1 - Z uvedených vzorců vyjádři neznámé ve složených závorkách:

1.a - $v = \frac{s}{t} \quad \{s\}$

$v = \frac{s}{t} \quad / \cdot t$

$vt = s$

$s = vt$

$v = \frac{s}{t} \quad \{t\}$

$v = \frac{s}{t} \quad / \cdot t$

$vt = s \quad \cdot / : v$

$v = \frac{s}{t}$

1.b - $s = s_0 + vt \quad \{s_0\}$

$s = s_0 + vt \quad / - vt$

$s - vt = s_0$

$s_0 = s - vt$

$s = s_0 + vt \quad \{v\}$

$s = s_0 + vt \quad / - s_0$

$s - s_0 = vt \quad / : t$

$\frac{s - s_0}{t} = v$

$v = \frac{s - s_0}{t}$

1.c - $p = h\rho g \quad \{h\}$

$p = h\rho g \quad / : \rho g$

$\frac{p}{\rho g} = h$

$h = \frac{p}{\rho g}$

$p = h\rho g \quad \{g\}$

$p = h\rho g \quad / : h\rho$

$\frac{p}{h\rho} = g$

$g = \frac{p}{h\rho}$

1.d - $F_1 r_1 = F_2 r_2 \quad \{F_1\}$

$F_1 r_1 = F_2 r_2 \quad / : r_1$

$F_1 = \frac{F_2 r_2}{r_1}$

$$F_1 r_1 = F_2 r_2 \ \{r_2\}$$
$$F_1 r_1 = F_2 r_2 \ / : F_2$$
$$\frac{F_1 r_1}{F_2} = r_2$$
$$r_2 = \frac{F_1 r_1}{F_2}$$

1.e - $$\frac{\Delta l}{\Delta l_1} = \frac{1}{E}\frac{F}{S} \ \{F\}$$
$$\frac{\Delta l}{\Delta l_1} = \frac{1}{E}\frac{F}{S} \ / \cdot ES$$
$$\frac{\Delta l ES}{\Delta l_1} = F$$
$$F = \frac{\Delta l}{\Delta l_1} ES$$
$$\frac{\Delta l}{\Delta l_1} = \frac{1}{E}\frac{F}{S} \ \{E\}$$
$$\frac{\Delta l}{\Delta l_1} = \frac{1}{E}\frac{F}{S} \ / \cdot E\Delta l_1$$
$$E\Delta l = \frac{F}{S}\Delta l_1 \ / : \Delta l$$
$$E = \frac{F}{S}\frac{\Delta l_1}{\Delta l}$$
$$\frac{\Delta l}{\Delta l_1} = \frac{1}{E}\frac{F}{S} \ \{\Delta l_1\}$$
$$\frac{\Delta l}{\Delta l_1} = \frac{1}{E}\frac{F}{S} \ / \cdot \Delta l_1 ES$$
$$ES\Delta l = F\Delta l_1 \ / : F$$
$$\frac{ES\Delta l}{F} = \Delta l_1$$
$$\Delta l_1 = \frac{ES\Delta l}{F}$$

1.f - $$\frac{\sin\alpha}{\sin\beta} = \frac{n_2}{n_1} \ \{\sin\beta\}$$
$$\frac{\sin\alpha}{\sin\beta} = \frac{n_2}{n_1} \ / \cdot \sin\beta \cdot n_1$$
$$\sin\alpha \cdot n_1 = \sin\beta \cdot n_2 \ / : n_2$$
$$\frac{\sin\alpha \cdot n_1}{n_2} = \sin\beta$$
$$\sin\beta = \frac{\sin\alpha \cdot n_1}{n_2}$$
$$\frac{\sin\alpha}{\sin\beta} = \frac{n_2}{n_1} \ \{n_1\}$$

$$\frac{\sin\alpha}{\sin\beta}=\frac{n_2}{n_1}\ /\cdot\sin\beta\cdot n_1$$
$$\sin\alpha\cdot n_1=\sin\beta\cdot n_2\ /:\sin\alpha$$
$$n_1=\frac{\sin\beta}{\sin\alpha}n_2$$
$$\frac{\sin\alpha}{\sin\beta}=\frac{n_2}{n_1}\ \{n_2\}$$
$$\frac{\sin\alpha}{\sin\beta}=\frac{n_2}{n_1}\ /\cdot n_1$$
$$n_1\frac{\sin\alpha}{\sin\beta}=n_2$$
$$n_2=n_1\frac{\sin\alpha}{\sin\beta}$$

2 - Z uvedených vzorců vyjádři neznámé ve složených závorkách:

2.a - $S=6a^2\ \{a\}$

$$S=6a^2\ /:6$$
$$\frac{S}{6}=a^2\ /\sqrt{\ }$$
$$\sqrt{\frac{S}{6}}=a$$
$$a=\sqrt{\frac{S}{6}}$$

2.b - $E_k=\frac{1}{2}mv^2\ \{m\}$

$$E_k=\frac{1}{2}mv^2\ /\cdot 2$$
$$2E_k=mv^2\ /:v^2$$
$$\frac{2E_k}{v^2}=m$$
$$m=\frac{2E_k}{v^2}$$
$$E_k=\frac{1}{2}mv^2\ \{v\}$$
$$E_k=\frac{1}{2}mv^2\ /\cdot 2$$
$$2E_k=mv^2\ /:m$$
$$\frac{2E_k}{m}=v^2\ /\sqrt{\ }$$
$$\sqrt{\frac{2E_k}{m}}=v$$
$$v=\sqrt{\frac{2E_k}{m}}$$

