Education and Sport Development

Department of Education and Sport Development
Departement van Onderwys en Sport Ontwikkeling
Lefapha la Thuto le Tlhabololo ya Metshameko

NORTH WEST PROVINCE

GRADE 12

MATHEMATICS P2

MID-YEAR EXAMINATION

JUNE 2019

MARKS: 150
TIME: 3 HOURS

This question paper consists of 13pages, 2 diagram sheets and the formula sheet.

NW/JUNE/MATH/ EMIS/6*******

INSTRUCTIONS AND INFORMATION

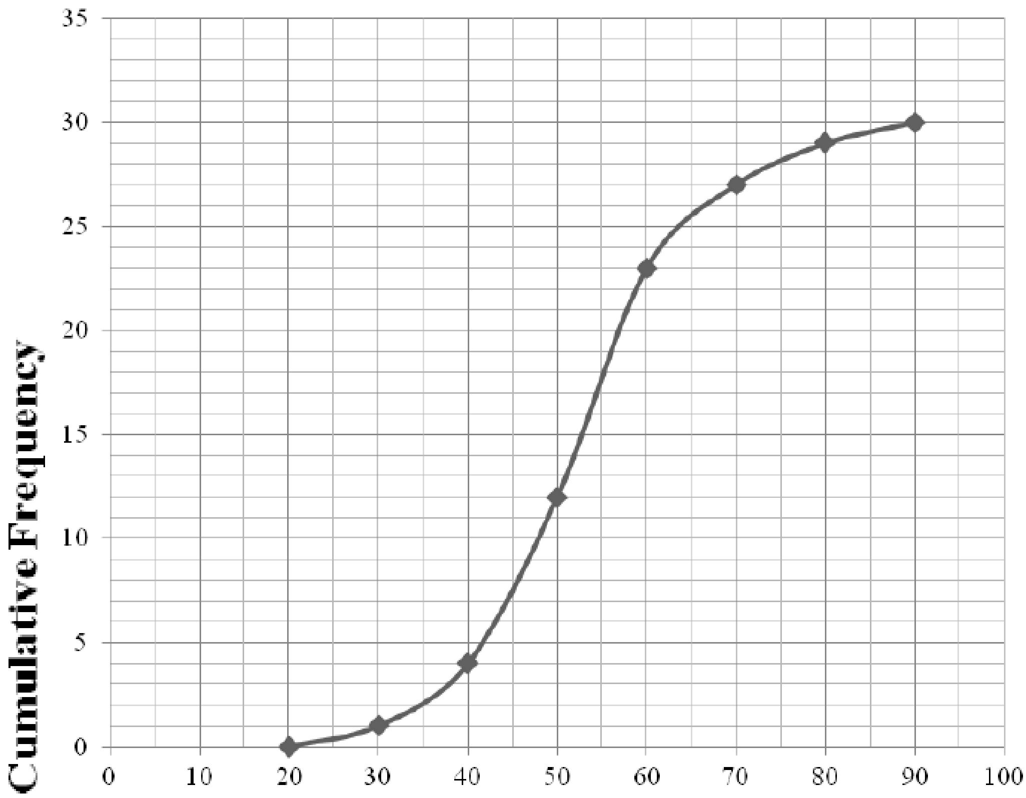
1. This question paper consists of 11 questions.
2. Answer ALL the questions.
3. Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining the answers.
4. Answers only will NOT necessarily be awarded full marks.
5. You may use an approved scientific calculator (non-programmable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

10 Write legibly and legibly.

QUESTION 1

Below is a cumulative frequency graph representing the 2018 mid-year matric Mathematics examination marks (in percentage) at a certain school. There were 30 learners who wrote the examination and the mean of the marks was 45,67%. To pass the exam a minimum mark of 30% is required. Intervals are: $20 \leq x < 30, 30 \leq x < 40$; …

CUMULATIVE FREQUENCY GRAPH



MARKS (in %)

1.1 How many learnersfailed the examination? (1)

1.2 Determine the modal group of this data. (2)

1.3 Given that the standard deviation is 18,6% determine how many learners achieved a mark within one standard deviation of the mean. (3)

1.4 Calculate the percentage of learners who obtained 70% and more. (4)

[10]

QUESTION 2

The traffic officer recorded number of offenders on particular days during the same hour. Unfortunately, the last two numbers were erased. She knew that the mean of the numbers is 10 and the standard deviation is 4.

To determine the missing numbers, the traffic officer drew the table below.

