Grade 5 Target E

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

Content Domain: Number and Operations—Fractions
Target E [m]: 5.NF.A Use equivalent fractions as a strategy to add and subtract fractions.
Standards included in Target 5.NF.A.1, 5.NF.A.2
Vertical Alignment
Achievement Level Descriptors
Evidence Required
Vocabulary
Response Types
Materials
Attributes
Claim 1: Concepts and Procedures (DOK 1, 2) Question Banks
Claim 3 Communicating Reasoning Question Banks
Claim 4 Modeling and Data Analysis Question Banks

Content Domain: Number and Operations—Fractions

Target E [m]: 5.NF.A Use equivalent fractions as a strategy to add and subtract fractions.

Standards included in Target 5.NF.A.1, 5.NF.A.2

5.NF.A Use equivalent fractions as a strategy to add and subtract fractions.

5.NF.A.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)

5.NF.A.2 Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2.

Vertical Alignment

Related Grade 4 standards

4.NF.A Extend understanding of fraction equivalence and ordering.

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4.NF.A.1 Explain why a fraction a/b is equivalent to a fraction (n × a)/(n × b) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

4.NF.A.2 Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

4.NF.B Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.

4.NF.B.3 Understand a fraction a/b with a > 1 as a sum of

Related Grade 6 Standards

None

Achievement Level Descriptors

Level 1 Students should be able to add two fractions and mixed numbers with unlike denominators and subtract two fractions with unlike denominators when one denominator is a factor of the other in mathematical problems (denominators < 12). They should be able to use benchmark fractions (1/4s and 1/2s) and number sense with fractions to estimate mentally and assess the reasonableness of answers.

Level 2 Students should be able to add fractions and mixed numbers with unlike denominators (denominators ≤12) in mathematical problems, subtract a mixed number from a whole number (denominators up to 4), and use benchmark fractions to estimate mentally and assess the reasonableness of answers (denominators ≤12).

Level 3 Students should be able to add and subtract fractions and mixed numbers with unlike denominators in word problems and use number sense of fractions to estimate mentally and assess the reasonableness of answers.

Level 4 No Descriptor

Evidence Required

1. The student adds or subtracts fractions with unlike denominators (including mixed numbers) by using visual fraction models or equations to represent the problem.

2. The student identifies and explains the use of equivalent fractions when adding or subtracting fractions with unlike denominators (including mixed numbers).

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Vocabulary
equivalent fractions, denominators, numerators, mixed numbers

Response Types
Multiple Choice, single correct response; Equation/Numeric; Fillin Table

Materials
visual fraction models, equations

Attributes
None

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.

5.NF.A.1 DOK Level 1

Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)

Evidence Required:

The student adds or subtracts fractions with unlike denominators (including mixed numbers) by using visual fraction models or equations to represent the problem.

Question Type 1: The student is presented with an addition problem involving fractions with unlike denominators.

1. Enter the sum. $\frac{2}{10} + \frac{30}{100}$

2. Enter the sum. $\frac{8}{6} + \frac{3}{12}$

3. Enter the sum. $\frac{3}{4} + \frac{13}{15}$

Rubric: (1 point) The student enters the correct sum (e.g., $\frac{50}{100}$ or $\frac{5}{10}$ or $\frac{1}{2}$; $\frac{19}{12}$ or $1\frac{7}{12}$; $\frac{47}{20}$ or $2\frac{7}{20}$). Allow for equivalencies.

Response Type: Equation/Numeric

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Question Type 2: The student is presented with a subtraction problem involving fractions with unlike denominators.

1. Enter the difference. $\frac{6}{10} - \frac{20}{100}$

2. Enter the difference. $\frac{15}{12} - \frac{3}{4}$

3: Enter the difference. $\frac{27}{9} - \frac{3}{8}$

Rubric: (1 point) The student correctly calculates the solution to a subtraction problem involving fractions (e.g., $\frac{40}{100}$ or $\frac{4}{10}$ or $\frac{2}{5}$; $\frac{6}{12}$ or $\frac{1}{2}$; $\frac{173}{72}$ or $2\frac{29}{72}$).

Response Type: Equation/Numeric

5.NF.A.1 DOK Level 2

Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)

Evidence Required:

The student identifies and explains the use of equivalent fractions when adding or subtracting fractions with unlike denominators (including mixed numbers).

Question Type 1: The student is presented with an addition or subtraction expression involving fractions with unlike denominators.

Which example shows a correct strategy and solution for subtracting 13 4 - 1 3.

A. $\frac{3}{4\times3} - \frac{1}{3\times4}$
$= \frac{3}{12} - \frac{1}{12}$
$= \frac{2}{12} = \frac{1}{6}$

B. $\frac{7}{4\times3} - \frac{1}{3\times4}$
$= \frac{7}{12} - \frac{1}{12}$
$= \frac{6}{12} = \frac{1}{2}$

C. $\frac{7\times3}{4\times3} - \frac{1\times4}{3\times4}$
$= \frac{21}{12} - \frac{4}{12}$
$= \frac{17}{12} = 1\frac{5}{12}$

D. $\frac{7\times3}{4\times3} - \frac{1\times3}{3\times4}$
$= \frac{21}{12} - \frac{3}{12}$
$= \frac{18}{12} = 1\frac{6}{12} = 1\frac{1}{2}$

Rubric: (1 point) The student selects the correct set of steps (e.g., C).

