Poster and Teaching Guide
Grades 2–4

SCHOLASTIC

Sponsored Educational Materials

BE A MATH NINJA

Geometry, measurement, and engineering inspired by LEGO® NINJAGO®

CLASSROOM POSTER:

WHAT ARE YOUR **INNER STRENGTHS?**

LESSONS INCLUDE:

>MEASURE L-LENGTH WITH LLOYD!

>UNLOCK AREA WITH NYA

>MASTER ANGLES WITH MASTER WU

+

>TOWER-BUILDING TEAM CHALLENGE

BONUS:

TAKE-HOME ENGINEERING CRAFT

+

FAMILY PHOTO SWEEPS

See inside for details.

THE LEGO NINJAGO MOVIE

SEPTEMBER 22

SEE IT IN REAL D 3D

#LEGONINJAGOMOVIE

Dear Teacher,

Welcome to **Be a Math Ninja**, a new program designed to help students understand big ideas in geometry, measurement, and engineering.

The lessons, worksheets, and activities are designed to provide a real-world, fun context for students and are aligned with applicable Common Core State Standards for Mathematics and Next Generation Science Standards.

We hope you enjoy our new program!

Sincerely,

Scholastic

ACTIVITY INSTRUCTIONS

Poster Activity: Finding Inner Strength

Hang up the poster on the flip side of this teaching guide (or download a digital version at **scholastic.com/mathninja**) and review the definitions of the listed inner strengths (*loyalty*, *compassion*, and *determination*). Ask students to give an example of how they have used these strengths in their own lives and how they can use them in the classroom. Challenge them to think of more character strengths!

Lesson 1: Putting It All Together!

Tiered For: Grade 2 (or additional review/support for Grades 3–4)

Objective: Students will be able to measure the length of objects using rulers and then use those measurements to solve word problems.

Materials: Student Worksheet 1, rulers marked in inches, tape measure, and yardstick for demonstration.

1. Show the class a small common classroom object, such as a whiteboard eraser, pencil, or crayon. Ask whether it would be easiest to measure the object with a ruler, yardstick, or tape measure (a ruler is most appropriate for small objects).

2. Demonstrate how to measure the object with a ruler. Indicate that a ruler has metric and customary sides and tell the class that you will be using the customary side because you want to measure in inches. Point out that the end of the object should be lined up with the hash mark for zero, not necessarily the end of the ruler.

3. Tell the class that measurements of multiple objects lined up can be added—e.g., three crayons, each measuring 4 inches, lined up end to end would have a total length of 12 inches (4 + 4 + 4).

4. Distribute Student Worksheet 1 and rulers. The worksheet can be completed individually, in pairs, or as a class.

5. Review answers as a class.

Student Worksheet 1 Answer Key: 1) 1″ and 2″; **2)** 18 bricks; **3)** 9 bricks; **4)** 3 ninjas; **5)** 18″

ACTIVITY INSTRUCTIONS (CONT.)

Lesson 2: Shape Up!

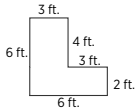
Tiered For: Grade 3 (or additional challenge/review for other grades)

Objective: Students will be able to determine the area of a rectilinear figure by dividing it into two or more rectangles.

Materials: Student Worksheet 2

1. Review methods for calculating the area of a rectangle. Draw a 6 x 8 rectangle on the board. Demonstrate that area can be determined by drawing a grid of six rows of eight squares, one unit square each inside the rectangle. Also demonstrate the length-times-width formula.

2. Copy the following drawing onto the board:



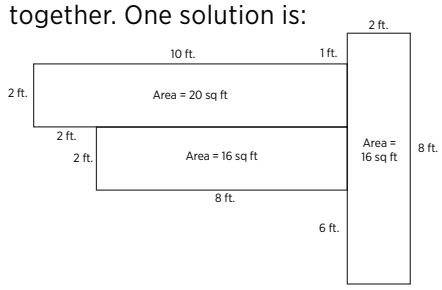
3. Ask the class how to determine the area of this figure. Point out that the figure can be divided into two rectangles. Draw a vertical line straight down as a continuation of the 4 m segment. This divides the figure into a 3 m x 6 m rectangle (area = 18 square meters) and a 3 m x 2 m rectangle (area = 6 square meters). 18 square meters plus 6 square meters equals 24 square meters.

