

9709 Mathematics Paper 3 - Algebra

Topical questions | 128 questions

1. Question | 9709 Feb-March 2016 P3 V2 Q4

4 The polynomial $4x^3 + ax + 2$, where a is a constant, is denoted by $p(x)$. It is given that $(2x + 1)$ is a factor of $p(x)$.

(i) Find the value of a . [2]

(ii) When a has this value,

(a) factorise $p(x)$, [2]

(b) solve the inequality $p(x) > 0$, justifying your answer. [3]

2. Question | 9709 May-June 2016 P3 V1 Q1

1 (i) Solve the equation $2|x - 1| = 3|x|$. [3]

(ii) Hence solve the equation $2|5^x - 1| = 3|5^x|$, giving your answer correct to 3 significant figures. [2]

3. Question | 9709 May-June 2016 P3 V1 Q8

8 Let $f(x) = \frac{4x^2 + 12}{(x + 1)(x - 3)^2}$.

(i) Express $f(x)$ in partial fractions. [5]

(ii) Hence obtain the expansion of $f(x)$ in ascending powers of x , up to and including the term in x^2 . [5]

4. Question | 9709 May-June 2016 P3 V2 Q2

2 Expand $\frac{1}{\sqrt{1 - 2x}}$ in ascending powers of x , up to and including the term in x^3 , simplifying the coefficients. [4]

5. Question | 9709 May-June 2016 P3 V3 Q1

1 Solve the inequality $2|x - 2| > |3x + 1|$. [4]

6. Question | 9709 May-June 2016 P3 V3 Q10

10 Let $f(x) = \frac{10x - 2x^2}{(x + 3)(x - 1)^2}$.

(i) Express $f(x)$ in partial fractions. [5]

(ii) Hence obtain the expansion of $f(x)$ in ascending powers of x , up to and including the term in x^2 . [5]

7. Question | 9709 Oct-Nov 2016 P3 V1 Q2

2 Expand $(2 - x)(1 + 2x)^{-\frac{3}{2}}$ in ascending powers of x , up to and including the term in x^2 , simplifying the coefficients. [4]

8. Question | 9709 Oct-Nov 2016 P3 V2 Q1

1 Solve the equation $\frac{3^x + 2}{3^x - 2} = 8$, giving your answer correct to 3 decimal places. [3]

9. Question | 9709 Oct-Nov 2016 P3 V2 Q2

2 Expand $(2 - x)(1 + 2x)^{-\frac{3}{2}}$ in ascending powers of x , up to and including the term in x^2 , simplifying the coefficients. [4]

10. Question | 9709 Oct-Nov 2016 P3 V3 Q4

4 The polynomial $4x^4 + ax^2 + 11x + b$, where a and b are constants, is denoted by $p(x)$. It is given that $p(x)$ is divisible by $x^2 - x + 2$.

(i) Find the values of a and b . [5]

(ii) When a and b have these values, find the real roots of the equation $p(x) = 0$. [2]

11. Question | 9709 Oct-Nov 2016 P3 V3 Q8

8 Let $f(x) = \frac{3x^2 + x + 6}{(x + 2)(x^2 + 4)}$.

(i) Express $f(x)$ in partial fractions. [5]

(ii) Hence obtain the expansion of $f(x)$ in ascending powers of x , up to and including the term in x^2 . [5]

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12. Question | 9709 Feb-March 2017 P3 V2 Q2

2 Solve the inequality $|x - 4| < 2|3x + 1|$. [4]

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13. Question part 1/2 | 9709 Feb-March 2017 P3 V2 Q9

9 Let $f(x) = \frac{x(6-x)}{(2+x)(4+x^2)}$.

(i) Express $f(x)$ in partial fractions.

[5]

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13. Question part 2/2 | 9709 Feb-March 2017 P3 V2 Q9

(ii) Hence obtain the expansion of $f(x)$ in ascending powers of x , up to and including the term in x^2 . [5]

[illegible]

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14. Question | 9709 May-June 2017 P3 V1 Q1

1 Solve the inequality $|2x + 1| < 3|x - 2|$. [4]

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15. Question | 9709 May-June 2017 P3 V1 Q2

- 2** Expand $\frac{1}{\sqrt[3]{1+6x}}$ in ascending powers of x , up to and including the term in x^3 , simplifying the coefficients. [4]

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16. Question | 9709 May-June 2017 P3 V2 Q2

2 Solve the inequality $|x - 3| < 3x - 4$. [4]

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17. Question part 1/2 | 9709 May-June 2017 P3 V2 Q8

8 Let $f(x) = \frac{5x^2 - 7x + 4}{(3x + 2)(x^2 + 5)}$.

(i) Express $f(x)$ in partial fractions.

