Name and Surname : ……………………………………………………………………………...

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

Hudson Park High School

GRADE 10

MATHEMATICS

NOVEMBER PAPER 2

Marks	:	100	Date	:	06 November 2023
Time	:	2 hours			
Examiner(s)	:	VNT SBL	Moderator(s)	:	SLT CYT SNC LBE

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. **A blank space of at least two lines should be left after each answer.**

4. **Fill in the details requested on the front of this Question Paper and the Answer Book before you start answering any questions.**

   Hand in your submission in the following manner :

   (on top) Answer Book
   (below) Question Paper

   Please DO NOT STAPLE your Answer Book and Question Paper together.

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. Answers must be written in blue or black ink, as distinctly as possible, on both sides of the page. An HB pencil (but not lighter eg. 2H) may be used for diagrams.

8. Round off answers to 2 decimal places, where necessary, unless instructed otherwise.

9. If (Euclidean) GEOMETRIC statements are made, REASONS must be stated appropriately.

QUESTION 1

1.1. Given the data set : 6 ; 7 ; 10 ; 11 ; 12 ; 14 ; 17; 18 ; 20

1.1.1. Write down the five number summary. Label your values clearly. (1)

1.1.2. Draw a box-and-whisker diagram. Include all relevant details. (2)

1.1.3. Calculate the semi-interquartile range. (1)

1.2. Consider the following set of data :

x	Frequency
5	17
10	13
15	21
20	11
25	12

For this set of date, determine the :

1.2.1. Upper quartile, Q_3 (2)

1.2.2. Third decile, D_3. (2)

1.3 At a certain school, the athletics coach recorded the age of athletes who attended his training session. The table below shows a summary of records :

Age (in years)	Number of athletes
$0 < x \leq 10$	12
$10 < x \leq 20$	30
$20 < x \leq 30$	18
$30 < x \leq 40$	12

For this data :

1.3.1. Write down the modal class. (1)

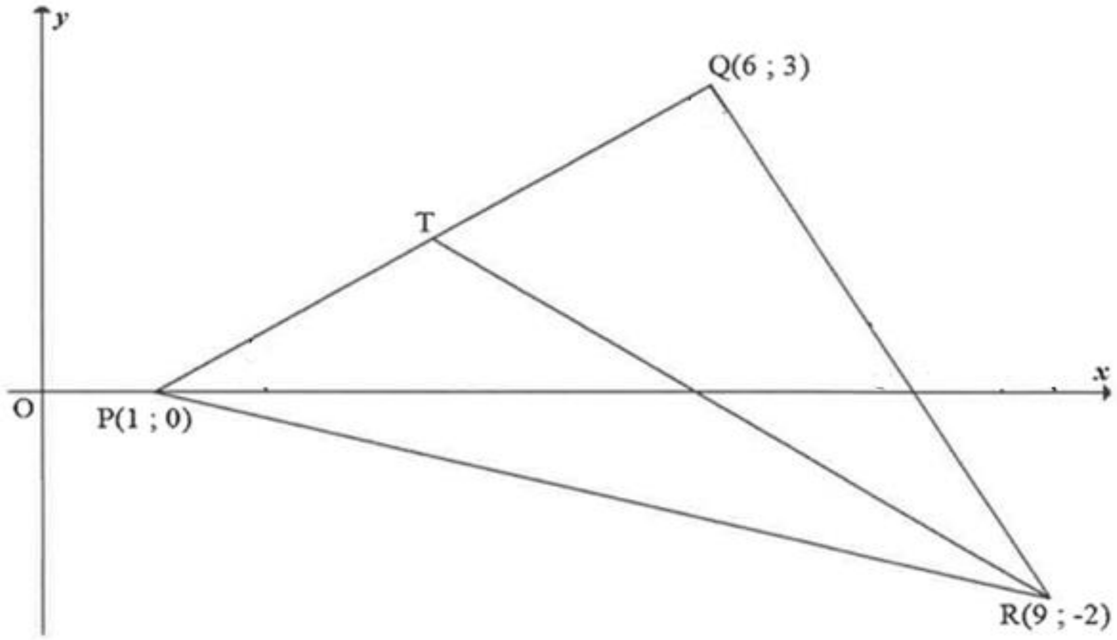
1.3.2. Estimate the mean, $\bar{x}$. (3)

