GCSE ONLINE TUTORING

RS REMOTE TUTORING

GCSE MATHEMATICS HIGHER TIER

UNIT 2: ALGEBRA

20 chapters | 240 curated questions | 4-6 marks

Student name: ______________________________

Contents and publication statement

This curated edition prioritises distinct tasks, accurate tier boundaries and visible reasoning. Marks indicate an independent teaching allocation, not an official OCR mark scheme.

HIGHER TIER

UNIT 2 | CHAPTER 1

Algebraic notation and substitution

12 curated questions | complete solutions

Chapter focus

Expressions, substitution, conventions and exact evaluation

Assessment progression

All questions require developed working. Questions 1-4 secure Higher methods; Questions 5-8 connect representations; Questions 9-12 develop Grade 7-9 reasoning.

You must show your working for every question worth 5 marks or more.

Source-use notice

Chapter 1: Algebraic notation and substitution

Q01 | 4 MARKS

For $x=3$, evaluate $3x^2 - x + 10$. Show substitution with brackets and check the sign of the squared term. Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

For $x=-3$, evaluate $6x^2 - 4x + 5$. Show substitution with brackets and check the sign of the squared term. Your solution must justify the main method or assumption and include a final check.

Chapter 1: Algebraic notation and substitution

Q03 | 4 MARKS

For $x=0$, evaluate $2x^2 - 2x + 8$. Show substitution with brackets and check the sign of the squared term. Your solution must justify the main method or assumption and include a final check.

Q04 | 4 MARKS

For $x=3$, evaluate $5x^2 - 5x + 3$. Show substitution with brackets and check the sign of the squared term. Your solution must justify the main method or assumption and include a final check.

Chapter 1: Algebraic notation and substitution

Q05 | 4 MARKS

For $x=-3$, evaluate $8x^2 - 3x + 6$. Show substitution with brackets and check the sign of the squared term. Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

For $x=0$, evaluate $4x^2 - x + 9$. Show substitution with brackets and check the sign of the squared term. Your solution must justify the main method or assumption and include a final check.

Chapter 1: Algebraic notation and substitution

Q07 | 4 MARKS

For x=3, evaluate 7x^2 - 4x + 4. Show substitution with brackets and check the sign of the squared term. Your solution must justify the main method or assumption and include a final check.

Q08 | 4 MARKS

For x=-3, evaluate 3x^2 - 2x + 7. Show substitution with brackets and check the sign of the squared term. Your solution must justify the main method or assumption and include a final check.

Chapter 1: Algebraic notation and substitution

Q09 | 4 MARKS

For x=0, evaluate 6x^2 - 5x + 10. Show substitution with brackets and check the sign of the squared term. Your solution must justify the main method or assumption and include a final check.

Q10 | 4 MARKS

For x=3, evaluate 2x^2 - 3x + 5. Show substitution with brackets and check the sign of the squared term. Your solution must justify the main method or assumption and include a final check.

Chapter 1: Algebraic notation and substitution

Q11 | 5 MARKS

You must show your working.
For $x=4$, evaluate $3x^2 - 4x + 6$. Show substitution with brackets and check the sign of the squared term. Your solution must justify the main method or assumption and include a final check.

Q12 | 6 MARKS

You must show your working.
For $x=5$, evaluate $4x^2 - 5x + 7$. Show substitution with brackets and check the sign of the squared term. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 4 MARKS

Substitute x=3: 3(3)^2-1(3)+10=34. Therefore the exact value is 34. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q02 | 4 MARKS

Substitute x=-3: 6(-3)^2-4(-3)+5=71. Therefore the exact value is 71. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q03 | 4 MARKS

Substitute $x=0$: $2(0)^2-2(0)+8=8$. Therefore the exact value is 8. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q04 | 4 MARKS

Substitute $x=3$: $5(3)^2-5(3)+3=33$. Therefore the exact value is 33. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q05 | 4 MARKS

Substitute x=-3: 8(-3)^2-3(-3)+6=87. Therefore the exact value is 87. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q06 | 4 MARKS

Substitute x=0: 4(0)^2-1(0)+9=9. Therefore the exact value is 9. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q07 | 4 MARKS

Substitute x=3: 7(3)^2-4(3)+4=55. Therefore the exact value is 55. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q08 | 4 MARKS

Substitute x=-3: 3(-3)^2-2(-3)+7=40. Therefore the exact value is 40. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q09 | 4 MARKS

Substitute $x=0$: $6(0)^2-5(0)+10=10$. Therefore the exact value is 10. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q10 | 4 MARKS

Substitute $x=3$: $2(3)^2-3(3)+5=14$. Therefore the exact value is 14. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q11 | 5 MARKS

Substitute x=4: $3(4)^2-4(4)+6=38$. Therefore the exact value is 38. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q12 | 6 MARKS

Substitute x=5: $4(5)^2-5(5)+7=82$. Therefore the exact value is 82. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Chapter completion record

Question	Score / marks	Repair target	Retest date
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HIGHER TIER

UNIT 2 | CHAPTER 2

Algebraic index laws

12 curated questions | complete solutions

Chapter focus

Integer and fractional exponents in algebraic expressions

Assessment progression

All questions require developed working. Questions 1-4 secure Higher methods; Questions 5-8 connect representations; Questions 9-12 develop Grade 7-9 reasoning.

You must show your working for every question worth 5 marks or more.

Source-use notice

Chapter 2: Algebraic index laws

Q01 | 4 MARKS

Simplify (x^6 y^-2)^2 / (x^4 y^1), using positive indices and stating restrictions. Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

Simplify (x^3 y^1)^2 / (x^3 y^4), using positive indices and stating restrictions. Your solution must justify the main method or assumption and include a final check.

Chapter 2: Algebraic index laws

Q03 | 4 MARKS

Simplify (x^6 y^-1)^2 / (x^2 y^2), using positive indices and stating restrictions. Your solution must justify the main method or assumption and include a final check.

Q04 | 4 MARKS

Simplify (x^3 y^2)^2 / (x^1 y^5), using positive indices and stating restrictions. Your solution must justify the main method or assumption and include a final check.

Chapter 2: Algebraic index laws

Q05 | 4 MARKS

Simplify (x^6 y^0)^2 / (x^4 y^3), using positive indices and stating restrictions. Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

Simplify (x^3 y^-2)^2 / (x^3 y^1), using positive indices and stating restrictions. Your solution must justify the main method or assumption and include a final check.

Chapter 2: Algebraic index laws

Q07 | 4 MARKS

Simplify (x^6 y^1)^2 / (x^2 y^4), using positive indices and stating restrictions. Your solution must justify the main method or assumption and include a final check.

Q08 | 4 MARKS

Simplify (x^3 y^-1)^2 / (x^1 y^2), using positive indices and stating restrictions. Your solution must justify the main method or assumption and include a final check.

Chapter 2: Algebraic index laws

Q09 | 4 MARKS

Simplify (x^6 y^2)^2 / (x^4 y^5), using positive indices and stating restrictions. Your solution must justify the main method or assumption and include a final check.

Q10 | 4 MARKS

Simplify (x^3 y^0)^2 / (x^3 y^3), using positive indices and stating restrictions. Your solution must justify the main method or assumption and include a final check.

Chapter 2: Algebraic index laws

Q11 | 5 MARKS

You must show your working.
Simplify (x^4 y^1)^3 / (x^4 y^4), using positive indices and stating restrictions. Your solution must justify the main method or assumption and include a final check.

Q12 | 6 MARKS

You must show your working.
Simplify (x^5 y^2)^4 / (x^1 y^5), using positive indices and stating restrictions. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 4 MARKS

Multiply powers inside the bracket, then subtract denominator powers: x^(6x2-4)y^(-2x2-1)=x^8y^-5. With positive indices this is x^8 x 1/y^5; x and y must be non-zero where they occur in a denominator. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q02 | 4 MARKS

Multiply powers inside the bracket, then subtract denominator powers: x^(3x2-3)y^(1x2-4)=x^3y^-2. With positive indices this is x^3 x 1/y^2; x and y must be non-zero where they occur in a denominator. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q03 | 4 MARKS

Multiply powers inside the bracket, then subtract denominator powers: x^(6x2-2)y^(-1x2-2)=x^10y^-4. With positive indices this is x^10 x 1/y^4; x and y must be non-zero where they occur in a denominator. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q04 | 4 MARKS

Multiply powers inside the bracket, then subtract denominator powers: x^(3x2-1)y^(2x2-5)=x^5y^-1. With positive indices this is x^5 x 1/y^1; x and y must be non-zero where they occur in a denominator. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q05 | 4 MARKS

Multiply powers inside the bracket, then subtract denominator powers: x^(6x2-4)y^(0x2-3)=x^8y^-3. With positive indices this is x^8 x 1/y^3; x and y must be non-zero where they occur in a denominator. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q06 | 4 MARKS

Multiply powers inside the bracket, then subtract denominator powers: x^(3x2-3)y^(-2x2-1)=x^3y^-5. With positive indices this is x^3 x 1/y^5; x and y must be non-zero where they occur in a denominator. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q07 | 4 MARKS

Multiply powers inside the bracket, then subtract denominator powers: x^(6x2-2)y^(1x2-4)=x^10y^-2. With positive indices this is x^10 x 1/y^2; x and y must be non-zero where they occur in a denominator. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q08 | 4 MARKS

Multiply powers inside the bracket, then subtract denominator powers: x^(3x2-1)y^(-1x2-2)=x^5y^-4. With positive indices this is x^5 x 1/y^4; x and y must be non-zero where they occur in a denominator. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q09 | 4 MARKS

Multiply powers inside the bracket, then subtract denominator powers: x^(6x2-4)y^(2x2-5)=x^8y^-1. With positive indices this is x^8 x 1/y^1; x and y must be non-zero where they occur in a denominator. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q10 | 4 MARKS

Multiply powers inside the bracket, then subtract denominator powers: x^(3x2-3)y^(0x2-3)=x^3y^-3. With positive indices this is x^3 x 1/y^3; x and y must be non-zero where they occur in a denominator. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q11 | 5 MARKS

Multiply powers inside the bracket, then subtract denominator powers: x^(4x3-4)y^(1x3-4)=x^8y^-1. With positive indices this is x^8 x 1/y^1; x and y must be non-zero where they occur in a denominator. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q12 | 6 MARKS

Multiply powers inside the bracket, then subtract denominator powers: x^(5x4-1)y^(2x4-5)=x^19y^3. With positive indices this is x^19 x y^3; x and y must be non-zero where they occur in a denominator. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Chapter completion record

Question	Score / marks	Repair target	Retest date
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HIGHER TIER

UNIT 2 | CHAPTER 3

Expanding and factorising quadratics

12 curated questions | complete solutions

Chapter focus

Products, common factors, monic and non-monic quadratics

Assessment progression

All questions require developed working. Questions 1-4 secure Higher methods; Questions 5-8 connect representations; Questions 9-12 develop Grade 7-9 reasoning.

You must show your working for every question worth 5 marks or more.

Source-use notice

Chapter 3: Expanding and factorising quadratics

Q01 | 4 MARKS

Expand 2(x - 2)(x + 4), then factorise your result to verify the original structure. Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

Expand x - 1(x + 3), then factorise your result to verify the original structure. Your solution must justify the main method or assumption and include a final check.

Chapter 3: Expanding and factorising quadratics

Q03 | 4 MARKS

Expand $2(x - 2)(x + 2)$, then factorise your result to verify the original structure. Your solution must justify the main method or assumption and include a final check.

Q04 | 4 MARKS

Expand $x - 1(x + 8)$, then factorise your result to verify the original structure. Your solution must justify the main method or assumption and include a final check.

Chapter 3: Expanding and factorising quadratics

Q05 | 4 MARKS

Expand 2(x - 2)(x + 7), then factorise your result to verify the original structure. Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

Expand x - 1(x + 6), then factorise your result to verify the original structure. Your solution must justify the main method or assumption and include a final check.

Chapter 3: Expanding and factorising quadratics

Q07 | 4 MARKS

Expand $2(x - 2)(x + 5)$, then factorise your result to verify the original structure. Your solution must justify the main method or assumption and include a final check.

Q08 | 4 MARKS

Expand $x - 1(x + 4)$, then factorise your result to verify the original structure. Your solution must justify the main method or assumption and include a final check.

Chapter 3: Expanding and factorising quadratics

Q09 | 4 MARKS

Expand 2(x - 2)(x + 3), then factorise your result to verify the original structure. Your solution must justify the main method or assumption and include a final check.

Q10 | 4 MARKS

Expand x - 1(x + 2), then factorise your result to verify the original structure. Your solution must justify the main method or assumption and include a final check.

Chapter 3: Expanding and factorising quadratics

Q11 | 5 MARKS

You must show your working.
Expand $2(x - 1)(x + 4)$, then factorise your result to verify the original structure. Your solution must justify the main method or assumption and include a final check.

Q12 | 6 MARKS

You must show your working.
Expand $x - 3(x + 6)$, then factorise your result to verify the original structure. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 4 MARKS

Expansion gives 2x^2 + 4x - 16. To reverse, split or identify the middle term and factorise: 2x^2 + 4x - 16=(2(x - 2))(x + 4). The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q02 | 4 MARKS

Expansion gives x^2 + 2x - 3. To reverse, split or identify the middle term and factorise: x^2 + 2x - 3=(x - 1)(x + 3). The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q03 | 4 MARKS

Expansion gives $2x^2 - 8$. To reverse, split or identify the middle term and factorise: $2x^2 - 8=(2(x - 2))(x + 2)$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q04 | 4 MARKS

Expansion gives $x^2 + 7x - 8$. To reverse, split or identify the middle term and factorise: $x^2 + 7x - 8=(x - 1)(x + 8)$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q05 | 4 MARKS

Expansion gives $2x^2 + 10x - 28$. To reverse, split or identify the middle term and factorise: $2x^2 + 10x - 28=(2(x - 2))(x + 7)$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q06 | 4 MARKS

Expansion gives $x^2 + 5x - 6$. To reverse, split or identify the middle term and factorise: $x^2 + 5x - 6=(x - 1)(x + 6)$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q07 | 4 MARKS

Expansion gives $2x^2 + 6x - 20$. To reverse, split or identify the middle term and factorise: $2x^2 + 6x - 20=(2(x - 2))(x + 5)$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q08 | 4 MARKS

Expansion gives $x^2 + 3x - 4$. To reverse, split or identify the middle term and factorise: $x^2 + 3x - 4=(x - 1)(x + 4)$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q09 | 4 MARKS

Expansion gives $2x^2 + 2x - 12$. To reverse, split or identify the middle term and factorise: $2x^2 + 2x - 12=(2(x - 2))(x + 3)$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q10 | 4 MARKS

Expansion gives $x^2 + x - 2$. To reverse, split or identify the middle term and factorise: $x^2 + x - 2=(x - 1)(x + 2)$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q11 | 5 MARKS

Expansion gives $2x^2 + 6x - 8$. To reverse, split or identify the middle term and factorise: $2x^2 + 6x - 8=(2(x - 1))(x + 4)$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q12 | 6 MARKS

Expansion gives $x^2 + 3x - 18$. To reverse, split or identify the middle term and factorise: $x^2 + 3x - 18=(x - 3)(x + 6)$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Chapter completion record

Question	Score / marks	Repair target	Retest date
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12			

HIGHER TIER

UNIT 2 | CHAPTER 4

Algebraic fractions and restrictions

12 curated questions | complete solutions

Chapter focus

Simplification, operations and excluded values

Assessment progression

All questions require developed working. Questions 1-4 secure Higher methods; Questions 5-8 connect representations; Questions 9-12 develop Grade 7-9 reasoning.

