HILLCREST HIGH SCHOOL

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INTERNAL ASSESSMENT

GRADE 12

MATHEMATICS
PAPER 2
SEPTEMBER 2020

MARKS: **150**

TIME: **3 HOURS**

This question paper consists of 9 pages and 1 information sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions

1. This question paper consists of 11 questions.
2. Answer ALL the questions in the SPECIAL ANSWER BOOK provided.
3. Clearly show ALL calculations, which you have used in determining your answers.
4. Answers only will NOT necessarily be awarded full marks.
5. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
6. If necessary, round off answers correct to TWO decimal places, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. An information sheet, with formulae, is included at the end of the question paper.
9. Number the answer correctly according to the numbering system used in this question paper.
10. Write neatly and legibly.

QUESTION 1

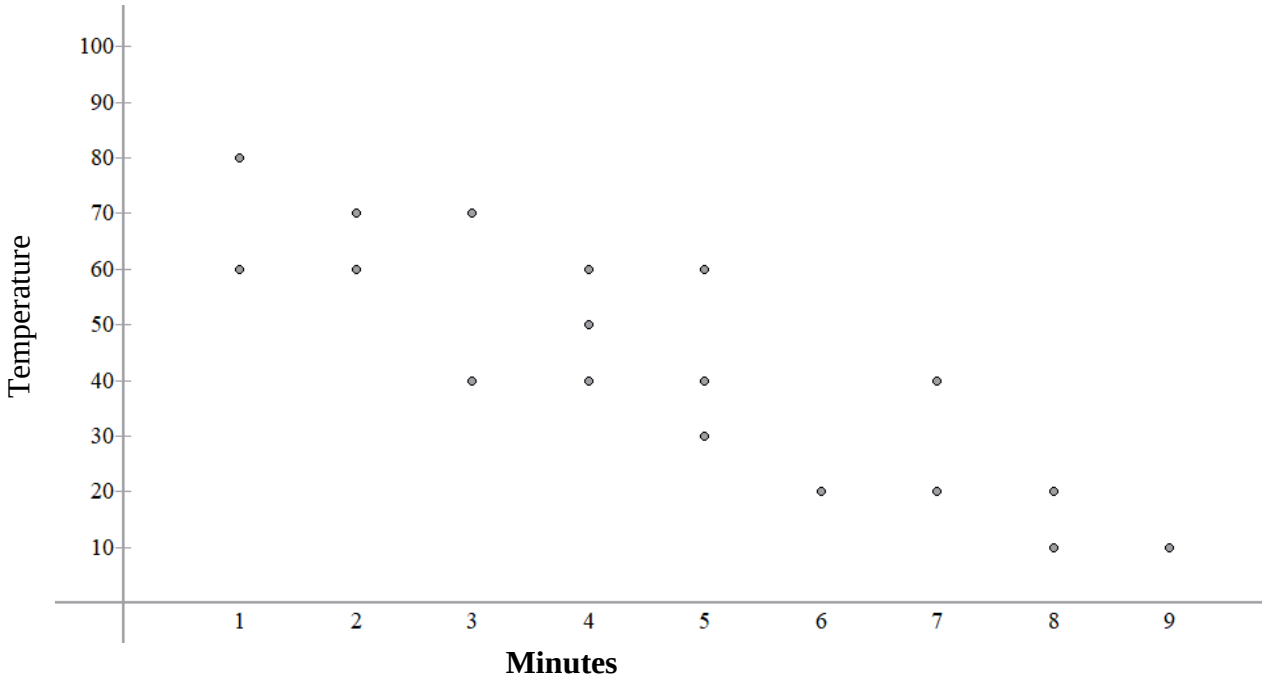
1.1 Complete the table: (4)

Interval	Frequency	Class Midpoint	Cumulative Frequency
$0 \leq x < 10$	7		
$10 \leq x < 20$	11		
$20 \leq x < 30$	22		
$30 \leq x < 40$	25		
$40 \leq x < 50$	10		
$50 \leq x < 60$	0		

