



Math Blast 7

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7th Grade Mathematics

A Career-Based Approach with SEL

Student Name _____

Edition 2 - Volume 1

Math Blast





7th Grade Mathematics

*A Career-Based Approach
with Social-Emotional Learning*

Edition 2
Volume 1

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Unit 1 | Scale Drawings

Carpentry

7th Grade Mathematics

North Carolina 7th Grade Math Standards

Unit 1

Draw, construct, and describe geometrical figures and describe the relationships between them.

NC.7.G.1

Solve problems involving scale drawings of geometric figures by:

- Building an understanding that angle measures remain the same and side lengths are proportional.
- Using a scale factor to compute actual lengths and areas from a scale drawing.
- Creating a scale drawing.

1.1 Angles and Angle Construction

Warm-Up

Write all you know about angles.

Main Topic Types of Angles

Architect of Your Dream House

Materials Needed:

Ruler (or straightedge), Pencil & Eraser, Protractor, Colored pencils (Blue, Red, Green)

Part 1: The Design Process

1. Use a pencil and a **ruler** to sketch the front view of your absolute dream house on the next page.
2. **The Golden Rule:** Every wall, roof line, window, chimney, and door must be drawn using a ruler so all lines are perfectly straight. No freehand sketching!
3. Make sure your design includes a variety of creative shapes (triangular roof peaks, slanted solar panels, custom windows, etc.) so you have different kinds of angles to work with.

Part 2: Coding the Blueprint

Once your drawing is complete, you will act as the building inspector. Analyze your lines and color-code your angles by drawing a small arc (or a square symbol for right angles) inside the corners using this key:

- **Blue Color = Acute Angles** (Angles less than 90°)
- **Red Color = Right Angles** (Angles that are exactly 90° — use a square mark)
- **Green Color = Obtuse Angles** (Angles greater than 90° but less than 180°)

Part 3: Measuring & Labeling

1. Use your **protractor** to carefully measure those 6 chosen angles.
2. Write the exact degree measurement directly next to the angle on your drawing.

Main Topic**My Dream House Design**

Angle

A figure formed by two rays sharing a common endpoint.

Acute Angle	
Sketch	Description

Right Angle	
Sketch	Description

Obtuse Angle	
Sketch	Description

Math History Detectives: Why 360 Degrees?

Go online and investigate why a full circle is split into exactly 360 degrees instead of an easier number like 100. Write your discovery.

Construct irregular polygons, then measure and label each interior angle using a protractor.

Triangle

Quadrilateral

Pentagon

Hexagon

T
A
S
K

1

- Construct a right angle ABC .
- Cut $\angle ABC$ into two parts by drawing $\overrightarrow{BD}$.
- $m\angle ABD = 30^\circ$.
- $m\angle DBC = (x + 15)^\circ$.
- Solve for x .

In task 1, $m\angle ABD + m\angle DBC = 90^\circ$. These two angles are complementary angles.
Define complementary angles.

Complementary
Angles

Two angles are complementary. If the measure of one angle is 35° , what is the measure of the other angle?	Angle A and Angle B are complementary. If Angle A is four times the measure of Angle B, what is the measure of Angle B?
If two angles form a right angle and one angle is represented by $2x^\circ$ while the other is $3x^\circ$, find the measure of the larger angle.	An angle is defined by the expression $5x^\circ$. If its complementary angle is $(4x + 18)^\circ$, find the value of x .
Two angles are complementary. If the measure of one angle is 55° , what is the measure of the other angle?	Two angles are complementary. If the measure of one angle is 61° , what is the measure of the other angle?

TASK

2

- Construct a straight angle ABC .
- Cut $\angle ABC$ into two parts by drawing $\overrightarrow{BD}$.
- $m\angle ABD = 30^\circ$.
- $m\angle DBC = (x + 15)^\circ$.
- Solve for x .

In task 2, $m\angle ABD + m\angle DBC = 180^\circ$. These two angles are supplementary angles.
Define supplementary angles.

Supplementary
Angles

Two angles are supplementary. If the measure of one angle is 115° , what is the measure of the other angle?	Angle X and Angle Y form a linear pair along a straight line. If Angle X measures 42° , what is the measure of Angle Y?
An angle measures $(2x)^\circ$ and its supplementary companion measures $(3x)^\circ$. What is the value of x ?	Angle A and Angle B are supplementary. If the measure of Angle A is 156° , what is the measure of Angle B?
Two adjacent angles form a straight angle. If one angle measures $(5x - 10)^\circ$ and the other angle measures $(x + 40)^\circ$, what is the value of x ?	If two angles are supplementary and have equal measurements, what must be the measure of each individual angle?

Honors Level

If two angles are complementary, what specific geometric shape do they form when they are placed adjacent to each other?

Why is it impossible for a single triangle to contain two obtuse angles?

Can two obtuse angles ever be supplementary? Why or why not?

A clock reads exactly 3:00. What is the angle measurement formed between the hour hand and the minute hand?

If you double the measurement of a sharp 30° acute angle, what type of angle do you create?

SEL Activity

The Angles of My Mind

Self-Awareness & Self-Management

The Concept: Angles are classified by how open or closed the two rays are relative to the 90° and 180° benchmarks.

Activity:

1. **The Math:** Classify these angle measurements: 45° , 90° , 135° , and 180° .

2. **The SEL Bridge:** Think of your mind as a dynamic hinge that opens and closes based on how safe or stressed you feel. Each type of angle represents an emotional state.

3. **The Classification Key:**
 - **The Acute State** ($< 90^\circ$): *Guarded or Highly Focused*. You might feel sharp, anxious, or defensive. Your walls are up, and your perspective is narrow.
 - **The Right State** ($= 90^\circ$): *Perfectly Balanced*. You feel upright, structured, stable, and ready to learn. You can hold your ground safely.
 - **The Obtuse State** ($> 90^\circ$): *Open and Inclusive*. Your perspective is relaxed. You are taking in a wide view, listening to others, and feeling flexible.
 - **The Straight State** ($= 180^\circ$): *Completely Flat or Exhausted*. You have laid your boundaries completely down to rest, or you feel totally checked out.

The "Angle Adjuster" Scenario Log

The Triggering Event	My Automatic Reaction (Acute/Obtuse?)	The Conscious Adjustment	My New Math Classification
A teammate critiques your drawing for a group presentation.	30° Acute (Defensive, thinking: "They hate my work!")	Take a deep breath. Realize they just want the group to get an A.	110° Obtuse (Open to feedback and collaboration)
You get home and see a massive pile of chores.	180° Straight (Completely overwhelmed, lying flat on the couch)	Break the chores into three tiny 10-minute intervals.	90° Right (Upright, structured, and ready to execute)

1.2 Triangles and Polygons

Warm-Up

Write all you know about triangles and polygons.

Main Topic Types of Triangles

TASK

1

- Plot three points that are equidistant from each other.
- Label the points A, B, and C.
- Connect the points using a ruler to form a triangle.
- Measure the length of each side using a ruler.
- Complete the table.

	$m\overline{AB}$	$m\overline{AC}$	$m\overline{BC}$
Length			

- Use a protractor to measure and label each interior angle.
- What is the sum of the interior angles of the triangle?
- What do you notice about the measurements of the interior angles?

Equilateral Triangle

T
A
S
K

2

- Plot and label three points A, B, and C. Make sure the distance from A to B is exactly equal to the distance from A to C.
- Connect the points using a ruler to form a triangle.
- Measure the length of each side using a ruler.
- Complete the table.

	$m\overline{AB}$	$m\overline{AC}$	$m\overline{BC}$
Length			

- Use a protractor to measure and label each interior angle.
- What is the sum of the interior angles of the triangle?
- What do you notice about the measurements of the interior angles?

Isosceles
Triangle

The Custom Gable Vent

A carpenter is building a triangular wooden gable vent for the peak of a roof. The client wants the vent to be an equilateral triangle. The carpenter cuts the first two base angles of the frame, making them exactly 60° each.

Before cutting the final joint at the top peak of the vent, what must the measurement of the missing third angle be to ensure the frame forms a perfect equilateral triangle?

The A-Frame Rafter Problem

Elena uses a speed square to measure the pitch of the roof at the eaves. She finds that the bottom-left base angle (angle A) is exactly 55° . Because the roof is a symmetric isosceles triangle, the bottom-right base angle (angle B) is also 55° . Before she cuts the ridge beam where the two rafters meet at the very top, she needs to find the peak angle (angle C).

What is the measurement of the missing peak angle (angle C)?

T
A
S
K

3

- Plot and label three points A, B, and C. Make sure the distances from each point are not equal.
- Connect the points using a ruler to form a triangle.
- Measure the length of each side using a ruler.
- Complete the table

	$m\overline{AB}$	$m\overline{AC}$	$m\overline{BC}$
Length			

- Use a protractor to measure and label each interior angle.
- What is the sum of the interior angles of the triangle?
- What do you notice about the measurements of the interior angles?

Scalene
Triangle

Polygon

A flat, two-dimensional shape with straight sides that are fully closed.

Name	Illustration	No. of Sides	No. of Vertices	Sum of Interior Angles
Triangle				
Quadrilateral				
Pentagon				
Hexagon				

Polygon

A flat, two-dimensional shape with straight sides that are fully closed.

Name	Illustration	No. of Sides	No. of Vertices	Sum of Interior Angles
Heptagon				
Octagon				
Nonagon				
Decagon				

Honors Level

Can an obtuse triangle also be a scalene triangle? Explain why or why not using the relationship between side lengths and angles.

Why is it impossible to create an equilateral right triangle? Explain using the angle sums of a triangle.

Can a right triangle have side lengths that are all consecutive integers?
If so, what are they? If not, why not?

If a pentagon has four right angles, what must the measure of the fifth angle be?
Is this pentagon regular or irregular?

Can a regular polygon be concave? Explain why or why not based on the definitions of "regular" and "concave."

SEL Activity

The Geometry of Our Social Shapes

Social Awareness & Relationship Skills

The Concept: The Triangle Angle Sum Theorem states that no matter what a triangle looks like—whether it is tall and sharp (acute) or wide and leaning (obtuse)—its three interior angles will *always* add up to exactly 180° . If you change one angle, the other two must automatically adjust to keep the shape closed.

Activity:

1. **The Math:** A triangle has two known interior angles measuring 45° and 85° . Calculate the missing third angle (x) needed to form a complete triangle.

2. **The SEL Bridge:** Think of a closed triangle as a Core Friendship Group. A healthy group doesn't need everyone to be exactly the same. You might have one loud, expressive friend (85°), a quiet, observant friend (45°), and a balanced mediator (50°). Your differences are what make the group work! Just like a triangle, you must adapt to each other's unique 'angles' to keep your friendship circle strong and connected.

3. **Task:** Think of your closest group of friends or family members.
 - What unique personality "angle" does each person bring to the table?

 - How do those different angles balance out to equal a stable, comfortable group environment?

1.3 Scale Factors

Warm-Up

Write 3 equivalent values of $\frac{2}{3}$.

Main Topic Scale Factor – Reading Blueprints

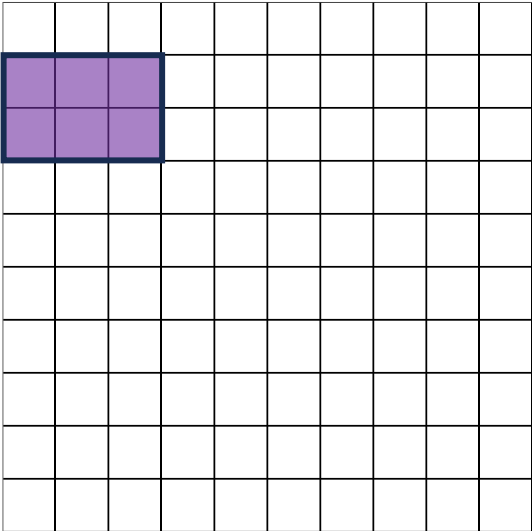
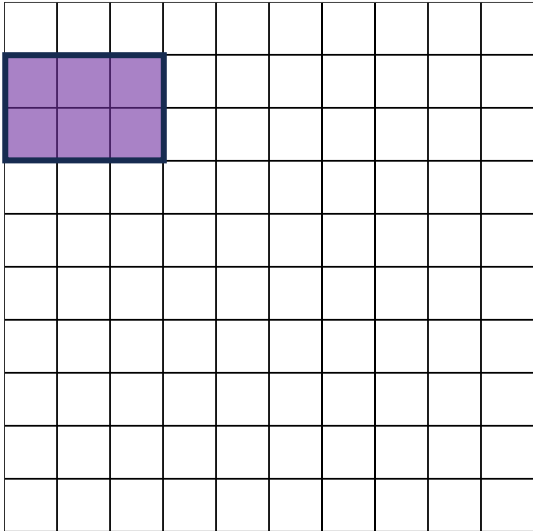
An architect hands a carpenter named Leo a set of blueprints for a custom outdoor deck. Obviously, a 20-foot deck cannot be drawn full-size on a sheet of paper, so the drawing is **scaled down**. The blueprint uses a scale factor where every $\frac{1}{4}$ inch on the paper represents 1 foot in real life.

Leo needs to know the actual, real-world length of the main support beam. He takes his tape measure to the blueprint and measures the line representing the beam. The line on the paper is exactly **5 inches long**.

Help Leo find the real-world length of the main support beam.



Main Topic Enlargement

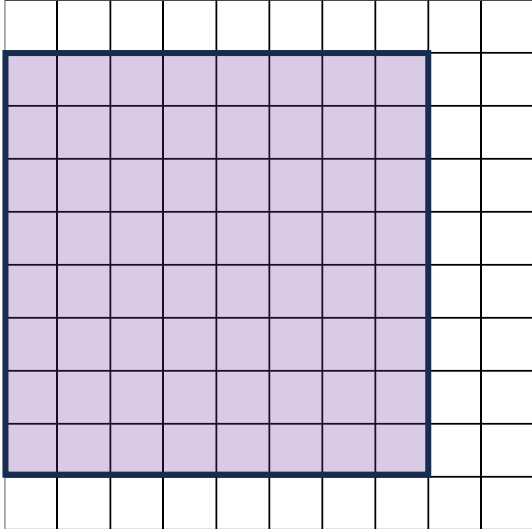
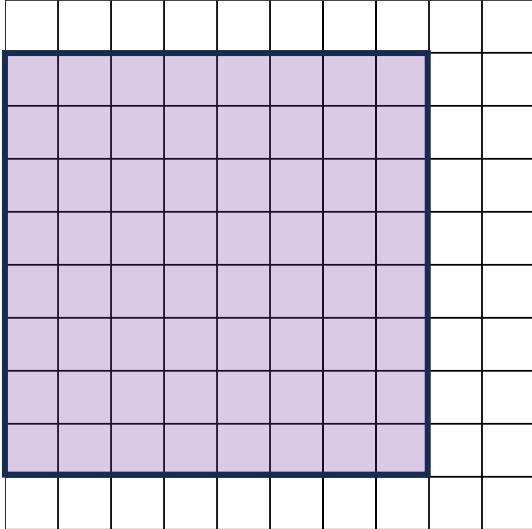
Enlarge the rectangle by 2x	Enlarge the rectangle by 3x
	
a. What is the dimension of the original rectangle? b. What is the dimension of the enlarged rectangle? c. What is the dimension of the rectangle when it is enlarged by 5x?	a. What is the dimension of the original rectangle? b. What is the dimension of the enlarged rectangle? c. What is the dimension of the rectangle when it is enlarged by 10x?

