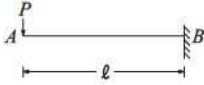
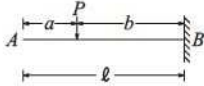
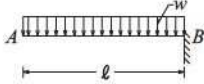
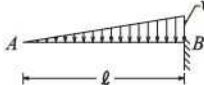
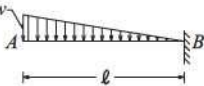
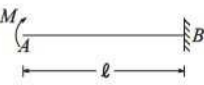
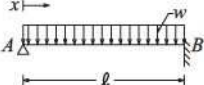
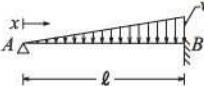
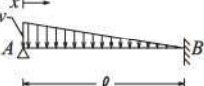
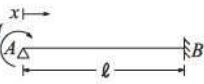
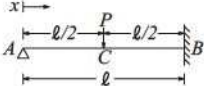


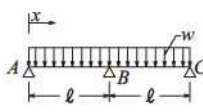
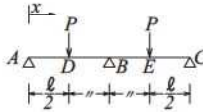
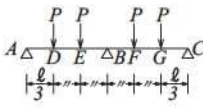
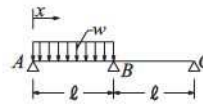
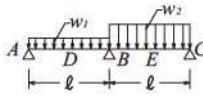
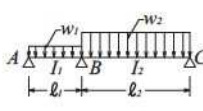
片持ちはりの応力計算公式

荷重形式	反力 R	曲げモーメント M	最大たわみ δ_{max}
	$R_B = P$	$M_B = -P\ell$	$\delta_A = \frac{1}{3} \frac{P\ell^3}{EI}$
	$R_B = P$	$M_B = -Pb$	$\delta_A = \frac{1}{6} \frac{P}{EI} (3b^2\ell - b^3)$
	$R_B = w\ell$	$M_B = -\frac{1}{2} w\ell^2$	$\delta_A = \frac{1}{8} \frac{w\ell^4}{EI}$
	$R_B = \frac{w\ell}{2}$	$M_B = -\frac{1}{6} w\ell^2$	$\delta_A = \frac{1}{30} \frac{w\ell^4}{EI}$
	$R_B = \frac{w\ell}{2}$	$M_B = -\frac{1}{3} w\ell^2$	$\delta_A = \frac{11}{120} \frac{w\ell^4}{EI}$
	$R_B = 0$	$M_B = M$	$\delta_A = -\frac{1}{2} \frac{M\ell^2}{EI}$
	$R_A = \frac{3}{8} w\ell$ $R_B = \frac{5}{8} w\ell$	$M_{max} = \frac{9}{128} w\ell^2$ ($x = \frac{3}{8}\ell$) $M_B = -\frac{1}{8} w\ell^2$	$\delta_{max} = 0.00541 \frac{w\ell^4}{EI}$ ($x = 0.4215\ell$)
	$R_A = \frac{1}{10} w\ell$ $R_B = \frac{2}{5} w\ell$	$M_{max} = 0.0298 w\ell^2$ ($x = 0.4474\ell$) $M_B = -\frac{1}{15} w\ell^2$	$\delta_{max} = 0.002385 \frac{w\ell^4}{EI}$ ($x = 0.4472\ell$)
	$R_A = \frac{11}{40} w\ell$ $R_B = \frac{9}{40} w\ell$	$M_{max} = 0.0423 w\ell^2$ ($x = 0.329\ell$) $M_B = -\frac{7}{120} w\ell^2$	$\delta_{max} = 0.003045 \frac{w\ell^4}{EI}$ ($x = 0.402\ell$)
	$R_A = -R_B = \frac{3}{2} \frac{M}{\ell}$	$M_{max} = M$ $M_B = -\frac{1}{2} M$	$\delta_{max} = \frac{1}{27} \frac{M\ell^2}{EI}$ ($x = \frac{1}{3}\ell$)
	$R_A = \frac{5}{16} P$ $R_B = \frac{11}{16} P$	$M_C = \frac{5}{32} P\ell$ $M_B = -\frac{3}{16} P\ell$	$\delta_{max} = 0.00932 \frac{P\ell^3}{EI}$ ($x = 0.4472\ell$)