1.2 Determine the means and standard deviation. (6)

1.3 Draw a Cumulative Frequency graph to determine whether the median is likely to be closer to 30 or 40. (6)
[16]

QUESTION 2



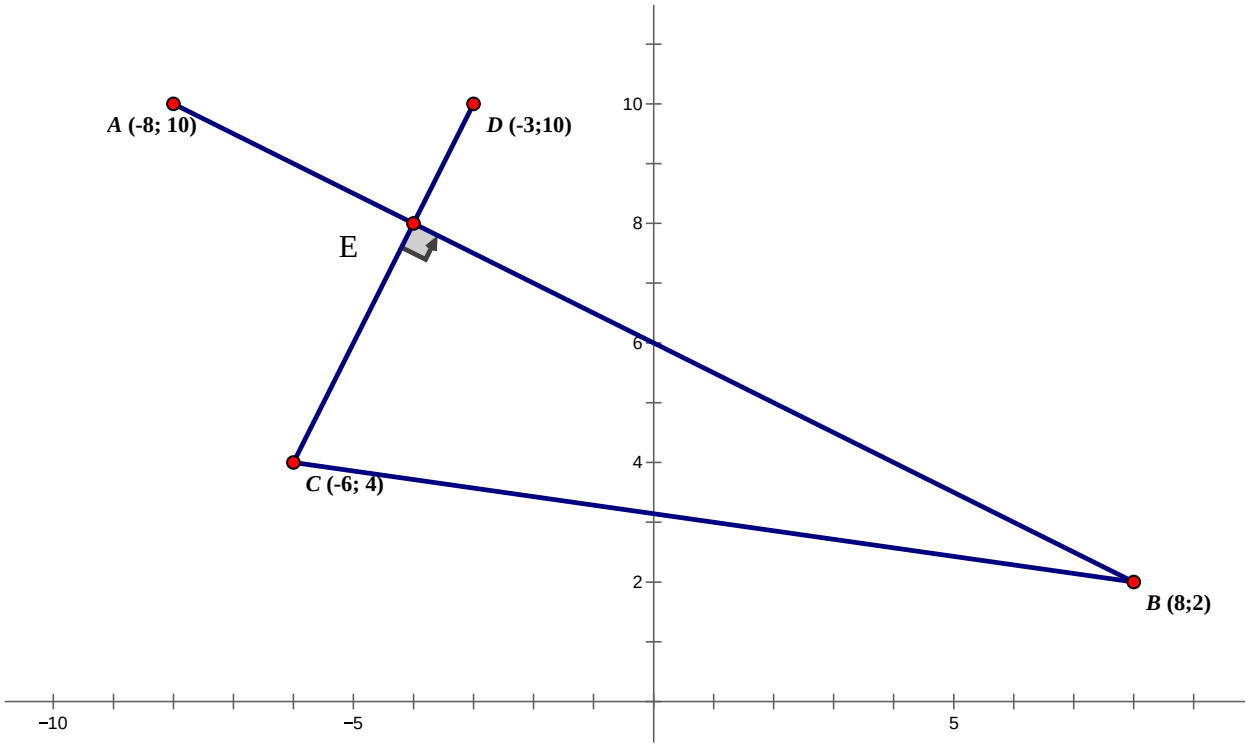
Scientists noted the temperature of a liquid as indicated above after having conducted an experiment.

2.1 Comment on the correlation between the variables. (2)

2.2 Determine the equation of the regression function. (4)
[6]

QUESTION 3

In the diagram A (-8; 10), B (8; 2), C (-6; 4) and D (-3; 10) are points in the Cartesian plane.



3.1 Determine the length of BC in simplified surd form. (3)

3 2 Calculate the gradient of AB. (2)

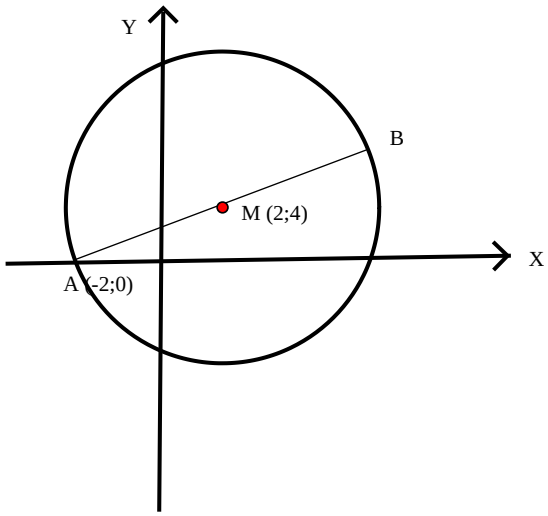
3.3 Show that the equation of the straight line through C and D is
$2x - y + 16 = 0$ (4)

3.4 Calculate the coordinates of E. (6)

3.5 Show that C, D and E are collinear. (3)
[18]

QUESTION 4

AB is a diameter of a circle with centre M (2; 4). The coordinates of A are (-2; 0).



