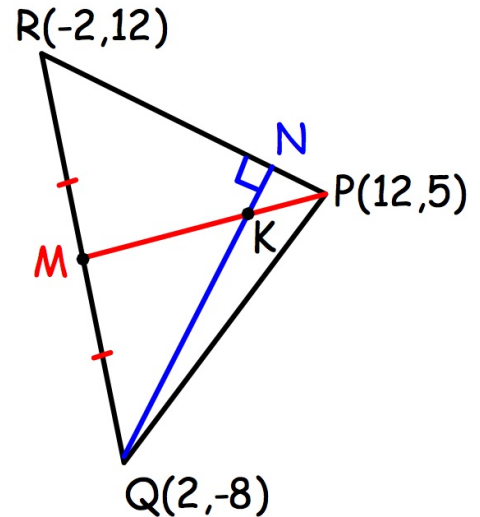
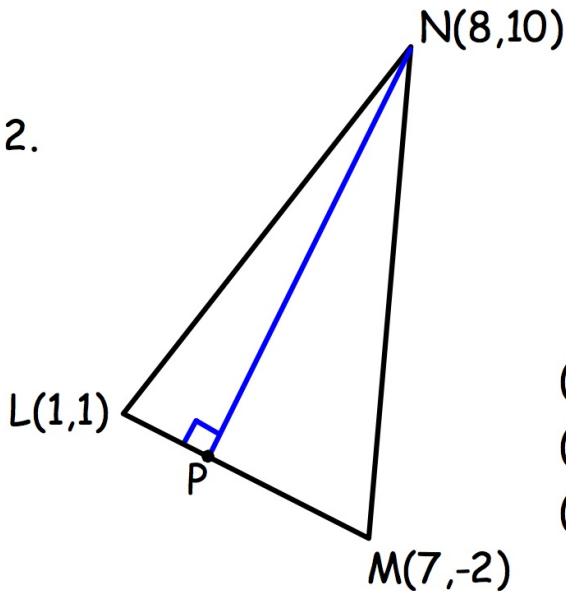


## LINES ASSOCIATED WITH TRIANGLES

1. (a) Find the equation of median  $PM$ .  
 (b) Find the equation of altitude  $QN$ .  
 (c) Find the point of intersection  $K$ .

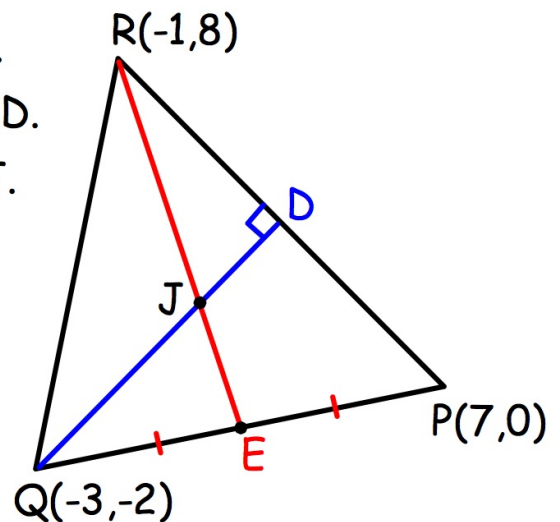


2.



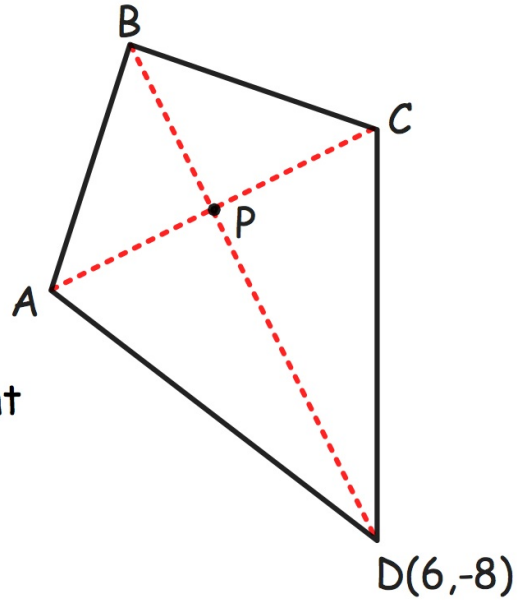
- (a) Find the equation of altitude  $PN$ .  
 (b) Find the equation of side  $LM$ .  
 (c) Find the coordinates of point  $P$ .

