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Exercise 1.1

$Q_E = 20 - 2P$ ; $Q_M = 10 - P$

a) if private: $SMB = Q_E + Q_M = 30 - 3P$.

$\Rightarrow P = \frac{10 - \frac{1}{3}Q}{}$

b) If public:

. $Q_E = 20 - 2P \Rightarrow P_E = 10 - \frac{1}{2}Q$.

. $Q_M = 10 - P \Rightarrow P_M = 10 - Q$.

$SMB = P_E + P_M = 10 - \frac{1}{2}Q + 10 - Q$.

$= 20 - \frac{3}{2}Q$.

Exercise 1.2

$Q_E = 44 - 4P$ ; $Q_J = 12 - 3P$.

a) If smartphones are private: $SMB = Q_E + Q_J$

$Q = 44 - 4P + 12 - 3P = 56 - 7P$

$\Rightarrow P_{Soviet} = 8 - \frac{1}{7}Q$

b) If smartphones are public.

$Q_E = 44 - 4P \Rightarrow P_E = 11 - \frac{1}{4}Q$.

$Q_J = 12 - 3P \Rightarrow P_J = 4 - \frac{1}{3}Q$.

$SMB = P_E + P_M = 11 - \frac{1}{4}Q + 4 - \frac{1}{3}Q = 15 - \frac{7}{12}Q$

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Exercise 2.1 bridge = public good ; MC = 3.

. Group 1 $Q = 20 - 4P \Rightarrow P = 5 - \frac{1}{4}Q$.

10 people $\Rightarrow P = 50 - 2.5Q$.

. Group 2 $Q = 18 - 2P \Rightarrow P = 9 - \frac{1}{2}Q$.

5 people $\Rightarrow P = 45 - \frac{5}{2}Q$.

. Entire Social Demand Curve.

$50 - 2Q + 45 - \frac{5}{2}Q = 95 - \frac{9}{2}Q$.

. Social optimum.

$SMB = MC \Leftrightarrow 95 - 5Q = 3$

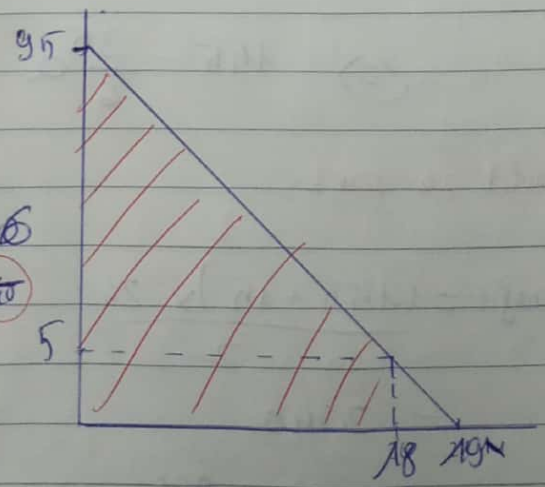
$\Rightarrow Q = 18.4$

. Build 18 bridges

Benefit $= \frac{(95+5) \times 18}{2} = 900$

Cost $= 3 \times 18 = 54$

$\Rightarrow$ Social surplus $= 900 - 54 = 846$

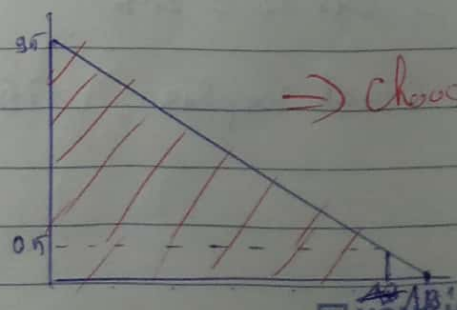



. Build 19 bridges.

Benefit $= \frac{(95+5) \times 19}{2} = 902.5$

Cost $= 3 \times 19 = 57$

$\Rightarrow$ Surplus $= 902.5 - 57 = 845.5$




$\Rightarrow$ Choose 18 bridges

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Exercise 2.2 parks = public good.; MC = 12.

. Group 1: 15 residents:

$$Q_1 = 30 - 6P \Rightarrow P = 5 - \frac{1}{6}Q$$

$$P_{total_1} = 75 - \frac{15}{6}Q = 75 - 2.5Q$$

. Group 2: 10 res

$$Q_2 = 24 - 3P \Rightarrow P = 8 - \frac{1}{3}Q.$$

$$P_{total_2} = 80 - \frac{10}{3}Q$$

. Entire social demand curve $= P_{t1} + P_{t2}$.

