

1. Question | 9709 Feb-March 2016 P1 V2 Q1

- 1** **(i)** Find the coefficients of x^4 and x^5 in the expansion of $(1 - 2x)^5$. [2]
- (ii)** It is given that, when $(1 + px)(1 - 2x)^5$ is expanded, there is no term in x^5 . Find the value of the constant p . [2]

2. Question | 9709 Feb-March 2016 P1 V2 Q3

- 3** The 12th term of an arithmetic progression is 17 and the sum of the first 31 terms is 1023. Find the 31st term. [5]

3. Question | 9709 May-June 2016 P1 V1 Q1

- 1** Find the term independent of x in the expansion of $\left(x - \frac{3}{2x}\right)^9$. [3]

4. Question | 9709 May-June 2016 P1 V1 Q9

- 9** **(a)** The first term of a geometric progression in which all the terms are positive is 50. The third term is 32. Find the sum to infinity of the progression. [3]
- (b)** The first three terms of an arithmetic progression are $2 \sin x$, $3 \cos x$ and $(\sin x + 2 \cos x)$ respectively, where x is an acute angle.
- (i)** Show that $\tan x = \frac{4}{3}$. [3]
- (ii)** Find the sum of the first twenty terms of the progression. [3]

[Questions 10 and 11 are printed on the next page.]

5. Question | 9709 May-June 2016 P1 V2 Q4

- 4** Find the term that is independent of x in the expansion of
- (i)** $\left(x - \frac{2}{x}\right)^6$, [2]
- (ii)** $\left(2 + \frac{3}{x^2}\right)\left(x - \frac{2}{x}\right)^6$. [4]

6. Question | 9709 May-June 2016 P1 V2 Q9

- 9** A water tank holds 2000 litres when full. A small hole in the base is gradually getting bigger so that each day a greater amount of water is lost.
- (i) On the first day after filling, 10 litres of water are lost and this increases by 2 litres each day.
- (a) How many litres will be lost on the 30th day after filling? [2]
- (b) The tank becomes empty during the n th day after filling. Find the value of n . [3]
- (ii) Assume instead that 10 litres of water are lost on the first day and that the amount of water lost increases by 10% on each succeeding day. Find what percentage of the original 2000 litres is left in the tank at the end of the 30th day after filling. [4]

[Questions 10 and 11 are printed on the next page.]

7. Question | 9709 May-June 2016 P1 V3 Q1

- 1** Find the coefficient of x in the expansion of $\left(\frac{1}{x} + 3x^2\right)^9$. [3]

8. Question | 9709 May-June 2016 P1 V3 Q4

- 4** The 1st, 3rd and 13th terms of an arithmetic progression are also the 1st, 2nd and 3rd terms respectively of a geometric progression. The first term of each progression is 3. Find the common difference of the arithmetic progression and the common ratio of the geometric progression. [5]

9. Question | 9709 Oct-Nov 2016 P1 V1 Q2

- 2** Find the term independent of x in the expansion of $\left(2x + \frac{1}{2x^3}\right)^{10}$. [4]

10. Question | 9709 Oct-Nov 2016 P1 V1 Q5

- 5** The sum of the 1st and 2nd terms of a geometric progression is 50 and the sum of the 2nd and 3rd terms is 30. Find the sum to infinity. [6]

11. Question | 9709 Oct-Nov 2016 P1 V2 Q4

- 4** In the expansion of $(3 - 2x)\left(1 + \frac{x}{2}\right)^n$, the coefficient of x is 7. Find the value of the constant n and hence find the coefficient of x^2 . [6]

12. Question | 9709 Oct-Nov 2016 P1 V2 Q8

- 8** (a) A cyclist completes a long-distance charity event across Africa. The total distance is 3050 km. He starts the event on May 1st and cycles 200 km on that day. On each subsequent day he reduces the distance cycled by 5 km.
- (i) How far will he travel on May 15th? [2]
- (ii) On what date will he finish the event? [3]
- (b) A geometric progression is such that the third term is 8 times the sixth term, and the sum of the first six terms is $31\frac{1}{2}$. Find
- (i) the first term of the progression, [4]
- (ii) the sum to infinity of the progression. [1]

13. Question | 9709 Oct-Nov 2016 P1 V3 Q2

- 2** The coefficient of x^3 in the expansion of $(1 - 3x)^6 + (1 + ax)^5$ is 100. Find the value of the constant a . [4]

14. Question | 9709 Oct-Nov 2016 P1 V3 Q9

- 9** (a) Two convergent geometric progressions, P and Q , have the same sum to infinity. The first and second terms of P are 6 and $6r$ respectively. The first and second terms of Q are 12 and $-12r$ respectively. Find the value of the common sum to infinity. [3]
- (b) The first term of an arithmetic progression is $\cos \theta$ and the second term is $\cos \theta + \sin^2 \theta$, where $0 \leq \theta \leq \pi$. The sum of the first 13 terms is 52. Find the possible values of θ . [5]

[Questions 10 and 11 are printed on the next page.]

