TEST NAME: **GPE.4**

TEST ID: **464098**

GRADE: **09**

SUBJECT: **Mathematics**

TEST CATEGORY: **My Classroom**

Student:

Class:

Date:

Read the passage - 'Designing a Hotel' - and answer the question below:

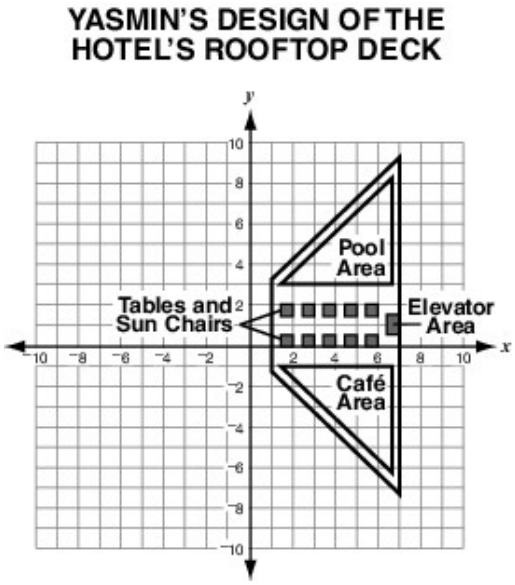
Designing a Hotel

Designing a Hotel

Yasmin is a high school student who wants to be an architect. A local architecture design firm is sponsoring a contest to design a new high-rise hotel building that will be located in the downtown area of the city in which Yasmin lives. The winner of the contest will earn an internship with the architecture firm, and Yasmin has decided to submit a design. She hopes that she will be able to learn more about architecture by creating the design and learn even more if she wins the internship.

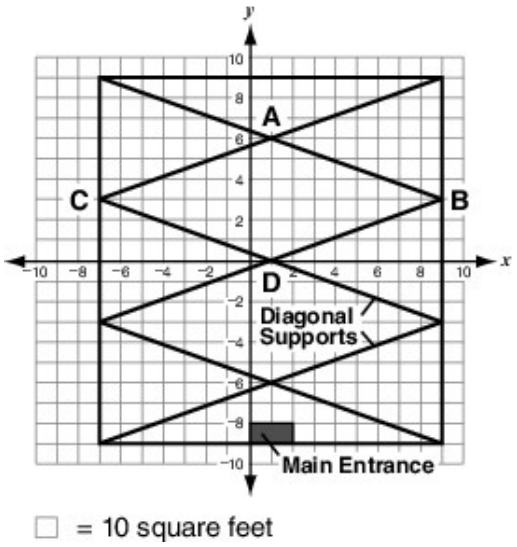
Yasmin wants hotel guests to be able to see the city and enjoy the warm weather, so one of the first elements she puts in her design plan is a rooftop deck. She asks her friends at school what they like to do when they visit a hotel, and the most common response is to go swimming. Yasmin decides to combine the two ideas and put the hotel pool on the roof.

She also incorporates a café area so that people can eat while enjoying the view. Then, she adds an area between the café and the pool where people can sit at tables in sun chairs, admiring the city skyline.



Another thing Yasmin wants is for her building to stand out among the other tall buildings downtown. She uses nonvertical supports to create an interesting pattern on the front of the building. The main structural supports will be inside and will not be visible from the outside.

YASMIN'S DESIGN OF THE FRONT OF THE HOTEL



Lastly, Yasmin plans to cover most of the outside of the building with dark glass. This way, she thinks, the building will look shiny and modern, and all of the hotel's guests will be able to have a great view of the city from their rooms.

Yasmin submits her design plans to the contest before the deadline and waits anxiously to find out whether she has won. She knows that winning this contest could be the start of the career she's hoping for.

1. Read "Designing a Hotel" and answer the question.

   The diagonal supports on the front of the hotel intersect each other to form quadrilaterals. Yasmin uses the coordinates of points *A*, *B*, *C*, and *D* to correctly prove the most specific classification for quadrilateral *CABD*. Which statements **best** describe the steps Yasmin could have taken to arrive at her conclusion?