[5]

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17. Question part 2/2 | 9709 May-June 2017 P3 V2 Q8

(ii) Hence obtain the expansion of $f(x)$ in ascending powers of x , up to and including the term in x^2 . [5]

[illegible]

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18. Question | 9709 May-June 2017 P3 V3 Q2

- 2** Expand $(3 + 2x)^{-3}$ in ascending powers of x up to and including the term in x^2 , simplifying the coefficients. [4]

[illegible]

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19. Question | 9709 Oct-Nov 2017 P3 V1 Q1

1 Find the quotient and remainder when x^4 is divided by $x^2 + 2x - 1$. [3]

[illegible]

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8 Let $f(x) = \frac{4x^2 + 9x - 8}{(x + 2)(2x - 1)}$.

[illegible]

Topical questions | 128 questions

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21. Question part 1/2 | 9709 Oct-Nov 2017 P3 V2 Q8

8 Let $f(x) = \frac{8x^2 + 9x + 8}{(1-x)(2x+3)^2}$.

(i) Express $f(x)$ in partial fractions.

[5]

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21. Question part 2/2 | 9709 Oct-Nov 2017 P3 V2 Q8

(ii) Hence obtain the expansion of $f(x)$ in ascending powers of x , up to and including the term in x^2 . [5]

[illegible]

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22. Question | 9709 Oct-Nov 2017 P3 V3 Q1

1 Find the quotient and remainder when x^4 is divided by $x^2 + 2x - 1$. [3]

[illegible]

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8 Let $f(x) = \frac{4x^2 + 9x - 8}{(x + 2)(2x - 1)}$.

(i) Express $f(x)$ in the form $A + \frac{B}{x+2} + \frac{C}{2x-1}$. [4]

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23. Question part 2/2 | 9709 Oct-Nov 2017 P3 V3 Q8

(ii) Hence show that $\int_1^4 f(x) \, dx = 6 + \frac{1}{2} \ln\left(\frac{16}{7}\right)$. [5]

[illegible]

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24. Question | 9709 Feb-March 2018 P3 V2 Q2

- 2 Expand $\sqrt[4]{1 - 4x}$ in ascending powers of x , up to and including the term in x^3 , simplifying the coefficients. [4]

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25. Question part 1/2 | 9709 Feb-March 2018 P3 V2 Q8

8 Let $f(x) = \frac{5x^2 + x + 27}{(2x + 1)(x^2 + 9)}$.

(i) Express $f(x)$ in partial fractions.

[5]

[illegible]

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25. Question part 2/2 | 9709 Feb-March 2018 P3 V2 Q8

(ii) Hence find $\int_0^4 f(x) \, dx$, giving your answer in the form $\ln c$, where c is an integer. [5]

[illegible]

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26. Question part 1/2 | 9709 May-June 2018 P3 V1 Q4

- 4** The polynomial $x^4 + 2x^3 + ax + b$, where a and b are constants, is divisible by $x^2 - x + 1$. Find the values of a and b . [5]

[illegible]

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26. Question part 2/2 | 9709 May-June 2018 P3 V1 Q4

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27. Question part 1/2 | 9709 May-June 2018 P3 V1 Q9

9 Let $f(x) = \frac{12x^2 + 4x - 1}{(x - 1)(3x + 2)}$.

(i) Express $f(x)$ in partial fractions.

[5]

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27. Question part 2/2 | 9709 May-June 2018 P3 V1 Q9

(ii) Hence obtain the expansion of $f(x)$ in ascending powers of x , up to and including the term in x^2 . [5]

[illegible]

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9 Let $f(x) = \frac{x - 4x^2}{(3 - x)(2 + x^2)}$.

(ii) Express $f(x)$ in the form $\frac{A}{3-x} + \frac{Bx+C}{2+x^2}$. [4]

[illegible]

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28. Question part 2/2 | 9709 May-June 2018 P3 V2 Q9

- (ii) Hence obtain the expansion of $f(x)$ in ascending powers of x , up to and including the term in x^3 . [5]

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29. Question | 9709 May-June 2018 P3 V3 Q1

- 1 Expand $\frac{4}{\sqrt{4-3x}}$ in ascending powers of x , up to and including the term in x^2 , simplifying the coefficients. [4]

[illegible]

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30. Question | 9709 Oct-Nov 2018 P3 V1 Q1

- 1** Find the set of values of x satisfying the inequality $2|2x - a| < |x + 3a|$, where a is a positive constant. [4]

[illegible]

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31. Question part 1/2 | 9709 Oct-Nov 2018 P3 V1 Q9

9 Let $f(x) = \frac{6x^2 + 8x + 9}{(2-x)(3+2x)^2}$.

(i) Express $f(x)$ in partial fractions.

[5]

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31. Question part 2/2 | 9709 Oct-Nov 2018 P3 V1 Q9

(ii) Hence, showing all necessary working, show that $\int_{-1}^0 f(x) \, dx = 1 + \frac{1}{2} \ln\left(\frac{3}{4}\right)$. [5]

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32. Question | 9709 Oct-Nov 2018 P3 V2 Q1

1 Solve the inequality $3|2x - 1| > |x + 4|$. [4]

[illegible]

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8 Let $f(x) = \frac{7x^2 - 15x + 8}{(1 - 2x)(2 - x)^2}$.

