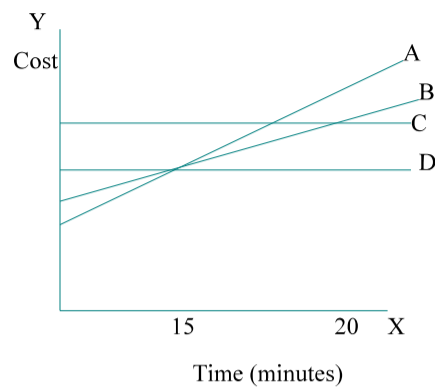


Shade the best answer on the answer sheet provided. Please place your name on the sheet.

- 1 According to the following diagram, which phone plan is best for callers who use their phone between 15 and 20 minutes per month?



- A) Plan A
 B) Plan B
 C) Plan C
 D) Plan D
- 2 Which 2 x 2 system below is inconsistent?

A) $\begin{cases} x = 3 \\ y = -2 \end{cases}$ B) $\begin{cases} 2x + y = 4 \\ -2x - y = -4 \end{cases}$ C) $\begin{cases} x = y \\ y = z \\ x = z \end{cases}$ D) $\begin{cases} y - 3x = 4 \\ y = 3x + 19 \end{cases}$

- 3 A system of two equations in two unknowns has many solutions. Describe how the graphs of the linear equations will appear on the x-y plane.

- A) the graphs will intersect in one point
 B) the graphs will intersect in many points
 C) the graphs will intersect in no points
 D) the graphs of both equations will not intersect

- 4 What is the inverse of the matrix $\begin{pmatrix} 3 & 7 \\ 4 & 9 \end{pmatrix}$?

A) $\begin{pmatrix} 9 & -7 \\ -4 & 3 \end{pmatrix}$ B) $\begin{pmatrix} -9 & 7 \\ 4 & -3 \end{pmatrix}$ C) $\begin{pmatrix} -3 & 4 \\ 7 & -9 \end{pmatrix}$ D) $\begin{pmatrix} 3 & -4 \\ -7 & 9 \end{pmatrix}$

- 5 In the x, y, z plane, where do the yz and xy plane intersect?

- A) the line $y = 0$
 B) the x axis
 C) the y axis
 D) the z axis

- 6 Which point lies on the yz trace of the plane $x + 5y - z + 10 = 0$?

- A) (1,0,-1)
 B) (0,2, 0)
 C) (0, -3,-5)
 D) (0, 1, 5)

- 7 What is a possible equation of a plane in 3 space that would contains the points (2,9,0) and (6.5,0,0) ?
- A) $x - y = 7$
 B) $2x - y + z = -6$
 C) $13x + 2y = z$
 D) $2x + y - 14z = 13$
- 8 A system of equations in two unknowns has a solution of (0,2). Which system below is an equivalent system ?
- A) $\begin{cases} x + y = 2 \\ x = 8 \end{cases}$
 B) $\begin{cases} 2x - y = -2 \\ x = 0 \end{cases}$
 C) $\begin{cases} 2x = 0 \\ y = -2 \end{cases}$
 D) $\begin{cases} x - y = 2 \\ x - y = -2 \end{cases}$
- 9 Heather is a chemist and mixes three acids. One solution contains 5% HCL, another 28% HCL and the last 25% HCL. She needs to make 4 liters of a solution that is 20% HCL. Heather would like to use three times as much of the 5% acid as the 28% acid. Which equation represents the amount of pure HCL acid in the 4 liters of solution?
- A) $x + y + z = 4$
 B) $z = 3x$
 C) $.05x + .28y + .25z = 2$
 D) $.5x + .28y + .25y = .8$
- 10 The determinant of a 2X2 coefficient matrix is 0. Which statement is true about the associated 2x2 system ?
- A) the equations in the system must be $x = 2$ and $y = 2$
 B) the two lines intersect in one point
 C) the lines are perpendicular
 D) the lines are parallel
- 11 The formula for the trajectory of a bullet from a high-powered rifle is $h = at^2 + bt + c$ where h is the height above the ground and t is the time after the bullet is fired. The muzzle of the rifle is 1.4 m above the ground when the bullet is fired, and the bullet is 1.45 m above the ground after 0.125 seconds, and 1.2 m above the ground after 0.375 seconds. What is the value of c in the formula?
- A) 0
 B) 0.375
 C) 1.2
 D) 1.4

