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

MENIHEK HIGH SCHOOL

MATHEMATICS 3206

FINAL EXAMINATION

JUNE 2008

Value: 100 marks **Time: 2 hours**

GENERAL INSTRUCTIONS

1. Candidates are required to do ALL items.
2. This examination consists of the following parts:
   Part I: 50 Multiple Choice {50%}
   Part II: Constructed Response {50%}
3. Part II requires candidates 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.

REGULATIONS FOR CANDIDATES

Candidates are expected to be thoroughly familiar with all regulations pertaining to their conduct during the examinations and comply with all requirements governing the following matters:

- Materials required
- Use of pen or pencil
- Punctuality
- Use of unauthorized means and penalties
- Leaving the room
- Completion of required information
- Materials not permitted
- Models of calculators permitted
- Communication and movement during the examination
- Time allowed

Formulae:

$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) \qquad d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$t_n = t_1 + (n-1)d \qquad t_n = an^2 + bn + c$$

$${}_nP_r = \frac{n!}{(n-r)!} \qquad {}_nC_r = \frac{n!}{(n-r)!r!}$$

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B) \qquad P(A \text{ and } B) = P(A) \times P(B)$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \qquad V = \frac{-b}{2a}$$

$$a^2 + b^2 = c^2 \qquad A = P\left(1 + \frac{r}{n}\right)^{nt}$$

PART I:
Multiple Choice (50%)

Directions: Circle the letter of the best possible answer on the answer sheet provided.

1. Successive terms in a sequence are subtracted, giving the same value. What is this value called?

   A) Common degree
   B) Common difference
   C) Cubic
   D) Pattern

2. What is the next number in the given sequence? $\{23,19,15,11,\ldots\}$

   A) -4
   B) 0.8
   C) 0
   D) 7

3. Which of the following sequences is a Fibonacci sequence?

   A) $\{1, 1, 2, 3, 5, 8, \ldots\}$
   B) $(1,2,3,4,5,\ldots)$
   C) $\{3, 9, 27, 81, \ldots\}$
   D) $\{3, 5, 7, 9, 11, \ldots\}$

4. Which rule would generate the sequence: $\{-2,-7,-12,-17,\ldots\}$?

   A) $t_n = 3 - 5n$
   B) $t_n = 5 - 3n$
   C) $t_n = 5n - 3$
   D) $t_n = 3n - 5$

5. If $t_n = 3n^2 - 4$, what is t_6 ?

   A) 14
   B) 32
   C) 104
   D) 320

6. What type of sequence is $\{5,15,33,59,93,\ldots\}$?

   A) arithmetic
   B) cubic
   C) geometric
   D) quadratic

7. What is the common difference of the sequence: $\{4,14,48,118,236,...\}$?

A) 10
B) 12
C) 15
D) 24

8. What level of common difference will prove that a relationship is cubic?

A) D_1
B) D_2
C) D_3
D) D_4

9. What is the minimum or maximum point of a parabola?

A) root
B) vertex
C) x-intercept
D) y-intercept

10. Solve for x: $x^2 + 7x + 12 = 0$

A) −3, −4
B) −1, 4
C) 1, −4
D) 3, 4

11. Which of the following defines a parabola which opens downward?

A) $y = -4x + 2$
B) $y = 4^{2x}$
C) $y = 4x^2 - 3x + 1$
D) $y = 5 - 4x^2$

12. A frisbee is tossed into the air and follows a parabolic path defined by: $y = -3x^2 + 6x$.
(***y*** is the height in metres and ***x*** is the time in seconds.)
What is the maximum height of the ball?

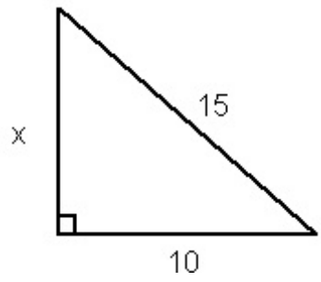
A) 0 m
B) 1 m
C) 1.5 m
D) 3.0 m

13. A ball is tossed into the air and follows a path defined by: $y = -\frac{1}{2}x^2 + 8x$.

(y is the height in metres and x is the time in seconds.)
How long is the ball in the air?

