ADDING AND SUBTRACTING POLYNOMIAL FUNCTIONS

POLYNOMIAL FUNCTIONS

- POLYNOMIAL FUNCTIONS ARE A GROUP OF FUNCTIONS THAT INCLUDES CONSTANT FUNCTIONS, LINEAR FUNCTIONS, QUADRATIC FUNCTIONS, AND CUBIC FUNCTIONS.

ADDING POLYNOMIAL FUNCTIONS

- YOU CAN ADD POLYNOMIAL FUNCTIONS TOGETHER TWO WAYS:

- 1. MAKE A TABLE OF VALUES FOR THE ADDENDS TO GENERATE THE VALUES OF THE FUNCTION THAT IS THE SUM. THEN, USE FINITE DIFFERENCES TO GENERATE A SYMBOLIC FUNCTION RULE.

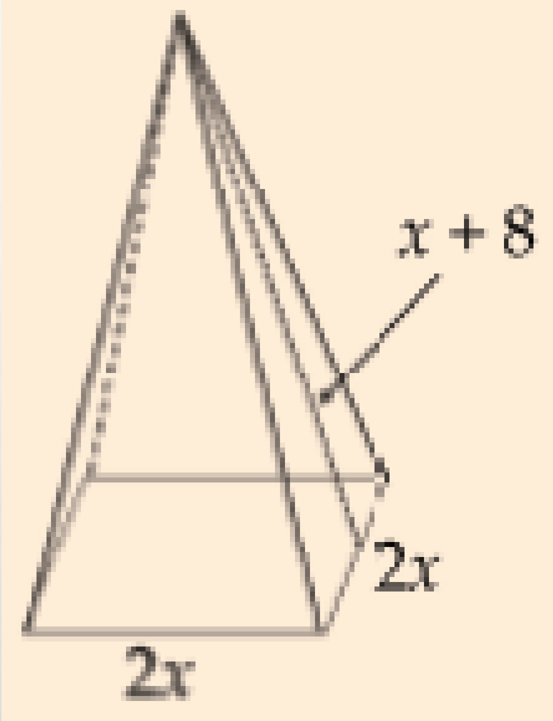
- 2. ADD TWO POLYNOMIAL FUNCTIONS TOGETHER BY ADDING THE SYMBOLIC FUNCTION RULES AND USING THE PROPERTIES OF ALGEBRA TO SIMPLIFY THE EXPRESSIONS.

SUBTRACTING POLYNOMIAL FUNCTIONS

- YOU CAN SUBTRACT POLYNOMIAL FUNCTIONS TWO WAYS:
- 1. MAKE A TABLE OF VALUES FOR THE SUBTRAHEND AND THE MINUEND TO GENERATE THE VALUES OF THE FUNCTION THAT IS THE DIFFERENCE. THEN, USE FINITE DIFFERENCES TO GENERATE A SYMBOLIC FUNCTION RULE.
- 2. SUBTRACT TWO POLYNOMIAL FUNCTIONS BY SUBTRACTING THE SYMBOLIC FUNCTION RULES AND USING THE PROPERTIES OF ALGEBRA TO SIMPLIFY THE EXPRESSIONS.

EXAMPLES

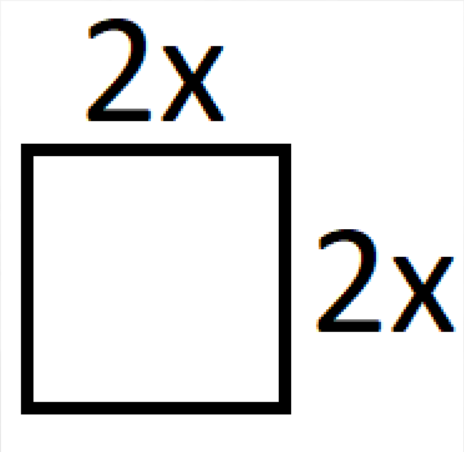
- BY CALCULATING THE SUM OF THE AREA OF THE BASE AND THE LATERAL SURFACE AREA, YOU CAN FIND THE SURFACE AREA OF THE SQUARE PYRAMID SHOWN BELOW. WRITE POLYNOMIAL REPRESENTATIONS FOR *B*(*X*), THE AREA OF THE BASE OF THE SQUARE PYRAMID, *L*(*X*), THE LATERAL SURFACE AREA OF THE SQUARE PYRAMID, AND *T*(*X*), THE TOTAL SURFACE AREA OF THE SQUARE PYRAMID. ADD THE POLYNOMIAL FUNCTIONS TO SHOW THAT *T*(*X*) = *B*(*X*) + *L*(*X*).



