



UNDERSTAND

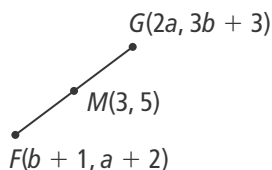
9. **Use Structure** Point K is $\frac{1}{n}$ of the way from $J(4, -5)$ to $L(0, -7)$.
- What are the coordinates of K if $n = 4$?
 - What is a formula for the coordinates of K for any n ?
10. **Error Analysis** Describe and correct the error a student made in finding the midpoint of $\overline{CD}$ with $C(-4, 5)$ and $D(-1, -4)$.

$$\left(\frac{-4 - (-1)}{2}, \frac{5 - (-4)}{2} \right)$$

$$\left(-\frac{3}{2}, \frac{9}{2} \right)$$

X

11. **Mathematical Connections** Point M is the midpoint of $\overline{FG}$. Can you determine the value of a ? Explain.

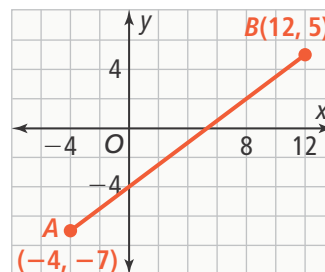


12. **Reason** Suppose $\overline{PQ}$ has one endpoint at $P(0, 0)$.
- If $(2, 5)$ is the midpoint of $\overline{PQ}$, what are the coordinates of point Q ?
 - How would you find Q if $(2, 5)$ is $\frac{1}{4}$ of the way from P to Q ?
13. **Higher Order Thinking** $\overline{PQ}$ has a length of 17 units with $P(-4, 7)$. If the x - and y -coordinates of Q are both greater than the x - and y -coordinates of P , what are possible integer value coordinates of Q ? Explain.
14. **Make Sense and Persevere** Suppose $\overline{PQ}$ has $P(a, b)$ and midpoint $M(c, d)$. What is an expression for PM ? Use the expression for PM to find an expression for PQ .

PRACTICE

Find the coordinates of each given point on $\overline{AB}$.

SEE EXAMPLE 2



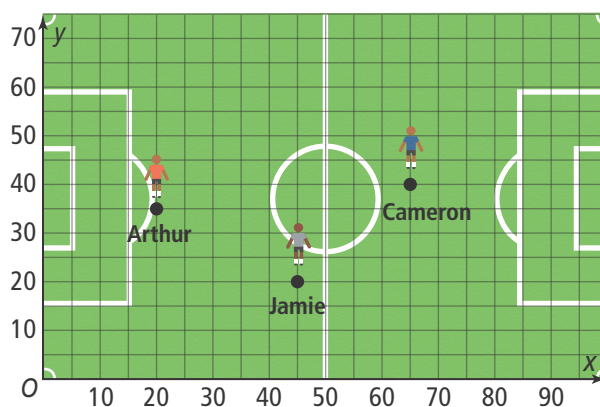
15. The point $\frac{3}{10}$ of the way from A to B .
16. The point $\frac{1}{4}$ of the way from B to A .

Find the midpoint of $\overline{PQ}$. SEE EXAMPLE 1

17. $P(3, 5)$, $Q(-2, 13)$
18. $P(-2, 2.5)$, $Q(1.4, 4)$
19. $P(4\frac{1}{3}, 3\frac{1}{6})$, $Q(-2\frac{1}{5}, 3\frac{2}{3})$

Cameron, Arthur, and Jamie are playing soccer. Their locations are recorded by a motion tracking system. The distance between grids is 5 meters.

