

MA 241

Homework #8

Due Tuesday, November 22, 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  $\ell$  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  $\ell$ . 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, using the distance formula, 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?
8. Solve the “Thedolite Problem” — see separate handout.