

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

MENIHEK HIGH SCHOOL

MATHEMATICS 3206

FINAL EXAMINATION

JUNE 2009

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

Formulae:

$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$t_n = t_1 + (n-1)d$$

$${}_n P_r = \frac{n!}{(n-r)!}$$

$$P(A \text{ and } B) = P(A) \times P(B)$$

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

$$a^2 + b^2 = c^2$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$t_n = an^2 + bn + c$$

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

$$V = \frac{-b}{2a}$$

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

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? {44, 38, 32, 26, ...}
 - A) -3
 - B) 0.7
 - C) 12
 - D) 20

3. Which of the following sequences is a Fibonacci sequence?
 - A) {0,1, 1, 2, 3,5,8, ...}
 - B) {0, 1, 2, 3, 4, 5...}
 - C) {2, 4, 6, 8, 10, ...}
 - D) {4, 8, 12, 16, 20, ...}

4. Which rule would generate the sequence: {- 2, 0, 2, 4,...} ?
 - A) $t_n = -2n + 4$
 - B) $t_n = 4 - 2n$
 - C) $t_n = 2n - 4$
 - D) $t_n = 2 - 4n$

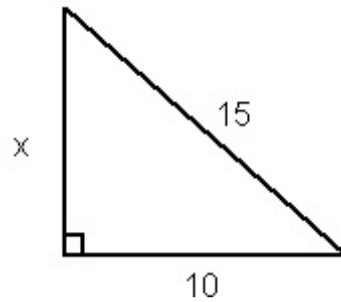
5. If $t_n = 3n^3 - 2$, what is t_5 ?
 - A) 22
 - B) 79
 - C) 190
 - D) 373

6. What type of sequence is {3, 4, 11, 30, 67,...} ?
 - A) arithmetic
 - B) cubic
 - C) geometric
 - D) quadratic

7. What is the common difference of the sequence: $\{-6, -8, -14, -24, -38, \dots\}$?
- A) -10
 - B) -8
 - C) -6
 - D) -4
8. What level of common difference will prove that a relationship is quadratic?
- 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: $x^2 - 3x - 18 = 0$
- A) 1, -3
 - B) 3, -6
 - C) -1, 3
 - D) -3, 6
11. Which of the following defines a parabola which opens upward?
- A) $y = -5x - 8$
 - B) $y = -3^{2x}$
 - C) $y = 3x^2 - 2x + 6$
 - D) $y = 5 - 8x^2$
12. What is a sequence called that eventually ends?
- A) Ending Sequence
 - B) Finish Sequence
 - C) Finite Sequence
 - D) Infinite Sequence
13. What is the approximate mean for the following set of data... $(16, 38, 49, 64, 49, 43, 27)$
- A) 41
 - B) 43
 - C) 48
 - D) 49

14. Solve for x:

- A) 5
- B) 11.2
- C) 18.0
- D) 125



15. Use the formula $v = \frac{-b}{2a}$ to identify the coordinates of the vertex of the quadratic equation defined by:

$$y = 3x^2 - 12x - 288$$

- A) (-2, 300)
- B) (2, 300)
- C) (2, -300)
- D) (-2, -300)

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

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

17. What is the coefficient 'b' equal to in the quadratic equation $y = 7x^2 + 12$?

- A) -7
- B) 0
- C) 7
- D) 12

18. Which of the following describes a growth curve?

- A) $y = 6x$
- B) $y = 9x^2 - 4x + 8$
- C) $y = \left(\frac{1}{3}\right)^x$
- D) $y = \left(\frac{9}{4}\right)^x$