Scale Factor

The ratio of the length of a side of a new, transformed shape (the image) to the length of the corresponding side of the original shape (the pre-image).

An architect drafts a blueprint for a rectangular patio that measures 4 inches wide by 6 inches long. Before building, she decides to enlarge the patio by a scale factor of 3.5. What are the new dimensions of the actual patio?

Main Topic Reduction

Reduce the rectangle by 2x	Reduce the rectangle by 3x
	
a. What is the dimension of the original rectangle? b. What is the dimension of the reduced rectangle? c. What is the dimension of the rectangle when it is reduced by 4x?	a. What is the dimension of the original rectangle? b. What is the dimension of the reduced rectangle? c. What is the dimension of the rectangle when it is reduced by 6x?

Scale Factor

The ratio of the length of a side of a new, transformed shape (the image) to the length of the corresponding side of the original shape (the pre-image).

An artist designs a rectangular logo for a t-shirt that is 24 cm wide and 36 cm long. He wants to reduce the design by a scale factor of $\frac{1}{6}$ to fit on a souvenir keychain. What are the dimensions of the reduced logo on the keychain?

Solve each problem and show all steps.

A model car is built using a scale factor of $\frac{1}{18}$. If the actual car is 180 inches long, how long is the model car?	If a triangle with a side length of 6 cm is dilated by a scale factor of $k = 2.5$, what is the new length of that side?
A blueprint uses a scale where 1 inch represents 4 feet. What is the scale factor of the blueprint written as a unitless ratio	If the scale factor between two similar triangles is $k = \frac{2}{3}$ what is the ratio of their perimeters?
If a line segment of length 12 units is reduced to a length of 9 units, what scale factor was applied?	Triangle PQR is dilated to form Triangle P'Q'R'. If $PQ = 5$ and $P'Q' = 25$, what is the scale factor of the dilation?
A photo is 4 inches wide by 6 inches long. It is enlarged using a scale factor of 1.5. What are the new dimensions?	A billboard image is scaled up from a 2-inch by 3-inch business card. If the billboard width is 12 feet, what is its length?

Main Topic

Scale Factor Applications

The Coffee Table to Dining Table A carpenter has a blueprint for a rustic coffee table that is 24 inches wide by 48 inches long. A client wants the exact same design built as a dining table, scaled up by a factor of 1.75. What will the dimensions of the dining table be?

The Garden Shed Expansion A standard tool shed floor plan measures 6 feet by 8 feet. A homeowner wants to enlarge the floor plan by a scale factor of 2.5 to build a larger workshop. What are the new dimensions of the workshop floor?

The Picnic Table A miniature children's picnic table is 3 feet long and 2 feet wide. A carpenter uses a scale factor of 2.2 to scale it up to full adult size. What are the length and width of the adult picnic table?

The Grand Staircase Model A master carpenter is designing a grand helical staircase that will stand 15 feet tall and 8 feet wide. Before cutting expensive hardwood, he builds a scale model using a reduction factor of 0.05. What are the height and width of the model staircase in inches? (*Hint: 1 foot = 12 inches*)

The Cabinet Door Profile A large pantry cabinet door is 24 inches wide and 72 inches tall. The carpenter needs to make a matching overhead spice cabinet door by scaling the dimensions down by a factor of $\frac{1}{3}$. What are the dimensions of the spice cabinet door?

The Bookcase Shelf A custom library bookcase has shelves that are 48 inches long and 12 inches deep. The carpenter is asked to make a smaller desktop book-rack using a scale factor of 0.375. What will the shelf dimensions of the desktop rack be?

Honors Level

If a scale factor is greater than 1, will the new shape be larger or smaller than the original?

If a scale factor is between 0 and 1 (like $\frac{1}{2}$), what happens to the original shape?

When you apply a scale factor to a shape, what happens to the measures of its angles?

If a scaled shape has sides that are all exactly half the length of the original shape, what is the scale factor?

If the scale factor for the sides of two squares is $\frac{1}{1}$, what is the ratio of their areas?

SEL Activity

The Scale Factor of My Mind

Self-Management & Self-Awareness

The Concept: When a scale factor is a fraction or decimal between 0 and 1, the new figure is a reduction. It shrinks uniformly, making a complex or massive layout easy to view all at once (like a map or a blueprint).

Activity:**The "Perspective Reducer" Blueprint.**

The Massive Life Overwhelm	The original "Dimension"	The Reduction Factor (k)	The New Manageable Focus
End-of-Year Exams: Feeling panicked about studying for 4 different subjects at once.	100% Total Panic	$k = 1/10$ (Focusing on just 1 summary sheet today)	10% Effort Steps: The mountain becomes a perfectly solvable step.
Friendship Drama: A massive argument involving an entire text thread of people.	24 hours of constant checking	$k = 0.25$ (Stepping away to look at the big picture)	6 hours of boundary space: The drama shrinks, letting you breathe.

1. **The Math:** Verify how multiplying a large whole number by a fractional scale factor reduces its size.
2. **The SEL Bridge:** Scaling down isn't about ignoring your life; it's about Strategic Reduction. Maps use a tiny scale factor so you can navigate an entire state without getting lost in every single blade of grass. When life feels too massive to handle, you can apply a fractional scale factor ($k = 0.1$) to shrink your immediate focus down to a single, manageable square inch.
3. **Reflection:** What is a massive worry you have right now that needs to be scaled down into a smaller, blueprint-sized task?

1.4 Congruent Polygons

Warm-Up

Write all you know about congruent polygons.

Main Topic

Scale Factor – Scaling Up a Dollhouse Model

The Chevron Accent Wall (Parallelograms)

A carpenter is installing a trendy accent wall using interlocking wooden boards cut into parallelograms to form a chevron pattern. For the pattern to line up without any gaps, every single wooden piece must be congruent.



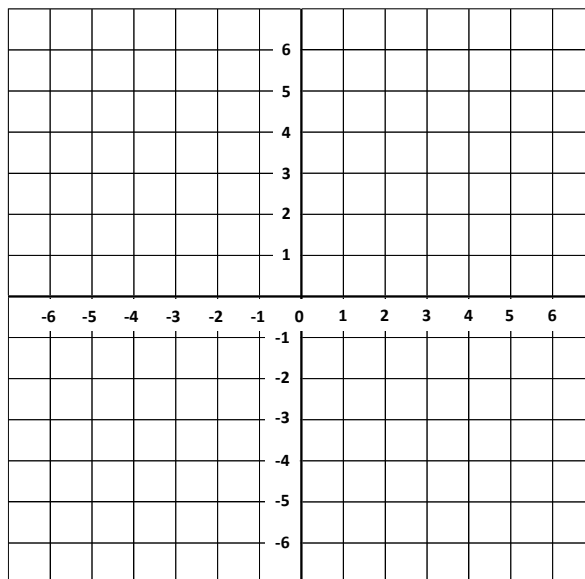
One of the wooden pieces has a top side measuring 14 inches, a slanted side measuring 8 inches, and a sharp corner angle of 45° . If a second piece is congruent to the first, what is the measure of its corresponding corner angle, and what is the length of its longest side?

Main Topic Corresponding Angles and Sides

TASK

1

- Plot A(-4, 6), B(-4, 1), and C(-1, 1), and connect them to create $\triangle ABC$.
- Translate (slide) $\triangle ABC$ 5 units to the right and 4 units down.
- Label the new triangle $\triangle DEF$.
- Mark the corresponding sides with tick marks (dashes) and the corresponding angles with arcs.
- Identify the corresponding sides and angles by completing the table below.



Corresponding Sides			Corresponding Angles		

Given quadrilateral $JKLM \cong$ quadrilateral $NPQR$, which side corresponds to segment LM ?	In the congruence statement $\triangle VWX$, if side SU is written, how should its corresponding side be correctly written to maintain proper vertex order?
If $\triangle ABC \cong \triangle DEF$, which angle corresponds to $\angle B$?	Given $\triangle MNO \cong \triangle PQR$, which angle matches with $\angle ONM$?

**Congruent
Polygons**

Polygons that are identical in both shape and size.

Constructing Congruent Triangles

Materials: Ruler, protractor, pencil, and eraser.

Directions:

1. **Construct:** Using your ruler and protractor, carefully construct two congruent triangles on your paper. Label the first triangle $\triangle ABC$ and the second triangle $\triangle DEF$.
2. **Measure & Label:** Use your tools to find the exact measurements of all three sides (in centimeters) and all three angles (in degrees) for both triangles. Clearly write these measurements next to their corresponding parts.
3. **Verify:** Swap papers with a partner. Have your partner remeasure your triangles to verify that your recorded dimensions are highly accurate and that $\triangle ABC \cong \triangle DEF$.

Main Topic Congruent Polygons Applications**Symmetrical Window Panes**

A construction crew is installing a large arched window that is divided into several smaller glass sections. The two outer sections are congruent triangles. If the left glass triangle has an interior angle measuring 35° at the bottom and a vertical side measuring 4 feet, what must be the measure of the corresponding bottom angle and the length of the corresponding vertical side on the right glass triangle?

**The Hexagonal Picnic Table**

A woodworker is constructing a large outdoor picnic table shaped like a regular hexagon. The table is split down the middle into two halves so it can be separated easily for transport. The left half of the tabletop is a polygon with an outer edge perimeter of 9 feet. What properties must the right half of the table have for the final assembled table to be a perfectly symmetrical, congruent match?

**The Matching Garden Benches**

A landscaper builds two identical wooden benches to place opposite each other in a park. The seating surfaces are congruent rectangles. The first bench surface has an area of 8 square feet and a length of 4 feet. What are the width and length dimensions of the second bench surface?



Honors Level

If two polygons are perfectly congruent, what does that tell you about their interior angles and their side lengths? Can one shape have a property that the other does not?

All congruent polygons are similar, but not all similar polygons are congruent. Explain why this statement is true using a square as an example.

If you trace Polygon A onto a piece of patty paper, what must you be able to do with that tracing for Polygon A and Polygon B to be considered truly congruent?

In geometry, we talk about "corresponding sides" and "corresponding angles." What does the word *corresponding* actually mean when you are comparing two separate congruent shapes?

What are the three "rigid transformations" (or turns, slides, and flips) that change a polygon's position or orientation on a grid but keep it perfectly congruent to the original?

SEL Activity

Congruent to My True Self

Self-Awareness & Relationship Skills

The Concept: Sometimes two polygons don't look congruent simply because of their orientation. A square resting flat on its base looks completely different from an identical square rotated 45° to look like a diamond. Yet, a quick measurement proves they are entirely identical.

Activity:

1. **The Logic:** If you assume two shapes aren't a match just because one is tilted, you make a geometric error. You have to look past the orientation to measure the corresponding parts.
2. **The Social Connection:** We often look at people from different backgrounds, cultures, or peer groups and assume we have absolutely nothing in common with them. They look 'tilted' compared to our orientation. But if you take the time to map out your corresponding parts—your shared fears, your hopes, your need for respect—you will often find that your human core is completely congruent to theirs.
3. **Closing Question:** How can looking past someone's outward 'orientation' or social label help you find a deep, congruent connection with a classmate you've never spoken to before?

1.5 Similar Polygons

Warm-Up

Write all you know about similar polygons.

Main Topic

Scale Factor – Scaling Up a Dollhouse Model

Maya is an apprentice carpenter. Before building a full-sized children's playhouse for a park, her boss asks her to build a small scale model. The scale factor from the model to the real playhouse is 8 (meaning the real playhouse is 8 times larger than the model).



Question A: The window on the model playhouse is 3 inches wide. How wide will the window be on the actual playhouse?

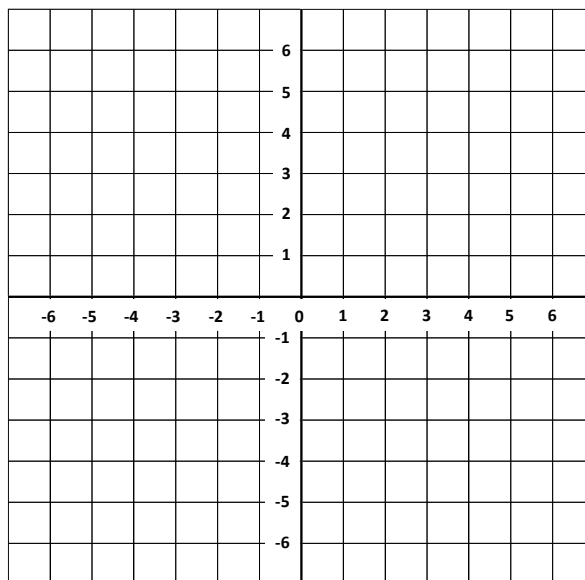
Question B: The actual playhouse needs to have a ceiling height of 72 inches so kids can stand up. How tall should Maya make the ceiling on her small model?

Main Topic Similar Polygons

TASK

1

- Plot A(-4, 6), B(-4, 1), and C(-1, 1), and connect them to create $\triangle ABC$.
- Plot D(0, 6), E(0, -4), and F(6, -4), and connect them to create $\triangle DEF$.
- Mark the corresponding sides with tick marks (dashes) and the corresponding angles with arcs.
- Identify the corresponding sides and angles by completing the table below.



Corresponding Sides			Corresponding Angles		

In $\triangle ABC$, $m\angle A = 40^\circ$ and $m\angle B = 60^\circ$.
In $\triangle DEF$, $m\angle D = 40^\circ$ and $m\angle F = 80^\circ$.
Are the triangles similar?
(Hint: Find the missing angles).

What can you conclude about the measurements of the sides and angles of the triangles in Task 1?

**Similar
Polygons**

Polygons that have the exact same shape, but different sizes.

Constructing Similar Triangles

Materials: Ruler, protractor, pencil, and eraser.

