

FIELD TRIP DAY

PRESENTED BY Oklahoma
OIL & NATURAL GAS



 BOK CENTER

WELCOME TO FIELD TRIP DAY

PRESENTED BY Oklahoma
OIL & NATURAL GAS

Thank you for joining us! We're excited to explore science, technology, engineering, and math through basketball with you. In this booklet, there's all kinds of facts, puzzles, and games to discover.

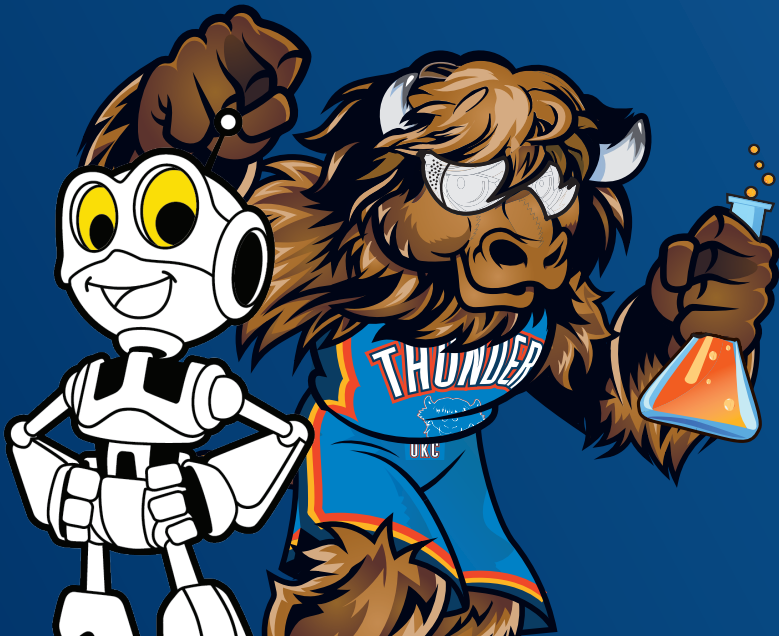
Want to learn more about STEM? Bring the Devon Thunder Explorers program into your classroom! You and your teachers can find out more at okcthunder.com/explorers

We hope you enjoy the game. Go Blue!

Your friends,

Rumble & Otto

Rumble and Otto



BASKETBALL PHYSICS

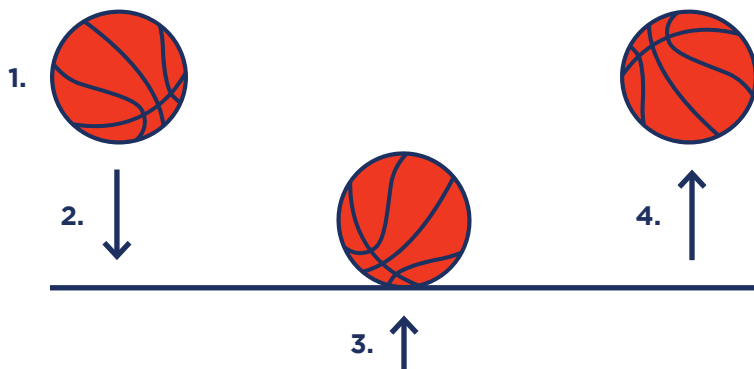
Rumble and Otto love to play basketball. One day at practice, they noticed the ball bounced differently depending on how they pushed it. Help Rumble and Otto identify the different forces acting on the basketball.

Fill in the blank with the type of force that is being used. Use the numbers in the picture below to help!

Types of Forces:

Gravity **Applied Force** **Normal Force** **Elastic Force**

1. Rumble and Otto used a/an _____ to push the basketball down.
2. _____ always pulls objects downward towards the Earth.
3. The _____ pushes back on the basketball when it hits the ground.
4. The basketball bounces back up because of the _____ from the rubber material.



