The Asian International School
Unit Backward Design
Mathematics, Starter, 2018-2019
Topic: Adding and Subtracting Fractions

Stage 1 - Desired Results

Established Goal(s)

Students will understand the basic concepts underlying operations on fractions that will serve as foundation for learning higher mathematics. Students will use their understanding of adding and subtracting fractions in solving real-life problems involving parts of a whole.

Understandings:	Essential Questions:
Students will understand that…	
	• How do we add and subtract fractions with the same denominators?
• To add or subtract fractions, they must have common denominators.	• How do we add and subtract fractions with different denominators?
• Similar fractions are fractions with the same or common denominators.	• In what way is the numerator different from the denominator?
• Unlike fractions are fractions with different denominators.	

Knowledge:	Skills:
Students will know…	*Student will be able to:*
• Add fractions with the same denominators	• Identify common denominator of the given fractions
• Add fractions with different denominators	• Adding fractions with the same denominators
• Subtract fractions with the same denominators	• Adding fractions with different denominators
• Subtract fractions with different denominators	• Subtracting fractions with the same denominators
	• Subtracting fractions with different denominators
• Commutative, Associative, zero property of fractions	• Apply commutative, associative, and zero property in fractions

Stage 2 - Assessment Evidence

Performance tasks:	Other Evidence:
• Hit the apple	• Group work
• Demonstrate the learning object to the class and discuss the dynamically linked components.	• Individual work
	• Board work
	• Computer presentation
• One denominator is fixed but the other denominator and both numerators can be adjusted to create the desired fractions.	• Worksheets
	• Math Links7 Homework activities

- As the fractions change, their fraction bars also change, as does their total on the vertical number line. - Number lines - This activity uses eighths, but can be adjusted to use other fractions and diagrams. Examples of <u>same denominator problems</u> are available. - Together the class constructs a number line from 0 to 2, labelled with eighths. The line should be labelled with both improper fractions and mixed numbers. - Present a contextual problem. - The family bought some pizzas. I ate 48 of the pepperoni pizza and 38 of the ham and pineapple pizza. How much pizza did I eat?	Math Links 7 Workbook

Stage 3 – Learning Plan

Learning Activities
Session 1
- Add and subtract fractions with the same denominator.
Introduce
♫"If adding or subtracting is your aim, The bottom numbers must be the same!
♫"Changing bottom with multiply or divide, The same to top must be applied,
♫"And don't forget to simplify, Before its time to say good bye"
- https://www.skillsyouneed.com/num/fractions.html
- Math Links 7C Textbook

Session 2
- Add and subtract fractions with the same denominator.
  - o Identify common denominator of the given fractions

- https://www.skillsyouneed.com/num/fractions.html
- Math Links 7C Textbook

Session 3
- Properties of fraction
  - o Commutative
  - o Associative
  - o zero
http://web.mnstate.edu/peil/MDEV102/U3/S22/S226.html

The Asian International School
Unit Backward Design
Mathematics, Starter, 2018-2019
Topic: Angle Pair

Stage 1 - Desired Results

Established Goal(s)

Identify and describe geometric relationships between angles formed when parallel lines are cut by a transversal: Use alternate interior, alternate exterior or corresponding angles 8.2.A.2.a. Determine the measurements of angles formed by parallel lines cut by a transversal line.

Understandings:	Essential Questions:
Students will understand that…	• How can I compare properties of basic figures?
• Adjacent angles have a common side and a common vertex (corner point) and don't overlap.	
• Two angles are Complementary when they add up to 90 degrees (a Right Angle ⌐).	
• Two Angles are Supplementary when they add up to 180 degrees.	

Knowledge:	Skills
Students will know…	*Student will be able to:*
• Adjacent angles	• Identify adjacent, complementary and supplementary angles
• Complementary angles	• Name adjacent, complementary and supplementary angles
• Supplementary angles	
• Linear pair (both adjacent and supplementary angles).	

Stage 2 - Assessment Evidence

Performance tasks:	Other Evidence:
• Tour anywhere.	• Summative Assessments / Short Quiz
	• Board work Activities
	• Math Links7 Homework activities
	• Math Links 7 Workbook
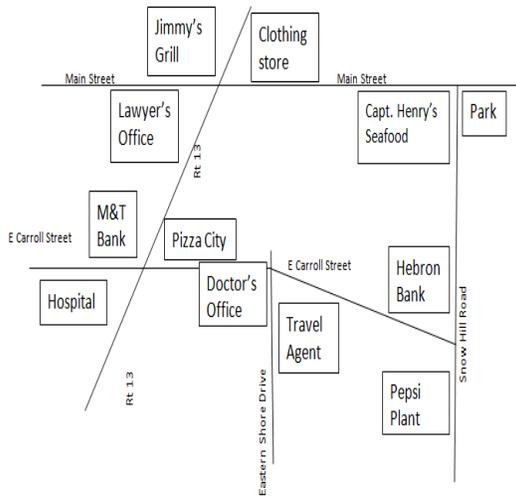
1) What building is located at an adjacent angle to the Travel Agent?

2) What building is located at an angle that is vertical to Pizza City?

3) What building is located at an angle that is supplementary to the hospital?

4) What building is located at an angle that is adjacent to the lawyer's office?

5) If the corner that the Hebron Bank is located on measures $85°$, what is the measure of the corner where the Pepsi Plant is located? What word describes this relationship?

6) If the corner that the lawyer's office is on measures $78°$, what is the measure of the corner where the clothing store is located? What word describes this relationship?

