GCSE ONLINE TUTORING

RS REMOTE TUTORING

GCSE MATHEMATICS HIGHER TIER

UNIT 1: NUMBER

13 chapters | 156 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 1 | CHAPTER 1

Ordering real numbers and directed calculation

12 curated questions | complete solutions

Chapter focus

Higher Number reasoning, exact calculation and proof

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

This chapter is independently authored and specification-mapped. It does not reproduce OCR questions, mark schemes, logos or proprietary layouts.

Chapter 1: Ordering real numbers and directed calculation

Q01 | 4 MARKS

A bank balance is -£146.80. A payment of £235.50 arrives, three equal bills of £41.75 leave, and a £9.20 fee is charged. Find the balance and interpret its sign. Your solution must justify the main method or assumption and include a final check.

Q02 | 6 MARKS

You must show your working.
A game score begins at 40. Correct answers add 7, incorrect answers subtract 4 and omitted answers subtract 1. After 18 questions, 10 were correct and the final score was 91. Find the numbers incorrect and omitted. Your solution must justify the main method or assumption and include a final check.

Chapter 1: Ordering real numbers and directed calculation

Q03 | 5 MARKS

You must show your working.
Evaluate $[(-4)^3-(-2)^5] \div [-3^2+5]$. Explain the difference between -3^2 and $(-3)^2$. Your solution must justify the main method or assumption and include a final check.

Q04 | 5 MARKS

You must show your working.
Show that $0.58 < \text{sqrt}(1/3) < 0.59$ is false as written, then repair it using two-decimal bounds. Your solution must justify the main method or assumption and include a final check.

Chapter 1: Ordering real numbers and directed calculation

Q05 | 6 MARKS

You must show your working.
The four values p, -9, 14 and 2p have range 41. Find every possible value of p. Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

Evaluate (-1)^101 + (-1)^202 - (-2)^4 + -2^4. Explain each sign before combining. Your solution must justify the main method or assumption and include a final check.

Chapter 1: Ordering real numbers and directed calculation

Q07 | 5 MARKS

You must show your working.
A number x is negative and satisfies $x^2<30$ and $|x-2|>6$. Find all possible integer values. Your solution must justify the main method or assumption and include a final check.

Q08 | 4 MARKS

Three consecutive integers have mean -7. Their squares are then given signs +, -, + in order. Evaluate the resulting signed sum. Your solution must justify the main method or assumption and include a final check.

Chapter 1: Ordering real numbers and directed calculation

Q09 | 5 MARKS

You must show your working.
A student orders -sqrt(27), -5.18 and -26/5 as -sqrt(27)<-26/5<-5.18. Identify and repair the error exactly. Your solution must justify the main method or assumption and include a final check.

Q10 | 5 MARKS

You must show your working.
Numbers x and y satisfy x<y<0 and xy=24. Decide which of x+y, x-y and y-x must be positive, negative or cannot be fixed. Your solution must justify the main method or assumption and include a final check.

Chapter 1: Ordering real numbers and directed calculation

Q11 | 5 MARKS

You must show your working.
A quantity changes from -12 to 18, then by -250% of that first change, and finally increases by 45. Find the final value and explain the meaning of the percentage step. Your solution must justify the main method or assumption and include a final check.

Q12 | 5 MARKS

You must show your working.
Prove that if x<y then -3x+4>-3y+4, and explain geometrically what the transformation does to order. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 4 MARKS

Balance=-146.80+235.50-3(41.75)-9.20=-146.80+235.50-125.25-9.20=-£45.75. The negative sign means the account is £45.75 overdrawn. 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 | 6 MARKS

Let i incorrect and o omitted. i+o=8. Score equation 40+70-4i-o=91 gives 4i+o=19. Subtract i+o=8 to get 3i=11, not an integer. Therefore the stated data are impossible; at least one recorded value is wrong. 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 | 5 MARKS

Numerator=-64-(-32)=-32. Denominator $-3^2+5=-9+5=-4$. Quotient=(-32)/(-4)=8. Here -3^2 means $-(3^2)$; brackets would make the base -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 | 5 MARKS

$0.58^2=0.3364>1/3$, so sqrt(1/3)<0.58; the lower inequality is false. Also $0.57^2=0.3249<1/3$. Correct bounds are 0.57<sqrt(1/3)<0.58. 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 | 6 MARKS

The extremes depend on p. If 2p is maximum and -9 minimum, 2p+9=41 gives p=16, valid. If 14 is maximum and 2p minimum, 14-2p=41 gives p=-13.5, but p itself=-13.5 is greater than 2p=-27, valid. Other extreme assignments either contradict ordering or repeat these. Thus p=16 or p=-13.5. 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.

Q06 | 4 MARKS

Odd power: (-1)^101=-1. Even power: (-1)^202=1. (-2)^4=16, while -2^4=-16. Expression=-1+1-16-16=-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 | 5 MARKS

$x^2<30$ gives $-\sqrt{30}<x<\sqrt{30}$, so integer x is -5 to 5. $|x-2|>6$ gives $x<-4$ or $x>8$. With x negative, intersection is 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

The integers are -8,-7,-6. Signed square sum $=(-8)^2-(-7)^2+(-6)^2=64-49+36=51$. 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 | 5 MARKS

-26/5=-5.2. Since $5.2^2=27.04>27$, we have 5.2>sqrt(27), so negating gives -5.2<-sqrt(27). Also $5.18^2=26.8324<27$, so -sqrt(27)<-5.18. Correct ascending order is -26/5, -sqrt(27), -5.18. 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 | 5 MARKS

Both x,y are negative, so x+y is negative. Since x<y, x-y is negative and y-x is positive. The product condition confirms neither is zero but is not otherwise needed. 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 change=18-(-12)=30. A change of -250% of 30 is -2.5×30=-75. From 18: 18-75+45=-12. The percentage is applied to the change of 30, not to the current value. 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 | 5 MARKS

Multiplying x<y by -3 reverses the inequality: -3x>-3y. Adding 4 preserves it: -3x+4>-3y+4. Geometrically, multiplication by a negative reflects the number line and reverses order; translation by 4 does not change order. 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
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

HIGHER TIER

UNIT 1 | CHAPTER 2

Operation structure, reciprocals and exact arithmetic

12 curated questions | complete solutions

Chapter focus

Higher Number reasoning, exact calculation and proof

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

This chapter is independently authored and specification-mapped. It does not reproduce OCR questions, mark schemes, logos or proprietary layouts.

Chapter 2: Operation structure, reciprocals and exact arithmetic

Q01 | 5 MARKS

You must show your working.
Solve (3/5)x - 7/10 = 11/6 exactly. Verify by substitution. Your solution must justify the main method or assumption and include a final check.

Q02 | 5 MARKS

You must show your working.
Find the exact value of (0.6 recurring + 0.25)/(1.2 - 5/8). Convert recurring notation before calculating. Your solution must justify the main method or assumption and include a final check.

Chapter 2: Operation structure, reciprocals and exact arithmetic

Q03 | 5 MARKS

You must show your working.
A journey is split into 2/5 at 48 km/h and the remaining 3/5 at 72 km/h. For a total distance of 180 km, find the exact total travel time. Your solution must justify the main method or assumption and include a final check.

Q04 | 5 MARKS

You must show your working.
Evaluate (3/7 of 14/15) ÷ (5/9 of 27/28). Show the meaning of “of” before division. Your solution must justify the main method or assumption and include a final check.

Chapter 2: Operation structure, reciprocals and exact arithmetic

Q05 | 5 MARKS

You must show your working.
Evaluate exactly: (11/12+3/8) ÷ (11/12-3/8). Include a check that the divisor is non-zero. Your solution must justify the main method or assumption and include a final check.

Q06 | 5 MARKS

You must show your working.
Evaluate exactly: (9/10+7/25) ÷ (9/10-7/25). Include a check that the divisor is non-zero. Your solution must justify the main method or assumption and include a final check.

Chapter 2: Operation structure, reciprocals and exact arithmetic

Q07 | 5 MARKS

You must show your working.
Evaluate exactly: (7/16+3/20) ÷ (7/16-3/20). Include a check that the divisor is non-zero. Your solution must justify the main method or assumption and include a final check.

Q08 | 5 MARKS

You must show your working.
Solve 5/(x-1)=7/3. State the excluded value and keep the solution exact. Your solution must justify the main method or assumption and include a final check.

Chapter 2: Operation structure, reciprocals and exact arithmetic

Q09 | 5 MARKS

You must show your working.
Solve 9/(x+5)=3/2. State the excluded value and keep the solution exact. Your solution must justify the main method or assumption and include a final check.

