CHAPTER 20	Launch Lab: Reproductive Strategies and Population Growth	BLM 20.0.1
HANDOUT		

Purpose: Graphing and analyzing population growth

Procedure

Use the data in the tables to create two graphs (one for each population) showing population size over time. Then answer the Analysis questions.

Size of a Hypothetical *Aedes* sp. Mosquito Population over One Growing Season

Day	Number of adult mosquitoes
0	20
6	40
12	80
18	160
36	320
42	640
48	1280
54	2560
60	5120
66	10 240

Number of Individuals in the Plains Bison (*Bison bison*, subspecies *bison*) Population of Pink Mountain, British Columbia

Year	Estimated number of plains bison
1988	447
1989	494
1990	546
1991	603
1992	666
1993	693
1994	765
1995	845
1996	934
1997	929

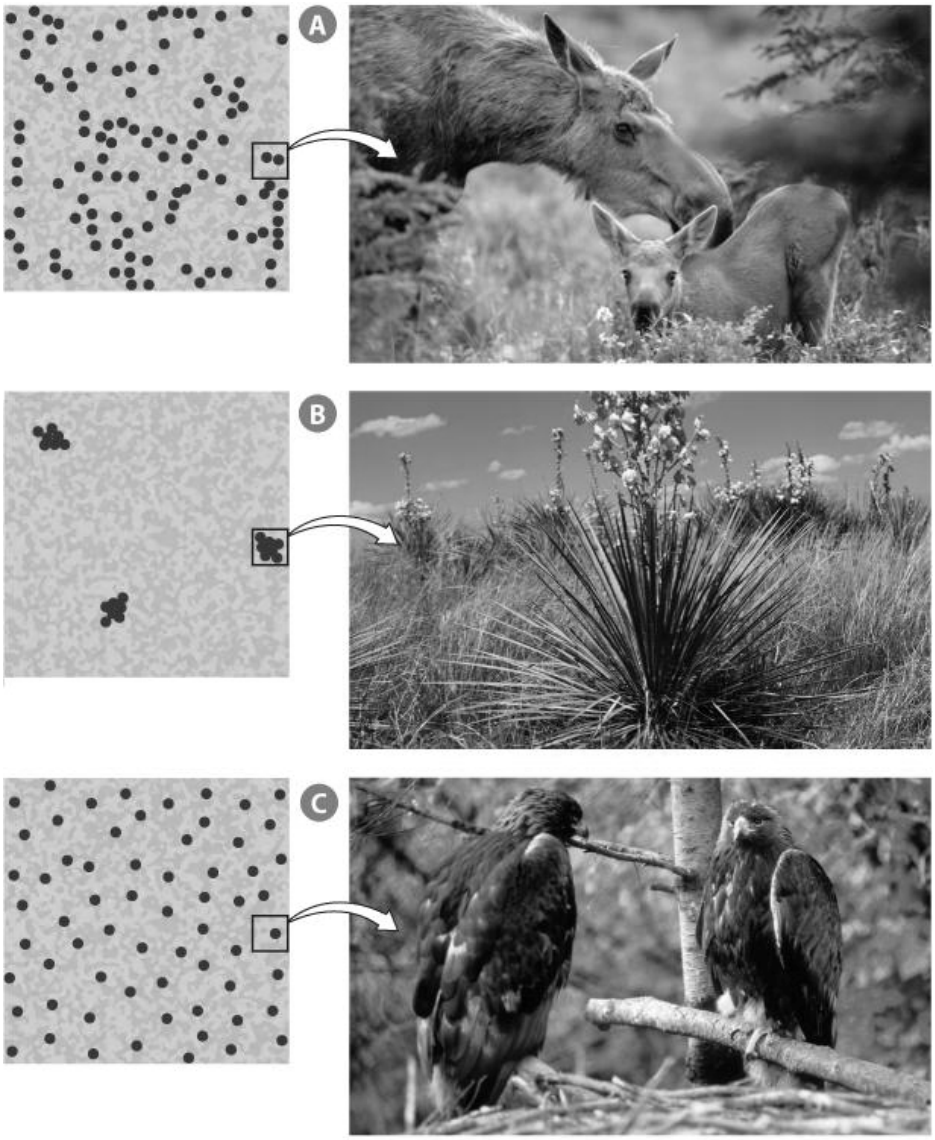
Analysis

1. Compare the shapes of your two graphs. Describe the growth of both populations during the given time intervals.

2. Make and record a hypothesis to account for the shape of your graph for the mosquito population and the bison population.

