80. (a) (i) $(x-2)^2+(y-1)^2=9$, the center is at $(2,\ 1)$, and the radius is 3.
$(x-6)^2+(y-4)^2=16$, the center is at $(6,\ 4)$, and the radius is 4.
The distance between centers is
$\sqrt{(2-6)^2+(1-4)^2}=\sqrt{(-4)^2+(-3)^2}=\sqrt{16+9}=\sqrt{25}=5$.
Since $5<3+4$, these circles intersect.

(ii) $x^2+(y-2)^2=4$, the center is at $(0,\ 2)$, and the radius is 2.
$(x-5)^2+(y-14)^2=9$, the center is at $(5, 1\,4)$, and the radius is 3.
The distance between centers is
$\sqrt{(0-5)^2+(2-14)^2}=\sqrt{(-5)^2+(-12)^2}=\sqrt{25+144}=\sqrt{169}=13$.
Since $13>2+3$, these circles do not intersect.

(iii) $(x-3)^2+(y+1)^2=1$, the center is at $(3,\ -1)$, and the radius is 1.
$(x-2)^2+(y-2)^2=25$, the center is at $(2,\ 2)$, and the radius is 5.
The distance between centers is
$\sqrt{(3-2)^2+(-1-2)^2}=\sqrt{1^2+(-3)^2}=\sqrt{1+9}=\sqrt{10}$.
Since $\sqrt{10}<1+5$, these circles intersect.

(b) As shown in the diagram, if two circles intersect, then the centers of the circles and one point of intersection form a triangle. So because in any triangle each side has length less than the sum of the other two, the two circles will intersect only if distance between their centers, d, is less than or equal to the sum of the radii, r_1 and r_2. That is, the circles will intersect if $d \le r_1 + r_2$.