1. Simplifica los cocientes entre factoriales:

   (a) $\frac{7!}{6!}$

   Sol: 7

   (b) $\frac{8!}{9!}$

   Sol: $\frac{1}{9}$

   (c) $\frac{9!}{5!\cdot 4!}$

   Sol: 126

   (d) $\frac{m!}{(m-1)!}$

   Sol: m

   (e) $\frac{(m+1)!}{(m-1)!}$

   Sol: $m\,(m+1)$

2. Calcula las siguientes operaciones:

   (a) $\binom{252}{250}$

   Sol: 31626

   (b) $\binom{25}{3}+\binom{25}{4}$

   Sol: 14950

   (c) $\binom{9}{6}+\binom{9}{7}+\binom{10}{2}$

   Sol: 165

   (d) $\binom{4}{2}+\binom{4}{3}+\binom{5}{4}+\binom{6}{5}+\binom{7}{6}+\binom{8}{7}$

   Sol: 36

   (e) $\binom{4}{0}+\binom{4}{1}+\binom{4}{2}+\binom{4}{3}$

   Sol: 15

3. Simplifica:

   (a) $\frac{6!}{5!}+\frac{8!}{6!}$

   Sol: 62

   (b) $\frac{n!}{(n-1)!}+\frac{(n+2)!}{n!}$

   Sol: n^2+4n+2

   (c) $\frac{\binom{n+3}{n}+\binom{n+2}{n}}{\frac{n+6}{6}}$

   Sol: $\frac{n(n+1)(n+2)(n+6)}{6(n^2+6)}$

4. Realiza los desarrollos de los siguientes binomios:

   (a) $(2+x)^4$

   Sol: $x^4+8x^3+24x^2+32x+16$

   (b) $(1+2\sqrt{2})^3$

   Sol: $25+22\sqrt{2}$

   (c) $(2-3\sqrt{2})^3$

   Sol: $-90\sqrt{2}+116$

   (d) $(\frac{x}{2}+\frac{2}{x^2})^5$

   Sol: $\frac{x^5}{32}+\frac{5x^2}{8}+\frac{5}{x}+\frac{20}{x^4}+\frac{40}{x^7}+\frac{32}{x^{10}}$

   (e) $(\frac{2}{\sqrt{2}}+\sqrt{2})^4$

   Sol: $16\frac{\sqrt{2}}{2}\sqrt{2}+48$

   (f) $(5\sqrt{2}-2\sqrt{3})^4$

   Sol: $-2480\sqrt{6}+6244$

   (g) $(2x^2-\frac{3}{x})^6$

   Sol: $64x^{12}-576x^9+2160x^6-4320x^3+4860-\frac{2916}{x^3}+\frac{729}{x^6}$

5. Realiza los desarrollos de los siguientes binomios para identificar determinados términos y coeficientes:

(a) $(2+x)^8$

Sol: $x^8 + 16x^7 + 112x^6 + 448x^5 + 1120x^4 + 1792x^3 + 1792x^2 + 1024x + 256$

(b) $(\frac{2}{5} + \frac{3}{x})^8$

Sol: $\frac{256}{390625} + \frac{3072}{78125x} + \frac{16128}{15625x^2} + \frac{48384}{3125x^3} + \frac{18144}{125x^4} + \frac{108864}{125x^5} + \frac{81648}{25x^6} + \frac{34992}{5x^7} + \frac{6561}{x^8}$

(c) $(2a^2b - 3a^3)^7$

Sol: $-2187a^{21} + 10206a^{20}b - 20412a^{19}b^2 + 22680a^{18}b^3 - 15120a^{17}b^4 + 6048a^{16}b^5 - 1344a^{15}b^6 + 128a^{14}b^7$

(d) $(3x - \frac{1}{x})^7$

Sol: $2187x^7 - 5103x^5 + 5103x^3 - 2835x + \frac{945}{x} - \frac{189}{x^3} + \frac{21}{x^5} - \frac{1}{x^7}$

(e) $(x^2 + \frac{1}{x})^{12}$

Sol: $x^{24} + 12x^{21} + 66x^{18} + 220x^{15} + 495x^{12} + 792x^9 + 924x^6 + 792x^3 + 495 + \frac{220}{x^3} + \frac{66}{x^6} + \frac{12}{x^9} + \frac{1}{x^{12}}$

(f) $(2x - \frac{1}{x})^{18}$

Sol: $262144x^{18} - 2359296x^{16} + 10027008x^{14} - 26738688x^{12} + 50135040x^{10} - 70189056x^8 + 76038144x^6 - 65175552x^4 + 44808192x^2 - 24893440 + \frac{11202048}{x^2} - \frac{4073472}{x^4} + \frac{1188096}{x^6} - \frac{274176}{x^8} + \frac{48960}{x^{10}} - \frac{6528}{x^{12}} + \frac{612}{x^{14}} - \frac{36}{x^{16}} + \frac{1}{x^{18}}$

(g) $(x^2 + \frac{1}{x})^8$

Sol: $x^{16} + 8x^{13} + 28x^{10} + 56x^7 + 70x^4 + 56x + \frac{28}{x^2} + \frac{8}{x^5} + \frac{1}{x^8}$

(h) $(\frac{2}{\sqrt{x}} + 1)^{10}$

Sol: $1 + \frac{180}{x} + \frac{3360}{x^2} + \frac{13440}{x^3} + \frac{11520}{x^4} + \frac{1024}{x^5} + \frac{20}{\sqrt{x}} + \frac{960}{x^{\frac{3}{2}}} + \frac{8064}{x^{\frac{5}{2}}} + \frac{15360}{x^{\frac{7}{2}}} + \frac{5120}{x^{\frac{9}{2}}}$

(i) $(\frac{x^2}{2} - \frac{3}{x})^6$

Sol: $\frac{x^{12}}{64} - \frac{9x^9}{16} + \frac{135x^6}{16} - \frac{135x^3}{2} + \frac{1215}{4} - \frac{729}{x^3} + \frac{729}{x^6}$

(j) $(\frac{x^2}{2} - \frac{3}{x})^8$

Sol: $\frac{x^{16}}{256} - \frac{3x^{13}}{16} + \frac{63x^{10}}{16} - \frac{189x^7}{4} + \frac{2835x^4}{8} - 1701x + \frac{5103}{x^2} - \frac{8748}{x^5} + \frac{6561}{x^8}$