90　表より，

$$\begin{aligned}\overline{x} &= \frac{1}{8}(8+4+6+5+7+8+4+2)\\ &= 5.5\\ \overline{y} &= \frac{1}{8}(5+6+4+6+4+3+7+9)\\ &= 5.5\\ \overline{x^2} &= \frac{1}{8}(8^2+4^2+\cdots+2^2)\\ &= 34.25\\ \overline{y^2} &= \frac{1}{8}(5^2+6^2+\cdots+9^2)\\ &= 33.5\\ \overline{xy} &= \frac{1}{8}(8\cdot5+4\cdot6+6\cdot4+5\cdot6\\ &\qquad +7\cdot4+8\cdot3+4\cdot7+2\cdot9)\\ &= 27\end{aligned}$$

したがって，

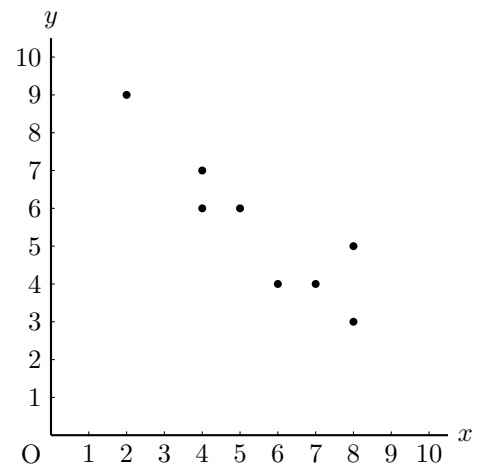
$$s_x = \sqrt{\overline{x^2}-\overline{x}^2} = \sqrt{34.25-5.5^2} = 2.0$$

$$s_y = \sqrt{\overline{y^2}-\overline{y}^2} = \sqrt{33.5-5.5^2} = 1.8027\cdots$$

$$s_{xy} = \overline{xy}-\overline{x}\,\overline{y} = 27-5.5\cdot5.5 = -3.25$$

よって，

$$r = \frac{s_{xy}}{s_x s_y} = \frac{-3.25}{2.0\cdot1.8027} = -0.9014\cdots \fallingdotseq \mathbf{-0.901}$$



91　表より，

$$\begin{aligned}\overline{x} &= \frac{1}{10}(36+38+43+45+52\\ &\qquad +57+65+68+71+73)\\ &= 54.8\\ \overline{y} &= \frac{1}{10}(117+126+133+131+137\\ &\qquad +136+143+152+149+158)\\ &= 138.2\\ \overline{x^2} &= \frac{1}{10}(36^2+38^2+\cdots+73^2)\\ &= 3178.6\\ \overline{y^2} &= \frac{1}{10}(117^2+126^2+\cdots+158^2)\\ &= 19239.8\\ \overline{xy} &= \frac{1}{10}(36\cdot117+38\cdot126+43\cdot133+45\cdot131\\ &\qquad +52\cdot137+57\cdot136+65\cdot143+68\cdot152\\ &\qquad +71\cdot149+73\cdot158)\\ &= 7723.4\end{aligned}$$

したがって，

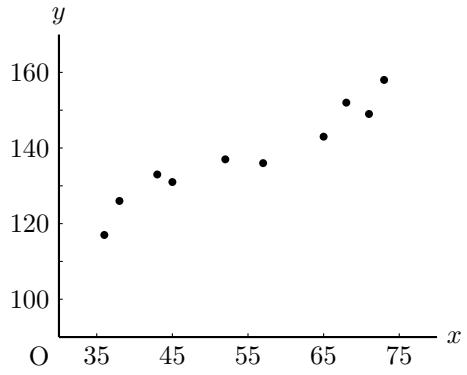
$$s_x = \sqrt{\overline{x^2}-\overline{x}^2} = \sqrt{3178.6-54.8^2} = 13.2499\cdots$$

$$s_y = \sqrt{\overline{y^2}-\overline{y}^2} = \sqrt{19239.8-138.2^2} = 11.8558\cdots$$

$$s_{xy} = \overline{xy}-\overline{x}\,\overline{y} = 7723.4-54.8\cdot138.2 = 150.04$$

よって，

$$r = \frac{s_{xy}}{s_x s_y} = \frac{150.04}{13.2499\cdot11.8558} = 0.9551\cdots \fallingdotseq \mathbf{0.955}$$



92 (1)　表より，

$$\begin{aligned}\overline{x} &= \frac{1}{7}(0+5+10+15+20+25+30)\\ &= 15\\ \overline{y} &= \frac{1}{7}(2+4+7+15+23+28+33)\\ &= 16\\ \overline{x^2} &= \frac{1}{7}(0^2+5^2+\cdots+30^2)\\ &= 325\\ \overline{xy} &= \frac{1}{7}(0\cdot 2+5\cdot 4+10\cdot 7+15\cdot 15\\ &\qquad +20\cdot 23+25\cdot 28+30\cdot 33)\\ &= 352.1\end{aligned}$$

