

Chapter 6 Project

This Mixtape Is Fire!

An activity to demonstrate the use of geometric formulas and properties in real life.

While most music listening today happens via online streaming, music is still distributed in a variety of physical formats, such as cassette tapes, CDs, and vinyl records.



Cassette Tape



Compact Disc (CD)



Vinyl Record

Imagine that you are a musical artist who wants to produce and distribute your own music using cassette tapes, CDs, and vinyl records. To save money, you plan to design the album artwork yourself and send the art files to the manufacturer along with the music files. The album artwork contains the cover art, information about each song, and all the credits. The dimensions of the album artwork for each type of physical media varies.

- For the cassette tape, the album artwork (called a J-card) is commonly printed on a 4-inch by 4.11-inch rectangle that is folded into a J shape and placed into a plastic case.
 - What is the perimeter of this sleeve?
 - What is the area of this sleeve?
- The plastic case for a cassette tape commonly measures 4.25 inches by 2.75 inches by 0.6 inches. The case is in the shape of a rectangular prism.
 - What is the surface area of a cassette case?
 - What is the volume of a cassette case? Round to the nearest hundredth.
- For the CD, the front artwork is commonly printed onto a 4.724-inch square and the back artwork is printed onto a 4.724-inch by 5.96-inch rectangle. Both the front and back artwork is inserted into a plastic case with dimensions 4.91 inches by 5.61 inches by 0.39 inches. The case is in the shape of a rectangular prism. The entire case is then wrapped in plastic film.
 - What is the total area of the front and back artwork? Round to the nearest hundredth.
 - What is the volume of the CD case? Round to the nearest hundredth.
 - A less common CD case has dimensions 4.92 inches by 5.51 inches by 0.41 inches. Which CD case size would require less plastic film to wrap it? How do you know?
- The vinyl record sleeve has a 12.375-inch square for the cover art. Suppose you want to designate a triangle at the top right of the cover art for the artist's name. This triangle has one leg along the right side of the sleeve measuring 3 inches and another leg along the top side of the sleeve measuring 4 inches.
 - What is the perimeter of the cover art excluding the triangle? Explain how you found this perimeter, using the Pythagorean Theorem in your explanation.
 - What is the area of the cover art excluding the triangle? Round to the nearest hundredth.
- Each vinyl record is circular with a diameter of 12 inches. Use the approximation $\pi \approx 3.14$.
 - What is the circumference of a 12-inch vinyl record?
 - In the middle of each record, there is a circle with a diameter of 3 inches with no music on it where a paper label is placed to identify the record. What is the area of the playable surface of this vinyl record that is not the center label? Explain how you found your answer.
 - You plan to have 500 vinyl records made for your album. At their center, each record has a height of 0.3 inches. The height along the outside of the record is 0.2 inches with a rounded edge. Can you use the formula for a volume of a cylinder to calculate the exact volume of a stack of 500 records? Explain your answer.

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1. a. 16.22 in. b. 16.44 in.^2
2. a. 31.775 in.^2 b. 7.01 in.^3
3. a. 50.47 in.^2 b. 10.74 in.^3
 - c. The less common CD case will require less plastic film to wrap. The surface area of the first case is about 63.30 in.^2 and the surface area of the less common case is about 62.77 in.^2 . A smaller surface area means less wrapping.
4. a. Cutting out 4 in. along the top results in a length of 8.375 in. Cutting 3 in. out from the right results in a length of 9.375 in. The length of the hypotenuse of the triangle is 5 in. by using the Pythagorean Theorem. Adding all of the sides results in a perimeter of 47.5 in.
 - b. 147.14 in.^2
5. a. 37.68 in.
 - b. First, find the area of the entire record. Next, find the area of the inner circle. Subtract the area of the smaller circle from the larger circle. 105.98 in.^2
 - c. No. Explanations will vary. Students should point out that the records are not uniform cylinders and that the stack will not be a solid cylinder. The formula for the volume of a cylinder can be used as an approximation for the volume of the stack of 500 records.