FINAL ANSWERS

1. midpoint JK$(-1, \frac{3}{2})$, midpoint KL$(0, \frac{-5}{2})$, midpoint JL(2,0);

   $|KL| = 3\sqrt{5}$ units, $|JL| = 2\sqrt{17}$ units, $|JK| = \sqrt{41}$ units.

   It is scalene since $\overline{KL} \neq \overline{JL} \neq \overline{JK}$

2. a)

$$M_{KL} = \left(0, -\frac{5}{2}\right)$$

slope of JM

$$m_{JM} = \frac{4-(-2.5)}{1-0} = 6.5$$

find b

$$4 = 6.5(1) + b$$
$$-2.5 = b$$

equation

$$y = 6.5x - 2.5$$

b)

$$M_{JL} = (2,0)$$

slope of KM_{JL}

$$m_{KM} = \frac{-1-0}{-3-2} = 0.2$$

find b

$$0 = 0.2(2) + b$$
$$-0.4 = b$$

equation

$$y = 0.2x - 0.4$$

c)

$$M_{JL} = (2,0)$$

slope of JL

$$m_{JL} = \frac{-4-4}{3-1} = -4$$

slope of right bisector

$$m = \frac{1}{4}$$

find b (using M)

$$0 = \frac{1}{4}(2) + b$$
$$-\frac{1}{2} = b$$

state the equation

$$y = \frac{1}{4}x - \frac{1}{2}$$

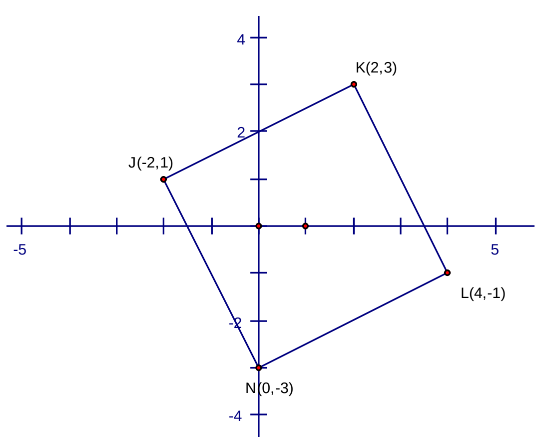
3. Find the length of AC and the length of BC

$$|AC| = \sqrt{(10-41)^2 + (63-18)^2} = \sqrt{(-21)^2 + (45)^2} = \sqrt{441 + 2025} = \sqrt{2466} = 49.66$$

$$|BC| = \sqrt{(87-41)^2 + (30-18)^2} = \sqrt{46^2 + 12^2} = \sqrt{2116 + 144} = \sqrt{2260} = 47.54$$

Fire station B is closer since $|BC| \le |AC|$

4.



$$m_{JK} = \frac{1}{2} \quad m_{KL} = -2 \quad m_{LN} = \frac{1}{2} \quad m_{JN} = -2$$

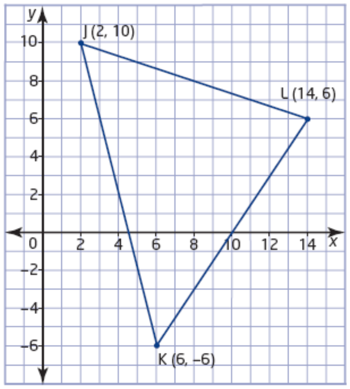
Adjacent sides have negative reciprocal slopes so adjacent sides are perperndicular. That means this quadrilateral is a rectangle because all angles are right angles.

Check if it is a square.

$$|JK| = \sqrt{4^2 + 2^2} = \sqrt{20} \qquad |JN| = \sqrt{2^2 + 4^2} = \sqrt{20}$$

Since two adjacent sides are equal, all four sides must be equal (because of the right angles). So this is a square.