2.c - $F = \frac{1}{2} C S \rho v^2 \ \{S\}$

$F = \frac{1}{2} C S \rho v^2 \ / \cdot 2$

$2F = C S \rho v^2 \ / : C \rho v^2$

$\frac{2F}{C \rho v^2} = S$

$S = \frac{2F}{C \rho v^2}$

$F = \frac{1}{2} C S \rho v^2 \ \{v\}$

$F = \frac{1}{2} C S \rho v^2 \ / \cdot \frac{2}{CS\rho}$

$\frac{2F}{CS\rho} = v^2 \ / \sqrt{\ }$

$\sqrt{\frac{2F}{CS\rho}} = v$

$v = \sqrt{\frac{2F}{CS\rho}}$

2.d - $F_d = \frac{mv^2}{r} \ \{m\}$

$F_d = \frac{mv^2}{r} \ / \cdot \frac{r}{v^2}$

$\frac{F_d r}{v^2} = m$

$m = \frac{F_d r}{v^2}$

$F_d = \frac{mv^2}{r} \ \{r\}$

$F_d = \frac{mv^2}{r} \ / \cdot r$

$r F_d = mv^2 \ / : F_d$

$r = \frac{mv^2}{F_d}$

$F_d = \frac{mv^2}{r} \ \{v\}$

$F_d = \frac{mv^2}{r} \ / \cdot \frac{r}{m}$

$F_d \frac{r}{m} = v^2 \ / \sqrt{\ }$

$$\sqrt{\frac{F_d r}{m}} = v$$

$$v = \sqrt{\frac{F_d r}{m}}$$

2.e - $F = \kappa \frac{m_1 m_2}{r^2} \quad \{m_1\}$

$$F = \kappa \frac{m_1 m_2}{r^2} \quad / \cdot \frac{r^2}{\kappa m_2}$$

$$\frac{F r^2}{\kappa m_2} = m_1$$

$$m_1 = \frac{F r^2}{\kappa m_2}$$

$$F = \kappa \frac{m_1 m_2}{r^2} \quad \{r\}$$

$$F = \kappa \frac{m_1 m_2}{r^2} \quad / \cdot r^2$$

$$F r^2 = \kappa m_1 m_2 \quad / : F$$

$$r^2 = \frac{\kappa m_1 m_2}{F} \quad / \sqrt{\ }$$

$$r = \sqrt{\frac{\kappa m_1 m_2}{F}}$$

2.f - $p = \frac{1}{3} \frac{N}{V} m_0 v_k^2 \quad \{V\}$

$$p = \frac{1}{3} \frac{N}{V} m_0 v_k^2 \quad / \cdot V$$

$$pV = \frac{N m_0 v_k^2}{3} \quad / : p$$

$$V = \frac{N m_0 v_k^2}{3p}$$

$$p = \frac{1}{3} \frac{N}{V} m_0 v_k^2 \quad \{v_k\}$$

$$p = \frac{1}{3} \frac{N}{V} m_0 v_k^2 \quad / \cdot \frac{3V}{N m_0}$$

$$\frac{3pV}{N m_0} = v_k^2 \quad / \sqrt{\ }$$

$$\sqrt{\frac{3pV}{N m_0}} = v_k$$

$$v_k = \sqrt{\frac{3pV}{N m_0}}$$

2.g - $V = \frac{1}{3}\pi r^2 v \ \{r\}$

$V = \frac{1}{3}\pi r^2 v \ / \cdot \frac{3}{\pi v}$

$\frac{3V}{\pi v} = r^2 \ / \sqrt{\ }$

$\sqrt{\frac{3V}{\pi v}} = r$

$r = \sqrt{\frac{3V}{\pi v}}$

$V = \frac{1}{3}\pi r^2 v \ \{v\}$

$V = \frac{1}{3}\pi r^2 v \ / \cdot \frac{3}{\pi r^2}$

$\frac{3V}{\pi r^2} = v$

$v = \frac{3V}{\pi r^2}$

2.h - $E_n = \frac{h^2}{8mL^2} n^2 \ \{n\}$

$E_n = \frac{h^2}{8mL^2} n^2 \ / \cdot \frac{8mL^2}{h^2}$

$\frac{8E_n mL^2}{h^2} = n^2 \ / \sqrt{\ }$

$\sqrt{\frac{8E_n mL^2}{h^2}} = n$

$n = \sqrt{\frac{8E_n mL^2}{h^2}}$

$E_n = \frac{h^2}{8mL^2} n^2 \ \{m\}$

$E_n = \frac{h^2}{8mL^2} n^2 \ / \cdot m$

$mE_n = \frac{h^2}{8mL^2} n^2 \ / : E_n$

$m = \frac{h^2 n^2}{8mL^2 E_n}$

$E_n = \frac{h^2}{8mL^2} n^2 \ \{L\}$

$E_n = \frac{h^2}{8mL^2} n^2 \ / \cdot L^2$

$E_n L^2 = \frac{h^2}{8m} n^2 \ / : E_n$

$$L^2 = \frac{h^2}{8mE_n} n^2 \quad /\sqrt{\ }$$

$$L = \sqrt{\frac{h^2 n^2}{8mE_n}}$$

3 - Z uvedených vzorců vyjádři neznámé ve složených závorkách:

3.a - $v = v_0 + at \ \{v_0\}$

$$v = v_0 + at \quad /-at$$
$$v - at = v_0$$
$$v_0 = v - at$$
$$v = v_0 + at \ \{t\}$$
$$v = v_0 + at \quad /-v_0$$
$$v - v_0 = at \quad /:a$$
$$\frac{v - v_0}{a} = t$$
$$t = \frac{v - v_0}{a}$$

3.b - $v = v_0 - gt \ \{v_0\}$

$$v = v_0 - gt \quad /+gt$$
$$v + gt = v_0$$
$$v_0 = v + gt$$
$$v = v_0 - gt \ \{g\}$$
$$v = v_0 - gt \quad /+gt$$
$$v + gt = v_0 \quad /-v$$
$$gt = v_0 - v \quad /:t$$
$$g = \frac{v_0 - v}{t}$$

3.c - $s = s_0 + v_0 t + \frac{1}{2} at^2 \ \{a\}$

$$s = s_0 + v_0 t + \tfrac{1}{2} at^2 \quad /-s_0 - v_0 t$$
$$s - s_0 - v_0 t = \tfrac{1}{2} at^2 \quad /\cdot \frac{2}{t^2}$$
$$\frac{2(s - s_0 - v_0 t)}{t^2} = a$$
$$a = \frac{2(s - s_0 - v_0 t)}{t^2}$$

$$s = s_0 + v_0 t + \tfrac{1}{2} at^2 \ \{v_0\}$$
$$s = s_0 + v_0 t + \tfrac{1}{2} at^2 \quad /-s_0 - \tfrac{1}{2} at^2$$
$$s - s_0 - \tfrac{1}{2} at^2 = v_0 t$$
$$\frac{2s - 2s_0 - at^2}{2} = v_0 t \quad /:t$$

$$\frac{2s-2s_0-at^2}{2t}=v_0$$

$$v_0=\frac{2s-2s_0-at^2}{2t}$$

3.d - $S=2\pi r\left(r+v\right)\ \{v\}$

$$S=2\pi r^2+2\pi rv\quad /-2\pi r^2$$

$$S-2\pi r^2=2\pi rv\quad /:2\pi r$$

$$\frac{S-2\pi r^2}{2\pi r}=v$$

$$v=\frac{S-2\pi r^2}{2\pi r}$$

3.e - $S=2\left(ab+ac+bc\right)\ \{a\}$

$$S=2ab+2ac+2bc\quad /-2bc$$

$$S-2bc=2ab+2ac$$

$$S-2bc=a\left(2b+2c\right)\quad /2b+2c$$

$$\frac{S-2bc}{2b+2c}=a$$

$$a=\frac{S-2bc}{2b+2c}$$

3.f - $l=l_0\left(1+\alpha\Delta t\right)\ \{l_0\}$

$$l=l_0\left(1+\alpha\Delta t\right)\quad /:1+\alpha\Delta t$$

$$\frac{l}{1+\alpha\Delta t}=l_0$$

$$l_0=\frac{l}{1+\alpha\Delta t}$$

$$l=l_0\left(1+\alpha\Delta t\right)\ \{\Delta t\}$$

$$l=l_0+l_0\alpha\Delta t\quad /-l_0$$

$$l-l_0=l_0\alpha\Delta t\quad /:l_0\alpha$$

$$\frac{l-l_0}{l_0\alpha}=\Delta t$$

$$\Delta t=\frac{l-l_0}{l_0\alpha}$$

3.g - $I=\frac{U_e}{R_i+R}\ \{U_e\}$

$$I=\frac{U_e}{R_i+R}\quad /\cdot\left(R_i+R\right)$$

$$\left(R_i+R\right)I=U_e$$

$$U_e=\left(R_i+R\right)I$$

$$I=\frac{U_e}{R_i+R}\ \{R\}$$

$$I = \frac{U_e}{R_i + R} \quad /\cdot (R_i + R)$$
$$I(R_i + R) = U_e$$
$$IR_i + IR = U_e \quad /- IR_i$$
$$IR = U_e - IR_i \quad /:I$$
$$R = \frac{U_e - IR_i}{I}$$

3.h - $Z = -\frac{f}{a-f} \ \{a\}$

$$Z = -\frac{f}{a-f} \quad /\cdot (a-f)$$
$$Z(a-f) = -f$$
$$Za - Zf = -f \quad /+ Zf$$
$$Za = Zf - f \quad /:Z$$
$$a = \frac{Zf - f}{Z}$$
$$Z = -\frac{f}{a-f} \ \{f\}$$
$$Z = -\frac{f}{a-f} \quad /\cdot (a-f)$$
$$Z(a-f) = -f$$
$$Za - Zf = -f \quad /+ Zf$$
$$Za = Zf - f$$
$$Za = f(Z-1)$$
$$\frac{Za}{Z-1} = f$$
$$f = \frac{Za}{Z-1}$$

