provided equivalent level of difficulty, with at least one answer a fraction

#6

(a) $(2x + 1)(3x - 2) (=0)$	B2	If not B2, award B1 for $(2x \pm 1)(3x \pm 2)$ or $(2x \pm 2)(3x \pm 1)$
$x = -1/2$ with $x = 2/3$	B1	Do not accept 0.6 for 2/3, unless sight of 2/3 Allow 0.66(...) or 0.67 for 2/3 Strict FT from 'their pair of brackets' provided equivalent level of difficulty, with at least one answer a fraction

Solving a quadratic equation: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	3	
#3	3	
#4	6	
#5	6	
Total	19	

Marking Scheme

#1

(d) No with valid explanation. e.g. 'The correct answers are $x = 3$ and $x = 2$.' or 'She has forgotten to put $x - 3$ and $x - 2$ equal to 0 and solve.' or 'When $x = -3$ the value is 30.' or 'The correct solution is $x = 3$ or $x = 2$.'	E1	Do not accept e.g. 'The values do not work' without supporting evidence. Allow 'No and $(-3 - 3) = -6$ and $(-2 - 2) = -4$ '
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#2

Component 1: Higher Tier	Mark	
(b)(i) $(x - 3)(x - 7)$ oe	B2	If not B2, award B1 for $(x \dots 3)(x \dots 7)$ or for $x(x - 7) - 3(x - 7)$ oe; ignore '= 0' If no marks, award SC1 for factors $x - 3$ and $x - 7$ stated but not as a product
(b)(ii) $x = 3, x = 7$	B1	STRICT FT from 'their $(x \dots a)(x \dots b)$ ' where a and b are constants;

#3

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment
(b) $(x - 3)(x + 6)$ oe $x = 3, x = -6$	B2 B1	If not B2, award B1 for $(x \dots 3)(x \dots 6)$ STRICT FT from 'their $(x \dots a)(x \dots b)$ ' where a and b are constants; accept ' $x = 3$ or $x = -6$ ', which is correct, allow for e.g. ' $x = 3$ and $x = -6$ '

#4

Component 1: Higher Tier	Mark	
(b) $4x = 3x(x-1) + 2(x-1)$ or $4x = (3x+2)(x-1)$ oe, si $4x = 3x^2 + 2x - 3x - 2$ or better $3x^2 - 5x - 2 = 0$ $(3x+1)(x-2) (=0)$ $x = -\frac{1}{3}, x = 2$	M2 M1 A1 M1 A1	$M1 \text{ for } \left(\frac{4}{x-1}\right) = \frac{3x+2}{x} \text{ si}$ Allow one error in expansion. CAO Allow for $(3x-1)(x+2)$ FT 'their $3x^2 - 5x - 2 = 0$ ' provided at least M2 previously awarded.
<u>Alternative method</u> $4 = (3 + \frac{2}{x})(x-1)$ $4 = 3x - 3 + \frac{2x}{x} - \frac{2}{x}$ $4x = 3x^2 - 3x + 2x - 2$ $3x^2 - 5x - 2 = 0$ $(3x+1)(x-2) (=0)$ $x = -\frac{1}{3}, x = 2$	M1 M1 M1 A1 M1 A1	Allow one error in expansion. CAO Allow for $(3x-1)(x+2)$ FT 'their $3x^2 - 5x - 2 = 0$ ' provided at least M2 previously awarded.

#5

Clears the fractions $4(x+2) + 12(2x-3) = 7(2x-3)(x+2)$	M2	May be seen or implied later e.g. $28x - 28 = 7(2x^2 + x - 6)$ $M1 \text{ for } \frac{4(x+2) + 12(2x-3)}{(2x-3)(x+2)} [=7]$ For first M1 or M2, allow recovery from omission of brackets e.g. $4 \times x + 2 + 12 \times 2x - 3 = 7 \times 2x - 3 \times x + 2$
Expands the brackets and collects all terms on one side $[4x + 8 + 24x - 36 = 7(2x^2 + x - 6)]$ $[28x - 28 = 14x^2 + 7x - 42]$ $14x^2 - 21x - 14 = 0$ or $2x^2 - 3x - 2 = 0$	M2	For M2 and M1 allow one error in expansion or collection M1 for 'their $28x - 28$ ' = 'their $14x^2 + 7x - 42$ ' FT for M2 or M1 only if of equivalent difficulty, so e.g. if brackets have been omitted, they must 'work as if they are there' for these marks
Factorises or solves their 3-term quadratic equation $(2x+1)(x-2) [=0]$ or equivalent $x = -\frac{1}{2}, x = 2$	M1 A1	May use the quadratic formula; must be correct for their equation; their equation must have real roots. CAO
	(6)	

Solving a quadratic equation: Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	3	
#3	3	
#4	10	
Total	19	

Marking Scheme

#1

(b) $(w + 11)(w - 3) = 0$ $w = -11$ with $w = 3$	B2 B1	B1 for $(w \dots 11)(w \dots 3)$ STRICT FT from 'their pair of brackets'
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#2

(c) $(w + 9)(w - 2) = 0$ $w = -9$ with $w = 2$	B2 B1	B1 for $(w \dots 9)(w \dots 2)$ STRICT FT from 'their pair of brackets' <i>Alternative:</i> $(w =) \{-7 \pm \sqrt{(7^2 - 4 \times 1 \times -18)}\} / 2$ M1 $(=) (-7 \pm \sqrt{121}) / 2$ A1 $w = -9$ with $w = 2$ A1 <i>Accept trial & improvement method only if both solutions are found correctly for B3</i>
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#3

(a) $2x(3x - 4) + 5x (=47)$ or $2x(3x + 1) - 5x (=47)$ or equivalent $6x^2 - 8x + 5x = 47$ or $6x^2 + 2x - 5x = 47$ $6x^2 - 3x - 47 = 0$	M1	Allow intention
	A1	Must be from convincing working shown
	A1	Must be from convincing working shown

#4

Component 2: Higher Tier	Mark	Comment
(a) $\frac{9}{4-x}$	B1	Allow $\frac{7}{x} + 5$
(b) $\frac{9}{4-x} = \frac{7}{x} + 5$ oe $9x = 7(4-x) + 5x(4-x)$ oe $9x = 28 - 7x + 20x - 5x^2$ oe $9x = 28 + 13x - 5x^2$ oe Correct completion to given answer $5x^2 - 4x - 28 = 0$	M1 m1 m1 m1 A1	FT 'their $\frac{9}{4-x}$ ', provided of the form $\frac{a}{bx+c}$ Equates correct or correct FT expressions Clears fractions e.g. $9x = (7+5x)(4-x)$; may be in stages Multiplies out Collects terms on RHS oe Not from wrong working
(c) $(5x-14)(x+2)$ $x = 2.8$ (or $x = -2$) $\left(\frac{7}{2.8}\right)(£)2.5(0)$	M2 B1	M1 for $(5x \dots 14)(x \dots 2)$ Must be seen CAO Allow if working solution seen in (b) and not contradicted in (c). <u>Using trial and improvement</u> Award B3 for a method leading to both solutions, namely $x = -2$ AND $x = 2.8$, otherwise B0. FT 'their derived positive value of x providing two solutions with one positive and one negative si' Allow this mark if the quadratic has been solved on the calculator (M0 A0 previously awarded).
<u>Alternative method:</u> $x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4 \times 5 \times -28}}{2 \times 5}$ oe $x = \frac{4 + \sqrt{576}}{10}$ (or $x = \frac{4 - \sqrt{576}}{10}$) oe $x = 2.8$ (or $x = -2$) $\left(\frac{7}{2.8}\right)(£)2.5(0)$	M1 m1 A1 B1	Must be seen; allow one slip in substitution for M1 m0 A0; formula must not be clearly incorrect. If the $-(-4)$ not clearly included in the fraction then M0 unless corrected later. Award M1 m0 A0 for missing brackets on the -4^2 unless corrected but allow use of 4^2 . Allow attempt to complete the square with at most one slip CAO Allow is working solution seen in (b) and not contradicted in (c) FT 'their derived positive value of x ', providing two solutions with one positive and one negative si Allow this mark if the quadratic has been solved on the calculator (M0 A0 previously awarded)
	(10)	

Completing the Square: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	5	
Total	9	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment
$(y =) (x + 7)^2 + 21$	B2	Mark final answer B1 for sight of $(x+7)^2$ or $(x + (14 \div 2))^2$ Ignore sight of '=0'
Turning point $(-7, 21)$	B2	Must follow from B1 FT from 'their' $(x+7)^2$ for the x coordinate FT 'their' 21 but not 70 or -49 for the y coordinate B1 for $(-7, \dots)$ or $(\dots, 21)$
	(4)	

#2

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment
(a) $(x+4)^2 + 2$ or $a=4, b=2$	B3	B2 for sight of $\left(x + \frac{8}{2}\right)^2 - 4^2$ or $(x+4)^2 - 4^2$ oe or B1 for sight of $\left(x + \frac{8}{2}\right)^2$ or $(x+4)^2$ Ignore '= 0' if seen.
(b) $(-4, -16)$	B2	FT -'their a' and 'their b' -18; B1 for each provided not from wrong working
	(5)	

Completing the Square: Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	3	
#3	4	
#4	6	
Total	16	

Marking Scheme

#1

(d) $(x + 9)^2 \pm \dots$	M1	
(Minimum value at $x =$) -9	A1	
(Minimum value is) -79	A1	

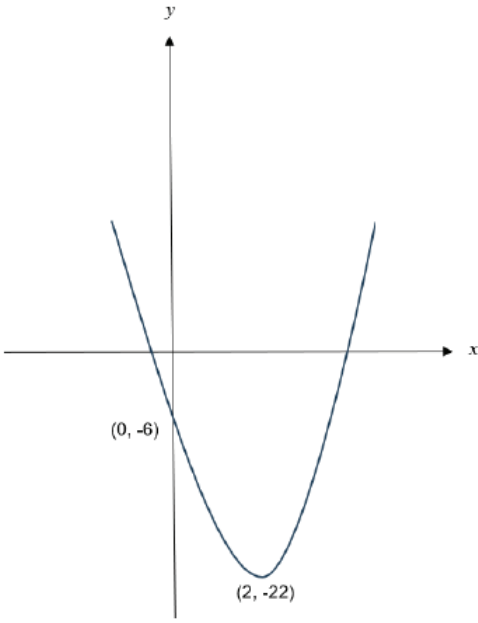
#2

(d) $(x + 7)^2 \pm \dots$	M1	
(Minimum value at $x =$) -7	A1	
(Minimum value is) -24	A1	

#3

$(x + 6)^2 \pm \dots$ + 21	B1 B1	Sight of $(x+6)^2$ or $(x + \frac{12}{2})^2$ Ignore sight of '=0' Accept 57 - 36 if not evaluated, otherwise mark final value. Do not accept '= -21' or '=21' $(x + 6)^2 + 21$, B1, B1 ISW.
Stationary point (-6, 21)	B2 (4)	Must follow completing the square FT from 'their $(x + 6)^2$ ' for the x coordinate FT their value but not 57 or - 36 for the y coordinate B1 for (.... , 21) or (-6,)

#4

Component 2: Higher Tier	Mark	Comment
$(y =) 4(x^2 - 4x) - 6$ or $4[x^2 - 4x - 1.5]$ or $4x^2 - 16x + 16 - 16 - 6$	B1	
$(y =) 4(x - 2)^2 - 4 \times 2^2 - 6$ or $4[(x - 2)^2 - 1.5 - 2^2]$ oe or $(2x - 4)^2 - 16 - 6$	B2	FT from $4(x^2 - 4x) + c$ Award B1 for $4(x - 2)^2$ or $(2x - 4)^2$ Either B2 or B1 implies the first B1.
$(y =) 4(x - 2)^2 - 22$ or $(2x - 4)^2 - 22$	B1	CAO
Sketch of a quadratic curve with (0,-6) indicated at the intercept with the y axis and (2, -22) indicated at stationary point 	B2	No marks are awarded for the graph unless an expression of the form $a(x \pm b)^2 \pm c$ obtained with $a > 1$, $b \neq 0$ and $c \neq 0$ FT 'their expression' in the form $a(x \pm b)^2 \pm c$ B1 for the correct shape curve with either the y-intercept coordinate correct, or the stationary point coordinates correct. Intercepts on the x-axis are not required but, if given they must be correct for their equation (4.345.. and -0.345 if correct)
	(6)	