19. Evaluate: $\left(\frac{3}{4}\right)^{-2}$

A) $\frac{-16}{9}$

B) $\frac{-9}{16}$

C) $\frac{9}{16}$

D) $\frac{16}{9}$

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

A) it decreases in value

B) it doubles in value

C) it increases in value

D) it remains the same value

21. Evaluate: $\left(\frac{2}{3}\right)^2 + 8^0$

A) $\frac{3}{9}$

B) $\frac{5}{9}$

C) $\frac{7}{9}$

D) $\frac{13}{9}$

22. How much **interest** would be earned if you invest \$540 at 2.5% annual interest compounded semi-annually for three years? Use the following formula $A = P\left(1 + \frac{r}{n}\right)^{nt}$

A) \$567.57

B) \$581.79

C) \$1094.13

D) \$2219.34

23. Express 0.000000306 in scientific notation.

A) 3.06×10^{-7}

B) 306×10^6

C) 3.06×10^9

D) 306×10^{-9}

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

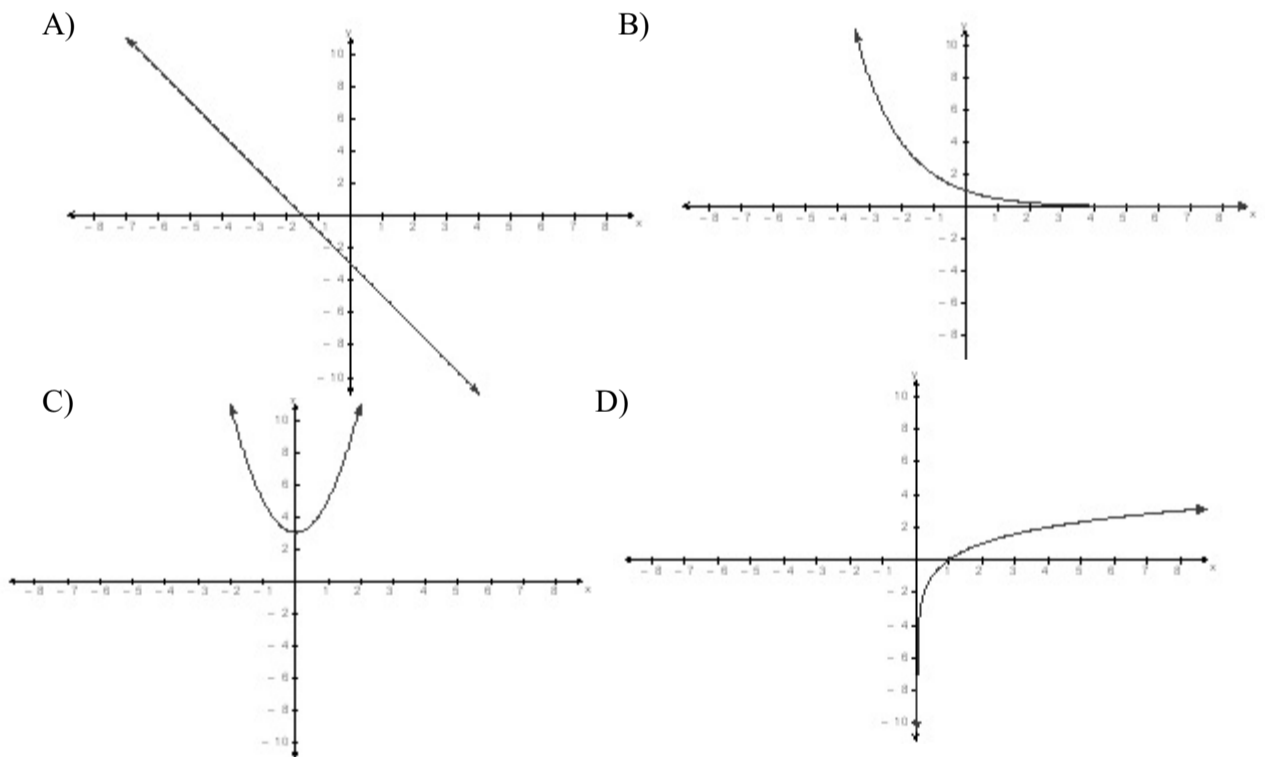
x	0	1	2	3
y	1	5	25	125

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

25. The value of an investment is modeled by the equation: $y = 645(1.55)^x$.
What is the rate of interest?

- A) 0.45%
- B) 1.55%
- C) 5.5%
- D) 55%

26. Which graph best represents a parabolic relationship?



27. What is the length of a line segment that has endpoints Q(3,7) and W(14,32)? Use the following formula $d = \sqrt{(X_2 - X_1)^2 + (Y_2 - Y_1)^2}$

