Maths Week 2: FAQ
Mathematics for Data Science - 1

- **Section formula** :
  If a point P $(x, y)$ **internally** cuts the line segment AB, which connects two points A ($x_1$,$y_1$) and B ($x_2$,$y_2$) in a ratio $m : n$, then the value of $x$ and $y$ will be

$$x = \frac{mx_2 + nx_1}{m + n}$$

$$y = \frac{my_2 + ny_1}{m + n}$$

  If we take coordinate of A to be ($x_2$,$y_2$) and coordinate of B to be ($x_1$,$y_1$), then the value of $x$ and $y$ will be

$$x = \frac{mx_1 + nx_2}{m + n}$$

$$y = \frac{my_1 + ny_2}{m + n}$$

1. **Activity Question 3.3** If the origin cuts the line segment P(-2, -4), Q $(6, k)$ in the ratio $1 : 3$, then the value of $k$ is ?
   a Cannot be determined
   b 0
   c 12
   d 18
   **Solution:**
   Taking coordinates of P to be ($x_1$,$y_1$) and coordinates of Q to be ($x_2$,$y_2$) and using the section formula

$$y = \frac{my_1 + ny_2}{m + n}$$

   we get ,

$$0 = \frac{1 \times k + 3 \times (-4)}{1 + 3}$$

   or, we get,

$$k = 12$$

2. **Activity Question 5.4** Through which of the following points do lines of slope 0 pass?
   a (0, 0)
   b (-100, 0.5)
   c (-0.05, 0)
   d (0, 4)
   **Solution:**
   In a Cartesian plane, infinite number of lines pass through any point. The equation of a line parallel to X-axis and passing through a point $(m, n)$ will be $y = n$.This line will have slope 0. Hence all the points in a Cartesian plane exist on some line which is parallel to the X-axis. Hence all options are correct.

3. **Activity Question 8.4** Choose the correct answers.
   $y = 2x - 8$ is the equation of a line in slope intercept form where -8 is the Y-intercept.
   $y = 0$ is the equation of a line passing through the origin.
   $y = 2x - 8$ does not meet the origin and the X-axis.
   $y = -2(x + 1)$ is the equation of a line in intercept form.
   **Solution:**
   To find the Y-intercept, put $x = 0$ in the equation $y = 2x - 8$ , from here we can calculate the Y-intercept to be -8.
   The Y-coordinate is constant and is equal to 0 for the given equation and only X-coordinate is variable. Hence this equation represents the X-axis.
   The point $(0, 0)$ does not satisfy the equation $y = 2x - 8$. So it does not pass through the origin.
   As the given line is not in the intercept form i.e. $\frac{x}{a} + \frac{y}{b} = 1$ form, this option is incorrect.

4. **Practice assignment, question 7**
   A plane begins to land when it is at a height of 1500 metre above the ground. It follows a straight line path and lands at a point which is at a horizontal distance of 2700 metre away. There are two towers which are at horizontal distances of 900 metre and 1800 metre away in the same direction as the landing point. Choose the correct option(s) regarding the plane's trajectory and safe landing.

   - The trajectory of the path could be $\frac{y}{27} + \frac{x}{15} = 100$ if x axis and y axis are horizontal and vertical respectively.
   - The maximum safe height of the towers are 1000 metre and 1500 metre respectively.
   - The trajectory of the path could be $\frac{y}{15} + \frac{x}{27} = 100$ if x axis and y axis are horizontal and vertical respectively.
   - The maximum safe height of the towers are 1500 metre and 500 metre respectively.
   - The maximum safe height of the towers are 1000 metre and 500 metre respectively.
   - None of the above.

   **Solution :**
   **Doubt : what is meant by safe height here?**

   At 900 m horizontal distance, the maximum height for safe flight is calculated to be 1000 m. This is the limiting value, such that the plane can just pass without touching the building. Similarly for 1800 m, maximum safe height is calculated to be 500 m.
   Also the X-coordinate of the point from where the plane begins to land when it is at a

height of 1500 metre above the ground is assumed to be 0 for help in calculation. Hence its coordinate will be (0, 1500).

5. **How does the equation of a straight line change when we take the mirror image of a straight line with respect to the X-axis, Y-axis and the straight line $y = -x$ ?**
**Solution :**
The corresponding lines and mirror images are shown below :