TEST NAME: **GPE.6**

TEST ID: **464113**

GRADE: **09**

SUBJECT: **Mathematics**

TEST CATEGORY: **My Classroom**

Student: _____

Class: _____

Date: _____

Read the passage - 'College Apartments' - and answer the question below:

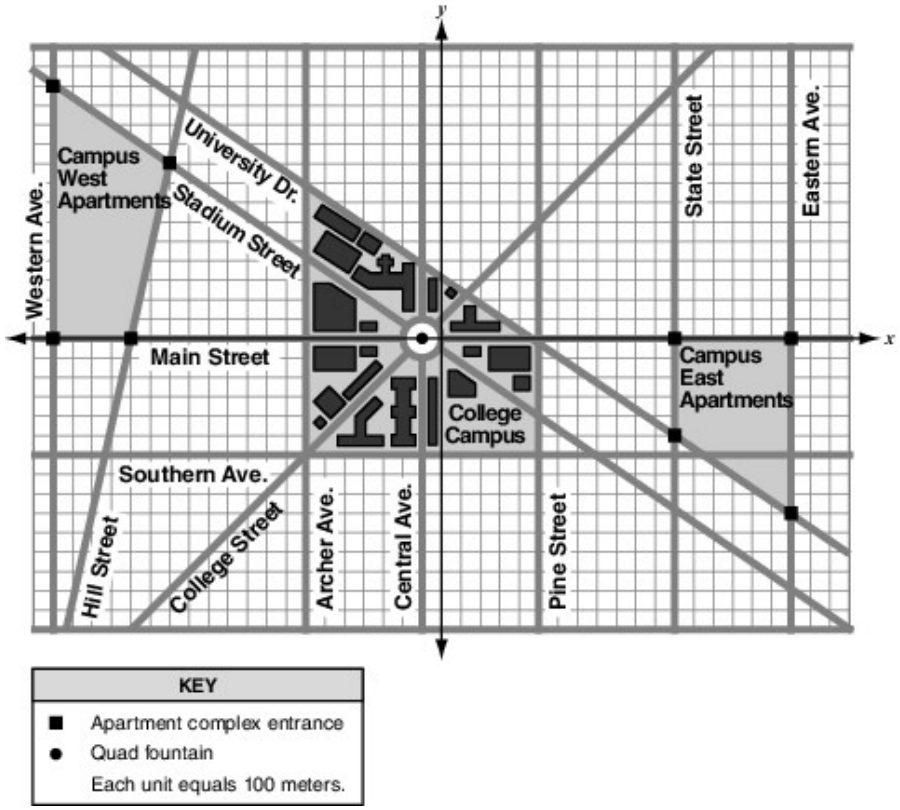
College Apartments

College Apartments

The number of students enrolled in a local college is increasing rapidly, and there is limited space in the high-rise residence halls on the college campus. Because of this, more students are moving to apartments near campus. The college is working with a real estate development company to plan two new apartment complexes to provide housing for the additional students.

The college has requested that each apartment complex have housing for at least 300 students, as well as such amenities as laundry and common study areas, so that it provides a similar environment to that of the residence halls. Each of the residence halls on campus is 11 stories tall; 10 floors each contain 32 one-bedroom dormitories, and 1 floor contains a study lounge, cafeteria, social area, and laundry room.

As shown in the map of the area near the college campus below, one new apartment complex will be to the west of campus and one will be to the east. The new developments are titled Campus West Apartments and Campus East Apartments, respectively.



Michael and Nancy work for the development company, and they are each managing the teams that are designing these two apartment complexes. They both want to create apartments that meet the college's requirements and that students want to live in.

Michael's team is developing a plan for an apartment complex where students will live in 2 large three-story apartment buildings. One building will have 20 two-bedroom apartments on each floor, and the other building will have 16 four-bedroom apartments on each floor. There will also be a separate, smaller building that contains the management office, a common area with a food court, a study center, and a laundry facility. Michael is also planning to put picnic tables outside so students can have an additional area in which to socialize, and students will have the option of getting a parking space in the apartment complex's parking lot.

Instead of a few large apartment buildings, Nancy's team has decided that many smaller apartment buildings will make the apartment complex feel more welcoming. This development will be made up of 15 four-story apartments that each have 2 three-bedroom apartments on each floor. Laundry will be included in each apartment. In this complex, there will also be two smaller buildings that serve as common areas. These buildings will include computer labs, pool tables, and a mini-market. There will not be a parking lot, but there will be an outdoor basketball court and a sand volleyball court.

