

MATH ON THE TRAIL

ELECTIVE ADVENTURE



SNAPSHOT OF ADVENTURE



In this Adventure, you will learn how to estimate the time it takes you to take a walk. If you know your pace, you can estimate how long it will take you and others to walk any given distance.

REQUIREMENTS

Approved by _____

1. Determine your walking pace by walking $\frac{1}{4}$ mile. Make a projection of how long it would take you to walk 2 miles. _____
2. Walk 2 miles and record the time it took you to complete them. _____
3. Make a projection of how long it would take you to hike a 20-mile trail over two days. List all the factors to consider for your projection. _____



- Elective Adventure
- Scan for this Adventure page

REQUIREMENT 1

Determine your walking pace by walking $\frac{1}{4}$ mile. Make a projection of how long it would take you to walk 2 miles.



If you have access to a track, find out if it is a standard-length track. If the track is around a football field, there is a good chance it's a standard track. Most outdoor tracks are 400 meters around, as measured in lane 1. That's slightly less than one-quarter of a mile (0.2485 to be exact).

If you don't have access to a track, you can use a smartphone app, a pedometer, or a fitness tracker to track your distance.

Time how long it takes you to walk at a relaxed pace around the track one time.

Since the track is one-quarter of a mile, multiplying your time around the track by 4 will give you an estimation of how long it would take you to walk 1 mile (four times around the track).

Now you have an estimation of how long it takes you to go 1 mile. How long would it take you to go 2 miles?

REQUIREMENT 2

Walk 2 miles and record the time it took you to complete them.

Now that you have estimated how long it should take you to walk 2 miles, determine if your estimate is accurate. Record your actual time walking 2 miles (eight times around the track).

Compare your estimate to your actual time. How close was it? If it was within a couple of minutes, you have a good estimation of your pace. If you were off by 15 minutes or more, you may want to check the math on your estimation.



REQUIREMENT 3

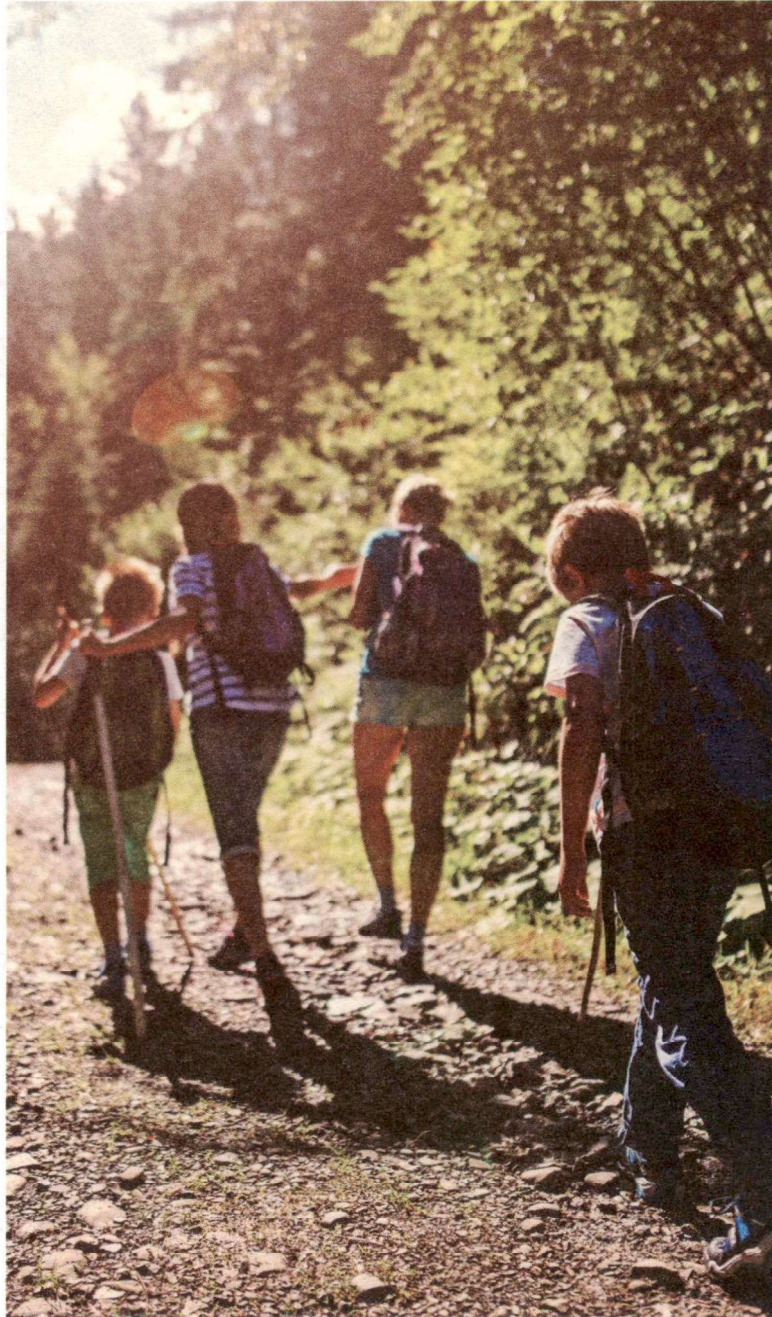
Make a projection of how long it would take you to hike a 20-mile trail over two days. List all the factors to consider for your projection.

