Math 11
Examination Review Questions

Linear Models

1. Determine the solutions to the following system of equations without technology:

$$\begin{cases} 2x - 3y - 6z = -78 \\ 5x - 2y - 4z = -63 \\ 7x - 2y + 2z = -9 \end{cases}$$

2. Sketch the plane 3x - 2y + 4z = 24. Clearly label the intercepts.

3. You have been offered three different positions as a car salesman. You are happy with all three companies so you make your decision as to which job to accept based on expected yearly earnings. The table below gives information on each company's salary package.

Company	Yearly base salary	Additional salary per car sold
Auto Buy	$30500	$150
Car Craze	$20000	$300
Real Deal	$35000	none

Explain clearly how you would choose the best (highest earnings) deal. Support your explanation by giving equations for each company's salary package and sketching a graph with the important points labeled. On your graph be sure to identify each company and identify what the x and y axes represent. Make sure your sketch is neat, scales are not necessary. Give a clear and concise conclusion.

4. Write a matrix equation that represents the system of equations given below and solve the system. If your solution involves decimal numbers, write them in fraction form. Clearly show your steps.

$$2x + y = 4$$
$$3x = 13 + 2y - 4z$$
$$2z - 8y = 3x + 24$$

5. Susan runs a marathon at a very steady pace. By 3pm she has run 4km and by 4pm she has run 24 km.
   a) Determine an equation that will describe Susan's distance run in terms of the time of day.
   b) Explain the meaning of the slope and y-intercept of this equation.

6. During this past year of operation a company rented an average of 12 lifts of scaffolding, four belt sanders and 6 carpet cleaners for the first week of any month. For the second week of any month they rented an average of 8 lifts of scaffolding, 6 belt sanders, 2 carpet cleaners and 1 wood splitter. During the third week of the month they rented an average of 2 lifts of scaffolding, 1 belt sander and 2 wood splitters. During the last week of the month they rented an average of 3 belt sanders and 1 carpet cleaner.
   a. *If they anticipate that these rentals will double when they open their new location in March set up a matrix that describes how many rentals they should expect on average? [Make sure you label the rows and columns]*
   b. *If they make a profit of $12 on each lift of scaffolding, $20 on each belt sander, $15 on each carpet cleaner and $10 on each wood splitter. How much money did they make, on average during each week of any month during this past year?*
   c. *How much profit will they anticipate making in an average month from their new location if their profit per item stays the same?*

7. (Use matrices to answer the following) You and your friend each call your local hardware stores A and B to price the items you wish to purchase. You want to buy 1 hammer, 1 screwdriver and 2 cans of white paint and your friend wants 1 hammer 2 screwdrivers and 3 cans of white paint. The prices of these goods are:

	Hammer	Screwdriver	Can of Paint
Store A	$ 7	$ 3	$ 19
Store B	$ 6	$ 2	$ 22

   a) What are your costs and your friend's costs at each of these stores?
   b) Should you buy from store A or from store B?
   c) If you combine your wish list and buy what you want as a joint order, which store should you purchase the order from?

8. Five oranges and 14 bananas cost $3.90. Eight oranges and 9 bananas cost $4.23. Determine the cost of an orange and the cost of a banana.

9. Susan has been calling her friends on her cell phone. Her parents are covering the basic monthly cost of the service; she is responsible for the cost of the minutes that she talks. The following is a record of her monthly bill for August, September and October. Use this information to determine the cost per minute when she calls during prime time and the cost per minute when she calls after hours.

	Minutes during prime time	Minutes after hours	Total Bill
August	500	800	$ 46.00
September	450	1050	$ 48.00
October	300	1500	$ 48.00

10. Bill has purchased 4 sets of lights, 3 bundles of tinsel, 2 packages of ornaments and 1 holiday CD. His friend Sydney purchased from the same displays 3 sets of lights, 2 bundles of tinsel, 1 package of ornaments and 2 holiday CDs, while Ralph bought 5 bundles of tinsel and 2 sets of lights and Adam bought 4 holiday CDs , 1 set of lights and 2 bundles of tinsel. They have lost their sales slips and want to find out the cost of each of the items. Bill paid $ 53.10 total, Sydney paid $ 49.15, Ralph paid $ 17 and Adam paid $ 51.90. If the items were purchased on a "hold the taxes" sale determine the cost of each of the items.

