

Measure and Model Square Pyramids

Grade 3 | 8 curated lessons | Arizona

WHEN TO TEACH IT

During geometry, measurement, spatial reasoning, and data work.

Where This Fits in Your Year

This pack fits naturally within Arizona Grade 3 during geometry, measurement, spatial reasoning, and data work.

Students investigate shape, dimension, comparison, construction, measurement, and evidence-based mathematical description.

The regional label identifies curriculum placement. It does not claim that every lesson completes an entire regional expectation, and no standards code is assigned on the basis of a title or topic alone.

Teach each lesson for the mathematical actions students actually perform and explain. Add locally required notation, algorithms, display forms, or problem types when they are not explicitly taught.

PLACEMENT PRINCIPLE

Use what the lesson substantively teaches. Do not infer additional coverage from the regional edition label.

LESSON GUIDE

8 Lessons from Exploring Pyramids Around the World Choose the lesson that fits the work already underway. The plans retain the full and short versions, access levels, language support, materials, and printable student work from the curated pack.

1. From Flat Paper to a Standing Pyramid
2. Count What Meets: Faces, Edges, Vertices
3. Fourteen, Twelve, Ten: Step Pyramid Count
4. Is 853 Almost Twice 480?
5. Two Bases, Two Sizes
6. The Word That Takes Two Inches
7. The Number Not on the Page
8. 373 Feet, Said Both Ways

CURATED LESSON

1. From Flat Paper to a Standing Pyramid Representation · Measuring and drawing a square base with four triangular faces, then folding

it into a solid

The book hands the builder every number this lesson needs: a square base at least five inches on each side, four triangles three and a half inches tall, slanted sides about four and one quarter inches long. Students measure and draw that flat net, cut around the triangles without cutting the base, and fold it up into a solid that stands. The measuring is the mathematics: every line is drawn to a stated length and checked before the next one goes down.

Full lesson — 20 minutes

1. Draw the square base (4 min) With the ruler flat on the paper, draw a square five inches on each side in the middle of a large sheet of heavy construction paper. Measure every side before you draw the next one and write the 5 beside each side as you finish it. Four sides, four fives, or the folded pyramid will lean. Word preview: base, inches > at least five inches on each side, in the middle of a large piece of heavy construction paper. This will be the base of our model pyramid.
2. Draw the four triangles (5 min) Use each side of your square as the bottom of a triangle. Draw four triangles that are three and a half inches tall, with the two slanted sides about four and one quarter inches long. Check one slanted side against the other before you move on to the next side of the square. Word preview: faces, equal > With the ruler, draw four triangles that are three and a half inches tall. The sides of the triangle should be about four and one quarter inches long. Make sure the two sides of each triangle are equal in length.
3. Cut only the triangles (5 min) Cut along the outside edges of the four triangles and stop at the square. The base has to stay joined to all four triangles, so run a finger around the four fold lines first and say do not cut here at each one. Then cut. > Once you've drawn the base and all four faces of the pyramid, use scissors to cut along the edges of the four triangles. Don't cut the square base.
4. Fold, meet, and tape (6 min) Fold each triangle up along the line it shares with the square. Bring the four tips together over the middle of the base and tape the points. Set the model down and check that it rests flat on its square base. If one tip sits off to the side, unfold and remeasure the triangle that came up short. > The triangles should meet each other at the top of the pyramid. Use tape to hold the four points together and you have made a three-dimensional or three-d model of the great pyramid at Giza.

Short version — 9 minutes

1. Draw the square base (4 min) Draw a square five inches on each side in the middle of the heavy paper, measuring every side before you draw the next. Write the 5 beside each one. Word

preview: base, inches > at least five inches on each side, in the middle of a large piece of heavy construction paper.

2. Draw the four triangles (5 min) Use each side of the square as the bottom of a triangle three and a half inches tall, with slanted sides about four and one quarter inches. Check the two slanted sides against each other on every triangle. Word preview: faces, equal > With the ruler, draw four triangles that are three and a half inches tall. The sides of the triangle should be about four and one quarter inches long.

