GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PRETORIA CENTRAL CLUSTER PAPER

JUNE 2019

GRADE 12

SUBJECT	**:**	**MATHEMATICS P1**
TIME	**:**	**3 HOURS**
MARKS	**:**	**150**

This question paper consists of 10 pages, including an information sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions:

1. This question paper consists of 9 questions. Answer ALL the questions.

2. Clearly show ALL calculations, diagrams, graphs, etc that you have used in determining the answers.

3. Answers only will not necessarily be awarded full marks.

4. An approved calculator (non-programmable and non-graphical) may be used, unless stated otherwise.

5. If necessary, answers should be rounded off to TWO decimal places, unless stated otherwise.

6. Number the answers EXACTLY as the questions are numbered.

7. Diagrams are not necessarily drawn to scale.

8. It is in your own interest to write legibly and present the work neatly.

9. A formula sheet is included at the end of the question paper.

QUESTION 1

1.1 Solve for x:

1.1.1 $x^2 + 9x + 14 = 0$ (3)

1.1.2 $4x^2 + 9x - 3 = 0$ (correct to two decimal places) (4)

1.1.3 $\sqrt{x-6} - 2 = \frac{15}{\sqrt{x-6}}$ (5)

1.1.4 $\frac{6x^2-3x}{3} \leq 3x^2$ (5)

1.2 Solve for x and y simultaneously:

$x + 2y = 3$ and $3x^2 + 4xy + 9y^2 - 16 = 0$ (6)

1.3 Evaluate:

$\frac{3^{2018}+3^{2016}}{3^{2017}}$ (2)

[25]

QUESTION 2

2.1 Consider the sequence; $\frac{1}{3}; 5; \frac{1}{9}; 8; \frac{1}{27}; 11;$ ... ...

2.1.1 If the pattern continues in the same way, write down the next two terms in the sequence (2)

2.1.2 Calculate the sum of the first 50 terms of the sequence (5)

2.2 Consider the sequence; 32; 21; 12; 5….

2.2.1 Write down the next two terms of the sequence if the pattern continues in the same way (2)

2.2.2. Determine the n^{th} term of the sequence (5)

2.2.3. Which term of the sequence is 1845? (4)

[18]

QUESTION 3

Give the geometric sequence; $6x + 12;\ 2x + 4;\ x - 7$

3.1. Solve for x (5)

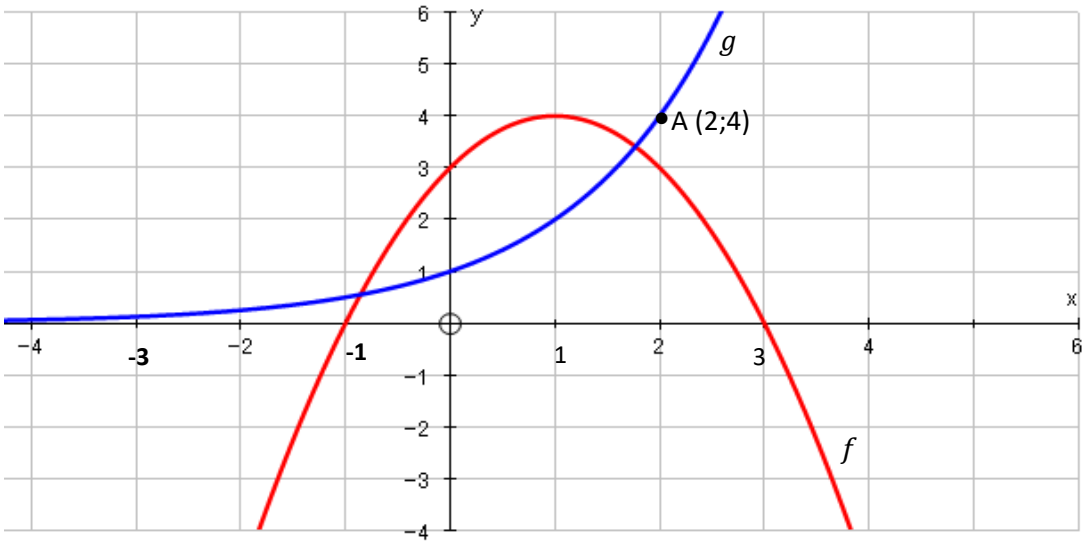
3.2. Is this a converging or diverging sequence? Justify your answer (3)