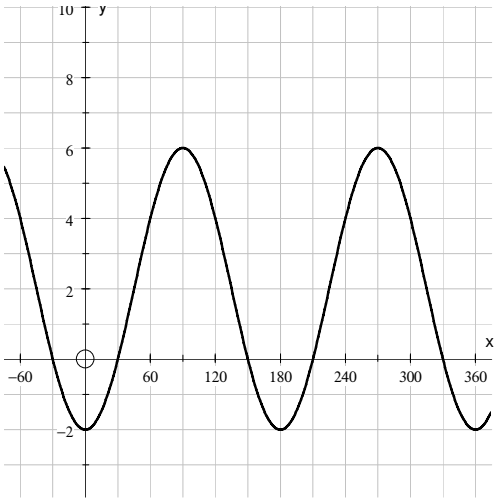
11. Susan has noted the following grocery expenses over a four week period. Determine her average cost per item at each of the local stores.

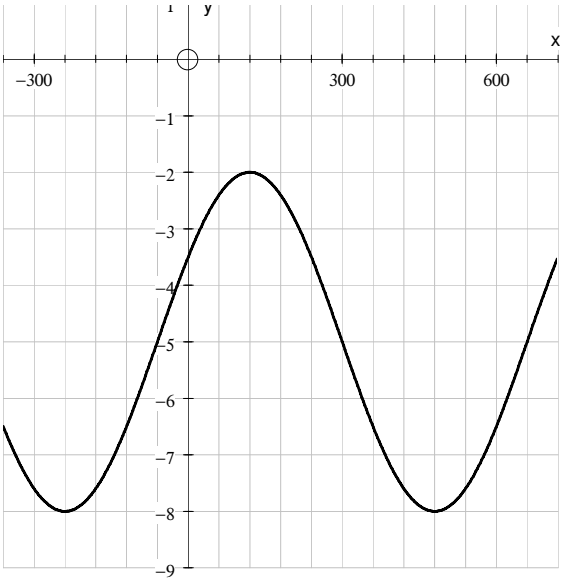
	# items purchased at the Meat store	# items purchased at the Bakery	# items purchased at the Farmer's Market	Total bill for the week
Week 1	2	4	12	$ 50
Week 2	3	5	11	$55.50
Week 3	2	6	14	$59
Week 4	3	7	10	$57

Math 11
Examination Review Questions

Sinusoidal Models

1. For each of the graphs state the amplitude, period, sinusoidal axis, phase shift and whether it describes a reflection or not. Also determine the equation that will describe each of the graphs.





2. The following equation describes a population of fox in a region.

$$-\tfrac{1}{8}(y-12)=\cos(60x)°$$

X represents the number of years since 2000
Y represents the fox population in a specific region

(a) State the period, amplitude, equation of the sinusoidal axis, phase shift, and whether it describes a reflection or not.

(b) Sketch a graph of this population ***by hand***. Label a minimum of three points.

3. A spring with a weight on the bottom is bouncing up and down. The spring is 12cm above the table top (its lowest point) at t=3 seconds and 1 seconds later it is 16cm above the table top (its highest point). Assuming that this up and down motion continues in a sinusoidal fashion.

(a) State the period, amplitude and sinusoidal axis for this situation.
(b) Sketch a graph depicting the height of the spring above the table top over time. ***Label five critical points***
(c) Determine an equation that describes the height of the spring above the table top in terms of time.
(d) Determine the height of the spring after 2.4 seconds.

