Interview script

1. Fraction pie

Show the student the yellow pie diagram.

a) What fraction of the circle is part B?
b) What fraction of the circle is part D?

2. Pattern blocks

Place the three pattern blocks on the table (yellow hexagon, red trapezium and blue rhombus).

Please note, students are permitted to move the shapes to support them in answering these questions.

a) How many blues would you need to cover the yellow?
You may move the blocks.
b) Blue is what fraction of the yellow?
c) How many blues would you need to cover the red?
If the student says '2' ask, "is it exactly 2"?
d) Blue is what fraction of the red?
e) If the yellow is one, what is the value of the blue?
f) If the blue is one, what is the value of the red?

3. Dots array

Show the student the green array of dots (some shaded)

a) What fraction of the dots is black?
b) What is another name for that fraction?

4. Simple operators

Administer orally, to be done in student's head

a) What is one-half of six?
b) What is one-fifth of ten?
c) What is two-thirds of nine?
d) What is one third of a half?
After the student gives an answer to part d) ask:
How did you solve this one?
Did you think of a picture in your mind to solve this?
If "Yes" say: Please describe what you imagined.
e) What is one-half of one-third?
After the student gives an answer to part e) ask:
How did you solve this one?
Did you think of a picture in your mind to solve this?
If "Yes" say: Please describe what you imagined.

5. Fractions on a number line

Give the student a blank piece of paper and pencil.

a) Please draw a number line and put two thirds on it.
If child does not mark 0 or 1, ask "Where does zero go? Where does one go?"

Give the child the number line from 0 to 6 (white page) and a pencil.

b) Please mark six thirds and label it for me.
c) Please mark eleven sixths and label it for me.

6. Pizza

Show the student the pale green picture of the 5 girls and the 3 pizzas.

Three pizzas were shared equally between 5 girls.

a) How much pizza does each girl get?
b) How did you work it out?

Provide the student with pencil and paper to draw if necessary.
If the student responds with "3 pieces" ask: Could you tell me what fraction of a pizza that is?

7. Draw me a whole

Show the student the pink rectangle. Provide a pencil.

a) If this is two-thirds of a shape, please draw me the whole shape.
Please explain your thinking.

If unsuccessful, go to Question 8.

Show the student the blue rectangle. Provide a pencil.

b) If this is four-thirds, please show me the whole.
How did you work this out?

8. Construct a sum

Place the yellow number cards and the empty fraction sum in front of the student.

a) Choose from these numbers to form two fractions that when added together are close to one, but not equal to one. *Record the student's final decision.*
b) Please explain how you know the answer would be close to one.
Record any change of solution.

9. Fraction pairs

Show the student each gold fraction pair card, one at a time.

Please point to the larger fraction…….
How did you decide?

Don't allow use of pencil and paper

10. Decimals on a number line

Show the pink, blue and yellow cards in turn and ask:

a) What number is this point on the number line? (*point to the arrow)*
b) What number is this point on the number line? *(point to the arrow)*
c) How much medicine in mLs is in this syringe?

11. Decimal density

Show the mauve card

a) Can you name a decimal between 0.1 and 0.11?
b) How many decimals are between 0.1 and 0.11?

12. Make me a decimal

Place the yellow cards randomly on the table.

Here are some number cards and some blanks that could be any number.

a) Could you use some of these cards to show me what *two tenths* would look like as a decimal?
b) Could you use some of these cards to show me what *27 thousandths* would look like as a decimal?

c) Could you use some of these cards to show me what *ten tenths* would look like as a decimal?
d) Could you use some of these cards to show me what *27 tenths* would look like as a decimal?

13. Ordering decimals

Place the orange cards randomly on the table.

Please put these numbers in order from smallest to largest.

14. Connecting fractions, decimal and percents

Show the child the blue card of the shaded grid.

There are one hundred squares here. Six have been shaded.

a) What fraction of squares has been shaded?
b) Is there another fraction name for that?
c) How would you write that as a decimal?
d) Is there a percentage name for that?

15. Decimal Comparison Test

Give the student the decimal comparison pairs.

For each pair, choose the number which is larger.

16. Decimal operations

Show the student the pink card with the two operations.

a) Which of these would result in a larger answer?