Students on campus are eager to secure apartments and roommates for next year and are comparing their options to determine which development is best for their needs.

1. Read "College Apartments" and answer the question.

   Joey and Mike are friends who live in different apartment complexes and want to meet on campus to study. Joey rides his bike to campus and travels along Main Street twice as fast as his friend Mike walks along Main Street. Joey leaves his apartment complex from the exit at Main and Eastern, and Mike leaves his apartment complex from the exit at Main and Hill. If both students get to their apartment complex exits at the same time and want to arrive at the study location at the same time, what are the coordinates of the place where they should meet on campus?

   A. $\left(-6\frac{2}{3}, 0\right)$

   B. $\left(-4\frac{2}{3}, 0\right)$

   C. $(-2, 0)$

   D. $\left(6\frac{2}{3}, 0\right)$

2. The endpoints of $\overline{PQ}$ are $(^{-}2, 8)$ and $(6, 12)$. What are the coordinates of the midpoint of $\overline{PQ}$?

   A. $(5, 7)$

   B. $(4, 10)$

   C. $(4, 4)$

   D. $(2, 10)$

3. The midpoint of line segment *MN* is located at $(^{-}5, ^{-}8)$. The endpoint *M* is located at $(3, 4)$. What are the coordinates of endpoint *N*?

   A. $(^{-}13, ^{-}20)$

   B. $(^{-}6.5, 3.5)$

   C. $(^{-}1, ^{-}2)$

   D. $(11, 16)$

4. What are the coordinates of the midpoint of the line segment with endpoints at $(4.5, 7.5)$ and $(9, 12)$?

   A. $(6.5, 9.5)$

   B. $(6.75, 9.75)$

   C. $(7.75, 10.75)$

   D. $(13.5, 19.5)$

5. What are the coordinates of the midpoint of the line segment with endpoints at $(5, ^{-}6)$ and $(8, ^{-}2)$?

   A. $(6, ^{-}5)$

   B. $(6.5, ^{-}4)$

   C. $(7.5, ^{-}3)$

   D. $(13, ^{-}8)$

6. The coordinates of the midpoint of a line segment are (9, ⁻13). The coordinates of an endpoint of the segment are (⁻4, 5). What are the coordinates of the other endpoint?

A. $\left(-2, \frac{1}{2}\right)$

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

C. $(14, -21)$

D. $(22, -31)$

7. A circle has a diameter that extends from (⁻5, 7) to (6, ⁻3). What are the coordinates of the center of the circle?

A. $\left(-\frac{11}{2}, 5\right)$

B. $\left(-4, \frac{13}{2}\right)$

C. $\left(\frac{1}{2}, 2\right)$

D. $(1, 4)$

8. A parallelogram has vertices (5, 0), (3, ⁻3), (⁻4, ⁻3), and (⁻2, 0). The diagonals of the parallelogram intersect at their midpoints. What are the coordinates of the intersection of the diagonals?

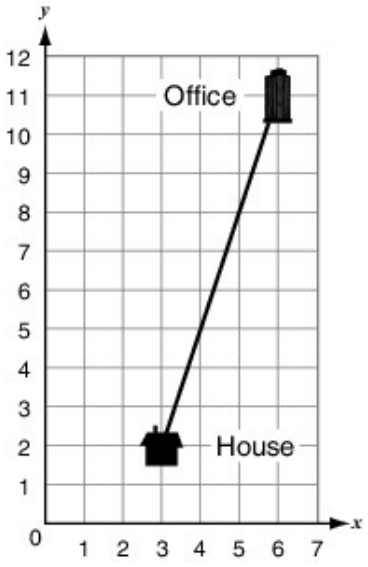
A. (⁻0.5, ⁻3)

B. (0.5, ⁻1.5)

C. (1.5, 0)

D. (4, ⁻1.5)

9. The locations of Mr. Zavala's house and office are mapped on the coordinate plane below.



His daughter's school is two-thirds the distance from his house to his office and lies on the segment shown. What are the coordinates of the school?