You must show your working for every question worth 5 marks or more.

Source-use notice

Chapter 4: Algebraic fractions and restrictions

Q01 | 4 MARKS

Simplify (x^2-16)/((x-4)(x+2)), and state every excluded value from the original expression. Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

Simplify (x^2-1)/((x-1)(x+5)), and state every excluded value from the original expression. Your solution must justify the main method or assumption and include a final check.

Chapter 4: Algebraic fractions and restrictions

Q03 | 4 MARKS

Simplify (x^2-16)/((x-4)(x+3)), and state every excluded value from the original expression. Your solution must justify the main method or assumption and include a final check.

Q04 | 4 MARKS

Simplify (x^2-1)/((x-1)(x+6)), and state every excluded value from the original expression. Your solution must justify the main method or assumption and include a final check.

Chapter 4: Algebraic fractions and restrictions

Q05 | 4 MARKS

Simplify (x^2-16)/((x-4)(x+4)), and state every excluded value from the original expression. Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

Simplify (x^2-1)/((x-1)(x+2)), and state every excluded value from the original expression. Your solution must justify the main method or assumption and include a final check.

Chapter 4: Algebraic fractions and restrictions

Q07 | 4 MARKS

Simplify (x^2-16)/((x-4)(x+5)), and state every excluded value from the original expression. Your solution must justify the main method or assumption and include a final check.

Q08 | 4 MARKS

Simplify (x^2-1)/((x-1)(x+3)), and state every excluded value from the original expression. Your solution must justify the main method or assumption and include a final check.

Chapter 4: Algebraic fractions and restrictions

Q09 | 4 MARKS

Simplify (x^2-16)/((x-4)(x+6)), and state every excluded value from the original expression. Your solution must justify the main method or assumption and include a final check.

Q10 | 4 MARKS

Simplify (x^2-1)/((x-1)(x+4)), and state every excluded value from the original expression. Your solution must justify the main method or assumption and include a final check.

Chapter 4: Algebraic fractions and restrictions

Q11 | 5 MARKS

You must show your working.
Simplify (x^2-4)/((x-2)(x+5)), and state every excluded value from the original expression. Your solution must justify the main method or assumption and include a final check.

Q12 | 6 MARKS

You must show your working.
Simplify (x^2-9)/((x-3)(x+6)), and state every excluded value from the original expression. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 4 MARKS

Factor x^2-16=(x-4)(x+4). Cancel x-4 to get (x+4)/(x+2). Original denominators require x!=4 and x!=-2. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q02 | 4 MARKS

Factor x^2-1=(x-1)(x+1). Cancel x-1 to get (x+1)/(x+5). Original denominators require x!=1 and x!=-5. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q03 | 4 MARKS

Factor $x^2-16=(x-4)(x+4)$. Cancel $x-4$ to get $(x+4)/(x+3)$. Original denominators require $x\neq4$ and $x\neq-3$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q04 | 4 MARKS

Factor $x^2-1=(x-1)(x+1)$. Cancel $x-1$ to get $(x+1)/(x+6)$. Original denominators require $x\neq1$ and $x\neq-6$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q05 | 4 MARKS

Factor x^2-16=(x-4)(x+4). Cancel x-4 to get (x+4)/(x+4). Original denominators require x!=4 and x!=-4. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q06 | 4 MARKS

Factor x^2-1=(x-1)(x+1). Cancel x-1 to get (x+1)/(x+2). Original denominators require x!=1 and x!=-2. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q07 | 4 MARKS

Factor $x^2-16=(x-4)(x+4)$. Cancel $x-4$ to get $(x+4)/(x+5)$. Original denominators require $x \neq 4$ and $x \neq -5$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q08 | 4 MARKS

Factor $x^2-1=(x-1)(x+1)$. Cancel $x-1$ to get $(x+1)/(x+3)$. Original denominators require $x \neq 1$ and $x \neq -3$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q09 | 4 MARKS

Factor $x^2-16=(x-4)(x+4)$. Cancel $x-4$ to get $(x+4)/(x+6)$. Original denominators require $x\neq4$ and $x\neq-6$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q10 | 4 MARKS

Factor $x^2-1=(x-1)(x+1)$. Cancel $x-1$ to get $(x+1)/(x+4)$. Original denominators require $x\neq1$ and $x\neq-4$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q11 | 5 MARKS

Factor x^2-4=(x-2)(x+2). Cancel x-2 to get (x+2)/(x+5). Original denominators require x!=2 and x!=-5. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q12 | 6 MARKS

Factor x^2-9=(x-3)(x+3). Cancel x-3 to get (x+3)/(x+6). Original denominators require x!=3 and x!=-6. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Chapter completion record

Question	Score / marks	Repair target	Retest date
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HIGHER TIER

UNIT 2 | CHAPTER 5

Complex formula rearrangement

12 curated questions | complete solutions

Chapter focus

Multi-stage rearrangement, powers and roots

Assessment progression

All questions require developed working. Questions 1-4 secure Higher methods; Questions 5-8 connect representations; Questions 9-12 develop Grade 7-9 reasoning.

You must show your working for every question worth 5 marks or more.

Source-use notice

Chapter 5: Complex formula rearrangement

Q01 | 4 MARKS

Make x the subject of y=(3x-1)/(10x+5). State the value of y for which your rearranged denominator is zero. Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

Make x the subject of y=(6x-4)/(5x+4). State the value of y for which your rearranged denominator is zero. Your solution must justify the main method or assumption and include a final check.

Chapter 5: Complex formula rearrangement

Q03 | 4 MARKS

Make x the subject of y=(2x-2)/(8x+3). State the value of y for which your rearranged denominator is zero. Your solution must justify the main method or assumption and include a final check.

Q04 | 4 MARKS

Make x the subject of y=(5x-5)/(3x+2). State the value of y for which your rearranged denominator is zero. Your solution must justify the main method or assumption and include a final check.

Chapter 5: Complex formula rearrangement

Q05 | 4 MARKS

Make x the subject of y=(8x-3)/(6x+5). State the value of y for which your rearranged denominator is zero. Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

Make x the subject of y=(4x-1)/(9x+4). State the value of y for which your rearranged denominator is zero. Your solution must justify the main method or assumption and include a final check.

Chapter 5: Complex formula rearrangement

Q07 | 4 MARKS

Make x the subject of y=(7x-4)/(4x+3). State the value of y for which your rearranged denominator is zero. Your solution must justify the main method or assumption and include a final check.

Q08 | 4 MARKS

Make x the subject of y=(3x-2)/(7x+2). State the value of y for which your rearranged denominator is zero. Your solution must justify the main method or assumption and include a final check.

Chapter 5: Complex formula rearrangement

Q09 | 4 MARKS

Make x the subject of y=(6x-5)/(10x+5). State the value of y for which your rearranged denominator is zero. Your solution must justify the main method or assumption and include a final check.

Q10 | 4 MARKS

Make x the subject of y=(2x-3)/(5x+4). State the value of y for which your rearranged denominator is zero. Your solution must justify the main method or assumption and include a final check.

Chapter 5: Complex formula rearrangement

Q11 | 5 MARKS

You must show your working.
Make x the subject of $y=(3x-4)/(6x+5)$. State the value of y for which your rearranged denominator is zero. Your solution must justify the main method or assumption and include a final check.

Q12 | 6 MARKS

You must show your working.
Make x the subject of $y=(4x-5)/(7x+2)$. State the value of y for which your rearranged denominator is zero. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 4 MARKS

y(10x+5)=3x-1; 10xy+5y=3x-1; x(10y-3)=-1-5y. Hence x=(1+5y)/(3-10y), requiring y!=3/10. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q02 | 4 MARKS

y(5x+4)=6x-4; 5xy+4y=6x-4; x(5y-6)=-4-4y. Hence x=(4+4y)/(6-5y), requiring y!=6/5. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q03 | 4 MARKS

y(8x+3)=2x-2; 8xy+3y=2x-2; x(8y-2)=-2-3y. Hence x=(2+3y)/(2-8y), requiring y!=1/4. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q04 | 4 MARKS

y(3x+2)=5x-5; 3xy+2y=5x-5; x(3y-5)=-5-2y. Hence x=(5+2y)/(5-3y), requiring y!=5/3. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q05 | 4 MARKS

$y(6x+5)=8x-3$; $6xy+5y=8x-3$; $x(6y-8)=-3-5y$. Hence $x=(3+5y)/(8-6y)$, requiring $y\neq 4/3$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q06 | 4 MARKS

$y(9x+4)=4x-1$; $9xy+4y=4x-1$; $x(9y-4)=-1-4y$. Hence $x=(1+4y)/(4-9y)$, requiring $y\neq 4/9$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q07 | 4 MARKS

$y(4x+3)=7x-4$; $4xy+3y=7x-4$; $x(4y-7)=-4-3y$. Hence $x=(4+3y)/(7-4y)$, requiring $y \neq 7/4$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q08 | 4 MARKS

$y(7x+2)=3x-2$; $7xy+2y=3x-2$; $x(7y-3)=-2-2y$. Hence $x=(2+2y)/(3-7y)$, requiring $y \neq 3/7$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q09 | 4 MARKS

$y(10x+5)=6x-5$; $10xy+5y=6x-5$; $x(10y-6)=-5-5y$. Hence $x=(5+5y)/(6-10y)$, requiring $y\neq 3/5$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q10 | 4 MARKS

$y(5x+4)=2x-3$; $5xy+4y=2x-3$; $x(5y-2)=-3-4y$. Hence $x=(3+4y)/(2-5y)$, requiring $y\neq 2/5$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q11 | 5 MARKS

$y(6x+5)=3x-4$; $6xy+5y=3x-4$; $x(6y-3)=-4-5y$. Hence $x=(4+5y)/(3-6y)$, requiring $y\neq 1/2$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q12 | 6 MARKS

$y(7x+2)=4x-5$; $7xy+2y=4x-5$; $x(7y-4)=-5-2y$. Hence $x=(5+2y)/(4-7y)$, requiring $y\neq 4/7$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Chapter completion record

Question	Score / marks	Repair target	Retest date
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HIGHER TIER

UNIT 2 | CHAPTER 6

Identities and algebraic proof

12 curated questions | complete solutions

Chapter focus

Coefficient comparison, parity and divisibility arguments

Assessment progression

All questions require developed working. Questions 1-4 secure Higher methods; Questions 5-8 connect representations; Questions 9-12 develop Grade 7-9 reasoning.

You must show your working for every question worth 5 marks or more.

Source-use notice

Chapter 6: Identities and algebraic proof

Q01 | 4 MARKS

Prove algebraically that the difference between the squares of $9k+1$ and $9k-1$ is divisible by 36 for every integer k. Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

Prove algebraically that the difference between the squares of $4k+1$ and $4k-1$ is divisible by 16 for every integer k. Your solution must justify the main method or assumption and include a final check.

Chapter 6: Identities and algebraic proof

Q03 | 4 MARKS

Prove algebraically that the difference between the squares of 7k+1 and 7k-1 is divisible by 28 for every integer k. Your solution must justify the main method or assumption and include a final check.

Q04 | 4 MARKS

Prove algebraically that the difference between the squares of 2k+1 and 2k-1 is divisible by 8 for every integer k. Your solution must justify the main method or assumption and include a final check.

Chapter 6: Identities and algebraic proof

Q05 | 4 MARKS

Prove algebraically that the difference between the squares of 5k+1 and 5k-1 is divisible by 20 for every integer k. Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

Prove algebraically that the difference between the squares of 8k+1 and 8k-1 is divisible by 32 for every integer k. Your solution must justify the main method or assumption and include a final check.

Chapter 6: Identities and algebraic proof

Q07 | 4 MARKS

Prove algebraically that the difference between the squares of $3k+1$ and $3k-1$ is divisible by 12 for every integer k. Your solution must justify the main method or assumption and include a final check.

Q08 | 4 MARKS

Prove algebraically that the difference between the squares of $6k+1$ and $6k-1$ is divisible by 24 for every integer k. Your solution must justify the main method or assumption and include a final check.

Chapter 6: Identities and algebraic proof

Q09 | 4 MARKS

Prove algebraically that the difference between the squares of 9k+1 and 9k-1 is divisible by 36 for every integer k. Your solution must justify the main method or assumption and include a final check. After completing the calculation, give one independent check that supports your result.

Q10 | 4 MARKS

Prove algebraically that the difference between the squares of 4k+1 and 4k-1 is divisible by 16 for every integer k. Your solution must justify the main method or assumption and include a final check. After completing the calculation, give one independent check that supports your result.

Chapter 6: Identities and algebraic proof

Q11 | 5 MARKS

You must show your working.
Prove algebraically that the difference between the squares of 5k+1 and 5k-1 is divisible by 20 for every integer k. Your solution must justify the main method or assumption and include a final check. After completing the calculation, give one independent check that supports your result.

Q12 | 6 MARKS

You must show your working.
Prove algebraically that the difference between the squares of 6k+1 and 6k-1 is divisible by 24 for every integer k. Your solution must justify the main method or assumption and include a final check. After completing the calculation, give one independent check that supports your result.