Q10 | 5 MARKS

You must show your working.
A machine completes 5/12 of a job in 2 1/2 hours at a constant rate. Find the exact time for the whole job and the time still required. Your solution must justify the main method or assumption and include a final check.

Chapter 2: Operation structure, reciprocals and exact arithmetic

Q11 | 6 MARKS

You must show your working.
A map scale calculation gives distance (7/8×3 3/7)÷(5/6) centimetres. Evaluate exactly, then convert using 1 cm represents 24 km. Your solution must justify the main method or assumption and include a final check.

Q12 | 6 MARKS

You must show your working.
A quantity is multiplied by 3/5, divided by 9/10 and then decreased by 7/12. The result is 3/4. Find the original quantity. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 5 MARKS

Add 7/10: (3/5)x=11/6+7/10=55/30+21/30=76/30=38/15. Multiply by reciprocal 5/3: x=38/15×5/3=38/9. Substitution gives 38/15-7/10=76/30-21/30=55/30=11/6. 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.

Q02 | 5 MARKS

0.6 recurring=2/3 and 0.25=1/4, so numerator=11/12. Denominator=6/5-5/8=48/40-25/40=23/40. Quotient=11/12×40/23=110/69. 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 | 5 MARKS

Distances are 72 km and 108 km. Times: 72/48=3/2 h and 108/72=3/2 h. Total=3 hours. Averaging the two speeds would not generally give the correct time. 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 | 5 MARKS

First quantity=3/7×14/15=2/5. Second=5/9×27/28=15/28. Divide: 2/5×28/15=56/75. 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 | 5 MARKS

The numerator is 31/24 and the divisor is 13/24, which is non-zero. Multiply by the reciprocal: 31/24÷13/24=31/13. 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 | 5 MARKS

The numerator is 59/50 and the divisor is 31/50, which is non-zero. Multiply by the reciprocal: 59/50÷31/50=59/31. 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 | 5 MARKS

The numerator is 47/80 and the divisor is 23/80, which is non-zero. Multiply by the reciprocal: 47/80÷23/80=47/23. 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 | 5 MARKS

The denominator requires x≠1. Cross-multiply: 15=7(x-1). Hence x-1=15/7, so x=22/7, which 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 | 5 MARKS

The denominator requires $x \neq -5$. Cross-multiply: $18=3(x+5)$. Hence $x+5=6$, so $x=1$, which 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 | 5 MARKS

Whole time$=(5/2)\div(5/12)=5/2\times12/5=6$ hours. Time remaining$=6-5/2=7/2$ hours. 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 | 6 MARKS

3 3/7=24/7. Then 7/8×24/7=3, and 3÷5/6=18/5 cm. Real distance=18/5×24=432/5 km=86.4 km. 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

Let x be original. (3/5)x÷(9/10)=(3/5)x×10/9=2x/3. So 2x/3-7/12=3/4. Then 2x/3=16/12=4/3, giving 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.

Chapter completion record

Question	Score / marks	Repair target	Retest date
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

HIGHER TIER

UNIT 1 | CHAPTER 3

Prime structure, HCF, LCM and divisibility proof

12 curated questions | complete solutions

Chapter focus

Higher Number reasoning, exact calculation and proof

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

This chapter is independently authored and specification-mapped. It does not reproduce OCR questions, mark schemes, logos or proprietary layouts.

Chapter 3: Prime structure, HCF, LCM and divisibility proof

Q01 | 6 MARKS

You must show your working.
Find the smallest positive integer that leaves remainder 2 when divided by 5, remainder 3 when divided by 7, and is divisible by 4. Your solution must justify the main method or assumption and include a final check.

Q02 | 5 MARKS

You must show your working.
A number is written as 2^4 × 3^3 × 5. How many of its positive factors are multiples of 60? Your solution must justify the main method or assumption and include a final check.

Chapter 3: Prime structure, HCF, LCM and divisibility proof

Q03 | 5 MARKS

You must show your working.
The LCM of 2^a×3² and 2³×3^b is 2^5×3^4, while their HCF is 2³×3². Find a and b. Your solution must justify the main method or assumption and include a final check.

Q04 | 6 MARKS

You must show your working.
The sum of two positive integers is 84 and their HCF is 12. Find all unordered pairs. Your solution must justify the main method or assumption and include a final check.

Chapter 3: Prime structure, HCF, LCM and divisibility proof

Q05 | 6 MARKS

You must show your working.
A positive integer has exactly three positive factors. Prove that it must be the square of a prime. Your solution must justify the main method or assumption and include a final check.

Q06 | 6 MARKS

You must show your working.
Show that the product of four consecutive integers is always divisible by 24. Your solution must justify the main method or assumption and include a final check.

Chapter 3: Prime structure, HCF, LCM and divisibility proof

Q07 | 6 MARKS

You must show your working.
Find all primes p for which p+10 and p+14 are also prime. Your solution must justify the main method or assumption and include a final check.

Q08 | 6 MARKS

You must show your working.
Two positive integers have product 7560 and HCF 6. Find the pair with the smallest possible difference. Your solution must justify the main method or assumption and include a final check.

Chapter 3: Prime structure, HCF, LCM and divisibility proof

Q09 | 6 MARKS

You must show your working.
Find every positive integer n for which HCF(n,84)=14 and LCM(n,84)=420. Your solution must justify the main method or assumption and include a final check.

Q10 | 6 MARKS

You must show your working.
Find the smallest positive integer that is divisible by 45, has exactly 18 positive factors and is not divisible by 8. Your solution must justify the main method or assumption and include a final check.

Chapter 3: Prime structure, HCF, LCM and divisibility proof

Q11 | 6 MARKS

You must show your working.
Two bells ring together at noon. Their intervals are whole numbers of minutes, have HCF 6 and LCM 180, and one interval is 30 minutes. Find all possible values of the other interval. Your solution must justify the main method or assumption and include a final check.

Q12 | 6 MARKS

You must show your working.
A student claims that every number with exactly 12 factors is divisible by 12. Disprove the claim, then give a 12-factor number that is divisible by 12. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 6 MARKS

Multiples of 4 that are 2 mod 5 are 12,32,52,72,92,... Check modulo 7: 52 leaves remainder 3. Therefore the smallest is 52. A systematic equivalent is n=20k+12; solve 20k+12 ≡3 mod7, giving 6k≡5, k≡2, hence n=52. 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 | 5 MARKS

A factor has form 2^a3^b5^c. To be a multiple of $60=2^2\times3\times5$, require a=2,3,4 (3 choices), b=1,2,3 (3 choices), c=1 (1 choice). Total $3\times3\times1=9$ factors. 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 | 5 MARKS

For each prime, the LCM uses the larger exponent and the HCF the smaller. For 2, max(a,3)=5 and min(a,3)=3, so a=5. For 3, max(2,b)=4 and min(2,b)=2, so b=4. Thus a=5, b=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 | 6 MARKS

Write the integers as 12a and 12b with HCF(a,b)=1. Then a+b=7. Positive unordered pairs are (1,6),(2,5),(3,4), all coprime. Hence the pairs are (12,72), (24,60), (36,48). 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 | 6 MARKS

If n has exactly three factors, they include 1 and n, with one factor d between. Since d divides n, the paired factor n/d must also be a factor; to avoid a fourth factor it must equal d. Thus $n=d^2$. If d were composite it would contribute another factor of n, so d must be prime. Hence $n=p^2$ for prime p. 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 | 6 MARKS

Among four consecutive integers there are two even numbers, one of which is divisible by 4; together they supply a factor $2\times4=8$. Also one of any three consecutive integers is divisible by 3, so the product contains factor 3. Since 8 and 3 are coprime, the product 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

Q07 | 6 MARKS

Consider modulo 3. The three numbers p,p+10,p+14 have residues p,p+1,p+2 modulo 3, so one is divisible by 3. For all three to be prime, that divisible number must equal 3. If p=3, the numbers are 3,13,17, all prime. If p+10=3 or p+14=3, p is negative. Thus p=3 only. 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 | 6 MARKS

Write numbers 6a,6b with HCF(a,b)=1. Then 36ab=7560, so ab=210=2×3×5×7. To keep a,b coprime, allocate whole prime powers between them. Factor pairs closest to √210 are 14 and15, and HCF(14,15)=1. Thus numbers are 84 and 90, difference 6. Any closer factor pair would contradict 14×15 being the closest around √210. 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 | 6 MARKS

Use $n \times 84 = 14 \times 420$, so $n = 70$. Check $70 = 2 \times 5 \times 7$ and $84 = 2^2 \times 3 \times 7$: HCF $= 2 \times 7 = 14$ and LCM $= 2^2 \times 3 \times 5 \times 7 = 420$. Therefore $n = 70$ only. 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 | 6 MARKS

Check successive multiples of 45. We have $45 = 3^2 \times 5$ with 6 factors; $90 = 2 \times 3^2 \times 5$ with 12; $135 = 3^3 \times 5$ with 8; and $180 = 2^2 \times 3^2 \times 5$ with $(2+1)(2+1)(1+1) = 18$ factors. Also 180 is not divisible by 8. Therefore the smallest is 180. 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 | 6 MARKS

Let the other interval be x. From 30x=6×180, x=36. Check HCF(30,36)=6 and LCM=180. Therefore the only possible interval is 36 minutes. 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

Counterexample: $32\times5=160$ has prime form $2^5\times5$, so it has $(5+1)(1+1)=12$ factors, but 160 is not divisible by 3 and hence not by 12. Example satisfying the claim: $60=2^2\times3\times5$ has $3\times2\times2=12$ factors and 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.

