Vertical Progression:

7th Grade	**7.EE.A Use properties of operations to generate equivalent expressions.** o **7.EE.A.2** Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.
Algebra 1	**ELG.MA.HS.A.4 Understand the relationship between zeros and factors of polynomials.** o **A-APR.3** Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. [quadratic and cubic polynomials]
Algebra 2	**ELG.MA.HS.A.4 Understand the relationship between zeros and factors of polynomials.** o **A-APR.2** Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $x – a$ is $p(a)$, so $p(a) = 0$ if and only if $(x – a)$ is a factor of $p(x)$. o **A-APR.3** Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. [quadratic and cubic polynomials]

Students will demonstrate command of the ELG by:

- Applying the Remainder Theorem to determine factors of a polynomial.
- Identifying zeros of polynomials when those polynomials can be factored.
- Drawing a rough graph of a polynomial function based on the zeros of the function.

Vocabulary:

- polynomial function
- remainder Theorem
- zeros of a function

Sample Instructional/Assessment Tasks:

1) Standard(s): A-APR.2-3

Source: Adapted from https://www.illustrativemathematics.org/content-standards/HSA/APR/B/2/tasks/1657

Item Prompt:

$f(x) = x^3 + 4x^2 + x - 6$

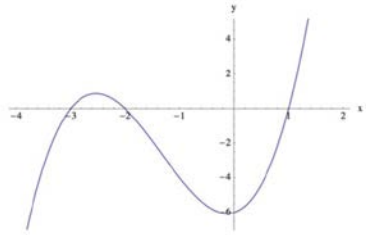
a) Identify all roots of *f(x)*.

b) Use this information to sketch a rough graph of *f*.

Correct Answer:

a) 1, -2, and -3 are zeros of *f*.

b)



2) Standard(s): A-APR.2

Source: https://www.illustrativemathematics.org/content-standards/HSA/APR/B/2/tasks/592

Item Prompt:

Consider the polynomial function, $P(x) = x^4 - 3x^3 + ax^2 - 6x + 14$, where *a* is an unknown real number. If $(x - 2)$ is a factor of this polynomial, what is the value of *a*?

Correct Answer:

$a = 1.5$