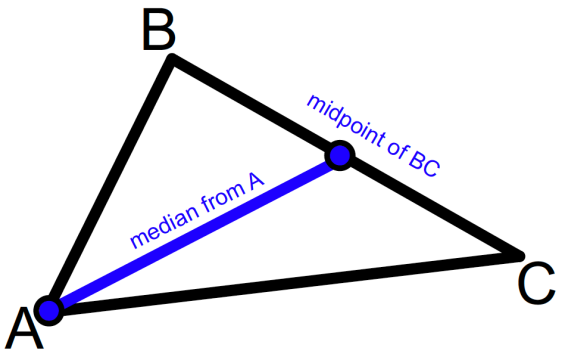
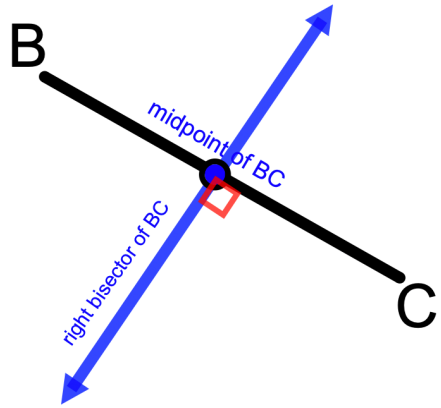
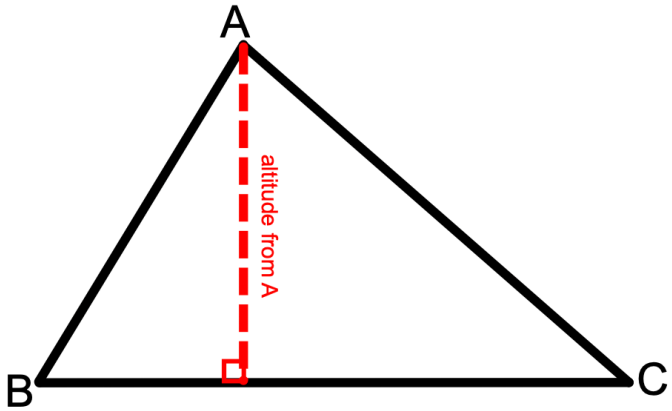
Unit 2- Analytic Geometry

Workbook

MPM2D







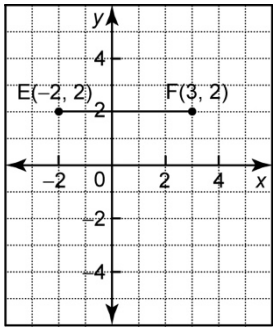
W1 – Midpoint and Length of a Line Segment Unit 2

MPM2D

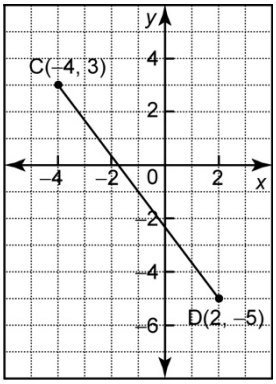
Jensen

1) Determine the coordinates of the midpoint of each line segment.

a)



b)



2) Determine the midpoint of the line segment defined by each pair of endpoints.

a) $J(5,7)$ and $K(3,9)$

b) $L(-1,0)$ and $M(1,-6)$

c) $A(5,9)$ and $B(-1,9)$

d) $C(-7,8)$ and $D(-2,-9)$

e) $E(\frac{-1}{9}, \frac{-1}{2})$ and $F(\frac{14}{9}, \frac{4}{3})$

f) $A\left(\frac{5}{3}, 1\right)$ and $B(0,2)$

g) $G\left(\frac{-3}{2}, \frac{-1}{3}\right)$ and $H\left(\frac{3}{4}, \frac{3}{5}\right)$

h) $M(6.6, 8.52)$ and $N(-5.5, 4.07)$

3) The endpoints of the diameter of a circle are $A(-5, -3)$ and $B(3, 7)$. Find the coordinates of the center of this circle.

