Geometry with Augmented Reality

Lesson Plan. Primary/Secondary School

Grade Level(s) : 8-10

Estimate Time: 2-3 hours

Age : 6-12 Years old

Materials:

- CleverBooks Geometry App
- Projector
- Tablet or mobile phone
- CleverBooks Geometry Printing Flash cards

Purpose :

In this lesson plan which is adaptable for grades 8-10, students use CleverBooks Geometry App resources to explore and interact with 3D Shapes.

Students will:

1. Explore different 2D and 3D Shapes using their mobile phone/Tablet
2. Know how AR technology works.
3. Develop their imagination with 3D object

Lesson Procedure:

1. The day before implementing this lesson, ask students to find an article online about 3D Shapes objects and generate a list of questions they have about the topic.
2. Display the Graphic Organizer on interactive whiteboard.
3. Encourage student volunteers to share what they already know about 3D Shapes objects based on their independent research.
4. Open **CleverBooks Geometry app** with Tablet and connect it with projector and play the interactive 3D Shapes using Flash cards for the class.
5. Pass out copies of Flash cards and let Students enjoying and learning.
6. Allow students to share their ideas and creations with the other class.

Extension Activities:
Have students work collaboratively to research the answers to any questions.

Teacher: YOUSSEF AYOUB
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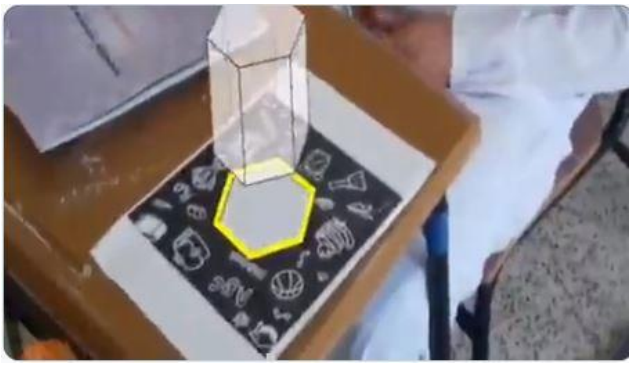
Explore Geometry

Created by: Samir Ezzaghdani

Picture/s:



Timeframe of activity: 30-40_ min

Tags: CleverBooks cards for geometry shapes

Grade Level: k-6

App/Tech Tools: CleverBooks Geometry apps/ phone

Additional material:
http://www.cleverbooks.eu/shop/

Learning Objectives:

Students use augmented reality (CleverBooks Geometry) to:

1. Learn different shapes
2. Distinguishes between different geometric shapes (square, hexagon, rectangle, etc.)
3. Can compare geometric shapes in 3D and 2D
4. Describe shapes and define their properties

Lesson Activity:

- Download the clever books geometry app on school smart device and some students 'devices
- Download books cards, print them thermally then distribute them to students
- Apply this to clever books geometry and apply lesson objectives
- Use peer learning to apply lesson objectives
- Each group displays its products in front of its counterparts by connecting its own device Portable interactive whiteboard.

Explore Geometry

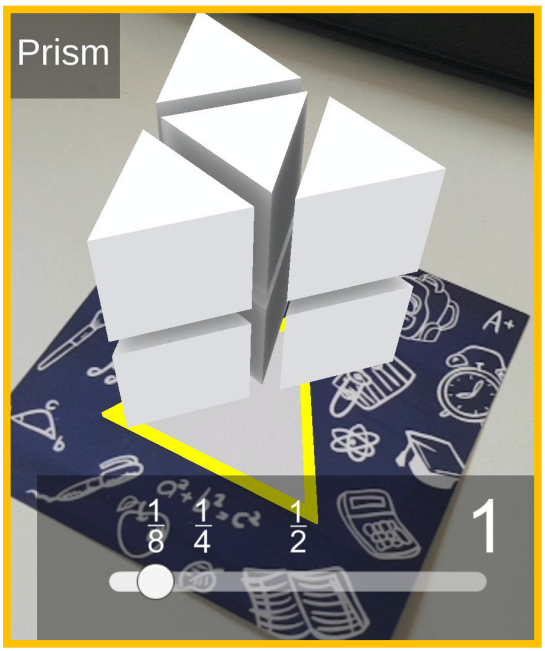
Created by: Samir Ezzaghdani

Questions outline:

- Open CleverBooks Geometry application on your devices and choose the icon shapes
- Place the camera on the interactive cards
- Use the items on the side to change geometric shapes
- Write your notes and discuss with your colleagues
- Write the summary of the lesson

How to link Squares and Cubes (2D and 3D) and the properties of these shapes to Algebra problems

Created by: Indigo Bytes(Lucille Dunne, Anni Kumar)



Timeframe of activity: 120 min

Tags: Mathematics Technology

Grade Level: Grade 9 extension

App/Tech Tools: Clever Books Geometry Marker - square/Cube Unity 3D and Vuforia

Additional material: Algebra Tiles, Lego Blocks, Mega Cube, Paint 3D and Merge Cube

Ex-Model the Product of Two Binomials Using Algebra Tiles

How To- Augmented Reality App Tutorial for Beginners with Vuforia and Unity 3D

Learning Objectives:

Instill a deeper understanding of mathematical concepts by using the CPA (Concrete, Pictorial, Abstract) approach of Singapore Mathematics.