Math 11
Examination Review Questions

4. Evaluate each of the following expressions. Simplify as much as possible.

a) $3\sin\frac{7\pi}{6} - 4\cos\frac{\pi}{3}$

b) $\cos\frac{3\pi}{4} \times \cos\frac{5\pi}{3}$

c) $\frac{\cos 30°}{\sin(-150°)}$

d) $\sin 120° - 4\cos^2 45°$

5. Solve the following trigonometric equations algebraically. State **all** solutions.

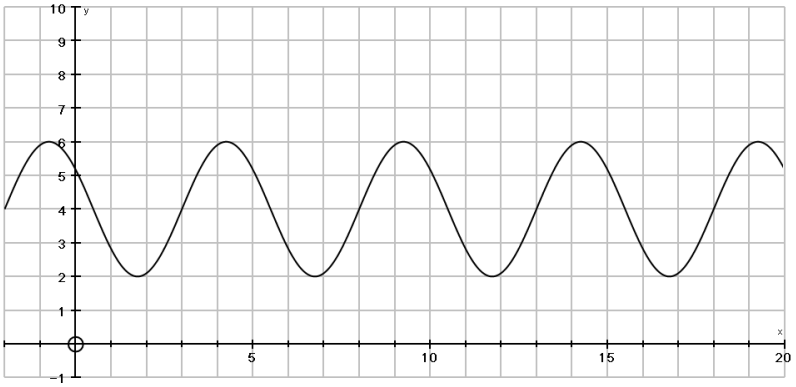
a) $4\cos(3x)° + 12 = 14$

b) $5 - 4\sin(\frac{1}{2}x)° = 1$

c) $2\cos(3(x-20))° + 10 = 9$

d) $-3\sin(2(x-5))° - 7 = 0$

6. State two equations for the following graph. One using radians and one using degrees.



7. The equation $y = -4.5\cos(30x)° + 5$ describes the depth of the water in a harbor in terms of the hours since 12 noon. Use this equation to answer the following questions**. In each case state whether you have been given the x or the y value and explain how you determined the answer.**

i) How deep is the water in the harbor at 2 p.m.?

ii) When is the depth of the water 4.5 m?

8.

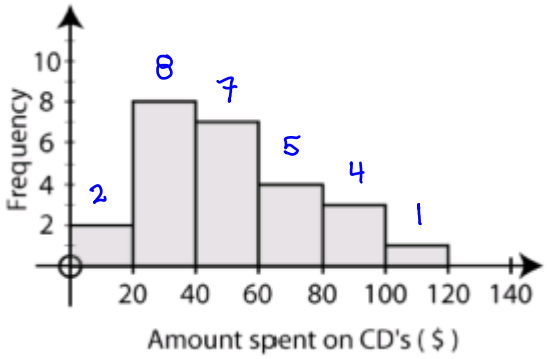
(1) A railroad track is to be laid out in the shape of a circle in which the radius is 60 metres. The track must have a central angle of 85°. Find the length of the track.

(2) Susan cuts out a pattern for a Princess hat. The pattern has the shape of a sector of a circle and has a radius of 65cm and an arc length of 100 cm. Determine the measure of the central angle, in degrees.

Math 11
Examination Review Questions

Statistics

1. A CD store owner conducted a survey at his store. He selected only people who purchased CDs. He asked each person how much money, on average, they spent on CDs each month. The results are shown in the histogram below:



a) How many people were surveyed?

b) What percentage of people surveyed spent $40 or more per month on CDs?

c) What percentage of people surveyed spent less than $80 per month on CDs?

2. A random sample of size 140 was selected from a large known population with $\mu = 200$ and $\sigma = 12$. Many samples of the same size were collected so that a sampling distribution of the sample means could be drawn.

a) What is the shape of this distribution and how do you know?

b) Where is the sampling distribution centered?

c) What is the standard deviation of this sampling distribution?

3. Sam randomly selected 6 grade 12 students. He asked them how many hours they spent on face book the previous week. The results of his survey are shown in the table below:

12	10	13	14	17	18

a) Is this a sample or a population? Explain.

b) Calculate the mean and standard deviation of the data by hand. Round to nearest 100^{th}. Show your work!

4. A hair dryer manufacturer makes a hair dryer that will last an average of 36 months before it needs to be replaced. The dyer's life span has a standard deviation of 2 months. The life of these dryers follows a normal curve.

a) What percentage of dryers will last more than 40 months?

b) What percentage will last between 34 months and 40 months?

c) If the manufacturer doesn't want to have to replace more than 1% of those dryers that are sold, how long should the warrantee be?