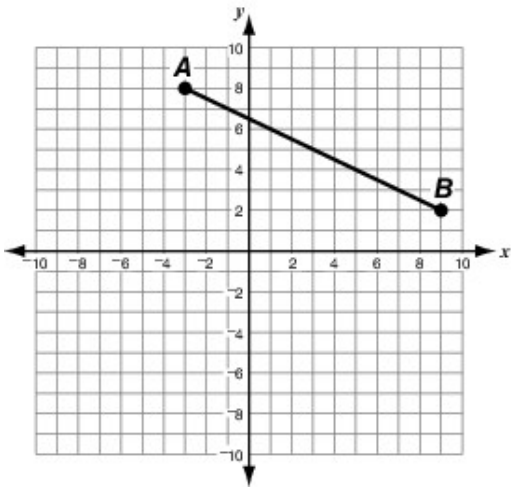
A. $(4, 5)$

B. $(4.2, 5.6)$

C. $(4.8, 7.4)$

D. $(5, 8)$

10. Examine the following coordinate grid.



Point *C* is the midpoint of $\overline{AB}$. There exists a point *D* that is located on $\overline{AB}$ and is one-third of the way from *C* to *B.* What are the coordinates of *D*?

A. $(1, 6)$

B. $(3, 5)$

C. $(5, 4)$

D. $(7, 3)$

11. The vertices of $\triangle JLM$ are $J(0, 4), L(6, 7),$ and $M(4, 1)$. The area of $\triangle JLM$ is 15 square units. What is the location of Point *K* on $\overline{JL}$ such that the area of $\triangle JKM$ is 10 square units?

A. $(2, 5)$

B. $(3, 5.5)$

C. $(4, 6)$

D. $(6, 11)$

12. On a coordinate grid, $\overline{PQ}$ has the endpoints $P(-2, -11)$ *and* $Q(13, 4)$. What is the location of a point *R* on $\overline{PQ}$ that is two-fifths of the way from *P* to *Q*?

A. $\left(\frac{16}{7}, \frac{-47}{7}\right)$

B. $(4, -5)$

C. $(7, -2)$

D. $\left(\frac{61}{7}, \frac{-2}{7}\right)$

13. Point *A* is located at $(6, 3)$ and point *D* is at $(18, 21)$. If points *B* and *C* are located on $\overline{AD}$ such that the ratio $AB : BC : CD$ is equal to $1 : 1 : 1$, what are the coordinates of points *B* and *C*?

A. $B(9, 7.5)$ and $C(12, 12)$

B. $B(10, 9)$ and $C(14, 15)$

C. $B(14, 11)$ and $C(26, 19)$

D. $B(12, 12)$ and $C(15, 16.5)$

14. A map is drawn on a coordinate grid. The post office is located at $(^{-}1, 4)$ and a school is located at $(^{-}5, 6)$. A bus stop is located halfway between the post office and the school. Where is the bus stop located on the map?

A. $(^{-}1.5, 0.5)$

B. $(^{-}2, 1)$

C. $(^{-}3, 5)$

D. $(^{-}6, 10)$

15. The endpoints of a line segment are located at $(15\pi, -16\pi)$ and $(-18\pi, -16\pi)$. What are the coordinates of the midpoint of the line segment?

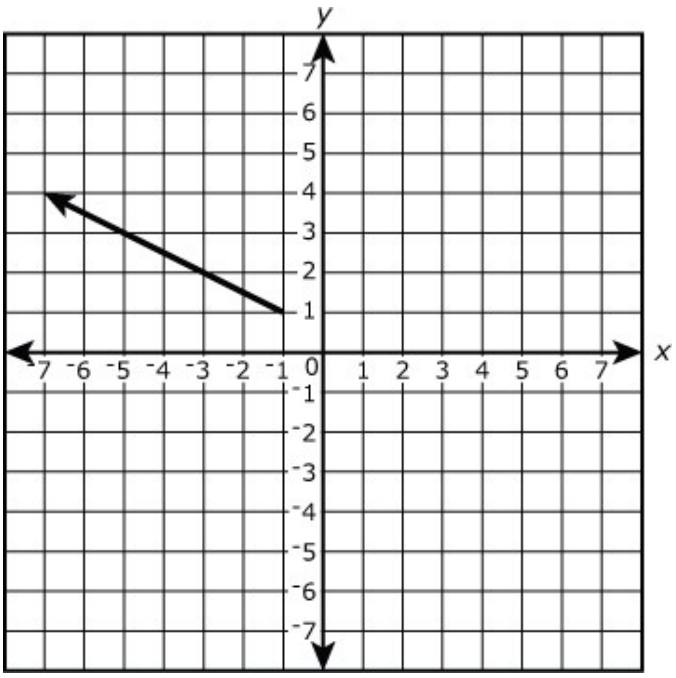
A. $\left(\frac{-3\pi}{2}, -16\pi\right)$

B. $\left(\frac{-\pi}{2}, -17\pi\right)$

C. $(17\pi, 0)$

D. $(-3\pi, 0)$

16. A directed line segment begins at $(-1, 1)$ and ends at $(-7, 4)$.



What point divides the directed line segment in a ratio of 1:2?