Calculate:

4.1 the coordinates of B (3)

4.2 the equation of the tangent to the circle at B. (4)

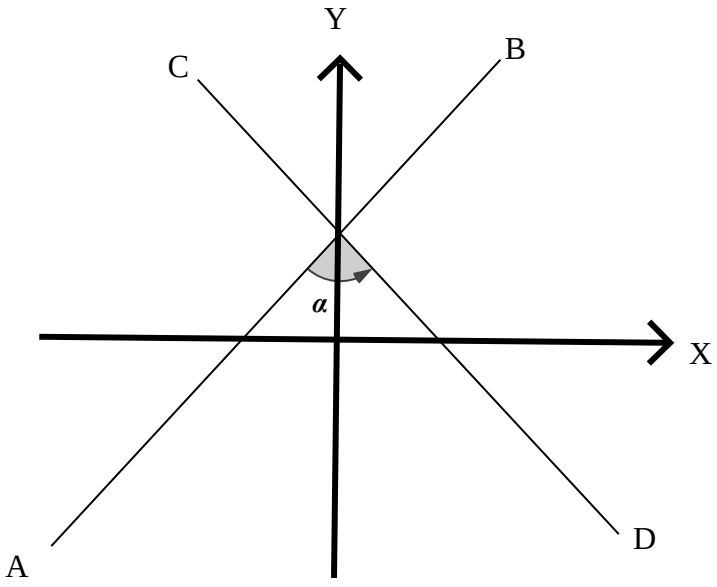
4.3 the coordinates of C, the point where the tangent cuts the line $y = 0$. (2)

4.4 the equation of the circle with centre M. (3)

4.5 the area of Δ ABC (4)

[16]

QUESTION 5

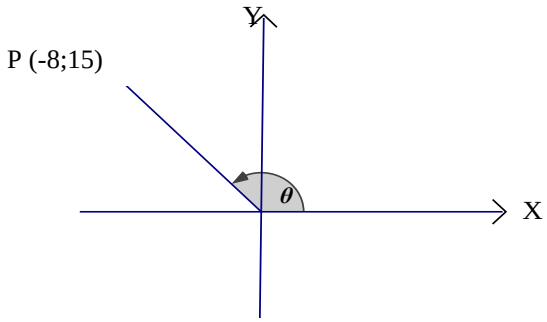


$3x - 2y + 2 = 0$ and $2x + 5y = 5$ are two straight lines.

Determine the size of the acute angle α between the two lines. (6)

[6]

QUESTION 6



6.1.1 Calculate OP (2)

6.1.2 Determine, without the use of a calculator, the value of $17\ Sin\ \theta - 8\ Tan\ \theta$ (4)

6.2 Simplify as far as possible:

$$Cos(-\theta).[Tan\ (180° - \theta).Sin\ (180° + \theta) - Sin\ (\theta - 90°)]$$ (6)

6.3 Determine the value of the following, without the use of a calculator:

$$\frac{Sin\ (120°).Tan(330°)}{Cos\ (240°)}$$ (4)

6.4 Prove the following identity:

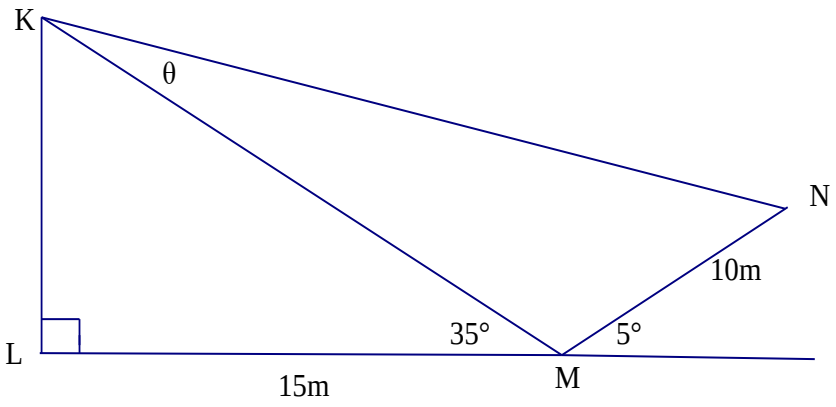
$$\frac{Sin\ x + Sin\ 2x}{1 + Cos\ x + Cos\ 2x} = Tan\ x$$ (4)

6.5 Determine the general solution of the equation:

$$Cos\ 2A + 3\ Sin^2 A - 4\ Sin\ A + 2 = 0$$ (7)

[27]

QUESTION 7



A person standing at point M looks up to the top, K of a double storey house. M is 15 m from the foot of the house. The angle of elevation from M to K is 35°. He turns around and walks in the opposite direction from the house at an inclination of 5° for 10 m to a point N. Let $M\widehat{K}N = \theta$.

