Combinations

Total points = 83

Problem Set

1.
$$n = 9 \checkmark$$
 $r = 5 \checkmark$
 $C(n,r) = \frac{n!}{(n-r)!r!} \checkmark$
 $C(9,5) = \frac{9!}{(9-5)!5!} \checkmark$
 $= \frac{9!}{4!5!} \checkmark$
 $= [126] \checkmark$ ways \checkmark

2. a.
$$n_1 = 11 \checkmark$$
 $r_1 = 4 \checkmark$
 $n_2 = 1 \checkmark$
 $r_2 = 1 \checkmark$
 $C(11, 4) \cdot C(1, 1) = \frac{11!}{(11 - 4)!4!} - \frac{1!}{(1 - 1)!1!}$
 $= \frac{11!}{7!4!} \cdot \frac{1!}{0!1!} \checkmark$
 $= \frac{330}{1!} \checkmark \text{ways} \checkmark$
b. $n_1 = 11 \checkmark$

$$= \frac{11!}{7!4!} \cdot \frac{1!}{0!1!} \checkmark$$

$$= \boxed{330} \checkmark \text{ ways } \checkmark$$
b. $n_1 = 11 \checkmark$
 $n_2 = 1 \checkmark$
 $n_2 = 1 \checkmark$
 $n_2 = 0 \checkmark$

$$C(11,5) \cdot C(1,0) = \frac{11!}{(11-5)!5!} - \frac{1!}{(1-0)!0!} \checkmark$$

$$= \frac{11!}{6!5!} \cdot \frac{1!}{1!0!} \checkmark$$

$$= \boxed{462} \checkmark \text{ways} \checkmark$$
3. a. $n_1 = 8 \checkmark$

$$r_1 = 0 \checkmark$$

$$n_2 = 6 \checkmark$$

$$r_2 = 4 \checkmark$$

$$n_3 = 4 \checkmark$$

$$r_3 = 0 \checkmark$$

$$C(8,0) \cdot C(6,4) \cdot C(4,0) = \frac{8!}{(8-0)!0!} \cdot \frac{6!}{(6-4)!4!} \cdot \frac{4!}{(4-0)!0!} \checkmark$$

$$= \frac{8!}{8!0!} \cdot \frac{6!}{2!4!} \cdot \frac{4!}{4!0!} \checkmark$$

$$= \boxed{15} \checkmark \text{ways} \checkmark$$
b. $n_1 = 8 \checkmark$

$$r_1 = 2 \checkmark$$

$$n_2 = 6 \checkmark$$

$$r_2 = 1 \checkmark$$

$$n_3 = 4 \checkmark$$

$$r_3 = 1 \checkmark$$

$$C(8,2) \cdot C(6,1) \cdot C(4,1) = \frac{8!}{(8-2)!2!} \cdot \frac{6!}{(6-1)!1!} \cdot \frac{6!}{(6-1)!1!}$$

··· (4-1)!1! ✓

 $= \frac{8!}{6!2!} \cdot \frac{6!}{5!1!} \cdot \frac{4!}{3!1!} \checkmark$ $= \boxed{672} \checkmark \text{ways} \checkmark$

= 462 √ ways √

3. c.
$$n_1 = 14 \checkmark$$
 $r_1 = 2 \checkmark$
 $n_2 = 4 \checkmark$
 $r_2 = 2 \checkmark$
 $C(14, 2) \cdot C(4, 2) = \frac{14!}{(14 - 2)!2!} \cdot \frac{4!}{(4 - 2)!2!} \checkmark$
 $= \frac{14!}{12!2!} \cdot \frac{4!}{2!2!} \checkmark$
 $= \frac{546}{12!2!} \checkmark \text{ways} \checkmark$
d. $n_1 = 8 \checkmark$
 $r_1 = 0 \checkmark$
 $r_2 = 10 \checkmark$
 $r_2 = 4 \checkmark$
 $C(8, 0) \cdot C(10, 4) = \frac{8!}{(8 - 0)!0!} \cdot \frac{10!}{(10 - 4)!4!} \checkmark$
 $= \frac{8!}{8!0!} \cdot \frac{10!}{6!4!} \checkmark$
 $= \frac{210}{12!0!} \checkmark \text{ways} \checkmark$
4. a. $n_1 = 6 \checkmark$
 $n_2 = 11 \checkmark$