3. (a) Find the equation of median  $RE$ .  
 (b) Find the equation of altitude  $QD$ .  
 (c) Find the point of intersection  $J$ .



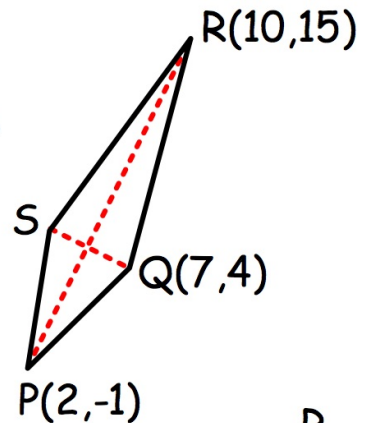
4. In  $\triangle ABC$ ,  $A$  is  $(2, -2)$ ,  $B$  is  $(-2, -3)$  and  $C$  is  $(-4, 4)$ .  
 Sketch the triangle including median  $AM$  and altitude  $BN$ 
  - (a) Find the equation of median  $AM$ .
  - (b) Find the equation of altitude  $BN$ .
  - (c) Find their point of intersection.

5. In  $\triangle ABC$ , A is (4,-8), B is (-9,2) and C is (11,6).  
 Sketch the triangle including median AP and altitude BQ
- Find the equation of median AP.
  - Find the equation of altitude BQ.
  - Find their point of intersection.

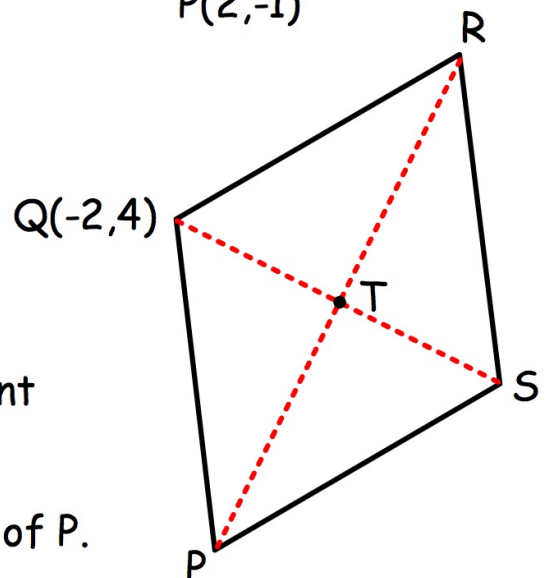


6. In kite ABCD,  
 diagonal AC has equation  $2y = x - 2$
- Find the equation of diagonal BD.
  - Find the coordinates of P, the point of intersection of the diagonals.

7. PQRS is a kite.
- Find the equations of diagonals PR and QS.
  - Find the coordinates of the point of intersection of the diagonals.
  - Find the coordinates of vertex S.



8. In rhombus PQRS,  
 diagonal PR has equation  $y = 2x - 2$
- Find the equation of diagonal QS.
  - Find the coordinates of T, the point of intersection of the diagonals.
  - If R is (5,8), find the coordinates of P.



## ANSWERS

1. (a)  $4y - x = 8$

(b)  $y - 2x = -12$

(c) K (8,4)

2. (a)  $y - 2x = -6$

(b)  $2y + x = 3$

(c) P (3,0)

3. (a)  $y + 3x = 5$

(b)  $y - x = 1$

(c) J (1,2)

4. (a)  $2y + x = -2$

(b)  $y - x = -1$

(c) (0,-1)

5. (a)  $y + 4x = 8$

(b)  $2y + x = -5$

(c) (3,-4)

6. (a)  $y + 2x = 4$

(b) P (2,0)

7. (a)  $y - 2x = -5$  ,  $2y + x = 15$

(b) (5,5)

(c) S (3,6)