   A. Use the slope formula to determine that opposite sides are parallel. Yasmin concluded that *CABD* must be a parallelogram.

   B. Use the distance formula to determine that two distinct pairs of consecutive sides are congruent. Yasmin concluded that *CABD* must be a kite.

   C. Use the distance formula to determine that all sides are congruent, and use the slope formula to determine that consecutive sides are perpendicular. Yasmin concluded that *CABD* must be a square.

   D. Use the distance formula to determine that all sides are congruent, and use the slope formula to determine that consecutive sides are not perpendicular. Yasmin concluded that *CABD* must be a rhombus.

2. A circle has its center at $(2, 3)$ and passes through the point $(-4, -5)$.
Which of these points also lies on the circle?

A. $(-3, -6)$

B. $(-1, -1)$

C. $(4, 5)$

D. $(8, 11)$

3. Consider the polygon in the *xy*-coordinate plane with vertices at points $(1, 3)$, $(3, 4)$, $(5, 0)$ and $(3, -1)$.

What is the most specific name for this polygon?

A. kite

B. parallelogram

C. rectangle

D. square

4. Which ***best*** describes the quadrilateral with vertices $(^{-}2, ^{-}2)$, $(^{-}3, 4)$, $(3, 0)$, and $(2, 6)$?

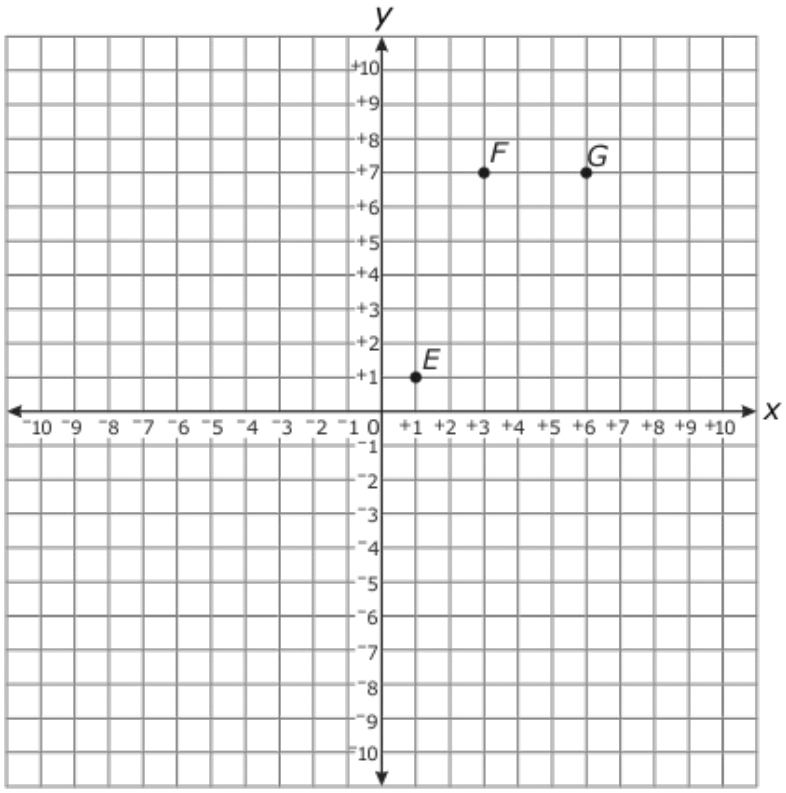
A. parallelogram

B. rectangle

C. rhombus

D. square

5. If *EFGH* is an isosceles trapezoid, what are the coordinates of *H*?



A. (4, 1)

B. (5, 1)

C. (7, 1)

D. (8, 1)

6. Quadrilateral *ABCD* is formed by joining the vertices $A(-6, 2), B(-1, 7), C(4, 2),$ and $D(-1, -3)$ graphed on a coordinate plane.

What type of quadrilateral is represented by *ABCD*?

