

**This is the script for Slide 14.**

**(p.6/7 Focus in High School Mathematics: Reasoning and Sense Making)**

**We need four students and one teacher. The rest of us think about which mathematical practices are being used.**

**Teacher:** Today's lesson requires that we calculate the distance between the center of a circle and a point on the circle in order to determine the circle's radius. Who remembers how to find the distance between two points?

**Student 1:** Isn't there a formula for that?

**Student 2:** I think it's  $x_1$  plus  $x_2$  squared, or something like that.

**Student 1:** Oh, yeah, I remember – there's a great big square root sign, but I don't remember what goes under it.

**Student 3:** I know! It's  $x_1$  plus  $x_2$  all over 2, isn't it?

**Student 4:** No, that's the midpoint formula.

(The discussion continues along these lines until the teacher reminds the class of the formula.)

At a later date.....

**Teacher:** Let's take a look at a situation in which we need to find the distance between two locations on a map. Suppose this map shows your school; your house, which is located two blocks west and five blocks north of school; and your best friend's house, which is located eight blocks east and one block south of school. If the city had a system of evenly spaced perpendicular streets, how many blocks would we have to drive to get from your house to your friend's house?

**Student 1:** Well, we would have to drive ten blocks to the east and six blocks to the south, so I guess it would be sixteen blocks, right?

**Teacher:** Now, what if you could use a helicopter to fly straight to your friend's house? How could we find the distance "as the crow flies"? Work with your partners to establish a coordinate-axis system and show the path you'd have to drive to get to your friend's house. Next, work on calculating the direct distance between the houses if you could fly.

**Student 1:** What if we use the school as the origin? Then wouldn't my house be at  $(-2, 5)$  and my friend's house at  $(8, -1)$ ?

**Student 2:** Yeah, that sounds right. Here, let's draw the path on the streets connecting the two houses and then draw a line segment connecting the two houses.

**Student 1:** Maybe we could measure the length of a block and find the distance with a ruler.

**Student 3:** Wait a minute – you just drew a right triangle, because the streets are perpendicular.

**Student 4:** So that means we could use the Pythagorean Theorem:  $10^2 + 6^2 = c^2$ , so  $c =$  the square root of 136.

**Student 2:** But how many blocks would that be?

**Student 3:** Shouldn't the distance be between eleven and twelve blocks, since 121 is less than 136 is less than 144? Actually, it's probably closer to twelve blocks, since 136 is much closer to 144.

(The teacher then extends the discussion to consider other examples and finally to develop a general formula.)

