1. What is the equation of the line parallel to $2x + 4y - 8 = 0$ which passes through the point $(-8, 2)$?

$$2x + 4y - 8 = 0$$
$$4y = -2x + 8$$
$$y = \frac{-2}{4}x + 2$$
$$y = \frac{-1}{2}x + 2$$

$$y = \frac{-1}{2}x + b$$
$$2 = \frac{-1}{2}(-8) + b$$
$$2 = 4 + b$$
$$b = -2$$
$$\boxed{y = \frac{-1}{2}x - 2}$$

2. What is the equation of the line perpendicular to $y = 4x - 12$ which passes through the point $(16, 6)$?
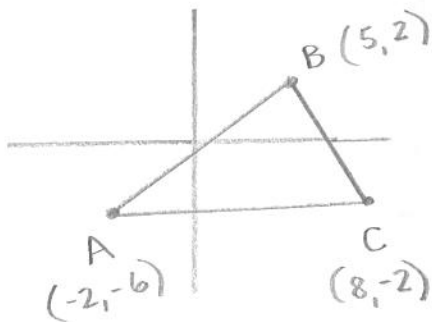
$$y = 4x - 12$$
$$y = \frac{-1}{4}x + b$$
$$6 = \frac{-1}{4}(16) + b$$
$$6 = -4 + b$$
$$b = 10$$

$$\boxed{y = \frac{-1}{4}x + 10}$$

3. Triangle ABC has coordinates A $(-2,-6)$, B $(5,2)$ and C $(8,-2)$. Find the perimeter of the triangle.

$$d\,\overline{AB} = \sqrt{(-2-5)^2 + (-6-2)^2}$$
$$= \sqrt{49 + 64}$$
$$= 10.63$$

$$d\,\overline{BC} = \sqrt{(5-8)^2 + (2+2)^2}$$
$$= \sqrt{9 + 16}$$
$$= 5$$

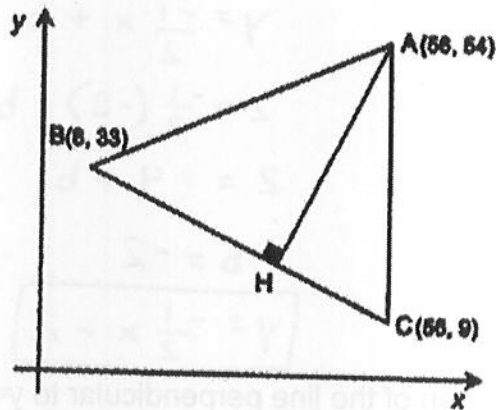$$d\,\overline{AC} = \sqrt{(-2-8)^2 + (-6+2)^2}$$
$$= \sqrt{100 + 16}$$
$$= 10.77$$

$$P = 10.63 + 5 + 10.77 = \boxed{26.4}$$

4. Points A (56,54), B (8,33) and C (56,9) are the vertices of a triangle. Segment $\overline{AH}$ is an altitude of this triangle. What is the measure of altitude $\overline{AH}$ to the nearest tenth?