Directions:

1. **Construct the Original:** Using your ruler and protractor, carefully construct a triangle on the left side of your paper. Label this original triangle $\triangle ABC$.
2. **Scale and Construct the Replica:** Choose a scale factor of either 2 (to double the size) or 0.5 (to halve the size). On the right side of your paper, construct a new triangle labeled $\triangle XYZ$ that is similar to your original, using your chosen scale factor.
3. **Measure & Label:** Use your tools to find the exact measurements of all three sides (in centimeters) and all three angles (in degrees) for both triangles. Clearly write these measurements next to their corresponding parts.
4. **Verify:** Swap papers with a partner. Have your partner check your work to verify that:
 - All three corresponding angle measurements are exactly equal ($\angle A \cong \angle X$, $\angle B \cong \angle Y$, $\angle C \cong \angle Z$).
 - All three corresponding side lengths are perfectly proportional based on your scale factor ($\frac{XY}{AB} = \frac{YZ}{BC} = \frac{ZX}{CA}$).
 - The final statement holds true: $\triangle ABC \sim \triangle XYZ$.

Fill in the Blanks

Directions: Fill in the blanks with the correct geometric term, mathematical symbol, or numerical value to complete each statement.

Part 1: Conceptual Foundations

1. Similar polygons have the exact same _____, but different _____.
2. If two polygons are similar, their corresponding angles are perfectly _____.
3. If two polygons are similar, their corresponding side lengths are _____, meaning they share the same ratio.
4. The symbol used in geometry to denote that two shapes are similar is _____.
5. The common ratio that compares any side length of a larger similar polygon to its matching side on the smaller polygon is called the _____.

Part 2: Working with Proportions

Use the similarity statement $\triangle ABC \sim \triangle XYZ$ to answer questions 6 through 8.

6. Angle $\angle B$ corresponds to and is equal in measure to angle _____.
7. If side $AB = 5$ cm and its corresponding side $XY = 15$ cm, the scale factor from the smaller triangle to the larger triangle is $1 : \underline{\hspace{2cm}}$.
8. To find a missing side length, you can set up a fraction equation known as a _____.

For example: $\frac{AB}{XY} = \frac{BC}{?}$. The missing denominator is segment _____.

Part 3: Real-World Properties

9. A dilation is a geometric transformation that stretches or shrinks a figure. A dilation always creates a figure that is _____ to the original figure.
10. If the scale factor between two similar quadrilaterals is $2:3$, and the perimeter of the smaller quadrilateral is 20 cm, the perimeter of the larger quadrilateral must be _____ cm.

Honors Level

If a scale factor is greater than 1, will the new shape be larger or smaller than the original?

If a scale factor is between 0 and 1 (like $\frac{1}{2}$), what happens to the original shape?

When you apply a scale factor to a shape, what happens to the measures of its angles?

If a scaled shape has sides that are all exactly half the length of the original shape, what is the scale factor?

If the scale factor for the sides of two squares is $\frac{1}{1}$, what is the ratio of their areas?

SEL Activity

Same Shape, Different Scales

Social Awareness & Self-Management

The Concept: For polygons to be similar, all corresponding sides must change by the exact same multiplier, known as the **Scale Factor (k)**. If you double one side, you must double *every* side, or the shape warps and loses its similarity.

Activity:

The "Growth Proportions" Tracker

Original Dimension (Your Baseline)	The Scale Factor (k)	New Scaled Dimension	The Balanced Outcome
School Effort: 3 hours of studying.	$k = 2$		Proportional Growth: Your focus matches your academic goals.
Social Stress: 2 hours of text drama.	$k = 2$		Warped Shape: If your stress doubles but your coping skills don't, your life goes out of proportion.

1. **The Math:** Look at the table. If you scale up your challenges (multiply them by 2), you must scale up your support system and coping habits by that exact same scale factor of 2 to keep your life geometry from warping.
2. **The SEL Bridge:** When life demands more from you ($k > 1$), you have to scale up your self-care and boundaries proportionally. If you only increase your workload but don't increase your rest, your shape becomes distorted and stressed out. Similarity teaches us the importance of maintaining structural balance.
3. **Reflection:** Think of an area in your life where the pressure has scaled up recently. What is a coping mechanism or support system you need to scale up to match it?

1.6 Area and Perimeter

Warm-Up

Write the area formula of the following shapes.

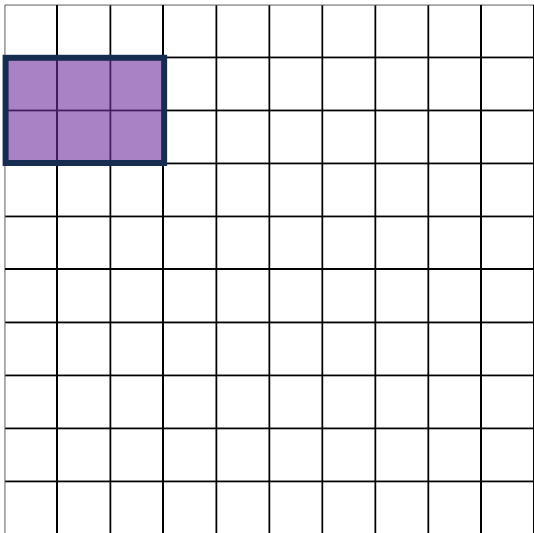
Triangle

Circle

Rectangle

Main Topic Enlargement – Area and Perimeter

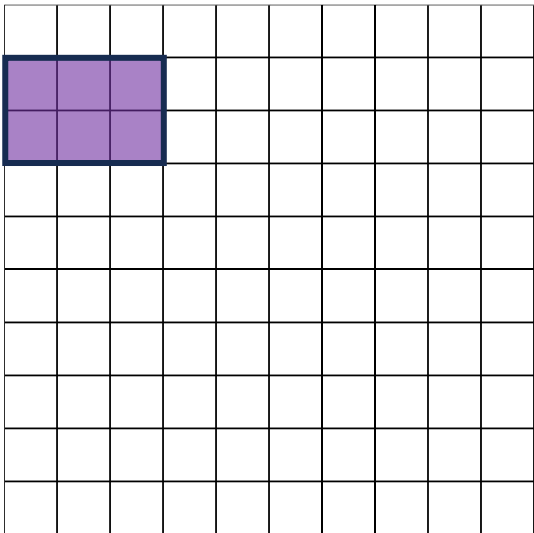
Enlarge the rectangle by 2x



	Area	Perimeter
Original Figure		
Enlarged Figure		

- a. What observations can you make regarding the total area of the figures?
- b. What observations can you make regarding the total perimeter of the figures?

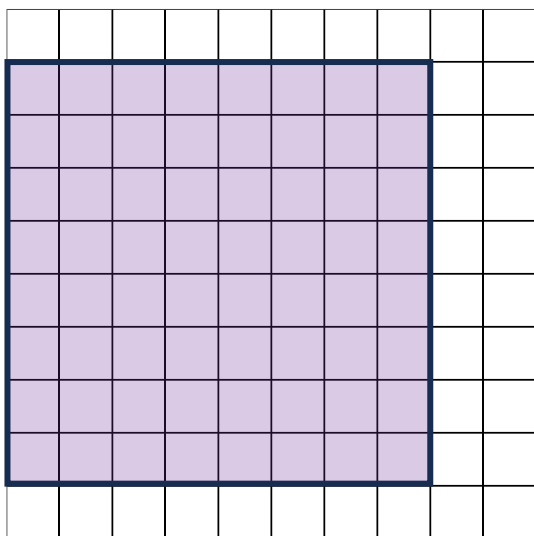
Enlarge the rectangle by 3x



	Area	Perimeter
Original Figure		
Enlarged Figure		

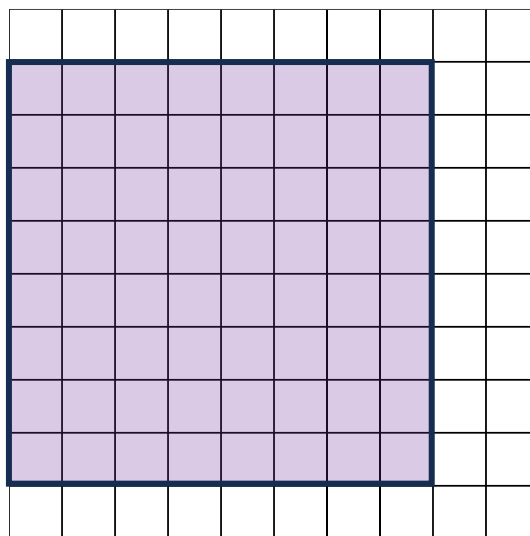
- a. What observations can you make regarding the total area of the figures?
- b. What observations can you make regarding the total perimeter of the figures?

Main Topic	Reduction – Area and Perimeter
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Reduce the rectangle by 2x

	Area	Perimeter
Original Figure		
Reduced Figure		

- a. What observations can you make regarding the total area of the figures?
- b. What observations can you make regarding the total perimeter of the figures?

Reduce the rectangle by 3x

	Area	Perimeter
Original Figure		
Reduced Figure		

- a. What observations can you make regarding the total area of the figures?
- b. What observations can you make regarding the total perimeter of the figures?

The Triangular Roof Truss Cut (The 0.5 X Reduction)

A team is framing a custom roof and builds a large triangular structural gable truss with a base of 12 meters and a height of 8 meters. The blueprints require a smaller, similar decorative triangular accent truss above the porch entryway that is scaled down by a factor of **one-half**.

- Compare the area of similar figures.
- Compare the perimeter of similar figures.

Main Topic Scale Drawing Applications**The Custom Picture Frames (Rectangles)**

A carpenter is making two similar rectangular picture frames. The smaller frame has a base of 8 inches and a perimeter of 28 inches. The larger frame is built using a scale factor of 2 (meaning every side is twice as long as the smaller frame).

- What is the perimeter of the larger picture frame?

- If the area of the smaller frame's opening is 48 square inches, what is the area of the larger frame's opening?

**The Triangular Deck Extension (Triangles)**

An apprentice is helping build a triangular deck extension that is similar in shape to an existing smaller deck. The two triangular decks are similar polygons. The smaller deck has a perimeter of 24 feet and an area of 24 square feet. The longest side of the smaller deck is 10 feet. The longest side of the new, larger deck is 15 feet.

- What is the perimeter of the larger deck?

- What is the area of the larger deck?



Honors Level

If two complex polygons are officially "similar," what must be true about their corresponding angles? What must be true about the ratios of their corresponding sides?

Why is perimeter measured in one-dimensional linear units (like centimeters), while area is measured in two-dimensional square units (like square centimeters)? How does this help us predict how they scale?

If you know that every side of a new polygon is exactly 4 times longer than the original polygon, what can you guess about the new perimeter before doing any addition?

Polygon A and Polygon B are similar. If the area of Polygon B is exactly 16 times larger than the area of Polygon A, what does this tell you about the relationship between their perimeters? How many times larger is the perimeter of Polygon B?

You have two similar triangular gardens. The larger garden has sides that are exactly 3 times longer than the smaller garden. If it takes 30 feet of fencing to enclose the small garden, how much fencing do you need for the large one?

SEL Activity

The Proportions of My Energy

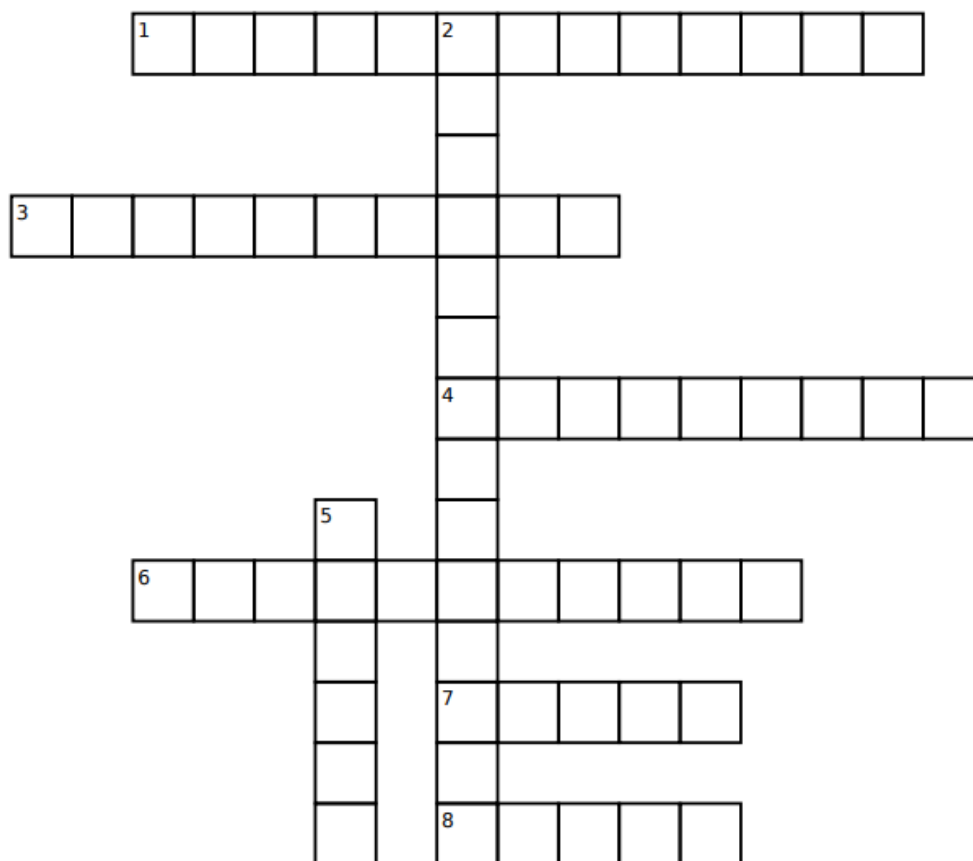
Self-Management & Self-Awareness

The Concept: If two polygons are similar, the ratio of their perimeters (or circumferences) is exactly equal to the scale factor (k). If you double the lengths of the sides, the outer boundary line doubles exactly.

Activity:

1. **The Math:** Rectangle A has a perimeter of 14 cm. Similar Rectangle B is created using a scale factor of $k = 3$. Calculate the perimeter of Rectangle B.
2. **The SEL Bridge:** Think of the Perimeter as your **Daily Schedule and Commitments**—the actual layout of your day. When you move from 6th grade to 7th grade, your schedule scales up linearly. You have more classes, more track practices, or more chores. Your outer boundary line simply stretches to hold the new layout.
3. **Task:** Look at your current weekly schedule. If your daily commitments scaled up by a factor of 3 tomorrow, what are the literal boundary lines you would need to put in place to keep your day organized?
4. **Reflection:** Think of a time you took on 'just one more activity' but ended up feeling completely exhausted. Why does the k^2 law of areas explain exactly why you burned out?