- A) 18.4
- B) 27.3
- C) 42.5
- D) 47.1

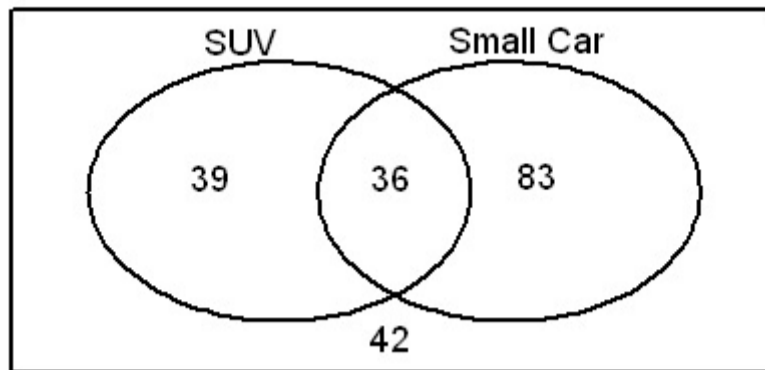
28. What is the center of a circle with endpoints on the diameter R(-6,5) and S(1,12)? Use the following formula $m = \left(\frac{X_1 + X_2}{2}, \frac{Y_1 + Y_2}{2} \right)$
- A) (-2.5, 8.5)
 B) (-2, 5)
 C) (2.5, 8.5)
 D) (5, -2)
29. When inscribing a circle inside of any triangle, which process is correct 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 $\sqrt{(-8 - 10)^2 + (6 - -6)^2}$?
- A) 7.5
 B) 12.2
 C) 18
 D) 21.6
32. What is the name of the formula which uses the three coefficients of a quadratic equation namely a, b & c to determine its roots?
- A) Arithmetic formula
 B) Geometric formula
 C) Power formula
 D) Quadratic formula
33. What would be the x-intercepts for the equation $x^2 - 4x - 12 = 0$. Use the formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
- A) 2, -6
 B) 6, -2
 C) 2, -5
 D) 5, -2

34. Which of the following would indicate a decay growth?
- A) $0.3(0.61)^x$
 B) $2.75(1.28)^x$
 C) $-4\left(\frac{5}{3}\right)^x$
 D) $9(1.76)^x$
35. Which of the following equations has a corresponding parabola which opens downward?
- A) $y = -3x + 7$
 B) $y = 5x^2 - 8$
 C) $y = -2x^2$
 D) $y = 8 + 5x^2$
36. What would be the first five terms of the sequence given by the equation $t_n = -2n - 2$
- A) (6, 9, 12, 15, 18)
 B) (7, 11, 15, 19, 23)
 C) (-2, 1, 4, 7, 10)
 D) (-4, -6, -8, -10, -12)
37. Suppose you rolled a die. What is the probability of rolling an odd 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 3 coins and 2 die?
- A) 6
 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. What is the median in the set of data $(64, 85, 86, 70, 72, 80, 83, 72, 65, 80)$
- A) 72
 - B) 72 and 80
 - C) 76
 - D) 80
41. What are the odds in favor of selecting a jack from a standard deck of cards of 52?
- A) $\frac{1}{13}$
 - B) $\frac{1}{12}$
 - C) $\frac{1}{4}$
 - D) $\frac{1}{3}$
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) $\frac{17}{52}$
 - B) $\frac{5}{52}$
 - C) $\frac{4}{52}$
 - 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 an 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. Which of the following would represent a linear equation with $t_1 = -9$, and $D_1 = 2$?
- A) $t_n = 2n - 11$
 B) $t_n = -2n - 9$
 C) $t_n = -2n + 9$
 D) $t_n = 2n + 11$
48. What is the mode for the following set of numbers. (64, 85, 86, 70, 72, 80, 83, 74, 65, 87) ?
- A) 70
 B) 76.6
 C) 77
 D) no mode