8; 4; 10; x ; y.

Number	**(number – mean)^2**
8	4
4	36
10	a
x	b
y	c

2.1 Determine the value of:

2.1.1 a (1)

2.1.2 b in terms of x (1)

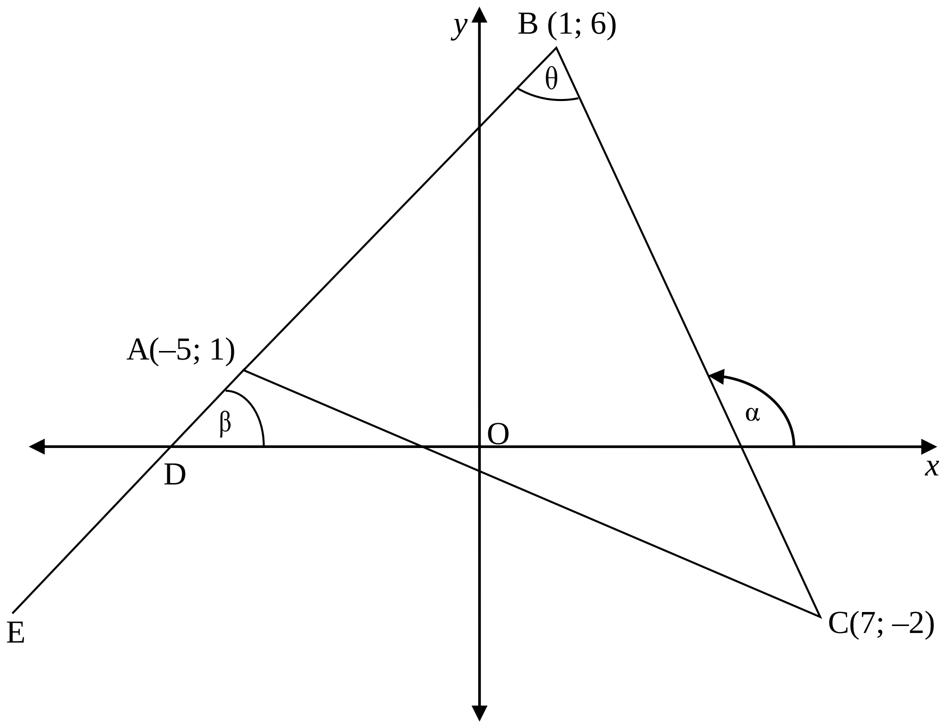
2.1.3 c in terms of y (1)

2.2 Calculate the values of x and y. (8)

[11]

QUESTION 3

In the diagram below, A(–5; 1) , B(1; 6) and C(7; –2) are vertices of ΔABC with BA produced to E. D is the x-intercept of BE and BE forms an angle, β , with the negative x – axis. BC forms an angle, α , with the positive x – axis. $A\hat{B}C = \theta$.



3.1 Determine:

3.1.1 the length of AC (correct to TWO decimal places) (2)

3.1.2 the equation of the straight line BC. (3)

3.1.3 the size of $A\hat{B}C$ (correct to ONE decimal place) (5)

3.1.4 the coordinates of P, the midpoint of AB. (2)

3.1.5 the equation of the line parallel to AC and passing through the point (–1; 3) (3)

