

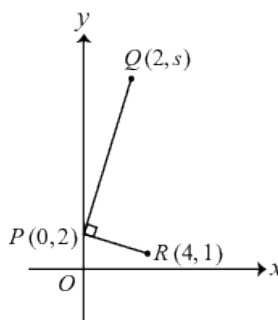


Grade 9/10 Math Circles

March 9, 2022

Analytic Geometry - Problem Set

1. (2018 Cayley, Question 8) For what value of k is the line through the points $(3, 2k + 1)$ and $(8, 4k - 5)$ parallel to the x -axis?
2. (2019 Cayley, Question 15) In the diagram below, the line segments PQ and PR are perpendicular. What is the value of s ?



3. Determine the values of a and b so that the lines $y = 3ax - b$ and $y = -2x + a$ intersect at $(1, 1)$.
4. We have a cheese cube of side length 10. An ant begins in one of the bottom corners, and walks diagonally across one of the side faces to its centre. The ant then burrows into the cheese on a diagonal trajectory until it pops out at the centre of the top face. How far was the ant's total journey on this path?
5. Given the triangle formed by the points $A(a, 0)$, $B(0, b)$, and $C(0, 0)$, show that the triangle formed by the midpoints of the sides of $\triangle ABC$ is one quarter the area of $\triangle ABC$.
6. Two radio towers are spread some distance, d , apart. One tower is 20 metres tall and the other is 15 metres tall. A rope is strung from the top of each tower to the bottom of the other tower. The ropes cross somewhere between the two towers. What height above the ground do the ropes meet?
7. A point A is chosen on the line $y = x + 5$ and a point B is chosen on $y = -2x + 1$. If the midpoint M of the line segment AB is $(3, 0)$, determine the coordinates of A and B .
8. A vertical line divides the triangle with vertices $A(0, 0)$, $B(4, 0)$ and $C(8, 4)$ into two regions of equal area. Find the equation of the line using analytic geometry.