Year 6	Western Adelaide Region - Maths Assessment Tasks Map *(Draft –November 2013)*							Proficiency Strands
Aims	**The Australian Curriculum Mathematics aims to ensure that students**……are confident, creative users and communicators of mathematics, able to investigate, represent and interpret situations in their personal and work lives and as active citizens; develop an increasingly sophisticated understanding of mathematical concepts and fluency with processes, and are able to pose and solve problems and reason in *Number and Algebra, Measurement and Geometry, and Statistics and Probability*; recognise connections between the areas of mathematics and other disciplines and appreciate mathematics as an accessible and enjoyable discipline to study.							• Understanding • Fluency • Problem Solving • Reasoning
Content Strands	**Number & Algebra**							
Sub Strands	**Number & Place Value**			**Fractions and Decimals**			**Money and Financial Mathematics**	**Patterns & Algebra**
Big Idea / Concept/ Key Understanding	Additive to Multiplicative Thinking			Partitioning			-Discounts can be efficiently and mentally calculated by drawing on knowledge of place value, fractions and decimals -Creating budgeting plans assists in achieving financial goals	-A pattern requires an element of repetition that can be described and generalised with a pattern rule -Patterns can be represented in many ways and can consist of multiple operations and inverse operations
	-Numbers have special properties that can be used to solve problems *(e.g. factor, multiple, prime)* -If a number is divisible by a composite number then it is also divisible by the prime factors of that number *(e.g. 216 is divisible by 8 because the number represented by the last 3 digits is divisible by 8, and therefore is also divisible by 2 and 4)* -An integer is any whole number that is positive, negative or zero			-The decimal numeral system has 10 as the base. A decimal is a tenth part. -Decimals are multiplied and divided using powers of 10 -A decimal fraction is a fraction whose denominator is a power of ten *(e.g. 6 tenths, 6 hundredths, 6 thousandths, etc.)*	-The denominator of a fraction names the part. The numerator tells their number -- how many -A unit fraction is a fraction whose numerator is 1 *(e.g. 1/3: in 2/3 the unit is 1/3 and we have 2 of them)* -Representations of quantities can be expressed as decimals, fractions and percentage -Drawing representations of fractions can assist when comparing fractions with like and unlike denominators -An integer is any whole number that is positive, negative or zero			
Australian Curriculum Content Descriptor	Identify and describe properties of prime, composite, square and triangular numbers	Investigate everyday situations that use integers Locate and represent these numbers on a number line	Select and apply efficient mental and written strategies and appropriate digital technologies to solve problems involving all four operations with whole numbers	Add and subtract decimals, with and without digital technologies, and use estimation and rounding to check the reasonableness of answers Multiply decimals by whole numbers and perform divisions by non-zero whole numbers where the results are terminating decimals, with and without digital technologies Multiply and divide decimals by powers of 10	Make connections between equivalent fractions, decimals and percentages Solve problems involving addition and subtraction of fractions with the same or related denominators	Find a simple fraction of a quantity where the result is a whole number, with and without digital technologies Compare fractions with related denominators and locate and represent them on a number line	Investigate and calculate percentage discounts of 10%, 25% and 50% on sale items, with and without digital technologies	Continue and create sequences involving whole numbers, fractions and decimals. Describe the rule used to create the sequence Explore the use of brackets and order of operations to write number sentences
Achievement Standard	Students **recognise the properties of prime, composite, square and triangular numbers**	Students **describe the use of integers** in everyday contexts	Students **solve problems involving all four operations** with whole numbers	Students **make connections between the powers of 10 and the multiplication and division of decimals** Students **add, subtract and multiply decimals and divide decimals** where the result is rational	Students **connect fractions, decimals and percentages** as different representations of the same number. Students **solve problems involving the addition and subtraction of related fractions**	Students **calculate a simple fraction of a quantity** Students **locate fractions and integers on a number line**	Students **calculate common percentage** discounts on sale items	Students **describe rules used in sequences involving whole numbers, fractions and decimals** Students **write correct number sentences using brackets and order of operations**
Summative Assessment Task		**6.1** Best Burgers			**6.2** Sports Field	**6.3** Brownies		**6.4** Target Number