A. $(-1, 1)$

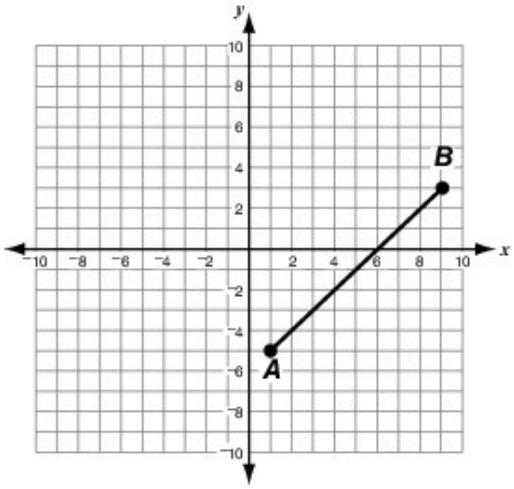
B. $(-3, 2)$

C. $(-5, 3)$

D. $(-7, 4)$

17. Point R divides a line segment with endpoints $P(4, 5)$ and $Q(10, 14)$ in the ratio such that $PR:RQ = 1:2$. What are the coordinates of point R?

18. Look at the line segment shown on the coordinate plane below.



What is the location of a point C on the line segment that is three times farther from A than from B?

A. $(3, -3)$

B. $(4, -2)$

C. $(6, 0)$

D. $(7, 1)$

19. Given Point A $(3, -4)$ and Point B $(8, 6)$ on directed line segment AB, what is the y-coordinate of Point F that partitions AB in the ratio of $3:2$?

A. -1

B. 0

C. 2

D. 6

20. What is the midpoint of the line segment with endpoints at (12, 7) and (8, 3)?

A. (2, 2)

B. (4, 4)

C. (10, 5)

D. (20, 10)

21. The center of a circle is at $Q(0, 6)$. A radius is drawn from Q to $P(4, 6)$. What are the coordinates of the endpoint of the diameter that includes segment PQ?

A. (0, 2)

B. (0, 10)

C. $(^{-}4, 6)$

D. $(6, ^{-}4)$

22. What is the midpoint of the line segment with endpoints at $(^{-}9.25, ^{-}3.75)$ and $(5.50, ^{-}1.50)$?

A. $(^{-}6.500, ^{-}2.000)$

B. $(^{-}5.375, ^{-}1.750)$

C. $(^{-}3.750, ^{-}5.250)$

D. $(^{-}1.875, ^{-}2.625)$

23. What is the midpoint of the line segment with endpoints at (6, 11) and (10, 3)?

A. (4, 8)

B. (7, 9)

C. (8, 7)

D. (16, 14)

24. Given points $P\ (1, -2)$ and $Q\ (5, 9)$ on directed line segment PQ, what is the x-coordinate of point B that partitions $\overline{PQ}$ with the ratio 3:7?

A. 2.2

B. 2.7

C. 3.8

D. 6.2

25. The endpoints of a line segment are located at (3, 6) and (4, ⁻5). What are the coordinates of the midpoint of the line segment?

