Short Solutions for Pre-Requisite Exercises

1. (a) 55
   (b) $\frac{n(n+1)}{2}$
2. Yes. 20.
3. (a) 540
   (b) 45
   (c) 520
   (d) False.
   Left side = 3000. Right side = 30.
4. $\sum_{j=1}^{n}\sum_{i=1}^{j} a_{ij}$
5. (a) $\frac{1-p^{101}}{1-p}$
   (b) $\frac{1}{1-p}$
   (c) $\frac{p^{100}}{1-p}$
6. e
7. e^2, e^8
8. $\frac{1}{2}(e^2-1)$
9. $e^x \approx 1+x$ for small x. Let $x = 0.01, -0.01$.
10. $e^x \approx 1+x$ for small x. Take the log of both sides.
11. $e^{-\mu}$
12. Hint: Why do we need to divide $n!$ by $(n-k)!$?
13. (a) 6!
    (b) $\frac{6!}{6}$
14. (a) 90
    (b) $\binom{10}{2}$

(c) $\binom{6}{2} \cdot \binom{4}{2}$

15. (a) $n \cdot (n-1)$

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

16. (a) $a^3 + 3a^2b + 3ab^2 + b^3$

    (b) $\sum_{k=1}^{n} \binom{n}{k} a^k b^{n-k}$

17. (a) $\frac{2}{x}$

    (b) $e^{-cx} - cxe^{-cx}$

    (c) $-\frac{1}{c}xe^{-cx} - \frac{1}{c^2}e^{-cx}$

    (d) 1

18. x can't be both the limit and the variable of integration. That's basically saying "integrate x from 0 to x."

19. (a) Hint: Sub $r+1$ into the definition of $\Gamma(r)$.

    (b) Hint: What does $\Gamma(0)$ equal?

    (c) $\frac{\Gamma(r)}{\lambda^r}$

20. $\frac{5}{4}$

21. $\int_0^1 \int_0^x (x + xy + y) dy dx$