5. a)



b) M(4,2) and N(8,8)

c)

$$|MN| = \sqrt{(8-4)^2 + (8-2)^2} = \sqrt{4^2 + 6^2} = \sqrt{52} = \sqrt{4}\sqrt{13} = 2\sqrt{13}$$

$$|KL| = \sqrt{(14-6)^2 + (6-(-6))^2} = \sqrt{8^2 + 12^2} = \sqrt{208} = \sqrt{16}\sqrt{13} = 4\sqrt{13}$$

Since $\overline{KL} = 2\overline{MN}$, MN is half of KL.

d)

$$m_{MN} = \frac{8-2}{8-4} = \frac{6}{4} = \frac{3}{2}$$

$$m_{KL} = \frac{6-(-6)}{14-6} = \frac{12}{8} = \frac{3}{2}$$

Since $m_{MN} = m_{KL}$, MN and KL are parallel

6. Find the equation of the right bisector

$$M_{QR} = \left(\frac{-2+4}{2}, \frac{5+1}{2}\right) = (1,3)$$

$$m_{QR} = \frac{5-1}{-2-4} = \frac{-2}{3}$$

slope of right bisector

$$m = \frac{3}{2}$$

$$y = mx + b$$

$$3 = \frac{3}{2}(1) + b$$

$$\frac{3}{2} = b$$

The equation of the right bisector is $y = \frac{3}{2}x + \frac{3}{2}$

Check if P(-3,-2) is on the line.

$LS = y \qquad RS = \frac{3}{2}x + \frac{3}{2}$

$LS = -2 \qquad RS = \frac{3}{2}(-3) + \frac{3}{2}$

$RS = -3$

LS and RS are not equal so the point is not on the right bisector.

7. a) $x^2 + y^2 = 49$ b) $x^2 + y^2 = 61$ c) $x^2 + y^2 = 67$

8. $r = \sqrt{64} = 8$ The diameter is 16 units.

$A = \pi r^2$

$A = \pi(8)^2$ The area of the circle is about 201 square units.

$A = 20.10619298$

9. The centroid is the point where the three medians of a triangle intersect. Determine the equation of two of the medians of the triangle and then find the point of intersection of these two lines.

10. Use the slopes to determine if any of the sides are perpendicular.

$$m_{DE} = \frac{4-14}{8-2} = \frac{-10}{6} = \frac{-5}{3} \qquad m_{EF} = \frac{10-4}{18-8} = \frac{6}{10} = \frac{3}{5}$$

Since the slopes of *DE and EF* are negative reciprocals, *DE* $\perp$ *EF*. Hence, ΔDEF is a right triangle.

11.

$$M = \left(\frac{\frac{-1}{2}+3}{2}, \frac{2+\frac{2}{3}}{2} \right)$$

$$M = \left(\frac{\frac{5}{2}}{2}, \frac{\frac{8}{3}}{2} \right)$$

$$M = \left(\frac{5}{2} \times \frac{1}{2}, \frac{8}{3} \times \frac{1}{2} \right)$$