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15. Question | 9709 Feb-March 2017 P1 V2 Q2

2 In the expansion of $\left(\frac{1}{ax} + 2ax^2\right)^5$, the coefficient of x is 5. Find the value of the constant a . [4]

[illegible]

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16. Question | 9709 May-June 2017 P1 V1 Q1

- 1 The coefficients of x^2 and x^3 in the expansion of $(3 - 2x)^6$ are a and b respectively. Find the value of $\frac{a}{b}$. [4]

[illegible]

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17. Question part 1/2 | 9709 May-June 2017 P1 V1 Q4

- 4 (a)** An arithmetic progression has a first term of 32, a 5th term of 22 and a last term of -28 . Find the sum of all the terms in the progression. [4]

[illegible]

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17. Question part 2/2 | 9709 May-June 2017 P1 V1 Q4

- (b) Each year a school allocates a sum of money for the library. The amount allocated each year increases by 2.5% of the amount allocated the previous year. In 2005 the school allocated \$2000. Find the total amount allocated in the years 2005 to 2014 inclusive. [3]

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18. Question | 9709 May-June 2017 P1 V2 Q1

- 1** **(i)** Find the coefficient of x in the expansion of $\left(2x - \frac{1}{x}\right)^3$. [2]

[illegible]

- (ii) Hence find the coefficient of x in the expansion of $(1 + 3x^2)\left(2x - \frac{1}{x}\right)^5$. [4]

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19. Question part 1/2 | 9709 May-June 2017 P1 V2 Q7

- 7 (a) The first two terms of an arithmetic progression are 16 and 24. Find the least number of terms of the progression which must be taken for their sum to exceed 20 000. [4]

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19. Question part 2/2 | 9709 May-June 2017 P1 V2 Q7

- (b) A geometric progression has a first term of 6 and a sum to infinity of 18. A new geometric progression is formed by squaring each of the terms of the original progression. Find the sum to infinity of the new progression. [4]

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20. Question | 9709 May-June 2017 P1 V3 Q1

- 1** The coefficients of x and x^2 in the expansion of $(2 + ax)^7$ are equal. Find the value of the non-zero constant a . [3]

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2 The common ratio of a geometric progression is r . The first term of the progression is $(r^2 - 3r + 2)$ and the sum to infinity is S .

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3 (a) A geometric progression has first term $3a$ and common ratio r . A second geometric progression has first term a and common ratio $-2r$. The two progressions have the same sum to infinity. Find the value of r . [3]

[illegible]

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- [illegible]

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23. Question | 9709 Oct-Nov 2017 P1 V2 Q1

1 Find the term independent of x in the expansion of $\left(2x - \frac{1}{4x^2}\right)^9$. [4]

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3 (a) Each year, the value of a certain rare stamp increases by 5% of its value at the beginning of the year. A collector bought the stamp for \$10 000 at the beginning of 2005. Find its value at the beginning of 2015 correct to the nearest \$100. [2]

[illegible]

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- [illegible]

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25. Question | 9709 Oct-Nov 2017 P1 V3 Q1

- 1** An arithmetic progression has first term -12 and common difference 6 . The sum of the first n terms exceeds 3000 . Calculate the least possible value of n . [4]

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$$(1+ax^2)\left(\frac{2}{x}-3x\right)^6. \quad [3]$$

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[illegible]

(ii) Hence find the coefficient of x^3 in the expansion of $(2 + 5x)(1 - 2x)^7$. [2]

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- Model *A* assumes that the daily amount of growth continues to be constant at the amount found for the first day.
- Model *B* assumes that the daily percentage rate of growth continues to be constant at the percentage rate of growth found for the first day.

(i) Using model A, find the predicted height in cm of the bamboo plant exactly 60 days after it was first measured. [2]

[illegible]

(ii) Using model B , find the predicted height in cm of the bamboo plant exactly 60 days after it was first measured. [3]

[illegible]

[illegible]

- [illegible]

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8 (a) A geometric progression has a second term of 12 and a sum to infinity of 54. Find the possible values of the first term of the progression. [4]

[illegible]

- (i) Find an expression, in terms of p , q and n , for S_n . [3]

[illegible]

- [illegible]

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31. Question | 9709 May-June 2018 P1 V2 Q1

- 1** The coefficient of x^2 in the expansion of $\left(2 + \frac{x}{2}\right)^6 + (a + x)^5$ is 330. Find the value of the constant a . [5]

[illegible]

[illegible]

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33. Question | 9709 May-June 2018 P1 V3 Q2

2 Find the coefficient of $\frac{1}{x}$ in the expansion of $\left(x - \frac{2}{x}\right)^5$. [3]

[illegible]

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34. Question | 9709 May-June 2018 P1 V3 Q3

- 3 The common ratio of a geometric progression is 0.99. Express the sum of the first 100 terms as a percentage of the sum to infinity, giving your answer correct to 2 significant figures. [5]

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35. Question | 9709 Oct-Nov 2018 P1 V1 Q4

4 The first term of a series is 6 and the second term is 2.

(i) For the case where the series is an arithmetic progression, find the sum of the first 80 terms. [3]

[illegible]

(ii) For the case where the series is a geometric progression, find the sum to infinity. [2]

[illegible]

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36. Question part 1/2 | 9709 Oct-Nov 2018 P1 V2 Q1

1 Find the coefficient of $\frac{1}{x^2}$ in the expansion of $\left(3x + \frac{2}{3x^2}\right)^7$. [4]

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36. Question part 2/2 | 9709 Oct-Nov 2018 P1 V2 Q1

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37. Question part 1/2 | 9709 Oct-Nov 2018 P1 V2 Q5

- 5** The first three terms of an arithmetic progression are 4, x and y respectively. The first three terms of a geometric progression are x , y and 18 respectively. It is given that both x and y are positive.