Math 11
Examination Review Questions

5. The Survey of Study Habits and Attitudes (SSHA) is a psychological test that measures the motivation, attitude toward school, and study habits of students. Scores range from 0 to 200. The mean score for US college students is about 115 with $\sigma=30$. A professor thinks that older students have a better attitude toward school and therefore a higher score, she gives the test to 35 students who are at least 30 years of age and gets a mean score of 135.2 with a standard deviation of 32.

   a) Find the 95% confidence interval for the true mean of the older population of students. Explain what this interval means.
   b) What can the professor conclude from her study? Explain clearly.

6. The following article was published Wednesday, May 24th 2007

Poll points to minority

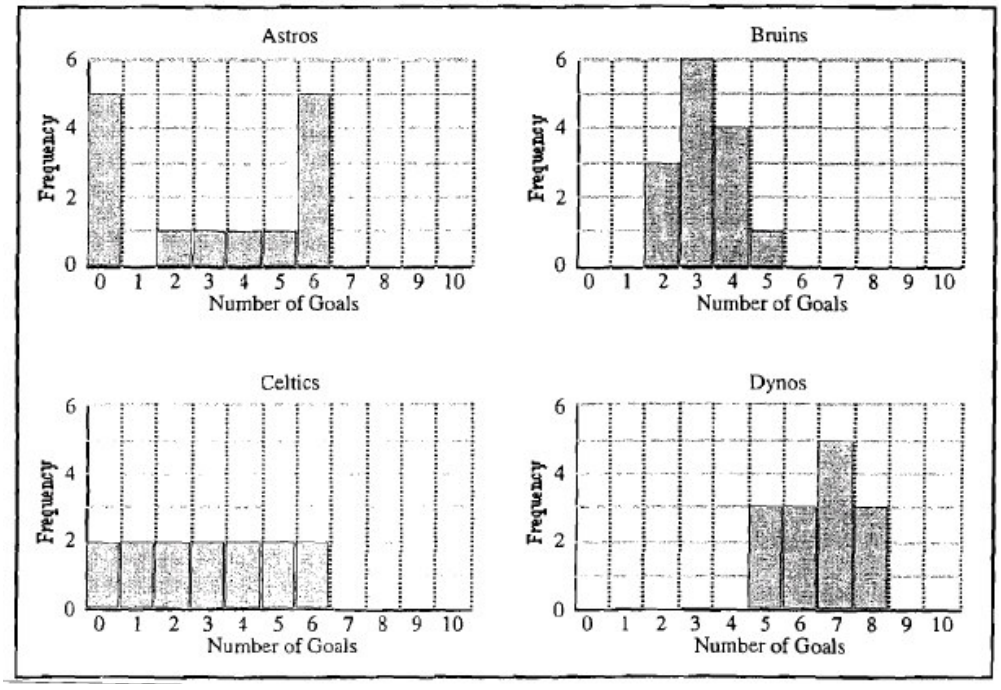
Tories still in lead at 34 per cent, but no breakthrough so far
By DAVID JACKSON Provincial Reporter

Nova Scotians appear ready to elect another minority Conservative government and leave the New Democrats and Liberals to battle for second place, the first published poll of the election campaign indicates.

The Corporate Research Associates poll, commissioned by The Chronicle Herald, found 34 per cent of decided and leaning voters would mark an X for the Conservatives. The Liberals were the choice of 30 per cent and the NDP was third at 27 per cent. The poll has a margin of error of 4.1 percentage points 19 times out of 20.

a) State the point estimate from the article above.
b) State the confidence level
c) State the margin of error
d) State the confidence interval
e) Explain the meaning of this confidence interval.

7. Four local hockey teams, the Astros, the Bruins, the Celtics, and the Dynos have just returned from an international hockey tournament in Quebec. The histograms below show the number of goals each team scored in the 14 games they played.



a) Which histogram represents the team with the highest mean value? Explain.

b) Which histogram represents the team with the highest value for the standard deviation? Explain.