What is the answer to each of these?

b) 8 x 0.1
c) 8 ÷ 0.1
d) Please explain how you found each answer.

17. Pod Tunes or New Tunes?

Show the student the two music cards.

Mental strategies are preferred but pen and paper may be offered if this is helpful.

Sometimes, people buy cards to download songs from the internet.
Here are two such cards—Pod Tunes and New Tunes.
With Pod Tunes, you get 16 songs for $24.
With New Tunes you get 12 songs for $20.

a) Which music card is the better value?
b) Please explain how you know.

18. Reserve bank and Chocolate Milk

Give the student some blank paper and a pen.

Not long ago, the Reserve Bank announced that interest rates were going up one quarter of one percent.

a) How would you write one quarter of one percent with numbers?
b) Could you write it a different way, that is still equal to one quarter of one percent?

Show the student the chocolate milk drink and percentage card.
Pen and paper can be provided if this is helpful.

c) This chocolate milk claims that one glass has 2.5 milligrams of Vitamin B6, which is 125% of the recommended daily allowance of B6. What would be the exact daily allowance of vitamin B6?

19. Cordial

Show the student the cordial card and ratio card.

A cordial drink needs to be made up of syrup and water in the ratio 1:4.

a) If you make enough cordial for three glasses, each containing 200 mL, how much syrup would you need for this?
b) Please explain how you worked this out.

20. Cheese Please

A calculator is required for this question.
Show the student the blue cheese card.

1 kilogram of cheese costs $12.59.

a) Estimate <u>round about</u> how much 0.34 kg would cost … Just round about.
b) How did you get your estimate?
c) Show me on the calculator how to get the exact answer.

Rational Number Interview Record Sheet

Student Name: Jake Schembri Grade: 5 Date: 12/8/15

1. Fraction pie

a. Part B (fraction?) 1/4 ☑

b. Part D (fraction?) 1/6 ☑

2. Pattern blocks

a. 3 ☑ b. 1/3 ☑ c. 1.5 ☑

d. — ⊟ e. 1/3 ☑ f. 1½ ☑

3. Dots array

a. 12/18 ☑

b. 6/18 ⊟ Jake thought he had to find the fraction for the unshaded blocks.

4. Simple operators

a. 1/2 of six 3 ☑

b. 1/5 of ten 2 ☑

c. 2/3 of nine 6 ☑

d. 1/3 of 1/2 — ⊟

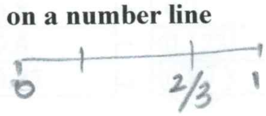
Form of picture if used —

e. 1/2 of 1/3 — ⊟

Form of picture if used —

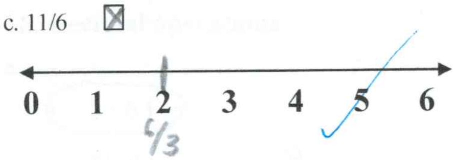
5. Fractions on a number line

a. 2/3 ☑



b. 6/3 ☑

c. 11/6 ☒



6. Pizza

a. 3/5 ☑

b. Satisfactory explanation ☑

First Jake said 3 then asked him to tell me a fraction.

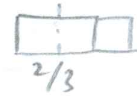
(5 girls 3 pieces)

$\frac{15}{5} = 3$

7. Draw me a whole

a. ☑ b. ☒

a)



8. Construct a sum

a. $\frac{1}{3} + \frac{5}{6}$

b. $\frac{1}{4} + \frac{5}{6}$

b. Satisfactory explanation ☒ unable to explain and justify.

9. Fraction pairs (see separate record sheet for fraction pairs)

10. Decimals on a number line

a. 1.3 ☑

b. 8.05 ☑

c. 1.7 mls ☑

Jake had to count the lines.

11. Decimal density

a. Decimal named? 0.10 ⊟ 0.105

b. How many? 10 ☑

0.1 and 0.10 are equivalent

12. Make me a decimal

a. two tenths 0.2 ☑

b. 27 thousandths 0.002

c. ten tenths 0.10

d. 27 tenths 0.27

Jake had to draw out the decimal place value chart on a piece of paper.