Difference between two squares: Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	1	
#3	1	
#4	1	
#5	5	
Total	9	

Marking Scheme

#1

Component 2: Higher Tier	Mark	Comment
(c) $(y + 20)(y - 20)$	B1	Allow $(x + 20)(x - 20)$ oe

#2

(c) $(b - 12)(b + 12)$	B1	
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#3

(b) $(b + 5)(b - 5)$	B1	CAO
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#4

(d) $(y - 11)(y + 11)$	B1	
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#5

Component 2: Higher Tier	Mark	Comments
(a) $-6 \leq x \leq 6$ or	B3	B2 for one of the following $-6 \leq x < 6$ $-6 < x \leq 6$ $-6 \leq x$ or $x \leq 6$ $-6 < x < 6$ B1 for one of the following: $(x-6)(x+6)$ $x \leq 6$ $x = \pm 6$
(b) Correct parabola starting at $(-6, 0)$ and ending at $(6, 0)$.	B2	B1 for correct parabola going through and extending beyond $(-6, 0)$ and $(6, 0)$. FT their (a) for B1 if possible.
	(5)	

Solving a Quadratic Equation (Quadratic Formula): Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	3	
Total	6	

#1

#2

280

Solving a Quadratic Equation (Quadratic Formula): Calculator

Question	Maximum Mark	Mark Awarded
#1	6	
#2	7	
#3	7	
Total	20	

#1

#2

282

#3

Showing $x^2 + 2x - 132.48 = 0$ or $2x^2 + 4x - 264.96 = 0$ $x = \frac{-4 \pm \sqrt{4^2 - 4 \times 2 \times -264.96}}{2 \times 2}$ or $x = \frac{-2 \pm \sqrt{2^2 - 4 \times 1 \times -132.48}}{2 \times 1}$ or $(x + 1)^2 - 133.48 = 0$ $x = \frac{-4 \pm \sqrt{2135.68}}{4}$ or $x = \frac{-2 \pm \sqrt{533.92}}{2}$ or $x + 1 = \sqrt{133.48}$ $x = 10.55\dots(\text{cm})$ or $10.6(\text{cm})$ (Volume =) $\frac{1}{3} \times \pi \times 10.55\dots^2 \times 12.55\dots$ Answer in the range 1462 (cm³) to 1483 (cm³)	B2 M1 A1 A1 M1 A1 (7)	B1 for $x^2 + (x + 2)^2 = 16.4^2$ FT for equivalent level of difficulty Allow 1 slip in substitution, not use of incorrect formula Either negative x-value not given or ignored in further working Candidate must not show working with negative x-value FT provided at least 2 marks previously awarded Must be from correct working FT for an answer in a similar range, not allowing truncation of 'their x' to a whole number or 1 d.p.
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Nth term (linear sequence): Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	2	
#3	2	
Total	6	

Marking Scheme

#1

(a) $8n - 5$	B2	B1 for $8n + k$ where $k \neq -5$
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#2

Component 1: Higher Tier	Mark	Comment
(b) $6n - 9$	B2	B1 for $6n \pm k$ where $k \neq 0$

#3

Component 1: Higher Tier	Mark	Comment
(b) $5n - 1$ or $-1 + 5n$	B2	Mark final answer B1 for: $5n + k$, where $k \neq -1$ - a correct answer seen and then spoiled. - an unsimplified expression which would lead to $5n - 1$ Allow the use of other variables for n for B1 or B2

Nth term (Quadratic sequence): Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	2	
#3	2	
#4	2	
Total	8	

Marking Scheme

#1

Component 1: Higher Tier	Mark	Comment
(c) $4n^2 - 1$	B2	May be seen as $(2n)^2 - 1$ B1 for $4n^2 + k$ or $(2n)^2 + k$ where $k \neq -1$

#2

Component 1: Higher Tier	Mark	
(b) $n^2 - 4$	B2	B1 for either: $n^2 + k$, $k \neq -4$ or 0 $kn^2 - 4$, $k \neq 1$ or 0.

#3

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment
(b) $n^2 + 2$	B2	B1 for $n^2 + k$ where $k \neq 0$ or 2 Allow B1 for $n^2 + bn + c$ where $b \neq 0$ or $c \neq 0$

#4

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment
(c) $\frac{n^2}{2} + 1$ oe	B2	B1 for $\frac{n^2}{2} + k$, $k \neq 1$

Nth term (Quadratic sequence): Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	2	
#3	2	
#4	2	
#5	2	
#6	2	
Total	12	

Marking Scheme

#1

$n^2 - 8$	B2	Award B1 for $(1)n^2 \pm$ 'any number', provided this number $\neq 0$ If no marks, award SC1 for $n^2 - 8n$
	(2)	

#2

$\dots n^2 + n + 1$	B2	CAO B1 for sight of $n^2 \pm \dots$, not for n^2 alone OR B1 for $an^2 \pm \dots$ where $a \neq 1$
	(2)	

#3

(b) $n^2 + 6$	B2	B1 for $n^2 \pm a$, where $a \neq 0$
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#4

(b) $n^2 + 3$	B2	B1 for $n^2 \pm a$, where $a \neq 0$
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#5

Component 2: Higher Tier	Mark	Comment
(b) $2n^2 + 1$ oe	B2	B1 for sight of $2n^2$

#6

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(b) $n^2 + n$ oe	B2	Accept unsimplified e.g. $n \times n + n$ B1 for $n^2 + kn + c$ where k and c are not both 0

Sequences (other): Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	2	
#3	3	
#4	3	
#5	3	
Total	12	

Marking Scheme

#1

Component 1: Higher Tier	Mark	Comment
(a) 55	B1	

#2

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment
(a) $\frac{243}{32}$	B2	B1 for a numerator of 243 or a denominator of 32 or for $-\frac{81}{16} \times -\frac{3}{2}$ si; implied by e.g. $-\frac{81^{x-3}}{16 \times 2}$

#3

Component 1: Higher Tier	Mark	Comment
(a)(i) $\frac{3125}{32}$	B2	B1 for a fraction with either: - a numerator of 3125 - a denominator of 32 - sight of $-\frac{625}{16} \times -\frac{5}{2}$
(a)(ii) 105	B1	

#4

Component 1: Higher Tier	Mark	Comment
(a) $-\frac{32}{9a}$	B2	B1 for one of the following: $\frac{32}{9a}$ $-\frac{32}{ka}$ where $k \neq 0$ $-\frac{k}{9a}$ where $k \neq 0$
(c)(i) 89	B1	

#5

Component 1: Higher Tier		Mark	
10	(a)(i)	B1	
	(a)(ii)	B2	B1 for sight of one of the following: • (6th term =) $\frac{1}{3\sqrt{3}\sqrt{3}}$ • (5th term =) $\frac{1}{3\sqrt{3}}$ • (ratio =) $\frac{1}{\sqrt{3}}$
	$\frac{1}{9}$		

Sequences (other): Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	2	
Total	3	

Marking Scheme

#1

Component 2: Higher Tier	Mark	Comment
^(a) 215	B1	

#2

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
^{(a)(i)} 82	B1	
^{(a)(ii)} $8\sqrt{2}$	B1	

Solving Inequalities: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	3	
#3	3	
#4	3	
#5	3	
Total	13	

Marking Scheme

#1

Component 1: Higher Tier	Mark	Comment
(b) Valid response e.g. '(Dividing by a negative) he should reverse the inequality'	E1	Allow 'the answer should be $x < -2$ '.

#2

(c)(i) $3x > 5 - 2$ oe $x > 1$ oe	M1	
	A1	No marks for use of "=", unless finally replaced to give $x > 1$ then award M1 A1; mark final answer
(ii) Empty circle at 1 with arrow right	B1	STRICT FT 'their (c)(i)' provided an inequality; if a line drawn rather than an arrow then there must be no idea of termination and it must extend as far as the end of the number line

#3

(c)(i) $10x \leq 15$ or equivalent $x \leq 1.5$ or equivalent	M1	
	A1	Mark final answer No marks for use of "=", unless finally replaced to give $x \leq 1.5$ then award M1 A1.
(ii) Solid circle at 1.5 with arrow left	B1	STRICT FT 'their (c)(i)' provided an inequality Accept any unambiguous notation provided there is no termination (so not a line with a circle at each end)

#4

(c) Line with solid circles at both ends starting at -2 and ending at 3	B1	
(d) $2x < 4 \times 3$ $x < 6$	M1 A1	No marks for use of "=", unless finally replaced to give $x < 6$ then award M1 A1. $x \leq 6$ is A0

#5

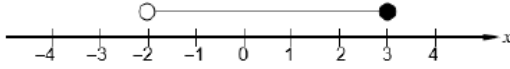
Component 1: Higher Tier	Mark	
(b)(i) $n < 45$ oe	B2	B1 for either: $2n < 99 - 9$ oe $n < k/2$, from $2n < k$, where k is a constant. Use of '=' is B0 unless finally replaced.
(b)(ii) 44	B1	FT 'their 45' - 1, unless 'their 45' = 99.

Solving Inequalities: Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	2	
#3	2	
#4	5	
Total	10	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(c) 	B1	

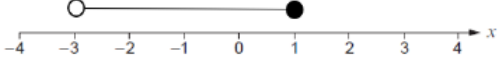
#2

Component 2: Higher Tier	Mark	Comment
(c) Yes indicated and clear explanation e.g. '–1 should not be included.' 'x can only be 0, 1, 2 or 3' '1 < –1 + 2 ≤ 5 is incorrect' '1 < 1 ≤ 5 is incorrect'	E1	Yes may be implied if a box is not ticked Allow Yes with 'x can be 0, 1, 2 or 3'
(d) Empty circle at –2 with arrow right	B1	If a line not an arrow, then line must extend to near the end of the number line; must be no indication of termination on the right.

#3

Component 2: Higher Tier	Mark	Comment
(b) $4x > 17 + 3$ oe $x > 5$	M1 A1	Mark final answer; no marks for use of "=", unless finally replaced to give $x > 5$ then award M1 A1.

#4

Component 2: Higher Tier	Mark	Comment
(b)(i) $11 + 5 < 4n - n$ or $n - 4n < -5 - 11$ $16 < 3n$ or $-3n < -16$ $\frac{16}{3} < n$ oe or $n > \frac{16}{3}$ oe	B1 B1 B1	Implies the first B1 ISW. Allow $5.33... < n$ or $n > 5.33...$ If $n > 5.3$ without $n > \frac{16}{3}$ award B1 B1 B0 FT from $16 < an$ or $b < 3n$ OR $-3n < c$ or $-dn < -16$ where a, b, c and d > 0 Use of equal signs is not awarded the marks unless finally replaced.
(b)(ii) 6	B1	FT 'their $n > \frac{a}{b}$ where $a > b$
(d) 	B1	

Inequalities (Graphs): Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
Total	3	

Marking Scheme

#1

Component 2: Higher Tier	Mark	Comment
(a) $x > -2$	B1	
$y \geq 3x + 1$	B2	B1 for one of the following: $y > 3x + 1$ $y = 3x + 1$ $y < 3x + 1$ $y \leq 3x + 1$ $y \geq kx + 1$ with $k > 1$ $y \geq 3x (\pm k)$

Changing the subject: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	5	
#3	3	
Total	12	

Marking Scheme

#1

Component 1: Higher Tier	Mark	
$a^3b + 35 = 7c$ or $\frac{a^3b}{7} = c - 5$	B1	FT until second error; marks may be awarded in a different order
$a^3b = 7c - 35$ or $a^3b = 7(c - 5)$	B1	
$a^3 = \frac{7c - 35}{b}$ or $a^3 = \frac{7(c - 5)}{b}$	B1	
$a = \sqrt[3]{\frac{7c - 35}{b}}$ or $a = \sqrt[3]{\frac{7(c - 5)}{b}}$	B1	
	(4)	Mark final answer

#2

For squaring both sides e.g $(x + y)^2 = 2(xy + w)$ or equivalent, seen or implied	B1	FT until second error where possible; a first line of $x^2 + y^2 = 2(xy + w)$ implies the first B1
$x^2 + y^2 + xy + yx = 2xy + 2w$ or better	B2	FT B1 FT for 3 out of 4 terms correct in $(x + y)^2 = x^2 + xy + yx + y^2$ or for $x^2 + y^2 + 2xy = 2xy + w$ or for $x^2 + y^2 + 2xy = 4xy + 2w$
$x^2 = 2w - y^2$	B1	Omission of $(2)xy$ in expansion of $(x + y)^2$ counts as one error FT for collection of 'their x terms' to one side and all other terms to the other
$x = \pm\sqrt{2w - y^2}$ CAO	B1	Mark final answer Allow $x = \sqrt{2w - y^2}$; the final subject must be x If B1 B2 B0, allow SC1 for a final answer of $x = \pm\sqrt{2w + y^2}$
	(5)	