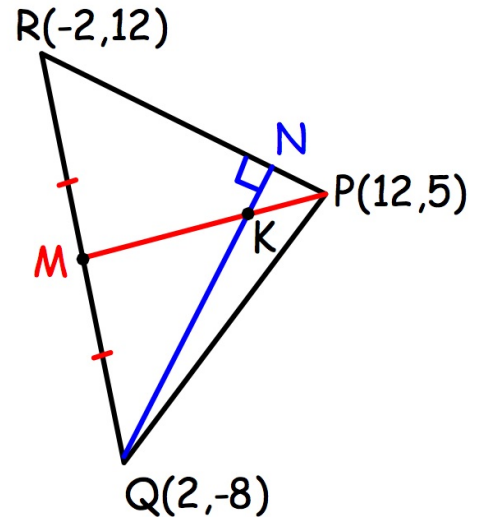
8. (a)  $2y + x = 6$

(b) T (2,2)

(c) P (-1,-4)

# SOLUTIONS

1. (a) Find the equation of median PM.  
 (b) Find the equation of altitude QN.  
 (c) Find the point of intersection K.



(a)  $M(0, 2) \quad P(12, 5)$

$$m_{PM} = \frac{5 - 2}{12 - 0} = \frac{3}{12} = \frac{1}{4}$$

$$\begin{aligned} P(a, b) \quad m_{PM} = 1/4 \quad y - b &= m(x - a) \\ P(12, 5) \quad m_{PM} = 1/4 \quad y - 5 &= 1/4(x - 12) \\ 4y - 20 &= x - 12 \\ \underline{\underline{4y - x = 8}} \end{aligned}$$

(b)  $m_{PR} = \frac{12 - 5}{-2 - 12} = \frac{7}{-14} = -\frac{1}{2}$

for perpendicular lines  $m_1 \times m_2 = -1$

$$m_{QN} = 2$$

$Q(a, b) \quad m_{QN} = 2$

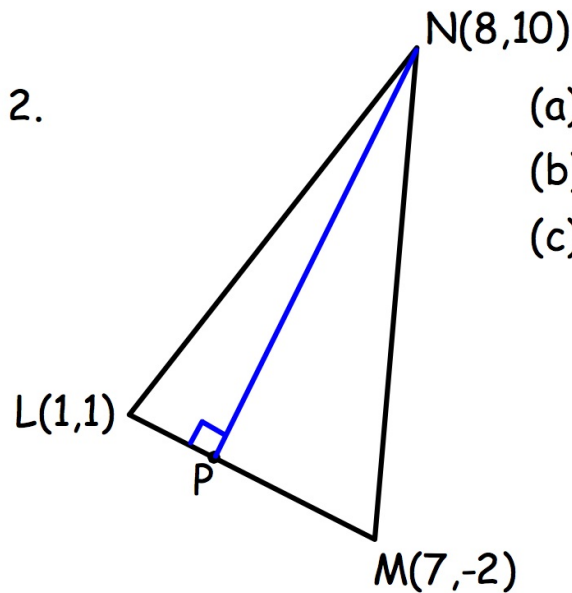
$$\begin{aligned} y - b &= m(x - a) \\ y - (-8) &= 2(x - 2) \\ y + 8 &= 2x - 4 \\ \underline{\underline{y - 2x = -12}} \end{aligned}$$

$$\begin{array}{r} \text{(c) PM} \quad 4y - x = 8 \quad \times 1 \\ \text{QN} \quad y - 2x = -12 \quad \times (-4) \\ \hline 4y - x = 8 \\ -4y + 8x = 48 \\ \hline \end{array}$$

$$\begin{array}{r} \text{ADD} \quad 7x = 56 \\ \quad \quad x = 8 \end{array}$$

$$\begin{array}{r} \text{PM} \quad 4y - x = 8 \\ \quad \quad 4y - 8 = 8 \\ \quad \quad 4y = 16 \\ \quad \quad y = 4 \end{array}$$

$$\underline{\underline{K(8, 4)}}$$



- (a) Find the equation of altitude PN.  
 (b) Find the equation of side LM.  
 (c) Find the coordinates of point P.