3.i - $hf = W_W + \frac{1}{2}mv^2 \ \{f\}$

$$hf = W_W + \frac{1}{2}mv^2 \quad /:h$$
$$f = \frac{W_W + \frac{1}{2}mv^2}{h}$$
$$f = \frac{\frac{2W_w + mv^2}{2}}{h}$$
$$f = \frac{2W_w + mv^2}{2h}$$
$$hf = W_W + \frac{1}{2}mv^2 \ \{m\}$$
$$hf = W_W + \frac{1}{2}mv^2 \quad /- W_w$$

$$hf - W_w = \frac{1}{2}mv^2 \quad /\cdot\frac{2}{v^2}$$

$$\frac{2(hf - W_w)}{v^2} = m$$

$$m = \frac{2(hf - W_w)}{v^2}$$

$$hf = W_W + \frac{1}{2}mv^2 \quad \{v\}$$

$$hf = W_W + \frac{1}{2}mv^2 \quad /-W_w$$

$$hf - W_w = \frac{1}{2}mv^2 \quad /\cdot\frac{2}{m}$$

$$\frac{2(hf - W_w)}{m} = v^2 \quad /\sqrt{\ }$$

$$\sqrt{\frac{2(hf - W_w)}{m}} = v$$

$$v = \sqrt{\frac{2(hf - W_w)}{m}}$$

3.j - $mgh_1 + \frac{1}{2}mv_1^2 = mgh_2 + \frac{1}{2}mv_2^2 \ \{h_1\}$

$$mgh_1 + \frac{1}{2}mv_1^2 = mgh_2 + \frac{1}{2}mv_2^2 \quad /:m$$

$$gh_1 + \frac{1}{2}v_1^2 = gh_2 + \frac{1}{2}v_2^2 \quad /-\frac{1}{2}v_1^2$$

$$gh_1 = gh_2 + \frac{1}{2}v_2^2 - \frac{1}{2}v_1^2 \quad /:g$$

$$h_1 = \frac{gh_2 + \frac{1}{2}v_2^2 - \frac{1}{2}v_1^2}{g}$$

$$h_1 = h_2 + \frac{\frac{v_2^2 - v_1^2}{2}}{g}$$

$$h_1 = h_2 + \frac{v_2^2 - v_1^2}{2g}$$

$$mgh_1 + \frac{1}{2}mv_1^2 = mgh_2 + \frac{1}{2}mv_2^2 \ \{v_2\}$$

$$mgh_1 + \frac{1}{2}mv_1^2 = mgh_2 + \frac{1}{2}mv_2^2 \quad /:m$$

$$gh_1 + \frac{1}{2}v_1^2 = gh_2 + \frac{1}{2}v_2^2 \quad /-gh_2$$

$$gh_1 - gh_2 + \frac{1}{2}v_1^2 = \frac{1}{2}v_2^2 \quad /\cdot 2$$

$$2gh_1 - 2gh_2 + v_1^2 = v_2^2 \quad /\sqrt{\ }$$

$$\sqrt{2gh_1 - 2gh_2 + v_1^2} = v_2,$$

$$v_2 = \sqrt{2gh_1 - 2gh_2 + v_1^2}$$

4 - Z uvedených vzorců vyjádři neznámé ve složených závorkách:

4.a - $v=\sqrt{\frac{\kappa M}{R+h}}\ \{R\}$

$v=\sqrt{\frac{\kappa M}{R+h}}\ /^2$

$v^2=\frac{\kappa M}{R+h}\ /\cdot\frac{(R+h)}{v^2}$

$R+h=\frac{\kappa M}{v^2}\ /-h$

$R=\frac{\kappa M}{v^2}-h$

$v=\sqrt{\frac{\kappa M}{R+h}}\ \{M\}$

$v=\sqrt{\frac{\kappa M}{R+h}}\ /^2$

$v^2=\frac{\kappa M}{R+h}\ /\cdot\frac{(R+h)}{\kappa}$

$\frac{v^2(R+h)}{\kappa}=M$

$M=\frac{v^2(R+h)}{\kappa}$

4.b - $T=2\pi\sqrt{\frac{l}{g}}\ \{l\}$

$T=2\pi\sqrt{\frac{l}{g}}\ /:2\pi$

$\frac{T}{2\pi}=\sqrt{\frac{l}{g}}\ /^2$

$\left(\frac{T}{2\pi}\right)^2=\frac{l}{g}\ /\cdot g$

$\frac{gT^2}{4\pi^2}=l$

$l=\frac{gT^2}{4\pi^2}$

$T=2\pi\sqrt{\frac{l}{g}}\ \{g\}$

$T=2\pi\sqrt{\frac{l}{g}}\ /:2\pi$

$\frac{T}{2\pi}=\sqrt{\frac{l}{g}}\ /^2$

$\left(\frac{T}{2\pi}\right)^2=\frac{l}{g}\ /\cdot g$

$$\frac{gT^2}{4\pi^2} = l \quad /\cdot \frac{4\pi^2}{T^2}$$
$$g = l\frac{4\pi^2}{T^2}$$

4.c - $u = \sqrt{a^2 + b^2 + c^2}; \{a\}$

$$u = \sqrt{a^2 + b^2 + c^2} \quad /^2$$
$$u^2 = a^2 + b^2 + c^2 \quad /-b^2 - c^2$$
$$u^2 - b^2 - c^2 = a^2 \quad /\sqrt{\ }$$
$$\sqrt{u^2 - b^2 - c^2} = a$$
$$a = \sqrt{u^2 - b^2 - c^2}$$

