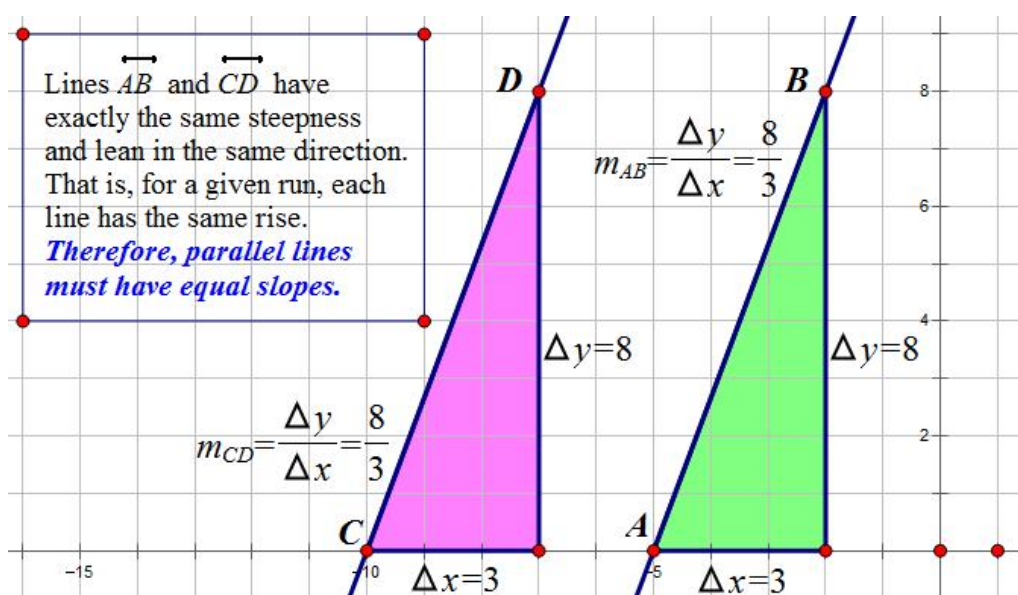
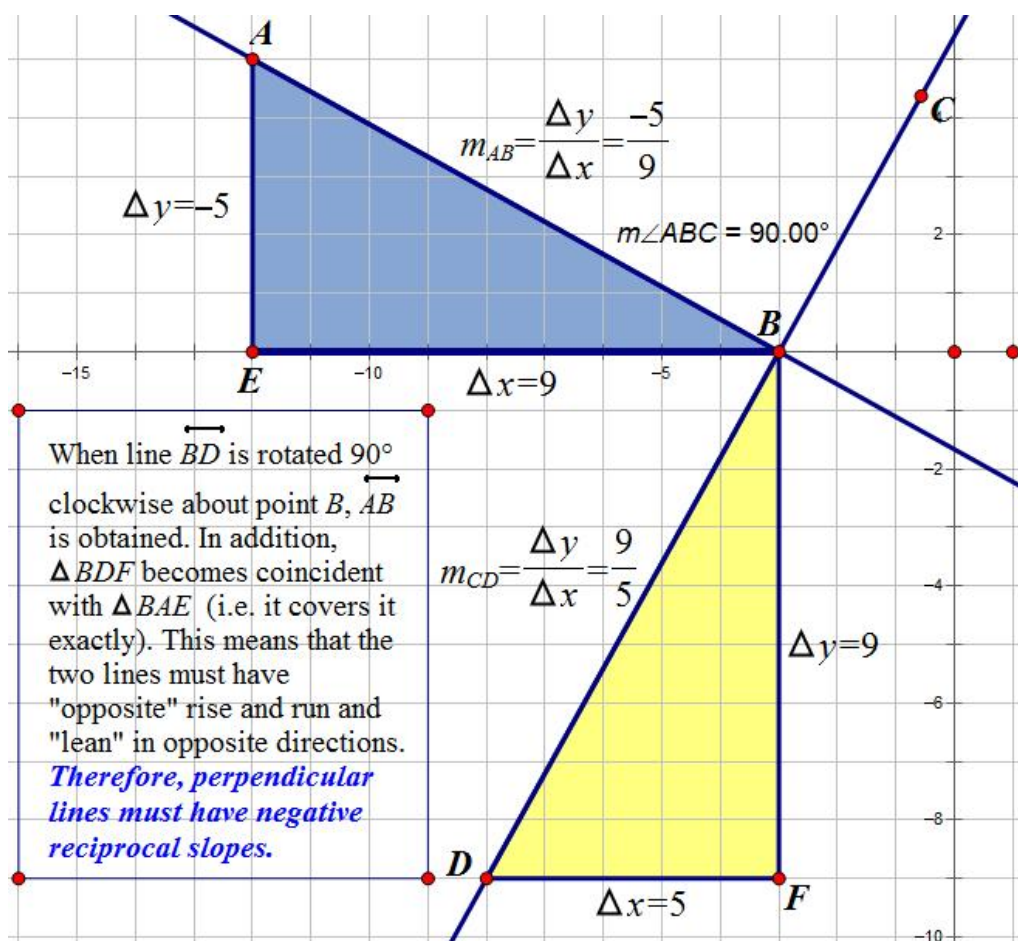