よって，

$$s_x{}^2 = \overline{x^2} - \overline{x}^2 = 325 - 15^2 = 100$$

$$s_{xy} = \overline{xy} - \overline{x}\,\overline{y} = 352.1 - 15\cdot 16 = 112.1$$

回帰直線の方程式を $y = ax + b$ とおくと，

$$\begin{aligned}a &= \frac{s_{xy}}{s_x{}^2} = \frac{112.1}{100} = 1.121\\ &\fallingdotseq 1.12\\ b = \overline{y} - a\overline{x} &= 16 - 1.121\cdot 15\\ &= -0.815\\ &\fallingdotseq -0.82\end{aligned}$$

したがって，y の x への回帰直線の方程式は，
$\boldsymbol{y = 1.12x - 0.82}$

(2)　(1) で求めた回帰直線の式に，$x = 35$ を代入すると，

$$\begin{aligned}y &= 1.12\cdot 35 - 0.82\\ &= 38.38\end{aligned}$$

したがって，**38 個**.

93　表より，

$$\begin{aligned}\overline{x} &= \frac{1}{8}(0.8+2.7+6.1+4.6\\ &\qquad +7.3+1.5+2.3+3.2)\\ &= 3.562\cdots\\ \overline{y} &= \frac{1}{8}(11.1+13.1+18.0+17.0\\ &\qquad +19.3+12.0+14.1+14.8)\\ &= 14.925\\ \overline{x^2} &= \frac{1}{8}(0.8^2+2.7^2+\cdots+3.2^2)\\ &= 17.1712\cdots\\ \overline{xy} &= \frac{1}{8}(0.8\cdot 11.1+2.7\cdot 13.1+6.1\cdot 18.0\\ &\qquad +4.6\cdot 17.0+7.3\cdot 19.3+1.5\cdot 12.0\\ &\qquad +2.3\cdot 14.1+3.2\cdot 14.8)\\ &= 58.8662\cdots\end{aligned}$$

よって，

$$s_x{}^2 = \overline{x^2} - \overline{x}^2 = 17.171 - 3.562^2 = 4.4833\cdots$$

$$s_{xy} = \overline{xy} - \overline{x}\,\overline{y} = 58.8662 - 3.562\cdot 14.925 = 5.7033\cdots$$

回帰直線の方程式を $y = ax + b$ とおくと，

$$\begin{aligned}a &= \frac{s_{xy}}{s_x{}^2} = \frac{5.7033}{4.4833} = 1.2721\cdots\\ &\fallingdotseq 1.27\\ b = \overline{y} - a\overline{x} &= 14.925 - 1.2721\cdot 3.562\\ &= 10.393\cdots\\ &\fallingdotseq 10.40\end{aligned}$$

したがって，y の x への回帰直線の方程式は，
$\boldsymbol{y = 1.27x + 10.40}$

94 (1)　表より，

$$\begin{aligned}\overline{x} &= \frac{1}{10}(164+175+179+169+181\\ &\qquad +179+168+170+172+166)\\ &= 172.3\end{aligned}$$

$$\begin{aligned}\overline{y} &= \frac{1}{10}(24.5+26.5+28.5+26.5+30.0\\ &\qquad +30.5+26.0+25.0+27.0+26.5)\\ &= 27.1\end{aligned}$$

$$\begin{aligned}\overline{x^2} &= \frac{1}{10}(164^2+175^2+\cdots+166^2)\\ &= 29718.9\end{aligned}$$

$$\begin{aligned}\overline{xy} &= \frac{1}{10}(164\cdot 24.5+175\cdot 26.5+179\cdot 28.5\\ &\qquad +169\cdot 26.5+181\cdot 30.0+179\cdot 30.5\\ &\qquad +168\cdot 26.0+170\cdot 25.0+172\cdot 27.0\\ &\qquad +166\cdot 26.5)\\ &= 4678.6\end{aligned}$$

よって，

$${s_x}^2 = \overline{x^2} - \overline{x}^2 = 29718.9 - 172.3^2 = 31.61$$

$$s_{xy} = \overline{xy} - \overline{x}\,\overline{y} = 4678.6 - 172.3\cdot 27.1 = 9.27$$

回帰直線の方程式を $y = ax + b$ とおくと，

$$\begin{aligned}a = \frac{s_{xy}}{{s_x}^2} = \frac{9.27}{31.61} &= 0.29326\cdots\\ &\fallingdotseq 0.29\\ b = \overline{y} - a\overline{x} &= 27.1 - 0.29326\cdot 172.3\\ &= -23.428\cdots\\ &\fallingdotseq -23.43\end{aligned}$$

したがって，y の x への回帰直線の方程式は，
$\boldsymbol{y = 0.29x - 23.43}$

(2)　(1) で求めた回帰直線の式に，$x = 180$ を代入すると，

$$\begin{aligned}y &= 0.29\cdot 180 - 23.43\\ &= 28.77\end{aligned}$$

靴のサイズは 0.5 きざみなので **29.0 cm**