NON-SERVICE STIPEND FOR *NON-STUDENT*
AWARD & ACCEPTANCE LETTER

March 8, 2016

Recipient Name _____

Recipient Physical Address (no P.O. Box) _____

Recipient Phone Number _____

Re: Stipend Award Grant #15-15196-3065-00

Dear FMMI Participant:

Congratulations! You have been selected to receive a stipend award for the period of March-June 2016 from the Franklin McKinley Mathematics Initiative at San Jose State University Research Foundation, which is funded by the US Department of Education. In order to remain eligible for this award, you must agree to the following conditions (**please note**: *A true stipend is a payment made to an individual for their attendance or participation only, NOT for services rendered. The payments can not be tied to "any obligation for past, present or future services." There can be no employer/employee relationship associated with the stipend payment. There are no fringe benefits associated with a stipend payment as they are NOT for services rendered.)*

1. Complete project activities and requirements by June 30, 2016.
2. Participate in 4 2-hour AY and 5-day summer institute professional development sessions from February-June, 2016.

The total amount of the award is $1,250.00 to be paid by June 30, 2016. Checks for this award will be either mailed or picked up at the reception desk at the SJSU Research Foundation, 210 North Fourth Street, 4th Floor.

Sincerely,

_____ FERDINAND RIVERA

Signature of Project Director *Name of Project Director*

AWARD ACCEPTANCE

Your signature below certifies the following:

- I have read and agree to the conditions stipulated above and do hereby accept this award.
- I understand that this award does not represent payment for services required as a condition of the grant.
- I am a legal resident or citizen of the United States.
- I **am** an SJSU or Research Foundation Employee: ___Yes ___No
- I am ***not a student*** and I am aware that the stipend award I receive may be considered taxable income and that San Jose State University Research Foundation is required by IRS to report this payment if the total award amount exceeds $600 per calendar year (1099).

_____ _____

Signature of Recipient Social Security Number

NON-SERVICE STIPEND FOR *NON-STUDENT*
AWARD & ACCEPTANCE LETTER

March 8, 2016

Recipient Name _____

Recipient Physical Address (no P.O. Box) _____

Recipient Phone Number _____

Re: Stipend Award Grant #15-15196-3065-00

Dear FMMI Participant:

Congratulations! You have been selected to receive a stipend award for the period of August-December 2016 from the Franklin McKinley Mathematics Initiative at San Jose State University Research Foundation, which is funded by the US Department of Education. In order to remain eligible for this award, you must agree to the following conditions (**please note**: *A true stipend is a payment made to an individual for their attendance or participation only, NOT for services rendered. The payments can not be tied to "any obligation for past, present or future services." There can be no employer/employee relationship associated with the stipend payment. There are no fringe benefits associated with a stipend payment as they are NOT for services rendered.)*

1. Complete project activities and requirements by December 30, 2016.
3. Participate in 4 2-hour AY professional development sessions from August-December, 2016.

The total amount of the award is $1,250.00 to be paid by December 30, 2016. Checks for this award will be either mailed or picked up at the reception desk at the SJSU Research Foundation, 210 North Fourth Street, 4th Floor.

Sincerely,

_____ FERDINAND RIVERA

Signature of Project Director *Name of Project Director*

AWARD ACCEPTANCE

Your signature below certifies the following:

- I have read and agree to the conditions stipulated above and do hereby accept this award.
- I understand that this award does not represent payment for services required as a condition of the grant.
- I am a legal resident or citizen of the United States.
- I **am** an SJSU or Research Foundation Employee: ___Yes ___No
- I am ***not a student*** and I am aware that the stipend award I receive may be considered taxable income and that San Jose State University Research Foundation is required by IRS to report this payment if the total award amount exceeds $600 per calendar year (1099).

_____ _____

Signature of Recipient Social Security Number

FAQS REGARDING THE STIPEND FOR PARTICIPATION

Q: Do I need to pay in order to get the 6 CEU units?

A: No. They are free. You do, however, need to be signed up specifically for the CEUs in order to receive them. At the first workshop on February 9 as you signed in there was box to check that you were interested in receiving the 6 CEUs from SJSU.

Q: What if at the first meeting I did not check the box declaring I was interested in receiving the 6 CEUs? Can I still enroll for them?

A: Yes. Be sure you that you are signed up for them at this workshop meeting.

Q: Will taxes be taken out of this stipend?

A: No. The SJSU Research Foundation will send you a 1099 form in January 2017.

Q: How will I receive the stipend? And when?

A: By mail in two equal installments. The first check of $1,250.00 (for full participation) will be mailed to you in July 2016, depending on SJSU Foundation's processing time. The second installment will be mailed to you in January 2017, again depending on SJSU Foundation's processing time. Please be sure we have the correct physical mailing address on file for you (not a P.O. Box).

Q: What happens if I miss a session(s)?

A: Your stipend amount will be pro-rated based upon your attendance.

Consent Form

Q: When do I need to return my consent forms?

A: At the beginning of the April 5, 2016 workshop.

Q: Can I sign and email my consent forms back to you?

A: No. We need a wet signature in blue or black ink.

FRANKLIN-McKINLEY/SJSU MATHEMATICS INITIATIVE

Meeting 2: March 8, 2016 Instructional Team Training

FM District Office 3:30-5:30

Session Outcomes:

- Review results of needs assessment from February
- Review results of assessment information from February
- Review information on Cognitive Rigor Matrix
- Analyze student work on fraction tasks
- Develop questions/prompts to increase DOK level

Facilitators

- Dr. Patty Swanson
- Margaret Bonanno
- Dr. Brent Duckor
- Dr. Joanne Rossi Becker
- Dr. Cheryl Roddick
- Carrie Holmberg

Norms

- Smart technology-free zone (closed laptops)
- Cellphones on vibrate
- Active listening
- Active participation

MEETING 2 AGENDA

1.	Welcome (Margaret)	2 min
2.	Overview of Teacher In-Put from February (Patty)	5 min
3.	Cognitive Rigor Matrix (handout) (Joanne & Brent)	20 min
4.	Analyzing Student Work (handout) (Brent, Cheryl, Joanne)	60 min
5.	Fraction Activity (handout) (Patty)	20 min
6.	Paperwork: stipends & IRB (handout) (Margaret)	5 min
7.	Plus/Delta Evaluation (Margaret)	5 min

Franklin McKinley Mathematics Institute
March 8, 2016 AY Session 2, 3:30-5:30
Franklin McKinley District Office

Third Grade Packet

1 Teacher's Copy of Equal Shares
1 Classroom Copy of Equal Shares
Student Work
PowerPoint Slides for Today's Session
Fraction Cards
Article of Formative Assessment in Seven Good Moves

Fourth Grade Packet

1 Teacher's Copy of Mariana's Fractions
1 Classroom Copy of Mariana's Fractions
Student Work
PowerPoint Slides for Today's Session
Fraction Cards
Article of Formative Assessment in Seven Good Moves

Fifth Grade Packet

1 Teacher's Copy of Make a Fraction
1 Classroom Copy of Make a Fraction
Student Work
PowerPoint Slides for Today's Session
Fraction Cards
Article of Formative Assessment in Seven Good Moves

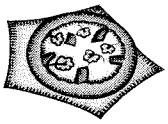
Sixth Grade Packet

1 Teacher's Copy of Ribbon and Bows
1 Classroom Copy of Ribbon and Bows
Student Work
PowerPoint Slides for Today's Session
Fraction Cards
Article of Formative Assessment in Seven Good Moves

Equal Shares

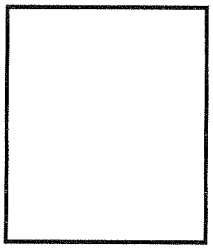
MAC Assessment Task





Matt and Jo have one brownie to share.

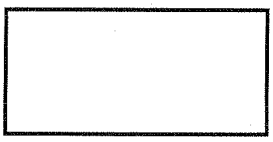
1. How can Matt and Jo share one brownie so that each gets a fair share? Use the shape below to show fair shares.



Describe the equal share each person gets _____

Sue, Don, Sara, and David have a large candy bar to share.

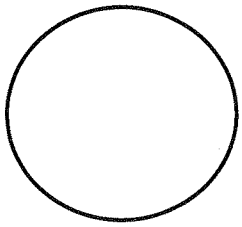
2. How can the 4 children fair share a candy bar? Show one way in the rectangle below.



Describe the equal share each person gets _____

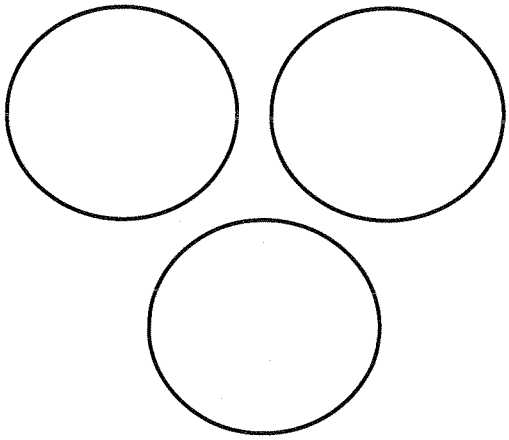
David thinks he knows another way to fair share the candy bar. Use the rectangle below to show a different way to have equal shares for 4 children.

3. How can Abel, Ben and Cathy fair share a pizza?
Show one way in the shape below.



Describe the equal share
each person will get _____

4. Abel, Ben, Cathy and their mom have enough money to buy three pizzas.
Show one way for these four people to fair share the three pizzas below.



Describe the equal share

each person will get _____

Tell how you know your answer is correct.

_____

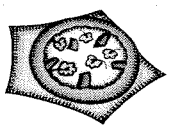
_____

_____

Porciones iguales

MAC Assessment Task





Matt y Jo tienen un pastelito para compartir.

1. ¿Cómo pueden Matt y Jo compartir un pastelito para que cada uno recibe una porción igual? Usa la figura abajo para mostrar porciones iguales.

Describe la porción igual
que recibe cada persona _____

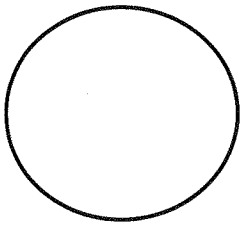
Sue, Don, Sara, y David tienen una barra grande de dulce para compartir.

2. ¿Cómo pueden compartr 4 niños una barra de dulce en forma igual? Muestra una manera en el rectángulo abajo.

Describe la porción igual
que recibe cada persona _____

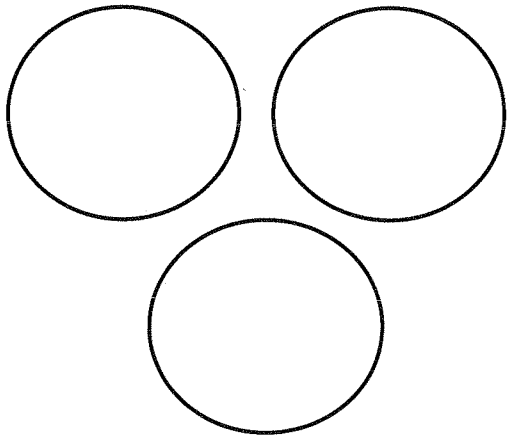
David piensa que sabe otra manera para compartir la barra en una forma de porciones iguales. Usa el rectángulo abajo para mostrar maneras diferentes para tener porciones iguales para 4 niños.

3. ¿Cómo pueden compartir Abel, Ben y Cathy una pizza en forma igual? Muestra una manera en la figura abajo.



Describe la porción igual
que recibe cada persona _____

4. Abel, Ben, Cathy y su madre tienen suficiente dinero para comprar tres pizzas. Muestra una manera que estas cuatro personas pueden compartir las tres pizzas abajo en forma igual.



Describe la porción igual
que recibe cada persona _____

Explica como sabes tu respuesta está correcta.