4.d - $f = \frac{1}{2\pi}\sqrt{\frac{k}{m}} \ \{k\}$

$$f = \frac{1}{2\pi}\sqrt{\frac{k}{m}} \quad /\cdot 2\pi$$
$$2\pi f = \sqrt{\frac{k}{m}} \quad /^2$$
$$4\pi^2 f^2 = \frac{k}{m} \quad /\cdot m$$
$$4\pi^2 f^2 m = k$$
$$k = 4\pi^2 f^2 m$$
$$f = \frac{1}{2\pi}\sqrt{\frac{k}{m}} \ \{m\}$$
$$f = \frac{1}{2\pi}\sqrt{\frac{k}{m}} \quad /\cdot 2\pi$$
$$2\pi f = \sqrt{\frac{k}{m}} \quad /^2$$
$$4\pi^2 f^2 = \frac{k}{m} \quad /\cdot \frac{m}{4\pi^2 f^2}$$
$$m = \frac{k}{4\pi^2 f^2}$$

4.e - $l = l_0\sqrt{1 - \frac{v^2}{c^2}} \ \{v\}$

$$l = l_0\sqrt{1 - \frac{v^2}{c^2}} \quad /: l_0$$
$$\frac{l}{l_0} = \sqrt{1 - \frac{v^2}{c^2}} \quad /^2$$
$$\left(\frac{l}{l_0}\right)^2 = 1 - \frac{v^2}{c^2} \quad /+\frac{v^2}{c^2} - \left(\frac{l}{l_0}\right)^2$$

$$\frac{v^2}{c^2}=1-\frac{l^2}{l_0^2} \quad /\cdot c^2$$

$$v^2=c^2\left(\frac{l_0^2-l^2}{l_0^2}\right) \quad /\sqrt{\ }$$

$$v=c\sqrt{\frac{l_0^2-l^2}{l_0^2}}$$

$$v=c\frac{\sqrt{l_0^2-l^2}}{l_0}$$

$$l=l_0\sqrt{1-\frac{v^2}{c^2}} \quad \{c\}$$

$$l=l_0\sqrt{1-\frac{v^2}{c^2}} \quad /:l_0$$

$$\frac{l}{l_0}=\sqrt{1-\frac{v^2}{c^2}} \quad /^2$$

$$\left(\frac{l}{l_0}\right)^2=1-\frac{v^2}{c^2} \quad /+\frac{v^2}{c^2}-\left(\frac{l}{l_0}\right)^2$$

$$\frac{v^2}{c^2}=1-\frac{l^2}{l_0^2} \quad /\cdot c^2$$

$$v^2=c^2\left(\frac{l_0^2-l^2}{l_0^2}\right) \quad /\sqrt{\ }$$

$$v=c\sqrt{\frac{l_0^2-l^2}{l_0^2}} \quad /:\sqrt{\frac{l_0^2-l^2}{l_0^2}}$$

$$\frac{v}{\sqrt{\frac{l_0^2-l^2}{l_0^2}}}=c$$

$$\frac{v}{\frac{\sqrt{l_0^2-l^2}}{l_0}}=c$$

$$c=\frac{l_0 v}{\sqrt{l_0^2-l^2}}$$

4.f - $V=\frac{\pi v}{6}\left(3\rho_1^2+3\rho_2^2+v^2\right) \quad \{\rho_1\}$

$$V=\frac{\pi v}{6}\left(3\rho_1^2+3\rho_2^2+v^2\right) \quad /\cdot\frac{6}{\pi v}$$

$$\frac{6V}{\pi v}=3\rho_1^2+3\rho_2^2+v^2 \quad /-3\rho_2^2-v^2$$

$$\frac{6V}{\pi v}-3\rho_2^2-v^2=3\rho_1^2 \quad /:3$$

$$\frac{6V-3\pi v\rho_2^2-\pi v^3}{\pi v}=3\rho_1^2 \quad /:3$$

$$\frac{6V-3\pi v\rho_2^2-\pi v^3}{3\pi v}=\rho_1^2 \quad /\sqrt{\ }$$

$$\sqrt{\frac{6V-3\pi v\rho_2^2-\pi v^3}{3\pi v}}=\rho_1$$

$$\rho_1=\sqrt{\frac{6V-3\pi v\rho_2^2-\pi v^3}{3\pi v}}$$

5 - Z uvedených vzorců vyjádři neznámé ve složených závorkách:

5.a - $\frac{1}{C}=\frac{1}{C_1}+\frac{1}{C_2} \quad \{C\}$

$$\frac{1}{C}=\frac{1}{C_1}+\frac{1}{C_2} \quad /\cdot C\cdot C_1\cdot C_2$$

$$C_1C_2=CC_2+CC_1$$

$$C_1C_2=C\left(C_2+C_1\right) \quad /:\left(C_2+C_1\right)$$

$$\frac{C_1C_2}{\left(C_2+C_1\right)}=C$$

$$C=\frac{C_1C_2}{\left(C_2+C_1\right)}$$

$$\frac{1}{C}=\frac{1}{C_1}+\frac{1}{C_2} \quad \{C_1\}$$

$$\frac{1}{C}=\frac{1}{C_1}+\frac{1}{C_2} \quad /\cdot C\cdot C_1\cdot C_2$$

$$C_1C_2=CC_2+CC_1 \quad /-CC_1$$

$$C_1C_2-CC_1=CC_2$$

$$C_1\left(C_2-C\right)=CC_2 \quad /:\left(C_2-C\right)$$

$$C_1=\frac{CC_2}{C_2-C}$$

5.b - $v=\frac{\left(d_1+d_2\right)v_1v_2}{d_1v_2+d_2v_1} \quad \{d_2\}$

$$v=\frac{d_1v_1v_2+d_2v_1v_2}{d_1v_2+d_2v_1}$$

$$v=\frac{d_1v_1v_2+d_2v_1v_2}{d_1v_2+d_2v_1} \quad /\cdot\left(d_1v_2+d_2v_1\right)$$

$$v\left(d_1v_2+d_2v_1\right)=d_1v_1v_2+d_2v_1v_2$$

$$d_1vv_2+d_2vv_1=d_1v_1v_2+d_2v_1v_2 \quad /-d_2v_1v_2-d_1vv_2$$

$$d_2vv_1-d_2v_1v_2=d_1v_1v_2-d_1vv_2$$

$$d_2\left(vv_1-v_1v_2\right)=d_1v_2\left(v_1-v\right) \quad /:\left(vv_1-v_1v_2\right)$$

$$d_2=\frac{d_1v_2\left(v_1-v\right)}{v_1\left(v-v_2\right)}$$

$$v=\frac{\left(d_1+d_2\right)v_1v_2}{d_1v_2+d_2v_1} \quad \{v_1\}$$

$$v=\frac{d_1v_1v_2+d_2v_1v_2}{d_1v_2+d_2v_1}$$

$$v=\frac{d_1v_1v_2+d_2v_1v_2}{d_1v_2+d_2v_1} \qquad /\cdot\left(d_1v_2+d_2v_1\right)$$

$$v\left(d_1v_2+d_2v_1\right)=d_1v_1v_2+d_2v_1v_2$$

$$d_1vv_2+d_2vv_1=d_1v_1v_2+d_2v_1v_2 \quad /-d_2vv_1$$

$$d_1vv_2=d_1v_1v_2+d_2v_1v_2-d_2vv_1$$

$$d_1vv_2=v_1\left(d_1v_2+d_2v_2-d_2v\right) \qquad /:\left(d_1v_2+d_2v_2-d_2v\right)$$

$$\frac{d_1vv_2}{d_1v_2+d_2v_2-d_2v}=v_1$$

$$v_1=\frac{d_1vv_2}{d_1v_2+d_2v_2-d_2v}$$

5.c - $u=\dfrac{u'+v}{1+\dfrac{u'v}{c^2}} \quad \{v\}$

$$u=\frac{u'+v}{\dfrac{c^2+u'v}{c^2}}$$

$$u=\frac{c^2\left(u'+v\right)}{c^2+u'v} \qquad /\cdot\left(c^2+u'v\right)$$

$$u\left(c^2+u'v\right)=c^2\left(u'+v\right)$$

$$c^2u+uu'v=c^2u'+c^2v \quad /-uu'v-c^2u'$$

$$c^2u-c^2u'=c^2v-uu'v$$

$$c^2\left(u-u'\right)=v\left(c^2-uu'\right) \qquad /:\left(c^2-uu'\right)$$

$$\frac{c^2\left(u-u'\right)}{c^2-uu'}=v$$

$$v=\frac{c^2\left(u-u'\right)}{c^2-uu'}$$

5.d - $\dfrac{1}{f}=\left(\dfrac{n_2}{n_1}-1\right)\left(\dfrac{1}{r_1}+\dfrac{1}{r_2}\right) \quad \{n_1\}$

$$\frac{1}{f}=\left(\frac{n_2}{n_1}-1\right)\left(\frac{r_1+r_2}{r_1r_2}\right)$$

$$\frac{1}{f}=\left(\frac{n_2}{n_1}-1\right)\frac{r_1+r_2}{r_1r_2} \qquad /\cdot\frac{r_1r_2}{r_1+r_2}$$

$$\frac{r_1r_2}{f\left(r_1+r_2\right)}=\frac{n_2}{n_1}-1 \qquad /+1$$

$$\frac{r_1r_2}{f\left(r_1+r_2\right)}+1=\frac{n_2}{n_1}$$

$$\frac{r_1r_2+f\left(r_1+r_2\right)}{f\left(r_1+r_2\right)}=\frac{n_2}{n_1} \qquad /\cdot n_1\cdot\frac{f\left(r_1+r_2\right)}{r_1r_2+f\left(r_1+r_2\right)}$$

$$n_1 = \frac{n_2 f\left(r_1 + r_2\right)}{r_1 r_2 + f\left(r_1 + r_2\right)}$$

$$\frac{1}{f} = \left(\frac{n_2}{n_1} - 1\right)\left(\frac{1}{r_1} + \frac{1}{r_2}\right) \qquad \{n_2\}$$

$$\frac{1}{f} = \left(\frac{n_2}{n_1} - 1\right)\left(\frac{r_1 + r_2}{r_1 r_2}\right)$$

