9.18. From Eqs. (9.2.3) and (9.2.6), respectively,

$$\text{SQNR} = 10\log_{10}\left(\frac{\sigma^2}{D}\right)$$

and

$$D = \frac{\Delta^2}{12}, \text{(uniformly distributed quantization noise).}$$

Following Example 9.2.2,

$$\sigma^2 = \left(\frac{31}{\sqrt{2}}\right)^2 = \frac{(31)^2}{2}$$

and

$$D = \frac{\Delta^2}{12} = \frac{(2)^2}{12}$$

hence

$$\text{SQNR} = 10\log_{10}\frac{6(31)^2}{2^2} = 10\log_{10}6 + 20\log_{10}\left(\frac{31}{2}\right) = 31.6\,\text{dB}.$$

9.19. Segment $0-1$ has $p_0 \cong 0$.

i	1	2	3	4	5	6	7	8
p_i	.00234	.00499	.01	.02	.04	.081	.173	.668

9.20. $D = 3917$ and $\sigma^2 = \frac{(8159)^2}{2}$ so

$$\text{SQNR} = 10\log_{10}\frac{\sigma^2}{D} = 39.3\,\text{dB}.$$

9.21. From Problems 9.18 and 9.20, the input powers are

$$10\log_{10}\frac{(31)^2}{2} = 26.8\,\text{dB}$$

and

$$10\log_{10}\frac{(8159)^2}{2} = 75.2\,\text{dB}$$

for an input dynamic range of $75.2 - 26.8 = 48.4\,\text{dB}$. The output SNR is 31.6 and 39.3 dB for the two input powers, respectively.

From Table 9.6.1, $\Delta_{\min} = 1$ and $\Delta_{\max} = 256$, so

$$20\log_{10}(256) = 48.2\,\text{dB}.$$