Lesson 10.7

Practice Level C

1. $(x - 2)^2 + (y - 2)^2 = 16$

2. $(x + 3)^2 + (y - 2)^2 = 4$

3. $(x - 5)^2 + (y + 2)^2 = 9$

4. $(x - 4.1)^2 + (y - 2.5)^2 = 9$

5. $(x - 3.7)^2 + (y + 6.2)^2 = 25$

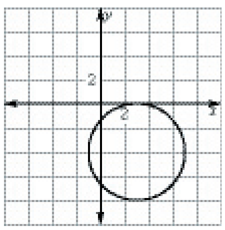
6. $\left(x - \frac{3}{2}\right)^2 + \left(y - \frac{5}{2}\right)^2 = \frac{1}{4}$

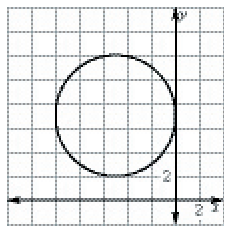
7. $\left(x - \frac{4}{3}\right)^2 + \left(y - \frac{7}{2}\right)^2 = 4$

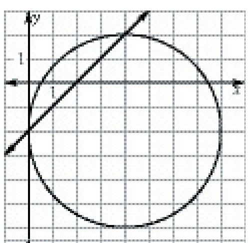
8. $(x - 1)^2 + (y - 3)^2 = 169$

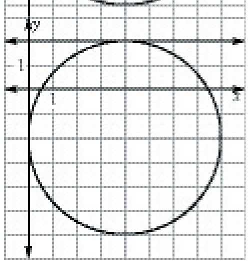
9. $(x + 5)^2 + (y + 2)^2 = 400$

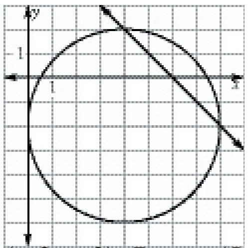
10. $(x + 1)^2 + (y - 2)^2 = 2500$

11. 

12. 

13.  secant; line intersects circle twice.

14.  tangent: intersects circle once.

15. 

secant; line intersects circle twice.

16. $(-2, -3)$; 7 **17.** $(5, -4)$; 8 **18.** $(-1, 0)$; 6
19. $(-3, 4)$; 5 **20.** $(-3, 7)$; $\sqrt{70}$ **21.** $(4, 2)$; $\sqrt{2}$
22. a. -14, 10 **b.** 4 **c.** $(x + 2)^2 + (y + 4)^2 = 16$, $(x + 2)^2 + (y + 4)^2 = 484$
23. *Sample answer:* The diagram shows $\overline{BM} \cong \overline{AM}$, so $M = \left(\frac{r+s}{2}, \frac{t}{2}\right)$ is the midpoint of $\overline{AB}$. The slope of $\overline{AB}$ is $\frac{t}{s-r}$, so the slope of the perpendicular bisector is $-\frac{s-r}{t} = \frac{r-s}{t}$.
Therefore, an equation of the perpendicular bisector is $y - \frac{t}{2} = \frac{r-s}{t}\left(x - \frac{r+s}{2}\right)$, or
$y = \frac{r-s}{t}x + \frac{t}{2} - \frac{r^2 - s^2}{2t}$. But (s, t) is a point on the circle $x^2 + y^2 = r^2$, so $s^2 + t^2 = r^2$ and
$\frac{r^2 - s^2}{2t} = \frac{t^2}{2t} = \frac{t}{2}$. So, the equation of the perpendicular bisector simplifies to $y = \frac{r-s}{t}x$.
Therefore, because the center of the circle $O(0, 0)$ satisfies the equation, the center lies on the perpendicular bisector of the chord.
24. *Sample answer:* First, observe that $B(s, t)$ is a point on the circle $x^2 + y^2 = r^2$, so $s^2 + t^2 = r^2$. Then,

$$(AB)^2 + (BC)^2$$
$$= (s - r)^2 + t^2 + (s + r)^2 + t^2$$
$$= (s^2 - 2sr + r^2) + t^2 + (s^2 + 2sr + r^2) + t^2$$
$$= 2r^2 + 2(s^2 + t^2)$$
$$= 2r^2 + 2r^2$$
$$= 4r^2 = (2r)^2 = (AC)^2$$

Because $(AB)^2 + (BC)^2 = (AC)^2$, $\triangle ABC$ is a right triangle by the Converse of the Pythagorean Thm.