7. A circle is centered at point (3, ⁻3). The diameter of the circle is 20 units. Which point lies on the circle?

A. (23, ⁻3)

B. (⁻3, 7)

C. (3, 7)

D. (3, ⁻17)

8. A circle is centered at the origin and has a radius of 5. Is the point $(3, 4)$ on the circle, and why or why not?

A. The point $(3, 4)$ is not on the circle because $3^2 + 4^2 \neq 5$.

B. The point $(3, 4)$ is on the circle because $3 + 4 = 5 + 2$.

C. The point $(3, 4)$ is not on the circle because $3 + 4 \neq 5$.

D. The point $(3, 4)$ is on the circle because $3^2 + 4^2 = 25$.

9. A circle is centered at the origin and has a radius of 3 units. Which point lies on the circle?

A. $(^-2, \sqrt{13})$

B. $(1, \sqrt{2})$

C. $(2, \sqrt{5})$

D. $(3, 3)$

10. The point $(^-5, 7)$ lies on a circle centered at $(^-2, 6)$. Which point also lies on the circle?

A. $(^-4, 12)$

B. $(^-2, 3)$

C. $(1, 5)$

D. $(19, ^-9)$

11. A circle has center $(1, 4)$ and a radius of 5. Which statement explains whether or not the point $(2, 2)$ is on the circle?

A. No, since $\frac{4-2}{1-2} \neq 5$.

B. No, since $\sqrt{(1 - 2)^2 + (4 - 2)^2} \neq 5$.

C. Yes, since $\frac{1}{2} = \frac{2}{4}$.

D. Yes, since $\sqrt{(1 - 2)^2 + (4 - 2)^2} = \sqrt{5}$.

12. Circle Q is centered at (0, 5). Point $R(^{-}5, 3)$ is on the circle. Which ordered pair could be S, such that $\overline{RS}$ is a diameter?

A. (5, 7)

B. $(2.5, ^{-}4)$

C. $(^{-}2.5, 4)$

D. $(^{-}5, 7)$

13. Which describes the quadrilateral with vertices $W(^{-}3, 1)$, $X(2, 2)$, $Y(3, 7)$, and $Z(^{-}2, 6)$?

A. trapezoid

B. kite

C. rhombus

D. rectangle

14. Right triangle JKL has vertices located at $J(4, 3)$ and $K(2, ^{-}2)$. Which could be the coordinates of point L?

A. (0, 3)

B. (0, 0)

C. $(^{-}1, 0)$

D. $(^{-}3, 0)$

15. Andy is studying a quadrilateral with the vertices $A(6, 1), B(8, 2), C(9, 4),$ and $D(7, 3)$. Which statement explains how Andy could prove what kind of quadrilateral this is?

A. find the slopes of the pairs of opposite sides to show that the figure is a parallelogram

B. find the slopes of the pairs of opposite sides to show that the quadrilateral is a rectangle

C. find the lengths of the diagonals to show that the quadrilateral is a parallelogram

D. find the lengths of the diagonals to show that the quadrilateral is a rectangle

16. Which method could be used to prove a quadrilateral on a coordinate plane is a parallelogram?

A. Apply the midpoint formula to show 2 pairs of adjacent sides have the same midpoint.

B. Apply the distance formula to show both pairs of opposite sides are congruent.

C. Apply the slope formula to show diagonals have slopes that are negative reciprocals.

D. Apply the slope formula to show opposite sides have slopes that are negative reciprocals.

17. The vertices of a quadrilateral are located at $W(^{-}3, 2)$, $X(3, 2)$, $Y(^{-}5, ^{-}1)$, and $Z(2, ^{-}1)$. Which is true about the quadrilateral?

A. $WX = YZ$

B. $WY = XZ$

C. $WX \parallel YZ$

D. $WY \parallel XZ$

18. A figure has vertices at (2, 5), (4, 3), (5, 4), and (3, 6). Which most precisely describes the figure?

A. parallelogram

B. rectangle

C. rhombus

D. square

19. Triangle *LMN* has the vertices (1, 6), (6, 3), and (5, 7). What type of triangle is Triangle *LMN*?

A. equilateral triangle

B. isosceles triangle

C. scalene triangle

D. obtuse triangle

20. Triangle *MNP* is a right isosceles triangle. *M* is located at ($^-5$, 3) and *N* is located at ($^-1$, 1). Which could be the coordinates of vertex *P*?