DATE: NAME: CLASS:

CHAPTER 20 HANDOUT	Patterns of Population Distribution	BLM 20.1.1



1. Study the figures shown above and describe the population distribution patterns that are depicted. What does this population pattern tell you about the population's habitat and the interaction among members of the populations?

   The distribution pattern of Population A is _____.

   The habitat of Population A is likely to be _____

   _____

   Members of Population A are likely to _____

   _____

   _____

   _____

CHAPTER 20 HANDOUT	Patterns of Population Distribution	BLM 20.1.1

The distribution pattern of Population B is _____.

The habitat of Population B is likely to be _____

_____

Members of Population B are likely to _____

_____

_____

_____

The distribution pattern of Population C is _____.

The habitat of Population C is likely to be _____

_____

Members of Population C are likely to _____

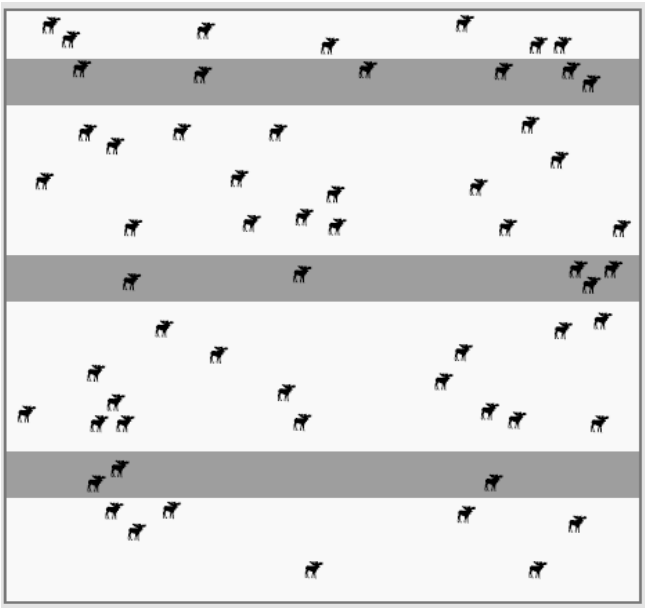
_____

_____

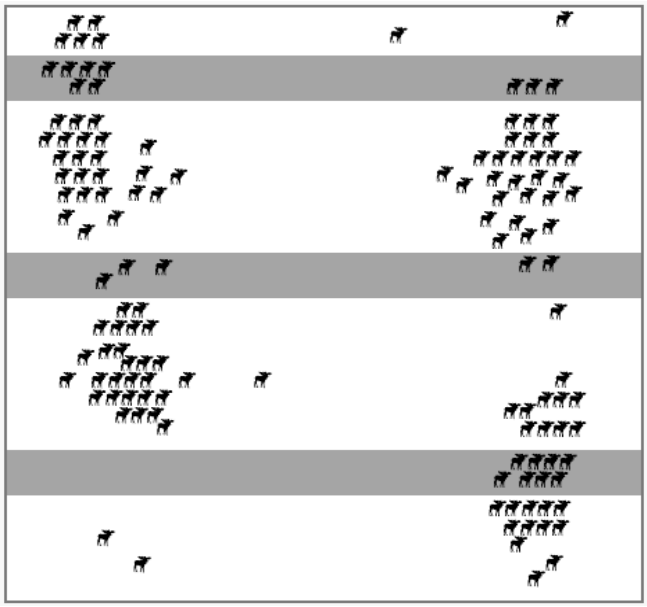
_____

CHAPTER 20	Thought Lab 20.1: Distribution Patterns and Population Size Estimates	BLM 20.1.2
HANDOUT		