7.1 Show by calculation that KM is 18,3 m. (2)

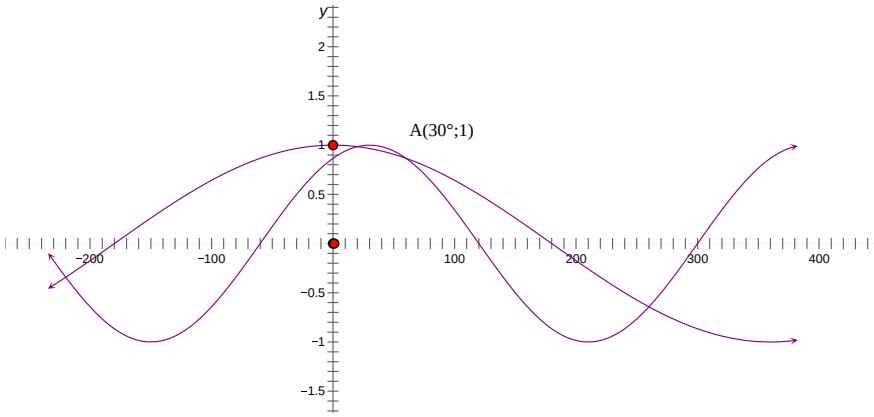
7.2 Calculate the length of KN. (4)

7.3 Calculate the size of θ, rounded off to one decimal place. (4)
[10]

QUESTION 8

$f(\theta) = Cos\ a\theta$ and
$g(x) = Cos\ (\theta - b)$, $\theta \in [-180°; 360°]$

A $(30°; 1)$ is turning point of *g(x)*



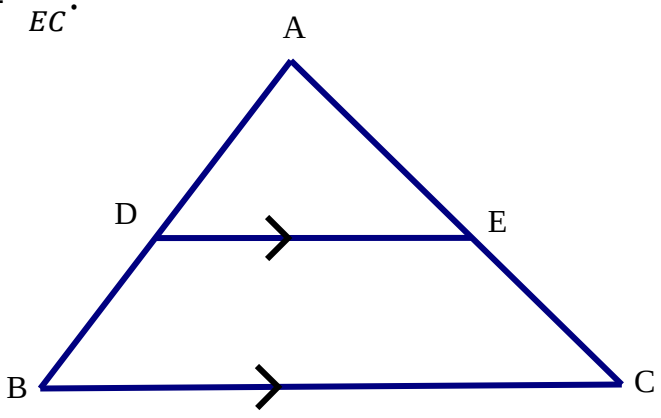
8.1 Determine the values of a and b. (2)

8.2 Determine the length between *f* and *g* if θ = 150°, by using a calculator. (Leave answer correct to three decimals.) (3)

8.3 What is the range of *g*? (1)
[6]

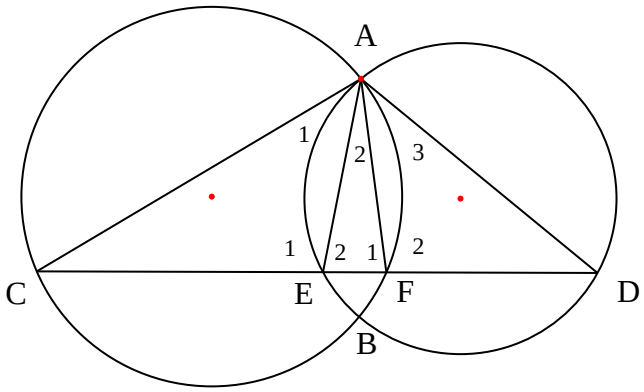
QUESTION 9

9.1 In ΔABC, DE // BC. Use the diagram to prove the theorem which states that if DE // BC, then $\frac{AD}{DB} = \frac{AE}{EC}$.



(5)

9.2 Two circles intersect at A and B. AC is a tangent to circle ABD at A. AD is a tangent to circle ACB at A. Straight line CEFD intersects the circles at E and F.