A. ($^-3$, $^-3$)

B. (0, 3)

C. (1, 4)

D. (3, 3)

21. A circle has a diameter of 16 units and is centered at the origin. Which point also lies on the circle?

A. $(4, -8\sqrt{3})$

B. $(4, -4)$

C. $(-6, 2\sqrt{7})$

D. $(-8\sqrt{2}, 0)$

22. Which is the ***best*** description of a quadrilateral with vertices at (4, 2), (8, 3), (8, $^-1$), and (4, $^-2$)?

A. kite

B. parallelogram

C. rhombus

D. square

23. *J*($^-5$, 3) and *K*(7, $^-3$) are the end points of a chord of a circle. Which information is needed to prove that $\overline{JK}$ is a diameter of the circle?

A. ($^-6$, 3) is the center of the circle and the midpoint of $\overline{JK}$.

B. ($^-1$, 0) is the center of the circle and the midpoint of $\overline{JK}$.

C. (1, 0) is the center of the circle and the midpoint of $\overline{JK}$.

D. (6, $^-3$) is the center of the circle and the midpoint of $\overline{JK}$.

24. Which term ***best*** describes the shape that has vertices at (0, 0), (2, 3), (⁻2, 4), and (⁻4, 1)?

A. parallelogram

B. rhombus

C. rectangle

D. square

25. Quadrilateral ABCD is graphed on a coordinate plane. Three of its vertices are at $A(2, 6)$, Point $B(6, 8)$, and Point $C(8, 4)$. Which of the following additional statements is sufficient to prove that quadrilateral ABCD is a square?

A. The slope of $\overline{AD}$ is -2.

B. The length of $\overline{CD}$ is $2\sqrt{5}$.

C. $\overline{CD}$ and $\overline{AD}$ are congruent.

D. $\overline{BD}$ has a slope of 3 and a length of $2\sqrt{10}$.

26. Which equation must be true if a quadrilateral with base $\overline{AD}$ and vertices $A(x_1, y_1), B(x_2, y_2), C(x_3, y_3)$, and $D(x_4, y_4)$ is a trapezoid?

A. $\frac{(y_2-y_1)}{(x_2-x_1)} = \frac{(y_3-y_2)}{(x_3-x_2)}$

B. $\frac{(y_3-y_1)}{(x_3-x_1)} = \frac{(y_4-y_2)}{(x_4-x_2)}$

C. $\frac{(y_4-y_3)}{(x_4-x_3)} = \frac{(y_4-y_1)}{(x_4-x_1)}$

D. $\frac{(y_4-y_1)}{(x_4-x_1)} = \frac{(y_3-y_2)}{(x_3-x_2)}$

27. Trapezoid *ABCD* is such that sides $\overline{AD}$ and $\overline{BC}$ are parallel and $CD > AB$.
Let $A(a+5, 2)$, $B(3, 4)$, and $C(-3, a-6)$ be three vertices of the trapezoid.
Which value of *a* proves *ABCD* is a right trapezoid?