(a) 
$$m_{LM} = \frac{-2 - 1}{7 - 1} = \frac{-3}{6} = -\frac{1}{2}$$
 for perpendicular lines  $m_1 \times m_2 = -1$   

$$m_{PN} = 2$$

$$N(8, 10) \quad m_{PN} = 2$$

$$y - b = m(x - a)$$

$$y - 10 = 2(x - 8)$$

$$y - 10 = 2x - 16$$

$$\underline{\underline{y - 2x = -6}}$$

(b) 
$$L(1, 1) \quad m_{LM} = -\frac{1}{2}$$

$$y - b = m(x - a)$$

$$y - 1 = -\frac{1}{2}(x - 1)$$

$$2y - 2 = -1(x - 1)$$

$$2y - 2 = -x + 1$$

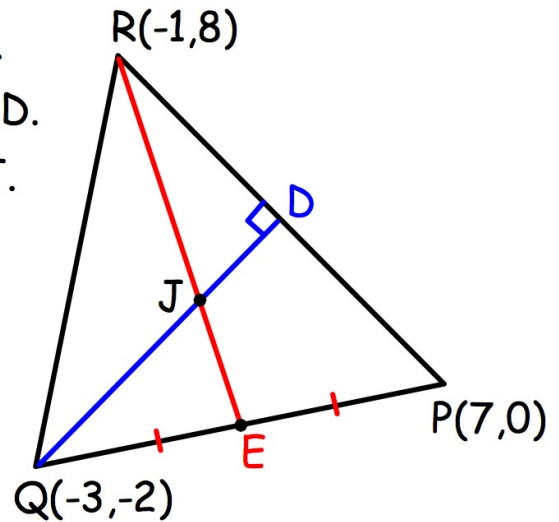
$$\underline{\underline{2y + x = 3}}$$

(c) 
$$\begin{array}{rcl} \text{PN} & y - 2x = -6 & \times 1 \\ \text{LM} & 2y + x = 3 & \times 2 \\ \hline & y - 2x = -6 & \\ & 4y + 2x = 6 & \\ \hline \text{ADD} & 5y & = 0 \\ & & y = 0 \end{array}$$

$$\begin{array}{rcl} \text{LM} & 2y + x = 3 \\ & 0 + x = 3 \\ & x = 3 \end{array}$$

$$\underline{\underline{P(3,0)}}$$

3. (a) Find the equation of median RE.  
 (b) Find the equation of altitude QD.  
 (c) Find the point of intersection J.



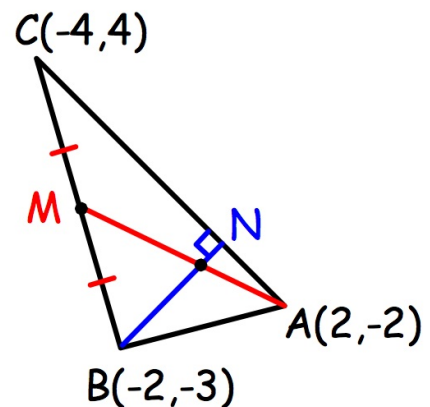
$$\begin{array}{rcl}
 \text{(a) RE} & y + 3x = 5 & \times 1 \\
 \text{(b) QD} & y - x = 1 & \times (-1) \\
 \hline
 & y + 3x = 5 \\
 & -y + x = -1 \\
 \hline
 \text{ADD} & 4x = 4 \\
 & x = 1
 \end{array}$$

$$\begin{array}{rcl}
 \text{QD} & y - x = 1 \\
 & y - 1 = 1 \\
 & y = 2
 \end{array}$$

(c) J (1,2)

4. In  $\triangle ABC$ , A is (2,-2), B is (-2,-3) and C is (-4,4).  
 Sketch the triangle including median AM and altitude BN

- (a) Find the equation of median AM.  
 (b) Find the equation of altitude BN.  
 (c) Find their point of intersection.



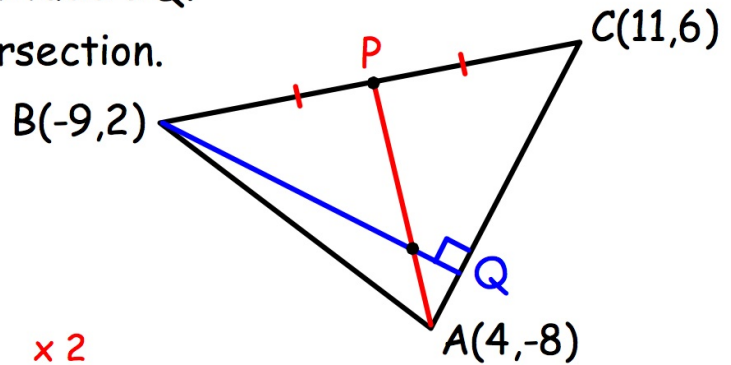
$$\begin{array}{rcl}
 \text{(a) AM} & 2y + x = -2 & \times (-1) \\
 \text{(b) BN} & y - x = -1 & \times 2 \\
 \hline
 \text{ADD} & 3y = -3 \\
 & y = -1
 \end{array}$$