A. $\left(\frac{7}{2}, \frac{1}{2}\right)$

B. $\left(\frac{1}{2}, \frac{-11}{2}\right)$

C. $\left(\frac{9}{2}, \frac{-1}{2}\right)$

D. $(7, 1)$

26. What is the midpoint of a line segment with endpoints at (⁻2, ⁻2) and (4, 4)?

A. (⁻6, ⁻6)

B. (1, 1)

C. (3, 3)

D. (6, 6)

27. What is the midpoint of the line segment with endpoints at (⁻12.5, 10.25) and (2.4, ⁻3.6)?

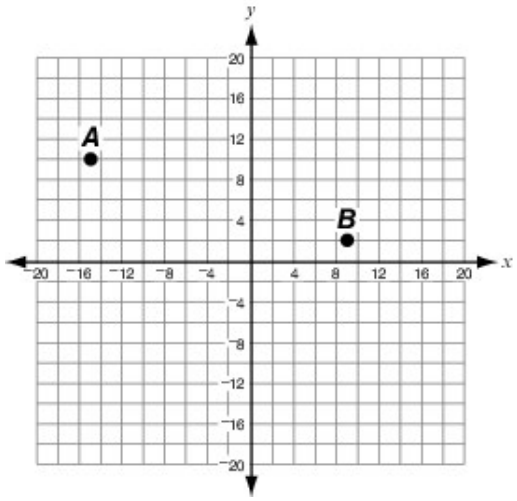
A. (⁻14.9, 13.85)

B. (⁻10.1, 6.65)

C. (⁻7.45, 6.925)

D. (⁻5.05, 3.325)

28. Wilson wants to draw a line segment connecting the points $A(-15, 10)$ and $B(9, 2)$ on the coordinate grid shown below.



What are the coordinates of the point that will divide the line segment one-fourth of the way from *A* to *B*?

A. $(-10.2, 8.4)$

B. $(-9, 8)$

C. $(3, 4)$

D. $(-12, 9)$

29. A line segment has endpoints at (⁻2,⁻10) and (10,2). What are the coordinates of the midpoint of the line segment?

A. (8, ⁻8)

B. (4, ⁻4)

C. (⁻6, ⁻6)

D. (⁻8, 4)

30. A line segment has endpoints at (6, 2) and (14, 6). What are the coordinates of the midpoint of the line segment?

A. (4, 2)

B. (8, 4)

C. (10, 4)

D. (20, 8)

31. A line segment has endpoints at (2, 4) and (6, 10). What are the coordinates of the midpoint of the line segment?

A. (2, 7)

B. (4, 7)

C. (4, 6)

D. ($^-$4, 6)

32. A line segment has endpoints at ($^-$3, $^-$2) and (4, 4). What are the coordinates of the midpoint of the line segment?

A. $(1, 2)$

B. $\left(\frac{7}{2}, 3\right)$

C. $\left(\frac{1}{2}, 1\right)$

D. $\left(\frac{-7}{2}, -3\right)$

33. A line segment has endpoints at $(-2\sqrt{3}, 7\sqrt{2})$ and $(5\sqrt{3}, -8\sqrt{2})$. What are the coordinates of the midpoint of the line segment?

A. $\left(\frac{-7}{2}\sqrt{3}, \frac{15}{2}\sqrt{2}\right)$

B. $\left(\frac{-3}{2}\sqrt{3}, 15\sqrt{2}\right)$

C. $\left(\frac{3}{2}\sqrt{3}, \frac{-1}{2}\sqrt{2}\right)$

D. $\left(\frac{7}{2}\sqrt{3}, \frac{-15}{2}\sqrt{2}\right)$

34. A line segment has endpoints at (4, 0) and (0, 8). What are the coordinates of the midpoint of the line segment?

A. (0, 2)

B. (4, 0)

C. (2, 4)

D. (0, 6)

35. A line segment with endpoints $K(^{-}5, 2)$ and $M(3, 6)$ is rotated 180 degrees about the origin. What is the midpoint of line segment *KM* after its rotation?

A. $(^{-}4, 1)$

B. $(^{-}1, 4)$

C. $(1, ^{-}4)$

D. $(4, ^{-}1)$

36. Point $C(4, 2)$ divides the line segment joining points $A(2, -1)$ and $B(x, y)$ such that $AC:CB = 3:1$. What are the coordinates of point *B*?

A. $(10, 11)$

B. $(11, 10)$

C. $\left(3, \frac{14}{3}\right)$

D. $\left(\frac{14}{3}, 3\right)$

37. A line segment has the endpoints at $(^{-}6, ^{-}19)$ and $(^{-}2, ^{-}3)$. What is the midpoint of the line segment?

A. $(^{-}8, ^{-}22)$

B. $(^{-}6, ^{-}11)$

C. $(^{-}4, ^{-}11)$

D. $(^{-}2, ^{-}8)$

38. Point *B* divides the line segment with end points $A(4, 3)$ and $C(7, 12)$ such that $AB:BC = 2:1$. What are the coordinates of point *B*?

