# Problem 1.5.6

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# Problem Statement

The point which divides the line segment joining the points $(7, -6)$ and $(3, 4)$ in the ratio $1 : 2$ is ....

| **Variable** | **Description** |
|---|---|
| $x$ | x coordinate of P |
| $y$ | y coordinate of P |

Table: Variables given

# Section Formula

Formula:

$$\mathbf{P} = \frac{k(\mathbf{B}) + (\mathbf{A})}{k+1} \tag{3.1}$$

Where:

'k' is the ratio in which the point divides the line segment

$$\mathbf{A} = \begin{pmatrix} 7 \\ -6 \end{pmatrix} \qquad \mathbf{B} = \begin{pmatrix} 3 \\ 4 \end{pmatrix} \tag{3.2}$$

# Obtaining $k$ Value

According to the problem , The point **P** divides the line segment joining **A** and **B** in the ratio $1 : 2$

Hence , k=2

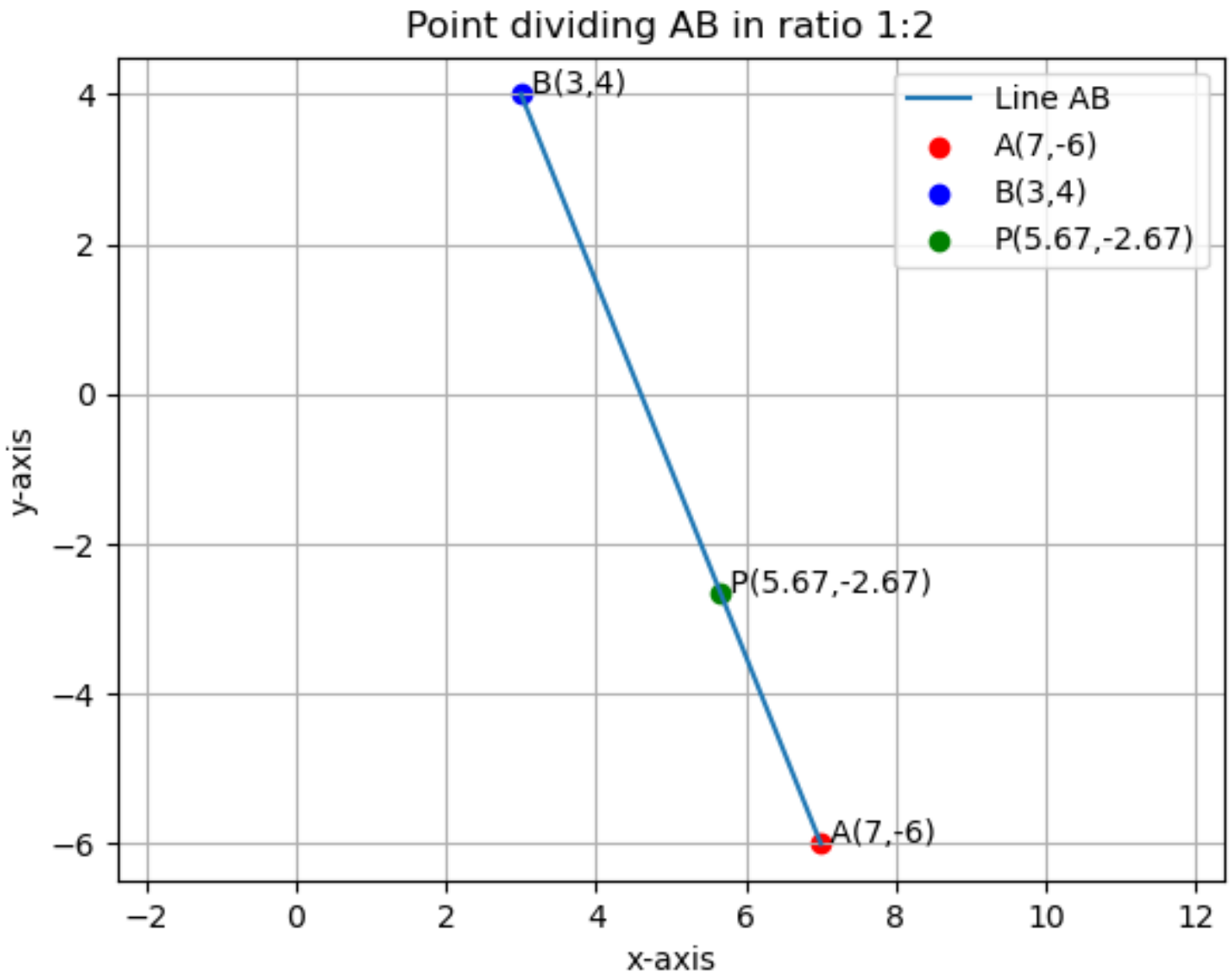
# Obtaining Point

$$\mathbf{P} = \frac{2\mathbf{B} + \mathbf{A}}{3} = \frac{2\begin{pmatrix} 7 \\ -6 \end{pmatrix} + \begin{pmatrix} 3 \\ 4 \end{pmatrix}}{3} = \frac{\begin{pmatrix} 17 \\ -8 \end{pmatrix}}{3} \tag{3.3}$$

$$\mathbf{P} = \begin{pmatrix} \frac{17}{3} \\ \frac{-8}{3} \end{pmatrix} \tag{3.4}$$

Hence the coordinates of $\mathbf{P}$ are $\left(\frac{17}{3}, \frac{-8}{3}\right)$

# Plot


Point dividing AB in ratio 1:2
B(3,4)
P(5.67,-2.67)
A(7,-6)
Line AB
A(7,-6)
B(3,4)
P(5.67,-2.67)
y-axis
x-axis
4
2
0
−2
−4
−6
−2
0
2
4
6
8
10
12

# C Code for generating points on line

```c
   #include <stdio.h>

//Store the given values as global constants
const int Ax = 7, Ay = -6;
 const int bx = 3 , By =4 ;
 const int m =1,n=2;

 // Function to compute the dividing point