Worked solutions

Q01 | 4 MARKS

Use difference of squares: $[(9k+1)^2-(9k-1)^2]=[(2)][2(9)k]=36k$. Since k is an integer, the result is divisible by 36. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q02 | 4 MARKS

Use difference of squares: $[(4k+1)^2-(4k-1)^2]=[(2)][2(4)k]=16k$. Since k is an integer, the result is divisible by 16. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q03 | 4 MARKS

Use difference of squares: $[(7k+1)^2-(7k-1)^2]=[(2)][2(7)k]=28k$. Since k is an integer, the result is divisible by 28. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q04 | 4 MARKS

Use difference of squares: $[(2k+1)^2-(2k-1)^2]=[(2)][2(2)k]=8k$. Since k is an integer, the result is divisible by 8. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q05 | 4 MARKS

Use difference of squares: $[(5k+1)^2-(5k-1)^2]=[(2)][2(5)k]=20k$. Since k is an integer, the result is divisible by 20. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q06 | 4 MARKS

Use difference of squares: $[(8k+1)^2-(8k-1)^2]=[(2)][2(8)k]=32k$. Since k is an integer, the result is divisible by 32. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q07 | 4 MARKS

Use difference of squares: $[(3k+1)^2-(3k-1)^2]=[(2)][2(3)k]=12k$. Since k is an integer, the result is divisible by 12. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q08 | 4 MARKS

Use difference of squares: $[(6k+1)^2-(6k-1)^2]=[(2)][2(6)k]=24k$. Since k is an integer, the result is divisible by 24. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q09 | 4 MARKS

Use difference of squares: $[(9k+1)^2-(9k-1)^2]=[(2)][2(9)k]=36k$. Since k is an integer, the result is divisible by 36. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context. A valid independent check uses substitution, an inverse operation, estimation, or the defining property as appropriate.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q10 | 4 MARKS

Use difference of squares: $[(4k+1)^2-(4k-1)^2]=[(2)][2(4)k]=16k$. Since k is an integer, the result is divisible by 16. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context. A valid independent check uses substitution, an inverse operation, estimation, or the defining property as appropriate.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q11 | 5 MARKS

Use difference of squares: $[(5k+1)^2-(5k-1)^2]=[(2)][2(5)k]=20k$. Since k is an integer, the result is divisible by 20. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context. A valid independent check uses substitution, an inverse operation, estimation, or the defining property as appropriate.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q12 | 6 MARKS

Use difference of squares: $[(6k+1)^2-(6k-1)^2]=[(2)][2(6)k]=24k$. Since k is an integer, the result is divisible by 24. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context. A valid independent check uses substitution, an inverse operation, estimation, or the defining property as appropriate.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Chapter completion record

Question	Score / marks	Repair target	Retest date
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HIGHER TIER

UNIT 2 | CHAPTER 7

Composite and inverse functions

12 curated questions | complete solutions

Chapter focus

Function notation, compositions, inverses and domains

Assessment progression

All questions require developed working. Questions 1-4 secure Higher methods; Questions 5-8 connect representations; Questions 9-12 develop Grade 7-9 reasoning.

You must show your working for every question worth 5 marks or more.

Source-use notice

Chapter 7: Composite and inverse functions

Q01 | 4 MARKS

Let $f(x)=3x+1$ and $g(x)=x^2-10$. Find $f(g(x))$, $g(f(x))$ and $f^{-1}(x)$, stating why the two compositions differ. Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

Let $f(x)=6x+4$ and $g(x)=x^2-5$. Find $f(g(x))$, $g(f(x))$ and $f^{-1}(x)$, stating why the two compositions differ. Your solution must justify the main method or assumption and include a final check.

Chapter 7: Composite and inverse functions

Q03 | 4 MARKS

Let f(x)=2x+2 and g(x)=x^2-8. Find f(g(x)), g(f(x)) and f^(-1)(x), stating why the two compositions differ. Your solution must justify the main method or assumption and include a final check.

Q04 | 4 MARKS

Let f(x)=5x+5 and g(x)=x^2-3. Find f(g(x)), g(f(x)) and f^(-1)(x), stating why the two compositions differ. Your solution must justify the main method or assumption and include a final check.

Chapter 7: Composite and inverse functions

Q05 | 4 MARKS

Let f(x)=8x+3 and g(x)=x^2-6. Find f(g(x)), g(f(x)) and f^(-1)(x), stating why the two compositions differ. Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

Let f(x)=4x+1 and g(x)=x^2-9. Find f(g(x)), g(f(x)) and f^(-1)(x), stating why the two compositions differ. Your solution must justify the main method or assumption and include a final check.

Chapter 7: Composite and inverse functions

Q07 | 4 MARKS

Let $f(x)=7x+4$ and $g(x)=x^2-4$. Find $f(g(x))$, $g(f(x))$ and $f^{-1}(x)$, stating why the two compositions differ. Your solution must justify the main method or assumption and include a final check.

Q08 | 4 MARKS

Let $f(x)=3x+2$ and $g(x)=x^2-7$. Find $f(g(x))$, $g(f(x))$ and $f^{-1}(x)$, stating why the two compositions differ. Your solution must justify the main method or assumption and include a final check.

Chapter 7: Composite and inverse functions

Q09 | 4 MARKS

Let $f(x)=6x+5$ and $g(x)=x^2-10$. Find $f(g(x))$, $g(f(x))$ and $f^{-1}(x)$, stating why the two compositions differ. Your solution must justify the main method or assumption and include a final check.

Q10 | 4 MARKS

Let $f(x)=2x+3$ and $g(x)=x^2-5$. Find $f(g(x))$, $g(f(x))$ and $f^{-1}(x)$, stating why the two compositions differ. Your solution must justify the main method or assumption and include a final check.

Chapter 7: Composite and inverse functions

Q11 | 5 MARKS

You must show your working.
Let f(x)=3x+4 and g(x)=x^2-6. Find f(g(x)), g(f(x)) and f^(-1)(x), stating why the two compositions differ. Your solution must justify the main method or assumption and include a final check.

Q12 | 6 MARKS

You must show your working.
Let f(x)=4x+5 and g(x)=x^2-7. Find f(g(x)), g(f(x)) and f^(-1)(x), stating why the two compositions differ. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 4 MARKS

$f(g(x))=3(x^2-10)+1=3x^2 - 29$. $g(f(x))=(3x+1)^2-10=9x^2 + 6x - 9$. From $y=3x+1$, $f^{-1}(x)=(x-1)/3$. Composition order changes the operations. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q02 | 4 MARKS

$f(g(x))=6(x^2-5)+4=6x^2 - 26$. $g(f(x))=(6x+4)^2-5=36x^2 + 48x + 11$. From $y=6x+4$, $f^{-1}(x)=(x-4)/6$. Composition order changes the operations. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q03 | 4 MARKS

f(g(x))=2(x^2-8)+2=2x^2 - 14. g(f(x))=(2x+2)^2-8=4x^2 + 8x - 4. From y=2x+2, f^(-1)(x)=(x-2)/2. Composition order changes the operations. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q04 | 4 MARKS

f(g(x))=5(x^2-3)+5=5x^2 - 10. g(f(x))=(5x+5)^2-3=25x^2 + 50x + 22. From y=5x+5, f^(-1)(x)=(x-5)/5. Composition order changes the operations. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q05 | 4 MARKS

$f(g(x))=8(x^2-6)+3=8x^2 - 45$. $g(f(x))=(8x+3)^2-6=64x^2 + 48x + 3$. From $y=8x+3$, $f^{-1}(x)=(x-3)/8$. Composition order changes the operations. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q06 | 4 MARKS

$f(g(x))=4(x^2-9)+1=4x^2 - 35$. $g(f(x))=(4x+1)^2-9=16x^2 + 8x - 8$. From $y=4x+1$, $f^{-1}(x)=(x-1)/4$. Composition order changes the operations. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q07 | 4 MARKS

f(g(x))=7(x^2-4)+4=7x^2 - 24. g(f(x))=(7x+4)^2-4=49x^2 + 56x + 12. From y=7x+4, f^(-1)(x)=(x-4)/7. Composition order changes the operations. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q08 | 4 MARKS

f(g(x))=3(x^2-7)+2=3x^2 - 19. g(f(x))=(3x+2)^2-7=9x^2 + 12x - 3. From y=3x+2, f^(-1)(x)=(x-2)/3. Composition order changes the operations. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q09 | 4 MARKS

$f(g(x))=6(x^2-10)+5=6x^2 - 55$. $g(f(x))=(6x+5)^2-10=36x^2 + 60x + 15$. From $y=6x+5$, $f^{-1}(x)=(x-5)/6$. Composition order changes the operations. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q10 | 4 MARKS

$f(g(x))=2(x^2-5)+3=2x^2 - 7$. $g(f(x))=(2x+3)^2-5=4x^2 + 12x + 4$. From $y=2x+3$, $f^{-1}(x)=(x-3)/2$. Composition order changes the operations. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q11 | 5 MARKS

$f(g(x))=3(x^2-6)+4=3x^2 - 14$. $g(f(x))=(3x+4)^2-6=9x^2 + 24x + 10$. From $y=3x+4$, $f^{-1}(x)=(x-4)/3$. Composition order changes the operations. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q12 | 6 MARKS

$f(g(x))=4(x^2-7)+5=4x^2 - 23$. $g(f(x))=(4x+5)^2-7=16x^2 + 40x + 18$. From $y=4x+5$, $f^{-1}(x)=(x-5)/4$. Composition order changes the operations. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Chapter completion record

Question	Score / marks	Repair target	Retest date
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HIGHER TIER

UNIT 2 | CHAPTER 8

Straight-line equations and perpendicular gradients

12 curated questions | complete solutions

Chapter focus

Gradient, intercepts, parallel and perpendicular lines

Assessment progression

All questions require developed working. Questions 1-4 secure Higher methods; Questions 5-8 connect representations; Questions 9-12 develop Grade 7-9 reasoning.

You must show your working for every question worth 5 marks or more.

Source-use notice

Chapter 8: Straight-line equations and perpendicular gradients

Q01 | 4 MARKS

A line has gradient 1 and passes through (2,3). Find its equation. Then find the equation of the perpendicular line through the same point. Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

A line has gradient 4 and passes through (-4,6). Find its equation. Then find the equation of the perpendicular line through the same point. Your solution must justify the main method or assumption and include a final check.

Chapter 8: Straight-line equations and perpendicular gradients

Q03 | 4 MARKS

A line has gradient 2 and passes through (-1,2). Find its equation. Then find the equation of the perpendicular line through the same point. Your solution must justify the main method or assumption and include a final check.

Q04 | 4 MARKS

A line has gradient 5 and passes through (2,5). Find its equation. Then find the equation of the perpendicular line through the same point. Your solution must justify the main method or assumption and include a final check.

Chapter 8: Straight-line equations and perpendicular gradients

Q05 | 4 MARKS

A line has gradient 3 and passes through (-4,8). Find its equation. Then find the equation of the perpendicular line through the same point. Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

A line has gradient 1 and passes through (-1,4). Find its equation. Then find the equation of the perpendicular line through the same point. Your solution must justify the main method or assumption and include a final check.

Chapter 8: Straight-line equations and perpendicular gradients

Q07 | 4 MARKS

A line has gradient 4 and passes through (2,7). Find its equation. Then find the equation of the perpendicular line through the same point. Your solution must justify the main method or assumption and include a final check.

Q08 | 4 MARKS

A line has gradient 2 and passes through (-4,3). Find its equation. Then find the equation of the perpendicular line through the same point. Your solution must justify the main method or assumption and include a final check.

Chapter 8: Straight-line equations and perpendicular gradients

Q09 | 4 MARKS

A line has gradient 5 and passes through (-1,6). Find its equation. Then find the equation of the perpendicular line through the same point. Your solution must justify the main method or assumption and include a final check.

Q10 | 4 MARKS

A line has gradient 3 and passes through (2,2). Find its equation. Then find the equation of the perpendicular line through the same point. Your solution must justify the main method or assumption and include a final check.

Chapter 8: Straight-line equations and perpendicular gradients

Q11 | 5 MARKS

You must show your working.
A line has gradient 4 and passes through (3,3). Find its equation. Then find the equation of the perpendicular line through the same point. Your solution must justify the main method or assumption and include a final check.

Q12 | 6 MARKS

You must show your working.
A line has gradient 5 and passes through (4,4). Find its equation. Then find the equation of the perpendicular line through the same point. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 4 MARKS

Using y-y1=m(x-x1), the first line is y=x+1. A perpendicular gradient is -1/1; its intercept is 5, so y=-x+5. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q02 | 4 MARKS

Using y-y1=m(x-x1), the first line is y=4x+22. A perpendicular gradient is -1/4; its intercept is 5, so y=-1/4x+5. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q03 | 4 MARKS

Using y-y1=m(x-x1), the first line is y=2x+4. A perpendicular gradient is -1/2; its intercept is 3/2, so y=-1/2x+3/2. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q04 | 4 MARKS

Using y-y1=m(x-x1), the first line is y=5x-5. A perpendicular gradient is -1/5; its intercept is 27/5, so y=-1/5x+27/5. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q05 | 4 MARKS

Using y-y1=m(x-x1), the first line is y=3x+20. A perpendicular gradient is -1/3; its intercept is 20/3, so y=-1/3x+20/3. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q06 | 4 MARKS

Using y-y1=m(x-x1), the first line is y=x+5. A perpendicular gradient is -1/1; its intercept is 3, so y=-x+3. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q07 | 4 MARKS

Using y-y1=m(x-x1), the first line is y=4x-1. A perpendicular gradient is -1/4; its intercept is 15/2, so y=-1/4x+15/2. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q08 | 4 MARKS

Using y-y1=m(x-x1), the first line is y=2x+11. A perpendicular gradient is -1/2; its intercept is 1, so y=-1/2x+1. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q09 | 4 MARKS

Using y-y1=m(x-x1), the first line is y=5x+11. A perpendicular gradient is -1/5; its intercept is 29/5, so y=-1/5x+29/5. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q10 | 4 MARKS

Using y-y1=m(x-x1), the first line is y=3x-4. A perpendicular gradient is -1/3; its intercept is 8/3, so y=-1/3x+8/3. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q11 | 5 MARKS

Using y-y1=m(x-x1), the first line is y=4x-9. A perpendicular gradient is -1/4; its intercept is 15/4, so y=-1/4x+15/4. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q12 | 6 MARKS

Using y-y1=m(x-x1), the first line is y=5x-16. A perpendicular gradient is -1/5; its intercept is 24/5, so y=-1/5x+24/5. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Chapter completion record

Question	Score / marks	Repair target	Retest date
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HIGHER TIER

UNIT 2 | CHAPTER 9

Quadratic graphs and discriminants

12 curated questions | complete solutions

Chapter focus

Roots, turning points and discriminant reasoning

Assessment progression

All questions require developed working. Questions 1-4 secure Higher methods; Questions 5-8 connect representations; Questions 9-12 develop Grade 7-9 reasoning.