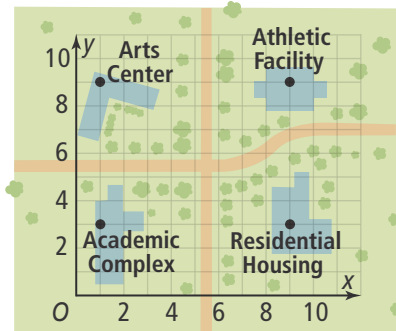
SEE EXAMPLES 3 AND 4



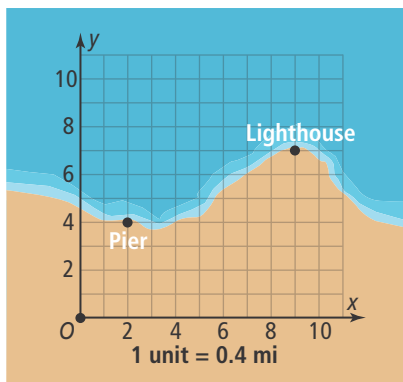
20. How far apart are Arthur and Jamie? Round to the nearest tenth of a meter.
21. Who is closer to Cameron? Explain.
22. The soccer ball is located at the point $(35, 60)$. Who is closest to the soccer ball?

APPLY

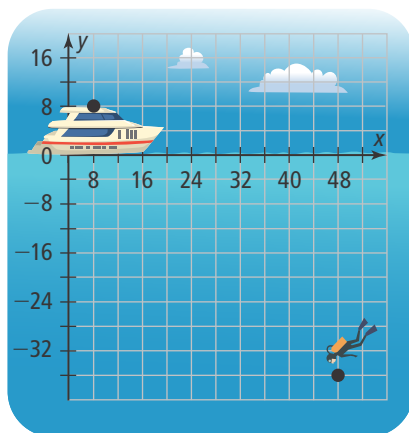
- 23. Model With Mathematics** A university is building a new student center that is two-thirds the distance from the arts center to the residential complex. What are the coordinates of the new center? Explain.



- 24. Mathematical Connections** A lighthouse casts a revolving beam of light as far as the pier. What is the area that the light covers?



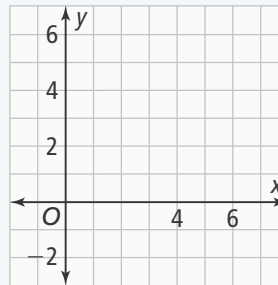
- 25. Make Sense and Persevere** A ship captain is attempting to contact a deep sea diver.



If the maximum range for communication is 60 meters, will he be able to communicate with the diver based on their current positions? Explain.

ASSESSMENT PRACTICE

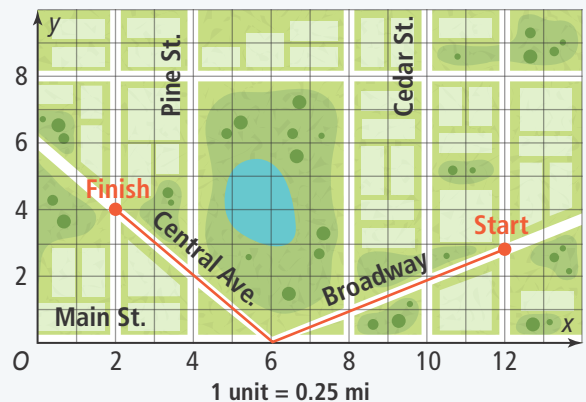
- 26.** $\overline{AB}$ has an endpoint at $A(1, -2)$ and midpoint $C(3, 2)$. Graph $\overline{AB}$ and point C .



- 27. SAT/ACT** $\overline{RS}$ has an endpoint at $R(6, -4)$ and length 17. Which of the following cannot be the coordinates of S ?

- (A) $(14, 11)$
- (B) $(6, 13)$
- (C) $(-9, -12)$
- (D) $(23, 13)$
- (E) $(23, -4)$

- 28. Performance Task** A parade route must start and end at the intersections shown on the map. The city requires that the total distance of the route cannot exceed 3 miles. A proposed route is shown.



Part A Why does the proposed route not meet the requirement?

Part B Assuming that the roads used for the route are the same and the end point is the same, at what intersection could the parade start so the total distance is as close to 3 miles as possible?

Part C The city wants to station video cameras halfway down each road in the parade. Using your answer to Part B, what are the coordinates of the locations for the cameras?