# Section Check In – 1.04 Sequences and Series

## Questions

 **1.** Find the first 4 terms, in ascending powers of , of the binomial expansion of , giving each term in its simplest form.

 **2.** Find the coefficient of  in the expansion of .

 **3.\*** A sequence of numbers  is given by , .

 Find   and 

 **4.\*** Find the binomial expansion of  in ascending powers of , as far as the term

in . Give each coefficient in its simplest form and state the values of  for which the expansion is valid.

 **5.** Find the coefficient of  in the expansion of .

 **6.\*** Find .

 **7.** **(a)** Write down the first 3 terms, in ascending powers of , of the binomial expansion of

 , where is a non-zero constant.

 **(b)** Given that in the expansion of , the coefficient of is nine times the coefficient

 of , find the value of .

 **8.\*** The second and fifth terms of a geometric sequence are 32 and 0.5 respectively.

 For this series, find

 **(a)** the common ratio and the first term of the sequence,

 **(b)** the sum of the first five terms,

 **(c)** the sum to infinity giving your answer to three decimal places.

 **9.\*** An athlete is training for the London marathon. He runs 7 miles on day 1 and then increases his run by 0.8 miles each day until he can run a complete marathon of 26.2 miles.

 **(a)** On which day of his training does he run the full 26.2 miles?

 **(b)** How many miles does he run over the whole training period?

**10.\*** A hat shop made a profit of £20 000 in 2015. A model for future trading predicts that profit will increase each year in a geometric sequence so that in 2016 the profit will be .

 **(a)** Give an expression for the expected profit in the year 2020.

 Given that 

 **(b) (i)** find the year that the profit will first exceed £ 30 000,

 **(ii)** find the total profit made by the hat shop in the years 2015 to 2020.

 Give your answer to the nearest hundred pounds.

**Extension**

If the first two terms of a sequence form an arithmetic sequence and also form a geometric sequence, what is the relationship between ,  and ?

Is it possible for the first three terms of a sequence to form an arithmetic sequence and also form a geometric sequence? If so, what can you say about and ?

## Worked solutions

 **1.** 

 **2.**  Coefficient of  is 

 **3.** , , , 

 **4.** 

 . This is valid for 

 **5.** 

|  |  |  |  |
| --- | --- | --- | --- |
|   |   |   |   |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

Note: since you only need the coefficient of  for you need not work out all the terms of the binomial expansion [].

 Coefficient of  []

  

 **6.** , , 

 , , 

 

 **7. (a)** 

 **(b)** , , 

 **8.**  

 **(a)** , , , . 

 **(b)** 

 **(c)**  to 3 d.p.

 **9.** , 

 **(a)** 

 

 

  days

 **(b)**  miles

**10. (a)** 

 **(b)** **(i)** 

 

 

 

 6 years later will be the year 2021

 **(ii)** , , 

 

 £143 100 to the nearest hundred

**Extension**

If the first two terms form an arithmetic and a geometric sequence

 

 

Therefore 

If the first three terms form an arithmetic and a geometric sequence

 and 

 so 



But  so 

So 



Therefore  so 



In this case, all terms of the sequence must be equal

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