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GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PROVINCIAL EXAMINATION

NOVEMBER 2022

GRADE 11

MATHEMATICS

(PAPER 1)

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TIME: 3 hours

MARKS: 150

9 pages

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INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. Answer ALL the questions.
2. This question paper consists of 9 questions.
3. Present your answers according to the instructions of each question.
4. Clearly show ALL calculations, diagrams, graphs etc., which were used in determining the answers.
5. Answers only will NOT necessarily be awarded full marks.
6. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
7. If necessary, answers should be rounded-off to TWO decimal places, unless stated otherwise.
8. Diagrams are NOT necessarily drawn to scale.
9. Number the questions correctly according to the numbering system used in this question paper.
10. Write neatly and legibly.

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QUESTION 1

1.1 Given: $\sqrt{3-x} = 2x - 3$.

1.1.1 If $x \in$ {Natural Numbers}, determine the value(s) of x for which $\sqrt{3-x}$ is a rational number. (2)

1.1.2 If $x \in$ {Real Numbers}, prove that $1{,}5 \leq x \leq 3$. (3)

1.2 Solve for the values of a and b:

$(3a - 8)(2b + 7) = 0$ (2)

1.3 Solve for x:

1.3.1 $4x^2 - 20x + 1 = 0$ (correct to TWO decimal places) (3)

1.3.2 $(x+1)(x-3) > 12$ (4)

1.3.3 $x - \sqrt{5+x} = 7$ (5)

1.4 If $x = 3$ and $y = a$ satisfy the equations $x - y = 1$ and $x^2 - 3xy + by^2 = -5$,

Determine:

1.4.1 The values of a and b. (4)

1.4.2 The other solution to the equations if ONE solution is (3 ; 2). (6)

1.5 Given: $(p+1)x^2 + 2px + (p+2) = 0$

1.5.1 Determine the value of p if the roots of the equation are equal. (4)

1.5.2 Determine the value(s) of $p, p \neq -1$, so that the above equation has roots which are real, rational and unequal. (2)

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QUESTION 2

2.1 Simplify WITHOUT the use of a calculator:

2.1.1 $\left(\frac{1}{3^{n-1}}.\frac{1}{3^{n+1}}\right)^{\frac{1}{n}}$ (3)

2.1.2 $\sqrt[3]{27^2}-\frac{2}{8^{-\frac{2}{3}}}+\frac{\sqrt[5]{2}}{4^{-\frac{2}{5}}}$ (4)

2.2 Solve for x:

$3^{2-x}+8=3^x$ (4)

[11]

QUESTION 3

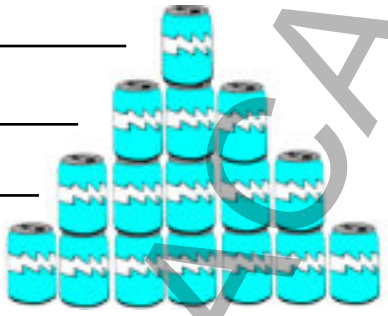
A packer packs cans into a pyramid.

ROW 1 _____

ROW 2 _____

ROW 3 _____

ROW 4 _____



The cans above are numbered forming a pattern from the FIRST number in each row.

This pattern is illustrated below.

ROW 1			**1**				
ROW 2		**2**	**3**	**4**			
ROW 3	**5**	**6**	**7**	**8**	**9**		
ROW 4	**10**	**11**	**12**	**13**	**14**	**15**	**16**

3.1 Determine an expression for the FIRST value in the n^{th} row of the pattern in the form $T_n = an^2 + bn + c$. (4)

3.2 Write down the number of the first can in the 50^{th} row (2)

3.3 In which row will the LAST numbered can be 121? (2)

3.4 If this pattern continues consistently, which row would have 241 cans?

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QUESTION 4

Given the quadratic pattern:

4 ; 9 ; x ; 37 ; …

4.1 Calculate the value of x. (4)

4.2 If $x = 20$, calculate between which two terms of the quadratic pattern will the FIRST difference be 599? (4)

4.3 An expression for the n^{th} term in the pattern can be written in the form $T_n = an^2 + bn + c$.

4.3.1 State whether the turning point of T_n is a local minimum or local maximum value. Substantiate your answer. (3)

4.3.2 If $T_n = 3n^2 - 4n + 5$, determine the range of T_n. (3)

4.4 If it is given that in the above pattern:

- The equation of the FIRST differences is $T_n = 6n - 1$.
- The quadratic equation is $T_n = 3n^2 - 4n + 5$.

