

SECTION 4.2 - MULTIPLYING A POLYNOMIAL BY A MONOMIAL

REVIEW

① SIMPLIFY  $\sqrt{96}$   
 $4\sqrt{6}$

② SIMPLIFY  $(5x^2y)(2x^{-1}y^3)$   
 $10xy^4$

③ PUT  $3x + 4y = 12$  IN SLOPE-INTERCEPT FORM.  
 $4y = -3x + 12$   
 $y = -\frac{3}{4}x + 3$

④ WHAT IS THE SLOPE OF ANY LINE THAT IS PERPENDICULAR TO  $4x + 3y = 24$ ?  
 $m = -\frac{A}{B} = -\frac{4}{3} \rightarrow m_{\perp} = \frac{3}{4}$

★ TO FIND THE PRODUCT OF A POLYNOMIAL AND A MONOMIAL, YOU CAN USE THE DISTRIBUTIVE PROPERTY.

EXAMPLE 1. FIND  $-3x^2(7x^2 - x + 4)$

HORIZONTAL METHOD

$$-3x^2(7x^2 - x + 4) =$$

$$-21x^4 + 3x^3 - 12x^2$$

VERTICAL METHOD

$$\begin{array}{r} 7x^2 - x + 4 \\ (x) \quad -3x^2 \\ \hline -21x^4 + 3x^3 - 12x^2 \end{array}$$

APPLICATION 1. FIND EACH PRODUCT.

①  $5a^2(-4a^2 + 2a - 7)$   
 $-20a^4 + 10a^3 - 35a^2$

②  $-6d^3(3d^4 - 2d^3 - d + 9)$   
 $-18d^7 + 12d^6 + 6d^4 - 54d^3$

③  $20x(2x^2 + 3x + 5)$   
 $40x^3 + 60x^2 + 100x$

④  $3y^2(-3y^2 + 8)$   
 $-9y^4 + 24y^2$

EXAMPLE 2. THE SAME METHOD CAN BE USED TO SIMPLIFY LARGE EXPRESSIONS.

SIMPLIFY  $2p(-4p^2 + 5p) - 5(2p^2 + 20)$   
 $-8p^3 + 10p^2 - 5p^2 - 20$   
 $\boxed{-8p^3 + 5p^2 - 20}$

APPLICATION 2. FIND EACH PRODUCT.

①  $3(5x^2 + 2x - 4) - x(7x^2 + 2x - 3)$   
 $15x^2 + 6x - 12 - 7x^3 - 2x^2 + 3x =$   
 $\boxed{-7x^3 + 13x^2 + 9x - 12}$

②  $15 + (10y^3 + 5 + 5y^2) - 2y(y^2 + 4y^2)$   
 $150y^3 + 6 + 75y^2 + 2 - 2y^2 + 2 - 8y^3 =$   
 $\boxed{150y^3 + 6 + 73y^2 + 2 - 8y^3}$

MULTIPLYING POLYNOMIALS + MONOMIALS CAN BE USED TO SOLVE REAL WORLD PROBLEMS.

EXAMPLE 3. FIND THE AREA OF THE TRAPEZOID SHOWN BELOW.

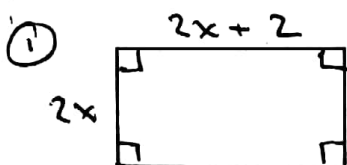


$$A = \frac{1}{2}(b_1 + b_2)h = \frac{(b_1 + b_2)h}{2}$$

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

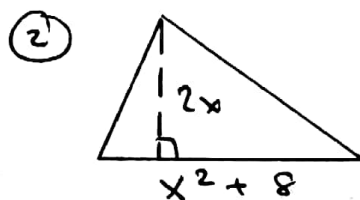
$$= \frac{1}{2}(3h + 5)h = \frac{1}{2}(3h^2 + 5h) = \boxed{\frac{3}{2}h^2 + \frac{5}{2}h}$$

APPLICATION 3. FIND THE AREAS OF THE FIGURES.



$$A = 2x(2x + 2)$$

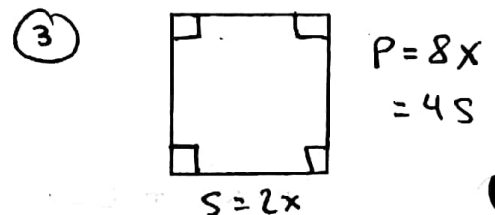
$$= \boxed{4x^2 + 4x}$$



$$A = \frac{1}{2}(x^2 + 8)(2x)$$

$$= x(x^2 + 8)$$

$$= \boxed{x^3 + 8x}$$



$$A = (2x)(2x)$$

$$= \boxed{4x^2}$$

CAN USE THE DISTRIBUTIVE PROPERTY TO SOLVE EQUATIONS THAT INVOLVE PRODUCTS OF MONOMIALS + POLYNOMIALS.

