Name and Surname : .....

Grade/Class : 10/..... **Mathematics Teacher** : .....

Hudson Park High School

GRADE 10

MATHEMATICS

June Exammination

Marks : 100 Date : 27 May 2024

Time : 2 hour

Examiner : VNT Moderator(s) : GRF; SBL; PHL; SMR; SLT

INSTRUCTIONS:

1. Illegible work, in the opinion of the marker, will earn zero marks.
2. Number your answers clearly and accurately, exactly as they appear on the question paper.
3. **NB** ∘ **Leave *2 lines* open between each of your answers.**
   ∘ **Start each new Question at the top of a page.**
4. **NB** ∘ **Hand in your submission in the following manner :**
   - **Answer on lined paper. Answer pages MUST be stapled together.**
   - **Question paper handed in seperately.**
5. Employ relevant formulae and show all working out.
   Answers alone *may* not be awarded full marks.
6. (Non-programmable and non-graphical) Calculators may be used, unless their usage is specifically prohibited.
7. Round off answers to 2 decimal places, where necessary, unless instructed otherwise.
8. If (Euclidean) GEOMETRIC statements are made, REASONS must be stated appropriately.
9. Answer in blue or black ink. Work that is done in pencil will not be eligible for queries.

Question 1

1.1 Given the equation: $P = \sqrt{\frac{-5}{x-2}}$, For which value(s) of x will P be:

1.1.1 undefined (1)

1.1.2 real (1)

1.2 Without the use of a calculator, determine between which two consecutive integers does $\sqrt{71}$ lie? Show all working out (2)

1.3 Convert the following decimal $0{,}94\dot{5}$, into a common fraction in its simplest form without the use of a calculator. Show all working out (4)

[8]

Question 2

2.1 Simplify the following expressions

2.1.1 $(2x+3)(2x^2-x-2)$ (2)

2.1.2 $\frac{x^3-27}{9-x^2} \div \frac{x^2+3x+9}{-x-3}$ (5)

2.1.3 $\frac{5^{x+1}.5^{x+2}}{45^{x+1}}$ (3)

2.1.4 $\frac{x+y}{x^{-2}-y^{-2}}$ (5)

2.2 If $2x - \frac{3}{x} = 5$, Determine the value of $4x^2 + \frac{9}{x^2}$ without the use of a calculator. (2)

2.3 Factorize fully the following expressions.

2.3.1 $-6x^2 + 9xy + 15y^2$ (2)

2.3.2 $\frac{1}{8}x^3 + b^9$ (2)

2.3.3 $\frac{1}{2}x^2 + \frac{5}{2}x - 3$ (2)

2.3.4 $-xy - (y-x)b + b^2$ (3)

[26]

Question 3

3.1 Solve for x:

3.1.1 $x(x+3) = 10$ (3)

3.1.2 $5 - 3x^{-\frac{2}{3}} = 0$ (3)

3.1.3 $5.7^{3x-2} = 8$ (3)

3.1.4 $3^{x+1}.3^x - 3^{2x} = 162$, without the use of a calculator (3)

3.1.5 $\frac{1-x}{x+1} = \frac{1-5x}{1-x}$ (4)

3.2 Given: $R = \frac{2\sqrt{x}}{3S}$

Make x the subject of the formula (2)

3.3 Given $-2 \leqslant -2x - 1 < 3$

3.3.1 Solve the inequality for x (2)

3.3.2 Now, write your answer.

(a) in interval notation. (1)

(b) on a number line. (1)

3.4 Solve the following equations simultaneously.

$2^{3x+3y} = 64$

$3x - y = 2$ (6)

[28]

