1.4 Pure: Sequences and Series (incl. Binomial Expansion): 30-minute Pack

EDEXCEL 9MA0 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 An arithmetic sequence has first term 40 and common difference -3. Find the 6th term.

(Total for Question 1 is 1 mark)

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2 A sequence is arithmetic with first term a = 7 and common difference d = 4.

(a) Find the 15th term of the sequence. **(2)**

(b) Show that the sum of the first n terms, S_n, satisfies $S_n = n(2n+5)$. **(3)**

(c) Given that $S_n = 900$, form a quadratic equation in n and hence find the value of n. **(4)**

(Total for Question 2 is 9 marks)

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3 A geometric series has first term a = 40 and sum to infinity 100.

(a) Find the common ratio, r. **(3)**

(b) Find the sum of the first 6 terms of the series, giving your answer to 3 significant figures. **(3)**

(c) Explain why the series would not have a sum to infinity if the common ratio were r=1.5 instead. **(1)**

(Total for Question 3 is 7 marks)

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4 Write down the coefficient of x in the expansion of $(1+x)^7$.

(Total for Question 4 is 1 mark)

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5 Consider the sum $\sum_{r=1}^{n} (4r - 3)$.

(a) Show that $\sum_{r=1}^{n} (4r-3) = n(2n-1)$. **(3)**

(b) Hence find the value of $\sum_{r=1}^{25} (4r-3)$. **(2)**

(c) Show that $\sum_{r=n+1}^{2n} (4r-3) = 6n^2 - n$. **(4)**

(Total for Question 5 is 9 marks)

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Mark scheme · 1.4 Pure: Sequences and Series (incl. Binomial Expansion): 30-minute Pack

Question 1

25 cao **B1**

Answer: 25

Question 2

(a) uses $u_n = a + (n-1)d$ with n=15 **M1**

(a) 63 cao **A1**

(a) Answer: 63

(b) correct substitution into $S_n = n/2(2a+(n-1)d)$ **M1**

(b) correct expansion and simplification **M1**

(b) $S_n = n(2n+5)$ cso, answer given **A1**

(b) Answer: $S_n = n(2n+5)$ (shown)

(c) forms $2n^2+5n-900=0$ **M1**

(c) solves the quadratic using the formula or by factorising **M1**

(c) n=20 cao **A1**

(c) rejects n=-22.5 since n must be a positive integer **A1**

(c) Answer: n = 20

Question 3

(a) uses $S_\infty = a/(1-r)$ **M1**

(a) forms 1-r = 40/100 **M1**

(a) r=0.6 cao **A1**

(a) Answer: r = 0.6

(b) correct use of $S_n = a(1-r^n)/(1-r)$ with n=6 **M1**

(b) correct value of $r^6 = 0.6^6$ = awrt 0.0467 **M1**

(b) awrt 95.3 **A1**

(b) Answer: 95.3 (3sf)

(c) states |r|>1 so the terms do not tend to zero and the series diverges, so no sum to infinity exists **B1**

(c) Answer: Because |r| = 1.5 > 1 the terms grow without bound so the series diverges.

Question 4

7 cao **B1**

Answer: 7

Question 5

(a) splits the sum as $4 \times \sum_{r=1}^{n} r - 3n$ **M1**

(a) uses $\sum_{r=1}^{n} r = n(n+1)/2$ and simplifies **M1**

(a) n(2n-1) cso, answer given **A1**

(a) Answer: n(2n-1) (shown)

(b) substitutes n=25 into n(2n-1) **M1**

(b) 1225 cao **A1**

(b) Answer: 1225

(c) expresses the required sum as $\sum_{r=1}^{2n} - \sum_{r=1}^{n}$ **M1**

(c) substitutes 2n into n(2n-1) to get 2n(4n-1) **M1**

(c) correct expansion and subtraction: $(8n^2-2n) - (2n^2-n)$ **M1**

(c) $6n^2 - n$ cso, answer given **A1**

(c) Answer: $6n^2 - n$ (shown)

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