_____

_____

_____

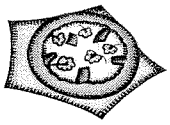
2013 MAC Rubrics Grade 3

Equal Shares	Rubric	
The core elements of performance required by this task are: • The student work is characterized by partitioning circles and rectangles into two, three, or four equal shares. (1.G.3) • The student work is characterized by describing the shares using words or notation for halves, thirds, fourths, and uses the phrases *half of, a third of, a quarter of.* (1.G.3) • The student work is characterized by attending to the meanings of the quantities. (MP2) • The student work is characterized by using definitions and previously established results in constructing arguments. (MP3) Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Divides the drawing into 2 approximately equal parts and gives correct answer such as: ½	1	1
2. Divides one rectangle into 4 approximately equal sections and gives correct answer such as: ¼ Divides the 2nd rectangle correctly into fourths in a different way	1 1	2
3. Divides the circle correctly into 3 approximately equal sections and gives correct answer such as: ⅓	1	1
4. Divides the three circles correctly such as: Divides pizzas into equal sections for 4 people. Gives correct answer such as: ¾ of one pizza or ¼ of three pizzas or 3 pieces Gives a correct explanation such as: There are four people and each part is an equal size or space and they get the same number of parts	1 1 1	3
Total Points		**7**

Equal Shares

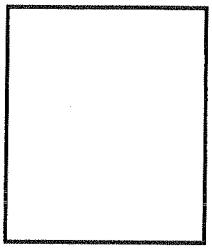
MAC Assessment Task





Matt and Jo have one brownie to share.

1. How can Matt and Jo share one brownie so that each gets a fair share? Use the shape below to show fair shares.



Describe the equal share each person gets _____

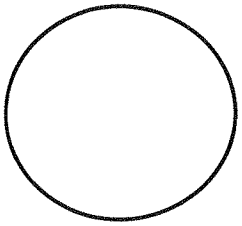
Sue, Don, Sara, and David have a large candy bar to share.

2. How can the 4 children fair share a candy bar? Show one way in the rectangle below.

Describe the equal share each person gets _____

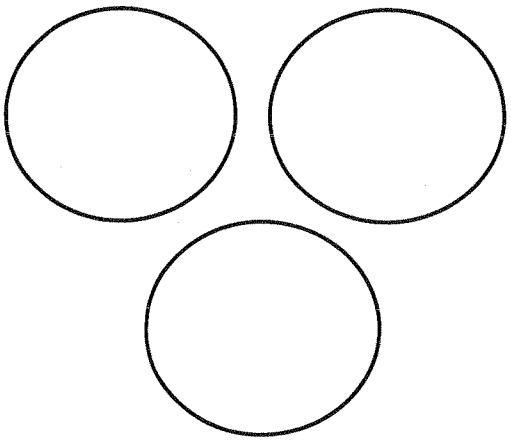
David thinks he knows another way to fair share the candy bar. Use the rectangle below to show a different way to have equal shares for 4 children.

3. How can Abel, Ben and Cathy fair share a pizza?
Show one way in the shape below.



Describe the equal share
each person will get _____

4. Abel, Ben, Cathy and their mom have enough money to buy three pizzas.
Show one way for these four people to fair share the three pizzas below.



Describe the equal share

each person will get _____

Tell how you know your answer is correct.

_____

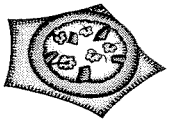
_____

_____

Porciones iguales

MAC Assessment Task





Matt y Jo tienen un pastelito para compartir.

1. ¿Cómo pueden Matt y Jo compartir un pastelito para que cada uno recibe una porción igual? Usa la figura abajo para mostrar porciones iguales.

Describe la porción igual
que recibe cada persona _____

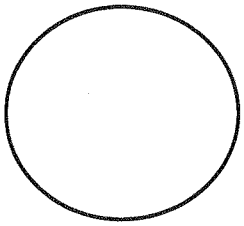
Sue, Don, Sara, y David tienen una barra grande de dulce para compartir.

2. ¿Cómo pueden compartr 4 niños una barra de dulce en forma igual? Muestra una manera en el rectángulo abajo.

Describe la porción igual
que recibe cada persona _____

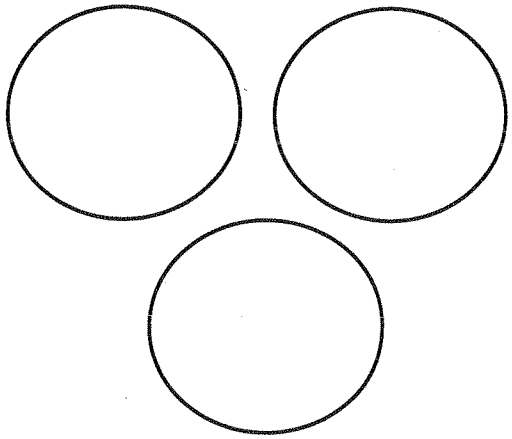
David piensa que sabe otra manera para compartir la barra en una forma de porciones iguales. Usa el rectángulo abajo para mostrar maneras diferentes para tener porciones iguales para 4 niños.

3. ¿Cómo pueden compartir Abel, Ben y Cathy una pizza en forma igual? Muestra una manera en la figura abajo.



Describe la porción igual
que recibe cada persona _____

4. Abel, Ben, Cathy y su madre tienen suficiente dinero para comprar tres pizzas. Muestra una manera que estas cuatro personas pueden compartir las tres pizzas abajo en forma igual.



Describe la porción igual
que recibe cada persona _____

Explica como sabes tu respuesta está correcta.

_____

_____

_____

2013 MAC Rubrics Grade 3

Equal Shares	Rubric	
The core elements of performance required by this task are: • The student work is characterized by partitioning circles and rectangles into two, three, or four equal shares. (1.G.3) • The student work is characterized by describing the shares using words or notation for halves, thirds, fourths, and uses the phrases *half of, a third of, a quarter of.* (1.G.3) • The student work is characterized by attending to the meanings of the quantities. (MP2) • The student work is characterized by using definitions and previously established results in constructing arguments. (MP3) Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
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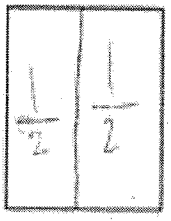
2. Divides one rectangle into 4 approximately equal sections and gives correct answer such as: ¼ Divides the 2nd rectangle correctly into fourths in a different way	1 1	2
3. Divides the circle correctly into 3 approximately equal sections and gives correct answer such as: ⅓	1	1
4. Divides the three circles correctly such as: Divides pizzas into equal sections for 4 people. Gives correct answer such as: ¾ of one pizza or ¼ of three pizzas or 3 pieces Gives a correct explanation such as: There are four people and each part is an equal size or space and they get the same number of parts	1 1 1	3
Total Points		7

3
3
3

Looking at Student Work on Equal Shares

Student A

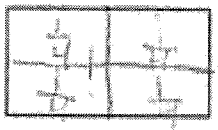
1. How can Matt and Jo share one brownie so that each gets a fair share? Use the shape below to show fair shares.



Describe the equal share each person gets half of the brownie

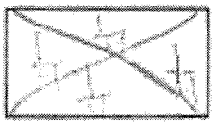
Sue, Don, Sara, and David have a large candy bar to share.

2. How can the 4 children fair share a candy bar?
Show one way in the rectangle below.



Describe the equal share each person gets one-fourth of the candy bar

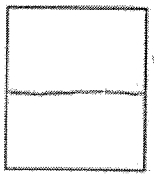
David thinks he knows another way to fair share the candy bar. Use the rectangle below to show a different way to have equal shares for 4 children.



Student E

Matt and Jo have one brownie to share.

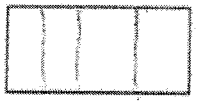
1. How can Matt and Jo share one brownie so that each gets a fair share? Use the shape below to show fair shares.



Describe the equal share each person gets You cut it in half. 10÷5=2

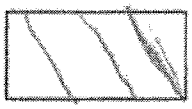
Sue, Don, Sara, and David have a large candy bar to share.

2. How can the 4 children fair share a candy bar?
Show one way in the rectangle below.



Describe the equal share each person gets You cut it in fourths. 8÷2=4

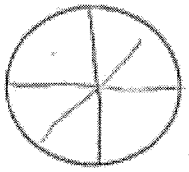
David thinks he knows another way to fair share the candy bar. Use the rectangle below to show a different way to have equal shares for 4 children.



You cut it in fourths 8÷2=4

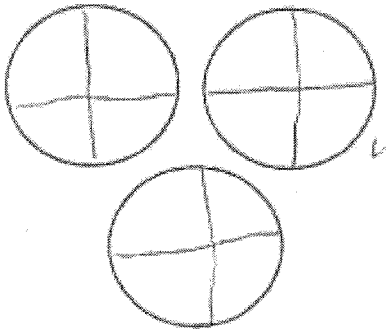
Student K part 2

3. How can Abel, Ben and Cathy fair share a pizza?
   Show one way in the shape below.



Describe the equal share
each person will get 2 4 X

4. Abel, Ben, Cathy and their mom have enough money to buy three pizzas.
   Show one way for these four people to fair share the three pizzas below.



Describe the equal share
each person will get 3

Tell how you know your answer is correct.

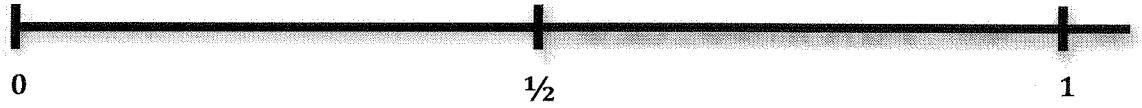
there are 3 pizzas if you cut the top to bottom side to side you will have 8 slices of pizzas then there's four in each pizzas take one

10 sets

Mariana's Fractions

MAC Assessment Task

Mariana likes to use a number line. She is learning about fractions.



1. Show Mariana where 1/6 is located on the number line.

2. Mariana thinks 5/6 is greater than 1. She is wrong.
   Where is 5/6 located? Show the spot on the number line.
   Explain how you know where 5/6 is located.

   _____

   _____

   _____

   _____

3. Mariana thinks that 3/4 is greater than 3/6.
   Do you agree or disagree with Mariana?

   _____.

   Show how you know.

4. What is another name for 3/4?

   _____.

   Show and label where that fraction is located on the number line.

5. 7/8 or 8/9 – which is closer to 1? _____

   Explain how you know which is closer to 1.

   _____

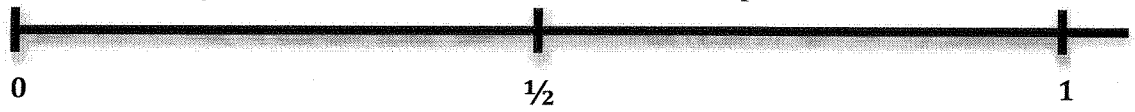
   _____

   _____

Fracciones de Mariana

MAC Assessment Task

A Mariana le gusta usar la recta numérica. Ella está aprendiendo las fracciones.



1. Demuestra a Mariana donde 1/6 está ubicada en la recta numérica.

2. Mariana piensa que 5/6 es mayor que 1. Ella está equivocada.
   ¿Dónde está ubicada 5/6 ? Muestra el lugar en la recta numérica.
   Explica como sabes dónde está 5/6.

   _____

   _____

   _____

   _____

3. Mariana piensa que 3/4 es mayor que 3/6.
   ¿Estás de acuerdo no de acuerdo con Mariana?

   _____.

   Muestra como sabes.

4. ¿Qué es otro nombre para 3/4?

   _____.

   Muestra e identifica donde está ubicada la fracción en la recta numérica.

5. 7/8 o 8/9 – ¿Cuál es más cercana a 1? _____

   Explica como sabes cual es más cercana a 1.

