**Finding Hypotenuse in Right Triangle**

**Section 1**

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| 00:00:00 | TEACHER: Just like the picture on the top of a puzzle box |
| 00:00:04 | shows me the relationship between the pieces of the puzzle, the Pythagorean theorem tells me the relationship between the sides of a right triangle. We're going to need to understand the Pythagorean theorem in order to completely answer the question, how can you find the length of the hypotenuse of a right triangle? |

**Section 2**

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| 00:00:00 | TEACHER: Let's take a look at the longest |
| 00:00:02 | side of a right triangle. A right triangle is a triangle that contains one right angle. The sides that make up the right angle are called the legs of the right triangle. And the side opposite the right angle is the hypotenuse. Also, the hypotenuse is always the longest side of a right triangle. Now, it turns out that if I know the lengths of the legs |
| 00:00:22 | of a right triangle, using the Pythagorean theorem, I can determine the length of the hypotenuse. The Pythagorean theorem tells me that the square of the hypotenuse is equal to the sum of the squares of the legs. Now, let's use the Pythagorean Theorem to find the length of the hypotenuse of this right triangle. The legs have been given as 24 feet and 7 feet. And we've been given the Pythagorean Theorem to use to |
| 00:00:46 | determine the value for C. So I'm going to use 7 for A, so substitute in 7 for A, and substitute in 24 for B. And that will be equal to C squared. Now, you could have substituted in 24 for A and 7 for B. You would've got the same answer. So 7 squared is 49. And 24 squared is 576. And that's all equal to C squared. |
| 00:01:11 | 49 plus 576 is 625 equal to C squared. Now, we're squaring C. And the inverse operation is square root. So in order to find C, I need to take the square root of both sides. So square root of C squared on the right. And the square root of 625 on the left. And I find on the right, I'm just left with C. The square |
| 00:01:40 | root of 625 is actually 25 because 625 is a perfect square. So C is equal to 25, but not only that, it's equal to plus or minus 25. You see, the square root of a positive number always has a positive and a negative root. However, we're dealing with distance. And a negative distance doesn't really make sense. |
| 00:02:04 | So we're going to use the positive 25 as our answer. So C is equal to 25. This is also called the principal square root. So for this triangle, C is equal to 25. Our unit of measurement is feet. So it is 25 feet. Also notice that 7, 24, 25 is a Pythagorean triple. So we could have determined C with that knowledge as well. |

**Section 4**

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| 00:00:00 | TEACHER: So let's take a look at using the Pythagorean |
| 00:00:02 | Theorem and its relation to real-life distances. Now to get the local coffee shop, Van left his house, walked 3 blocks south, and then walked 4 blocks west. Now when he got to the coffee shop, Van realized he could take a more direct route home. And that more direct route is this pink line here back home. So the question is, how many blocks will Van have to walk to get home from the coffee shop if he takes the more |
| 00:00:34 | direct route? Now the more direct route in this scenario is the hypotenuse of this right triangle that I've outlined here. OK, so in order to determine the length of the hypotenuse, I need to use the Pythagorean Theorem a squared plus b squared equals c squared. Now I'll substitute in 3 for a, 4 for b, and I'll leave c |
| 00:00:58 | as c because that's what we're looking for. So 3 squared is 9. 4 squared is 16. And that's equal to c squared. 9 plus 16 is 25. And that's equal to c squared. Now in order to solve for c here, I have a c squared. So the inverse operation will be taking the square root. |
| 00:01:14 | So I'll take the square root of both sides. The square root of c squared, and that's equal to plus or minus the square root of 25. Now I have to consider the plus and the minus square root of 25 because, well, negative 5 squared is 25 and 5 squared is 25. But I'm talking about distances here. So I'm only going to take the positive square root of 25, or |
| 00:01:39 | the principle root. So I'm going to move our work just right up here to give us a little bit more room. So I'm going to take the positive square root of 25, which is just 5. And that is equal to the square root of c squared, which is just c. So how many blocks will Van have to walk to get home from |
| 00:01:58 | the coffee shop if he takes the most direct route? Well, that would be 5 blocks home. 5 is the length of the hypotenuse. |

