Name: _____ Date: _____ Date: _____

PreCalculus 12
7.1-7.3 Worksheet

Key

1) An English Exam contains eight questions, of which you must answer any three. How many ways can the three questions be chosen?

$_8C_3 = 56$

2) In the word MATHEMATICS, how many different arrangements are there

a) Using all the letters?

b) If the word must start with 'C'?

c) If the 'M's must be together?

d) If the letters 'H' and 'S' must be apart?

a) $\frac{11!}{2!2!2!} = 4,989,600$

b) C _____ $\frac{10!}{2!2!2!} = 453,600$

c) MM _____ $\frac{10!}{2!2!} = 907,200$

d) together HS _____ $\frac{10!}{2!2!2!} \cdot 2!$

So apart is total ways − together ways

$= \frac{11!}{2!2!2!} - \frac{10!}{2!2!2!} \cdot 2!$

$= 4989600 - 907200 = 4,082,400$

3) A telephone number must start with the area code 604 or 778. The first digit of the seven digit number cannot start with a 0 or 1. How many telephone numbers are possible? $\underset{604\ 778}{2} \quad \underset{2\text{-}9}{8} \quad \underset{0\text{-}9}{10} \quad 10 \quad 10 \quad 10 \quad 10 \quad 10 = 16,000,000$

4) Mr. Griffiths is one of the seven math teachers in the Math department. In how many ways can three of the teachers be chosen to attend a math conference such that Mr. Griffiths is one of the teachers attending?

$_6C_2 = 15$

5) A bag of candy contains seven Mars bars and nine KitKats. In how many ways can two Mars bars and three Kit Kats be drawn from the bag of candy?

$_7C_2 \cdot {}_9C_3 = 1764$

6) How many ways are there to seat six people around a circular table?

Fixed

$5! = 120$

7) Three couples go to a movie and occupy six consecutive seats. In how many ways can the people be seated if the couples must sit together?

AB CD EF $\quad 3!\,2!\,2!\,2! = 48$

8) How many ways can you be dealt a five card hand containing three Jacks of any suit and two even black cards?

$_4C_3 \cdot {}_{10}C_2 = 180$

= 10 black even cards in a deck

9) Mr. Griffiths brings two pairs of jeans, two pairs of shorts, five T-shirts and three sweaters on a trip. His fashion sense forbids him to wear shorts and sweaters together. How many different possible outfits are there?

unrestricted $\underset{\text{bottoms}}{4} \quad \underset{\text{tops}}{8}$ — shorts sweaters together $2 \cdot 3 = 32 - 6 = 26$

10) In how many ways can a jury team be selected from a group of 25 prospective jurors if the first twelve people selected become jurors and the next three selected are alternate jurors?

$_{25}C_{12} \cdot {}_{13}C_3 = 1,487,285,800$

11) What is the probability of winning the grand prize when playing Lotto 6-49? You must correctly pick six of the possible 49 numbers.

$\frac{1}{{}_{49}C_6} = \frac{1}{13,983,816}$

12) The English alphabet has 21 consonants and 5 vowels. How many six letter words contain

a) exactly one vowel?

b) exactly two vowels?

c) at least one vowel?

d) at least two vowels?

a) $_5C_1\ 21\ 21\ 21\ 21\ 21 \cdot 6 = 122,523,030$ (6 places to place vowel)

b) $_6C_2\ 21\ 21\ 21\ 21 \cdot 5 \cdot 5$ (repeating 1st vowel gives another choice; 5 places to place 1st vowel; 5 places to place 2nd vowel)

$= 72,930,375$

c) $26^6 - 21^6 = 223,149,655$ (all − no vowels)

d) $223,149,655 - 122,523,030$ (all − no vowels − 1 vowel) $= 100,626,625$

13) In how many ways can 6 be chosen from 4 officers and 8 privates to include at least 1 officer?

all − no officers $= {}_{12}C_6 - {}_8C_6 = 896$

14) In how many ways can the word CORPORATION be arranged such that the vowels are always together?

OOOAI _____ $= \frac{7!}{2!} \cdot \frac{5!}{3!} = 50,400$

15) A password consists of two letters followed by three numbers. How many possible passwords are there if:

a) Repeats are allowed? $26\ 26\ 10\ 10\ 10 = 676,000$

b) Repeats are not allowed? $26\ 25\ 10\ 9\ 8 = 468000$

$_{26}P_2 \cdot {}_{10}P_3$