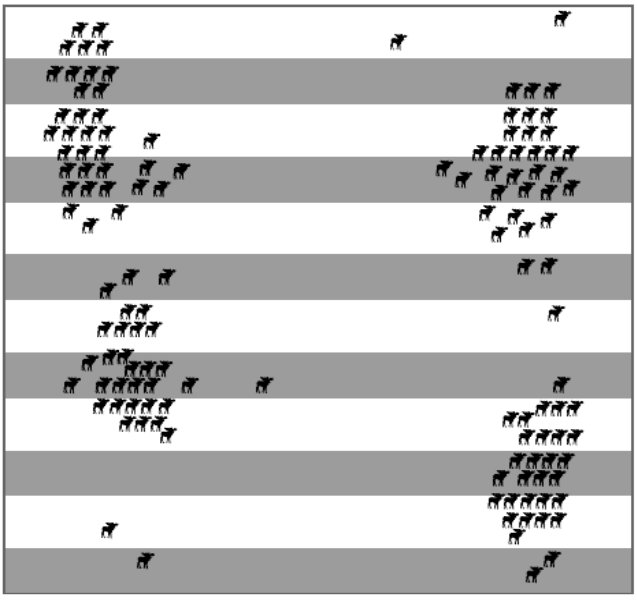
Purpose: To see how transects (long, narrow areas of land used for ecological study) might be used to sample different moose populations.



Distribution pattern 1



Distribution pattern 2



Distribution pattern 3

Procedure

1. Examine the three diagrams of hypothetical moose populations. What are the two different distribution patterns shown?

2. The shaded parts of the diagrams represent the transects that were used to sample each population. Calculate the area per transect. (In these diagrams, 1.0 cm represents 1.0 km.)

3. For each hypothetical population, count the moose within each transect.

4. For each hypothetical population, calculate the average number of moose per transect.

5. Calculate the average density of each hypothetical moose population.

6. Calculate the total study area that is inhabited by one moose population. Estimate the total number of moose in each hypothetical population.

Thought Lab 20.1: Distribution Patterns and Population Size Estimates (cont'd)

Analysis

1. The actual numbers of moose in the three populations are 60, 133, and 133, respectively. How close were your estimates to the actual sizes of the populations?

2. Explain the difference, if any, between your estimate and the actual size of the first population.

3. Explain any differences between your estimates and the actual sizes of the second and third populations.

4. How would you design a sampling experiment on a real population of wild moose? (**Note:** In real life, the time and expenses involved usually restricts the proportion sampled to between 10 and 20 percent of the total area of interest.)

Extension

5. There is concern that an introduced population of moose may deplete the resources in its home range. Why would scientists want to know the density of this population? If you were given the size of this population, how would you calculate its population density?

CHAPTER 20	Thought Lab 20.2: What Limits the Growth of Grizzly Bear Populations?	BLM 20.1.8
HANDOUT		

Purpose: Recognizing the intrinsic factors that limit grizzly bear population growth.

Procedure

Using the data in the first table, draw a graph that shows the change in size of the Alberta grizzly bear population outside the National Parks over time. Then complete the following Analysis questions.

Number of Grizzly Bears in Alberta, Outside the National Parks

Year	Population size
1988	575
1989	536
1990	547
1991	638
1992	669
1993	686
1994	700
1995	735
1996	765
1997	776
1998	807
1999	833
2000	841

Source: Alberta Wildlife Status Reports, Alberta Sustainable Resource Development, 2002

Analysis

1. To manage the grizzly bear population better, the government of Alberta introduced a hunting lottery that awards a limited number of grizzly bear hunting licenses. Predict the year that this regulation was introduced.

2. The number of grizzly bear deaths in Alberta from 1976 to 1988 was estimated to be 581. Only 281 deaths were recorded from 1988 to 2000. How does this information affect the prediction you made in question 1? Explain your answer.

3. Determine the per capita growth rate (*cgr*) for each of the following time intervals: 1991 to 1992, 1997 to 1998, and 1998 to 1999. Suggest why the *cgr* has changed over time.