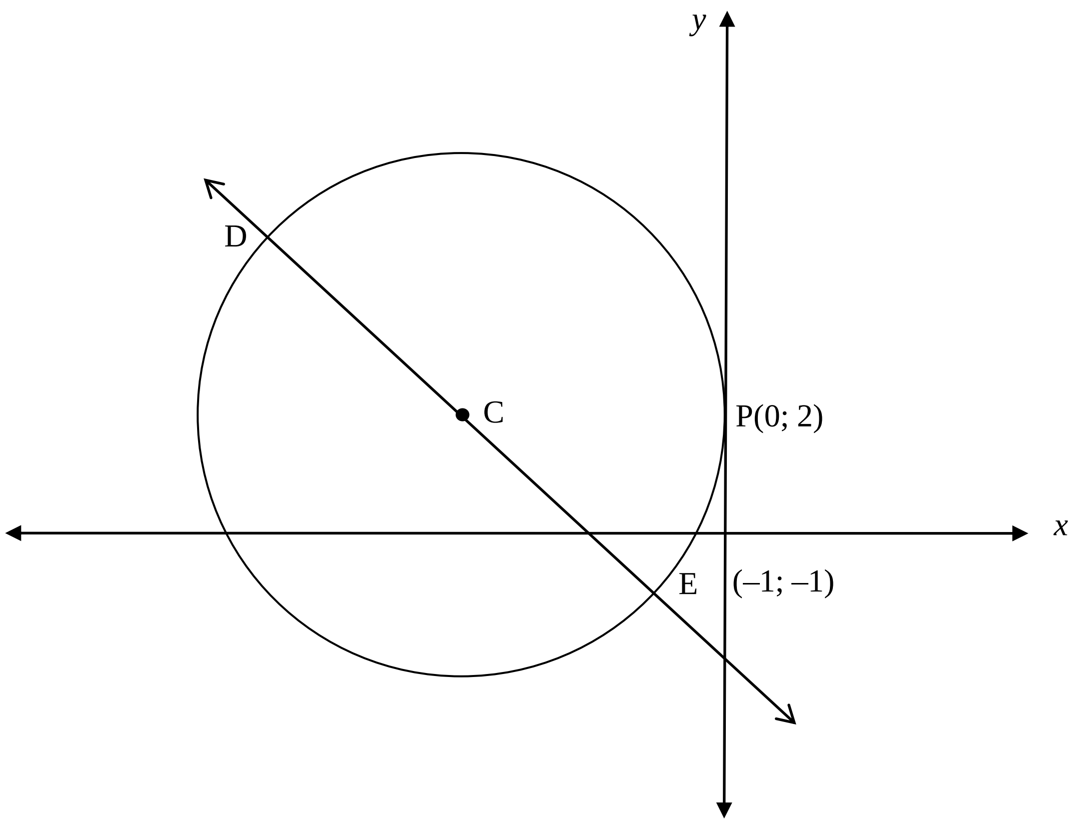
3.2 Show that AB is perpendicular to the line $6x + 5y = 18$. (4)

3.3 If the coordinates of E are (a; – 3), determine the value of a. (4)

[23]

QUESTION 4

In the diagram below, centre C of the circle lies on the straight line $3x + 4y + 7 = 0$
The straight line cuts the circle at D and E(– 1; – 1). The circle touches the y-axis at P(0; 2).



4.1 Determine the equation of a the circle in the form $(x-a)^2 + (y-q)^2 = r^2$ (5)

4.2 Determine the length of diameter DE. (1)

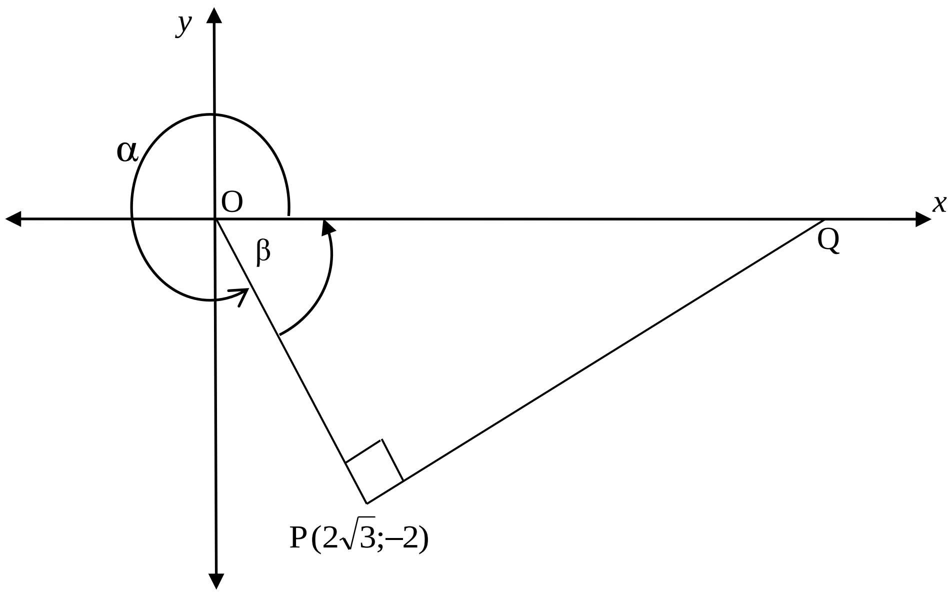
4.3 Determine the equation of the perpendicular bisector of PE. (6)

4.4 Show that the perpendicular bisector of PE and the straight line DE intersect at C. (4)

[16]

