❖ Topic 1 – Polynomials

Subtopic 1.1 Adding and Subtracting Polynomials

1. Select all that are polynomials.

   A. $49x^2 - 64$

   B. $-7xy + \frac{2}{y}$

   C. $45y^2 + y - y^3 + 8 + x^3$

   D. -16

   E. $3x^{-2} + 6x^2$

   F. $49\sqrt{x} - 64$

2. Select all of the statements that are true.

   A. 25 is a monomial of degree 1.

   B. $5x^2 + 3\sqrt{x} + 1$ is not a polynomial.

   C. $8y^5 - 2y^3 + 27y^2$ is a trinomial of degree 10.

   D. The leading coefficient of $8y + 6y^3 + 2y^5$ is 2.

   E. $3xy^5 - 7x^2$ is a polynomial of degree 5.

3. Find $(3 - 4x - 9x^2) - (-8x^2 + 7)$.

   A. $x^2 - 4x - 4$

   B. $-x^2 - 4x - 4$

   C. $-17x^2 - 4x + 10$

   D. $-11x^2 + 3x - 9x^2$

4. Answer the following questions (**i-ii**).

i. Write the following polynomial in standard form. Then identify the leading coefficient.

$4b^5 + 2b - 17b^6 - 4b^2$

Standard form:

Leading Coefficient:

ii. Find the difference: $(5d^2 - 4cd + 3c^2) - (d^2 - 9cd - c^2)$

5. Determine whether the given expression is a polynomial. If it is a polynomial, find the degree, and determine whether it is monomial, binomial, trinomial, or a polynomial with more than three terms

$8ab - 3g$

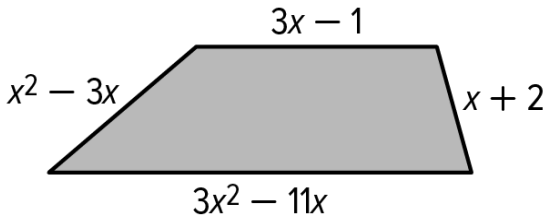
-101.5

$2x^{-2} + 12xy$

$2x^3 - 16x + 5x - 27$

$9x^4 - 8x^2 + 5x - 27$

6. What is the perimeter of this figure?



Perimeter = ___ x^2 + __ x + ___

(*Show your work*)

7. The volume of Box U is ($6x^2 + 8 - x + 9x^3$). The volume of Box V is ($3x^3 + 7x + 5$). Write an expression in standard form to represent the difference of the between the volume of Box U and the volume of Box V.

(Show your work)

Subtopic 1.2 Multiplying Monomials and Polynomials

1. Select the statements that are sometimes true.

   A. The product of two monomials is a binomial.

   B. The product of two binomials is a trinomial.

   C. The product of a binomial and a trinomial is a polynomial with four terms.

   E. The product of two binomials is a binomial.

2. Find the product of $(4h + 5)$ and $(h - 6)$.

   A. $5h - 1$

   B. $4h^2 - 19h - 30$

   C. $4h^2 - 24h - 30$

   D. $4h^2 - 30$

3. Find $(7x + 3)^2$

   A. $21x^2 + 42x + 9$

   B. $49x^2 + 42x + 9$

   C. $49x^2 + 9$

   D. $28x^2 + 42x + 18$

4. Find the product:

   $(2c^3 - 3c + 1)(4c^2 - 2c + 5)$

5. Solve $2h(h - 5) - 3h(h + 4) = h(6 - h) - 56$. (Show your work).

6. Solve the below equation, for q:

$$-2q(4q - 9) - q(-8q + 15) = 3(4q + 6)$$

A. -2

B. 2

C. $\frac{2}{5}$

D. $\frac{4}{3}$

7. Solve the equation $x(x + 2) + 4x = x^2 + 6$ for x.

A. 0

B. 1

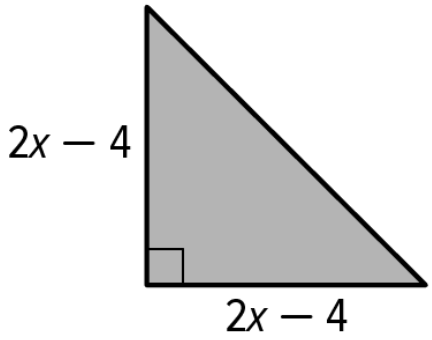
C. 2

D. 3

8. Simplify the below expression:

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

9. The right triangle shown has two sides that are each 2x – 4 inches long.



If the area of a triangle is $A = \frac{1}{2}bh$, where b is the base and h is the height of the triangle, what is the area of the triangle shown above? (Write in simplest form).