#3

$6x + 6y = 8x - 5$	B1	FT until 2nd error; Expands brackets
$6y + 5 = 8x - 6x$	B1	FT; collects terms; implies first B1
$x = \frac{6y + 5}{2}$	B1	FT; divides; mark final answer; final answer may be unsimplified e.g. $x = \frac{-5 - 6y}{6 - 8}$
	(3)	

Changing the subject: Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	2	
#3	2	
#4	2	
#5	4	
#6	4	
Total	15	

Marking Scheme

#1

Component 2: Higher Tier	Mark	Comment
(c) $x = \frac{a}{b}$	B1	Do not allow $x = a \div b$

#2

Eduqas Autumn 2019 C2 Higher Tier		
(d) $e = (\pm) \frac{t^2}{3}$	B2	B1 for $e = \frac{t^x}{3}$ or $e = yt^2$, where $x \neq 0$ and $y \neq 0$

#3

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
$R = \frac{p^3}{q}$	B2	B1 for one of the following: $RQ = P^3$ $R = P^3 \div Q$ $\frac{p^3}{q}$ (R omitted) B0 for $P^3 \div Q$
	(2)	

#4

Component 2: Higher Tier	Mark	Comment
$\frac{g + 3f}{4} = e$	B2	B1 for $g + 3f = 4e$ or $-g - 3f = -4e$ If no marks, award SC1 for an answer of $\frac{g - 3f}{4} = e$
	(2)	

#5

Component 2: Higher Tier	Mark	Comments
$a = 7x + 7y^5 + 2$ $a - 7x - 2 = 7y^5$ $\frac{a-7x-2}{7} = y^5$ $y = \sqrt[5]{\frac{a-7x-2}{7}}$	B1 B1 B1 B1	FT each step until second error Expand brackets Isolate $7y^5$ Isolate y^5 Mark final answer
<u>Alternative method</u> $a - 2 = 7(x + y^5)$ $\frac{a-2}{7} = x + y^5$ or $a - 2 = 7x + 7y^5$ $\frac{a-2}{7} - x = y^5$ or $\frac{a-2-7x}{7} = y^5$ $y = \sqrt[5]{\frac{a-2}{7} - x}$ or $y = \sqrt[5]{\frac{a-2-7x}{7}}$	B1 B1 B1 B1	FT each step until second error Mark final answer
	(4)	

#6

(a) $w = 7/e$	B1	CAO. Accept $7/e = w$
(b) $3w + 15 - f = g$ or $3w + 15 = f + g$ $3w = f + g - 15$ $w = \frac{f + g - 15}{3}$	B1 B1 B1	FT until 2 nd error occurs Mark final answer <u>Alternative method:</u> $w + 5 - f/3 = g/3$ B1 $w = g/3 + f/3 - 5$ B2
	(4)	Mark final answer, if further incorrect manipulation, award final B1 not final B2

Changing the Subject (when the subject appears more than once): Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	5	
#3	4	
Total	13	

Marking Scheme

#1

Component 1: Higher Tier	Mark	Comment
Clears the root and simplifies e.g. $64x^3 = 7y + xy$ si	B2	FT expressions of equivalent difficulty until 2nd error; marks can be awarded in a different order B1 for $(4x)^3 = 7y + xy$ si; Implied by e.g. $kx^3 = 7y + xy$ where $k \neq 0$ or 64 OR $64x = 7y + xy$
Factorises e.g. $64x^3 = y(7+x)$ or $(4x)^3 = y(7+x)$	B1	FT
Divides e.g. $y = \frac{64x^3}{7+x}$	B1	FT; final answer must be simplified
	(4)	

#2

Component 1: Higher Tier	Mark	Comment
$9e^2 = 7 - de^2$	B1	FT until 2 nd error for equivalent level of difficulty Squaring both sides Allow 3^2e^2 or $(3e)^2$ for $9e^2$
$9e^2 + de^2 = 7$	B1	Isolating terms in e^2
$e^2(9 + d) = 7$	B1	Factorising
$e^2 = \frac{7}{9+d}$	B1	Isolating e^2
$e = (\pm) \sqrt{\frac{7}{9+d}}$	B1	Taking square root. Mark final answer.
	(5)	

#3

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	
$3(x + y) = wy + 7$ or $3x + 3y = wy + 7$ oe	B1	FT if of equivalent difficulty until 2nd error Clears the fraction
$3y - wy = 7 - 3x$ or $3x - 7 = wy - 3y$ oe	B1	FT; collects terms
$y(3 - w) = 7 - 3x$ or $3x - 7 = y(w - 3)$ oe	B1	FT; factorises; allow omission of closing bracket
$y = \frac{7 - 3x}{3 - w}$ or $y = \frac{3x - 7}{w - 3}$ oe	B1	FT; divides
(4)		

Simplifying Algebraic Fractions: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	5	
Total	5	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	
(b) $(2x+1)(2x-1)$	B2	Allow for $4\left(x^2 - \frac{1}{4}\right) = 4\left(x - \frac{1}{2}\right)\left(x + \frac{1}{2}\right)$ B1 for sight of $(2x)^2 - 1^2$; allow for sight of $(2x)^2 - 1$
$6x^2 - 13x + 5 = (2x-1)(3x-5)$ soi	B2	B1 for $6x^2 - 13x + 5 = (2x \dots 1)(3x \dots 5)$
$\frac{2x+1}{3x-5}$	B1	CAO; mark final answer

Simplifying Algebraic Fractions: Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
Total	4	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(Numerator =) $(2x + 5)(2x - 5)$	B2	B1 for sight of $(2x)^2 - 5^2$
(Denominator =) $3x(2x - 5)$	B1	
$\frac{2x+5}{3x}$ oe	B1	Mark final answer. FT provided no more than 1 previous error and simplification required.
	(4)	

Straight-line Graphs: Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
Total	3	

Marking Scheme

#1

(a) $y = 4x + 7$	B3	Must be given as an equation B2 for sight of $y = 4x (+ \dots)$ or $m = 4$, OR B1 for sight of $y = (\dots x) + 7$ or $c = 7$
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Parallel and Perpendicular gradients: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	2	
#3	3	
#4	4	
#5	6	
#6	7	
Total	23	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment
$y = k - 4x$ with $k \neq 12$	B1	Accept the equation of a different parallel line in any form e.g. $2y = -8x$
	(1)	

#2

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	
(a)(ii) $y = 3x + 2$ only indicated	B1	
(b) $y = 4x$ only indicated	B1	

#3

Component 1: Higher Tier	Mark	Comment
(a) Correctly rewriting the equations in the form $y = mx + c$ $y = 4x + 3$ AND $y = 4x - 6.5$ (So lines parallel)	B3	B2 for: - one correct equation and a correct but incomplete rearrangement of the other seen e.g. $y = 4x - 6.5$ and $3y = 12x + 9$ - both in the form $y = 4x + c$ with an error in one constant term, provided constants aren't equal. e.g. $y = 4x - 6.5$ and $y = 4x + 9$ B1 for: - one correct equation $y = 4x - 6.5$ or or $y = 4x + 3$ - two equations of the form $y = 4x + \dots$ with errors in both constant terms or no constant terms. Allow all marks for equivalent complete methods e.g. $6y - 24x = 18$ AND $6y - 24x = -39$ or $(3y = 12x + 9$ AND $3y = 12x - 19.5)$ and a clear statement that the two equations are of the same form and the only difference is the constant, so they are parallel.

#4

Component 1: Higher Tier	Mark	
(a) $y = 4x - 5$ only indicated	B1	
(b) $\frac{9-3}{2a-a}$ oe, si	B1	
$\frac{9-3}{2a-a} = \frac{3}{4} \times \left(\frac{2}{2}\right)$ oe, si	M1	FT 'their derived gradient' providing numerator or denominator correct. $2a - a = 8$
(a =) 8	A1	Award B1 M1 for change in $y = 6$ and change in $x = 8$. CAO
	(4)	

#5

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	
-2	B2	B1 for $\frac{16-4}{-5-5}$ with at most one arithmetic error oe, si; may be implied by a right-angled triangle drawn with dimensions 'their 20' and $(-)10$ or 20 and 'their $(-)10$ ' marked and 'their $\frac{y \text{ diff}}{x \text{ diff}}$ ', which must be negative, calculated; If no marks, award SC1 for a derived answer of 2.
(0, 6)	B2	May be on diagram B1 for each correct coordinate or for sight of $\left(\frac{-5+5}{2}, \frac{16-4}{2}\right)$
$y = \frac{1}{2}x + 6$ leading to $2y = x + 12$	B2	FT 'their 6' and 'their -2' for B1 B1 for $y = \frac{1}{2}x + c$ or for $y = kx + 6$ $k \neq 0$ If B2 B2 B0, award SC1 for showing $2y = x + 12$ is the same as $y = \frac{1}{2}x + 6$ and that $-2 \times \frac{1}{2} = -1$ and that (0, 6) is on the line $y = \frac{1}{2}x + 6$
	(6)	

#6

(a) $m = 2$ si $c = 1$ si $y = 2x + 1$	B1 B1 B1	could be gradient = 2 could be y-intercept = 1 Implies all 3 marks
(b) $m = -0.5$ si (midpoint =) (1, 3) $3 = -0.5(1) + c$ $y = -0.5x + 3.5$ ISW	B1 B1 M1 A1	FT 'their gradient AB'; must be clear indication of being the gradient FT 'their -0.5' provided $\neq 2$; Accept other full methods e.g. $\frac{y-3}{x-1} = \text{'their } -0.5 \text{'}$ or $y-3 = \text{'their } -0.5 \text{'}(x-1)$ Accept any correct form e.g. $\frac{y-3}{x-1} = -0.5$ or $y-3 = -0.5(x-1)$
	(7)	

Parallel and Perpendicular gradients: Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	3	
#3	5	
#4	6	
Total	16	

Marking Scheme

#1

(b) $y = 8x + 3$ and $y - 8x - 8 = 0$, with no other equations indicated	B2	B1 for both correct answers with another equation also indicated, or B1 for one correct selection with at most one incorrect selection
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#2

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(Gradient of the perpendicular line =) -2	B1	May be implied in later working
$5 = -2 \times -1 + c$ or $(y - 5) = -2(x + 1)$ oe or $y = -2x + 3$	M1	FT for gradients of 2 and $-\frac{1}{2}$ only
$2x + y - 3 = 0$ or $-2x - y + 3 = 0$	A1	FT Allow $y + 2x - 3 = 0$ oe Mark final answer <u>Note:</u> B0 M1 A1 for the following Gradient of 2 leading to $2x - y + 7 = 0$ oe Gradient of $-\frac{1}{2}$ leading to $x + 2y - 9 = 0$ oe
	(3)	

#3

Component 2: Higher Tier	Mark	Comment
(a) (gradient =) -4	B1	May be seen as: $y = -4x + c$ or $4x = c - y$ where c may be numeric but $c \neq 5$
$-1 = -4(1) + c$ or $4(1) = c - (-1)$ oe	M1	FT 'their -4'
$y = -4x + 3$ or $y = 3 - 4x$ $y = -4x + 5$ is B0 M0 A0 (the original) $y = -4x - 3$ probably from using $(-1, 1)$ check B1 M0 A0	A1	CAO If gradient of 4 used, award M1 and SC1 for an answer of $y = 4x - 5$ if appropriate working seen
(b) $y = 5x + 7$ oe	B2	B1 for gradient = 5, may be seen in an equation e.g. $y = 5x + c$
	(5)	

#4

Component 2: Higher Tier	Mark	Comment
(b) (Gradient of AB =) . -4	B1	FT 'their gradient of AB'
(Gradient of perpendicular bisector =). $\frac{1}{4}$	B1	
(Mid-point of AB =) (-1, 2)	B1	
$y - 2 = \frac{1}{4}(x - (-1))$ or $2 = \frac{1}{4}x - 1 + c$ oe	M1	FT 'their perpendicular bisector gradient' and 'their mid-point'
$4y - 8 = x + 1$ or $y = \frac{1}{4}x + 2\frac{1}{4}$ oe or better	A1	Allow any correct intermediate step.
for convincingly showing $4y = x + 9$	A1	CAO

Simultaneous Equations (Graphically): Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	2	
#3	2	
Total	5	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	
(a)(i) Answer in range 0.8 to 0.9	B1	Allow answer in range 0.8 to 0.9 and $\frac{5}{6}$ but do not allow $\frac{5}{6}$ only (question requires use of graph); must be the only answer not for coordinates as final answer

#2

Component 1: Higher Tier	Mark	
(a) $x = 0.7$ or 0.8 $y = 1.4$ or 1.5	B1 B1	If no marks award SC1 for one of the following: - a value of x between 0.7 and 0.8 (including $\frac{7}{9}$) <u>and</u> a value of y between 1.4 and 1.5 (including $1\frac{4}{9}$ or $\frac{13}{9}$), - correct values given as coordinates in the working lines, - correct answers, written to 1 decimal place, reversed.