(i) Find the value of x and the value of y .

[4]

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37. Question part 2/2 | 9709 Oct-Nov 2018 P1 V2 Q5

(ii) Find the fourth term of each progression.

[3]

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38. Question | 9709 Oct-Nov 2018 P1 V3 Q1

1 Find the coefficient of $\frac{1}{x^3}$ in the expansion of $\left(x - \frac{2}{x}\right)'$. [3]

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39. Question | 9709 Oct-Nov 2018 P1 V3 Q5

- 5 In an arithmetic progression the first term is a and the common difference is 3. The n th term is 94 and the sum of the first n terms is 1420. Find n and a . [6]

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40. Question | 9709 Feb-March 2019 P1 V2 Q1

1 The coefficient of x^3 in the expansion of $(1 - px)^5$ is -2160 . Find the value of the constant p . [3]

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41. Question part 1/2 | 9709 Feb-March 2019 P1 V2 Q6

- 6** (i) The first and second terms of a geometric progression are p and $2p$ respectively, where p is a positive constant. The sum of the first n terms is greater than $1000p$. Show that $2^n > 1001$. [2]

[illegible]

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41. Question part 2/2 | 9709 Feb-March 2019 P1 V2 Q6

- (ii) In another case, p and $2p$ are the first and second terms respectively of an arithmetic progression. The n th term is 336 and the sum of the first n terms is 7224. Write down two equations in n and p and hence find the values of n and p . [5]

[illegible]

[illegible]

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43. Question part 1/2 | 9709 May-June 2019 P1 V1 Q8

- 8 (a)** The third and fourth terms of a geometric progression are 48 and 32 respectively. Find the sum to infinity of the progression. [3]

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44. Question | 9709 May-June 2019 P1 V2 Q1

1 Find the coefficient of x in the expansion of $\left(\frac{2}{x} - 3x\right)^5$. [3]

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10 (a) In an arithmetic progression, the sum of the first ten terms is equal to the sum of the next five terms. The first term is a .

[illegible][illegible]

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45. Question part 2/2 | 9709 May-June 2019 P1 V2 Q10

(b) The sum to infinity of a geometric progression is 9 times the sum of the first four terms. Given that the first term is 12, find the value of the fifth term. [4]

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- [illegible]

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- Boxer A's weight loss in week 2 is 0.98 kg. It is given that his weekly weight loss follows an arithmetic progression.

(i) Write down an expression for his total weight loss after x weeks. [1]

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(ii) He reaches his 13 kg target during week n . Use your answer to part **(i)** to find the value of n . [2]

[illegible]

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47. Question part 2/2 | 9709 May-June 2019 P1 V3 Q5

Boxer B 's weight loss in week 2 is 0.92 kg and it is given that his weekly weight loss follows a geometric progression.

(iii) Calculate his total weight loss after 20 weeks and show that he can never reach his target. [4]

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48. Question | 9709 Oct-Nov 2019 P1 V1 Q1

1 Find the term independent of x in the expansion of $\left(2x + \frac{1}{4x^2}\right)^6$. [3]

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- [illegible]

- [illegible]

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50. Question | 9709 Oct-Nov 2019 P1 V2 Q1

1 The coefficient of x^2 in the expansion of $(4 + ax)\left(1 + \frac{x}{2}\right)^6$ is 3. Find the value of the constant a . [4]

[illegible]

[illegible]

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- (i) Find the value of x . [2]

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- [illegible]

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(ii) In the expansion of $(1 + (px - 2x^2))^6$ the coefficient of x^2 is 48. Find the value of the positive constant p . [3]

[illegible]

[illegible][illegible]

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53. Question part 2/2 | 9709 Oct-Nov 2019 P1 V3 Q9

[illegible]

(iii) One of these ratios gives a progression which is convergent. Find the sum to infinity. [2]

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[illegible]

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56. Question | 9709 May-June 2020 P1 V1 Q1

- 1** The sum of the first nine terms of an arithmetic progression is 117. The sum of the next four terms is 91.

Find the first term and the common difference of the progression. [4]

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57. Question | 9709 May-June 2020 P1 V1 Q2

- 2** The coefficient of $\frac{1}{x}$ in the expansion of $\left(kx + \frac{1}{x}\right)^9 + \left(1 - \frac{2}{x}\right)^8$ is 74.

Find the value of the positive constant k .

