HILLCREST HIGH SCHOOL

Grade 10 Mathematics Exam
June 2019

Examiner: Mrs Sparks
MARKS: 100

Moderator: Mrs Woodrow
TIME: 2 hours

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 12 questions. Answer ALL the questions.
2. Write your name and **your Mathematics teacher**'s name on your answer booklet.
3. Clearly show ALL calculations, diagrams, graphs, etc which you have used to determine your answers.
4. Answers only will NOT necessarily be awarded full marks.
5. An approved scientific calculator (non-programmable) may be used, unless otherwise stated.
6. If necessary, answers should be rounded off to TWO decimal places, unless otherwise stated.
7. Number the answers EXACTLY as the questions are numbered.
8. Diagrams are not necessarily drawn to scale.
9. It is in your own interest to write legibly and to present your work neatly.
10. A DIAGRAM SHEET is attached to your answer booklet for QUESTION 4.1.

QUESTION 1:

1.1 Simplify the following as far as possible:

1.1.1 $(6x - y)(x^2 + 2xy + y^2)$ (3)

1.1.2 $\frac{x^2-1}{x^2+2x+1} \div \frac{3x-3}{x^3+1}$ (4)

1.2 Simplify the following: $\sqrt{9a^6 + 16a^6}$ (2)

[9]

QUESTION 2:

2.1 Solve for x in each of the following:

2.1.1 $3^{2y} = 81^{y+2}$ (3)

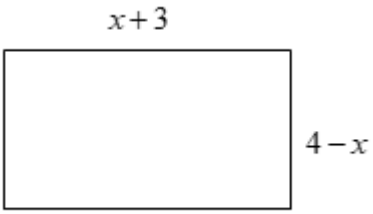
2.1.2 $-2 < x + 1 \leq 4$, then express your solution in interval notation (3)

2.2 Solve for a and b simultaneously:

$5a + 6b = 4$

$3a + b = 5$ (5)

2.3 Study the rectangle alongside:



For what value(s) of x will the area of the rectangle be 0? (2)

[13]

QUESTION 3:

3.1 The sequence 14; 11; 8; 5; …. is given.

3.1.1 Determine the general term (T_n) for this pattern. (2)

3.1.2 Calculate the 15th term of the sequence. (2)

3.2 Use the figures below to answer the questions.

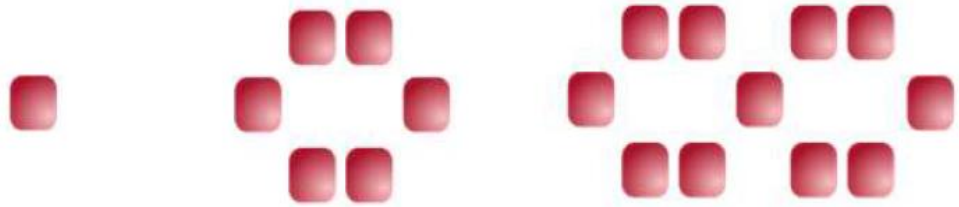


Fig 1 Fig 2 Fig 3

3.2.1 Determine a formula that will describe the pattern. (2)

3.2.2 If you have 131 blocks, determine which figure (term) you could draw? (3)

3.3 If $T_n = -(n-1)^2$, determine the first three terms in the pattern (2)

[11]

QUESTION 4:

4.1 On the diagram sheet in your answer booklet, draw a rough sketch of the following functions using the prescribed description:

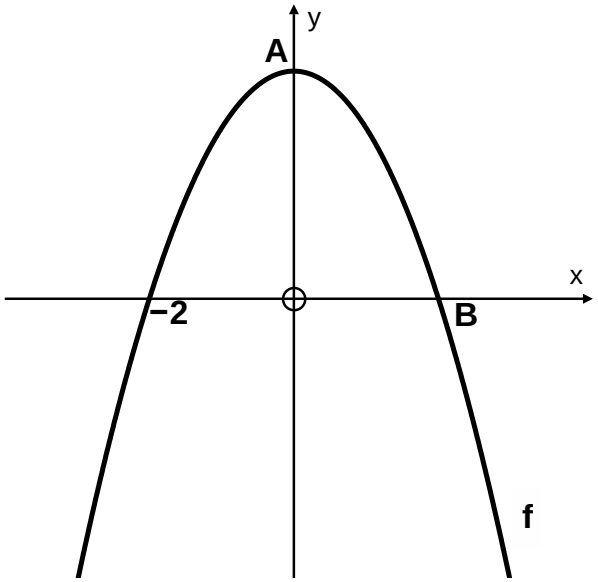
4.1.1 $y = mx + c$
$m > 0 \quad c < 0$ (2)

4.1.2 $y = ax^2 + q$
$a < 0 \quad q > 0$ (2)