•

Stage 3 – Learning Plan

Learning Activities
Session 1
- Identifying angle pairs
  - Adjacent
  - complementary
  - supplementary angles
  - Linear pair (both adjacent and supplementary angles).
Session 2
- Naming angles
  - Adjacent
  - complementary
  - supplementary angles

The Asian International School
Unit Backward Design
Mathematics, Starter, 2018-2019
Topic: Angles and Angle Notation

Stage 1 - Desired Results

Established Goal(s)

Geometric figures can be analyzed based on their properties. Geometric figures can be classified based on their properties. Parallel sides, particular angle measures, and symmetry can be used to classify geometric figures. Two lines are parallel if they never intersect and are always equidistant.

Understandings:
Students will understand that…

Acute Angle	an angle that is less than 90°
Right Angle	an angle that is 90° exactly
Obtuse Angle	an angle that is greater than 90° but less than 180°
Straight Angle	an angle that is 180° exactly
Reflex Angle	an angle that is greater than 180°

●

Essential Questions:

- How can you describe the relationships among the angles of a triangle?
- How are geometric objects different from one another?
- What makes an angle a right angle?
- How can you use only a right angle to classify all angles?

Knowledge:
Students will know…

- Half-plane

- Ray lies between two rays

- Angles

    o   Naming angles

    o   Acute, right, obtuse, straight and reflex angle

- Measuring Angles.

Skills:
Student will be able to:

- Name a half-plane
- Give examples of half-planes
- Construct a ray between two other rays
- Name angles (θ)
- Identify acute, right, obtuse straight and reflex angles
- Measure angles with a protractor

Stage 2 - Assessment Evidence

Performance tasks:
- Is This the Right Angle?
- My Many Triangles.
  https://www.georgiastandards.org/Georgia-

Other Evidence:

- Summative Assessments / Short Quiz

- Board work Activities

| Standards/Frameworks/4th-Math-Unit-6.pdf | • Math Links7 Homework activities |
| | • Math Links 7 Workbook |

Stage 3 – Learning Plan

Learning Activities

Session 1

- Half-plane

- Ray lies between two rays

http://www.mathsisfun.com/angles.html

Session 2

- Angles

  o Naming angles

    ▪ Acute

    ▪ Right

    ▪ Obtuse

    ▪ straight an

    ▪ reflex angle

http://www.mathsisfun.com/angles.html

Session 3

- Measure angles with a protractor.

http://www.mathsisfun.com/angles.html

The Asian International School
Unit Backward Design
Mathematics, Starter, 2018-2019
Topic: Circles

Stage 1 - Desired Results

Established Goal(s)

At the end of this unit, students will learn to...
- Measure angles inside the circle
- Construct a circle with a given radius or diameter

Understandings:	Essential Questions:
Students will understand that…	
• A circle is the set of all points equidistant from a given point.	• How do you determine the measure of angles formed by chords?
• The point from which all the points on a circle are equidistant is called the center of the circle, and the distance from that point to the circle is called the radius of the circle.	• How can you use circles to solve real world problems?
•	

Knowledge:	Skills:
Students will know…	*Student will be able to:*
	• Define center, radius, diameter, points (Interior, exterior, on the circle), arcs and chords
• Terminologies	• Measuring angles inside the circle
o Center	• Construct a circle with a given radius or diameter
o Radius	
o Diameter	
o Points (Interior, exterior, on the circle)	
o Arcs	
o Chords	
• Degree measure of an angle inside the circle	

Stage 2 - Assessment Evidence

Performance tasks:	Other Evidence:
• Create a crop circle. https://daniellagher.wordpress.com/2013/10/23/performance-tasks-the-geometry-of-a-crop-circle/	• Summative Assessments / Short Quiz
	• Board work Activities
	• Math Links7 Homework activities
	• Math Links 7 Workbook

Stage 3 – Learning Plan

Learning Activities

Session 1

- Definition of Terms
    - Center
    - Radius
    - Diameter
    - Points (Interior, exterior, on the circle)
    - Arcs
    - Chords

Session 2

- Measuring angles inside the circle

Session 3

- Construct a circle with a given radius or diameter

Session 4

-

The Asian International School
Unit Backward Design
Mathematics, Starter, 2018-2019
Topic: Constructing Angles

Stage 1 - Desired Results

Established Goal(s)

In this unit, students will be able to construct an angle given a degree measure and construct a bisector of a given angle measure using a protractor and compass.

Understandings:	**Essential Questions:**
Students will understand that…	
• Constructing angles is an important part of geometry as this knowledge is extended for construction of other geometric figures as well, primarily the triangles.	• How do you identify and name an angle? • How can you measure and classify an angle?

Knowledge:	**Skills:**
Students will know…	*Student will be able to:*

• Draw angle with a given measure
 	
 • Bisect an angle
  o protractor
  o Compass
	• Construct an angle given a degree measure
	 • Construct the bisector of a given angle using a protractor and compass

Stage 2 - Assessment Evidence

Performance tasks:	**Other Evidence:**
• Constructing angles. • http://www.math-aids.com/Geometry/	• Summative Assessments / Short Quiz • Board work Activities • Math Links7 Homework activities • Math Links 7 Workbook

Stage 3 – Learning Plan

Learning Activities
Session 1
• Draw angle with a given measure

Session 2
• Bisect an angle

- o protractor
- o compass
-

Session 3

- Construct the bisector of a given angle using a protractor and compass
  https://www.khanacademy.org/math/basic-geo/basic-geo-angle/measure-angles/v/constructing-angles

The Asian International School
Unit Backward Design
Mathematics, Starter, 2018-2019
Topic: Divisibility

Stage 1 - Desired Results

Established Goal(s)

Students apply divisibility rules, to understand factors and multiples

Understandings:	**Essential Questions:**
Students will understand that…	• How are numbers related to one another?
• Factors and divisibility are related because multiplication and division are inverse operations; because of this patterns exist between the two.	• How can we determine if a number is divisible by 2, 5 and 10?
	• How can we determine if a number is divisible by 3 and 9?
	• How can we determine if a number is divisible by 7?
	• How can we determine if a number is divisible by 6?

