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1. Find an equation of the plane that passes through the points $(0,1,1)$, $(1,0,1)$, $(1,1,0)$.

$P \qquad Q \qquad R$

$\rightarrow u = \vec{PQ} = Q - P = (1,0,1) - (0,1,1) = \langle 1, -1, 0 \rangle$

$\rightarrow v = \vec{PR} = R - P = (1,1,0) - (0,1,1) = \langle 1, 0, -1 \rangle$

$\rightarrow u \times v = \begin{vmatrix} i & j & K \\ 1 & -1 & 0 \\ 1 & 0 & -1 \end{vmatrix} = \begin{vmatrix} -1 & 0 \\ 0 & -1 \end{vmatrix} i - \begin{vmatrix} 1 & 0 \\ 1 & -1 \end{vmatrix} j + \begin{vmatrix} 1 & -1 \\ 1 & 0 \end{vmatrix} K = i + j + k$

$\rightarrow$ Choosing point $Q(1,0,1)$: $1(x-1) + 1(y-0) + 1(z-1) = 0$

$\rightarrow x - 1 + y + z - 1 = 0$

$\rightarrow \boxed{x + y + z = 2}$

2. Find the intersection of the line

$$\mathbf{r}(t) = \langle 1, 1, 0 \rangle + t\langle 0, 2, 4 \rangle$$

and the plane

$$x + y + z = 14 \quad .$$

$\rightarrow r(t) = \langle 1,1,0 \rangle + \langle 0, 2t, 4t \rangle = \langle 1, 1+2t, 4t \rangle, \quad x = 1; \; y = 1+2t; \; z = 4t$

$\rightarrow x + y + z = 14 \; ; \; (1) + (1+2t) + (4t) = 14 \; ; \; 2 + 6t = 14 \; ; \; 6t = 12 \; ; \; \underline{t = 2}$

$\rightarrow$ Point of intersection: $\boxed{(1, 5, 8)}$