1.4. The average in a Grade 10 Maths class, with 25 learners, is 58 %.
When the Grade 10's were checking their marks, it was found that a mark of 81 % had been mistakenly entered as 18 %.
With the mark corrected from 18 % to 81 %, what will the new class average be? (3)

[15]

QUESTION 2

2. In the diagram below, $P\ (1;0), Q\ (6;3)\ and\ R\ (9;-2)$ are the vertices of a triangle. T is a point on PQ such that T is the midpoint of PQ



2.1. Determine the

2.1.1. Coordinates of T (2)

2.1.2. Equation of QR (3)

2.2. Prove that $PQ \perp QR$ (3)

2.3. Calculate the

2.3.1. Length of PQ, in surd form (2)

2.3.2. Area of ΔPQR (3)

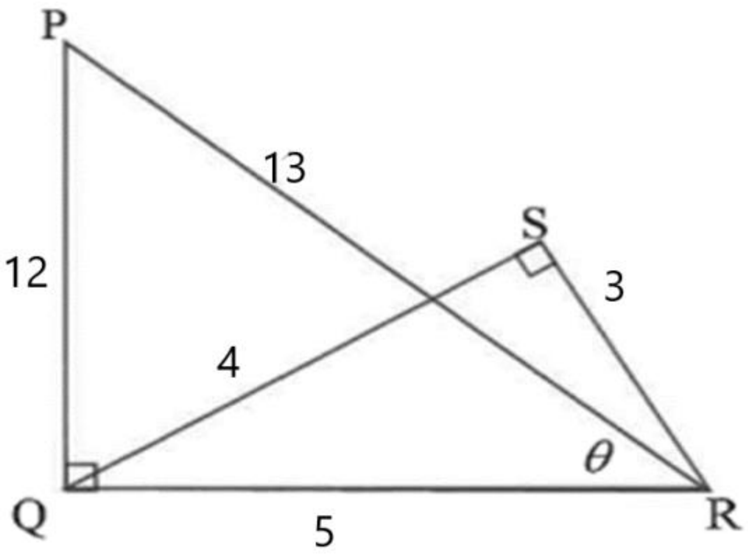
2.4. Write down the coordinates of A (not shown on the diagram), if $PAQR$ is a parallelogram. (2)

[15]

QUESTION 3

3.1. CALCULATORS MAY NOT BE USED IN THIS QUESTION

ΔPQR and ΔSQR are right-angled triangles as shown in the diagram below.
$PR = 13,\ \ PQ = 12, SQ = 4,\ \ QR = 5,\ \ SR = 3$ and $P\hat{R}Q = \theta$.



Refer to the diagram and determine the following:

3.1.1. $\sin S\hat{Q}R$ (1)

3.1.2. $\sec\theta$ (1)

3.1.3. $\tan(90° - \theta)$ (1)

3.2. Simplify the following, WITHOUT the use of a calculator. Show all working out and any special diagrams used.

$$\frac{\sin 45° + \cot 90°}{\cos 45°.\tan^2 30°}$$ (5)

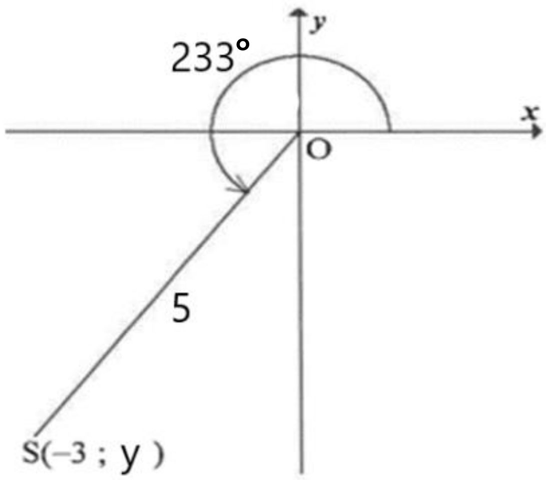
3.3. Solve for x, correct to ONE decimal place :

3.3.1. $2\tan x = 3$ $(x \in [0°; 90°])$ (2)

