

EVIDENCE OF UNDERSTANDING

PRE ALGEBRA

The Oklahoma Library of Digital Resources is an innovative initiative to provide Oklahoma educators with high-quality, interactive teaching resources.

We appreciate our sponsors:



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GETTING TO KNOW OKLDR

WHO IS OSSBA?

The Oklahoma State School Boards Association (OSSBA) works to promote quality public education for the children of Oklahoma through training and information services to school board members. The Association is a leader among leaders in Oklahoma education and a visible presence in the local school districts and throughout the state.

The OSSBA was created in 1944 to provide support for local school board members with a variety of information, assistance, and representation services. OSSBA reaches every school board member through training opportunities. It creates and encouraged effective leaders to promote public education and cultivates productive alliances with governing bodies. OSSBA trains school board members to participate in an effective and supportive manner to provide direction for educational innovation and improves public perception of education in Oklahoma by sharing strategies and tools with our member school districts to focus on the success of Oklahoma public education.

OSSBA works with school boards to demonstrate the impact they have on student achievement. We work to provide meaningful two-way communication of advocacy, services, and training activities to local boards of education and their stakeholders. Other services we provide that have a direct impact on student achievement include strategic planning and superintendent searches. Our legal team provides free legal information to the school districts.

WHY OKLDR?

In the summer of 2016, OSSBA set out on a journey assist teachers in the integration of technology into their classrooms. The Oklahoma Library of Digital Resources (OKLDR) became a collection of digital content resources selected by Oklahoma educators to support the Oklahoma Academic Standards. The resources were curated by teachers from school districts across Oklahoma. Each collection contained a variety of learning resources, such as videos, apps, pdf documents, and websites, and are designed so that teachers can then build their lesson plans. The resources helped bridge the digital equity gap among students while helping schools make the most of limited resources.

After collaborating with educators, school and district leaders for a couple of years, OKLDR has been enhanced in the following ways:

- Resources are now an Open Education Resource (OER) “book” format, making it easier to use and accessible on multiple devices.
- Resources map to ESSA expectations for evidence of student understanding and students’ mastery of the academic standards.
- Tools are now agnostic and can be used on multiple devices.
- Lessons are now focused on student engagement through the use of technology. The first OKLDR version focused on teacher resources. This is a major change.
- To prioritize student learning, teacher resources are now located at the back of each book.

HOW TO USE THE BOOK



The Oklahoma Academic Standards for this lesson are grouped together by key topics. Sometimes you will see only one standard, but other times you will see a grouping of standards.



Evidence of Understanding is the key. This is the concept you want your students to master that reinforces the standards. Mastery means deeper understanding, not just “skim the surface” learning.



Digital Tools are the recommended applications and/or tools for the lesson. Think of this element as the “supplies box.”



In Practice is a suggested activity to engage the students to demonstrate mastery of the standard. You will notice that this is just one suggested lesson, and sometimes there might be a second lesson. The suggested lesson, developed by Oklahoma teachers, is meant to give you a starting point. You might decide to use the lesson or it might give you an idea of something else you could do to teach the concept.

MOVING FORWARD

As you can see the OKLDR book has been designed to inspire educators to have students demonstrate their understanding of the Oklahoma Academic Standards through the use of technology as a productivity tool. While educators have limited time in the day to plan and research high quality content, this book is a jumping off point, with suggested peer-reviewed activities and resources.

While you might encounter extra white space in the book, it is intentional for growth. As you integrate the activities into your lessons, you are encouraged to send us student work samples that might be included in the book, as well as additional activities and resources that could be included in future revisions.

Next Steps:

- We would love to add samples of student work to the activities, so please send the work to: okldr@ossba.org.
- If you would like to be involved in future course creation, or know teachers who would like to be involved, please contact us at: okldr@ossba.org.
- See anything that needs to be changed or enhanced? Contact us at: okldr@ossba.org.