Three Levels

Support Start from paper that already carries the five-inch square in light pencil, and spend the whole time on the four triangles: three and a half inches tall, slanted sides about four and one quarter inches, checked one against the other. Everything after that stays the same, including the cutting, the folding, and the tape.

At Grade Draw the five-inch square, then the four triangles, then cut, fold, and tape. Write the measurement beside every line you draw so a partner can check your paper against the book's numbers before you pick up the scissors.

Extension Before you fold, put one finger on the middle of a triangle's bottom edge and another on its tip: that gap is the three and a half inches. Now run a finger up a slanted side, which the book gives as about four and one quarter inches. Tell a partner why the slanted trip has to be the longer one, pointing at both paths while you say it.

English Learners

Number and measurement travel across languages: a student who reads a ruler in any language reads this one, and 5, three and a half, and four and one quarter sit at the same marks on every inch ruler. What does not travel is the instruction syntax. The phrase five inches on each side spreads one number over four sides, and many languages mark that spreading differently, so a student may measure one side and stop. Walk through a sentence naming the inches on this side and then the inches on each side while the student points first at one side and then around all four. Let students count and check measurements in their everyday language and report the number in English.

Materials

Workbook

Word cards: base, equal, faces, inches — card set Cut along each line. One word on each card. base

- equal · faces · inches Sentence strips: this side, each side — strip set Say each sentence with your number in it. Point as you say it. _____ inches on this side. _____ inches on each side.

Large sheet of heavy construction paper, one per student · Ruler marked in inches · Pencil · Safety scissors

- Clear tape · Word cards: base, equal, faces, inches

CURATED LESSON

2. Count What Meets: Faces, Edges, Vertices Concept · Naming and counting the faces, edges, and vertices of a square pyramid The parts of a solid are named one at a time. Faces are the flat surfaces, edges are where faces meet, a vertex is the point where three or more edges meet, the base is the bottom, and the great pyramid has a square base and four triangular faces. Students take a folded paper pyramid and count each kind of part with a marker in hand so nothing is counted twice: five faces, eight edges, five vertices.

Full lesson — 20 minutes

1. Count the faces (4 min) Take the folded paper pyramid and run a flat hand over every surface, sticking one dot on each surface as you go so none gets counted twice. Count the dots aloud and say what you found: one square face and four triangle faces, five faces in all. Word preview: faces > Pyramids, cubes, and most other 3D shapes have sides called faces. The great pyramid has a square base and four triangular faces.
2. Trace the edges where faces meet (5 min) Faces meet in lines. Draw over every one of those lines with the crayon. Work all the way around the bottom first, then up each slant to the top. No line gets colored twice. Count the colored lines and say the number aloud. Word preview: edges > Faces are flat surfaces that meet at the edges of the shape.
3. Find every vertex (5 min) Press a fingertip on each point where three or more of your colored lines run together and stick a dot on it. Count the dots: four down at the base, one up at the top. Write the three counts on the index card, faces first, then edges, then vertices. Word preview: vertex > The point or corner where three or more edges meet is called a vertex.
4. Say the count to another pair (6 min) Trade models with another pair and check their card against their model, touching each face, each edge, and each vertex as you count it. Then say the whole sentence with your own numbers inside it: this pyramid has five faces, eight edges, and five vertices, and the face it rests on is its base. Word preview: base > The base is the bottom of the object.

Short version — 9 minutes

1. Count the faces (4 min) Run a flat hand over every surface of the folded pyramid, sticking one dot on each so none is counted twice. Say the count aloud: one square face, four triangle faces, five in all. Word preview: faces > Pyramids, cubes, and most other 3D shapes have sides called faces.

2. Find every vertex (5 min) Press a fingertip on each point where three or more edges run together

and stick a dot on it. Count the dots, four at the base and one at the top, and write the number on the card. Word preview: vertex > The point or corner where three or more edges meet is called a vertex.

Three Levels

Support Work with a model whose eight edges are already drawn in crayon, and put your time into the two counts that are still open, the faces and the vertices. Say both numbers aloud and write all three on the card, the same card everyone else fills in.

At Grade Count all three kinds of part yourself, marking as you go so nothing is counted twice, write the counts on the card, and check another pair's card against their model before you say the sentence.