Determine if there is a possible common value for n in both patterns.
Support your answer with an appropriate calculation. (3)
[17]

QUESTION 5

5.1 Calculate the effective interest rate, if the nominal interest rate is 13,5% compounded monthly. (4)

5.2 Using simple interest, how long would it take (to the nearest month) for R6 800 to grow to R7 500 at an interest rate of 7,5% per annum? (3)

5.3 Simone invested R5 000 into a savings account with an interest rate of 5% per annum, compounded semiannually. How much will Simone have after 6 years? (3)

5.4 Given: $A = P(1 + in)$ where P and i are positive constants.

5.4.1 State whether the graph of A, as a function of n, is linear, quadratic, exponential or none of these. (1)

5.4.2 Draw a possible graph of A, as a function of n in your ANSWER BOOK. (2)

5.4.3 If n increases by 1, determine the increase in A. (1)
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QUESTION 6

Given: $f(x) = \frac{2}{x-2} + 1$ and $g(x) = \left(\frac{1}{2}\right)^x - 1$

6.1 Write down the equations of the asymptotes of f. (2)

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

6.3 On the same set of axes, sketch the graphs of f and g in your ANSWER BOOK. Indicate clearly all intercepts with the axes as well as the asymptotes. (4)

6.4 Write down the domain of f. (1)

6.5 Write down the range of g. (1)

6.6 Determine the equation of h, the axis of symmetry of f, which has negative gradient. (2)

6.7 Describe how the graph of $p(x) = \frac{2}{x}$ was transformed to obtain f. (2)

6.8 Calculate the distance between the intersection of f with g, and the intersection of the asymptotes of f. (2)

6.9 The graph of g intersects f at the point $K(0\ ;\ 0)$.

Determine K', the point of intersection of $f(x-3)$ and $g(x-3)$. (2)

6.10 For which values of x is: $f(x).g(x) \geq 0$? (1)

[18]

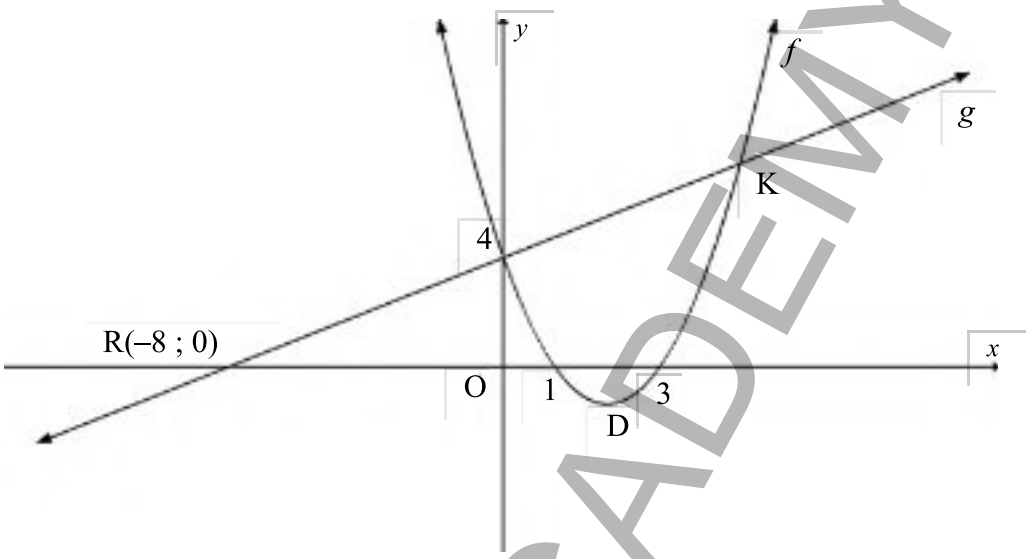
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QUESTION 7

The graphs of $f(x) = ax^2 + bx + c$ and $g(x) = mx + q$ are sketched below.

- The x-intercepts of f are at (1 ; 0) and (3 ; 0).
- The y-intercept of f is (0 ; 4).
- Point D is the turning point of f.
- The x-intercept of g is at (– 8; 0).
- The graphs of f and g intersect at points K and (0 ; 4).