Knowledge:	**Skills:**
Students will know…	*Student will be able to:*
• a is divisible by b if $\frac{a}{b}$ gives a remainder of zero	• Use English notations
• Evenly divisible properties	• Identify when a sum is divisible by a given number
• Divisibility rules for 2 , 5 and 10	• Identify when a number is divisible by 2, 5 and 10
• divisibility rule for 3 and 9	• Identify when a number is divisible by 3 and 9
• divisibility rule for 7	• Identify when a number is divisible by 7
• divisibility rule for 6	• Identify when a number is divisible by 6

Stage 2 - Assessment Evidence

Performance tasks:	**Other Evidence:**
• Given what you've learned about divisibility, find digits A and B in the number below so that the following conditions are true. Show all of your work.	• Group work
• The 5-digit number must be divisible by 4.	• Individual work
• The 5-digit number must be divisible by 9.	• Board work
• Digit A cannot be the same as digit B.	• Computer presentation
• 1 2, A 3 B	• Worksheets
• Explain the steps you followed to solve the problem.	

Stage 3 – Learning Plan

Learning Activities

Session 1

- Using proper English notations in writing division.
- Identify when a sum is divisible by a given number.

Session 2

- Identify when a number is divisible by 2, 5 and 10
- Identify when a number is divisible by 3 and 9

Session 3

- Identify when a number is divisible by 7
- Identify when a number is divisible by 6

https://www.education.com/lesson-plan/divisibility-rules/

Name_____   Date_____

Use each number 0-9 only once to complete the puzzle.

Divisible by 3 and 9	☐	0	☐
Divisible by 4 and 6	6	☐	☐
Divisible by 2 and 5	☐	7	☐
Divisible by 4 and 9	9	☐	6
Divisible by 3 and 5	9	1	☐
Divisible by 2 and 9	5	☐	4
Divisible by 6 and 5	3	☐	0

The Asian International School
Unit Backward Design
Mathematics, Starter, 2018-2019
Topic: Fractions

Stage 1 - Desired Results

Established Goal(s)

- At the end of the unit, the students will define fraction, numerator, denominator, fraction bar, unit fraction, and multiple.
- Identify the number of shaded parts and the number of equal parts in a shape (circle, rectangle).
- Identify a fraction by comparing the number of shaded parts to the number of equal parts

Understandings:	Essential Questions:
Students will understand that…	
	- When can you say that a number is a fraction?
- A fraction is a part of a whole.	- What is numerator?
- A fraction has two parts:	- What is denominator?
o the numerator	
o the denominator	

Knowledge:	Skills:
Students will know…	*Student will be able to:*
- Mathematical terminologies	- Define numerator and denominator of a fraction.
o Numerator(number of parts considered)	- Represent fraction algebraically and geometrically.
o Denominator (total number of parts that make up the whole).	- Identify the number of shaded parts and the number of equal parts in a shape.
- $\frac{a}{b}$ where a and b are integers, $b \neq 0$	- Identify a fraction by comparing the number of shaded parts to the number of equal parts.

Stage 2 - Assessment Evidence

Performance tasks:	Other Evidence:
- Gardening Fractions	- Group work
	- Individual work
	- Board work
	- Computer presentation
	- Worksheets
	- Math Links7 Homework activities
	- Math Links 7 Workbook

Gardening Fractions

Farmer Brown planted a garden with different vegetables. This is the whole garden.
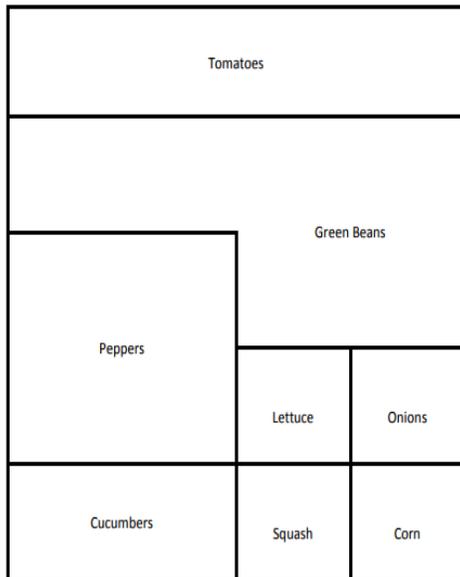
• Explain your work for each problem using pictures, words, and symbols.
• 1) What fraction of the garden is planted with each type of vegetable?
• 2) How much more of the garden is planted with tomatoes than with cucumbers?
• 3) Farmer Brown wants to fertilize exactly of the garden today. What combination of vegetables covers exactly one-half of Farmer Brown's garden?

Stage 3 – Learning Plan

Learning Activities
Session 1
Definition of Terms
• Fraction
  ○ Numerator
  ○ Denominator
https://www.skillsyouneed.com/num/fractions.html
Math Links 7C textbook
Session 2
• Teacher will review lessons from previous session.
• Students will work by pair or group and answer some exercises given.
  ○ Student identifies Fraction for Shaded Area.
https://www.mathworksheets4kids.com/fractions/identify/shade-1.pdf
https://www.mathworksheets4kids.com/fractions/identify/quarter-half.pdf
  ○ Student will construct and shades figure for a given fraction.
• Students will answer exercises on the board and discuss their answers.

The Asian International School
Unit Backward Design
Mathematics, Starter, 2018-2019
Topic: Fundamental operations on natural Numbers

Stage 1 - Desired Results

Established Goal(s)

Evaluate the fundamental operations on Natural numbers; e.g., Addition and Multiplication,

Subtraction and division.

Understandings:	Essential Questions:
Students will understand that…	
	• What is an odd number?
• Any integer that can be divided exactly by 2 is an even number.	• What is and even number?
	• How can we predict the result whether it is even or odd number before adding or multiplying a number.
• Any integer that cannot be divided exactly by 2 is an odd number.	