Lesson Activity:

1. Revision of the properties of a square including perimeter and area.

   Revision of a regular hexagon (cube) properties including total surface area and volume.

   use Clever Books Geometry Marker - square/Cube.

2. Model squaring a binomial using Algebra Tiles.

3. Using Lego Blocks model a binomial cube.

4. Using a Mega Cube, Unity 3D and Vuforia create a marker based Augmented Reality App that models 6 different examples of a binomial cube, each linked to a face (marker) of the cube.

Questions outline:

- Students would be divided groups to create a model using the Lego or the AR App to expand a set of different binomial squared problems.
- Here the students are asked to write coding for a virtual robot that has to move in a virtual playfield according to the solution of the algebraic equations or solving perimeter i.e., students could once make the robot move on the playfield by simple addition of the sides of the figure and see the result and then would apply formula and check the result how the robot moves and compare the result. Students can also use the features of AI to train their model to perform in an efficient manner i.e. would give perfect result for the values it has not been trained for.

Additional Ideas (optional):

We can also use Paint 3d and https://miniverse.io/cube to create our own 3d Models and use it in AR to further enhance the idea of solving algebraic equations using 3D cubes. As the 3D model is created by the teacher therefore it has a personalized effect that students like a lot.

Vuforia Engine 9.1

Use Vuforia Engine to build Augmented Reality Android, iOS, and UWP applications for mobile devices and AR glasses. Apps can be built with Unity, Android Studio, Xcode, and Visual Studio. Vuforia Engine can also be accessed through the Unity Package Manager by adding Vuforia's package repository with the script below.

unity **Add Vuforia Engine to a Unity Project or upgrade to the latest version**
add-vuforia-package-9-1-7.unitypackage (2.57 KB)

unity **Download for HoloLens Development in Unity 2018.4**
VuforiaSupportInstaller-Windows-9-1-7.zip (130.75 MB)

Download for Android
vuforia-sdk-android-9-1-7.zip (32.30 MB)

iOS **Download for iOS**
vuforia-sdk-ios-9-1-7.zip (59.16 MB)

Download for UWP
vuforia-sdk-uwp-9-1-7.zip (20.22 MB)

unity Store

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Eligibility:
Students enrolled in an accredited educational institution of legal age to consent to the collection and processing of their personal information, e.g., age 13 in the US, 16 in the EU. Must join the GitHub Student Developer Pack to be verified.

Personal

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Eligibility:
Revenue or funding less than $100K in the last 12 months

A tour around the Math

Created by: **Amr Gad Elkariem Hussein Elsherief**

Timeframe of activity: 30 – 45 min

Tags: Math - Cards for geometrical shapes – shapes, 2-D, 3-D, dimensional shapes – Mathematical Rules

Grade Level: Primary stage (Grade 1-6)

App/Tech Tools: Cleverbooks Geometry App, device (tablet/phone)

Additional material: printable shape markers, Cleverbooks Geometry – cubes puzzles

Learning Objectives:

By the end of this activity, the student will be able to:

1. Recognize the augmented reality for education (Geometry – building)
2. Recognize the difference between solid and polygon
3. Deduce the number of sides – vertices – angles in each polygon (square – triangle – rectangle – Hexagon)
4. Deduce the number of faces – edges – vertices in each solid (Cube – Cuboid – Cond - Cylinder - Sphere – Pyramid)
5. Differentiate between the parts of circle (radius - diameter)
6. Determine the type of triangle according to its angles (Right – acute – obtuse) triangle
7. Analyzing and rebuilding solids (2D – 3D)
8. Deduce the name of solid after and before folding
9. Read and write the fractions by digits and by letters (half – third – quarter – eighth)
10. Deduce The meaning of circular sector and its angle
11. Deduce how to calculate the circumference of circle
12. Draw The shapes and solids after and before folded (after knowing them by using phone)

13. Analyze, compare, create, and compose shapes
14. Performs self-assessment through an electronic test using the application - Geometry

Suggested Questions:

- Defernite between Solid and Polygon
- If there a piece of pizza, and the mother wants to distribute it between 4 persons, represent the share of each one using the suitable fraction
- And if there another pizza and the father want to distribute it between 8 persons what is the share of each one (compare between the first and the second fraction)
- How engineers and artists distinguish between geometric shapes and non-spatial geometric shapes when building and drawing homes, hotels and tools

Lesson Activity:

1. Choose for Students as a leader of 4 groups and each Leader choose 3 students to help him in a certain task.
2. Each student downloads the application of CleveBooks Geometry and see it to choose the suitable task for him.
3. After that each leader choose the suitable task as:
   a) first group choose (solids and polygons)
   b) second group choose (types of triangle according to its angles)
   c) The third group choose the fraction
   d) The fourth group choose the circle and its parts
4. Each leader distributes the required task among each member of the team.
5. Print papers using for geometry which fin in the application and student using photoshop to separate each picture.
6. Distribute interactive cards to each group to facilitate the task.
7. Each group search the data by many ways (GoogleChrome – make PowerPoint – make a video cartoon) and other ways.
8. Each group displays its products in front of its counterparts by connecting its own device Portable interactive whiteboard.
9. Also making skype between students to explain the products of CleverBooks.
10. Making cartoon to explain augmented reality and its app – how to use it – what's the benefits of it.
11. Using video cartoon and champion between two schools by asking the questions which include the application to understand this application is talk about what.
12. Honoring the students participating by school administration and from Math's teacher.

A tour around the Math

Created by: **Amr Gad Elkariem Hussein Elsherief**

Questions outline:

- What are the names of some 2D shapes?
- What are the names of some 3D shapes?
- What are some words you can use to describe 2D and 3D objects? (flat, solid, corners, edges, sides, faces, vertices)?
- What does the word “net” mean or look like when creating 3D (solid) shapes?
- Search in your environment for two-dimensional shapes and for three-dimensional figures that match the figures you've learned?

Additional Ideas (optional):

- Videos by the student leader of first group (explain CleverBooks Geometry)

Resources:

The link of videos:

- https://drive.google.com/open?id=1H9x_nMUkNj2dQPnlx9lil4doF_GgZfyx
- https://drive.google.com/open?id=1WS5bUIvxbIQq1ZEYK2Xq_1Tj5x24zdyb
- https://drive.google.com/open?id=1O5vZrXrjrvo5I_PNVi-BVMZkNcyVL2vv

Pictures about how to use

- https://drive.google.com/open?id=1A8KNGAI2rM6lHg0AKsYbPYG1Gp1CAHGt
- https://drive.google.com/open?id=1fAuWeLLBmwCg30dtMmXhPTwdtjNo-Wzq

The student leader (Sylavia Salah) made a video of how to use CleverBooks Geometry

- https://drive.google.com/open?id=1uGP2U-A2sOK9TV7aoQu3e5fi7WGo7Nvc

Maria Explain the CleverBooks Geometry

- https://drive.google.com/open?id=1UjL7gkCTRt2s0DwkScJe-q8AY1hi9cg7
- https://drive.google.com/open?id=1eMLw4ZJrJ4qv-ZsNF2yxhxOJOzVdwIlH

Lekaa explain CleverBooks Geometry

- https://drive.google.com/open?id=1z6jyc56-mTgr5I5wxO9YIdTqlfj9XgZz
- https://drive.google.com/open?id=1Jxf8cYPa0nVT9S0V3OlWINpcjde8NkCM

The student Leader (Logina) made a PowerPoint about the difference between solids and polygons

- https://drive.google.com/open?id=1EX4JAJW3USUaZ-hg7ytNsCWzwSh8aU-r

Now the student Sylvia Salah made a cartoon about:

1- The circle

- https://drive.google.com/open?id=1PbrP1M00_BwdO2BkiFoiZvTsF66ECnrr

2- The fraction

- https://drive.google.com/open?id=1QDTJyFvVsnk78O7DwOwuFUUi8EPoyCVS

The student leader (Nardeen Wael) made a PowerPoint about types of triangle according to its angles

- https://drive.google.com/open?id=1m6_9J91mEfBfWkJbQ-8n5lUMob7qQOJF

The student (Eveleen) made a video cartoon about champion between two schools and the questions about solids which found in application

- https://drive.google.com/open?id=1O0EXZW5D3R4MQwcdSxQqHxphE94Ys0Y5
- https://drive.google.com/open?id=1gj9WhyXCtn5siQbp0ltwqGT3R4_YR0b6
- https://drive.google.com/open?id=1qCuPuC7vHVZSGW5yULGwdN83ZZZOXxqO