$$\begin{array}{rcl}
 \text{BN} & y - x = -1 \\
 -1 - x = -1 & & \\
 x = 0 & &
 \end{array}$$

(c) (0,-1)

5. In  $\triangle ABC$ , A is (4,-8), B is (-9,2) and C is (11,6).  
 Sketch the triangle including median AP and altitude BQ

- (a) Find the equation of median AP.
- (b) Find the equation of altitude BQ.
- (c) Find their point of intersection.



(a)	AP	$y + 4x = 8$	$\times 2$
(b)	BQ	$2y + x = -5$	$\times (-1)$
		$2y + 8x = 16$	
		$-2y - x = 5$	
ADD		$7x = 21$	
		$x = 3$	

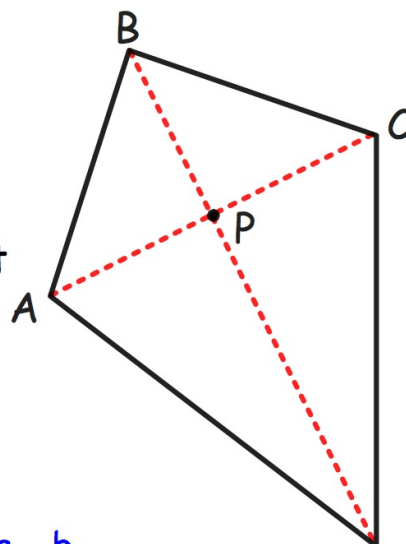
AP	$y + 4x = 8$
	$y + 12 = 8$
	$y = -4$

(c) (3,-4)

6. In kite ABCD,  
diagonal AC has equation  $2y = x - 2$

(a) Find the equation of diagonal BD.

(b) Find the coordinates of P, the point of intersection of the diagonals.



(a)  $2y = 1x - 2$

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

$$y = mx + c$$

$$m_{AC} = \frac{1}{2}$$

for perpendicular lines  $m_1 \times m_2 = -1$

$$m_{BD} = -2$$

$$D(a, b) \quad m_{BD} = -2 \quad D(6, -8)$$

$$y - b = m(x - a)$$

$$y - (-8) = -2(x - 6)$$

$$y + 8 = -2x + 12$$

$$\underline{\underline{y + 2x = 4}}$$

(b)	AC	$2y - x = -2$	$\times 1$
	BD	$y + 2x = 4$	$\times (-2)$

---


$$2y - x = -2$$

$$-2y - 4x = -8$$

---


$$\text{ADD} \quad -5x = -10$$

$$x = 2$$

$$\text{BD} \quad y + 2x = 4$$

$$y + 4 = 4$$

$$y = 0$$

$$\underline{\underline{P(2,0)}}$$

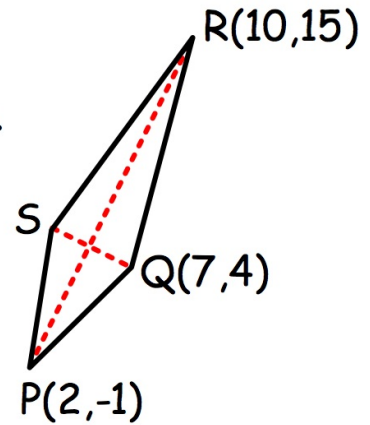


7. PQRS is a kite.

(a) Find the equations of diagonals PR and QS.

(b) Find the coordinates of the point of intersection of the diagonals.

(c) Find the coordinates of vertex S.