 void get_dividing_point(float *Px, float *Py)
 {
 *Px=(n*Ax + m*Bx)/(float)(m+n);
 *Py=(n*Ay + m*By)/(float)(m+n);
 }

 //Function to print stored values
```

# C Code for generating points on line

```
        void print_values()
 {
 printf("Point A = (%d,%d)\n",Ax,Ay);
printf("Point B = (%d,%d)\n",Bx,By);
printf("Ratio m;n = %d:%d\n",m,n);
 }
```

# Python Code for Plotting

```
import sys
import math
sys.path.insert(0, '/home/darisy-sreetej/Downloads/codes/CoordGeo
    ')

import numpy as np
import numpy.linalg as LA
import matplotlib.pyplot as plt
import matplotlib.image as mpimg

# local imports
from line.funcs import *
from triangle.funcs import *

# Points A and B
A = np.array([7, -6])
B = np.array([3, 4])
```

# Python Code for Plotting

```
# Ratio m:n = 1:2
m, n = 1, 2

# Section formula in vector form: P = (nA + mB) / (m+n)
P = (n*A + m*B) / (m+n)

# Generate line coordinates for plotting
line_AB = line_gen(A, B)

# Plotting
plt.plot(line_AB[0,:], line_AB[1,:], label="Line AB") # Line AB
plt.scatter(A[0], A[1], color='red', label='A(7,-6)')
plt.scatter(B[0], B[1], color='blue', label='B(3,4)')
plt.scatter(P[0], P[1], color='green', label=f'P({P[0]:.2f},{P
    [1]:.2f})')

# Add text labels
plt.text(A[0], A[1], ' A(7,-6)', fontsize=10)
```

# Python Code for Plotting

```
plt.text(B[0], B[1], ' B(3,4)', fontsize=10)
plt.text(P[0], P[1], f' P({P[0]:.2f},{P[1]:.2f})', fontsize=10)

# Formatting
plt.xlabel('x-axis')
plt.ylabel('y-axis')
plt.legend()
plt.grid(True)
plt.axis('equal')
plt.title("Point dividing AB in ratio 1:2")
plt.savefig("../figs/plot.png")
plt.show()
```