[5]

[illegible]

- [illegible]

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59. Question | 9709 May-June 2020 P1 V2 Q1

1 (a) Find the coefficient of x^2 in the expansion of $\left(x - \frac{2}{x}\right)^9$. [2]

[illegible]

(b) Find the coefficient of x^2 in the expansion of $(2 + 3x^2) \left(x - \frac{2}{x}\right)^6$. [3]

[illegible]

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60. Question | 9709 May-June 2020 P1 V2 Q4

- 4** The n th term of an arithmetic progression is $\frac{1}{2}(3n - 15)$.

Find the value of n for which the sum of the first n terms is 84.

[5]

[illegible]

[illegible]

- [illegible]

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8 The first term of a progression is $\sin^2 \theta$, where $0 < \theta < \frac{1}{2}\pi$. The second term of the progression is $\sin^2 \theta \cos^2 \theta$.

[illegible]

(b) (i) Find the common difference of the progression in terms of $\sin \theta$. [3]

[illegible][illegible]

63. Question | 9709 Oct-Nov 2020 P1 V1 Q5

5 In the expansion of $\left(2x^2 + \frac{a}{x}\right)^6$, the coefficients of x^6 and x^3 are equal.

(a) Find the value of the non-zero constant a . [4]

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(b) Find the coefficient of x^6 in the expansion of $(1 - x^3)\left(2x^2 + \frac{a}{x}\right)^6$. [1]

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(a) Show that $r = 2R - 1$. [3]

[illegible]

(b) Express S in terms of a . [4]

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65. Question | 9709 Oct-Nov 2020 P1 V2 Q1

- 1** The coefficient of x^3 in the expansion of $(1 + kx)(1 - 2x)^5$ is 20.

Find the value of the constant k .

[4]

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66. Question | 9709 Oct-Nov 2020 P1 V2 Q2

- 2** The first, second and third terms of a geometric progression are $2p + 6$, $-2p$ and $p + 2$ respectively, where p is positive.

Find the sum to infinity of the progression.

[5]

[illegible]

The k th term in the progression is greater than 200.

Find the smallest possible value of k . [5]

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68. Question | 9709 Oct-Nov 2020 P1 V3 Q5

- 5** In the expansion of $(a + bx)^7$, where a and b are non-zero constants, the coefficients of x , x^2 and x^4 are the first, second and third terms respectively of a geometric progression.

Find the value of $\frac{a}{b}$. [5]

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69. Question part 1/2 | 9709 Oct-Nov 2020 P1 V3 Q7

7 The first and second terms of an arithmetic progression are $\frac{1}{\cos^2 \theta}$ and $-\frac{\tan^2 \theta}{\cos^2 \theta}$, respectively, where $0 < \theta < \frac{1}{2}\pi$.

(a) Show that the common difference is $-\frac{1}{\cos^4 \theta}$. [4]

[illegible]

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69. Question part 2/2 | 9709 Oct-Nov 2020 P1 V3 Q7

(b) Find the exact value of the 13th term when $\theta = \frac{1}{6}\pi$.

[3]

[illegible]

[illegible][illegible][illegible]

(a) For the case where the progression is geometric, the sum to infinity is $\frac{1}{\cos \theta}$.

(i) Show that the second term is $\cos \theta \sin^2 \theta$. [3]

[illegible]

(ii) Find the sum of the first 12 terms when $\theta = \frac{1}{3}\pi$, giving your answer correct to 4 significant figures. [2]

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71. Question part 2/2 | 9709 Feb-March 2021 P1 V2 Q9

- (b)** For the case where the progression is arithmetic, the first two terms are again $\cos \theta$ and $\cos \theta \sin^2 \theta$ respectively.

Find the 85th term when $\theta = \frac{1}{3}\pi$.

[4]

[illegible]

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Topical questions | 152 questions

72. Question | 9709 May-June 2021 P1 V1 Q2

- 2 The sum of the first 20 terms of an arithmetic progression is 405 and the sum of the first 40 terms is 1410.

Find the 60th term of the progression.

[5]

This image shows a full page of a worksheet designed for handwriting practice. It consists of approximately 20 horizontal rows. Each row is defined by two parallel dotted lines, creating a series of uniform gaps for letter height. The entire page is otherwise blank, with no text or other markings.

[illegible]

- [illegible]

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74. Question | 9709 May-June 2021 P1 V1 Q5

- 5** The fifth, sixth and seventh terms of a geometric progression are $8k$, -12 and $2k$ respectively.

Given that k is negative, find the sum to infinity of the progression. [4]

[illegible]

9709 Mathematics Paper 1 - Series

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75. Question | 9709 May-June 2021 P1 V2 Q4

- 4** The coefficient of x in the expansion of $\left(4x + \frac{10}{x}\right)^5$ is p . The coefficient of $\frac{1}{x}$ in the expansion of $\left(2x + \frac{k}{x^2}\right)^5$ is q .

Given that $p = 6q$, find the possible values of k . [5]

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

8 The first, second and third terms of an arithmetic progression are a , $\frac{3}{2}a$ and b respectively, where a and b are positive constants. The first, second and third terms of a geometric progression are a , 18 and $b + 3$ respectively.

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

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(b) Find the sum of the first 20 terms of the arithmetic progression. [3]

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[illegible]

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Topical questions | 152 questions

78. Question part 1/2 | 9709 May-June 2021 P1 V3 Q9

- 9 (a)** A geometric progression is such that the second term is equal to 24% of the sum to infinity.