7.1 Determine the equation of f in the form $y = ax^2 + bx + c$. (3)

7.2 Determine the coordinates of point D. (3)

7.3 Determine the equation of a line p, which is perpendicular to g, passing through point D. (5)

7.4 Calculate the size of $K\hat{R}O$. (correct to TWO decimal places) (2)

7.5 Determine the coordinates of point K. (4)

7.6 Write down the values of x for which:

7.6.1 $f(x) < 0$ (1)

7.6.2 $\dfrac{f(x)}{g(x)} \geq 0$ (2)

7.7 When the graph of f is shifted 3 units down and 2 units to the right it forms the graph of h. Write down the equation of h in the form $h(x) = a(x - p)^2 + q$. (2)

7.8 The graph of $j(x) = ax - 8$ is such that it passes through the point (–4 ; 0).

7.8.1 Determine the value of a. (2)

7.8.2 Describe the transformation of the graph of g to j. (1)

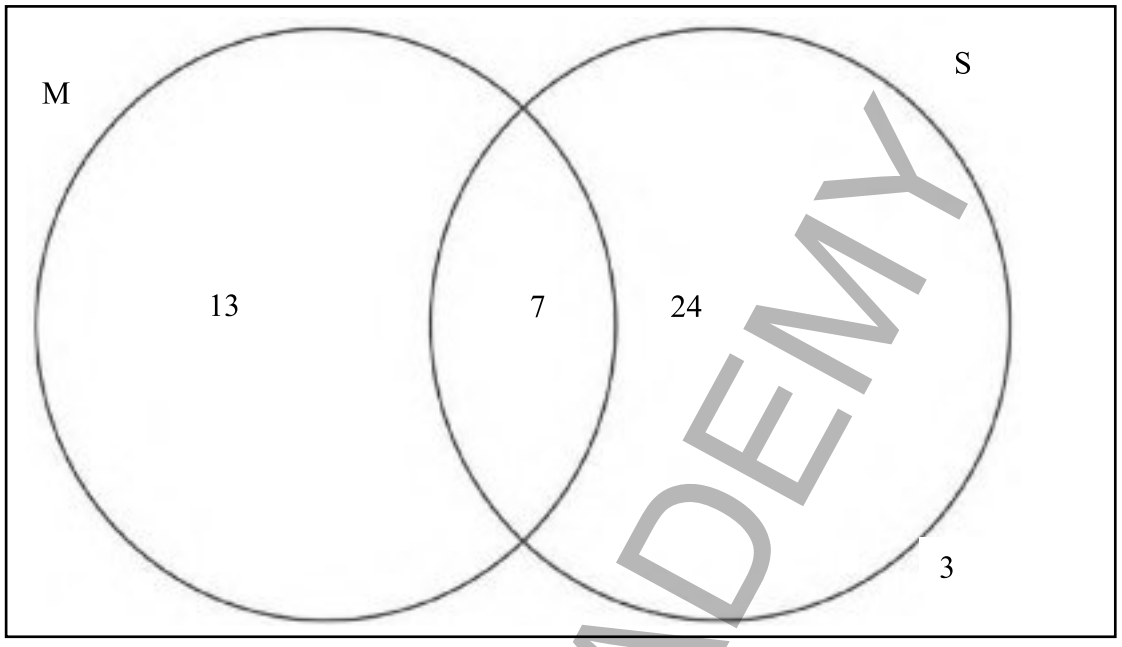
[2

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QUESTION 8

The Venn diagram below shows the number of learners in a grade 11 class who passed Mathematics (M) and Physical Sciences (S).



8.1 What is the total number of learners in this class? (1)

8.2 Suppose a learner is picked from the class at random.

What is the probability that such a learner:

8.2.1 passed Mathematics? (1)

8.2.2 passed both Mathematics and Physical Sciences? (1)

8.2.3 passed neither Mathematics nor Physical Sciences? (1)

8.2.4 passed Mathematics or Physical Sciences? (2)

8.2.5 passed only Mathematics or only Physical Sciences. (2)

8.3 A smoke detector system in a large hotel uses two devices, A and B. If smoke is present, the probability that it is detected by device A is 0,95. The probability that it will be detected by device B is 0,98 and the probability that it will be detected by BOTH devices simultaneously is 0,94.

8.3.1 If smoke is present, what is the probability that it will be detected by device A or B or both devices? (2)

8.3.2 What is the probability that the smoke will NOT be detected? (1)

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QUESTION 9

9.1 A supermarket conducted a survey on its service to customers. This was done on a Wednesday morning. The survey indicated that 78% of the customers were satisfied with the service offered and 90% agreed that the supermarket was a stress-free environment to do shopping. The total number of customers interviewed was 130.

9.1.1 Would you agree that the supermarket can regard the findings of the survey as reliable? Motivate your answer. (2)

9.1.2 Give ONE recommendation to the supermarket on using surveys to gather information regarding its customer service. (1)

9.2 Three cards are selected at random (WITHOUT replacement) from a standard full pack of playing cards. There are 52 cards in the pack, jokers are excluded.
Determine the probability that the cards are all the same colour. (5)
[8]

TOTAL: 150

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END