[4]

QUESTION 5:

Given the sketch of $f(x) = -x^2 + 4$



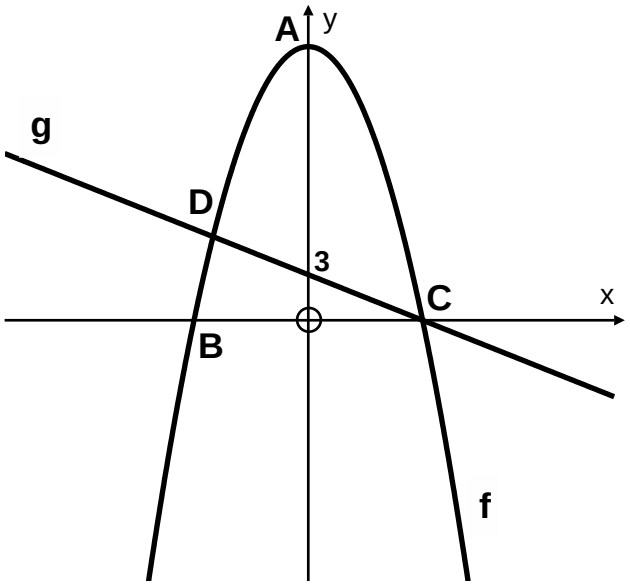
5.1 Write down the range of f (2)

5.2 Explain how you would shift the graph of f to result in the function $y = -x^2 + 1$ (2)

[4]

QUESTION 6:

The diagram shows the graphs of $f(x) = 18 - 2x^2$ and $g(x) = mx + c$, where g intersect with the y-axis at 3 and intersects with the function f at C and D. A lies on the y-axis. B and C lie on the x-axis.



Determine:

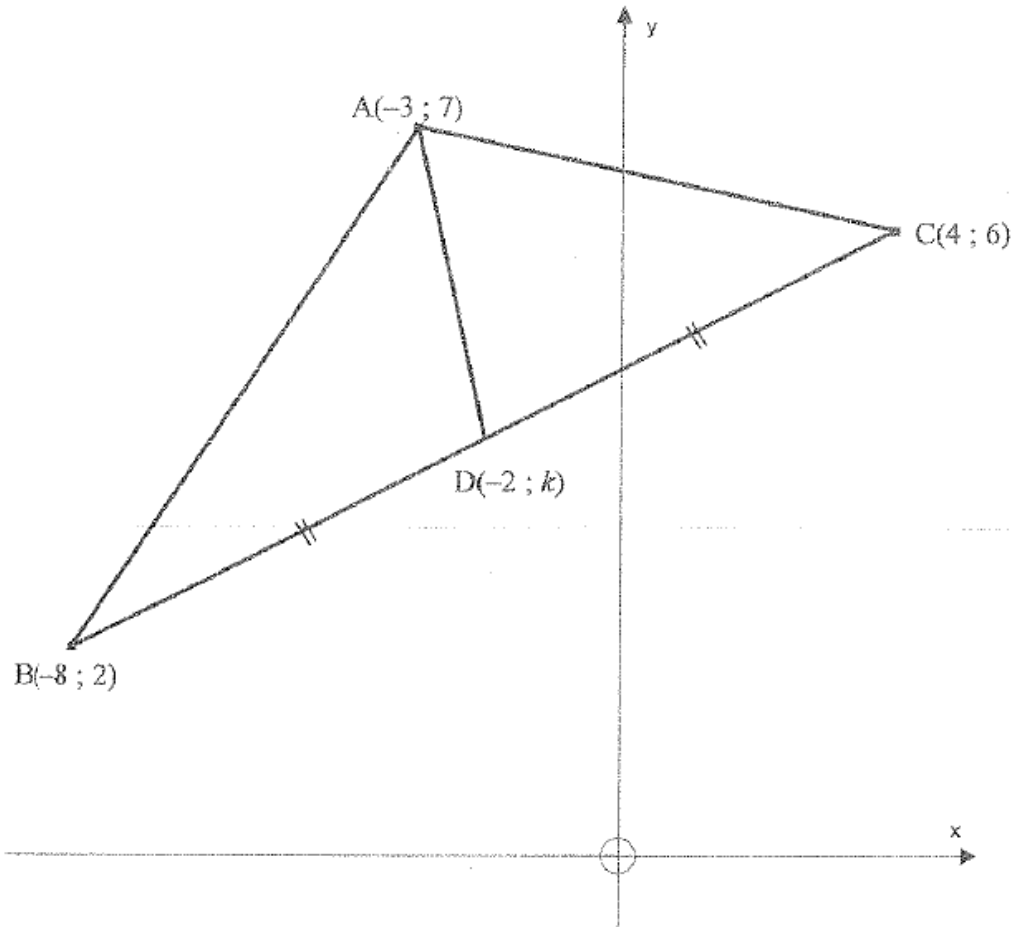
6.1 The co-ordinates of A, B and C. (6)

