**Volume of Cylinder**

**Section 1**

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| 00:00:00 | TEACHER: Take a look at these stacked coins. |
| 00:00:03 | Don't they appear to create the shape of a cylinder? Well, how much space do they take up? In order to answer that question, we'll need to continue to answer the question, how can you find the volume of a cylinder? |

**Section 2**

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| 00:00:00 | TEACHER: Let's take a look at |
| 00:00:01 | identifying parts of a cylinder. A cylinder is a solid figure with circular bases that are congruent and parallel. The circular bases are found here. That's a base. And that's a base. They're congruent. So they have the same measure and area. |
| 00:00:21 | And the height of the cylinder is the perpendicular distance between the bases. Now let's take a look at a base versus not a base. As you see on the left, we have a cylinder that is actually standing on one of its bases. And this is labeled properly. So we have this base here. We have this circular base here. |
| 00:00:47 | And if we wanted to, we could also label the height. However, in this example, not a base is referring to the labeling that has taken place on this cylinder where labeling this part of the cylinder as a base. But it's not a circular shape, so it can't be a base. Rather, this is a base. And over here, on the other side, this circular shape would also be a base. |
| 00:01:18 | You can also label the height of a cylinder, the perpendicular distance between the two bases. It would be this distance here. We could write the word height on the outside or on the inside. It doesn't matter as long as it's referring to the perpendicular distance between the two bases. |

**Section 4**

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| 00:00:00 | TEACHER: Remember that the volume of the cylinder is a |
| 00:00:03 | measurement of how much space it can hold. To the right, we have the circular bases here. And we can think about volume of a cylinder in terms of how many of these circular bases it can hold. So essentially, what I'm talking about is what if I took these bases to the right and just started stacking them right on top of each other inside of this cylinder, over and over and over again until this cylinder was full? |
| 00:00:30 | I would know it was full because I had reached the height of the cylinder, or h. Now how does this take up space? Well, each of these bases has an area. And as I stack them, I'm stacking area on top of area on top of area. So I keep stacking and stacking and stacking. That takes up some area. |
| 00:00:54 | The next one takes up some more area. The next one takes up some more area, until I'm all the way at the top. But how many did I stack? Remember, we said we knew it would be filled when I reached h. So there are h areas. And this gives us some indication of the formula for |
| 00:01:12 | the volume of a cylinder. So this volume should be B for the base area. How many bases did we stack? We stacked h of them. So the formula in general is V equals Bh. Let's take a closer look at the formula. We already found that volume is equal to the area of the base times the height of the cylinder. |
| 00:01:44 | But what is B? B represents the area of this base, and it's a circle. So how do we find the area of a circle? We know that the area of this circle is pi r squared. So I can replace that B with pi r squared. And I bring that h down over here. And remember that r is the radius of this circle. I can use this volume formula or this volume formula. |
| 00:02:21 | They're equivalent. The difference is one highlights r, the radius, and one doesn't. |

**Section 6**

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| 00:00:00 | TEACHER: So how can we calculate |
| 00:00:01 | the volume of a cylinder? Let's take a look at this flow chart to get a mental image of what's happening. We've been given a cylinder, and what we want to know is, have we been given the radius? If we haven't been given the radius, we want to find it. Now, if we've been given the diameter, we just need to take half, and we have the radius. |
| 00:00:19 | Once we have r, we can use the formula V = Bh to calculate the volume. However, if we have been given the radius, we can jump right into using the formula to find the volume of a cylinder. Let's take a look at some cylinders and calculate their volume. |

**Section 7**

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| 00:00:00 | TEACHER: Let's see if we can use the formula for the volume |
| 00:00:02 | of a cylinder to calculate its volume. We want to use this formula V equals Bh to calculate the volume of this cylinder. Now let's start with the formula and see what values we've been given. Well, I've been given the B value as 9 pi inches squared. And I've also been given the height-- which is the h value-- |
| 00:00:25 | at 7 inches. So since I have these values, I want to substitute these measures into the formula. So my B was 9pi. And my height-- excuse me-- was 7. OK, so this B became 9pi, and this height is 7. |
| 00:00:52 | Let's simplify and do multiplication to finish up. What's 9 times 7? 63. Now we have units here. We've been given it in inches. And since we're working with volume, it needs to be inches cubed in our final answer. Now we don't want to times 63 times 3.14 or any other |
| 00:01:14 | decimal approximation of pi. When we leave pi as the symbol, it is the exact value. We don't want an estimation unless we're specifically told to give one. |

**Section 9**

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| 00:00:00 | TEACHER: Let's calculate the volume of a cylinder. |
| 00:00:04 | Let's take a look at the question. What is the volume of a cylinder with the radius of 5 feet and a height of 3 feet. We've been given the formula V equals Bh. Our first step is to substitute the given measures for the corresponding variables. So we have V equals Bh. And we've been given a radius of 5 feet. |
| 00:00:26 | But I don't see an r here. Where's the r? Remember it's in the B. I could rewrite this formula as pi r squared h. Because the base is equal to pi r squared. Let's substitute our 5 in for r. And we need a value for h. What can we substitute for h? We were given a height of 3 feet. |
| 00:00:51 | We're going to substitute the 3. So we're going to do 5 squared which is 25. And 3. Right now we're simplifying. I'm going to move our work up here. 25 times 3 is 75. We have 75 pi, but we have a unit. We were given feet, and since we're finding volume, it's |
| 00:01:22 | going to be in cubic feet. This is the volume of the cylinder. |

**Section 12**

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| 00:00:00 | TEACHER: Let's calculate the volume of this cylinder. |
| 00:00:03 | We've been given the formula for the volume, and we've been given measurements for the cylinder, however we haven't been given a radius-- we've been given the diameter. The diameter is 16. In order to find the radius from the diameter we only want half of that-- so we're going to take the diameter, cut it in half, which is going to give me 8. |
| 00:00:22 | This is equal to r. Now that I have my r I can substitute this value into the formula to find volume. I was given the formula as V equals Bh. I don't see an r there, but we know there's an r in the B, so let's rewrite it to show it. Now I can substitute in my r, which shows 8. We're going to have to square that, and what's h? h Is the |
| 00:00:54 | height of the cylinder, and it was given as 6. So let's substitute our 6 in for h-- we're now simplifying-- 8 squared is 64. We're going to have to multiply by that 6-- I'm moving our work up here-- 64 times 6 is 384-- pi. |
| 00:01:23 | And what about our units? We're in inches-- we're going to need to cube those inches because we're talking about volume. Inches cubed-- this is the volume of this cylinder. |