

The two lines with equations  $ax + 8y = 10$  and  $ax - 2y = 5$  ( $a \geq 0$ ) are perpendicular. Find  $a$ .

*Since the lines are perpendicular, the slopes are opposite reciprocals.*

$ax + 8y = 10$  has slope  $= -\frac{a}{8}$ ;  $ax - 2y = 5$  has slope  $= \frac{a}{2}$

$$\text{so } -\frac{a}{8} = -\frac{2}{a}$$

$$a^2 = 16$$

Since  $a \geq 0$ ,  $a = 4$ .

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Let  $f(x) = x^2$ . For positive numbers  $a$  and  $b$ , let  $P(a, b)$  be the y-intercept of the line through  $(a, f(a))$  and  $(-b, f(-b))$ . Find  $P(4, 6) + P(3, 5)$ .

*$P(4, 6)$  equals the y - intercept of the line through  $(4, 16)$  and  $(-6, 36)$ .*

*The slope of this line is  $-2$  and the y - intercept is  $24$ .*

*$P(3, 5)$  equals the y - intercept of the line through  $(3, 9)$  and  $(-5, 25)$ .*

*The slope of this line is  $-2$  and the y - intercept is  $15$ .*

*So,  $P(4, 6) + P(3, 5) = 39$ .*