

Name and Surname : .....

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

Hudson Park High School



GRADE 10

MATHEMATICS

JUNE EXAMINATION

Marks : 100

Date : 29 May 2023

Time : 2 hour

Examiner : PHL

Moderator(s) : SLT CYT LBE SBL VNT  
KMP

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** ◦ **Start each new Question at the top of a page.**  
◦ **Leave 2 lines open between each of your answers.**
4. **NB** ◦ Fill in the details requested on the front of this Question Paper  
◦ Hand in your submission in the following manner :  
(on top) Answer pages in order  
(below) Question Paper  
**DO NOT STAPLE the Answer pages and Question Paper.**
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. Answers must be written in blue and black ink, as distinctly as possible, on both sides of the page.  
An HB pencil ( but not lighter eg 2H) may be for diagrams.

## QUESTION 1

1.1 Given:  $x \in \{-34; -8; 0; 7; 9\}$

Choose the correct value(s) of  $x$  from the list above so that  $\sqrt{\frac{36}{9+x}}$  is

1.1.1  $\mathbb{Q}$  (1)

1.1.2  $\mathbb{Q}'$  (1)

1.1.3  $\mathbb{R}'$  (1)

1.1.4  $\mathbb{Z}$  (1)

1.2 Simplify as far as possible

1.2.1  $[5a^2 - (3a + b)][5a^2 + (3a + b)]$  (2)

1.2.2  $(x^3 - y^3)(x^4 + x^2y^2 + y^3)$  (2)

1.2.3  $x^{\frac{3}{5}}(3x^{\frac{2}{5}} - 4x^{\frac{-3}{5}})$  (2)

1.2.4  $\frac{5 \cdot 2^{n+2}}{2^{n+4} - 6 \cdot 2^{n+1}}$  (3)

1.2.5  $\frac{2x-1}{x^2-3x+2} - \frac{x-4}{x^2-4} - \frac{1}{1-x}$  (5)

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## QUESTION 2

2.1 Solve for  $x$ :

$$2.1.1 \quad 6(1 - x^2) = 5x \quad (3)$$

$$2.1.2 \quad 2a(x - b) = 3(a - x) \quad (3)$$

$$2.1.3 \quad 2^{x(x-3)} = 0,25 \quad (4)$$

$$2.1.4 \quad 3x - \frac{4x+4}{16} = 3 + \frac{3(x-1)}{4} \quad (3)$$

$$2.1.5 \quad 4.5^x = 120 \quad (3)$$

$$2.1.6 \quad 5.x^{\frac{-2}{3}} - 7 = 0 \quad (4)$$

$$2.1.7 \quad 2(x + 3) - 5 = 2x + 1 \quad (1)$$

2.2 Solve for  $a$  and  $b$  simultaneously

$$\begin{aligned} 3a - 2b &= -29 \\ 2a - b &= -18 \end{aligned} \quad (4)$$

2.3 Given  $-1 \leq 3 - 2x \leq 5$

$$2.3.1 \quad \text{Solve for } x \quad (2)$$

2.3.2 Represent the solution in (2.3.1)

a) on a number line. (1)

b) in interval notation. (1)

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### QUESTION 3

3.1 Given the sequence 20; 17; 14; .....;  $-103$ .

3.1.1 Show that the sequence is an arithmetic sequence. (1)

3.1.2 Determine the general term ( $T_n$ ) simplify your answer. (2)

3.1.3 Calculate the number of terms in the sequence. (2)

3.1.4 Which term in the sequence will be the first to have a negative value? (2)

3.2 The first three terms of an arithmetic sequence are:

$$x + 2 ; 4x; 6x + 4; \dots$$

3.2.1 Determine the value of  $x$ . (2)

3.2.2 Hence, write down the first three terms of this arithmetic sequence. (1)

3.3 Given:

$$1 = 1$$

$$1 + 3 = 4$$

$$1 + 3 + 5 = 9$$

$$1 + 3 + 5 + 7 = 16$$

3.3.1 Write down two more lines of this pattern. (2)

3.3.2 Now, consider:  $1 + 3 + 5 + 7 + \dots$

a) Determine an expression for  $T_n$ , the general term of the sequence. (3)

b) If there are 235 terms in the sequence calculate the sum of all of the terms in the sequence. (1)

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## QUESTION 4

4.1 If  $A = 15^\circ$  and  $B = 48^\circ$ , evaluate the following using a calculator.

4.1.1  $\cos^2(A + B)$  (2)

4.1.2  $\frac{1}{2} \tan 2A \cdot \cos B$  (1)

4.2 Solve the following equations if  $\theta$  is an acute angle.

4.2.1  $8\sin\theta = 4$ .  $\theta \in (0^\circ; 90^\circ)$  (2)

4.2.2  $4 + \cos(\theta + 20^\circ) = 5,123$ .  $(\theta + 20^\circ) \in (0^\circ; 90^\circ)$  (3)

4.2.3  $\frac{4}{3} \cos\theta = \sin 37^\circ$ .  $\theta \in (0^\circ; 90^\circ)$  (3)

4.3 **CALCULATORS MAY NOT BE USED IN THIS QUESTION.**

Show all your working out .