Extension Fold one triangle flat down onto the table, then fold it back, and do that for each triangle in turn. Then tell a partner why a square base can hold exactly four triangles and never five: each bottom edge carries one triangle, and there are four bottom edges.

English Learners

Counting and one-to-one touching carry over from any language, and a student can point at a face long before naming one. The words are the whole load here, and three of the four fight an everyday English meaning: a face is not a person's face, a base is not a base you run to, and edges here are lines where two surfaces meet, not the rim of a table. Run a sentence naming the part and then how many of them there are, with the model in hand and a finger on the part being named. A student may count in their family language first and then say the frame in English.

Materials

Workbook

Count card: faces, edges, vertices — half page Write your three counts in order. Faces _____

Edges _____ Vertices _____ Sentence strip: faces, edges, vertices, base — strip set

Say the whole sentence with your own counts in it. Touch each part as you name it. This pyramid has _____ faces, _____ edges, and _____ vertices. The face it rests on is its base.

Word cards: base, edges, faces, vertex — card set Cut along each line. One word on each card. base

- edges · faces · vertex Folded paper square pyramid, one per pair · Sticky dots · Crayon · Index card, one per pair · Pencil · Word cards: base, edges, faces, vertex

CURATED LESSON

3. Fourteen, Twelve, Ten: Step Pyramid Count Fluency · Subtracting within 20 to build and order a run of square sizes that falls by twos The step pyramid is built from six squares whose sides run 14, 12, 10, 8, 6 and 4 inches, and the book shows where the first drop comes from: measure in one inch from each side of a fourteen-inch square and you are left with a twelve-inch square. Students run that subtraction on an inch strip, write the whole run back by twos, deal six number cards largest to smallest while naming the difference at each step, and check that the run has exactly six terms against the book's six stacked mastabas.

Full lesson — 20 minutes

1. Take one inch from each side (5 min) Lay the fourteen-inch strip flat and mark one inch in from the left end, then one inch in from the right end. Count the inches left between your two marks. Say the arithmetic out loud while you point: fourteen, take one, take one more, twelve. Word preview:

inches > On the first sheet, draw a square that is 14 inches on each side. Now measure in one inch from each side of the square and draw a square that is 12 inches on each side.

2. Count the six squares back by twos (4 min) Write the run of square sizes on the recording strip.

Start at 14 and take two away each time, until the book's list runs out. 14, 12, 10, 8, 6, 4. Read your run back against the book's list and fix any number that does not match. Word preview: square, smaller > Repeat these steps to create the remaining mastabas, using a 12 inch square, a 10 inch square, an 8 inch square, a 6 inch square, and a 4 inch square.

3. Deal the sizes in order (5 min) Shuffle the six number cards, then deal them out largest to smallest, the way the mastabas are stacked. After each card, say the difference between it and the card before:

twelve, that is two less than fourteen. If a card lands out of place the difference will not be two, and that is your signal to move it. Word preview: mastaba > Stack the mastabas on top of each other, from largest to smallest, using tape to hold them together. Each mastaba was smaller than the one below it.

4. Stop where the book stops (6 min) Count the cards in your finished run and check that number against the book: six. Then say what the next two numbers would be if the rule kept going, two and then zero, and say why a builder has to stop at four instead. > He designed a tomb that looked like six mastabas stacked on top of each other.

Short version — 9 minutes

1. Take one inch from each side (5 min) Mark one inch in from each end of the fourteen-inch strip and count the inches left between the marks. Say it out loud: fourteen, take one, take one more, twelve. Word preview: inches > Now measure in one inch from each side of the square and draw a square that is 12 inches on each side.

2. Count the six squares back by twos (4 min) Write the run of square sizes from 14, taking two away each time, and stop where the book's list stops: 14, 12, 10, 8, 6, 4. Check it against the book's list. Word preview: square, smaller > Repeat these steps to create the remaining mastabas, using a 12 inch square, a 10 inch square, an 8 inch square, a 6 inch square, and a 4 inch square.

Three Levels

Support Work with a strip that already carries both one-inch marks, and put everything into the count: fourteen, twelve, ten, eight, six, four, touching each number on the strip as you say it. The card dealing and the check against the book's six stay exactly as written.