Find the possible values of the common ratio.

[3]

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

- $$\frac{\text{5th term of } P}{\text{12th term of } Q} = \frac{1}{3} \quad \text{and} \quad \frac{\text{Sum of first 5 terms of } P}{\text{Sum of first 5 terms of } Q} = \frac{2}{3}.$$

Find the value of a and the value of d .

[6]

[illegible]

79. Question | 9709 Oct-Nov 2021 P1 V1 Q1

1 (a) Expand $\left(1 - \frac{1}{2x}\right)^2$. [1]

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(b) Find the first four terms in the expansion, in ascending powers of x , of $(1 + 2x)^6$. [2]

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(c) Hence find the coefficient of x in the expansion of $\left(1 - \frac{1}{2x}\right)^2 (1 + 2x)^6$. [2]

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4 The first term of an arithmetic progression is a and the common difference is -4 . The first term of a geometric progression is $5a$ and the common ratio is $-\frac{1}{4}$. The sum to infinity of the geometric progression is equal to the sum of the first eight terms of the arithmetic progression.

(a) Find the value of a . [4]

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The k th term of the arithmetic progression is zero.

(b) Find the value of k . [2]

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[illegible]

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Topical questions | 152 questions

82. Question | 9709 Oct-Nov 2021 P1 V2 Q6

- 6** The second term of a geometric progression is 54 and the sum to infinity of the progression is 243. The common ratio is greater than $\frac{1}{2}$.

Find the tenth term, giving your answer in exact form.

[5]

[illegible]

[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.

- Find the values of k and a . [4]

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. The background is plain white, providing a clear guide for letter height and placement. There are no margins, text, or other markings present.

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- This image shows a full page of a blank sheet of white paper. It features approximately 20 horizontal dotted lines spaced evenly apart, providing a guide for handwriting practice. The lines extend across the entire width of the page. There are no margins, text, or other markings present.

(a) Find the smallest value of n for which the n th term is negative. [2]

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(b) Find the value of k . [3]

[illegible]

[illegible]

[illegible]

Topical questions | 152 questions

4 The first term of a geometric progression and the first term of an arithmetic progression are both equal to a .

Given that the terms are all positive and not all equal, find the sum of the first twenty terms of the arithmetic progression in terms of a . [6]

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Topical questions | 152 questions

88. Question part 1/2 | 9709 May-June 2022 P1 V1 Q2

- 2** The thirteenth term of an arithmetic progression is 12 and the sum of the first 30 terms is -15 .

Find the sum of the first 50 terms of the progression.

[5]

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Topical questions | 152 questions

88. Question part 2/2 | 9709 May-June 2022 P1 V1 Q2

Topical questions | 152 questions

3 The coefficient of x^4 in the expansion of $\left(2x^2 + \frac{k}{x}\right)^n$ is a . The coefficient of x^2 in the expansion of $(2kx - 1)^4$ is b .

[illegible]

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Topical questions | 152 questions

89. Question part 2/2 | 9709 May-June 2022 P1 V1 Q3

(b) Given that $a + b = 216$, find the possible values of k .

[3]

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Topical questions | 152 questions

90. Question | 9709 May-June 2022 P1 V2 Q1

- 1** The coefficient of x^4 in the expansion of $(3+x)^5$ is equal to the coefficient of x^2 in the expansion of $\left(2x + \frac{a}{x}\right)^6$.

Find the value of the positive constant a . [4]

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9709 Mathematics Paper 1 - Series

Topical questions | 152 questions

91. Question | 9709 May-June 2022 P1 V2 Q2

- 2** The second and third terms of a geometric progression are 10 and 8 respectively.

Find the sum to infinity.

[4]

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Topical questions | 152 questions

4 The first, second and third terms of an arithmetic progression are k , $6k$ and $k + 6$ respectively.

[illegible]

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Topical questions | 152 questions

93. Question | 9709 May-June 2022 P1 V3 Q1

- 1** The coefficient of x^3 in the expansion of $\left(p + \frac{1}{p}x\right)^4$ is 144.

Find the possible values of the constant p .

[4]

[illegible]

(a) Show that $(n-1)d = \frac{11726}{n} - 8$. [1]

[illegible]

(b) Given that the n th term is 139, find the values of n and d , giving the value of d as a fraction. [4]

[illegible]

Topical questions | 152 questions

4 The coefficient of x^2 in the expansion of $\left(1 + \frac{2}{p}x\right)^5 + (1 + px)^6$ is 70.

[6]

This image shows a full page of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page, typical of notebook or legal stationery. There are no margins, text, or other markings on the page.

- [3]

[illegible]

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[illegible]

Topical questions | 152 questions

2 The first, second and third terms of an arithmetic progression are a , $2a$ and a^2 respectively, where a is a positive constant.

Find the sum of the first 50 terms of the progression. [5]

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Topical questions | 152 questions

98. Question | 9709 Oct-Nov 2022 P1 V2 Q4

- 4** A geometric progression is such that the third term is 1764 and the sum of the second and third terms is 3444.

