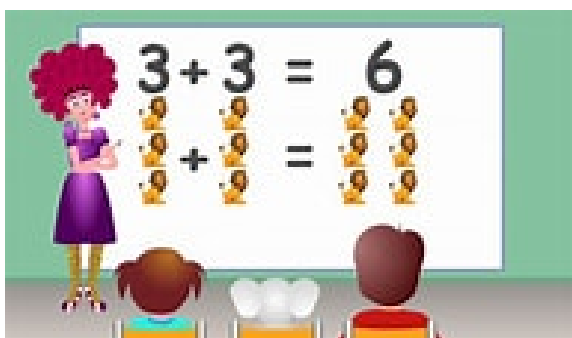


## Curriculum Outcome

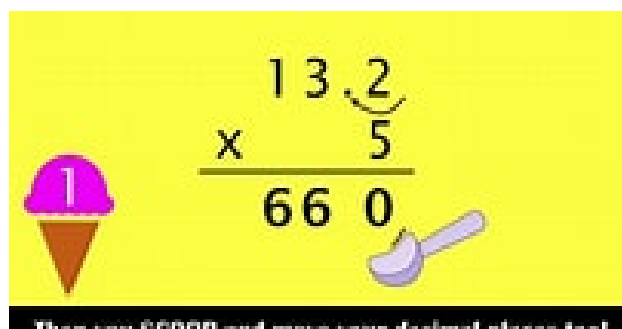
- (PR 5) Demonstrate an understanding of polynomials (limited to of degree less than or equal to 2).
- (PR 6) Model, record and explain the operations of addition and subtraction of polynomial expressions, concretely, pictorially and symbolically (limited to polynomials of degree less than or equal to 2).
- (PR 7) Model, record and explain the operations of multiplication and division of polynomial expressions (limited to polynomials of degree less than or equal to 2) by monomials, concretely, pictorially and symbolically.

**Student Friendly:**

**"Multiplying polynomials by a constant "**



# Lets Go "Old School"



**Addition without a Calculator**

$$\begin{array}{r} 1 \ 1 \\ 7 \ 2 \ 6 \\ + 5 \ 8 \ 7 \\ \hline 1 \ 3 \ 1 \ 3 \end{array}$$

**Addition without a Calculator**

$$\begin{array}{r} \phantom{+} 1 \phantom{0} 1 \phantom{0} 1 \phantom{0} 1 \\ \phantom{+} 1 \phantom{0} 5 \phantom{0} 9 \phantom{0} 2 \phantom{0} 8 \\ + \phantom{0} 9 \phantom{0} 6 \phantom{0} 7 \phantom{0} 2 \\ \hline 2 \phantom{0} 5 \phantom{0} 6 \phantom{0} 0 \phantom{0} 0 \end{array}$$

## Multiplication without a Calculator

$$\begin{array}{r} 816 \\ \times 7 \\ \hline 5712 \end{array}$$

	800	10	6
7	5600	70	42

$$\begin{array}{r} 1 \\ 5600 \\ + 70 \\ + 42 \\ \hline 5712 \end{array}$$

## Multiplication without a Calculator

$$\begin{array}{r}
 254 \\
 \times 58 \\
 \hline
 2032 \\
 12700 \\
 \hline
 14732
 \end{array}$$

	200	50	4
50	10000	2500	200
8	1600	400	32

$$\begin{array}{r}
 1 \\
 + 10000 \\
 + 2500 \\
 + 200 \\
 + 1600 \\
 + 400 \\
 + 32 \\
 \hline
 14732
 \end{array}$$

# Multiplication without a Calculator

$$\begin{array}{r}
 943 \\
 \times 819 \\
 \hline
 8487 \\
 29430 \\
 754400 \\
 \hline
 772317
 \end{array}$$