Thought Lab 20.2: What Limits the Growth of Grizzly Bear Populations? (cont'd)

4. Population counts were made in several bear management regions around the province. Some of the data are shown in following table.

Grizzly Bear Population Sizes in Alberta

Region	Area (km^2)	Bear population
A	14 128	31
B	6 089	44
C	22 840	168

Source: Alberta Wildlife Status Reports, Alberta Sustainable Resource Development, 2002

a) For each region, determine the number of grizzly bears per 1000 km^2.

b) Compare the densities for the three regions. Suggest three reasons for the differences, if any. Explain your thinking.

5. Very few grizzly bears die of old age. What are two other possible causes of death, not associated with human activities?

Thought Lab 20.2: What Limits the Growth of Grizzly Bear Populations? (cont'd)

6. Studies have shown that male grizzly bears will cross roads and use underpasses to forage in a better environment. Females tend to remain in more restricted areas.

a) How might the movement of male and female grizzly bears in their habitat affect genetic diversity in the population?

b) How would this behaviour influence the per capita growth rate of the population?

7. Grizzly bears reach sexual maturity at five years of age. When food is abundant, females average two cubs per litter every other year. With inadequate nutrition, females produce fewer cubs.

a) Compared with mosquitoes, how would you describe the life strategy of grizzly bears?

b) Explain why the biotic potential of grizzly bears is relatively low.

Thought Lab 20.2: What Limits the Growth of Grizzly Bear Populations? (cont'd)

c) How might grizzly bears' low biotic potential present challenges for people who are working to conserve the grizzly bear population?

8. Near Lake Louise, Alberta, there is a road sign that asks drivers on the highway to reduce their speed from 90 to 70 km/h along a 15 km stretch where grizzly bears are known to forage for food, especially at dusk and dawn. Do you think that lowering the speed limit along this stretch of highway is a reasonable action? Would the installation of underpasses along this stretch of highway be a better alternative? Compare the advantages and disadvantages of each option. What questions might you want answered before making a decision about this issue?

9. One report concluded that people must "find a way" to prevent the Trans-Canada highway from being a barrier to grizzly bear migration. List the stakeholders in this issue. Based on the point of view of one of these stakeholders, suggest what actions could be taken to overcome the fragmentation of the grizzly bear's habitat. Share your ideas on this issue in a class discussion.

CHAPTER 20	Investigation 20.A: Interspecific and Intraspecific Competition Among Seedlings	BLM 20.2.1
HANDOUT		

Questions:

Part 1—How does intraspecific competition affect the growth f individuals in a population?

Part 2—How does interspecific competition affect the growth of individuals in different populations?

Part 1: Intraspecific Competition

Safety Precautions

The sprouts may become contaminated. Do not eat them.

Hypothesis

Make and record a hypothesis about how increasing intraspecific competition will affect the growth of individuals in a population.

Materials

- seeds (such as basil, marigold, radish, grass, lettuce, bean, or clover seeds)
- vermiculite or potting soil
- flower pots
- scissors
- ruler
- balance

Experimental Plan

1. With your group, establish the manipulated and responding variables.
2. State and record your hypothesis.
3. Using some of the listed materials as a starting point, design a procedure for your experiment. Be sure to include controlled variables in your procedure. Also include the criteria you will use to measure your experimental results.
4. Create a data table for your results. Decide how you will later present the data.
5. Once your group has agreed on the plan, have your teacher approve it.

Data and Observations

Conduct your investigation, and record your results. Then present the data in a graph.

Part 2: Interspecific Competition

Safety Precautions

The sprouts may become contaminated. Do not eat them.

Hypothesis

Make and record a hypothesis about the effect of interspecific competition on the growth of individuals in different populations.

HANDOUT

Investigation 20.A: Interspecific and Intraspecific Competition Among Seedlings (cont'd)

Experimental Plan

Using some of the suggested materials listed in Part 1, design an experiment to demonstrate interspecific competition among populations of seedlings. Follow the same steps to plan your investigation that you followed in Part 1.

Data and Observations

Conduct your investigation, and record your results. If possible, present the data in a graph.

Analysis

1. How did you manipulate the degree of intraspecific competition in your experiment in Part 1?

2. Were the criteria you used to measure your experimental results and evaluate the differences in the seedlings' growth effective? Explain.

3. Consult with your classmates to see which procedures provided the most effective demonstrations of

a) intraspecific competition

b) interspecific competition

Investigation 20.A: Interspecific and Intraspecific Competition Among Seedlings (cont'd)

4. Critique your experimental plans for Part 1 and Part 2. What changes would you make if you could conduct this investigation again?

Conclusions

5. How did the intraspecific competition in Part 1 affect the growth of individual seedlings?

6. In Part 1, were you able to detect the effect of intraspecifi c competition on the entire population that you planted? If so, explain how and describe your results. If not, how would you expect intraspecific competition to affect a population?

7. In Part 2, how did interspecific competition affect the growth of the seedlings in the competing populations? Provide an explanation for these results.

Investigation 20.A: Interspecific and Intraspecific Competition Among Seedlings (cont'd)

8. In Part 2, did one population compete better overall? If so, which one? Provide an explanation for this result.

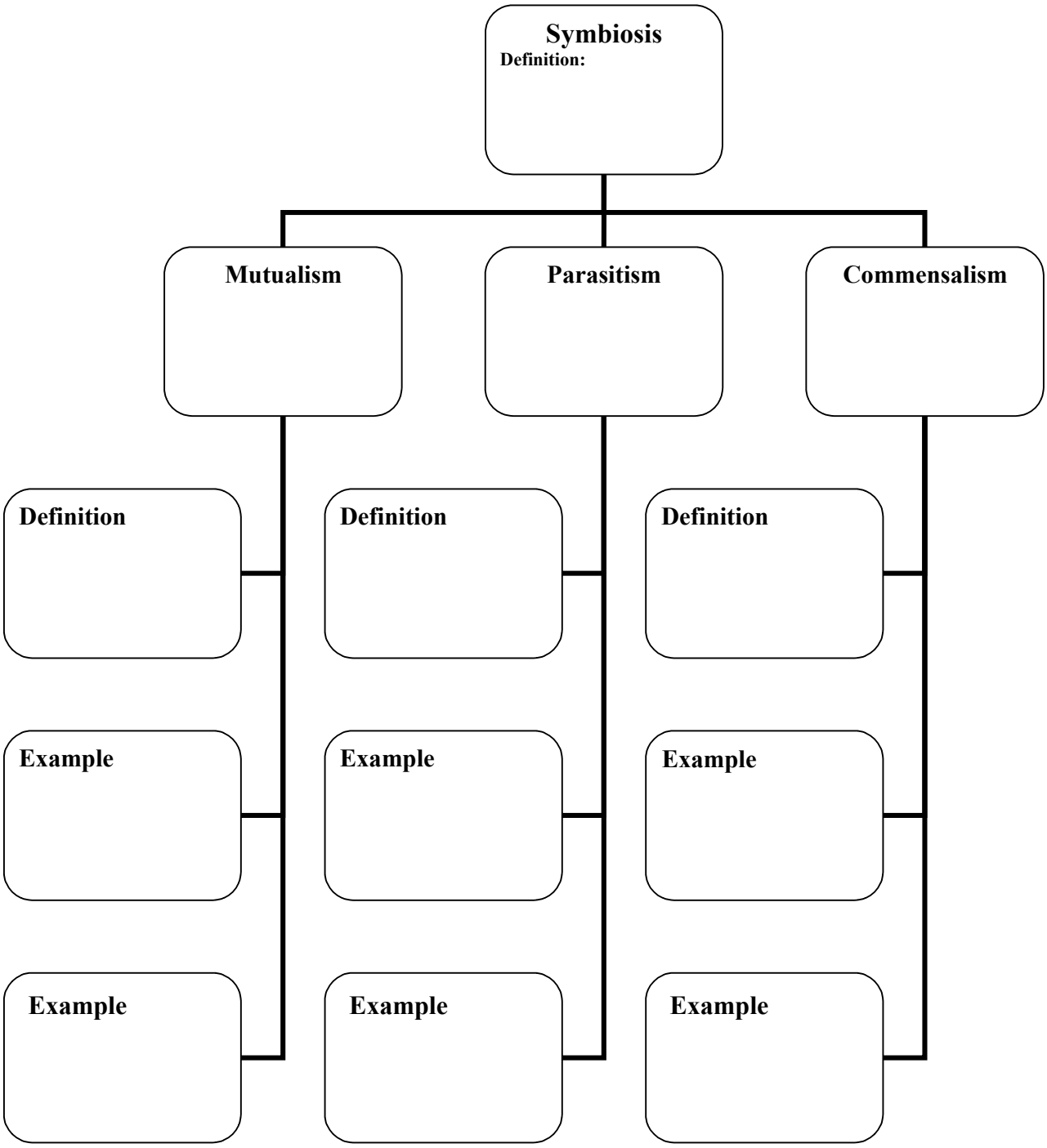
9. Your results were based on the germination of seeds. The death rate of plants is highest at this stage. Hypothesize how your results might have been different if you had used adult plants in both Part 1 and Part 2. How could you test your hypotheses?