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Response Type: Multiple Choice, single correct response

5.NF.A.1 DOK Level 1

Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)

Evidence Required:

The student identifies and explains the use of equivalent fractions when adding or subtracting fractions with unlike denominators (including mixed numbers).

Question Type 1: The student is presented with a real-world addition problem involving fractions with unlike denominators.

David used $\frac{21}{4}$ feet of cloth to make a shirt. He also used $\frac{31}{3}$ feet to make a scarf. Which expression could be used to correctly determine the amount of cloth, in feet, David used altogether?

A. $5 + \frac{1}{12}$
B. $5 + \frac{2}{7}$
C. $2 + 3 + \frac{1}{12} + \frac{1}{12}$
D. $2 + 3 + \frac{3}{12} + \frac{4}{12}$

Question Type 2: The student is presented with a real-world subtraction problem involving fractions with unlike denominators. Example Stem: Sara has $\frac{13}{4}$ feet of cloth. She used $\frac{1}{3}$ foot to make a bow. Which expression could be used to correctly determine the amount of cloth, in feet, that remains?

A. $1 - \frac{3}{12} - \frac{1}{12}$
B. $1 - \frac{9}{12} - \frac{4}{12}$
C. $1 + \frac{3}{12} - \frac{1}{12}$
D. $1 + \frac{9}{12} - \frac{4}{12}$

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

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Response Type: Multiple Choice, single correct response

Question Type 3: The student is presented with an addition or subtraction expression involving fractions with unlike denominators.

Which expression is equivalent to $2 - \frac{1}{3} + \frac{2}{5}$?

A. $\frac{2}{15} - \frac{1}{15} + \frac{2}{15}$ C. $\frac{17}{15} - \frac{7}{15} + \frac{8}{15}$

B. $\frac{2}{15} - \frac{5}{15} + \frac{6}{15}$ D. $\frac{30}{15} - \frac{5}{15} + \frac{6}{15}$

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

Response Type: Multiple Choice, single correct response

5.NF.A.1 DOK Level 2

Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)

Evidence Required:

The student identifies and explains the use of equivalent fractions when adding or subtracting fractions with unlike denominators (including mixed numbers).

Question Type 1: The student is presented with a fraction equation showing equivalent fractions used to add or subtract fractions with unlike denominators.

1. Enter the numerator that makes the equation true. $1\frac{3}{4} + 1\frac{1}{3} = 1\,\square/12 + 1\frac{4}{12}$

2. Enter the numerator that makes the equation true. $1\frac{3}{4} + 1\frac{1}{3} = 1 + 1 + \square/12 + \frac{4}{12}$

Rubric: (1 point) The student enters the number that will make the equation true (e.g., 9; 9).

Response Type: Equation/Numeric

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Claim 3 Communicating Reasoning Question Banks

Claim Descriptors and Targets

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

Example 1

Example Item 3C.1d (Grade 5)
Primary Target 3C (Content Domain NF), Secondary Target 1F (CCSS 4.NF.A.2), Tertiary Target 3D

Flo ate $\frac{3}{4}$ of a sandwich and Arnie ate $\frac{2}{3}$ of a sandwich. If Arnie ate more, what must be true?

A. Flo's sandwich is bigger.
B. Arnie's sandwich is bigger.
C. The sandwiches are the same size.
D. It doesn't matter which sandwich is bigger.

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

Response Type: Multiple Choice, single correct response

Example 2

Brian is adding $\frac{2}{3} + \frac{7}{5}$. He wrote: $\frac{2}{3} + \frac{7}{5} = \frac{2+7}{3+5} = \frac{9}{8}$

Brian's approach is not correct. Select all of the statements that could indicate mistakes with Brian's approach.

A. He added the denominators.
B. He didn't write $\frac{7}{5}$ as a mixed number.
C. He didn't write his answer as a mixed number.
D. He added the numerators when the denominators were different.

Rubric: (1 point) The student clicks on the mistakes in the algorithm (A and S).

Response Type: Multiple Choice, multiple correct response

Claim 4 Modeling and Data Analysis Question Banks

Claim Descriptors and Targets

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Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.

Example 1

Gina is making cookies. The last three steps used to make the cookies are shown.

Step 5: Roll the dough into balls that are 12-inch wide.

Step 6: Place the balls on a baking tray 2 inches apart.

Step 7: Bake for 12 minutes.

This recipe makes 18-24 cookies

Gina plans to

- give cookies to 9 people;
- give each person 3 cookies; and
- have no extra cookies remaining.

Which action will help Gina get closest to the exact number of cookies she needs?

A. Place the cookies 3 inches apart.
B. Bake the cookies for only 10 minutes.
C. Roll the cookies slightly larger than 12-inch wide.
D. Roll the cookies slightly smaller than 12-inch wide.

Rubric: (1 point) The student correctly determines which action will help Gina get closest to the exact number of cookies (D).

Response Type: Multiple Choice, single correct response

Example 2

Part A
A liter is more than a cup. Estimate the number of liters in a cup. You can use the picture to help you make an estimate.

Enter your estimate, in liters, in the response box. [ ]
Part B
There are about 0.24 liters in one cup. How much greater or less than your estimate is the real amount?
Enter the difference in the response box. [ ]

Rubric: (1 point) The student finds the difference between their estimate, a, and the actual number of liters (|19-a|).
Response Type: Equation/Numeric