At Grade Mark the strip, count the run, write it, deal the cards largest to smallest naming each difference of two, and count the terms against the book's six mastabas.

Extension Start the same rule at twelve instead of fourteen and run it down to four. Count how many mastabas that stack would have, then tell a partner what changed and what stayed the same about the rule itself.

English Learners

Counting back by twos is portable: a student who counts fluently in another language will run 14, 12, 10, 8, 6, 4 on the first try. The English that carries the load is the subtraction talk, take one from each side and two less than, where from and than do the mathematical work and are the easiest words to lose. Practice Fourteen take two is twelve. Twelve is two less than fourteen. with a finger on two cards at once. Invite students to count aloud in their first language and then say the two less than sentence in English.

Materials

Workbook

Recording strip: the run of six square sizes — strip set Start at 14. Take two away each time. Stop where the book's list stops. 1st square, _____ inches on each side 2nd square, _____ inches on each side 3rd square, _____ inches on each side 4th square, _____ inches on each side 5th square, _____ inches on each side 6th square, _____ inches on each side Number cards: 4, 6, 8, 10, 12, 14 — card set Cut along each line. One number on each card. One set for each pair. 4 · 6 · 8 · 10 · 12 · 14 Word cards: inches, mastaba, smaller, square — card set Cut along each line. One word on each card. inches · mastaba · smaller · square Paper strip fourteen inches long, marked in inches · Pencil · Recording strip · Number cards 4, 6, 8, 10, 12, 14, one set per pair · Word cards: inches, mastaba, smaller, square

CURATED LESSON

4. Is 853 Almost Twice 480?

Reasoning · Adding and subtracting within 1000 to test a comparison the text states Two heights and one comparison are stated: the Trans-America Building is 853 feet tall, almost twice the height of the Great Pyramid, which was about 480 feet tall when it was first built. Students do the arithmetic the comparison rests on. They add 480 and 480 to get 960, then subtract twice, finding that the building stops 107 feet short of doubled and stands 373 feet above the pyramid.

Full lesson — 20 minutes

1. Find the two heights (4 min) Read the two sentences on the strip and underline the feet in each: 853 for the Trans-America Building, about 480 for the Great Pyramid. Write both numbers at the top of

your sheet, the taller building first, and keep the word about in front of the 480. Word preview: height > It is 853 feet tall, almost twice the height of the great pyramid at Giza. The Great Pyramid is around 4500 years old and was about 480 feet tall when it was first built.

2. Double the smaller one (5 min) Twice the Great Pyramid's height means one 480 and then another 480. Add them on your sheet with the ones under the ones and the tens under the tens, regrouping where you need to. Write the total where your partner can see it. Word preview: twice

3. Put 960 and 853 side by side (5 min) Subtract once to find how far the real building falls short of doubled, 960 take away 853. Subtract again to find how far it stands above the pyramid, 853 take away 480. Circle the smaller of your two differences.

4. Say what the numbers show (6 min) The book says almost twice. Say that sentence back to a partner with your own numbers inside it. Twice about 480 feet is 960 feet. The building is 853 feet, so it stops 107 feet short of twice as tall. Then say which wording the numbers hold up, almost twice or exactly twice, and put a finger on the 107 as your reason. Word preview: twice > It is 853 feet tall, almost twice the height of the great pyramid at Giza.

Short version — 9 minutes

1. Find the two heights (4 min) Underline the feet in each sentence on the strip and write both numbers at the top of your sheet: 853, and about 480. Word preview: height > It is 853 feet tall, almost twice the height of the great pyramid at Giza. The Great Pyramid is around 4500 years old and was about 480 feet tall when it was first built.

2. Double the smaller one (5 min) Add 480 and 480 on your sheet, ones under ones and tens under tens, regrouping where you need to, and write the total in large figures. Word preview: twice

Three Levels

Support The two heights arrive already written at the top of your sheet, 853 feet and about 480 feet, so all of your time goes into the doubling and the two subtractions. Say the finished sentence with all three numbers in it, the same sentence everyone else says.