A) 4 s
B) 8 s
C) 16 s
D) 32 s

14. Solve for x:



A) 5
B) 11.1
C) 18.0
D) 125

15. Use technology to identify the coordinates of the vertex of the quadratic equation defined by:

$y = -4x^2 - 12x + 6$

A) (−4,−124)
B) (−3.4, 0.4)
C) (−2.2, 10)
D) (−1.5, 15)

16. What is the point where a graph crosses the y-axis and the x-coordinate is 0?

A) root
B) verte[x]
C) x- intercept
D) y-intercept

17. What is the coefficient **'c'** equal to in the quadratic equation $y = -4x^2 + 3x$?

A) −4
B) 0
C) 2
D) 3

18. Which of the following describes a growth curve?

A) $y = \frac{2}{7}x$

B) $y = 6x^2 + 3x - 1$

C) $y = \left(\frac{3}{4}\right)^x$

D) $y = \left(\frac{8}{5}\right)^x$

19. Evaluate: $\left(\frac{2}{3}\right)^{-2}$

A) $\frac{9}{4}$

B) $\frac{6}{4}$

C) $\frac{-4}{6}$

D) $\frac{-4}{9}$

20. What happens to an investment that depreciates in value?

A) it decreases in value
B) it increases in value
C) it remains the same value
D) it doubles in value

21. Evaluate: $\left(\frac{1}{2}\right)^{2} + 6^{0}$

A) $\frac{5}{4}$

B) $\frac{3}{2}$

C) $\frac{13}{2}$

D) 7

22. How much **interest** would be earned if you invest $700 at 3.5% annual interest compounded monthly for two years?

A) $4.92
B) $50.68
C) $750.68
D $1395.58

23. Express 0.00000456 in scientific notation.

A) 4.56×10^{-6}

B) 4.56×10^{6}

C) 4.56×10^{-8}

D) 456×10^{8}

24. Which equation best represents the exponential relationship given in the table below.

x	0	3	6	9
y	2	4	8	16

A) $y = 2x + 2$

B) $y = 2x^2 - 3x + 2$

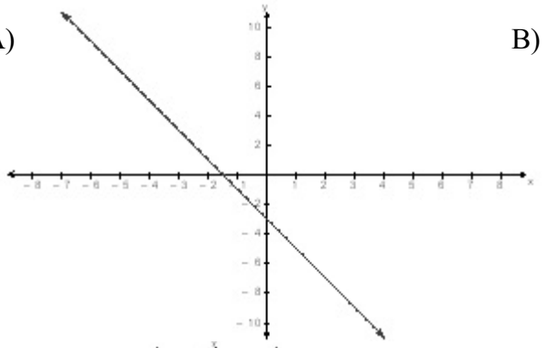
C) $y = 2^x$

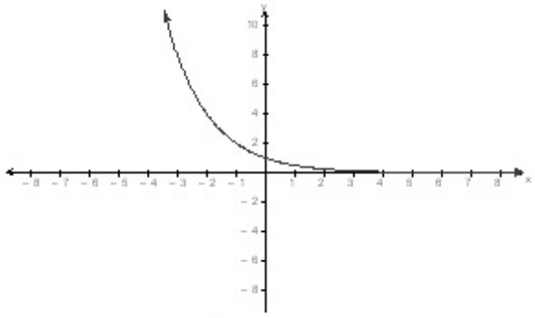
D) $y = 2(2)^{\frac{x}{3}}$

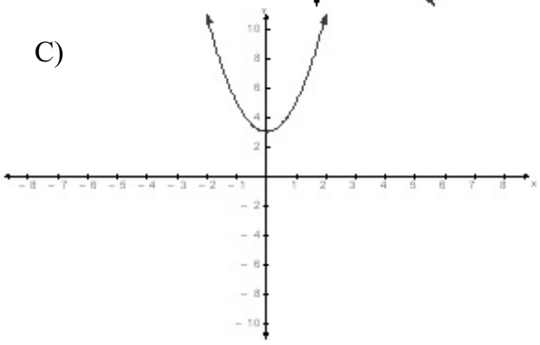
25. The value of an investment is modeled by the equation: $y = 825(1.045)^x$.
What is the rate of interest?

