

## Self-Test 3

Describe briefly the locus of points that satisfy the conditions.

1. In the plane of two intersecting lines  $j$  and  $k$ , and equidistant from the lines
2. In space and  $t$  units from point  $P$
3. In space and equidistant from points  $W$  and  $X$  that are 10 cm apart
4. In the plane of  $\angle DEF$ , equidistant from the sides of the angle, and 4 cm from  $\overrightarrow{EF}$
5. In the plane of two parallel lines  $s$  and  $t$ , equidistant from  $s$  and  $t$ , and 4 cm from a particular point  $A$  in the plane (three possibilities)
6. Construct a large isosceles  $\triangle RST$ . Then construct the locus of points that are equidistant from the vertices of  $\triangle RST$ .
7. Draw a long segment,  $\overline{BC}$ , and an acute angle,  $\angle 1$ . Construct a right triangle with an acute angle congruent to  $\angle 1$  and hypotenuse congruent to  $\overline{BC}$ .

### Extra

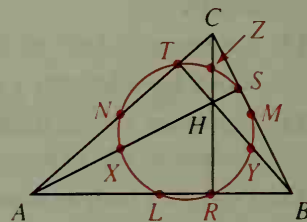
## The Nine-Point Circle

Given any  $\triangle ABC$ , let  $H$  be the intersection of the three altitudes. There is a circle that passes through these nine special points:

midpoints  $L, M, N$  of the three sides

points  $R, S, T$ , where the three altitudes of the triangle meet the sides

midpoints  $X, Y, Z$  of  $\overline{HA}, \overline{HB}, \overline{HC}$



### Key steps of proof:

1.  $XYMN$  is a rectangle.
2. The circle circumscribed about  $XYMN$  has diameters  $\overline{MX}$  and  $\overline{NY}$ .
3. Because  $\angle XSM$  and  $\angle YTN$  are right angles, the circle contains points  $S$  and  $T$  as well as  $X, Y, M$ , and  $N$ .
4.  $XLMZ$  is a rectangle.
5. The circle circumscribed about  $XLMZ$  has diameters  $\overline{MX}$  and  $\overline{LZ}$ .
6. Because  $\angle XSM$  and  $\angle ZRL$  are right angles, the circle contains points  $S$  and  $R$  as well as  $X, L, M$ , and  $Z$ .