- 12 Which matrix equation is set up correctly for the system displayed below?

$$\begin{cases} 2x - y = -8 \\ 4y - 9x + z = 0 \\ 2x = -z + 14 \end{cases}$$

- A) $\begin{pmatrix} 2 & -1 \\ -9 & 4 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -8 \\ 0 \end{pmatrix}$
- B) $\begin{pmatrix} 2 & -1 & 0 \\ 4 & -9 & 1 \\ 2 & 0 & -1 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} -8 \\ 0 \\ 14 \end{pmatrix}$
- C) $\begin{pmatrix} 2 & -1 & 0 \\ -9 & 4 & 1 \\ 2 & 0 & -1 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} -8 \\ 0 \\ 14 \end{pmatrix}$
- D) $\begin{pmatrix} 2 & -1 & 0 \\ -9 & 4 & 1 \\ 2 & 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} -8 \\ 0 \\ 14 \end{pmatrix}$

- 13 A Ferris wheel rotates on an axle 5 metres above the ground. If the wheel is 1 metre above the ground and it takes 20 seconds to complete one half of a full rotation, what is the speed of the wheel to one decimal place?

- A) .4 m/s
B) .6 m/s
C) .8 m/s
D) 1.3 m/s

- 14 Which statement below is an example of periodic and sinusoidal behaviour?

- A) The bouncing of a ball over a stairwell.
B) The filling of a bottle from a tap that has a large bottom and a narrow top.
C) The tidal action over a 48 hour period in Lake Melville.
D) The sound reflecting off a wall over 4 seconds.

- 15 Which statement is **true** about the graph of $\frac{1}{3}(y - 3) = \cos(x + 60^\circ)$?

- A) It shifts $y = \cos x$ 60° right, 3 units down and is stretched vertically by a factor of $\frac{1}{3}$.
- B) It shifts $y = \cos x$ 60° left, 3 units up, and is stretched vertically by a factor of 3
- C) It shifts $y = \cos x$ 60° down, 3 units right and is stretched vertically by a factor of $\frac{1}{3}$.
- D) It shifts $y = \cos x$ 60° up, 3 units left and is stretched vertically by a factor of 3.

16 What is the functional form of $-2(y-6) = \sin 3(x-30^\circ)$?

A) $y = \frac{-1}{2} \sin 3(x - 30^\circ) + 6$

B) $y = \frac{1}{2} \sin 3(x - 30^\circ) - 6$

C) $y = -2 \sin 3(x - 30^\circ) + 6$

D) $y = 2 \sin 3(x - 30^\circ) - 6$

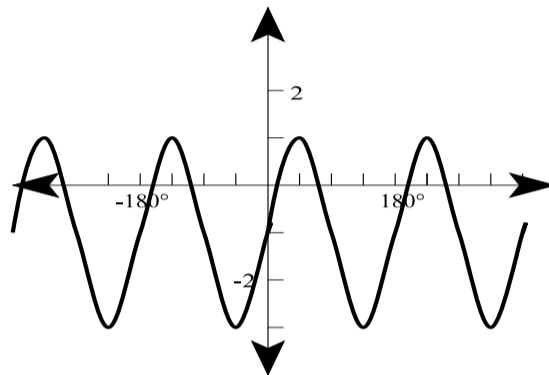
17 The graph of $y = 2 \sin (2x) - 1$ is shown below. What are the solutions to the equation $-3 = 2 \sin (2x) - 1$?

A) $x = -45^\circ$

B) $x = -45^\circ + 180^\circ k, k \in I$

C) $x = -45^\circ + 360^\circ k, k \in I$

D) $x = 135^\circ + 360^\circ k, k \in I$



18 What is the vertical stretch factor of the function $-\frac{1}{3}(y + 6) = \cos 4(x - 20^\circ)$?

A) -6

B) -3

C) 3

D) 4

19 What is the correct mapping rule for the graph $-\frac{1}{4}(y - 3) = \cos(2x)$ when compared to the base graph of $y = \cos x$?