EXAMPLES

- **STEP 1** USE THE INFORMATION IN THE FIGURE TO WRITE A FUNCTION, ***B***(***X***), WHICH REPRESENTS THE AREA OF THE BASE OF THE SQUARE PYRAMID.

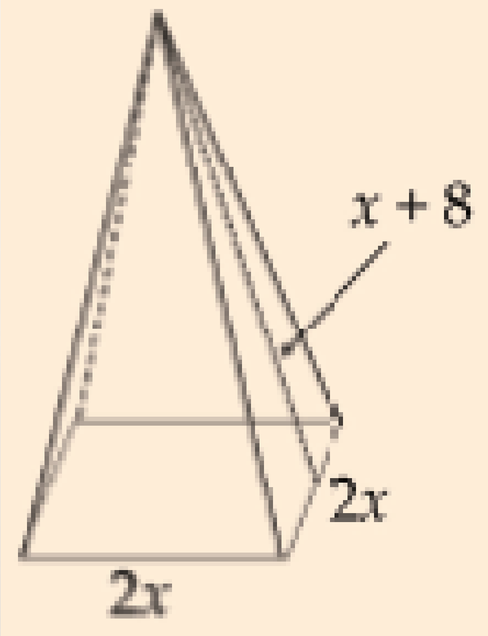
- A = S^2
- B(X) = $(2X)^2$
- B(X) = (2X)(2X)
- B(X) = $4X^2$



EXAMPLES

- **STEP 2** USE THE INFORMATION IN THE FIGURE TO WRITE A FUNCTION, ***L*(*X*)**, WHICH REPRESENTS THE LATERAL SURFACE AREA OF THE SQUARE PYRAMID.

- L = ½ PL
- L(X) = ½ (4S)(X + 8)
- L(X) = ½ (4*2X)(X + 8)
- L(X) = ½ (8X)(X + 8)
- L(X) = ½ ($8X^2$ + 64X)
- L(X) = $4X^2$ + 32X



EXAMPLES

- **STEP 3** CREATE A TABLE OF VALUES FOR THE TOTAL SURFACE AREA OF THE SQUARE PYRAMID. USE FINITE DIFFERENCES IN THE TABLE, INCLUDING WORKING BACKWARDS TO FIND A ZERO TERM, TO DETERMINE T(X), A FUNCTION THAT REPRESENTS THE TOTAL SURFACE AREA OF THE SQUARE PYRAMID.
- $T(X) = 8X^2 + 32X$