NUMBER AND OPERATIONS

REAL NUMBER SYSTEM



PA.N.1.1 Develop and apply the properties of integer exponents, including $a^0=1$ (with $a \neq 0$), to generate equivalent numerical and algebraic expressions.

PA.N.1.2 Express and compare approximations of very large and very small numbers using scientific notation.

PA.N.1.3 Multiply and divide numbers expressed in scientific notation, express the answer in scientific notation.

PA.N.1.4 Classify real numbers as rational or irrational. Explain why the rational number system is closed under addition and multiplication and why the irrational system is not. Explain why the sum of a rational number and an irrational number is irrational; and the product of a non-zero rational number and an irrational number is irrational.

PA.N.1.5 Compare real numbers; locate real numbers on a number line. Identify the square root of a perfect square to 400 or, if it is not a perfect square root, locate it as an irrational number between two consecutive positive integers.



Evidence of Understanding

Students will be able to create a video to demonstrate their understanding of the real number system.



Digital Tools

- *Video Editor-* Clips, WeVideo, Do-Ink, iMovie
- *Animation -* PowtoonFlipaclip, Animatic Bitmoji
- *Student Response-* Kahoot, Plickers, Nearpod, Google Forms, Socrative



In Practice

- Assign each student the topics below:
 - Exponent Rules
 - Multiplying and Dividing Scientific Notation
 - Classifying Numbers
 - Performing Operations with Real Numbers
 - Perfect and Non-Perfect Square Roots on a Number Line
- Each student will use a video editor, bitmoji creator, and Powtoon to create a video teaching their topics.
- After creation of videos, students may work in partners to watch another students video and ask and answer questions.

ALGEBRAIC REASONING AND ALGEBRA

FUNCTIONS



PA.A.1.1 Recognize that a function is a relationship between an independent variable and a dependent variable in which the value of the independent variable determines the value of the dependent variable.

PA.A.1.2 Use linear functions to represent and explain real-world and mathematical situations.

PA.A.1.3 Identify a function as linear if it can be expressed in the form $y=mx+b$ or if its graph is a straight line.

PA.A.2.1 Represent linear functions with tables, verbal descriptions, symbols, and graphs; translate from one representation to another.

PA.A.2.2 Identify, describe, and analyze linear relationships between two variables.

PA.A.2.3 Identify graphical properties of linear functions including slope and intercepts. Know that the slope equals the rate of change, and that the y-intercept is zero when the function represents a proportional relationship.

PA.A.2.4 Predict the effect on the graph of a linear function when the slope or y-intercept changes. Use appropriate tools to examine these effects.

PA.A.2.5 Solve problems involving linear functions and interpret results in the original context.



Evidence of Understanding

Students will be able use graphing tool, sketch application and spreadsheet to create tables, calculate slope, and graph lines from slope-intercept form.



Digital Tools

- *Graphing* - GeoGebra, Desmos
- *Sketch Application*- Sketches School, Notes, ibis, Absolute Board, Google Draw, Auto Draw, Do-Ink, Paper by 53, Web Paint
- *Spreadsheet*- Numbers, Google Sheets, Microsoft Excel



In Practice

- Using a spreadsheet, students will create 5 tables of 4 ordered pairs that apply to real world situations.
- Students will calculate slope for each table, then write the slope-intercept form of the line for each table.
- Students will then use Geogebra, Desmos, and sketch application to graph and label each line on a coordinate plane.
- Students will submit their final graph and notes.
- Stipulations on lines: at least 2 (but not all) must be negative slope, at least 2 (but not all) must have a negative y-intercept, at least 2 must have a fraction as a slope.

EXPRESSIONS, EQUATIONS AND INEQUALITIES



PA.A.3.1 Use substitution to simplify and evaluate algebraic expressions.

PA.A.3.2 Justify steps in generating equivalent expressions by identifying the properties used, including the properties of operations (associative, commutative, and distributive laws) and the order of operations, including grouping symbols.