$$\frac{6!}{(6-3)!3!} \cdot \frac{11!}{(11-1)!1!} \checkmark$$

$$= \frac{6!}{3!3!} \cdot \frac{11!}{10!1!} \checkmark$$

$$= \frac{6!}{3!3!} \cdot \frac{11!}{10!1!} \checkmark$$

$$= \frac{220}{220!} \checkmark \text{committees} \checkmark$$
b. $n = 17 \checkmark$

$$r = 4 \checkmark$$

$$C(n,r) = \frac{n!}{(n-r)!r!} \checkmark$$

$$C(17,4) = \frac{17!}{(17-4)!4!} \checkmark$$

$$= \frac{17!}{13!4!} \checkmark$$

$$= \frac{11!}{(6-1)!1!} \cdot \frac{11!}{(11-3)!3!} \checkmark$$

$$= \frac{6!}{5!1!} \cdot \frac{11!}{8!3!} \checkmark$$

$$= \frac{6!}{5!90!} \checkmark \text{committees} \checkmark$$

Combinations Total points = 83

Problem Set 1. $n = 9 \checkmark$

$$C(9,5) = \frac{9!}{(9-5)!5!} \checkmark$$

$$= \frac{9!}{4!5!} \checkmark$$

$$= [126] \checkmark \text{ ways } \checkmark$$
2. a. $n_1 = 11 \checkmark$

$$r_1 = 4 \checkmark$$

$$n_2 = 1 \checkmark$$

$$C(11,4) \cdot C(1,1) = \frac{1!}{(11-4)!4!} - \frac{1!}{(1-1)!1!} \checkmark$$

$$= \frac{11!}{7!4!} \cdot \frac{1!}{0!1!} \checkmark$$

$$= [330] \checkmark \text{ ways } \checkmark$$
b. $n_1 = 11 \checkmark$

$$r_1 = 5 \checkmark$$

$$n_2 = 1 \checkmark$$

$$r_2 = 0 \checkmark$$

$$C(11,5) \cdot C(1,0) = \frac{1!}{1!} \checkmark$$

3. c.
$$n_{1} = 14 \checkmark$$
 $r_{1} = 2 \checkmark$
 $n_{2} = 4 \checkmark$
 $r_{2} = 2 \checkmark$
 $C(14,2) \cdot C(4,2) =$

$$\frac{14!}{(14-2)!2!} \cdot \frac{4!}{(4-2)!2!} \checkmark$$

$$= \frac{14!}{12!2!} \cdot \frac{4!}{2!2!} \checkmark$$

$$= \frac{546}{12!2!} \cdot \frac{4!}{2!2!} \checkmark$$

$$= \frac{17!}{(17-4)!4!} \checkmark$$

$$= \frac{17!}{(17-4)!4!} \checkmark$$

$$= \frac{17!}{13!4!} \checkmark$$

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$$= \frac{17!}{13!4!} \checkmark$$

$$= \frac{17!}{13!4!} \checkmark$$

$$= \frac{17!}{2 \cdot 380} \checkmark \text{committees}$$

$$\checkmark$$

$$C(6,1) \cdot C(11,3) =$$

$$6! \quad 11! \quad \checkmark$$

$$r_{1} = 4 \checkmark$$

$$c(17,4) = \frac{17!}{(17-4)!4!} \checkmark$$

$$= \frac{17!}{13!4!} \checkmark$$

$$= \frac{17!}{2 \cdot 380} \checkmark \text{committees}$$

$$\checkmark$$

$$C(6,1) \cdot C(11,3) =$$

$$6! \quad 11! \quad \checkmark$$

$$r_{2} = 3 \checkmark$$

$$C(6,1) \cdot C(11,3) =$$

$$6! \quad 11! \quad \checkmark$$

$$r_{2} = 3 \checkmark$$

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