At Grade Find both heights in the sentences, double the smaller, subtract both ways, and say the comparison aloud with 960, 853 and 107 all inside one sentence.

Extension The book's model instructions say to keep the base the same but double the height of the triangles, so a three and a half inch triangle becomes seven inches. Work that doubling out on paper, then tell a partner what it does and does not settle. The paper triangle is exactly twice as tall, because you doubled the one number the instruction names. The two real buildings are not: 853 feet stops 107 feet short of twice 480. Say which of the two is exact and which is almost, and point at the number that tells you.

English Learners

The arithmetic here is language-independent: 480 plus 480 and 960 take away 853 look identical on paper in any classroom, and a student can be right long before they can say why. The comparison syntax is what blocks them. Almost twice the height of packs a multiplier, a hedge, and a possessive into five words, and taller than reverses in ways many languages handle differently. Rehearse Twice ___ feet is ___ feet. The building is ___ feet. before asking for the full comparison. Students may reason through the doubling in their strongest language and give the finished sentence in English.

Materials

Workbook

Recording sheet: the two height sentences, the doubling and the two differences — At Grade, full page Read both sentences. Underline the feet in each one. The Trans-America Building: "It is 853 feet tall, almost twice the height of the great pyramid at Giza." The Great Pyramid at Giza: "The Great Pyramid is around 4500 years old and was about 480 feet tall when it was first built." The two heights — The taller building, in feet _____ · The Great Pyramid, in feet (keep the word about in front of it) _____ Double the smaller one. Add the Great Pyramid's height to itself. Ones under the ones, tens under the tens. Add here. Write the total where your partner can see it. Put the two numbers side by side. Take 853 away from your total. That is how far the building falls short of doubled. Take 480 away from 853. That is how far the building stands above the pyramid. Circle the smaller of your two differences.

Recording sheet with the two heights already written — Support, full page The two heights — The taller building, in feet: 853 feet · The Great Pyramid, in feet: about 480 feet Double the smaller one.

Add the Great Pyramid's height to itself. Ones under the ones, tens under the tens. Add here. Write the total where your partner can see it. Put the two numbers side by side. Take 853 away from your total. Take 480 away from 853. Circle the smaller of your two differences.

Word cards: height, twice — card set Cut along each line. One word on each card. height · twice Height sentence strip carrying the book's two height sentences · Pencil · Recording sheet · Word cards: height, twice

CURATED LESSON

5. Two Bases, Two Sizes Application · Measuring, comparing and covering two square bases given in inches and half

inches

Two of the book's models have stated base squares: at least five inches on each side for the great pyramid, about 2.5 inches on each side for the Nubian one. Students measure and cut both, lay the small square into a corner of the large one to see what is left over, count how many small squares it takes to cover the large one, and then slot the step pyramid's four-inch square into the order.

Full lesson — 20 minutes

1. Cut both base squares (5 min) Measure and cut two squares: one five inches on each side for the great pyramid model, one two and a half inches on each side for the Nubian model. Write the side length on each square the moment you cut it out. Word preview: base, smaller > at least five inches on each side, in the middle of a large piece of heavy construction paper. Make the square base for this pyramid smaller than the great pyramid base. About 2.5 inches on each side.
2. Lay one on the other (4 min) Set the small square into one corner of the large square with two sides lined up exactly. Mark how much of the big side is left uncovered and measure that piece.

Say what you measured out loud: two and a half inches, the same length as the small square's side.

3. Cover the big square (5 min) Slide the small square around the big one and count how many times it has to be laid down to cover the big square with no gaps and no overlaps. Then mark the big square into that many parts to show your count.
4. Put a third base in order (6 min) The smallest mastaba of the step pyramid is four inches on each side. Take that square and put all three in order from widest to narrowest. Then say each gap out loud. Five to four is one inch. Four to two and a half is one and a half inches. Word preview: inches > Repeat these steps to create the remaining mastabas, using a 12 inch square, a 10 inch square, an 8 inch square, a 6 inch square, and a 4 inch square.

Short version — 9 minutes

1. Cut both base squares (5 min) Measure and cut a square five inches on each side and a square two and a half inches on each side, writing the side length on each one as you finish it. Word preview:

base, smaller > at least five inches on each side, in the middle of a large piece of heavy construction paper. About 2.5 inches on each side.