   _____

   _____

   _____

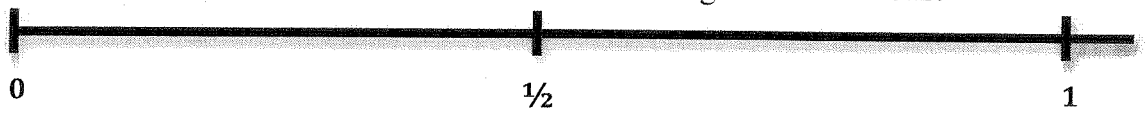
2013 MAC Rubrics Grade 4

Mariana's Fractions	Rubric	
• The core elements of performance required by this task are: • Student work is characterized by correctly placing a unit fraction on the number line. (3.NF.2a) • Student work is characterized by explaining why a non-unit fraction is located at a specific location. (3.NF.2b) • Student work is characterized by explaining which of two fractions with common numerators is greater. (3.NF.3d) • Student work is characterized by creating an equivalent fraction and locating its position on the number line. (3.NF.3a,b) Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Correctly places 1/6 on the number line	1	1
2. Correctly places 5/6 on the number line	1	
Gives correct explanation such as: I started at zero and I measure five lengths of 1/6 over to the right.	1	2
3. Gives correct answer: **Agree** with Mariana **and** gives a correct explanation such as: That 3/6 is the same as ½. ½ is smaller length than 3/4, so 3/6 is smaller than ¾.	1	1
4. Gives a correct answer such as: 6/8 (accept any equivalent fraction)	1	
Correctly places the equivalent fraction on the number line.	1	2
5. Gives correct answer such as: 8/9 (accept any equivalent fraction)	1	
Gives correct explanation such as: 7/8 is 1/8 away from 1 and 8/9 is 1/9 away from 1. 1/9 is smaller than 1/8, so 8/9 is closer to 1.	1	2
Total Points		**8**

Mariana's Fractions

MAC Assessment Task

Mariana likes to use a number line. She is learning about fractions.



1. Show Mariana where 1/6 is located on the number line.

2. Mariana thinks 5/6 is greater than 1. She is wrong.
   Where is 5/6 located? Show the spot on the number line.
   Explain how you know where 5/6 is located.

   _____

   _____

   _____

   _____

3. Mariana thinks that 3/4 is greater than 3/6.
   Do you agree or disagree with Mariana?

   _____.

   Show how you know.

4. What is another name for 3/4?

_____.

Show and label where that fraction is located on the number line.

5. 7/8 or 8/9 – which is closer to 1? _____

Explain how you know which is closer to 1.

_____

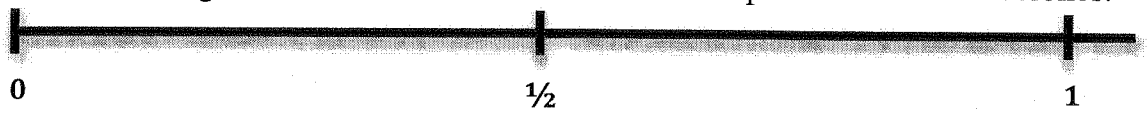
_____

_____

Fracciones de Mariana

MAC Assessment Task

A Mariana le gusta usar la recta numérica. Ella está aprendiendo las fracciones.



1. Demuestra a Mariana donde 1/6 está ubicada en la recta numérica.

2. Mariana piensa que 5/6 es mayor que 1. Ella está equivocada.
   ¿Dónde está ubicada 5/6 ? Muestra el lugar en la recta numérica.
   Explica como sabes dónde está 5/6.

   _____

   _____

   _____

   _____

3. Mariana piensa que 3/4 es mayor que 3/6.
   ¿Estás de acuerdo no de acuerdo con Mariana?

   _____.

   Muestra como sabes.

4. ¿Qué es otro nombre para 3/4?

   _____.

   Muestra e identifica donde está ubicada la fracción en la recta numérica.

5. 7/8 o 8/9 – ¿Cuál es más cercana a 1? _____

   Explica como sabes cual es más cercana a 1.

   _____

   _____

   _____

2013 MAC Rubrics Grade 4

Mariana's Fractions	Rubric	
• The core elements of performance required by this task are: • Student work is characterized by correctly placing a unit fraction on the number line. (3.NF.2a) • Student work is characterized by explaining why a non-unit fraction is located at a specific location. (3.NF.2b) • Student work is characterized by explaining which of two fractions with common numerators is greater. (3.NF.3d) • Student work is characterized by creating an equivalent fraction and locating its position on the number line. (3.NF.3a,b) Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Correctly places 1/6 on the number line	1	1
2. Correctly places 5/6 on the number line	1	
Gives correct explanation such as: I started at zero and I measure five lengths of 1/6 over to the right.	1	2
3. Gives correct answer: **Agree** with Mariana **and** gives a correct explanation such as: That 3/6 is the same as ½. ½ is smaller length than 3/4, so 3/6 is smaller than ¾.	1	1
4. Gives a correct answer such as: 6/8 (accept any equivalent fraction)	1	
Correctly places the equivalent fraction on the number line.	1	2
5. Gives correct answer such as: 8/9 (accept any equivalent fraction)	1	
Gives correct explanation such as: 7/8 is 1/8 away from 1 and 8/9 is 1/9 away from 1. 1/9 is smaller than 1/8, so 8/9 is closer to 1.	1	2
Total Points		**8**

Student F part 2

4. What is another name for 3/4?

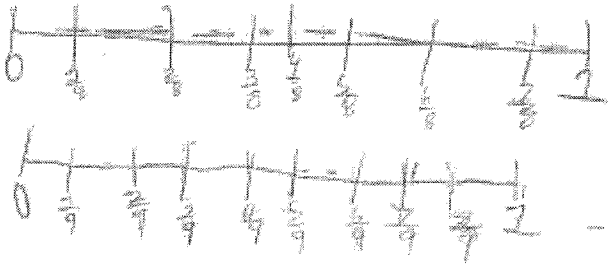
Another name for 3/4 is 5/4 X

Show and label where that fraction is located on the number line.

5. 7/8 or 8/9 – which is closer to 1? both are equal X

Explain how you know which is closer to 1.

I know they are both equal because I made a number line and they were both the closest to the 1.



Student G part 2

4. What is another name for 3/4?

2/3 X

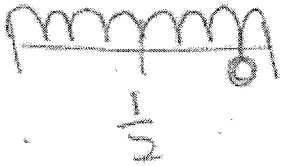
Show and label where that fraction is located on the number line.

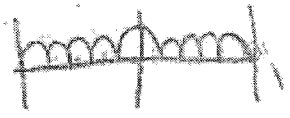
5. 7/8 or 8/9 – which is closer to 1? same X

Explain how you know which is closer to 1.

They're both 1 away from 1 whole

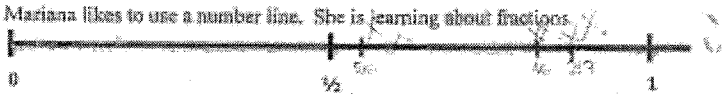
X





5

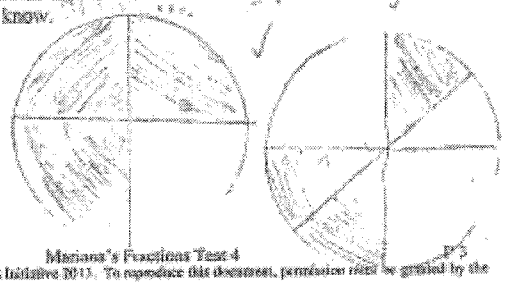
Mariana likes to use a number line. She is learning about fractions.



1. Show Mariana where 1/6 is located on the number line.

2. Mariana thinks 5/6 is greater than 1. She is wrong.
   Where is 5/6 located? Show the spot on the number line.
   Explain how you know where 5/6 is located.

3. Mariana thinks that 3/4 is greater than 3/6.
   Do you agree or disagree with Mariana?
   Show how you know.



15

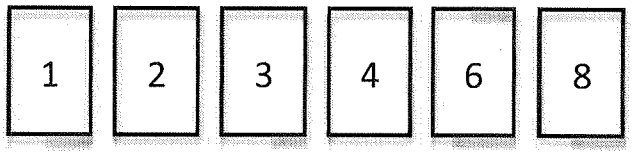
10 sets

7

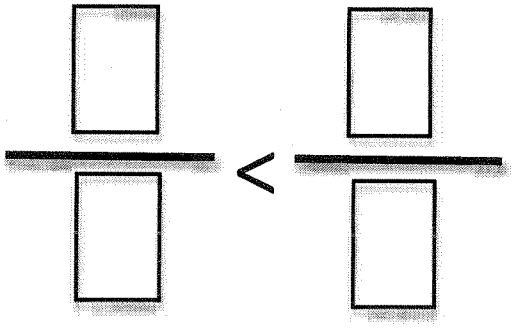
Make A Fraction

MAC Assessment Task

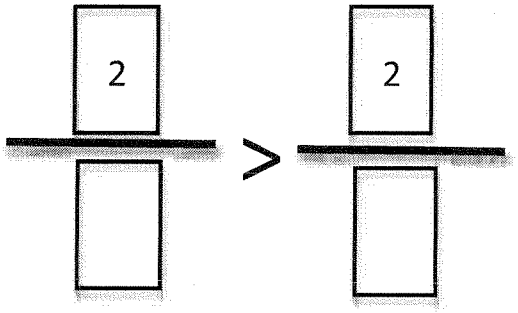
Here are the digits you can use. You can use a digit more than once.



1. Use the digits to make fractions that will make the statement true.

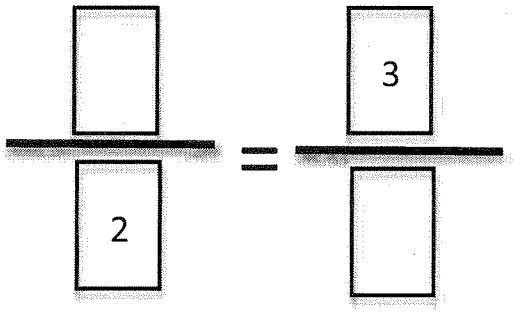


2. Use the digits to make fractions that will make the statement true.



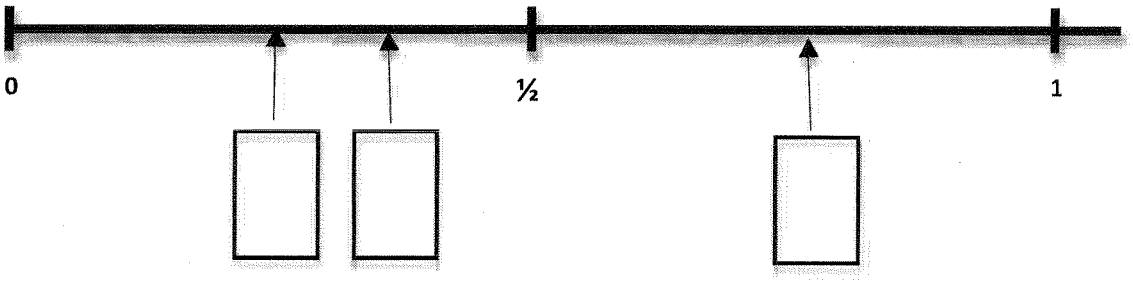
Explain how you figured it out.

3. Use the digits to make fractions that will make the statement true.



Explain why the fractions are equal.