3.3.2. $\sin 2(x + 30°) = \tan 2565°$ $(2(x + 30°) \in [0°; 90°])$ (3)

3.3.3. $\dfrac{\operatorname{cosec} x}{2} = 3$ $(x \in [0°; 90°])$ (3)

3.4 In the diagram, $S(-3; y)$ and $OS = 5$:



WITHOUT the use of a calculator, and by using the diagram, determine :

3.4.1. y (1)

3.4.2. $\sin 233°$ (1)

3.4.3. $\cos 53°$ (1)

3.5. Given: $\sin 20° = k \qquad (0 < k < 1)$

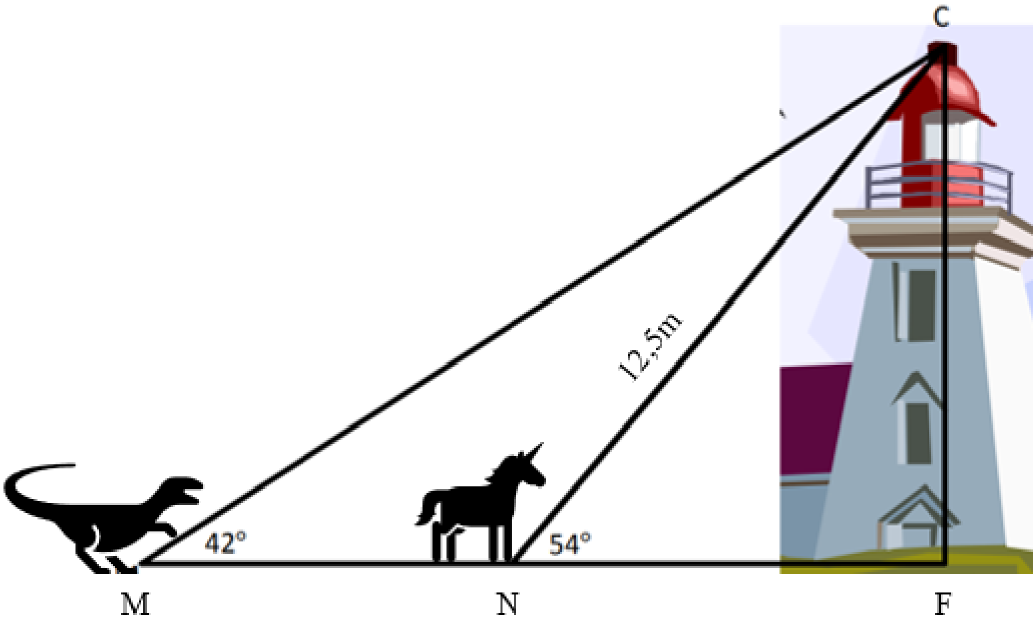
3.5.1. Represent the given information in a diagram drawn in the correct quadrant. Show all relevant details on your diagram. (2)

3.5.2. Hence, use your diagram to determine :

(a) $\tan 20°$ (1)

(b) $\cos 70°$ (1)

3.6. A dinosaur (at point M) is chasing a unicorn (at point N) who is trying to get to the safety of a lighthouse. Points M and N are on the same horizontal plane as the foot of the lighthouse, F. The angles of elevation from point M and point N to the top of the lighthouse, C, are 42° and 54° respectively. The distance from the unicorn (at point N) to the top of the lighthouse is 12,5 m. $M\hat{F}C = 90°$



Determine:

3.6.1. CF (2)

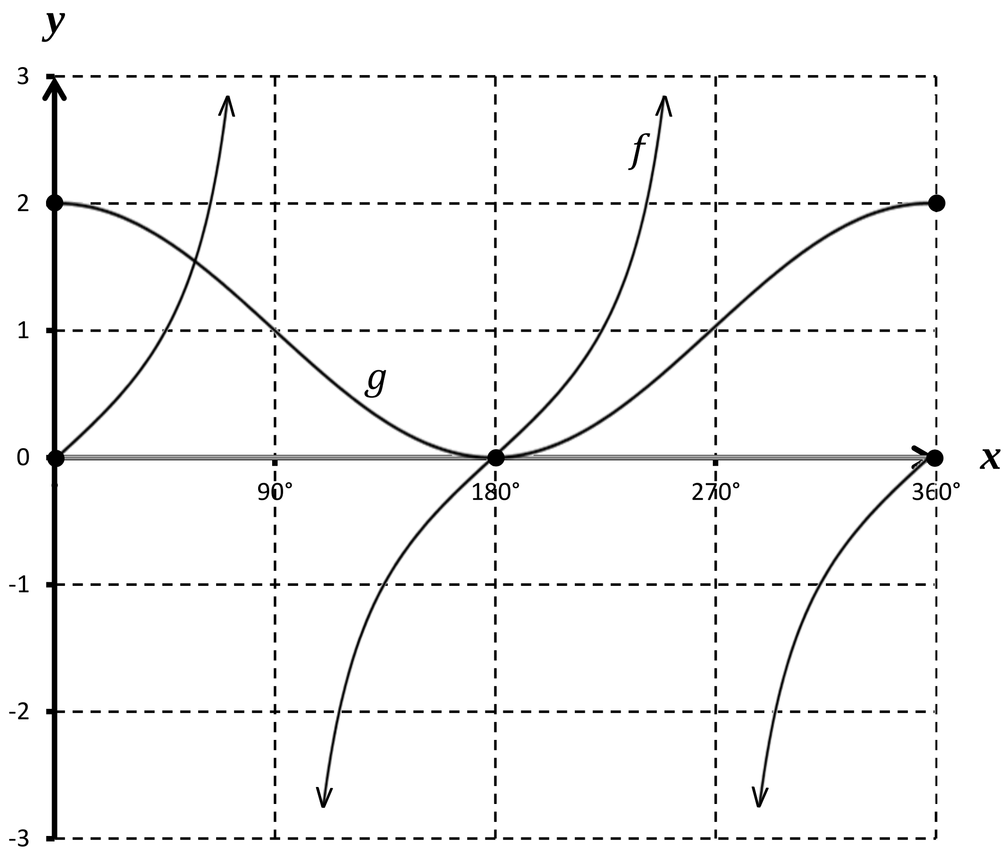
3.6.2. NF (2)

3.6.3. MN (3)

[30]

QUESTION 4

4.1. The graphs of $f(x) = tan\,x$ and $g(x) = cos\,x + 1$ for $x \in [0°; 360°]$ are sketched below.



4.1.1. Write down the:

(a) equation of the asymptotes of $f(x)$ (2)

(b) amplitude of $g(x)$ (1)

(c) range of $3g(x) + 2$ (1)

4.1.2. Use the graphs to determine the following :

(a) the value of $g(360°)$ (1)

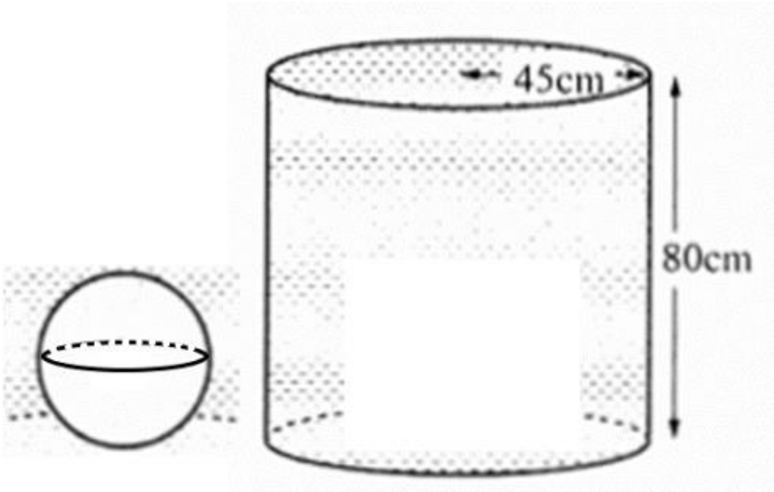
(b) value(s) of x for which $f(x).\,g(x) \leq 0$ (3)

4.1.3. Determine the equation of h, in $y - form$, if h is the reflection of g in the $x - axis$. (2)

[10]

QUESTION 5

5.1 Shown below are a solid glass sphere (with a diameter of 30 cm) and an empty cylindrical can (with no top) that has a radius of 45 cm and a height of 80 cm.