2. Lay one on the other (4 min) Set the small square in a corner of the large one with two sides lined up, then measure the strip of the big side that is left uncovered and say the length aloud.

Three Levels

Support Both squares arrive already cut, five inches and two and a half inches, with the side length written on each. Your work starts at laying one on the other and runs straight through the covering count and the ordering, exactly as written.

At Grade Measure and cut both squares, mark and measure the uncovered strip, count the coverings, and order all three squares while naming each gap.

Extension Both models use triangles three and a half inches tall, but one base is half the width of the other. Stand both finished models up and tell a partner which one leans in more sharply, using the two base measurements, five inches and two and a half inches, as your whole reason.

English Learners

Measuring and covering are visible acts, and a student can do this entire lesson correctly while the English is still arriving. The words to rehearse are the comparison pair, because wider than and narrower than are two halves of one fact and many languages build them differently, so a student who has the arithmetic can still produce the wrong half. Give the frame The ____ base is ____ inches wider than the ____ base. and have the student say it with a hand flat on each square. Reasoning in the strongest language first is welcome; the frame is said in English.

Materials

Workbook

Four-inch square for the ordering step — full page Cut on the line. One square for each pair. 4 inches on each side The five-inch and two-and-a-half-inch base squares, already drawn — Support, full page Cut on the lines. The side length is written on each square. 5 inches on each side · 2 and a half inches on each side Word cards: base, inches, smaller — card set Cut along each line. One word on each card. base · inches

- smaller Heavy paper, two sheets per pair · Ruler marked in inches · Safety scissors · Pencil · Paper square four inches on each side, one per pair · Word cards: base, inches, smaller

CURATED LESSON

6. The Word That Takes Two Inches Integrated · Cutting two inner squares from the same fourteen-inch square, one following each side and one following one side, and using the book's own next measurement to decide which word the builder meant Full lesson — 20 minutes

1. Read the sentence two ways (4 min) Read the book's instruction aloud from the first strip. Then read the second strip, where each side has become one side. Before anyone picks up a ruler, tell your partner in your own words what each version tells a builder's hands to do. Word preview:

each

2. Cut both inner squares (5 min) Take your two fourteen-inch paper squares. On the first, measure in one inch from every side and cut out the inner square that wording gives you. On the second, measure in one inch from a single side only and cut out that inner square. Keep the two squares apart so you know which wording made which. Word preview: inches

3. Measure what each wording left (5 min) Measure both inner squares and write the two numbers on your card, twelve inches and thirteen inches. Say the subtraction that made each one out loud:

fourteen take one and one more, and fourteen take one. Word preview: inches

4. Check against the book's number and say why (6 min) Set both squares beside the book's next instruction and put a finger on the one that matches the twelve inches it names. Then say the sentence that explains the difference: each takes an inch off both ends, so the width loses two inches and not one. Word preview: each > Now measure in one inch from each side of the square and draw a square that is 12 inches on each side.

Short version — 9 minutes

1. Read the sentence two ways (4 min) Read the book's instruction aloud from the first strip, then read the second strip where each side has become one side, and tell your partner what each version tells a builder's hands to do. Word preview: each

2. Cut both inner squares (5 min) From your two fourteen-inch squares, measure in one inch from every side on the first and from a single side on the second, and cut out the inner square each wording gives you. Word preview: inches

Three Levels

Support Your first square is already measured and cut to twelve inches. Put your time into the second wording: measure in one inch from one side only, cut, and measure what you get. Then say which of the two squares the book's sentence orders, and why.

At Grade Cut both inner squares from the two wordings, measure both, and say the sentence naming which one the book requires and why each costs two inches rather than one.

Extension Find the second place this book leans on each, where the great pyramid's base is drawn at least five inches on each side. Say what a builder would produce if that sentence said one side instead, and put a measurement in your answer.

English Learners

Each is a distributive word, and many languages carry that idea with a marker on the noun rather than a separate word in front of it, so a student may read each side and hear the side. That is not a decoding problem and it will not be fixed by slowing down: the word has to be tied to a motion. Have students say each side while their finger walks all four sides of the square, then one side while the finger stops. Rehearse the frame I measured in one inch from ____ side, so I took away ____ inches.