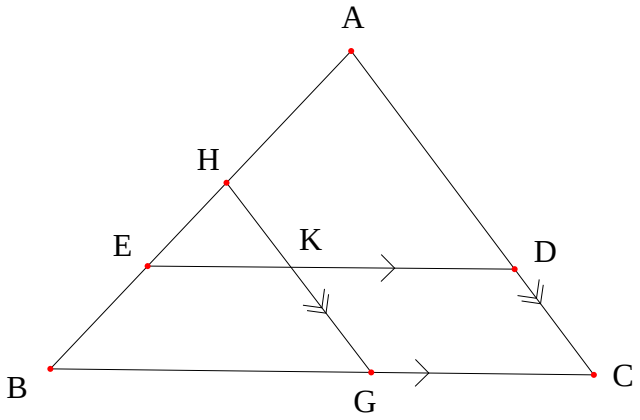
Prove the following, stating reasons:

9.2.1 AE = AF (6)

9.2.2 Δ ACE /// Δ DAF (3)

9.2.3 AC . DF = AD . AF (3)

9.3



In Δ ABC, HG // AC and ED // BC

$\frac{AD}{DC} = \frac{3}{2}$ and $\frac{BG}{GC} = \frac{2}{1}$

If AB = 15 units, determine giving reasons:

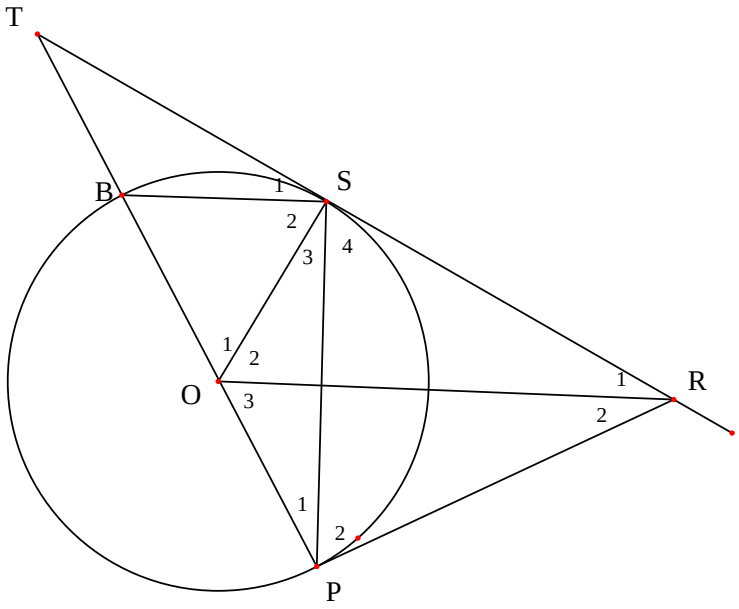
9.3.1 the length of AE (4)

9.3.2 the length of AH (3)

9.3.3 the value of $\frac{GK}{KH}$ (3)

[27]

QUESTION 10



In the diagram two tangents RP and RS are drawn from the point R, outside the circle with centre O. PO produced cuts the circle at B and meets the tangent RS produced at T. Let $S_1 = x$.

Prove with reasons, that:

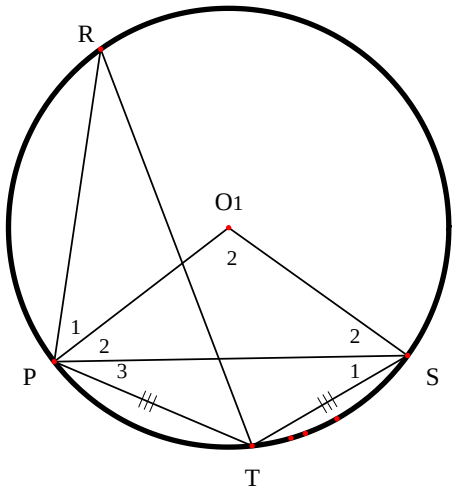
10.1 POSR is a cyclic quad (3)

10.2 BS // OR (4)

10.3 $\hat{R}_1 = ½\hat{O}_1$ (3)

10.4 $B\hat{O}R = 90° + x$ (4)
[14]

QUESTION 11



In the diagram points R, P, T and S are on the circumference of circle with centre O.
PT = TS and $P\hat{O}S = 110°$

11.1 If $S_1 = x$, name 2 other angles that equal x, with reasons. (2)

11.2 Calculate $P\hat{T}S$ with reasons. (2)
[4]