Developed by Karly Hefferan, Chris Miethke, Susan Glaister, Karen Knox, Lauren Fletcher-Rees & Dawn Dyer

6.1 – Number & Place Value

Identify, describe and locate integers

Western Adelaide Region
Mathematics Performance Assessment Tasks *(Updated: November 2013)*

Year 6

Big Idea(s)
-Numbers have special properties that can be used to solve problems *(e.g. factor, multiple, prime).*
-An integer is any whole number that is positive, negative or zero.

Australian Curriculum Content Descriptor
Investigate everyday situations that use integers. Locate and represent these numbers on a number line.

Achievement Standard
By the end of Year 6, students describe the use of integers in everyday contexts.

Related Mathematical Proficiencies
- *Understanding* includes describing properties of different sets of numbers
- *Fluency* includes representing integers on a number line

Prior Learning Experiences

Do I use ongoing Formative Assessment to inform the teaching & learning cycle? Do I provide learning experiences that enable students to build on their knowledge?

It is important that students have had experiences with the learning opportunities below before administrating the assessment task.

Developing:
Understanding Fluency Problem Solving Reasoning

Through experiences with:
- Mental routines involving the 4 operations
- Fluency and automaticity of basic number facts – exploring different strategies *(not rote learning)*
- Exploring a range of strategies involving the 4 operations *(e.g. chunking, partial algorithms, open number lines, lattice and area models for multiplication, partitioning for division, formal operations- last)*
- Reflection to discuss and share efficient strategies for problem solving with the 4 operations
- Problem Solving situations involving the 4 operations, including multi-step problems
- A range of experiences with addition, subtraction, multiplication and division strategies, using both mental and written computation
- Locating and highlighting the relevant information and facts in worded problems
- Vocabulary development of key terminology
- Using estimation and approximation before solving a problem as a strategy
- Locating and ordering integers (positive and negative) on a number line
- Place value of larger numbers, including ordering and sequencing on open number lines

Feedback

How will I provide feedback to students?

Teacher observations

Conferences 1:1 with peers & teacher

Learning log: Student identifies areas for focus

SNW (S- strengths, N – needing improvement, W- where to next)

Stars/smiley faces

Summative Assessment

*Does the assessment task indicate **how well** students understand and can apply their learning? (**how well** = extent, depth and sophistication of thinking – informs A-E grading)*

Best Burgers *(see attachment 6.1)*

Entry Level
The Best Burger shop pays its staff weekly wages. Best Burger is a small business and it employs 4 people. Every week the 2 cooks work 35 hours each for $20 an hour and the 2 waiters work 30 hours each week for $15 an hour. How much altogether does Best Burgers pay its 4 employees each week?

Challenge Level
1. How much more money does a cook earn than a waiter per week?
2. Jane, one of the cooks, is saving to buy a car valued at $4500. She has already saved $750. How much more money does she need?
3. Jane plans to save $200 per week. How long will it take her to save the rest of the money needed to buy the car?
4. How could you represent how long it will take Jane to buy the car using a number line?

Explain how you worked out your answers.

Questioning *– "Which operations did you use to help you solve the problem?" "How can you check your answers?" "How could using estimation help you solve the problem?" "Is there a more efficient strategy you could have used?" "Could you write a similar problem of your own?"*

Organisation
Teacher – Provide students with problem page (see attachment 6.1); explain any unfamiliar terms *(e.g. wages)*
Students – Best Burgers problem (attachment 6.1); pencil/pen

Evidence

What evidence am I looking for that demonstrates the student has got it?

Students will:
- Demonstrate knowledge by successfully using efficient strategies to solve the given problem.
- Show understanding by explaining strategies used and applying their knowledge to solve more complex questions.