4. In each box below write a fraction that matches the location on the number line.

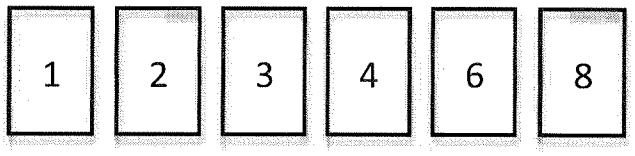


5. Can two fractions point to the same location on the number line? Explain.

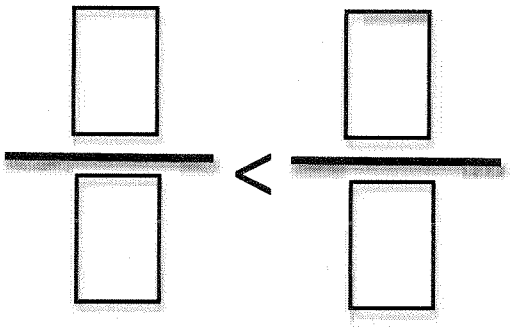
Construyendo una fracción

MAC Assessment Task

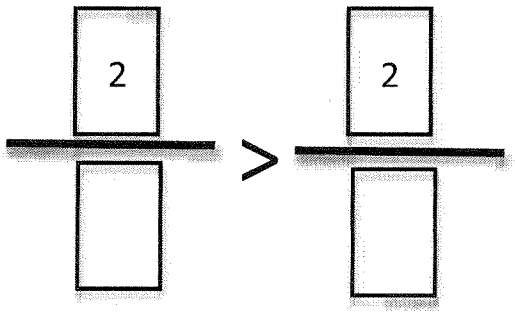
Aquí están los dígitos que puedes usar. Puedes usar un dígito más de una vez.



1. Usa los dígitos para hacer fracciones que hará verdadera el enunciado.

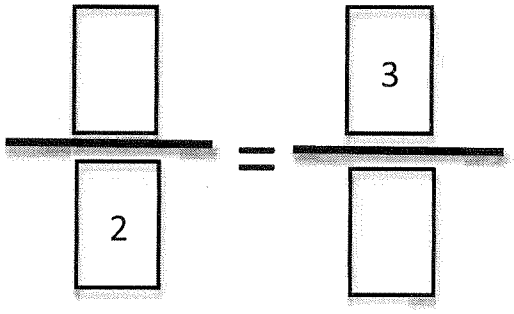


2. Usa los dígitos para hacer fracciones que hará verdadera el enunciado.



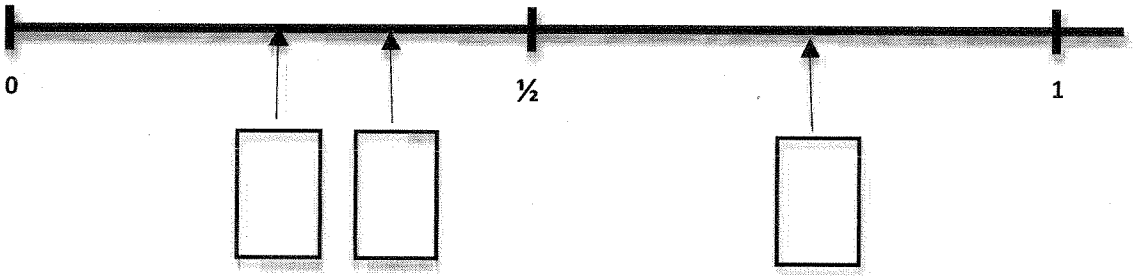
Explica como lo calculaste.

3. Usa los dígitos para hacer fracciones que hará verdadera el enunciado.



Explica porque las fracciones son iguales.

4. En cada caja abajo, escribe la fracción que va de acuerdo con la posición en la recta numérica.



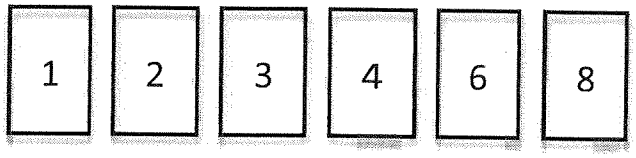
5. ¿Pueden dos fracciones indicar la misma posición en la recta numérica? Explica.

Make A Fraction	Rubric	
The core elements of performance required by this task are: Student work is characterized by using equivalent fractions as a strategy to add and subtract fractions. Add and subtract fractions with unlike denominators by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. (5.NF.1) Mathematical Practice: Reason abstractly and quantitatively. (MP 2) Mathematical Practice: Construct viable arguments and critique the reasoning of others. (MP 3) Mathematical Practice: Attend to precision. (MP 6) Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Gives a correct inequality such as: $1/6 < 2/3$	1	1
2. Gives a correct inequality such as: $\mathbf{2}/3 > \mathbf{2}/4$ Correctly explains how they figured it out such as: The smaller fraction has the larger denominator	1 1	2
3. Gives a correct equality such as: $1/\mathbf{2} = \mathbf{3}/6$ Correctly explains how they figured it out such as: I found two equivalent fractions	1 1	2
4. Gives correct answers such as: ¼, 1/3, ¾ All three correct 2 points Two correct 1 points	 2 (1)	2
5. Gives a correct explanation such as: Two fractions can point to the same location on the number line if the fractions are equivalent, such as ¾ and 6/8	1	1
Total Points		**8**

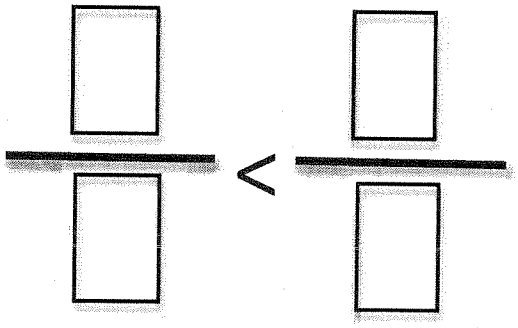
Make A Fraction

MAC Assessment Task

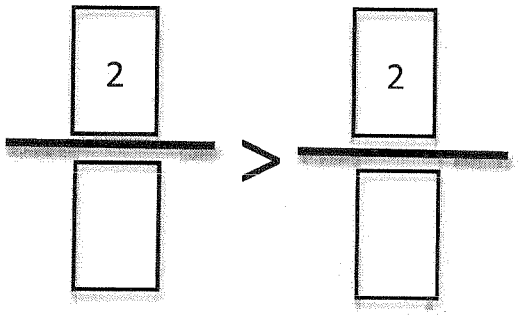
Here are the digits you can use. You can use a digit more than once.



1. Use the digits to make fractions that will make the statement true.

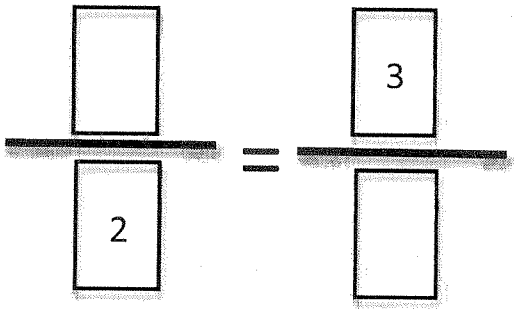


2. Use the digits to make fractions that will make the statement true.



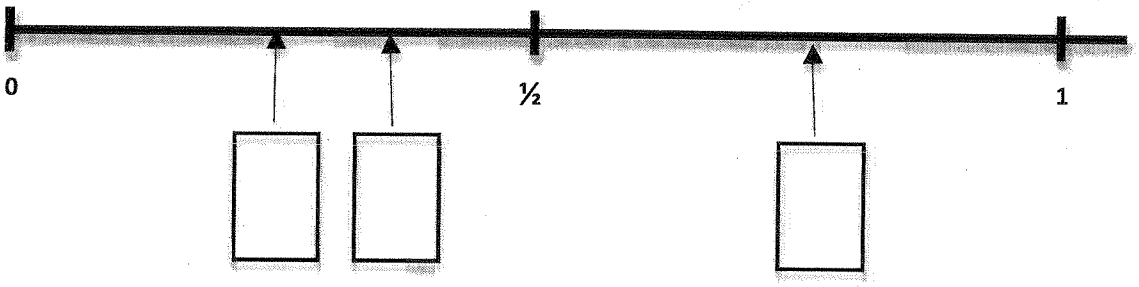
Explain how you figured it out.

3. Use the digits to make fractions that will make the statement true.



Explain why the fractions are equal.

4. In each box below write a fraction that matches the location on the number line.

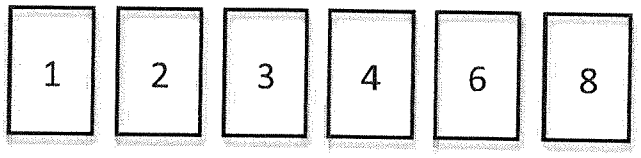


5. Can two fractions point to the same location on the number line? Explain.

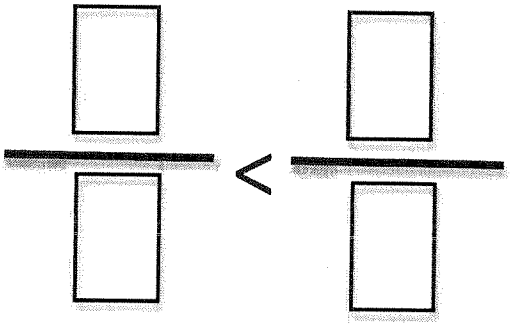
Construyendo una fracción

MAC Assessment Task

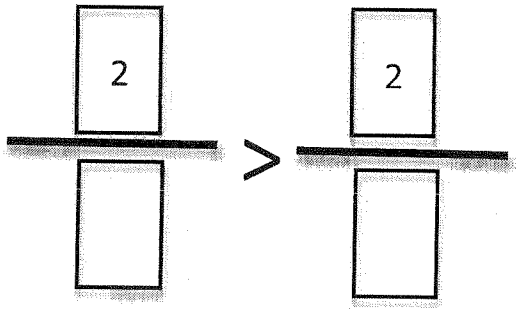
Aquí están los dígitos que puedes usar. Puedes usar un dígito más de una vez.



1. Usa los dígitos para hacer fracciones que hará verdadera el enunciado.

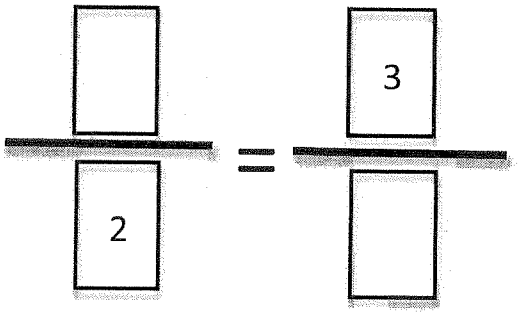


2. Usa los dígitos para hacer fracciones que hará verdadera el enunciado.



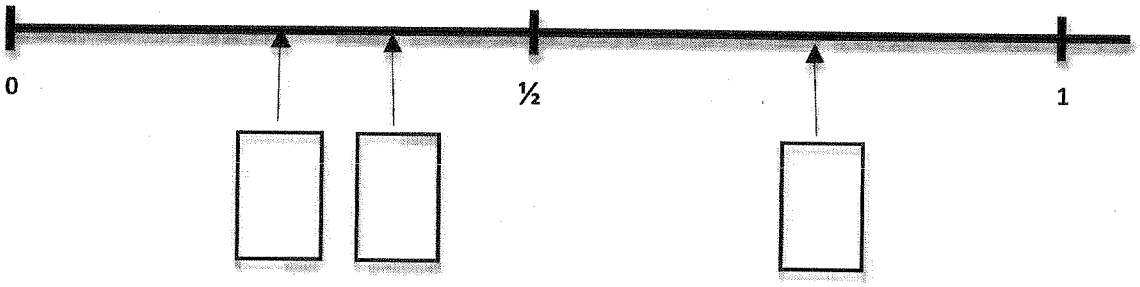
Explica como lo calculaste.

3. Usa los dígitos para hacer fracciones que hará verdadera el enunciado.



Explica porque las fracciones son iguales.