[illegible]

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33. Question part 2/2 | 9709 Oct-Nov 2018 P3 V2 Q8

(ii) Hence obtain the expansion of $f(x)$ in ascending powers of x , up to and including the term in x^2 . [5]

[illegible]

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34. Question | 9709 Oct-Nov 2018 P3 V3 Q1

- 1** Find the set of values of x satisfying the inequality $2|2x - a| < |x + 3a|$, where a is a positive constant. [4]

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9 Let $f(x) = \frac{6x^2 + 8x + 9}{(2 - x)(3 + 2x)^2}$.

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(ii) Hence, showing all necessary working, show that $\int_{-1}^0 f(x) \, dx = 1 + \frac{1}{2} \ln\left(\frac{3}{4}\right)$. [5]

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36. Question part 1/2 | 9709 Feb-March 2019 P3 V2 Q8

8 Let $f(x) = \frac{12 + 12x - 4x^2}{(2 + x)(3 - 2x)}$.

(i) Express $f(x)$ in partial fractions.

[5]

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36. Question part 2/2 | 9709 Feb-March 2019 P3 V2 Q8

(ii) Hence obtain the expansion of $f(x)$ in ascending powers of x , up to and including the term in x^2 . [5]

[illegible]

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37. Question part 1/2 | 9709 May-June 2019 P3 V1 Q8

8 Let $f(x) = \frac{16 - 17x}{(2 + x)(3 - x)^2}$.

(i) Express $f(x)$ in partial fractions.

[5]

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37. Question part 2/2 | 9709 May-June 2019 P3 V1 Q8

(ii) Hence obtain the expansion of $f(x)$ in ascending powers of x , up to and including the term in x^2 . [5]

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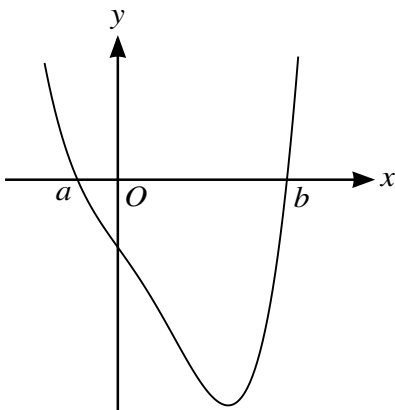
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38. Question | 9709 May-June 2019 P3 V2 Q1

- 1** Find the coefficient of x^3 in the expansion of $(3-x)(1+3x)^{\frac{1}{3}}$ in ascending powers of x . [4]

[illegible]

6



The diagram shows the curve $y = x^4 - 2x^3 - 7x - 6$. The curve intersects the x -axis at the points $(a, 0)$ and $(b, 0)$, where $a < b$. It is given that b is an integer.

(i) Find the value of b . [1]

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(ii) Hence show that a satisfies the equation $a = -\frac{1}{3}(2 + a^2 + a^3)$. [4]

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39. Question part 2/2 | 9709 May-June 2019 P3 V3 Q6

[illegible]

- (iii) Use an iterative formula based on the equation in part (ii) to determine a correct to 3 decimal places. Give the result of each iteration to 5 decimal places. [3]

[illegible]

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40. Question part 1/2 | 9709 May-June 2019 P3 V3 Q9

9 Let $f(x) = \frac{2x(5-x)}{(3+x)(1-x)^2}$.

(i) Express $f(x)$ in partial fractions.

[5]

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40. Question part 2/2 | 9709 May-June 2019 P3 V3 Q9

(ii) Hence obtain the expansion of $f(x)$ in ascending powers of x up to and including the term in x^3 . [5]

[illegible]

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41. Question | 9709 Oct-Nov 2019 P3 V1 Q2

2 Solve the inequality $|2x - 3| > 4|x + 1|$. [4]

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42. Question part 1/2 | 9709 Oct-Nov 2019 P3 V1 Q8

8 Let $f(x) = \frac{x^2 + x + 6}{x^2(x + 2)}$.

(i) Express $f(x)$ in partial fractions.

[5]

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42. Question part 2/2 | 9709 Oct-Nov 2019 P3 V1 Q8

(ii) Hence, showing full working, show that the exact value of $\int_1^4 f(x) \, dx$ is $\frac{9}{4}$. [5]

[illegible]

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43. Question | 9709 Oct-Nov 2019 P3 V2 Q1

- 1** Solve the equation $5 \ln(4 - 3^x) = 6$. Show all necessary working and give the answer correct to 3 decimal places. [3]

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3 The polynomial $x^4 + 3x^3 + ax + b$, where a and b are constants, is denoted by $p(x)$. When $p(x)$ is divided by $x^2 + x - 1$ the remainder is $2x + 3$. Find the values of a and b . [5]

[illegible]

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45. Question | 9709 Oct-Nov 2019 P3 V3 Q1

1 Solve the inequality $2|x + 2| > |3x - 1|$. [4]

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46. Question | 9709 Oct-Nov 2019 P3 V3 Q2

- 2** The polynomial $6x^3 + ax^2 + bx - 2$, where a and b are constants, is denoted by $p(x)$. It is given that $(2x + 1)$ is a factor of $p(x)$ and that when $p(x)$ is divided by $(x + 2)$ the remainder is -24 . Find the values of a and b . [5]

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47. Question | 9709 Feb-March 2020 P3 V2 Q1

1 (a) Sketch the graph of $y = |x - 2|$.

