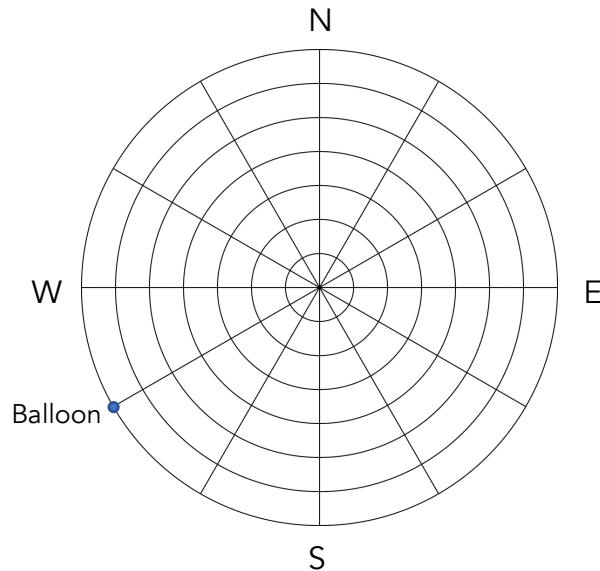




Supervising the Sky



Air traffic controllers monitor the space around an airport by keeping track of various airplane's locations and movement using a radar screen like the one shown below. At the center of the grid is the air traffic control tower. The radius of each of the surrounding rings increases by five miles. When an airplane enters that tower's airspace, it is seen on the grid by a bright point called a screen pixel.



1. An airplane is 15 miles away from the tower. Show all the possible locations of the plane.
2. Because this information alone is not enough to locate the airplane, controllers also mark locations with an angle that is measured counterclockwise from due east. Plot a point that represents the location of an airplane that is 15 miles and $\frac{2\pi}{3}$ radians from the tower.
3. Hot-air balloons are not allowed within 20 miles of an airport for safety reasons. If a hot air balloon is identified on the radar screen, police must be notified of its location. The police must be given rectangular north-south-east-west directions, in reference to the control tower, to find the possible offender on their GPS. If a hot-air balloon appears on the radar screen at the point shown, what coordinates should the air traffic controller give the police (i.e. how many miles north/south and how many miles west/east is the balloon from the tower)?
4. The hot-air balloon continues to move. By the time the police are able to catch up to the balloon, it is located 13 miles east and 15 miles south of the airport tower. Does this balloon violate the 20-mile limit? How do you know?
5. What angle could be used to locate the balloon's new location on the radar grid?

Lesson 8.1 – Polar Coordinates

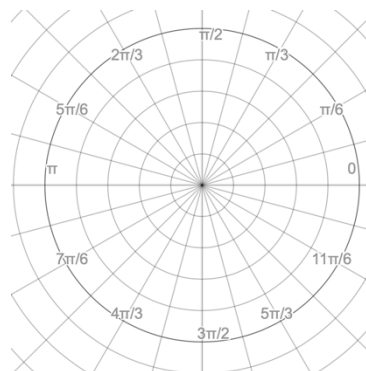
QuickNotes

Check Your Understanding

1. Plot the point on the polar grid. Then give two other polar coordinates for the same point.

a) $(3, \frac{\pi}{3})$

b) $(-5, \frac{7\pi}{4})$



2. If the point (r, θ_1) and $(-r, \theta_2)$ have the same location on the polar grid, what can you conclude about θ_1 and θ_2 ?
3. Convert the point $(4, \frac{2\pi}{3})$ from polar to rectangular coordinates.
4. Convert the point $(1, \sqrt{3})$ from rectangular to polar coordinates.
5. Which point is further from the origin: the point with rectangular coordinates $(-5, 3)$ or the point with polar coordinates $(6, \frac{5\pi}{6})$? Explain.