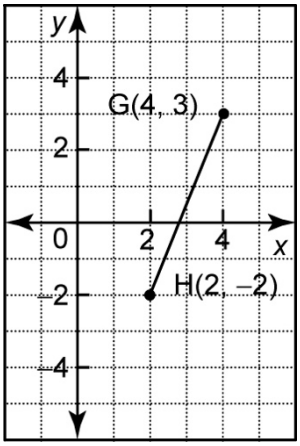
4) One endpoint of a diameter of a circle centered at the origin is $(-5, 2)$. Find the coordinates of the other endpoint of this diameter.

5) For a line segment DE, one endpoint is $D(6,5)$, and the midpoint is $M(4,2)$. Find the coordinates of endpoint E.

6) The endpoints of AB are $A(10,16)$ and $B(-6,-12)$. Find the coordinates of the points that divide the segment into four equal parts.

7) The endpoints of PQ are $P(3,-4)$ and $Q(11,c)$. The midpoint of PQ is $M(d,3)$. Find the values of c and d.

8) Find the exact length of the line segment.



9) Calculate the exact length of the line segment defined by each pair of endpoints.

a) A(-6, -2) and B(4, 3)

b) C(-2, 0) and D(7, -3)

c) E(-5, -6) and F(-1, -2)

d) G(0, 5) and H(8, -1)

e) (−5, 6) and (3, −2)

f) $\left(-\frac{3}{4}, -\frac{2}{5}\right)$ and $\left(\frac{1}{4}, \frac{3}{5}\right)$

10) On a street map of his town, Jordan's house has coordinates (8,1). The town's two high schools are at (0,5) and (6,11). Which school is closer to Jordan's house?

11) The vertices of ΔABC are $A(2,5)$, $B(-6,-1)$ and $C(10,-1)$.

a) Determine the length of each side of this triangle.

b) What is the perimeter of the triangle?

c) Classify the triangle.

12) A circle has a diameter with endpoints $R(-4, 6)$ and $T(10, -8)$.

a) Find the length of this diameter exactly.

b) Find the length of the radius of this circle. Round to the nearest tenth.

Answers

1)a) $\left(\frac{1}{2}, 2\right)$ **b)** $(-1, -1)$

2)a) $(4,8)$ **b)** $(0, -3)$ **c)** $(2,9)$ **d)** $\left(-\frac{9}{2}, -\frac{1}{2}\right)$ **e)** $\left(\frac{13}{18}, \frac{5}{12}\right)$ **f)** $\left(\frac{5}{6}, \frac{3}{2}\right)$ **g)** $\left(\frac{-3}{8}, \frac{2}{15}\right)$ **h)** $(0.549, 6.295)$

3) $(-1, 2)$

4) $(5, -2)$

5) $(2, -1)$

6) $(6,9)$, $(2,2)$, $(-2, -5)$

7) $c = 10, d = 7$

8) $\sqrt{29}$

9)a) $\sqrt{125} = 5\sqrt{5}$ **b)** $\sqrt{90} = 3\sqrt{10}$ **c)** $\sqrt{32} = 4\sqrt{2}$ **d)** 10 **e)** $\sqrt{128} = 8\sqrt{2}$ **f)** $\sqrt{2}$

10) The school at $(0,5)$ is closer to Jordan's house.

11)a) $AB = AC = 10, BC = 16$ **b)** 36 units **c)** isosceles

12)a) $\sqrt{392} = 14\sqrt{2}$ **b)** $7\sqrt{2}$

W2 – Median, Right Bisector, Altitude Unit 2

MPM2D

Jensen

1) ΔABC has vertices $A(3,4)$, $B(-5,2)$, and $C(1,-4)$. Determine an equation for