Scale Drawings



Across	Down
1. Sides that are in the same relative position on the original object and the scale drawing. 3. An equation stating that two ratios are equal. 4. A scale drawing that is smaller than the actual real-world object. 6. A scale drawing that is larger than the actual real-world object. The scale factor for an enlargement is always greater than 1. 7. A comparison of two quantities by division. 8. The ratio that compares the measurements of the drawing to the measurements of the actual real-world object.	2. Figures that have the exact same shape but are different sizes. 5. A scale _____ is a scale written as a ratio in simplest form without units.



Unit 2 | Proportional Relationships

Culinary Arts

7th Grade Mathematics

North Carolina 7th Grade Math Standards

Unit 2

Analyze proportional relationships and use them to solve real-world and mathematical problems.	
NC.7.RP.1	Compute unit rates associated with ratios of fractions to solve real-world and mathematical problems.
NC.7.RP.2	Recognize and represent proportional relationships between quantities. a. Understand that a proportion is a relationship of equality between ratios. ○ Represent proportional relationships using tables and graphs. ○ Recognize whether ratios are in a proportional relationship using tables and graphs. ○ Compare two different proportional relationships using tables, graphs, equations, and verbal descriptions. b. Identify the unit rate (constant of proportionality) within two quantities in a proportional relationship using tables, graphs, equations, and verbal descriptions. c. Create equations and graphs to represent proportional relationships. d. Use a graphical representation of a proportional relationship in context to: ○ Explain the meaning of any point (x,y). ○ Explain the meaning of $(0, 0)$ and why it is included. ○ Understand that the y-coordinate of the ordered pair $(1,r)$ corresponds to the unit rate and explain its meaning.
NC.7.RP.3	Use scale factors and unit rates in proportional relationships to solve ratio and percent problems.

Solve real-world and mathematical problems using numerical and algebraic expressions, equations, and inequalities.	
NC.7.EE.3	Solve multi-step real-world and mathematical problems posed with rational numbers in algebraic expressions. • Apply properties of operations to calculate with positive and negative numbers in any form. • Convert between different forms of a number and equivalent forms of the expression as appropriate.

Draw, construct, and describe geometrical figures and describe the relationships between them.	
NC.7.G.1	Solve problems involving scale drawings of geometric figures by: • Building an understanding that angle measures remain the same and side lengths are proportional. • Using a scale factor to compute actual lengths and areas from a scale drawing. • Creating a scale drawing.

2.1 Understanding Ratios and Proportions

Warm-Up

Write all you know about ratios and proportions.

Main Topic

Ratio

A chef is preparing a signature dry rub for a large batch of smoked pork. The original recipe calls for a specific ratio of paprika to brown sugar to achieve the perfect balance of color and sweetness.

- The required ratio is 3 teaspoons of paprika for every 5 teaspoons of brown sugar.
- For the large batch, the chef needs to use 18 teaspoons of paprika.



Fill out the table.

Paprika (teaspoons)	3	6	9	12	15	18	21	24
Brown Sugar (teaspoons)								

Create an equation to solve for the amount of brown sugar (s) needed to maintain the flavor ratio.



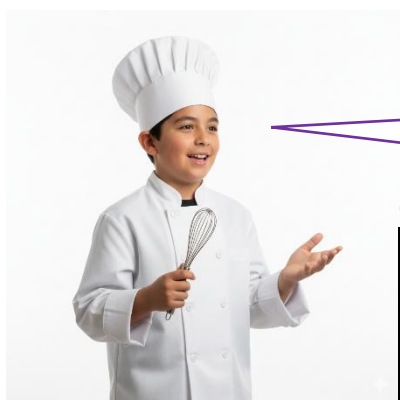
Main Topic **Ratio****Ratio**

A comparison between two numbers.
It compares the sizes of two quantities of the same unit.

Statement	Reading	Colon Form	Fraction Form
3 teaspoons of paprika for every 5 teaspoons of brown sugar	3 is to 5	3: 5	$\frac{3}{5}$

Complete the table.

Statement	Reading	Colon Form	Fraction Form
		5: 7	



A fruit salad recipe calls for 3 apples for every 5 oranges.
If you use 15 apples, how many oranges do you need?

Complete the table.

No. of Apples	3	6				
No. of Oranges	5	10				

Solve the problems.

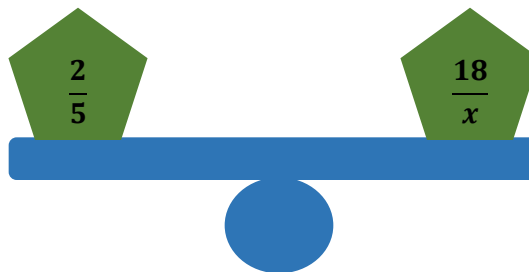
In a classroom, the ratio of pencils to pens is 4:3. If there are 24 pencils, how many pens are there?	A cookie recipe uses 2 cups of flour for every 3 cups of sugar. If you only have 1 cup of flour, how much sugar should you use to keep the same ratio?
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Main Topic Proportions

Proportion

A statement that two ratios are equal.

What value of x maintains the balance of the fractions?



Solve the problems.

On a map, 1 inch represents 5 miles. If two cities are 3 inches apart on the map, what is the actual distance between them?	You want to print a photo that is 4 inches wide by 6 inches tall. You want to enlarge it so that the width is 10 inches. How tall will the enlarged photo be if you keep the same proportions?
To make a certain shade of green paint, you need to mix 3 parts blue paint with 2 parts yellow paint. If you have 6 cups of blue paint, how many cups of yellow paint do you need?	A car travels 120 miles in 3 hours. At the same rate, how far will it travel in 5 hours?



Need Help?

Main Topic

Unit Conversion



To accurately convert units, you'll need to know equivalent values. For example, there are 60 minutes in one hour. There are 12 inches in 1 foot.

Go online and research several equivalent values of units.

The movie is 120 minutes long.
How many hours is the movie?

A basketball player is 6 feet 3 inches tall.
How tall are they in inches?

A fish tank holds 15 gallons of water.
How many quarts of water is this?

A car travels at 60 miles per hour.
How fast is it going in feet per second?



Need Help?

Honors Level

How does a ratio fundamentally differ from a fraction?
When is it appropriate to use one term over the other?

Describe the two primary methods for testing whether two ratios form a true proportion (e.g., cross-multiplication versus scaling factor). Which method is more versatile and why?

When scaling a recipe, a chef adds a new ingredient in a non-proportional amount.
How does this failure to maintain the ratio affect the final product?

When setting up a proportion, why is it essential that the units in the numerators match each other and the units in the denominators match each other?

What is the crucial characteristic that defines a quantity as a rate rather than a ratio?
(Hint: Consider the units.)

SEL Activity

The Proportional Friendship

Relationship Skills & Responsible Decision-Making

The Concept: A ratio compares two quantities. A ratio of 3:1 means for every 3 units of one thing, there is 1 unit of another.

Activity:

1. **The Math:** Write the ratio of "Listening to Speaking" if a person talks for 10 minutes and listens for 30 minutes. Simplify it.
2. **The SEL Bridge:** Every relationship has a ratio of energy. Think about a healthy friendship. It shouldn't always be 1:0 (where one person does all the work). A balanced friendship thrives on a consistent ratio of mutual support.
3. **Task:** Write down your ideal ratio for a group project: My Effort : My Partner's Effort. If your ratio is 1:1, what happens to the project if your partner's side drops to 0?

The "Daily Exchange" Table.

The Interaction	The Raw Ratio	The Unit Rate (Per 1 Event)
15 texts sent : 3 texts replied	15/3	___ texts sent per ___ reply
4 compliments given : 4 smiles returned	4/4	___ compliment per ___ smile

4. **The SEL Bridge:** Look at the first unit rate (5:1). If you have to send 5 texts just to get 1 reply back, how does that make you feel? Unit rates help us see the baseline reality of a situation. Is the 'cost' of the interaction worth the return?"

2.2 Solving Proportions

Warm-Up

Convert minutes to hours and vice-versa.

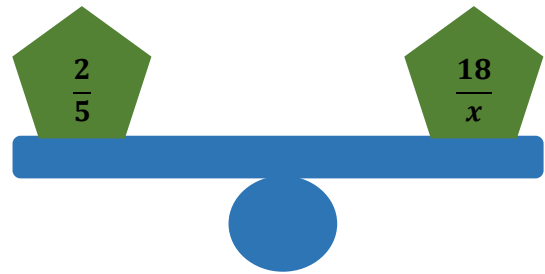
45 minutes

2.25 hours

Main Topic

Cross Multiplication

- What value is multiplied to 2 to get 18?
- Multiply that value to 5 to solve for x.



Cross Multiplication Method

- Equate the ratios to each other.
- Multiply 2 and x.
- Multiply 5 and 18.
- Equate the products to each other.
- Solve for x.

Checkpoint

- Equate the ratios to each other.
- Plug in the solution to x.
- Simplify both sides of the equation.
- Are the values of the sides equal?

T
A
S
K

1



Need Help?

Main Topic

Proportions

Solve for x.

$$\frac{3}{4} = \frac{x}{12}$$

$$\frac{5}{7} = \frac{25}{x}$$

$$\frac{x}{6} = \frac{15}{18}$$

$$\frac{4}{x} = \frac{20}{45}$$

A city has a population of 500,000 people and an area of 100 square miles. What is the population density of the city in people per square mile?

An architect creates a scale model of a building where 1 inch represents 5 feet. If the height of the building in the model is 12 inches, what is the actual height of the building in feet?

If Justin runs at a speed of 5 miles per hour, how far does he run in 3 hours?

If there are 5 boys for every 7 girls in a group, and there are 35 girls total, how many boys are there?

Main Topic Proportions

Teacher Turn	Student Turn
$\frac{4x}{10} = \frac{3x + 3}{9}$	$\frac{7x + 3}{6} = \frac{4x}{5}$

Teacher Turn	Student Turn
$\frac{9}{10} = \frac{5x + 3}{7x - 1}$	$\frac{5}{6} = \frac{5x - 10}{3x + 3}$

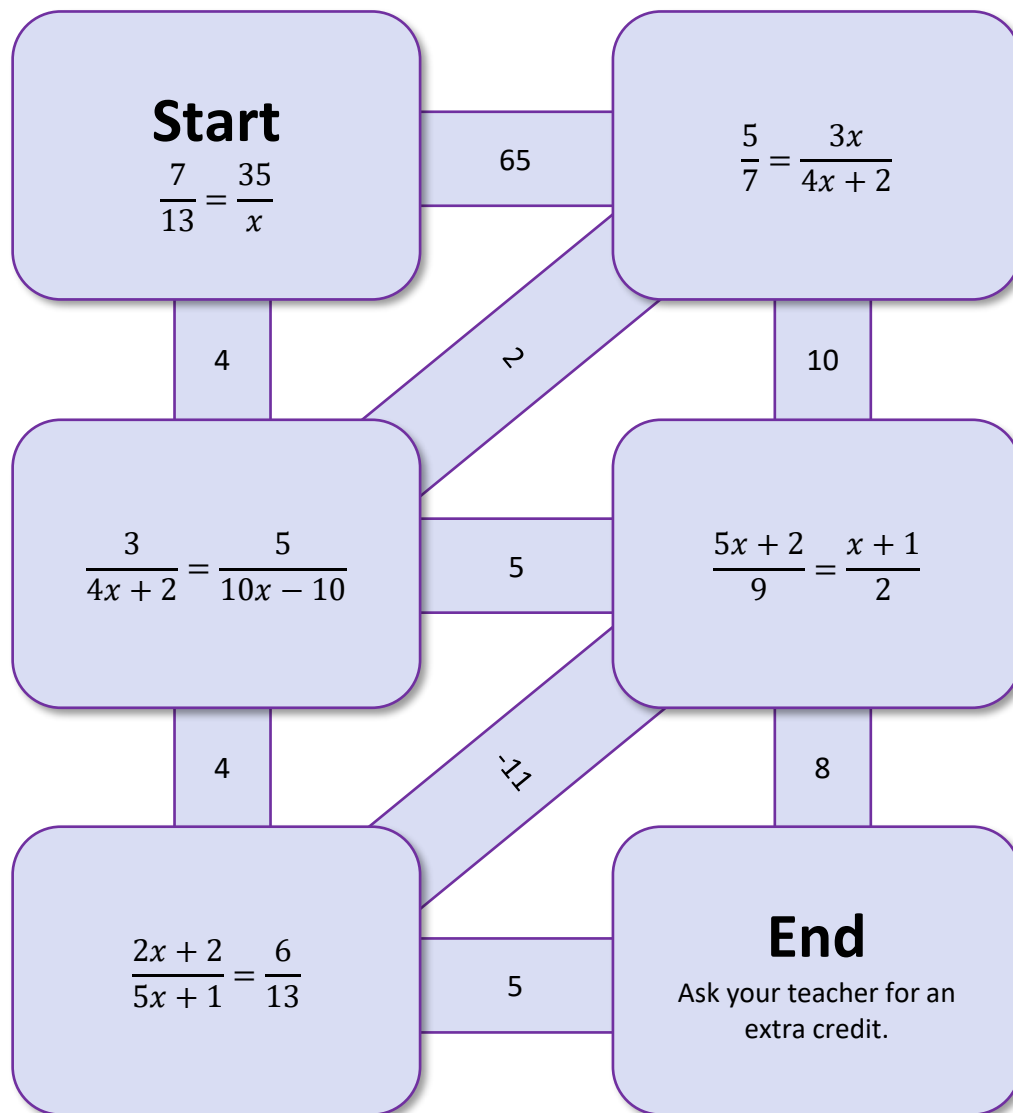
Teacher Turn	Student Turn
$\frac{9}{3x - 3} = \frac{10}{2x + 6}$	$\frac{5}{7x + 1} = \frac{6}{10x - 2}$



Need Help?

Proportions Maze

Solve a question from “Start”.
Connect the shapes by passing through the correct answer to the previous question.



Main Topic**Proportions Applications****Adjusting Marinade Concentration**

A chef is preparing a marinade where the ratio of vinegar to oil must be 2:7. The chef starts with 4 cups of vinegar and then adds an unknown amount of concentrated lime juice (L) to boost the acid. The amount of oil used is 21 cups.

How many cups of concentrated lime juice (L) were added to the vinegar to maintain the required ratio of total acid (vinegar + lime) to oil?