はりの応力計算公式

荷重形式	単純支持 \triangle			両端固定 ㄣ		
	反力 R	曲げモーメント M_0	最大たわみ δ_{max}	反力 R	固定端モーメント C_A, C_B	最大たわみ δ_{max}
	$R_A = R_B = \frac{P}{2}$	$M_0 = \frac{P\ell}{4}$	$\delta_{max} = \frac{P\ell^3}{48EI}$	$R_A = R_B = \frac{P}{2}$	$C_A = -C_B = -\frac{P\ell}{8}$	$\delta_{max} = \frac{P\ell^3}{192EI}$
	$R_A = \frac{Pb}{\ell}$ $R_B = \frac{Pa}{\ell}$	$M_C = \frac{Pab}{\ell}$	$\delta_{max} = \frac{Pb(\ell^2 - b^2)^{3/2}}{9\sqrt{3}EI\ell}$ ($a > b$ のとき) $x = \sqrt{\frac{\ell^2 - b^2}{3}}$ $\delta_c = \frac{Pa^2b^2}{3EI\ell}$	$R_A = \frac{Pb^2}{\ell^2}(3a+b)$ $R_B = \frac{Pa^2}{\ell^2}(3b+a)$	$C_A = -\frac{Pab^2}{\ell^2}$ $C_B = \frac{Pa^2b}{\ell^2}$	$\delta_{max} = \frac{2Pa^3b^2}{3EI(3a+b)^2}$ ($x = \frac{2a\ell}{3a+b}$)
	$R_A = R_B = P$	$M_0 = \frac{P\ell}{3}$	$\delta_{max} = \frac{23}{648} \frac{P\ell^3}{EI}$	$R_A = R_B = P$	$C_A = -C_B = -\frac{2P\ell}{9}$	$\delta_{max} = \frac{5}{648} \frac{P\ell^3}{EI}$
	$R_A = R_B = \frac{3P}{2}$	$M_0 = \frac{P\ell}{2}$	$\delta_{max} = \frac{19}{384} \frac{P\ell^3}{EI}$	$R_A = R_B = \frac{3P}{2}$	$C_A = -C_B = -\frac{5P\ell}{16}$	$\delta_{max} = \frac{1}{96} \frac{P\ell^3}{EI}$
	$R_A = R_B = \frac{w\ell}{2}$	$M_0 = \frac{w\ell^2}{8}$	$\delta_{max} = \frac{5}{384} \frac{w\ell^4}{EI}$	$R_A = R_B = \frac{w\ell}{2}$	$C_A = -C_B = -\frac{w\ell^2}{12}$	$\delta_{max} = \frac{1}{384} \frac{w\ell^4}{EI}$
	$R_A = wb \frac{2c+b}{2\ell}$ $R_B = wb \frac{2a+b}{2\ell}$	$M_{max} = R_A(a + \frac{R_A}{2w})$ ($x = a + R_A/w$)	$\delta_c = \frac{wb}{48EI\ell} \{(\ell+a-c)(\ell-a+c) - \frac{b^2}{4}\}^2 + \frac{b^2(2\ell-b)}{16}$	$R_A = \frac{wb}{2\ell^2} \{(b+2c)\ell^2 - (a-c)(2ac+bc+ab)\}$ $R_B = wb - R_A$	$C_A = -\frac{wb}{8\ell^2} \{(b+2c)^2(2a+b) + \frac{1}{3}b^2(2\ell-6c-3b)\}$ $C_B = \frac{wb}{8\ell^2} \{(2a+b)^2(b+2c) + \frac{1}{3}b^2(2\ell-6a-3b)\}$	$\delta_x = \frac{1}{6EI} \{3C_A x^2 - R_A x^3 + \frac{w}{4}(x-a)^4\}$
	$R_A = \frac{w\ell}{6}$ $R_B = \frac{w\ell}{3}$	$M_{max} = 0.064w\ell^2$ ($x = 0.577\ell$)	$\delta_{max} = 0.00652 \frac{w\ell^4}{EI}$ ($x = 0.519\ell$)	$R_A = \frac{3w\ell}{20}$ $R_B = \frac{7w\ell}{20}$	$C_A = -\frac{w\ell^2}{30}$, $C_B = \frac{w\ell^2}{20}$ $M_{max} = 0.0215w\ell^2$ ($x = 0.548\ell$)	$\delta_{max} = 0.00131 \frac{w\ell^4}{EI}$ ($x = 0.525\ell$)
	$R_A = R_B = \frac{w\ell}{4}$	$M_0 = \frac{w\ell^2}{12}$	$\delta_{max} = \frac{1}{120} \frac{w\ell^4}{EI}$	$R_A = R_B = \frac{w\ell}{4}$	$C_A = -C_B = -\frac{5w\ell^2}{96}$ $M_{max} = \frac{w\ell^2}{32}$	$\delta_{max} = \frac{7}{3840} \frac{w\ell^4}{EI}$
	$R_A = R_B = \frac{w(\ell-a)}{2}$	$M_0 = \frac{w}{24}(3\ell^2 - 4a^2)$	$\delta_{max} = \frac{w}{1920EI}(5\ell^2 - 4a^2)^2$	$R_A = R_B = \frac{w(\ell-a)}{2}$	$C_A = -C_B = -\frac{w}{12}(\ell^2 - 2a^2 + \frac{a^3}{\ell})$	$\delta_{max} = \frac{w}{1920EI}(5\ell^2 - 20\ell a^2 + 16a^4)$
	$R_A = R_B = \frac{w\ell}{4}$	$M_C = \frac{w\ell^2}{16}$ $M_{D,E} = \frac{5w\ell^2}{96}$	$\delta_{max} = \frac{7}{1024} \frac{w\ell^4}{EI}$	$R_A = R_B = \frac{w\ell}{4}$	$C_A = -C_B = -\frac{17}{384}w\ell^2$ $M_C = \frac{7}{384}w\ell^2$	$\delta_{max} = \frac{w\ell^4}{768EI}$
	$R_A = R_B = \frac{w\ell}{4}$	$M_C = \frac{7w\ell^2}{108}$	$\delta_{max} = \frac{259}{38880} \frac{w\ell^4}{EI}$	$R_A = R_B = \frac{w\ell}{4}$	$C_A = -C_B = -\frac{37}{864}w\ell^2$ $M_C = \frac{19}{864}w\ell^2$	$\delta_{max} = \frac{407}{311040} \frac{w\ell^4}{EI}$
	$R_A = -R_B = \frac{M}{\ell}$	$M_C = \frac{Ma}{\ell}$ or $-\frac{Mb}{\ell}$	$\delta_{max} = \frac{M(\ell^2 - 3b^2)^{3/2}}{9\sqrt{3}EI\ell}$ ($x = \sqrt{\frac{\ell^2 - 3b^2}{3}}$)	$R_A = -R_B = \frac{6abM}{\ell^2}$	$C_A = -\frac{bM}{\ell^2}(2\ell - 3b)$ $C_B = -\frac{aM}{\ell^2}(2\ell - 3a)$	$\delta_{max} = \frac{b(2a-b)^2M}{54a^2EI}$ ($x = \ell(3a-\ell)/3a$)
	$R_A = -R_B = \frac{M}{\ell}$	$M_x = -M(1 - \frac{x}{\ell})$	$\delta_{max} = \frac{M\ell^2}{9\sqrt{3}EI}$ ($x = (1 - \frac{1}{\sqrt{3}})\ell$)	—	—	—