When hiking, chances are you won't be on a flat surface the whole time. There may be hills, rocks, mud, and other types of obstacles. You might want to stop and look at the scenery or listen to the animals. (You'll definitely want to take plenty of water breaks.) When you go on a hike, you won't walk in a straight line. These are just some examples of things that will slow you down.

Here are factors you want to consider that will impact your time:

- ▶ **Difficulty rating.** Hiking trails usually have their difficulty level clearly marked, and the designations range from easy to hard. There's no universal standard for evaluating trails, however, so these classifications are open to interpretation.
- ▶ **Distance.** It's best to consider the total length of the trail and whether it's a loop or a one-way route. If it's not a loop, determine the distance to your destination and back. You'll also notice that your pace may slow down toward the end of your hike, as your den or family may be more tired compared to when you started.
- ▶ **Grade.** How steep the trail is, or the difference between its lowest and highest points, will impact the difficulty of the hike.
- ▶ **Terrain.** It's harder to walk on loose sand than it is on hard, packed earth.

On a long hike, you'll also want to plan time to rest, see points of interest, and maybe even eat lunch.



MODULAR DESIGN

ELECTIVE ADVENTURE



SNAPSHOT OF ADVENTURE



Some of your favorite building toys are probably modular. Learning to build using modular design is a good way to conserve resources. In this Adventure, you will gain an understanding of modular design, build using modular-based materials, and practice making directions for others to follow.

REQUIREMENTS

Approved by

1. Learn what modular design is and identify three things that use modular design in their construction. _____
2. Using modular-based building pieces, build a model without a set of instructions. _____
3. Using the model made in requirement 2, create a set of step-by-step instructions on how to make your model. _____
4. Have someone make your model using your instructions. _____
5. Using the same modular pieces used in requirement 2, build another model of something different. _____
6. With your parent or legal guardian's permission, watch a video demonstrating how something was built using modular design. _____



- Elective Adventure
- Scan for this Adventure page

REQUIREMENT 1

**Learn what modular design is
and identify three things that use modular
design in their construction.**

Modular design is a design principle that takes a project and divides it into smaller parts. These smaller parts are called modules. Modules can be independently created, modified, replaced, or exchanged with other modules or between different systems.



Another way to think of modular design is that it allows you to take smaller pieces that are easier to make and fit them together

easily to form a bigger item. Instead of each piece of the building being unique (one of a kind), the pieces can be used in different parts of the build.

The earliest form of modular design was in the 1830s when modular homes were first built. A modular home uses the same doors, windows, floors, walls, and materials for each house instead of each house using items that were custom made for just one house.

One of the first hotels in Walt Disney World, the Contemporary, was built using modular design. The frame of the building was made first, then each room was built on the ground at a separate location. The rooms even had all the same furniture in them. When a room was finished, it was transported to the hotel site and then lifted with a crane and slid into the frame of the hotel.

REQUIREMENT 2

Using modular-based building pieces, build a model without a set of instructions.

Modular-based building pieces are pieces that are easy to connect with each other. The pieces often have the same shape or have a part of them that is made to connect to another piece.

Before you start making your model, read over the other requirements for this Adventure. You don't want to make your model too big or use too many parts, and you will want to remember how you made it so you can create directions for requirement 3.



REQUIREMENT 3

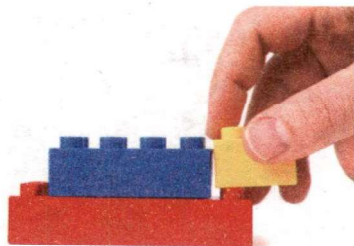
Using the model made in Requirement 2, create a set of step-by-step instructions on how to make your model.

You can write your directions, use photos for them, or use a combination of both. You may even choose to make a short video. Think about the instructions you have used to make models. Which ones did you find the easiest to follow?