The student leader (Nardeen) made collect pictures about fractions

- https://drive.google.com/open?id=154Eti5PiGW557zlr9EtWKu_Pu5BuG7S4

The student Leader (Logina) Made a PowerPoint about circle

-] https://drive.google.com/open?id=1zrD5xSWiQFrhsC8ka-26tVWJs0bHNE0H

The student Leader (Sylvia) made continue videos

The triangle

- https://drive.google.com/open?id=1saWkSR0xtrSJ16u2pY_KmiFz1r22XSGl

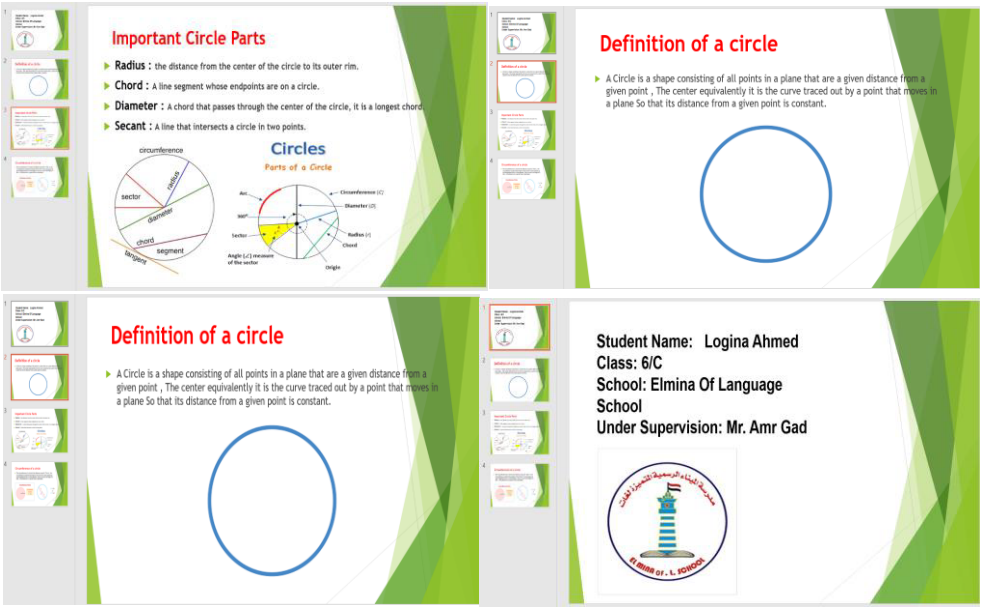
Fractions

- https://drive.google.com/open?id=1mvWxDUIFA9nM4B8Djvliy4JegmOby7Mu

The triangle

- https://drive.google.com/open?id=1Ka_bqjc7QzDzqfuKUr2MVKKWnM6qcbfS

Some photos:



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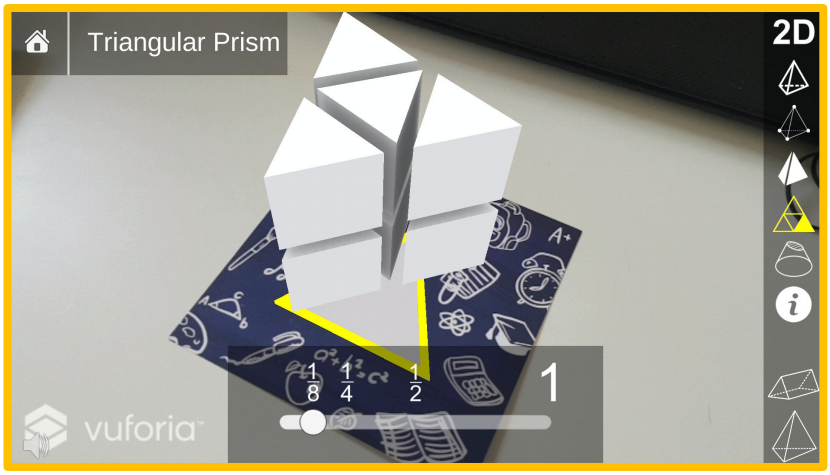
Explore geometry

Created by: **Badria Al Taamari**



Timeframe of activity: 45 min
Number of students: 10
Tags: Cards for geometrical shapes - mathematical rules
Grade Level: K-6
App/Tech Tools: Clever Books Geomatry App, device (phone/tablet)
Additional material: Clever Books www.cleverbooks.eu/shop/

Learning Objectives:

The student will be at the end of the activity.

Augmented Reality for Operations "on: Engineering and using it.