**Scaling a Soup Recipe**

An original soup recipe has a ratio of stock to total solids (vegetables + seasonings) of 5:3. The chef is scaling the recipe. The new batch requires 15 quarts of stock. The total solids include 8 pounds of pre-mixed vegetables plus an unknown amount of new seasoning mix (S) to be added.

How many pounds of new seasoning mix (S) must the chef add to the vegetables to maintain the required ratio of stock to total solids?

Honors Level

When you are asked to "solve a proportion," what is the ultimate mathematical quantity you are trying to find, and why is this value unique?

Explain *why* the method of cross-multiplication is mathematically valid. What property of equality justifies this step?

How does the conceptual meaning of a proportion (an equality between two ratios) differ from simply finding an equivalent fraction?

When setting up a proportion from a word problem, why is it essential to maintain unit consistency (i.e., making sure the same units appear in the same position, either both in the numerator or both in the denominator)?

Describe the concept of the scaling factor in a proportion. How can the scaling factor be used as an alternative method to solve for the unknown variable?

SEL Activity

Solving for the Missing Piece

Self-Management & Responsible Decision-Making

The Concept: A proportion is an equation stating that two ratios are equal. If one number changes, the others must adjust to keep the balance.

Activity:

- The Math:** Solve the proportion: $\frac{2 \text{ hours of free time}}{5 \text{ school days}} = \frac{x \text{ hours of free time}}{15 \text{ school days}}$
- The SEL Bridge:** "Think of x as your **Missing Need**. If your school days triple from 5 to 15, your brain mathematically *needs* your free time to triple as well to keep your stress levels proportional. If you keep x at 2 hours, your life scale tilts into burnout.
- Task:** Look at a change in your life right now (e.g., *I have more homework* or *I am trying a new sport*). If that side of the equation increased, what is the missing variable (x) you need to change on your side to stay happy?

The "Life Alignment" Calculator

The Balanced Starting Ratio	The New Situation	The Algebraic Setup	The Solution (x)
$\frac{1 \text{ hour of talk time}}{2 \text{ close friends}}$	You suddenly have 5 close friends.	$\frac{1}{2} = \frac{x}{5}$ $2x = 5$	x = ____ hours of talk time needed.
$\frac{30 \text{ mins of exercise}}{1 \text{ high-stress day}}$	You are facing a 4-day test week.	$\frac{30}{1} = \frac{x}{4}$ $1x = 120$	x = ____ mins of exercise needed.

2.3 Connecting with Geometry

Warm-Up

Differentiate the terms “similar” and “congruent”.

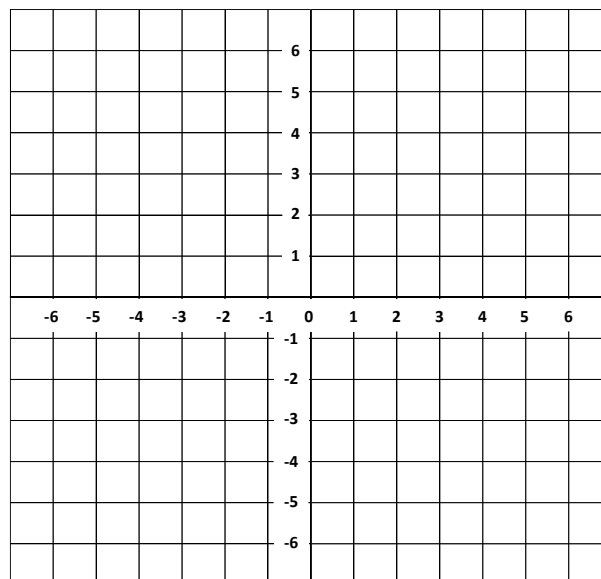
Main Topic Similar Polygons

TASK

1

- Plot and connect points $A(-6, 4)$, $B(-6, 2)$, $C(-3, 2)$.
- Plot and connect points $D(-2, -1)$, $E(-2, -5)$, $F(4, -5)$.
- What do you notice about the shapes?

- List the sides that correspond to each other.



- Write several equations based on the corresponding sides of the shapes.

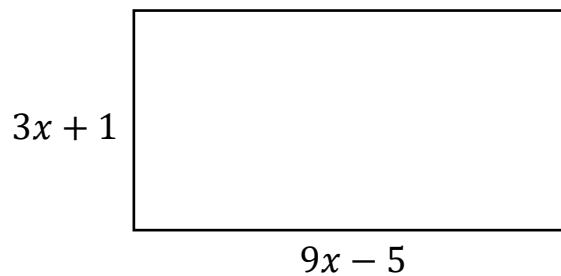
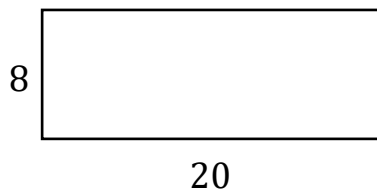


Need Help?

Main Topic Similar Polygons**T
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K****2**

- Draw triangle ABC.
 - $\overline{AB} = 9 \text{ units}$
 - $\overline{BC} = 13 \text{ units}$
 - Draw a similar triangle DEF.
 - $\overline{DE} = 5x + 3$
 - $\overline{EF} = 7x + 5$
 - List the corresponding sides.
-
- Write several equations based on the corresponding sides of the shapes.
-
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- Solve for x.

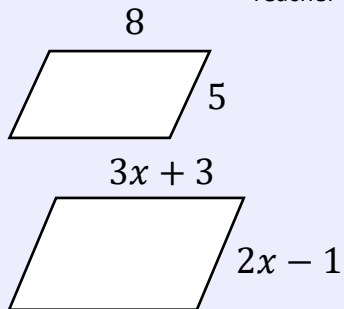
Solve for x.



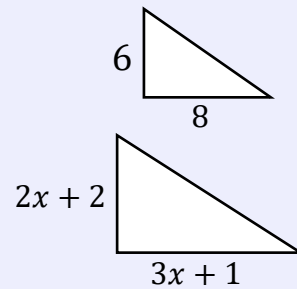
I Do - We Do - You Do

Solve for x .**I Do**

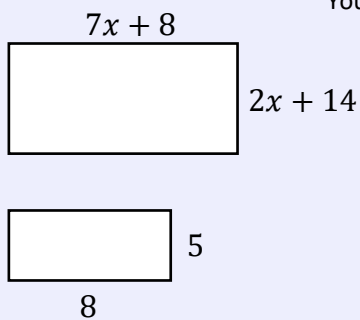
Teacher models how to solve this problem.

**We Do**

Work with classmates and minimal teacher guidance.

**You Do**

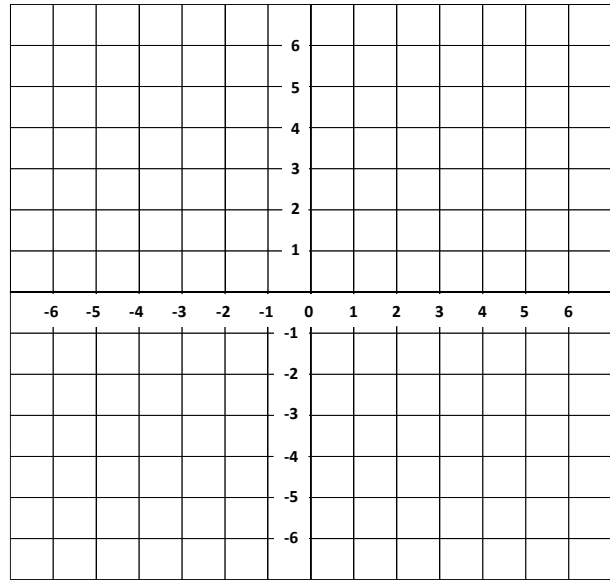
You can do it on your own.



Main Topic **Congruent Polygons**
**T
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K**
3

- Plot and connect points
 $A(1, 5), B(-1, 1), C(5, 1)$.
- Plot and connect points
 $D(-2, -1), E(-4, -5), F(2, -5)$.
- What do you notice about the shapes?

- List the sides that correspond to each other.



- Write several equations based on the corresponding sides of the shapes.

**Similar
Polygons**

Polygons that have the same shape but different sizes.

**Congruent
Polygons**

Polygons that have exactly the same size and shape.

Main Topic	Proportions Applications
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Scaling a Rectangular Cake

A baker is scaling a rectangular sheet cake. The original ratio of (Length + 5 inches) to Width is 4:3. If the new cake is 15 inches wide, what is the original length (L) needed to maintain the similar shape ratio?



Garnish Placement



A circular plate requires a garnish where the ratio of (Plate Diameter + 10 mm border) to Garnish Diameter is 6:1. If the garnish diameter is 50 mm, what must the plate diameter (D) be?

Sushi Roll

A sushi chef needs to use a nori sheet where the ratio of (Nori Length + 3 cm overlap) to Nori Width is 7:4. If the nori sheet is 16 cm wide, what is the required length (L)?



Honors Level

What is the minimal geometric information required to prove that two polygons are similar?
Why is proportionality insufficient without angular congruence?

Define the scale factor in the context of similar polygons. How is it calculated, and what does the scale factor tell you about the relative sizes of the corresponding sides?

When setting up a proportion to solve for an unknown side length, why is it absolutely crucial that you pair up corresponding sides (sides that are opposite congruent angles)?

A flagpole casts a shadow. Explain how you can use the concept of similar triangles and proportions to determine the actual height of the flagpole without climbing it. What constant (proportional) relationship are you assuming?

If you know the perimeter of two similar polygons and the length of one side of the smaller polygon, explain how you can use a proportion to find the corresponding side length of the larger polygon without knowing the scale factor first.

SEL Activity

The Scaled-Up Version of You

Self-Awareness & Relationship Skills

The Concept: Identifying similar polygons, checking for congruent angles, and calculating scale factors.

Activity:

1. **The Math:** Two quadrilaterals are similar. Quadrilateral 1 has angles of 90° , 90° , 110° and 70° . What are the angles of the larger Quadrilateral 2?
2. **The SEL Bridge:** Think of your angles as your **Core Values**—the things like honesty, humor, or kindness that define the 'shape' of your character. As you grow older, your life will get bigger, but your 'angles' should stay the same.
3. **Task:** Identify one "Angle" (a core value) in yourself that you hope never changes, no matter how big or old you get.

Your Current Self (Small Polygon)	Your Future Mentor (Large Polygon)	The Ratio (Self Mentor)	The Scale Factor
Side a (Patience): 2 units	Side a' (Patience): 6 units	$6/2$	
Side b (Courage): 3 units	Side b' (Courage): 9 units	$9/3$	

4. **Reflection:** If you want to scale up your 'Kindness Side' from a 4 to an 8, your scale factor is 2. What actions do you need to double to make that growth happen?

2.4 Word Problems

Warm-Up

Write all you know about ratios and proportions.

Main Topic

Word Problems

School Supplies: Sarah is organizing her school supplies. The ratio of pens to pencils in her pencil case is 3:5. If she has 12 pens, how many pencils does she have?

Baking Cookies: A cookie recipe calls for a ratio of 2 cups of flour to 1 cup of sugar. If you want to make a larger batch and use 6 cups of flour, how much sugar will you need?

Basketball Team: The ratio of boys to girls on a basketball team is 5:4. If there are 15 boys on the team, how many girls are there?



Main Topic

Word Problems

Map Scale: On a map, 1 inch represents 50 miles. If the distance between two cities on the map is 3.5 inches, what is the actual distance between them?

Scale Model: A model car is built to a scale of 1:24. If the model car is 8 inches long, how long is the actual car?

Recipe Conversion: A recipe for pancakes yields 12 servings and calls for 2 cups of flour. If you want to make 18 servings, how much flour will you need?

Fruit Punch: A fruit punch recipe calls for a ratio of 3 parts orange juice to 2 parts pineapple juice to 1 part cranberry juice. If you want to make 36 cups of punch, how many cups of each juice will you need?

Fundraising: A school club is selling raffle tickets. For every 5 tickets sold, the club earns \$2. If they need to raise \$200, how many tickets do they need to sell?

Shadow Length: A tree casts a shadow that is 15 feet long. At the same time, a 6-foot tall person standing next to the tree casts a shadow that is 4 feet long. How tall is the tree?

Main Topic**More Word Problems**

Shadow Play: A 6-foot tall person standing next to a flagpole casts a shadow that is 8 feet long. At the same time, the flagpole casts a shadow that is 40 feet long. How tall is the flagpole?

Blueprint Proportions: An architect is designing a house. On the blueprint, the house is 10 inches wide and 15 inches long. If the actual house will be 40 feet wide, how long will it be?

Similar Triangles: Two triangles are similar. The sides of the smaller triangle measure 3 cm, 4 cm, and 5 cm. The longest side of the larger triangle measures 15 cm. What are the lengths of the other two sides of the larger triangle?

Photograph Enlargement: A photograph is 4 inches wide and 6 inches long. You want to enlarge it to a poster that is 24 inches wide. How long will the poster be?

Model Airplane: A model airplane is built to a scale of 1:50. If the wingspan of the model airplane is 12 inches, what is the wingspan of the actual airplane?

Main Topic

Challenge Problems

Nested Squares: A square is drawn inside a larger square so that the corners of the smaller square touch the midpoints of the sides of the larger square. If the side length of the smaller square is 6 inches, what is the area of the larger square?

Similar Rectangles: Two rectangles are similar. The ratio of the length to the width of the first rectangle is 3:2. The length of the second rectangle is 12 cm. What is the perimeter of the second rectangle?

Triple Ratio Challenge: A candy mix contains chocolates, caramels, and gummies in the ratio 5:3:2. If there are 90 candies in total, how many of each type are in the mix?

Multi-Step Proportion Problem: A train travels 240 miles in 4 hours. If it continues at the same speed, how far will it travel in 7 hours? How long will it take to travel 540 miles?

Nested Ratios: The ratio of boys to girls in a class is 4:5. The ratio of students wearing glasses to those not wearing glasses is 2:7. If there are 18 students wearing glasses, how many boys are in the class?

Main Topic**More Challenge Problems**

Scale Drawing with Area: A rectangular garden is drawn on a map with a scale of 1 cm : 3 meters. If the area of the garden on the map is 12 square centimeters, what is the actual area of the garden in square meters?