$$A = \pi r^2$$

$$A = 4\pi r^2$$

$$V = A.H$$

$$V = \frac{1}{3}AH$$

$$V = \frac{4}{3}\pi r^3$$

5.1.1. Calculate the total surface area of the sphere. (2)

5.1.2. The sphere is now placed into the empty cylindrical can. What volume of water would be necessary to now fill the can ? (3)

5.2. Object 1 has a mass of m, a velocity of v and a kinetic energy of E.

The formula to calculate the kinetic energy of an object is : $E = \frac{1}{2}mv^2$.

Object 2 has a

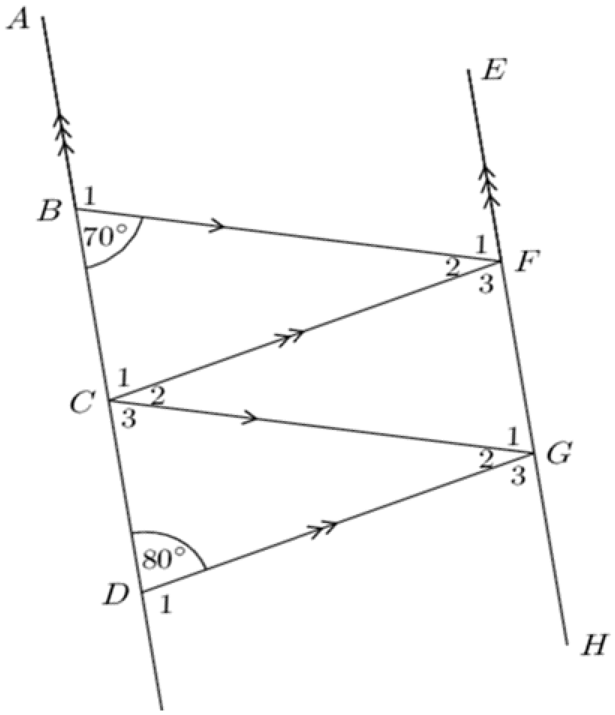
- mass which is triple that of Object 1, and
- velocity which is a quarter of that of Object 1.

If the kinetic energy of Object 1 is 64, what will the kinetic energy of Object 2 be ? (2)

[7]

QUESTION 6

6.1. In the diagram below $AD \parallel EG, BF \parallel CG$ and $CF \parallel DG$. $C\widehat{D}G = 80°$ and $CB\hat{}F = 70°$. Complete the table below by writing down a valid reason for each statement given



STATEMENT	REASONS
$\hat{B}_1 = B\hat{C}G$	6.1.1.
$\hat{F}_1 = 70°$	6.1.2.
$\hat{C}_2 + \hat{F}_3 + \hat{G}_1 = 180°$	6.1.3.
$\hat{G}_2 + \hat{G}_3 = \hat{C}_2 + \hat{F}_3$	6.1.4.
$\hat{F}_2 + \hat{F}_3 + 70° = 180°$	6.1.5.

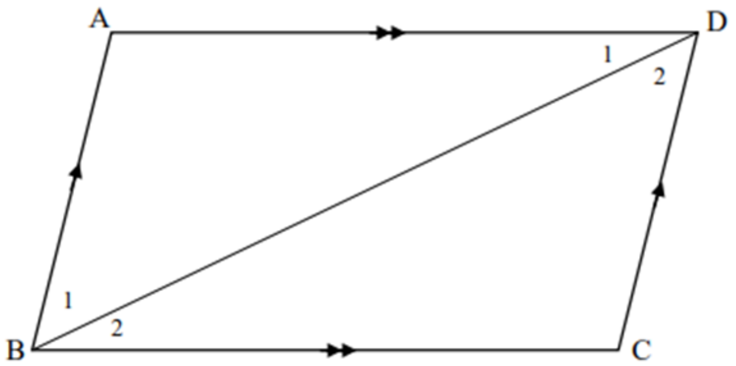
(5)

6.2. What type of quadrilateral is $BDGF$? (1)

[6]

