# 1.2 arithmetic sequences and series\_P\_2

**1a.** *[4 marks]*

In an arithmetic sequence,  ,  and .

Find the value of .

**1b.** *[2 marks]*

Find the exact value of .

**1c.** *[5 marks]*

Consider the terms, , of this sequence such that  ≤ .

Let  be the sum of the terms for which  is not a multiple of 3.

Show that .

**2a.** *[1 mark]*

On her first day in a hospital, Kiri receives  milligrams (mg) of a therapeutic drug. The amount of the drug Kiri receives increases by the same amount, , each day. On the seventh day, she receives 21 mg of the drug, and on the eleventh day she receives 29 mg.

Write down an equation, in terms of  and , for the amount of the drug that she receives on the seventh day.

**2b.** *[1 mark]*

Write down an equation, in terms of  and , for the amount of the drug that she receives on the eleventh day.

**2c.** *[2 marks]*

Write down the value of  and the value of .

**2d.** *[3 marks]*

Kiri receives the drug for 30 days.

Calculate the total amount of the drug, in mg, that she receives.

**2e.** *[3 marks]*

Ted is also in a hospital and on his first day he receives a 20 mg antibiotic injection. The amount of the antibiotic Ted receives decreases by 50 % each day. On the second day, Ted receives a 10 mg antibiotic injection, on the third day he receives 5 mg, and so on.

Find the amount of antibiotic, in mg, that Ted receives on the fifth day.

**2f.** *[3 marks]*

The daily amount of antibiotic Ted receives will first be less than 0.06 mg on the  th day. Find the value of .

**2g.** *[3 marks]*

Hence find the total amount of antibiotic, in mg, that Ted receives during the first  days.

**3a.** *[3 marks]*

A new café opened and during the first week their profit was $60.

The café’s profit increases by $10 every week.

A new tea-shop opened at the same time as the café. During the first week their profit was also $60.

The tea-shop’s profit increases by 10 % every week.

Find the tea-shop’s profit during the 11th week.

**3b.** *[3 marks]*

Calculate the tea-shop’s **total** profit for the first 12 weeks.

**3c.** *[4 marks]*

In the *m*th week the tea-shop’s **total** profit exceeds the café’s **total** profit, for the first time since they both opened.

Find the value of *m*.

**4a.** *[4 marks]*

The 3rd term of an arithmetic sequence is 1407 and the 10th term is 1183.

Find the first term and the common difference of the sequence.

**4b.** *[3 marks]*

Calculate the number of positive terms in the sequence.



**5a.** *[2 marks]*

Rosa joins a club to prepare to run a marathon. During the first training session Rosa runs a distance of 3000 metres. Each training session she increases the distance she runs by 400 metres.

Write down the distance Rosa runs in the th training session.

**5b.** *[2 marks]*

A marathon is 42.195 kilometres.

In the th training session Rosa will run further than a marathon for the first time.

Find the value of .

**5c.** *[4 marks]*

Calculate the total distance, in **kilometres**, Rosa runs in the first 50 training sessions.

**5d.** *[3 marks]*

Carlos joins the club to lose weight. He runs 7500 metres during the first month. The distance he runs increases by 20% each **month**.

Find the distance Carlos runs in the fifth month of training.

**5e.** *[3 marks]*

Calculate the total distance Carlos runs in the first year.

**6.** *[3 marks]*

Phil takes out a bank loan of $150 000 to buy a house, at an annual interest rate of 3.5%. The interest is calculated at the end of each year and added to the amount outstanding.

David visits a different bank and makes a single deposit of $*Q* , the annual interest rate being 2.8%.

Hence or otherwise, find the minimum value of  that would permit David to withdraw annual amounts of $5000 indefinitely. Give your answer to the nearest dollar.

**7a.** *[3 marks]*

Antonio and Barbara start work at the same company on the same day. They each earn an annual salary of  euros during the first year of employment. The company gives them a salary increase following the completion of each year of employment. Antonio is paid using plan A and Barbara is paid using plan B.

Plan A: The annual salary increases by  euros each year.

Plan B: The annual salary increases by  each year.

Calculate

i)     Antonio’s annual salary during his second year of employment;

ii)    Barbara’s annual salary during her second year of employment.

**7b.** *[4 marks]*

Write down an expression for

i)     Antonio’s annual salary during his  th year of employment;

ii)    Barbara’s annual salary during her  th year of employment.



**7c.** *[2 marks]*

Determine the number of years for which Antonio’s annual salary is greater than or equal to Barbara’s annual salary.

**7d.** *[7 marks]*

Both Antonio and Barbara plan to work at the company for a total of  years.

i)     Calculate the **total amount** that **Barbara** will be paid during these  years.

ii)    Determine whether Antonio earns more than Barbara during these  years.

**8a.** *[2 marks]*

The first three terms of an arithmetic sequence are .

Find the common difference.

**8b.** *[2 marks]*

Find the 30th term of the sequence.

**8c.** *[2 marks]*

Find the sum of the first 30 terms.

**9a.** *[2 marks]*

Prachi is on vacation in the United States. She is visiting the Grand Canyon.

When she reaches the top, she drops a coin down a cliff. The coin falls down a distance of  metres during the first second,  metres during the next second,  metres during the third second and continues in this way. The distances that the coin falls during each second forms an arithmetic sequence.

(i)     Write down the common difference,  , of this arithmetic sequence.

(ii)    Write down the distance the coin falls during the fourth second.

**9b.** *[2 marks]*

Calculate the distance the coin falls during the  second.

**9c.** *[3 marks]*

Calculate the **total** distance the coin falls in the first  seconds. Give your answer in kilometres.

**9d.** *[3 marks]*

Prachi drops the coin from a height of  metres above the ground.

Calculate the time, to the nearest second, the coin will take to reach the ground.

**9e.** *[2 marks]*

Prachi visits a tourist centre nearby. It opened at the start of  and in the first year there were  visitors. The number of people who visit the tourist centre is expected to increase by  each year.

Calculate the number of people expected to visit the tourist centre in .

**9f.** *[3 marks]*

Calculate the total number of people expected to visit the tourist centre during the first  years since it opened.

**10a.** *[1 mark]*

In an arithmetic sequence .

Write down the value of the common difference.

**10b.** *[3 marks]*

Find the first term.

**10c.** *[2 marks]*

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

**11a.** *[2 marks]*

The sum of the first  terms of an arithmetic sequence is given by .

Write down the value of

(i)     ;

(ii)     .

**11b.** *[1 mark]*

The  term of the arithmetic sequence is given by .

Show that .

**11c.** *[2 marks]*

The  term of the arithmetic sequence is given by .

Find the common difference of the sequence.

**11d.** *[2 marks]*

The  term of the arithmetic sequence is given by .

Find .

**11e.** *[3 marks]*

The  term of the arithmetic sequence is given by .

Find the lowest value of  for which  is greater than .

**11f.** *[2 marks]*

The  term of the arithmetic sequence is given by .

There is a value of  for which



Find the value of .

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