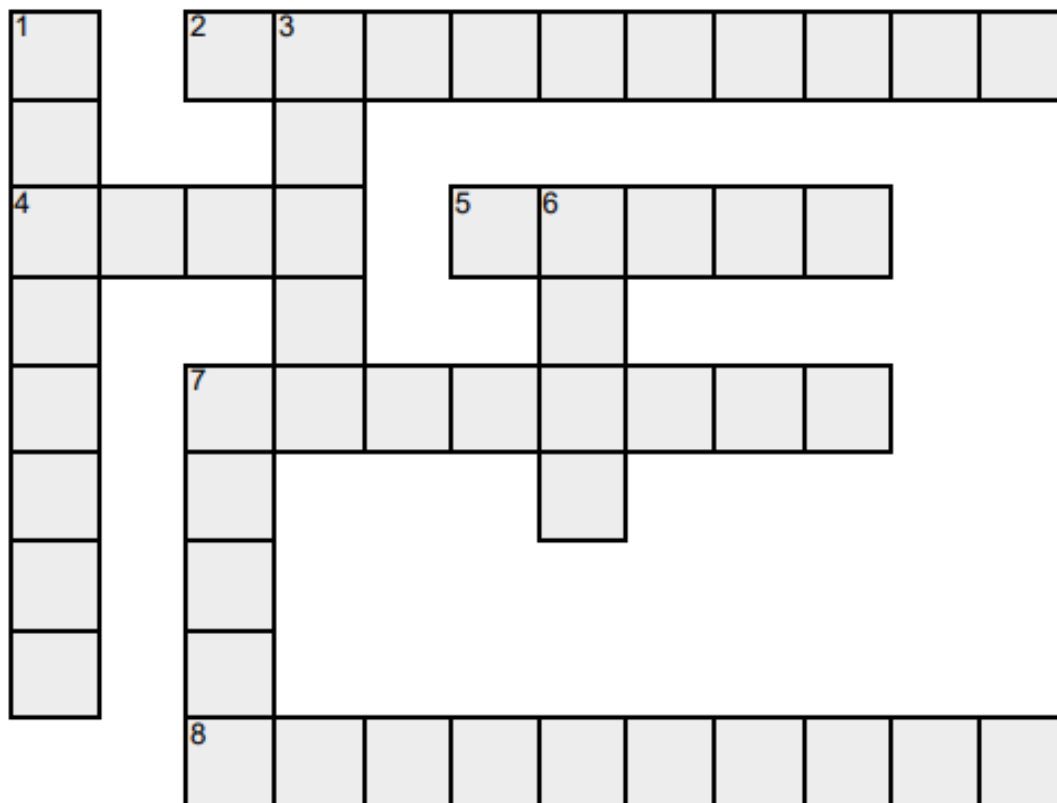
Golden Ratio Mystery: A rectangular painting has dimensions that follow the Golden Ratio (approximately 1.618:1). If the longer side of the painting is 30 inches, what is the length of the shorter side to the nearest tenth of an inch?

Compound Proportions: If 6 workers can build a wall in 10 days, how long will it take 15 workers to build the same wall, assuming they work at the same rate?

Percentage Proportions: A store is having a sale where all items are 25% off. If the original price of a shirt was \$40, what is the sale price? If the sale price of a jacket is \$60, what was its original price?

Mix Trail Recipe: A recipe for trail mix calls for a ratio of 3 parts nuts to 2 parts dried fruit to 1 part seeds. You have 1 cup of nuts, $\frac{1}{2}$ cup of dried fruit, and $\frac{1}{4}$ cup of seeds. What is the maximum amount of trail mix you can make, and what will be the ratio of ingredients in your mix?

Proportional Relationships



Across	Down
2. A statement that expresses equality between two ratios.	1. A statement that expresses equality between two expressions.
4. A standard amount used to measure a specific quantity, like length, weight, time, etc.	3. A comparison of two quantities of the same unit.
5. _____ multiplication is a process in solving proportion equations.	6. A comparison between two quantities with different units expressed as a ratio.
7. A value or a set of values that satisfies the equation.	7. The ratio between the corresponding dimensions of two similar figures is called a _____ factor.
8. Ratios are _____ if their simplified forms are the same.	



Unit 3 | Rates and Percentages

Marketing and Sales

7th Grade Mathematics

North Carolina 7th Grade Math Standards

Unit 3

Analyze proportional relationships and use them to solve real-world and mathematical problems.	
NC.7.RP.1	Compute unit rates associated with ratios of fractions to solve real world and mathematical problems
NC.7.RP.3	Use scale factors and unit rates in proportional relationships to solve ratio and percent problems.

3.1 Understanding Rates and Percentages

Warm-Up

Write all you know about rates and percents.

Main Topic

Units of Measurement



A **unit** is a standard quantity used for measurement.
Write the units below in the correct group and write the notation of each unit.

Meters Years Centimeters Liters
Grams Ounces Miles Hours
Celsius Kelvin Fahrenheit Feet
Seconds Inches Pounds Cubic feet Gallons
Cubic meters

Length

Weight

Time

Temperature

Volume

Rate

A ratio that compares two quantities with different units.

Zesty's Lemonade Stand

Zesty has two employees, Alice and Ben, who work the afternoon shift. Zesty tracks their individual performance to see who is more efficient at the combined tasks of taking the order, pouring the lemonade, and accepting payment.

On a busy Saturday, Zesty records the following data over a one-hour period:

- **Alice:** Sold 48 cups of lemonade in 60 minutes.
- **Ben:** Sold 35 cups of lemonade in 45 minutes.

The key performance indicator (KPI) Zesty uses is a **rate** that compares two quantities with different units:

$$\text{Rate} = \frac{\text{Cups Sold}}{\text{Minutes Worked}}$$

What is the sales rate for Alice and for Ben, expressed in cups per minute?

Based on the unit rates, which employee is more efficient (has the higher rate)?



If the more efficient employee works for a full 3.5 hours during a new summer festival, how many cups of lemonade can Zesty expect them to sell?

Main Topic Units of Measurement

A car travels 180 miles in 3 hours. What is its average speed in miles per hour?	A package of 12 pencils costs \$2.40. What is the price per pencil?
A person's heart beats 72 times in one minute. What is their heart rate in beats per second?	A student reads 45 pages in 30 minutes. What is their reading speed in pages per hour?
A train covers a distance of 450 kilometers in 5 hours. What is its average speed in kilometers per hour?	A chef uses 8 pounds of flour to bake 64 loaves of bread. What is the ratio of loaves per pound of flour?
A farmer harvests 150 bushels of corn from a 5-acre field. What is the yield rate in bushels per acre?	A bookstore sold 78 novels over 6 days. What was the average sales rate in novels per day?

Main Topic

Percentages

Percentage

A number or ratio expressed as a fraction of 100 and it is denoted using a percent sign, %.

$$\frac{50}{100} = 50\%$$

$$\frac{24}{100} = 24\%$$

$$\frac{78}{100} = 78\%$$

$$\frac{10}{100} = 10\%$$

Write each fraction as an equivalent fraction with a denominator of 100.

$\frac{2}{5}$	$\frac{6}{25}$	$\frac{1}{4}$

Write each fraction as a percent.

$\frac{2}{5}$	$\frac{6}{25}$	$\frac{1}{4}$

Write each percent as a fraction.

80%	45%	10%



The Lemonade Stand Rate

You and your partner, Alex, are running a lemonade stand on a hot Saturday afternoon. You decide to run two different marketing tests during the day to see which one is more effective at converting passersby into paying customers.

Your price is a standard \$1.50 per cup.

The Core Rate (Conversion Rate)

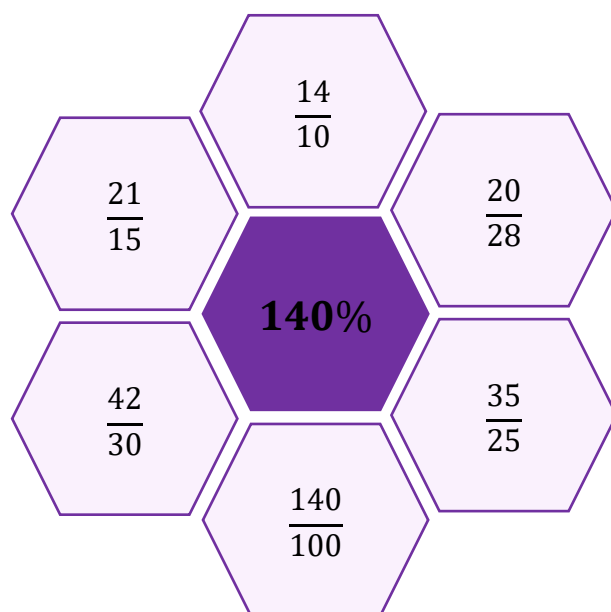
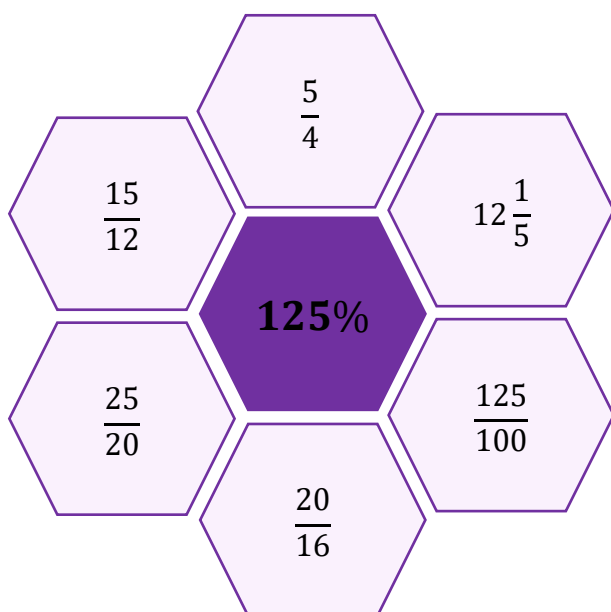
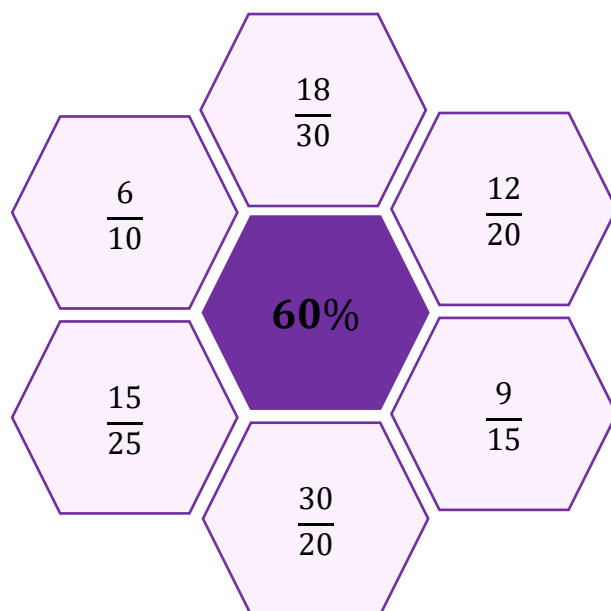
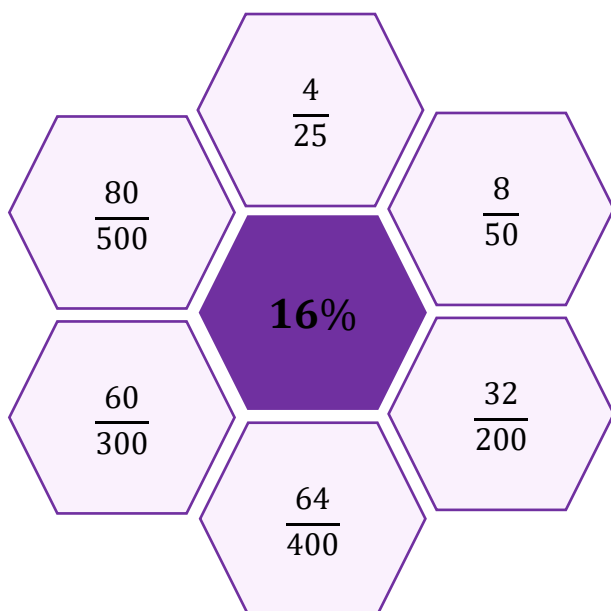
The fundamental rate you are tracking is the Conversion Rate (CR):

$$CR = \frac{\text{Number of Sales}}{\text{Number of Potential Customers (Passersby)}} \times 100$$

The "Free Sample" Strategy (Morning)		The "Premium Signage" Strategy (Afternoon)	
From 10:00 AM to 1:00 PM, you implement a marketing tactic: offering a free 1 oz taste of the lemonade to anyone who pauses to look at the sign.		From 2:00 PM to 5:00 PM, you remove the free samples but replace your plain sign with a large, brightly colored, professional-looking banner advertising "FRESH SQUEEZED & ICED."	
Metric	Value	Metric	Value
Total Passersby	250	Total Passersby	200
Passersby who Stopped/Sampled	50	Actual Sales (Conversions)	24
Actual Sales (Conversions)	20	Revenue	24 x \$1.50 = \$36.00
Revenue	20 x \$1.50 = \$30.00	What percentage of <i>total passersby</i> resulted in a sale?	
What percentage of <i>total passersby</i> resulted in a sale?			
What percentage of the <i>people who took a sample</i> resulted in a sale?			
Which marketing strategy was more effective?			

Odd One Out

Cross out the fraction that is not equivalent to the value in the middle.



Honors Level

How does a rate fundamentally differ from a ratio, and why must a rate always involve units that are not the same?

Explain why a percentage is best understood as a specific type of part-to-whole ratio, and what the "whole" is always defined as.

In real-world scenarios, why is calculating the unit rate often more useful for comparison and decision-making than comparing raw totals?

If a recipe requires ingredients A, B, and C in the ratio 2:3:5, and you decide to double the amount of ingredient B only, how does the new ratio (A:B:C) complicate the process of scaling the *entire* recipe proportionally?

When calculating percent error, why is the denominator conceptually defined as the *true* or *actual* value, and how does switching the denominator change the meaning of the resulting percentage?

SEL Activity

The Emotional Economy

Self-Management & Self-Awareness

The Concept: A unit rate tells us how much of something changes per *one* single unit of something else (e.g., cost per gallon, or miles per hour).

Activity:

1. **The Math:** You spend 120 minutes on homework over 4 days. What is your unit rate of homework time per day?
2. **The SEL Bridge:** Think of your energy as a **Unit Rate**. How much energy are you spending *per hour* at school? If you start the day with 100% battery and burn 15% per hour, how many hours until you run completely empty?
3. **Task:** Calculate your current "Stress Rate" today. If you have 3 major tasks and they take a combined total of 90 units of your energy, what is your stress rate per task?
4. **Closing Question:** If your stress is at a 90, and you have a self-care strategy that offers a '10% off' discount versus one that offers a '50% off' discount, which one do you need to pick right now? How can you actively lower your internal market price?