はりの応力計算公式

荷重形式	反力 R	曲げモーメント M	最大たわみ δ_{\max}
	$R_A = R_C = \frac{3}{8} w l$ $R_B = \frac{5}{4} w l$	$M_B = -\frac{1}{8} w l^2$ $M_D = \frac{9}{128} w l^2$ $(x = \frac{3}{8} l)$	$\delta_{\max} = \frac{w l^4}{185 E I}$ $(x = 0.422 l)$
	$R_A = \frac{5}{16} P$ $R_C = \frac{5}{16} P$ $R_B = \frac{8}{8} P$	$M_B = -\frac{3}{16} P l$ $M_D = M_E = \frac{5}{32} P l$	$\delta_{\max} = \frac{P l^3}{48 \sqrt{5} E I}$ $(x = \frac{1}{\sqrt{5}} l)$ $\delta_D = \delta_E = \frac{7 P l^3}{768 E I}$
	$R_A = R_C = \frac{2}{3} P$ $R_B = \frac{8}{3} P$	$M_B = -\frac{1}{3} P l$ $M_E = M_F = \frac{1}{9} P l$ $M_D = M_G = \frac{2}{9} P l$	$\delta_D = \delta_G = \frac{7}{486} P l^3$
	$R_A = \frac{7}{16} w l$ $R_C = -\frac{1}{16} w l$ $R_B = \frac{5}{8} w l$	$M_B = -\frac{1}{16} w l^2$ $M_D = \frac{49}{512} w l^2$ $(x = \frac{7}{16} l)$	$\delta_D = \frac{7 w l^4}{768 E I}$ $(x = \frac{1}{2} l)$
	$R_A = \frac{1}{16} (7w_1 - w_2) l$ $R_C = \frac{1}{16} (7w_2 - w_1) l$ $R_B = \frac{5}{8} (w_1 + w_2) l$	$M_B = -\frac{1}{16} (w_1 + w_2) l^2$	$\delta_D = \frac{1}{768 E I} (7w_1 - 3w_2) l^4$ $\delta_E = \frac{1}{768 E I} (7w_2 - 3w_1) l^4$
 <p style="text-align: center;">$\alpha = \frac{l_2 l_1}{l_1 l_2}$</p>	$W = w_1 l_1 + w_2 l_2$ $R_B = W - R_A - R_C$ $R_A = \frac{w_1 l_1}{2} - \frac{1}{8(1+\alpha) l_1} (\alpha w_1 l_1^2 + w_2 l_2^2)$ $R_C = \frac{w_2 l_2}{2} - \frac{1}{8(1+\alpha) l_2} (\alpha w_1 l_1^2 + w_2 l_2^2)$	$M_B = -\frac{1}{8(1+\alpha)} (\alpha w_1 l_1^2 + w_2 l_2^2)$	$\delta_D = \frac{5 w_2 l_2^4}{384 E I_2} - \frac{M_B l_2^2}{16 E I_2}$ <p style="text-align: center;">(BC は¹⁾中央部)</p>

3