Knowledge:	Skills:
Students will know…	*Student will be able to:*
	• Perform operations without calculator.
• The correct proper notations for division and multiplication.	• Understand and perform long division.
	• Understand and use correct proper notations for division and multiplication.
o $a \cdot b$ or ab for multiplication	• Understand the concept and basic properties of even and odd numbers.
o $\frac{a}{b}$ for division	• Performing basic operations on consecutive numbers.
• The basic properties of even and odd numbers	o Sum and product of two consecutive numbers.
o odd + odd	o Sum and product of two even consecutive numbers.
o odd · odd	
o even + even	
o even · even	
o odd + even	
o odd · even	

Stage 2 - Assessment Evidence

Performance tasks:	Other Evidence:
• Find four pairs of integers with a sum of 5.	
• Find four pairs of integers with a sum of 10	• Summative Assessments / Short Quiz
• **Operations with Even and Odd Numbers**	• Board work Activities
Add two even numbers and the result is even.	• Group work
Add two odd numbers and the result is even.	• Individual work
Add one even and one odd and the result is odd.	• Board work

| Multiply two even numbers and the result is even. Multiply two odd numbers and the result is odd. Multiply one even and one odd and the result is even. | • Computer presentation |
| • Explain what method you used to find the pairs. | • Worksheets |

Stage 3 – Learning Plan

Learning Activities

Session 1
- Correct proper notation
    - Multiplication
        - $a \cdot b$ or ab
    - Division
        - $\frac{a}{b}$

http://www.mathsisfun.com/long_division.html

Session 2
- Perform long division

http://www.mathsisfun.com/long_division.html

Session 3
- Concept and basic properties of even and odd numbers

Even + Even	Even	2 + 4 = 6
Even + Odd	Odd	6 + 3 = 9
Odd + Even	Odd	5 + 12 = 17
Odd + Odd	Even	3 + 5 = 8
Even × Even	Even	4 × 8 = 32
Even × Odd	Even	4 × 7 = 28
Odd × Even	Even	5 × 8 = 40
Odd × Odd	Odd	5 × 7 = 35

http://www.mathsisfun.com/numbers/even-odd.html

- Performing basic operations on consecutive numbers
  - sum and product of two consecutive numbers
  - sum and product of two even consecutive numbers

The Asian International School
Unit Backward Design
Mathematics, Starter, 2018-2019
Topic: Introduction to Integers

Stage 1 - Desired Results

Established Goal(s)

To allow students to discover the mathematical rules for adding integers with the same signs and adding integers with different signs.

Understandings:	Essential Questions:
Students will understand that….	
	• How do addition and subtraction of integers compare?
• The sum of two negative integers is a negative integer.	• When will the sum of two integers be positive? Negative? Or zero?
• The sum of two positive integers is a positive integer.	

Knowledge:	Skills:
Students will know…	*Student will be able to:*
• Addition of integers of the same sign	• Identify the rules in adding integers
• Addition of integers of the different sign	• Perform addition of integers without calculator
• Subtraction of integers	• Perform subtraction of integers without calculator
	• Define the set of integers, positive numbers, negative numbers, opposites and signs.
	• Identify the opposite of an integer.
	• Indicate an integer from a number line.
	• Differentiate between a positive integer and a negative integer.
	• Recognize that a positive integer can be written with or without a sign.

Stage 2 - Assessment Evidence

Performance tasks:	Other Evidence:
• Show me a sign.	• Summative Assessments / Short Quiz
• Manage your family's checkbook for one month.	• Board work Activities
http://tleportfolio.weebly.com/uploads/6/9/7/5/6975460/7	• Math Links7 Homework activities
thmathubdintegers.pdf	• Math Links 7 Workbook

Stage 3 – Learning Plan

Learning Activities
Session 1

- Addition of integers of the same sign

http://www.mathsisfun.com/positive-negative-integers.html

Session 2
- Addition of integers of the different sign
- Subtraction of integers

http://www.mathsisfun.com/positive-negative-integers.html

The Asian International School
Unit Backward Design
Mathematics, Starter, 2018-2019
Topic: Integers_Multiplication and division of integers

Stage 1 - Desired Results

Established Goal(s)

To allow students to discover the mathematical rules for multiplying and dividing integers with the same signs and multiplying and dividing integers with different signs.

Understandings:	**Essential Questions:**
Students will understand that…	
	• What will be the sign result if we multiply or divide integers with the same sign?
• The procedure for multiplying and dividing integers with like signs.	• What will be the sign result if we multiply or divide integers with different signs?
• The procedure for multiplying and dividing integers with unlike signs.	• When multiplying and dividing integers, how do you determine the sign?
Knowledge:	**Skills:**
Students will know…	*Student will be able to:*
• Multiply integers of the same sign	• Identify the rules in multiplying integers
	• Perform multiplication of integers without calculator
• Multiply integers of different signs	• Restate that the product of two integers with unlike signs is a negative integer.
• Divide integers of the same sign	• Restate that the product of two integers with like signs is a positive integer.
• Divide integers of different signs	• Define the Associative Law of Multiplication.
	• Perform multiplication of two integers with like signs.
	• Perform multiplication of two integers with unlike signs.
	• Recognize that the Associative Law of Multiplication applies to integer multiplication.
	• Perform multiplication of three integers, two at a time, applying the rules for multiplying integers.
	• Recognize that when multiplying three integers, one can multiply the product of any two by the third.
	• Apply the procedures for integer multiplication to complete five interactive exercises.
	• Perform division of integers without calculator

Stage 2 - Assessment Evidence

Performance tasks:	Other Evidence:
• Multiplying and dividing integers group games. https://jeopardylabs.com/play/multiplying-dividing-integers, hundreds, thousand, etc.	• Summative Assessments / Short Quiz • Board work Activities • Math Links7 Homework activities • Math Links 7 Workbook

Stage 3 – Learning Plan

Learning Activities

Session 1
- Multiply integers of the same sign

- Divide integers of the same sign

Session 2
- Multiply integers of different signs
- Divide integers of different signs

The Asian International School
Unit Backward Design
Mathematics, Starter, 2018-2019
Topic: Multiplying and Diving Fractions

Stage 1 - Desired Results

Established Goal(s)

- Understanding properties (Commutative, Associative, distributive and identity property of fractions) of fractions and apply it in multiplication and division of fractions.