#3

(a) $x = -1.6$ or -1.7 $y = 1.3$ or 1.4	B1 B1	If no marks then SC1 for a value of x between -1.6 and -1.7 and a value of y between 1.3 and 1.4 or for correct values given as coordinates
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Simultaneous Equations (algebraic): Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
Total	2	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment
(b) $x = 3$ $y = 2$	B1 B1	

Simultaneous Equations (algebraic): Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	3	
Total	6	

Marking Scheme

#1

Component 2: Higher Tier	Mark	Comment
(d)		No marks for T&I; no marks for an unsupported answer.
Method to eliminate an unknown e.g. equal coefficients AND appropriate addition or subtraction	M1	Allow one error in one term, not in the equated coefficients
or rearranges one equation and substitutes into the other		
Finds one unknown	A1	CAO; $x = 3.5$, $y = -0.5$
Finds the other unknown	A1	FT 'their x ' or 'their y ' used in one of their equations

#2

Component 2: Higher Tier	Mark	Comment
(c)		No marks for T&I; no marks for an unsupported answer.
Method to eliminate an unknown e.g. equal coefficients and subtraction	M1	Allow one error in one term, not in the equated coefficients if appropriate
or rearranges one equation and substitutes into the other		
Finds one unknown	A1	CAO; $x = 2$, $y = -3$
Finds the other unknown	A1	FT 'their x ' or 'their y ' used in one of their equations

Simultaneous Equations (forming and solving): Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	5	
Total	5	

Marking Scheme

#1

(b) $2a + 3c = 72$ and $3a + c = 66$ Method to eliminate an unknown e.g. equal coefficients and subtraction Finds one unknown Finds the other unknown (£)15(.00)	B1 M1 A1 A1 B1	May use other letters or words throughout this part FT their equations provided one is correct and the other is linear in the same pair of unknowns or rearranges one equation and substitutes into the other Allow one error in one term, not in the equated coefficients CAO; $a = 18$ or $c = 12$ FT 'their a' or 'their c' used in one of their equations FT $2(\text{'their derived } a') + 2(\text{'their derived } c') - 45$ provided $2(\text{'their derived } a') + 2(\text{'their derived } c')$ is greater than 45
		<u>Alternative method:</u> Adult ticket costs £18, child ticket costs £12 found using trials B4 (£)15(.00) FT $2(\text{'their derived } a') + 2(\text{'their derived } c') - 45$ provided $2(\text{'their derived } a') + 2(\text{'their derived } c')$ is greater than 45 B1

Simultaneous Equations (forming and solving): Calculator

Question	Maximum Mark	Mark Awarded
#1	5	
#2	6	
Total	11	

Marking Scheme

#1

$7a + 2g = 6(.)15$ AND $5a + 8g = 9(.)19$	B1	Both equations are required for the award of B1
Method to eliminate variable, e.g. equal coefficients and method to find second variable	M1	FT provided at least one equation is correct and the other is of equivalent difficulty. Allow 1 error in one term, not one with equal coefficients
First variable	A1	a = 67(p) or a = (£ 0).67 or g = 73(p) or g = (£ 0).73
Second variable	A1	FT their first variable provided M1 previously awarded
(£)4.99	B1 (5)	CAO, not FT

#2

$6c + 3r = 24(.)60$ AND $5c + 2r = 18(.)60$	B1	Both equations given, c & r may be other letters, words are accepted
Method to solve simultaneous equations, allow an error but not in the equated variable with an attempt to subtract	M1	FT provided at least one equation is correct and consistent place value, with equivalent level of difficulty Allow 1 error in one term, not one with equal coefficients
First variable correct	A1	Accept in £ or p Curtain £2.20 Rail £3.80
Method to calculate second variable	m1	FT their first variable provided M1 previously awarded
Second variable correct	A1	Accept in £ or p
$(40 - (7c+5r) = 40 - 34.40 =)$ (£)5.6(0) or 560(p)	B1 (6)	FT 'their c' and 'their r' provided M1 previously awarded If units are given they must be correct <i>Unsupported answers, no marks</i>

Simultaneous Equations (one quadratic and one linear): Calculator

Question	Maximum Mark	Mark Awarded
#1	6	
#2	6	
#3	7	
Total	19	

#2

$3x + 2 = 4x^2 + 5x - 7$ $4x^2 + 2x - 9 = 0$ $x = \frac{-2 \pm \sqrt{(2^2 - 4 \times 4 \times -9)}}{2 \times 4}$ $x = \frac{-2 \pm \sqrt{148}}{8}$ $x = 1.27069... \text{ or } x = 1.27 \text{ and } x = -1.77069... \text{ or } x = -1.77$ $x = 1.27 \text{ with } y = 5.81 \text{ (or } y = 5.80) \text{ and } x = -1.77 \text{ with } y = -3.31 \text{ (or } y = -3.32)$	M1 A1 Must be equated to zero. '=0' may be implied in further work to solve, if no further work and not '=0' then A0 m1 A1 A1 A1 FT provided M1, m1 previously awarded using their values of x in $3x + 2$ or equivalent to find y-values to 2 d.p. Accept answers given as coordinates <i>Alternative using $x = (y - 2)/3$</i> M1 $y = 4\frac{(y-2)^2}{3^2} + 5\frac{(y-2)}{3} - 7$ or equivalent A1 $4y^2 - 10y - 77 = 0$ or equivalent, must equate to zero m1 $y = \{10 \pm \sqrt{((-10)^2 - 4 \times 4 \times -77)}\} / 2 \times 4$ or equivalent, allow 1 slip in substitution A1 $y = (10 \pm \sqrt{1332}) / 8$ or equivalent A1 $y = -3.312... \text{ or } y = -3.31$ and $y = 5.812... \text{ or } y = 5.81$ A1 $x = 1.27, y = 5.81$ with $x = -1.77, y = -3.31$ FT to final A1, provided M1, m1 previously awarded using their values of y in $(y - 2)/3$ or equivalent to find x-values to 2 d.p. (6)
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#3

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
$3x^2 + 2(x^2 - 6x + 9) = 12$ or better $5x^2 - 12x + 6 = 0$ $(x =) \frac{-(-12) \pm \sqrt{(-12)^2 - 4 \times 5 \times 6}}{2 \times 5}$ $(x =) \frac{12 \pm \sqrt{24}}{10}$ $(x =) 1.68(9..)$ or 1.69 or 1.7 and $0.71(0..)$ or 0.7 (Solutions =) $(1.7, -1.3)$ and $(0.7, -2.3)$	B2 B1 M1 m1 A1 B1	If not B2, award B1 for either: $3x^2 + 2(x - 3)^2 = 12$ or better $3x^2 + 2(x^2 + 6x + 9) = 12$ or better ($y = x + 3$ used) Allow B1 for $5x^2 + 12x + 6 = 0$ (from $y = x + 3$) FT from B1 provided only one error in the expansion of $(x - 3)^2$ and an equation of the form $ax^2 + bx + c = 0$ is obtained with a, b and $c \neq 0$. The equation may be implied by appropriate substitution into the quadratic formula. The substitution into the formula must be seen for M1, otherwise award M0 m0 A0. FT 'their derived $5x^2 - 12x + 6 = 0$' for M1 and possible m1. Allow one slip in substitution for M1 only but must be correct formula. Can be implied from at least one correct value of x evaluated. CAO FT their x values provided M1 awarded. Allow for $x = 1.7, y = -1.3$ and $x = 0.7, y = -2.3$ Must be correct to 1 decimal place.
<u>Alternative Method</u> $3(y^2 + 6y + 9) + 2y^2 = 12$ or better $5y^2 + 18y + 15 = 0$ $(y =) \frac{-(18) \pm \sqrt{(18)^2 - 4 \times 5 \times 15}}{2 \times 5}$ $(y =) \frac{-18 \pm \sqrt{24}}{10}$ $(y =) -1.31(0..)$ or -1.3 and $-2.28(9..)$ or -2.29 or -2.3 (Solutions =) $(1.7, -1.3)$ and $(0.7, -2.3)$	B2 B1 M1 m1 A1 B1	If not B2, award B1 for either: $3(y + 3)^2 + 2y^2 = 12$ or better $3(y^2 - 6y + 9) + 2y^2 = 12$ or better ($x = y - 3$ used) Allow B1 for $5y^2 - 18y + 15 = 0$ (from $x = y - 3$) FT from B1 provided only one error in the expansion of $(y + 3)^2$ and an equation of the form $ay^2 + by + c = 0$ is obtained with a, b and $c \neq 0$. The equation may be implied by appropriate substitution into the quadratic formula. The substitution into the formula must be seen for M1, otherwise award M0 m0 A0. FT 'their derived $5y^2 + 18y + 15 = 0$' for M1 and possible m1 Allow one slip in substitution for M1 only but must be correct formula. Can be implied from at least one correct value of y evaluated. CAO FT their y values provided M1 awarded. Allow for $x = 1.7, y = -1.3$ and $x = 0.7, y = -2.3$ Must be correct to 1 decimal place
	(7)	

Quadratic Graphs: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	3	
#3	4	
#4	5	
#5	7	
Total	21	

Marking Scheme

#1

Component 1: Higher Tier	Mark	Comment
(b) (-2, 9)	B2	B1 for each If no final coordinate given, award B2 for an unambiguous $x = -2$ and $y = 9$ seen in working B1 for one of $x = -2$ or $y = 9$ seen in working

#2

(a) $y = 2(x+1)(x-4)$ oe; ISW	B3	B2 for $y = k(x+1)(x-4)$, where k is -2 or any non-zero positive value e.g. 1 or B1 for a factor of $(x+1)$ or $(x-4)$ seen or implied If no marks then SC2 for an answer of $y = 2(x-1)(x+4)$ or equivalent or SC1 for an answer of $y = k(x-1)(x+4)$ oe, where k is -2 or any non-zero positive value e.g. 1
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#3

Component 1: Higher Tier	Mark	
(b)(i) -8	B1	Allow (0, -8) or $y = -8$
(b)(ii) (-1, -9)	B2	B1 for each. If no final coordinate given, allow: - B2 for an unambiguous $x = -1$ AND $y = -9$ seen in the working - B1 for an unambiguous $x = -1$ OR $y = -9$ seen in the working If no marks, award SC1 for $(-9, -1)$.
(b)(iii) $x = -4, x = 2$	B1	If answer line is not completed, allow $-4, 2$, but do not allow $(-4, 2)$

#4

Component 1: Higher Tier	Mark	Comment
(a) maximum point indicated	B1	
(b) $(x-5)^2 - 16 = 0$ si $5 \pm \sqrt{16}$ or $(x-1)(x-9)$ $x = 1, x = 9$	B1 M2 A1	May be seen in stages M1 for $x-5 = \pm\sqrt{16}$ or $5 + \sqrt{16}$ or $x^2 - 10x + 9 (= 0)$ Not from wrong working; allow (1, 0) and (9, 0) final answer of $x = 9$ only implies M1
	(5)	