A. $a = -8$

B. $a = -\frac{24}{5}$

C. $a = 1$

D. $a = \frac{16}{3}$

28. Which ***best*** describes the quadrilateral with vertices at (7, 8), (9, 10), (7, 12), and (5, 10)?

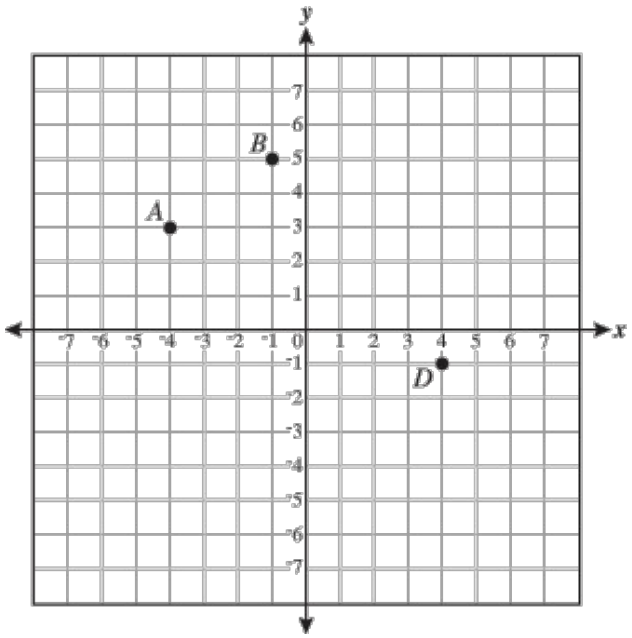
A. non-square rectangle

B. non-square rhombus

C. square

D. trapezoid

29. Three vertices of quadrilateral *ABCD* are $A(-4, 3), B(-1, 5)$, and $D(4, -1)$, as shown below.



In order for *ABCD* to be a parallelogram, what must be the coordinates of point *C*?

A. $(-1, -7)$

B. $(1.5, 2)$

C. $(2, -4)$

D. $(7, 1)$

30. Square *MNPQ* has vertices at *M*(1, 1), *N*(1, 4), and *P*(4, 4). What are the coordinates of *Q*?

A. (4, 1)

B. (7, 4)

C. (1, ⁻2)

D. (1, 4)

31. $\triangle RST$ has vertices at $R(7, -4)$, $S(12, -12)$, and $T(2, -12)$. What type of triangle is $\triangle RST$?

A. equilateral

B. isosceles

C. scalene

D. right

32. Three of the vertices of a square are located at $(-1, 1)$, $(4, 1)$, and $(4, 6)$. What are the coordinates of the fourth vertex of the square?

A. $(-1, 5)$

B. $(-1, 6)$

C. $(5, -1)$

D. $(6, -1)$

33. The vertices of parallelogram *PQRS* are $P(-4, 5)$, $Q(3, 3)$, $R(6, -4)$, and $S(-1, -2)$.

Part A. *PQRS* shares a side with square *PSTU*. What are the coordinates of *T* and *U*? Show your work.

Part B. Prove that *PSTU* is a square.

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

34. Triangle *PQR* has vertices $P(-2, 8)$, $Q(2, 4)$, and $R(4, 6)$. Which best describes triangle *PQR*?

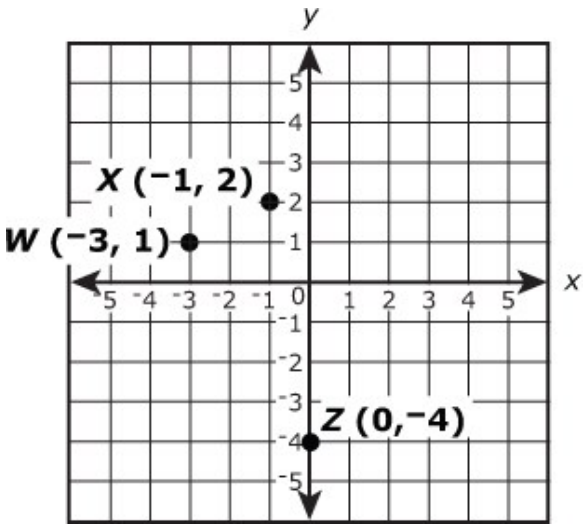
A. a right triangle with $\overline{PQ} \perp \overline{QR}$

B. a right triangle with $\overline{PQ} \perp \overline{PR}$

C. an isosceles triangle with $\overline{PQ} \cong \overline{QR}$

D. an isosceles triangle with $\overline{PQ} \cong \overline{PR}$

35. Three vertices of parallelogram *WXYZ* are shown on the coordinate plane.



Which statement explains whether or not the coordinates of *Y* could be $(2, -5)$?