Eg: Hundreds Tens Ones Tenth Hundredth Thousandth Hundred Thousandths

321.2345

13. Ordering decimals

- Correct solution:

0	0.00987	0.01	0.10	0.356	0.9	1	1.7 1.70	2
1	9	2	4	8	3	5	6	7

Or indicate if any or all of these errors are present (circle one or more)

- No evidence of equivalence of 1.70 and 1.7
- Zero misplaced
- 0.00987 chosen as largest of the decimals less than one
- 0.00987 chosen as the largest number
- ….. [1] [2] …..
- ….. [0.9] [0.10] …….

14. Connecting fractions, decimals and percents

a. A fraction? 6/100 ☑

b. Another fraction? NO ☐ 3/50

c. A decimal? 0.06 ☑

d. A percentage? 6% ☑

15. Decimal Comparison Test

0.3	(0.217)	–	(0.653)	0.3 ✓
0.9	(0.10)	–	(0.43)	0.2 ✓
(0.234)	0.8	–	0.7	(0.87) ✓
(0.12)	0.6	–	(0.123)	0.09 ✓
(0.087)	0.87	–	(0.89)	0.7 ✓

Jake believes larger is bigger. (misconception).

"Longer is Larger"

16. Decimal operations

a.

- (8 x 0.1)
- 8 ÷ 0.1 ☐

b. Satisfactory explanation ☐

c & d

8 x 0.1 ans 8.1 ☐ Satisfactory explanation ☐ 0.8

8 ÷ 0.1 ans: — ☐ Satisfactory explanation ☐ 80

↑ unsure

17. Pod Tunes or New Tunes

a.

- Pod tunes
- New tunes
- Same value
- Don't know ☑

b. satisfactory explanation ☐

18. Reserve Bank & Chocolate milk drink

a. 0.25 ☑

b. ________ ☐

c. ________ ☐

d. satisfactory explanation ☐

19. Cordial

a.

- 120 mLs
- 150 mLs
- other ________ ☐

$\frac{200}{5} = 40 \quad 40 \times 3 = 120$

← was able to explain and justify why!!!

20. Cheese please

a. Estimate ________ ☐

b. Satisfactory explanation ☐

* Jake was unable to answer this. He was able to show me how to work it out on the calculator.

c.

- 12.59 x 0.34
- 0.34 x 12.59
- 12.59 ÷ 0.34
- 0.34 ÷ 12.59
- Other ________________________

9. Fraction Pairs

a. $\frac{3}{8}$ $\frac{7}{8}$

- **d the same and compares n**
- Benchmarking to ½ and/or 1
- Residual thinking (1/8 < 5/8)
- Other (satisfactory)

- Compares numerator only (7>3)
- Gap thinking (1 < 5)
- Smaller numbers mean bigger fractions
- Other (unsatisfactory)

b. $\frac{2}{4}$ $\frac{4}{8}$ (same)

- **Equivalent ("the same")**
- Other (satisfactory)

- "Higher" or "larger" numbers
- Gap thinking (2 < 4)
- Other (unsatisfactory)

c. $\frac{1}{2}$ $\frac{5}{8}$

- **Benchmarks to one half (5/8 > 1/2)**
- Converts to common denominator (5/8 > 4/8)
- Other (satisfactory)

- "Higher" or "larger" numbers
- Gap thinking (1 < 3)
- Other (unsatisfactory)

d. $\frac{2}{4}$ $\frac{4}{2}$

- **Equates to ½ and 2**
- Equates to a ½ and more than 1
- Converts to common denominator (8/4 > 2/4 or 4/2 > 1/2 etc)
- Other (satisfactory)

- "Both the same"
- Compares numerators or denominators (4 > 2)
- Improper fraction
- Other (unsatisfactory)

e. $\frac{4}{7}$ $\frac{4}{5}$

- **n the same and compares d**
- Converts to common denominator (28/35 >20/35)
- Benchmarks to ½ and 1
- Residual thinking (1/5 < 3/7)
- Other (satisfactory)

