

# COMPARING MODELS OF GROWTH

- 1) Which situations illustrate linear growth? Which illustrate exponential growth? Explain.
- a) John earns \$8 per hour. How do his earnings grow?
  - b) Mika's short-term deposit pays 4% compounded monthly. How does the amount grow?
  - c) The student population at a school has increased by 100 students in each of the past 5 years. How does the population grow?
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- d) Guong's regular interest CSB pays 4.75% simple interest. How does the amount grow?
  - e) The population of Ontario has increased by 1.6% annually over the last 8 years. How has the population grown?

2) **Communication** A city council wants to discourage illegal parking. It has two plans.

Plan A: A \$10 fine for the first offence. The fine increases by \$10 for each subsequent offence.

Plan B: A \$10 fine for the first offence. The fines doubles for each subsequent offence.

- a) For each plan, make a table of values to show the fines for 0 to 6 offences.
- b) Graph the data from the tables on the same grid.
- c) Which type of growth does each plan illustrate? Explain how you know.
- d) Will the city receive greater revenue from Plan A or Plan B? Explain.
- e) How likely is it that Plan B would be adopted? Explain.

3) A school has a population of 800 students.

- a) Suppose the population grows by 80 students each year. Copy and complete this table.

Year $n$	0	1	2	3	4	5
Population $P$						

- b) Suppose the population grows by 10% each year.  
Copy the table in part a. Complete the table for a 10% annual growth.
- c) Graph the data from both tables on the same grid.
- d) What type of growth do the data in part a represent? Explain.
- e) What type of growth do the data in part b represent? Explain.
- f) With which type of growth will the population grow faster? Explain.

# ANSWERS

- 1) a) Linear growth because \$8 is added each hour.  
 b) Exponential growth because each succeeding amount is multiplied by a constant.  
 c) Linear growth because 100 students are added each year.  
 d) Linear growth because the same constant is added to the amount each period.  
 e) Exponential growth because the population is multiplied by 1.016 each year.

3)

a)

Year $n$	Population $P$
0	800
1	880
2	960
3	1040
4	1120
5	1200

b)

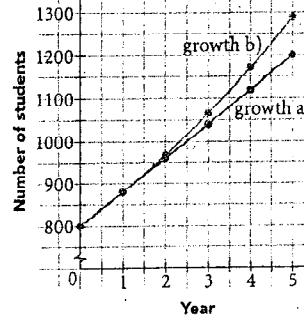
Year $n$	Population $P$
0	800
1	880
2	968
3	1065
4	1172
5	1289

- 2) a) Let the number of offences be  $x$  and the value of fines in dollars be  $y$ .

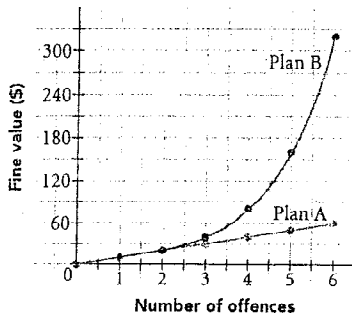
Plan A	
Year	Fine
0	0
1	10
2	20
3	30
4	40
5	50
6	60

Plan B	
Year	Fine
0	0
1	10
2	$10 \times 2 = 20$
3	$20 \times 2 = 40$
4	$40 \times 2 = 80$
5	$80 \times 2 = 160$
6	$160 \times 2 = 320$

- c) School Population



- b) Illegal Parking Fine Plans



- c) Plan A represents linear growth as the number 10 is repeatedly added. Plan B represents exponential growth as the number 2 is repeatedly multiplied.  
 d) Plan B, because for all offenders with more than 2 fines, the fine is higher.  
 e) It is unlikely that Plan B would be adopted as citizens would object to the very high fines for multiple offences.

- d) Linear growth because a constant amount is added each year.

- e) Exponential growth because each amount is multiplied by a constant.  
 f) Exponential growth because the amount added gets larger every year.