You must show your working for every question worth 5 marks or more.

Source-use notice

Chapter 9: Quadratic graphs and discriminants

Q01 | 4 MARKS

For $y=x^2 + 4x - 5$, find the roots, y-intercept, axis of symmetry and discriminant. Use them to describe the graph. Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

For $y=x^2 - 2x - 8$, find the roots, y-intercept, axis of symmetry and discriminant. Use them to describe the graph. Your solution must justify the main method or assumption and include a final check.

Chapter 9: Quadratic graphs and discriminants

Q03 | 4 MARKS

For $y=x^2 + 3x - 10$, find the roots, y-intercept, axis of symmetry and discriminant. Use them to describe the graph. Your solution must justify the main method or assumption and include a final check.

Q04 | 4 MARKS

For $y=x^2 - 3x - 10$, find the roots, y-intercept, axis of symmetry and discriminant. Use them to describe the graph. Your solution must justify the main method or assumption and include a final check.

Chapter 9: Quadratic graphs and discriminants

Q05 | 4 MARKS

For y=x^2 + 2x - 15, find the roots, y-intercept, axis of symmetry and discriminant. Use them to describe the graph. Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

For y=x^2 + x - 2, find the roots, y-intercept, axis of symmetry and discriminant. Use them to describe the graph. Your solution must justify the main method or assumption and include a final check.

Chapter 9: Quadratic graphs and discriminants

Q07 | 4 MARKS

For $y=x^2 + x - 20$, find the roots, y-intercept, axis of symmetry and discriminant. Use them to describe the graph. Your solution must justify the main method or assumption and include a final check.

Q08 | 4 MARKS

For $y=x^2 - 4$, find the roots, y-intercept, axis of symmetry and discriminant. Use them to describe the graph. Your solution must justify the main method or assumption and include a final check.

Chapter 9: Quadratic graphs and discriminants

Q09 | 4 MARKS

For $y=x^2 - 25$, find the roots, y-intercept, axis of symmetry and discriminant. Use them to describe the graph. Your solution must justify the main method or assumption and include a final check.

Q10 | 4 MARKS

For $y=x^2 - x - 6$, find the roots, y-intercept, axis of symmetry and discriminant. Use them to describe the graph. Your solution must justify the main method or assumption and include a final check.

Chapter 9: Quadratic graphs and discriminants

Q11 | 5 MARKS

You must show your working.
For $y=x^2 - x - 12$, find the roots, y-intercept, axis of symmetry and discriminant. Use them to describe the graph. Your solution must justify the main method or assumption and include a final check.

Q12 | 6 MARKS

You must show your working.
For $y=x^2 - x - 20$, find the roots, y-intercept, axis of symmetry and discriminant. Use them to describe the graph. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 4 MARKS

Factor form gives roots x=1, x=-5. The y-intercept is -5. The axis is the midpoint, x=-2. The discriminant is 36>0, confirming two distinct real roots; the positive x^2 coefficient means the graph opens upward. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q02 | 4 MARKS

Factor form gives roots x=4, x=-2. The y-intercept is -8. The axis is the midpoint, x=1. The discriminant is 36>0, confirming two distinct real roots; the positive x^2 coefficient means the graph opens upward. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q03 | 4 MARKS

Factor form gives roots x=2, x=-5. The y-intercept is -10. The axis is the midpoint, x=-3/2. The discriminant is 49>0, confirming two distinct real roots; the positive x^2 coefficient means the graph opens upward. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q04 | 4 MARKS

Factor form gives roots x=5, x=-2. The y-intercept is -10. The axis is the midpoint, x=3/2. The discriminant is 49>0, confirming two distinct real roots; the positive x^2 coefficient means the graph opens upward. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q05 | 4 MARKS

Factor form gives roots x=3, x=-5. The y-intercept is -15. The axis is the midpoint, x=-1. The discriminant is 64>0, confirming two distinct real roots; the positive x^2 coefficient means the graph opens upward. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q06 | 4 MARKS

Factor form gives roots x=1, x=-2. The y-intercept is -2. The axis is the midpoint, x=-1/2. The discriminant is 9>0, confirming two distinct real roots; the positive x^2 coefficient means the graph opens upward. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q07 | 4 MARKS

Factor form gives roots x=4, x=-5. The y-intercept is -20. The axis is the midpoint, x=-1/2. The discriminant is 81>0, confirming two distinct real roots; the positive x^2 coefficient means the graph opens upward. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q08 | 4 MARKS

Factor form gives roots x=2, x=-2. The y-intercept is -4. The axis is the midpoint, x=0. The discriminant is 16>0, confirming two distinct real roots; the positive x^2 coefficient means the graph opens upward. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q09 | 4 MARKS

Factor form gives roots x=5, x=-5. The y-intercept is -25. The axis is the midpoint, x=0. The discriminant is 100>0, confirming two distinct real roots; the positive x^2 coefficient means the graph opens upward. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q10 | 4 MARKS

Factor form gives roots x=3, x=-2. The y-intercept is -6. The axis is the midpoint, x=1/2. The discriminant is 25>0, confirming two distinct real roots; the positive x^2 coefficient means the graph opens upward. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q11 | 5 MARKS

Factor form gives roots x=4, x=-3. The y-intercept is -12. The axis is the midpoint, x=1/2. The discriminant is 49>0, confirming two distinct real roots; the positive x^2 coefficient means the graph opens upward. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q12 | 6 MARKS

Factor form gives roots x=5, x=-4. The y-intercept is -20. The axis is the midpoint, x=1/2. The discriminant is 81>0, confirming two distinct real roots; the positive x^2 coefficient means the graph opens upward. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Chapter completion record

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HIGHER TIER

UNIT 2 | CHAPTER 10

Graph transformations

12 curated questions | complete solutions

Chapter focus

Translations, reflections and stretches of functions

Assessment progression

All questions require developed working. Questions 1-4 secure Higher methods; Questions 5-8 connect representations; Questions 9-12 develop Grade 7-9 reasoning.

You must show your working for every question worth 5 marks or more.

Source-use notice

Chapter 10: Graph transformations

Q01 | 4 MARKS

The graph $y=f(x)$ is transformed to $y=3f(x+2)+1$. Describe the transformations in a valid order and map the point (2,5). Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

The graph $y=f(x)$ is transformed to $y=6f(x-1)-2$. Describe the transformations in a valid order and map the point (2,5). Your solution must justify the main method or assumption and include a final check.

Chapter 10: Graph transformations

Q03 | 4 MARKS

The graph y=f(x) is transformed to y=2f(x+3)+1. Describe the transformations in a valid order and map the point (2,5). Your solution must justify the main method or assumption and include a final check.

Q04 | 4 MARKS

The graph y=f(x) is transformed to y=5f(x-0)-2. Describe the transformations in a valid order and map the point (2,5). Your solution must justify the main method or assumption and include a final check.

Chapter 10: Graph transformations

Q05 | 4 MARKS

The graph $y=f(x)$ is transformed to $y=8f(x-3)+1$. Describe the transformations in a valid order and map the point (2,5). Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

The graph $y=f(x)$ is transformed to $y=4f(x+1)-2$. Describe the transformations in a valid order and map the point (2,5). Your solution must justify the main method or assumption and include a final check.

Chapter 10: Graph transformations

Q07 | 4 MARKS

The graph $y=f(x)$ is transformed to $y=7f(x-2)+1$. Describe the transformations in a valid order and map the point (2,5). Your solution must justify the main method or assumption and include a final check.

Q08 | 4 MARKS

The graph $y=f(x)$ is transformed to $y=3f(x+2)-2$. Describe the transformations in a valid order and map the point (2,5). Your solution must justify the main method or assumption and include a final check.

Chapter 10: Graph transformations

Q09 | 4 MARKS

The graph $y=f(x)$ is transformed to $y=6f(x-1)+1$. Describe the transformations in a valid order and map the point (2,5). Your solution must justify the main method or assumption and include a final check.

Q10 | 4 MARKS

The graph $y=f(x)$ is transformed to $y=2f(x+3)-2$. Describe the transformations in a valid order and map the point (2,5). Your solution must justify the main method or assumption and include a final check.

Chapter 10: Graph transformations

Q11 | 5 MARKS

You must show your working.
The graph $y=f(x)$ is transformed to $y=3f(x+2)-1$. Describe the transformations in a valid order and map the point (2,5). Your solution must justify the main method or assumption and include a final check.

Q12 | 6 MARKS

You must show your working.
The graph $y=f(x)$ is transformed to $y=4f(x+1)$. Describe the transformations in a valid order and map the point (2,5). Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 4 MARKS

f(x+2) translates the graph 2 units left; multiplying by 3 gives a vertical stretch factor 3; the final term translates it 1 units up. Thus (2,5) maps to (0,16). Horizontal movement changes x-coordinates; vertical operations change y-coordinates. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q02 | 4 MARKS

f(x-1) translates the graph 1 units right; multiplying by 6 gives a vertical stretch factor 6; the final term translates it 2 units down. Thus (2,5) maps to (3,28). Horizontal movement changes x-coordinates; vertical operations change y-coordinates. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q03 | 4 MARKS

f(x+3) translates the graph 3 units left; multiplying by 2 gives a vertical stretch factor 2; the final term translates it 1 units up. Thus (2,5) maps to (-1,11). Horizontal movement changes x-coordinates; vertical operations change y-coordinates. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q04 | 4 MARKS

f(x-0) translates the graph 0 units horizontally; multiplying by 5 gives a vertical stretch factor 5; the final term translates it 2 units down. Thus (2,5) maps to (2,23). Horizontal movement changes x-coordinates; vertical operations change y-coordinates. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q05 | 4 MARKS

f(x-3) translates the graph 3 units right; multiplying by 8 gives a vertical stretch factor 8; the final term translates it 1 units up. Thus (2,5) maps to (5,41). Horizontal movement changes x-coordinates; vertical operations change y-coordinates. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q06 | 4 MARKS

f(x+1) translates the graph 1 units left; multiplying by 4 gives a vertical stretch factor 4; the final term translates it 2 units down. Thus (2,5) maps to (1,18). Horizontal movement changes x-coordinates; vertical operations change y-coordinates. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q07 | 4 MARKS

f(x-2) translates the graph 2 units right; multiplying by 7 gives a vertical stretch factor 7; the final term translates it 1 units up. Thus (2,5) maps to (4,36). Horizontal movement changes x-coordinates; vertical operations change y-coordinates. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q08 | 4 MARKS

f(x+2) translates the graph 2 units left; multiplying by 3 gives a vertical stretch factor 3; the final term translates it 2 units down. Thus (2,5) maps to (0,13). Horizontal movement changes x-coordinates; vertical operations change y-coordinates. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q09 | 4 MARKS

f(x-1) translates the graph 1 units right; multiplying by 6 gives a vertical stretch factor 6; the final term translates it 1 units up. Thus (2,5) maps to (3,31). Horizontal movement changes x-coordinates; vertical operations change y-coordinates. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q10 | 4 MARKS

f(x+3) translates the graph 3 units left; multiplying by 2 gives a vertical stretch factor 2; the final term translates it 2 units down. Thus (2,5) maps to (-1,8). Horizontal movement changes x-coordinates; vertical operations change y-coordinates. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q11 | 5 MARKS

f(x+2) translates the graph 2 units left; multiplying by 3 gives a vertical stretch factor 3; the final term translates it 1 units down. Thus (2,5) maps to (0,14). Horizontal movement changes x-coordinates; vertical operations change y-coordinates. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q12 | 6 MARKS

f(x+1) translates the graph 1 units left; multiplying by 4 gives a vertical stretch factor 4; the final term translates it 0 units vertically. Thus (2,5) maps to (1,20). Horizontal movement changes x-coordinates; vertical operations change y-coordinates. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Chapter completion record

Question	Score / marks	Repair target	Retest date
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HIGHER TIER

UNIT 2 | CHAPTER 11

Gradients, tangents and areas under graphs

12 curated questions | complete solutions

Chapter focus

Rates, chords, tangents and trapezia

Assessment progression

All questions require developed working. Questions 1-4 secure Higher methods; Questions 5-8 connect representations; Questions 9-12 develop Grade 7-9 reasoning.

You must show your working for every question worth 5 marks or more.

Source-use notice

Chapter 11: Gradients, tangents and areas under graphs

Q01 | 4 MARKS

For $y=3x^2+1$, calculate the gradient of the chord from $x=0$ to $x=4$. Then find the trapezium estimate of the area under the curve using only the two endpoint ordinates. Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

For $y=6x^2+4$, calculate the gradient of the chord from $x=3$ to $x=7$. Then find the trapezium estimate of the area under the curve using only the two endpoint ordinates. Your solution must justify the main method or assumption and include a final check.

Chapter 11: Gradients, tangents and areas under graphs

Q03 | 4 MARKS

For $y=2x^2+2$, calculate the gradient of the chord from $x=1$ to $x=5$. Then find the trapezium estimate of the area under the curve using only the two endpoint ordinates. Your solution must justify the main method or assumption and include a final check.

Q04 | 4 MARKS

For $y=5x^2+5$, calculate the gradient of the chord from $x=4$ to $x=8$. Then find the trapezium estimate of the area under the curve using only the two endpoint ordinates. Your solution must justify the main method or assumption and include a final check.

Chapter 11: Gradients, tangents and areas under graphs

Q05 | 4 MARKS

For $y=8x^2+3$, calculate the gradient of the chord from $x=2$ to $x=6$. Then find the trapezium estimate of the area under the curve using only the two endpoint ordinates. Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

For $y=4x^2+1$, calculate the gradient of the chord from $x=0$ to $x=4$. Then find the trapezium estimate of the area under the curve using only the two endpoint ordinates. Your solution must justify the main method or assumption and include a final check.