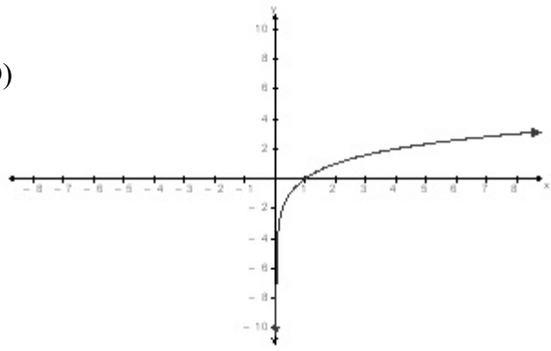
A) 0.045%
B) 1.045%
C) 4.5%
D) 45%

26. Which graph best represents an exponential relationship?

A) 

B) 

C) 

D) 

27. What is the length of a line segment that has endpoints Q(0,5) and W(18,29) ?

A) 5
B) 6.5
C) 30
D) 900

28. What is the center of a circle with endpoints on the diameter R(-4,2) and S(2,6)?

A) (-4,8)
B) (-3,-2)
C) (-1,4)
D) (2,2)

29. When inscribing a circle inside of any triangle, which process is correct using a compass and straightedge?

A) Find the midpoint of all sides and construct a circle around each vertex.
B) Find the angle bisectors of each angle and circumscribe the triangle.
C) Find the perpendicular bisectors of each side. Use the point of intersection as the center of the circle and the distance from this point to a side as the radius and draw the circle.
D) Find the angle bisectors of each angle. Use the point of intersection as the center and distance to a side of the triangle as a radius and then draw the circle.

30. What is the point where the perpendicular bisectors of the sides of any triangle meet called ?

A) circumcenter
B) incenter
C) midpoint
D) Tangent

31. What is the value of $\sqrt{(-2-6)^2+(4--2)^2}$?

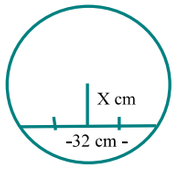
A) 4.5
B) 8.2
C) 10
D) 100

32. Which figure below would have the same incenter as well as the same circumcenter?

A) scalene triangle
B) equilateral triangle
C) rectangle
D) right triangle

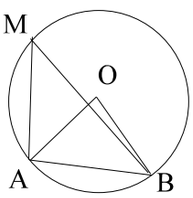
33. A circle has a radius of 20 cm. How far away from the center is a 32 cm chord?

A) 3 cm
B) 8 cm
C) 10 cm
D) 12 cm

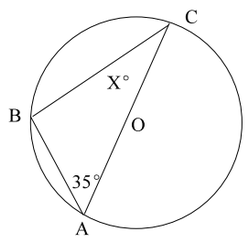


34. What is the measure of ∠OAB if ∠M = 40° and O is the center of the circle?

A) 20°
B) 40°
C) 50°
D) 80°

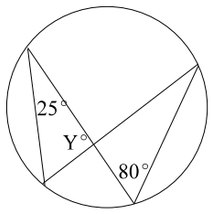


35. What is the measure of x below if O is the center of the circle?



A) 35°
B) 55°
C) 90°
D) 110°

36. What is the measure of y below?



A) 25°
B) 50°
C) 75°
D) 80°

37. Suppose you rolled a die. What is the probability of rolling an even number?

A) $\frac{1}{6}$
B) $\frac{1}{2}$
C) $\frac{2}{3}$
D) $\frac{5}{6}$

38. What are the total number of members in a sample space for the tossing of 4 coins and two die?

A) 8
B) 20
C) 52
D) 576

39. A coin and a die are rolled. What is the probability of getting a tail on the coin and a six on the die?

A) $\frac{1}{16}$
B) $\frac{1}{12}$
C) $\frac{1}{8}$
D) $\frac{3}{8}$

40. When it is certain that an event (E) will occur, what probability is the event assigned?

A) -1
B) 0
C) 1-P(E)
D) 1

41. What are the odds in favor of selecting a club from a standard deck of cards of 52?

A) 1:4 *or* $\frac{1}{4}$

B) 1:3 *or* $\frac{1}{3}$

C) 1:2 *or* $\frac{1}{2}$

D) 1:1 *or* $\frac{1}{1}$

42. The probability of an event happening is $\frac{9}{10}$. Which statement is true?

A) This event is very unlikely to happen because the probability is high.
B) This event will likely happen because the odds are low.
C) The odds of this event happening is 1 to 9.
D) The odds of this event happening is 9 to 1.

