1.a. $52 * 51 * 50 = 132,600$ w/o replacement   no jokers
       $54 * 53 * 52 = 148,824$ w/o replacement   w/ jokers
       (this method is more typical for cards)

b. $6^5 = 7,776$

c. $(26)^4 = 456,976$ assume all caps or all lower case
                            as standard, unless told otherwise

d.   QRSTU = 5 options

     $5 * 4 * 3 * 2 = 120$ w/o repetition
     $(5)^4 = 655$ w/ repetition

e.   consider the list of males: The first one has 12 choices, the
     second 11, the third 10, etc.
     $= 12! = 479,001,600$

f. $(26)^3 (10)^4 = 175,760,000$

g. $(36)^9 = 1.015599567 \times 10^{14} \approx 100$ trillion

h. $(26 \times 2 + 10 + 32)^8 = (94)^8 = 6.095689 \times 10^{15} \approx 6$ quadrillion
     $(94)^{13} = 4.47365 \times 10^{25} \approx 45$ septillion

i. $2 * 3 * 8 * 2 = 96$

j. $\binom{5}{1} + \binom{5}{2} + \binom{5}{3} + \binom{5}{4} + \binom{5}{5} = 5 + 10 + 10 + 5 + 1 = 31$

k. $210 * 209 * 208 = 9,129,120$

l. $\binom{210}{3} = 1,521,520$

2.a. i. $\frac{5}{26}$ ii. $\frac{21}{26}$ iii. $\frac{21}{26} \cdot \frac{5}{25} \cdot \frac{20}{24} = \frac{7}{52}$ w/o replacement

26. $\frac{1}{5}$

c. isosahedral is 20 sides $\frac{1}{20}$

d. dodecahedral is 12 sides $\frac{11}{12}$

e. $\frac{2}{6} = \frac{1}{3}$ since 1,2 are both less than 3

f. $\frac{1}{6} * \frac{1}{6} = \frac{1}{36}$.

g. you can get a 7 w/ 1&6, 6&1, 2&5, 5&2, 3&4, 4&3 = 6 ways
$\frac{6}{36} = \frac{1}{6}$

h. i. $\frac{26}{65}$ ii. $\frac{4}{65}$ iii. $\frac{18}{65}$

i. $\frac{8}{52} = \frac{2}{13}$

j. $\frac{4}{52} * \frac{4}{51} = \frac{16}{2652} = \frac{4}{663}$ w/o replacement assumed.

k. $\frac{1}{52} * \frac{1}{51} = \frac{1}{2652}$ w/o replacement assumed.

l. 46 total marbles.
0% since there are no red marbles.
$\frac{14}{46} \cdot \frac{13}{45} = \frac{91}{1035}$ w/o replacement assumed.

3. $3 * \frac{1}{6} + 0 * \frac{1}{6} - 1 * \frac{4}{6} = \frac{3}{6} - \frac{4}{6} = \frac{-1}{6}$ no, you should not play this game; you expect to lose money.

4. $30,000 * \left(\frac{1}{23} \cdot \frac{1}{22} \cdot \frac{1}{21} \cdot \frac{1}{20} \cdot \frac{1}{19} \cdot \frac{1}{18} \right) - 1 = -.9995872$

5. $40,000,000 \left(\frac{1}{59} \cdot \frac{1}{58} \cdot \frac{1}{57} \cdot \frac{1}{56} \cdot \frac{1}{55} \cdot \frac{1}{35} \right) - 2 = -1.998097...$

min payout ↑   ↑ power ball   ↑ cost to play

6a. $7 + 2 = 9$

↑ ↑ ↖ total

against for

Prob $= \dfrac{2}{9}$

b. $3 + 5 = 8$

↗ ↑ ↖ total

for against

prob. $\dfrac{3}{8}$

7. a. Prob $= \dfrac{3}{7}$ ← for ← total   against $= 7 - 3 = 4$ odds for 3 to 4

odds against 4 to 3

b. Prob $\dfrac{2}{11}$ ← against ← total   for $= 11 - 2 = 9$ odds for 9 to 2

odds against 2 to 9.