Understandings:
Students will understand that…

- To multiply fractions, multiply the numerator with numerator and multiply the denominator with denominator.
- To divide fractions, turn the second fraction *(the one you want to divide by)* upside down
(this is now a reciprocal).Multiply the first fraction by that reciprocal.

Essential Questions:

- How to multiply and divide fractions?

Knowledge:
Students will know…

- Multiply fractions

- Commutative, Associative, distributive and identity property of fractions

- Divide fractions

  o $\dfrac{\frac{a}{b}}{\frac{c}{d}} = \dfrac{a}{b}\left(\dfrac{d}{c}\right)$

  o $\dfrac{\frac{a}{b}}{c} = \dfrac{ac}{b}$

  o $\dfrac{\frac{a}{b}}{c} = \dfrac{a}{bc}$

Skills:
Student will be able to:
- Multiply fractions without using calculator
- Apply commutative, associative, and zero property of multiplication in fractions.
- Divide fractions using basic rules.

Stage 2 - Assessment Evidence

Performance tasks:
- Fractions of collections
- Finding one-third of a number is the same as dividing by three, and can be represented with materials in a similar way.
- For example, 13 of 12 and 12 ÷ 3 could both be modelled using 12 counters partitioned into three equal groups of four.

Other Evidence:

- Summative Assessments / Short Quiz

- Board work Activities

- Math Links7 Homework activities

- Math Links 7 Workbook
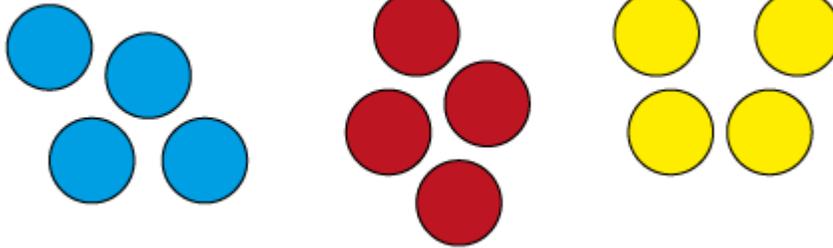
-
- Using 12 counters to model division.
- The mathematical relations suggested by the three equal groups of four counters are:
- 3 × 4   • = 12
- 12 ÷ 3   • = 4
- 13 of 12   • = 4
- Working with fractions of collections is helped by a sound knowledge of factors and multiples.
- Using arrays and area grids strengthens the relationships between multiplication, division and fractions, by making the inverse relations more apparent.
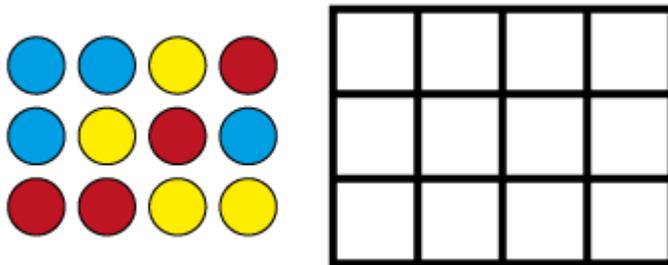
-
- An array of 12 and a grid of 12.
- 3 × 4   • = 12   • 4 × 3   • = 12
- 12 ÷ 3   • = 4   • 12 ÷ 4   • = 3
- 13 of 12   • = 4   • 14 of 12   • = 3
-

Stage 3 – Learning Plan

Learning Activities
Session 1
- Multiply fractions
Introduce
- ♫"Multiplying fractions: no big problem, Top times top over bottom times bottom.
  "And don't forget to simplify, Before it's time to say goodbye" ♫
https://www.mathsisfun.com/fractions_multiplication.html
http://web.mnstate.edu/peil/MDEV102/U3/S22/S222.html#MultiplyRule

Session 2

- Properties of Fractions
  - Commutative
  - Associative
  - Distributive
  - Identity

http://web.mnstate.edu/peil/MDEV102/U3/S22/S226.html

Session 3
- Divide Fractions

Introduce
- ♫*"Dividing fractions, as easy as pie, Flip the second fraction, then multiply.*
  And don't forget to simplify, Before it's time to say goodbye" ♫
- "leave me, change me, turn me over"

https://www.mathsisfun.com/fractions_division.html
http://onlinemschool.com/math/library/fraction/division/

The Asian International School
Unit Backward Design
Mathematics, Starter, 2018-2019
Topic: Order of Operation

Stage 1 - Desired Results

Established Goal(s)

   Understanding order of operations; e.g. The order of operations rule and practice how to use it.

Understandings:	Essential Questions:
Students will understand that…	- What is the purpose of mathematical rules to solve equations? - What is the Order of Operations rule and how is it used? - How greatly do outcomes differ when solved incorrectly?
- There are certain rules following order of operations when simplifying: Parentheses, Exponents, Multiplication/Division, and Addition/Subtraction. - Multiplication and division are done based on order of appearance from left to right in the problem, and addition and subtraction are done based on order of appearance from left to right in the problem.	