A. $(5, 6)$

B. $(6, 5)$

C. $(6, 9)$

D. $(9, 6)$

39. A rail line is mapped on a coordinate grid with station A at $A(12, 14)$ and station B at $B(-10, -8)$. A train leaves station A at the same time another train leaves station B on a parallel track. The train leaving station A is traveling at 30 miles per hour, and the train leaving station B is traveling at 25 miles per hour. If the trains are traveling toward each other at a constant speed, what are the coordinates of the location at which the trains will pass each other?

A. $(0, 2)$

B. $(1, 3)$

C. $(2, 4)$

D. $(3, 5)$

40. Point A has coordinates $(0, 0)$, and point B has coordinates $(9, 6)$. What are the two points on $\overline{AB}$ that divide the segment into three congruent parts?

41. Legend has it that there is buried treasure on Geometry Island deep in the Caribbean. The legend describes the island as having only three palm trees and says that if a curiously smart pirate were to find the centroid of the triangle formed by the trees, then that pirate would suddenly find great riches! From the southernmost palm tree, a second palm tree is 12 paces north and 6 paces west. The third tree is 6 paces north and 8 paces east of the southernmost tree.

Part A

Using graph paper, draw a suitable model of the island, detailing the coordinates of the trees. Plot the southernmost palm tree at the origin and let each unit on the coordinate grid represent one pace.

Part B

Research the definition of a centroid and draw the special segments of a triangle that form the centroid on your graph paper.

Part C

Using the fact that a centroid divides each of the three special segments of the triangle in a ratio of 2:1, find the coordinates of the buried treasure. Explain each step using words and your graph.

42. A diameter of a circle has endpoints at (1, 2) and ($^{-}$4, $^{-}$6). What are the coordinates of the center of the circle?

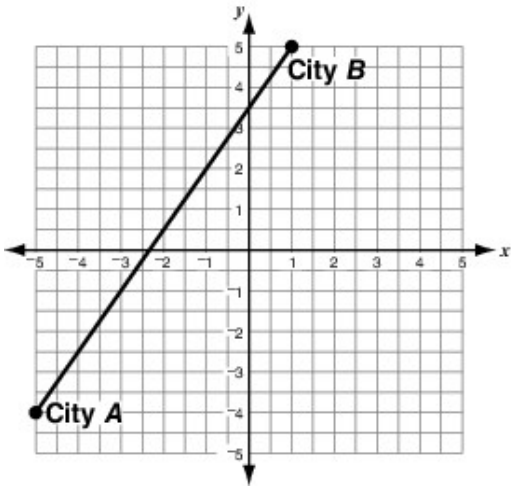
A. $\left(^{-}1\frac{1}{2}, ^{-}2\right)$

B. $\left(^{-}2, ^{-}1\frac{1}{2}\right)$

C. $(0, 0)$

D. $\left(2\frac{1}{2}, 4\right)$

43. A highway connecting two cities is represented on the coordinate plane below. The highway has two rest areas along the route such that they divide the distance between the cities into three equal parts.



Part A. In what ratio does the rest area closest to city A divide the distance from city A to city B?