#5

(a)														
<table><tr><td>x</td><td>-2</td><td>-1</td><td>-0.5</td><td>0</td><td>1</td></tr><tr><td>y</td><td>1</td><td>-1</td><td>-1.25</td><td>-1</td><td>1</td></tr></table>	x	-2	-1	-0.5	0	1	y	1	-1	-1.25	-1	1	B2	B1 for any two correct
x	-2	-1	-0.5	0	1									
y	1	-1	-1.25	-1	1									
(b)	All 5 correct points plotted correctly and joined with a smooth curve	B2	Mark intent B1 for a smooth curve at least through 3 correct pairs of coordinates or for all of their 5 pairs of coordinates plotted correctly Allow 2 marks here if curve correct even if there is a slip in their table											
(c)	$x = -\frac{1}{2}$ oe	B1	Equation must be stated; check graph; not for $x = -\frac{1}{2} y = -1.25$											
(d)	(x =) 0.5 to 0.7 , -1.5 to -1.7	B2	or FT 'their curve' B1 for one correct root If their curve has more than 2 roots, they must give all their solutions for B2 and may omit one solution only for B1.											
		(7)												

Quadratic Graphs: Calculator

Question	Maximum Mark	Mark Awarded
#1	7	
#2	6	
#3	3	
Total	16	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(a) -4	B1	
(b) All 7 correct points plotted correctly and joined with a smooth curve	B2	Tolerance $\pm$ a small square; FT 'their points' and 'their curve' for 2 marks provided the curve is reasonably parabolic B1 for a smooth curve at least through 4 pairs of coordinates or for all of 'their 7 pairs of coordinates' plotted correctly
(c) -1, 3	B1	Must be exact as values given in the table. Do not award for (-1, 0) and (3, 0)
(d) The line $y = 1$ drawn $x = -1.2$ to -1.3 $x = 3.2$ to 3.3	B1 B1 B1	Allow for appropriate marks on the curve at $y = 1$ for at least one intersection FT 'their curve' provided there are at least 2 intersections; if their curve has more than 2 intersections with $y = 1$, they must give all their solutions for B2. Allow these marks for calculated solutions e.g. $x = -1.2360...$ and $x = 3.2360...$ Award B1 only if both solutions are given as coordinates e.g. (-1.2, 1) and (3.2, 1)
	(7)	

#2

(a) 3	B1	Accept (0, 3) Do not accept (3, 0)
(b) -12	B1	Accept (-3, -12) Do not accept (-12, -3)
(c) (1, 4)	B1	Do not accept '4' or (4, 1)
(d) (-1, 0) and (3, 0)	B2	With no extra coordinates B1 for sight of '-1' and '3'
(e) Sight or indication of 'Yes' with appropriate working shown, e.g. $3 + 16.4 - 67.24 (= -47.84)$	B1 (6)	

#3

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(a) -2.2	B1	CAO B0 for (3.5, -2.2)
(b) 5.6	B2	B1 for $3.5 - 1.4$ or $3.5 + (3.5 - 1.4)$ or clear evidence of attempting one of these. Accept 3.45 to 3.55 as 'their 3.5'
	(3)	

Velocity-Time Graphs (linear): Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
Total	4	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	
(a) Acceleration	B1	Accept rate of change of velocity
(b) $\frac{1}{2} \times 60 \times k + 210 \times k + \frac{1}{2} \times 120 \times k = 2400$ or $\frac{1}{2} \times (210 + 390) \times k = 2400$ or $\frac{1}{2} \times (1) \times k + 3.5 \times k + \frac{1}{2} \times 2 \times k = 2400$ or $\frac{1}{2} \times (3.5 + 6.5) \times k = 2400$	M2	If unit conversion attempted, allow 1 consistent error for M2 Ignore errors in unit conversion for M1 M1 for an attempt to sum at least 2 out of 3 areas with at most one error or for an attempt to find the area of a trapezium with at most one error in the structure of the formula, si
8 (m/s)	A1	CAO Final answer of 480 (metres per minute) implies M2
	(4)	

Velocity-Time Graphs (non-linear): Calculator

Question	Maximum Mark	Mark Awarded
#1	6	
#2	9	
Total	15	

Marking Scheme

#1

(a) $(30 \div 60 =) 0.5 \text{ (km/min)}$	B1	Accept an answer in the range 0.46(km/min) to 0.52(km/min)
(b) Tangent drawn at $t = 17$ <u>difference in y values</u> $(\div 60)$ difference in x values (km/min ²)	B1 M1 A1	Allow with $\div 60$ for change of units omitted for M1 only (Note: 0.01 to 0.03 km/min ²)
(c) $(33 - 44) \div 10$ ($\times 60$) -66 (km/h ²)	M1 A1 (6)	Allow $(44 - 33) \div 10$ ($\times 60$) Allow with $\times 60$ for change of units omitted for M1 only Must be negative

#2

(a) $(9) \div 60 \div 60$ $\times 1000$	M1 M1																	
Reading from graph 16 (seconds)	A2	FT from 'their 2.5(m/s)' provided at least M1 previously awarded A1 for 2.5(...m/s)																
(b) Reasonable statement, e.g. 'tangent at $t = 22$ is almost parallel to the gradient during this period'	E1	Do not accept, e.g. 'positive gradient' Allow, e.g. 'gradient of the tangent is positive', 'the tangent follows the trend'																
(c) Attempt to find at least one point, i.e. value of v for $0 < t \leq 60$ At least 2 correct plots or 2 appropriate values of v Suitable curve between 10 and 60, or 3 values of v evaluated in the interval $10 \leq t \leq 60$, Two times with difference of 2.5 m/s	S1 P1 C1 B1 (9)	<table border="1"><tr><td>t</td><td>(0)</td><td>10</td><td>20</td><td>30</td><td>40</td><td>50</td><td>60</td></tr><tr><td>v</td><td>(7)</td><td>7.1</td><td>7.4</td><td>7.9</td><td>8.6</td><td>9.5</td><td>10.6</td></tr></table> (20 and 51 seconds, allow 20 and 50 seconds)	t	(0)	10	20	30	40	50	60	v	(7)	7.1	7.4	7.9	8.6	9.5	10.6
t	(0)	10	20	30	40	50	60											
v	(7)	7.1	7.4	7.9	8.6	9.5	10.6											

Rate of Change Graphs: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	7	
Total	11	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(a) 0 (cm per year)	B1	
(b) Gradient of the chord joining (10, 145) to (15, 168) $\frac{168 - 145}{15 - 10}$	M2	M1 for the gradient of a chord with one point correct
4.6 (cm per year)	A1	CAO
	(4)	

#2

Component 1: Higher Tier	Mark	Comment
(a) Tangent drawn at time 6 seconds $\frac{\text{Difference in } y}{\text{Difference in } x} \text{ oe}$ Correctly evaluated negative gradient from their tangent	M1 m1 A1	 Allow the m1 if two positive values are used. Accept answer written as a correctly simplified, improper fraction (unless it gives a whole number), mixed number or decimal. If answer is only given as a decimal, it must be correct to 1 decimal place – rounded or truncated. Ignore units.
(b) 17.5 or $\frac{35}{2}$ oe	B2	ISW B1 for $(37 - 2) \div 2$ Ignore units.
(c) Line drawn from (7, 40) to (7.8, 0)	B2	B1 for either - a line from (7, 40) through (7.5, 15) - sight of 48 seconds (from $40 \div 5/6$)
	(7)	

Trapezium Rule: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	5	
#3	8	
Total	16	

Marking Scheme

#1

(a) Valid comment e.g. 'An estimate of the acceleration (at 40 seconds).' or 'How fast the vehicle was accelerating (at 40 seconds).'	E1	Allow acceleration or deceleration only without reference to 'at 40 seconds'. Allow e.g. 'How fast the vehicle was decelerating (at 40 seconds).'
(b)(i) Valid explanation e.g. 'The rectangles are all bigger than the area they are estimating.' or 'The rectangles she has chosen give an overestimate.' or 'The area is overestimated.' or 'It is an overestimate.'	E1	
(b)(ii) Valid improvement e.g. 'She could use some triangles as well as rectangles.' or 'She could use trapezia.' or 'She could use thinner rectangles.' or 'She could lower the height of the first 3 and the last 2 bars so that the top went through a cross.' or 'She could use the trapezium rule.'	E1	Check diagram for information to further explain their comment e.g. drawing the positions of new rectangles
	(3)	

#2

(a) Summation of areas of 4 vertical strips	S1	e.g. trapezium rule or equivalent attempted with trapezia or triangles and rectangles Do not allow for 'counting squares and adding', even if by strip
(y values =) 17, 5, 1, [5, 17] si	B1	ignore extra correct y values for this mark;
Correct calculation for the area using 4 trapezia oe	M1	FT 'their y-values' e.g. $2\left(\frac{1}{2} \times 2 \times (17 + 5) + \frac{1}{2} \times 2 \times (5 + 1)\right)$
56 (square units)	A1	CAO
(b) Overestimate with valid reason e.g. '(The curve is convex so) the area of under the curve for each strip is less than the area of the trapezium estimating that area.'	E1	Allow e.g. 'The trapeziums are above the curve' or 'The curve is convex' Comments must be based on an attempt to find the area using 4 vertical strips in (a)
	(5)	

#3

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment
(a) Sight of tangent at $t = 6$ Uses $\frac{\text{vertical diff}}{\text{horizontal diff}}$ oe Correct evaluation (m/s^2 or ms^{-2})	S1 M1 A1	FT 'their $\frac{\text{vertical diff}}{\text{horizontal diff}}$ '; must be negative; allow improper fractions <i>NB allow full marks if calculus method used.</i>
(b)(i) Summation of areas of strips (v values =) (0) 16, 24, (24, 16, 0) si Correct calculation for the area using 5 strips	S1 B1 M1	e.g. trapezium rule or equivalent attempted with trapezia/triangles/rectangles Ignore extra correct v values for this mark; accept mid-ordinates 9, 21, 25, (21, 9) FT 'their v -values' e.g. $2\left(\frac{1}{2} \times 2 \times 16 + \frac{1}{2} \times 2 \times (16 + 24)\right) + 2 \times 24$ or $2\left(\frac{1}{2} \times 2 \times 16 + 2 \times 20 + 1 \times 24.5\right)$ or $2\left(\frac{1}{2} \times 2 \times 16 + \frac{1}{2} \times 2 \times (16 + 24)\right) + 2 \times 25$ (using mid-ordinates) $2(9 \times 2) + 2(21 \times 2) + 25 \times 2$ M0 if only using rectangles except for use of mid-ordinate rule approaches
160 or 161 or 162 (square units)	A1	FT; mid-ordinates give 170
(b)(ii) Distance (travelled in metres)	E1 (8)	

Trapezium Rule: Calculator

Question	Maximum Mark	Mark Awarded
#1	7	
Total	7	

Marking Scheme

#1

Component 2: Higher Tier	Mark	Comment
(a)		
Reasonable tangent drawn at $t = 3.5$	S1	
Calculates $\frac{\text{vertical diff}}{\text{horizontal diff}}$	M1	FT 'their tangent' provided S1 awarded
Correct gradient	A1	FT 'their $\frac{\text{vertical diff}}{\text{horizontal diff}}$ '; must be negative
(b)		
Correct calculation for the area using 3 trapezia and 2 triangles oe e.g. $\frac{1}{2} \times (1) \times 15 + \frac{1}{2} \times (1) \times (15 + 35) + \frac{1}{2} \times (1) \times (35 + 32)$ $+ \frac{1}{2} \times (1) \times (32 + 25) + \frac{1}{2} \times (1) \times 25$	M3	Allow 14 to 15 and 24 to 25 for v at $t = 1$ and $t = 4$ M2 for a correct calculation with one error (possibly repeated) in a v value or M1 for a sum of 5 areas using strips of equal width with at most 2 errors
107 (metres)	A1	FT Accept answer in range 105 to 109 inclusive with working; ignore any units if stated
	(7)	

Kinematics: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	3	
Total	6	

Marking Scheme

#1

Component 1: Higher Tier	Mark	
$\frac{v-6}{15-5}$ $\frac{v-6}{15-5} = 0.5$ $(v =) 11 \text{ (m/s)}$	S1 M1 A1	Forms a gradient in terms of v FT 'their $\frac{\text{vertical diff}}{\text{horizontal diff}}$; implies the S1
Alternative method 1 $v = u + at$ with $u = 6, a = 0.5, t = 10$ $6 + (0.5)(10)$ $(v =) 11 \text{ (m/s)}$	S1 M1 A1	Implies the S1
Alternative method 2 Right-angled triangle drawn with horizontal 10 marked or use of $a = \frac{\text{change in } v}{\text{change in } t}$ $0.5 \times 10 \text{ (+6)}$ $(v =) 11 \text{ (m/s)}$	S1 M1 A1	Implies the S1
Alternative method 3 $v = 0.5t + 3.5$ $v = 0.5(15) + 3.5$ $(v =) 11 \text{ (m/s)}$	S1 M1 A1 (3)	Finds the equation of the line; allow in terms of y and x: $(y = v, x = t)$ $y = 0.5x + c$ $6 = 0.5(5) + c$ $c = 3.5$

#2

Component 1: Higher Tier	Mark	Comment
$\frac{12 - w}{10 - 5}$ or $\frac{w - 12}{10 - 5}$ $\frac{w - 12}{10 - 5} = -1.5$ or $\frac{12 - w}{10 - 5} = 1.5$ $w = 4.5 \text{ (m/s)}$	S1 M1 A1	Implies S1 Allow for $\frac{w - 12}{10 - 5} = 1.5$ CAO An answer of $w = 19.5$ is awarded S1 M1 A0 provided no incorrect working seen.
<u>Alternative method</u> Use of $v = u + at$ with $u = 12$, $a = -1.5$, $t = 5$ $12 - 1.5 \times 5$ $w = 4.5 \text{ (m/s)}$	S1 M1 A1	Allow S1 and M1 for use of $a = 1.5$ Implies S1 CAO
	(3)	

Reciprocal Graphs: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	6	
Total	7	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment
(b) Valid criticism e.g. 'The graphs are not labelled so you cannot tell which is which' or 'None of the branches should cross the x -axis'	E1	Allow e.g. 'There is no scale so she might have drawn something like $\frac{2}{x}$ and $-\frac{2}{x}$.'