Knowledge:	Skills:
Students will know…	*Student will be able to:*
The exact order of doing operations.	- Define arithmetic operations. - Calculate the value of an expression without calculator - Identify operations at each step

Stage 2 - Assessment Evidence

Performance tasks:	Other Evidence:
- Treasure Hunt - https://ccgps-task-submission-guidelines.wikispaces.com/file/view/Performance+Task+Order+of+Operations+Treasure+Hunt.pdf	- Group work - Individual work - Board work - Computer presentation - Worksheets

Stage 3 – Learning Plan

Learning Activities
Session 1
- Exact order of doing operations
   - "Operations" means things like add, subtract, multiply, divide, squaring, etc. If it isn't a number it is probably an operation.

- o PEMDAS
- o BODMAS
- o BEDMAS

http://www.mathsisfun.com/operation-order-pemdas.html

Session 2
- Perform the operation
  - o Identify operations at each step

Example:

$7 + (6 \times 5^2 + 3)$

$7 + (6 \times 25 + 3)$ Exponent first

$7 + (150 + 3)$ Start inside *Parentheses*, multiply

$7 + (153)$ inside *Parentheses*, Then *Add*

$7 + 153$ *Parentheses* completed, last operation is an *Add*

160 DONE!

http://www.mathsisfun.com/operation-order-pemdas.html

The Asian International School
Unit Backward Design
Mathematics, Starter, 2018-2019
Topic: Powers of natural number

Stage 1 - Desired Results

Established Goal(s)

Understanding powers (exponents) of natural numbers; e.g., Basic operations, Exponential growth problems.

Understandings:	**Essential Questions:**
Students will understand that…	
	• Can I simplify expressions containing natural number exponents by applying the addition rule for laws of exponents?
• The power of a number says how many times to use the number in a multiplication.	

Knowledge:	**Skills:**
Students will know…	*Student will be able to:*
• Definition of powers(exponents) of natural numbers	• Simplify a^n to a natural number
• Basic operations $\quad a^m \cdot a^n = a^{m+n}$	• Will be able to define base and exponent (powers).
• $\dfrac{a^m}{a^n} = a^{m-n}$	• Perform basic operations
• $(a^m)^n = a^{mn}$	• Understand the concept of exponential growth
• Exponential growth problems	

Stage 2 - Assessment Evidence

Performance tasks:	**Other Evidence:**
• Change is fundamental to understanding functions.	• Summative Assessments / Short Quiz
• Numbers or objects that repeat in predictable ways can be described or generalized.	• Board work Activities
• An operation can be "undone" by its inverse.	• Group work
• Rules of arithmetic and algebra can be used together with notions of equivalence to transform equations and inequalities so solutions can be found.	• Individual work
	• Board work
	• Computer presentation
	• Worksheets

Stage 3 – Learning Plan

Learning Activities
Session 1
• Definition of powers(exponents) of natural numbers

- The power of a number says how many times to use the number in a multiplication.
- 8^2 could be called "8 to the second power", "8 to the power of 2".

http://www.mathsisfun.com/algebra/exponent-laws.html

Session 2
- Basic operations
    - $x^2x^3 = (xx)(xxx) = xxxxx = x^5$
      So, $x^2x^3 = x^{(2+3)} = x^5$

    - $x^4/x^2 = (xxxx) / (xx) = xx = x^2$
      So, $x^4/x^2 = x^{(4-2)} = x^2$

    - $(x^3)^4 = (xxx)^4 = (xxx)(xxx)(xxx)(xxx) = xxxxxxxxxxxx = x^{12}$
      So $(x^3)^4 = x^{3 \times 4} = x^{12}$

http://www.mathsisfun.com/algebra/exponent-laws.html
    - Exponential growth and decay
http://www.mathsisfun.com/algebra/exponential-growth.html

The Asian International School
Unit Backward Design
Mathematics, Starter, 2018-2019
Topic: Prime and Composite

Stage 1 - Desired Results

Established Goal(s)

Understanding primes and composites; e.g., Factorization, prime Numbers, composite numbers and prime decomposition.

Understandings:	Essential Questions:
Students will understand that…	
• A prime number is a number which has only two factors, one and itself.	• What is the difference between prime and composite numbers?
• A composite number is a number which has more than 2 factors.	• What is prime factorization?
• Applying the rules of divisibility help differentiate between a prime and composite number.	• How to find prime factorization of a number?

Knowledge:	Skills:
Students will know…	*Student will be able to:*
• Factorization	• Define prime and composite numbers
• Definition of Prime Numbers (1 is not prime)	• Write a number into two factors
	• Identify if a given number is prime or composite
• Definition of Composite numbers	• Identify 1 is neither prime nor composite
• Prime decomposition	• Find the prime numbers in a given range of number
	• Factor a number into prime numbers

Stage 2 - Assessment Evidence

Performance tasks:	Other Evidence:
• Divisibility rules can help determine whether a number has particular factors.	• Group work
• Examples:	• Individual work
○ Factors of 12 are 1, 2, 3, 4, 6, 12	• Board work
○ The multiples of 12 are 12, 24, 36, 48…	• Computer presentation
• Students will apply the divisibility rules to determine to whether a number is prime or composite.	• Worksheets
• Students will determine if a given number is prime or composite, and write a brief summary explaining how they differentiated between the two using the divisibility rules.	

