# 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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