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TABLE 1

Helpful resources, organizations, and tools were used to collaborate during the project.

Helpful resources, organizations, and tools	
Organizations and tools	Description of organizations and tools
Illustrative Mathematics	<p>Illustrative Mathematics (IM) is a discerning community of educators dedicated to the coherent learning of mathematics. IM shares carefully vetted resources for teachers and teacher leaders to provide children with an understanding of mathematics and skills for using it. Illustrative Mathematics has provided instructional and assessment tasks, lesson plans, unit blueprints, practice standard elaboration and materials, professional learning videos and other resources for teachers, assessment writers, and professional developers since 2011.</p> <p>http://www.illustrativemathematics.org</p>
Teaching Channel	<p>Teaching Channel is an online community where teachers can watch, share, and learn diverse techniques to help every student grow. Teaching Channel (TCH) Teams is a fee-based, private professional learning platform. TCH Teams allows teachers to upload personally created videos or videos found on Teaching Channel to a private space where they can be shared, viewed, annotated and used for coaching and reflection.</p> <p>https://www.teachingchannel.org</p>
Google Hangouts and Google Docs	<p>Google provides many free collaborative services. Google Hangouts is a service for group video calls. Google Docs allows for creating, editing, and collaborating on documents.</p>

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TABLE 2

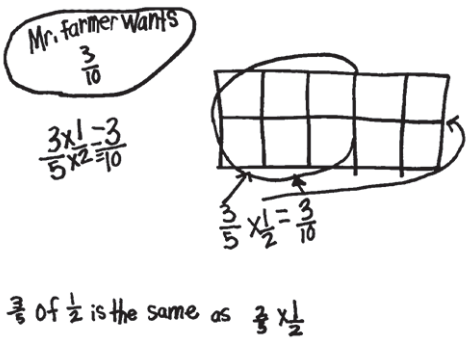
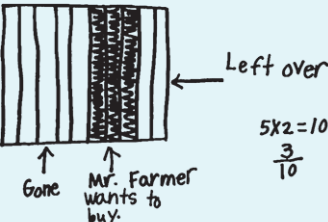
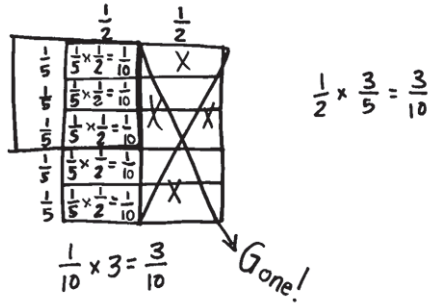
These fifth-grade instructional tasks align to the Common Core State Standards for Mathematics (CCSSM) (CCSSI 2010).

Fifth-grade instructional tasks	Standards
Connecting area model to a context https://www.illustrativemathematics.org/content-standards/tasks/2075	5.NF.B.4
New park problem https://www.illustrativemathematics.org/content-standards/tasks/2102	5.NF.B.4 5.NF.B.6
Cross country training https://www.illustrativemathematics.org/content-standards/tasks/2080	5.NF.B.4
Sharing lunches https://www.illustrativemathematics.org/content-standards/tasks/2074	5.NF.A.2 5.NF.B.3 5.NF.B.4
Cornbread fundraiser (task and lesson plan) https://www.illustrativemathematics.org/content-standards/tasks/2078	5.NF.B.4
Extending multiplication from whole numbers https://www.illustrativemathematics.org/content-standards/tasks/2076	5.NF.B.4
Mrs. Gray’s homework assignment https://www.illustrativemathematics.org/content-standards/tasks/2079	5.NF.B.5.b 5.NF.B.4
Scaling up and down https://www.illustrativemathematics.org/content-standards/tasks/2101	5.NF.B.5
To multiply or not to multiply variation 2 https://www.illustrativemathematics.org/content-standards/tasks/2077	5.NF.A 5.NF.B.6

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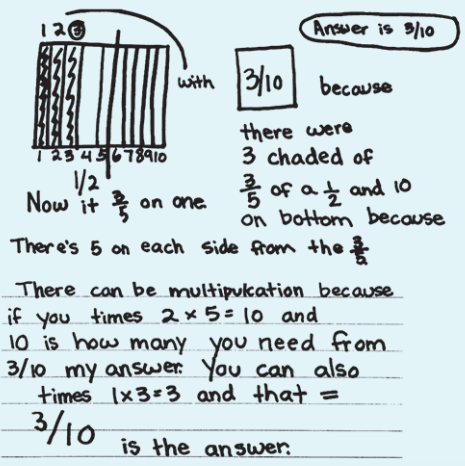
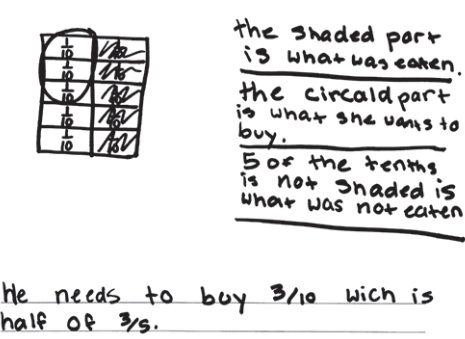
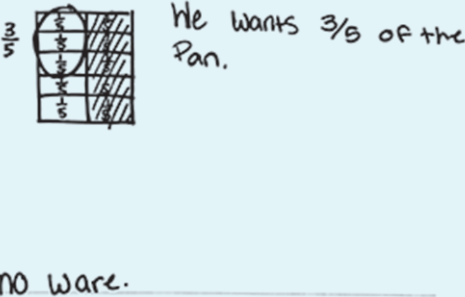
TABLE 3