$$= 75 - 2.5Q + 80 - \frac{10}{3}Q = 155 - \frac{35}{6}Q$$

Social optimum: SMB = MC

$$\Leftrightarrow 155 - \frac{35}{6}Q = 12 \Rightarrow Q = 24.51$$

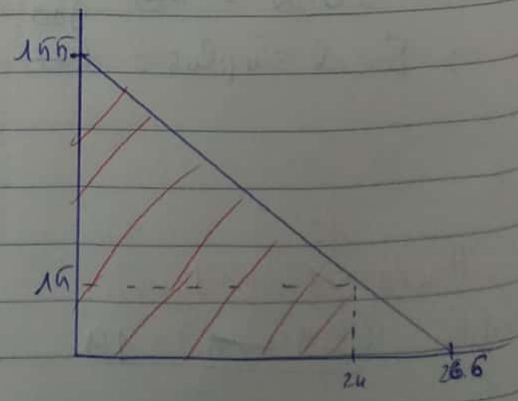
Build 24 parks

$$\text{Benefit} = \frac{(155 + 15) \times 24}{2}$$

$$= 2040$$

Cost $= 24 \times 12 = 288$.

=> Social surplus = 1752

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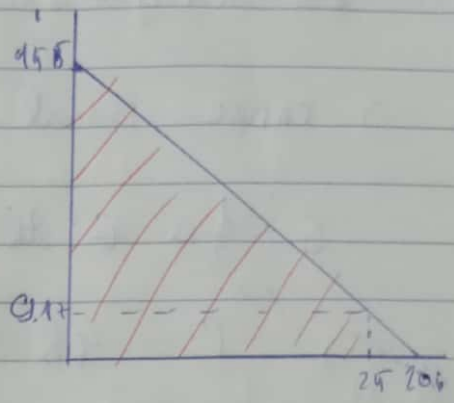
Build 25 parks

benefit = $\frac{(45.5 + 9.17) \times 25}{2} = 2052.13$




cost = $12 \times 25 = 300$

=) Social surplus = 2052.13 - 300
= 1752.13

=> choose 25 parks

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Exercise 3.1

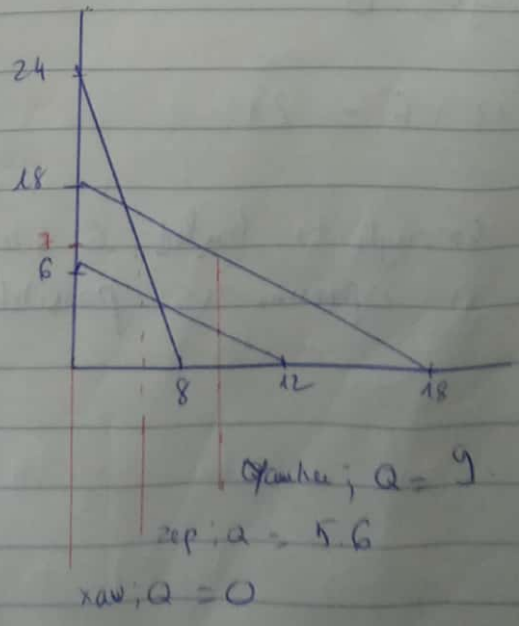
$Q_x = 12 - 2P \Rightarrow P_x = 6 - \frac{1}{2}Q$

$Q_y = 18 - P \Rightarrow P_y = 18 - Q$

$Q_2 = 8 - \frac{1}{3}P \Rightarrow P_2 = 24 - 3Q$

$MC = 21$

a) $x = y = z = \frac{MC}{3} = 7$




=) Government will choose to build 9 bike paths.

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b) ~~6 +~~ $x + y + z = 21$.

$\Rightarrow$ entire Social Demand Curve

$$6 - \frac{1}{2}Q + 18 - Q + 24 - 3Q$$

$$\Leftrightarrow P = 48 - \frac{9}{2}Q = SMB$$

. Social optimum. SMB = SMC.

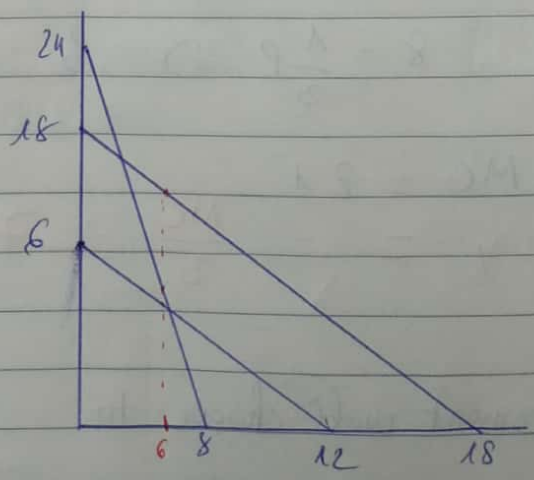
$$48 - \frac{9}{2}Q = 21 \Rightarrow Q = 6.$$

↳ optimal bike paths for government

at $Q = 6$;

Xavier pays 3
Yank pays 12
Zep pays 6

$3 + 12 + 6 = 21$.