## PROBLEMS: PARALLEL AND PERPENDICULAR LINES

### Key Ideas

- **Parallel lines** have **equal slopes** because
  - they have the same steepness
  - they lean in the same direction
  - they change at the same rate
  - for a given run, the lines will have the same rise
- **Perpendicular lines** have **negative reciprocal slopes** because
  - they lean in opposite directions
  - one increases and the other decreases
  - if one of the lines has a slope of  $\Delta y / \Delta x$ , the other's is  $-\Delta x / \Delta y$



### Problems

1. A line is parallel to the line  $3x + y - 1 = 0$  and passes through the point with co-ordinates  $(-1, 2)$ . Find the equation of the line in standard form.
2. A line is perpendicular to the line  $3x + y - 1 = 0$  and passes through the point with co-ordinates  $(-1, 2)$ . Find the equation of the line in standard form.
3. A line is parallel to the  $x$ -axis and passes through the point with co-ordinates  $(-1, 2)$ . Find the equation of the line.
4. A line is perpendicular to the  $x$ -axis and passes through the point with co-ordinates  $(-1, 2)$ . Find the equation of the line.
5. A line is perpendicular to the line  $7x + 6y - 42 = 0$  and has the same  $x$ -intercept as the line  $y = -\frac{2}{3}x + 5$ . Find the equation of the line in standard form.
6. A line is both perpendicular to and has the same  $x$ -intercept as  $7x + 6y - 42 = 0$ . Find the equation of the line in standard form.
7. A line is perpendicular to  $9x - 5y - 45 = 0$  and passes through the point of intersection of the lines  $y = -\frac{2}{3}x + 5$  and  $y = \frac{5}{3}x - 6$ . Find the equation of the line in standard form.
8. A line is parallel to  $9x - 5y - 45 = 0$  and passes through the point whose  $x$ -co-ordinate equals the  $y$ -intercept of  $y = -\frac{2}{3}x + 5$  and whose  $y$ -co-ordinate equals the  $x$ -intercept of  $y = \frac{5}{3}x - 6$ . Find the equation of the line in standard form.
9. Because they are so fascinated with René Descartes, Grishma and Nistha take a stroll along the Cartesian plane. Grishma walks along the line  $9x - 5y - 45 = 0$  and Nistha walks along a line perpendicular to  $9x - 5y - 45 = 0$  and passing through the point  $(-1, -2)$ . If Grishma starts at the  $x$ -intercept of  $9x - 5y - 45 = 0$ , Nistha starts at the point  $(-1, -2)$  and they both walk at the same speed heading toward the point of intersection of the lines, will they collide? If not, what should be the ratio of their speeds to ensure that they do collide?

### Answers

1.  $3x + y + 1 = 0$
2.  $x - 3y + 7 = 0$
3.  $y = 2$
4.  $x = -1$
5.  $6x - 7y - 45 = 0$
6.  $6x - 7y - 36 = 0$
7.  $35x + 63y - 282 = 0$
8.  $9x - 5y - 27 = 0$
9. They do not collide because Grishma starts farther from the point of intersection than Nishtha. To ensure a collision, Grishma must move  $\frac{\sqrt{61056}}{\sqrt{51304}} \doteq 1.09$  times faster than Nishtha.