4. Also show that the same result could be obtained by drawing a horizontal line across as a continuation of the lower 3 m segment. This divides the figure into a 6 m x 2 m rectangle (area = 12 square meters) and a 3 m x 4 m rectangle (area = 12 square meters). 12 square meters plus 12 square meters equals 24 square meters.

5. Distribute Student Worksheet 2. The worksheet can be completed individually, in pairs, or as a class.

6. Review answers as a class.

Student Worksheet 2 Answer Key:
1) Total area equals 52 sq ft. The figure can be divided into smaller rectangles and the areas of the smaller rectangles can be determined and added together. One solution is:



2) The areas of the smaller rectangles are 4 sq ft, 6 sq ft, 8 sq ft, and 8 sq ft. Added together, the area is 26 sq ft.

Lesson 3: The Path to Enlightenment

Tiered For: Grade 4 (or additional challenge/review for other grades)

Objective: Students will be able to use protractors to measure angles needed to solve a real-world problem.

Materials: Student Worksheet 3, protractors, rulers

1. Review the following angle vocabulary as necessary:
   - *Acute*: Measuring less than 90°
   - *Right*: Measuring exactly 90°
   - *Obtuse*: Measuring greater than 90° and less than 180°

2. Review the concept of map scale as necessary.

3. Distribute Student Worksheet 3 to the class. For most classes, it would be best to complete the first step or two with the entire class. Then have the rest of the worksheet completed individually or in pairs.

4. Ask the class to look at the diagram as though they were standing at the Garden of Selflessness looking north. Point out that to walk to the Cliffs of Contemplation, they have to turn to the right.

5. Ask the class to measure the angle of this first turn by placing the hole of the protractor over the "X" and the bottom of the protractor parallel with the bottom of the page. The line segment for the path goes through the 45/135 marking on the protractor, so the turn is 45° to the right.

6. Ask the class to measure the distance from the Garden of Selflessness to the Cliffs of Contemplation (1"). Since the scale is 1" = .5 mile, the distance between the two locations is .5 mile.

7. Ask the class to complete the worksheet individually or in pairs.

8. Review answers as a class.

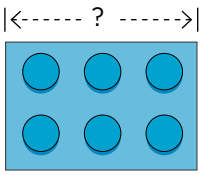
Student Worksheet 3 Answer Key:
1) 45° right, .5 mile; **2)** 90° left, 1 mile; **3)** 45° right, .75 mile; **4)** 90° left, 1 mile;
5) 135° left, 1.5 miles

MORE LESSONS ONLINE!
Visit **Scholastic.com/MathNinja** for digital versions of these lessons plus **two bonus lessons**!

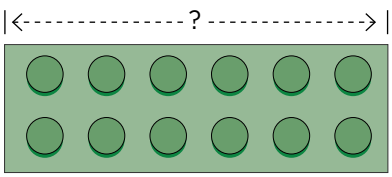
Putting It All Together!

Lloyd and his five companions are on the hunt for Garmadon! To reach him, they must cross a dangerous canyon that is 18 inches long. If they work together, they can build a bridge to carry themselves safely over the canyon. Help them complete their mission by answering the following:

1 Lloyd and his companions have bricks to build a bridge. Use your ruler to measure the length of each brick.



A 2 x 3 brick is _____ long.



A 2 x 6 brick is _____ long.

Note: To build a bridge, bricks must be placed side by side and add up to 18 inches in length. Don't worry, a Master Builder is on the way to connect the bridge parts with extra bricks!

Learn From Lloyd

Try drawing a picture of the bricks next to one another and then measure them!

2 What is the least amount of 2 x 3 bricks needed to cross the canyon? To form the base of this bridge, the bricks don't need to overlap.