Chapter 11: Gradients, tangents and areas under graphs

Q07 | 4 MARKS

For $y=7x^2+4$, calculate the gradient of the chord from $x=3$ to $x=7$. Then find the trapezium estimate of the area under the curve using only the two endpoint ordinates. Your solution must justify the main method or assumption and include a final check.

Q08 | 4 MARKS

For $y=3x^2+2$, calculate the gradient of the chord from $x=1$ to $x=5$. Then find the trapezium estimate of the area under the curve using only the two endpoint ordinates. Your solution must justify the main method or assumption and include a final check.

Chapter 11: Gradients, tangents and areas under graphs

Q09 | 4 MARKS

For y=6x^2+5, calculate the gradient of the chord from x=4 to x=8. Then find the trapezium estimate of the area under the curve using only the two endpoint ordinates. Your solution must justify the main method or assumption and include a final check.

Q10 | 4 MARKS

For y=2x^2+3, calculate the gradient of the chord from x=2 to x=6. Then find the trapezium estimate of the area under the curve using only the two endpoint ordinates. Your solution must justify the main method or assumption and include a final check.

Chapter 11: Gradients, tangents and areas under graphs

Q11 | 5 MARKS

You must show your working.
For y=3x^2+4, calculate the gradient of the chord from x=3 to x=7. Then find the trapezium estimate of the area under the curve using only the two endpoint ordinates. Your solution must justify the main method or assumption and include a final check.

Q12 | 6 MARKS

You must show your working.
For y=4x^2+5, calculate the gradient of the chord from x=4 to x=8. Then find the trapezium estimate of the area under the curve using only the two endpoint ordinates. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 4 MARKS

Endpoint ordinates are 1 and 49. Chord gradient=(49-1)/(4-0)=12. One trapezium gives area=1/2(1+49)(4)=100 square units. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q02 | 4 MARKS

Endpoint ordinates are 58 and 298. Chord gradient=(298-58)/(7-3)=60. One trapezium gives area=1/2(58+298)(4)=712 square units. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q03 | 4 MARKS

Endpoint ordinates are 4 and 52. Chord gradient=(52-4)/(5-1)=12. One trapezium gives area=1/2(4+52)(4)=112 square units. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q04 | 4 MARKS

Endpoint ordinates are 85 and 325. Chord gradient=(325-85)/(8-4)=60. One trapezium gives area=1/2(85+325)(4)=820 square units. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q05 | 4 MARKS

Endpoint ordinates are 35 and 291. Chord gradient=(291-35)/(6-2)=64. One trapezium gives area=1/2(35+291)(4)=652 square units. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q06 | 4 MARKS

Endpoint ordinates are 1 and 65. Chord gradient=(65-1)/(4-0)=16. One trapezium gives area=1/2(1+65)(4)=132 square units. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q07 | 4 MARKS

Endpoint ordinates are 67 and 347. Chord gradient=(347-67)/(7-3)=70. One trapezium gives area=1/2(67+347)(4)=828 square units. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q08 | 4 MARKS

Endpoint ordinates are 5 and 77. Chord gradient=(77-5)/(5-1)=18. One trapezium gives area=1/2(5+77)(4)=164 square units. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q09 | 4 MARKS

Endpoint ordinates are 101 and 389. Chord gradient=(389-101)/(8-4)=72. One trapezium gives area=1/2(101+389)(4)=980 square units. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q10 | 4 MARKS

Endpoint ordinates are 11 and 75. Chord gradient=(75-11)/(6-2)=16. One trapezium gives area=1/2(11+75)(4)=172 square units. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q11 | 5 MARKS

Endpoint ordinates are 31 and 151. Chord gradient=(151-31)/(7-3)=30. One trapezium gives area=1/2(31+151)(4)=364 square units. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q12 | 6 MARKS

Endpoint ordinates are 69 and 261. Chord gradient=(261-69)/(8-4)=48. One trapezium gives area=1/2(69+261)(4)=660 square units. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Chapter completion record

Question	Score / marks	Repair target	Retest date
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HIGHER TIER

UNIT 2 | CHAPTER 12

Circle equations and tangents

12 curated questions | complete solutions

Chapter focus

Centres, radii, intersections and perpendicular tangents

Assessment progression

All questions require developed working. Questions 1-4 secure Higher methods; Questions 5-8 connect representations; Questions 9-12 develop Grade 7-9 reasoning.

You must show your working for every question worth 5 marks or more.

Source-use notice

Chapter 12: Circle equations and tangents

Q01 | 4 MARKS

A circle has equation (x+2)^2+(y+2)^2=36. State its centre and radius, verify (4,-2) lies on it, and find the tangent there. Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

A circle has equation (x-1)^2+(y-1)^2=9. State its centre and radius, verify (4,1) lies on it, and find the tangent there. Your solution must justify the main method or assumption and include a final check.

Chapter 12: Circle equations and tangents

Q03 | 4 MARKS

A circle has equation (x+3)^2+(y+1)^2=36. State its centre and radius, verify (3,-1) lies on it, and find the tangent there. Your solution must justify the main method or assumption and include a final check.

Q04 | 4 MARKS

A circle has equation (x-0)^2+(y-2)^2=9. State its centre and radius, verify (3,2) lies on it, and find the tangent there. Your solution must justify the main method or assumption and include a final check.

Chapter 12: Circle equations and tangents

Q05 | 4 MARKS

A circle has equation (x-3)^2+(y-0)^2=36. State its centre and radius, verify (9,0) lies on it, and find the tangent there. Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

A circle has equation (x+1)^2+(y+2)^2=9. State its centre and radius, verify (2,-2) lies on it, and find the tangent there. Your solution must justify the main method or assumption and include a final check.

Chapter 12: Circle equations and tangents

Q07 | 4 MARKS

A circle has equation (x-2)^2+(y-1)^2=36. State its centre and radius, verify (8,1) lies on it, and find the tangent there. Your solution must justify the main method or assumption and include a final check.

Q08 | 4 MARKS

A circle has equation (x+2)^2+(y+1)^2=9. State its centre and radius, verify (1,-1) lies on it, and find the tangent there. Your solution must justify the main method or assumption and include a final check.

Chapter 12: Circle equations and tangents

Q09 | 4 MARKS

A circle has equation (x-1)^2+(y-2)^2=36. State its centre and radius, verify (7,2) lies on it, and find the tangent there. Your solution must justify the main method or assumption and include a final check.

Q10 | 4 MARKS

A circle has equation (x+3)^2+(y-0)^2=9. State its centre and radius, verify (0,0) lies on it, and find the tangent there. Your solution must justify the main method or assumption and include a final check.

Chapter 12: Circle equations and tangents

Q11 | 5 MARKS

You must show your working.
A circle has equation (x+2)^2+(y-1)^2=16. State its centre and radius, verify (2,1) lies on it, and find the tangent there. Your solution must justify the main method or assumption and include a final check.

Q12 | 6 MARKS

You must show your working.
A circle has equation (x+1)^2+(y-2)^2=25. State its centre and radius, verify (4,2) lies on it, and find the tangent there. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 4 MARKS

The centre is (-2,-2) and radius 6. Substitution gives 6^2+0^2=36. The radius to (4,-2) is horizontal, so the tangent is vertical: x=4. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q02 | 4 MARKS

The centre is (1,1) and radius 3. Substitution gives 3^2+0^2=9. The radius to (4,1) is horizontal, so the tangent is vertical: x=4. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q03 | 4 MARKS

The centre is (-3,-1) and radius 6. Substitution gives 6^2+0^2=36. The radius to (3,-1) is horizontal, so the tangent is vertical: x=3. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q04 | 4 MARKS

The centre is (0,2) and radius 3. Substitution gives 3^2+0^2=9. The radius to (3,2) is horizontal, so the tangent is vertical: x=3. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q05 | 4 MARKS

The centre is (3,0) and radius 6. Substitution gives 6^2+0^2=36. The radius to (9,0) is horizontal, so the tangent is vertical: x=9. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q06 | 4 MARKS

The centre is (-1,-2) and radius 3. Substitution gives 3^2+0^2=9. The radius to (2,-2) is horizontal, so the tangent is vertical: x=2. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q07 | 4 MARKS

The centre is (2,1) and radius 6. Substitution gives 6^2+0^2=36. The radius to (8,1) is horizontal, so the tangent is vertical: x=8. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q08 | 4 MARKS

The centre is (-2,-1) and radius 3. Substitution gives 3^2+0^2=9. The radius to (1,-1) is horizontal, so the tangent is vertical: x=1. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q09 | 4 MARKS

The centre is (1,2) and radius 6. Substitution gives 6^2+0^2=36. The radius to (7,2) is horizontal, so the tangent is vertical: x=7. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q10 | 4 MARKS

The centre is (-3,0) and radius 3. Substitution gives 3^2+0^2=9. The radius to (0,0) is horizontal, so the tangent is vertical: x=0. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q11 | 5 MARKS

The centre is (-2,1) and radius 4. Substitution gives 4^2+0^2=16. The radius to (2,1) is horizontal, so the tangent is vertical: x=2. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q12 | 6 MARKS

The centre is (-1,2) and radius 5. Substitution gives 5^2+0^2=25. The radius to (4,2) is horizontal, so the tangent is vertical: x=4. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Chapter completion record

Question	Score / marks	Repair target	Retest date
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HIGHER TIER

UNIT 2 | CHAPTER 13

Fractional linear equations

12 curated questions | complete solutions

Chapter focus

Equations with algebraic denominators and validity checks

Assessment progression

All questions require developed working. Questions 1-4 secure Higher methods; Questions 5-8 connect representations; Questions 9-12 develop Grade 7-9 reasoning.

You must show your working for every question worth 5 marks or more.

Source-use notice

Chapter 13: Fractional linear equations

Q01 | 4 MARKS

Solve 3/(x-4)+1=5. State the excluded value and verify the solution in the original equation. Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

Solve 6/(x-1)+4=11. State the excluded value and verify the solution in the original equation. Your solution must justify the main method or assumption and include a final check.

Chapter 13: Fractional linear equations

Q03 | 4 MARKS

Solve 2/(x-4)+2=5. State the excluded value and verify the solution in the original equation. Your solution must justify the main method or assumption and include a final check.

Q04 | 4 MARKS

Solve 5/(x-1)+5=11. State the excluded value and verify the solution in the original equation. Your solution must justify the main method or assumption and include a final check.

Chapter 13: Fractional linear equations

Q05 | 4 MARKS

Solve 8/(x-4)+3=12. State the excluded value and verify the solution in the original equation. Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

Solve 4/(x-1)+1=6. State the excluded value and verify the solution in the original equation. Your solution must justify the main method or assumption and include a final check.

Chapter 13: Fractional linear equations

Q07 | 4 MARKS

Solve $7/(x-4)+4=12$. State the excluded value and verify the solution in the original equation. Your solution must justify the main method or assumption and include a final check.

Q08 | 4 MARKS

Solve $3/(x-1)+2=6$. State the excluded value and verify the solution in the original equation. Your solution must justify the main method or assumption and include a final check.

Chapter 13: Fractional linear equations

Q09 | 4 MARKS

Solve $6/(x-4)+5=12$. State the excluded value and verify the solution in the original equation. Your solution must justify the main method or assumption and include a final check.

Q10 | 4 MARKS

Solve $2/(x-1)+3=6$. State the excluded value and verify the solution in the original equation. Your solution must justify the main method or assumption and include a final check.

Chapter 13: Fractional linear equations

Q11 | 5 MARKS

You must show your working.
Solve 3/(x-2)+4=8. State the excluded value and verify the solution in the original equation. Your solution must justify the main method or assumption and include a final check.

Q12 | 6 MARKS

You must show your working.
Solve 4/(x-3)+5=10. State the excluded value and verify the solution in the original equation. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 4 MARKS

Restriction: x!=4. Then 3/(x-4)=4, so x-4=3/4 and x=19/4. Substitution returns 5; the solution is not excluded. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q02 | 4 MARKS

Restriction: x!=1. Then 6/(x-1)=7, so x-1=6/7 and x=13/7. Substitution returns 11; the solution is not excluded. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q03 | 4 MARKS

Restriction: x!=4. Then 2/(x-4)=3, so x-4=2/3 and x=14/3. Substitution returns 5; the solution is not excluded. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q04 | 4 MARKS

Restriction: x!=1. Then 5/(x-1)=6, so x-1=5/6 and x=11/6. Substitution returns 11; the solution is not excluded. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q05 | 4 MARKS

Restriction: x!=4. Then 8/(x-4)=9, so x-4=8/9 and x=44/9. Substitution returns 12; the solution is not excluded. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q06 | 4 MARKS

Restriction: x!=1. Then 4/(x-1)=5, so x-1=4/5 and x=9/5. Substitution returns 6; the solution is not excluded. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q07 | 4 MARKS

Restriction: x!=4. Then 7/(x-4)=8, so x-4=7/8 and x=39/8. Substitution returns 12; the solution is not excluded. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q08 | 4 MARKS

Restriction: x!=1. Then 3/(x-1)=4, so x-1=3/4 and x=7/4. Substitution returns 6; the solution is not excluded. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q09 | 4 MARKS

Restriction: x!=4. Then 6/(x-4)=7, so x-4=6/7 and x=34/7. Substitution returns 12; the solution is not excluded. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q10 | 4 MARKS

Restriction: x!=1. Then 2/(x-1)=3, so x-1=2/3 and x=5/3. Substitution returns 6; the solution is not excluded. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q11 | 5 MARKS

Restriction: x!=2. Then 3/(x-2)=4, so x-2=3/4 and x=11/4. Substitution returns 8; the solution is not excluded. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q12 | 6 MARKS

Restriction: x!=3. Then 4/(x-3)=5, so x-3=4/5 and x=19/5. Substitution returns 10; the solution is not excluded. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Chapter completion record

Question	Score / marks	Repair target	Retest date
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HIGHER TIER

UNIT 2 | CHAPTER 14

Quadratic formula

12 curated questions | complete solutions

Chapter focus

Exact and approximate roots using the quadratic formula

Assessment progression

All questions require developed working. Questions 1-4 secure Higher methods; Questions 5-8 connect representations; Questions 9-12 develop Grade 7-9 reasoning.

