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Start time: 9:03
End time: 10:05

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1) $U_n = 7.5m$
   $U_1 = 1.5m$
   $S_n = 81$

① $7.5 = 1.5 + (n-1)d$

② $81 = \frac{n}{2}(1.5 + 7.5)$ M1

$81 = \frac{9n}{2}$

$n = 18$ A1

Sub into ①

$7.5 = 1.5 + 17d$ M1
$6 = 17d$
$d = \frac{6}{17}$ A1

$d = 0.3529$
≈ 0.353 (3 s.f.)   4/4

2) N/A
   — Haven't done area of sector
   or any geometry yet.

3)
 a) $\frac{7^n - a^n}{7^n} = \frac{n}{2}(u_1 + u_n)$ M1A1

   $\frac{2(7^n - a^n)}{7^n} = u_1 + u_n$

   $u_n = \frac{2(7^n - a^n)}{7^n} - u_1$

 b) $S_n = 1 - \left(\frac{a}{7}\right)^n$ $S_n = \frac{u_1(1 - r^n)}{r - 1}$

   so $r = \frac{a}{7}$ $\frac{7^n - a^n}{7^n}$ M1A1A1

   $u_1 = 1$ A1

3c). N/A → haven't done sum to infinity   **6/6**

4. $\dfrac{S_{10}}{10} = 6$ ✓

$\dfrac{S_{20}}{20} = 16$ ✓

$\dfrac{5(2u_1 + 9d)}{10} = 6$ **M1A1**

→ $2u_1 + 9d = 12$ ① ✓

$\dfrac{10(2u_1 + 19d)}{20} = 16$

→ $2u_1 + 19d = 32$ ② ✓   **A1**

$\quad\ 2u_1 + 19d = 32$ **M1**
$-\ 2u_1 + 9d = 12$
$\qquad\quad 10d = 20$
$\qquad\qquad d = 2$ ✓ → sub into ①

$2u_1 + 18 = 12$ ✓
$2u_1 = -6$
$u_1 = -3$ **A1**   **A1**

$u_5 = -3 + 14 \cdot 2$

$\boxed{= 25}$ ✓   **6/6**

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5. N/A → haven't done sum to infinity

6. N/A → ———— '' ————

7.
a) $S_6 = 81$ **M1**
$\quad S_{11} = 231$ ✓   **M1**

$3(2u_1 + 5d) = 81$ ✓   **A1**

$\dfrac{11}{2}(2u_1 + 10d) = 231$ **A1**

$2u_1 + 5d = 27$ ① ✓

$2u_1 + 10d = 42$ ② ✓

$5d = 15$
$\boxed{d = 3}$ → sub into ①   **A1**

$2u_1 + 15 = 27$
$\boxed{u_1 = 6}$ ✓   **A1**

b) $S_2 = 1$ $\qquad$ $u_1 = \dfrac{1}{1+r}$

$S_4 = 5$

$S_2 = \dfrac{u_1(r^2-1)}{r-1} = 1$

$S_4 = \dfrac{u_1(r^4-1)}{r-1} = 5$

$u_1 r^2 - u_1 = r-1$

$u_1 r^4 - u_1 = 5r - 5$

$u_1 r^4 - u_1 = 5(u_1 r^2 - u_1)$

$u_1 r^4 - u_1 = 5u_1 r^2 - 5u_1$

$5u_1 r^2 - u_1 r^4 - 4u_1 = 0$

$\dfrac{5r^2}{1+r} - \dfrac{r^4}{1+r} - \dfrac{4}{1+v} = 0$

$r = 2$ ✓ $\qquad$ A1

$u_1 = \dfrac{1}{3}$ ✓ $\qquad$ A1

Arithmetic:

c) $u_r = 6 + (r-1)3$

Geometric:

$u_r = \dfrac{1}{3} \cdot 2^{r-1}$ $\qquad$ A1

$6 + 3r - 3$

$= (3 + 3r)\left(\dfrac{1}{3} \cdot 2^{r-1}\right)$ $\qquad$ M1

$= \dfrac{?}{?}(r+1)2^{r-1}$ $\qquad$ AG

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