[1]

(b) Solve the inequality $|x - 2| < 3x - 4$.

[3]

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9 Let $f(x) = \frac{2 + 11x - 10x^2}{(1 + 2x)(1 - 2x)(2 + x)}$.

[5]

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48. Question part 2/2 | 9709 Feb-March 2020 P3 V2 Q9

(b) Hence obtain the expansion of $f(x)$ in ascending powers of x , up to and including the term in x^2 .
[5]

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49. Question | 9709 May-June 2020 P3 V1 Q1

- 1** Find the set of values of x for which $2(3^{1-2x}) < 5^x$. Give your answer in a simplified exact form. [4]

[illegible]

2 (a) Expand $(2 - 3x)^{-2}$ in ascending powers of x , up to and including the term in x^2 , simplifying the coefficients. [4]

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(b) State the set of values of x for which the expansion is valid. [1]

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51. Question part 1/2 | 9709 May-June 2020 P3 V1 Q5

5 (a) Find the quotient and remainder when $2x^3 - x^2 + 6x + 3$ is divided by $x^2 + 3$. [3]

[illegible]

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(b) Using your answer to part (a), find the exact value of $\int_1^3 \frac{2x^3 - x^2 + 6x + 3}{x^2 + 3} dx$. [5]

[illegible]

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52. Question | 9709 May-June 2020 P3 V2 Q1

1 Find the quotient and remainder when $6x^4 + x^3 - x^2 + 5x - 6$ is divided by $2x^2 - x + 1$. [3]

[illegible]

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53. Question | 9709 May-June 2020 P3 V3 Q1

1 Solve the inequality $|2x - 1| > 3|x + 2|$. [4]

[illegible]

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54. Question | 9709 Oct-Nov 2020 P3 V1 Q1

1 Solve the inequality $2 - 5x > 2|x - 3|$. [4]

[illegible]

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55. Question part 1/2 | 9709 Oct-Nov 2020 P3 V1 Q9

9 Let $f(x) = \frac{8 + 5x + 12x^2}{(1 - x)(2 + 3x)^2}$.

(a) Express $f(x)$ in partial fractions.

[5]

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55. Question part 2/2 | 9709 Oct-Nov 2020 P3 V1 Q9

(b) Hence obtain the expansion of $f(x)$ in ascending powers of x , up to and including the term in x^2 . [5]

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2 (a) Expand $\sqrt[3]{1 + 6x}$ in ascending powers of x , up to and including the term in x^3 , simplifying the coefficients. [4]

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(b) State the set of values of x for which the expansion is valid. [1]

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57. Question | 9709 Oct-Nov 2020 P3 V3 Q1

1 Solve the inequality $2 - 5x > 2|x - 3|$. [4]

[illegible]

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58. Question part 1/2 | 9709 Oct-Nov 2020 P3 V3 Q9

9 Let $f(x) = \frac{8 + 5x + 12x^2}{(1 - x)(2 + 3x)^2}$.

(a) Express $f(x)$ in partial fractions.

[5]

[illegible]

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58. Question part 2/2 | 9709 Oct-Nov 2020 P3 V3 Q9

(b) Hence obtain the expansion of $f(x)$ in ascending powers of x , up to and including the term in x^2 . [5]

[illegible]

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2 The polynomial $ax^3 + 5x^2 - 4x + b$, where a and b are constants, is denoted by $p(x)$. It is given that $(x + 2)$ is a factor of $p(x)$ and that when $p(x)$ is divided by $(x + 1)$ the remainder is 2.

[5]

[illegible]

Topical questions | 128 questions

6 Let $f(x) = \frac{5a}{(2x-a)(3a-x)}$, where a is a positive constant.

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9709 Mathematics Paper 3 - Algebra

Topical questions | 128 questions

60. Question part 2/3 | 9709 Feb-March 2021 P3 V2 Q6

(b) Hence show that $\int_a^{2a} f(x) \, dx = \ln 6$. [4]

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60. Question part 3/3 | 9709 Feb-March 2021 P3 V2 Q6

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9709 Mathematics Paper 3 - Algebra

Topical questions | 128 questions

61. Question | 9709 May-June 2021 P3 V1 Q1

1 Solve the inequality $2|3x - 1| < |x + 1|$. [4]

[illegible]

9709 Mathematics Paper 3 - Algebra

Topical questions | 128 questions

62. Question | 9709 May-June 2021 P3 V2 Q1

1 Solve the inequality $|2x - 1| < 3|x + 1|$. [4]

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Topical questions | 128 questions

9 Let $f(x) = \frac{14 - 3x + 2x^2}{(2 + x)(3 + x^2)}$.

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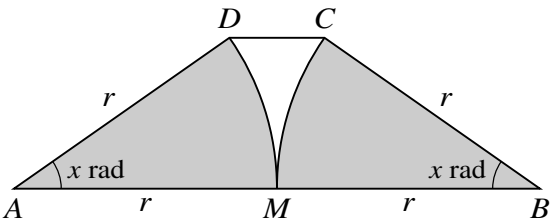
Topical questions | 128 questions

63. Question part 2/2 | 9709 May-June 2021 P3 V2 Q9

(b) Hence obtain the expansion of $f(x)$ in ascending powers of x , up to and including the term in x^2 . [5]

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10



The diagram shows a trapezium $ABCD$ in which $AD = BC = r$ and $AB = 2r$. The acute angles BAD and ABC are both equal to x radians. Circular arcs of radius r with centres A and B meet at M , the midpoint of AB .

