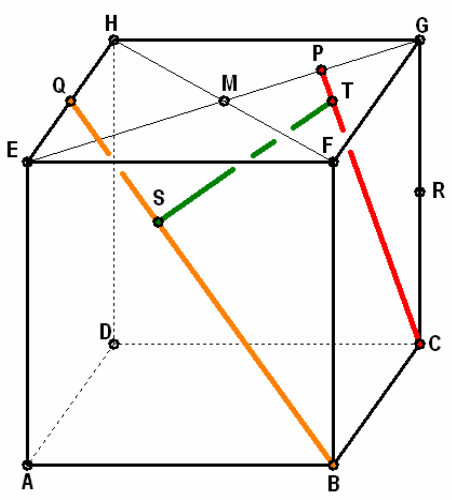
75)a) B(0|36|18)
C(0|0|0)
P(9|9|9)
Q(36|18|36)



Skizze: matheprof.at

$\overrightarrow{CP} = \begin{pmatrix} 9 \\ 9 \\ 36 \end{pmatrix} = 9 \cdot \begin{pmatrix} 1 \\ 1 \\ 4 \end{pmatrix}$

$g_{CP}: X = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} + t \cdot \begin{pmatrix} 1 \\ 1 \\ 4 \end{pmatrix} \Rightarrow \boxed{T(t|t|4t)}$

$\overrightarrow{BQ} = \begin{pmatrix} 36 \\ -18 \\ 36 \end{pmatrix} = 18 \cdot \begin{pmatrix} 2 \\ -1 \\ 2 \end{pmatrix}$

$g_{BQ}: X = \begin{pmatrix} 0 \\ 36 \\ 0 \end{pmatrix} + k \cdot \begin{pmatrix} 2 \\ -1 \\ 2 \end{pmatrix} \Rightarrow \boxed{S(2k|36-k|2k)}$

$\overrightarrow{ST} = \begin{pmatrix} t-2k \\ t-36+k \\ 4t-2k \end{pmatrix}$

$\overrightarrow{ST} \perp^{!} \begin{pmatrix} 1 \\ 1 \\ 4 \end{pmatrix} \Leftrightarrow \begin{matrix} t-2k \\ +t+k-36 \\ +16t-8k \end{matrix} =^{!} 0 \Rightarrow \boxed{18t-9k-36=0}$

$\overrightarrow{ST} \perp^{!} \begin{pmatrix} 2 \\ -1 \\ 2 \end{pmatrix} \Leftrightarrow \begin{matrix} 2t-4k \\ -t-k+36 \\ +8t-4k \end{matrix} =^{!} 0 \Rightarrow \boxed{9t-9k+36=0}$

$\left.\begin{matrix} 18t-9k-36=0 \\ 9t-9k+36=0 \end{matrix}\right\}$ -↓

9t-72=0
9t=72
$\boxed{t=8} \Rightarrow 9 \cdot 8 - 9k = -36$
$9k = 108$
$\boxed{k = 12}$

$\Rightarrow \overline{CT} : \overline{TP} = 8:1$
$\wedge \ \overline{BS} : \overline{SQ} = 12:6 = 2:1$

b) z.z.: $g_{ST} \parallel g_{AR}$

S(24|24|24)
T(8|8|32)
A(36|36|0)
R(0|0|18)

$\overrightarrow{ST} = \begin{pmatrix} -16 \\ -16 \\ 8 \end{pmatrix} = 8 \cdot \begin{pmatrix} -2 \\ -2 \\ 1 \end{pmatrix}$ $\quad \overrightarrow{AR} = \begin{pmatrix} -36 \\ -36 \\ 18 \end{pmatrix} = 18 \cdot \begin{pmatrix} -2 \\ -2 \\ 1 \end{pmatrix}$

$\Rightarrow \overrightarrow{ST} \parallel \overrightarrow{AR} \Rightarrow g_{ST} \parallel g_{AR}$ $\quad \overline{ST} : \overline{AR} = 8:18 = 4:9$