[8]

QUESTION 4

In the diagram below, the graphs of the following functions are represented:

$f(x) = ax^2 + bx + c$ and $g(x) = ab^x$. $A(2;4)$ is a point on g. The graphs cut the axes as given below.



x

4.1 Determine the equation of g. (4)

4.2 Write down the equation of the asymptote of g. (1)

4.3 Determine the equation of f in the form $y = ax^2 + bx + c$. (4)

4.4 Find the equation of the axis of symmetry of f. (1)

4.5 Write down the equation of h, the reflection of the graph of g about the x-axis. (1)

4.6 Write down the inverse of h in the form $y = \cdots$ (2)

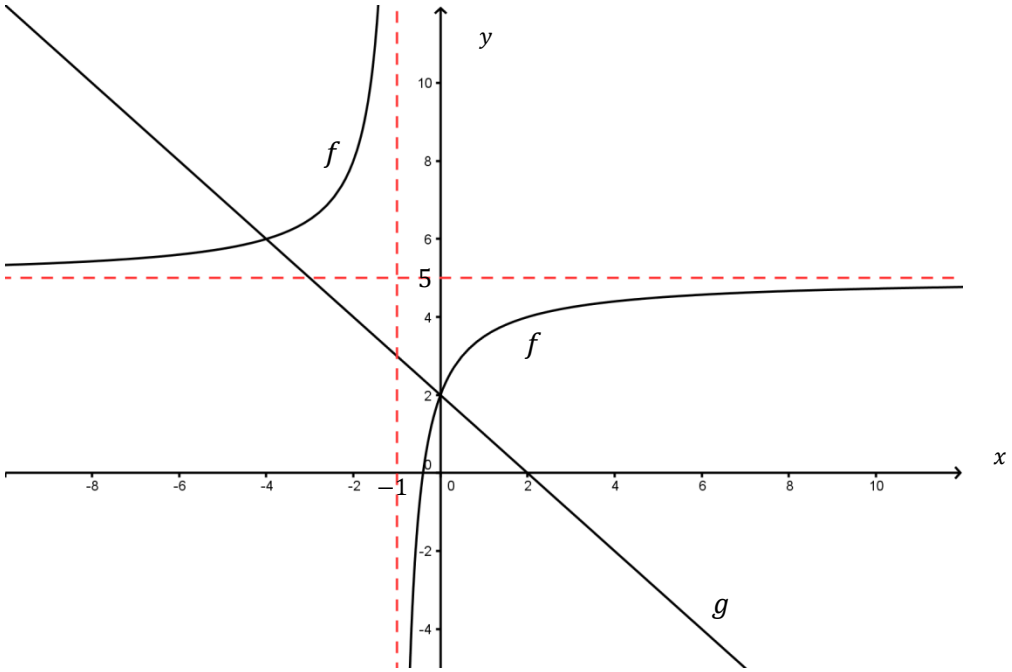
4.7 Describe transformation of h to k where $k(x) = -2^{x-1} - 4$ (2)

[15]

QUESTION 5

The diagram represents the graphs of $f(x) = \frac{a}{x-p} + q$ and $g(x) = mx + c$.

The graph of g cuts the x-axis at 2 and the y-axis at 2. The y-intercept of f is 2.