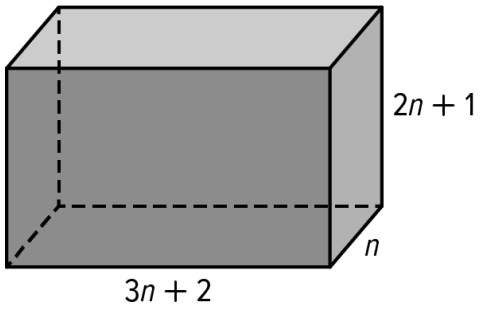
A. $A = 4x^2 - 16x + 16$

B. $A = 2x^2 - 8x + 8$

C. $A = 2x^2 + 8x - 8$

D. $A = 2x^2 - 4x + 8$

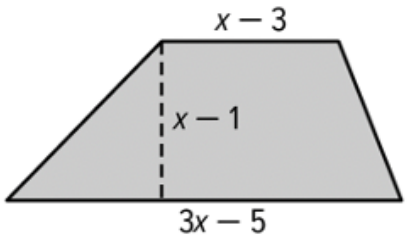
10. A cardboard box company designs all of its boxes so that they have a depth of n, a height of 2n + 1, and a width of 3n + 2.



Write an expression in standard form for the volume V of one of these boxes.

(Show your work).

11. The area of a trapezoid is one-half the height times the sum of the bases, $A = \frac{1}{2}h(b_1 + b_2)$.



The area of the trapezoid at the right is _____.

12. A horse farm is developing a new indoor arena in a rectangular building. They want the width of the building to be 4y feet and the length to be 2y + 9 feet. Write an expression in simplest form to represent the area A of the building in terms of y.

13. Solve the equation $5b^2 - 5b + 7(b + 4) = 5(b^2 + 4)$.

14. Find each product.

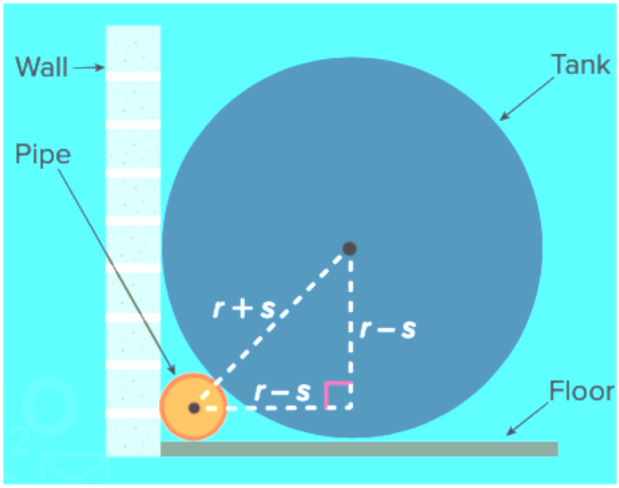
i. $(2a - 3b)^2$

ii. $(g + 5h)^2$

iii. $(6y - 13)(6y + 13)$

iv. $(2m + 3)(2m - 3)(m + 4)$

15. A cylindrical tank is placed along a wall. A cylindrical PVC pipe will be hidden in the corner behind the tank. See the side-view diagram shown. The radius of the tank is r inches, and the radius of the PVC pipe is s inches.



i. Use the Pythagorean Theorem to write an equation for the relationship between the two radii. Simplify your equation so that there is a zero on one side of the equal sign.

ii. Write a polynomial equation you could solve to find the radius s of the PVC pipe if the radius of the tank is 20 inches.

Subtopic 1.3 Using the Distributive Property

1. What is the greatest common factor (GCF) of $40xy^2 - 60x^3y^4 + 80x^4y^2$?

   _____

2. If the area of a given parallelogram is represented by the expression $3x^2 + 15x - 2xy - 10y$, what is the factored form of this expression?

   (Show your work).