8. The American Kennel Club determines that expected life span for an American Cocker Spaniel is N(12.5, 2.3) years.
   a) You select one dog at random from this population. What is the probability it will live more than 15 years?
   b) You select a random sample of 15 dogs, what is the probability the mean life of this sample will be greater than 15 years?
   c) If life expectancy for this population was not normal, would your answer for part b above be different? Explain.
   d) John, the local vet, collects the life expectancy of 25 randomly chosen mixed breed dogs and finds a mean value of 14.3 years and a standard deviation of 1.5 years. Determine a 90% confidence interval for this population. Do your results show that mixed breed dogs will live longer than a purebred Cocker Spaniel? Explain.

Trigonometric Applications

1. Points A and B are on opposite sides of the Grand Canyon. Point C is 200m from A. Angle B measures 87^0 and angle C measures 67^0. What is the distance between A and B?

2. A person at A looks due east and sees a UFO with an angle of elevation of 40^0. At the same instant another person, 1 km due west of A, looks due east and sights the same UFO with an angle of elevation of 25^0. a) Find the distance between A and the UFO. b) How far is the UFO from the ground?

3. A vertical flagpole is attached to the top edge of a building. A man stands 125m from the base of the building. From his viewpoint, the angle of elevation to the bottom of the flagpole is $60°$; to the top is $62.5°$. Determine the height of the flag pole.

4. In a recreation park a children's slide is 9m long and make an angle of $39°$ with the ground. Its top is reached by a ladder 6m long. What is the angle of inclination of the ladder?

5. A small town is separated from the local power plant by mountainous terrain and several lakes. Until now, electrical power has been routed through a nearby city. ? The recent development of a stronger wire permits a direct line to be constructed. Sighting from the town, the angle between the city and the power plant is $77°$. The distance between the city and the town is 123 km. The distance from the power plant to the city is 156 km. What is the distance "as the crow flies" between the town and the power plant?

6. A bridge is supported by triangular braces. If the sides of each brace have lengths 63 feet, 46 feet and 40 feet, find the measure of the angle opposite the 46 ft side.

7. For each of the following questions draw diagrams and determine the distance requested.
   a) A person walks on a bearing of 120º for 5 km. They then walk on a bearing of 040º for 3 km. How far, in a straight line, is the person from their starting point?

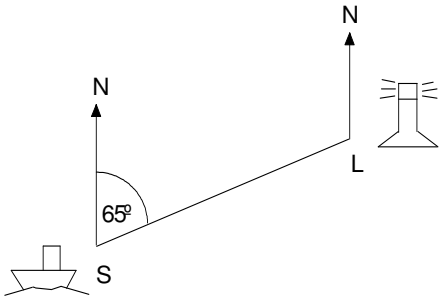
   b) Runners in a cross country race run on a bearing of 055º for 4 km. The runners then change direction and then run the next 6 km on a bearing of 100º. How far, in a straight line, are the runners from the starting point?

c) A car travels on a bearing of 200º for 5 km, and then on a bearing of 300º for another 5 km. How far, in a straight line, is the car from its starting point?

d) A yacht sails from a port on a bearing of 085º for 10 km, and then on a bearing of 240º for 6 km. How far, in a straight line, is the yacht from the port?

e) An airplane leaves an airport on a bearing of 150º and flies for 65 km. It then flies on a bearing of 035º for 40 km. How far, in a straight line, is the aeroplane from the airport.

8. The diagram below shows the position of a ship (S) from a lighthouse (L). The diagram is not drawn accurately.
   a) What is the bearing of the lighthouse from the ship?
   b) What is the bearing of the ship from the lighthouse?



9. A helicopter takes off and flies on a bearing of 075º for 45 km. It then flies on a bearing of 080º for 60 km, after which, the helicopter flies on a bearing of 300º for 70 km.

   a) Draw a picture of the helicopter's journey.

   b) What distance did the helicopter travel?
   c) At the end of its journey how far is the helicopter from the start.