4. En cada caja abajo, escribe la fracción que va de acuerdo con la posición en la recta numérica.



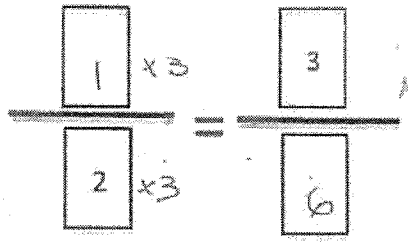
5. ¿Pueden dos fracciones indicar la misma posición en la recta numérica? Explica.

Make A Fraction	Rubric	
The core elements of performance required by this task are: Student work is characterized by using equivalent fractions as a strategy to add and subtract fractions. Add and subtract fractions with unlike denominators by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. (5.NF.1) Mathematical Practice: Reason abstractly and quantitatively. (MP 2) Mathematical Practice: Construct viable arguments and critique the reasoning of others. (MP 3) Mathematical Practice: Attend to precision. (MP 6) Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Gives a correct inequality such as: $1/6 < 2/3$	1	1
2. Gives a correct inequality such as: $\mathbf{2}/3 > \mathbf{2}/4$ Correctly explains how they figured it out such as: The smaller fraction has the larger denominator	1 1	2
3. Gives a correct equality such as: $1/\mathbf{2} = \mathbf{3}/6$ Correctly explains how they figured it out such as: I found two equivalent fractions	1 1	2
4. Gives correct answers such as: ¼, 1/3, ¾ All three correct 2 points Two correct 1 points	 2 (1)	2
5. Gives a correct explanation such as: Two fractions can point to the same location on the number line if the fractions are equivalent, such as ¾ and 6/8	1	1
Total Points		**8**

Make A Fraction Student Work – 5

Student D

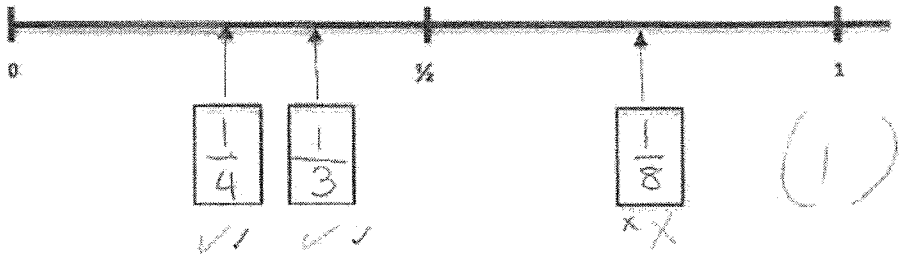
3. Use the digits to make fractions that will make the statement true.



Explain why the fractions are equal.

Why they are equal is because if you multiply 2x3 will equal 6 and 1x3 = 3,

6. In each box below write a fraction that matches the location on the number line.

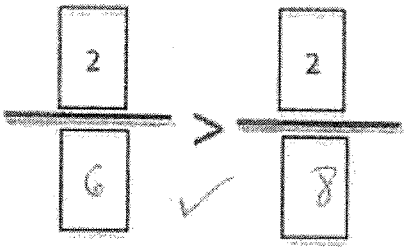


5. Can two fractions point to the same location on the number line? Explain.

It can't because it wouldn't make any sense with two fractions on the same spot.

Student E

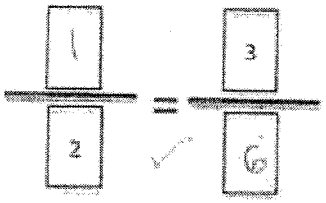
2. Use the digits to make fractions that will make the statement true.



Explain how you figured it out.

I figured it out by knowing that the denominator can make the fraction small or big.

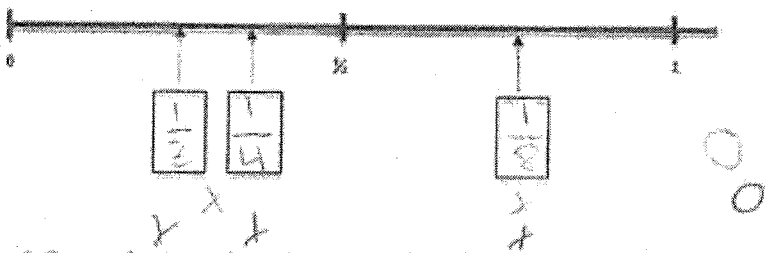
3. Use the digits to make fractions that will make the statement true.



Explain why the fractions are equal.

Because 3 is half of 6 and 1 is half of 2. They are both half of the denominator

4. In each box below write a fraction that matches the location on the number line.



5. Can two fractions point to the same location on the number line? Explain.

Yes, two fractions can be in the same place on a number line because the two fractions could be equivalent.

6

6

10 sets

Ribbon and Bows

Assessment Task

Suzannah is making bows for her friends out of a long piece of ribbon.

1 foot = 12 inches

1. It takes 8 inches of ribbon to make a bow. If you had a foot of ribbon, what fractional part would be required to make a bow?

   _____ foot

2. Suzannah made 7 bows. How many feet of ribbon did she use?

   _____feet

   Show how you figured it out.

3. Suzannah purchased 8 5/6 feet of ribbon.
   How many bows can she make with all that ribbon? _____
   Show how you figured it out.

Suzannah decides to make a bigger bow. It takes 1¼ feet of ribbon to make a bow. She buys 14 ¾ feet of ribbon.

4. She tells her little sister, "I can make 11 bows and I will give you the 8 inches I have left for you to make a little bow for yourself."

   Is Suzannah correct? Explain how you know whether she is correct or if she is wrong.

Listones y moños

Assessment Task

Suzannah está haciendo moños para sus amigas de una pieza larga de listón.

1 pie = 12 pulgadas

1. Se necesita 8 pulgadas de listón para hacer un moño. Si tuvieras un pie de listón, ¿qué parte fraccional sería requerida para hacer el moño?

   _____ pie

2. Suzannah hizo 7 moños. ¿Cuántos pies de listón usó ella? _____pies
   Muestra como lo calculaste.

3. Suzannah compró 8 5/6 pies de listón.
   ¿Cuántos moños puede hacer ella con todo ese listón? _____
   Muestra cómo lo calculaste.

Suzannah decide hacer un moño más grande. Se necesita 1¼ pies de listón para hacer un moño. Ella compra 14 ¾ pies de listón.

4. Ella dice a su hermanita, "Yo puedo hacer 11 moños y te daré las 8 pulgadas que me sobran para que hagas un moñito para ti."

   ¿Está correcta Suzannah? Explica como sabes si ella está correcta o equivocada.

Ribbon and Bows	Rubric	
The core elements of performance required by this task are: The Number System Apply and extend previous understandings of multiplication and division to divide fractions by fractions. 6.NS.1. Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions Ratios and Proportional Relationships Understand ratio concepts and use ratio reasoning to solve problems. 6.RP2. Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship. 6.RP3. Use ratio and rate reasoning to solve real-world and mathematical problems, Mathematical Practice: MP1. Make sense of problems and persevere in solving them. Mathematical Practice: MP2 Reason abstractly and quantitatively. Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Gives correct answers: **2/3** of a foot	1	1
2. Gives correct answer: **4 2/3** feet Shows how they figured it out such as: 7 x 2/3 = 14/3 (accept (7 x 8 inches)/12=4 8/12)	1 1	2
3. Gives correct answer: **13** bows (accept 13 ¼) Shows how they figured it out such as: 8 5/6 ÷ 2/3 = 53/6 x 3/2 = 53/4 53/4 = 13 ¼	1 1	2
4. Indicates that Suzannah is incorrect Correctly confirms that Suzannah can make 11 bows Explains how she knows Suzannah is incorrect such as: 11 x 1 ¼ = 13 ¾ feet leaving 12 inches not 8	1 1 1	3
Total Points		**8**

Ribbon and Bows

Assessment Task

Suzannah is making bows for her friends out of a long piece of ribbon.

1 foot = 12 inches

1. It takes 8 inches of ribbon to make a bow. If you had a foot of ribbon, what fractional part would be required to make a bow?

   _____ foot

2. Suzannah made 7 bows. How many feet of ribbon did she use?

   _____feet

   Show how you figured it out.

3. Suzannah purchased 8 5/6 feet of ribbon.
   How many bows can she make with all that ribbon? _____
   Show how you figured it out.

Suzannah decides to make a bigger bow. It takes 1¼ feet of ribbon to make a bow. She buys 14 ¾ feet of ribbon.

4. She tells her little sister, "I can make 11 bows and I will give you the 8 inches I have left for you to make a little bow for yourself."

   Is Suzannah correct? Explain how you know whether she is correct or if she is wrong.

Listones y moños

Assessment Task

Suzannah está haciendo moños para sus amigas de una pieza larga de listón.

1 pie = 12 pulgadas

1. Se necesita 8 pulgadas de listón para hacer un moño. Si tuvieras un pie de listón, ¿qué parte fraccional sería requerida para hacer el moño?

   _____ pie

2. Suzannah hizo 7 moños. ¿Cuántos pies de listón usó ella? _____pies
   Muestra como lo calculaste.

3. Suzannah compró 8 5/6 pies de listón.
   ¿Cuántos moños puede hacer ella con todo ese listón? _____
   Muestra cómo lo calculaste.

Suzannah decide hacer un moño más grande. Se necesita 1¼ pies de listón para hacer un moño. Ella compra 14 ¾ pies de listón.

4. Ella dice a su hermanita, "Yo puedo hacer 11 moños y te daré las 8 pulgadas que me sobran para que hagas un moñito para ti."

   ¿Está correcta Suzannah? Explica como sabes si ella está correcta o equivocada.

Ribbon and Bows	Rubric	
The core elements of performance required by this task are: The Number System Apply and extend previous understandings of multiplication and division to divide fractions by fractions. 6.NS.1. Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions Ratios and Proportional Relationships Understand ratio concepts and use ratio reasoning to solve problems. 6.RP2. Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship. 6.RP3. Use ratio and rate reasoning to solve real-world and mathematical problems, Mathematical Practice: MP1. Make sense of problems and persevere in solving them. Mathematical Practice: MP2 Reason abstractly and quantitatively. Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
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4. Indicates that Suzannah is incorrect Correctly confirms that Suzannah can make 11 bows Explains how she knows Suzannah is incorrect such as: 11 x 1 ¼ = 13 ¾ feet leaving 12 inches not 8	1 1 1	3
Total Points		**8**

Ribbon and Bows Gr 6 Student Work

Student D

1. It takes 8 inches of ribbon to make a bow. If you had a foot of ribbon, what fractional part would be required to make a bow?

$\frac{8}{12} = \frac{2}{3}$ ✓ foot 1 1

2. Suzannah made 7 bows. How many feet of ribbon did she use? $\frac{14}{3}$ ✓ feet 1 1

   Show how you figured it out.

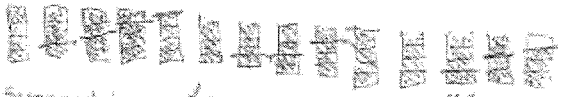
1 1

3. Suzannah purchased 8 5/6 feet of ribbon.
   How many bows can she make with all that ribbon? 13 bows ✓ 1 1
   Show how you figured it out.

1 1

4. She tells her little sister, "I can make 11 bows and I will give you the 8 inches I have left for you to make a little bow for yourself."

   Is Suzannah correct? Explain how you know whether she is correct or if she is wrong.



Suzannah is wrong ✓ because there is only $\frac{1}{3}$ of a foot of ribbon left, which is only 3⅓ inches.

Student G part 2

Suzannah decides to make a bigger bow. It takes 1¼ feet of ribbon to make a bow. She buys 14 ¾ feet of ribbon.

4. She tells her little sister, "I can make 11 bows and I will give you the 8 inches I have left for you to make a little bow for yourself."

   Is Suzannah correct? Explain how you know whether she is correct or if she is wrong.