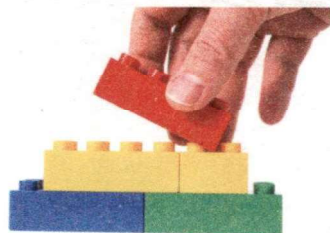
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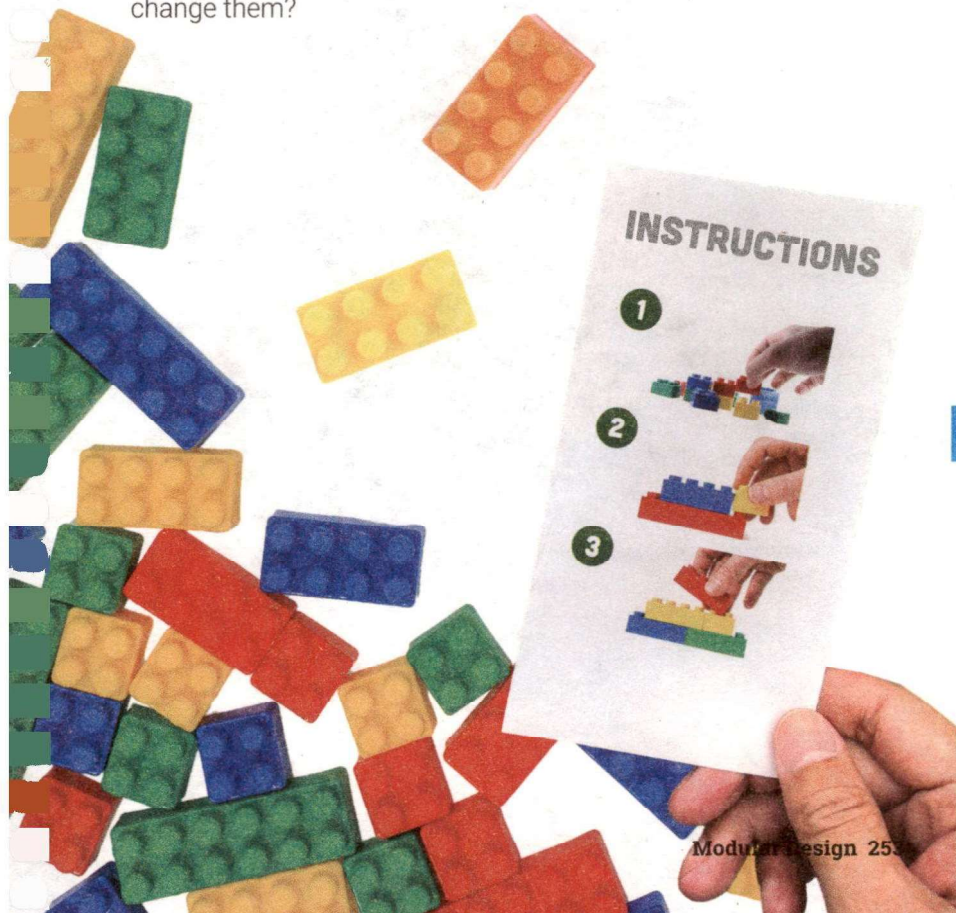
REQUIREMENT 4

Have someone make your model using your instructions.

Provide someone in your den or family with the pieces you used to make your model and the instructions you created. Don't help them. Let them do it on their own.

When they are done, discuss with them what parts of your instructions were helpful and what parts, if any, they had difficulty understanding.

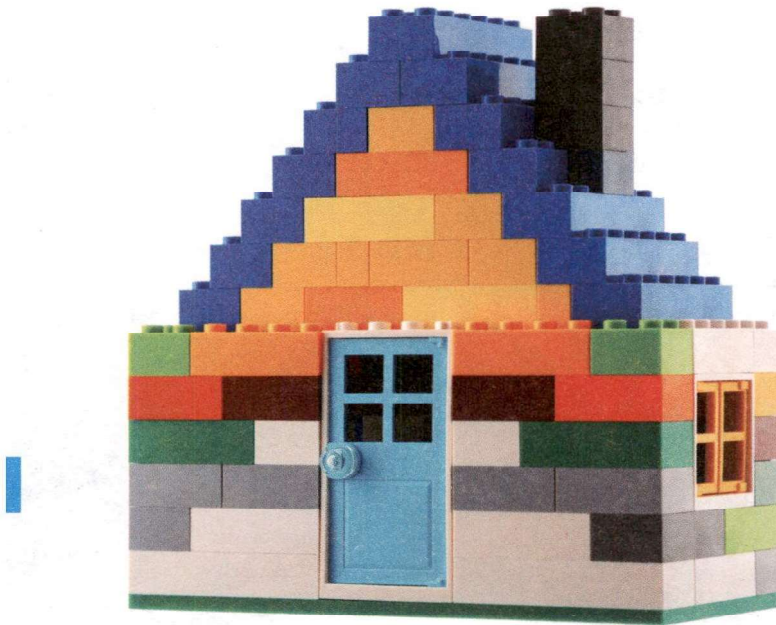
If you were to create your instructions again, how would you change them?



REQUIREMENT 5

Using the same modular pieces used in Requirement 2, build another model of something different.

Using modular pieces allows you to make something completely different using the same parts. Imagine building a car in real life and then using those same pieces to build an airplane. That is the power and potential of modular design.



REQUIREMENT 6

With your parent or legal guardian's permission, watch a video demonstrating how something was built using modular design.

With your parent or legal guardian, search the internet for "modular construction," as this term will give you the best results. The video doesn't need to be long. Some videos are a time-lapse, which means they take pictures at different times during the build and then show the pictures one after another. Some videos record the whole construction and then speed it up so you can see the entire process in a short period of time.