- More area (sometimes related to an image)
- Compares denominator only (7>5)
- Gap thinking (1< 3)
- Other (unsatisfactory)

f. $\frac{3}{7}$ $\frac{5}{8}$

- **Benchmarks to one half (3/7 < 1/2 & 5/8 > 1/2)**
- Converts to common denominator (35/56 > 24/56)
- Other (satisfactory)

- Residual thinking (3/8 < 4/7)
- "Higher" or "larger" numbers
- Gap thinking (3 < 4)
- Other (unsatisfactory)

(smaller denominator bigger pieces)

g. $\frac{5}{6}$ $\frac{7}{8}$

- **Residual thinking (1/6 > 1/8)**
- Converts to common denominator (21/24 >20/24 or 42/48 > 40/48)
- Other (satisfactory)

- "Higher" or "larger" numbers
- Gap thinking (both have a gap of one)
- Other (unsatisfactory)

h. $\frac{3}{4}$ $\frac{7}{9}$

- **Residual thinking with equivalence (2/8 > 2/9)**
- Residual thinking (1/4 > 2/9) with some other proof
- Converts to common denominator (28/36 > 27/36)
- Other (satisfactory)

- "Higher" or "larger" numbers
- Gap thinking (1 < 2)
- Other (unsatisfactory)

Descriptors:

5.1 Assess student learning (**the interview**)
5.3 Make consistent and comparable judgements (highlighted in green)
5.4 Interpret student data (highlighted in yellow)

Rational Number Assessment

Teacher report on your student's Rational Number Knowledge and any misconceptions

Jake has a clear understanding of proper fractions and the role of the numerator and denominator. Jake is aware that the numerator tells you how many parts are needed and the denominator tells you how many equal parts the whole is broken into. He is able to identify correctly fractions displayed on a pie chart, on pattern blocks and on dot arrays. Jake understands how to work out simple operations with fractions. For example: 1/5 of ten is 2, ½ of six is 3. Jake is competent in labelling proper fractions onto a number line, however is unable to label improper fractions. It is evident that Jake does not have a clear understanding of improper fractions as he can draw proper fractions, however finds it challenging to make sense of improper fractions. Jake was able to construct two fractions that when added together where close to one and has a very strong ability to identify which fraction pair is larger. He understands that if the denominators are the same, the numerator that is larger is the bigger fraction. Jake is aware that equivalent fractions are fractions with the same value (eg: 2/4 and 4/8). Jake used benchmarking and residual thinking to help him compare fractions and identify the larger fraction in the pair. Jake usually compared fractions to ½ when benchmarking.

Jake is able to identify the decimal on a number line by counting each interval. Jake found naming decimals in between two decimals given and identifying how many decimals are in between two decimals challenging. Jake was able to correctly make decimals that were given to him verbally. In order to do this Jake had to draw out a decimal place value chart to help him label the decimal point and zeros accurately. Jake needs assistance with ordering decimals. Jake was unaware that 1.7 and 1.70 are equivalent, he did not understand the role of zero and chose the larger fraction as the largest number. Jake has the misconception that larger the decimal, larger the number. This is evident when he had to identify which decimals were bigger in a pair.

Comment [JV1]: 5.1 Assess student learning

Interviews are a formal form of assessment. Interviews can be used as a diagnostic assessment, so that teachers can gain knowledge about the student's current mathematical knowledge and thinking. This takes place at the start of a unit.

Interviews can also be used as a summative assessment so that teachers can identify what the students have learnt throughout the unit. This would take place at the end of the unit.

Comment [JV2]: 5.4 Interpret student data

I had to interpret student data and then evaluate the students learning by looking at the mathematics interview.

In these two paragraphs I have identified what the student could do, how he solved the mathematical problems and areas that he found challenging.

It is vital that teachers evaluate student data as it helps them plan future lessons and helps them modify teaching practices.

Critical evaluation of the usefulness of mathematics interviews for gaining knowledge about students' current mathematical knowledge that can be used to plan future learning opportunities.

