

MA 241

Homework #9

Due Tuesday, November 24, in class

1. Page 94, #13 in *Looking for Pythagoras*.
2. Determine the length of the long inside diagonal of an $a \times b \times c$ rectangular prism.
3. (a) Make a careful diagram by drawing a coordinate system and plotting the points $A(1, 5)$ and $B(-4, 2)$.
(b) Use your diagram and the Pythagorean Theorem to determine the length of the segment \overline{AB} .
(c) Based on this experience, provide a general explanation about to use the Pythagorean Theorem to justify the distance formula $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ for the distance between arbitrary points $A(x_1, y_1)$ and $B(x_2, y_2)$.
4. Let $A = (0, 5)$ and ℓ be the horizontal line given by $y = 1$. Consider the set of all points $P(x, y)$ such that the distance from P to A equals the (vertical) distance from P to ℓ . Write an equation to describe this set of points. Simplify it as much as possible. What kind of shape do you get?
5. (a) Let $A = (3, -5)$ and $P = (x, y)$. Assume that $AP = 9$. Why does this imply that $(x - 3)^2 + (y + 5)^2 = 81$?
(b) Let $A = (h, k)$ and r be a positive real number. Explain why $(x - h)^2 + (y - k)^2 = r^2$ is the equation of the circle centered at A with radius r .
(c) Consider the set of all points (x, y) satisfying $x^2 + 4x + y^2 - 6y = 87$. Show that this is a circle and determine its center and radius.
6. (a) Write $\frac{17}{140}$ as a decimal. If there is a repeating part, clearly indicate what that part is, and explain how you know this part will repeat forever.
(b) Write $\frac{17}{390625}$ as a decimal. If there is a repeating part, clearly indicate what that part is, and explain how you know this part will repeat forever.
(c) Show how to express $17.123456\overline{3456}$ as a rational number.
7. Suppose you draw a line through the point $(0, 0)$ with slope $\sqrt{2}$. How many points of the form (a, b) , with a and b both integers, will be on this line? Why?