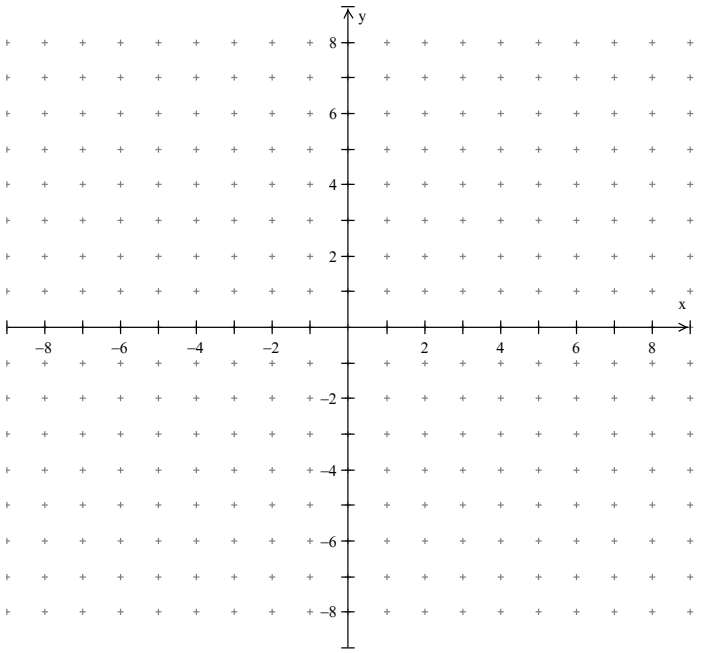
a) the median from C to AB

b) the altitude from A to BC

c) the right bisector of AC

2) Draw △JKL with vertices J(–6, 4), K(–4, –5), and L(6, 1).

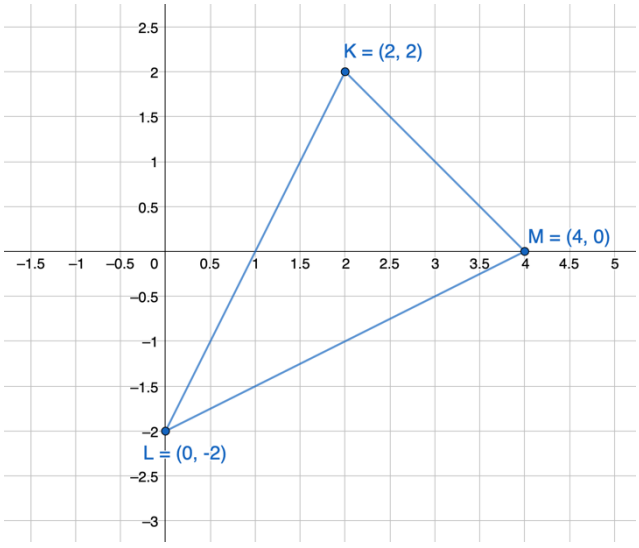
a) Draw the median from vertex J. Then, find an equation in slope *y*-intercept form for this median.



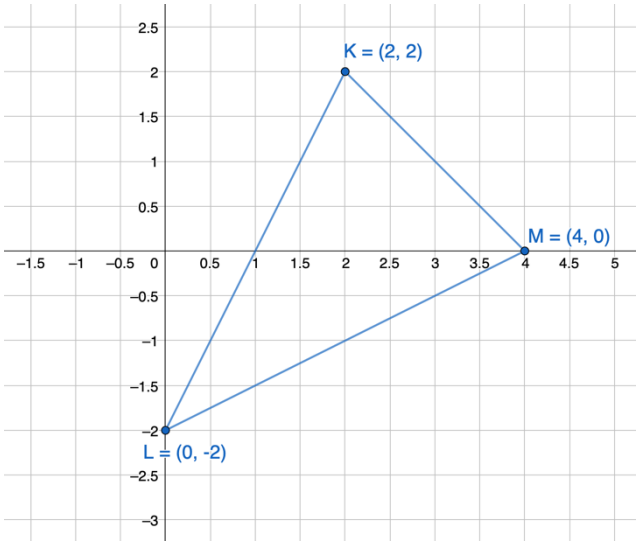
b) Draw the right bisector of KL. Then, find an equation in slope *y*-intercept form for this right bisector.

