

Math: Numbers and Geometry

Math: Numbers and Geometry in Ancient Egypt

Subject: Math

Grade Level: Middle School (Grade 8)

Duration: 5 days (45 minutes each)

Standards:

- **MA.8.GR.1.1 & MA.8.GR.1.2** – Understand and apply the Pythagorean Theorem to solve real-world and mathematical problems.
- **MA.8.GR.2.1 & MA.8.GR.2.2** – Explore congruence and similarity using transformations.
- **MA.8.GR.2.3** – Describe the effects of transformations on two-dimensional figures and use them to create geometric art.
- **MA.8.NSO.1.1 & MA.8.NSO.1.2** – Use rational approximations and translate between number systems and forms.

Objectives:

- Apply the Pythagorean Theorem to analyze ancient monument structures.
 - Use geometric transformations to design and interpret Egyptian patterns and symbols.
 - Calculate volume of 3D shapes used in historical construction.
 - Identify and construct symmetrical figures inspired by Egyptian artifacts.
 - Decode and compute using ancient Egyptian numerals and unit fractions.
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Day 1: Monument Measurements – Math in the Making

Materials:

- Graph paper, rulers, tape measures
- Visuals comparing pyramids and modern monuments
- Calculators
- Projector or smartboard

Hook (5 min):

- Display a side-by-side visual comparison of the Great Pyramid of Giza and the Statue of Liberty.
- Pose the question: “Which one do you think is taller?” Have students guess and explain their reasoning.

Introduction (10 min): Present actual heights and base dimensions of the monuments. Introduce the idea of using geometry to explore monument size and structure.

Mini-Lesson (10 min): Demonstrate how to use the Pythagorean Theorem to determine the slant height of a pyramid.

Guided Practice (10 min): Distribute problem sets where students calculate the slant height and surface area of a pyramid using simplified dimensions.

Independent Practice (10 min): Students draw scale models of pyramids or monuments using measurements and apply the Pythagorean Theorem.

Closure (5 min): Students share their drawings with a partner and discuss one geometric insight gained.

Assessment:

- Formative: Observation of group discussion and problem-solving steps
 - Summative: Labeled drawing and correct calculations
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Day 2: Geometry in Ancient Design

Materials:

- Pattern blocks, tracing paper, mirrors
- Images of Egyptian tiles, murals, and architecture
- Colored pencils and rulers

Hook (5 min):

- Display a repeating Egyptian border pattern.
- Ask: “What do you notice about the shapes? Are they flipped, turned, or repeated?”

Mini-Lesson (10 min): Explain transformations (translation, rotation, reflection, dilation) using Egyptian art examples. Use tracing paper and mirrors for demonstration.

Activity (25 min): Students design a border pattern using a combination of transformations. Each design must incorporate at least three types of transformations with labels and explanations.

Closure (5 min): Students walk around and identify transformations in classmates' work.

Assessment:

- Completed design using transformations
 - Exit slip: "Which transformation helped you the most in creating your pattern?"
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Day 3: Calculating Volume – Building Like an Engineer

Materials:

- Volume formula reference sheets
- Cubic unit blocks
- 3D models or nets of pyramids and prisms
- Calculators

Hook (5 min):

- Show a video of a modern construction site and one of pyramid construction.
- Ask: "What do you think builders had to figure out before starting construction?"

Mini-Lesson (10 min): Review volume formulas, focusing on pyramids and prisms. Work through a few practice problems.

Activity (25 min): Students receive measurements of a hypothetical burial chamber and calculate its volume. Then, they estimate how many blocks of certain volume would be needed.

Closure (5 min): Quick round robin: "What's one thing you learned about volume today?"

Assessment:

- Completed volume calculations and material estimates
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Day 4: Geometry and Art – Symmetry in Egyptian Design

Materials:

- Grid paper, compasses
- Egyptian motif templates
- Colored pencils and symmetry mirrors

Hook (5 min):

- Present the symmetrical mask of King Tut.
- Ask: “What makes this design balanced and powerful?”

Mini-Lesson (10 min): Demonstrate how to find and draw lines of symmetry using grids and compasses.

Activity (25 min): Students replicate a half-design of an Egyptian artifact using symmetry principles, then color and embellish it.

Closure (5 min): Peer gallery walk: “What symbolism or pattern stood out to you in your peer’s design?”

Assessment:

- Completed symmetrical art
- Peer feedback using a structured compliment card

Day 5: Egyptian Math – Decoding Numerals and Fractions

Materials:

- Hieroglyph number sheets
- Fraction strips, ancient marketplace role-play items
- Calculators, math journals

Hook (5 min): Put a few large Egyptian numbers on the board. Ask: “What do you think these mean?” Partner students to guess and check.

Mini-Lesson (10 min): Introduce base-10 Egyptian numerals and unit fractions. Highlight how all fractions were expressed as sums of unit fractions.

Activity (25 min): Students complete decoding tasks and simulate a trade in a “marketplace,” converting prices using Egyptian math.

Closure (5 min): Reflect in journals: “What was the hardest part about using unit fractions? What was fun?”

Assessment:

- Completed decoding sheet
- Marketplace math log
- Journal response