1- Differentiate the square, rectangle, triangle, hexagon and circle in terms of the number of sides
2- Deduce from square, rectangle, triangle, hexagon, and circle (solids)
3- Defines the number of characters in each stereoscopic
4- Determines the number of points of intersection of the sides in each stereoscope
5- Defines the number of faces in both anthropomorphic
6- Draw from each three-dimensional, three-dimensional segment Geometry

7- Embodies the flat shape-2D of each 3D pyramid
8- Performs self-assessment through an electronic test using the application - Geomatry App

Suggested questions:

First, I suggest asking a student what the difference is between a two-dimensional term and a three-dimensional term - and how engineers and artists distinguish between geometric shapes and non-spatial geometric shapes when building and drawing homes, hotels and tools

Lesson Activity: Part 1

1- I download the engineering application to students 'devices one day before the lesson
2- I make sure that the Bluetooth is connected between the smart screen and the student's devices
3- Distribute the students to the diodes and each smart device
1- Distribute the tasks to the students so that each pair has a task Different on the other binaries
4- Distribute interactive cards to each binary group according to its message (square - rectangle - triangle - hexagonal circle)
5- Distribute a worksheet for each binary according to its task in writing the required results which are (number of letters - number of faces, number of points - discoveries Others)
6- Each group displays its products in front of its counterparts by connecting its own device Portable interactive whiteboard.

Questions outline:

1- Open the application- Geomatry App- from your device and choose the icon shapes
2- Place the mobile camera on the interactive card
3- Write down the information required from you in the worksheet by moving between icons
4- Distinguish between three-dimensional solids and two-dimensional shapes, whichever takes the form of a vacuum and occupies a space "of space?
5- I am waiting for you from other discoveries in the application, always proud of it in front of your colleagues when you show your products on the interactive screen

Work papers

shape	number of letters	number of intersection points of letters	number of faces	Cut out its horizontal plane	Added discoveries	Group 1
Rectangle						
parallelepiped						
Cuboid						

shape	number of letters	number of intersection points of letters	number of faces	Cut out its horizontal plane	Added discoveries	Group 2
triangle						
Triangular prism						
Tetrahedron						

shape	number of letters	number of intersection points of letters	number of faces	Cut out its horizontal plane	Added discoveries	Group 3
Square						
Cube						
Square pyramid						
Frustum						

shape	number of letters	number of intersection points of letters	number of faces	Cut out its horizontal plane	Added discoveries	Group 4
Hexagon						
Hexagonal Torus						
Hexagonal Prism						

shape	number of letters	number of intersection points of letters	number of faces	Cut out its horizontal plane	Added discoveries	Group 5
Circle						
Sphere						
Cylinder						
Con						
Tours						

Lesson Activity: Part 2

Additional ID to reinforce "what students have learned through the -Geomatry App- and actually link information to convert it into knowledge, students will create a circle and then through learning by playing ((volleyball strategy))".
I choose a student to throw the ball to his colleague who chooses him to answer the name of the numbered form with the image that I display on the screen in terms of the number of characters, the number of faces and the number of points and the form of the horizontal and vertical section of it and in the event that the second student does not know the correct answer he will toss the ball again to another student, and so on until The numbers end in the image.

Additional Ideas (optional)

Search in your environment for two-dimensional shapes and for three-dimensional figures that match the figures you've learned

Homework - Self - evaluation

I ask the student to do a self-test through a five-stage application-Geomatry App- with screen capture video and send it to me via my email with an assessment of the degree it

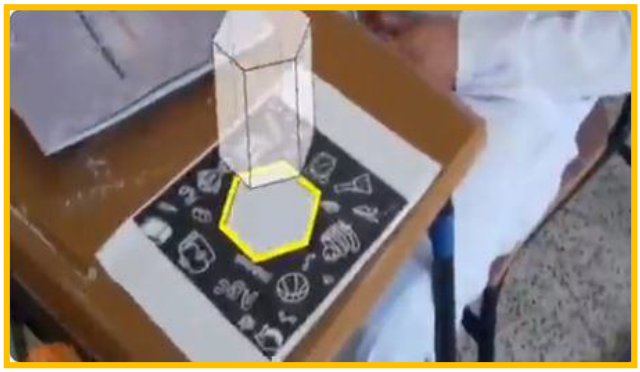
Notes

1. The binary group distributes the assignment among them accurately with the accuracy of each student in his role in learning and teaching
2. If the number of students is large, the teacher can divide the students into groups consisting of 3 or 4 students and distribute the roles between students
3. In the event that smart devices are not available with students, the teacher can use one device that connects to the screen and displays the interaction of the application with each card separately, and every important task is accomplished for the same common worksheet for all students

The study plan is over
Teacher: Badria Al Taamari
Email: badreyatamary3@gmail.com
Syria - lattakia
My school - blended learning