### EXAMPLE 4. SOLVE

$$2a(5a-2) + 3a(2a+6) + 8 = a(4a+1) + 2a(6a-4) + 50$$

$$10a^2 - 4a + 6a^2 + 18a + 8 = 4a^2 + a + 12a^2 - 8a + 50$$

$$\cancel{10a^2} + 14a + 8 = \cancel{16a^2} - 7a + 50 \quad 21a + 8 = 50$$

$$+ 7a$$

$$+ 7a$$

$$21a = 42$$

$$a = 2$$

### APPLICATION 4. SOLVE.

$$\textcircled{1} 2x(x+4) + 7 = (x+8) + 2x(x+1) + 12$$

$$\cancel{2x^2} + 8x + 7 = x + 8 + \cancel{2x^2} + 2x + 12$$

$$8x + 7 = 3x + 20$$

$$5x = 13$$

$$x = \frac{13}{5}$$

$$\textcircled{2} d(d+3) - d(d-4) = 9d - 16$$

$$\cancel{d^2} + 3d - \cancel{d^2} + 4d = 9d - 16$$

$$7d = 9d - 16$$

$$2d = 12$$

$$d = 6$$

### PRACTICE

① FIND EACH PRODUCT:

$$\textcircled{A} 5w(-3w^2 + 2w - 4) = -15w^3 + 10w^2 - 20w$$

$$\textcircled{B} 6g^2(3g^3 + 4g^2 + 10g - 1) = 18g^5 + 24g^4 + 60g^3 - 6g^2$$

$$\textcircled{C} 4km^2(8km^2 + 2k^2m + 5k) = 32k^2m^4 + 8k^3m^3 + 20k^2m^2$$

$$\textcircled{D} -3p^4r^3(2p^2r^4 - 6p^6r^3 - 5) = -6p^6r^7 + 18p^{10}r^6 + 15p^4r^3$$

$$\textcircled{E} c^2d^3(5cd^7 - 3c^3d^2 - 4d^3) = 5c^3d^{10} - 3c^5d^5 - 4c^2d^6$$

2) SIMPLIFY EACH EXPRESSION:

$$\text{(A)} \quad + (4t^2 + 15t + 4) - 4(3t - 1)$$
$$4t^2 + 15t + 4 - 12t + 4$$
$$4t^2 + 15t - 8t + 4$$

$$\text{(B)} \quad x(3x^2 + 4) + 2(7x - 3)$$
$$3x^3 + 4x + 14x - 6$$
$$3x^3 + 18x - 6$$

$$\text{(C)} \quad -2d(d^3c^2 - 4dc^2 + 2d^2c) + c^2(dc^2 - 3d^4)$$
$$-2d^4c^2 + 8d^2c^2 - 4d^3c + dc^4 - 3d^4c^2 =$$
$$-5d^4c^2 + 8d^2c^2 - 4d^3c + dc^4$$

$$\text{(D)} \quad -5w^2(8w^2x - 11wx^2) + 6x(9wx^4 - 4w - 3x^2)$$
$$-40w^4x + 55w^3x^2 + 54wx^5 - 24wx - 18x^3$$

3) SOLVE EACH EQUATION.

$$\text{(A)} \quad -6(11 - 2c) = 7(-2 - 2c)$$
$$-66 + 12c = -14 - 14c$$
$$-52 = -26c \quad c = 2$$

$$\text{(B)} \quad + (2t + 3) + 20 = 2 + (t - 3)$$
$$2t + 3 + 20 = 2 + t - 3$$
$$20 = -9 + t \quad t = \frac{-20}{9}$$

$$\text{(C)} \quad -2(w + 1) + w = 7 - 4w$$
$$-2w - 2 + w = 7 - 4w$$
$$-w - 2 = 7 - 4w$$
$$3w = 9$$
$$w = 3$$

$$\text{(D)} \quad a(a + 3) + a(a - 6) + 35 = a(a - 5) + a(a + 7)$$
$$a^2 + 3a + a^2 - 6a + 35 = a^2 - 5a + a^2 + 7a$$
$$-3a + 35 = 2a$$
$$35 = 5a \quad a = 7$$