PA.A.4.1 Illustrate, write, and solve mathematical and real-world problems using linear equations with one variable with one solution, infinitely many solutions, or no solutions. Interpret solutions in the original context.

PA.A.4.2 Represent, write, solve, and graph problems leading to linear inequalities with one variable in the form $px+q>r$ and $px+q<r$, where p , q , and r are rational numbers.

PA.A.4.3 Represent real-world situations using equations and inequalities involving one variable.



Evidence of Understanding

Students will be able use a video editor to show their steps to solve 2 equations and 2 inequalities, graph their solution, including their explanation of one of them. Students will also know the different properties of operations.



Digital Tools

- *Video Editor-* Clips, WeVideo, Do-Ink, iMovie
- Digital Camera
- *Music Video Editor-* TikTok, Instagram, YouTube



In Practice

- Students will be given 2 equations and 2 inequalities.
- Students will create a music video demonstrating how to solve each of them, including a visual of the solutions graphed.
- In the video, students will explain their step in solving the equations or inequalities and also talk about the different properties of operations using creative techniques to differentiate and remember each property.

GEOMETRY & MEASUREMENT (GM)

PYTHAGOREAN THEOREM



PA.GM.1.1 Informally justify the Pythagorean Theorem using measurements, diagrams, or dynamic software and use the Pythagorean Theorem to solve problems in two and three dimensions involving right triangles.

PA.GM.1.2 Use the Pythagorean Theorem to find the distance between any two points in a coordinate plane.



Evidence of Understanding

Students will be able to use camera to apply Pythagorean theorem in order to calculate the distance from the ground to the kite flying in the air.



Digital Tools

- Camera, photo app
- *Word Processor* - Pages, Google Docs, Microsoft Word
- *Sketch Application*- Sketches School, ibis Paint X



In Practice

- Students will fly a kite and take a picture of someone flying a kite.
- After the picture is taken, find the actual distance from the person to a point under the kite and find the length of the string.
- Mark up the photo using a sketch application giving the distances above.
- Students will use the pythagorean theorem, to find how high the kite was flying in the air, students will document and submit using a word processor.

THREE-DIMENSIONAL FIGURES



PA.GM.2.1 Calculate the surface area of a rectangular prism using decomposition or nets. Use appropriate measurements such as cm^2 .

PA.GM.2.2 Calculate the surface area of a cylinder, in terms of π and using approximations for π , using decomposition or nets. Use appropriate measurements such as cm^2 .

PA.GM.2.3 Develop and use the formulas $V=lwh$ and $V=Bh$ to determine the volume of rectangular prisms. Justify why base area (B) and height (h) are multiplied to find the volume of a rectangular prism. Use appropriate measurements such as cm^3 .



Evidence of Understanding

Students will be able to find the surface area and volume of a three dimensional object they build in 3D design or video game and label dimensions of each object.



Digital Tools

- *Video Game* - Minecraft (Apple), Minecraft (Google)
- *3D Design* - 3DCio, Tinkercad, uMake
- *Word Processor* - Pages, Google Docs, Microsoft Word



In Practice

- Students will create a 3D structure in Minecraft or on Tinkercad, including at least one cylinder and one rectangular prism.
- Student will take screenshot their picture on Minecraft or Tinkercad and label all the dimensions of the objects. If using Tinkercad students can label on the screen.
- Students will formulate surface area and volume using the formulas and document and submit using a word processor.

DATA & PROBABILITY (D)

INTERPRETING DATA



PA.D.1.1 Describe the impact that inserting or deleting a data point has on the mean and the median of a data set. Know how to create data displays using a spreadsheet and use a calculator to examine this impact.

PA.D.1.2 Explain how outliers affect measures of central tendency

PA.D.1.3 Collect, display and interpret data using scatterplots. Use the shape of the scatterplot to informally estimate a line of best fit, make statements about average rate of change, and make predictions about values not in the original data set. Use appropriate titles, labels and units.