43. A deck of 52 playing cards has one card selected randomly. What is the probability of selecting a Queen or a club?

A) $\frac{4}{52}$

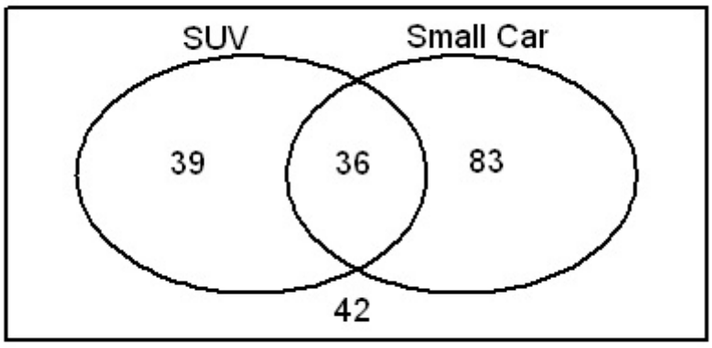
B) $\frac{5}{52}$

C) $\frac{17}{52}$

D) $\frac{4}{13}$

Use the following Venn diagram to answer **questions 44 and 45**.

A survey was conducted in the city of St. John's ,NL and respondents were asked "Do you own a SUV or a small car?" to determine spending habits on gasoline purchases. The results are displayed below.



44. How many people surveyed owned a SUV?

A) 36
B) 39
C) 75
D) 200

45. What is the probability that a person selected did not own an SUV?

A) $\frac{1}{8}$

B) $\frac{21}{100}$

C) $\frac{83}{200}$

D) $\frac{5}{8}$

46. A card is selected from a deck of 52 cards and then is replaced. What is the probability of selecting the Jack of Spades twice in a row?

A) $\frac{1}{2704}$

B) $\frac{1}{1352}$

C) $\frac{1}{52}$

D) $\frac{1}{26}$

47. What is the value of 8! - 6! ?

A) 2
B) 56
C) 720
D) 39600

48. In how many way can you make arrangements of 3 letters from the letters ABCDE?

A) 3
B) 5
C) 30
D) 60

49. What is the value of ${}_9C_6$?

A) 84
B) 252
C) 504
D) 60,480

50. A coach has 17 people to fill out a roster for a hockey team. In how many ways can she do this if she insists that one of the players play goal always?

A) 16!

B) ${}_{17}P_{17}$

C) ${}_{17}C_{17}$

D) $\frac{17!}{1!}$

PART II
Constructed Response: 50%

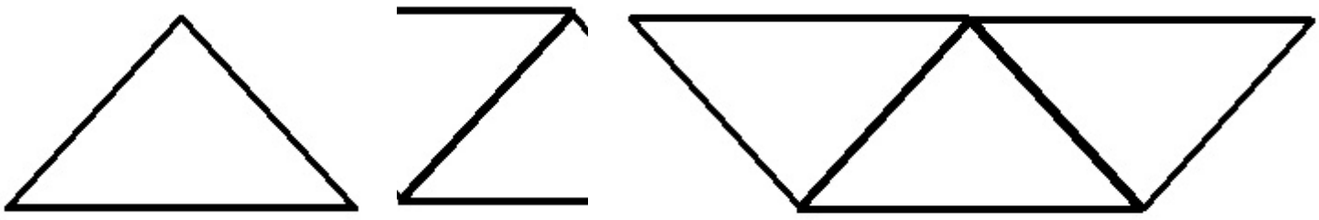
Part II requires students to show ALL necessary steps and calculations as credit may be given for incomplete or partially correct solutions. Correct answers without calculations will not merit full marks.

1. Identify the type of sequence shown. If the sequence is arithmetic or quadratic, write the equation for the sequence in the form $y = mx + b$ or $y = ax^2 + bx + c$. Then find the **12th** term.

(4%)

$$\{2, 15, 34, 59, 90, 127, \ldots\}$$

2. A local contractor is using iron rods to construct a fence. The first three sections of fence are shown.



Section 1 Section 2 Section 3

a) Draw a sketch showing the next two sections of the fence.

(2%)

b) Write a sequence corresponding to the total number of rods used to construct the first four sections of fence by completing the table below.