Chapter completion record

Question	Score / marks	Repair target	Retest date
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

HIGHER TIER

UNIT 1 | CHAPTER 4

Systematic listing and the product rule for counting

12 curated questions | complete solutions

Chapter focus

Higher Number reasoning, exact calculation and proof

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

This chapter is independently authored and specification-mapped. It does not reproduce OCR questions, mark schemes, logos or proprietary layouts.

Chapter 4: Systematic listing and the product rule for counting

Q01 | 6 MARKS

You must show your working.
Use digits 1-7 once each to form a seven-digit number. How many arrangements have 1 before 2 before 3, not necessarily adjacent? Your solution must justify the main method or assumption and include a final check.

Q02 | 6 MARKS

You must show your working.
Find the number of positive integer solutions to $a+b+c=12$ where $a,b,c \geq 1$. Give a systematic counting argument. Your solution must justify the main method or assumption and include a final check.

Chapter 4: Systematic listing and the product rule for counting

Q03 | 4 MARKS

A two-digit number is formed from 1,2,3,4,5 without repetition. List systematically those divisible by 3 and count them. Your solution must justify the main method or assumption and include a final check.

Q04 | 6 MARKS

You must show your working.
A delivery driver visits four different towns and returns home. Travel must begin at home; reversing a tour counts as the same route. Find the number of distinct tours. Your solution must justify the main method or assumption and include a final check.

Chapter 4: Systematic listing and the product rule for counting

Q05 | 6 MARKS

You must show your working.
A staircase has 8 steps. A person may climb 1 or 2 steps at a time. Count the possible step sequences systematically. Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

A code uses one of 4 letters followed by two digits chosen from 5 available digits, with repetition allowed. Exactly 3 specified digit-pairs are forbidden. Find the number of valid codes. Your solution must justify the main method or assumption and include a final check.

Chapter 4: Systematic listing and the product rule for counting

Q07 | 4 MARKS

A code uses one of 3 letters followed by two digits chosen from 8 available digits, with repetition allowed. Exactly 5 specified digit-pairs are forbidden. Find the number of valid codes. Your solution must justify the main method or assumption and include a final check.

Q08 | 4 MARKS

A journey has 4 choices for stage 1, 2 for stage 2 and 6 for stage 3. One complete combination is unavailable for each stage-1 choice. Find the number of valid journeys. Your solution must justify the main method or assumption and include a final check.

Chapter 4: Systematic listing and the product rule for counting

Q09 | 4 MARKS

A journey has 6 choices for stage 1, 4 for stage 2 and 2 for stage 3. One complete combination is unavailable for each stage-1 choice. Find the number of valid journeys. Your solution must justify the main method or assumption and include a final check.

Q10 | 5 MARKS

You must show your working.
Choose 4 people from 10 for an unordered team. Derive the count from an ordered product and explain the division. Your solution must justify the main method or assumption and include a final check.

Chapter 4: Systematic listing and the product rule for counting

Q11 | 5 MARKS

You must show your working.
Choose 3 people from 7 for an unordered team. Derive the count from an ordered product and explain the division. Your solution must justify the main method or assumption and include a final check.

Q12 | 5 MARKS

You must show your working.
Choose 2 people from 11 for an unordered team. Derive the count from an ordered product and explain the division. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 6 MARKS

There are 7! total arrangements. For each placement of the other digits, the six relative orders of 1,2,3 are equally represented, and exactly one is 1 before2 before3. Count=7!/3!=5040/6=840. 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 | 6 MARKS

Let x=a-1,y=b-1,z=c-1, so x+y+z=9 with non-negative integers. Place 9 identical units and 2 separators: choose separator positions among11, giving 11×10÷2=55 solutions. 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

Digit sum must be divisible by3. Valid ordered pairs are from residue-compatible digits: 12,15,21,24,42,45,51,54. There are 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 | 6 MARKS

Arrange four towns in 4!=24 orders. Each tour and its reverse describe the same undirected cycle from home, so divide by2: 12 distinct tours. 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 | 6 MARKS

Let f(n)=f(n-1)+f(n-2), according to whether the last move is1 or2. Starting f(1)=1,f(2)=2 gives 3,5,8,13,21,34. Therefore f(8)=34 sequences. 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

Unrestricted codes=$4\times5^2=100$. Each forbidden digit-pair combines with any of 4 letters, so exclude $4\times3=12$. Valid codes=88. 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

Unrestricted codes=$3\times8^2=192$. Each forbidden digit-pair combines with any of 3 letters, so exclude $3\times5=15$. Valid codes=177. 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

Unrestricted journeys=$4\times2\times6=48$. There are 4 unavailable complete combinations, so valid journeys=44. 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

Unrestricted journeys=6×4×2=48. There are 6 unavailable complete combinations, so valid journeys=42. 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 | 5 MARKS

Ordered selections=10×9×8×7. Each team is counted 4!=24 times through internal orders. Hence the number of teams is 210. 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

Ordered selections=7×6×5. Each team is counted 3!=6 times through internal orders. Hence the number of teams is 35. 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 | 5 MARKS

Ordered selections=11×10. Each team is counted 2!=2 times through internal orders. Hence the number of teams 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.

Chapter completion record

Question	Score / marks	Repair target	Retest date
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

HIGHER TIER

UNIT 1 | CHAPTER 5

Integer indices, roots and estimating powers

12 curated questions | complete solutions

Chapter focus

Higher Number reasoning, exact calculation and proof

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

This chapter is independently authored and specification-mapped. It does not reproduce OCR questions, mark schemes, logos or proprietary layouts.

Chapter 5: Integer indices, roots and estimating powers

Q01 | 5 MARKS

You must show your working.
Find all integer x satisfying 2^(x+1)≤64<2^(x+3). Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

A student concludes that cube root(-64) is undefined because square root(-64) is not real. Correct the argument. Your solution must justify the main method or assumption and include a final check.

Chapter 5: Integer indices, roots and estimating powers

Q03 | 5 MARKS

You must show your working.
Simplify (x^6 y^4)^2 ÷ (x^5 y^-1). Give a single expression with positive indices and state restrictions. Your solution must justify the main method or assumption and include a final check.

Q04 | 5 MARKS

You must show your working.
Simplify (x^7 y^3)^2 ÷ (x^6 y^1). Give a single expression with positive indices and state restrictions. Your solution must justify the main method or assumption and include a final check.

Chapter 5: Integer indices, roots and estimating powers

Q05 | 5 MARKS

You must show your working.
Simplify (x^3 y^6)^2 ÷ (x^1 y^5). Give a single expression with positive indices and state restrictions. Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

Solve 2^(3x+5)=2^13, then verify by substitution. Your solution must justify the main method or assumption and include a final check.

Chapter 5: Integer indices, roots and estimating powers

Q07 | 4 MARKS

Solve 4^(2x+2)=4^12, then verify by substitution. Your solution must justify the main method or assumption and include a final check.

Q08 | 5 MARKS

You must show your working.
Prove that sqrt(190) lies between 13 and 14, then determine the nearer integer without finding the decimal root. Your solution must justify the main method or assumption and include a final check.

Chapter 5: Integer indices, roots and estimating powers

Q09 | 5 MARKS

You must show your working.
Prove that sqrt(680) lies between 26 and 27, then determine the nearer integer without finding the decimal root. Your solution must justify the main method or assumption and include a final check.

Q10 | 4 MARKS

Find the smallest positive integer k such that 5^k>20000. Show the two consecutive powers that prove minimality. Your solution must justify the main method or assumption and include a final check.