3.2 Converting Fractions to Percentages

Warm-Up

Write the following as a percent.

$$\frac{15}{100}$$

$$\frac{5}{100}$$

$$\frac{253}{100}$$

$$\frac{80}{100}$$

Main Topic Percentages

Explain in your own words what 100% means.

TASK

1

- Draw a circle.
- The circle represents \$20, 100%, and 1.
- Divide the circle into 4 equal parts.
- Label each part with \$, %, and part of a whole.

Quick Math

How many quarters are there in one dollar? Prove.



Need Help?

T
A
S
K

2

- Draw a circle.
- The circle represents \$24, 100%, and 1.
- Divide the circle into 8 equal parts.
- Label each part with \$, %, and part of a whole.

T
A
S
K

3

- Draw a circle.
- The circle represents \$72, 100%, and 1.
- Divide the circle into 6 equal parts.
- Label each part with \$, %, and part of a whole.

T
A
S
K

4

- Draw a circle.
- The circle represents \$90, 100%, and 1.
- Divide the circle into 5 equal parts.
- Label each part with \$, %, and part of a whole.

Main Topic Fractions to Percentages
School Fun Run: The Sales Goal Challenge!

You are part of the Marketing and Sales Team for the annual school Fun Run! Your main job is to sell special edition T-shirts. The goal is to get a T-shirt order from every student in the middle school.

There are 500 students in the middle school in total.


Tracking the Sales Success

Your team has sold T-shirts for three weeks, and you need to report your progress to the principal. To make the report easy to read, the principal wants to know the **percentage** of T-shirts sold each week.

Week 1 Sales

No. of T-shirts Sold	No. of T-shirts Sold (Fraction)	No. of T-shirts Sold (Percent)	No. of Unsold T-shirts
100			

Week 2 Sales

No. of T-shirts Sold	No. of T-shirts Sold (Fraction)	No. of T-shirts Sold (Percent)	No. of Unsold T-shirts
150			

Week 3 Sales

No. of T-shirts Sold	No. of T-shirts Sold (Fraction)	No. of T-shirts Sold (Percent)	No. of Unsold T-shirts
75			

What is the total percentage sold?



Need Help?

Percent Matching

Match the equivalent values by connecting the shapes.

Column A

$$\frac{2}{5}$$

$$\frac{8}{9}$$

$$\frac{12}{15}$$

$$\frac{29}{35}$$

$$\frac{15}{7}$$

Column B

80%

40%

82.9%

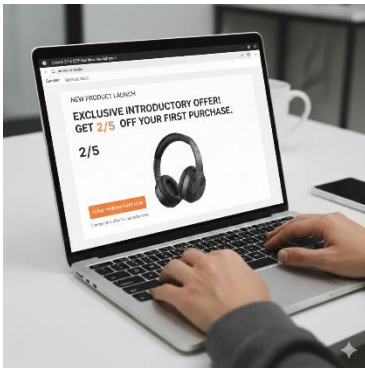
88.9%

214.3%

Use the space below to show the complete work to receive full credit.

Main Topic Percentages Applications**Email Campaign Conversion Rate**

A new product launch was advertised via an email campaign sent to a list of potential customers. The Sales Team needs to report the **conversion rate** (the fraction of people who bought the product after opening the email). $\frac{3}{20}$ of the people who opened the email ended up purchasing the product.

**Discount Strategy Analysis**

The Marketing Team is testing different discount strategies to clear out old inventory. One strategy is to offer a fixed fraction off the original price. They need to express the discount as a percentage for their advertising materials. The discount offered is $\frac{2}{5}$ off the original price.

Customer Complaint Rate

The Customer Service department tracks the number of products sold versus the number of products that generated a complaint. The Marketing Team wants to minimize the complaint rate and needs to track it as a percentage. For every 270 products sold, 32 products generated a complaint.



Honors Level

Why are fractions and percentages considered different ways of expressing the same conceptual value?

Explain why the denominator of 100 is conceptually critical for any percentage, and how this relates to the idea of a part-to-whole relationship.

How does the decimal representation act as an essential bridge between a fraction and its corresponding percentage?

Conceptually, how is converting a fraction to a percentage related to the idea of finding a rate per 100 units?

Provide a marketing or sales scenario where using a percentage is clearly more impactful or understandable than using a fraction, and explain why.

SEL Activity

The Progress Tracker

Self-Awareness & Growth Mindset

The Concept: A fraction can look small or confusing depending on its denominator. Converting it to a percentage standardizes it out of 100, making it easier to see the big picture.

Activity:

1. **The Math:** You accomplished 7 out of 10 goals today (7/10). Scale the fraction to find the percentage.
2. **The SEL Bridge:** When you look at 7/10, your brain might instantly focus on the 3 things you *didn't* do. But when you convert it to 70%, you realize you passed the day! You did the vast majority of what you wanted to achieve.
3. **Task:** Write down a raw fraction of your day today (e.g., *I enjoyed 6 out of 8 class periods, or I felt confident during 3 out of 5 interactions*). Convert that fraction to a percentage. Does seeing it as a number out of 100 change how successful you feel?
4. **Closing Question:** If your energy output this week is at 120%, what fraction of rest do you need to calculate for your weekend to bring your baseline back down to a healthy, balanced 100%?

3.3 Converting Decimals to Percentages

Warm-Up

Write the following as a percent.

$\frac{3}{8}$

$5\frac{3}{4}$

Main Topic Decimal to Percent Conversion

Write the digits in the boxes.

Twenty-five hundredths

Hundred Millions	Ten Millions	Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths

Convert the decimal to fraction.

Convert the fraction to percent.

Quick Math

Convert to percent.

$\frac{56}{100}$

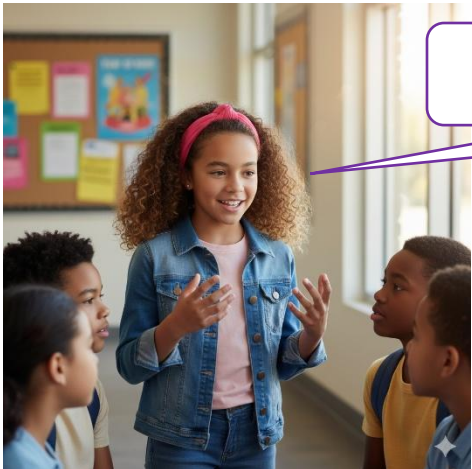
$\frac{17}{100}$

$\frac{94}{100}$

$\frac{156}{100}$



Need Help?



List the steps in converting 0.5 to percent.

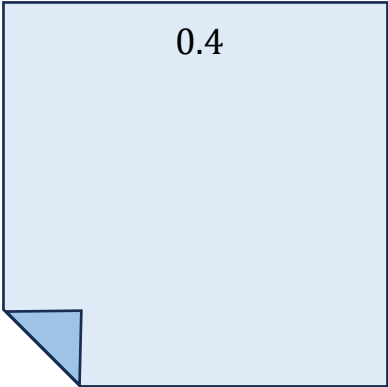
Decimal	Reading	Fraction	Percent
0.07			
0.7			
0.65			
2.09			
5.12			
10.3			

Percent Gallery

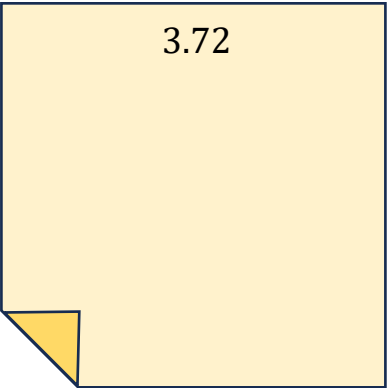
Solve a problem on a sticky note. Show all your work.

Then, post your sticky note next to the poster across the classroom.

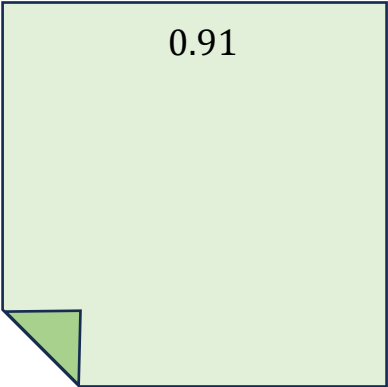
Once everyone has finished, take a look at your classmates' work and see if you can learn from their approach!



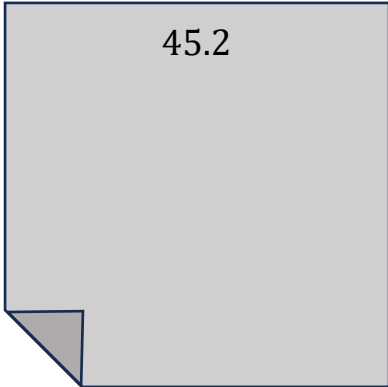
0.4



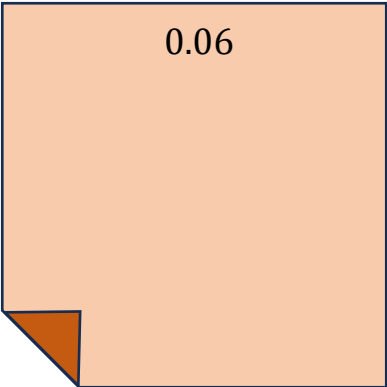
3.72



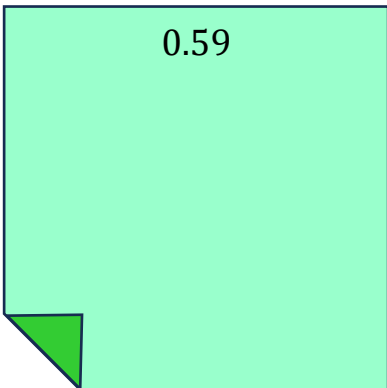
0.91



45.2



0.06



0.59

Main Topic Percent to Fraction and Decimal Conversion

An online cookie store tracks the source of every purchase to see which sales channel is most effective. Over the last hour, the total number of customer purchases was 100.

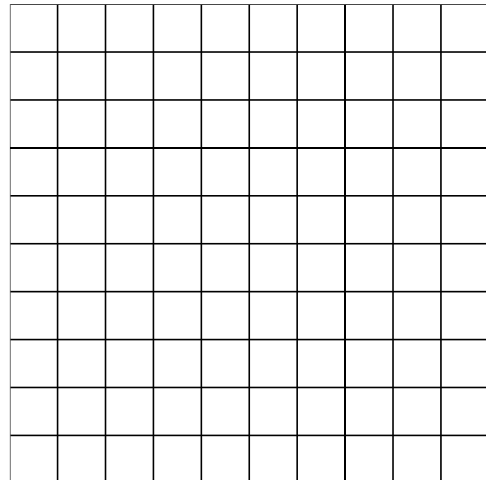
- **50** purchases came directly from the **Website** (Organic Search).
- **20** purchases came from **Social Media Ads** (Facebook/Instagram).
- **30** purchases came from **Email Promotions** (Newsletter/Campaigns).

If you randomly select one purchase record from last month, what is the probability that the customer made the purchase because of an **Email Promotion**?

	Fraction	Percent	Decimal
Probability			

$$30\% \rightarrow 30 \text{ percent} \rightarrow \frac{30}{100} \rightarrow 0.3$$

for every
hundred



Accurately draw a pie chart that represents the sales origin.



Write each percent as a fraction and a decimal.

42%	8%
60%	12.5%
425%	7.6%

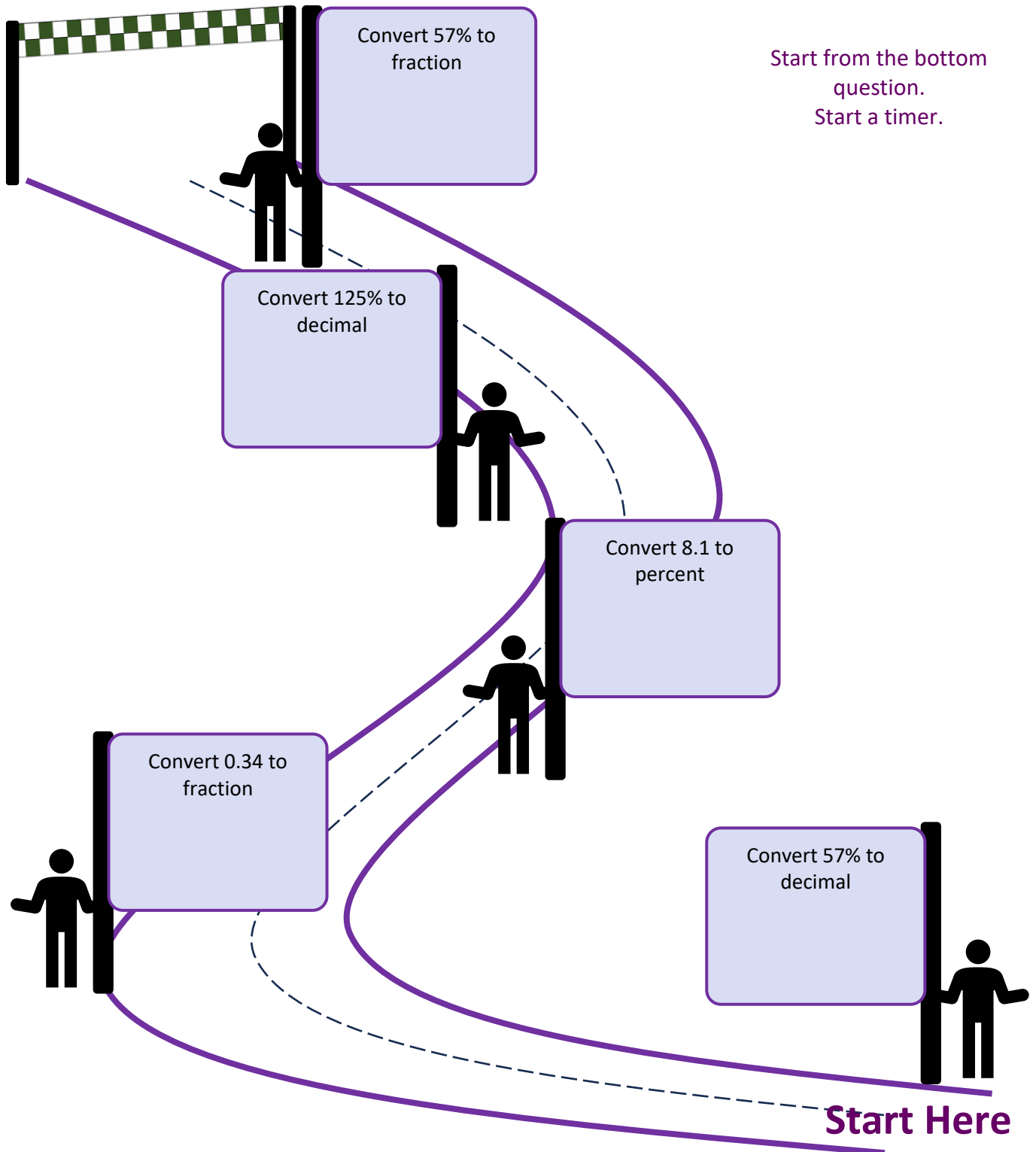
A clothing store is having a clearance sale. All sweaters are marked $\frac{1}{3}$ off the original price. The cashier needs to quickly calculate the discount amount using the store's electronic register, which only accepts decimal entries. What is the discount expressed as a decimal (rounded to the nearest hundredth)?

