1a) $2^7 = 128$

1b) $\binom{7}{3} = 35$

2) a) $\dfrac{4 \cdot 48}{(52)(51))} \approx 0.018$

b) $\dfrac{\binom{13}{2}}{\binom{52}{2}} \approx 0.059$

c) $\dfrac{51}{(52)(51)} \approx 0.019$

3) Consider the experiment: toss a balanced coin four times.

a) 0, 1, 2, 3, 4

b) $p(0) = \frac{1}{16}$, $p(1) = \frac{4}{16} = \frac{1}{4}$, $p(2) = \frac{6}{16} = \frac{3}{8}$, $p(3) = \frac{4}{16} = \frac{1}{4}$, $p(4) = \frac{1}{16}$

c) $P(1 \leq X \leq 3) = p(1) + p(2) + p(3) = \frac{4}{16} + \frac{6}{16} + \frac{4}{16} = \frac{14}{16} = \frac{7}{8}$

d) $E(X) = 0(\frac{1}{16}) + 1(\frac{4}{16}) + 2(\frac{6}{16}) + 3(\frac{4}{16}) + 4(\frac{1}{16}) = 2$. Interpretation: if we repeatedly toss these four coins many times, the average number of heads which show should be (very close to) 2.

4) a) $\frac{x}{8} \geq 0$ for $x \geq 0$, and the total probability is 1: $\int_0^4 \frac{x}{8} dx = [\frac{x^2}{16}]_0^4 = 1 - 0 = 1$

b) $\displaystyle\int_1^3 \frac{x}{8} dx = [\frac{x^2}{16}]_1^3 = \frac{9}{16} - \frac{1}{16} = \frac{1}{2}$

c) $P(X = 2) = 0$ since this is a continuous probability density.