   She is correct. ✗

$14\frac{3}{4} \div 1\frac{1}{4} =$

$\frac{59}{4} \cdot \frac{5}{4} = \frac{11.5}{1}$ ✗

Student H

Franklin-McKinley/SJSU Mathematics Initiative

March 8, 2016

Todays Agenda

- Announcements (Dr. Park)
- Share out findings from Needs Assessment
- Review Bloom's Taxonomy, DOK Levels & Cognitive Rigor Matrix
- Analyzing student work—by grade, task, cognitive level, and "next steps"
- Homework for April 5th
- Human Line Activity/4 Corners
- Close (Forms)

Needs Assessment

- Multi-step word problems
- Students with low language and basic math skills
- Using models (tape models)
- Time
- Essential vs. adaptable lessons
- Manipulatives (ease of use, linking to problems)
- Learning to listen, inquiry, number talks

Needs Assessment (cont.)

Content Areas:

Fractions, Division, Ratios, Place Value, Area, Area & Perimeter, Measurement Conversions, Place Geometry, Algebra, Statistics (6^{th})

Collaboration:

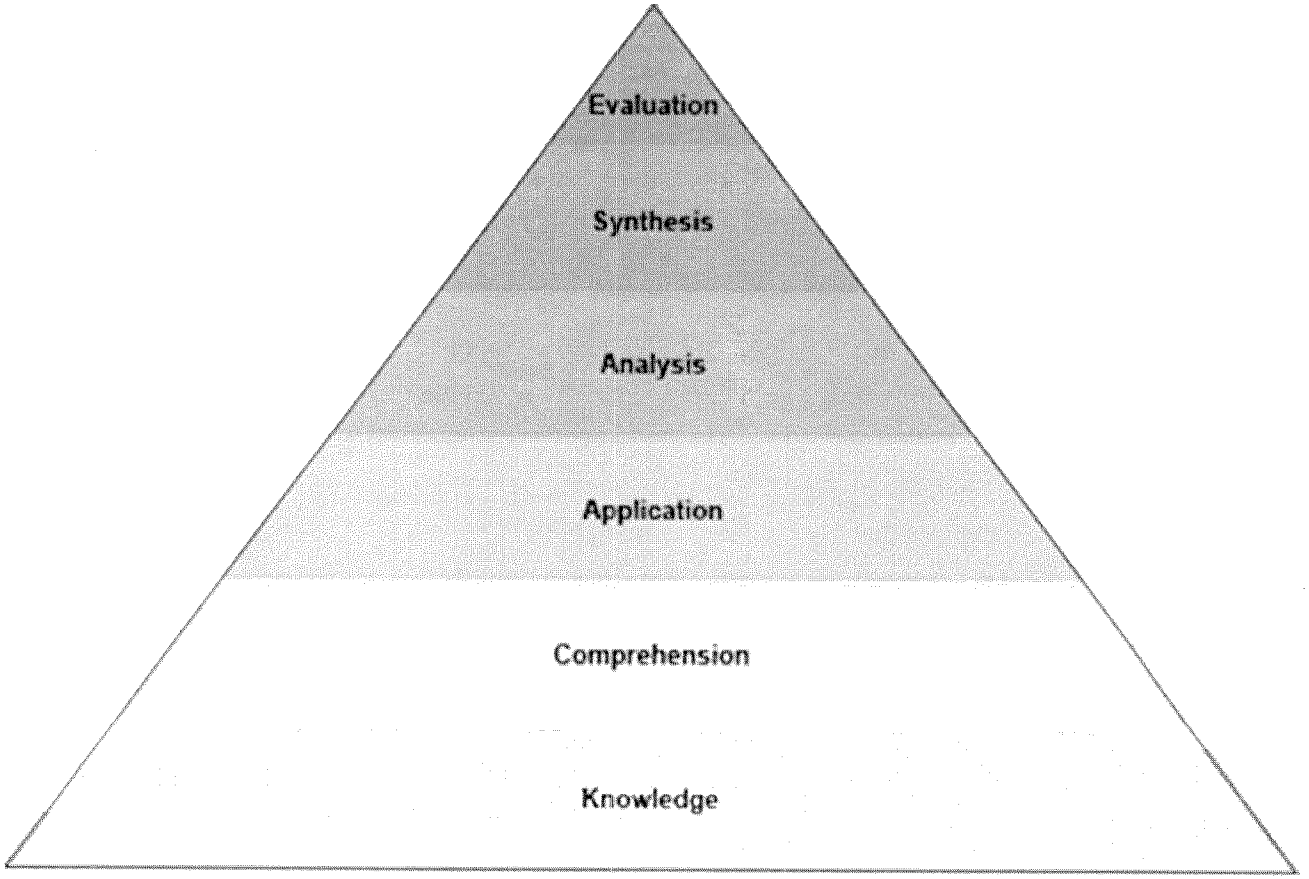
For teachers Needed…within grade level team, between grade levels, data driven…

For students Need work on student collaboration for problem solving (as opposed to working independently in a group), listening, group roles, strategies for heterogeneous grouping…

3x5 Cards: Robin says

- We need more “Time”
- We need support “Building into the lesson points for them to talk”
- We should begin “Thinking of different ways to implement formative assessment”

BLOOM'S ORIGINAL TAXONOMY (1956)



Bloom's Taxonomy of learning. Adapted from: Bloom, B.S. (Ed.) (1956) Taxonomy of educational objectives: The classification of educational goals. Handbook I, cognitive domain. New York ; Toronto: Longmans, Green.

Cognitive Demand:

The kind and level of thinking required of students to successfully engage with and solve a task.

Cognitive rigor (CR) matrix with curricular examples.

Revised Bloom's Taxonomy levels	Webb's Depth-of-Knowledge Levels Level 1 Recall and Reproduction	Level 2 Skills and Concepts	Level 3 Strategic Thinking/ Reasoning	Level 4 Extended Thinking
Remember Retrieve knowledge from long-term memory, recognize, recall, locate, identify	Recall, recognize, locate basic facts, ideas, principles Recall or identify conversions between units of measure Identify facts/details in texts			
Understand Construct meaning, clarify, paraphrase, represent, translate, illustrate, give examples, classify, categorize, summarize, generalize, infer a logical conclusion, predict, compare/contrast, match like ideas, explain, construct models	Compose/decompose numbers Evaluate an expression Locate points on a grid Symbolize math relationships Write simple sentences Describe/explain how or why	Specify and explain relationships Give non-examples/examples Make and record observations Summarize results, concepts, ideas Infer or predict from data or texts Identify main ideas	Explain, generalize, or connect ideas using supporting evidence Explain phenomena in terms of concepts Write full composition to meet specific purpose Identify themes	Explain how concepts or ideas specifically relate to other content domains or concepts Develop generalizations of the results obtained or strategies used and apply them to new problem situations
Apply Carry out or use a procedure in a given situation; carry out (apply to a familiar task), or use (apply) to an unfamiliar task	Follow simple/routine procedures Solve a one-step problem Calculate, measure, apply a rule Apply an algorithm or formula Represent in words or diagrams a concept or relationship Apply rules or use resources to edit spelling and grammar	Select a procedure according to task needed and perform it Solve routine problem applying multiple concepts or decision points Retrieve information from a graph and use it solve a multi-step problem Use models to represent concepts Write paragraph using appropriate organization, text structure	Use concepts to solve non-routine problems Design investigation for a specific purpose or research question Conduct a designed investigation Use reasoning, planning, and evidence Revise final draft for meaning or progression of ideas	Select or devise an approach among many alternatives to solve a novel problem Conduct a project that specifies a problem, identifies solution paths, solves the problem, and reports results Illustrate how multiple themes (historical, geographic, social) may be interrelated
Analyze Break into constituent parts, determine how parts relate, differentiate between relevant-irrelevant distinguish, focus, select, organize, outline, find coherence, deconstruct (e.g., for bias or point of view)	Retrieve information from a table or graph to answer a question Identify or locate specific information contained in maps, charts, tables, graphs, or diagrams	Categorize, classify materials Compare/ contrast figures or data Select appropriate display data Extend a pattern Identify use of literary devices Identify text structure of paragraph	Compare information within or across data sets or texts Analyze and draw conclusions Generalize a pattern Organize/interpret data Analyze author's craft or viewpoint	Analyze multiple sources of evidence or multiple works by the same author, or across genres Analyze complex/abstract themes Gather, analyze, and organize information Analyze discourse styles
Evaluate Make judgments based on criteria, check, detect inconsistencies or fallacies, judge, critique			Cite evidence and develop a logical argument for concepts Describe, compare, and contrast solution methods Verify reasonableness of results Justify conclusions made	Gather, analyze, and evaluate relevancy and accuracy Draw and justify conclusions Apply understanding in a novel way, provide argument or justification for the application
Create Reorganize elements into new patterns/structures, generate, hypothesize, design, plan, construct, produce	Brainstorm ideas, concepts, or perspectives related to a topic or concept	Generate conjectures or hypotheses based on observations or prior knowledge	Synthesize information within one source or text Formulate an original problem Develop a complex model for a given situation	Synthesize information across multiple sources or texts Design a model to inform and solve a real-world, complex, or abstract situations

Recall & Reproduction

What are the decimal and percent

equivalents for the fractions: $\frac{1}{2} and \frac{1}{4}?$

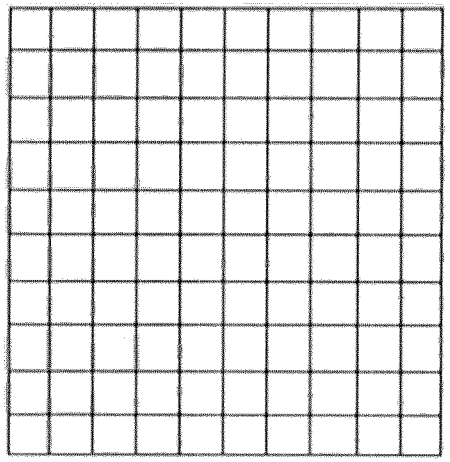
Basic Skills & Concepts

Convert the fraction $\frac{3}{5}$ to a decimal

and a percent.

Using a 10x10 grid, identify the decimal

and percent equivalents of $\frac{3}{5}$.

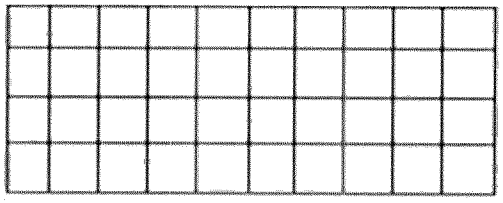


Shade 6 small squares in a 4 x 10 rectangle. Using the rectangle, explain how to determine each of the following:

a) the percent of area that is shaded.

b) the decimal part of area shaded.

c) the fractional part of area shaded.



For each problem, what kind of thinking is required? How are the tasks alike and different?

Martha's Carpeting

Martha is carpeting her room which is 15 feet long and 10 feet wide. How many square feet of carpet will she need, and how much baseboard will she need to run around the edge of the carpet? Explain your thinking.

The Fencing Task

Ms Brown's class is raising rabbits for the science fair. They have 24 feet of fencing with which to build a rectangular pen. If the students want the rabbits to have as much room as possible, how long should each of the sides of the pen be? Explain your thinking.

