Supplementary Worksheet Key

Unit 7

1. Cannot begin with 0:

$$9 \cdot \underset{(\text{odds})}{5} = \boxed{45}$$

2. a) $8 \cdot 4 - \overset{(22, 44, 66, 88)}{4} = \boxed{28}$

   b) $8 \cdot 4 = \boxed{32}$

3. $2 \times 2 \times 2 \times 2 \times 2 = 2^5 = \boxed{32}$

4. $4 \times 4 \times 4 \times 4 \times 4 = 4^5 = \boxed{1024}$

5. $(26 + 10)^6 = 36^6 = \boxed{2\,176\,782\,336}$

6. $5 \times 10 = 50$ holes $\qquad 2^{50} = \boxed{1.126 \times 10^{15}}$

7. $0, 1, 2, 3, 4, 5 = 6$

   $0, 1, 2 = 3$ $\qquad 6 \times 3 = \boxed{18}$

8. $60 \times 59 \times 59 = \boxed{208\,860}$

   (1st, 3rd can be same!)

9. $\dfrac{8!}{3!\,3!\,2!} = \boxed{560}$

10. $\dfrac{9!}{4!\,2!\,3!} = \boxed{1260}$

11. $\dfrac{5!}{2!\,3!} = \boxed{10}$

12. $\dfrac{10!}{3!\,2!\,4!\,1!} = \boxed{12600}$

13. $4! = \boxed{24}$

14. ${}_{10}P_4 = \boxed{5040}$

15. ${}_{20}P_4 = \boxed{116280}$

16. a) $\dfrac{n!}{(n-2)!} = 12 \rightarrow n(n-1) = 12 \rightarrow n^2 - n - 12 = 0$

$(n-4)(n+3) = 0$

$\boxed{n = 4}$

b) $\dfrac{n!}{(n-2)!} = 20 \longrightarrow n(n-1) = 20 \longrightarrow n^2 - n - 20 = 0$

$(n-5)(n+4) = 0$

$\boxed{n = 5}$

c) $\dfrac{n!}{(n-2)!} = 30 \longrightarrow n(n-1) = 30 \longrightarrow n^2 - n - 30 = 0$

$(n-6)(n+5) = 0$

$\boxed{n = 6}$

d) $\frac{n!}{(n-2)!} = 90 \longrightarrow n(n-1) = 90 \longrightarrow n^2 - n - 90 = 0$

$(n-10)(n+9) = 0$

$\boxed{n = 10}$

e) $\frac{n!}{(n-3)!} = 24 \longrightarrow n(n-1)(n-2) = 24$

$(n^2 - n)(n-2) = 24$

$n^3 - 3n^2 + 2n - 24 = 0$

$(n+2)(n^2 - 5n + 12) = 0$

$(n-4)(n^2 + n + 6) = 0$

not factorable

$\boxed{n = 4}$

4	1	-3	2	-24
		4	4	24
	1	1	6	0

f) $\boxed{n = 5}$ g) $\boxed{n = 6}$ h) $\boxed{n = 10}$

i) $\frac{6!}{(6-n)!} = 30 \longrightarrow \frac{6!}{30} = (6-n)!$

$\frac{720}{30} = (6-n)!$

$24 = (6-n)!$

$\boxed{n = 2}$

j) $\boxed{n = 3}$ k) $\boxed{n = 4}$ l) $\boxed{n = 5 \text{ or } 6}$

17. a) $\dfrac{(n+2)!}{n!} = \dfrac{(n+2)(n+1)\cancel{n!}}{\cancel{n!}}$

$\boxed{= n^2 + 3n + 2}$

b) $\dfrac{(n-3)!}{n!} = \dfrac{\cancel{(n-3)!}}{(n)(n-1)(n-2)\cancel{(n-3)!}}$ $\boxed{\dfrac{1}{n(n-1)(n-2)}}$

c) $\dfrac{(n+1)!}{(n-1)!} = \dfrac{(n+1)(n)\cancel{(n-1)!}}{\cancel{(n-1)!}} = \boxed{n^2+n}$

d) $\dfrac{(n+4)!}{(n+2)!} = \dfrac{(n+4)(n+3)\cancel{(n+2)!}}{\cancel{(n+2)!}} = \boxed{n^2+7n+12}$

18. ${}_5P_1 \cdot {}_5P_1 \cdot {}_8C_2 = \boxed{700}$

19. a) ${}_{10}C_3 = \boxed{120}$

b) ${}_{10}P_3 = \boxed{720}$

20a) $({}_4C_0 \cdot {}_{12}C_5) + ({}_4C_1 \cdot {}_{12}C_4) + ({}_4C_2 \cdot {}_{12}C_3) + ({}_4C_3 \cdot {}_{12}C_2)$
$+ ({}_4C_4 \cdot {}_{12}C_1) = 792 + 1980 + 1320 + 264 + 12$

$\boxed{= 4368}$

OR

${}_{16}C_5 = \boxed{4368}$

b) ${}_{36}C_5 = \boxed{376992}$

c) ${}_{13}C_5 = \boxed{1287}$

d) ${}_{26}C_5 = \boxed{65780}$

21. $({}_6C_2 \cdot {}_6C_2) + ({}_6C_3 \cdot {}_6C_1) + ({}_6C_4)$

$= (15 \cdot 15) + (20 \cdot 6) + 15$

$= \boxed{360}$

22 a) ${}_{26}C_3 \cdot {}_{26}C_2 = \boxed{845000}$

b) $({}_{26}C_3 \cdot {}_{26}C_2) + ({}_{26}C_4 \cdot {}_{26}C_1) + {}_{26}C_5$

$= 845000 + (14950 \cdot 26) + 65780$

$= \boxed{1\ 299\ 480}$

c) $\underbrace{({}_{26}C_3 \cdot {}_{26}C_2)} + ({}_{26}C_2 \cdot {}_{26}C_3) + \underbrace{({}_{26}C_1 \cdot {}_{26}C_4)} + \underbrace{({}_{26}C_5)}$

$= 1\ 299\ 480 + 845\ 000$

$= \boxed{2\ 144\ 480}$

23. a) $({}_8C_2 \cdot {}_{12}C_3) + ({}_8C_3 \cdot {}_{12}C_2) + ({}_8C_4 \cdot {}_{12}C_1) + {}_8C_5$

$= 6160 + 3696 + 840 + 56$

$= \boxed{10\,752}$

b) $({}_{12}C_2 \cdot {}_8C_3) + ({}_{12}C_3 \cdot {}_8C_2) + ({}_{12}C_4 \cdot {}_8C_1) + ({}_{12}C_5)$

$= 3696 + 6160 + 3960 + 792$

$= \boxed{14608}$

c) $({}_{12}C_2 \cdot {}_8C_3) + ({}_{12}C_3 \cdot {}_8C_2)$

$= 3696 + 6160$

$= \boxed{9856}$