Chapter 5: Integer indices, roots and estimating powers

Q11 | 4 MARKS

Find the smallest positive integer k such that 4^k>3000. Show the two consecutive powers that prove minimality. Your solution must justify the main method or assumption and include a final check.

Q12 | 4 MARKS

Find the smallest positive integer k such that 6^k>100000. Show the two consecutive powers that prove minimality. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 5 MARKS

64=2^6. First inequality gives x+1≤6, so x≤5. Second gives6<x+3, so x>3. Thus x=4 or5. 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

Odd roots preserve sign because $(-4)^3=-64$, so cube root(-64)=-4. Even roots of negative numbers are not real, but odd roots are real. 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 | 5 MARKS

Power then subtract divisor exponents: x^(6×2-5)=x^7; y^(4×2--1)=y^9. Rewrite negative exponents as reciprocals. The simplified structure is x^7 × y^9, with x,y≠0 where required. 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 | 5 MARKS

Power then subtract divisor exponents: x^(7×2-6)=x^8; y^(3×2-1)=y^5. Rewrite negative exponents as reciprocals. The simplified structure is x^8 × y^5, with x,y≠0 where required. 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 | 5 MARKS

Power then subtract divisor exponents: x^(3×2-1)=x^5; y^(6×2-5)=y^7. Rewrite negative exponents as reciprocals. The simplified structure is x^5 × y^7, with x,y≠0 where required. 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

Equal powers with common base 2 give 3x+5=13. Hence x=8/3. Substitution makes both exponents 13. 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

Equal powers with common base 4 give $2x+2=12$. Hence $x=5$. Substitution makes both exponents 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 | 5 MARKS

$13^2=169<190<196=14^2$. The midpoint is 13.5; its square is 182.25. Since 190 is above this midpoint square, the root is closer to 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

Q09 | 5 MARKS

$26^2=676<680<729=27^2$. The midpoint is 26.5; its square is 702.25. Since 680 is below this midpoint square, the root is closer to 26. 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

5^6=15625≤20000, while 5^7=78125>20000. Therefore the smallest value is k=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

Q11 | 4 MARKS

4^5=1024≤3000, while 4^6=4096>3000. Therefore the smallest value is k=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 | 4 MARKS

6^6=46656≤100000, while 6^7=279936>100000. Therefore the smallest value is k=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
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

HIGHER TIER

UNIT 1 | CHAPTER 6

Fractional indices and inverse powers

12 curated questions | complete solutions

Chapter focus

Higher Number reasoning, exact calculation and proof

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

This chapter is independently authored and specification-mapped. It does not reproduce OCR questions, mark schemes, logos or proprietary layouts.

Chapter 6: Fractional indices and inverse powers

Q01 | 4 MARKS

Evaluate 4^(5/2) and 4^(-5/2) exactly. Verify by identifying the 2th root first. Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

Evaluate 25^(3/2) and 25^(-3/2) exactly. Verify by identifying the 2th root first. Your solution must justify the main method or assumption and include a final check.

Chapter 6: Fractional indices and inverse powers

Q03 | 4 MARKS

Evaluate 64^(3/2) and 64^(-3/2) exactly. Verify by identifying the 2th root first. Your solution must justify the main method or assumption and include a final check.

Q04 | 4 MARKS

Evaluate 1331^(2/3) and 1331^(-2/3) exactly. Verify by identifying the 3th root first. Your solution must justify the main method or assumption and include a final check.

Chapter 6: Fractional indices and inverse powers

Q05 | 4 MARKS

Evaluate 125^(4/3) and 125^(-4/3) exactly. Verify by identifying the 3th root first. Your solution must justify the main method or assumption and include a final check.

Q06 | 5 MARKS

You must show your working.
Simplify z^(7/4)×z^(3/4)÷z^(1/2) as one power. Show the exact fraction arithmetic and state restrictions. Your solution must justify the main method or assumption and include a final check.

Chapter 6: Fractional indices and inverse powers

Q07 | 5 MARKS

You must show your working.
Simplify z^(9/5)×z^(-4/5)÷z^(2/5) as one power. Show the exact fraction arithmetic and state restrictions. Your solution must justify the main method or assumption and include a final check.

Q08 | 5 MARKS

You must show your working.
Simplify z^(15/10)×z^(-3/10)÷z^(1/5) as one power. Show the exact fraction arithmetic and state restrictions. Your solution must justify the main method or assumption and include a final check.

Chapter 6: Fractional indices and inverse powers

Q09 | 5 MARKS

You must show your working.
Simplify z^(19/15)×z^(4/15)÷z^(2/5) as one power. Show the exact fraction arithmetic and state restrictions. Your solution must justify the main method or assumption and include a final check.

Q10 | 5 MARKS

You must show your working.
Solve 32^(x/5)=8 using a common integer base, then verify. Your solution must justify the main method or assumption and include a final check.

Chapter 6: Fractional indices and inverse powers

Q11 | 5 MARKS

You must show your working.
Solve 81^(x/4)=3 using a common integer base, then verify. Your solution must justify the main method or assumption and include a final check.

Q12 | 5 MARKS

You must show your working.
Solve 125^(x/3)=25 using a common integer base, then verify. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 4 MARKS

The 2th root of 4 is 2. Raising to power 5 gives 2^5=32. The negative-index value is its reciprocal, 1/32. 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.

Q02 | 4 MARKS

The 2th root of 25 is 5. Raising to power 3 gives 5^3=125. The negative-index value is its reciprocal, 1/125. 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 2th root of 64 is 8. Raising to power 3 gives 8^3=512. The negative-index value is its reciprocal, 1/512. 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 3th root of 1331 is 11. Raising to power 2 gives 11^2=121. The negative-index value is its reciprocal, 1/121. 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 3th root of 125 is 5. Raising to power 4 gives 5^4=625. The negative-index value is its reciprocal, 1/625. 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 | 5 MARKS

Combined exponent=7/4+(3/4)-1/2=2. Therefore the expression is z^(2); division and any negative powers require z≠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

Q07 | 5 MARKS

Combined exponent=9/5+(-4/5)-2/5=3/5. Therefore the expression is z^(3/5); division and any negative powers require z≠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.

Q08 | 5 MARKS

Combined exponent=15/10+(-3/10)-1/5=1. Therefore the expression is z^(1); division and any negative powers require z≠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

Q09 | 5 MARKS

Combined exponent=19/15+(4/15)-2/5=17/15. Therefore the expression is z^(17/15); division and any negative powers require z≠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.

Q10 | 5 MARKS

The 5th root of 32 is 2, so the left side is 2^x. Since 8=2^3, x=3. Direct substitution verifies the equality. 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 4th root of 81 is 3, so the left side is 3^x. Since 3=3^1, x=1. Direct substitution verifies the equality. 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 | 5 MARKS

The 3th root of 125 is 5, so the left side is 5^x. Since 25=5^2, x=2. Direct substitution verifies the equality. 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
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

HIGHER TIER

UNIT 1 | CHAPTER 7

Surds and exact radical arithmetic

12 curated questions | complete solutions

Chapter focus

Higher Number reasoning, exact calculation and proof

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

This chapter is independently authored and specification-mapped. It does not reproduce OCR questions, mark schemes, logos or proprietary layouts.

Chapter 7: Surds and exact radical arithmetic

Q01 | 4 MARKS

Without a calculator, determine which is greater: 5sqrt(3) or 3sqrt(8). Justify a comparison of squares. Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

A rectangle has length 4+sqrt(3) cm and width 4-sqrt(3) cm. Find its exact area and explain why it is rational. Your solution must justify the main method or assumption and include a final check.

Chapter 7: Surds and exact radical arithmetic

Q03 | 4 MARKS

Simplify 4sqrt(20)-2sqrt(5) completely, showing the square factor used. Your solution must justify the main method or assumption and include a final check.

Q04 | 4 MARKS

Simplify 5sqrt(63)-3sqrt(7) completely, showing the square factor used. Your solution must justify the main method or assumption and include a final check.

Chapter 7: Surds and exact radical arithmetic

Q05 | 4 MARKS

Simplify 4sqrt(75)-1sqrt(3) completely, showing the square factor used. Your solution must justify the main method or assumption and include a final check.

Q06 | 5 MARKS

You must show your working.
Expand and simplify (2+sqrt(3))(5-sqrt(3)). Give an exact answer. Your solution must justify the main method or assumption and include a final check.

Chapter 7: Surds and exact radical arithmetic

Q07 | 5 MARKS

You must show your working.
Expand and simplify (5+sqrt(6))(4-sqrt(6)). Give an exact answer. Your solution must justify the main method or assumption and include a final check.

