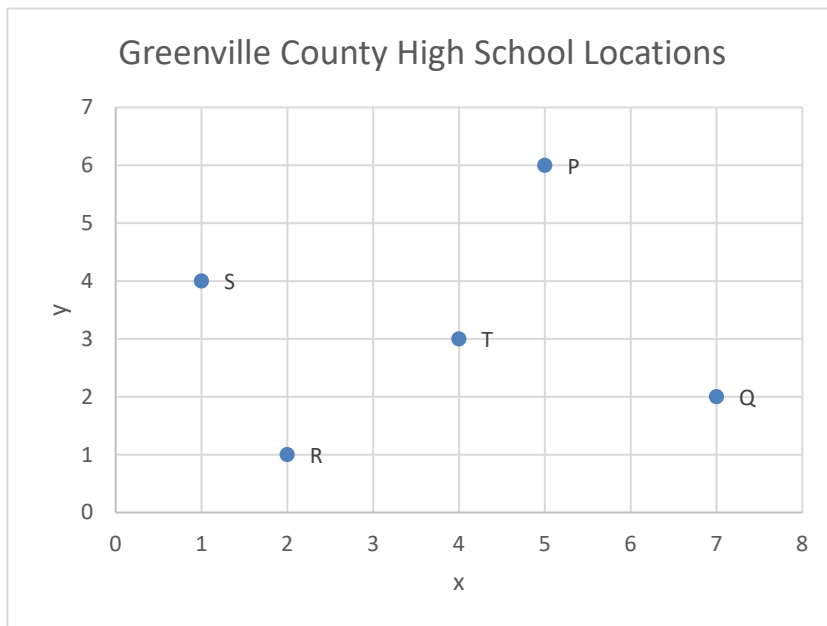


The County of Greenville is trying to build a new high school in Fountain Inn due to the increased population. They are trying to decide if the location they selected is optimal. The points  $P(5, 6)$ ,  $Q(7, 2)$ ,  $R(2, 1)$ , and  $S(1, 4)$  are the current high school locations and point  $T(4, 3)$  is the proposed site for the new high school. You can see the high schools on the axes below.

Horizontal scale: 1 unit represents 5 miles.

Vertical scale: 1 unit represents 5 miles.

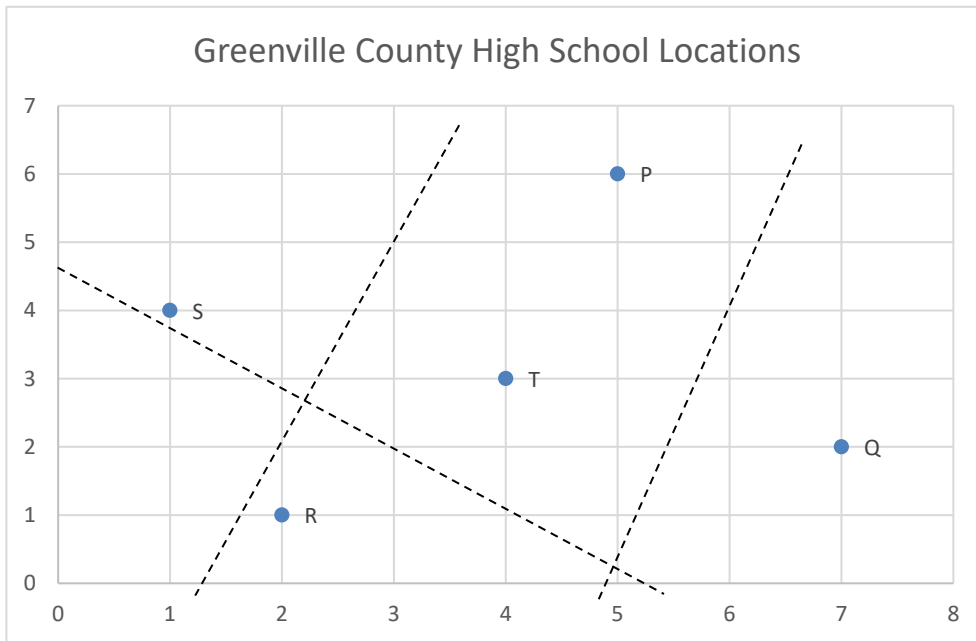


(a) Calculate the gradient of the line segment  $PT$ .

(2 marks)

(This problem continues on the next page.)

Using the high school locations, an unfinished Voronoi Diagram is below.



(b) Find the equation of the line which would complete the Voronoi Cell containing site T. Give your answer in the form  $ax + by + d = 0$  where  $a$ ,  $b$ , and  $d \in \mathbb{Z}$ .

(3 marks)

(c) Explain the importance of the Voronoi cell containing site T.

(1 mark)

Mark scheme:

$$(a) \frac{3-6}{4-5} \quad (M1)$$

$$= 3 \quad (A1)$$

$$(b) y - 5 = -\frac{1}{3}(x - 3)$$

*or*

$$y - 4 = -\frac{1}{3}(x - 6) \quad (M1)(A1)$$

(Award A1 for their  $-\frac{1}{3}$  seen, award M1 for the use of either point (3, 5) or (6, 4) and their normal gradient into the equation of the line)

$$x + 3y - 18 = 0 \quad (A1)$$

- (c) Since every other point in the cell is closer to point T, which means there is a greater population draw to that high school location than any other location in the county. (R1)