A. No, since $-2 - 0 \neq -1 - (-3)$.

B. Yes, since $-2 - 0 = -3 - (-1)$.

C. No, since $\sqrt{(2 - (-1))^2 + (-5 - 2)^2} \neq \sqrt{(-3 - 0)^2 + (1 - (-4))^2}$.

D. Yes, since $\sqrt{(-1 - (-3))^2 + (2 - 1)^2} = \sqrt{(-2 - 0)^2 + (-5 - (-4))^2}$.

36. A triangle has the vertices ($^-5$, $^-1$), ($^-2$, $^-3$), and ($^-5$, $^-4$). Which term describes the triangle?

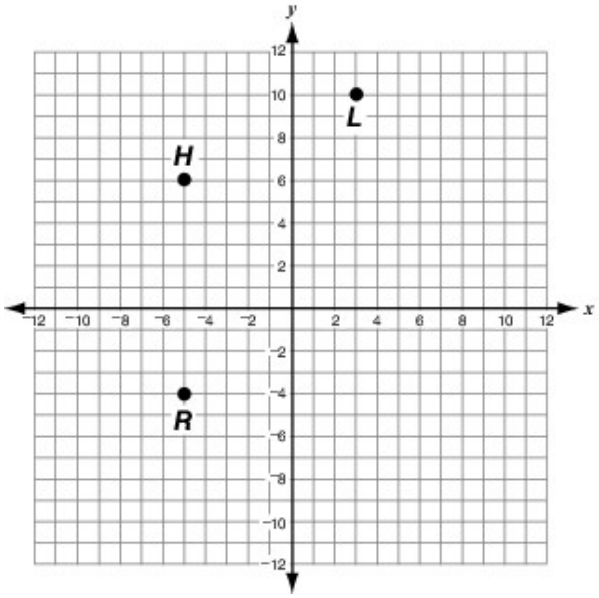
A. equilateral triangle

B. scalene triangle

C. right triangle

D. isosceles triangle

37. The town officials in Justin's town are making plans to expand the services offered to residents. The map below shows the current location of the high school, *H*; the library, *L*; and the recreation center, *R*.



Part A. A developer wants to build a gas station, *G*, that is located southeast of the high school so that right triangle *LHG* is formed with the high school and the library. If the coordinates of the gas station are positioned such that $0 < y < 6$ and are only whole number values, what are the possible locations of the gas station?

Part B. Town regulations state that a gas station cannot be built within 0.5 mile of a school. Graph the location of the gas station, *G*, on the coordinate grid above if each coordinate represents 0.2 mile. Explain why the developer will need to build the gas station at this location.

Part C. A new park, *P*, is going to be built centered at $(3, -4)$ with a circular boundary that passes through point $(0, -4)$. If Justin's house, *J*, is located at $(2, -8)$, does he live on the boundary of the park? Explain.

Part D. Justin claims that the location of the mall, *M*, being built at $(-6, -8)$ forms a parallelogram with his house, the park, and the recreation center. Prove whether or not Justin is correct using the coordinate grid above to justify your answer. Do these locations form any other type of special quadrilateral? Explain why or why not.

Part E. The new mall is planned to cover a rectangular area that measures 0.96 square mile with a width of 0.8 mile. If the center of the mall is located at $(-6, -8)$ on the coordinate grid, what is one possible set of coordinates that could be the locations of the vertices that make up the rectangular area of the mall? Explain using the coordinate grid above to justify your answer.

38. Triangle *PQR* has vertices located at (2, 2), (5, $^{-}$4), and ($^{-}$4, $^{-}$1). What type of triangle is triangle *PQR*?

A. equilateral

B. isosceles

C. obtuse

D. scalene

39. Three vertices of a rectangle are ($^{-}$2, 0), (4, 2), and (5, $^{-}$1). What are the coordinates of the fourth vertex?

A. ($^{-}$3, 3)

B. ($^{-}$3, $^{-}$1)

C. ($^{-}$1, $^{-}$3)

D. (3, 3)

40. The center of a circle is located at ($^{-}$6, 6) and a point on the circle is located at ($^{-}$4, 3). Which is another point that lies on the circle?