Explore Geometry

Created by: Samir Ezzaghdani



Timeframe of activity: 30-40_ min

Tags: CleverBooks cards for geometry shapes

Grade Level: k-6

App/Tech Tools: CleverBooks Geometry apps/phone

Additional material:

Learning Objectives:

Students use augmented reality (CleverBooks Geometry) to:

1. Learn different shapes
2. Distinguishes between different geometric shapes (square, hexagon, rectangle, etc.)
3. Can compare geometric shapes in 3D and 2D
4. Describe shapes and define their properties

Lesson Activity:

- Download the clever books geometry app on school smart device and some students 'devices
- Download books cards, print them thermally then distribute them to students
- Apply this to clever books geometry and apply lesson objectives
- Use peer learning to apply lesson objectives
- Each group displays its products in front of its counterparts by connecting its own device Portable interactive whiteboard.

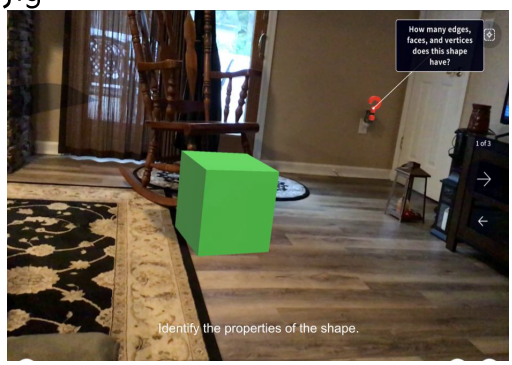
Questions outline:

- Open CleverBooks Geometry application on your devices and choose the icon shapes
- Place the camera on the interactive cards
- Use the items on the side to change geometric shapes
- Write your notes and discuss with your colleagues
- Write the summary of the lesson

Geometry, Tessellations, and Augmented Reality

Created by: Kimberly Mattina

Jig



Assemblr

Timeframe of activity: 180 minutes

Tags: Geometry, STEM, shapes, patterns, tessellations, AR

Grade Level: middle school

App/Tech Tools: Cleverbook Geometry App, iPad, Chromebook, marker, Google Drawings, AR App of your choice

Additional material: Geometry, Tessellation and AR lesson

Learning Objectives: Students will be able to:

- 3D: explore geometric shapes, such as, prisms, cone, cylinder, sphere, torus
  - solve the specific equation for that shape
  - identify the properties of the shape
- 2D: explore geometric shapes such as hexagonal torus, hexagonal prism
  - identify vertices, faces, edges of the shape
  - solve the specific equation for that shape
- Identify a pattern
- Create a tessellation in Google Drawings.
- Create an AR presentation on shapes.

Lesson Activity:

- Students will work independently or in pairs.
- Each student or group will have a Chromebook, iPad and the Cleverbooks Geometry markers. (circle and hexagon)
- Each student will use the Cleverbooks Geometry app to explore each 2D and 3D shape.
- Each student will choose which shape to explore and study.
- Students will calculate the specific formulas.
- Students will identify the properties of the shape.
- Students will create a tessellation using Google Drawings. Example
- Students will refer to the Geometry, Tessellation and AR Presentation for details

Questions outline:

Part 1: Exploring the shapes

2d shapes:

- How many faces, edges, and vertices did your shape have?
- Given the input, what was the volume of the shape?

3d shapes:

- What were the properties of the shape you selected?
- Given the input, what was the volume or surface area of the shape?

Part 2: Patterns

- Create a tessellation of the shape you selected using Google Drawings.
- Be sure to include additional shapes and colors and to follow the pattern.

Part 3: AR tour:

- Create an AR tour presentation on 3 geometry shapes.
- Use Tinkercad to create your own shapes or find the shapes in the AR app library of your choosing.
- Label or create a voice over to identify the properties of the shape.
- Each shape should have a related question and answer.
- Optional - Include an image of your tessellation into the AR tour.

Math Standards:

Geometry 7.G A. Draw, construct, and describe geometrical figures and describe the relationships between them.

1. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

2. Draw (with technology, with ruler and protractor, as well as freehand) geometric shapes with given conditions.

B. Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

6. Solve real-world and mathematical problems involving area, volume and surface area of two and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Technology Standards:

8.2.8.C.1 Explain how different teams/groups can contribute to the overall design of a product.

8.2.8.D.1 Design and create a product that addresses a real world problem using a design process under specific constraints.

8.2.8.D.2 Identify the design constraints and

trade-offs involved in designing a prototype (e.g., how the prototype might fail and how it might be improved) by completing a design problem and reporting results in a multimedia presentation, design portfolio or engineering notebook.

