in this video we're gonna go over the Pythagorean theorem and we're gonna talk about how to use it to solve problems associated with geometry so let's go over the formula first so if we have a right triangle and this side is called a B and hypotenuse to C then the formula is C squared is equal to a squared plus B squared C is the hypotenuse it's the longest of the three sides and a and B are known as the legs of the right triangle so let's say if we have a triangle that looks like this and let's say this side is five and this is 12 calculate the value of x now if you want to try it feel free to pause the video so let's use the formula C squared is equal to a squared plus B squared so a can be five or twelve it doesn't matter so let's say if we choose a to be twelve and B is five the hypotenuse C is across the box which is X so we have x squared is equal to twelve squared plus five squared now twelve times 12 is 144 and five squared is 25 144 plus 25 is 169 now to calculate the value of x we need to take the square root of both sides the square root of 169 is 13 and so that's how you can calculate the hypotenuse of a right triangle now let's work on another example

so let's say the hypotenuse is 10 this is 5 and our goal is to calculate why go ahead and do this so let's use the same formula C squared is equal to a squared plus B squared so C is the hypotenuse so in this problem C is 10 a we could say it's y and then B is 5 so it's gonna be 10 squared is equal to Y squared plus 5 squared 10 times 10 is a hundred and 5 squared is 25 so we need to subtract both sides by 25 now 100 minus 25 is 75 so now our next step is take the square root of both sides so Y is equal to the square root of 75 now how can we simplify this value to get the right answer once you get the exact answer and it's fully simplified for him what perfect square goes into 75 25 is a perfect square that goes into it 25 times 3 is 75 and the square root of 25 is 5 so Y is equal to 5 square root of 3 now let's work on some word problems what is the area of a square with a diagonal length of 12 inches so first let's draw a square and so this is just a rough sketch of a square and this is the diagonal of the square so that's 12 now let's call this X all 4 sides of a square are the same so this is X so

notice that we have a right triangle the area of a square is the left times the width both the length and the width is equal to X so the area of a square is x squared so we can calculate the value of x we can calculate the area of the square so let's use the theorem to calculate X so C squared is equal to a squared plus B squared C the hypotenuse is 12 a is equal to X in this example and B is equal to X so 12 squared is x squared plus x squared 1 x squared plus 1 x squared is 2x squared + 12 squared is 144 so first we need to divide both sides by 2 144 divided by 2 is 72 and so that's equal to x squared now let's take the square root of both sides so X is equal to the square root of 72 now a is equal to x squared and x squared is 72 so a is just 72 so that's the area of the square by the way if you want to simplify this radical you can say that 72 is 36 times 2 and the square root of 36 is 6 so X is 6 square root 2 but the area is x squared and we can see that x squared is 72 which means a is 72 in this example number four in rhombus ABCD b/e is seven and C E is 24 calculate the perimeter of the rhombus so the first thing needs to know is that the diagonals of a rhombus bisect each other and 90 degrees B E is 7 and C E is 24 because of rhombus the diagonals of a rhombus bisect each other hey E and E C are congruent be e and E D are congruent so if B E is 7 e d is 7 and if EC is 24 ie is 24 now all four sides of a rhombus are congruent
so let's say if we call this s this is s that's us that's s so the perimeter is 4 s now notice that we have four congruent right triangles this is 7 this is 24 and this is s so let's use the Pythagorean theorem to calculate s C squared is equal to a squared plus B squared in this case C is the hypotenuse s a we could say it's 24 and B is 7 24 times 24 that's 576 and 7 squared is 49
now 576 plus 49 is 625 so now let's take the square root of both sides the square root of 625 is 25 so now we can calculate the perimeter so it's 4 s or 4 times 25 which is a hundred so that's the perimeter for this particular rhombus it's a hundred units number five what is the area of the isosceles trapezoid shown below
so first we'll need a formula the area is 1/2 B 1 plus B 2 times H so B 1 is the first base that's 12 B 2 is the

second base which is 20 and H is the height of the trapezoid so somehow we need to calculate H in order to calculate the area so how can we do so now the first thing we need to realize is that for an isosceles trapezoid a B is congruent to C D so both sides are equal to 5 next we need to draw two right triangles now we know that ad is 20 that was given to us in the beginning now if we add two additional points let's call this e and f EF is the same as BC that's 12 now if these two sides are congruent and this and that has to be congruent these two a E and F D must be congruent to each other so if we call this X and X we could say that X plus 12 plus X is equal to 20 or 2x plus 12 is equal to 20 so let's subtract both sides by 12 so 20 minus 12 is 8 and if we divide by 2 we can see that X is 4 so we could put a four here so now we can find H the missing side so now let's focus on this right triangle C squared is equal to a squared plus B squared the hypotenuse is 5 a we can say it's 4 and B is H 5 squared is 25 4 times 4 16 and 25 minus 16 is 9 so H squared is 9 and if you take the square root of both sides we can see that H is equal to 3 so now that we have the value of H we can calculate the area of the trapezoid using this formula that is this formula here so it's going to be 1/2 b1 which is 12 plus B 2 which is 20 times the height of 3 now 12 plus 20 is 32 and half of 32 is 16 16 times 3 is 48 so this right here is the answer that's the area of the trapezoid