You must show your working for every question worth 5 marks or more.

Source-use notice

Chapter 14: Quadratic formula

Q01 | 4 MARKS

Solve 1x^2+3x-5=0 using the quadratic formula. Give exact roots and three-decimal approximations. Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

Solve 1x^2+6x-2=0 using the quadratic formula. Give exact roots and three-decimal approximations. Your solution must justify the main method or assumption and include a final check.

Chapter 14: Quadratic formula

Q03 | 4 MARKS

Solve $1x^2+2x-5=0$ using the quadratic formula. Give exact roots and three-decimal approximations. Your solution must justify the main method or assumption and include a final check.

Q04 | 4 MARKS

Solve $1x^2+5x-2=0$ using the quadratic formula. Give exact roots and three-decimal approximations. Your solution must justify the main method or assumption and include a final check.

Chapter 14: Quadratic formula

Q05 | 4 MARKS

Solve 1x^2+8x-5=0 using the quadratic formula. Give exact roots and three-decimal approximations. Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

Solve 1x^2+4x-2=0 using the quadratic formula. Give exact roots and three-decimal approximations. Your solution must justify the main method or assumption and include a final check.

Chapter 14: Quadratic formula

Q07 | 4 MARKS

Solve 1x^2+7x-5=0 using the quadratic formula. Give exact roots and three-decimal approximations. Your solution must justify the main method or assumption and include a final check.

Q08 | 4 MARKS

Solve 1x^2+3x-2=0 using the quadratic formula. Give exact roots and three-decimal approximations. Your solution must justify the main method or assumption and include a final check.

Chapter 14: Quadratic formula

Q09 | 4 MARKS

Solve 1x^2+6x-5=0 using the quadratic formula. Give exact roots and three-decimal approximations. Your solution must justify the main method or assumption and include a final check.

Q10 | 4 MARKS

Solve 1x^2+2x-2=0 using the quadratic formula. Give exact roots and three-decimal approximations. Your solution must justify the main method or assumption and include a final check.

Chapter 14: Quadratic formula

Q11 | 5 MARKS

You must show your working.
Solve $2x^2+3x-3=0$ using the quadratic formula. Give exact roots and three-decimal approximations. Your solution must justify the main method or assumption and include a final check.

Q12 | 6 MARKS

You must show your working.
Solve $3x^2+4x-4=0$ using the quadratic formula. Give exact roots and three-decimal approximations. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 4 MARKS

With a=1, b=3, c=-5, discriminant=3^2-4(1)(-5)=29. Thus x=(-3 plus or minus sqrt(29))/2. Exact roots are -3/2 + sqrt(29)/2 and -sqrt(29)/2 - 3/2; approximately 1.193 and -4.193. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q02 | 4 MARKS

With a=1, b=6, c=-2, discriminant=6^2-4(1)(-2)=44. Thus x=(-6 plus or minus sqrt(44))/2. Exact roots are -3 + sqrt(11) and -sqrt(11) - 3; approximately 0.317 and -6.317. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q03 | 4 MARKS

With a=1, b=2, c=-5, discriminant=2^2-4(1)(-5)=24. Thus x=(-2 plus or minus sqrt(24))/2. Exact roots are -1 + sqrt(6) and -sqrt(6) - 1; approximately 1.449 and -3.449. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q04 | 4 MARKS

With a=1, b=5, c=-2, discriminant=5^2-4(1)(-2)=33. Thus x=(-5 plus or minus sqrt(33))/2. Exact roots are -5/2 + sqrt(33)/2 and -sqrt(33)/2 - 5/2; approximately 0.372 and -5.372. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q05 | 4 MARKS

With a=1, b=8, c=-5, discriminant=8^2-4(1)(-5)=84. Thus x=(-8 plus or minus sqrt(84))/2. Exact roots are -4 + sqrt(21) and -sqrt(21) - 4; approximately 0.583 and -8.583. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q06 | 4 MARKS

With a=1, b=4, c=-2, discriminant=4^2-4(1)(-2)=24. Thus x=(-4 plus or minus sqrt(24))/2. Exact roots are -2 + sqrt(6) and -sqrt(6) - 2; approximately 0.449 and -4.449. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q07 | 4 MARKS

With a=1, b=7, c=-5, discriminant=7^2-4(1)(-5)=69. Thus x=(-7 plus or minus sqrt(69))/2. Exact roots are -7/2 + sqrt(69)/2 and -sqrt(69)/2 - 7/2; approximately 0.653 and -7.653. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q08 | 4 MARKS

With a=1, b=3, c=-2, discriminant=3^2-4(1)(-2)=17. Thus x=(-3 plus or minus sqrt(17))/2. Exact roots are -3/2 + sqrt(17)/2 and -sqrt(17)/2 - 3/2; approximately 0.562 and -3.562. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q09 | 4 MARKS

With a=1, b=6, c=-5, discriminant=6^2-4(1)(-5)=56. Thus x=(-6 plus or minus sqrt(56))/2. Exact roots are -3 + sqrt(14) and -sqrt(14) - 3; approximately 0.742 and -6.742. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q10 | 4 MARKS

With a=1, b=2, c=-2, discriminant=2^2-4(1)(-2)=12. Thus x=(-2 plus or minus sqrt(12))/2. Exact roots are -1 + sqrt(3) and -sqrt(3) - 1; approximately 0.732 and -2.732. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q11 | 5 MARKS

With a=2, b=3, c=-3, discriminant=3^2-4(2)(-3)=33. Thus x=(-3 plus or minus sqrt(33))/4. Exact roots are -3/4 + sqrt(33)/4 and -sqrt(33)/4 - 3/4; approximately 0.686 and -2.186. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q12 | 6 MARKS

With a=3, b=4, c=-4, discriminant=4^2-4(3)(-4)=64. Thus x=(-4 plus or minus sqrt(64))/6. Exact roots are -2 and 2/3; approximately -2.000 and 0.667. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Chapter completion record

Question	Score / marks	Repair target	Retest date
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HIGHER TIER

UNIT 2 | CHAPTER 15

Completing the square and optimisation

12 curated questions | complete solutions

Chapter focus

Vertex form, extrema and equation solving

Assessment progression

All questions require developed working. Questions 1-4 secure Higher methods; Questions 5-8 connect representations; Questions 9-12 develop Grade 7-9 reasoning.

You must show your working for every question worth 5 marks or more.

Source-use notice

Chapter 15: Completing the square and optimisation

Q01 | 4 MARKS

Write x^2 - 4x + 6 in completed-square form. State the turning point and the minimum or maximum value, then solve x^2 - 4x + 6=11. Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

Write x^2 + 8x + 13 in completed-square form. State the turning point and the minimum or maximum value, then solve x^2 + 8x + 13=6. Your solution must justify the main method or assumption and include a final check.

Chapter 15: Completing the square and optimisation

Q03 | 4 MARKS

Write $x^2 + 2x + 1$ in completed-square form. State the turning point and the minimum or maximum value, then solve $x^2 + 2x + 1=9$. Your solution must justify the main method or assumption and include a final check.

Q04 | 4 MARKS

Write $x^2 - 4x - 1$ in completed-square form. State the turning point and the minimum or maximum value, then solve $x^2 - 4x - 1=4$. Your solution must justify the main method or assumption and include a final check.

Chapter 15: Completing the square and optimisation

Q05 | 4 MARKS

Write x^2 + 8x + 14 in completed-square form. State the turning point and the minimum or maximum value, then solve x^2 + 8x + 14=7. Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

Write x^2 + 2x + 2 in completed-square form. State the turning point and the minimum or maximum value, then solve x^2 + 2x + 2=10. Your solution must justify the main method or assumption and include a final check.

Chapter 15: Completing the square and optimisation

Q07 | 4 MARKS

Write $x^2 - 4x$ in completed-square form. State the turning point and the minimum or maximum value, then solve $x^2 - 4x=5$. Your solution must justify the main method or assumption and include a final check.

Q08 | 4 MARKS

Write $x^2 + 8x + 15$ in completed-square form. State the turning point and the minimum or maximum value, then solve $x^2 + 8x + 15=8$. Your solution must justify the main method or assumption and include a final check.

Chapter 15: Completing the square and optimisation

Q09 | 4 MARKS

Write x^2 + 2x + 3 in completed-square form. State the turning point and the minimum or maximum value, then solve x^2 + 2x + 3=11. Your solution must justify the main method or assumption and include a final check.

Q10 | 4 MARKS

Write x^2 - 4x + 1 in completed-square form. State the turning point and the minimum or maximum value, then solve x^2 - 4x + 1=6. Your solution must justify the main method or assumption and include a final check.

Chapter 15: Completing the square and optimisation

Q11 | 5 MARKS

You must show your working.
Write x^2 - 6x + 7 in completed-square form. State the turning point and the minimum or maximum value, then solve x^2 - 6x + 7=7. Your solution must justify the main method or assumption and include a final check.

Q12 | 6 MARKS

You must show your working.
Write x^2 - 8x + 15 in completed-square form. State the turning point and the minimum or maximum value, then solve x^2 - 8x + 15=8. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 4 MARKS

Completed-square form is (x-2)^2+2. Turning point (2,2); it is a minimum because the square coefficient is positive. Equation gives (x-2)^2=9, so x=-1 or x=5. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q02 | 4 MARKS

Completed-square form is (x+4)^2-3. Turning point (-4,-3); it is a minimum because the square coefficient is positive. Equation gives (x+4)^2=9, so x=-7 or x=-1. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q03 | 4 MARKS

Completed-square form is (x+1)^2. Turning point (-1,0); it is a minimum because the square coefficient is positive. Equation gives (x+1)^2=9, so x=-4 or x=2. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q04 | 4 MARKS

Completed-square form is (x-2)^2-5. Turning point (2,-5); it is a minimum because the square coefficient is positive. Equation gives (x-2)^2=9, so x=-1 or x=5. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q05 | 4 MARKS

Completed-square form is $(x+4)^2-2$. Turning point $(-4,-2)$; it is a minimum because the square coefficient is positive. Equation gives $(x+4)^2=9$, so $x=-7$ or $x=-1$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q06 | 4 MARKS

Completed-square form is $(x+1)^2+1$. Turning point $(-1,1)$; it is a minimum because the square coefficient is positive. Equation gives $(x+1)^2=9$, so $x=-4$ or $x=2$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q07 | 4 MARKS

Completed-square form is $(x-2)^2-4$. Turning point $(2,-4)$; it is a minimum because the square coefficient is positive. Equation gives $(x-2)^2=9$, so $x=-1$ or $x=5$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q08 | 4 MARKS

Completed-square form is $(x+4)^2-1$. Turning point $(-4,-1)$; it is a minimum because the square coefficient is positive. Equation gives $(x+4)^2=9$, so $x=-7$ or $x=-1$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q09 | 4 MARKS

Completed-square form is $(x+1)^2+2$. Turning point $(-1,2)$; it is a minimum because the square coefficient is positive. Equation gives $(x+1)^2=9$, so $x=-4$ or $x=2$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q10 | 4 MARKS

Completed-square form is $(x-2)^2-3$. Turning point $(2,-3)$; it is a minimum because the square coefficient is positive. Equation gives $(x-2)^2=9$, so $x=-1$ or $x=5$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q11 | 5 MARKS

Completed-square form is (x-3)^2-2. Turning point (3,-2); it is a minimum because the square coefficient is positive. Equation gives (x-3)^2=9, so x=0 or x=6. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q12 | 6 MARKS

Completed-square form is (x-4)^2-1. Turning point (4,-1); it is a minimum because the square coefficient is positive. Equation gives (x-4)^2=9, so x=1 or x=7. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Chapter completion record

Question	Score / marks	Repair target	Retest date
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HIGHER TIER

UNIT 2 | CHAPTER 16

Linear-quadratic simultaneous equations

12 curated questions | complete solutions

Chapter focus

Substitution, intersections and verification

Assessment progression

All questions require developed working. Questions 1-4 secure Higher methods; Questions 5-8 connect representations; Questions 9-12 develop Grade 7-9 reasoning.

You must show your working for every question worth 5 marks or more.

Source-use notice

Chapter 16: Linear-quadratic simultaneous equations

Q01 | 4 MARKS

Solve simultaneously y=4x-2 and x^2+y^2=5. Give every intersection and verify both equations. Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

Solve simultaneously y=3x+1 and x^2+y^2=185. Give every intersection and verify both equations. Your solution must justify the main method or assumption and include a final check.

Chapter 16: Linear-quadratic simultaneous equations

Q03 | 4 MARKS

Solve simultaneously y=2x-3 and x^2+y^2=5. Give every intersection and verify both equations. Your solution must justify the main method or assumption and include a final check.

Q04 | 4 MARKS

Solve simultaneously y=x and x^2+y^2=50. Give every intersection and verify both equations. Your solution must justify the main method or assumption and include a final check.

Chapter 16: Linear-quadratic simultaneous equations

Q05 | 4 MARKS

Solve simultaneously y=4x+3 and x^2+y^2=234. Give every intersection and verify both equations. Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

Solve simultaneously y=3x-1 and x^2+y^2=5. Give every intersection and verify both equations. Your solution must justify the main method or assumption and include a final check.

Chapter 16: Linear-quadratic simultaneous equations

Q07 | 4 MARKS

Solve simultaneously y=2x+2 and x^2+y^2=116. Give every intersection and verify both equations. Your solution must justify the main method or assumption and include a final check.

Q08 | 4 MARKS

Solve simultaneously y=x-2 and x^2+y^2=4. Give every intersection and verify both equations. Your solution must justify the main method or assumption and include a final check.

Chapter 16: Linear-quadratic simultaneous equations

Q09 | 4 MARKS

Solve simultaneously $y=4x+1$ and $x^2+y^2=466$. Give every intersection and verify both equations. Your solution must justify the main method or assumption and include a final check.

Q10 | 4 MARKS

Solve simultaneously $y=3x-3$ and $x^2+y^2=45$. Give every intersection and verify both equations. Your solution must justify the main method or assumption and include a final check.

Chapter 16: Linear-quadratic simultaneous equations

Q11 | 5 MARKS

You must show your working.
Solve simultaneously $y=4x-2$ and $x^2+y^2=212$. Give every intersection and verify both equations. Your solution must justify the main method or assumption and include a final check.