Stage 3 – Learning Plan

Learning Activities

Session 1
- Factors and multiples
    - Tables of factors and multiples

http://www.mathsisfun.com/numbers/factors-multiples-table.html
http://www.mathsisfun.com/numbers/factors-multiples.html

Session 2
- Prime and composite
    - A Prime Number can be divided evenly only by 1 or itself.
    - And it must be a whole number greater than 1.
    - 1 is not prime
    - It is a Composite Number when it can be divided evenly by numbers other than 1 or itself.

https://www.mathsisfun.com/prime-factorization.html
http://www.mathsisfun.com/prime-composite-number.html

Session 3
- Prime decomposition

https://www.mathsisfun.com/prime-factorization.html
http://www.mathsisfun.com/prime-composite-number.html

The Asian International School
Unit Backward Design
Mathematics, Starter, 2018-2019
Topic: Properties of Fractions

Stage 1 - Desired Results

Established Goal(s)

Demonstrate and apply a knowledge and sense of numbers, including numeration and operations (addition, subtraction, multiplication, division) patterns, ratios, and proportions

Understandings:	Essential Questions:
Students will understand that…	
	• Write each of these numbers in words.
• Equivalent fractions have the same value, even though they may look different.	• Calculate the following numbers like 23 x 10.
	• Put each of these sets of numbers in order, starting with the smallest.
• Multiplying both numerator and denominator by the same amount, yield an equivalent fraction.	• Calculate the following number using a mental method.
• Simplifying (or reducing) fractions means to make the fraction as simple as possible.	• Calculate these numbers using written methods.
• To simplify a fraction, divide the top and bottom by the highest number that can divide into both numbers exactly.	• How to use of calculator in solving number problems.

Knowledge:	Skills:
Students will know…	*Student will be able to:*
• Equivalent fractions	• Determine when two fractions are equivalent.
• Basic properties of a fractions	• Given a fraction, find other equivalent fractions.
$\quad\circ\quad \dfrac{-1}{2} = \dfrac{2}{-4}$ (– can be in numerator or denominator)	• Convert fractions to common denominator.
	• Explain why two given fractions are or are not equivalent.
$\quad\circ\quad \dfrac{1}{2}\left(\dfrac{3}{3}\right) = \dfrac{3}{6}$	• Recognize that equivalent fractions are equal in value.
$\quad\circ\quad \dfrac{a}{b} = \dfrac{\frac{a}{n}}{\frac{b}{n}}$ or $\dfrac{a}{b} = \dfrac{a/n}{b/n}$	• Simplify a fraction by dividing its numerator and its denominator by a common factor.
• Simplify fractions	• Reduce fractions to their simplest form.
	• Compare fractions using > , < , =
• Compare fractions	• Arrange fractions in ascending or descending order.

Stage 2 - Assessment Evidence

Performance tasks:	Other Evidence:
• Grids and arrays	• Group work
• The most valuable aspect of using grids and arrays is that	• Individual work

they focus thinking on factors and multiples, which is the essential foundation for developing general strategies for creating equivalent fractions.

- Representations such as circles and fraction walls are more likely to promote additive thinking.
- For example, this fraction wall clearly shows that 36 is equivalent to 12 but tends to suggest the additive relationship of 16 + 16 + 16 = 12.
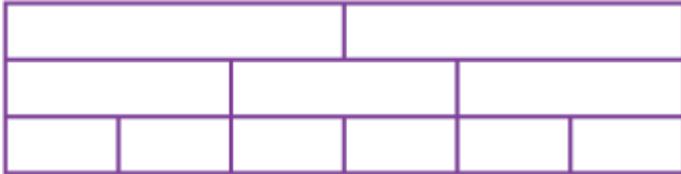
-
- A fraction wall.
- On the other hand, having to create the one grid that will show both halves and sixths demands thinking about the multiplicative relationship between the denominators 2 and 6 (i.e. 2 × 3 = 6).
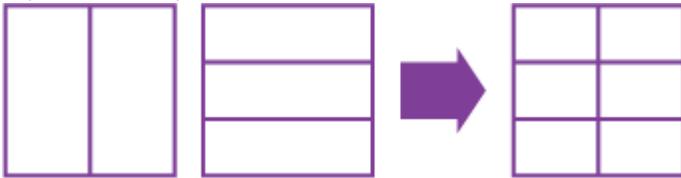
-
- Combining grids.

	- Board work
	- Computer presentation
	- Worksheets
	- Math Links7 Homework activities
	- Math Links 7 Workbook

Stage 3 – Learning Plan

Learning Activities

Session 1
- Equivalent fractions
- Basic properties of fraction
  - o Multiplying the numerator and denominator of a fraction by a non-zero number, the results of the new fraction is said to be equivalent to the original fraction. Dividing the numerator and denominator of a fraction by the same non-zero number will also yield an equivalent fraction.

http://onlinemschool.com/math/library/fraction/fraction_property/

Session 2
- Simplifying fractions
  - o Any fraction can be fully reduced to its lowest terms by dividing both the numerator and denominator by their greatest common divisor. This is called reducing or simplifying fraction.

http://onlinemschool.com/math/library/fraction/simplify/

Session 3
- Comparing fractions
  - o *To compare fraction with the common numerators (top number of a fraction) you need to compare denominators and to see which fraction is greater.*
    - ▪ *The fraction with the smallest denominator is the larger fraction if the numerators are the*

same.
- o *To compare fraction with the common denominators (bottom number of a fraction) you need to compare numerators and to see which fraction is greater.*
    - ▪ *The fraction with the biggest numerator is the larger fraction if the denominators are the same.*
- o *To compare fractions with different denominators you need to make the denominator the same finding the least common multiple (LCM) of the denominators (which is called the Least Common Denominator). Then to compare numerators and to see which fraction is greater.*

http://onlinemschool.com/math/library/fraction/comparison/

Stage 1 - Desired Results

Established Goal(s)

In these lessons and examples, we will learn the following properties of Integers: Commutative Property for Addition, Associative Property for Addition, Distributive Property, and Identity Property for Addition, Identity Property for Multiplication, Inverse Property for Addition and Zero Property for Multiplication.

Understandings:	Essential Questions:
Students will understand that… • Understand additive inverse and that opposite quantities combine to make zero. • Understand subtraction of integers as adding the additive inverse and apply this to real world situations.	• Write each of these numbers in words. • Calculate the following numbers like 23 x 10. • Put each of these sets of numbers in order, starting with the smallest. • Calculate the following number using a mental method. • Calculate these numbers using written methods. • How to use of calculator in solving number problems.

