6.2 Recursive Procedures – Worksheet

MCR3U

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SOLUTIONS

1) Write the first four terms of each sequence.

a) $t_1 = 4,\ t_n = t_{n-1} + 3$

4, 7, 10, 13

b) $t_1 = 50,\ t_n = \frac{t_{n-1}}{2}$

$50, 25, \frac{25}{2}, \frac{25}{4}$

c) $t_1 = 100,\ t_n = \frac{5t_{n-1}}{0.1} = 50 \cdot t_{n-1}$

100, 5000, 250 000, 12 500 000

2) Write the first four terms of each sequence

a) $f(1) = 3, f(n) = \frac{f(n-1)}{n}$

$f(2) = \frac{f(1)}{2} = \frac{3}{2}$

$f(3) = \frac{f(2)}{3} = \frac{3/2}{3} = \frac{3}{6} = \frac{1}{2}$

$f(4) = \frac{f(3)}{4} = \frac{1/2}{4} = \frac{1}{8}$

$3, \frac{3}{2}, \frac{1}{2}, \frac{1}{8}$

b) $f(1) = 0.5),\ f(n) = -f(n-1)$

$f(1) = 0.5$

$f(2) = -f(1) = -0.5$

$f(3) = -f(2) = -(-0.5) = 0.5$

$f(4) = -f(3) = -0.5$

$0.5, -0.5, 0.5, -0.5$

3) Determine a recursion formula for each sequence.

a) 5, 11, 17, 23, ...

$t_n = t_{n-1} + 6$

b) 4, 1, −2, −5, ...

$t_n = t_{n-1} - 3$

c) 4, 8, 16, 32, ...

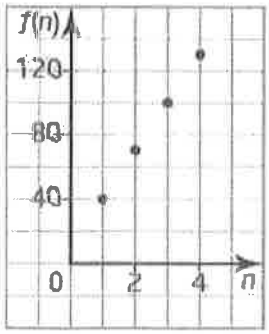
$t_n = 2t_{n-1}$

d) $-4, -2, -1, -\frac{1}{2}$

$t_n = \frac{t_{n-1}}{2}$

4) For each graph, write the sequence of terms and determine a recursion formula.

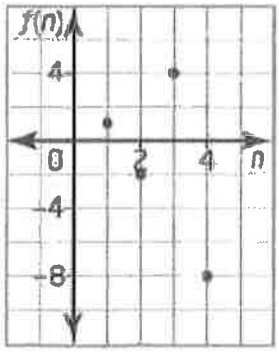
a)



40, 70, 100, 130

$t_n = t_{n-1} + 30$

b)



1, -2, 4, -8

$t_n = -2t_{n-1}$

5) A new theatre is being built for a youth orchestra. This theatre has 50 seats in the first row, 54 in the second row, 62 in the third row, 74 in the next row, and so on. Represent the number of seats in the rows as a sequence and then write a recursion formula to represent the number of seats in any row.

50, 54, 62, 74, ...

$t_n = t_{n-1} + 4(n-1)$

6) Write the first four terms of each sequence.

a) $t_1 = 1,\ t_n = (t_{n-1})^2 + 3n$

$t_2 = (1)^2 + 3(2) = 7$

$t_3 = (7)^2 + 3(3) = 58$

$t_4 = (58)^2 + 3(4) = 3376$

b) $t_1 = \frac{1}{2},\ t_n = 4t_{n-1} + 2$

$t_2 = 4(\frac{1}{2}) + 2 = 4$

$t_3 = 4(4) + 2 = 18$

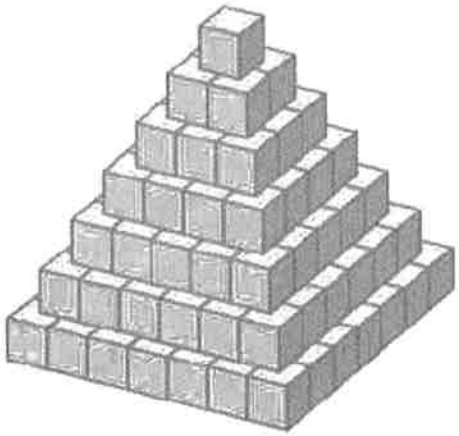
$t_4 = 4(18) + 2 = 74$

7) A square based pyramid with height 7 meters is constructed with cubic blocks measuring 1 m on each side. Write a recursion formula for the sequence that represents the number of blocks used at each level from top down.

n 1 2 3 4 5 6 7

t_n 1, 4, 9, 16, 25, 36, 49

$t_n = t_{n-1} + 2n - 1$



Answers

1) a) 4, 7, 10, 13 **b)** 50, 25, $\frac{25}{2}$, $\frac{25}{4}$ **c)** 100, 5 000, 250 000, 12 500 000

2) a) 3, $\frac{3}{2}$, $\frac{1}{2}$, $\frac{1}{8}$ **b)** 0.5, -0.5, 0.5, -0.5

3) a) $t_n = t_{n-1} + 6$ **b)** $t_n = t_{n-1} - 3$ **c)** $t_n = 2 \cdot t_{n-1}$ **d)** $t_n = \frac{t_{n-1}}{2}$

4) a) $t_n = t_{n-1} + 30$ **b)** $t_n = -2t_{n-1}$

5) $t_n = t_{n-1} + 4(n-1)$

a) 1, 7, 58, 3376 **b)** $\frac{1}{2}$, 4, 18, 74

7) $t_n = t_{n-1} + 2n - 1$