49. Evaluate $(2^3 + 2^0)^{-2}$

- A) $\frac{1}{81}$
- B) $\frac{1}{9}$
- C) 9
- D) 81

50. Factor completely $3x^2 - 30x + 75$

- A) $(x + 40)(x + 35)$
- B) $3(x - 10)(x + 3)$
- C) $3(x - 5)(x - 5)$
- D) $(x - 6)(x + 5)$

PART II
Constructed Response: 50%

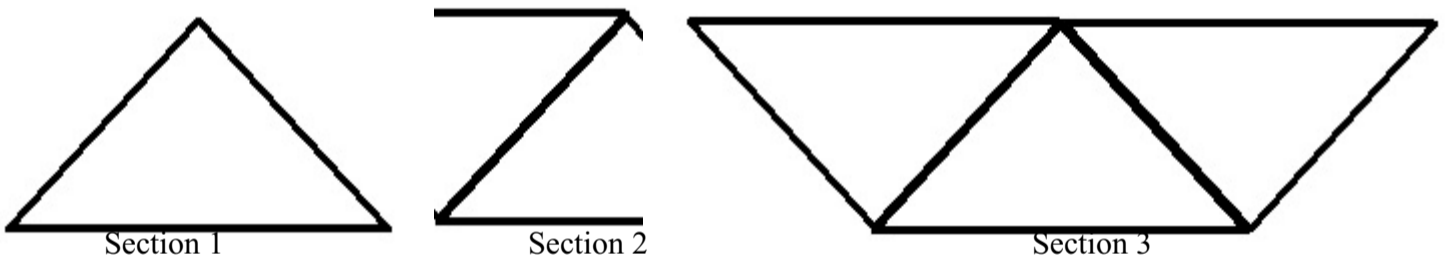
Part II requires students to show ALL necessary steps and calculations as credit may be given for incomplete or partially correct solutions. Correct answers without calculations will not merit full marks.

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 11th term.

(4%)

$$\{4, 9, 20, 37, 60, \dots\}$$

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



- 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 15th section of fence.
(2%)

3. Find the x-intercepts using the quadratic formula.

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

(4%)

$$4x^2 + 8x - 5 = 0$$

4. Perform any 2 (**two**) of the following constructions.

- A) Construct a triangle given the following three sides (4cm, 5cm & 6cm).
- B) Construct a 22.5° angle.
- C) Construct a square with a measurement of 6cm.
- D) Construct an equilateral triangle.

(6%)

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

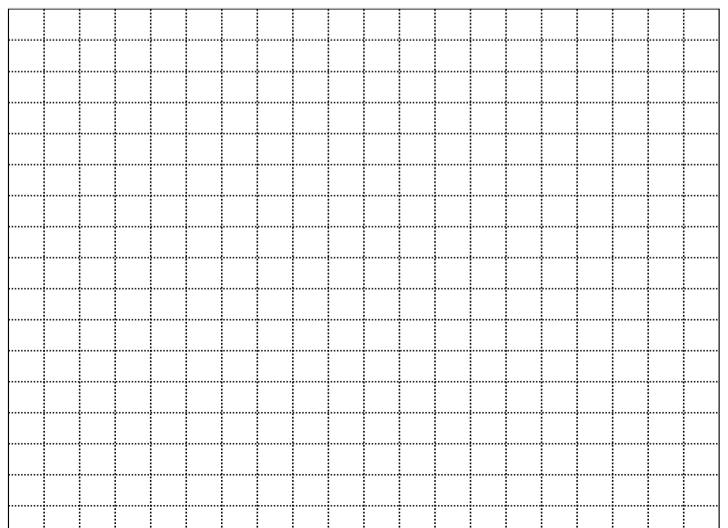
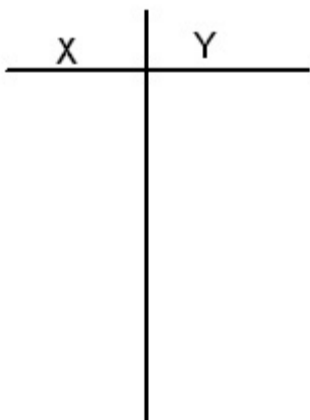
- a) Using the formula, $y = a(b)^{\frac{x}{c}}$, find the equation of best fit that describes the data, where x represents time in minutes and y represents the temperature in degrees Celsius.
- b) Use the equation to determine the temperature of the coffee after 15 minutes.