- (a) Given that the sum of the areas of the shaded sectors is 90% of the area of the trapezium, show that x satisfies the equation $x = 0.9(2 - \cos x) \sin x$. [3]

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- (b) Verify by calculation that x lies between 0.5 and 0.7. [2]

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- $$x_{n+1} = \cos^{-1} \left(2 - \frac{x_n}{0.9 \sin x_n} \right)$$

[illegible]

- [illegible]

9709 Mathematics Paper 3 - Algebra

Topical questions | 128 questions

65. Question | 9709 May-June 2021 P3 V3 Q1

- 1** Expand $(1 + 3x)^{\frac{2}{3}}$ in ascending powers of x , up to and including the term in x^3 , simplifying the coefficients. [4]

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Find the values of a and b . [6]

[illegible]

9709 Mathematics Paper 3 - Algebra

Topical questions | 128 questions

67. Question | 9709 Oct-Nov 2021 P3 V2 Q2

2 Solve the inequality $|3x - a| > 2|x + 2a|$, where a is a positive constant.

[illegible]

9709 Mathematics Paper 3 - Algebra

Topical questions | 128 questions

68. Question | 9709 Oct-Nov 2021 P3 V2 Q4

4 Express $\frac{4x^2 - 13x + 13}{(2x - 1)(x - 3)}$ in partial fractions.

[5]

[illegible]

9709 Mathematics Paper 3 - Algebra

Topical questions | 128 questions

69. Question | 9709 Oct-Nov 2021 P3 V3 Q1

1 Find the quotient and remainder when $2x^4 + 1$ is divided by $x^2 - x + 2$. [3]

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(b) Solve the inequality $|2x - 3| < 3x + 2$. [3]

[illegible]

9709 Mathematics Paper 3 - Algebra

Topical questions | 128 questions

71. Question | 9709 Feb-March 2022 P3 V2 Q1

1 Solve the inequality $|2x + 3| > 3|x + 2|$. [4]

[illegible]

9709 Mathematics Paper 3 - Algebra

Topical questions | 128 questions

72. Question part 1/2 | 9709 Feb-March 2022 P3 V2 Q8

8 (a) Find the quotient and remainder when $8x^3 + 4x^2 + 2x + 7$ is divided by $4x^2 + 1$. [3]

[illegible]

[illegible]

[illegible]

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Topical questions | 128 questions

5 The polynomial $ax^3 - 10x^2 + bx + 8$, where a and b are constants, is denoted by $p(x)$. It is given that $(x - 2)$ is a factor of both $p(x)$ and $p'(x)$.

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9709 Mathematics Paper 3 - Algebra

Topical questions | 128 questions

74. Question part 2/3 | 9709 May-June 2022 P3 V1 Q5

(b) When a and b have these values, factorise $p(x)$ completely.

[3]

[illegible]

9709 Mathematics Paper 3 - Algebra

Topical questions | 128 questions

74. Question part 3/3 | 9709 May-June 2022 P3 V1 Q5

3

Topical questions | 128 questions

3 The polynomial $ax^3 + x^2 + bx + 3$ is denoted by $p(x)$. It is given that $p(x)$ is divisible by $(2x - 1)$ and that when $p(x)$ is divided by $(x + 2)$ the remainder is 5.

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Topical questions | 128 questions

76. Question part 1/2 | 9709 May-June 2022 P3 V2 Q8

8 Let $f(x) = \frac{x^2 + 9x}{(3x - 1)(x^2 + 3)}$.

(a) Express $f(x)$ in partial fractions.

[5]

[illegible]

[illegible]

9709 Mathematics Paper 3 - Algebra

Topical questions | 128 questions

77. Question | 9709 May-June 2022 P3 V3 Q1

- 1** Find, in terms of a , the set of values of x satisfying the inequality

$$2|3x + a| < |2x + 3a|,$$

where a is a positive constant.

