1.

(a) When a ball bounces, it reaches 90% of the height reached on the previous bounce. If the ball is initially dropped at 5 meters, find the height the ball reaches after the 5th bounce. (2 marks)

(b) Find the number of bounces it would take to no longer reach a height of 2 meters. (2 marks)

(c) Find the total distance the ball travels (3 marks)

Mark scheme:

(a) height $= 5 * 0.90^5$ (A1)

height $= 2.95$ meters (A1)

(b) $5 * 0.90^n < 2$ (M1)

$0.90^n < 0.4$

$n > \log_{0.90} 0.4$ (A1)

$n > 8.69672 \ldots$

$n = 9$ (A1)

(c) Method 1:
Recognizing this as a geometric series to infinity
First term of $5 * 0.90$
Common ratio $= 0.90$ (M1)

Recognizing the need to double the distance and add 5 (M1)

Total Distance: $2\left(\frac{5*0.90}{1-0.90}\right) + 5 = 95$ meters (A1)

Method 2:
Recognizing this as a geometric series to infinity
First term of 5

Common Ratio $= 0.90$ (M1)

Recognizing the need to double the distance and subtract 5 (M1)

Total Distance: $2\left(\frac{5}{1-0.90}\right) - 5 = 95$ meters (A1)