

- 1** (i) In a 'Make Ten' quiz game, contestants get £10 for answering the first question correctly, then a further £20 for the second question, then a further £30 for the third, and so on, until they get a question wrong and are out of the game.
- (A) Haroon answers six questions correctly. Show that he receives a total of £210. [1]
- (B) State, in a simple form, a formula for the total amount received by a contestant who answers n questions correctly.
- Hence find the value of n for a contestant who receives £10 350 from this game. [4]
- (ii) In a 'Double Your Money' quiz game, contestants get £5 for answering the first question correctly, then a further £10 for the second question, then a further £20 for the third, and so on doubling the amount for each question until they get a question wrong and are out of the game.
- (A) Gary received £75 from the game. How many questions did he get right? [1]
- (B) Bethan answered 9 questions correctly. How much did she receive from the game? [2]
- (C) State a formula for the total amount received by a contestant who answers n questions correctly.
- Hence find the value of n for a contestant in this game who receives £2 621 435. [4]
- 2** The first term of a geometric series is 5.4 and the common ratio is 0.1.
- (i) Find the fourth term of the series. [1]
- (ii) Find the sum to infinity of the series. [2]
- 3** The 11th term of an arithmetic progression is 1. The sum of the first 10 terms is 120. Find the 4th term. [5]

4 (a) André is playing a game where he makes piles of counters. He puts 3 counters in the first pile. Each successive pile he makes has 2 more counters in it than the previous one.

(i) How many counters are there in his sixth pile? [1]

(ii) André makes ten piles of counters. How many counters has he used altogether? [2]

(b) In another game, played with an ordinary fair die and counters, Betty needs to throw a six to start.

The probability P_n of Betty starting on her n th throw is given by

$$P_n = \frac{1}{6} \times \left(\frac{5}{6}\right)^{n-1}.$$

(i) Calculate P_4 . Give your answer as a fraction. [2]

(ii) The values P_1, P_2, P_3, \dots form an infinite geometric progression. State the first term and the common ratio of this progression.

Hence show that $P_1 + P_2 + P_3 + \dots = 1$. [3]

(iii) Given that $P_n < 0.001$, show that n satisfies the inequality

$$n > \frac{\log_{10} 0.006}{\log_{10} \left(\frac{5}{6}\right)} + 1.$$

Hence find the least value of n for which $P_n < 0.001$. [4]

5 The first term of a geometric series is 8. The sum to infinity of the series is 10.

Find the common ratio. [3]

6 A sequence is given by the following.

$$u_1 = 3$$
$$u_{n+1} = u_n + 5$$

(i) Write down the first 4 terms of this sequence. [1]

(ii) Find the sum of the 51st to the 100th terms, inclusive, of the sequence. [4]

7 The n th term of an arithmetic progression is $6 + 5n$. Find the sum of the first 20 terms. [4]