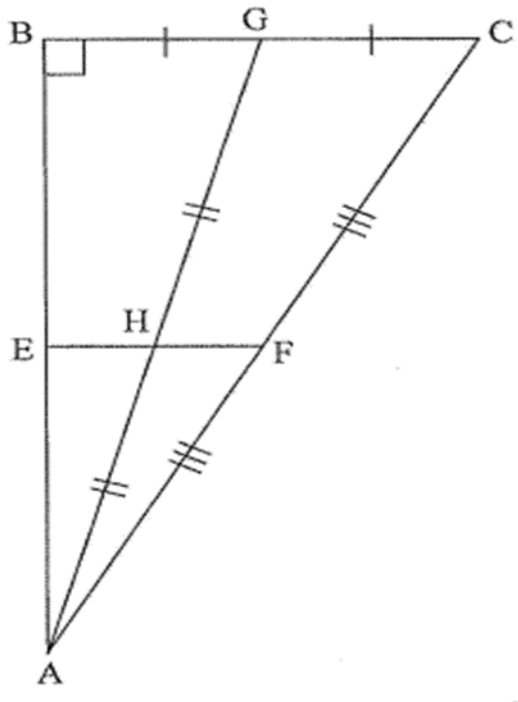
QUESTION 7

7.1. Consider the quadrilateral $ABCD$ given below. Answer the following question, stating the relevant reasons.



Prove the THEOREM that states that $AD = BC$ (5)

7.2. ΔABC is a right-angled triangle at $B. F$ and G are the midpoints of AC and BC respectively. H is the midpoint of $AG. E$ lies on AB such that FHE is a straight line.



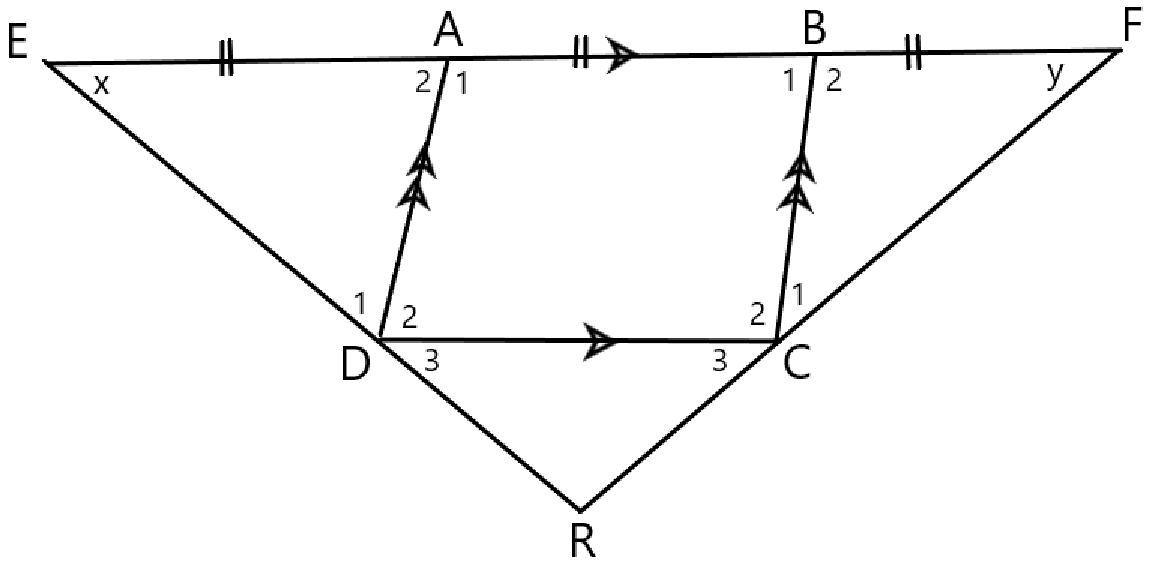
7.2.1. Prove that $BE = EA$. (3)

7.2.2. Give the reason why the area of $\Delta ABG =$ area of ΔAGC. (2)

[10]

QUESTION 8

8. $ABCD$ is a rhombus and $EA = AB = BF$



Let $\hat{E} = x$ and $\hat{F} = y$.

Prove that:

8.1. $EA = DA$ (1)

8.2. $E\hat{R}F = 90°$ (6)

[7]

TOTAL	**100**