Find the 50th term.

[4]

[illegible]

3 **(a)** Find the first three terms in ascending powers of x of the expansion of $(1 + 2x)^5$. [2]

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(b) Find the first three terms in ascending powers of x of the expansion of $(1 - 3x)^4$. [2]

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(c) Hence find the coefficient of x^2 in the expansion of $(1 + 2x)^5(1 - 3x)^4$. [2]

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9709 Mathematics Paper 1 - Series

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100. Question part 1/2 | 9709 Oct-Nov 2022 P1 V3 Q9

- 9** The first term of a geometric progression is 216 and the fourth term is 64.

- (a)** Find the sum to infinity of the progression.

[3]

[illegible]

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100. Question part 2/2 | 9709 Oct-Nov 2022 P1 V3 Q9

The second term of the geometric progression is equal to the second term of an arithmetic progression.

The third term of the geometric progression is equal to the fifth term of the same arithmetic progression.

(b) Find the sum of the first 21 terms of the arithmetic progression. [6]

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Topical questions | 152 questions

4 The circumference round the trunk of a large tree is measured and found to be 5.00 m. After one year the circumference is measured again and found to be 5.02 m.

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- This image shows a blank sheet 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.

- [illegible]

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Topical questions | 152 questions

102. Question | 9709 Feb-March 2023 P1 V2 Q6

6 In the expansion of $\left(\frac{x}{a} + \frac{a}{x^2}\right)^n$, it is given that

$$\frac{\text{the coefficient of } x^4}{\text{the coefficient of } x} = 3.$$

Find the possible values of the constant a .

[6]

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 and extend across the entire width of the page. There is no text or other markings on the sheet.

2 (a) Find the first three terms in the expansion, in ascending powers of x , of $(2 + 3x)^4$. [2]

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(b) Find the first three terms in the expansion, in ascending powers of x , of $(1 - 2x)^5$. [2]

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(c) Hence find the coefficient of x^2 in the expansion of $(2 + 3x)^4(1 - 2x)^5$. [2]

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(a) Given that the common difference of the progression is not zero, find the value of p . [3]

This image shows a blank sheet 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) Using this value, find the sum to infinity of the geometric progression with first two terms $\frac{p^2}{6}$ and $2p - 6$. [2]

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Topical questions | 152 questions

2 The coefficient of x^4 in the expansion of $(x + a)^6$ is p and the coefficient of x^2 in the expansion of $(ax + 3)^4$ is q . It is given that $p + q = 276$.

[illegible]

9709 Mathematics Paper 1 - Series

Topical questions | 152 questions

106. Question part 1/2 | 9709 May-June 2023 P1 V2 Q9

- 9** The second term of a geometric progression is 16 and the sum to infinity is 100.

- (a) Find the two possible values of the first term. [4]

[illegible]

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106. Question part 2/2 | 9709 May-June 2023 P1 V2 Q9

(b) Show that the n th term of one of the two possible geometric progressions is equal to 4^{n-2} multiplied by the n th term of the other geometric progression. [4]

[illegible]

[illegible]

- Find the values of the constants a and b . [4]

[illegible]

Topical questions | 152 questions

8 A progression has first term a and second term $\frac{a^2}{a+2}$, where a is a positive constant.

- [illegible]

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Topical questions | 152 questions

108. Question part 2/2 | 9709 May-June 2023 P1 V3 Q8

- (b) For the case where the progression is arithmetic and $a = 6$, determine the least value of n required for the sum of the first n terms to be less than -480 . [5]

[illegible]

Topical questions | 152 questions

1 (a) Expand $(1 + 3x)^6$ in ascending powers of x up to, and including, the term in x^2 . [2]

[illegible]

- [illegible]

9709 Mathematics Paper 1 - Series

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110. Question | 9709 Oct-Nov 2023 P1 V1 Q7

- 7 The sum of the first two terms of a geometric progression is 15 and the sum to infinity is $\frac{125}{7}$. The common ratio of the progression is negative.

Find the third term of the progression.

[7]

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111. Question | 9709 Oct-Nov 2023 P1 V2 Q1

- 1** The coefficient of x^3 in the expansion of $(3 + 2ax)^5$ is six times the coefficient of x^2 in the expansion of $(2 + ax)^6$.

Find the value of the constant a .

[4]

[illegible]

9709 Mathematics Paper 1 - Series

Topical questions | 152 questions

112. Question part 1/2 | 9709 Oct-Nov 2023 P1 V2 Q5

- 5 The first, second and third terms of a geometric progression are $\sin \theta$, $\cos \theta$ and $2 - \sin \theta$ respectively, where θ radians is an acute angle.

(a) Find the value of θ .

[3]

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(b) Using this value of θ , find the sum of the first 10 terms of the progression. Give the answer in the form $\frac{b}{\sqrt{c}-1}$, where b and c are integers to be found. [3]

This image shows a full page of white paper with horizontal dashed lines, typical of primary school handwriting practice 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.

(i) $(1 + 2x)^5$. [1]

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(ii) $(1 - ax)^6$, where a is a constant. [2]

[illegible]

In the expansion of $(1 + 2x)^5(1 - ax)^6$, the coefficient of x^2 is -5 .