Interviews are a useful assessment strategy for gaining knowledge about a student's current mathematical knowledge and thinking. Mathematical interviews are an effective assessment strategy as they give teachers an insight into how students think and reason, this is a main component of pedagogical content knowledge (Jenkins, 2009 and Clarke, Mitchell and Roche, 2005). Jenkins (2009) indicates that "Students' mathematical thinking is characterized primarily in terms of how students make sense of mathematics—the strategies they apply to problem situations, the mathematical representations they create, the arguments they make, and the conceptual understandings they demonstrate" (p.442). Interviews help teachers understand how the student thinks mathematically; they can see how students work out problems, what strategies they use and lastly how they reason and justify their thinking (Jenkins, 2009 and Clarke, Mitchell and Roche, 2005). Interviews enable teachers to "think about their students, the mathematics they are learning, the tasks that are appropriate for the learning of that mathematics, and the questions that need to be asked to lead them to better understanding'' (Sowder, 2007, cited in Clarke, Clarke and Roche, 2011, p. 906).

Mathematic interviews help teachers cater for all students and plan engaging mathematic lessons that enable students to demonstrate their understanding. Interviews help teachers understand their students. They are able to identify what students know and what students need help with. If they have a clear picture of how students learn and their learning styles, they would be able to plan effective and appropriate lessons to help all students achieve their goals (Clarke, Mitchell and Roche, 2005). Interviews help teachers identify students "misconceptions and error patterns in computation" (Ashlock, 2002, cited in Moyer and Milewicz, 2002, p.295). Teachers can identify what students need assistance with, modify lessons so they meet students' needs and help to improve their performance. Interviews are effective as it gives you a chance to sit down with each student. In every classroom, there is at least one student who does not participate in class or group discussions. Interviews gives teachers an opportunity to sit down and have one on one time with these students (Clarke, Mitchell and Roche, 2005). Teachers are able to see what these students know and can do in order to cater for them.

Teachers gain insights of student's mathematical thinking through questioning. Questioning is very effective as you are able to get an insight to what a student is thinking or how they worked out a problem. Moyer and Milewicz (2002) states that "Teachers who can question effectively at various levels within the cognitive domain, such as knowledge, comprehension, application, analysis, synthesis, and evaluation (Bloom, 1956), are better able to discern the range and depth of children's thinking" (p.293). Teachers can ask questions that enable students to extend their learning, such as, can you do that a quicker way? Is there another method to work this question out? Is there a pattern? Does that method always work? Interviews also teach teachers to wait for students responses (Clarke, Mitchell and Roche, 2005). Giving student's time to think after asking a question is very important, as students have time to think about what is asked and are able to come up with a rich response.

Overall, interviews are an effective assessment strategy into finding out how students think and make sense of math's; they help teachers plan tasks that meet all students' needs.

Comment [JV3]: 5.1 Assess student learning

Interviews are a formal form of assessment. Interviews can be used as a diagnostic assessment, so that teachers can gain knowledge about the student's current mathematical knowledge and thinking. This takes place at the start of a unit.

Interviews can also be used as a summative assessment so that teachers can identify what the students have learnt throughout the unit. This would take place at the end of the unit.

Comment [JV4]: 5.3 Make consistent and comparable judgments

Interviews are a useful assessment strategy for gaining knowledge about the student's current mathematical knowledge and thinking. They help teachers understand what students know and areas that they find challenging. This helps the teacher plan effective and appropriate lessons to help all students achieve their goals.

Comment [JV5]: 5.3 Make consistent and comparable judgements.

Interviews are effective as teachers are able to gain an understanding of the student's mathematical thinking through questioning. Students are able to identify how the student solved the problem and why they solved it the way they did.

Critical evaluation of the usefulness of Open Tasks with Rubrics for gaining knowledge about students' current mathematical knowledge that can be used to plan future learning opportunities.

Open tasks with rubrics are successful in gaining knowledge about student's current mathematical knowledge and thinking. Open tasks are effective as they enable the whole class to participate, they can easily be modified or extended in order to scaffold learning (Ferguson, 2009). Varygiannes (2014) states that open tasks promote "engagement in tasks that will enable our students to reason effectively, use systems thinking, make judgments and decisions, and solve problems" (p.278). Teachers can assess these open tasks with rubrics. Rubrics are a set of criteria that include descriptions of levels of performance (Stevens and Levi, 2012 and Reys et al., 2012).

