

Springburn Academy : Mathematics Department

Higher Mathematics : Lesson Starters

Block 2 Recurrence Relations

Only use a calculator if necessary

Task 1

1 Olga normally runs a total distance of 28 miles per week.
She decides to increase her distance by 10% a week for the next four weeks.
How many miles will she run in the fourth week?

2 It is estimated that an iceberg weighs 84 000 tonnes.
As the iceberg moves into warmer water, it's weight decreases by 25% each day.
What will the iceberg weigh after 3 days?

3 Given $f(x) = 3x^2(2x - 1)$, find $f'(-1)$

4 Convert $\frac{3\pi}{2}$ to degree measure.

Task 2

1 A sequence is defined by the recurrence relation $U_{n+1} = 3u_n - 7$ and $u_0 = 1$.
What is the value of u_4 ?

2 A sequence is defined by the recurrence relation $U_{n+1} = 0.6U_n + 5$ and $U_0 = 8$
Calculate the value of U_3 and find the smallest value of n for which $U_n > 12$

3 $f(x) = \frac{x}{1-2x}$, find (a) $f(f(x))$ (b) $f^{-1}(x)$

4 Find the midpoint of $(-12, 3)$ and $(5, 8)$.

Task 3

1 $U_{n+1} = \frac{1}{4}U_n + 8$ with $U_0 = 32$. Evaluate U_2 .

2 A sequence is generated by the recurrence relation $U_{n+1} = 14u_n + 7$, with $U_0 = -2$.

What is the limit of this sequence as $n \rightarrow \infty$?

3 Write down the exact value of $\cos 225^\circ$.

4 Find the equation of the line perpendicular to $8x + 16y - 12 = 0$ and passes through the point $(-9, 2)$

Task 4

1 A sequence is generated by the recurrence relation $U_{n+1} = 0.7U_n + 10$.

What is the limit of this sequence as $n \rightarrow \infty$?

2 A sequence is defined by the recurrence relation $U_n = 0.9U_{n-1} + 2$, with $U_1 = 3$.

(a) Calculate the value of U_2

(b) What is the smallest value of n for which $U_n > 10$?

(c) Find the limit of this sequence as $n \rightarrow \infty$.

3 Write down the exact value of $\tan 300^\circ$.

4 Convert 60° to radian measure.

Task 5

- 1 (a) A sequence is defined by $U_{n+1} = -12U_n$ with $U_0 = -16$.
Write down the values of U_1 and U_2
- (b) A second sequence is given by 4, 5, 7, 11,
It is generated by the recurrence relation $V_{n+1} = pV_n + q$ with $V_1 = 4$.
Find the values of p and q
- (c) Either the sequence in (a) or the sequence in (b) has a limit.
(i) Calculate this limit.
(ii) Why does the other sequence not have a limit?
- 2 Two sequences are generated by the recurrence relations $U_{n+1} = aU_n + 10$ and $V_{n+1} = a^2 V_n + 16$.
The two sequences approach the same limit as $n \rightarrow \infty$.
Determine the value of a and evaluate the limit.
- 3 If $f(x) = kx^3 + 5x - 1$ and $f'(1) = 14$, find the value of k .
- 4 Given that the points $S(-4, 5, 1)$, $T(-16, -4, 16)$ and $U(-24, -10, 26)$ are collinear, calculate the ratio in which T divides SU .