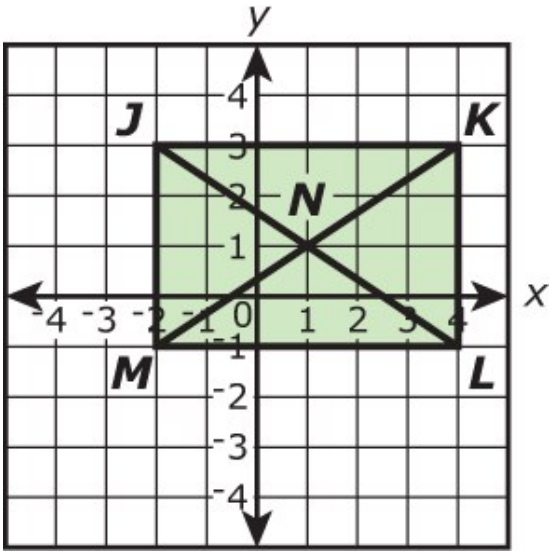
A. ($^{-}$4, 8)

B. ($^{-}$6, 2)

C. ($^{-}$8, 3)

D. ($^{-}$12, 12)

41. In the diagram, quadrilateral *JKLM* is a parallelogram.



Which statement proves parallelogram *JKLM* is a rectangle?

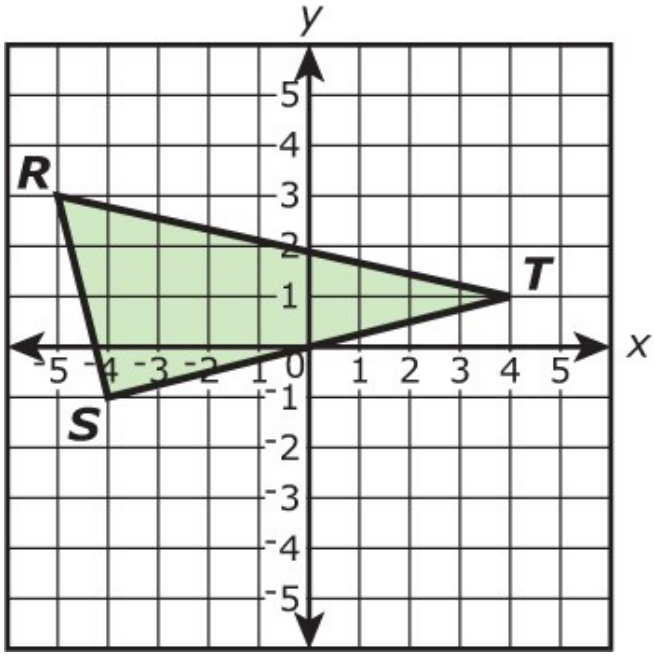
A. The midpoint of $\overline{JL}$ and $\overline{KM}$ is $(1, 1)$.

B. The slope of $\overline{JM}$ and $\overline{KL}$ is 0.

C. $JL = KM = \sqrt{52}$

D. $JK = LM = 12$

42. Right triangle *RST* has a right angle at *S*.



What would prove triangle *RST* is a right triangle?

A. Use the distance formula to show $RT = ST$.

B. Use the distance formula to show $RS = ST$.

C. Use the slope formula to show the slope of $\overline{RS}$ is equal to the slope of $\overline{ST}$.

D. Use the slope formula to show the product of the slope of $\overline{RS}$ and $\overline{ST}$ is -1.

43. A circle is centered at the origin and passes through the point $(-\sqrt{2}, \sqrt{5})$.
Which point does ***not*** lie on the circle?

A. $(2, \sqrt{3})$

B. $(\sqrt{3}, \sqrt{3})$

C. $(\sqrt{6}, 1)$

D. $(\sqrt{2}, \sqrt{5})$

44. Three vertices of a trapezoid are (⁻1, 4), (⁻4, 3), and (⁻5, ⁻1). Which could be the fourth vertex of the trapezoid?

A. (2, ⁻1)

B. (1, 1)

C. (0, 1)

D. (⁻1, ⁻1)

45. Three vertices of a rectangle are located at (⁻5, 3) (1, ⁻1), and (⁻1, ⁻4). What are the coordinates of the fourth vertex of the rectangle?