A) $(x,y) \rightarrow (.5x, -4y+3)$

B) $(x,y) \rightarrow (-.5x, 4y-3)$

C) $(x,y) \rightarrow (2x, -4y+3)$

D) $(x,y) \rightarrow (2x, 4y-3)$

20 Using the unit circle where is the cot x undefined?

A) -1

B) 0° and 90°

C) 90° and 270°

D) 0° and 180°

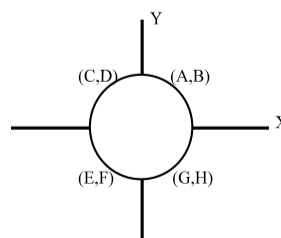
21 In the diagram below, the radius of the circle is 1. Which letter represents $\sin (-344^\circ)$?

A) A

B) B

C) E

D) G



22 What is 200° in radian measure in terms of pi?

A) $\frac{\pi}{10}$ B) $\frac{\pi}{9}$ C) $\frac{5\pi}{9}$ D) $\frac{10\pi}{9}$

23 What is the exact value of $\cot -210^\circ$?

A) $-\frac{1}{\sqrt{2}}$
B) $-\frac{\sqrt{3}}{3}$
C) $-\sqrt{3}$
D) -4

24 What is 4.89 radians to the nearest degree?

A) 5°
B) 70°
C) 280°
D) 880°

25 What are the coordinates of the point (1,0) after it has rotated $\frac{-5\pi}{6}$?

A) $\left(-\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$
B) $\left(-\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$
C) $\left(-\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$
D) $\left(\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$

26 What is the simplified value of $\frac{\sqrt{2}}{\sqrt{5}-2}$?

A) $\frac{\sqrt{10}}{5-3\sqrt{5}}$
B) $\sqrt{10}+2\sqrt{2}$
C) $\frac{\sqrt{10}+2\sqrt{2}}{3}$
D) $\frac{\sqrt{10}+3\sqrt{2}}{8}$

- 27 What is the simplified form of the expression $(1 - \cos^2 x) \cot^2 x$?
- A) $\cos^2 x$
 B) $\tan^2 x$
 C) $\sin^2 x$
 D) $\csc^2 x$
- 28 What is the simplified version of the expression $\frac{1}{x} - \frac{1}{x+1}$?
- A) $\frac{1}{x}$
 B) 1
 C) $\frac{x+1}{x}$
 D) $\frac{1}{x(x+1)}$
- 29 Solve for x in the equation: $5 \sin x - \sqrt{2} = 0$, $0^\circ \leq x \leq 360^\circ$
- A) $-16^\circ, 32^\circ, 328^\circ$
 B) $16^\circ, 134^\circ$
 C) $16^\circ, 164^\circ$
 D) $16^\circ, 206^\circ$
- 30 In which quadrant would the terminal arm of an angle lie if the cosecant and cotangent ratios are both negative?
- A) first
 B) second
 C) third
 D) fourth
- 31 What is $\csc^2 x - 1$ always equal to?
- A) $\cos x$
 B) $\tan x$
 C) $\cot^2 x$
 D) $\tan^2 x$
- 32 What is the simplified value of $(2 + \sqrt{3})^2$?
- A) 5
 B) 7
 C) $4 + \sqrt{3}$
 D) $7 + 4\sqrt{3}$
- 33 What is $\frac{8}{mn}$ written with a denominator of $4m^3n^2$?
- A) $\frac{8}{4m^3n^2}$ B) $\frac{8}{4mn}$ C) $\frac{32m^2n}{4m^3n^2}$ D) $\frac{32}{4m^3n^2}$

- 34 What is $\cot x$ in terms of $\sin x$ and $\cos x$?
- A) $\frac{\cos x}{\sin x}$
 B) $\csc x$
 C) $\frac{\sin x}{\cos x}$
 D) $\sec x$
- 35 The shadow of a tree is 18.5 meters long. The height of the tree is 25.6 meters. What is the angle of depression of the sun?
- A) 3°
 B) 5°
 C) 36°
 D) 54°
- 36 If θ is an angle in a scalene triangle with one angle being 47° where the $\sin \theta = .6754$, what are the possible values of θ ?
- A) 17°
 B) just 42°
 C) $42^\circ, 138^\circ$
 D) $17^\circ, 153^\circ$
- 37 What is the exact area of a triangle with sides 20 and 30 cm with an obtuse angle in the figure measuring 135° ?
- A) $150\sqrt{2} \text{ cm}^2$
 B) $300\sqrt{2} \text{ cm}^2$
 C) 300 cm^2
 D) $300\sqrt{3} \text{ cm}^2$
- 38 Examination marks for a literature 3201 public exam are normally distributed. What percentage of students scored in the interval $(\mu, \mu - 2\sigma)$?
- A) 13.5%
 B) 47.5%
 C) 68%
 D) 95%
- 39 Which statement is true?
- A) The population mean is fixed and the sample mean is fixed.
 B) The population mean is random and the sample mean is fixed.
 C) The population mean is random and the sample mean is random.
 D) The population mean is fixed and the sample mean is random.
- 40 A NHL hockey team is randomly selected and all of its members are weighed. The sample mean is used to predict the population average weight of all NHL players. What type of random sampling is this called?
- A) clustered
 B) simple random
 C) Stratified Sample
 D) systematic