6. An investment of \$1500 in a GIC earns 6.5% annual interest compounded bi-weekly. How much will the investment be worth after 5 years? $A = P\left(1 + \frac{r}{n}\right)^{nt}$

(4%)

7. Graph $y = 2^x$, completing the table of values.

(4%)



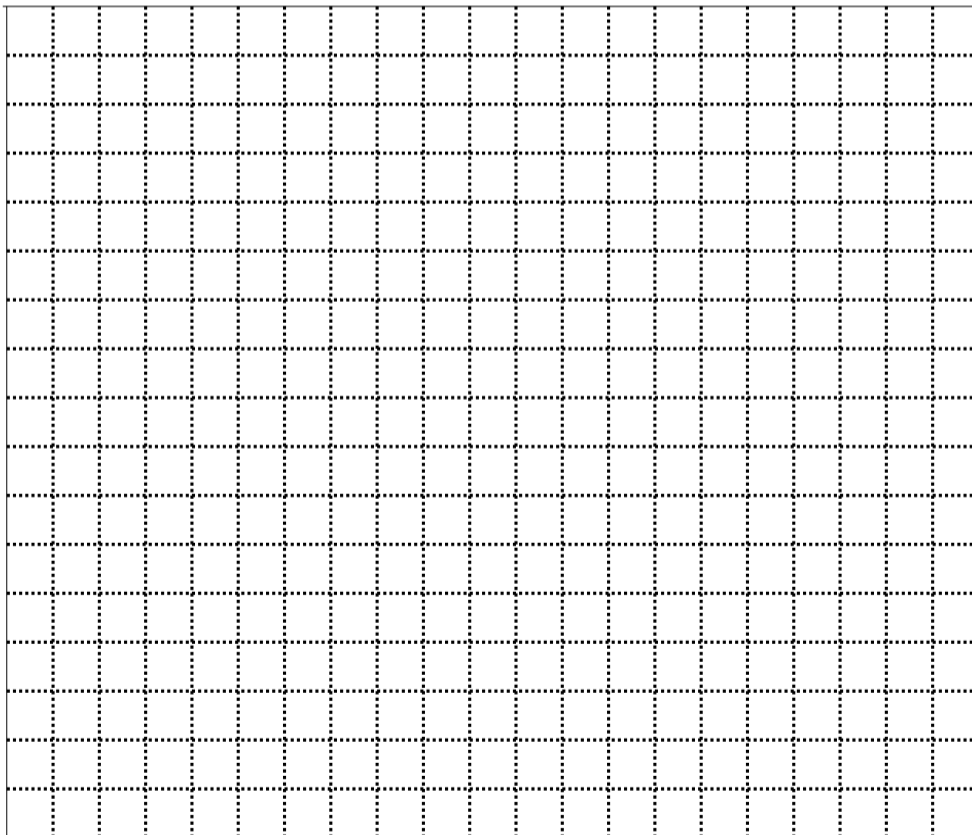
8. Find the midpoint and the distance for the following.