8.2.8.D.3 Build a prototype that meets a STEM-based design challenge using science, engineering, and math principles that validate a solution

8.2.8.D.5 Explain the impact of resource selection and the production process in the development of a common or technological product or system

Explore 2D&3D Shapes

Created by: **Christine Danhoff**

Timeframe of activity: 30-45 min.

Tags: math, shapes, 2-D, 3-D, 3 dimensional shapes

Grade Level: K-2

App/Tech Tools: Cleverbooks Geometry App, device (tablet/phone)

Additional materials: printable shape markers , Cleverbooks Geometry Workbook

Learning Objectives:

- Identify and describe 2D and 3D shapes.
- Analyze, compare, create, and compose shapes.
- Identify shapes as two-dimensional (lying in a plane, "flat") or three-dimensional ("solid").
- Analyze and compare two- and three-dimensional shapes using key vocabulary terms - vertices, faces, edges, sides.

Lesson Activity:

- Divide students into small groups with the shape markers, or share shape markers with your students virtually, if remote learning.
- Ask students: **What shapes do you see around you in our world?** Wait for responses and record on a whiteboard, paper, virtually, etc.
- Hold up the shape markers from the workbook. Ask students to identify each of the 2D shapes shared. How do they know that the shape is a rectangle, triangle, etc.? (number of sides)
- Guide students to explore the circle shape marker with the app. What 3D shapes have either a circle face or are solid? Students explore the different shapes, zoom in and out, and try the cross section and fraction buttons. As a group, analyze the cone, cylinder, and sphere discussing how many flat sides or faces, edge or sides each has. Ask students to come up with a real-life example of each 3D shape.

- Guide students to explore the square shape marker next. As they explore, ask them to explain in their small groups what shapes, either 2D or 3D they see. How would they explain or describe each shape? (Ex. A cube has 6 faces, 12 edges, and 8 vertices.) Have students touch the 2D button. What happened to your shape? Discuss the term "net". Ask students what 2D shapes make up that 3D shape. What real-life examples can you give for these 3D shapes? 2D shapes?
- Have students continue with the other shape markers - triangle, rectangle, and hexagon. Prompt them to continue to use their math vocabulary to describe the different 2D and 3D shapes.
- If grade-level appropriate for students, have them work in their small groups to try the TEST, and/or the GAME option within the app.
- Once students have explored the 3D shapes, wrap up with an exit ticket question to have them share 1 new thing they learned today.
- For additional lessons and activities, see some of the ideas below to help supplement this unit.

Questions outline:

- What are the names of some 2D shapes?
- What are the names of some 3D shapes?
- Is there more than one way to create the same shape using other shapes?(Example - 6 triangles to make a hexagon)
- What are some words you can use to describe 2D and 3D objects? (flat, solid, corners, edges, sides, faces, vertices)
- What makes 2D and 3D objects different?
- What does the word "net" mean or look like when creating 3D (solid) shapes?

Additional Ideas (optional):

- Review with a Game:
  - Breakout Edu Games - Digital and Kit Games
  - Gimkit.com
    - K review - Shapes
    - Grades 1 & 2 review - 3D Shapes
- Go on a 2D and 3D Shape Scavenger Hunt - Check out this Goosechase Sample or create your own
- Apply and Practice Activities-
  - Seesaw Activities - Community Library
  - Google Activities -
  - Sort 2D and 3D Shapes
  - Sort 3D Shapes
  - Find 3D Shapes in Our World -Add images or take pictures to add to slides
- Create and compose shapes online

TITLE: Exploring 3D shapes using CleverBooks Geometry and 3DBear

Created by: Amal Abu Saleh

Timeframe of activity: 45 min

Tags: Mathematics

Grade Level: 3

App/Tech Tools: CleverBooks Geometry, 3DBear, Mobile device (tablet or mobile phone)

Additional material: CleverBooks Geometry Budling Blocks or Geometry Workbook, Lego blocks, 3D Models

Learning Objectives:

In this lesson, students will use Augmented reality with CleverBooks Geometry App and 3D Bear App, to explore the solid figures, and to write and discover the number of faces, edge, vertices and name the solid figures using the tools and technology.

Lesson Activity:

- Teacher will divide the class into 4 groups. (Sphere group, Cylinder group, Cube group and Cone group)
- Each group will be given CleverBooks shape marker of a solid figure.
- Students will explore their solid figure using the AR Geometry app, 3DBear App to write the number of faces, edges, and vertices.
- Teacher will discuss answers and their work with them.
- Students will observe the 2D outline for each 3D figure.
- Each Group will be invited to the front of the class and speak to the class about their figure.
- The teacher will distribute the rest of solid figure cards among the class.
- Students will observe different solid figures and name them.