Students may talk the two cuts through in their strongest language and give the frame in English.

Materials

Workbook

Two-wordings card: what each cut left — half page Write what you measured on each square. Say the subtraction beside it. From every side: my inner square is _____ inches. Fourteen take _____. From one side only: my inner square is _____ inches. Fourteen take _____. The book's next instruction names _____ inches, so the book means _____ side.

Sentence strips: the two wordings — strip set Read each strip aloud. Point at the word that changed.

Measure in one inch from each side of the square. Measure in one inch from one side of the square.

Word cards: each, inches — card set Cut along each line. One word on each card. each · inches Two sentence strips, the book's instruction and the same instruction with one side in place of each side

- Two paper squares fourteen inches on each side, per pair · Ruler marked in inches · Safety scissors · Pencil · Two-wordings card · The book's next instruction, the one naming the twelve inch square, displayed where every pair can read it · Word cards: each, inches

CURATED LESSON

7. The Number Not on the Page Integrated · Supplying the triangle height for the Trans-America model, which the book never states, by reading the two sentences that send you back to the great pyramid instructions and doubling the number you find there Full lesson — 20 minutes

1. Hunt for the missing measurement (5 min) Read the Trans-America model instructions all the way through, looking for a triangle height. Report back to your partner that no number is given anywhere on the page. Then mark the two sentences that tell you where to look instead. Word preview: same

2. Read the sentences that fund the number (4 min) Read both of those sentences aloud. Turn back to the great pyramid instructions and read the height sentence there. Write three and a half inches on your build card, and write the sentence that supplied it on the line beside it. Word preview:

same > [SOURCE LINE REQUIRED — the two Trans-America model sentences that redirect the builder. Do not paraphrase; pull verbatim from the book or leave this line blank.]

3. Double it and draw it (5 min) Double three and a half inches and write the seven on your card.

Then draw a triangle seven inches tall above a base line, and measure the finished height to prove it is seven. Word preview: double

4. Say the number with its line (6 min) Give the whole answer to your partner: first the number, then the sentence that produced it. A number offered without its sentence goes back, and so does a sentence offered without its number. Word preview: double, same Short version — 9 minutes
1. Read the sentences that fund the number (4 min) Read the two redirecting sentences aloud, turn back to the great pyramid instructions, read the height sentence there, and write three and a half inches on your build card with the sentence that supplied it beside it. Word preview: same
2. Double it and draw it (5 min) Double three and a half inches, write the seven on your card, and draw a triangle seven inches tall above a base line, measuring it to prove it. Word preview: double

Three Levels

Support The three sentences you need are printed on your card already, in the order you will use them. Read all three aloud, then do the doubling and the drawing exactly as everyone else does: three and a half, and three and a half more, then a seven-inch triangle you measure to check.

At Grade Find the two sentences yourself, follow them back to the height, double it, draw the seven-inch triangle, and give both halves of the answer, the number and the line that funds it.

Extension The book also says to keep the base measurements the same, and the great pyramid instructions ask for a square at least five inches on each side. Tell a partner why the height comes out to exactly one number while the base does not, and say what the book would have to add before the base could be pinned down the same way.

English Learners

Two ordinary words are doing all the work in this lesson and neither one names a number: the same, which tells a reader to carry a value across unchanged, and double, which tells them to change it.

Both are common English words with heavy mathematical loads, and many languages mark carrying-over and doubling with different structures than English uses, so a student can read every word here and still not know which number to write. Rehearse *The book says , so I the number.

Three and a half doubled is ____.* Encourage students to trace the reference and work the doubling in their strongest language, then read the two book sentences and give the number in English.

