A standard deck of 52 cards has the following characteristics:

- 4 suits (spades, clubs, diamonds, and hearts).
- Each suit has 13 cards.
- Two suits are black (spades and clubs).
- Two suits are red (diamonds and hearts).
- Face cards are considered to be Jacks, Queens, and Kings.

Poker is a card game played from a deck of 52 cards.

a) How many different five card poker hands are possible?

$_{52}C_5 = 2\,598\,960$

b) In how many of the hands in a) will there be:

i) all diamonds?

$_{13}C_5 = 1287$

ii) 4 black cards and 1 red card?

$(_{26}C_4)(_{26}C_1)$

$= 14950(26) = 388700$

iii) 3 kings and 2 queens?

$(_4C_3)(_4C_2) = 4(6)$

$= 24$

$52 - 4 = 48$

iv) 3 kings?

+ 2 non kings

$(_4C_3)(_{48}C_2)$

$= 4(1128)$

$= 4512$

v) four aces?

$(_4C_4)(_{48}C_1)$ + 1 non ace

$= 1(48)$

$= 48$

vi) 5 cards of the same suit? (called a "flush")

5 clubs or 5 diamonds or 5 spades or 5 hearts

$4\,(_{13}C_5) = 5148$

Complete Assignment Questions #1 - #12

Assignment

1. Pete's Perfect Pizza Company has 9 choices of topping available.

   a) How many different 2-topping pizzas can be made? $_9C_2 = 36$

   b) How many different 3-topping pizzas can be made? $_9C_3 = 84$

2. A theatre company consisting of 6 players is to be chosen from 15 actors. How many selections are possible if the company must include Mrs. Jones?

choose 5 from 14. $_{14}C_5 = 2002$

3. How many different rectangles can be formed by eight horizontal lines and three vertical lines?

choose 2 from 8 horizontal

choose 2 from 3 vertical

$(_8C_2)(_3C_2) = 28(3) = 84$

4. Edinburgh High School has a twelve-member student council. A four member sub-committee is to be selected to organize dances.

a) How many different sub-committees are possible?

$_{12}C_4 = 495$

b) How many four member sub-committees are possible if the council president and vice-president must be members?

choose 2 from 10

$_{10}C_2 = 45$

5. A basketball coach has five guards and seven forwards on his basketball team.

a) In how many different ways can he select a starting team of two guards and three forwards?

$(_5C_2)(_7C_3) = 10(35) = 350$

b) How many different starting teams are there if the star player, who plays guard, must be included?

choose 1 from guards
choose 3 from 7 forwards.

$(_4C_1)(_7C_3) = 4(35) = 140$

6. Twelve face cards are removed from a deck of fifty-two cards. From the face cards, three card hands are dealt. Determine the number of distinct three card hands that are possible which include no repititions.

a) no restrictions

$_{12}C_3 = 220$

b) 3 kings

$_4C_3 = 4$

c) 1 Queen and 2 kings

$(_4C_1)(_4C_2) = 4(6) = 24$

d) exactly 1 Jack + 2 non jacks.

$(_4C_1)(_8C_2) = 4(28) = 112$

7. Consider a standard deck of 52 cards. Determine the number of distinct six card hands are possible which include

a) no restrictions

$_{52}C_6 = 20\,358\,520$

b) only clubs

$_{13}C_6 = 1716$

c) 2 clubs and 4 diamonds

$(_{13}C_2)(_{13}C_4) = 78(715) = 55\,770$

d) no sevens

$_{48}C_6 = 12\,271\,512$

e) 4 tens + 2 nontens.

$(_4C_4)(_{48}C_2) = 1128$

f) exactly 1 Jack and 4 Queens + 1 other card.

$(_4C_1)(_4C_4)(_{44}C_1)$

$= 4(1)(44) = 176$

8. Explain the meaning of $\binom{10}{2}$. Why does $\binom{2}{10}$ not make sense?

$\binom{10}{2}$ number of ways of selecting 2 items from 10 where order of selection is not important.

$\binom{2}{10}$ does not make sense as you can't choose 10 items from 2.

9. Develop a problem where ${}_9C_4$ would be applicable as a solution.

There are 9 ____. In how many ways can 4 of them be chosen?

Multiple Choice

10. There are 16 students in a class. The number of ways in which four students can be chosen to complete a survey is

$16C_4 = \frac{16!}{12!4!}$ $(16-4)=12$.

A. $4!$ **B.** $\frac{16!}{4!}$

C. $\frac{16!}{12!\,4!}$ **D.** $\frac{16!}{12!}$

11. There are three girls and six boys on Leven High School softball team. Each of the students is capable of playing any fielding position on the team. There are nine fielding positions: a pitcher, a catcher, four infielders (first base, second base, third base, shortstop), and three outfielders (left field, centre field, right field).

For a particular game, Leven High School is in the field first. If the pitcher must be a girl and the catcher must be a boy, how many different positional line-ups are possible at the start of the game?

A. ${}_3C_1 \times {}_6C_1 \times 7!$

B. ${}_3C_1 \times {}_6C_1 \times 9!$

C. ${}_3C_1 \times {}_6C_1 \times {}_7C_4 \times {}_3C_3$

D. ${}_3C_1 \times {}_6C_1$

pitcher ${}_3C_1$

catcher ${}_6C_1$

other 7 positions where order is important $\rightarrow 7!$

Numerical Response

12. Sarah is one of a group of eight people from which a committee of four people must be formed. The number of different committees possible if Sarah must sit on the committee is ____.

(Record your answer in the numerical response box from left to right.)

3	5		

${}_7C_3 = 35$

Answer Key

1. a) 36 b) 84 2. 2002 3. 84 4. a) 495 b) 45
5. a) 350 b) 140 6. a) 220 b) 4 c) 24 d) 112
7. a) 20 358 520 b) 1716 c) 55 770 d) 12 271 512 e) 1128 f) 176
8. The number of ways of selecting 2 items from 10 where the order of selection is not important. You cannot select 10 items from 2.
9. Answers may vary. 10. C 11. A 12.

3	5		