Back on the Court

The Oklahoma City Thunder are hitting the hardwood once again!

Imagine running out on the court, pushing the ball down only to have it bounce back up to your hand, making a pleasing sound as it meets and leaves the court. Imagine your shoes gripping the glossy surface. You change directions swiftly and the rubber of your shoes squeak against the floor’s waxy finish. It’s time to get limber, so you stretch and get low to the court. As you do, you see the lights above reflect softly on the glistening floor. As your leg slides across the court, you think how fortunate it will be that this flooring will let you slide, hence reducing your chance of injury. As you stand back up, you let your eyes scan the full basketball court. It is not just beautiful but an essential part of the game.

Every NBA basketball court has the same measurements. These courts are standardized, so the coaches and players know what to expect wherever they go and whoever they play.

Video of an NBA Court Being Painted

Not all basketball courts are the same though. Have you ever played basketball? If so, where did you play? Did you play indoors or outdoors? Though all NBA basketball courts may be remarkably similar, games of basketball have been played on concrete driveways, outdoor asphalt courts, vinyl surface floors, hardwoods, and more.

Though basketball courts can be beautiful, these marvels of design do not always attract as much attention as a buzzer beating bucket, a jaw-dropping dunk, or even a no look pass. For this activity, we are going to put our focus on the court and design our own court along the way.

Here’s what you’ll need:

- A small bouncy ball
- A variety of surfaces to test
- A ruler
- Pencil
- Journal
- A variety of surfaces such as cardboard, paper, and plastic with which to make a court
- Scissors
- Other potential materials including glue, tape, and markers

This activity is designed to be done in pairs or alone. It can be done at home or in a classroom.
If you can, team up with a partner and start by looking around you. There are all kinds of surfaces that surround you. Pick four surfaces that are flat and stable enough to bounce the ball and that are also widely varied. In this experiment, the surfaces are your **variables** so you want a diverse sample.

Draw a table to record your results. On the far left side of the table, write down the four surfaces you chose. Include descriptions of how they each feel. Are they smooth, bumpy, or scratchy? Rigid or spongy? Hard or soft?

Next, you will test how well the ball bounces on each surface. To do this, hold a ruler straight up touching the surface. Choose the height from which you’re going to drop the ball and be sure to use that same height each test. You want to measure how high the ball bounces on its first bounce compared to its second bounce. The bottom of the ball is where you’re going to measure from, so keep a close eye on it. Because the surface is the only variable in this activity, be sure to use the same ball each time.

As the ball is in motion towards the surface it has **kinetic energy**. This means energy of motion. By measuring the distance of the ball to the surface on each bounce, you are able to record how the kinetic energy possessed by the ball is affected.

**Pro-tip: Though working with a partner isn’t required for this activity, having a teammate sure can come in handy for making observations and measurements.**

When performing this activity and making your observations, think about Isaac Newton’s Laws of Motion, specifically, “every object in a state of uniform motion will remain in that state of motion unless acted on by an external force”. In the game of basketball there is a lot of motion. For this activity, we are primarily thinking about the ball. If the object in a state of uniform motion is the ball, what external force is acting on it?

Consider another one of the Laws of Motion: “For every action there is an equal and opposite reaction.” If the ball going down is one action, what is the equal and opposite reaction? With this in mind, consider the reaction of the ball to each of the surfaces. How is the ball bounce affected by the different surfaces? What do you think could cause these differences?

If you love playing basketball, you will often play or practice wherever you can, from air conditioned hardwood gymnasiums to an outdoor backboard and bucket on concrete or hard-packed dirt.

In the Warm Up, you experimented with different surfaces to see if some surfaces are just better at bouncing a ball than others. Looking at your list of surfaces, consider the following three questions: Would you want to fall onto that surface? How easy would it be to keep that surface clean and dry? Would you want to have to carry or move that surface?

Why ask these questions?

Did you know that NBA basketball courts are picked up, put away, and put back down for warm-ups and games? Sports arenas often host other big events like concerts, rodeos, or even other sporting events.

In order to do this, a crew has to be able to move the floor, store it, and return it before the teams arrive to warm up for the next game. The floor has to be sturdy enough to move without being damaged or having the quality of the surface changed. It has to be able to be put together the same way each time and in a way that fits together securely. Safety is always the top priority in sports!