_____

3 How many 2 x 6 bricks are needed?

_____

4 Lloyd is worried that if all six ninjas build the bridge, no one will be left to guard NINJAGO® City from Garmadon's evil army. Each ninja has two 2 x 6 bricks and two 2 x 3 bricks. How many ninjas would have to take their bricks to the canyon for there to be enough bricks to build the bridge?

_____

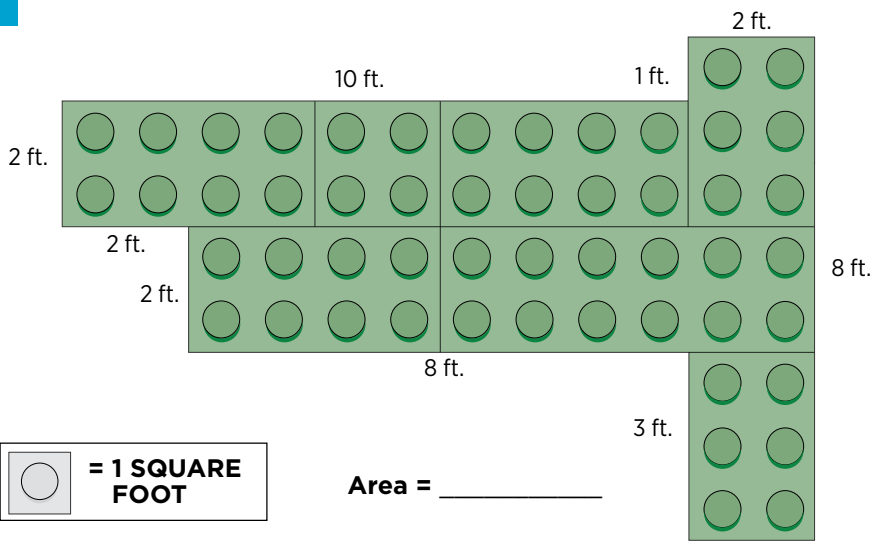
5 What is the total length of the unused bricks when laid side by side?

_____

Shape Up!

Nya is on a mission to retrieve powerful magic objects from a cave when she is caught in Garmadon's trap! Her escape is blocked by two enchanted locks. To free herself, she must discover the key code that will open the mystical locks.

1 To discover the key code for the first lock, find the area of this devilishly unusual shape!



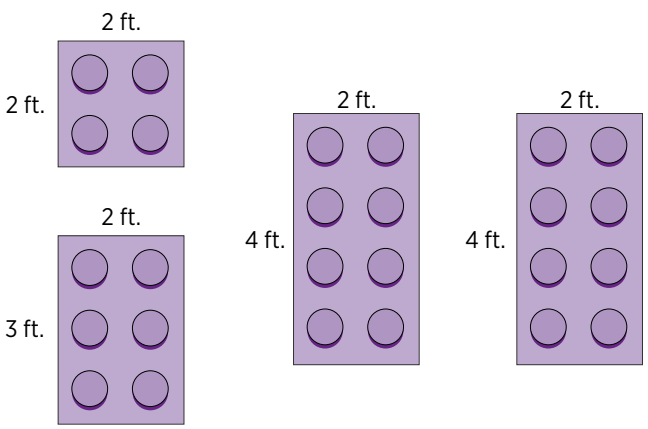
= 1 SQUARE FOOT

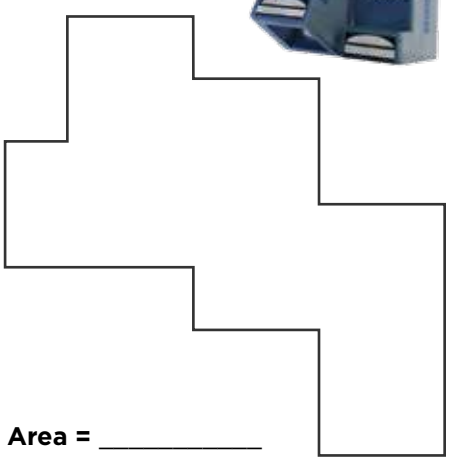
Area = _____

Nya's Knowledge

Break down the unusual shape into separate rectangles. Figure out those rectangles' areas and add them together for the total area.