Martha's Bedroom vs. Rabbit Pens

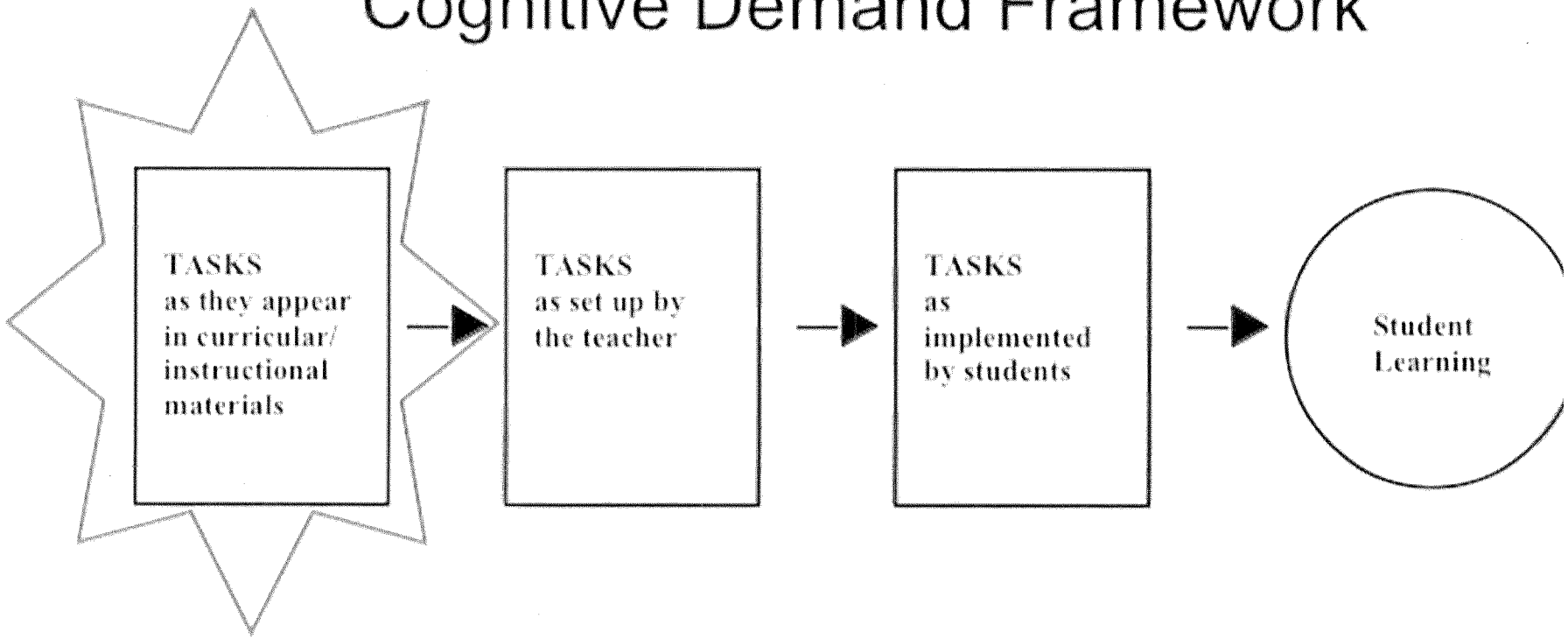
ALIKE

- Both require Area and Perimeter calculations
- Both require students to "explain your thinking"
- Both are word problems, set in a "real world" context

NOT ALIKE

- Rabbit Pens requires a systematic approach
- Rabbit Pens leads to generalization and justification
- The "thinking" in Rabbit Pens is complex - requires more than applying a memorized formula

Cognitive Demand Framework



Analysis of Student Work

Please sit by grade level

- Each grade level will receive a MARS task related to fractions.

- First **on your own** do the task.

- Then examine the rubric & discuss with your group.

Analyzing Student Work

- In your group, discuss the student work. Discuss questions/probes you would use with that student to increase the DOK level of the work.
- Pick one of the samples to share out with the whole group. Put the student work on a poster and add your group's questions/probes.
- Gallery walk to examine the student work across the grades 3-6.

For April 5

- Give the task to your class
- Bring in a couple of samples of student work.
  - One strong sample
  - One or two samples that show a student struggling with the mathematics or explaining
- We will work on giving feedback to student work at the next session.

Four Corners Activity
&
Human Number Line

Adapting Engage NY to Enhance

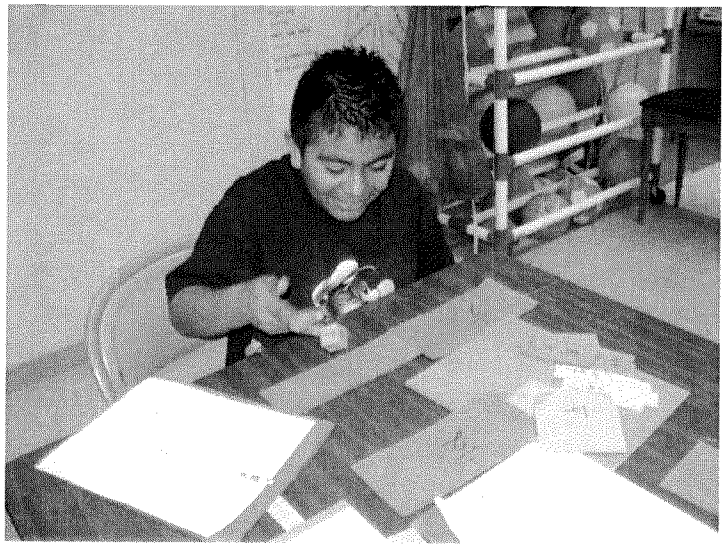
Access to Content
Engagement in Content
Language Development

T: (Write $\frac{2}{3}$.) Talk to your partner. Is $\frac{2}{3}$ greater than $\frac{1}{2}$ or less than $\frac{1}{2}$?

S: There are no thirds that are equal to $\frac{1}{2}$. → $\frac{1}{2}$ is between $\frac{1}{3}$ and $\frac{2}{3}$, so $\frac{2}{3}$ must be greater. → I can draw a model to prove that. → $\frac{2}{3}$ is almost 1. → 1 third is less than 1 half, and 2 thirds is greater than 1 half. → We can see on our other number line that $\frac{3}{6}$ is right between $\frac{1}{3}$ and $\frac{2}{3}$, and $\frac{2}{3}$ is equal to $\frac{4}{6}$. So, $\frac{2}{3}$ is greater than $\frac{1}{2}$.

T: (Write $\frac{2}{5}$.) Talk to your partner. Is $\frac{2}{5}$ greater than $\frac{1}{2}$ or less than $\frac{1}{2}$?

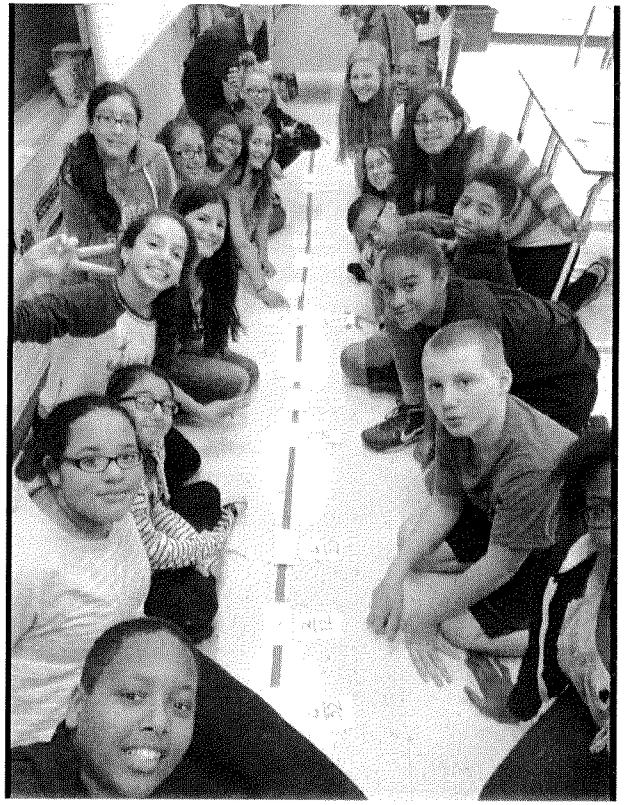
S: Five is an odd number, so it doesn't divide evenly by 2. Halfway between 0 fifths and 5 fifths should be somewhere between 2 fifths and 3 fifths. So, 2 fifths must be less than 1 half. → $\frac{1}{2}$ is halfway between $\frac{2}{5}$ and $\frac{3}{5}$, so $\frac{2}{5}$ is less than $\frac{1}{2}$.



3rd Module 5 Topic D Fractions on a Number Line

4th Module 5 Topic C Fraction Comparison

5th & 6th sensible computation



Lesson Outline

Launch

How do you know when a fraction is close to 0, ½, 1, or 2?

Four Corners Activity

"____ is close to _____ because…"

Human Number Line

Counting unit fractions

Placing fractions on the number line

Comparing fraction pairs

Closing: Comparison Strategies

Same denominators-more of the same size parts

Same numerators-same number of parts but different sizes

More or less than ½ or 1 whole

Closeness to ½ or 1 whole - the size of the missing or extra piece(s)

Fraction Cards

Introductory Discussion Cards
Benchmarks of 0, ½, 1, 2
Unit fractions
Close or equal to 0
Close or equal to 1/2
Close or equal to 1
Close or equal to 2

$\frac{99}{100}$	$\frac{15}{14}$	$\frac{6}{5}$
$\frac{3}{47}$	$\frac{1}{7}$	$\frac{2}{25}$
$\frac{15}{31}$	$\frac{6}{10}$	$\frac{3}{7}$
$\frac{24}{50}$	$\frac{17}{9}$	$\frac{9}{5}$

0	$\frac{1}{2}$
1	2

$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$
$\frac{1}{6}$	$\frac{1}{7}$	$\frac{1}{8}$
$\frac{1}{9}$	$\frac{1}{10}$	$\frac{1}{11}$
$\frac{1}{12}$	$\frac{1}{25}$	$\frac{1}{100}$

$\frac{2}{20}$	$\frac{3}{100}$	$\frac{1}{50}$
$\frac{2}{35}$	$\frac{2}{11}$	$\frac{4}{99}$
$\frac{5}{1000}$	$\frac{3}{49}$	$\frac{1}{31}$
$\frac{6}{66}$	$\frac{4}{36}$	$\frac{2}{50}$

$\frac{2}{5}$	$\frac{5}{8}$	$\frac{4}{7}$
$\frac{6}{11}$	$\frac{51}{100}$	$\frac{3}{8}$
$\frac{6}{12}$	$\frac{32}{60}$	$\frac{5}{9}$
$\frac{4}{9}$	$\frac{3}{7}$	$\frac{51}{99}$

4 5	5 6	6 7
11 9	9 11	8 8
12 13	97 101	87 85
14 15	14 16	87 100

$\frac{4}{2}$	$\frac{7}{3}$	$\frac{9}{4}$
$\frac{9}{5}$	$\frac{5}{3}$	$\frac{8}{8}$
$\frac{30}{16}$	$\frac{17}{8}$	$\frac{13}{6}$
$\frac{29}{15}$	$\frac{30}{17}$	$\frac{50}{24}$

EL EDUCATIONAL LEADERSHIP

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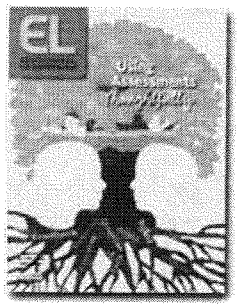
Using Assessments Thoughtfully Pages 28-32

Formative Assessment in Seven Good Moves



March 2014

By listening carefully to what students say and thinking deeply about how to better guide them, teachers can become accomplished formative assessors.

Brent Duckor

The research is clear: What teachers do in their classrooms matters. But which practices really make a difference? John Hattie (2012) conducted an extensive meta-analysis, looking at 800 meta-analyses that focused on locating a specific student achievement outcome and identifying an influence on that outcome. Formative assessment topped his list of the most influential practices that improve student outcomes.