6.2 The values of m and c (3)

[9]

QUESTION 7:

In the diagram below A(-3; 7), B(-8; 2) and C(4; 6) are the vertices of triangle ABC. AD is drawn such that D(-2; k) is the midpoint of BC



7.1 Calculate the gradient of BC. (2)

7.2 Calculate the length of BC. (leave your answer in surd form) (2)

7.3 Determine the value of k. (2)

7.4 Determine the equation of a line that is parallel to BC and passes through A(-3;7). (3)

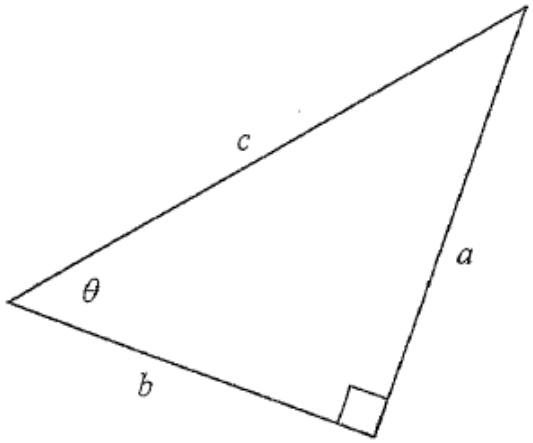
7.5 If the value of k is 4, prove that $AD \perp BC$. (3)

7.6 Hence, calculate the area of ΔABC. (4)

[16]

QUESTION 8:

A right-angled triangle has sides a, b and c and the angle θ, as shown below.



8.1 Write the following in terms of a, b and c:

8.1.1 $\cos\theta$ (1)

8.1.2 $\tan\theta$ (1)

8.1.3 $\sin(90° - \theta)$ (2)

8.2 Given that $\hat{A} = 38°$ and $\hat{B} = 146°$. Calculate the value of $2cosecA + \cos 3B$ (2)

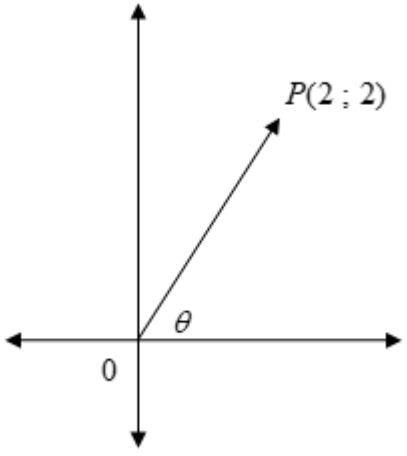
8.3 Solve for x, correct to one decimal place, for $0° < x < 90°$.

$$sin2x + 1 = 1{,}506$$ (3)

[9]

QUESTION 9:

9.1 In the figure, P is the point (2 ; 2). Determine, <u>without the use of a calculator</u>:



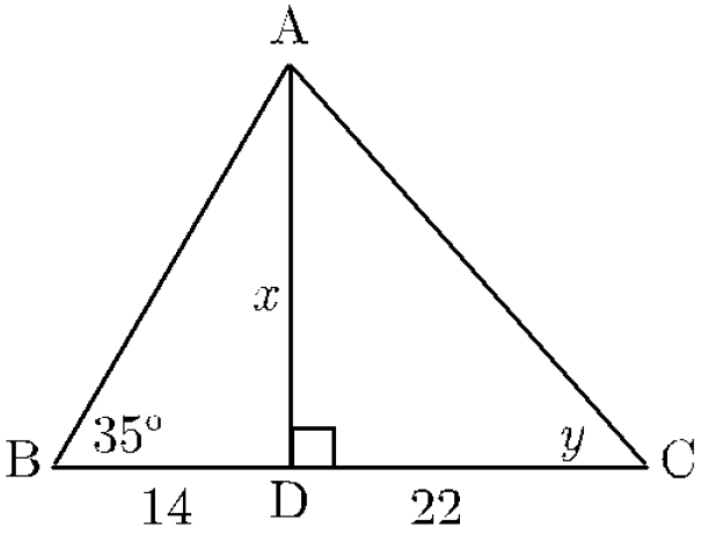
9.1.1 OP (leave answer in surd form) (2)

9.1.2 $\sin\theta - \cos\theta$ (2)

[4]

QUESTION 10:

Refer to the diagram below and answer the following questions:



10.1 Calculate the value of the side x and then the angle y. (6)

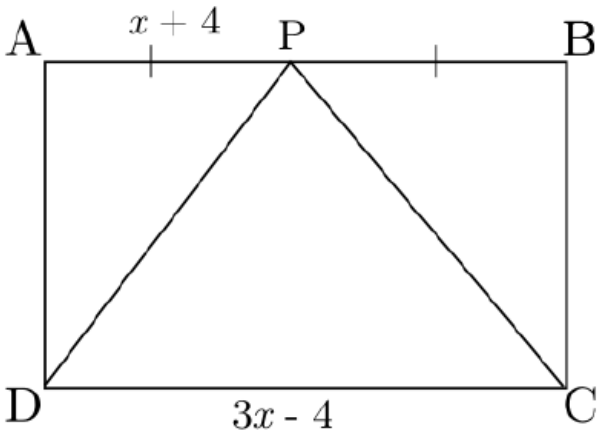
10.2 Determine the length of AB. (3)

[9]

QUESTION 11:

11.1 Complete the theorem: The diagonals of a parallelogram… (1)

11.2 ABCD is a rectangle and AP = PB.



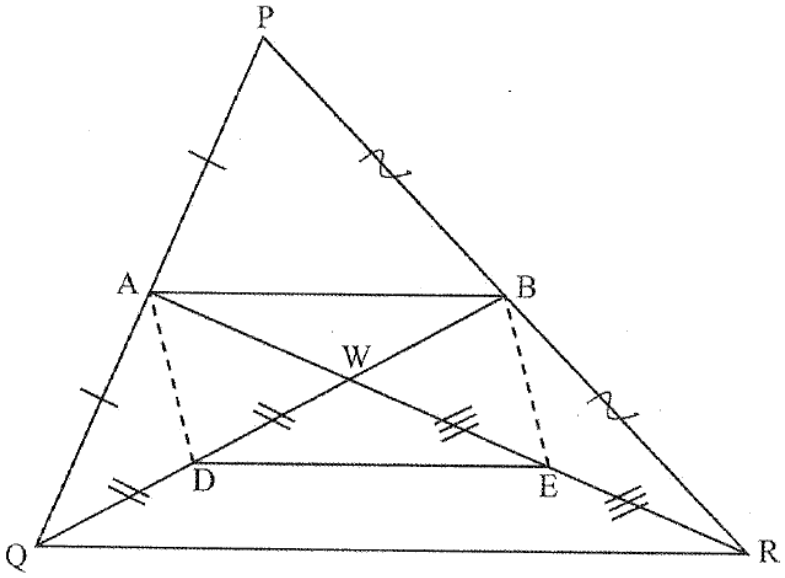
11.2.1 Calculate the value of x. (2)

11.2.2 If BC = $2x$, determine the length of PC correct to two decimal places. (4)

[7]

QUESTION 12:

In ΔPQR, A and B are the midpoints of sides PQ and PR respectively. AR and BQ intersect at W. D and E are points on WQ and WR such that WD = DQ and WE = ER.



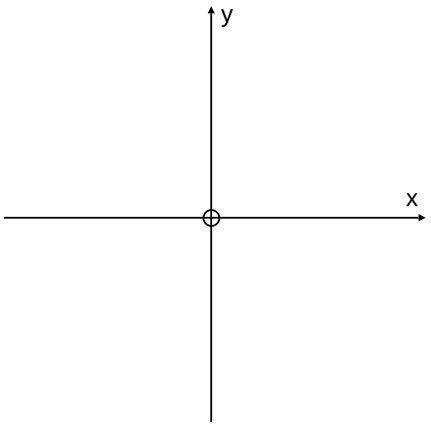
Prove that ADEB is a parallelogram. [5]

Grade 10 Mathematics 2019 ANSWER BOOKLET												
Name:							Maths Teacher:					
1	2	3	4	5	6	7	8	9	10	11	12	Total:
(9)	(13)	(11)	(4)	(4)	(9)	(16)	(9)	(4)	(9)	(7)	(5)	100 marks

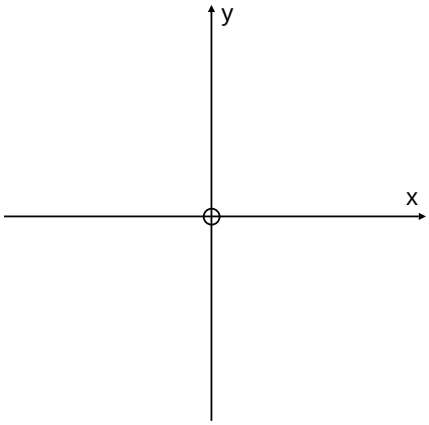
Diagram Sheet

ANSWER Question 4.1.1 and 4.1.2 on this sheet (on the axes below)

4.1.1



4.1.2



START ANSWERING FROM HERE:

