Combinations

Total points = 83

Problem Set

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

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

   b. $n_1 = 11$ ✓
   $r_1 = 5$ ✓
   $n_2 = 1$ ✓
   $r_2 = 0$ ✓
   $C(11,5) \cdot C(1,0) = \frac{11!}{(11-5)!5!} \cdot \frac{1!}{(1-0)!0!}$ ✓
   $= \frac{11!}{6!5!} \cdot \frac{1!}{1!0!}$ ✓
   $= \boxed{462}$ ✓ ways ✓

3. a. $n_1 = 8$ ✓
   $r_1 = 0$ ✓
   $n_2 = 6$ ✓
   $r_2 = 4$ ✓
   $n_3 = 4$ ✓
   $r_3 = 0$ ✓
   $C(8,0) \cdot C(6,4) \cdot C(4,0) = \frac{8!}{(8-0)!0!} \cdot \frac{6!}{(6-4)!4!} \cdot \frac{4!}{(4-0)!0!}$ ✓
   $= \frac{8!}{8!0!} \cdot \frac{6!}{2!4!} \cdot \frac{4!}{4!0!}$ ✓
   $= \boxed{15}$ ✓ ways ✓

   b. $n_1 = 8$ ✓
   $r_1 = 2$ ✓
   $n_2 = 6$ ✓
   $r_2 = 1$ ✓
   $n_3 = 4$ ✓
   $r_3 = 1$ ✓
   $C(8,2) \cdot C(6,1) \cdot C(4,1) = \frac{8!}{(8-2)!2!} \cdot \frac{6!}{(6-1)!1!} \cdot \frac{4!}{(4-1)!1!}$ ✓
   $= \frac{8!}{6!2!} \cdot \frac{6!}{5!1!} \cdot \frac{4!}{3!1!}$ ✓
   $= \boxed{672}$ ✓ ways ✓

   c. $n_1 = 14$ ✓
   $r_1 = 2$ ✓
   $n_2 = 4$ ✓
   $r_2 = 2$ ✓
   $C(14,2) \cdot C(4,2) = \frac{14!}{(14-2)!2!} \cdot \frac{4!}{(4-2)!2!}$ ✓
   $= \frac{14!}{12!2!} \cdot \frac{4!}{2!2!}$ ✓
   $= \boxed{546}$ ✓ ways ✓

   d. $n_1 = 8$ ✓
   $r_1 = 0$ ✓
   $n_2 = 10$ ✓
   $r_2 = 4$ ✓
   $C(8,0) \cdot C(10,4) = \frac{8!}{(8-0)!0!} \cdot \frac{10!}{(10-4)!4!}$ ✓
   $= \frac{8!}{8!0!} \cdot \frac{10!}{6!4!}$ ✓
   $= \boxed{210}$ ✓ ways ✓

4. a. $n_1 = 6$ ✓
   $r_1 = 3$ ✓
   $n_2 = 11$ ✓
   $r_2 = 1$ ✓
   $C(6,3) \cdot C(11,1) = \frac{6!}{(6-3)!3!} \cdot \frac{11!}{(11-1)!1!}$ ✓
   $= \frac{6!}{3!3!} \cdot \frac{11!}{10!1!}$ ✓
   $= \boxed{220}$ ✓ committees ✓

   b. $n = 17$ ✓
   $r = 4$ ✓
   $C(n,r) = \frac{n!}{(n-r)!r!}$ ✓
   $C(17,4) = \frac{17!}{(17-4)!4!}$ ✓
   $= \frac{17!}{13!4!}$ ✓
   $= \boxed{2,380}$ ✓ committees ✓

   c. $n_1 = 6$ ✓
   $r_1 = 1$ ✓
   $n_2 = 11$ ✓
   $r_2 = 3$ ✓
   $C(6,1) \cdot C(11,3) = \frac{6!}{(6-1)!1!} \cdot \frac{11!}{(11-3)!3!}$ ✓
   $= \frac{6!}{5!1!} \cdot \frac{11!}{8!3!}$ ✓
   $= \boxed{990}$ ✓ committees ✓

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   $= \frac{6!}{5!1!} \cdot \frac{11!}{8!3!}$ ✓
   $= \boxed{990}$ ✓ committees ✓