- 41 A random sample size of 40 is selected from a known population with a mean of 21.5 and a standard deviation of 4.3. Samples sizes are repeatedly drawn allowing a sampling distribution of the sample mean to be drawn. What is the standard deviation of the sampling mean?
- A) .68
 - B) 4.3
 - C) 6.32
 - D) 8.12
- 42 A sample size of 50 Rice Crispy Cereal boxes produces a sample mean of 889 g. Determine a 95% confidence interval for the population mean if the sample standard deviation for the sample is 9.25g?
- A) 886.44 to 891.56
 - B) 886.85 to 891.15
 - C) 885.65 to 892.35
 - D) 887.67 to 890.56
- 43 A news broadcaster on CBC announces “The latest government poll stated that 54.5% of the voters in the province would vote PC. The government feels the polls is accurate within 4%, 19 times out of 20.” What is the margin of error?
- A) 4
 - B) 19
 - C) 20
 - D) 95
- 44 A company randomly selected 10 of its super size dessert cookies and analyzed them for fat content. The researcher reported the population mean fat content in one cookie is between 9.92 and 12.45 g with 99% confidence. What did she actually mean by this statement?
- A) There is a 0.99 probability the population mean falls in the interval 9.92 to 12.45
 - B) The method used to produce this interval from 9.92 to 12.45 has a 0.99 probability of enclosing the population mean.
 - C) She is positively sure the mean is between 9.92 and 12.45.
 - D) The method used to produce this interval from 9.92 to 12.45 has a 0.01 probability of enclosing the population mean.
- 45 Which question below could be considered a binomial question ?
- A) How many hours of TV do you watch per week?
 - B) What is the mean number of hours you run each week?
 - C) Are there 40 , 50 or 60 people in your Chemistry 1001 class?
 - D) Do you use the internet for less than 10 hours per week or more than 10 hours per week?

Part II

In this section of the examination candidates must show all workings. Correct solutions alone will **NOT** merit full marks. **Your approach** is evaluated as well as your final answer.

- 1 Suppose you are combining three mixtures of silver nitrate. One mixture is 20% silver nitrate, one is 30% silver nitrate and one 35% silver nitrate. You need to make 20 liters of a mixture that is 31% silver nitrate. You use eight times as much as the 35% solution as the 20% solution. Set up a three by three system of equations and solve the system **algebraically** to determine how much of each mixture did you use. 5%

EITHER

- 2 Find the equation of a plane in the x-y-z coordinate system in the form $x + Ay + Bz + C = 0$ that contains the following points : 6%
A(10,1,1) B(2,-2,2) C(12,7,3)
Please set up a matrix equation to solve your system of equations.

OR

2 A 30 mm military shell takes 1.5 seconds to hit its target. The shell travels according to the parabolic function $H(t) = at^2 + bt + c$. The barrel of the gun is on the roof of a tank 14 feet above ground. After 0.1 seconds, the shell is 14.55 feet in the air. 0.2 seconds after the shell is fired, the shell is 15 feet in the air.