4% $m = \left(\frac{X_1 + X_2}{2}, \frac{Y_1 + Y_2}{2} \right)$ $d = \sqrt{(X_2 - X_1)^2 + (Y_2 - Y_1)^2}$

P(12, -15) and Q(6, 8)

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: A(-4, 6) B(3, 0) and C(6, 5). Using a compass and a straightedge, find the incenter of the three buildings.

4%



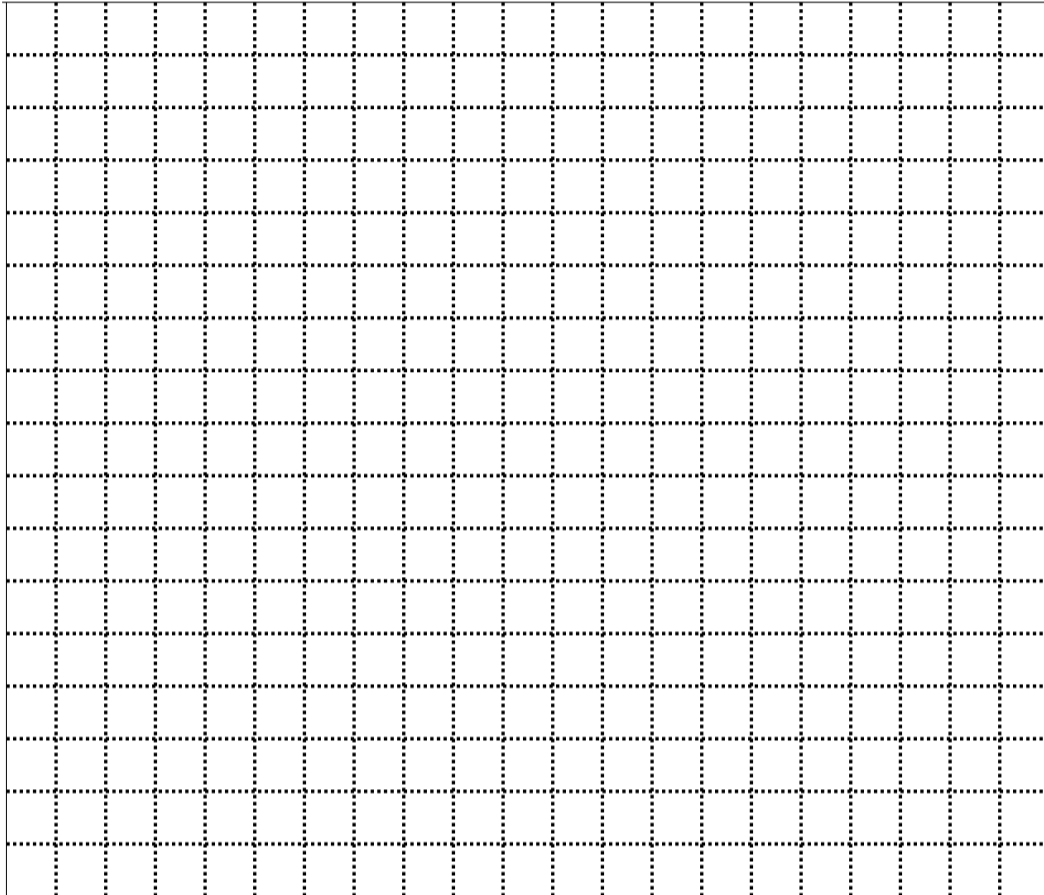
10. Algebraically determine the vertex for the following... $V = \frac{-b}{2a}$

(2%) $y = 2x^2 + 7x - 15$

11. 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(-6,3) , B(-1,-9) and C (5,2).

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, find the **cicumcenter**.

4%



12. A bag has 6 green marbles, 5 blue marbles and 7 red marbles. What would be the probability of...

(4%)

- A) Picking out a green, then a blue, then a red without replacing any of them.
- B) Picking out a red, then a red, then a blue, with replacing them.