3. Factor $6xy^3 + 18x^2y^4$.

   A. $6xy^3(1 + 3xy)$
   B. $6xy^3(y + 3xy)$
   C. $6xy^2(y + 3xy)$
   D. Prime

4. Factor $6xy - 8x - 15y + 20$

   A. $(2x + 5)(3y + 4)$
   B. $(2x + 5)(3y - 4)$
   C. $(2x - 5)(3y + 4)$
   D. $(2x - 5)(3y - 4)$

5. An expression for the area of a rectangle is $xy - 2x + 3y - 6$. Express this area in factored form.

   A. $(x + 3)(y - 2)$
   B. $(xy - 2x)(3y - 6)$
   C. $x(y - 2) + 3(y - 2)$
   D. $(x - 2)(y + 3)$

6. Factor $3x^3 + 2x^2y + 3xy^2 + 2y^3$

A. $x^2(3x + 2y) + y^2(3x + 2y)$
B. $(x^2 + y^2)(3x + 2y)$
C. $xy(3x^2 + 2x + 3y + 2y^2)$
D. $(3x + 2y)(x + y)(x - y)$

7. Factor each of the polynomials below:

i. $10x^2 + 100x^3z$

ii. $2x^3z - 6x^3y + 8x^2z$

iii. $10x^2y^{11}z^3 - x^5y^9z + 2x^2yz^3 + x^2yz$

iv. $2uv + 6u + 5v + 15$

Subtopic 1.4 Factoring Quadratic Trinomials

1. Factor $x^2 + 5x + 6$.

   A. $(x + 2)(x + 3)$

   B. $(x + 6)(x + 1)$

   C. $(x - 2)(x - 3)$

   D. $(x + 2)(x + 4)$

2. Factor $x^2 - 7x + 6$.

   A. $(x - 6)(x - 1)$
   B. $(x - 6)(x + 1)$
   C. $(x + 6)(x - 1)$
   D. Prime

3. Factor $x^2 + x - 12$.

   A. $(x - 3)(x - 4)$
   B. $(x - 3)(x + 4)$
   C. $(x + 3)(x - 4)$
   D. Prime

4. Factor $4x^2 - 35x + 49$.

   A. $(x - 7)(4x - 7)$
   B. $(x - 7)(4x + 7)$
   C. $(x + 7)(4x - 7)$
   D. Prime

5. Factor $3x^2 - 2x - 5$.

   A. $(3x - 5)(x - 1)$
   B. $(3x + 5)(x - 1)$
   C. $(3x - 5)(x + 1)$
   D. Prime

6. Factor the below expressions:

   $x^2 - 5x - 36$

   $4x^2 - 17x + 4$

   $2x^2 + 11x + 5$

7. Solve the equation $x^2 + 3x - 4 = 0$

8. The height of a projectile in feet is given by $-16t^2 + vt + h_0$, where t is the time in seconds, v is the initial upward velocity in feet per second, and h_0 is the initial height in feet. A T-shirt is propelled from 32 feet above ground level into the air at an initial velocity of 16 feet per second.

   i. Write an expression to represent how much time the T-shirt is in the air.

   ii. Factor the expression that represents the amount of time the T-shirt is in the air.

Subtopic 1.5 Factoring Special Products

1. Factor $x^2 - 8x + 16$

   A. $(x + 4)^2$
   B. $(x + 2)^2$
   C. $(x - 2)^2$
   D. $(x - 4)^2$

2. Factor $4x^2 - 121$.

   A. $(x - 11)(x + 11)$
   B. $(2x - 11)(2x - 11)$
   C. $(2x - 11)(2x + 11)$
   D. Prime

3. Select all polynomials that can be factored using the differences of squares.

   A. $-4y^2 + k^2$
   B. $49x^2 - 64y^2$
   C. $-4y^2 - k^2$
   D. $m^2 - 10{,}000$
   E. $121 - 16x^2y^2$

4. Factorize the below expression:

   $9x^2 - 6x + 1$

5. Explain how you could use mental math and the differences of squares to find the product of 28 and 32.

6. Factor $5x^3 - 20x$ completely.

   A. $5x(x - 4)$
   B. Prime
   C. $5x(x + 2)(x + 2)$
   D. $5x(x + 2)(x - 2)$

7. Factor $25a^2 - 36b^2$

   A. $(5a + 6b)(5a - 6b)$
   B. $(5a + 3b)(5a + 3b)$
   C. $(5a - 6b)^2$
   D. $(5a + 6b)^2$

8. Find x such that $(x + 6)^2 = x^2 - 6^2$.

9. Consider the polynomial $P(x) = (x-1)^2 - (x-5)^2$.

i. Expand and reduce $P(x)$.

ii. Factorize $P(x)$.

iii. Factorize $P(x)$ without expanding. How does your answer compare to your answer in part ii?

iii. Solve the equation $P(x) = 8$.

10. Answer questions (i-iii)

i. Factor $\boldsymbol{x^3 - 6x^2 - 4x + 24}$ completely.

ii. Factor $\boldsymbol{x^4 - 14x^3 + 49x^2}$ completely.

iii. Find the length and width of a rectangle with the given area: $A = x^2 + 7x - 78$.