[4]

[illegible]

Topical questions | 128 questions

7 Let $f(x) = \frac{5x^2 + 8x - 3}{(x - 2)(2x^2 + 3)}$.

[illegible]

9709 Mathematics Paper 3 - Algebra

Topical questions | 128 questions

78. Question part 2/2 | 9709 May-June 2022 P3 V3 Q7

(b) Hence obtain the expansion of $f(x)$ in ascending powers of x , up to and including the term in x^2 . [5]

[illegible]

9709 Mathematics Paper 3 - Algebra

Topical questions | 128 questions

79. Question | 9709 Oct-Nov 2022 P3 V1 Q1

- 1 (a)** Sketch the graph of $y = |2x + 1|$. [1]

- (b)** Solve the inequality $3x + 5 < |2x + 1|$. [3]

[illegible]

Topical questions | 128 questions

10 Let $f(x) = \frac{2x^2 + 7x + 8}{(1+x)(2+x)^2}$.

[5]

[illegible]

9709 Mathematics Paper 3 - Algebra

Topical questions | 128 questions

80. Question part 2/2 | 9709 Oct-Nov 2022 P3 V1 Q10

(b) Hence obtain the expansion of $f(x)$ in ascending powers of x , up to and including the term in x^2 . [5]

[illegible]

81. Question | 9709 Oct-Nov 2022 P3 V2 Q2

2 The polynomial $2x^3 - x^2 + a$, where a is a constant, is denoted by $p(x)$. It is given that $(2x + 3)$ is a factor of $p(x)$.

(a) Find the value of a . [2]

[illegible]

(b) When a has this value, solve the inequality $p(x) < 0$. [4]

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Topical questions | 128 questions

82. Question part 1/3 | 9709 Oct-Nov 2022 P3 V2 Q10

10 Let $f(x) = \frac{4 - x + x^2}{(1 + x)(2 + x^2)}$.

(a) Express $f(x)$ in partial fractions.

[5]

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Additional Page

If you use the following lined page to complete the answer(s) to any question(s), the question number(s) must be clearly shown.

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Topical questions | 128 questions

83. Question | 9709 Oct-Nov 2022 P3 V3 Q2

- 2** Expand $\sqrt{\frac{1+2x}{1-2x}}$ in ascending powers of x , up to and including the term in x^2 , simplifying the coefficients. [5]

[illegible]

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Topical questions | 128 questions

84. Question part 1/3 | 9709 Oct-Nov 2022 P3 V3 Q11

11 Let $f(x) = \frac{5 - x + 6x^2}{(3 - x)(1 + 3x^2)}$.

(a) Express $f(x)$ in partial fractions.

[5]

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Additional Page

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Topical questions | 128 questions

85. Question | 9709 Feb-March 2023 P3 V2 Q3

- 3** The polynomial $2x^4 + ax^3 + bx - 1$, where a and b are constants, is denoted by $p(x)$. When $p(x)$ is divided by $x^2 - x + 1$ the remainder is $3x + 2$.

Find the values of a and b .

[5]

[illegible]

Topical questions | 128 questions

11 Let $f(x) = \frac{5x^2 + x + 11}{(4 + x^2)(1 + x)}$.

[5]

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Topical questions | 128 questions

(b) Hence show that $\int_0^2 f(x) \, dx = \ln 54 - \frac{1}{8}\pi$. [5]

If you use the following lined page to complete the answer(s) to any question(s), the question number(s) must be clearly shown.

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(b) Solve the inequality $3x + 8 > |2x + 3|$. [3]

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Topical questions | 128 questions

88. Question | 9709 May-June 2023 P3 V1 Q3

3 Find the coefficient of x^3 in the binomial expansion of $(3 + x)\sqrt{1 + 4x}$. [4]

[illegible]

Topical questions | 128 questions

8 Let $f(x) = \frac{3 - 3x^2}{(2x + 1)(x + 2)^2}$.

[5]

[illegible]

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9709 Mathematics Paper 3 - Algebra

Topical questions | 128 questions

90. Question | 9709 May-June 2023 P3 V2 Q1

1 Solve the inequality $|5x - 3| < 2|3x - 7|$. [4]

[illegible]

Topical questions | 128 questions

9 Let $f(x) = \frac{2x^2 + 17x - 17}{(1 + 2x)(2 - x)^2}$.

[5]

[illegible]

Topical questions | 128 questions

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Topical questions | 128 questions

92. Question | 9709 May-June 2023 P3 V3 Q2

2 Find the quotient and remainder when $2x^4 - 27$ is divided by $x^2 + x + 3$.

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Topical questions | 128 questions

10 Let $f(x) = \frac{21 - 8x - 2x^2}{(1 + 2x)(3 - x)^2}$.

[5]

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Topical questions | 128 questions

93. Question part 2/2 | 9709 May-June 2023 P3 V3 Q10

- (b)** Hence obtain the expansion of $f(x)$ in ascending powers of x , up to and including the term in x^2 . [5]

[illegible]

Topical questions | 128 questions

10 Let $f(x) = \frac{24x + 13}{(1 - 2x)(2 + x)^2}$.

This image shows a single page of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

(b) Hence obtain the expansion of $f(x)$ in ascending powers of x , up to and including the term in x^2 .
[5]

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(c) State the set of values of x for which the expansion in (b) is valid. [1]

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9709 Mathematics Paper 3 - Algebra

Topical questions | 128 questions

95. Question | 9709 Oct-Nov 2023 P3 V2 Q1

1 (a) Sketch the graph of $y = |4x - 2|$.

