(1) The bigger of the two doesn't exceed 3, so we could have $(1/2/3, 1/2/3)$, the chance is $\frac{9}{36} = \frac{1}{4}$.

(2) Choose one pair from three pairs, and the single one can be chosen from the 4 singles left. $C_3^1 C_4^1 / C_6^3 = \frac{3}{5}$.

(3) $P_6^3/6^3 = \frac{5}{9}$.

(4) $P(A \cap B^c \cap C^c) + P(A^c \cap B \cap C^c) + P(A^c \cap B^c \cap C) = \frac{1}{2}\frac{2}{3}\frac{4}{5} + \frac{1}{2}\frac{1}{3}\frac{4}{5} + \frac{1}{2}\frac{2}{3}\frac{1}{5} = \frac{7}{15}$.

(5) A land two heads and B zero or one: $(\frac{2}{3})^2 \times (1 - (\frac{1}{3})^2)$. A land one head and B land zero: $2\frac{2}{3}\frac{1}{3}(\frac{2}{3})^2$. Sum up to $\frac{48}{81}$.

(6) Two red one green or three red: $(C_6^2 C_4^1 + C_6^3)/C_{10}^3 = 2/3$.

(7) I set the question to "sum to 8". You could have (1,1,6)(1,2,5)(1,3,4)(1,4,3)(1,5,2)(1,6,1), conditional probability for A to be 1, 6/21;
(2,1,5)(2,2,4)(2,3,3)(2,4,2)(2,5,1), conditional probability 5/21;
(3,1,4)(3,2,3)(3,3,2)(3,4,1), 4/21
(4,1,3)(4,2,2)(4,3,1), 3/21
(5,2,1)(5,1,2), 2/21
(6,1,1) 1/21
expectation $E = \frac{6}{21} + 2 \times \frac{5}{21} + 3 \times \frac{4}{21} + 4 \times \frac{3}{21} + 5 \times \frac{2}{21} + 6 \times \frac{1}{21} = \frac{8}{3}$.

(8) $P(A \cap B) = P(B)P(A|B) = 1/12$. $P(A \cup B) = P(A) + P(B) - P(A \cap B) = 1/2 + 1/3 - 1/12 = 9/12$. $P((A \cup B)^c) = 1/4$.

(9) In this problem you will get the same answer either interpreting "two heads and a tail" as a fixed order "HHT" or three cases ("HHT", "HTH", "THH"), because from the former one to get the later one you will times a factor C_3^2 on both numerators and denominators.
I will do the second way of interpretation.
A: $C_3^2(\frac{1}{4})^2\frac{3}{4}$.
B: $C_3^2(\frac{1}{2})^2\frac{1}{2}$.
C: $C_3^2(\frac{3}{4})^2\frac{1}{4}$.
The conditional probability

$$P(A|condition) = \frac{\frac{1}{3} \times C_3^2(\frac{1}{4})^2\frac{3}{4}}{\frac{1}{3} \times (C_3^2(\frac{1}{4})^2\frac{3}{4} + C_3^2(\frac{1}{2})^2\frac{1}{2} + C_3^2(\frac{3}{4})^2\frac{1}{4})} = \frac{3}{20}.$$

$$P(B|condition) = \frac{8}{20}.$$

$$P(C|condition) = \frac{9}{20}.$$

C is the most probable coin to produce such pattern, with 45% chance of being chosen.

(10) $P_3^3 P_2^2 P_1^1 / P_6^6 = 1/60$.

(11) $C_3^2(\frac{3}{5})^2\frac{2}{5}+(\frac{3}{5})^3=81/125$.

(12)

$$\int_1^2\int_{\sqrt{y-1}}^1 e^{x^3}dxdy=\int_0^1\int_1^{x^2+1}dye^{x^3}dx=\frac{1}{3}e^{x^3}|_0^1=\frac{1}{3}(e-1).$$

(13) Denote $f(x,y):=d^2=x^2+(y-1)^2$. $g(x,y):=4x^2+y^2-4$. The gradient $\bigtriangledown f=(2x,2(y-1))$, $\bigtriangledown g=(8x,2y)$. We have $(x,y-1)=\lambda(4x,y)$ and $g=0$. Possible extreme value points: $(\frac{\pm\sqrt{5}}{3},\frac{4}{3})$ when have minimal value $d=\sqrt{2/3}$. And (0,-2) when have max value $d=3$. (0,2) is not an extreme value point.