2 To find the key code to the second lock, cut out the shapes on the left and completely cover the shape on the right. Then, find the area of the shape on the right.

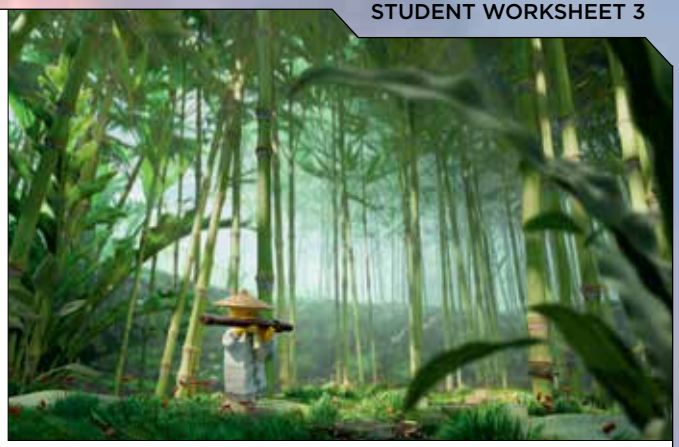


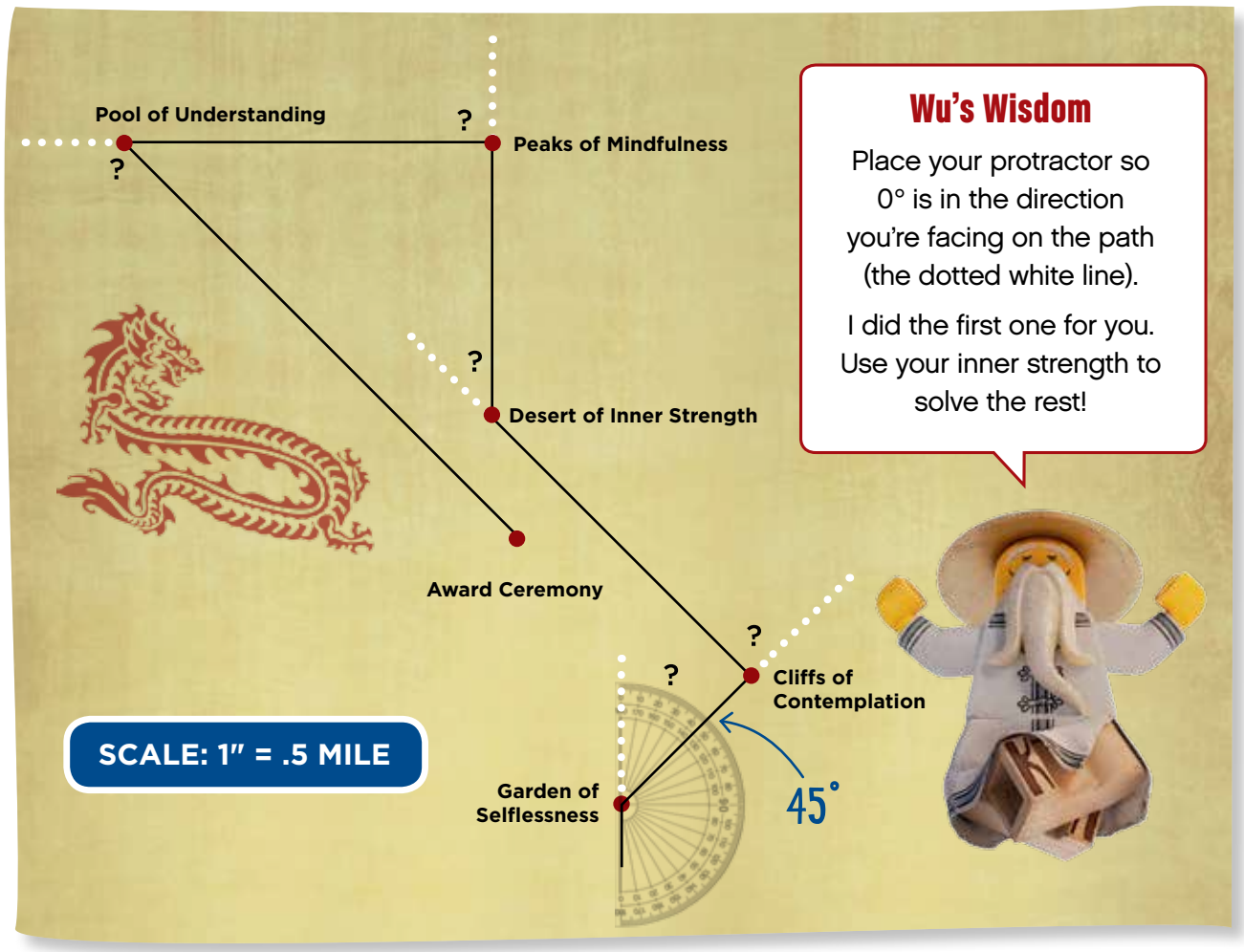


Area = _____

The Path to Enlightenment

Master Wu summons Lloyd and the other ninjas to a secret meeting. "To reach the next level in your development, you will have to undergo a series of trials designed to overcome your ego," he explains. "Start at the Garden of Selflessness and follow the map until you have overcome all the trials."





DIRECTIONS: Use a protractor and ruler to find the route the ninjas must take.

1. From the **Garden of Selflessness**, turn 45 degrees right and travel .5 miles to the Cliffs of Contemplation.
2. Then, turn _____ degrees left and go _____ miles to the **Desert of Inner Strength**.
3. From there, turn _____ degrees right and walk _____ miles to the **Peaks of Mindfulness**.
4. After that, turn _____ degrees left and journey _____ miles to the **Pool of Understanding**.
5. Finally, turn _____ degrees left and travel the last _____ miles to attend the **Award Ceremony** to recognize your accomplishment.

Tower Trials

NINJAGO® City has challenged teams of architects, engineers, and Master Builders to design and build the tallest tower to help keep watch over the city. Your team will have 35 minutes and a limited set of materials to design and construct the tallest tower. Have fun!

MATERIALS PER GROUP

- 4 blocks or LEGO® bricks