Advanced – Students demonstrate appropriate and efficient strategies to accurately calculate the earnings of the staff in the given problem. They are able to identify money required to purchase an item and the length of time this would take. They represent stages in savings using a number line. They clearly explain strategies used and justify their answers using mathematical reasoning.

Competent – Students accurately calculate wages paid to all employees and explain their thinking using mathematical language. They use efficient strategies to solve the problem. They attempt to solve the challenge level problems with some success.

Developing – Students demonstrate some/little understanding in calculating the total wages of employees. They require support to attempt to solve the task. Some/little mathematical thinking is evident.

Solutions
Entry Level: $1400 Cooks $900 Waiters $2300 Total
Challenge Level:
1) $250 per week more
2) $3750 left to pay
3) 18 weeks (including final payment of $150)

6.2 – Fractions & Decimals

Connect fractions, decimals and percentages

Western Adelaide Region

Mathematics Performance Assessment Tasks *(Updated: November 2013)*

Year 6

Big Idea(s)

-Representations of quantities can be expressed as decimals, fractions and percentage.

-Drawing representations of fractions can assist when comparing fractions with like and unlike denominators.

Australian Curriculum Content Descriptor

Make connections between equivalent fractions, decimals and percentages.
Solve problems involving addition and subtraction of fractions with the same or related denominators.

Achievement Standard

By the end of Year 6, students connect fractions, decimals and percentages as different representations of the same number. They solve problems involving the addition and subtraction of related fractions.

Related Mathematical Proficiencies

- *Understanding* includes representing fractions and decimals in various ways and describing connections between them
- *Fluency* includes using operations with fractions, decimals & percentages
- *Problem Solving* includes formulating and solving authentic problems using fractions, decimals and percentages

Prior Learning Experiences

Do I use ongoing Formative Assessment to inform the teaching & learning cycle? Do I provide learning experiences that enable students to build on their knowledge?

It is important that students have had experiences with the learning opportunities below before administrating the assessment task.

Developing:
Understanding Fluency Problem Solving Reasoning

Through experiences with:

- Fractions, decimals and percentages games- bingo, barrier games, board games etc.
- Calculating fractions, percentages and decimals of a range of units *(i.e. collections, quantity, area, volume, whole number, time, ingredients)*
- Exploring graphs and charts involving percentages in real life situations
- Paper folding, cutting, fraction kits
- Dividing a whole into fraction, percentages and decimals
- Making, naming, recording parts of a whole *(i.e. collection, quantity, area, whole number, time)* as fractions, percentages and decimals
- Practice fluency converting between fractions, percentages and decimals
- Order fractions, decimals, percentages and decimals e.g. number line

Feedback

How will I provide feedback to students?

Teacher observations

Conferences 1:1 with peers & teacher

Learning log: Student identifies areas for focus

SNW (S- strengths, N – needing improvement, W- where to next)

Stars/smiley faces

Summative Assessment

*Does the assessment task indicate **how well** students understand and can apply their learning? (**how well** = extent, depth and sophistication of thinking – informs A-E grading)*

Design a Playing Field *(see attachment 6.2)*

Entry Level

The SRC were brainstorming ways in which they could modify their existing playing areas to allow more students to play at lunchtimes. They decided that the new playing area should include the following;

- 50% soccer/cricket pitch
- 25% netball/basketball courts
- 15% gym
- 10% playground

Record each area as a percentage, fraction and decimal.

Challenge Level

1. How might your design change if ¼ of the netball/basketball courts become a seating area? Draw your new design to include the new seating area.
How could you check your solutions? What fraction of the whole playing area would be used as a seating area? How did you work out the problem?

2. During the week the reception to year 2 students use the soccer/cricket pitch for $^{1}/_{10}$ of the time, while the year 3-5 students use it for $^{2}/_{5}$ of the time, and the remainder of the time is for the year 6-7 students. What fraction of time is the soccer/cricket pitch used by year 6-7 students? How did you work this out? Can you suggest other fractions for sharing the playing field? Explain your thinking.