Questions outline:

- If I want to pick two solids that will roll, neither of them has vertices? Which solid figure I will choose?
- Sara chooses two solids with more than one square faces. Which the two solids did she choose?
- How are sphere, cylinder, and cone alike? How are they different?
- What dimension does a solid figure have that a plane figure does not?

TITLE: Augmented Reality Geometry

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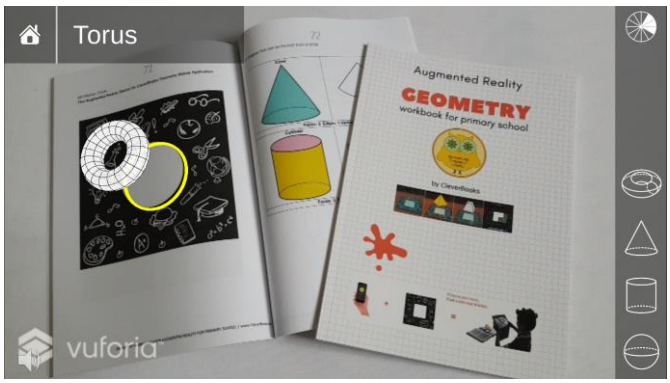

Timeframe of activity: 30-45 min

Tags: Cards for geometrical shapes - mathematical rules

Grade Level: K-7

App/Tech Tools: CleverBooks Geometry App, tablets

Additional material: CleverBooks Geometry Workbook

Learning Objectives:

By the end of this activity, the student will be able to:

- Recognize regular and irregular shapes.
- Recognize the types of regular shape.
- Make a comparison between the polygon and solid.
- Recognize polygon types such as (square - rectangle - circle - triangle – hexagon).
- Deduce the number of sides - vertices - angles - in a polygon.
- Recognize the types of solid such as (cube - cuboid - cylinder - spherical – pyramid).
- Deduce the number of sides - vertices - angles - and only a face in each polygon.
- Analyzing and reconstructing stereoscopic shapes.
- Deduce the name of the hologram after and before folding.
- Know the parts of the circle radius - the diameter.
- Deduce how to calculate the circumference of a circle and the area of a circle.
- Know the parts of the triangle, base and height.
- Deduce how to calculate the area and perimeter of a triangle.
- Analyzing and reconstructing shapes and finding the difference between them.
- Performs self-assessment through an electronic test using the application – Geometry.

Suggested questions:

- Which is the difference between three-dimensional and flat shapes?
- To bring the concept closer to the students, by giving an example from the real life ... If someone offers you a meal in a restaurant consisting of a burger, a mug of juice, finger chips ... How would you classify the contents of this meal in terms of three-dimensional and flat shapes?

Lesson Activity:

Divide my class students into three groups, and we elect a leader for each group

- I apply the reverse lesson strategy by sending the link of the scientific material to students before explaining it using Microsoft Teams.

- The next day, I distribute the CleverBooks Geometry resources from the Workbook to the three groups.
- So that the leader of the first group was given the Circle shape.
- The leader of the second group was given the Triangle shape.
- The leader of the second group was given the Hexagon shape.
- In addition, I give each leader a set of cards containing the following information.
- Number of vertices/number of faces / number of characters / number of angles.
- The group leader, in cooperation with a team, fills it out.
- The leader of each group exchanges his energy with the other groups in order to inform the students about the rest of the figures as well as the conclusions of his fellow students.

Work sheet ●

Group 1				
shape	Number of letters	Number of faces	Number of intersection point of letters	Cut out its horizontal plane
Circle				
Cylinder				
Sphere				
Explore other shapes and write your notes				

Group 2				
shape	Number of letters	Number of faces	Number of intersection point of letters	Cut out its horizontal plane
A rectangle				
Cubic				
Cuboid				
Explore other shapes and write your notes				

Group 3				
shape	Number of letters	Number of faces	Number of intersection point of letters	Cut ou tits horizontal plane
Triangle				
Pyramid				
Prism				
Explore other shapes and write your notes				

Questions outline:

- Open the application- CleverBooks Geometry App- from your device and choose the icon shapes.
- Place the mobile camera on the marker with a Geometrical shape.
- Name some of 2D shapes and their properties.
- Name some of the 3D shapes and their properties.
- Find 2D shapes that have the same number of sides.
- Find 3D shapes that have the same number of letters and faces.

Additional Ideas (optional):

A video of the group leader explaining to his colleagues how to use (CleverBooks Geometry).

Resources:

The link of videos:

- https://youtu.be/utuIf3xZx3M
- https://youtu.be/6RGXaCpEtks
- https://youtu.be/9_ITK6saFdU

The student Leader (Ola) a Explain the Clever- Books Geometry

- https://1drv.ms/v/s!At5_v2zU3pSRgz0OprGtFxghRJly