3) ΔKLM has vertices $K(2,2)$, $L(0,-2)$, and $M(4,0)$. Draw and determine the equation of…

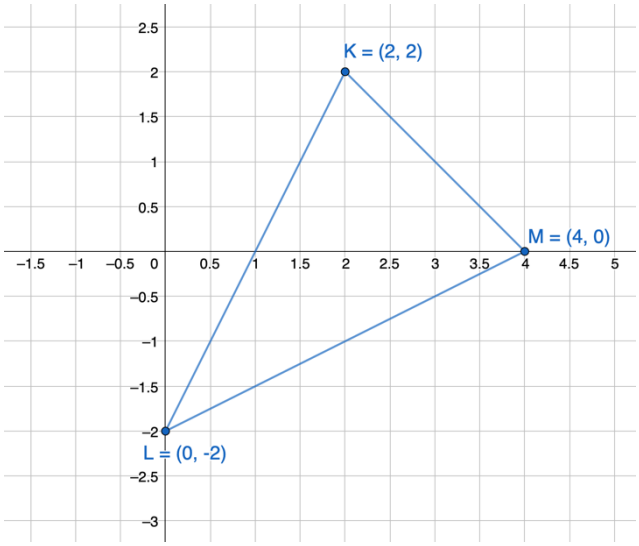
a) the median from vertex K



b) the right bisector of KL



c) The altitude from vertex K



4) A triangle has vertices A(−4, 2), B(−2, −6), and C(6, −2).

a) Determine the length of the median from vertex A.

b) Determine an equation in the form $y = mx + b$ for the median from vertex A.

5) Determine an equation for the right bisector of the line segment with endpoints D(–3, 5) and M(7, –9).

Answers

1)a) $y = -\frac{7}{2}x - \frac{1}{2}$ **b)** $y = x + 1$ **c)** $y = -\frac{1}{4}x + \frac{1}{2}$

2)a) $y = -\frac{6}{7}x - \frac{8}{7}$ **b)** $y = -\frac{5}{3}x - \frac{1}{3}$

3)a) $x = 2$ **b)** $y = -\frac{1}{2}x + \frac{1}{2}$ **c)** $y = -2x + 6$

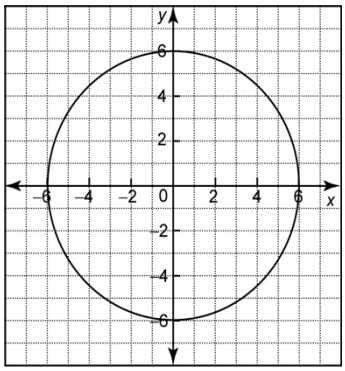
4)a) $\sqrt{72} = 6\sqrt{2}$ **b)** $y = -x - 2$

5) $y = \frac{5}{7}x - \frac{24}{7}$

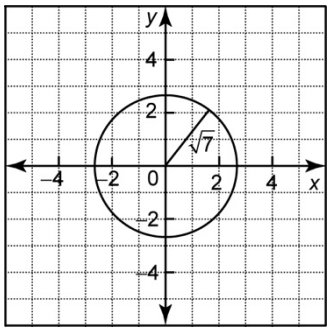
W3 – Equation of a Circle Unit 2
Circle MPM2D
Jensen

1) Determine the equation of each circle.

a)



b)



2) State the radius of each of the following circles.

a) $x^2 + y^2 = 49$ **b)** $x^2 + y^2 = 16$ **c)** $x^2 + y^2 = 64$ **d)** $x^2 + y^2 = 1.44$

3) Find an equation for the circle centred at the origin that passes through each point.

a) $(3, -4)$ **b)** $(-5, 2)$

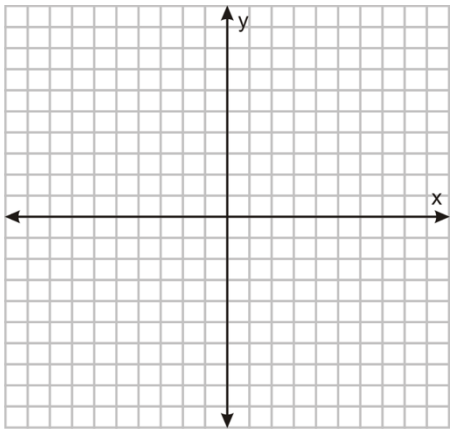
4) Determine whether each point is on, inside, or outside the circle defined by $x^2 + y^2 = 26$.

a) (1, 3) **b)** $(-4, 6)$ **c)** (1, 5)