Materials

Workbook

Build card: the number and the line — half page Write the number you found, then the sentence that gave it to you. The great pyramid's triangle height is _____ inches. The sentence that told me:

_____ Doubled, that is _____ inches. I measured my drawn triangle: _____ inches.

Three-sentence card — Support, half page Read all three aloud in this order, then double the number. [SOURCE LINES REQUIRED — the two Trans-America redirecting sentences and the great pyramid height sentence, verbatim.] Word cards: double, same — card set Cut along each line. One word on each card. double · same Build card · Ruler marked in inches · Pencil · Paper for the triangle

- The Trans-America model instructions and the great pyramid model instructions, displayed side by side so both are readable at once · Word cards: double, same

CURATED LESSON

8. 373 Feet, Said Both Ways Integrated · Computing the exact difference between the two heights the book sets side by side, stating the relation in both directions over a single diagram, then doing the same with two measurements you cut yourself Full lesson — 20 minutes

1. Pull both heights out of the book (4 min) Find and read aloud the two sentences that give the heights. Write 853 and about 480 at the top of your grid paper. Word preview: taller > It is 853 feet tall, almost twice the height of the great pyramid at Giza. The Great Pyramid is around 4500 years old and was about 480 feet tall when it was first built.

2. Draw the two bars and find the gap (4 min) Draw two bars on the grid paper, the longer one labeled 853 and the shorter one 480. Subtract, then label the length by which the longer bar runs past the shorter one: 373 feet. Word preview: taller

3. Say it both ways over one diagram (5 min) Write both sentences under your diagram, the building 373 feet taller and the pyramid 373 feet shorter. Say each one aloud with a finger on the bar it names, and check that both sentences are pointing at the same 373. Word preview: taller, shorter

4. Do it with something you can hold (7 min) Measure and cut the two model base squares, five inches and two and a half inches on a side. Lay one on the other to find the difference, then say both directions again with the words that fit width: wider than and narrower than. Word preview:

shorter Short version — 9 minutes

1. Draw the two bars and find the gap (4 min) Draw two bars on grid paper, the longer labeled 853 and the shorter 480, then subtract and label the length by which the longer bar runs past the shorter one: 373 feet. Word preview: taller

2. Say it both ways over one diagram (5 min) Write both sentences under the diagram, the building 373 feet taller and the pyramid 373 feet shorter, and say each aloud with a finger on the bar it names, checking that both sentences point at the same 373. Word preview: taller, shorter

Three Levels

Support Your two bars are drawn and labeled 853 and 480 already. Find the 373 and fill both frames on your card, *___ is 373 feet taller than ___* and *___ is 373 feet shorter than ___*, then say both aloud with a finger on each bar as you name it.

At Grade Find both heights, draw and label the bars, subtract for the difference, write and say both directions, then do the whole thing again with the two base squares you measure and cut yourself.

Extension The book says the building is almost twice the height of the pyramid. Work out twice 480, set it beside 853, and tell a partner how almost twice and 373 feet taller can both be true of the same two numbers, and which of the two tells a builder more.

English Learners

Comparative syntax is where this lesson will break for a multilingual student, and it will break after the arithmetic is already right. English marks comparison in three places at once, an ending on the adjective, the word than, and the order of the two nouns, and reversing the sentence changes the adjective while keeping than in place. Several languages mark the comparison on the second noun instead, or use one adjective where English needs taller and shorter, so a student can produce 373 correctly and then attach the wrong word to it. Drill the pair together, never singly: The building is 373 feet taller than the pyramid. The pyramid is 373 feet shorter than the building. Have the student point at the taller bar on the first sentence and the shorter bar on the second so the word changes hands with the finger. Students may work the subtraction and rehearse the pair in their strongest language before giving both sentences in English.

Materials

Workbook

Bar diagram sheet: 853 and 480 — full page Write both heights at the top. Draw one bar for each.

Label the gap. The Trans-America Building _____ feet The Great Pyramid _____ feet

The gap between them _____ feet Sentence frame card: both directions — half page Fill in both. Point at the bar you name. _____ is _____ feet taller than _____.

_____ is _____ feet shorter than _____. Now say the same two ways about your base squares, using wider than and narrower than.

Word cards: shorter, taller — card set Cut along each line. One word on each card. shorter · taller
Grid paper · Pencil · Ruler marked in inches · Heavy paper for two base squares · Safety scissors ·
Bar diagram sheet · Sentence frame card carrying both directions, taller than and shorter than · The book's two height sentences, displayed one above the other · Word cards: shorter, taller