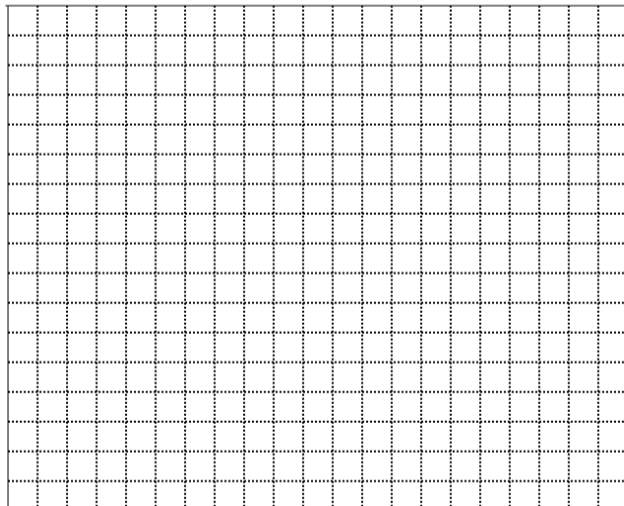
A) Find the function that describes its path by setting up a system of equations. Please set up a matrix equation to solve your system. 5%

B) Determine the height of the target the tank had to hit. 1%

3 Given the equation $\frac{1}{4}(y + 1) = \cos 2(x + 45^\circ)$, sketch its graph for **at least two periods** on the graph paper provided below. In your sketch be sure to provide the following: 8%

A) A **mapping rule** of the image $y = \cos x$.

B) Table of values for the above equation in **functional** form.



4 Find the exact value of $\frac{6 \cos 300^\circ}{3 - 4 \csc 135^\circ}$. 4%

5 **Either:** Solve for **all** x : $\sec 2(x + 30^\circ) = -2$ 6%

Or: Solve for x : $\tan x \cos x - 2 \sin^2 x = 0, 0^\circ < x < 720^\circ$

6 Show or prove $\tan x + \cot x = \csc x \sec x$ 4%

7 A disabled fishing boat at point D is due South of another fishing trawler at T. A third boat in the vicinity is 40° east of North from the disabled fishing boat at point G at a distance of 150 km. The boat located at G is 200 km away from boat T. Using the application laws of sines and or cosines, find the distance from the third boat disabled boat to boat T. 7%

8 A random sample of 350 Canadian doctors showed that 238 provided at least some charity care (i.e., treated people at no cost).

A) Determine the sample proportion. 1%

B) Find a 99% confidence interval for p . Give a brief explanation of the meaning of your interval in the context of this problem. 4%

C) Another random sample of 100 Canadian doctors showed that 76 provided at least some charity care. Find a 99% confidence interval for p and compare to the one you found in B. Which interval is of more use in drawing conclusions about the entire population of Canadian doctors and the proportion that provide at least some charity care. Provide at least two reasons. 4%

Have a safe and enjoyable summer!

(Make Wise Choices! Ambition bites the nails of Success!)

**DO NOT OPEN THE EXAMINATION PAPER UNTIL
YOU ARE TOLD BY THE SUPERVISOR TO BEGIN**

MATHEMATICS 2205

June 2006

Menihek Highschool Final Examination

Value: 100 marks

Time: 2 hours

GENERAL INSTRUCTIONS

1. Candidates are required to do all items. Some internal choice is allowed in Part II, Section B.
2. The examination consists of the following parts:

<i>PART I</i>	<i>45 multiple choice</i>	<i>45%</i>
<i>PART II</i>	<i>Constructed response</i>	<i>55%</i>
3. Answers to multiple choice items are to be given on the answer sheet provided. **All other items are to be answered in this paper.** No examination papers are to be removed from the room.
4. For Part II Items, candidates are reminded to show all necessary steps and calculations as credit may be given for incomplete or partially correct solutions. Correct answers without calculations will not merit full marks.
5. Be sure **NOT** to staple part I and II together. Enjoy your summer holiday and don't forget about us when your name is on the marquee!

REGULATIONS FOR CANDIDATES

Candidates are expected to be thoroughly familiar with all regulations pertaining to their conduct during the examinations. These were explained by the chief supervisor prior to the first session, and have been posted for further reference near the entrance to the examination room. Candidates should ensure that they understand and comply with all requirements governing the following matters:

- Materials required
- Materials not permitted
- Calculator use
- Use of pen or pencil
- Communication and movement during the examination
- Punctuality
- Leaving the room
- Use of answer booklets
- Completion of required information
- Use of unauthorized means, and penalties

Full Name: _____ **Teacher** _____

Mathematics 2205

Full Name: _____

PART 1

1 A B C D

2 A B C D

3 A B C D

4 A B C D

5 A B C D

6 A B C D

7 A B C D

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