If Rumble used a lot of force to bounce a basketball, would that ball have a **small bounce** or a **big bounce**? Circle the best answer.

Why did you pick this answer? Have you tried bouncing a ball really hard before?

OBSERVATION CHALLENGE

Here's an interesting fact: basketball is full of science! The sounds you hear, the materials you see, and even the dribble of the basketball can all be explained with science.

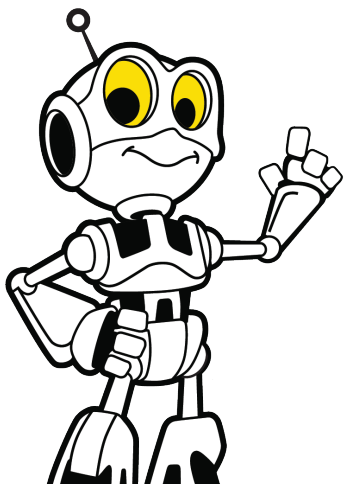
Can you spot the science? Use the gameboard below to find how science works in a basketball game. Play with your friends to see who can find the most!

GRAVITY PULLING DOWN ON A BALL	PLAYERS PASSING THE BALL (FORCE)	REACTION TIME WHEN A PLAYER MISSES A SHOT	THE BALL'S SOUND WHEN IT BOUNCES
PLAYERS DRINKING WATER TO REHYDRATE	LIGHT REFLECTION OFF THE POLISHED COURT SURFACE	PLASTIC USED TO MAKE SOMETHING IN THE ARENA	MORE ENERGY USED WHEN A PLAYER MOVES FAST
SWISH SOUND OF THE NET	NYLON USED TO MAKE A NET	PLAYERS SHOOTING THE BALL (ANGLES)	BASKETBALL SHOE SQUEAK (FRICTION)

You're a scientist now, too!

Did you know that scientists observe the world around them just like you did during the game?

By asking questions and noticing details, scientists uncover the mysteries behind everything from the bounce of a basketball to the colors in nature. Every time you observe or investigate, you're thinking like a scientist. Science is all about curiosity. Anyone can be a scientist- including you!



SCIENCE OF THE COURT

Otto loves sharing the science of basketball with others. He told Rumble that the things they see on game day are made of all kinds of materials. Check out the items below and the different materials used to make them!

Backboards are often made of **acrylic**, making a clear and tough surface.

Basketball nets use **nylon** and **polyester**. The jersey's players wear are also made of these materials!

The basketball rim is made of a mixture of different metals, called **steel**.



The surface of a basketball is made of **rubber** so that it's easier to grip.

Leather is often used to cover the basketball so that it will last longer.

Air is inside the basketball, allowing it to bounce and keep its round shape.

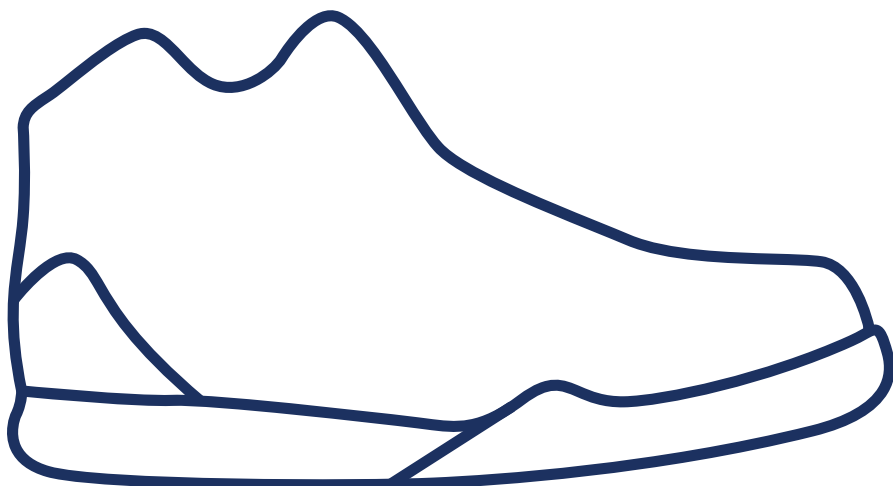
Bleachers are often made of **metals**, **plastics**, and sometimes **wood**! These materials are strong and sturdy for crowded arenas.