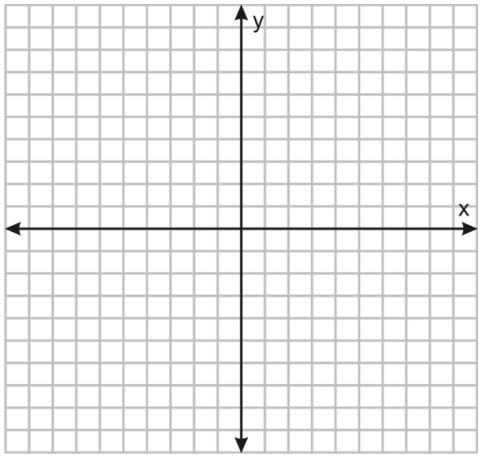
5) The point $A(4, b)$ lies on the circle defined by $x^2 + y^2 = 25$.

a) Find the possible value(s) of b.

b) Use a graph to show that the point(s) corresponding to the possible value(s) of b are on the circle.



6)a) Graph the circle defined by $x^2 + y^2 = 45$.



b) Verify algebraically that the line segment joining $P(-3, 6)$ and $Q(6, -3)$ is a chord of this circle. (In other words, verify that P and Q are points on the circle)

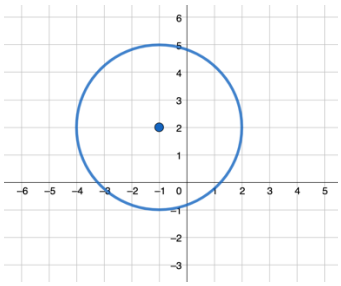
.

c) Find an equation in the form $y = mx + b$ for the right bisector of chord PQ.

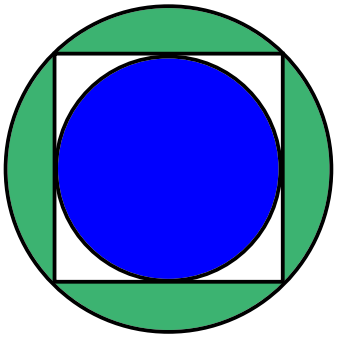
7) Determine an equation for each of the following circles.

a) centered at $(4,3)$ with a radius of 5

b)

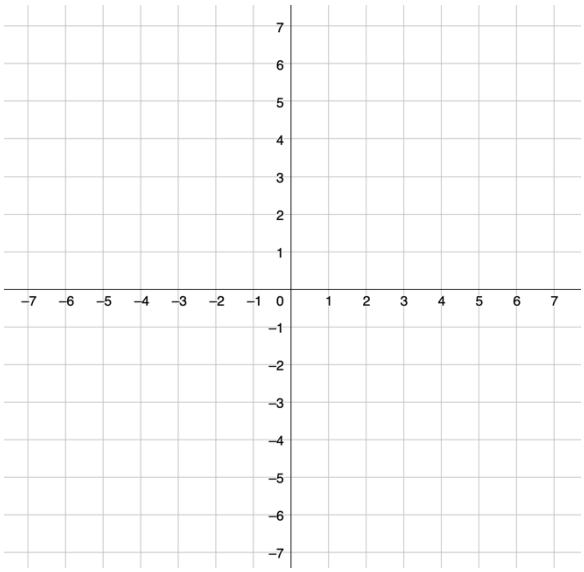


8) An equation for the small circle in this diagram is $x^2 + y^2 = 4$. Determine the equation for the larger circle.



9)a) Graph the circle defined by $x^2 + y^2 = 41$.

b) Verify algebraically that the line segment joining $U(-4,5)$ and $V(-5,-4)$ is a chord of this circle.

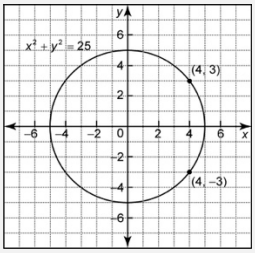


c) Determine an equation for the line that passes through the origin and is perpendicular to the chord UV.

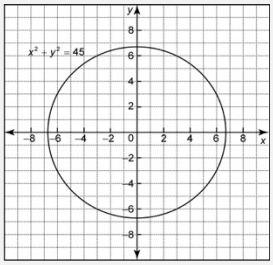
d) Verify that this line passes through the midpoint of the chord.