Using what you learned in Warm Up, design a floor that has the characteristics needed to be a good basketball court. In this case, the court itself needs to aid both the basketball and the player. In Warm Up, you made observations and considered Newton’s Laws of Motion. We need a court that transfers plenty of energy back to the ball and the player without absorbing too much. The court also needs to be safe enough to protect players if they fall or slide.
Your challenge is to design and build a court that is 23.5 cm long and 12.5 cm wide. The court should be sturdy enough to be taken apart and retain the characteristics that made it a good basketball court. It has to fit back together snugly without pieces sliding or moving. The pieces must also be able to be stored within a space that is 6 cm x 3.5 cm.

In order to complete this challenge, it may prove helpful to use a series of steps called the Engineering Design Process. Each step helps reveal information that may prove beneficial in the next step. The design process is also iterative. This means the steps can, and should, be repeated to improve results. There are many ways to utilize the engineering design process. For Game Time, let’s look at the engineering design process as the following series of repeatable questions:

What is the problem you are trying to solve?
What research can you do and what information do you know that could help create a solution to the problem?
What are the specific requirements the solution will need to have?

After answering those questions, use these repeatable steps of the Engineering Design Process:

**Brainstorm**—Consider the problem, the information that you have discovered, and the specific requirements of the solution. Use a pencil and a journal. Start writing and sketching ideas. Design a solution.

**Create**—Now that you have ideas for a solution, build it! This will be the prototype, or first model. It may not be perfect and you may find yourself having to make adjustments in the middle of building it. Sometimes failure is an important part of the engineering design process. It can lead to even better solutions.

**Test**—Once your prototype is done, test it. Does it effectively solve the problem that you were trying to address? Does it meet the specific requirements of the project? If the model doesn’t effectively pass these tests, you can always go back to the Brainstorm or Create steps and make improvements.


Write your findings and observations in your journal. Was your basketball court a success? You can look back at the Engineering Design Process to help answer this question.

The problem you were trying to solve was to design a basketball court that could be taken apart and put back together easily. A good basketball court has certain characteristics, including not absorbing much energy from the ball. Also, the court had specific requirements. In this case, it had to be a certain size when it is put together and also be able to fit within a certain size when it is taken apart.

Brainstorming, creating, building, and testing allows you to not only solve the problem, but also allows for improvements to be made as the Engineering Design Process is repeated.

During the 2021-22 basketball season, the Oklahoma City Thunder revealed its first-ever alternative court. On City Nights, the Thunder would play in special alternative jerseys on a court that would only be used on these special nights.

The court looked different from the traditional OKC Thunder hardwood, but still included all the markings needed during basketball games such as the three-point line and baselines.
What benefits could you imagine an alternative court providing? Do you think it would add any excitement to the game or make the game feel more special?

If time allows, design your own special edition basketball court. Consider the court from the perspective of the athlete and the audience. If the court design has too many elements, it could cause confusion to both the athlete and the audience. If the design has too few elements, the audience may lose interest. You may choose to use a general theme to sketch several ideas. You may think about color. Some colors are warm, like red, and are often associated with excitement or intensity. Blue is considered a cool color. Because we associate blue with the sky and large bodies of water, it is often perceived as calm or even strong.

Once you have settled on a design, remember that these markings must match up each time the court goes back together. What system will you create to make sure the court fits back together efficiently? You may find that it is more difficult to assemble the court in the correct order now that all markings must align perfectly.

Nearly all NBA teams play on hardwood courts which are made from maple trees and by just a few companies. Ultimately, the trees that these courts are made of even grow in the same region. The wood is very hard, has a very dense grain, and is light in color. These characteristics mean the basketball player gets great energy return. The court absorbs very little energy from the player or the basketball. The tight grain ensures that the court is durable. The light color makes for a court that can be designed to be visually exciting for sports fans without being too distracting for watching game play. An additional benefit of the light color of the wood is that it reflects the overhead light and helps lighten the arena.

The hardwood itself is about ¾ inch thick, or a little less than 2 centimeters. Below, the hardwood courts often have additional construction or systems that aid in shock absorption, bounce, and even athletic performance.

Above the stained and painted hardwood is a high-gloss finish coat that is used on all NBA courts. This top layer helps athletes get a good grip on the floor and provides consistency for traveling teams. For the safety of the players and officials, the NBA requires that all courts are refinished every year.

The courts themselves face a lot of wear. Not only do they have to stand up to the physical activity of games, warm ups, and even half-time shows, the courts also have to withstand being picked up and put back down dozens and dozens of times each season! For this reason, basketball courts are often retired and changed about every ten years.

Do you want to learn more?
Research: Force, Lever, Load, Mechanical Advantage, Work

Meets 4th through 7th grade Science Standards PS3.2: Energy, PS3.3: Energy, and PS3.1: Energy

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