[1]

(b) Solve the inequality $1 + 3x < |4x - 2|$.

[4]

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Topical questions | 128 questions

96. Question | 9709 Oct-Nov 2023 P3 V2 Q3

- 3** The polynomial $2x^3 + ax^2 - 11x + b$ is denoted by $p(x)$. It is given that $p(x)$ is divisible by $(2x - 1)$ and that when $p(x)$ is divided by $(x + 1)$ the remainder is 12.

Find the values of a and b .

[5]

[illegible]

Topical questions | 128 questions

3 The polynomial $2x^3 + ax^2 + bx + 6$, where a and b are constants, is denoted by $p(x)$. When $p(x)$ is divided by $(x + 2)$ the remainder is -38 and when $p(x)$ is divided by $(2x - 1)$ the remainder is $\frac{19}{2}$.

Find the values of a and b . [5]

[illegible]

Topical questions | 128 questions

9 Let $f(x) = \frac{17x^2 - 7x + 16}{(2 + 3x^2)(2 - x)}$.

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(b) Hence obtain the expansion of $f(x)$ in ascending powers of x , up to and including the term in x^3 .
[5]

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(c) State the set of values of x for which the expansion in (b) is valid. Give your answer in an exact form.
[1]

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9709 Mathematics Paper 3 - Algebra

Topical questions | 128 questions

99. Question | 9709 Feb-March 2024 P3 V2 Q1

- 1** Find the quotient and remainder when $x^4 - 3x^3 + 9x^2 - 12x + 27$ is divided by $x^2 + 5$. [3]

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Topical questions | 128 questions

2 (a) Find the coefficient of x^2 in the expansion of $(2x-5)\sqrt{4-x}$. [4]

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Topical questions | 128 questions

10 Let $f(x) = \frac{36a^2}{(2a+x)(2a-x)(5a-2x)}$, where a is a positive constant.

[5]

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Topical questions | 128 questions

102. Question | 9709 May-June 2024 P3 V1 Q1

- 1** Expand $(3+x)(1-2x)^{\frac{1}{2}}$ in ascending powers of x , up to and including the term in x^2 , simplifying the coefficients. [4]

[illegible]

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Topical questions | 128 questions

103. Question | 9709 May-June 2024 P3 V2 Q1

- 1 (a)** Sketch the graph of $y = |x - 2a|$, where a is a positive constant. [1]

- (b)** Solve the inequality $2x - 3a < |x - 2a|$. [2]

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Topical questions | 128 questions

104. Question | 9709 May-June 2024 P3 V2 Q2

2 Express $\frac{6x^2 - 9x - 16}{2x^2 - 5x - 12}$ in partial fractions.

[5]

[illegible]

9709 Mathematics Paper 3 - Algebra

Topical questions | 128 questions

105. Question | 9709 May-June 2024 P3 V3 Q5

5 Express $\frac{6x^2 - 2x + 2}{(x - 1)(2x + 1)}$ in partial fractions.

[5]

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Topical questions | 128 questions

7 Let $f(x) = 8x^3 + 54x^2 - 17x - 21$.

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[illegible]



$8 \cos^3 \theta + 54 \cos^2 \theta - 17 \cos \theta - 21 = 0,$

for $0^\circ \leq \theta \leq 360^\circ$.

[3]



9709 Mathematics Paper 3 - Algebra

Topical questions | 128 questions

107. Question | 9709 Oct-Nov 2024 P3 V1 Q1

- 1 The polynomial $4x^3 + ax^2 + 5x + b$, where a and b are constants, is denoted by $p(x)$. It is given that $(2x+1)$ is a factor of $p(x)$. When $p(x)$ is divided by $(x-4)$ the remainder is equal to 3 times the remainder when $p(x)$ is divided by $(x-2)$.

Find the values of a and b .

[5]

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Topical questions | 128 questions

2 Find the exact value of $\int_1^3 x^2 \ln 3x \, dx$. Give your answer in the form $a \ln b + c$, where a and c are rational and b is an integer. [5]

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Topical questions | 128 questions

109. Question part 1/2 | 9709 Oct-Nov 2024 P3 V1 Q7

$$\text{Let } f(x) = \frac{5x^2 + 8x + 5}{(1 + 2x)(2 + x^2)}.$$

[5]

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[4]

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Topical questions | 128 questions

110. Question | 9709 Oct-Nov 2024 P3 V2 Q1

- 1** Expand $(9-3x)^{\frac{1}{2}}$ in ascending powers of x , up to and including the term in x^2 , simplifying the coefficients. [4]

[illegible]

9709 Mathematics Paper 3 - Algebra

Topical questions | 128 questions

111. Question part 1/2 | 9709 Oct-Nov 2024 P3 V3 Q8

8 Let $f(x) = \frac{7a^2}{(a-2x)(3a+x)}$, where a is a positive constant.

(a) Express $f(x)$ in partial fractions.

[3]

[illegible]

- [illegible]

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- This image shows a full page of white paper with horizontal dashed lines, typical of primary school writing paper. The lines are evenly spaced and run across the entire width of the page. There are no margins, text, or other markings on the paper.