**Section 6**

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| 00:00:00 | TEACHER: The Pythagorean theorem tells us the |
| 00:00:03 | relationship between the three sides of a right triangle. However, it does not promise that c squared is going to be a perfect square. So in our final answer, I might have a square root symbol. Or I might have to approximate that value. Either way, we need to be able to handle the situation to answer the question, how can you find the length of the |
| 00:00:25 | hypotenuse of a right triangle? |

**Section 7**

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| 00:00:00 | TEACHER: Let's take a look at this right triangle. |
| 00:00:02 | We want to solve for the value of the hypotenuse. Only it turns out that this value will not be a perfect square. So how do we handle that? Let's take a look. I'm going to write out our Pythagorean relationship here. a squared plus b squared equals c squared. That's going to be my a. |
| 00:00:22 | That's going to be my b. So I'm going to have 3 squared plus 2 squared equals c squared. 3 squared is 9. 2 squared is 4. That's equal to c squared still. 9 plus 4 is 13 equals c squared. To solve this, I take the square root of both sides. |
| 00:00:49 | And I'll move our work just maybe right around here. Now, I'm going to take the positive square root of 13, because there are no negative distances in this situation. So I'm going to take the positive square root of 13. So I just don't include a symbol here. It's assumed to be positive. The square root of c squared is just c. So our answer for c is the square root of 13-- |
| 00:01:16 | I could find an approximation here, but I'm looking for an exact value. And if I leave the square root symbol there, this is an exact value. So c is equal to the square root of 13. |

**Section 10**

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| 00:00:00 | TEACHER: Let's take a look at this applied problem, finding |
| 00:00:02 | the length of a ladder. So Robert wants to hang a picture above his entertainment center. So how long must a ladder be to reach a height 13 feet if the bottom of the ladder is placed 3 feet from the base of the wall? So drawing a model for this, this could be my wall at 13 feet. |
| 00:00:18 | And this could be my ladder of an unknown length. And I'm placing that ladder 3 feet from the base of the wall. So I can model this problem using the Pythagorean Theorem because this looks like a right triangle to me. So a squared plus b squared is equal to c squared. I will use this to solve for c. I have a value for a. |
| 00:00:39 | I'll use 3 for a. I'll substitute 13 in for b. And this is equal to c squared. 3 squared is 9, and 13 squared is 169, equals c squared. 9 plus 169 is 178. Now solving for c, I take the square root of both sides. OK, so the square root of 178 is equal to the square root of c squared, which is just c. |
| 00:01:14 | Now 178 is not a perfect square. So leaving it in this form, square root of 178, doesn't make much sense to me as being the length of a ladder. So I'm going to use a calculator to give me an approximate number for this length. So the square root of 178 is 13.3416. Well, let's just round it to the nearest tenths place. So that will give us 13.3. |
| 00:01:43 | So c is approximately 13.3 feet. So that means the length of the ladder that he will need to reach the top of that wall at 13 feet is 13.3 feet. |

**Section 12**

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| 00:00:00 | TEACHER: So let's take a look at right triangles and |
| 00:00:03 | measures in this applied situation. So Jenna is shopping for a new computer model. If she knows the measurements of the sides of the monitor, how can she figure out the diagonal measurement? So we know the sides of the monitor to be 11 inches and 14 inches. And we'd like to know the length of this diagonal. Well, the entire monitor is in the shape of a rectangle. |
| 00:00:26 | So I know that the interior angles are right angles. That will make the diagonal split the rectangle into 2 right triangles. So I can use the Pythagorean Theorem, a squared plus b squared is equal to c squared. Substitute 11 in for a. Substitute in 14 for b. And I can solve for c using this equation. |
| 00:00:50 | And c, the hypotenuse of the right triangle, will be the diagonal of the monitor. So 11 squared is 121, and 14 squared is 196, equals c squared. 121 and 196 added together will give me 317 equals c squared. Take the square root of both sides. So the square root of 317 is equal to the square root of c |
| 00:01:25 | squared, which is just c. So the length of the diagonal of the monitor is the square root of 317. Well, 317 isn't a perfect square. And leaving it like this, I really don't have any idea of how long that diagonal is. So if you use a calculator and find the square root of 317 and round to the nearest tenths place, you'll find that |
| 00:01:49 | the length of c is approximately 17.8 inches. So the length of the diagonal measurement of this computer monitor is approximately 17.8 inches long. |