# Zonal Informatics Olympiad, 2004

*Solutions*

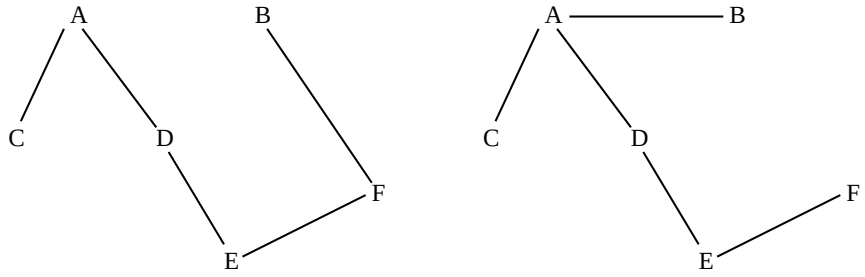
1. (a) $\left.\begin{array}{l}\text{but–bud–bed–be–}\\ \text{be–bed–bud–but–}\end{array}\right\}$ –bet–get–got–god–go–do–dog– $\left\{\begin{array}{l}\text{–dig–dug}\\ \text{–dug–dig}\end{array}\right.$

   (b) quit–quite–suite–site–sit– $\left\{\begin{array}{c}\text{–sat–}\\ \text{–fit–}\end{array}\right\}$ –fat–fate–gate

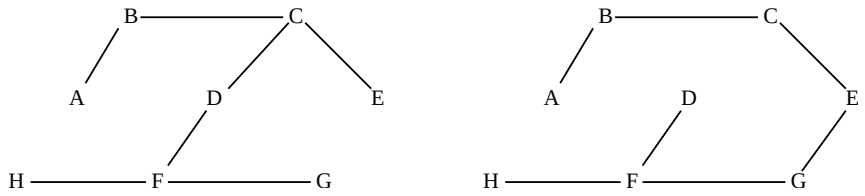
   (c) later–lather–father–bather–bathe–bath–bat– $\left\{\begin{array}{c}\text{–cat–rat–}\\ \text{–rat–cat–}\end{array}\right\}$ –fat–fate–mate–matt

2. (a) 45 (b) 147 (c) 886

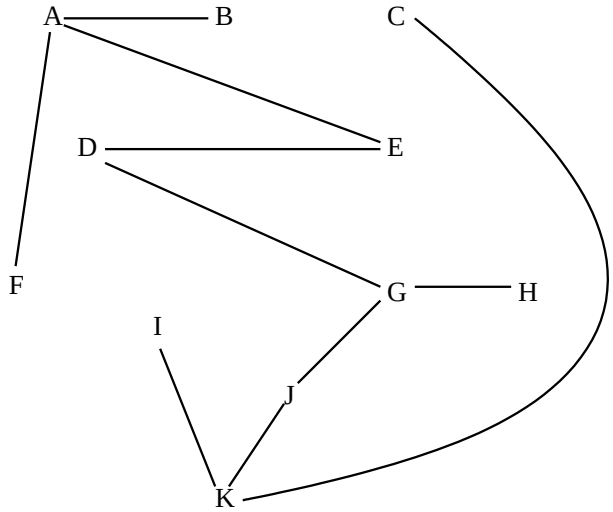
3. (a)




   (b)

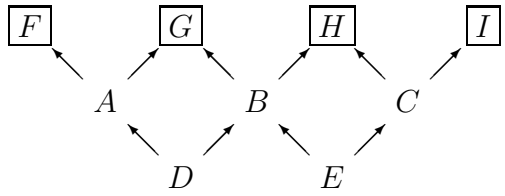



   (c)



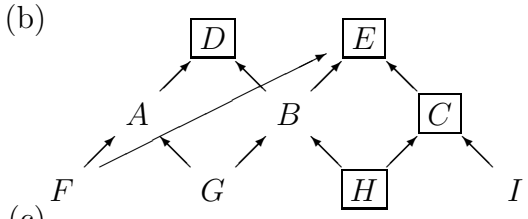
4. An arrow in the diagram shows that the carton below can fit inside the carton above. Boxed items are cartons that *must* be outermost in any valid solution.

(a)



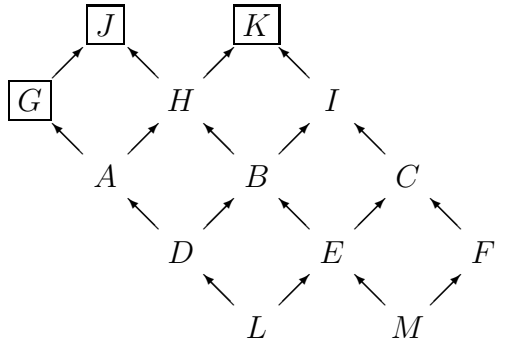

$D$ in $A$ in $F$, $E$ in $B$ in $G$, $C$ in $H$, $I$
$D$ in $A$ in $F$, $E$ in $B$ in $G$, $H$, $C$ in $I$
$D$ in $A$ in $F$, $G$, $E$ in $B$ in $H$, $C$ in $I$
$D$ in $A$ in $F$, $G$, $B$ in $H$, $E$ in $C$ in $I$
$F$, $D$ in $A$ in $G$, $E$ in $B$ in $H$, $C$ in $I$
$F$, $D$ in $A$ in $G$, $B$ in $H$, $E$ in $C$ in $I$
$F$, $A$ in $G$, $D$ in $B$ in $H$, $E$ in $C$ in $I$
...
(Any valid packing where outermost are $F$, $G$, $H$, $I$)

(b)




$H$
$I$ in $C$
$F$ in $A$ in $D$
$G$ in $B$ in $E$

(c)




$L$ in $D$ in $A$ in $G$
$M$ in $E$ in $B$ in $H$ in $J$
$F$ in $C$ in $I$ in $K$

$L$ in $D$ in $A$ in $G$
$E$ in $B$ in $H$ in $J$,
$M$ in $F$ in $C$ in $I$ in $K$

$D$ in $A$ in $G$
$L$ in $E$ in $B$ in $H$ in $J$
$M$ in $F$ in $C$ in $I$ in $K$

5. (a) $A_1 = S$, $A_2 = S$, $A_3 = S$, $A_4 = S$, $A_5 = S$, $A_6 = S$, $A_7 = S$
$G_1 = R$, $G_2 = R$, $G_3 = R$, $G_4 = R$

(b) $A_1 = \mathbf{X}$, $A_2 = R$, $A_3 = \mathbf{Y}$, $A_4 = \mathbf{Y}$, $A_5 = R$
$G_1 = \overline{\mathbf{Y}}$, $G_2 = S$, $G_3 = S$, $G_4 = \overline{\mathbf{Y}}$, $G_5 = \overline{\mathbf{X}}$, $G_6 = S$, $G_7 = S$, $G_8 = S$
where $\mathbf{X} = \neg\overline{\mathbf{X}}$, $\mathbf{Y} = \neg\overline{\mathbf{Y}}$, (i.e., $\mathbf{X} = S$ iff $\overline{\mathbf{X}} = R$, $\mathbf{Y} = S$ iff $\overline{\mathbf{Y}} = R$)

(c) $A_1 = R$, $A_2 = R$, $A_3 = S$, $A_4 = R$, $A_5 = R$, $A_6 = \mathbf{X}$
$G_1 = S$, $G_2 = S$, $G_3 = S$, $G_4 = S$, $G_5 = R$, $G_6 = S$, $G_7 = \overline{\mathbf{X}}$, $G_8 = S$, $G_9 = S$
where $\mathbf{X} = \neg\overline{\mathbf{X}}$.