Questioning *"How many ways can you divide the playing field?" "Which way is best and why?" "How could you work this out if you did not have grid paper?"*

Organisation

Teacher –attachment 6.2 or alternatively provide students with 1cm grid paper
Students – attachment 6.2; pencil; ruler

Evidence

What evidence am I looking for that demonstrates the student has got it?

Students will:

- Demonstrate knowledge by accurately representing percentages of a whole in a given word problem.
- Show understanding by accurately converting percentages to fractions and decimals and using this knowledge to solve given problems.

Advanced –Students demonstrate understanding of percentage by converting percentages to decimals and fractions. They explain how they solved their problem using mathematical terms. They successfully calculate the seating area as $^{1}/_{16}$ of the whole field, showing their working out and explaining their thinking. They accurately calculate $^{5}/_{10}$ of the time used by year 6/7 students (may convert $^{5}/_{10}$ to ½). They suggest other ways of sharing the time. They provide reasonable explanations for their choices.

Competent –Students demonstrate an understanding of percentages, fractions and decimals by successfully completing the entry level task. They explain how they solved the problem using mathematical language. They attempt the challenge activities with some success.

Developing –Students demonstrate some/little understanding of converting percentages to fractions and decimals. They attempt to divide the playing field using the given percentages.

6.3 – Fractions & Decimals

Calculate a simple fraction of a quantity and locate fractions on a number line

Western Adelaide Region

Mathematics Performance Assessment Tasks *(Updated: November 2013)*

Year 6

Big Idea(s)

-Representations of quantities can be expressed as decimals, fractions and percentage.

-Drawing representations of fractions can assist when comparing fractions with like and unlike denominators.

-An integer is any whole number that is positive, negative or zero.

Australian Curriculum Content Descriptor

Find a simple fraction of a quantity where the result is a whole number, with and without digital technologies.
Compare fractions with related denominators and locate and represent them on a number line.

Achievement Standard

By the end of Year 6, students calculate a simple fraction of a quantity. They locate fractions and integers on a number line.

Related Mathematical Proficiencies

- *Fluency* includes converting between fractions and decimals and using operations with fractions, decimals & percentages
- *Problem Solving* includes formulating and solving authentic problems using fractions, decimals and percentages

Prior Learning Experiences

Do I use ongoing Formative Assessment to inform the teaching & learning cycle? Do I provide learning experiences that enable students to build on their knowledge?

It is important that students have had experiences with the learning opportunities below before administrating the assessment task.

Developing:

Understanding Fluency Problem Solving Reasoning

Through experiences with:

- Modelling and exploring halves, quarters, thirds, fifths, eights, tenths, etc.
- Make, name and record fractions, including mixed numbers and improper fractions
- Counting by halves and thirds, including mixed numbers
- Representing fractions using fractions thinkboards – *(e.g. the answer is 1 ¼)*
- Investigating equivalent fractions
- Problem solving situations and rich tasks involving finding unknown fractions, explaining fractions, comparing fractions
- Patterning - adding and subtracting fractions
- Exploring fractions in real-world contexts – *(e.g. fractions of a quantity- sharing lollies)*
- Locating and recording common fractions on a number line 0-1, then on an open number line
- Place value to tenths and hundredths
- Fractions games – e.g. make a whole *(Professor Dianne Siemon)*

Feedback

How will I provide feedback to students?