$$\frac{1}{f} = \left(\frac{n_2}{n_1} - 1\right)\frac{r_1 + r_2}{r_1 r_2} \qquad /\cdot \frac{r_1 r_2}{r_1 + r_2}$$

$$\frac{r_1 r_2}{f\left(r_1 + r_2\right)} = \frac{n_2}{n_1} - 1 \qquad /+1$$

$$\frac{r_1 r_2}{f\left(r_1 + r_2\right)} + 1 = \frac{n_2}{n_1}$$

$$\frac{r_1 r_2 + f\left(r_1 + r_2\right)}{f\left(r_1 + r_2\right)} = \frac{n_2}{n_1} \qquad /\cdot n_1$$

$$n_1 \frac{r_1 r_2 + f\left(r_1 + r_2\right)}{f\left(r_1 + r_2\right)} = n_2$$

$$n_2 = n_1 \frac{r_1 r_2 + f\left(r_1 + r_2\right)}{f\left(r_1 + r_2\right)}$$

$$\frac{1}{f} = \left(\frac{n_2}{n_1} - 1\right)\left(\frac{1}{r_1} + \frac{1}{r_2}\right) \qquad \{r_1\}$$

$$\frac{1}{f} = \frac{n_2 - n_1}{n_1}\left(\frac{1}{r_1} + \frac{1}{r_2}\right) \qquad /\cdot \frac{n_1}{n_2 - n_1}$$

$$\frac{n_1}{f\left(n_2 - n_1\right)} = \frac{1}{r_1} + \frac{1}{r_2} \qquad /-\frac{1}{r_2}$$

$$\frac{n_1}{f\left(n_2 - n_1\right)} - \frac{1}{r_2} = \frac{1}{r_1}$$

$$\frac{n_1 r_2 - f\left(n_2 - n_1\right)}{r_2 f\left(n_2 - n_1\right)} = \frac{1}{r_1} \qquad /\cdot \frac{r_2 f\left(n_2 - n_1\right)}{n_1 r_2 - f\left(n_2 - n_1\right)} \cdot r_1$$

$$r_1 = \frac{r_2 f\left(n_2 - n_1\right)}{n_1 r_2 - f\left(n_2 - n_1\right)}$$

6 - Ze soustavy rovnic pro rovnoměrně zrychlený pohyb s nulovou počáteční rychlostí $v = at$, $s = \frac{1}{2}at^2$ vyjádři:

6.a - čas t pomocí rychlosti v a zrychlení a

Stačí použít rovnici pro rychlost $v = at$

$v = at \quad /:a$

$$\frac{v}{a} = t$$

$$t = \frac{v}{a}$$

6.b - b) čas t pomocí dráhy s a zrychlení a

Všechny tři veličiny se vyskytují v rovnici pro dráhu, vyjádříme čas z ní

$$s = \frac{1}{2}at^2 \quad /\cdot\frac{2}{a}$$

$$\frac{2s}{a} = t^2 \quad /\sqrt{\ }$$

$$\sqrt{\frac{2s}{a}} = t$$

$$t = \sqrt{\frac{2s}{a}}$$

c) zrychlení a pomocí dráhy s a rychlosti v

tyto tři veličiny se společně nevyskytují ani v jedné z rovnic. Vyjádříme si z první rovnice čas pomocí rychlosti a zrychlení a dosadíme za něj do rovnice pro dráhu

$$v = at \Rightarrow t = \frac{v}{a}$$

$$s = \frac{1}{2}at^2 = \frac{1}{2}a\left(\frac{v}{a}\right)^2$$

$$s = \frac{1}{2}at^2 = \frac{1}{2}a\left(\frac{v}{a}\right)^2$$

$$s = \frac{1}{2}a\frac{v^2}{a^2}$$

$$s = \frac{v^2}{2a} \quad /\cdot\frac{a}{s}$$

$$a = \frac{v^2}{2s}$$

d) čas t pomocí dráhy s a rychlosti v

tyto tři veličiny se společně nevyskytují ani v jedné z rovnic. Vyjádříme si z první rovnice zrychlení pomocí rychlosti a času a dosadíme za něj do rovnice pro dráhu

$$v = at \Rightarrow a = \frac{v}{t}$$

$$s = \frac{1}{2}at^2 = \frac{1}{2}\frac{v}{t}t^2$$

$$s = \frac{1}{2}vt \quad /\cdot\frac{2}{v}$$

$$\frac{2s}{v} = t$$

$$t = \frac{2s}{v}$$

e) dráhu s pomocí zrychlení a a rychlosti v

tyto tři veličiny se společně nevyskytují ani v jedné z rovnic. Vyjádříme si z první rovnice čas pomocí rychlosti a zrychlení a dosadíme za něj do rovnice pro dráhu

$$v = at \Rightarrow t = \frac{v}{a}$$

$$s = \frac{1}{2}at^2 = \frac{1}{2}a\left(\frac{v}{a}\right)^2$$

$$s = \frac{1}{2}at^2 = \frac{1}{2}a\left(\frac{v}{a}\right)^2$$

$$s = \frac{1}{2} a \frac{v^2}{a^2}$$

$$s = \frac{v^2}{2a}$$

f) rychlost v pomocí zrychlení a a dráhy s
tyto tři veličiny se společně nevyskytují ani v jedné z rovnic. Vyjádříme si z první rovnice čas pomocí rychlosti a zrychlení a dosadíme za něj do rovnice pro dráhu

