

Sam Hopkins  
HW 15.

$$1) \quad M_1 = 20 \times 5 \quad M_2 = 5 \times 10 \quad M_3 = 10 \times 12 \quad M_4 = 12 \times 6 \quad M_5 = 6 \times 25$$

Level 1:

$$M_1 \times M_2 = 20 \times 5 \times 10 = 1000$$

$$M_2 \times M_3 = 5 \times 10 \times 12 = 600$$

$$M_3 \times M_4 = 10 \times 12 \times 6 = 720$$

$$M_4 \times M_5 = 12 \times 6 \times 25 = 1800$$

		20	$M_1$	1000	1800	1500	4210
				$M_2$	600	960	1710
				10	$M_3$	720	2220
					12	$M_4$	1800
						6	$M_5$
							25

$$\text{Level 2: } (M_1 \times M_2) \times M_3 = 20 \times 10 \times 12 = 2400 + 1000 = 3400$$

$$M_1 \times (M_2 \times M_3) = 20 \times 5 \times 12 = 1200 + 600 = 1800$$

$$(M_2 \times M_3) \times M_4 = 5 \times 12 \times 6 = 360 + 600 = 960$$

$$M_2 \times (M_3 \times M_4) = 5 \times 10 \times 6 = 300 + 720 = 1020$$

$$(M_3 \times M_4) \times M_5 = 10 \times 6 \times 25 = 1500 + 720 = 2220$$

$$M_3 \times (M_4 \times M_5) = 10 \times 12 \times 25 = 3000 + 1800 = 4800$$

Level 3:

$$(M_1 \times M_2 \times M_3) \times M_4 = 20 \times 12 \times 6 = 1440 + 1800 = 3240$$

$$M_1 \times (M_2 \times M_3 \times M_4) = 20 \times 5 \times 6 = 600 + 960 = 1560$$

$$(M_1 \times M_2) \times (M_3 \times M_4) = 20 \times 10 \times 6 = 1200 + 720 + 1000 = 2920$$

$$(M_2 \times M_3 \times M_4) \times M_5 = 5 \times 6 \times 25 = 750 + 960 = 1710$$

$$M_2 \times (M_3 \times M_4 \times M_5) = 5 \times 10 \times 25 = 1250 + 2220 = 3470$$

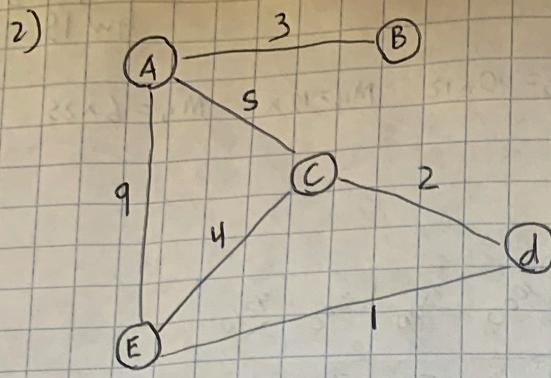
$$(M_2 \times M_3) \times (M_4 \times M_5) = 5 \times 12 \times 25 = 1500 + 1800 + 600 = 3900$$

$$\text{Level 4: } (M_1 \times M_2 \times M_3 \times M_4) \times M_5 = 20 \times 6 \times 25 = 3000 + 1500 = 4500$$

$$M_1 \times (M_2 \times M_3 \times M_4 \times M_5) = 20 \times 5 \times 25 = 2500 + 1710 = 4210$$

$$(M_1 \times M_2 \times M_3) \times (M_4 \times M_5) = 20 \times 12 \times 25 = 6000 + 1800 + 1800 = 9600$$

$$(M_1 \times M_2) \times (M_3 \times M_4 \times M_5) = 20 \times 10 \times 25 = 5000 + 1000 + 2220 = 8220$$



$$D^0 = \begin{array}{c|ccccc} & A & B & C & D & E \\ \hline A & 0 & 3 & 5 & - & 9 \\ B & 3 & 0 & - & - & - \\ C & 5 & - & 0 & 2 & 4 \\ D & - & - & 2 & 0 & 1 \\ E & 9 & - & 4 & 1 & 0 \end{array}$$

$$D^1 = \begin{array}{c|ccccc} & A & B & C & D & E \\ \hline A & 0 & 3 & 5 & - & 9 \\ B & 3 & 0 & 8 & - & 12 \\ C & 5 & 8 & 0 & 2 & 4 \\ D & - & - & 2 & 0 & 1 \\ E & 9 & 12 & 4 & 1 & 0 \end{array}$$

$$D^2 = \begin{array}{c|ccccc} & A & B & C & D & E \\ \hline A & 0 & 3 & 5 & - & 9 \\ B & 3 & 0 & 8 & - & 12 \\ C & 5 & 8 & 0 & 2 & 4 \\ D & - & - & 2 & 0 & 1 \\ E & 9 & 12 & 4 & 1 & 0 \end{array}$$

$$D^3 = \begin{array}{c|ccccc} & A & B & C & D & E \\ \hline A & 0 & 3 & 5 & 7 & 9 \\ B & 3 & 0 & 8 & 10 & 12 \\ C & 5 & 8 & 0 & 2 & 4 \\ D & 7 & 10 & 2 & 0 & 1 \\ E & 9 & 12 & 4 & 1 & 0 \end{array}$$

$$D^4 = \begin{array}{c|ccccc} & A & B & C & D & E \\ \hline A & 0 & 3 & 5 & 7 & 8 \\ B & 3 & 0 & 8 & 10 & 11 \\ C & 5 & 8 & 0 & 2 & 3 \\ D & 7 & 10 & 2 & 0 & 1 \\ E & 8 & 11 & 3 & 1 & 0 \end{array}$$

$$AS = \begin{array}{c|ccccc} & A & B & C & D & E \\ \hline A & 0 & 3 & 5 & 7 & 9 \\ B & 3 & 0 & 8 & 10 & 11 \\ C & 5 & 8 & 0 & 2 & 3 \\ D & 7 & 10 & 2 & 0 & 1 \\ E & 8 & 11 & 3 & 1 & 0 \end{array}$$

K = "C"

K = "D"

K = "E"