Knowledge:
 Students will know…
 	
 • Commutative
 	
      ○ $a + b = b + a$
 	
      ○ $a \cdot b = b \cdot a$
 	
 • Associative
 	
      ○ $a + (b + c) = (a + b) + c$
 	
      ○ $a \cdot (b \cdot c) = (a \cdot b) \cdot c$
 	
 • Distributive
 	
      ○ $a(b + c) = ab + ac$
 	
 • Additive Inverse
 	
      ○ $a + (-a) = 0$
 	
 • Identity
 	
      ○ $a + 0 = 0 + a = a$
	Skills:
	 Student will be able to:
	
	 • Identify the property used in a given equation.
	 • Calculate an equation using the properties.
	 • Apply the properties of integers to some expressions.

- a $\cdot$ 1 = 1 $\cdot$ a = a

Stage 2 - Assessment Evidence

Performance tasks:
- Measurements and monetary conversion.
- Properties of Integers worksheets.
  https://www.mathworksheets4kids.com/properties.php

Other Evidence:
- Summative Assessments / Short Quiz
- Board work Activities
- Math Links7 Homework activities
- Math Links 7 Workbook

Stage 3 – Learning Plan

Learning Activities
Session 1
- Commutative

  o $a + b = b + a$

  o $a \cdot b = b \cdot a$

- Associative

  o $a + (b + c) = (a + b) + c$

  o $a (b \cdot c) = (a \cdot b) c$

- Distributive

  o $a(b + c) = ab + ac$

http://www.math.com/school/subject1/lessons/S1U1L13GL.html#sm1

Session 2
Additive Inverse
$a + (-a) = 0$
Identity
$a + 0 = 0 + a = a$
$a \cdot 1 = 1 \cdot a = a$
http://www.math.com/school/subject1/lessons/S1U1L13GL.html#sm1

Stage 1 - Desired Results

Established Goal(s)

In this unit we will explore a branch of mathematics known as Set Theory. We will focus on basic symbols, set notations, terminologies, and operations.

Understandings:	Essential Questions:
Students will understand that…	
	• How do you create order out of chaos?
• A set is a collection of well defined, unordered, distinct objects or elements, with something in common.	• What is a set?
• The elements of a set are the things within it. They are also called the member of a set.	• What is a natural number?
• The symbol ∈ means 'is an element of a set and ∉ which means 'is not an element of a set.	
• The empty set has no elements at all. It is written {} or ∅.	

Knowledge:	Skills:
Students will know…	*Student will be able to:*
• Mathematical terms;	• Identify and write basic set notation which indicates whether an object is, or is not an element of a set.
○ Unit set,	• Describe the meaning of basic set notation.
○ Finite and infinite sets,	• Understand the concept of sets
○ Order of sets,	• Understand and explain the meaning of unit and empty set, finite and infinite set
○ Union	• Perform basic set operations (Union, intersection, complement)
○ Intersection of sets,	• Calculate the order of sets.
○ Complement of a set,	• Identify and create subsets.
○ Empty set,	• Calculate the number of subsets of a finite set.
○ Subset,	
○ Power of a set.	
○ Natural number	
▪ Even	
▪ Odd	

Stage 2 - Assessment Evidence

Performance tasks:	Other Evidence:
• Pre-Assessment on Real Numbers,	• Board work Activities
• Placement on Number Line Quiz/Ticket	• Group work
• Rational vs. Irrational	• Individual work
• Numbers Set Notations Venn Diagrams Set	• Computer presentation

• Relationships (Union, Intersection, Complement) Properties of Real Numbers	• Worksheets

Stage 3 – Learning Plan

Learning Activities
Session 1
Definition of terms
- Definition of terms:
  - Unit set,
  - Finite and infinite sets,
  - order of sets,
  - Union and Intersection of sets,
  - Complement of a set,
  - Empty set, Subset,
  - Power of a set.

http://www.mathscoop.com/pre-calculus/set-theory/what-is-a-set.php
Mathematics Matters 2 Textbook

Session 2
Perform basic set operation (Union, Intersection, and complement)
https://www.skillsyouneed.com/num/set-theory.html
Mathematics Matters 2 Textbook

Session 3
- Identify subsets
- Calculate the number of subsets of a finite set
https://www.mathsisfun.com/sets/sets-introduction.html
Mathematics Matters 2 Textbook

The Asian International School
Unit Backward Design
Mathematics, Starter, 2018-2019
Topic: Triangles

Stage 1 - Desired Results

Established Goal(s)

Students will be able to classify triangles by their sides and angles and use appropriate tools in constructing a triangle.

Understandings:	Essential Questions:
Students will understand that…	
	• How do you identify and name a triangle?
• The triangles have different types based upon the length of the sides and the measurement of their angles.	• How do you use a tool to construct a triangle?

Knowledge:	Skills:
Students will know…	*Student will be able to:*
	• Name triangles
• Define triangles	• Identify interior, exterior and boundary points
• Naming triangles	• Constructing triangles given lengths or angle measures
• Interior, exterior, boundary	

Stage 2 - Assessment Evidence

Performance tasks:	Other Evidence:
• What am i?	• Summative Assessments / Short Quiz
• Classifying/naming triangles.	• Board work Activities
• Construct me.	• Math Links7 Homework activities
	• Math Links 7 Workbook

Stage 3 – Learning Plan

Learning Activities
Session 1
- Definition of Terms:

- Naming triangles

    o by capital letter at the vertex

    o by lower-case letter or number inside the angle

    o   by three capital letter with the vertex letter placed in the middle.

Session 2
- Identify interior
- exterior and
- boundary points

Session 3
- Constructing triangles given lengths or angle measures.