Q12 | 6 MARKS

You must show your working.
Solve simultaneously $y=x-1$ and $x^2+y^2=41$. Give every intersection and verify both equations. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 4 MARKS

Substitution gives $17x^2 - 16x - 1=0$, with x-values $-1/17$, 1. Hence intersections are [(-1/17, -38/17), (1, 2)]. Substituting each point satisfies the line and gives $x^2+y^2=5$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q02 | 4 MARKS

Substitution gives $10x^2 + 6x - 184=0$, with x-values $-23/5$, 4. Hence intersections are [(-23/5, -64/5), (4, 13)]. Substituting each point satisfies the line and gives $x^2+y^2=185$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q03 | 4 MARKS

Substitution gives $5x^2 - 12x + 4=0$, with x-values 2/5, 2. Hence intersections are [(2/5, -11/5), (2, 1)]. Substituting each point satisfies the line and gives $x^2+y^2=5$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q04 | 4 MARKS

Substitution gives $2x^2 - 50=0$, with x-values -5, 5. Hence intersections are [(-5, -5), (5, 5)]. Substituting each point satisfies the line and gives $x^2+y^2=50$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q05 | 4 MARKS

Substitution gives $17x^2 + 24x - 225=0$, with x-values -75/17, 3. Hence intersections are [(-75/17, -249/17), (3, 15)]. Substituting each point satisfies the line and gives $x^2+y^2=234$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q06 | 4 MARKS

Substitution gives $10x^2 - 6x - 4=0$, with x-values -2/5, 1. Hence intersections are [(-2/5, -11/5), (1, 2)]. Substituting each point satisfies the line and gives $x^2+y^2=5$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q07 | 4 MARKS

Substitution gives $5x^2 + 8x - 112=0$, with x-values $-28/5$, 4. Hence intersections are [(-28/5, -46/5), (4, 10)]. Substituting each point satisfies the line and gives $x^2+y^2=116$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q08 | 4 MARKS

Substitution gives $2x^2 - 4x=0$, with x-values 0, 2. Hence intersections are [(0, -2), (2, 0)]. Substituting each point satisfies the line and gives $x^2+y^2=4$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q09 | 4 MARKS

Substitution gives $17x^2 + 8x - 465=0$, with x-values $-93/17$, 5. Hence intersections are [(-93/17, -355/17), (5, 21)]. Substituting each point satisfies the line and gives $x^2+y^2=466$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q10 | 4 MARKS

Substitution gives $10x^2 - 18x - 36=0$, with x-values $-6/5$, 3. Hence intersections are [(-6/5, -33/5), (3, 6)]. Substituting each point satisfies the line and gives $x^2+y^2=45$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q11 | 5 MARKS

Substitution gives 17x^2 - 16x - 208=0, with x-values -52/17, 4. Hence intersections are [(-52/17, -242/17), (4, 14)]. Substituting each point satisfies the line and gives x^2+y^2=212. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q12 | 6 MARKS

Substitution gives 2x^2 - 2x - 40=0, with x-values -4, 5. Hence intersections are [(-4, -5), (5, 4)]. Substituting each point satisfies the line and gives x^2+y^2=41. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Chapter completion record

Question	Score / marks	Repair target	Retest date
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HIGHER TIER

UNIT 2 | CHAPTER 17

Iterative numerical solutions

12 curated questions | complete solutions

Chapter focus

Rearrangements, convergence and interval checks

Assessment progression

All questions require developed working. Questions 1-4 secure Higher methods; Questions 5-8 connect representations; Questions 9-12 develop Grade 7-9 reasoning.

You must show your working for every question worth 5 marks or more.

Source-use notice

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Chapter 17: Iterative numerical solutions

Q01 | 4 MARKS

Use $x_{n+1}=0.5(x_n+3/x_n)$ with $x_1=1.0$ to find x_4. Give six decimal places and explain what equation the fixed point satisfies. Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

Use $x_{n+1}=0.5(x_n+6/x_n)$ with $x_1=1.0$ to find x_4. Give six decimal places and explain what equation the fixed point satisfies. Your solution must justify the main method or assumption and include a final check.

Chapter 17: Iterative numerical solutions

Q03 | 4 MARKS

Use $x_{n+1}=0.5(x_n+2/x_n)$ with $x_1=1.0$ to find x_4. Give six decimal places and explain what equation the fixed point satisfies. Your solution must justify the main method or assumption and include a final check.

Q04 | 4 MARKS

Use $x_{n+1}=0.5(x_n+5/x_n)$ with $x_1=1.0$ to find x_4. Give six decimal places and explain what equation the fixed point satisfies. Your solution must justify the main method or assumption and include a final check.

Chapter 17: Iterative numerical solutions

Q05 | 4 MARKS

Use $x_{n+1}=0.5(x_n+8/x_n)$ with $x_1=1.0$ to find x_4. Give six decimal places and explain what equation the fixed point satisfies. Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

Use $x_{n+1}=0.5(x_n+4/x_n)$ with $x_1=1.0$ to find x_4. Give six decimal places and explain what equation the fixed point satisfies. Your solution must justify the main method or assumption and include a final check.

Chapter 17: Iterative numerical solutions

Q07 | 4 MARKS

Use $x_{n+1}=0.5(x_n+7/x_n)$ with $x_1=1.0$ to find x_4. Give six decimal places and explain what equation the fixed point satisfies. Your solution must justify the main method or assumption and include a final check.

Q08 | 4 MARKS

Use $x_{n+1}=0.5(x_n+3/x_n)$ with $x_1=1.0$ to find x_4. Give six decimal places and explain what equation the fixed point satisfies. Your solution must justify the main method or assumption and include a final check. After completing the calculation, give one independent check that supports your result.

Chapter 17: Iterative numerical solutions

Q09 | 4 MARKS

Use $x_{n+1}=0.5(x_n+6/x_n)$ with $x_1=1.0$ to find x_4. Give six decimal places and explain what equation the fixed point satisfies. Your solution must justify the main method or assumption and include a final check. After completing the calculation, give one independent check that supports your result.

Q10 | 4 MARKS

Use $x_{n+1}=0.5(x_n+2/x_n)$ with $x_1=1.0$ to find x_4. Give six decimal places and explain what equation the fixed point satisfies. Your solution must justify the main method or assumption and include a final check. After completing the calculation, give one independent check that supports your result.

Chapter 17: Iterative numerical solutions

Q11 | 5 MARKS

You must show your working.
Use x_(n+1)=0.5(x_n+3/x_n) with x_1=1.5 to find x_4. Give six decimal places and explain what equation the fixed point satisfies. Your solution must justify the main method or assumption and include a final check.

Q12 | 6 MARKS

You must show your working.
Use x_(n+1)=0.5(x_n+4/x_n) with x_1=2.0 to find x_4. Give six decimal places and explain what equation the fixed point satisfies. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 4 MARKS

Iterations: $x_2=2.000000$, $x_3=1.750000$, $x_4=1.732143$. At a fixed point $x=0.5(x+3/x)$, so $x^2=3$; the positive iteration approaches $\sqrt{3}$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q02 | 4 MARKS

Iterations: $x_2=3.500000$, $x_3=2.607143$, $x_4=2.454256$. At a fixed point $x=0.5(x+6/x)$, so $x^2=6$; the positive iteration approaches $\sqrt{6}$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q03 | 4 MARKS

Iterations: $x_2=1.500000$, $x_3=1.416667$, $x_4=1.414216$. At a fixed point $x=0.5(x+2/x)$, so $x^2=2$; the positive iteration approaches sqrt(2). The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q04 | 4 MARKS

Iterations: $x_2=3.000000$, $x_3=2.333333$, $x_4=2.238095$. At a fixed point $x=0.5(x+5/x)$, so $x^2=5$; the positive iteration approaches sqrt(5). The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q05 | 4 MARKS

Iterations: $x_2=4.500000$, $x_3=3.138889$, $x_4=2.843781$. At a fixed point $x=0.5(x+8/x)$, so $x^2=8$; the positive iteration approaches sqrt(8). The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q06 | 4 MARKS

Iterations: $x_2=2.500000$, $x_3=2.050000$, $x_4=2.000610$. At a fixed point $x=0.5(x+4/x)$, so $x^2=4$; the positive iteration approaches sqrt(4). The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q07 | 4 MARKS

Iterations: $x_2=4.000000$, $x_3=2.875000$, $x_4=2.654891$. At a fixed point $x=0.5(x+7/x)$, so $x^2=7$; the positive iteration approaches sqrt(7). The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q08 | 4 MARKS

Iterations: $x_2=2.000000$, $x_3=1.750000$, $x_4=1.732143$. At a fixed point $x=0.5(x+3/x)$, so $x^2=3$; the positive iteration approaches sqrt(3). The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context. A valid independent check uses substitution, an inverse operation, estimation, or the defining property as appropriate.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q09 | 4 MARKS

Iterations: $x_2=3.500000$, $x_3=2.607143$, $x_4=2.454256$. At a fixed point $x=0.5(x+6/x)$, so $x^2=6$; the positive iteration approaches $\sqrt{6}$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context. A valid independent check uses substitution, an inverse operation, estimation, or the defining property as appropriate.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q10 | 4 MARKS

Iterations: $x_2=1.500000$, $x_3=1.416667$, $x_4=1.414216$. At a fixed point $x=0.5(x+2/x)$, so $x^2=2$; the positive iteration approaches $\sqrt{2}$. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context. A valid independent check uses substitution, an inverse operation, estimation, or the defining property as appropriate.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q11 | 5 MARKS

Iterations: $x_2=1.750000$, $x_3=1.732143$, $x_4=1.732051$. At a fixed point $x=0.5(x+3/x)$, so $x^2=3$; the positive iteration approaches sqrt(3). The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q12 | 6 MARKS

Iterations: $x_2=2.000000$, $x_3=2.000000$, $x_4=2.000000$. At a fixed point $x=0.5(x+4/x)$, so $x^2=4$; the positive iteration approaches sqrt(4). The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Chapter completion record

Question	Score / marks	Repair target	Retest date
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12			

HIGHER TIER

UNIT 2 | CHAPTER 18

Quadratic inequalities

12 curated questions | complete solutions

Chapter focus

Critical values, sign analysis and integer solutions

Assessment progression

All questions require developed working. Questions 1-4 secure Higher methods; Questions 5-8 connect representations; Questions 9-12 develop Grade 7-9 reasoning.

You must show your working for every question worth 5 marks or more.

Source-use notice

Chapter 18: Quadratic inequalities

Q01 | 4 MARKS

Solve (x+4)(x-2)<=0. Represent the solution on a number line and list all integer solutions between -10 and 10. Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

Solve (x+1)(x-4)<=0. Represent the solution on a number line and list all integer solutions between -10 and 10. Your solution must justify the main method or assumption and include a final check.

Chapter 18: Quadratic inequalities

Q03 | 4 MARKS

Solve (x+5)(x+1)<=0. Represent the solution on a number line and list all integer solutions between -10 and 10. Your solution must justify the main method or assumption and include a final check.

Q04 | 4 MARKS

Solve (x+2)(x-1)<=0. Represent the solution on a number line and list all integer solutions between -10 and 10. Your solution must justify the main method or assumption and include a final check.

Chapter 18: Quadratic inequalities

Q05 | 4 MARKS

Solve (x-1)(x-7)<=0. Represent the solution on a number line and list all integer solutions between -10 and 10. Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

Solve (x+3)(x-2)<=0. Represent the solution on a number line and list all integer solutions between -10 and 10. Your solution must justify the main method or assumption and include a final check.

Chapter 18: Quadratic inequalities

Q07 | 4 MARKS

Solve $(x-0)(x-4)<=0$. Represent the solution on a number line and list all integer solutions between -10 and 10. Your solution must justify the main method or assumption and include a final check.

Q08 | 4 MARKS

Solve $(x+4)(x+1)<=0$. Represent the solution on a number line and list all integer solutions between -10 and 10. Your solution must justify the main method or assumption and include a final check.

Chapter 18: Quadratic inequalities

Q09 | 4 MARKS

Solve (x+1)(x-5)<=0. Represent the solution on a number line and list all integer solutions between -10 and 10. Your solution must justify the main method or assumption and include a final check.

Q10 | 4 MARKS

Solve (x+5)(x-0)<=0. Represent the solution on a number line and list all integer solutions between -10 and 10. Your solution must justify the main method or assumption and include a final check.

Chapter 18: Quadratic inequalities

Q11 | 5 MARKS

You must show your working.
Solve (x+4)(x-2)<=0. Represent the solution on a number line and list all integer solutions between -10 and 10. Your solution must justify the main method or assumption and include a final check. After completing the calculation, give one independent check that supports your result.

Q12 | 6 MARKS

You must show your working.
Solve (x+3)(x-0)<=0. Represent the solution on a number line and list all integer solutions between -10 and 10. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 4 MARKS

Critical values are -4 and 2. The product is non-positive between the roots, including endpoints, so -4<=x<=2. Required integers: [-4, -3, -2, -1, 0, 1, 2]. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q02 | 4 MARKS

Critical values are -1 and 4. The product is non-positive between the roots, including endpoints, so -1<=x<=4. Required integers: [-1, 0, 1, 2, 3, 4]. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q03 | 4 MARKS

Critical values are -5 and -1. The product is non-positive between the roots, including endpoints, so -5<=x<=-1. Required integers: [-5, -4, -3, -2, -1]. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q04 | 4 MARKS

Critical values are -2 and 1. The product is non-positive between the roots, including endpoints, so -2<=x<=1. Required integers: [-2, -1, 0, 1]. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q05 | 4 MARKS

Critical values are 1 and 7. The product is non-positive between the roots, including endpoints, so 1<=x<=7. Required integers: [1, 2, 3, 4, 5, 6, 7]. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q06 | 4 MARKS

Critical values are -3 and 2. The product is non-positive between the roots, including endpoints, so -3<=x<=2. Required integers: [-3, -2, -1, 0, 1, 2]. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q07 | 4 MARKS

Critical values are 0 and 4. The product is non-positive between the roots, including endpoints, so 0<=x<=4. Required integers: [0, 1, 2, 3, 4]. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q08 | 4 MARKS

Critical values are -4 and -1. The product is non-positive between the roots, including endpoints, so -4<=x<=-1. Required integers: [-4, -3, -2, -1]. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q09 | 4 MARKS

Critical values are -1 and 5. The product is non-positive between the roots, including endpoints, so -1<=x<=5. Required integers: [-1, 0, 1, 2, 3, 4, 5]. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q10 | 4 MARKS

Critical values are -5 and 0. The product is non-positive between the roots, including endpoints, so -5<=x<=0. Required integers: [-5, -4, -3, -2, -1, 0]. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q11 | 5 MARKS

Critical values are -4 and 2. The product is non-positive between the roots, including endpoints, so -4<=x<=2. Required integers: [-4, -3, -2, -1, 0, 1, 2]. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context. A valid independent check uses substitution, an inverse operation, estimation, or the defining property as appropriate.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q12 | 6 MARKS

Critical values are -3 and 0. The product is non-positive between the roots, including endpoints, so -3<=x<=0. Required integers: [-3, -2, -1, 0]. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Chapter completion record

Question	Score / marks	Repair target	Retest date
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HIGHER TIER

UNIT 2 | CHAPTER 19

Arithmetic, geometric and quadratic sequences

12 curated questions | complete solutions

Chapter focus

nth terms, recurrence and proof of membership

Assessment progression

All questions require developed working. Questions 1-4 secure Higher methods; Questions 5-8 connect representations; Questions 9-12 develop Grade 7-9 reasoning.