#2

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment
(a)(i) Valid explanation e.g. 'There is no value for which $0 \times \dots = 1$ ' or '1 cannot be divided by 0' or 'Because if one of them is zero, the product would be zero not 1'.	E1	Allow e.g. ' $x = \frac{1}{y}$, $y = \frac{1}{x}$ if x or y can be zero these have no value' Do not allow e.g. 'Because then the value could not be 1' without further explanation
(a)(ii) Correct graph: One branch in 1st quadrant, not touching either axis and correct shape One branch in 3rd quadrant, not touching either axis and correct shape	B2	For 2 marks, must be 2 distinct curves; allow some slight curving back at ends B1 for either branch correct If no marks, SC1 for both branches correct but joined e.g. with a straight line.
(a)(iii) inversely	B1	allow poor spelling; allow 'inverse' or 'not directly' or 'not in direct' or 'not direct' or 'not' or 'indirectly' Do not allow e.g. 'invertional' or 'inversamental'
(b) 5×0.1^2 oe, si	M1	Substitutes and rearranges; may be in stages; implied by e.g. $\frac{V}{0.1^2} = 5$, $\frac{V}{0.2} = 5$, $V = 5 \times 0.2$ (must be clear that '0.2' is what they think is 0.1^2)
0.05 oe	A1 (6)	Implies M1

Exponential Graphs: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
Total	2	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment
(b) Substitutes a pair of co-ordinates with non-zero x co-ordinate into $y = k^x$	S1	not from wrong working; implies S1
4	B1	

Trigonometric Graphs: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	4	
#3	4	
Total	11	

Marking Scheme

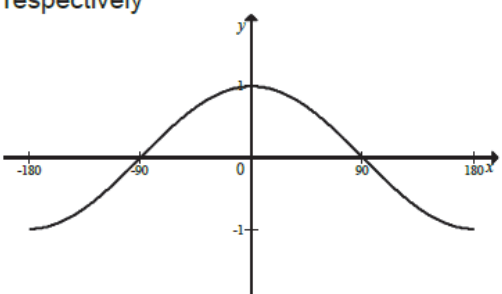
#1

(a) Correct sine graph over full domain with maxima and minimum at 1 and -1 respectively	B2	B1 for correct shape over full domain but 1 and -1 not marked or for correct roots, maxima and minimum but incorrect shape e.g. ruled sections or for the correct curve from 0° to 360° with 1 and -1 marked
(b) 4	B1	
	(3)	

#2

(a) Correct tangent graph over full domain	B2	B1 for asymptotes at $x = 90^\circ$ and $x = 270^\circ$ and correct shape for at least one complete and continuous section; be generous with shape
(b) 45° and 225°	B2	with no extras in range B1 for either, ignoring extras, or for $180 + \text{'their } 45\text{'}$ providing 'their 45' is acute If no marks then SC1 for sight of $\tan 45 = 1$
	(4)	

#3

Component 1: Higher Tier	Mark	
(a)(i) Correct cosine graph over full domain with minima and maximum at -1 and 1 respectively 	B2	B1 for correct shape over full domain but 1 and -1 not marked OR for correct roots, minima and maximum but incorrect shape e.g. ruled sections OR for the correct curve from at least 0° to 180° with 1 and -1 marked
(a)(ii) $30^\circ, -30^\circ$	B2	And no extras in range B1 for either, ignoring extras; if no marks, award SC1 for stating $\cos 30 = \frac{\sqrt{3}}{2}$

Trigonometric Graphs: Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	4	
#3	4	
Total	11	

Marking Scheme

#1

(a) Correct sketch	B1	
(b) 23.578....(°) and 156.42...(°) alone	B2	B1 for either angle Accept rounding and truncation of angles
	(3)	

#2

Component 2: Higher Tier	Mark	Comment
(a) 136.9(7...) or 137(°) AND 223(°) with no other values	B2	B1 for either angle. Allow embedded answers. Penalise -1 for each additional incorrect value. Ignore additional correct values outside the range for B2 or B1. If no marks award SC1 for answers of 136(°) AND 224(°) with no other values
(b) A correct translation through $\begin{pmatrix} 0 \\ -1 \end{pmatrix}$ with at least -2 indicated on the y axis and 180 and 360 indicated on the x axis.	B2	B1 for a correct translation through $\begin{pmatrix} 0 \\ -1 \end{pmatrix}$ without labels on the axes.
	(4)	

#3

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(a) Correct sketch with inflection points at (0,0), (180, 0) and (360,0) AND graph tending towards the vertical asymptotes at $x = 90$ and $x = 270$	B2	If vertical asymptotes not seen, they may be implied by a break in the curve of 'their sketch' at $x = 90$ $x = 270$ provided there is asymptotic behaviour. Graph must be attempted from $x = 0$ to $x = 360$. Ignore continuation of sketch beyond these values. B1 for sketch with inflection points at (0,0), (180, 0) and (360,0) only OR vertical asymptotes seen at 90 and 270 only
(b) 40 and 220 and no others in the range	B2	B1 for either one
	(4)	

Translation of Graphs: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	2	
#3	2	
#4	4	
Total	9	

Marking Scheme

#1

(a) No implied or indicated with valid explanation e.g. '(All the y-coordinates change sign so) it is a reflection in the x-axis'	E1	
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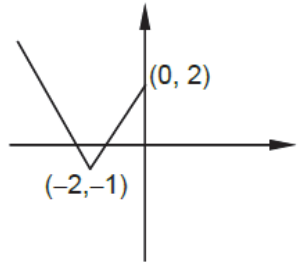
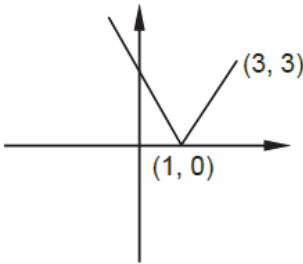
#2

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	
(b) Reflection in the x-axis	B1	Mark intent
(-2, 1) and (-6, -0.5) indicated	B1	CAO

#3

(b) Translation through $\begin{pmatrix} 0 \\ k \end{pmatrix}$ where $k > 0$	B1	
A(-2, 1) and B(2, 5) seen or scales marked	B1	

#4

Component 1: Higher Tier	Mark	
(b)(i) Translation through $\begin{pmatrix} 0 \\ k \end{pmatrix}$, where $k < 0$ Correct coordinates seen or scale marked	B1 B1	Allow good freehand 
(b)(ii) Translation through $\begin{pmatrix} k \\ 0 \end{pmatrix}$, where $k > 0$ Correct coordinates seen or scale marked	B1 B1	Allow good freehand 

Translation of Graphs: Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	5	
Total	9	

Marking Scheme

#1

Component 2: Higher Tier	Mark	Comment
(a)(i) Reflection in y -axis	B1	Ignore coordinates for this mark; graph must be in 1st quadrant, starting at origin and ending at a point on the x -axis
Correct coordinates seen or scale marked	B1	$A(3, 0)$ and $B(1, 1)$
(a)(ii) Translation through $\begin{pmatrix} 0 \\ k \end{pmatrix}$ where $k > 0$	B1	Ignore coordinates for this mark; graph must be in 2nd quadrant, but mark intent for the end points to have the same y -coordinate
Correct coordinates seen or scale marked	B1	$A(-3, 2)$ and $B(-1, 3)$

#2

(a) Reflection in the x -axis $(0, 2)$	M1 A1	Accept 2 indicated correctly on the y -axis
(b) Horizontal translation Correct translation with $(1, 0)$ and $(3, 0)$ indicated on the x -axis	B1 B2	Any horizontal translation without including any other transformation Accept indication of 1 and 3 on the x -axis with the correct translation B1 for a correct translation with only one of the values 1 and 3 indicated, or for a horizontal translation with $(-1, 0)$ and $(1, 0)$ indicated on the x -axis as intersections, or for a horizontal translation to show $y = g(x)$ with $(0, 0)$ and $(2, 0)$ indicated on the x -axis as intersections

Identities: Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
Total	3	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(a) $14x^2 - 16xy - 3xy + 15y^2$ convincingly leading to $14x^2 - 19xy + 15y^2$	B2	B1 for either $14x^2 - 16xy$ or $-3xy + 15y^2$
(b) A correct explanation e.g. 'The expression is true for all values of x and y.' 'It is always true'	E1	Allow, e.g. 'The different expressions have the same value.' 'To show the two expressions are identical.' Do not allow, e.g. 'It means they are identical.' 'It represents the same thing written in different ways.' Explanations involving equations.
	(3)	

Algebraic Proof: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
Total	2	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment																								
(a) $(n+1)(n+2)$ odd $\times$ even $\rightarrow$ even (since $n+1$ and $n+2$ are consecutive numbers so one will be odd and one even)	B1 B1	Allow $n(n+3) + 2$ with (odd $\times$ even) or (even $\times$ odd) is even then $+ 2$ is even Suitable complete explanation.																								
<u>Alternative method 1 - using expansion of odd and even expressions</u> $(2k)^2 + 3(2k) + 2 = 4k^2 + 6k + 2$ AND 'all terms even' AND $(2k+1)^2 + 3(2k+1) + 2 = 4k^2 + 10k + 6$ AND 'all terms even'	B2	B1 for working correct expansion, simplification and justification of either $(2k)^2 + 3(2k) + 2$ OR $(2k+1)^2 + 3(2k+1) + 2$																								
<u>Alternative method 2 – using combinations of odd and even terms</u> Correct justification e.g. if n is odd then $n^2 + 3n + 2$ is odd + odd + even $\rightarrow$ even AND if n is even then $n^2 + 3n + 2$ is even + even + even $\rightarrow$ even	B2	B1 for justification with either odd OR even values for n. OR B1 for at least 4 correctly evaluated terms from substituting two (or more) odd values AND two (or more) even values of n. <table><tr><td>n</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>n^2+3n+2</td><td>6</td><td>12</td><td>20</td><td>30</td><td>42</td></tr></table> <table><tr><td>n</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr><tr><td>n^2+3n+2</td><td>56</td><td>72</td><td>90</td><td>110</td><td>132</td></tr></table>	n	1	2	3	4	5	n^2+3n+2	6	12	20	30	42	n	6	7	8	9	10	n^2+3n+2	56	72	90	110	132
n	1	2	3	4	5																					
n^2+3n+2	6	12	20	30	42																					
n	6	7	8	9	10																					
n^2+3n+2	56	72	90	110	132																					

Algebraic proof: Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
Total	3	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(c) $2n + 2$ and $2n + 4$ $(2n + 2n + 2 + 2n + 4 =) 6n + 6$	B1	oe
	B1	FT $2n +$ 'their $2n + 2$ ' + 'their $2n + 4$ '
Convincing statement of divisibility by 6 e.g. $= 6(n + 1)$ or 'both terms divide by 6'	E1	oe