Teacher observations

Conferences 1:1 with peers & teacher

Learning log: Student identifies areas for focus

SNW (S- strengths, N – needing improvement, W- where to next)

Stars/smiley faces

Summative Assessment

*Does the assessment task indicate **how well** students understand and can apply their learning? (**how well** = extent, depth and sophistication of thinking – informs A-E grading)*

Chocolate Brownies *(attachment 6.3)*

Entry Level

Marlene's friends were coming for morning tea. They asked if she could make her famous chocolate brownies. She knew two of her friends were on a diet so she wanted to cut down on the sugar in the recipe so all of her friends could enjoy them. She decided to only use $^2/_3$ of the amount of sugar mentioned in the recipe. **How much sugar will she need?**

Chocolate Brownies *(makes 12)*

250g butter
2 cups brown sugar
3 eggs
$^1/_3$ cup cocoa powder
2 ½ cups flour
¼ cup chopped walnuts
1½ tspn vanilla

Challenge Level

What if Marlene wanted to make 36 of her diet brownies for morning tea so her friends could each take some home with them? How much of each ingredient would be needed?

Questioning *– "How did you calculate $^2/_3$ of a quantity?" "What strategies did you use?" "How did your knowledge of fractions help you to solve the problem?" "Could you represent the solution in a different way?" "What strategies did you use to calculate multiple amounts of the recipe?"*

Organisation

Teacher – copies of attachment 6.3 or alternatively display the task on the board; paper for folding and fractions bars for students to use if they choose
Students – attachment 6.3 (optional); recording paper; whiteboards

Evidence

What evidence am I looking for that demonstrates the student has got it?

Students will:

- Demonstrate knowledge by calculating a simple fraction of a quantity.
- Show understanding by multiplying fractions to find a larger quantity required.

Advanced –Students demonstrate an understanding of fractions of a quantity by accurately identifying the amounts required when reducing and increasing ingredients in a recipe.

Competent –Students demonstrate an understanding of fractions of a quantity. They model and explain their thinking using mathematical terms and fractional diagrams. They may solve or attempt to solve a problem involving multiplying fractions.

Developing –Students demonstrate some/little understanding of fractions of a quantity and are unable to find an accurate solution to the problem. They attempt to use diagrams and symbols when problem solving. They are able to draw a diagram showing $^1/_3$, then $^2/_3$ when directed to.

6.4 – Patterns & Algebra *Describe number sequences using whole numbers, fractions & decimals*	Western Adelaide Region **Mathematics Performance Assessment Tasks** *(Updated: November 2013)*	Year 6

Big Idea(s)

-A pattern requires an element of repetition that can be described and generalised with a pattern rule.

-Patterns can be represented in many ways and can consist of multiple operations and inverse operations.

Australian Curriculum Content Descriptor

Continue and create sequences involving whole numbers, fractions and decimals. Describe the rule used to create the sequence.
Explore the use of brackets and order of operations to write number sentences.

Achievement Standard

By the end of Year 6, students describe rules used in sequences involving whole numbers, fractions and decimals. They write correct number sentences using brackets and order of operations.

Related Mathematical Proficiencies

- *Understanding* includes representing fractions and decimals in various ways
- *Fluency* includes using brackets appropriately
- *Reasoning* includes describing results for continuing number sequences

Prior Learning Experiences

Do I use ongoing Formative Assessment to inform the teaching & learning cycle? Do I provide learning experiences that enable students to build on their knowledge?

It is important that students have had experiences with the learning opportunities below before administrating the assessment task.

Developing:

Understanding Fluency Problem Solving Reasoning

Through experiences with:

- Number patterns
- Unknown number sentences
- Addition, subtraction, multiplication and division
- Multiples and factors
- Problem solving involving the 4 operations
- Landmark numbers (25, 50, 75, 100)
- Using calculators
- Explore number patterns & revisit efficient strategies for mental computation
- Problem solving situations & investigations involving multi-step and combinations of the four operations
- Explore how to use a calculator to assist with order of operations
- Practise recording number sentences as multi-step solutions (over a number of lines) to show working out & strategies used
- Explore formulas in Excel using brackets

BEDMAS

1. Calculations must be done from left to right.
2. Calculations in brackets (parenthesis) are done first. When you have more than one set of brackets, do the inner brackets first.
3. Exponents/Orders (or radicals) must be done next.
4. Multiply and divide in the order the operations occur.
5. Add and subtract in the order the operations occur.