You must show your working for every question worth 5 marks or more.

Source-use notice

Chapter 19: Arithmetic, geometric and quadratic sequences

Q01 | 4 MARKS

A quadratic sequence begins [7, 17, 35, 61, 95]. Find its nth term using differences, then determine whether 385 is the 10th term. Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

A quadratic sequence begins [6, 16, 32, 54, 82]. Find its nth term using differences, then determine whether 312 is the 10th term. Your solution must justify the main method or assumption and include a final check.

Chapter 19: Arithmetic, geometric and quadratic sequences

Q03 | 4 MARKS

A quadratic sequence begins [4, 7, 14, 25, 40]. Find its nth term using differences, then determine whether 175 is the 10th term. Your solution must justify the main method or assumption and include a final check.

Q04 | 4 MARKS

A quadratic sequence begins [3, 6, 11, 18, 27]. Find its nth term using differences, then determine whether 102 is the 10th term. Your solution must justify the main method or assumption and include a final check.

Chapter 19: Arithmetic, geometric and quadratic sequences

Q05 | 4 MARKS

A quadratic sequence begins [12, 27, 50, 81, 120]. Find its nth term using differences, then determine whether 435 is the 10th term. Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

A quadratic sequence begins [4, 12, 26, 46, 72]. Find its nth term using differences, then determine whether 292 is the 10th term. Your solution must justify the main method or assumption and include a final check.

Chapter 19: Arithmetic, geometric and quadratic sequences

Q07 | 4 MARKS

A quadratic sequence begins [9, 17, 29, 45, 65]. Find its nth term using differences, then determine whether 225 is the 10th term. Your solution must justify the main method or assumption and include a final check.

Q08 | 4 MARKS

A quadratic sequence begins [1, 2, 5, 10, 17]. Find its nth term using differences, then determine whether 82 is the 10th term. Your solution must justify the main method or assumption and include a final check.

Chapter 19: Arithmetic, geometric and quadratic sequences

Q09 | 4 MARKS

A quadratic sequence begins [10, 23, 44, 73, 110]. Find its nth term using differences, then determine whether 415 is the 10th term. Your solution must justify the main method or assumption and include a final check.

Q10 | 4 MARKS

A quadratic sequence begins [2, 8, 20, 38, 62]. Find its nth term using differences, then determine whether 272 is the 10th term. Your solution must justify the main method or assumption and include a final check.

Chapter 19: Arithmetic, geometric and quadratic sequences

Q11 | 5 MARKS

You must show your working.
A quadratic sequence begins [5, 15, 33, 59, 93]. Find its nth term using differences, then determine whether 383 is the 10th term. Your solution must justify the main method or assumption and include a final check.

Q12 | 6 MARKS

You must show your working.
A quadratic sequence begins [4, 6, 10, 16, 24]. Find its nth term using differences, then determine whether 94 is the 10th term. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 4 MARKS

First differences are [10, 18, 26, 34]; second difference is 8, so the n^2 coefficient is 4. Matching the remaining linear and constant parts gives 4n^2-2n+5. At n=10 this equals 385, so the stated value is the 10th term. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q02 | 4 MARKS

First differences are [10, 16, 22, 28]; second difference is 6, so the n^2 coefficient is 3. Matching the remaining linear and constant parts gives 3n^2+1n+2. At n=10 this equals 312, so the stated value is the 10th term. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q03 | 4 MARKS

First differences are [3, 7, 11, 15]; second difference is 4, so the n^2 coefficient is 2. Matching the remaining linear and constant parts gives 2n^2-3n+5. At n=10 this equals 175, so the stated value is the 10th term. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q04 | 4 MARKS

First differences are [3, 5, 7, 9]; second difference is 2, so the n^2 coefficient is 1. Matching the remaining linear and constant parts gives 1n^2+0n+2. At n=10 this equals 102, so the stated value is the 10th term. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q05 | 4 MARKS

First differences are [15, 23, 31, 39]; second difference is 8, so the n^2 coefficient is 4. Matching the remaining linear and constant parts gives 4n^2+3n+5. At n=10 this equals 435, so the stated value is the 10th term. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q06 | 4 MARKS

First differences are [8, 14, 20, 26]; second difference is 6, so the n^2 coefficient is 3. Matching the remaining linear and constant parts gives 3n^2-1n+2. At n=10 this equals 292, so the stated value is the 10th term. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q07 | 4 MARKS

First differences are [8, 12, 16, 20]; second difference is 4, so the n^2 coefficient is 2. Matching the remaining linear and constant parts gives 2n^2+2n+5. At n=10 this equals 225, so the stated value is the 10th term. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q08 | 4 MARKS

First differences are [1, 3, 5, 7]; second difference is 2, so the n^2 coefficient is 1. Matching the remaining linear and constant parts gives 1n^2-2n+2. At n=10 this equals 82, so the stated value is the 10th term. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q09 | 4 MARKS

First differences are [13, 21, 29, 37]; second difference is 8, so the n^2 coefficient is 4. Matching the remaining linear and constant parts gives 4n^2+1n+5. At n=10 this equals 415, so the stated value is the 10th term. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q10 | 4 MARKS

First differences are [6, 12, 18, 24]; second difference is 6, so the n^2 coefficient is 3. Matching the remaining linear and constant parts gives 3n^2-3n+2. At n=10 this equals 272, so the stated value is the 10th term. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q11 | 5 MARKS

First differences are [10, 18, 26, 34]; second difference is 8, so the n^2 coefficient is 4. Matching the remaining linear and constant parts gives 4n^2-2n+3. At n=10 this equals 383, so the stated value is the 10th term. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q12 | 6 MARKS

First differences are [2, 4, 6, 8]; second difference is 2, so the n^2 coefficient is 1. Matching the remaining linear and constant parts gives 1n^2-1n+4. At n=10 this equals 94, so the stated value is the 10th term. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Chapter completion record

Question	Score / marks	Repair target	Retest date
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HIGHER TIER

UNIT 2 | CHAPTER 20

Connected Higher algebraic modelling

12 curated questions | complete solutions

Chapter focus

Multi-stage construction, solution and interpretation

Assessment progression

All questions require developed working. Questions 1-4 secure Higher methods; Questions 5-8 connect representations; Questions 9-12 develop Grade 7-9 reasoning.

You must show your working for every question worth 5 marks or more.

Source-use notice

Chapter 20: Connected Higher algebraic modelling

Q01 | 4 MARKS

A rectangle has perimeter 36 cm. Its width is x cm. Form a quadratic for its area, find the maximum area exactly, and decide whether width 12 cm gives at least 90% of the maximum. Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

A rectangle has perimeter 30 cm. Its width is x cm. Form a quadratic for its area, find the maximum area exactly, and decide whether width 7 cm gives at least 90% of the maximum. Your solution must justify the main method or assumption and include a final check.

Chapter 20: Connected Higher algebraic modelling

Q03 | 4 MARKS

A rectangle has perimeter 36 cm. Its width is x cm. Form a quadratic for its area, find the maximum area exactly, and decide whether width 10 cm gives at least 90% of the maximum. Your solution must justify the main method or assumption and include a final check.

Q04 | 4 MARKS

A rectangle has perimeter 30 cm. Its width is x cm. Form a quadratic for its area, find the maximum area exactly, and decide whether width 5 cm gives at least 90% of the maximum. Your solution must justify the main method or assumption and include a final check.

Chapter 20: Connected Higher algebraic modelling

Q05 | 4 MARKS

A rectangle has perimeter 36 cm. Its width is x cm. Form a quadratic for its area, find the maximum area exactly, and decide whether width 8 cm gives at least 90% of the maximum. Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

A rectangle has perimeter 30 cm. Its width is x cm. Form a quadratic for its area, find the maximum area exactly, and decide whether width 11 cm gives at least 90% of the maximum. Your solution must justify the main method or assumption and include a final check.

Chapter 20: Connected Higher algebraic modelling

Q07 | 4 MARKS

A rectangle has perimeter 36 cm. Its width is x cm. Form a quadratic for its area, find the maximum area exactly, and decide whether width 6 cm gives at least 90% of the maximum. Your solution must justify the main method or assumption and include a final check.

Q08 | 4 MARKS

A rectangle has perimeter 30 cm. Its width is x cm. Form a quadratic for its area, find the maximum area exactly, and decide whether width 9 cm gives at least 90% of the maximum. Your solution must justify the main method or assumption and include a final check.

Chapter 20: Connected Higher algebraic modelling

Q09 | 4 MARKS

A rectangle has perimeter 36 cm. Its width is x cm. Form a quadratic for its area, find the maximum area exactly, and decide whether width 12 cm gives at least 90% of the maximum. Your solution must justify the main method or assumption and include a final check. After completing the calculation, give one independent check that supports your result.

Q10 | 4 MARKS

A rectangle has perimeter 30 cm. Its width is x cm. Form a quadratic for its area, find the maximum area exactly, and decide whether width 7 cm gives at least 90% of the maximum. Your solution must justify the main method or assumption and include a final check. After completing the calculation, give one independent check that supports your result.

Chapter 20: Connected Higher algebraic modelling

Q11 | 5 MARKS

You must show your working.
A rectangle has perimeter 32 cm. Its width is x cm. Form a quadratic for its area, find the maximum area exactly, and decide whether width 8 cm gives at least 90% of the maximum. Your solution must justify the main method or assumption and include a final check.

Q12 | 6 MARKS

You must show your working.
A rectangle has perimeter 34 cm. Its width is x cm. Form a quadratic for its area, find the maximum area exactly, and decide whether width 9 cm gives at least 90% of the maximum. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 4 MARKS

Length=18-x, so $A=x(18-x)=-x^2+18x$. Completing the square or symmetry gives maximum at $x=9$, with $A=81$ cm^2. For $x=12$, $A=72$, which is 88.9% of the maximum; therefore it does not reach 90%. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q02 | 4 MARKS

Length=15-x, so $A=x(15-x)=-x^2+15x$. Completing the square or symmetry gives maximum at $x=15/2$, with $A=225/4$ cm^2. For $x=7$, $A=56$, which is 99.6% of the maximum; therefore it does reach 90%. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q03 | 4 MARKS

Length=18-x, so $A=x(18-x)=-x^2+18x$. Completing the square or symmetry gives maximum at $x=9$, with $A=81$ cm^2. For $x=10$, $A=80$, which is 98.8% of the maximum; therefore it does reach 90%. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q04 | 4 MARKS

Length=15-x, so $A=x(15-x)=-x^2+15x$. Completing the square or symmetry gives maximum at $x=15/2$, with $A=225/4$ cm^2. For $x=5$, $A=50$, which is 88.9% of the maximum; therefore it does not reach 90%. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q05 | 4 MARKS

Length=18-x, so $A=x(18-x)=-x^2+18x$. Completing the square or symmetry gives maximum at x=9, with A=81 cm^2. For x=8, A=80, which is 98.8% of the maximum; therefore it does reach 90%. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q06 | 4 MARKS

Length=15-x, so $A=x(15-x)=-x^2+15x$. Completing the square or symmetry gives maximum at x=15/2, with A=225/4 cm^2. For x=11, A=44, which is 78.2% of the maximum; therefore it does not reach 90%. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q07 | 4 MARKS

Length=18-x, so $A=x(18-x)=-x^2+18x$. Completing the square or symmetry gives maximum at $x=9$, with $A=81$ cm^2. For $x=6$, $A=72$, which is 88.9% of the maximum; therefore it does not reach 90%. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q08 | 4 MARKS

Length=15-x, so $A=x(15-x)=-x^2+15x$. Completing the square or symmetry gives maximum at $x=15/2$, with $A=225/4$ cm^2. For $x=9$, $A=54$, which is 96.0% of the maximum; therefore it does reach 90%. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q09 | 4 MARKS

Length=18-x, so A=x(18-x)=-x^2+18x. Completing the square or symmetry gives maximum at x=9, with A=81 cm^2. For x=12, A=72, which is 88.9% of the maximum; therefore it does not reach 90%. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context. A valid independent check uses substitution, an inverse operation, estimation, or the defining property as appropriate.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q10 | 4 MARKS

Length=15-x, so A=x(15-x)=-x^2+15x. Completing the square or symmetry gives maximum at x=15/2, with A=225/4 cm^2. For x=7, A=56, which is 99.6% of the maximum; therefore it does reach 90%. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context. A valid independent check uses substitution, an inverse operation, estimation, or the defining property as appropriate.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Worked solutions

Q11 | 5 MARKS

Length=16-x, so A=x(16-x)=-x^2+16x. Completing the square or symmetry gives maximum at x=8, with A=64 cm^2. For x=8, A=64, which is 100.0% of the maximum; therefore it does reach 90%. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Q12 | 6 MARKS

Length=17-x, so A=x(17-x)=-x^2+17x. Completing the square or symmetry gives maximum at x=17/2, with A=289/4 cm^2. For x=9, A=72, which is 99.7% of the maximum; therefore it does reach 90%. The written justification should identify the decisive method or assumption; the check should confirm the result independently or test it against the context.

Credit a correct method and accurate progress; reserve the final mark for the required answer, justification or contextual conclusion.

Chapter completion record

Question	Score / marks	Repair target	Retest date
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