Open tasks with rubrics help teachers identify what students know and do not know, as they are able to explore mathematical concepts independently. Open tasks allows students to independently investigate a problem, generalise, make their own decisions and identify alternatives. Open tasks have multiple answers to the problem and enable students to answer the question using their choice of strategies, methods and mathematical representations (Varygiannes, 2014). Using a **rubric** can help the teacher justify where the student is at with their learning in order to help them plan future lessons. Sullivan, Griffioen, Gray & Powers (2009) indicates that, "students might approach the tasks arithmetically, or they might seek more generalised solutions" (p. 5). Open tasks with rubrics help teachers understand that children learn and think differently and help them identify student's strengths and areas for improvement.

Open tasks with rubrics enable teachers to gain a realistic insight into a student's learning, as these tasks are problematic and require higher level thinking (Ferguson, 2009). Open tasks focus on concepts rather than on procedures or recalling mathematical facts. Students have to think of an appropriate method, strategy or representation to solve the problem they are given. Rubrics help teachers assess the student's mathematical knowledge and thinking, their ability to solve the problem and their strategies. Sullivan, Griffioen, Gray & Powers (2009), states that open tasks allow, "opportunities for creativity and active decision making by the students with the advantage that one task can be applicable to a wide range of levels of understanding" (p. 5). Open tasks with rubrics help teachers assist students, cater for all students learning styles, modify, and extend lessons to suit student's needs.

How this excerpt demonstrates my understanding of the focus area 5.3:
Using rubrics to assess students' work enables teachers to engage in assessment moderation practices to ensure consistent and comparable judgements are made against the rubric criteria. This practice ensures students are marked fairly.

Comment [JV6]: 5.3 Make consistent and comparable judgements.

These two paragraphs indicate that open tasks with rubrics are an effective assessment strategy as you are able to gain knowledge about students' current mathematical thinking.

Open tasks are effective as every student is able to participate at their own level and comfort. They can be easily modified or extended to meet the needs of every student.

Comment [JV7]:
5.3 Make consistent and comparable judgments.

Open tasks help teachers identify what a student can do and what a student finds difficult.

Comment [JV8]: 5.3 Make consistent and comparable judgements.

Rubrics can help teachers justify where the student is at with their learning. This will help them plan future lessons.

Comment [JV9]: 5.3 Make consistent and comparable judgements.

Open tasks enable students to use any methods, strategies or representations they know to solve a problem.
Students are able to choose the method, strategy or representation that they feel comfortable with, as there are many ways of working out a mathematical problem.

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Rational Number - Open Task

Name: Jessica Vella

Your friend rolled 2 ten-sided dice (0-9) and used the numbers to make a fraction. She made a fraction between 4/9 and 4/6. What could this fraction be?

Show a range of solutions (as many as possible).

Explain whether you believe you have found all solutions or not, including how you know that all solutions have/haven't been found.

$$\frac{4}{9} \quad \frac{\square}{\square} \quad \frac{4}{6}$$

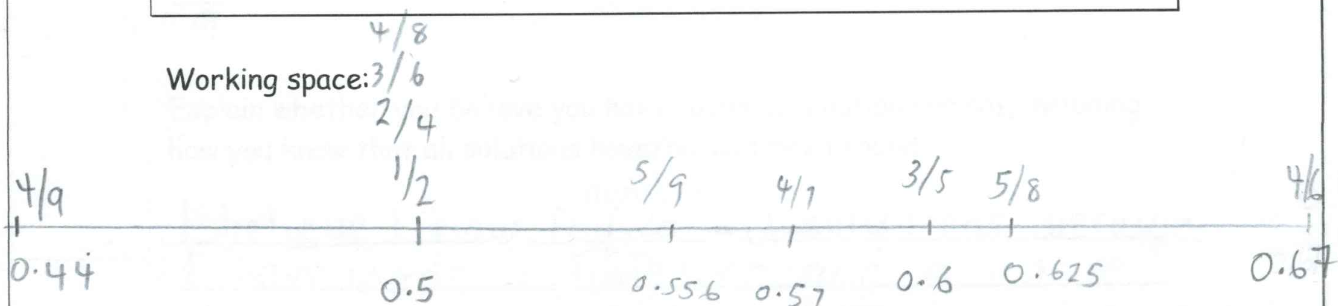
<u>Solutions</u>:

$\frac{1}{2}$, $\frac{2}{4}$, $\frac{3}{6}$, $\frac{4}{8}$

$\frac{5}{9}$, $\frac{4}{7}$, $\frac{3}{5}$, $\frac{5}{8}$

✓

Working space:



*Lattice diagram

Working space (cont'd):
(Please attach extra sheets if more working space required)

DIE 1 (Numerator)

DIE 2 (Denominator)

	0	1	2	3	4	5	6	7	8	9
0	0/0									
1	0/1	1/1								
2	0/2	1/2	2/2							
3	0/3	1/3	2/3	3/3						
4	0/4	1/4	2/4	3/4	4/4					
5	0/5	1/5	2/5	3/5	4/5	5/5				
6	0/6	1/6	2/6	3/6	4/6	5/6	6/6			
7	0/7	1/7	2/7	3/7	4/7	5/7	6/7	7/7		
8	0/8	1/8	2/8	3/8	4/8	5/8	6/8	7/8	8/8	
9	0/9	1/9	2/9	3/9	4/9	5/9	6/9	7/9	8/9	9/9

$\frac{4}{6} = 0.67$

$\frac{4}{9} = 0.44$

Explain whether you believe you have found all solutions or not, including how you know that all solutions have/haven't been found.

I believe I have found all solutions because I have made a time [number] line and a lattice diagram to prove that there is only 8 solutions. I converted the fractions into decimals so that it was easier to compare the fractions.

I found that the lattice diagram was a better way of visually working out the problem as I can identify all possibilities.

Rational Number Open Task – Rubric

Goes Beyond	Student is able to identify all eight fractions in-between 4/9 and 4/6 which are 1/2, 2/4, 3/6, 4/8, 5/9, 4/7, 3/5 and 5/8. Student was able to communicate their solutions effectively by using multiple (more than one), appropriate mathematical models/representations. (Example: Lattice diagram, timeline or fraction wall). Student demonstrates a clear understanding of the task by using one or more efficient mathematical strategies that is suitable for the task. (Example: Benchmarking, finding equivalent fractions, converting fractions to decimals and has an understanding of common denominators). Evidence is used to clearly explain and justify whether they believed they found all solutions or not, including how they know that all solutions were found or not.
Task Accomplished	Student was able to resolve all eight fractions that were in-between 4/9 and 4/6 (1/2, 2/4, 3/6, 4/8, 5/9, 4/7, 3/5 and 5/8). Student was competent in expressing their solutions and solving the task using one appropriate mathematical model/representation. (Example: Lattice diagram, number line or fraction wall). Student was able to display a clear understanding of the task by using a correct mathematical strategy such as benchmarking, finding equivalent fractions or converting fractions to decimals. Student clearly explained whether they believed they found all solutions or not, including a justification of how they know that all solutions were found or not.

Substantial Progress	Student was able to resolve several (3-6) fractions in-between 4/9 and 4/6 (1/2, 2/4, 3/6, 4/8, 5/9, 4/7, 3/5 and 5/8). Student attempts to use a mathematical model/ representation to display their solutions. Student was able to use a suitable strategy to find fractions such as converting fractions to decimals, benchmarking or finding equivalent fractions to assist them, however was unable to find all eight fractions. There was some correct explanations to whether they believed they found all solutions or not, and justifications to how they know all solutions where found or not.
Some Progress	Student was able to attempt the problem by finding several correct solutions (3-6 fractions). The student used a suitable strategy for finding several fractions in-between 4/9 and 4/6 (Example: benchmarking, equivalence, converting fractions to decimals). The student ineffectively communicated the fractions that they found. The student did not use a mathematical representation/model to communicate clearly their solutions. There is some correct reasoning to whether they believed they found all solutions or not, however student did not justify how they know.
Little Progress	Student made little or no evidence of engagement in the task. Student was able to find one or two correct fractions in between 4/9 and 4/6 (1/2, 2/4, 3/6, 4/8, 5/9, 4/7, 3/5 and 5/8). There is no strategy or attempt made in developing a method or constructing a mathematical model or representation. (Student may have misunderstood the problem).