	900	40	3
800	720 000	32 000	2400
10	9 000	400	30
9	8 100	360	27

$$\begin{array}{r}
 211 \\
 720\,000 \\
 + 32\,000 \\
 + 2\,400 \\
 + 9\,000 \\
 + 400 \\
 + 30 \\
 + 8\,100 \\
 + 360 \\
 + 27 \\
 \hline
 772\,317
 \end{array}$$



$$1) \ 45\ 789$$

$$+ \ 8\ 231$$



$$2) \ 1\ 5\ 9$$

$$\times \ 4\ 4\ 2$$







$$\begin{array}{r} 11 \ 11 \\ 1) 45 \ 789 \end{array}$$

$$+ \quad 8 \ 231$$

---

$$\mathbf{54 \ 020}$$



$$2) \quad 159$$

$$\times 442$$

---


$$\begin{array}{r} 318 \\ 6360 \\ 63600 \\ \hline 70278 \end{array}$$

	100	50	9
400	40 000	20 000	3 600
40	4 000	2 000	360
2	200	100	18

$$\begin{array}{r} 11 \\ 40\ 000 \\ + 20\ 000 \\ + 3\ 600 \\ + 4\ 000 \\ + 2\ 000 \\ + 360 \\ + 200 \\ + 100 \\ + 18 \\ \hline 70\ 278 \end{array}$$

# Why are we doing this????



# Multiplying Polynomials

We already know how multiply:

Mono x Mono

$$(5x^3y^6)(-7x^2y)$$

Mono x Bi

$$(-2y^4)(8y^3 - 6x)$$

## Multiplying Polynomials

What about a

$$(Bi) \times (Bi)$$

$$(2x - 5)(3x + 8)$$

Two ways to do

**Option 1**  
**Arrows Method**

$$(2x - 5)(3x + 8)$$

$$6x^2 + 16x - 15x - 40$$

$$6x^2 + x - 40$$

**Option 2**  
**Box Method**

$$(2x - 5)(3x + 8)$$

	3x	+8
2x	$6x^2$	$16x$
-5	$-15x$	$-40$

$$6x^2 + 16x - 15x - 40$$

$$6x^2 + x - 40$$

Now you try!!

$$(4x^5 - 6y) (7x^5 - 6y)$$

$$35x^{10} - 24x^5y - 42x^5y + 36y^2$$

$$35x^{10} - 66x^5y + 36y^2$$



Now you try!!

$$(3rx^5 + 8xy) (9r^2x^3 - 6x^2y)$$

$$27r^3x^{10} - 18rx^7y + 72r^2x^4y - 48x^3y^2$$

## Multiplying Polynomials

What about a

(Bi) x (Tri)

$$(x^2 + 6)(5x^2 + 2x - 7)$$

Two ways to do

**Option 1**  
**Arrows Method**

$$(x^2 + 6)(5x^2 + 2x - 7)$$

$$5x^4 + 2x^3 - 7x^2 + 30x^2 + 12x - 42$$

$$5x^4 + 2x^3 + 23x^2 + 12x - 42$$

## Option 2 Box Method

$$(x^2 + 6)(5x^2 + 2x - 7)$$

	$5x^2$	$+2x$	$-7$
$x^2$	$5x^4$	$2x^3$	$-7x^2$
$+6$	$5x^2$	$+12x$	$-42$

$$5x^4 + 2x^3 - 7x^2 + 30x^2 + 12x - 42$$

$$5x^4 + 2x^3 + 23x^2 + 12x - 42$$

## Multiplying Polynomials

What about a

(Tri) x (Tri)

$$(7x^2 + 4x - 3) (x^2 - 8x + 1)$$

Two ways to do

**Option 1**  
**Arrows Method**

$$(7x^2 + 4x - 3) (x^2 - 8x + 1)$$

$$7x^4 - 56x^3 - 7x^2 + 4x^3 - 32x^2 - 4x + 3x^2 + 24x - 3$$

$$7x^4 - 56x^3 + 4x^3 - 7x^2 - 32x^2 + 3x^2 - 4x + 24x - 3$$

$$7x^4 - 52x^3 - 36x^2 + 20x - 3$$

## Option 2 Box Method

$$(7x^2 + 4x - 3) (x^2 - 8x + 1)$$

	$x^2$	$-8x$	$1$
$7x^2$	$7x^4$	$-56x^3$	$-7x^2$
$+4x$	$4x^3$	$-32x^2$	$-4x$
$-3$	$3x^2$	$+24x$	$-3$

$$7x^4 - 56x^3 - 7x^2 + 4x^3 - 32x^2 - 4x + 3x^2 + 24x - 3$$

$$7x^4 - 56x^3 + 4x^3 - 7x^2 - 32x^2 + 3x^2 - 4x + 24x - 3$$

$$7x^4 - 52x^3 - 36x^2 + 20x - 3$$