What makes formative assessment so effective? It depends on whom you talk to. Although experts tell us that formative assessment is one of the most powerful ways to raise student achievement (Black & Wiliam, 1998), we don't always know *which* practices are most effective, *when* to deploy them, and *why* a particular combination actually worked for a particular student in a particular classroom. We often hear that the best feedback practices must be specific, addressable, timely, ongoing, and content-rich (Wiggins, 2012). But many beginning teachers and administrators don't have a clear idea of what these terms mean.

For informed teacher educators, formative assessment is more than a checklist of qualities or collection of activities. Rather, it's made up of a sequence of *moves* that invite a positive, ongoing relationship between teachers and their students. It's the job of teacher educators to connect theory to practice and work with beginners to become better formative assessors.

Seven Essential Moves

Through watching hours of videotaped lessons and observing even more live lessons in middle and high school classrooms, my colleagues and I have identified seven basic moves that are essential to rich formative assessment practice (Duckor, Honda, Pink, Wilmot, & Wilson, 2012). These moves involve asking effective questions, giving students adequate time to think and respond, and asking probing follow-up questions that deepen student understanding. By practicing these moves, beginning teachers can develop into skillful assessors.

We created the names for these seven formative assessment moves to better describe to teacher candidates what we, as teacher educators, are looking for during observations in the classroom.

Move 1. Prime students first.

Priming sets the stage for all other formative assessment moves. Teachers will need to let the class know they'll be asking questions and calling on students in ways that students may be unfamiliar with. Questions will also prompt students to more deeply reflect on their classmates' responses and make new connections. Some students may experience this new classroom culture as strange.

For example, if a teacher follows up on a student's response by asking, "Can you say more about why that is?" some students might see this as a challenge or even a personal attack. A

more positive follow-up question—such as, "I like this idea. Could you elaborate, explaining it in your own words?"—would more likely encourage a fuller and richer student response.

Thus, teachers need to establish norms and routines for inviting student participation, especially for students who aren't familiar with assessment practices outside the normal experience of "doing school." They also need to reflect on the various moves they do implement, whether it's increasing wait time or not having students raise hands to answer questions. By keeping notes on how the various approaches worked and with which students, we can agree on goals for the beginning teacher's next steps in becoming a more competent formative assessor (Duckor & Holmberg, 2013).

Like anthropologists doing fieldwork, teachers who are developing their skills in formative assessment are trying to understand and practice a new way of school life—for themselves and for their students. In the formative assessment– driven classroom, everyone is consciously engaged in practices that promote further learning, as opposed to those that merely assess student achievement (Stiggins, 2002).

It's not uncommon for students who have suddenly been immersed in this "foreign" classroom culture to ask questions like these:

- Why is the teacher asking "why?" so much?
- Why is the teacher using equity sticks (Popsicle sticks with a student's name written on each one) to call on us?
- Why is the teacher waiting a bit before taking answers, instead of just calling on Mary and John, who have their hands up?
- Why is the teacher putting *all* answers on the whiteboard, even the wrong ones?
- Why is the teacher always answering a question with another question?
- Why can't the teacher just solve the problem and write the correct answer on the board so we can move on?

Unfortunately, the literature on formative assessment provides few accounts of the culture shock many students experience when they're expected to learn in this new and perhaps puzzling manner.

Move 2. Pose good questions.

Asking questions seems so easy. Teachers prompt students here and there to answer a few questions during a lecture, typically calling on just a few students to give the correct answer. Most students simply nod their heads while waiting for the teacher to get back to the lecture.

When it comes to effective posing of questions, the *kinds* of questions teachers ask matter. In the beginning teacher's classroom, questions often fall flat. Sometimes the questions imply a right/wrong dichotomy, which fails to invite or elicit a range of student responses. For example, "Can someone give me the definition of mitosis?"

Other times, the questions are too open-ended. They tend to overshoot and intimidate students: "Why did the French Revolution occur?" "How do polynomial functions work?" "Can someone tell me what a thesis is?"

But some questions can promote thinking and learning. An effective question sizes up the context for learning, has a purpose related to the lesson and unit plan, and, ideally, is related to larger essential questions in the discipline. During a lesson on the civil rights movement (Gold & Lanzoni, 1993), a teacher at New York's Central Park East Secondary School asked students, "Should the integration of public facilities [in this scenario, a skating rink owned by whites] extend beyond the ruling on education addressed by the *Brown v. Board of Education* decision?" As the students worked to integrate primary sources into their oral arguments—and used words from those documents to make sense of such concepts as segregation, integration, and equality—they engaged in a lively give-and-take discussion. All the while, the teacher pushed back on their diverse responses, inviting deeper reflection.

Posing good questions requires that teachers *know their audience* and adapt questioning strategies to the responses of their students in real time. A well-posed question creates an opportunity to meet learners at their current level of understanding. Thus, formative assessors need to know (or at least anticipate) their students' learning progressions with complex material so they can scaffold questions at key points (pit stops and bottlenecks) in the unit.

Move 3. Pause during questioning.

We all need time to process information, to "transfer files" from our short-term to our long-term memory and back again. Our processing speed varies according to the nature of the information we're asked to process and our degree of familiarity with it. That said, beginning teachers tend to feel uncomfortable with wait time between their questions and their students' responses. Moreover, they don't provide their students with enough protocols for participation, such as turn-and-talk, think-pair-share, or polling for opinions, all of which can provide the wait time needed to increase participation.

Pausing requires preparation. A stopwatch, a smartphone, or a variety of audio or video devices can help track time between a question and a response. Teachers might also try counting out the pause in their heads. The goal is to slow the process down.

One low-tech solution to slowing down the question-and-answer exchange is to set up a think-pair-share and journal entry routine after posing a question to the class. Students can briefly talk to one another, then write out their responses in their journals, and then raise their hands to show they're ready to address the teacher's question.

In a heterogeneous classroom with language learners, students with special needs, and students with different learning styles, pausing can make all the difference. Giving students extra time to clarify their thinking gets more students into the discussion and makes teachers more aware of the level of understanding of every student in the class. In the absence of such information, the formative assessor doesn't even know where to start with follow-up questioning strategies designed to further elicit student thinking.

Move 4. Probe student responses.

Too often, beginning teachers ask a question as though the answer to that question were obvious: "Does everyone understand?" "Did you copy the information yet?" "Can we move on now?" Or the teacher will ask a question that has a single right answer. As soon as one student answers the question correctly, there's no need for follow-up because "we" now have the correct answer. Compounding the difficulty, teachers may pose a question, get a correct response, and then silently wonder, "OK, now what do I do?" Thus the familiar, "Uh ... good job!"

Probing suggests there's always more to know. Asking the standard questions (Who? What? Where? When? How? Why?) may lead to an initial set of student responses that satisfy the requirement for getting through the lesson in time for Friday's quiz. But formative assessment is more than a march toward the known. It's a process for uncovering deeper understanding, which means having access to evidence about what students are thinking.

For example, how can a teacher know whether a student truly understands why things sink or float without first posing the question and then probing a variety of possible responses? Research on buoyancy misconceptions reveals that students typically think that big, heavy things sink and small, light things float; that hollow things float; and that sharp edges make things sink (Yin, Tomita, & Shavelson, 2008). After asking students why some things float and others sink, the teacher might ask, "So who thinks things float because they're hollow? Can you say why? Turn to your partner and ask for an example of a hollow thing that might sink."

Probing is about collecting more substantial evidence to make decisions about what to teach, reteach, or even preteach for a particular group of students. The more one learns about how real students in a particular classroom approach the material, the better one can guide them through the bottlenecks, cul-de-sacs, and eddies that will inevitably mark a student's progression toward an understanding of conceptually difficult material.

Move 5. Bounce questions throughout the classroom.

Feedback is about generating a loop. That loop can be represented by the connections or nodes of talk in the classroom. Too often, the loop is too small, occurring mostly between the teacher and a few eager students.

Beginning teachers often pounce on the first hand raised in response to a question. There seems to be an unbreakable bond between teachers who struggle to elicit the correct answer from their students and the small number of willing students who have that answer. Too often, the symbiotic relationship between these two or three students and the teacher leads to a false sense of feedback. When asked after a lesson, "So who seems to understand the objective of the lesson?" the beginning teacher typically recalls the answers that the hardworking, engaged students supplied.

Teachers can use equity sticks, index cards, or other tools to generate a "bounce" of responses across the classroom. They can even make notations on the seating chart to keep track of patterns of participation. By increasing the breadth and depth of student responses, the teacher is better able to draw meaningful conclusions about student understanding.

Without consistent procedures and visible practices related to "bouncing," or spreading questions throughout the classroom, there's little hope that the majority of the students will actually engage in thinking through a topic. We know from research on academic language and English language development that providing opportunities for students to articulate their thinking—in a variety of productive modes—is essential. This practice also makes it more likely that all students will feel included in classroom conversations (Zwiers, 2007).

Move 6. Use tagging to generate a wide range of responses.

A biology teacher begins class by writing the word *cell* on the whiteboard and asking, "What is a cell?" Several students shout out their answers. The teacher says, "Not quite, but good tries"; writes the correct textbook definition on the whiteboard; and asks students to copy it into their journals. Bad move.

Tagging is recognizing student contributions to questions posed by the teacher (or other students). A simple tagging routine is the word web. Experienced formative assessors put a word up in the classroom, making it visible to all students —for example, "What is the first thing that pops into your head when you see the word *ratio*?" Then they ask students to write down their thinking. The word webs that emerge from these call-and-response brainstorming procedures encompass both on- and off-target responses, which all build a better picture of student thinking about the topic.

Sometimes it helps to have students turn to a peer and share a response or question orally before they write. Students might write a definition or draw a picture—whatever works to get their thinking started. The idea is to generate a wide range of responses.

Researchers point out that teachers are often uncomfortable with soliciting unorthodox or wrong answers (Black & Wiliam, 1998). Teachers may think that misconceptions could derail the discussion. Of course, misconceptions and students' prior knowledge are at the very heart of the learning process in a formative assessment–driven classroom (Shepard, 2000). If teachers don't create a space for students to express both their understandings and their misunderstandings, students who are too embarrassed to express a potentially incorrect answer will simply remain silent.

Move 7. Build your bins.

We come full circle with the seventh move, binning. If posing questions is the alpha, then binning is the omega move for the skilled formative assessor. Bins are how we teachers categorize student responses. We label some bins *correct answer*, others *misconception*, others *proficient*, and so on. Educational psychologists might refer to bins as mental schema for assimilating and accommodating new experiences. When students respond to a question, the teacher can potentially categorize, sort, and "bin" it for later use.

For example, beginning teachers often have difficulty hearing any responses that don't fall into their *correct answer* bin. They're often unfamiliar with student learning progressions—how students work themselves through the building blocks of a big idea. In the science curriculum that deals with why things sink or float, for example, teachers should know about common student misconceptions related to mass, volume, density, and relative density. By failing to tag responses that evoke those misconceptions, teachers reduce the power of formative assessment to uncover difficult learning steps along the way. A teacher needs to know, through practical training and rich classroom experience, where kids get stuck and why.

How to build this teacher knowledge of different students' learning progressions, in relation to different topics and different levels of background knowledge, is one of the most important formative assessment challenges (Heritage, 2008).

Practice, Practice, Practice: On Making Good Moves

Our challenge as teacher educators is to plant the seeds of formative assessment in our preservice teachers so those seeds take root and flourish in these teachers' careers. Of course, beginning teachers are overwhelmed by many demands— classroom management, content-knowledge preparation, grading, and staying on top of their workloads, to name a few. Beginning teachers may also feel constrained by conflicting messages about what matters to students, parents, and administrators.

However, because formative assessment has such a great effect on student outcomes, beginning teachers need to take note. By practicing these seven basic moves, all teachers can develop the requisite expertise and become more skilled formative assessors. Research shows us that formative assessment makes a difference not only for student outcomes, but also for principals and teachers looking to build stronger relationships in their schools and classrooms.

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Brent Duckor is an assistant professor at the Lurie College of Education, San Jose State University, California.