(2%)

Section #	1	2	3	4
# of rods used				

c) Use a formula to determine how many rods are needed for the 20^{th} section of fence. (2%)

3. Solve using the quadratic formula. $12x^2 - 2x - 2 = 0$ (4%)

4. Jonah is cementing his garage floor. The area of the floor is given by: $A = 2w^2 + 4w + 5$ where ***w*** represents the width of the floor in metres and ***A*** represents the area of the floor in square meters. Find the width of the garage floor if its area is 885 m^2. (4%)

5. A hot cup of coffee cools exponentially with time. The time and temperature of the coffee is recorded in the table below.

(4%)

Time(mins)	0	4	8	12	16	20
Temperature (°C)	100	50	25	12.5	6.25	3.125

a) Using the formula, $y = a(b)^{\frac{x}{c}}$, find the equation of best fit that describes the data, where ***x*** represents time in minutes and ***y*** represents the temperature in degrees Celsius.

b) Use the equation to determine the temperature of the coffee after 15 minutes.

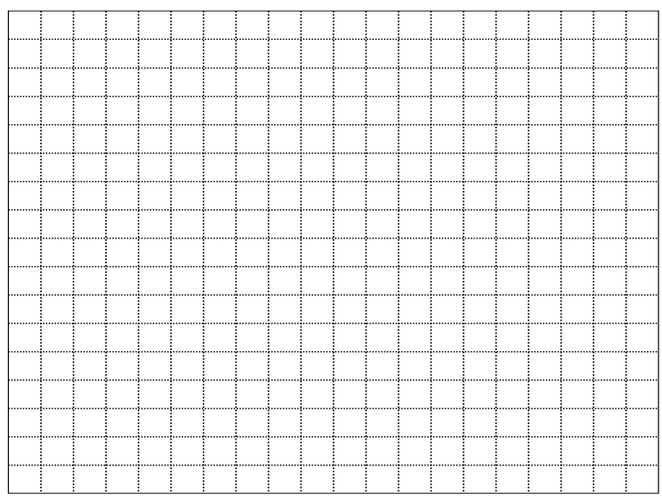
6. An investment of $300 in a GIC earns 4.5% annual interest compounded weekly. How much will the investment be worth after 8 years?

(4%)

7. Graph $y = \left(\frac{1}{2}\right)^x$, completing the table of values.

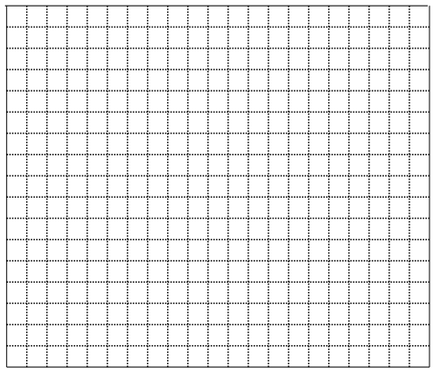
(4%)

X	Y



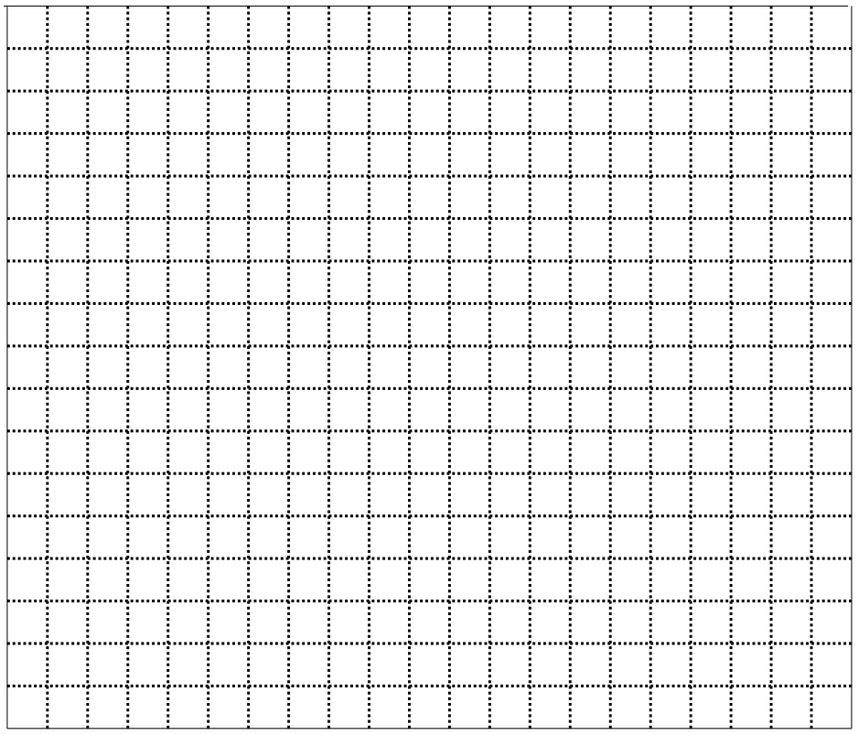
8. Using the distance formula and the Pythagorean theorem, show that $\triangle SOX$ is a right triangle , given S(-1,6), O(5,0), and X(-2,-7). You must show $leg^2 + leg^2 = hypotenuse^2$.