Feedback

How will I provide feedback to students?

Teacher observations

Conferences 1:1 with peers & teacher

Learning log: Student identifies areas for focus

SNW (S- strengths, N – needing improvement, W- where to next)

Stars/smiley faces

Summative Assessment

*Does the assessment task indicate **how well** students understand and can apply their learning? (**how well** = extent, depth and sophistication of thinking – informs A-E grading)*

Target Number *(Calculator Task)*

Entry Level

Your challenge is to get to the target number of 300, or as close to 300 as you can get using the numbers 3, 4, 9, 25, 75 and 100. You need to use at least 3 different operations (+, -, x, ÷).
You can use a calculator, however you need to record your thinking.

Challenge Level

Is there another way?
What if you didn't need to use all the numbers?
What if you needed to use each operation at least once?
What is the highest number you can make with all 6 digits? What is the smallest number you can make?

Questioning *– "What strategies did you use?" "Is there another way?" "What did you find challenging? Easy?" "Are there any patterns?" "If you could choose 6 numbers what would you choose and why?"*

Organisation

Teacher – record the 6 digits on the board and each operation to be used; calculators 1 per student
Students – working out paper; calculator; eraser; pencil

Evidence

What evidence am I looking for that demonstrates the student has got it?

Students will:

- Demonstrate knowledge by describing appropriate strategies for problem solving.
- Show understanding by recording number sentences using order of operations.

Advanced –Students demonstrate multiple ways of solving the problem. They use brackets to demonstrate an understanding of order of operations. They demonstrate deep knowledge of multiplying using landmark numbers and identifying patterns. They use each of the four operations and explain any rules and patterns used to solve the task.

Competent –Students demonstrate multiple attempts at solving the problem, moving closer to finding a solution with each attempt. They identify a strategy and show understanding of landmark numbers. They explain their strategies using mathematical thinking.

Developing –Students demonstrate some/little understanding of the problem. They are unable to independently identify strategies that will assist in finding a solution.

POSSIBLE SOLUTION:
Competent- (9x25)+100-75=300
Advanced- (9x25)+100-75÷1=300

Attachment 6.1 – Best Burgers

6.1 Best Burgers

The Problem

The Best Burger shop employs 4 people. The 2 cooks work 35 hours each per week for $20 an hour. The 2 waiters work 30 hours each week for $15 an hour.

How much altogether does Best Burgers pay its 4 employees each week?

Challenge

1. How much more money does a cook earn than a waiter per week?

2. Jane, one of the cooks, is saving to buy a car valued at $4500.
   She has already saved $750. How much more money does she need?
   Jane plans to save $200 per week. How long will it take her to save the rest of the money needed to buy the car?

Explain how you worked out your answers.

6.1 Best Burgers

The Problem

The Best Burger shop employs 4 people. The 2 cooks work 35 hours each per week for $20 an hour. The 2 waiters work 30 hours each week for $15 an hour.

How much altogether does Best Burgers pay its 4 employees each week?

Challenge

1. How much more money does a cook earn than a waiter per week?

2. Jane, one of the cooks, is saving to buy a car valued at $4500.
   She has already saved $750. How much more money does she need?
   Jane plans to save $200 per week. How long will it take her to save the rest of the money needed to buy the car?

Explain how you worked out your answers.