DATE: NAME: CLASS:

CHAPTER 20 HANDOUT	Symbiotic Relationships	BLM 20.2.3

Complete the following concept map by:

a) Defining the term symbiosis.
b) Defining the terms mutualism, parasitism, and commensalism.
c) Identifying two examples of mutualism, parasitism, and commensalism.



NAME:

HANDOUT

Age Structure, 2001
Alberta, Newfoundland and Labrador, Nunavut

Use the data below to construct age pyramids for each of the Canadian provinces.

Newfoundland and Labrador

	Male	Female
Total - Age	250,960	261,965
0-4	12,705	12,115
5-9	14,975	14,065
10-14	17,870	17,045
15-19	20,065	19,390
20-24	16,725	17,145
25-29	14,640	15,885
30-34	17,140	18,900
35-39	19,995	21,730
40-44	21,200	22,275
45-49	21,330	21,955
50-54	19,805	19,890
55-59	15,050	15,105
60-64	11,470	11,410
65-69	9,460	9,695
70-74	7,620	8,655
75-79	5,550	7,105
80-84	3,345	5,310
85-89	1,485	2,950
90-94	455	1,070
95-99	75	230
100+	10	40

Alberta

	Male	Female
Total - Age	1,486,590	1,488,220
0-4	95,265	91,165
5-9	106,865	101,615
10-14	114,105	108,570
15-19	114,035	108,925
20-24	109,735	105,395
25-29	107,010	104,445
30-34	109,425	109,345
35-39	125,745	127,220
40-44	133,735	131,815
45-49	117,900	114,365
50-54	95,390	93,240
55-59	68,060	67,140
60-64	52,745	53,140
65-69	45,690	47,125
70-74	38,175	42,205
75-79	26,640	35,345
80-84	15,645	24,715
85-89	7,500	14,695
90-94	2,315	5,930
95-99	530	1,595
100+	65	235

Nunavut

	Male	Female
Total – Age	13,840	12,905
0-4	1,725	1,630
5-9	1,710	1,630
10-14	1,685	1,545
15-19	1,285	1,235
20-24	1,085	1,050
25-29	1,105	1,170
30-34	1,205	1,090
35-39	1,030	935
40-44	770	720
45-49	650	580
50-54	575	525
55-59	390	325
60-64	255	245
65-69	165	115
70-74	90	55
75-79	50	35
80-84	30	15
85-89	10	10
90-94	5	5
95-99	0	0
100+	0	0

Age (122) and Sex (3) for Population, for Canada, Provinces, Territories, Census Metropolitan Areas and Census Agglomerations, 2001 Census - 100% Data

1. Use the data provided from the Census of Canadian Population for 2001 to construct a population pyramid for Alberta, Nunavut, and Newfoundland (use graph paper). Label your pyramid clearly.

2. How would you rank provincial spending priorities in education, healthcare, and labour for the next decade in each of the three provinces? Write your answer on lined paper. Justify your answer.