▷. **Definition**. Let A point $(x_0, y_0) \in \mathbb{R}^2$ is:

- inside the circle whose equation is $(x-h)^2+(y-k)^2 = r^2$ provided $(x_0-h)^2+(y_0-k)^2 < r^2$
- on the circle whose equation is $(x-h)^2+(y-k)^2 = r^2$ provided $(x_0-h)^2+(y_0-k)^2 = r^2$
- outside the circle $(x-h)^2+(y-k)^2 = r^2$ provided $(x_0-h)^2+(y_0-k)^2 > r^2$.

►. **Theorem 1**. Each point on or inside the circle whose equation is

$$(x-1)^2 + (y-2)^2 = 4$$

is also inside the circle whose equation is

$$x^2 + y^2 = 26 \ .$$

Symbolically written: $\quad (\ \forall (x, y) \in \mathbb{R}^2\ )\ [\ (x-1)^2 + (y-2)^2 \le 4 \implies x^2 + y^2 < 26\ ]$.

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1. Let x, h, r be real numbers and $r > 0$. For each of the following statements, indicate whether the statement is TRUE or FALSE. No justification needed.

   (a) If $(x-h)^2 \le r^2$, then $0 \le |x-h| \le r$.

   (b) If $(x-h)^2 \le r^2$, then $-r \le x-h \le r$.

   (c) If $-3 \le x \le 2$, then $0 \le x^2 \le 4$.

   (d) If $-3 \le x \le 2$, then $0 \le x^2 \le 9$.

2. Prove Theorem 1 algebraically by using (in)equalities, similar to the class example involving the distance between points in $\mathbb{R}^2$. Do **not** use calculus. Do not argue geometrically but rather use geometric idea to form your Thinking Land.

▷. **Hint**. If $(x-1)^2 + (y-2)^2 \le 4$, then $0 \le (x-1)^2 \le 4$ since

$$0 \le (x-1)^2 = (x-1)^2 + 0 \le (x-1)^2 + (y-2)^2 \le 4.$$

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