Q08 | 5 MARKS

You must show your working.
Expand and simplify (7+sqrt(2))(5-sqrt(2)). Give an exact answer. Your solution must justify the main method or assumption and include a final check.

Chapter 7: Surds and exact radical arithmetic

Q09 | 5 MARKS

You must show your working.
Expand and simplify (5+sqrt(7))(3-sqrt(7)). Give an exact answer. Your solution must justify the main method or assumption and include a final check.

Q10 | 5 MARKS

You must show your working.
Rationalise 6/(5+sqrt(7)) and give the exact result. Your solution must justify the main method or assumption and include a final check.

Chapter 7: Surds and exact radical arithmetic

Q11 | 5 MARKS

You must show your working.
Rationalise 9/(2+sqrt(3)) and give the exact result. Your solution must justify the main method or assumption and include a final check.

Q12 | 5 MARKS

You must show your working.
Rationalise 8/(5+sqrt(17)) and give the exact result. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 4 MARKS

Both are positive, so squaring preserves order. (5sqrt(3))^2=75 and (3sqrt(8))^2=72. Hence 5sqrt(3)>3sqrt(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.

Q02 | 4 MARKS

Area=(4+sqrt(3))(4-sqrt(3))=16-3=13 cm^2. Conjugate factors cancel the surd cross-terms. 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

sqrt(20)=sqrt(4×5)=2sqrt(5). Therefore the expression is (4×2-2)sqrt(5)=6sqrt(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

sqrt(63)=sqrt(9×7)=3sqrt(7). Therefore the expression is (5×3-3)sqrt(7)=12sqrt(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

Q05 | 4 MARKS

sqrt(75)=sqrt(25×3)=5sqrt(3). Therefore the expression is (4×5-1)sqrt(3)=19sqrt(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 | 5 MARKS

Expansion gives 10-2sqrt(3)+5sqrt(3)-3. Collecting terms gives 7+3sqrt(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 | 5 MARKS

Expansion gives 20-5sqrt(6)+4sqrt(6)-6. Collecting terms gives 14-1sqrt(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.

Q08 | 5 MARKS

Expansion gives 35-7sqrt(2)+5sqrt(2)-2. Collecting terms gives 33-2sqrt(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

Q09 | 5 MARKS

Expansion gives 15-5sqrt(7)+3sqrt(7)-7. Collecting terms gives 8-2sqrt(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 | 5 MARKS

Multiply by the conjugate 5-sqrt(7). The denominator is 25-7=18. Cancelling the common factor 6 gives (5-sqrt(7))/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

Multiply by the conjugate 2-sqrt(3). The denominator is 4-3=1. No numerical cancellation is available, giving 9(2-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 | 5 MARKS

Multiply by the conjugate 5-sqrt(17). The denominator is 25-17=8. Cancelling the common factor 8 gives (5-sqrt(17)). 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
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

HIGHER TIER

UNIT 1 | CHAPTER 8

Fractions and exact fraction arithmetic

12 curated questions | complete solutions

Chapter focus

Higher application of shared Number content with multi-step 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

This chapter is independently authored and specification-mapped. It does not reproduce OCR questions, mark schemes, logos or proprietary layouts.

Chapter 8: Fractions and exact fraction arithmetic

Q01 | 4 MARKS

Calculate 7^2, sqrt(49) and the cube root of 8. Then simplify 7^2x7^2 as a single power and explain the index rule used. Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

Calculate 8^2, sqrt(64) and the cube root of 125. Then simplify 8^2x8^2 as a single power and explain the index rule used. Your solution must justify the main method or assumption and include a final check.

Chapter 8: Fractions and exact fraction arithmetic

Q03 | 4 MARKS

Calculate 9^2, sqrt(81) and the cube root of 27. Then simplify 9^2x9^2 as a single power and explain the index rule used. Your solution must justify the main method or assumption and include a final check.

Q04 | 4 MARKS

Calculate 10^2, sqrt(100) and the cube root of 216. Then simplify 10^2x10^2 as a single power and explain the index rule used. Your solution must justify the main method or assumption and include a final check.

Chapter 8: Fractions and exact fraction arithmetic

Q05 | 4 MARKS

Calculate 11^2, sqrt(121) and the cube root of 64. Then simplify 11^2x11^2 as a single power and explain the index rule used. Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

Calculate 12^2, sqrt(144) and the cube root of 8. Then simplify 12^2x12^2 as a single power and explain the index rule used. Your solution must justify the main method or assumption and include a final check.

Chapter 8: Fractions and exact fraction arithmetic

Q07 | 4 MARKS

Calculate 13^2, sqrt(169) and the cube root of 125. Then simplify 13^2x13^2 as a single power and explain the index rule used. Your solution must justify the main method or assumption and include a final check.

Q08 | 4 MARKS

Calculate 14^2, sqrt(196) and the cube root of 27. Then simplify 14^2x14^2 as a single power and explain the index rule used. Your solution must justify the main method or assumption and include a final check.

Chapter 8: Fractions and exact fraction arithmetic

Q09 | 4 MARKS

Calculate 15^2, sqrt(225) and the cube root of 216. Then simplify 15^2x15^2 as a single power and explain the index rule used. Your solution must justify the main method or assumption and include a final check.

Q10 | 4 MARKS

Calculate 16^2, sqrt(256) and the cube root of 64. Then simplify 16^2x16^2 as a single power and explain the index rule used. Your solution must justify the main method or assumption and include a final check.

Chapter 8: Fractions and exact fraction arithmetic

Q11 | 5 MARKS

You must show your working.
Calculate 16^3, sqrt(256) and the cube root of 125. Then simplify 16^2x16^3 as a single power and explain the index rule used. Your solution must justify the main method or assumption and include a final check.

Q12 | 6 MARKS

You must show your working.
Calculate 16^4, sqrt(256) and the cube root of 216. Then simplify 16^2x16^4 as a single power and explain the index rule used. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 4 MARKS

7^2=49; sqrt(49)=7; cube root of 8=2. Same-base multiplication adds powers, so 7^2x7^2=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.

Q02 | 4 MARKS

8^2=64; sqrt(64)=8; cube root of 125=5. Same-base multiplication adds powers, so 8^2x8^2=8^4. 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

9^2=81; sqrt(81)=9; cube root of 27=3. Same-base multiplication adds powers, so 9^2x9^2=9^4. 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

10^2=100; sqrt(100)=10; cube root of 216=6. Same-base multiplication adds powers, so 10^2x10^2=10^4. 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

Q05 | 4 MARKS

11^2=121; sqrt(121)=11; cube root of 64=4. Same-base multiplication adds powers, so 11^2x11^2=11^4. 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

12^2=144; sqrt(144)=12; cube root of 8=2. Same-base multiplication adds powers, so 12^2x12^2=12^4. 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

13^2=169; sqrt(169)=13; cube root of 125=5. Same-base multiplication adds powers, so 13^2x13^2=13^4. 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

14^2=196; sqrt(196)=14; cube root of 27=3. Same-base multiplication adds powers, so 14^2x14^2=14^4. 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

15^2=225; sqrt(225)=15; cube root of 216=6. Same-base multiplication adds powers, so 15^2x15^2=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.

Q10 | 4 MARKS

16^2=256; sqrt(256)=16; cube root of 64=4. Same-base multiplication adds powers, so 16^2x16^2=16^4. 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

16^3=4096; sqrt(256)=16; cube root of 125=5. Same-base multiplication adds powers, so 16^2x16^3=16^5. 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

16^4=65536; sqrt(256)=16; cube root of 216=6. Same-base multiplication adds powers, so 16^2x16^4=16^6. 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
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

HIGHER TIER

UNIT 1 | CHAPTER 9

Decimals and fraction-decimal conversion

12 curated questions | complete solutions

Chapter focus

Higher application of shared Number content with multi-step 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

This chapter is independently authored and specification-mapped. It does not reproduce OCR questions, mark schemes, logos or proprietary layouts.

Chapter 9: Decimals and fraction-decimal conversion

Q01 | 4 MARKS

Calculate 4/7+4/7 and 4/7x4/7 in simplest form. Then calculate 4/7 divided by 4/7 and explain the reciprocal step. Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

Calculate 1/4+6/8 and 1/4x6/8 in simplest form. Then calculate 1/4 divided by 6/8 and explain the reciprocal step. Your solution must justify the main method or assumption and include a final check.