$\Rightarrow$ enough to build 6 bike paths
$\Rightarrow$ optimum is possible

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Exercise 3.2

$Q_A = 17 - 3P \Rightarrow P_A = \frac{17}{3} - \frac{1}{3}Q$.

$Q_B = 24 - 2P \Rightarrow P_B = 12 - \frac{1}{2}Q$

$Q_C = 8 - \frac{1}{2}P \Rightarrow P_C = 16 - 2Q$

$MC = 24$

a) Tax evenly

$a = b = c = \frac{MC}{3} = 8$.

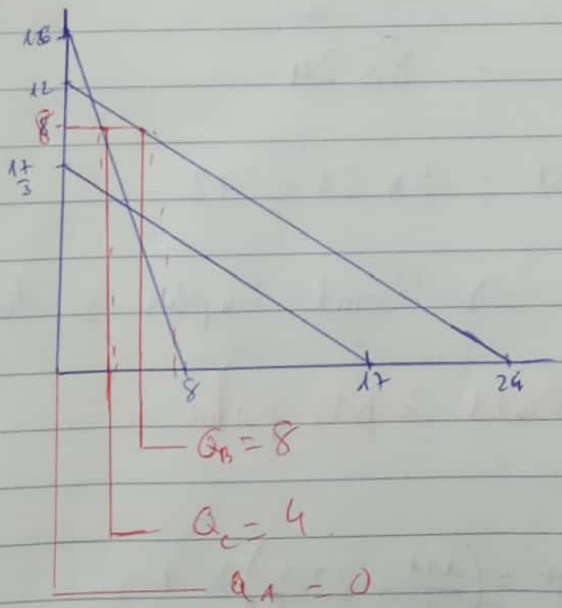
at $P = 8$.

$Q_A = 0$;

$Q_B = 8$

$Q_C = 4$

$\Rightarrow$ Goverment will build 8 bike paths




b) $a + b + c = 24$

- Entire Social Demand Curve

$\frac{17}{3} - \frac{1}{3}Q + 12 - \frac{1}{2}Q + 16 - 2Q$

$\Rightarrow P = \frac{101}{3} - \frac{17}{6}Q = SMB$

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. Soaal optimum

$SMB = SMC$

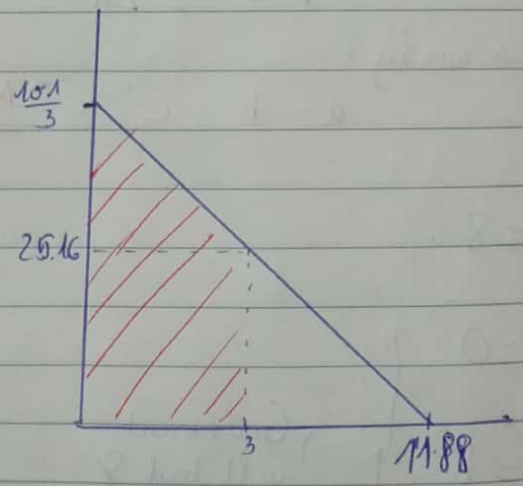
$\Leftrightarrow \frac{101}{3} - \frac{17}{6}Q = 24.$

$\Rightarrow Q = 3.41$

. Build 3 bike paths.

$$\text{Benefit} = \frac{\left(\frac{101}{3} + 25.16\right) \times 3}{2}$$

$= 88.24$



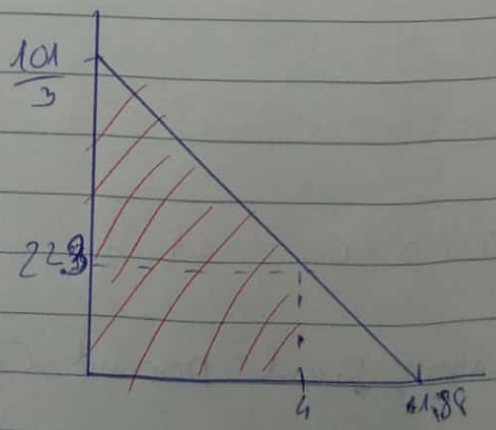

Cost $= 3 \times 24 = 72$

$\Rightarrow$ Social surplus $= 16.24$

. Build 4 bike paths

$$\text{Benefit} = \frac{\left(\frac{101}{3} + 22.3\right) \times 4}{2}$$

$= 111.9.$




Cost $= 4 \times 24 = 96$

$\Rightarrow$ Soaal surplus $= 15.9.$

$\Rightarrow$ Build 3 paths.

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at $Q = 3$

A will pay: $\frac{14}{3} = 4.7$

B will pay 10.5

C will pay 10.

$4.7 + 10.5 + 10 > 24$

$\Rightarrow$ Government can build 3 patths

Social optimum is possible