Trial and Improvement / Iteration: Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	4	
#3	2	
#4	4	
#5	5	
#6	4	
Total	23	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment																
		Correct evaluation regarded as enough to identify if < 0 or > 0 . If evaluations not seen accept 'too high' or 'too low'. <u>Note:</u> Some candidates may test $2x^3 - 5x = 23$																
One correct evaluation $2 \leq x \leq 3$	B1	<table><tr><th>x</th><th>$2x^3 - 5x - 23$</th><th></th><th></th></tr><tr><td>2</td><td>-17</td><td>2.62</td><td>-0.130...</td></tr></table>	x	$2x^3 - 5x - 23$			2	-17	2.62	-0.130...								
x	$2x^3 - 5x - 23$																	
2	-17	2.62	-0.130...															
2 correct evaluations $2.55 \leq x \leq 2.75$, one < 0 , one > 0 .	B1	<table><tr><td>2.1</td><td>-14.978</td><td>2.63</td><td>0.232...</td></tr><tr><td>2.2</td><td>-12.704</td><td>2.64</td><td>0.559....</td></tr><tr><td>2.3</td><td>-10.166</td><td></td><td></td></tr><tr><td>2.4</td><td>-7.352</td><td></td><td></td></tr></table>	2.1	-14.978	2.63	0.232...	2.2	-12.704	2.64	0.559....	2.3	-10.166			2.4	-7.352		
2.1	-14.978	2.63	0.232...															
2.2	-12.704	2.64	0.559....															
2.3	-10.166																	
2.4	-7.352																	
2 correct evaluations $2.55 \leq x \leq 2.65$, one < 0 , one > 0 .	M1	<table><tr><td>2.5</td><td>-4.25</td><td>2.55</td><td>-2.587...</td></tr><tr><td>2.6</td><td>-0.848</td><td>2.65</td><td>0.969...</td></tr><tr><td>2.7</td><td>2.866</td><td>2.75</td><td>4.843...</td></tr></table>	2.5	-4.25	2.55	-2.587...	2.6	-0.848	2.65	0.969...	2.7	2.866	2.75	4.843...				
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2.6	-0.848	2.65	0.969...															
2.7	2.866	2.75	4.843...															
$x = 2.6$	A1	<table><tr><td>2.8</td><td>6.904</td><td></td><td></td></tr><tr><td>2.9</td><td>11.278</td><td></td><td>...</td></tr><tr><td>3</td><td>16</td><td></td><td></td></tr></table> <u>Note:</u> Evidence for M1 must be <u>seen</u> before A1 can be awarded.	2.8	6.904			2.9	11.278		...	3	16						
2.8	6.904																	
2.9	11.278		...															
3	16																	
	(4)																	

#2

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment																																																												
One correct evaluation with $3 \leq x \leq 4$	B1	Correct evaluation enough to imply > 40 or < 40 ; If evaluations not seen then may be implied by e.g. 'too big' or 'too small'; Solving $x^3 + x - 40 = 0$ should be marked equivalently																																																												
Two correct evaluations with $3.25 \leq x \leq 3.45$ and one > 40 , one < 40 soi	B1																																																													
Two correct evaluations with $3.25 \leq x \leq 3.35$ and one > 40 , one < 40 soi	M1																																																													
3.3	A1	Providing at least B1 awarded allow this M1 for a clear statement of the solution, e.g. between 3.3 and 3.4. <table><tr><th>x</th><th>$x^3 + x$</th><th>or</th><th>$x^3 + x - 40$</th></tr><tr><td>3</td><td>30</td><td></td><td>-10</td></tr><tr><td>3.1</td><td>32.891</td><td></td><td>-7.109</td></tr><tr><td>3.2</td><td>35.968</td><td></td><td>-4.032</td></tr><tr><td>3.25</td><td>37.578...</td><td></td><td>-2.421...</td></tr><tr><td>3.3</td><td>39.237</td><td></td><td>-0.763</td></tr><tr><td>3.35</td><td>40.945...</td><td></td><td>0.945...</td></tr><tr><td>3.4</td><td>42.704</td><td></td><td>2.704</td></tr><tr><td>3.45</td><td>44.513...</td><td></td><td>4.513...</td></tr><tr><td>3.5</td><td>46.375</td><td></td><td>6.375</td></tr><tr><td>3.6</td><td>50.256</td><td></td><td>10.256</td></tr><tr><td>3.7</td><td>54.353</td><td></td><td>14.353</td></tr><tr><td>3.8</td><td>58.672</td><td></td><td>18.672</td></tr><tr><td>3.9</td><td>63.219</td><td></td><td>23.219</td></tr><tr><td>4</td><td>68</td><td></td><td>28</td></tr></table>	x	$x^3 + x$	or	$x^3 + x - 40$	3	30		-10	3.1	32.891		-7.109	3.2	35.968		-4.032	3.25	37.578...		-2.421...	3.3	39.237		-0.763	3.35	40.945...		0.945...	3.4	42.704		2.704	3.45	44.513...		4.513...	3.5	46.375		6.375	3.6	50.256		10.256	3.7	54.353		14.353	3.8	58.672		18.672	3.9	63.219		23.219	4	68		28
x	$x^3 + x$	or	$x^3 + x - 40$																																																											
3	30		-10																																																											
3.1	32.891		-7.109																																																											
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4	68		28																																																											
	(4)																																																													

#3

Component 2: Higher Tier	Mark	Comment
No indicated or implied with $(2 \times 1.81^3 - 3 \times 1.81^2 - 2 =) 0.03(1....) \text{ AND}$ $(2 \times 1.82^3 - 3 \times 1.82^2 - 2 =) 0.1(19...) \text{ AND}$ a correct explanation e.g 'one should be positive, and one should be negative'. '0 is not between 0.119.. and 0.03..' '0.119... and 0.03.. are both positive' <u>Alternative Method</u> No indicated or implied with $(2 \times 1.81^3 - 3 \times 1.81^2 =) 2.03(1....) \text{ AND}$ $(2 \times 1.82^3 - 3 \times 1.82^2 =) 2.1(19...) \text{ AND}$ a correct explanation e.g 'one should be more than 2, and one should be less than 2'. '0 is not between 0.119.. and 0.03..' '0.119... and 0.03.. are both positive'	B2 Allow for 0.03 seen and an explanation saying that 1.82 will lead to a greater answer that is not negative. Award B1 for one of the following: 0.03(1....) and 0.1(19...) seen with a correct explanation but with yes indicated. - a correct explanation following an error in their substitution. 0.03(1....) and 0.1(19...). B2 Allow for 2.03 seen and an explanation saying that 1.82 will lead to a greater answer that is not negative. Award B1 for one of the following: 2.03(1....) and 2.1(19...) seen with a correct explanation but with yes indicated. - a correct explanation following an error in their substitution. 2.03(1....) and 2.1(19...).	
	(2)	

#4

Component 2: Higher Tier	Mark	Comment																																																												
One correct evaluation with $1 \leq x \leq 2$	B1	Correct evaluation enough to imply > 0 or < 0 ; If evaluations not seen then may be implied by e.g, 'too big' or 'too small'; Mark solving $2x^3 + x^2 = 12$ equivalently																																																												
Two correct evaluations with $1.55 \leq x \leq 1.75$ and one > 0 , one < 0 si	B1																																																													
Two correct evaluations with $1.65 \leq x \leq 1.75$ and one > 0 , one < 0 si	M1																																																													
1.7	A1	<table><tr><th>x</th><th>$2x^3 + x^2 - 12$</th><th>or</th><th>$2x^3 + x^2$</th></tr><tr><td>1</td><td>-9</td><td></td><td>3</td></tr><tr><td>1.1</td><td>-8.128</td><td></td><td>3.872</td></tr><tr><td>1.2</td><td>-7.104</td><td></td><td>4.896</td></tr><tr><td>1.3</td><td>-5.916</td><td></td><td>6.084</td></tr><tr><td>1.4</td><td>-4.552</td><td></td><td>7.448</td></tr><tr><td>1.5</td><td>-3</td><td></td><td>9</td></tr><tr><td>1.55</td><td>-2.149...</td><td></td><td>9.850...</td></tr><tr><td>1.6</td><td>-1.248</td><td></td><td>10.752</td></tr><tr><td>1.65</td><td>-0.293...</td><td></td><td>11.706...</td></tr><tr><td>1.7</td><td>0.716</td><td></td><td>12.716</td></tr><tr><td>1.75</td><td>1.781...</td><td></td><td>13.781...</td></tr><tr><td>1.8</td><td>2.904</td><td></td><td>14.904</td></tr><tr><td>1.9</td><td>5.328</td><td></td><td>17.328</td></tr><tr><td>2</td><td>8</td><td></td><td>20</td></tr></table> If no marks, award SC2 for a complete method with a final answer of 1.1 from $(2x)^3 + x^2 - 12 = 0$ or $(2x)^3 + x^2 = 12$	x	$2x^3 + x^2 - 12$	or	$2x^3 + x^2$	1	-9		3	1.1	-8.128		3.872	1.2	-7.104		4.896	1.3	-5.916		6.084	1.4	-4.552		7.448	1.5	-3		9	1.55	-2.149...		9.850...	1.6	-1.248		10.752	1.65	-0.293...		11.706...	1.7	0.716		12.716	1.75	1.781...		13.781...	1.8	2.904		14.904	1.9	5.328		17.328	2	8		20
x	$2x^3 + x^2 - 12$	or	$2x^3 + x^2$																																																											
1	-9		3																																																											
1.1	-8.128		3.872																																																											
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1.9	5.328		17.328																																																											
2	8		20																																																											
	(4)																																																													

#5

Component 2: Higher Tier	Mark	Comments
(a) +3	B1	Allow 'Plus 3' but not 3
(b)(i) Correct rearrangement to $x = \sqrt{\frac{2x+5}{x}}$	B1	Allow working back from $x = \sqrt{\frac{2x+5}{x}}$ to $x^3 - 2x - 5 = 0$
(b)(ii) $x_2 = \sqrt{\frac{9}{2}}$ or 2.12(...) $x_3 = 2.08(\dots)$ $x_4 = 2.09(\dots)$ $x_5 = 2.09(\dots)$	M1 m1	Allow omission of $x_5 = 2.09\dots$; allow for $x_3 = 2.09$ $x_4 = 2.1(0)$ $x_5 = 2.09$ (from rounding consistently to 2dp)
(x =) 2.1	A1	Allow omission of $x_5 = 2.09\dots$, ignore extra iterations if listed; answer without/with incorrect working does not imply the method marks
	(5)	

#6

Component 2: Higher Tier	Mark	Comment			
(b)		Correct evaluation regarded as enough to identify if < 0 or > 0 . If evaluations not seen accept 'too high' or 'too low'.			
		Some candidates may test $2x^3 + 11x^2 + 16x - 65 = 0$			
		x	$2x^3 + 11x^2 + 16x$		
		1.6	61.952		
One correct evaluation $1.6 \leq x \leq 1.7$	B1	1.61	62.619...		
		1.62	63.291...		
2 correct evaluations $1.635 \leq x \leq 1.655$, one < 0 , one > 0 .	B1	1.63	63.967...		
		1.64	64.647...	1.635	64.306...
		1.65	65.331...	1.645	64.989...
2 correct evaluations $1.645 \leq x \leq 1.655$, one < 0 , one > 0 .	M1	1.66	66.020...	1.646	65.0575..
		1.67	66.712...	1.655	65.675...
		1.68	67.409...		
$x = 1.65$	A1	1.69	68.110...		
		1.7	68.816...		
		<u>Note:</u> Evidence for M1 must be <u>seen</u> before A1 can be awarded. No marks awarded for an unsupported answer of 1.65.			