Chapter 9: Decimals and fraction-decimal conversion

Q03 | 4 MARKS

Calculate 4/7+1/8 and 4/7x1/8 in simplest form. Then calculate 4/7 divided by 1/8 and explain the reciprocal step. Your solution must justify the main method or assumption and include a final check.

Q04 | 4 MARKS

Calculate 1/4+1/9 and 1/4x1/9 in simplest form. Then calculate 1/4 divided by 1/9 and explain the reciprocal step. Your solution must justify the main method or assumption and include a final check.

Chapter 9: Decimals and fraction-decimal conversion

Q05 | 4 MARKS

Calculate 4/7+2/9 and 4/7x2/9 in simplest form. Then calculate 4/7 divided by 2/9 and explain the reciprocal step. Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

Calculate 1/4+1/10 and 1/4x1/10 in simplest form. Then calculate 1/4 divided by 1/10 and explain the reciprocal step. Your solution must justify the main method or assumption and include a final check.

Chapter 9: Decimals and fraction-decimal conversion

Q07 | 4 MARKS

Calculate 4/7+1/10 and 4/7x1/10 in simplest form. Then calculate 4/7 divided by 1/10 and explain the reciprocal step. Your solution must justify the main method or assumption and include a final check.

Q08 | 4 MARKS

Calculate 1/4+9/11 and 1/4x9/11 in simplest form. Then calculate 1/4 divided by 9/11 and explain the reciprocal step. Your solution must justify the main method or assumption and include a final check.

Chapter 9: Decimals and fraction-decimal conversion

Q09 | 4 MARKS

Calculate 4/7+8/11 and 4/7x8/11 in simplest form. Then calculate 4/7 divided by 8/11 and explain the reciprocal step. Your solution must justify the main method or assumption and include a final check.

Q10 | 4 MARKS

Calculate 1/4+6/12 and 1/4x6/12 in simplest form. Then calculate 1/4 divided by 6/12 and explain the reciprocal step. Your solution must justify the main method or assumption and include a final check.

Chapter 9: Decimals and fraction-decimal conversion

Q11 | 5 MARKS

You must show your working.
Calculate 4/5+9/12 and 4/5x9/12 in simplest form. Then calculate 4/5 divided by 9/12 and explain the reciprocal step. Your solution must justify the main method or assumption and include a final check.

Q12 | 6 MARKS

You must show your working.
Calculate 5/6+1/12 and 5/6x1/12 in simplest form. Then calculate 5/6 divided by 1/12 and explain the reciprocal step. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 4 MARKS

Common-denominator addition gives 8/7. Multiplication gives 16/49. Division means multiply by the reciprocal: 4/7x7/4=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.

Q02 | 4 MARKS

Common-denominator addition gives 1. Multiplication gives 3/16. Division means multiply by the reciprocal: 1/4x4/3=1/3. 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

Common-denominator addition gives 39/56. Multiplication gives 1/14. Division means multiply by the reciprocal: 4/7x8=32/7. 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.

Q04 | 4 MARKS

Common-denominator addition gives 13/36. Multiplication gives 1/36. Division means multiply by the reciprocal: 1/4x9=9/4. 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

Q05 | 4 MARKS

Common-denominator addition gives 50/63. Multiplication gives 8/63. Division means multiply by the reciprocal: 4/7x9/2=18/7. 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

Common-denominator addition gives 7/20. Multiplication gives 1/40. Division means multiply by the reciprocal: 1/4x10=5/2. 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

Common-denominator addition gives 47/70. Multiplication gives 2/35. Division means multiply by the reciprocal: 4/7x10=40/7. 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

Common-denominator addition gives 47/44. Multiplication gives 9/44. Division means multiply by the reciprocal: 1/4x11/9=11/36. 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.

Worked solutions

Q09 | 4 MARKS

Common-denominator addition gives 100/77. Multiplication gives 32/77. Division means multiply by the reciprocal: 4/7x11/8=11/14. 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.

Q10 | 4 MARKS

Common-denominator addition gives 3/4. Multiplication gives 1/8. Division means multiply by the reciprocal: 1/4x2=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

Q11 | 5 MARKS

Common-denominator addition gives 31/20. Multiplication gives 3/5. Division means multiply by the reciprocal: 4/5x4/3=16/15. 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

Common-denominator addition gives 11/12. Multiplication gives 5/72. Division means multiply by the reciprocal: 5/6x12=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.

Chapter completion record

Question	Score / marks	Repair target	Retest date
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

HIGHER TIER

UNIT 1 | CHAPTER 10

Percentages, reverse percentages and change

12 curated questions | complete solutions

Chapter focus

Higher application of shared Number content with multi-step 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

This chapter is independently authored and specification-mapped. It does not reproduce OCR questions, mark schemes, logos or proprietary layouts.

Chapter 10: Percentages, reverse percentages and change

Q01 | 4 MARKS

Convert 1/5 to a decimal and percentage. Convert 0.3 to a fraction in simplest form. Order 1/5, 0.3 and 50% from smallest to largest. Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

Convert 1/2 to a decimal and percentage. Convert 0.6 to a fraction in simplest form. Order 1/2, 0.6 and 53% from smallest to largest. Your solution must justify the main method or assumption and include a final check.

Chapter 10: Percentages, reverse percentages and change

Q03 | 4 MARKS

Convert 1/11 to a decimal and percentage. Convert 0.4 to a fraction in simplest form. Order 1/11, 0.4 and 56% from smallest to largest. Your solution must justify the main method or assumption and include a final check.

Q04 | 4 MARKS

Convert 4/11 to a decimal and percentage. Convert 0.7 to a fraction in simplest form. Order 4/11, 0.7 and 59% from smallest to largest. Your solution must justify the main method or assumption and include a final check.

Chapter 10: Percentages, reverse percentages and change

Q05 | 4 MARKS

Convert 7/11 to a decimal and percentage. Convert 0.5 to a fraction in simplest form. Order 7/11, 0.5 and 37% from smallest to largest. Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

Convert 1/4 to a decimal and percentage. Convert 0.3 to a fraction in simplest form. Order 1/4, 0.3 and 40% from smallest to largest. Your solution must justify the main method or assumption and include a final check.

Chapter 10: Percentages, reverse percentages and change

Q07 | 4 MARKS

Convert 1/2 to a decimal and percentage. Convert 0.6 to a fraction in simplest form. Order 1/2, 0.6 and 43% from smallest to largest. Your solution must justify the main method or assumption and include a final check.

Q08 | 4 MARKS

Convert 2/13 to a decimal and percentage. Convert 0.4 to a fraction in simplest form. Order 2/13, 0.4 and 46% from smallest to largest. Your solution must justify the main method or assumption and include a final check.

Chapter 10: Percentages, reverse percentages and change

Q09 | 4 MARKS

Convert 5/13 to a decimal and percentage. Convert 0.7 to a fraction in simplest form. Order 5/13, 0.7 and 49% from smallest to largest. Your solution must justify the main method or assumption and include a final check.

Q10 | 4 MARKS

Convert 1/14 to a decimal and percentage. Convert 0.5 to a fraction in simplest form. Order 1/14, 0.5 and 52% from smallest to largest. Your solution must justify the main method or assumption and include a final check.

Chapter 10: Percentages, reverse percentages and change

Q11 | 5 MARKS

You must show your working.
Convert 1/7 to a decimal and percentage. Convert 0.6 to a fraction in simplest form. Order 1/7, 0.6 and 53% from smallest to largest. Your solution must justify the main method or assumption and include a final check.

Q12 | 6 MARKS

You must show your working.
Convert 3/14 to a decimal and percentage. Convert 0.7 to a fraction in simplest form. Order 3/14, 0.7 and 54% from smallest to largest. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 4 MARKS

1/5=0.2=20%. 0.3=3/10. Converting all to decimals gives [0.2, 0.3, 0.5], so the order is 1/5, 3/10, 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

1/2=0.5=50%. 0.6=3/5. Converting all to decimals gives [0.5, 0.6, 0.53], so the order is 1/2, 53/100, 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.

Worked solutions

Q03 | 4 MARKS

1/11=0.0909091=9.09091%. 0.4=2/5. Converting all to decimals gives [0.09090909090909091, 0.4, 0.56], so the order is 1/11, 2/5, 14/25. 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

4/11=0.363636=36.3636%. 0.7=7/10. Converting all to decimals gives [0.36363636363636365, 0.7, 0.59], so the order is 4/11, 59/100, 7/10. 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.