Sometimes a **vinyl coating** is used on the bleacher seats for extra protection, color, and comfort.

BONUS: Can you find the bolded materials during the game? Where did you find those items?

BASKETBALL ENGINEERING

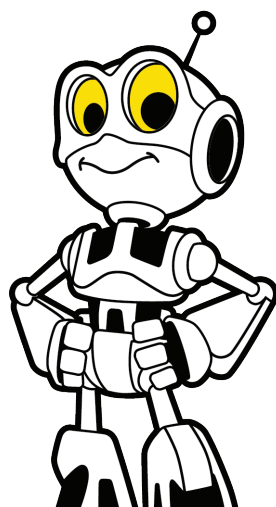
Rumble and Otto noticed that the players were wearing really cool basketball shoes. They decided they wanted to make their own! Use the shoe below to help design a shoe for Rumble and Otto.



Is your shoe made of plastic, leather, foam, or rubber? Does your shoe make basketball players faster, jump higher, or something else? Be creative with your designs!

Did you know?

Basketball shoes are carefully tested to make sure players stay safe, quick, and comfortable on the court. Designers use things like padded tops to support players' ankles, grippy outsoles to help players stop quickly and run fast, and extra cushioning to make sure players can jump high without getting hurt.



DECRYPT THE MESSAGE

Otto's language processor must be broken. He sent Rumble a text, but it looks like his message is in robot code!

Otto's code uses a "shift" encryption. To decode it, you will need to shift each letter in the alphabet by a certain number of spaces. You'll need the key to know how many spaces to shift. Without the key, there's no way to translate this code!

The key indicates how many places you need to shift forward in the alphabet. For example, if the key = 3, you would begin by finding the letter that is 3 spaces in the alphabet from the letter "A", which is "D."

Otto's key is 21, so you will need to move twenty-one spaces from "A" to letter "U." If you get to "Z" and you still have more spaces left to shift forward, start over again at the beginning of the table with "A".

A	B	C	D	E	F	G
H	I	J	K	L	M	N
O	P	Q	R	S	T	U
						A
V	W	X	Y	Z		

To decrypt Otto's message, find each letter of his note in the box to the left and exchange it for the shifted letter you wrote in yourself.

Otto's Encrypted Message:

FYZM VRGE HGMEYZHARR

What does Otto's text message to Rumble say?

Otto's Decrypted Message: _____

Did you know?

Encryption is used every day to keep us safe! Each time you text a friend, watch a video, or play a game online, your device uses encryption to keep your information safe. It's like your phone and computer are whispering secrets that only they understand, keeping everything private and secure.

STEM WORD SEARCH

Rumble and Otto are learning new words in science class! Can you help them?

N F F N M G F O S S I L S U F
O R M P A A N M P R R G P K O
H I U A T S Z R G N V P H X R
A C G R T E C O S Y S T E M C
B T R T E U R F E U C Q X B E
I I A I R V I E K N D M T M K
T O V C U W E A T H E R I N G
A N I L I X Y U L C D R Y K U
T J T E R O S I O N F G G C J
I V Y S D G T W N O F E J Y B

Ecosystem
Fossils
Habitat

Energy
Friction
Matter

Erosion
Gas
Particles

Force
Gravity
Weathering



BASKETBALL WORD SCRAMBLE

Otto and Rumble scrambled up some of their favorite words about basketball. See if you can unscramble the words in the spaces below.

W H T R O



Hint: Passing the ball to another player.

Z Z U B R E



Hint: The sound the game clock makes when time runs out.