line $\overline{BC}$: $(8,33)$ $(56,9)$

$$\frac{9-33}{56-8} = \frac{-24}{48} = \frac{-1}{2}$$

$$y = -\frac{1}{2}x + b$$

$$33 = \frac{-1}{2}(8) + b$$

$$33 = -4 + b$$

$$37 = b$$

$$y = \frac{-1}{2}x + 37$$

line $\overline{AH}$: $y = 2x + b$

$$54 = 2(56) + b$$

$$54 = 112 + b$$

$$b = -58$$

$$y = 2x - 58$$

$$-\frac{1}{2}x + 37 = 2x - 58$$

$$-2.5x = -95$$

$$x = 38$$

$$y = 2(38) - 58$$

$$y = 76 - 58$$

$$y = 18$$

point H : $(38, 18)$

$$d\,\overline{AH} = \sqrt{(56-38)^2 + (54-18)^2}$$
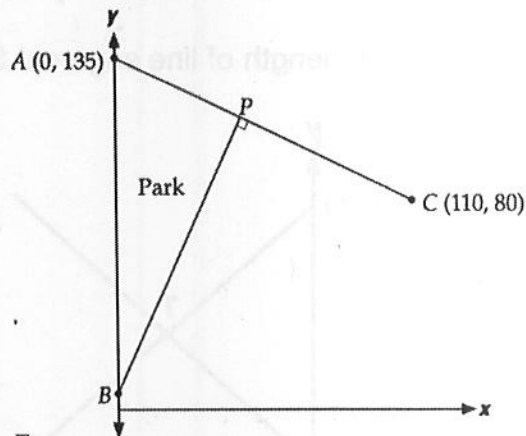
$$= \sqrt{324 + 1296}$$

$$\boxed{= 40.25}$$

5. A local municipality would like to designate an area for a park. The situation has been scaled in meters on the following Cartesian plane.
   - Point P is located along segment $\overline{AC}$ in a ratio of 4:7
   - $\overline{AC}$ is perpendicular to $\overline{PB}$
   - The area designated for the park is $\triangle ABP$

What is the area of the park?

Point P

$x = 0 + \frac{4}{11}(110 - 0)$

$x = 40$

$y = 135 + \frac{4}{11}(80 - 135)$

$y = 115$

$(40, 115)$

$\overline{AC} : (0, 135) \ (110, 80)$

$\frac{80 - 135}{110 - 0} = \frac{-55}{110} = \frac{-1}{2}$

so, $\overline{PB} = y = 2x + b$

$115 = 2(40) + b$

$b = 35$

$y = 2x + 35$

point B : $y = 2(0) + 35$

$y = 35$

$d\ AP = \sqrt{(0-40)^2 + (135 - 115)^2}$

$= \sqrt{1600 + 400}$

$= 44.72$

$d\ BP = \sqrt{(0-40)^2 + (35 - 115)^2}$

$= \sqrt{1600 + 6400}$

$= 89.44$

$A = \frac{b \times h}{2}$

$A = \frac{44.72 \times 89.44}{2}$

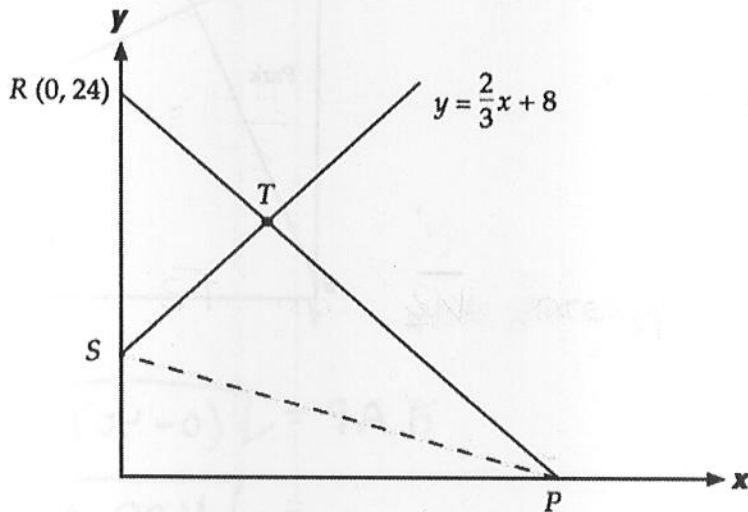$\boxed{A = 2000\ m^2}$

6. In the Cartesian Plane below:

   - $\overline{RP} \perp \overline{ST}$

   - The equation of ST is $y = \dfrac{2}{3}x + 8$

   - Point R is located on the y-axis

   What is the length of line segment SP?