Answers

1)a) $x^2 + y^2 = 36$ **b)** $x^2 + y^2 = 7$
2)a) 7 **b)** 4 **c)** 8 **d)** 1.2
3)a) $x^2 + y^2 = 25$ **b)** $x^2 + y^2 = 29$
4a) inside **b)** outside **c)** on
5)a) $(4,3)$ and $(4,-3)$ **b)**



6)a)

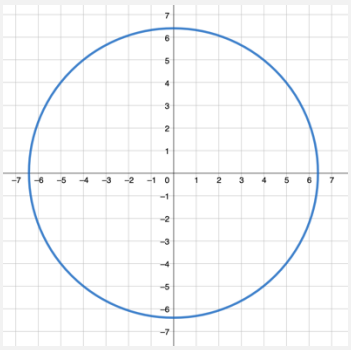


b) see solution for steps **c)** $y = x$

7)a) $(x-4)^2 + (x-3)^2 = 25$ **b)** $(x+1)^2 + (y-2)^2 = 9$

8) $x^2 + y^2 = 8$

9a)



b) see solutions **c)** $y = -\frac{1}{9}x$ **d)** The line passes through the midpoint $\left(-\frac{9}{2}, \frac{1}{2}\right)$

W4 – Geometric Properties of Shapes Unit 2

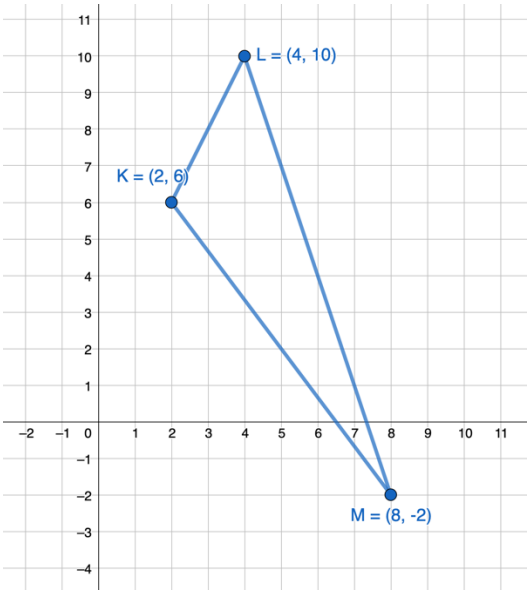
MPM2D

Jensen

1) A triangle has vertices $C(1,4)$, $D(-2,2)$, and $E(3,1)$. Determine if ΔCDE is a right triangle.

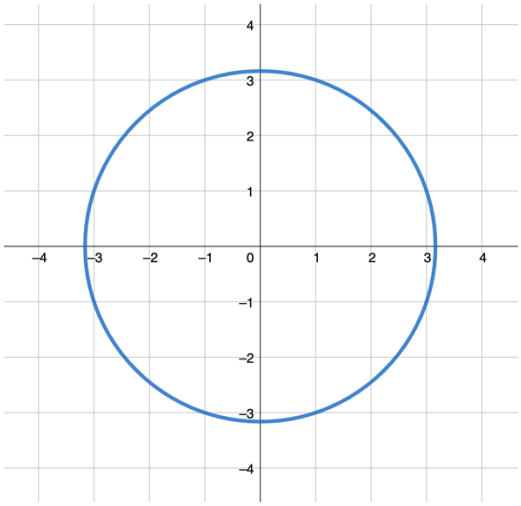
2) The vertices of a triangle are $K(2,6)$, $L(4,10)$, and $M(8,-2)$. Let P be the midpoint of KL and Q be the midpoint of LM. Verify that…

a) PQ is parallel to KM

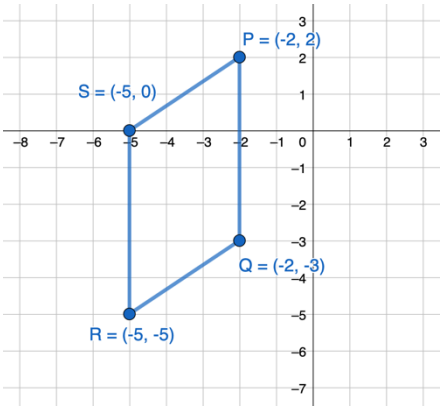


b) PQ is half the length of KM

3) The equation of a circle with center $O(0,0)$ is $x^2 + y^2 = 10$. The points $C(3,1)$ and $D(1,-3)$ are the endpoints of chord CD. Verify that the center of the circles lies on the right bisector of chord CD.



4) Verify that the quadrilateral with vertices $P(-2,2)$, $Q(-2,-3)$, $R(-5,-5)$, and $S(-5,0)$ is a parallelogram.



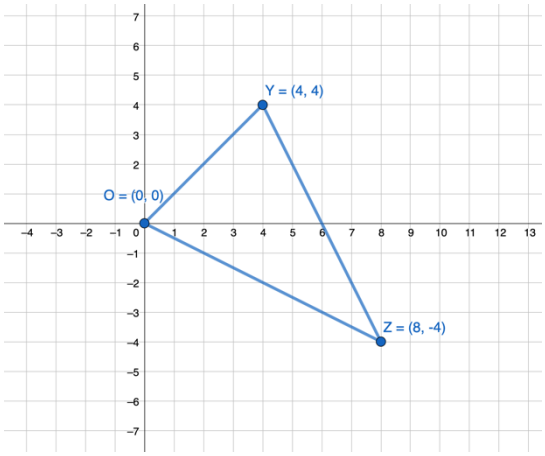
5) A triangle has vertices of $K(-2,2)$, $L(1,5)$, and $M(3,-3)$. Verify that…

a) the triangle has a right angle.

b) the midpoint of the hypotenuse is the same distance from each vertex.

6) A triangle has vertices $X(0,0), Y(4,4)$, and $Z(8,-4)$

a) Write the equation for each of the three medians.



b) The centroid of a triangle is the point of intersection of the medians of the triangle. Verify algebraically that the centroid of ΔXYZ is at $(4,0)$.

7) The endpoints of the diameter of a circle are $M(-3,5)$ and $N(9,7)$. Determine…

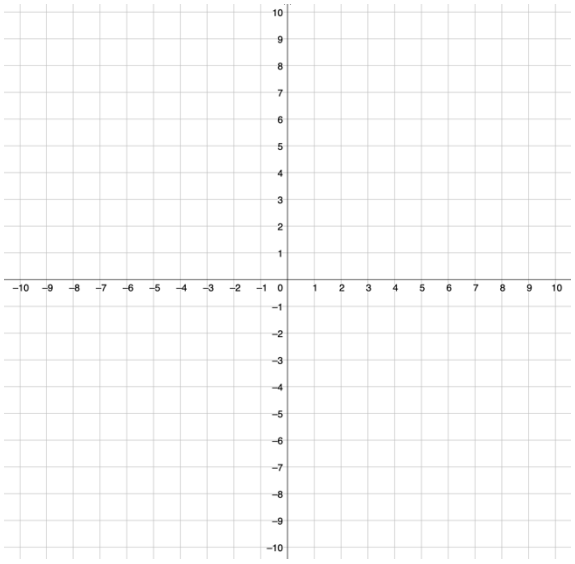
a) the coordinates of the center of the circle.

b) the length of the radius

8) Determine whether the triangle with vertices $A(-3,4), B(-1,-2)$, and $C(3,2)$ is isosceles.

9) A triangle has vertices $J(-2,0), (4,-3)$, and $L(8,8)$.

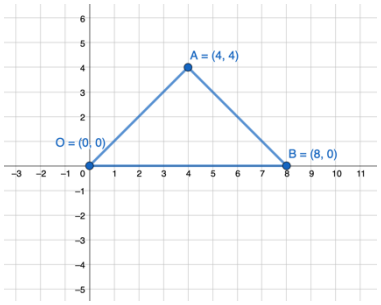
a) Find an equation for the altitude from vertex L.



b) Find the length of the altitude.

c) Find the area of ΔJKL

10) ΔAOB has vertices $A(4,4)$, $O(0,0)$, and $B(8,0)$. Determine the coordinates of the circumcenter of ΔAOB.



11) Find the exact distance from the point $D(4,-2)$ to the line segment joining the points $E(1,3)$ and $F(-4,-2)$.