NAME _____

DYNAMIC EQUILIBRIUM
Population Calculation Practice

1. Calculate the population density if there were 300 birds in a 10 ha area in 1985 near Sylvan Lake.

D=N/A =300/10 =30 bird/hectare

2. Data from a sparrow population was collected over a year in Jan., 1999.

Original Population: 1000
Natality: 800
Mortality: 600
Immigration: 300
Emigration: 200

Calculate the population growth rate.

Gr=? Gr=$\Delta N/\Delta T$ ΔN =(n+i)-(m+e) =300 sparrows so… =300/ 1 year

Gr=**300/yr**

3. In Canada, the population in 1986 was 25.0 million compared to 23.1 million in 1976. Calculate the annual per capita growth rate.

Cgr=? Cgr==$\Delta N/N^i$ $= \frac{25 \text{ million} - 23.1 \text{ million}}{23.1 \text{million}}$ =**0.0822**

4. On a range of 450 hectares, there are 1 275 jackrabbits. Studies indicate the following counts for this population:

a. Determine the change in population size.
b. Determine the per capita growth rate.

Mortality	2 225/year
Natality	3400/year
Emigration	775/year
Immigration	150/year

a. ΔN =(n+i)-(m+e)

=(3400+150)-(2225+775)
=**550**

b. cgr =$\Delta N/N^i$

=550/1275

=**0.43**

5 . On October 15, 1992, the beginning of the grouse hunting season that year, biologists counted 75 spruce grouse in a 30 hectare forest plot. On December 15, 1992, 42 spruce grouse were counted in the same area.

a. What was the density of the grouse population on October 15? On December 15?

D=N/A =75/30 =**2.5 grouse/ha**

D=N/A =42/30 =**1.4 grouse/ha**

6. Data from a sparrow population was collected over a year, starting in January 1995. The study area was 4 000 ha.
   Original population 200 000 (January 1995)
   Natality 150 000
   Mortality 130 000
   Immigration 5 000
   Emigration 2 000

a.) Calculate the original population density. Record your answer as a whole number.

D=N/A
= 200000/4000
=50 sparrow/ha

b.) Calculate the new population size. Record your answer as a whole number.

ΔN =(n+i)-(m+e)
=(150000+5000)-(13000+2000)
=23,000
=23,000 + 200,000 **=223,000 sparrows**

c.) Calculate the new population density. Record your answer as a whole number.

D=N/A
=223000 / 4000 **=55.75 sparrows/ha**

d.) Calculate the per capita growth rate (cgr) for the 1995 year.

cgr $=\Delta N/N^i$

$=\frac{23\ 000}{200{,}000}$ (already calculated) (initial population)

Cgr = 0.115

7). A biologist studied a population of flying turtles in a wetland area in the Congo for 5 years. The initial population was 25 flying turtles. She determined that the natality averaged 40 flying turtles per year, the mortality averaged 25 flying turtles per year, while immigration was 3 flying turtles per year, and emigration was 5 flying turtles per year.

a. Calculate the growth rate (gr) of this population in the **first year** of the study. Record your answer in the space below. **Growth Rate: _____ individuals/year**

Gr=$\Delta N/\Delta T$ ΔN =(n+i)-(m+e) =(40+3)-(25+5) =13 / 1

=13 individual/year

b. Based on this information, what would be the population of flying turtles in this study area at the end of 5 years? Record answer in the space below. **Population Size in 5 years: _____ individuals**

ΔN =(n+i)-(m+e) X 5 years
=13 X 5
=65 PLUS THE ORIGINAL POPULATION OF 25
=90 flying turtle population

c. Calculate the per capita growth rate (cgr) for this population of flying turtles frogs during the **entire study period.** ***NOTE: think about this one*** **Per capita growth rate: _____**

cgr =$\Delta N/N^i$
=65 / 25
=2.6 per capita growth rate

1) Limiting factors can be classified as density dependent and density independent. The severity is dependent on population size in regards to density dependent factors. Density independent factors affect any population size equally. For each of the following indicate is they are DD or DI.

__DI___1. Freezing weather
___DD__2. Has a greater effect on a larger population
___DI__3. A volcanic eruption
__DD___4. Predation
__DI___5. Floods
__DD___6. Food supply
__DI___7. May limit the population before it even gets close to carrying capacity
__DD___8. Disease or parasites
__DD___9. Decreases when the population is below carrying capacity; increases when the population exceeds carrying capacity
___DI__10. Fire
__DI___11. Intensity of effect no greater for larger population, no less for smaller population
__DD___12. May cause cyclical changes in lynx and hare populations
__DI___13. Storms
__DD___14. Tends to be a biotic factor
__DI___15. Tends to be an abiotic factor

2) K -selected and r -selected life histories are the two ends of the spectrum of life -history patterns. State whether each of the following characteristic is an example of a K - selected life history pattern (K) or an r - selected life history pattern (r).

__r___1. Age at first reproduction occurs younger

__r___2. Relative body size is small

__K___3. Stability of population near carrying capacity

___K__4. Low number of offspring

__r___5. Large number of offspring per reproduction

___K__6. Emphasis on quality and care of offspring

__K___7. Polar bears are an example

___r__8. Rapid population growth when conditions are favourable

__r___9. Dandelions and insects are examples