

3. Moving Basketball

CTE Standards: Arts and Media Sector

- 5.0 Problem Solving and Critical Thinking. Conduct short as well as more sustained research to create alternative solutions to answer a question or solve a problem unique to the Arts, Media, and Entertainment sector, using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques.
- 5.1 Identify and ask significant questions that clarify various points of view to solve problems.
- 5.2 Solve predictable and unpredictable work-related problems using various types of reasoning (inductive, deductive) as appropriate.

CTE Standards: Game Design Pathway

- D3.0 Acquire and apply appropriate game programming concepts and skills to develop a playable video game.
- D3.1 Implement common programming concepts, including logic operators, conditional statements, loops, variables, events, actions, and handling user input.
- D3.2 Understand the basics of game physics, including collision and motion.
- D3.4 Explore the basics of random number generation.
- D3.5 Implement a small video game utilizing mathematics and physics that features at least one moving object (such as a spaceship), which rotates along an axis and moves in whichever direction it is facing after rotation. The game must include collision physics.

Student learning outcomes

- Create a web page with an embedded SVG
- Use clipping paths to create a basketball image
- Use JavaScript to move the basketball
- Understand the need for `setTimeout()` to repeat the animation
- Understand the math for calculating a realistic rotation
- Understand how to use variables to store:
 - the user's settings (such as speed), and
 - the current state of the animation (such as locations).

Real world applications:

- Video games that involve motion.
- Advertising that involves animation.
- Web sites that require motion.
- Human interaction.

Assignment requirements:

- The page displays an SVG image with a basketball in one corner.
- The basketball will move in all directions on the screen (right, left, up, down, and combinations).
- A form allows users to change the basketball color and speed.
- HTML elements: buttons with various different functions.
- JavaScript concepts:
 - `onclick`
 - `getElementById`
 - Application initialization
 - `setTimeout`

Lesson Outline (next page)

Lesson Outline

1. View previous examples of student work
2. Create an SVG canvas to draw on
 - a. Use the HTML web page template on the class blog
 - b. Use the SVG template on the class blog
 - c. Change the size of the SVG to 800 x 200
 - d. What does 800 x 200 even mean?
 - e. Add a light colored background rectangle to the SVG
 - f. Add a "floor" line to the SVG
3. Create a basketball
 - a. Decide on a size for the basketball
 - b. Use clipping paths to create the lines on the basketball
4. Make the basketball move across the screen
 - a. How could we do this?
 - b. Adding JavaScript to the page
 - c. What attributes could we change?
 - d. cx, cy or transform?
 - e. JavaScript setTimeout() method
 - f. Creating a complicated string from component parts
5. Make the basketball roll realistically
 - a. Add a rotation to the transform
 - b. How do we calculate the appropriate amount of rotation?
 - c. Radius, diameter, circumference, translation
6. Make the basketball bounce off a wall
 - a. Add variables for incremental displacement / delta
 - b. Add variables for current displacement
7. Next lesson:
 - a. Make the basketball move in both x and y directions?
 - b. Make the basketball bounce off both vertical and horizontal walls?
 - c. Add user interaction to change the direction of the ball.
 - d. Add random numbers to make the animation more realistic.