5.1 Determine the values of a, p, q. (4)

5.2 Write down domain and range of f (4)

5.3 Write down equations of axes of symmetry of $f(x) + 1$. (2)

5.4 Determine the equation of g in the form $y = mx + c$. (2)

5.5 Calculate the points of intersection of f and g. (5)

[17]

QUESTION 6

6.1 Mr Nkosi invest R 30 000. She was quoted a nominal interest of 7,3% per annum compounded monthly.

6.1.1 Calculate the effective rate per annum. (3)

6.1.2 Using the effective rate if Mr Nkosi invest his money for a period of 5 years , but after 16 months makes another deposit of R 6 000 and the interest changes to 7,8% compounded quarterly. Calculate how much he will receive after 5 years. (5)

6.2. Mr Nkosi owns a truck company that delivers newspapers around the city. He wants to replace one of the truck in 6 years' time. He bought the truck for R250 000.The truck depreciates at 11,3% p.a. and the rate of inflation is at 13,2% p.a.

Calculate:

6.2.1. expected cost of the truck in 6 years to come (3)

6.2.2. the book value of the truck (2)

6.2.3. the amount he needs to deposit in if he sells his old truck to add to the cost of the new one (2)

[15]

QUESTION 7

7.1 Determine $f'(x)$ from first principle if:

$f'(x) = -x^2 + 4$ (5)

7.2 Determine the derivative of:

7.2.1 $y = 3x^2 + 10x$ (2)

7.2.2 $f(x) = (x - \frac{3}{x})^2$ (3)

7.3 Given: $f(x) = 2x^3 - 23x^2 + 80x - 84$

7.3.1 Prove that $(x - 2)$ is a factor of f (2)

7.3.2 Hence, or otherwise, factorise $f(x)$ fully. (2)

7.3.3 Determine the x- coordinates of the turning points of *f*. (4)

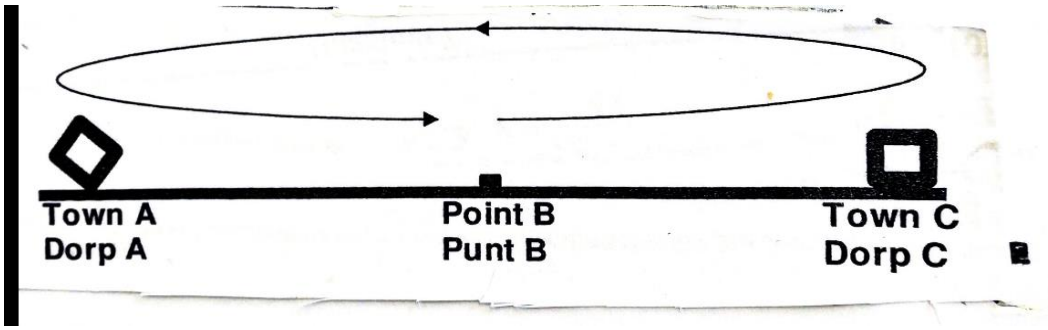
7.3.4 Sketch the graph of f, clearly labelling ALL turning points and intercepts with the axes. (3)

7.3.5 Determine the coordinates of the y- intercept of the tangent to f that has a slope of 40 and touches f at a point where the x- coordinate is an integer. (6)

[27]

QUESTION 8

A marathon athlete trains between two towns A and C.



The athlete starts at point B which lies between towns A and C. To complete one cycle, he runs from point B to town C, passes point B on his way to town A and back to point B. The road between the towns is in a straight line. The displacement, in kilometres, from point B after t hours, is given by:

$$s(t) = -t^3 + 12t^2 - 32t$$

8.1 How many hours will it take the athlete to complete a full cycle and return to point B? (3)

8.2 Calculate the distance between point B and town C. (5)

8.3 Calculate the maximum speed that the athlete has reached while training. (3)

[11]

QUESTION 9

9.1 The events A and B are independent. P (A) = 0, 4 and P (B) = 0, 5. Determine:

9.1.1 P(A and B) (2)

9.1.2 P(A or B) (2)

9.1.3 P(not A and not B) (2)

9.2 Two identical bags are filled with balls. Bag A contains 3 pink and 2 yellow balls. Bag B contains 5 pink and 4 yellow balls. It is equally likely that Bag A or Bag B is chosen. Each ball has an equal chance of being chosen from the bag. A bag is chosen at random and a ball is then chosen at random from the bag.