9709 Mathematics Paper 3 - Algebra

Topical questions | 128 questions

112. Question part 1/2 | 9709 Oct-Nov 2024 P3 V3 Q9

9 (a) Find the quotient and remainder when $x^4 + 16$ is divided by $x^2 + 4$. [3]

[illegible]

[illegible]

Topical questions | 128 questions

9 The polynomial $6x^3 + ax^2 + bx + 9$ is denoted by $p(x)$, where a and b are constants. It is given that $(x-3)$ is a factor of $p(x)$, and when the first derivative $p'(x)$ is divided by $(x-3)$ the remainder is 72.

This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no margins, text, or other markings on the page.

[illegible]

This image shows a full page of white paper with ten horizontal dashed lines, typical of primary school handwriting practice paper. The lines are evenly spaced and extend across the entire width of the page. There is no text or other markings on the paper.

[5]

[illegible]

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- This image shows a full page of a worksheet designed for handwriting practice. It features approximately 20 evenly spaced horizontal dotted lines across the entire width of the page, providing a guide for letter height and placement. The background is plain white, and there are no other markings or text present.

9709 Mathematics Paper 3 - Algebra

Topical questions | 128 questions

115. Question | 9709 May-June 2025 P3 V1 Q1

1 (a) Sketch the graph of $y = |2x - 3|$.

[1]

(b) Solve the inequality $3x - 1 < |2x - 3|$.

[2]

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Find the values of p and q . [5]

This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no margins, text, or other markings on the page.

[illegible]

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- This image shows a full page of white paper with ten horizontal dashed lines, evenly spaced from top to bottom. The lines are thin and black, typical of primary school writing paper. There are no margins, text, or other markings on the page.

(b) Hence or otherwise solve the inequality $|3x - 2a| < x + 5a$. [3]

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Topical questions | 128 questions

119. Question part 1/2 | 9709 May-June 2025 P3 V3 Q7

7 Let $f(x) = \frac{3a-5x}{(3a+2x)(2a-x)}$, where a is a positive constant.

(a) Express $f(x)$ in partial fractions.

[3]

[illegible]

- [illegible]

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9709 Mathematics Paper 3 - Algebra

Topical questions | 128 questions

120. Question part 1/2 | 9709 May-June 2025 P3 V5 Q9

9 (a) Express $\frac{12x^2 + 55x - 2}{(3x - 2)(x + 6)}$ in partial fractions.

[5]

[illegible]



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- This image shows a full page of a notebook or worksheet. It features approximately 28 horizontal dotted lines spaced evenly down the page, providing a guide for handwriting practice. The lines are light gray and extend across the entire width of the page. There is no text or other markings on the page.

Topical questions | 128 questions

10 Let $f(x) = \frac{x^5 + 2x - 11}{(3+x)(2+x^2)}$.

[6]

[illegible]

[illegible]

[1]

(b) Hence or otherwise solve the inequality $|x+3a| > a-2x$.

[2]

[illegible]

9709 Mathematics Paper 3 - Algebra

Topical questions | 128 questions

123. Question | 9709 Oct-Nov 2025 P3 V2 Q2

2 Solve the equation $3 \times 2^{x+1} = 4 \times 3^{2x-3}$. Give your answer correct to 3 significant figures. [4]

This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no margins, text, or other markings on the page.

124. Question | 9709 Oct-Nov 2025 P3 V2 Q5

5 (a) It is given that $f(x) = (x-a)^2 g(x)$, where $f(x)$ and $g(x)$ are polynomials.

Show that $(x - a)$ is a factor of $f'(x)$. [2]

[illegible]

(b) It is given that $(x-3)^2$ is a factor of $2x^3 - 4x^2 + px + q$, where p and q are constants.

Find the values of p and q . [5]

This image shows a full page of a handwriting practice worksheet. It consists of multiple sets of three horizontal dashed lines, providing a guide for letter height and placement. The lines are evenly spaced across the entire page, leaving ample room for writing practice. There is no text or other markings on the page.

[5]

This image shows a full page of a handwriting practice worksheet. It consists of multiple sets of three horizontal dotted lines, providing a guide for letter height and placement. The lines are evenly spaced across the entire page, leaving ample room for writing practice. There is no text or other markings on the page.

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- [illegible]

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126. Question | 9709 Oct-Nov 2025 P3 V3 Q1

1 Solve the inequality $|3x+2| < 3|2x-1|$. [4]

[illegible]

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127. Question | 9709 Oct-Nov 2025 P3 V3 Q2

2 Find the quotient and the remainder when $3x^4 - 2x^2$ is divided by $x + 1$. [3]

[illegible]

9709 Mathematics Paper 3 - Algebra

Topical questions | 128 questions

128. Question | 9709 Oct-Nov 2025 P3 V5 Q1

- 1 (a)** Sketch the graph of $y = |3x - 6|$. [1]

- (b)** Solve the inequality $5x - 3 < |3x - 6|$. [3]

[illegible]