The Website Analytics Team reported that the site's conversion rate (the number of visitors who make a purchase) for the last week was 0.07. The Marketing Manager wants to display this rate on a progress dashboard using a percentage and a simplified fraction. What is the conversion rate expressed as a percentage and as a simplified fraction?

The manager of a pizza restaurant set a sales quota for the night. By closing time, the restaurant had achieved 120% of its original sales goal due to a large catering order. The regional supervisor needs to record this achievement as a fraction for financial reports. Express the restaurant's achievement (120%) as a mixed number or improper fraction in simplest form.



Reaching the Finish Line



Honors Level

Why does the conversion from a decimal to a percentage universally involve the operation of multiplication by 100?

Explain the conceptual importance of the hundredths place when mentally converting a decimal to a percentage.

When the decimal point moves two places to the right to form a percentage, what underlying mathematical relationship is this visual movement representing?

How does the Latin etymology of "per cent" (per hundred) justify the reason for converting a decimal to an equivalent value out of 100?

Explain the order of conversion: Why is it often easiest to go from **Fraction → Decimal → Percentage**, and how does the decimal value act as the intermediate "bridge"?

SEL Activity

The Mindful Shift

Self-Management & Responsible Decision-Making

The Concept: When a decimal only has one digit after the decimal point (like 0.8), you must add a **placeholder zero** to allow the decimal point to make its two full hops.

Activity:

The Decimal Mood	The Step-by-Step Hop	The Percentage Impact
0.9 (Preparedness)	0.90 → Hop twice	_____ Ready
0.5 (Friendliness)	0.50 → Hop twice	_____ Open to making new friends

1. **The Math:** Practice adding the placeholder zero and converting the decimals in the chart above.
2. **The SEL Bridge:** Sometimes, you feel like you don't have enough data or energy to make a big impact—you feel like a single, lonely digit like 0.8. Adding that placeholder zero is like **pausing to give yourself space**. It doesn't change your core value, but it gives you the room you need to expand into a massive 80% presence.
3. **Reflection:** When you feel small or limited, how can taking a deep breath act like a 'placeholder zero' to give you the space to react calmly?

3.4 Word Problems

Warm-Up

Circle equivalent values.

0.2857

2.857%

28.57%

$\frac{2}{7}$

Main Topic

Finding the Part - Discounts and Savings



My parents snagged this bike for just \$60, which is 75% of the original price.
We'll use the money we saved to buy me a helmet.

TASK

1

- Write 75% as a fraction, then simplify.
- Divide the shape into 4 equal parts, then label each part.
- Cut the shape provided by your teacher into 4 equal parts.
- How many cutouts can you use to cover 75% of the shape?
- Divide \$60 into 3, then label each piece of the cutouts with \$20.
- What is the amount of the unused cutout?



Need Help?

I'm super excited to finally be getting my braces!
And with the 20% discount, we're only paying \$2400.



T
A
S
K

2

- Write 80% as a fraction, then simplify.
- Divide the shape into 5 equal parts, then label each part.
- Cut the shape provided by your teacher into 5 equal parts.
- How many cutouts can you use to cover 80% of the shape?
- Divide \$2400 into 4, then label each piece of the cutouts with \$600.
- What is the amount of the unused cutout?



Solve each problem and show all steps.

You bought a pair of shoes for \$72, which is 60% of the original amount. How much did you save?

Your sister scored a great deal on shoes! They were 30% off, and she paid only \$77. What was the original price, and how much did she save?

Main Topic	Finding the Percent
-------------------	----------------------------

what	is	of	percent
x	=	.	/100

8 is what percent of 16?

12 is what percent of 48?

18 is what percent of 24?

Solve each problem and show all steps.

9 is what percent of 36?	21 is what percent of 30?
6 is what percent of 40?	50 is what percent of 25?

Main Topic Finding the Whole

what	is	of	percent
x	=	.	/100

12 is 25% of what number?

15 is 30% of what number?

9 is 12% of what number?

Solve each problem and show all steps.

64 is 80% of what number?	3 is 1% of what number?
55 is 11% of what number?	90 is 45% of what number?

Main Topic

Word Problems

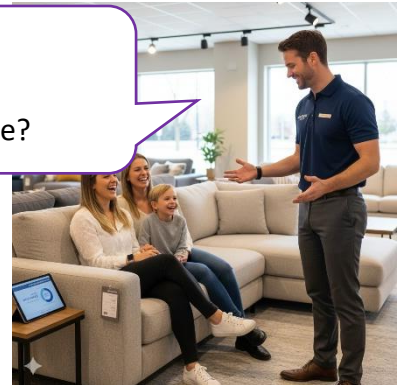


I bought a new laptop for \$800, which was 25% off the original price.

- How much was the original price of the laptop?
- How much money did I save on the laptop?

A couch is on sale for \$1200, representing a 40% discount.

- What was the original price of the couch?
- How much would you save by purchasing the couch on sale?



A pair of jeans originally priced at \$60 is on clearance for \$36.

- What percentage discount is being offered on the jeans?
- How much money would you save by buying the jeans on clearance?

SEL Activity

Decoding the Message

Responsible Decision-Making & Relationship Skills

The Concept: Before you can solve a word problem, you have to strip away the descriptive words and find your three core mathematical pieces: the *Percent*, the *Whole*, and the *Part*.

Activity:

1. **The Math Word Problem:** *Maya wants to buy a jacket that originally costs \$60. The store is running a 25% off sale. How much money will Maya save?*
2. **The SEL Bridge:** When a friend tells you a dramatic story, your brain gets flooded with details. To help them, you have to find the 'Givens.' You have to separate the facts from the extra drama.
3. **Task:** Look at Maya's problem.
 - What is the **Whole** (the starting point)?
 - What is the **Percent** (the rate of change)?
 - Solve for the **Part** (the impact).
4. **Social Application:** If a friend tells you, *"Everyone hates me, I messed up 3 questions out of 20 on the quiz!"* What is the *real* whole and part? Use math to show them they actually got an 85%!

3.5 More Word Problems

Warm-Up

Circle equivalent values.

0.625

6.26%

62.5%

$\frac{5}{8}$

Main Topic

Discount and Saving



My parents snagged this bike for just \$48, which is 80% of the original price.
We'll use the money we saved to buy me a helmet.

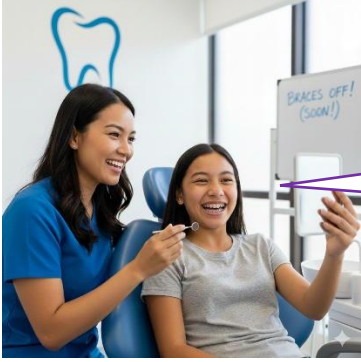
TASK

1

- Write 80% as a fraction, then simplify.
- Divide the shape into 5 equal parts, then label each part.
- Cut the shape provided by your teacher into 5 equal parts.
- How many cutouts can you use to cover 80% of the shape?
- Divide \$48 into 4.
- Label each piece of the cutouts by dollar amount.
- What is the amount of the used cutout?
- How much was the original amount of the bike?



Need Help?



I'm super excited to finally be getting my braces!
And with the 10% discount, we're only paying \$2880.

T
A
S
K

2

- Write 90% as a fraction, then simplify.
- Divide the shape into 10 equal parts, then label each part.
- Cut the shape provided by your teacher into 10 equal parts.
- How many cutouts can you use to cover 90% of the shape?
- Divide \$2880 into 9.
- Label each piece of the cutouts by the dollar amount.
- What is the amount of the used cutout?
- What was the original amount for the braces?

Practice.

You bought a pair of shoes for \$56, which is 70% of the original amount. How much did you save?

Your sister scored a great deal on shoes! They were 40% off, and she paid only \$72. What was the original price, and how much did she save?

Main Topic Applications of Percentages in Marketing and Sales**Calculating a Discount**

A shoe store is running a weekend promotion: 25% off all athletic sneakers. A new pair of sneakers is regularly priced at \$80. How much money does a customer save, and what is the final price of the shoes? (Focus on finding the *part* when the *whole* and the *percent* are known.)

Percentage Increase in Sales

A small bakery sold 50 dozen cookies in October. In November, thanks to a new marketing campaign, they sold 60 dozen cookies. What was the percentage increase in cookie sales from October to November? (Focus on finding the *percent change* relative to the *original whole*.)

Percentage Decrease in Inventory

A bookstore started the week with 400 copies of a popular new novel. By the end of the week, they had sold 320 copies, leaving them with 80 copies. What percentage of the original book inventory was sold? (Focus on finding the *part* as a *percent* of the *whole*.)

Meeting a Sales Quota

A Sales Team's monthly goal (quota) is to sell 30 cars. By the third week of the month, the team has sold 24 cars. What percentage of the monthly quota have they achieved so far, and what percentage do they still need to meet?

Finding the Original Price (Reverse Percent)

A sign says, "You saved \$15! That was 20% off the original price!" What was the original price of the item before the discount was applied? (Focus on finding the *whole* when the *part* and the *percent* are known.)

SEL Activity

The Hidden Added Costs (The Emotional Tax)

Responsible Decision-Making & Relationship Skills

The Concept: A ratio compares two quantities. A ratio of 3:1 means for every 3 units of one thing, there is 1 unit of another.

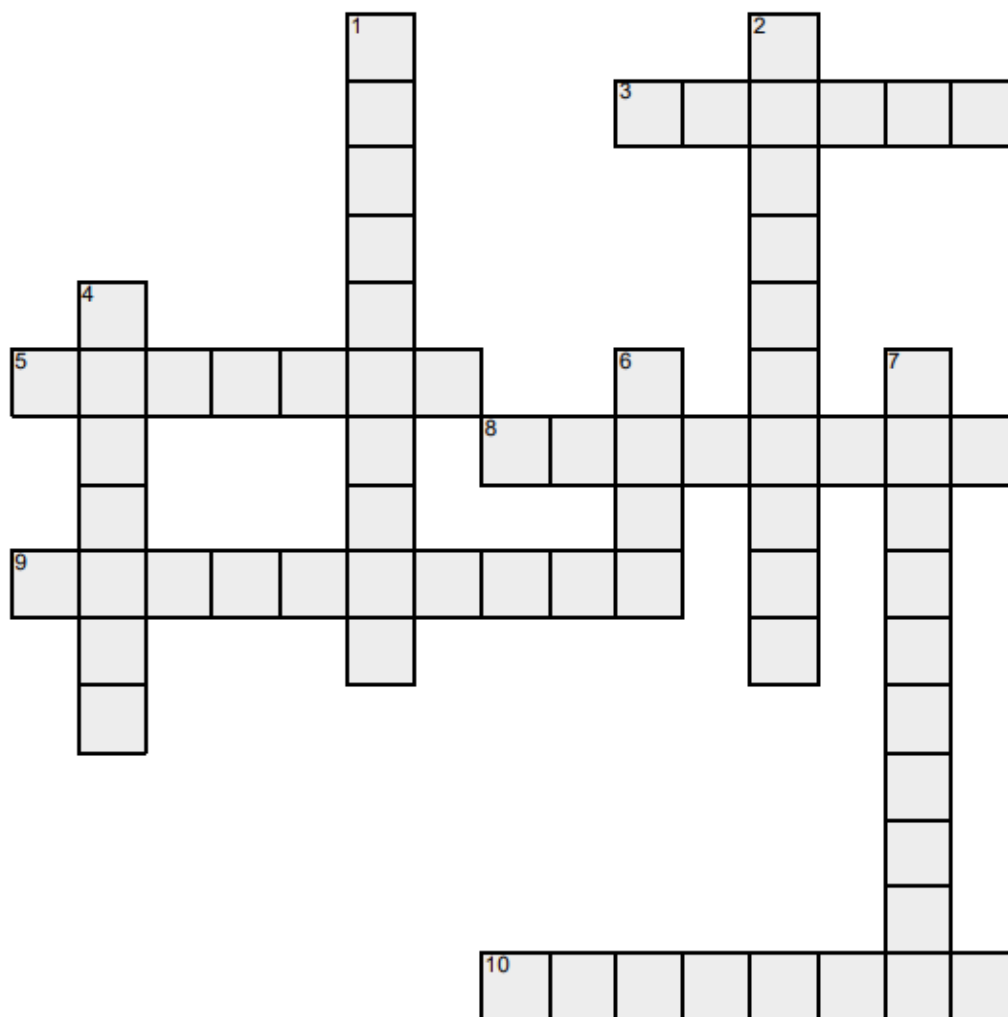
Activity:

The "Social Cost" Calculator

The Scenario	The Mathematical Setup	The True Total Cost
Buying a \$15 shirt with an 8% sales tax .	$15 + (0.08 \times 15)$	
Agreeing to a 2-hour hangout that has a 50% 'Emotional Tax' (complaining).	$2 \text{ hours} + (0.50 \times 2)$	<u> </u> hours worth of energy drained

1. **The Math:** Calculate the final costs in the table above to practice multi-step percent addition.
2. **The SEL Bridge:** In life, some choices look cheap on the surface but carry a hidden 'Percent Increase' or tax. Going to a party where people are unkind might seem like fun, but the emotional tax is high. Word problems teach us to calculate the *total* cost before we commit.
3. **Reflection:** Think about a time you made a choice that seemed easy or fun at first, but ended up causing you stress, regret, or drama later.
 - What was the "hidden percent increase" or emotional tax of that choice?
 - Was it worth the final cost?

Rates and Percentages



Across	Down
3. An increase in the price of an item.	1. _____ ratios represent the same relationship between quantities.
5. A way of representing a number that includes a whole number part and a fractional part separated by a decimal point.	2. An equation that states that two ratios are equal.
8. A way of representing a part of a whole or a ratio between two quantities.	4. A ratio that compares a number to 100.
9. A way of expressing a number or ratio as a fraction of 100.	6. A comparison of two quantities with different units.
10. A reduction in the price of an item.	7. The process of changing the representation of a quantity or expression without altering its fundamental value.



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