S S T I S A



Hint: A pass to a teammate that leads directly to a score.

E M T U O I T



Hint: A short break in the game called by a coach.

H S S I W



Hint: The perfect sound of the ball going through the net without touching the rim.

D E U B R O N



Hint: When a player grabs the ball after a missed shot attempt.

B L D E R I B



Hint: Bouncing the ball continuously while moving around the court.

U K N D



Hint: A powerful move when a player forcefully pushes the ball down through the hoop.

BONUS: Place the letters written in the circles above into the spaces below to find out why Rumble and Otto love playing basketball!

— — — — — — — —

ANSWER KEY

BASKETBALL PHYSICS

- 1. APPLIED FORCE**
- 2. GRAVITY**
- 3. NORMAL FORCE**
- 4. ELASTIC FORCE**

ANSWER KEY
DECRYPT THE MESSAGE

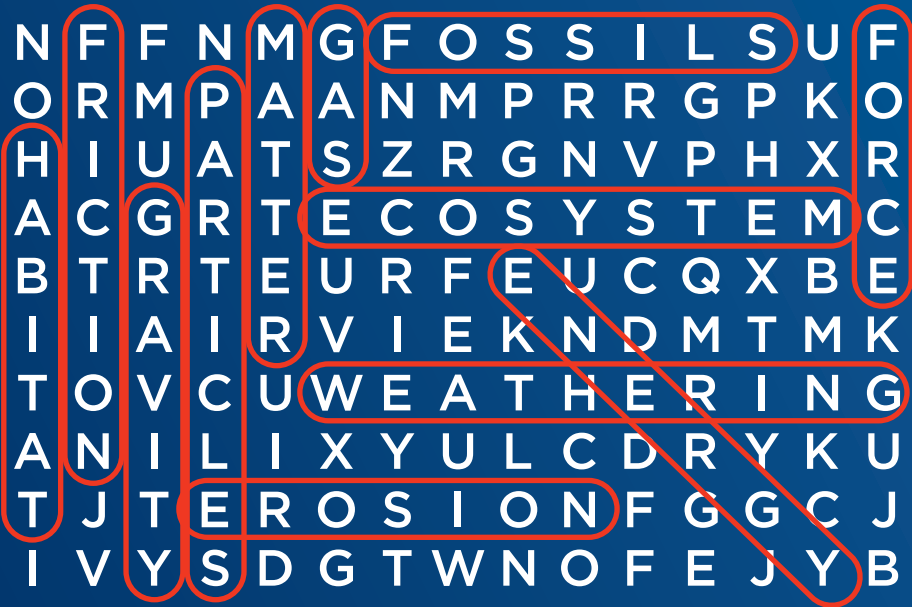
A	B	C	D	E	F	G
G	H	I	J	K	L	M
H	I	J	K	L	M	N
N	O	P	Q	R	S	T
O	P	Q	R	S	T	U
U	V	W	X	Y	Z	A
V	W	X	Y	Z		
B	C	D	E	F		

Otto's Encrypted Message:
FYZM VRGE HGMEYZHARR

Otto's Decrypted Message:
LET'S PLAY BASKETBALL

ANSWER KEY

STEM WORD SEARCH



science
museum
OKLAHOMA

Where curiosity knows no bounds

ANSWER KEY

BASKETBALL WORD SCRAMBLE

WHTRO	THROW
ZZUBRE	BUZZER
SSTISA	ASSIST
EMTUOIT	TIMEOUT
HSSIW	SWISH
DEUBRON	REBOUND
BLDERIB	DRIBBLE
UKND	DUNK

BONUS: TEAMWORK

AUTOGRAPHS





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THINK LIKE A GEEK

THE BUMPS ON A
BASKETBALL CREATE FRICTION
AND HELP PLAYERS GRIP THE
BALL FOR DRIBBLING,
PASSING, AND SHOOTING



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