(a)  $P(2, -1) \quad R(10, 15)$

$R(10, 15) \quad m_{PR} = 2$

$$m_{PR} = \frac{-1 - 15}{2 - 10} = \frac{-16}{-8} = 2$$

$$y - b = m(x - a)$$

$$y - 15 = 2(x - 10)$$

$$y - 15 = 2x - 20$$

$$\underline{\underline{y - 2x = -5}}$$

$$m_{PR} = 2$$

$Q(7, 4) \quad m_{QS} = -1/2$

$$y - b = m(x - a)$$

$$y - 4 = -1/2(x - 7)$$

$$2y - 8 = -1(x - 7)$$

$$2y - 8 = -x + 7$$

$$\underline{\underline{2y + x = 15}}$$

for perpendicular lines  $m_1 \times m_2 = -1$

$$m_{QS} = -1/2$$

(b) PR  $y - 2x = -5$   $\times (-2)$   
 QS  $2y + x = 15$   $\times 1$

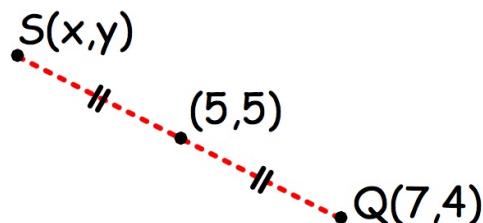
PR  $y - 2x = -5$   
 $y - 10 = -5$   
 $y = 5$

$$\underline{\underline{-2y + 4x = 10}}$$

$$\underline{\underline{2y + x = 15}}$$

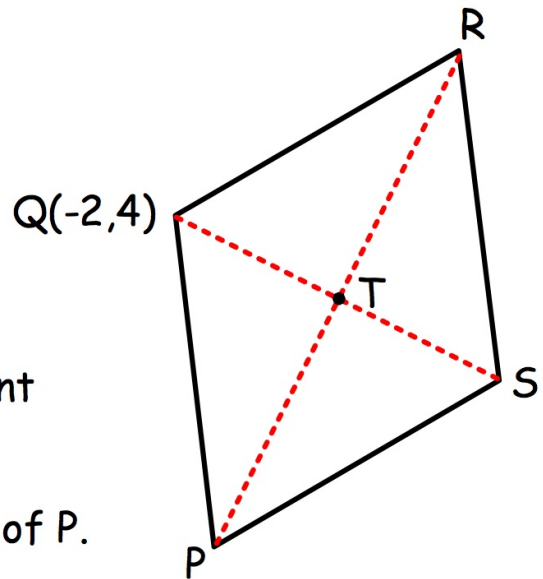
$$\underline{\underline{(5, 5)}}$$

ADD  $5x = 25$   
 $x = 5$



(c)  $S(3, 6)$

8. In rhombus PQRS,  
diagonal PR has equation  $y = 2x - 2$

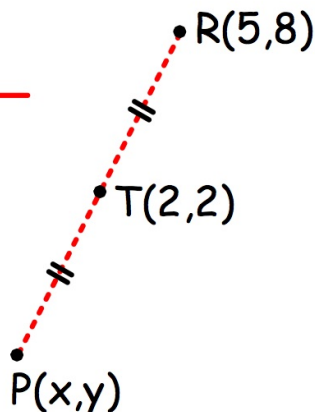


- (a) Find the equation of diagonal QS.  
 (b) Find the coordinates of T, the point of intersection of the diagonals.  
 (c) If R is (5,8), find the coordinates of P.

(a)	$y = 2x - 2$	$Q(-2, 4)$	$y - b = m(x - a)$
	$y = mx + c$	$m_{QS} = -1/2$	$y - 4 = -1/2(x - (-2))$
	$m_{PR} = 2$		$2y - 8 = -1(x + 2)$
			$2y - 8 = -x - 2$
			<u><u><math>2y + x = 6</math></u></u>

for perpendicular lines  $m_1 \times m_2 = -1$   
 $m_{QS} = -1/2$

(b)	PR	$y - 2x = -2$	$\times (-2)$	PR	$y - 2x = -2$
	QS	$2y + x = 6$	$\times 1$		$y - 4 = -2$
		<hr/>			$y = 2$
		$-2y + 4x = 4$			<u><u><math>T(2,2)</math></u></u>
		$2y + x = 6$			
		<hr/>			
	ADD	$5x = 10$			
		$x = 2$			



(c) P(-1, -4)