We organized samples of student work into themes and described them.

Exit task student work samples and teacher notes		
	Observations	Possible misconceptions or next steps
<p>(a)</p>  <p>Mr. farmer wants $\frac{3}{10}$</p> $\frac{3 \times 1 = 3}{5 \times 2 = 10}$ $\frac{3}{5} \times \frac{1}{2} = \frac{3}{10}$ <p>$\frac{3}{5}$ of $\frac{1}{2}$ is the same as $\frac{3}{5} \times \frac{1}{2}$</p>	<p>Student uses an algorithm to solve. The algorithm and solution do not match the representation.</p>	<p>Student may be grappling with but not yet understanding the algorithm.</p>
<p>(b)</p>  <p>Left over</p> $5 \times 2 = 10$ $\frac{3}{10}$ <p>Gone</p> <p>Mr. Farmer wants to buy.</p> <p>Multiplication comes in when you are finding the denominator because there is 2 halves and five fifth in each so you do $5 \times 2 = 10$ and so then you have your denominator.</p>	<p>Student represents the problem and connects the representation to context. Student explains that multiplication was used to find a common denominator.</p>	<p>Student understands and represents the problem. Student may not yet connect the problem to an operation.</p>
<p>(c)</p>  $\frac{1}{2} \times \frac{3}{5} = \frac{3}{10}$ $\frac{1}{10} \times 3 = \frac{3}{10}$ <p>Gone!</p> <p>I see it in $\frac{1}{5} \times \frac{1}{2} = \frac{1}{10}$ in each box.</p>	<p>Student multiplies $\frac{1}{5} \times \frac{1}{2}$ to find the value of each partitioned part of the cornbread. Student uses multiplication to find the value of the three remaining parts $\frac{1}{10} \times 3 = \frac{3}{10}$. Student seems to understand algorithm for multiplying a fraction by a fraction.</p>	<p>It is unclear if the student relied on the commutative property or misrepresented $3 \times \frac{1}{10}$.</p>

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TABLE 3 cont'd.

Exit task student work samples and teacher notes		
<p>(d)</p> 	<p>Student operates with the numerators and the denominators separately. Student understands the relationship of $\frac{3}{5}$ to $\frac{3}{10}$. Student connects the operations to the answer of $\frac{3}{10}$, which is also shown in the representation.</p>	<p>The teacher could probe for a conceptual understanding of the algorithm.</p>
<p>(e)</p> 	<p>Student represents the problem and attends to context. Parts are labeled and student explains the meaning of each part; e.g., “the shaded part is what was eaten.” Student identifies the relationship between $\frac{3}{10}$ and $\frac{3}{5}$.</p>	<p>The student uses the diagram to solve, but could be asked if or how she sees $\frac{1}{2}$ as multiplication, because she does not use multiplication to solve.</p>
<p>(f)</p> 	<p>Student represents the problem. Each part is labeled $\frac{1}{5}$. Student does not see a connection to multiplication.</p>	<p>Student has a misconception of the whole, perhaps interpreting half of the cornbread as the whole.</p>

(continued on next page)

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TABLE 3 cont'd.

Exit task student work samples and teacher notes

(g)

$$\frac{1}{2} \times \frac{15}{15} = \frac{15}{30}$$

$$\frac{3}{5} \times \frac{6}{6} = \frac{18}{30}$$

$$\frac{18}{30} + \frac{15}{30} = \frac{33}{30}$$

$$\frac{33}{30} = \frac{11}{10}$$

2 4 6 8 10 12 14 16
1 2 3 4 5 6 7 8
8 20 21 24 26 28
9 10 11 12 13 14
30
15
5 10 15 20 25 30
1 2 3 4 5 6

I am thinging that if i use
equivalent fractons my answer will
be $1\frac{3}{30}$ because it would be
nomaly be $\frac{35}{30}$ but simpleside
it to be $1\frac{3}{30}$

Student lists factors and multiples. Student finds equivalent fractions.

Student may not conceptualize the relative size of a given fraction. The student also misunderstands how to represent the problem.