(b) Find the possible values of a . [4]

[illegible]

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

[illegible]

is 432.

Find the value of the constant a .

[5]

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Find the sum of the first 100 terms of this arithmetic progression. [4]

[illegible]

- The sum to infinity of this geometric progression is denoted by S . The sum to infinity of the even-numbered terms (i.e. $a_2, a_4, a_6, \dots$) is denoted by S_E .

Find the values of S and S_F . [4]

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117. Question | 9709 May-June 2024 P1 V1 Q3

3 The coefficient of x^3 in the expansion of $(3+ax)^6$ is 160.

(a) Find the value of the constant a .

[2]

[illegible]

(b) Hence find the coefficient of x^3 in the expansion of $(3+ax)^6(1-2x)$.

[3]

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Topical questions | 152 questions

8 (a) The first three terms of an arithmetic progression are 25 , $4p - 1$ and $13 - p$, where p is a constant.

Find the value of the tenth term of the progression. [4]

[illegible]

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Topical questions | 152 questions

118. Question part 2/2 | 9709 May-June 2024 P1 V1 Q8

- (b) The first three terms of a geometric progression are 25 , $4q - 1$ and $13 - q$, where q is a positive constant.

Find the sum to infinity of the progression.

[4]

[illegible]

Find the value of the positive constant a . [3]

[illegible]

[5]

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Topical questions | 152 questions

121. Question part 1/2 | 9709 May-June 2024 P1 V2 Q5

- 5** The first and second terms of an arithmetic progression are $\tan \theta$ and $\sin \theta$ respectively, where $0 < \theta < \frac{1}{2}\pi$.

- (a) Given that $\theta = \frac{1}{4}\pi$, find the exact sum of the first 40 terms of the progression. [4]

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.

- [illegible]

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- 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.

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Topical questions | 152 questions

122. Question | 9709 May-June 2024 P1 V3 Q1

1 Find the coefficient of x^2 in the expansion of

$$(2-5x)(1+3x)^{10}. \quad [4]$$

[illegible]

Topical questions | 152 questions

123. Question part 1/2 | 9709 May-June 2024 P1 V3 Q7

(a) Find the common difference. [2]

[illegible]

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.



(a) Find the value of r . [3]

[illegible]

(b) Find the sum of the first 20 terms of the geometric progression. Give your answer correct to 4 significant figures. [2]

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.

[3]

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125. Question | 9709 Oct-Nov 2024 P1 V1 Q1

- 1** In the expansion of $\left(kx + \frac{2}{x}\right)^4$, where k is a positive constant, the term independent of x is equal to 150.

Find the value of k and hence determine the coefficient of x^2 in the expansion. [4]

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Topical questions | 152 questions

10 An arithmetic progression has first term 5 and common difference d , where $d > 0$. The second, fifth and eleventh terms of the arithmetic progression, in that order, are the first three terms of a geometric progression.

[illegible]

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Topical questions | 152 questions

126. Question part 2/2 | 9709 Oct-Nov 2024 P1 V1 Q10



- (b) The sum of the first 77 terms of the arithmetic progression is denoted by S_{77} . The sum of the first 10 terms of the geometric progression is denoted by G_{10} .

Find the value of $S_{77} - G_{10}$. [5]

[illegible]

- (a) Find the sum of the first 20 terms of the progression. [2]

[illegible]

(b) Find the value of k . [3]

[illegible]

4 Find the term independent of x in the expansion of each of the following:

$$\textbf{(a)} \quad \left(x + \frac{3}{x^2}\right)^6 \qquad [2]$$

$$\textbf{(b)} \quad (4x^3 - 5)\left(x + \frac{3}{x^2}\right)^6. \quad [4]$$

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129. Question | 9709 Oct-Nov 2024 P1 V3 Q1

- 1 An arithmetic progression has fourth term 15 and eighth term 25.

Find the 30th term of the progression.

[3]

[illegible]

130. Question | 9709 Oct-Nov 2024 P1 V3 Q3

- 3 (a)** Find the coefficients of x^3 and x^4 in the expansion of $(3-ax)^5$, where a is a constant. Give your answers in terms of a . [3]

[illegible]

- (b)** Given that the coefficient of x^4 in the expansion of $(ax+7)(3-ax)^5$ is 240, find the positive value of a . [3]

[illegible]

9709 Mathematics Paper 1 - Series

Topical questions | 152 questions

131. Question | 9709 Oct-Nov 2024 P1 V3 Q6

- 6** The first term of a convergent geometric progression is 10. The sum of the first 4 terms of the progression is p and the sum of the first 8 terms of the progression is q . It is given that $\frac{q}{p} = \frac{17}{16}$.

Find the two possible values of the sum to infinity.

[5]

[4]

[illegible]

- [2]

[illegible]

9709 Mathematics Paper 1 - Series

Topical questions | 152 questions

133. Question | 9709 Feb-March 2025 P1 V2 Q5

5 An arithmetic progression has first term 5 and common difference 6.

For this progression, find the sum of all the terms that lie between 150 and 400. [6]

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(a) Find the common ratio. [4]

[illegible]

(b) The first nine terms of the progression are now removed.