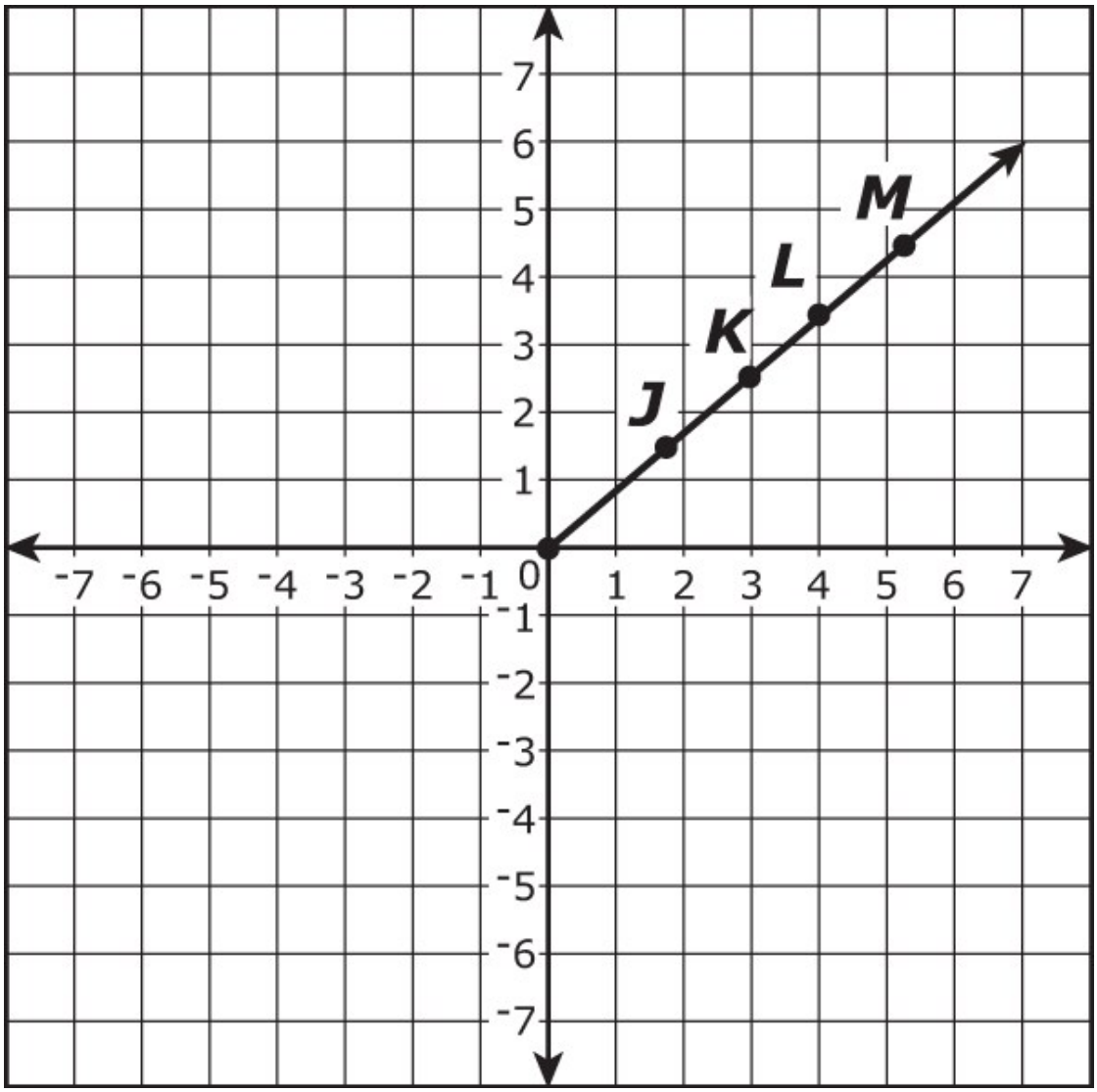
Part B. What are the coordinates of the point representing the first rest area?

Part C. What are the coordinates of the point representing the second rest area?

Part D. If a service station is built halfway between the rest areas, what are the coordinates of the point representing the service station?

Use words, numbers, and/or pictures to show your work.

44. A directed line segment beginning at $(0, 0)$ and ending at $(7, 6)$ is shown.



Which point divides the directed line segment in the ratio of $\frac{3}{4}$?

A. *J*

B. *K*

C. *L*

D. *M*

45. Jason marks two points, $A(4, 6)$ and $B(8, 2)$, on a coordinate grid. He then marks point *C* on $\overline{AB}$.

- If point *C* divides $\overline{AB}$ in the ratio $\overline{AC}:\overline{CB} = 1:3$, what are the coordinates of point *C*?
- Jason wants to check to be sure he calculated the location of point *C* correctly. Show one way he could do this.

Use words, numbers and/or pictures to show your work.

46. A line segment has endpoints at ($^{-}3$, $^{-}5$) and (6, 1). In which quadrant does the midpoint of the segment lie?