4.3.1 Draw fully labeled special angles diagrams used for

a)  $30^\circ$  and  $60^\circ$  (1)

b)  $45^\circ$  (1)

c)  $0^\circ$  and  $90^\circ$  (1)

4.3.2 Hence, using the diagrams in (4.3.1) evaluate

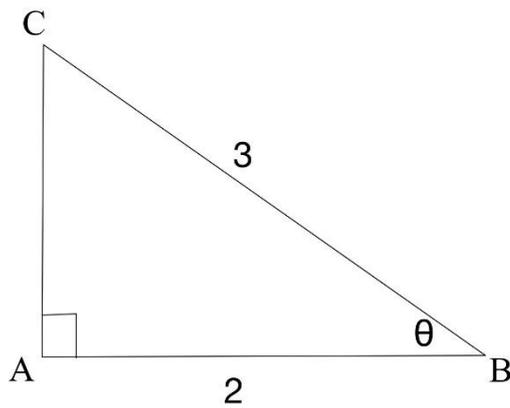
a)  $\operatorname{cosec} 60^\circ$  (1)

b)  $\tan 45^\circ$  (1)

c)  $\cot 90^\circ$  (1)

d)  $-3 \sec^2 30^\circ$  (2)

4.4 Given triangle ABC with  $\hat{A} = 90^\circ$ ,  $AB = 2$  units and  $CB = 3$  units.



4.4.1 Determine the length of AC, leaving your answer in surd form. (2)

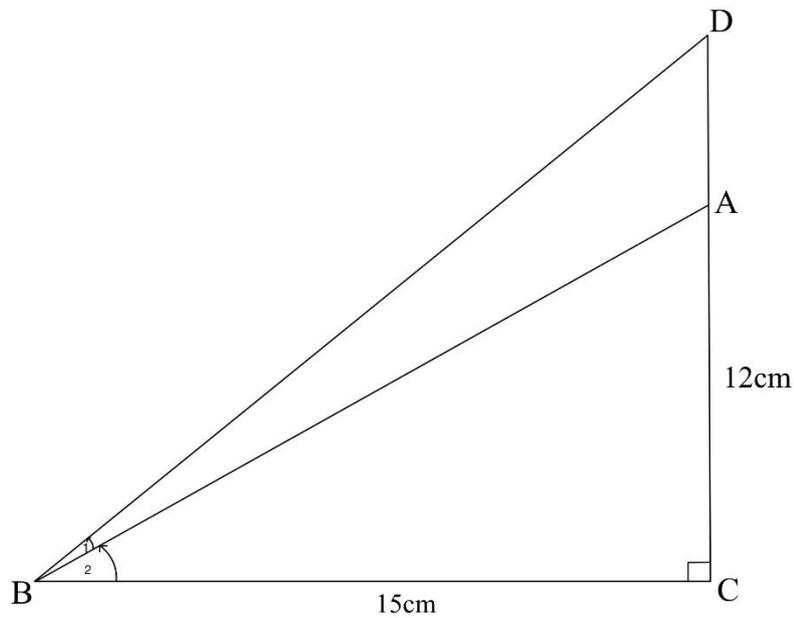
4.4.2 Write down the value of:

a)  $\sin \theta$  (1)

b)  $2\cos^2\theta$  (2)

c)  $\tan(90^\circ - \theta)$  (1)

- 4.5 In triangle ABC,  $\hat{C} = 90^\circ$ ,  $BC = 15\text{cm}$  and  $\hat{DBC} = 53^\circ$ .



Calculate the :

4.5.1 length of AD (3)

4.5.2 size of  $\hat{B}_1$  (3)

- 4.6 If  $\tan A + 4 = 0$  and  $\sin A > 0$ . Use a diagram, drawn in the correct quadrant,

(but no calculator ) to calculate  $\sqrt{1 - \sin^2 A}$ . (6)

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**TOTAL 100 MARKS**