6.2 The Playing Field

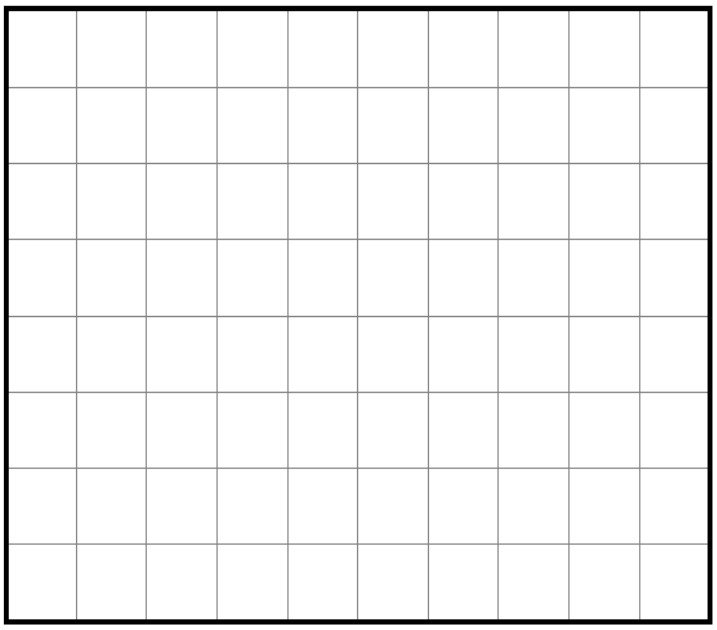
The Problem

Create a design for the playing area of a new school. Include the following

- 50% soccer/cricket pitch
- 25% netball/basketball courts
- 15% gym
- 10% playground

Express these percentages as fractions and decimals.

The whole Playing Field



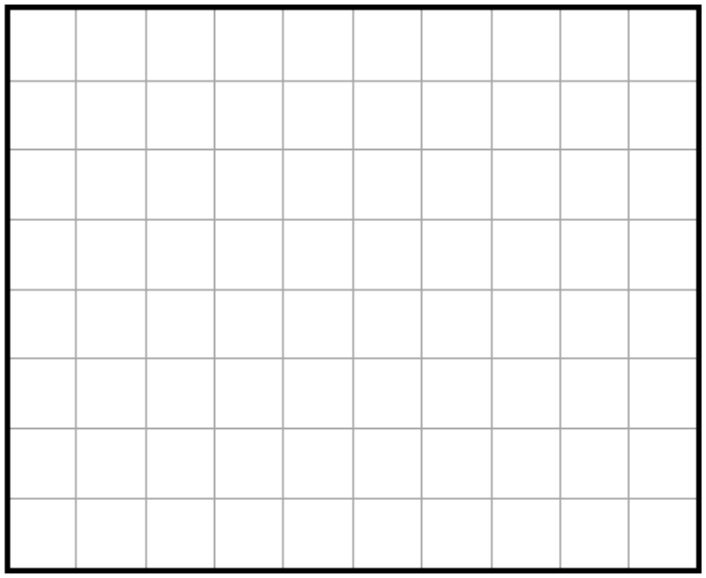
Challenge

1. How might your design change if ¼ of the netball/basketball courts became a seating area? Draw your new design to include the seating area. How do you know you are right?
What fraction of the whole playing area would be used as a seating area? How did you work this out?

2. During the week, Rec – year 2 students use the soccer/cricket pitch for $^1/_{10}$ of the time. Year 3-5 students use it for $^2/_5$ of the time, and the remainder of the time is for the year 6-7 students.
What fraction of time is the soccer/cricket pitch used by year 6-7 students?
How did you work this out?

Can you suggest other fractions for sharing the playing field?
Explain your thinking.

Redesign the playing field to include the tennis court



Name:

Date:

Chocolate Brownies

Marlene's friends were coming for morning tea. They asked if she could make her famous chocolate brownies. She knew two of her friends were on a diet so she wanted to cut down on the sugar in the recipe so all of her friends could enjoy them. She decided to only use 2/3 of the amount of sugar mentioned in the recipe.

How much sugar will she need?

Chocolate Brownies *(makes 12)*

250g butter
2 cups brown sugar
3 eggs
1/3 cup cocoa powder
2 ½ cups flour
¼ cup chopped walnuts
1½ tspn vanilla

What if Marlene wanted to make 36 brownies for morning tea so her friends could each take some home with them? How much of each ingredient would be needed?