4%



9. Stagg Construction Limited has been given the contract to design a swimming pool that is equidistant from three apartment complexes located at the following coordinates on a coordinate grid: S(-3,6), T (8, 3), W(3, -4). Using a compass and a straightedge, determine the approximate coordinates of the optimum location for the swimming pool P from the three buildings.

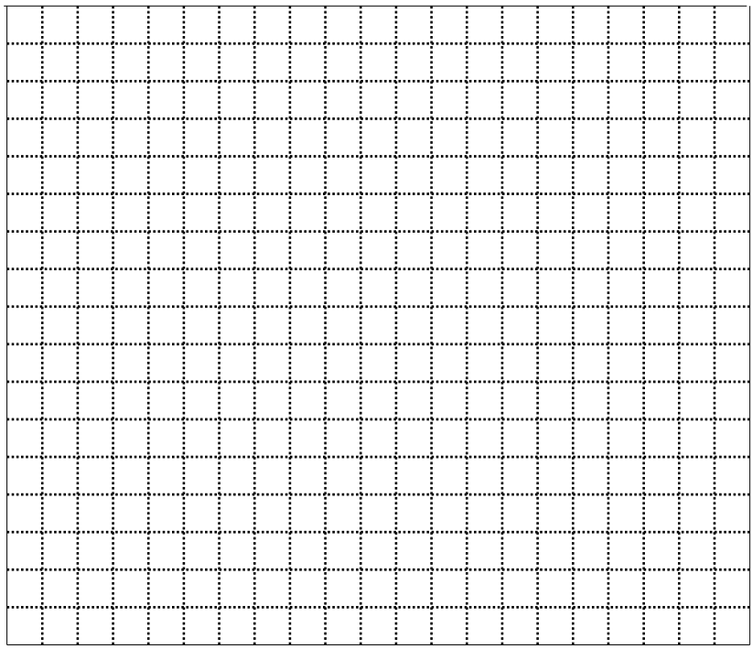
4%



10. Three water lines are running between three separate buildings in the town of Paradise Officials wish to install a fire hydrant that will service all three buildings in the event of an emergency. The locations of the buildings are on the co-ordinate grid at A(-7,5) , B(-1,-8) and C (4,3).

The town would like to service the three water lines that connect the fire hydrant with one massive water pump. Using your compass and straightedge, determine the coordinate location where the pump would be equidistant from each water line connecting the three buildings.

4%



11. General Motors recently had a year end sale entitled "Ring in and Win". John was lucky enough to win his purchase at such an event. He was given the following options to choose from:

Colors: red ®, black (b), yellow (y), green (g)

Transmission: standard (s) , automatic (a)

Keyed Entry: Keyless Entry (KL) Keyed Entry (KE)

A) Construct a tree diagram and list all the members of the sample space.

3%

B) John advises the salesperson that he wish to have a black automatic truck that has a keyless entry. What is the probability that his truck is on the lot?

1%

12. Using proper permutation and /or combination notation answer the following questions. Show the calculations involved.

A) Eight people are qualified to work for three positions with IOCC. How many ways is this possible if the three positions are a truck driver, shovel operator and a millwright?

2%

B) From a council of 4 females and 3 males, how many ways can you select a committee that has 3 members?

2%