A. (⁻7, 0)

B. (⁻6, 0)

C. (⁻6, ⁻1)

D. (⁻5, 1)

46. A triangle is created by the points (⁻3, 5), (0, 5) and (⁻1, 0). A circle is centered at (5, 0) and passes through the point (10, 5). What is true about where the point (⁻2, 5) lies in relation to the triangle and the circle?

A. The point (⁻2, 5) is on neither the triangle nor the circle.

B. The point (⁻2, 5) is on the triangle but not the circle.

C. The point (⁻2, 5) is on the circle but not the triangle.

D. The point (⁻2, 5) is on both the triangle and the circle.

47. Andrew drew parallelogram *PQRS* on a coordinate plane with vertices at $P(x_1, y_1), Q(x_2, y_2), R(x_3, y_3)$, and $S(x_4, y_4)$. Which set of assertions is sufficient to prove that *PQRS* is a square?

A. $\sqrt{(x_4+x_1)^2+(y_4+y_1)^2} = \sqrt{(x_2+x_1)^2+(y_2+y_1)^2}$ and $\frac{y_2-y_1}{x_2-x_1} = \frac{x_4-x_1}{y_1-y_4}$

B. $\sqrt{(x_4-x_1)^2+(y_4-y_1)^2} = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ and $\frac{y_2-y_1}{x_2-x_1} = \frac{y_4-y_1}{x_4-x_1}$

C. $\sqrt{(x_4+x_1)^2+(y_4+y_1)^2} = \sqrt{(x_2+x_1)^2+(y_2+y_1)^2}$ and $\frac{y_2-y_1}{x_2-x_1} = \frac{y_4-y_1}{x_4-x_1}$

D. $\sqrt{(x_4-x_1)^2+(y_4-y_1)^2} = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ and $\frac{y_2-y_1}{x_2-x_1} = \frac{x_4-x_1}{y_1-y_4}$

48. Which statement **best** describes the triangle formed by joining the points $A(-3, 6), B(-11, 2)$, and $C(-4, -2)$.

A. $\triangle ABC$ is equilateral.

B. $\triangle ABC$ is a right triangle.

C. $\triangle ABC$ is isosceles with $BC = CA$.

D. $\triangle ABC$ is isosceles with $AB = CA$.

49. A circle is centered at (5, 2) and passes through (7, 5). Which point also lies on the circle?

A. (6, 3.5)

B. (0, 0)

C. (2, 3)

D. (3, $^{-}$1)

50. Rectangle *WXYZ* has coordinates *W*(3, 5), *X*(6, 3), and *Y*(2, $^{-}$3). What are the coordinates of point *Z*?

A. (0, 0)

B. (0, 1)

C. ($^{-}$1, 0)

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

51. A circle is centered at ($^{-}$5, 2) and has a radius of 4. Which point lies on the circle?

A. ($^{-}$5, $^{-}$2)

B. ($^{-}$3, 4)

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

D. (3, $^{-}$3)

52. The vertices of quadrilateral *RSTU* are located at *R*(⁻3, 4), *S*(1, 6), *T*(2, 3), and *U*(⁻2, 1). Which best describes quadrilateral *RSTU*?

A. square with side length $\sqrt{20}$

B. square with side length $\sqrt{10}$

C. rectangle with side lengths $\sqrt{20}$ and $\sqrt{10}$

D. rectangle with side lengths $\sqrt{20}$ and $\sqrt{8}$

53. What most precisely describes the quadrilateral with vertices at (0, 2), (3, 4), (6, 2), and (3, ⁻5)?

A. trapezoid

B. rhombus

C. rectangle

D. kite

54. Three vertices of a parallelogram are located at (⁻5, 0), (1, ⁻1), and (3, 2). What are the coordinates of the fourth vertex?

A. (⁻6, 2)

B. (⁻5, 2)

C. (⁻4, 3)

D. (⁻3, 3)