- 20 sticks of uncooked spaghetti
- 10 marshmallows
- 1 meter of tape
- 5 toothpicks
- Scissors

HERE ARE THE RULES:

- You may use any or all of the materials provided. No other materials may be used.
- You may ask your teacher to measure your structure at any time within the 35-minute period. Your structure must stand for 30 seconds without falling.
- The structure must be free-standing and you may not hold on to your structure during the 30-second period.

SUGGESTIONS:

- Make sure all group members have a chance to contribute to the design and construction of the tower.
- Spend some time planning, but leave enough time to try out your ideas.
- Don't be afraid to try something different or unusual!

Builder Tip:

Materials don't have to be used as is. Try breaking spaghetti or pushing marshmallows together, for example.

Good Luck!

FAMILY ENGINEERING ACTIVITY

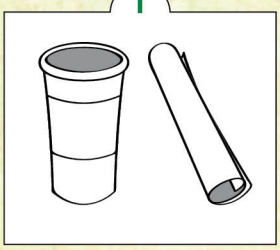
BUILD YOUR OWN ZIP LINE

This zip-line craft was made with poster board and binder clips.

Bring home the engineering concepts we've been exploring in class as your family experiments with different materials to build the fastest zip-line car to race back to NINJAGO® City. Combine your family's ideas to build something awesome. Don't forget to trick it out with stylish decorations!

Directions

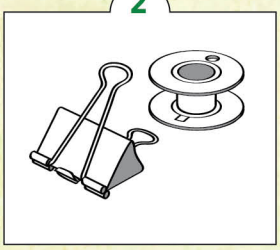
1



Choose your car type

A zip-line car can take many forms. For example, you can make a basket-style car out of a paper cup or a long cable car out of rolled-up poster board.