Composite / Inverse Functions: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	4	
#3	6	
#4	7	
#5	7	
#6	7	
#7	7	
#8	8	
Total	50	

Marking Scheme

#1

Component 1: Higher Tier	Mark	
(a) $h\left(\frac{1}{6}\right)$ or $\left(\frac{1}{6}\right)^3$ OR $hg(x) = \frac{x^3}{8}$ oe $\frac{1}{216}$	M1 A1	must be $\frac{1}{6}$ OR Accept e.g. $hg(x) = \left(\frac{x}{2}\right)^3$ Allow e.g. $hg \rightarrow \left(\frac{x}{2}\right)^3$ or any clear indication they know what the function is If no marks, SC1 for 'their $\frac{1}{3}$ ' correctly cubed, as final answer providing they have shown $\frac{1}{3}$ or exact equivalent
(b) $h^{-1}(x) = \sqrt[3]{x}$ or $x = h(-2)$ or $(-2)^3$ $(x =) -8$	M1 A1	
	(4)	

#2

(a)(i) $g(64)$ 14	M1 A1	or for $gf(x) = \frac{x^2 + 6}{5}$ seen or implied CAO
(a)(ii) $g^{-1}(x) = 5x - 6$	B2	Allow $y = \dots$ etc B1 for $x = 5y - 6$ if x and y not interchanged later or SC1 for y or $g^{-1}(x) = 5x + 6$ or equivalent

#3

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	
(a)(i) $\sin 30$ $\frac{1}{2}$ or 0.5	M1 A1	or $fg(x) = \sin(x - 90)$
(c) $[k^{-1}(x) =] \sqrt[3]{x+23}$ $x+23 = 5^3$ or better $x = 102$	B2 M1 A1	Award B1 for $x = \sqrt[3]{y+23}$ oe, unless x and y interchanged later or SC1 for $(y \text{ or } k^{-1}(x) =) \sqrt[3]{x-23}$ oe FT 'their inverse function' if possible; must be of equivalent difficulty; M0 for e.g. $\frac{1}{x^3-23} = 5$ CAO
Alternative method: $k^{-1}(x) = 5$ means $x = k(5)$ si $k(5) = 5^3 - 23$ $x = 102$	B2 M1 A1	CAO

#4

Component 1: Higher Tier	Mark	Comment
(a) $h^{-1}(x) = \sqrt{x-3}$ Valid explanation e.g. 'You cannot find the square root of a negative number, so the smallest value of x is 3'.	B2 E1	B1 for $x^2 = y - 3$ or equivalent
(b) $fg(x) = (x-4)^2 + 5$ $gf(x) = (x^2+5) - 4$ $(x-4)^2 + 5 - ((x^2+5) - 4)$ $(x^2 - 8x + 16 + 5 - x^2 - 1) \Rightarrow 20 - 8x$	B1 B1 M1 A1	 FT 'their $fg(x)$ ' and/or ' $gf(x)$ ' provided of equivalent difficulty Must not be from incorrect working.
	(7)	

#5

(a) $g^{-1}(x) = \frac{4-x}{3}$ $4-x = 3x+6$ or equivalent $x = -\frac{1}{2}$	B2 M1 A1	B1 for $x = \frac{4-y}{3}$ or equivalent unless x and y interchanged later or SC1 for y or $g^{-1}(x) = \frac{4+y}{3}$ or equivalent <u>Alternative method:</u> $x = g(x+2)$ B1 $x = 4-3(x+2)$ B1 $x = -2-3x$ or equivalent M1 $x = -\frac{1}{2}$ A1
(b) $4-3(4-3x)$ $9x-8$	M1 A1	
(c) Valid explanation e.g. '$h(-1) = h(1) = 6$ so both are equal to $g(6)$.'	E1	Allow '1^2 is the same as $(-1)^2$'. Allow for working out $gh(-1)$ and $gh(1)$ and showing they are both e.g. -14.
	(7)	

#6

(a) $8 \div \frac{8}{x}$ oe x	M1 A1	
(b) Valid explanation e.g. 'They are the same function.'	E1	allow e.g. '$f(x)$ is a self-inverse function'; allow the inverse function found and the explanation stated
(c) $(g^{-1}(x) =) x-5$ $(g^{-1}f(x) =) \frac{8}{x} - 5$ $\frac{8}{x} = 16$ or better $(x =) \frac{1}{2}$ oe	B1 B1 M1 A1	CAO
<u>Alternative method:</u> $f(x) = g(11)$ $f(x) = 16$ $\frac{8}{x} = 16$ or better $(x =) \frac{1}{2}$ oe	M1 M1 M1 A1	
	(7)	

#7

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment
(a) $f^{-1}(x) = x^2 + 1$ Valid explanation e.g. 'The smallest value of x^2 is 0, so $x^2 + 1$ cannot be less than 1' or ' $x^2 + 1 < 1$ means $x^2 < 0$ and a square number cannot be negative.'	B2 E1	Allow for $y = x^2 + 1$ B1 for $x = y^2 + 1$ oe, seen, unless x and y interchanged later or SC1 for $(y \text{ or } f^{-1}(x) =) x^2 - 1$ oe Allow for ' $x^2 < 0$ is impossible' or ' $x^2 < 0, x < 0$ there are no real solutions.'
Alternative method: <i>The range of $f^{-1}(x)$ is the domain of $f(x)$ (which is $x \geq 1$)</i> <i>Therefore $f^{-1}(x) \geq 1$</i>	E2 E1	NB there is no E1 by this method.
(b) $gh(x) = 5^{x+3}$ $5^{x+3} = 5^{-2}$ or $5^2 \times 5^{x+3} = 5^0$ or $5^x \times 5^3 = \frac{1}{5^2}$ or better $x + 3 = -2$ or $x + 5 = 0$ si $(x =) -5$	B1 M1 m1 A1	Writes equation in powers of 5; implies B1; must be using correct expression for gh Interprets the equation Implies 4 marks if not from wrong working
	(7)	

#8

(a)(i) Valid explanation e.g. '7 divided by 0 is not defined.'	E1	Accept e.g. 'You cannot divide by 0.' 'The denominator is 0.' is not sufficient
(a)(ii) Swop variables and change subject or vice versa $y = \frac{7}{x} + 1 \left(f^{-1}(x) = \frac{7}{x} + 1 \right)$	M1 A1	Allow one sign or arithmetic slip CAO
(b) $(hg(x) =) 9(x + 1)$ $9(x + 1)(x - 1) = 7$ $x^2 = \frac{7}{9} + 1$ oe $x = \pm \frac{4}{3}$ oe	B2 M1 M1 A1	B1 for $9(\sqrt[3]{x+1})^3$ FT 'their hg' if of equivalent difficulty CAO
	(8)	

Composite / Inverse Functions: Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	6	
Total	10	

Marking Scheme

#1

Component 2: Higher Tier	Mark	Comments
(a) $f^{-1}(x) = \sqrt[3]{x}$	B1	$f^{-1}(x)$ = may be omitted
(b) $g(x) = 125x^3 - 75x^2 + 15x - 1$	B3	Mark final answer; $g(x)$ = may be omitted B2 for either of: A correct unsimplified answer $125x^3 - 25x^2 - 25x^2 + 5x - 25x^2 + 5x + 5x - 1$ OR $(25x^2 - 5x - 5x + 1)(5x - 1)$ expanded with three of the four terms correct OR $(25x^2 + 10x + 1)(5x - 1) = 125x^3 + 25x^2 - 5x - 1$ B1 for attempt at expansion of $(25x^2 - 5x - 5x + 1)(5x - 1)$
	(4)	

#2

Component 2: Higher Tier	Mark	Comment
(a) $y = \frac{x+1}{4}$ leading to $4y - 1 = x$ or $x = \frac{y+1}{4}$ leading to $4x = y + 1$ $h^{-1}(x) = 4x - 1$ $2x^2 = 4x - 1$ leading to $2x^2 - 4x + 1 = 0$	M1 A1 A1	Changes the subject fully or swaps the variables and requires one step only to change the subject; must be derived not found from the given equation; allow other variables e.g. $h = \dots$ Allow $y = 4x - 1$
21.(b) $\frac{-(-4) \pm \sqrt{(-4)^2 - 4(2)(1)}}{2(2)}$ or better $\frac{4 \pm \sqrt{8}}{4}$ oe, si 1.71, 0.29	M1 A1 B1	Allow if this work seen in (a) Substitution into the formula must be seen for M1, otherwise award M0 A0. Allow one slip in substitution but not in the formula If completing the square used award for sight of $2(x - 1)^2 \pm \dots$ Implied by 1.707 10..., 0.292 89...
	(6)	

Equation of a circle / Tangent to a circle: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	7	
#3	3	
#4	3	
Total	17	

Marking Scheme

#1

(a) 14	B2	B1 for $2 \times \sqrt{49}$ or for radius = 7 si
(b) (-7, 7)	B2	FT 'their derived radius' from part (a) B1 for $T(-\sqrt{49}, \sqrt{49})$ or equations of tangents stated as $x = -7$ and $y = 7$ or clear sketch with correct intersecting tangents marked and axes appropriately numbered. NB Sketch may be in answer space for part (a).
	(4)	

#2

(a) $(p =) 5$ oe	B1	
(b) $(m_{\text{radius}} =) \frac{5}{5}$ or 1 $(m_{\text{tan}} =) -1$ $5 = -1 \times 5 + c$ oe $y = 10 - x$ oe	M1 m1 M1 A1	FT ' $\text{their } p$ ' $\frac{5}{5}$ FT ' $\text{their } 1$ ' FT ' $\text{their gradient of tangent}$ ' and ' $\text{their } p$ ': ' $\text{their } p$ ' = ' $\text{their } (-1) \times 5 + c$ ' Allow for e.g. $y - 5 = -1(x - 5)$ or $\frac{y-5}{x-5} = -1$ Allow for $y = -x + c$ $5 = -1 \times 5 + c$ $c = 10$
Candidates starting with the answer and working back score 2, 3 or 4 SC marks for: $5 = 5m + 10$ or $\frac{5-0}{5-10} = -1$ leading to $m = -1$ and $\left(m_{\text{radius}} = \frac{5}{5} = 1\right)$ $1 \times -1 = -1$ (therefore $OP \perp PR$) Conclusion including tangent is perpendicular to radius and therefore $y = -x + 10$ is the equation of the tangent (at P).	SC2 SC1 SC1	NB For final SC1, the equation $y = -x + 10$ must be stated at some point.
(c) $10 - \sqrt{50}$ or $10 - 5\sqrt{2}$ ISW	B2	or exact equivalent B1 for $R(10, 0)$ or $OR = 10$ or $Q(\sqrt{50}, 0)$ or $OQ = \sqrt{50}$ or exact equivalent
	(7)	

#3

$\therefore$ (a) $\sqrt{144} - \sqrt{4} = 10$ or $12 - 2 = 10$	B2	B1 for $\sqrt{144} - \sqrt{4}$ or for (radius of outer circle =)12 or (radius of inner circle =) 2 seen
(b) $y = -12$	B1	
	(3)	

#4

Component 1: Higher Tier	Mark	
(a) 20 (units)	B1	Ignore any units if stated
(b) $B(-12, 16)$	B2	Allow brackets omitted; allow $x = -12$, $y = 16$ B1 for each coordinate OR B1 for $(12 - 24, -16 + 32)$ oe seen OR B1 for $(-12)^2 + 16^2 = 400$ If no marks award SC1 for a sketch of a circle , centre $(0, 0)$ with A marked in the correct quadrant
	(3)	

Equation of a circle / Tangent to a circle: Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	3	
#3	3	
Total	7	

Marking Scheme

#1

Component 2: Higher Tier	Mark	Comment
(b) C(17, 0)	B1	Allow for sight of $x = 17$ provided $y = 0$ is not contradicted; may be seen on diagram Do not allow for 17 alone or $c = 17$

#2

Component 2: Higher Tier	Mark	Comment
(a) $x^2 + y^2 = 25$ or $x^2 + y^2 = 5^2$	B1	
(b) (1,5)	B2	Allow $x = 1$ and $y = 5$ B1 for $5 = 2x + 3$ or better
	(3)	

#3

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
$a = 8$	B3	Award B2 for any one of the following: $\left(\frac{a}{2}\right)^2 + \left(\frac{a}{2}\right)^2 = 32$ $\left(\frac{a}{2}\right)^2 = 16$ $a^2 = \left(\frac{\sqrt{2a^2}}{2}\right)^2 + (\sqrt{32})^2$ $a^2 = \frac{a^2}{2} + 32$ - sight of $4^2 + 4^2 = 32$ - sight of $x = 4$ AND $y = 4$ - sight of (4, 4) If not B2, award B1 for any one of the following: - sight of line and curve meet at $\left(\frac{a}{2}, \frac{a}{2}\right)$ - sight of $x = 4$ (from $2x^2 = 32$ oe) - sight of $y = 4$ (from $2y^2 = 32$ oe) $2x^2 = 32$ $y = -x + c$ where $c > 0$ $\frac{a^2}{2} + \frac{a^2}{2} = 32$ $\frac{a^2}{2} = 16$ $a^2 = \frac{\sqrt{2a^2}^2}{2} + \sqrt{32}^2$
	(3)	