Evidence of Understanding

Students will be able explore the effects of a random data point on the mean and median of a collection of points by using a spreadsheet and scatter plot.



Digital Tools

- *Spreadsheet*- Numbers, Google Sheets, Microsoft Excel
- *Word Processor* - Pages, Google Docs, Microsoft Word



In Practice

- Students will collect data that has 2 pieces of information (age vs shoe size, arm length vs number of siblings, etc).
- Students will put data into a spreadsheet, using the spreadsheet, and calculate the mean, median, mode, and range as well as create a scatter plot.
- Using a word processor the student will explain what type of correlation their scatter plot has and evaluate the mean and median is affected by a random data point.

PROBABILITY



PA.D.2.1 Calculate experimental probabilities and represent them as percents, fractions and decimals between 0 and 1 inclusive. Use experimental probabilities to make predictions when actual probabilities are unknown.

PA.D.2.2 Determine how samples are chosen (random, limited, biased) to draw and support conclusions about generalizing a sample to a population.

PA.D.2.3 Compare and contrast dependent and independent events.



Evidence of Understanding

Students will be able to use screen recording and a probability app to determine experimental and theoretical probability then compare and state the independent and dependent events in their activity.



Digital Tools

- Screen Recording
- *Video Editor*- Clips, WeVideo, Do-Ink, iMovie
- *Decision Making App* - Dice Roller, Tiny Decisions
- *Word Processor* - Pages, Google Docs, Microsoft Word



In Practice

- Students will create their own probability activity using an app of their choice to collect data (such as dice, spinners, notes, etc).
- Using a word processor and screen recording students will document experimental and theoretical probability of their scenario.
- Students will use a video editor to create a video with screen recording and screen shots.
- Students will compare theoretical and experimental probability results and state whether the experiment is dependent or independent.

RESOURCES

TEACHER

Math is Fun: Exponents

M.A.P. Lesson: Applying Properties of Exponents

Super Base Video: Exponents

Georgia Lesson: Exponents

Scientific Notation Video

M.A.P. Lesson: Estimating Length through Scientific Notation

Scientific Notation Digital Game

CK12 Lesson: Intro to Scientific Notation

CK12 Lesson: Operations with Scientific Notation

Number Types Video

M.A.P. Lesson: Classifying Rational and Irrational Numbers

Operations Video

Ordering Video

CK12: Orders Real Numbers

Approximating Square Roots Video

Ex-Exponents Math Rap Video

Functions Shmoop Video

CK12: Domain and Range of a Function

Functions in Real Life Video

M.A.P. Linear Equations and Graphs Matching Activity

Linear Equations Activity

Graph! (Linear Equations Song Video)

Math is Fun: What is a Function?

Graphing Linear Equations

M.A.P. Comparing Lines and Linear Equations

Slope of a Line

Multi-Step Equations with Variable on Both Sides Shmoop Video

Substitution of Variables in Expressions Video

STUDENT

Translate Phrases to Expressions and Evaluate

Properties Song Video

Order of Operations Using Properties (Proofs)

Real World Problems with Linear Equations

M.A.P. Solving Linear Equations with One Variable

Inequalities with One Variable Shmoop Video

Inequality Word Problems

Pythagorean Theorem Song Video

Pythagorean Theorem Lesson

Distance of Two Points Using Pythagorean Theorem

Building a Box (Surface Area of a Rectangular Prism)

CK12: Surface Area of a Rectangular Prism

Surface Area of a Cylinder

Volume using the Area of the Base Video

Exploring the Effects of the Change of Data

Effects of Outliers on Central Tendency Video

Math is Fun: Scatter Plots

Scatter Plot Interactive Practice

Theoretical and Experimental Probability

CK12 Experimental Probability

Three Act Math: Probability

Bias and Sampling Practice

CK12 Sampling and Bias

Scatter Plots Shmoop Video

Independent and Dependent Word Problem Practice