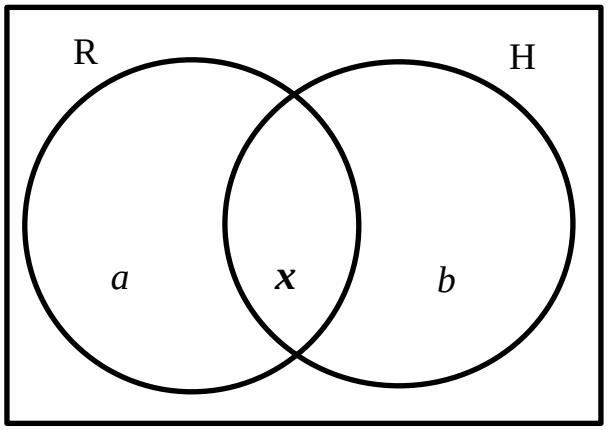
9.2.1 Represent the information by means of a tree diagram. Clearly indicate the probability associated with each branch of the tree diagram and write down all the outcomes. (2)

9.2.2 What is the probability that a yellow ball will be chosen from **Bag A**? (1)

9.3 Eastside High School offers only two sporting activities, namely rugby (R) and hockey (H). The following information is given and partly represented in the diagram.

S = 600

- There are 600 learners in the school.
- 372 learners play hockey.
- 288 learners play rugby.
- 56 of the learners play NO sport.
- The number of learners that play both hockey and rugby is x.



56

9.3.1 Write down the values of a and b in terms of x. (2)

9.3.2 Calculate the value of x. (2)

9.3.3 Are the events playing rugby and playing hockey mutually exclusive? Justify your answer. (1)

[14]

TOTAL: [150]

INFORMATION SHEET: MATHEMATICS

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

$$A = P(1+ni) \qquad A = P(1-ni) \qquad A = P(1-i)^n$$

$$A = P(1+i)^n$$

$T_n = a + (n-1)d \qquad S_n = \frac{n}{2}(2a + (n-1)d)$

$$T_n = ar^{n-1} \qquad S_n = \frac{a\left(r^n - 1\right)}{r-1} \; ; \qquad r \neq 1 \qquad S_\infty = \frac{a}{1-r}; \; -1 < r < 1$$

$$F = \frac{x\left[(1+i)^n - 1\right]}{i} \qquad P = \frac{x[1-(1+i)^{-n}]}{i}$$

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

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

$$y = mx + c \qquad y - y_1 = m(x - x_1) \qquad m = \frac{y_2 - y_1}{x_2 - x_1} \qquad m = \tan\theta$$

$$(x-a)^2 + (y-b)^2 = r^2$$

In ΔABC:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \qquad a^2 = b^2 + c^2 - 2bc.\cos A \qquad area\,\Delta ABC = \frac{1}{2}ab.\sin C$$

$$\sin(\alpha + \beta) = \sin\alpha.\cos\beta + \cos\alpha.\sin\beta \qquad \sin(\alpha - \beta) = \sin\alpha.\cos\beta - \cos\alpha.\sin\beta$$

$$\cos(\alpha + \beta) = \cos\alpha.\cos\beta - \sin\alpha.\sin\beta \qquad \cos(\alpha - \beta) = \cos\alpha.\cos\beta + \sin\alpha.\sin\beta$$

$$\cos 2\alpha = \begin{cases} \cos^2\alpha - \sin^2\alpha \\ 1 - 2\sin^2\alpha \\ 2\cos^2\alpha - 1 \end{cases} \qquad \sin 2\alpha = 2\sin\alpha.\cos\alpha \qquad \bar{x} = \frac{\sum fx}{n}$$

$$\partial^2 = \frac{\sum_{i=1}^{n}\left(x_i - \bar{x}\right)^2}{n} \qquad P(A) = \frac{n(A)}{n(S)} \qquad P\,(A \text{ or } B) = P\,(A) + P\,(B) - P\,(A \text{ and } B)$$

$$\hat{y} = a + bx \qquad b = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sum(x - \bar{x})^2}$$