$$M = \left(\frac{5}{4}, \frac{4}{3} \right)$$

12. A rectangle.

13. The equation of the right bisector of JL

$$M_{JL} = (3,1) \qquad m_{JL} = \frac{-1}{2}$$

Slope = 2

$$y = mx + b$$
$$1 = 2(3) + b$$
$$-5 = b$$

$$y = 2x - 5$$

The equation of the right bisector of JK

$$M_{LK} = (5,5) \qquad m_{LK} = \frac{3}{4}$$

Slope = $-\frac{4}{3}$

$$y = mx + b$$
$$5 = \frac{-4}{3}(5) + b$$
$$\frac{35}{3} = b$$

$$y = -\frac{4}{3}x + \frac{35}{3}$$

The equation of the right bisector of LK

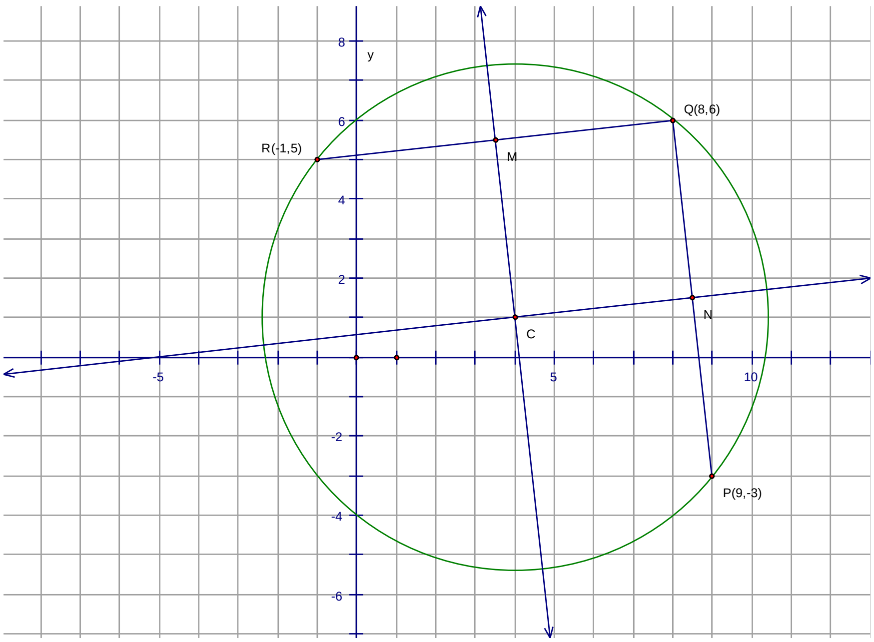
$$M_{LK} = (2,4) \qquad m_{LK} = 2$$

Slope = $-\frac{1}{2}$

$$y = mx + b$$
$$4 = \frac{-1}{2}(2) + b$$
$$5 = b$$

$$y = -\frac{1}{2}x + 5$$

14. Find the equation of the right bisector of two of the “chords” of the circle, then find where they cross.



Equation of right bisector of PQ

$$N=\left(\frac{9+8}{2},\frac{-3+6}{2}\right)$$
$$=\left(\frac{17}{2},\frac{3}{2}\right)$$

$$m_{PQ}=\frac{-3-6}{9-8}$$
$$=-9$$
$$slope=\frac{1}{9}$$

$$y=mx+b$$
$$\frac{3}{2}=\frac{1}{9}\left(\frac{17}{2}\right)+b$$
$$\frac{3}{2}=\frac{17}{18}+b$$
$$\frac{27}{18}-\frac{17}{18}=b$$
$$\frac{10}{18}=b$$
$$\frac{5}{9}=b$$

$$y=\frac{1}{9}x+\frac{5}{9}$$

Equation of right bisector of RQ

$$M=\left(\frac{8-1}{2},\frac{6+5}{2}\right)$$
$$=\left(\frac{7}{2},\frac{11}{2}\right)$$

$$m_{RQ}=\frac{6-5}{8-(-1)}$$
$$=\frac{1}{9}$$
$$slope=-9$$

$$y=mx+b$$
$$\frac{11}{2}=-9\left(\frac{7}{2}\right)+b$$
$$\frac{11}{2}=\frac{-63}{2}+b$$
$$\frac{74}{2}=b$$
$$37=b$$

$$y=-9x+37$$

Find the point of intersection of the two right bisectors.

$$\frac{1}{9}x+\frac{2}{9}=-9x+37$$
$$\frac{1}{9}x+9x=37-\frac{2}{9}$$
$$\frac{1}{9}x+\frac{81}{9}x=\frac{333}{9}-\frac{5}{9}$$
$$\frac{82}{9}x=\frac{328}{9}$$
$$82x=328$$
$$x=4$$

$$sub\ \ x=4\ \ \text{int}\,o\ \ y=-9x+37$$
$$y=-9(4)+37$$
$$y=-36+37$$
$$y=1$$

The centre of the circle is at (4,1)