a. Jaccard's coefficient $J(1,7)$ vs $J(1,6)$

$\Gamma(1)=\{2,3,4,5\}$ $\Gamma(6)=\{3,4,7\}$ $\Gamma(7)=\{4,5,6,8\}$

$$J(1,7)=\frac{|\Gamma(1)\cap\Gamma(7)|}{|\Gamma(1)\cup\Gamma(7)|}=\frac{|\{4,5\}|}{|\{2,3,4,5,6,8\}|}=\frac{2}{6}=\frac{1}{3}$$

$$J(1,6)=\frac{|\Gamma(1)\cap\Gamma(6)|}{|\Gamma(1)\cup\Gamma(6)|}=\frac{|\{3,4\}|}{|\{2,3,4,5,7\}|}=\frac{2}{5}$$

$J(1,7)<J(1,6)\Rightarrow(1,6)$ is more likely to form a link

b. Adamic/Adar $A(1,7)$ vs $A(1,6)$

$\Gamma(1)\cap\Gamma(7)=\{4,5\}$ $\Gamma(1)\cap\Gamma(6)=\{3,4\}$

$|\Gamma(3)|=|\{1,2,4,5,6\}|=5$ $|\Gamma(4)|=|\{1,2,3,6,7\}|=5$ $|\Gamma(5)|=|\{1,3,7\}|=3$

$$A(1,7)=\sum_{z\in\{4,5\}}\frac{1}{\log|\Gamma(z)|}=\frac{1}{\log 5}+\frac{1}{\log 3}=1.431+2.096=3.527$$

$$A(1,6)=\sum_{z\in\{3,4\}}\frac{1}{\log|\Gamma(z)|}=\frac{1}{\log 5}+\frac{1}{\log 5}=\frac{2}{\log 5}=2.861$$

$A(1,7)>A(1,6)\Rightarrow(1,7)$ is more likely to form a link

c. Preferential attachment $P(1,7)$ vs $P(1,6)$

$P(1,7)=|\Gamma(1)|\cdot|\Gamma(7)|=4\cdot4=16$

$P(1,6)=|\Gamma(1)|\cdot|\Gamma(6)|=4\cdot3=12$

$P(1,7)>P(1,6)\Rightarrow(1,7)$ is more likely to form a link

d. Katz $K(1,7)$ vs $K(1,6)$ $\beta=0.05$

$$\sum_{\ell=1}^{\infty}\beta^{\ell}\cdot|paths_{x,y}^{\langle\ell\rangle}|=\sum_{\ell=1}^{3}0.05^{\ell}\cdot|paths_{x\to y}^{\langle\ell\rangle}|$$ using $\ell\to3$

$K(1,7)=0.05^1\cdot0+0.05^2\cdot2+0.05^3\cdot5=0.005625$

$K(1,6)=0.05^1\cdot0+0.05^2\cdot2+0.05^3\cdot7=0.005875$

$K(1,7)<K(1,6)\Rightarrow(1,6)$ is more likely to form a link

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e. SimRank with $C=1$ $S(1,7)$ vs $S(1,6)$

$S_0(a,b)=\begin{cases}0 & \text{if } a\neq b\\ 1 & \text{if } a=b\end{cases}$ $\quad S_{k+1}(a,b)=\frac{C}{|\Gamma(a)|\cdot|\Gamma(b)|}\cdot\sum_{i\in\Gamma(a)}\sum_{j\in\Gamma(b)}S(i,j)$

$|\Gamma(1)|=|\{2,3,4,5\}|=4$ $|\Gamma(6)|=|\{3,4,7\}|=3$ $|\Gamma(7)|=|\{4,5,6,8\}|=4$

$$S_0(1,7)=0\rightarrow S_1(1,7)=\frac{1}{4\cdot4}\cdot\sum_{i\in\Gamma(1)}\sum_{j\in\Gamma(7)}S(i,j)=\frac{1}{4\cdot4}(1+1)=\frac{2}{16}=\frac{1}{8}$$

$$S_0(1,6)=0\rightarrow S_1(1,6)=\frac{1}{4\cdot3}\cdot\sum_{i\in\Gamma(1)}\sum_{j\in\Gamma(6)}S(i,j)=\frac{1}{12}\cdot(1+1)=\frac{2}{12}=\frac{1}{6}$$

$S(1,7)<S(1,6)\Rightarrow(1,6)$ is more likely to form a link.