Question 4

4.1 Given 125; 120; 115; 110 ....

4.1.1 Determine the general formula for the sequence. (2)

4.1.2 Determine the 150th term (2)

4.1.3 What term in the pattern will be equal to -220 (2)

4.2 Given $2x - 1;\ x + 2;\ 3x - 1$ ...

4.2.1 Determine the value of x (2)

4.2.2 Write down the numerical value of the first three terms (1)

4.2.3 Write down the 4th term in the sequence, in terms of x (1)

4.3

				2				
			2		2			
		2		4		2		
	2		6		6		2	
2		8		12		8		2

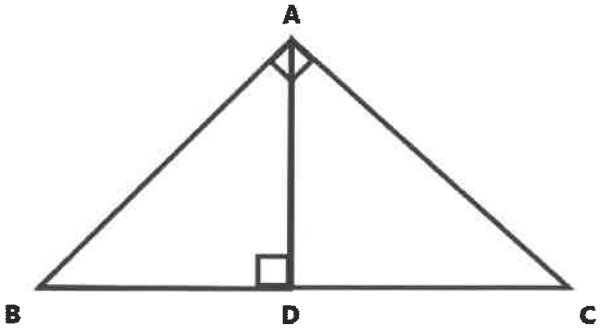
4.3.1 Write down the next row (6th row) of numbers (2)

4.3.2 Determine the formula for the sum of numbers for the nth row. (1)

[13]

Question 5

5.1 Consider the following diagram.



$B\hat{A}C = 90°\ and\ AD \perp BC.$

In terms of $AB, AC, BC, AD, BD\ and/or\ DC$, write down **TWO** the ratio of $cos\hat{B}$ (2)

5.2 if $x = 88{,}4°$ and $y = 144{,}7°$, evaluate the following to two decimal places.

5.2.1 $\frac{2sinx}{cosy+10}$ (1)

5.2.2 $5sin^2y$ (1)

5.3 Solve for θ to **ONE** decimal place.

5.3.1 $3tan\theta = sin20°$ $[\theta \in (0°; 90°)]$ (2)

5.3.2 $2cos3(\theta - 10°) = 1{,}71$ $[\ 0° < 3(\theta - 10°) < 90°\ ]$ (3)

5.4 5.4.1 If $\theta = 70°$, determine the value of $3sec\theta$ (1)

5.4.2 Solve for θ, where $\theta \in (0°; 90°)$

$2cot\theta - 3 = 0$ (3)

5.5 5.5.1 Draw the special diagram used to deal with the special angles of $30°$ and $60°$ (1)

5.5.2 Hence, determine the value of $tan30°$, without the use of a calculator (1)

[15]

Question 6

6.1 Given: $sin\theta = \frac{4}{5}$, where $cos\theta < 0$

6.1.1 Explain why θ will be an angle in quadrant 2 (1)

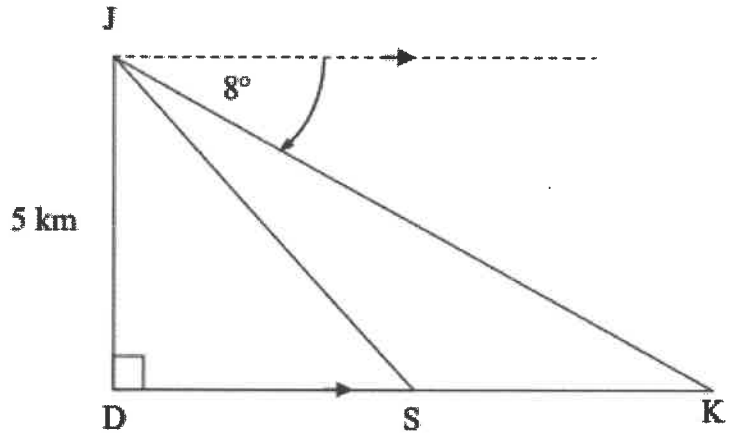
6.1.2 Now, draw a fully labelled diagram in quadrant 2, include all relevant details in the diagram (3)

6.1.3 Now, using the diagram (but, no calculators), determine the value of $1 - cos^2\theta$ (2)

6.2 A space craft at J is flying directly over point D on the ground at a height of 5 kilometers.

It is heading to land at point on the surface at K. The angle of depression from J to K is 8°.

S is a point along the route from D to K.



6.2.1 Calculate the distance DK, to the nearest kilometer. (3)

6.2.2 Calculate the distance of DS, if $SK = 6km$ (1)

[10]

TOTAL 100 MARKS