Worked solutions

Q05 | 4 MARKS

7/11=0.636364=63.6364%. 0.5=1/2. Converting all to decimals gives [0.6363636363636364, 0.5, 0.37], so the order is 37/100, 1/2, 7/11. 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

1/4=0.25=25%. 0.3=3/10. Converting all to decimals gives [0.25, 0.3, 0.4], so the order is 1/4, 3/10, 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

1/2=0.5=50%. 0.6=3/5. Converting all to decimals gives [0.5, 0.6, 0.43], so the order is 43/100, 1/2, 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.

Q08 | 4 MARKS

2/13=0.153846=15.3846%. 0.4=2/5. Converting all to decimals gives [0.15384615384615385, 0.4, 0.46], so the order is 2/13, 2/5, 23/50. 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

Q09 | 4 MARKS

5/13=0.384615=38.4615%. 0.7=7/10. Converting all to decimals gives [0.38461538461538464, 0.7, 0.49], so the order is 5/13, 49/100, 7/10. 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

1/14=0.0714286=7.14286%. 0.5=1/2. Converting all to decimals gives [0.07142857142857142, 0.5, 0.52], so the order is 1/14, 1/2, 13/25. 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

1/7=0.142857=14.2857%. 0.6=3/5. Converting all to decimals gives [0.14285714285714285, 0.6, 0.53], so the order is 1/7, 53/100, 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.

Q12 | 6 MARKS

3/14=0.214286=21.4286%. 0.7=7/10. Converting all to decimals gives [0.21428571428571427, 0.7, 0.54], so the order is 3/14, 27/50, 7/10. 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.

Chapter completion record

Question	Score / marks	Repair target	Retest date
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

HIGHER TIER

UNIT 1 | CHAPTER 11

Standard form

12 curated questions | complete solutions

Chapter focus

Higher application of shared Number content with multi-step 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

This chapter is independently authored and specification-mapped. It does not reproduce OCR questions, mark schemes, logos or proprietary layouts.

Chapter 11: Standard form

Q01 | 4 MARKS

Write 1.9e+06 in standard form. Calculate (1.9x10^6)x(2x10^1) and give the answer in standard form, explaining how the coefficient is normalised. Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

Write 1400 in standard form. Calculate (1.4x10^3)x(5x10^1) and give the answer in standard form, explaining how the coefficient is normalised. Your solution must justify the main method or assumption and include a final check.

Chapter 11: Standard form

Q03 | 4 MARKS

Write 1.7e+06 in standard form. Calculate (1.7x10^6)x(3x10^1) and give the answer in standard form, explaining how the coefficient is normalised. Your solution must justify the main method or assumption and include a final check.

Q04 | 4 MARKS

Write 1200 in standard form. Calculate (1.2x10^3)x(6x10^1) and give the answer in standard form, explaining how the coefficient is normalised. Your solution must justify the main method or assumption and include a final check.

Chapter 11: Standard form

Q05 | 4 MARKS

Write 1.5e+06 in standard form. Calculate (1.5x10^6)x(4x10^1) and give the answer in standard form, explaining how the coefficient is normalised. Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

Write 1800 in standard form. Calculate (1.8x10^3)x(2x10^1) and give the answer in standard form, explaining how the coefficient is normalised. Your solution must justify the main method or assumption and include a final check.

Chapter 11: Standard form

Q07 | 4 MARKS

Write 1.3e+06 in standard form. Calculate (1.3x10^6)x(5x10^1) and give the answer in standard form, explaining how the coefficient is normalised. Your solution must justify the main method or assumption and include a final check.

Q08 | 4 MARKS

Write 1600 in standard form. Calculate (1.6x10^3)x(3x10^1) and give the answer in standard form, explaining how the coefficient is normalised. Your solution must justify the main method or assumption and include a final check.

Chapter 11: Standard form

Q09 | 4 MARKS

Write 1.9e+06 in standard form. Calculate (1.9x10^6)x(6x10^1) and give the answer in standard form, explaining how the coefficient is normalised. Your solution must justify the main method or assumption and include a final check.

Q10 | 4 MARKS

Write 1400 in standard form. Calculate (1.4x10^3)x(4x10^1) and give the answer in standard form, explaining how the coefficient is normalised. Your solution must justify the main method or assumption and include a final check.

Chapter 11: Standard form

Q11 | 5 MARKS

You must show your working.
Write 15000 in standard form. Calculate (1.5x10^4)x(5x10^2) and give the answer in standard form, explaining how the coefficient is normalised. Your solution must justify the main method or assumption and include a final check.

Q12 | 6 MARKS

You must show your working.
Write 160000 in standard form. Calculate (1.6x10^5)x(6x10^3) and give the answer in standard form, explaining how the coefficient is normalised. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 4 MARKS

1.9e+06=1.9x10^6. Multiply coefficients and add powers, then move the decimal if the coefficient is at least 10. The normalised result is 3.8x10^7, with 1<=coefficient<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

1400=1.4x10^3. Multiply coefficients and add powers, then move the decimal if the coefficient is at least 10. The normalised result is 7x10^4, with 1<=coefficient<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.

Worked solutions

Q03 | 4 MARKS

1.7e+06=1.7x10^6. Multiply coefficients and add powers, then move the decimal if the coefficient is at least 10. The normalised result is 5.1x10^7, with 1<=coefficient<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.

Q04 | 4 MARKS

1200=1.2x10^3. Multiply coefficients and add powers, then move the decimal if the coefficient is at least 10. The normalised result is 7.2x10^4, with 1<=coefficient<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.

Worked solutions

Q05 | 4 MARKS

1.5e+06=1.5x10^6. Multiply coefficients and add powers, then move the decimal if the coefficient is at least 10. The normalised result is 6x10^7, with 1<=coefficient<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.

Q06 | 4 MARKS

1800=1.8x10^3. Multiply coefficients and add powers, then move the decimal if the coefficient is at least 10. The normalised result is 3.6x10^4, with 1<=coefficient<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.

Worked solutions

Q07 | 4 MARKS

1.3e+06=1.3x10^6. Multiply coefficients and add powers, then move the decimal if the coefficient is at least 10. The normalised result is 6.5x10^7, with 1<=coefficient<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.

Q08 | 4 MARKS

1600=1.6x10^3. Multiply coefficients and add powers, then move the decimal if the coefficient is at least 10. The normalised result is 4.8x10^4, with 1<=coefficient<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.

Worked solutions

Q09 | 4 MARKS

1.9e+06=1.9x10^6. Multiply coefficients and add powers, then move the decimal if the coefficient is at least 10. The normalised result is 1.14x10^8, with 1<=coefficient<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

1400=1.4x10^3. Multiply coefficients and add powers, then move the decimal if the coefficient is at least 10. The normalised result is 5.6x10^4, with 1<=coefficient<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.

Worked solutions

Q11 | 5 MARKS

15000=1.5x10^4. Multiply coefficients and add powers, then move the decimal if the coefficient is at least 10. The normalised result is 7.5x10^6, with 1<=coefficient<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.

Q12 | 6 MARKS

160000=1.6x10^5. Multiply coefficients and add powers, then move the decimal if the coefficient is at least 10. The normalised result is 9.6x10^8, with 1<=coefficient<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.

Chapter completion record

Question	Score / marks	Repair target	Retest date
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

HIGHER TIER

UNIT 1 | CHAPTER 12

Rounding, estimation and bounds

12 curated questions | complete solutions

Chapter focus

Higher application of shared Number content with multi-step 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

This chapter is independently authored and specification-mapped. It does not reproduce OCR questions, mark schemes, logos or proprietary layouts.

Chapter 12: Rounding, estimation and bounds

Q01 | 4 MARKS

Round 233.106 to 1 decimal place(s) and 3 significant figures. Estimate (233.1x20)/4 using one significant figure values. Write the error interval for your decimal-place rounded value. Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

Round 255.036 to 1 decimal place(s) and 2 significant figures. Estimate (255.0x23)/7 using one significant figure values. Write the error interval for your decimal-place rounded value. Your solution must justify the main method or assumption and include a final check.

Chapter 12: Rounding, estimation and bounds

Q03 | 4 MARKS

Round 276.966 to 1 decimal place(s) and 3 significant figures. Estimate (277.0x19)/5 using one significant figure values. Write the error interval for your decimal-place rounded value. Your solution must justify the main method or assumption and include a final check.

Q04 | 4 MARKS

Round 298.896 to 1 decimal place(s) and 2 significant figures. Estimate (298.9x22)/8 using one significant figure values. Write the error interval for your decimal-place rounded value. Your solution must justify the main method or assumption and include a final check.

Chapter 12: Rounding, estimation and bounds

Q05 | 4 MARKS

Round 320.826 to 1 decimal place(s) and 3 significant figures. Estimate (320.8x25)/6 using one significant figure values. Write the error interval for your decimal-place rounded value. Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

Round 342.756 to 1 decimal place(s) and 2 significant figures. Estimate (342.8x21)/4 using one significant figure values. Write the error interval for your decimal-place rounded value. Your solution must justify the main method or assumption and include a final check.

Chapter 12: Rounding, estimation and bounds

Q07 | 4 MARKS

Round 364.686 to 1 decimal place(s) and 3 significant figures. Estimate (364.7x24)/7 using one significant figure values. Write the error interval for your decimal-place rounded value. Your solution must justify the main method or assumption and include a final check.

Q08 | 4 MARKS

Round 386.616 to 1 decimal place(s) and 2 significant figures. Estimate (386.6x20)/5 using one significant figure values. Write the error interval for your decimal-place rounded value. Your solution must justify the main method or assumption and include a final check.

Chapter 12: Rounding, estimation and bounds

Q09 | 4 MARKS

Round 408.546 to 1 decimal place(s) and 3 significant figures. Estimate (408.5x23)/8 using one significant figure values. Write the error interval for your decimal-place rounded value. Your solution must justify the main method or assumption and include a final check.

Q10 | 4 MARKS

Round 430.476 to 1 decimal place(s) and 2 significant figures. Estimate (430.5x19)/6 using one significant figure values. Write the error interval for your decimal-place rounded value. Your solution must justify the main method or assumption and include a final check.

Chapter 12: Rounding, estimation and bounds

Q11 | 5 MARKS

You must show your working.
Round 437.786 to 2 decimal place(s) and 3 significant figures. Estimate (437.8x20)/7 using one significant figure values. Write the error interval for your decimal-place rounded value. Your solution must justify the main method or assumption and include a final check.

Q12 | 6 MARKS

You must show your working.
Round 445.096 to 3 decimal place(s) and 2 significant figures. Estimate (445.1x21)/8 using one significant figure values. Write the error interval for your decimal-place rounded value. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 4 MARKS

To 1 d.p.: 233.1. To 3 s.f.: 233. A one-significant-figure estimate is approximately 1000. Error interval: 233.05<=x<233.15; the upper bound is 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

To 1 d.p.: 255.0. To 2 s.f.: 260. A one-significant-figure estimate is approximately 857.143. Error interval: 254.95<=x<255.05; the upper bound is 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

To 1 d.p.: 277.0. To 3 s.f.: 277. A one-significant-figure estimate is approximately 1200. Error interval: 276.95<=x<277.05; the upper bound is 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

To 1 d.p.: 298.9. To 2 s.f.: 300. A one-significant-figure estimate is approximately 750. Error interval: 298.85<=x<298.95; the upper bound is 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

To 1 d.p.: 320.8. To 3 s.f.: 321. A one-significant-figure estimate is approximately 1000. Error interval: 320.75<=x<320.85; the upper bound is 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

To 1 d.p.: 342.8. To 2 s.f.: 340. A one-significant-figure estimate is approximately 1500. Error interval: 342.75<=x<342.85; the upper bound is 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

To 1 d.p.: 364.7. To 3 s.f.: 365. A one-significant-figure estimate is approximately 1142.86. Error interval: 364.65<=x<364.75; the upper bound is 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

To 1 d.p.: 386.6. To 2 s.f.: 390. A one-significant-figure estimate is approximately 1600. Error interval: 386.55<=x<386.65; the upper bound is 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

To 1 d.p.: 408.5. To 3 s.f.: 409. A one-significant-figure estimate is approximately 1000. Error interval: 408.45<=x<408.55; the upper bound is 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

To 1 d.p.: 430.5. To 2 s.f.: 430. A one-significant-figure estimate is approximately 1333.33. Error interval: 430.45<=x<430.55; the upper bound is 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

To 2 d.p.: 437.79. To 3 s.f.: 438. A one-significant-figure estimate is approximately 1142.86. Error interval: 437.785<=x<437.795; the upper bound is 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

To 3 d.p.: 445.096. To 2 s.f.: 450. A one-significant-figure estimate is approximately 1000. Error interval: 445.096<=x<445.096; the upper bound is 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
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

HIGHER TIER

UNIT 1 | CHAPTER 13

Recurring decimals and exact proof

12 curated questions | complete solutions

Chapter focus

Converting recurring decimals to exact fractions by algebra

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: Recurring decimals and exact proof

Q01 | 4 MARKS

Let $x=0.8444\ldots$. Use an algebraic subtraction method to write x as a fraction, then verify the decimal pattern. Your solution must justify the main method or assumption and include a final check.

Q02 | 4 MARKS

Let $x=0.3333\ldots$. Use an algebraic subtraction method to write x as a fraction, then verify the decimal pattern. Your solution must justify the main method or assumption and include a final check.

Chapter 13: Recurring decimals and exact proof

Q03 | 4 MARKS

Let $x=0.6222\ldots$. Use an algebraic subtraction method to write x as a fraction, then verify the decimal pattern. Your solution must justify the main method or assumption and include a final check.

Q04 | 4 MARKS

Let $x=0.1888\ldots$. Use an algebraic subtraction method to write x as a fraction, then verify the decimal pattern. Your solution must justify the main method or assumption and include a final check.

Chapter 13: Recurring decimals and exact proof

Q05 | 4 MARKS

Let x=0.4777... . Use an algebraic subtraction method to write x as a fraction, then verify the decimal pattern. Your solution must justify the main method or assumption and include a final check.

Q06 | 4 MARKS

Let x=0.7666... . Use an algebraic subtraction method to write x as a fraction, then verify the decimal pattern. Your solution must justify the main method or assumption and include a final check.

Chapter 13: Recurring decimals and exact proof

Q07 | 4 MARKS

Let x=0.2555... . Use an algebraic subtraction method to write x as a fraction, then verify the decimal pattern. Your solution must justify the main method or assumption and include a final check.

Q08 | 4 MARKS

Let x=0.5444... . Use an algebraic subtraction method to write x as a fraction, then verify the decimal pattern. Your solution must justify the main method or assumption and include a final check.

Chapter 13: Recurring decimals and exact proof

Q09 | 4 MARKS

Let x=0.8333... . Use an algebraic subtraction method to write x as a fraction, then verify the decimal pattern. Your solution must justify the main method or assumption and include a final check.

Q10 | 4 MARKS

Let x=0.3222... . Use an algebraic subtraction method to write x as a fraction, then verify the decimal pattern. Your solution must justify the main method or assumption and include a final check.

Chapter 13: Recurring decimals and exact proof

Q11 | 5 MARKS

You must show your working.
Let x=0.4444... . Use an algebraic subtraction method to write x as a fraction, then verify the decimal pattern. Your solution must justify the main method or assumption and include a final check.

Q12 | 6 MARKS

You must show your working.
Let x=0.5666... . Use an algebraic subtraction method to write x as a fraction, then verify the decimal pattern. Your solution must justify the main method or assumption and include a final check.

Worked solutions

Q01 | 4 MARKS

10x=8.444... and 100x=84.444... . Subtract: 90x=76, so x=38/45. Division reproduces the stated recurring decimal. 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

10x=3.333... and 100x=33.333... . Subtract: 90x=30, so x=1/3. Division reproduces the stated recurring decimal. 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

10x=6.222... and 100x=62.222... . Subtract: 90x=56, so x=28/45. Division reproduces the stated recurring decimal. 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

10x=1.888... and 100x=18.888... . Subtract: 90x=17, so x=17/90. Division reproduces the stated recurring decimal. 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

10x=4.777... and 100x=47.777... . Subtract: 90x=43, so x=43/90. Division reproduces the stated recurring decimal. 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

10x=7.666... and 100x=76.666... . Subtract: 90x=69, so x=23/30. Division reproduces the stated recurring decimal. 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

10x=2.555... and 100x=25.555... . Subtract: 90x=23, so x=23/90. Division reproduces the stated recurring decimal. 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

10x=5.444... and 100x=54.444... . Subtract: 90x=49, so x=49/90. Division reproduces the stated recurring decimal. 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

10x=8.333... and 100x=83.333... . Subtract: 90x=75, so x=5/6. Division reproduces the stated recurring decimal. 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

10x=3.222... and 100x=32.222... . Subtract: 90x=29, so x=29/90. Division reproduces the stated recurring decimal. 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

10x=4.444... and 100x=44.444... . Subtract: 90x=40, so x=4/9. Division reproduces the stated recurring decimal. 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

10x=5.666... and 100x=56.666... . Subtract: 90x=51, so x=17/30. Division reproduces the stated recurring decimal. 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
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			