



GEOMETRY IN SOCCER

How can a **pentagon** and a **hexagon** make a **sphere**?



It turns out that a combination of pentagons and hexagons, when sewed together in the right way, make a nearly perfect sphere.

In the 1970s, scientists at Adidas came up with the classic black and white design for the World Cup soccer ball. (Adidas has made every World Cup ball since.)



The well-inflated, nearly perfect sphere with a strong outside covering made for a good soccer ball. The pattern of black and white shapes helped players follow the the ball as it traveled down the field.

CLASSIC SOCCER BALL

To find out how many hexagons and pentagons are on a soccer ball, complete the following math challenges:

Number of hexagons = the number of sides in a hexagon **plus** the number of sides in a nonagon **plus** the number of sides in a pentagon.

Number of pentagons = the number of sides in a pentagon **plus** the number of sides in a triangle **plus** the number of sides in a square.

FUEL FOR THOUGHT

HOW MUCH AIR IS BEST?

What happens if you kick or drop a deflated soccer ball?

Why do you think that happens?

Engineering Soccer Footwear

Soccer cleats are engineered to provide the best possible traction and directional control. There are different types of cleats for different weather types, such as slippery conditions, hard fields and turf.

Cleats were originally made with calf or cow leather. Later they were made out of kangaroo leather because it would stretch and fit better to the player's foot, giving better control. Cleats weigh about 7 ounces (200g).



THE BIOLOGY OF SOCCER



Good nutrition and hydration can separate winners from losers on the soccer field.

The athlete that plays a sport is key to the game. Like the balls, shoes and clothing, the athlete needs to prepare and care for his or her body to get the best possible performance.

Exercise and diet are important parts of keeping one's body in good shape. Drinking plenty of water to keep hydrated is essential.

Hydration: the addition of water; the replacement of body fluids

About what percentage of your body is made up of water?

$$13 + 13 + 4 + 30 + 5 + 5 = \underline{\quad} \%$$

Water is the main ingredient of most parts of the human body.

The Thirsty Games

During a game, a soccer player can lose 2 to 3 quarts of body fluid through sweat – enough to fill a 2-liter soda bottle, or 8 cups.

Athlete Tip: Don't wait until you are thirsty to drink some water. Grab a sip every time you pass the water fountain.

Mouth and Nose

The saliva in your mouth and mucus in your nose are made up of water.

Eyes

The tears in your eyes are made of water.

Skin

The sweat that keeps you cool on hot days or when you exercise is made up of water.

Stomach

The fluids in your stomach are made up of water and help your body digest food.

Blood

The blood that moves nutrients around your body and takes waste out of your body is mostly made up of water.

Joints

The liquid around your joints helps them move smoothly.

Dehydration Holds You Back:

During the 2006 World Cup, British soccer star David Beckham blamed his poor performance on dehydration, or a lack of water. All it takes is 1-percent dehydration for performance to suffer, and from there, it just gets worse.

For instance, one study found that an athlete with 5-percent dehydration averaged a 30-percent decline in performance!



SCIENTIST'S NOTEBOOK

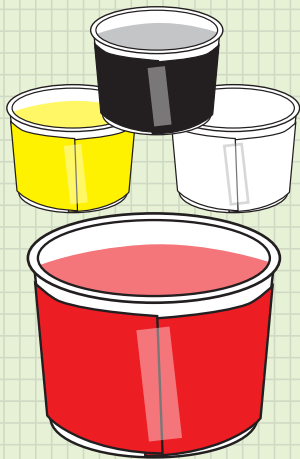
Color and Heat

MATERIALS:

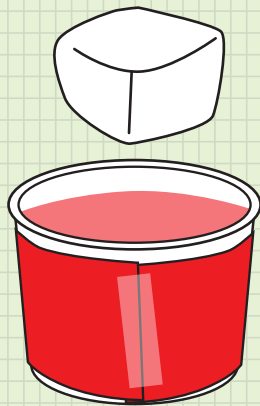
- sunny day or heat lamp
- 4 ice cubes
- 4 clear plastic cups
- 4 sheets of different colored paper
- scissors
- clear tape

DO DIFFERENT COLORS ABSORB HEAT BETTER THAN OTHERS?

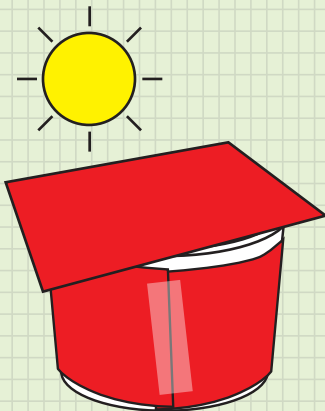
Investigate how the color of a material affects how much heat it absorbs.



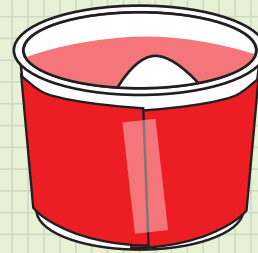
Wrap each paper cup in a different color of paper.



Place the wrapped paper cups in a sunny spot. Place an ice cube in each cup.



Cover each cup with a piece of the same color paper.



Check the ice cube every few minutes and record which ice cube melts first, second, third and fourth. Then answer the question below.

	MELTED FIRST	MELTED SECOND	MELTED THIRD	MELTED FOURTH	MELT TIME (MINUTES)
RED					
WHITE					
BLACK					
YELLOW					

How can this information help you decide what to wear on a very hot day?

Well, What Do You Know?

1. A pentagon has six sides.
 TRUE FALSE
2. Soccer cleats weigh about 7 ounces.
 TRUE FALSE
3. When a ball hits a hard surface it changes shape.
 TRUE FALSE
4. PSI stands for "Puppies per Sandy Incline."
 TRUE FALSE
5. Your body is made up of about 70% water.
 TRUE FALSE
6. During a soccer game a player can lose 2 to 3 quarts of water.
 TRUE FALSE

The STEM ZONE

ON AIR: Studio C

Become an on-air personality or a broadcast technician in the Chevron STEM ZONE. Use technology and find out how a professional television studio works!