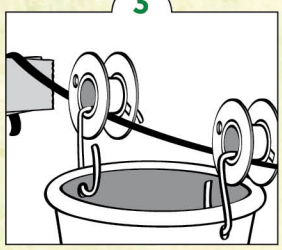
2



Attach a pulley

Affix a piece(s) to the car that will hang on the zip line itself and allow the car to descend. Binder clips or sewing bobbins work great!

3



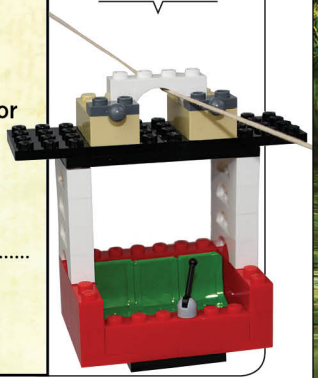
Secure a cable

Tie smooth string (e.g., fishing line or unwaxed dental floss) to two anchor points in the room at different heights. Make sure it's nice and taut!

SNEAKY SCIENCE: Test out different lengths/tension of string and materials for cars. How does the angle of the zip line or the weight of the cargo also affect the speed?

BRICK CHALLENGE

Test other ideas by using LEGO® bricks or other building materials to construct an even sturdier escape vehicle.



SHOW US YOUR INNER NINJA!

Enter the LEGO® NINJAGO® Family Photo Sweepstakes

Take or upload a photo that demonstrates your family's strength of character, body, and mind. You'll be entered automatically for a chance to win awesome prizes.

Enter by uploading your photo at scholastic.com/innerninja

PRIZES INCLUDE

- Tickets to see The LEGO® NINJAGO® Movie
- LEGO® NINJAGO® apparel and Scholastic books

NO PURCHASE NECESSARY. Void where prohibited. Eligible: Current residents of the 50 states of the United States of America and the District of Columbia who are 18 years of age or older at the time of entry and are the parent/legal guardian of at least one child who is seventeen (17) or younger. Sweepstakes begins at 12:00:01 a.m. ET on August 9, 2017, and ends at 11:59:59 p.m. ET on September 22, 2017. Enter: Visit scholastic.com/innerninja to share/upload a photo and complete all required fields on the entry form, ARV: $104. For Official Rules, including prizing details, visit scholastic.com/innerninja/rules.pdf.

BE A MATH NINJA

ACTIVITY INSTRUCTIONS

Lesson: Bridging the Gap

Tiered For: Grade 5–6

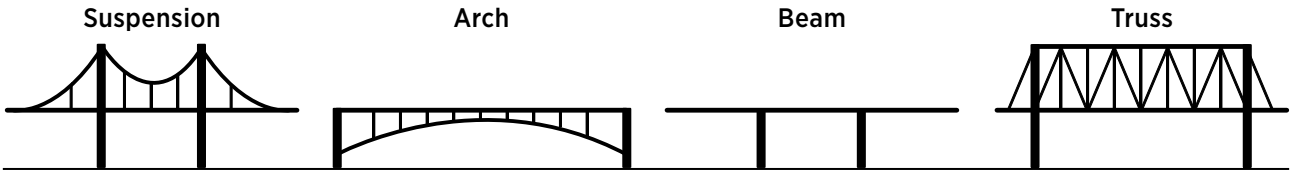
Objective: Students will be able to consider mathematical and engineering principles as they design a model of a structure

Materials: 75 craft sticks per group, glue, small container, Bridging the Gap Student Worksheet

1. Ask students if they know of any famous bridges. Examples might include the Golden Gate Bridge, Tower Bridge in London, George Washington Bridge, etc. Ask them if they can describe the features of these bridges (e.g., suspension cables, towers, etc.)

2. On the board, draw diagrams of the major types of bridges, including suspension, arch, beam, and truss bridges. Point out the characteristics of each type. Suspension bridges tend to be used for longer distances. The roadway is held up by a series of suspension cables. Arch bridge design has been used for thousands of years. The curved design of the arch bridge spreads the load to the supports at either end of the bridge. A truss bridge uses triangular structures in the design to support the load. Beam bridges are supported by piers at either end. If a beam design is used to cover longer distances, additional piers will be necessary.