$\overline{RP}$: $y = \dfrac{-3}{2}x + b$

$24 = \dfrac{-3}{2}(0) + b$

$b = 24$

$y = \dfrac{-3}{2}x + 24$

S : $x = 0$

so, $Y = \dfrac{2}{3}(0) + 24$

$Y = 24$

$(0, 24)$

P : $y = \dfrac{-3}{2}x + 24$

$0 = \dfrac{-3}{2}x + 24$

$-24 = \dfrac{-3}{2}x$

$x = 16$

$(16, 0)$

$d\,SP = \sqrt{(0-16)^2 + (8-0)^2}$

$= \sqrt{256 + 64}$

$= 17.89$

7. Find the perimeter of triangle ABC.
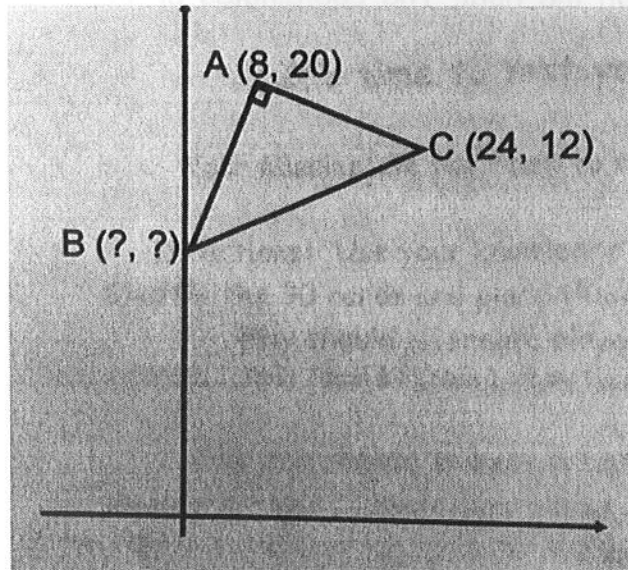
$AC: (8,20)\ (24,12)$

$$\frac{12-20}{24-8} = \frac{-8}{16} = \frac{-1}{2}$$

$AB: \quad y = 2x + b$

$20 = 2(8) + b$

$20 = 16 + b$

$b = 4$

$y = 2x + 4$

$y = 2(0) + 4$

$y = 4$

$B(0,4)$

$dAC = \sqrt{(8-24)^2 + (20-12)^2}$

$= \sqrt{256 + 64}$

$= 17.89$

$dBC = \sqrt{(0-24)^2 + (4-12)^2}$

$= \sqrt{576 + 64}$

$= 25.29$

$dAB = \sqrt{(8-0)^2 + (20-4)^2}$

$= \sqrt{64 + 256}$

$= 17.89$

$P = 17.89 + 17.89 + 25.29$

$\boxed{= 61.07}$

8. Right trapezoid STUV is represented on the Cartesian plane on the right. The coordinates of vertices S, T and U are S (8,42), T (14,34) and U (18,12). Vertex V is located on the y-axis.
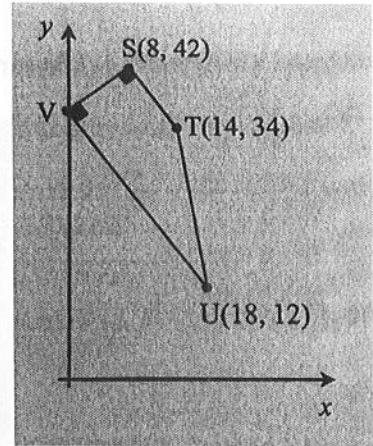
Determine the coordinates of vertex V.

$(8, 42)$ $(14, 34)$

$$\frac{42-34}{8-14} = \frac{8}{-6} = \frac{-4}{3}$$

$*$ we know that $\overline{ST}$ and $\overline{SV}$ are perpendicular

$y = \frac{3}{4} x + b$

$42 = \frac{3}{4}(8) + b$

$42 = 6 + b$

$\quad b = 36$

$SV = y = \frac{3}{4} x + 36$

$V = (0, ?)$

$y = \frac{3}{4}(0) + 36$

$y = 36$

$\boxed{V = (0, 36)}$