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8.2

1 (a) $0!\,5!$

$(0!)(5 \times 4 \times 3 \times 2 \times 1)$

$= 120$

(b) $\frac{12!}{9!} \qquad \frac{12 \times 11 \times 10 \times 9!}{9!} = 12 \times 11 \times 10$

$= 1320$

(c) $\frac{20!}{18!} = \frac{20 \times 19 \times 18!}{18!} = 20 \times 19 = 380$

2 (a) $\binom{16}{9} = \frac{16!}{9!\,(16-9)!} = 11440$

(b) $\binom{22}{10} = \frac{22!}{10!\,(22-10)!} = 646646$

(c) ${}^{12}C_5 = \frac{12!}{5!\,(12-5)!} = 792$

(d) ${}^{18}C_{11} = \frac{18!}{11!\,(18-11)!} = 31824$

3) ROW

$0^{th} \rightarrow \qquad 1$

$1^{st} \rightarrow \qquad 1 \quad 1 \qquad p = {}^4C_2$

$2^{nd} \rightarrow \qquad 1 \quad 2 \quad 1 \qquad q = {}^5C_3$

$3^{rd} \rightarrow \qquad 1 \quad 3 \quad 3 \quad 1 \qquad r = {}^6C_3$

$4^{th} \rightarrow \qquad 1 \quad 4 \quad 6 \quad 4 \quad 1 \qquad s = {}^6C_4$

$5^{th} \rightarrow \qquad 1 \quad 5 \quad 10 \quad 10 \quad 5 \quad 1$

$6^{th} \rightarrow \qquad 1 \quad 6 \quad 15 \quad 20 \quad 15 \quad 6 \quad 1$

4) ${}^{n-1}C_{r-1} \qquad {}^{14}C_7$

5) $\binom{10}{n}\left(\frac{1}{6}\right)^n\left(\frac{5}{6}\right)^{10-n}, \quad 0 \leq n \leq 10$

a) $\binom{10}{0}\left(\frac{1}{6}\right)^0\left(\frac{5}{6}\right)^{10-0} = 0.162$ to 3.s.f

b) $\binom{10}{5}\left(\frac{1}{6}\right)^5\left(\frac{5}{6}\right)^{10-5} = 0.0130$ to 3.sf

6) $\binom{25}{11} = \frac{25!}{11!\,p!} \qquad 25 - 11 = 14 = p$

7) $\binom{30}{q} = \frac{30!}{q!\,8!} \qquad 30 - 8 = 22 \qquad q = 22$

8a) ${}^{k+2}C_k = \frac{(k+2)(k+1)}{2}$ Chapter 8.2

$\frac{(k+2)!}{k!((k+2)-k)!} = \frac{(k+2)(k+1)k!}{k!\,2!} = \frac{(k+2)(k+1)}{2}$

(b) ${}^{k+2}C_k = 36$

$\frac{k^2+3x+2}{2} = 36$

$k^2 + 3x - 70 = 0$

$k^2 + 10k - 7k - 70 = 0$

$k(k+10) - 7(k+10)$

$(k-7)\quad(k+10)$

$k = 7$

-70
/ \
10 -7

(c) k is a positive integer

8.3 Chapter 8.3

1 (a) $(1+x)^5$

$\binom{5}{0}(1)^5(x)^0 + \binom{5}{1}(1)^4(x)^1 + \binom{5}{2}(1)^3(x)^2 + \binom{5}{3}(1)^2(x)^3 + \binom{5}{4}(1)^1(x)^4 + \binom{5}{5}(1)^0(x)^5$

$1 + (5x) + 10x^2 + 10x^3 + 5x^4 + 1x^5$

(b) $(2+x)^6$

$\binom{6}{0}(x)^6(2)^0 + \binom{6}{1}(x)^5(2)^1 + \binom{6}{2}(x)^4(2)^2 + \binom{6}{3}(x)^3(2)^3 + \binom{6}{4}(x)^2(2)^4 + \binom{6}{5}(x)^1(2)^5 + \binom{6}{6}(x)^0(2)^6$

$x^6 + 12x^5 + 60x^4 + 160x^3 + 240x^2 + 192x + 64$

(c) $(10+x)^4$

$\binom{4}{0}(10)^4(x)^0 + \binom{4}{1}(10)^3(x)^1 + \binom{4}{2}(10)^2(x)^2 + \binom{4}{3}(10)^1(x)^3 + \binom{4}{4}(10)^0(x)^4$

$10{,}000 + 4000x + 600x^2 + 40x^3 + x^4$