Common Bridge Types:



3. Divide the class into teams of three to five students each. Explain the rules as indicated on the worksheets and distribute the worksheet and materials.

4. Give the class 30 minutes to design and build their model bridge and fill out the design portions of the worksheet.

5. The next day, have groups present their models to the class, explaining the thinking that went into the design.

6. Test each bridge by placing a container on top of the model. Add increasingly heavier weights until the model collapses. The bridge that holds the most weight before collapsing is the winner.

7. Review the activity with the class, discussing why some designs were more successful than others.

Bridging the Gap

NINJAGO City has begun a massive construction project to connect the isolated sectors of the city with a series of bridges. The leaders of the city have invited engineers to submit their designs.

During the design phase of a project, engineers often use models to test their design ideas. Design a bridge for the city, and then build a physical model of it to see how well it works.

Master Builder Tip:
Triangles are very strong shapes. Try putting them into ***your plan!***

Directions:

- Your model bridge must be at least 1 foot long.
- You and your group will have 75 wooden craft sticks and glue to use.
- The bridge able to hold the most weight is the winner!

Draw a picture of your design:
Explain how you came up with your design:
How well did your design work? What would you do differently next time?

BE A MATH NINJA

ACTIVITY INSTRUCTIONS

Lesson: Race to Save the City

Tiered For: Grade 6 (or additional challenge for grade 5)

Objective: Students will be able to solve unit rate problems involving distance, rate, and time.

Materials: Race to Save the City Student Worksheet, calculators (optional)

1. Present the following problem to the class: You have a hankering for a hot fudge sundae, and the best ice cream shop in the state opens at 11 a.m. If you live 10 miles from the shop and the speed limit on the road is 40 miles per hour, when should you leave to get there when the shop opens?

2. Discuss with the class and make sure they understand that they should leave at 10:45 because it will take 15 minutes to get there (10 miles/40 mph = .25 hour. .25 hour = 15 minutes and 11:00 - 00:15 = 10:45).

3. Indicate that there is a formula, distance = rate times time (d=rt), that is commonly used to solve this type of problem. Manipulate the equation to show that rate = distance/time and time = distance/rate.

4. Present the following problem for the class to solve in pairs: It took Sydney's family 2 hours to drive to an amusement park that is 80 miles away. How fast was the car traveling? (80 miles/2 hours = 40 mph)

5. Distribute the worksheet to students to complete individually or in pairs. Calculators are optional.

6. Discuss answers as a class.

Answer Key: Lloyd, 2 hrs; Cole, 4 hrs; Nya, 1.5 hrs; Jay, 4.5 hours; Kai, 4 hrs; Zane, 1.5 hour

Race to Save the City

Master Wu has received word of yet another plot by Garmadon to capture NINJAGO City! He has summoned the ninjas to return to defend the city as quickly as possible. The ninjas are on missions at different locations on the island. Look at the data listed in the table and determine how long it will take each ninja to return to the city.

Name	Distance From City (in miles)	Vehicle Speed (mph)	Time to Return to NINJAGO City
Lloyd	120	60	
Cole	180	45	
Nya	90	60	
Jay	90	20	
Kai	140	35	
Zane	75	50	

SCHOLASTIC

WHAT ARE YOUR STRENGTHS?

WHEN YOU FIND YOUR INNER NINJA, YOU CAN BUILD GREAT THINGS!

Loyalty

The sense of duty to a cause, person, or group

Loyalty at work: Kai is a real team player. He's always ready to pitch in when his friends need him, and to help protect the people of NINJAGO® City.

Compassion

The concern for the suffering or misfortune of others

Compassion at work: Lloyd understands why NINJAGO® City fears Lord Garmadon, and he wants to do everything he can to protect the people he loves.

Determination

The sense of purpose that drives you to succeed

Determination at work: Nya is focused, confident, and motivated. When she puts her mind to accomplishing something, she's going to do her very best.

THE LEGO NINJAGO MOVIE

SEPTEMBER 22

SEE IT IN REAL D 3D

#LEGONINJAGOMOVIE