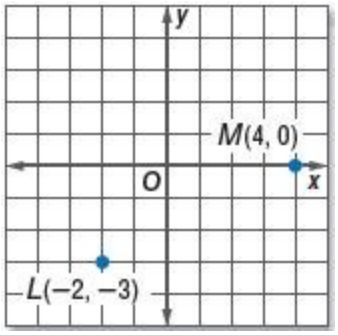
1-3 Distance and Midpoints

Find the distance between each pair of points.

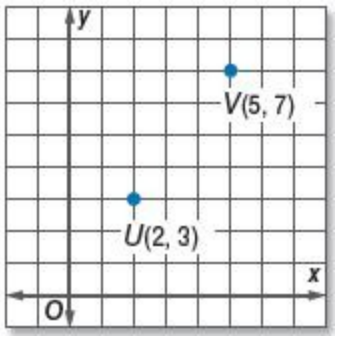
20. 

SOLUTION:

Use the Distance Formula.

$$\begin{aligned} ML &= \sqrt{(x_2-x_1)^2+(y_2-y_1)^2} && \text{Distance Formula} \\ &= \sqrt{(-2-4)^2+(-3-0)^2} && \text{Substitution.} \\ &= \sqrt{(-6)^2+(-3)^2} && \text{Subtraction.} \\ &= \sqrt{36+9} && \text{Square terms.} \\ &= \sqrt{45} && \text{Addition.} \\ &\approx 6.7 \end{aligned}$$

The distance between M and L is $\sqrt{45}$ or about 6.7 units.

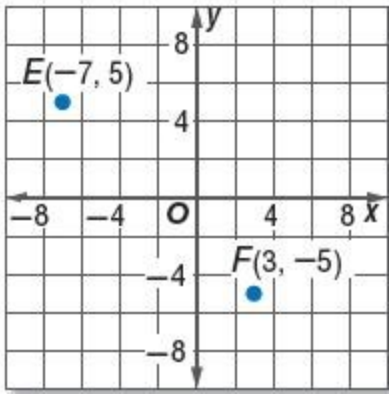
22. 

SOLUTION:

Use the Distance Formula.

$$\begin{aligned} UV &= \sqrt{(x_2-x_1)^2+(y_2-y_1)^2} && \text{Distance Formula} \\ &= \sqrt{(2-5)^2+(3-7)^2} && \text{Substitution.} \\ &= \sqrt{(-3)^2+(-4)^2} && \text{Subtraction.} \\ &= \sqrt{9+16} && \text{Square terms.} \\ &= \sqrt{25} && \text{Addition.} \\ &= 5 \end{aligned}$$

The distance between U and V is 5 units.

24. 

SOLUTION:

Use the Distance Formula.

$$\begin{aligned} EF &= \sqrt{(x_2-x_1)^2+(y_2-y_1)^2} && \text{Distance Formula} \\ &= \sqrt{(3-(-7))^2+(-5-5)^2} && \text{Substitution} \\ &= \sqrt{10^2+(-10)^2} && \text{Subtraction.} \\ &= \sqrt{100+100} && \text{Square terms} \\ &= \sqrt{200} && \text{Addition.} \\ &\approx 14.1 \end{aligned}$$

The distance between E and F is $\sqrt{200}$ or about 14.1 units.

26. $P(3, 4)$, $Q(7, 2)$

SOLUTION:

Use the Distance Formula.

$$\begin{aligned} PQ &= \sqrt{(x_2-x_1)^2+(y_2-y_1)^2} && \text{Distance Formula} \\ &= \sqrt{(7-3)^2+(2-4)^2} && \text{Substitution.} \\ &= \sqrt{4^2+(-2)^2} && \text{Subtraction.} \\ &= \sqrt{16+4} && \text{Square terms.} \\ &= \sqrt{20} && \text{Addition.} \\ &\approx 4.5 \end{aligned}$$

The distance between P and Q is $\sqrt{20}$ or about 4.5 units.

28. *Y*(–4, 9), *Z*(–5, 3)

SOLUTION:

Use the Distance Formula.

$$\begin{aligned} YZ &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} && \text{Distance Formula} \\ &= \sqrt{(-5-(-4))^2 + (3-9)^2} && \text{Substitution.} \\ &= \sqrt{(-1)^2 + (-6)^2} && \text{Subtraction.} \\ &= \sqrt{1+36} && \text{Square terms.} \\ &= \sqrt{37} && \text{Addition.} \\ &\approx 6.1 \end{aligned}$$

The distance between *X* and *Y* is $\sqrt{37}$ or about 6.1 units.

30. *C*(5, 1), *D*(3, 6)

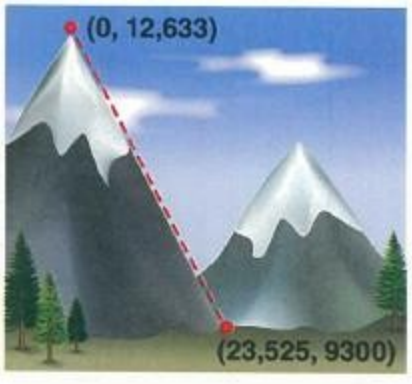
SOLUTION:

Use the Distance Formula.

$$\begin{aligned} CD &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} && \text{Distance Formula} \\ &= \sqrt{(3-5)^2 + (6-1)^2} && \text{Substitution.} \\ &= \sqrt{(-2)^2 + 5^2} && \text{Subtraction.} \\ &= \sqrt{4+25} && \text{Square terms.} \\ &= \sqrt{29} && \text{Addition.} \\ &\approx 5.4 \end{aligned}$$

The distance between *C* and *D* is $\sqrt{29}$ or about 5.4 units.

31. **CCSS REASONING** Vivian is planning to hike to the top of Humphreys Peak on her family vacation. The coordinates of the peak of the mountain and of the base of the trail are shown. If the trail can be approximated by a straight line, estimate the length of the trail. (*Hint*: 1 mi = 5280 ft)



SOLUTION:

Use the Distance Formula.

$$\begin{aligned} d &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} && \text{Distance Formula} \\ &= \sqrt{(23,525-0)^2 + (9300-12,633)^2} && \text{Substitution.} \\ &= \sqrt{(23,525)^2 + (-3333)^2} && \text{Subtraction.} \\ &= \sqrt{553,425,625+1,108,89} && \text{Square terms.} \\ &= \sqrt{564,534,514} && \text{Addition.} \\ &\approx 23,760 \end{aligned}$$

Divide by 5280 to convert to miles.

$23760 \div 5280 = 4.5$

The length of the trail is about 4.5 mi.