Find the sum to infinity of the remaining terms of the progression. [3]

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134. Question part 2/2 | 9709 Feb-March 2025 P1 V2 Q8



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Topical questions | 152 questions

3 The third term of a geometric progression is 18 and the sum of the first three terms is 26. It is given that the common ratio is negative.

- [illegible]

- [illegible]

5 (a) Find the first three terms, in ascending powers of x , in the expansion of each of the following expressions.

(i) $(2 - px)^5$ [2]

[illegible]

$$\textbf{(ii)} \quad \left(1 - \frac{1}{2}x\right)^4 \quad [2]$$

(b) Given that the coefficient of x^2 in the expansion of $(2 - px)^5 \left(1 - \frac{1}{2}x\right)^4$ is 93, find the possible values of the constant p . [3]

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Topical questions | 152 questions

3 The coefficient of x^7 in the expansion of $\left(px^2 + \frac{4}{p}x\right)^9$ is 1280.

[4]

[illegible]

Topical questions | 152 questions

138. Question part 1/2 | 9709 May-June 2025 P1 V2 Q10

- (i) Find the value of k . [2]

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- Find the sum to infinity of the progression. Give your answer in the form $\frac{a}{\sqrt{b}-c}$, where a , b and c are integers. [5]

[illegible]

9709 Mathematics Paper 1 - Series

Topical questions | 152 questions

139. Question part 1/2 | 9709 May-June 2025 P1 V3 Q2

2 The first two terms of a geometric progression are

$$4 \sin^2 \theta, \quad 8 \sin^3 \theta,$$

where θ is an angle such that $0 < \theta < \frac{1}{6}\pi$.

Given that the sum to infinity of the progression is $\frac{1}{2}$, find the value of θ . Give your answer in the form $\sin^{-1} k$, where k is a rational number. [4]

[illegible]

9709 Mathematics Paper 1 - Series

Topical questions | 152 questions

139. Question part 2/2 | 9709 May-June 2025 P1 V3 Q2



Topical questions | 152 questions

4 (a) Find the first three terms in the expansion of $\left(2 - \frac{3}{2}x\right)^5$ in ascending powers of x . [3]

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9709 Mathematics Paper 1 - Series

Topical questions | 152 questions

141. Question | 9709 May-June 2025 P1 V3 Q6

- 6 An arithmetic progression has first term a and common difference 2. The N th term is 55 and the sum of the first $3N$ terms is 5760.

Find the values of N and a .

[6]

9709 Mathematics Paper 1 - Series

Topical questions | 152 questions

142. Question | 9709 May-June 2025 P1 V5 Q2

- 2** In the expansion of $(3+ax)^5 + (6-x)^4$, the coefficient of x^2 is six times the coefficient of x .

Find the possible values of the constant a .

[5]

[illegible]

On Ananya's first birthday, her mother also gives her \$10. Every subsequent year, her mother gives her 20% more than she gave her the previous year.

(a) Show that on Ananya's eleventh birthday she receives more from her mother than from her father. [3]

[illegible]

9709 Mathematics Paper 1 - Series

Topical questions | 152 questions

143. Question part 2/2 | 9709 May-June 2025 P1 V5 Q6



(b) Find the total amount of money Ananya receives up to and including her eighteenth birthday. [5]

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144. Question | 9709 Oct-Nov 2025 P1 V1 Q2

2 A geometric progression has first term a and common ratio $\cos \theta$, where $0 < \theta < \frac{1}{2}\pi$. It is given that the second term is 8 and the fifth term is $\frac{1}{8}$.

(a) Find the value of θ . Give your answer correct to 3 significant figures. [3]

[illegible]

(b) Find the exact value of the sum to infinity. [2]

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the coefficient of x^4 is 216.

Find the value of the positive constant p .

[5]

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- (a)** It is given that $(S_7 - 1)$, S_4 , S_9 are the first three terms of a second arithmetic progression.

[4]

[illegible]

[4]

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9709 Mathematics Paper 1 - Series

Topical questions | 152 questions

147. Question | 9709 Oct-Nov 2025 P1 V2 Q2

2 Find the term independent of x in the expansion of $\left(2x^2 - \frac{3}{x}\right)^6$. [3]

[illegible]

- (a) Show that $a^2 - 10ac + 9c^2 = 0$. [3]

[illegible]

(b) (i) Find the sum to infinity of the geometric progression. [5]

[illegible]

9709 Mathematics Paper 1 - Series

Topical questions | 152 questions

148. Question part 2/2 | 9709 Oct-Nov 2025 P1 V2 Q8

[illegible]

- (ii) Find the sum of the first 20 terms of the arithmetic progression. [3]

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[illegible]

(b) Hence find the coefficient of x^3 in the expansion of $(3-x+2x^3)\left(2-\frac{1}{2}x\right)^6$. [2]

[illegible]

Topical questions | 152 questions

4 The first, second and third terms of a progression are 20, k and $k-5$ respectively.

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[illegible]

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

- [illegible]

[illegible]

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