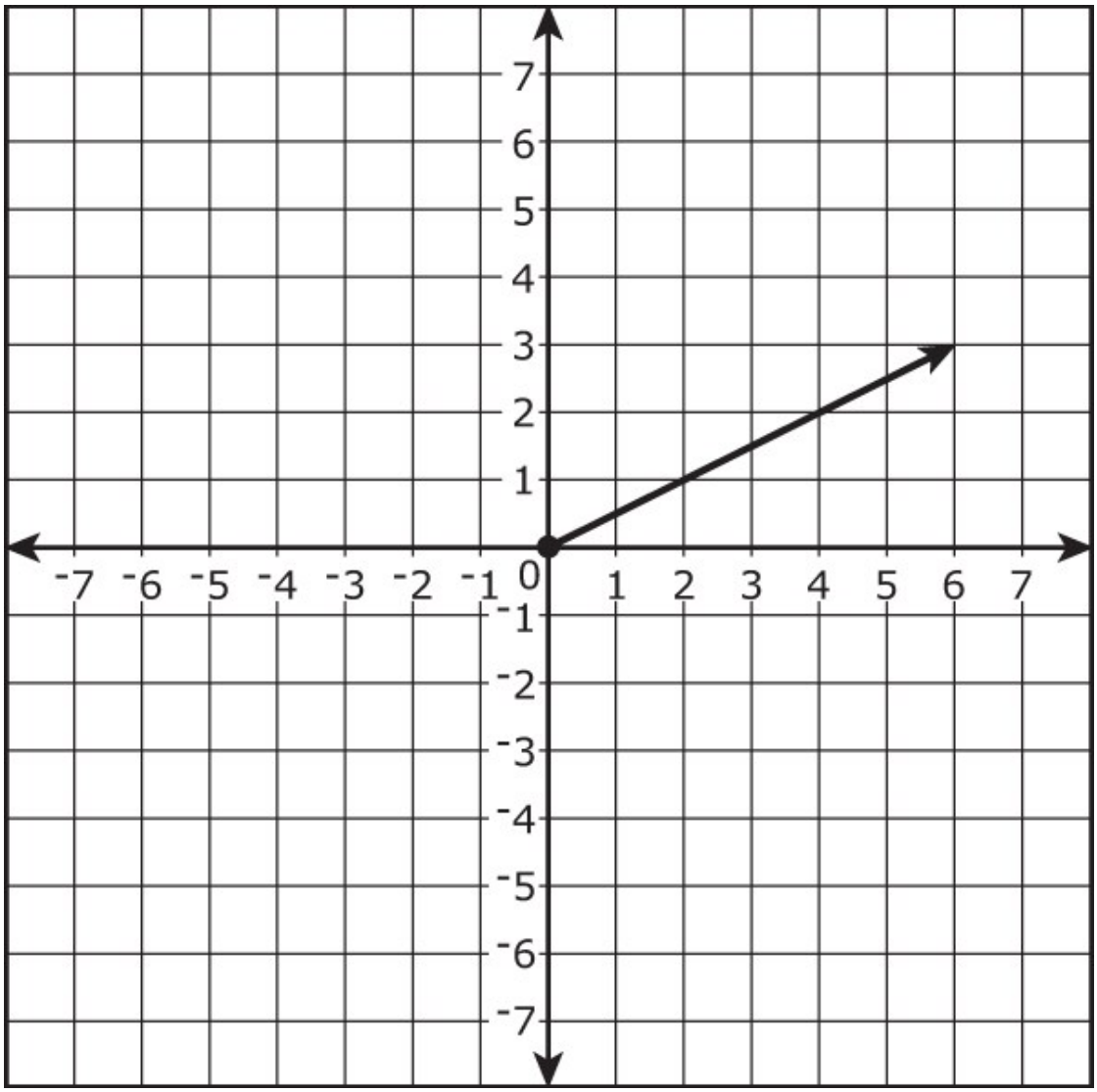
A. I

B. II

C. III

D. IV

47. A directed line segment begins at $(0, 0)$ and ends at $(6, 3)$.



What is the coordinate of the point that divides the segment in a ratio of $\frac{1}{2}$?

A. $(4, 2)$

B. $(3, 1.5)$

C. $(2, 1)$

D. $(1, 0.5)$

48. A circle has a diameter that extends from (4, ⁻6) to (⁻8, 10). What are the coordinates of the center of the circle?

A. (⁻2, 2)

B. (⁻3, 6)

C. (⁻4, 4)

D. (⁻6, 8)

49. The center of a circle is located at (0, 4). The endpoint, *X*, of one of the circle's radii is (⁻4, ⁻5). Segment *XY* is a diameter of the circle. Where is point *Y* located?

A. (13, 4)

B. (5, 4)

C. (4, 5)

D. (4, 13)

50. What is the midpoint of the line segment with endpoints at (3.4, ⁻2.7) and (⁻12.5, 6.8)?

A. (⁻9.10, 4.10)

B. (⁻7.95, 4.75)

C. (⁻5.10, 2.10)

D. (⁻4.55, 2.05)