

Recursive Functions - Worksheet

1. 02-03 C1 Recursive Functions

Find $F(18)$.

$$F(x) = \begin{cases} F(x-4) - 2 & \text{if } x \geq 4 \\ 10 & \end{cases}$$

2. 02-03 C1 Recursive Functions

Find $F(F(F(3)))$

$$F(x) = \begin{cases} x + 1 & \text{if } x \geq 4 \\ 3x & \text{if } 0 \leq x < 4 \\ 1/x & \text{if } x < 0 \end{cases}$$

3. 03-04 C1 Recursive Functions

Find $f(10)$

$$f(x) = \begin{cases} f(x-2) + 1 & \text{if } x \geq 6 \\ x & \text{otherwise} \end{cases}$$

4. 03-04 C1 Recursive Functions

Find $f(8)$.

$$f(x) = \begin{cases} f(f(x-3)) + 2 & \text{if } x > 2 \\ x^2 - 5 & \text{if } x \leq 2 \end{cases}$$

5. 04-05 C1 Recursive Functions

Find $f(5)$

$$f(x) = \begin{cases} f(f(x-3)) + 3 & \text{if } x > 0 \\ x^2 - 2 & \text{otherwise} \end{cases}$$

6. 04-05 C1 Recursive Functions

Find $f(13,2)$

$$f(x,y) = \begin{cases} f(x-3, y+2) - 1 & \text{if } x > 3 \\ y + x & \text{if } x = 3 \\ f(2x+1, y-4) + 1 & \text{if } x < 3 \end{cases}$$

7. 05-06 C1 Recursive Functions

Find $F(5)$

$$F(X) = \begin{cases} F(F(X-1)) - 2 & \text{if } X \geq 4 \\ F(X-2) + 1 & \text{if } 1 \leq X < 4 \\ X^2 - 3 & \text{if } X < 1 \end{cases}$$

8. 05-06 C1 Recursive Functions

Start with a segment 16cm in length. At each end draw a segment half as long, perpendicular to the original segment and intersecting at the new segment's midpoint. If this process is continued infinitely, a fractal is created. Counting the original segment as stage 1, how many segments are added during the 5th stage?

9. 06-07 C1 Recursive Functions

Find $f(23)$

$$f(x) = \begin{cases} f(x-6) + 2 & \text{if } x > 10 \\ x^2 + 1 & \text{otherwise} \\ 2 * f(x+1) - 1 & \text{if } x < 6 \end{cases}$$

10. 06-07 C1 Recursive Functions

Find $f(5, 11)$

$$f(x, y) = \begin{cases} f(x+1, y-2) + 1 & \text{if } x < y \\ 2 * f(x+2, y-1) - 2 & \text{if } x = y \\ 3x - 4y & \text{if } x > y \end{cases}$$

11. 07-08 C1 Recursive Functions

Find $f(10)$

$$f(x) = \begin{cases} f(x-3) + x & \text{if } x > 8 \\ f(x+1) - 2 & \text{if } 6 < x \leq 8 \\ x^2 - x & \text{if } x \leq 6 \end{cases}$$

12. 07-08 C1 Recursive Functions

$[x]$ = greatest integer less than or equal to x

Find $f(f(f(f(150))))$, given:

$$f(x) = \begin{cases} f([x/5] - 2) + 10 & \text{if } x > 20 \\ f([x/3] + 2) - 5 & \text{if } 10 \leq x \leq 20 \\ [x/2] + x & \text{if } x < 10 \end{cases}$$

13. 08-09 C1 Recursive Functions

Find $f(10)$, given:

$$f(x) = \begin{cases} f(x-2) + x & \text{if } x > 5 \\ f(x+1) - x & \text{if } x < 5 \\ 4x & \text{if } x = 5 \end{cases}$$

14. 08-09 C1 Recursive Functions

An amoeba is placed in a jar at noon. It splits into two amoebas at midnight. This process repeats every 12 hours for each amoeba in the jar. How long (in days) will it take to have 1000 amoebas or more?

15. 09-10 C1 Recursive Functions

Find $f(12)$ given:

$$f(x) = \begin{cases} f(x-2)+1 & \text{if } x > 7 \\ f(x+1)-2 & \text{if } x < 7 \\ 4 & \text{if } x = 7 \end{cases}$$

16. 09-10 C1 Recursive Functions

Find $f(10,4)$ given:

$$f(x,y) = \begin{cases} f(x-2, y+1)-3 & \text{if } x > y \\ x^2 - 3y & \text{if } x < y \\ f(x+2, y-2)+1 & \text{if } x = y \end{cases}$$

17. 10-11 C1 Recursive Functions

Find $f(36)$ given:

$$f(x) = \begin{cases} f(x/2) - 3 & \text{if } x \text{ is even} \\ f(x+1) + 4 & \text{if } x \text{ is not prime and odd} \\ x^2 & \text{otherwise} \end{cases}$$

18. 10-11 C1 Recursive Functions

Find $f(1,11)$ given:

$$f(x,y) = \begin{cases} f(x+2, y-3) + 2 & \text{if } x < y \\ 2x + 5y & \text{if } x > y \\ f(x-1, y) - 3 & \text{if } x = y \end{cases}$$

19. 11-12 C1 Recursive Functions

Find $f(12)$ given:

$$f(x) = \begin{cases} f(x-2) + 3 & \text{if } x \geq 7 \\ x - 5 & \text{if } x < 7 \end{cases}$$

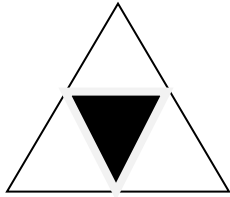
20. 11-12 C1 Recursive Functions

Find $f(12, 4)$ given:

$$f(x,y)=\begin{cases} f(x-1,y+2)+1 & \text{if } x > y \\ x-y & \text{if } x \leq y \end{cases}$$

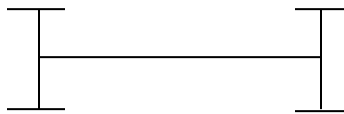
21. 02-03 C1 Recursive Functions

Consider the following recursive algorithm: Given an equilateral triangle, connect the midpoints of the sides. Paint the triangle formed. Repeat the process 4 more times with all the remaining unpainted triangles. How many triangles will be painted?



22. 05-06 C1 Recursive Functions

Start with a segment 16 cm in length. At each end draw a segment half as long, perpendicular to the original segment and intersecting at the new segment's midpoint. If this process is continued infinitely, a fractal is created. Counting the original segment as stage 1, what is the total length of all segments after stage 6 is completed?



23. 06-07 C1 Recursive Functions

Start with an equilateral triangle. Find the midpoint of each side. Connect those midpoints. Remove the triangle formed. In the second step, the procedure is applied to the 3 remaining triangles. Continuing in this manner, how many new triangles are removed in the fifth step?