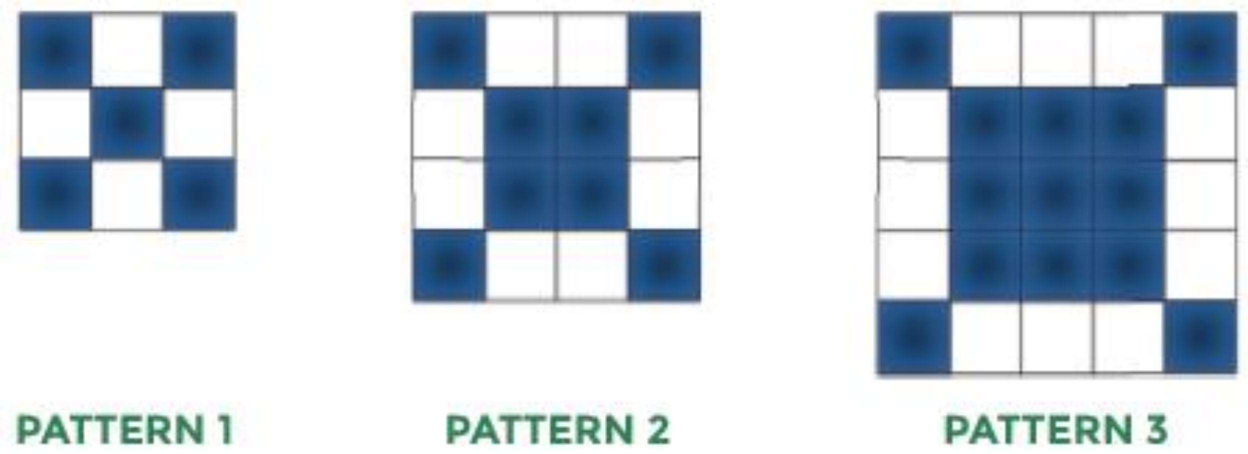
X	Y_1	Y_2	Y_3
0	0	0	0
1	4	36	40
2	16	80	96
3	36	132	168
4	64	192	256
5	100	260	360
6	144	336	480
7	196	420	616
8	256	512	768
9	324	612	936
10	400	720	1120

EXAMPLES

- **STEP 4** ADD ***B***(***X***) + ***L***(***X***). COMPARE THE SUM TO ***T***(***X***).
    - $B(X) + L(X) = 4X^2 + 4X^2 + 32X$
    - $B(X) + L(X) = 8X^2 + 32X$
    - $T(X) = 8X^2 + 32X$
- THEREFORE, $T(X) = B(X) + L(X)$

EXAMPLES

- A CONTRACTOR CREATES CUSTOM PATTERNS FOR TILE BACKSPLASHES. WRITE POLYNOMIALS TO DESCRIBE HOW MANY TILES ARE NEEDED FOR EACH PATTERN AND HOW MANY BLUE TILES ARE NEEDED FOR EACH PATTERN. USE THESE TO WRITE A POLYNOMIAL TO EXPRESS HOW MANY WHITE TILES ARE NEEDED FOR THE *N*TH PATTERN.



EXAMPLES

- **STEP 1** USE THE GEOMETRIC PATTERN TO DETERMINE $\boldsymbol{T(N)}$, A FUNCTION THAT REPRESENTS THE TOTAL NUMBER OF TILES NEEDED FOR THE $\boldsymbol{N}^{TH}$ TILE BACKSPLASH PATTERN.

- EACH PATTERN IS A SQUARE WITH SIDE LENGTHS THAT HAVE TWO MORE TILES THAN THE PATTERN NUMBER. THEREFORE, $T(N) = (N + 2)^2$.

EXAMPLES

- **STEP 2** USE THE GEOMETRIC PATTERN TO DETERMINE ***B***(***N***), A FUNCTION THAT REPRESENTS THE NUMBER OF BLUE TILES NEEDED FOR THE ***N***TH TILE BACKSPLASH PATTERN.

- EACH PATTERN HAS A SQUARE OF BLUE TILES IN THE MIDDLE OF THE PATTERN AS WELL AS BLUE TILES IN THE FOUR CORNERS OF THE LARGER SQUARE. THEREFORE, $B(N) = N^2 + 4$.

EXAMPLES

- **STEP 3** USE ***T***(***N***) AND ***B***(***N***) TO DETERMINE ***W***(***N***), A FUNCTION THAT REPRESENTS THE NUMBER OF WHITE TILES NEEDED FOR THE ***N***TH TILE BACKSPLASH PATTERN.

- THE NUMBER OF WHITE TILES NEEDED FOR THE TILE BACKSPLASH PATTERN CAN BE FOUND BY SUBTRACTING THE NUMBER OF BLACK TILES NEEDED FROM THE TOTAL NUMBER OF TILES NEEDED. THEREFORE, $W(N) = T(N) - B(N)$.

- $W(N) = T(N) - B(N) = (N + 2)2 - (N2 + 4) = N2 + 4N + 4 - N2 - 4 = 4N$