4) The sample space S has size $|S| = 6^3 = 216$. (All outcomes equally likely)

a) Only possibility is $(5,5,5)$ so $\frac{1}{216}$

b) Total of 18 only occurs in 1 way $(6,6,6)$.
Total of 17 occurs in 3 ways, $(5,6,6), (6,5,6)$ and $(6,6,5)$
~~Total of~~ So a total of at most 16 occurs in $216 - 3 - 1$ ways
with probability $= \frac{212}{216}$

c) The only prime numbers 1-6 are 2,3,5
Number of ways of getting three different primes is $P(3,3) = 3! = 6$
So probability is $\frac{6}{216} = \frac{1}{36}$

d) All different happens in $P(6,3)$ ways so probability is $\frac{P(6,3)}{216}$

10) 12 balls in total so $|S| = 12^2$ $\left(\begin{array}{l}\text{assume the balls are numbered and thus}\\\text{distinguishable, it makes things much easier !}\end{array}\right)$

a) 3 ways of picking first ball red and 3 for the second. So probability is $\frac{3 \times 3}{12 \times 12}$

b) $\frac{3 \times 3}{9 \times 9}$ ways of picking both blue ones. So $1 - \frac{9 \times 9}{12 \times 12}$ is prob. of picking at most one

c) 9×9 ways of picking no blue ones. So $1 - \frac{81}{144}$ is prob. of picking at least one

d) BW in 3×4 ways and WB in 4×3 ways. So probability $= \frac{24}{144}$

e) Prob of RR $= \frac{25}{216}$, so prob of at least one B or W is $1 - \frac{25}{144}$.

12) $|S| = \binom{12}{2}$.   a) $\frac{\binom{3}{2}}{\binom{12}{2}}$ b) $1 - \frac{\binom{3}{2}}{\binom{12}{2}}$.

c) $\binom{9}{2}$ ways of picking no blue balls. So $1 - \frac{\binom{9}{2}}{\binom{12}{2}}$ ways of picking at least one

d) $4 \times 3 = 12$ ways of picking $1W$ and B. So probability $= \frac{12}{\binom{12}{2}}$

e) RR in $\binom{5}{2}$ ways. So at least W or B in $1 - \frac{\binom{5}{2}}{\binom{12}{2}}$