HIGHER

2.4 Arithmetic and Geometric Sequences and Series: 1-hour Pack

Total Marks

EDEXCEL 4MA1 · Calculator allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A ball is dropped from a height of 55 m onto a hard floor. After each bounce it rises to 3/5 of the height it fell from. Assume it keeps bouncing for ever.
Find the total distance the ball travels before it comes to rest.

(Total for Question 1 is 5 marks)

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2 The first four terms of an arithmetic sequence are -3, -6, -9, -12, ...
Show whether -120 is a term of the sequence.

(Total for Question 2 is 4 marks)

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3 An arithmetic series has first term 15 and common difference 7.
Find the sum of the first 17 terms.

(Total for Question 3 is 2 marks)

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4 The expressions 3x - 11, 4x - 13 and 4x - 11 are the first three terms of an arithmetic sequence.
Find the value of x.

(Total for Question 4 is 3 marks)

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5 A channel has 9 followers on day 1. Each day the number of followers is 3 times the number on the previous day.
Assuming this pattern continues, find the first day on which the value is greater than 100000.

(Total for Question 5 is 4 marks)

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6 A geometric series has first term 7 and common ratio 1/2.
Find the sum of the first 6 terms.

(Total for Question 6 is 2 marks)

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7 The first four terms of a geometric sequence are 972, 648, 432, 288, ...
(a) Write down the common ratio.
(b) Find the 7th term.

(Total for Question 7 is 4 marks)

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8 A ball is dropped from a height of 55 m onto a hard floor. After each bounce it rises to 1/2 of the height it fell from. Assume it keeps bouncing for ever.
Find the total distance the ball travels before it comes to rest.

(Total for Question 8 is 5 marks)

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9 The first four terms of an arithmetic sequence are 26, 30, 34, 38, ...
Show whether 424 is a term of the sequence.

(Total for Question 9 is 4 marks)

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10 The first row of a theatre has 24 seats. Each row after it has 5 more seats than the row in front. There are 12 rows. Find the total number of seats in the theatre.

(Total for Question 10 is 3 marks)

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11 The expressions x - 1, 3x - 15 and 4x - 23 are the first three terms of an arithmetic sequence.
Find the value of x.

(Total for Question 11 is 3 marks)

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12 A channel has 875 followers on day 1. Each day the number of followers is 6/5 times the number on the previous day.
Assuming this pattern continues, find the first day on which the value is greater than 500.

(Total for Question 12 is 4 marks)

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Mark scheme · 2.4 Arithmetic and Geometric Sequences and Series: 1-hour Pack

Question 1

upward heights form a geometric series with first term 33 and ratio 3/5	**M1**
sum of upward heights = a/(1 - r) = 33/(2/5)	**M1**
sum of upward heights = 165/2	**A1**
total = 55 + 2 x 165/2 (each rise is matched by a fall)	**M1**
total distance = 220 m	**A1**

Answer: Total distance = 220 m

Question 2

nth term = -3n	**M1**
sets -3n = -120	**M1**
n = 40	**A1**
n is a positive whole number, so -120 is a term	**B1**

Answer: Yes, -120 is the 40th term

Question 3

S = (n/2)(2a + (n - 1)d) with a = 15, d = 7, n = 17	**M1**
S = 1207	**A1**

Answer: S = 1207

Question 4

uses (second term) - (first term) = (third term) - (second term)	**M1**
forms and simplifies a linear equation in x	**M1**
x = 4	**A1**

Answer: x = 4

Question 5

models the value on day n as $9 \times (3)^{n-1}$	**M1**
solves or tests: $9 \times (3)^{n-1} > 100000$	**M1**
value on day 9 is 59049 (not greater than 100000) and on day 10 is 177147	**A1**
n = 10	**A1**

Answer: n = 10

Question 6

$S = a(r^n - 1)/(r - 1)$ with a = 7, r = 1/2, n = 6	**M1**
441/32	**A1**

Answer: Sum = 441/32

Question 7

common ratio = second term / first term = 648/972	**M1**
r = 2/3	**A1**
7th term = $972 \times (2/3)^6$	**M1**
256/3	**A1**

Answer: (a) r = 2/3; (b) 256/3

Question 8

upward heights form a geometric series with first term 55/2 and ratio 1/2	**M1**
sum of upward heights = a/(1 - r) = (55/2)/(1/2)	**M1**
sum of upward heights = 55	**A1**
total = 55 + 2 x 55 (each rise is matched by a fall)	**M1**
total distance = 165 m	**A1**

Answer: Total distance = 165 m

Question 9

nth term = 4n + 22	**M1**
sets 4n + 22 = 424	**M1**
n = 201/2	**A1**
n is not a positive whole number, so 424 is not a term	**B1**

Answer: No, 424 is not a term

Question 10

identifies an arithmetic series with a = 24, d = 5, n = 12	**M1**
uses the sum formula S = (n/2)(2a + (n - 1)d) or (n/2)(first + last)	**M1**
total = 618	**A1**

Answer: Total = 618

Question 11

uses (second term) - (first term) = (third term) - (second term)	**M1**
forms and simplifies a linear equation in x	**M1**
x = 6	**A1**

Answer: x = 6

Question 12

models the value on day n as $875 \times (6/5)^{n-1}$	**M1**
solves or tests: $875 \times (6/5)^{n-1} > 500$	**M1**
value on day 1 is 875, which is already greater than 500	**A1**
n = 1	**A1**

Answer: n = 1

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