HS Target D

Domain, Target, Standards, DOK, Vertical Alignments, Achievement Levels, Evidence Required, Vocabulary, Response Types, Materials, Attributes, Question Types, and Question Banks (Examples)

Content Domain: Algebra
Target D [m]: A-SSE.A Interpret the structure of expressions.
Standards included in Target D: A-SSE.A, A-SSE.A.2
Vertical Alignment
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Claim 1: Concepts and Procedures (DOK 1, 2) Question Banks
Claim 3 Communicating Reasoning Question Banks

Content Domain: Algebra

Target D [m]: A-SSE.A Interpret the structure of expressions.

Standards included in Target D: A-SSE.A, A-SSE.A.2

A-SSE.A Interpret the structure of expressions

A-SSE.A.2 Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.

Vertical Alignment

Related Grade 8 standards

8.EE.A Work with radicals and integer exponents

8.EE.A.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.

Achievement Level Descriptors

Level 1 Students should be able to identify parts of an expression, such as terms, factors,

coefficients, exponents, etc.

Level 2 Students should be able to interpret parts of an expression, such as terms, factors, coefficients, exponents, etc. They should also be able to recognize equivalent forms of linear expressions.

Level 3 Students should be able to recognize equivalent forms of expressions and use the structure of an expression to identify ways to rewrite it.

Level 4 Students should be able to look for and use structure and repeated reasoning to make generalizations about the possible equivalent forms expressions can have.

Evidence Required

1. The student uses the structure of an expression to identify ways of rewriting it.

Vocabulary
expression, factor, difference of squares, difference of cubes, sum of cubes, quadratic expression

Response Types
Multiple Choice, single correct response; Matching Tables, Drag and Drop

Materials
algebraic expressions, words or symbols for common structures for algebraic expressions

Attributes
The expressions given should be ones that fit common structures such that recognition of the structure then allows for application of a factoring strategy to be applied.

Claim 1: Concepts and Procedures (DOK 1, 2) Question Banks
Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.

Claim 1 A-SSE.A.2 DOK Level 1

Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 – y^4$ as $(x^2)^2 – (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 – y^2)(x^2 + y^2)$.

Evidence Required
The student uses the structure of an expression to identify ways of rewriting it.

Question Type 1: The student is presented with an expression that is a difference of two squares.

1. Select the expression that is equivalent to $x^2 - 4$.

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

Rubric: (1 point) The student selects the correct option (e.g., B).

Response Type: Multiple Choice, single correct response

Question Type 2: The student is presented with an expression that is the sum/difference of expressions that have a common factor.

1. Select the expression that is equivalent to $(x + 4)^2 - (x - 2)(x + 4)$.

A. $4(x + 4)$
B. $2(x + 1)(x + 4)$
C. $(x + 4) - (x - 2)$
D. $(x + 4)[(x + 4) - (x - 2)]$

Rubric: (1 point) The student selects the correct option (e.g., D).

Response Type: Multiple Choice, single correct response

Question Type 3: The student is presented with an expression that is a sum/difference of two cubes.

1. Determine whether each expression is equivalent to $(x^3 + 8)$. Select Yes or No for each expression.

	Yes	No
$(x+2)^3$		
$(x-2)(x^2+2x+4)$		
$(x+2)(x^2-2x+4)$		

2. Determine whether each expression is equivalent to $(8x^3 - 64)$. Select Yes or No for each expression.

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	Yes	No
$(2x-4)^3$		
$8(x-8)^3$		
$8(x-2)(x^2+2x+4)$		
$(2x-4)(4x^2+8x+16)$		

Rubric: (1 point) The student selects the correct options (e.g., NNY;NNYY).

Response Type: Matching Tables

Claim 1 A-SSE.A.2 DOK Level 2

Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.

Evidence Required:

The student uses the structure of an expression to identify ways of rewriting it.

Question Type 1: The student is presented with four equations.

1. Determine if each equation is true for all values of x. Select Yes or No for each equation.

	Yes	No
$x^2+4=(x+2)^2$		
$(2x+6)^2=4(x+3)^2$		
$(x-3)(x-3)=(x-9)^2$		
$x^2-10x+25=(x-5)(x+5)$		

2. Determine if each equation is true for all values of x. Select Yes or No for each equation.

	Yes	No
$2^{3x}=6^x$		
$100^x=10^{2x}$		
$e^x.e^x=e^{2x}$		
$2^{10x}=10^{2x}$		

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Rubric: (1 point) The student selects the correct options (e.g., NYNN; NYYN).

Response Type: Matching Tables

Question Type 2: The student is presented with two equivalent rational expressions with missing components that may be found using structure without carrying out the calculation.

1. Drag one or more expressions into each box to create an equation that is true for all values of x. (Assume no denominator equals zero.)

$$\frac{3}{x+2} + \frac{4}{x} = \frac{3\square + 4\square}{\square}$$

Preset Choices: x x^2 $(x+2)$ $x(x+2)$ (x^2+2)

2. Drag one or more expressions into each box to create an equation that is true for all values of x. (Assume no denominator equals zero.)

$$\frac{3}{x+2} + \frac{4}{x} + \frac{2}{x^2} = \frac{3\square + 4\square + 2\square}{\square}$$

Preset Choices:

x x^2 $(x + 2)$ $x(x + 2)$ $x^2(x + 2)$

Rubric: (1 point) The student drags the correct options.

1: x, (x + 2), x(x + 2);

2: x^2, x(x + 2), (x + 2), x^2(x + 2)

Response Type: Drag and Drop

Question Type 3: The student is presented with two equivalent expressions with missing numbers that may be found using structure without carrying out the calculation.

1. Drag a number into each box to create an equation that is true for all values of x.

$$2(4x+3)(3x+5) = \square x^2 + 58x + \square$$

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Palette Choices: 6 8 12 15 24 29 30 58

2. Drag a number into each box to create an equation that is true for all values of x.

$$\frac{3(n+2)(4n+1)}{6} = \square n^2 + \frac{9}{2}n + \square$$

Palette Choices: $\frac{1}{6}$ $\frac{1}{3}$ $\frac{1}{2}$ 1 2 4 6 12

3. Drag a number into the box to create an equation that is true for all values of x.

$$(x+2)^2 - 5 = x^2 + 4x + \square$$

Palette Choices: -4 -1 4 9

4. Drag a number into the box to create an equation that is true for all values of x.

$$(x-7)^2 + 51 = x^2 + \square x + 100$$

Palette Choices: -14 0 2 14 49

5. Drag a number into the box to create an equation that is true for all values of x.

$$\square(x-10)(x+12) = 3(x+1)^2 - 363$$

Palette Choices: -12 -1 1 3 10

Rubric: (1 point) The student places the correct number in the box(es).

1: 24, 30;
2: 2, 1;
3: -1;
4: -14;
5: 3.

Response Type: Drag and Drop

<u>Claim 3 Communicating Reasoning Question Banks</u>

Claim Descriptors and Targets

Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others.

<u>Example 1</u>

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Mrs. Beno wrote this equation on the board and asked, “Is this a true equation?”

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

Nigel said, “Sometimes it is, and sometimes it isn’t.”

For each case shown, determine whether this equation is true or false.

Case	True	False
$x \neq 0, y \neq 0$		
$x = 0, y \neq 0$		
$x \neq 0, y = 0$		
$x = 0, y = 0$		

Rubric: (1 point) The student correctly indicates which conditions make the equation true and which make it false (FTTT).

Response Type: Matching Table