$$v = at \Rightarrow t = \frac{v}{a}$$

$$s = \frac{1}{2} a t^2 = \frac{1}{2} a \left(\frac{v}{a} \right)^2$$

$$s = \frac{1}{2} a t^2 = \frac{1}{2} a \left(\frac{v}{a} \right)^2$$

$$s = \frac{1}{2} a \frac{v^2}{a^2}$$

$$s = \frac{1}{2} \frac{v^2}{a} \quad / \cdot 2a$$

$$2sa = v^2 \quad / \sqrt{\ }$$

$$\sqrt{2sa} = v$$

$$v = \sqrt{2sa}$$

g) zrychlení a pomocí dráhy s a rychlosti v
tyto tři veličiny se společně nevyskytují ani v jedné z rovnic. Vyjádříme si z první rovnice čas pomocí rychlosti a zrychlení a dosadíme za něj do rovnice pro dráhu

$$v = at \Rightarrow t = \frac{v}{a}$$

$$s = \frac{1}{2} a t^2 = \frac{1}{2} a \left(\frac{v}{a} \right)^2$$

$$s = \frac{1}{2} a t^2 = \frac{1}{2} a \left(\frac{v}{a} \right)^2$$

$$s = \frac{1}{2} a \frac{v^2}{a^2}$$

$$s = \frac{1}{2} \frac{v^2}{a} \quad / \cdot \frac{a}{s}$$

$$a = \frac{v^2}{2s}$$

7 - Ze soustavy rovnic pro rovnoměrně zrychlený pohyb $v = v_0 + at$, $s = v_0 t + \frac{1}{2} a t^2$ vyjádři:

7.a - a) čas *t* pomocí rychlostí *v*, v_0 a zrychlení *a*
Tyto čtyři veličiny se vyskytují v rovnici pro rychlost. Čas tedy vyjádříme z této rovnice.

$$v = v_0 + at \quad / - v_0$$

$$v - v_0 = at \quad / : a$$

$$\frac{v-v_0}{a}=t$$

$$t=\frac{v-v_0}{a}$$

7.b - b) rychlost v_0, pomocí času *t*, dráhy *s* a zrychlení *a*

Tyto čtyři veličiny se vyskytují v rovnici pro dráhu. Čas tedy vyjádříme z této rovnice.

$$s=v_0t+\frac{1}{2}at^2 \qquad /-\frac{1}{2}at^2$$

$$s-\frac{1}{2}at^2=v_0t$$

$$\frac{2s-at^2}{2}=v_0t \qquad /:t$$

$$\frac{2s-at^2}{2t}=v_0$$

$$v_0=\frac{2s-at^2}{2t}$$

7.c - c) zrychlení *a* pomocí dráhy *s* a rychlostí *v* a v_0

Tyto čtyři veličiny se nevyskytují ani v jedné z rovnic. Musíme tedy z rovnice pro rychlost vyjádřit čas a dosadit za něj do rovnice pro dráhu

$$v=v_0+at \qquad /-v_0$$

$$v-v_0=at \qquad /:a$$

$$\frac{v-v_0}{a}=t$$

$$t=\frac{v-v_0}{a}$$

$$s=v_0t+\frac{1}{2}at^2=v_0\left(\frac{v-v_0}{a}\right)+\frac{1}{2}a\left(\frac{v-v_0}{a}\right)^2$$

$$s=\frac{v_0v-v_0^2}{a}+\frac{1}{2}a\frac{v^2-2vv_0+v_0^2}{a^2}$$

$$s=\frac{2v_0v-2v_0^2}{2a}+\frac{v^2-2vv_0+v_0^2}{2a}$$

$$s=\frac{2v_0v-2v_0^2+v^2-2vv_0+v_0^2}{2a}$$

$$s=\frac{v^2-v_0^2}{2a} \qquad /\cdot\frac{a}{s}$$

$$a=\frac{v^2-v_0^2}{2s}$$

7.d - d) dráhu *s* pomocí zrychlení *a* a rychlostí *v* a v_0

Tyto čtyři veličiny se nevyskytují ani v jedné z rovnic. Musíme tedy z rovnice pro rychlost vyjádřit čas a dosadit za něj do rovnice pro dráhu

$$v=v_0+at \qquad /-v_0$$

$$v-v_0=at \qquad /:a$$

$$\frac{v-v_0}{a}=t$$

$$t=\frac{v-v_0}{a}$$

$$s=v_0t+\frac{1}{2}at^2=v_0\left(\frac{v-v_0}{a}\right)+\frac{1}{2}a\left(\frac{v-v_0}{a}\right)^2$$

$$s=\frac{v_0v-v_0^2}{a}+\frac{1}{2}a\frac{v^2-2vv_0+v_0^2}{a^2}$$

$$s=\frac{2v_0v-2v_0^2}{2a}+\frac{v^2-2vv_0+v_0^2}{2a}$$

$$s=\frac{2v_0v-2v_0^2+v^2-2vv_0+v_0^2}{2a}$$

$$s=\frac{v^2-v_0^2}{2a}$$