QUESTION 5

In the diagram below, $P(2\sqrt{3};-2)$ is a point on the Cartesian plane, with reflex angle $Q\hat{O}P = \alpha$. Q is the point on the *x* – axis so that $O\hat{P}Q = 90^{\circ}$



Calculate:

5.1 the size of β . (3)

5.2 the length of OP. (2)

5.3 the co-ordinates of Q. (3)

[8]

QUESTION 6

6.1 Without using a calculator, determine the value of:

$$\frac{\cos^2 15^\circ - \sin 15^\circ.\cos 75^\circ}{\cos^2 15^\circ + \sin 15^\circ.\cos 15^\circ.\tan 15^\circ}$$ (5)

6.2 Prove the following identity:

$$\frac{1-\cos 2A}{\sin 2A} = \tan A$$ (4)

6.3 Calculate the value of *x*, if $x \in [-180^0; 360^0]$

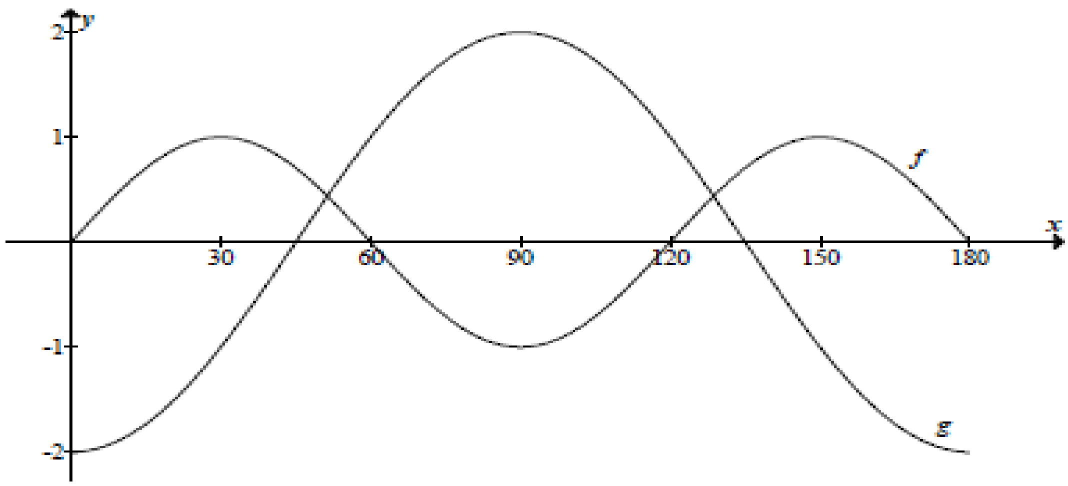
$$\cos 2x = \cos x + 2$$ (6)

[15]

QUESTION 7

In the sketch below, the graphs *f* and *g* are shown, where:

$f(x) = \sin bx$ and $g(x) = a\cos cx$, for $x \in [0^0; 180^0]$



7.1 Determine the numerical values of:

7.1.1 *a* (1)

7.1.2 *b* (1)

7.1.3 *c* (1)

7.2 Write down:

7.2.1 the range of *g*. (1)

7.2.2 the period of *f*. (1)

7.3 For which value(s) of x is:

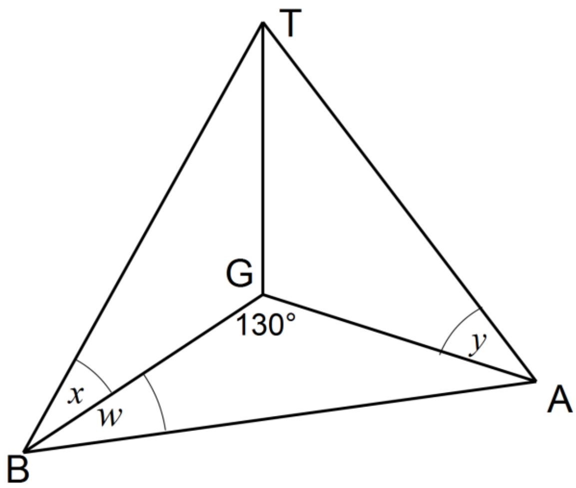
7.3.1 $f(x) - g(x) = 2$ (2)

7.3.2 $f(x) < 0$ (1)

[8]

QUESTION 8

A, B and G are points on the horizontal ground. TG is a vertical tower. The angles of elevation of T from B and A are x and y respectively. $G\hat{B}A = w$ and $B\hat{G}A = 130^0$.



8.1 Express TG in terms of x and BG. (2)

8.2 Show that:

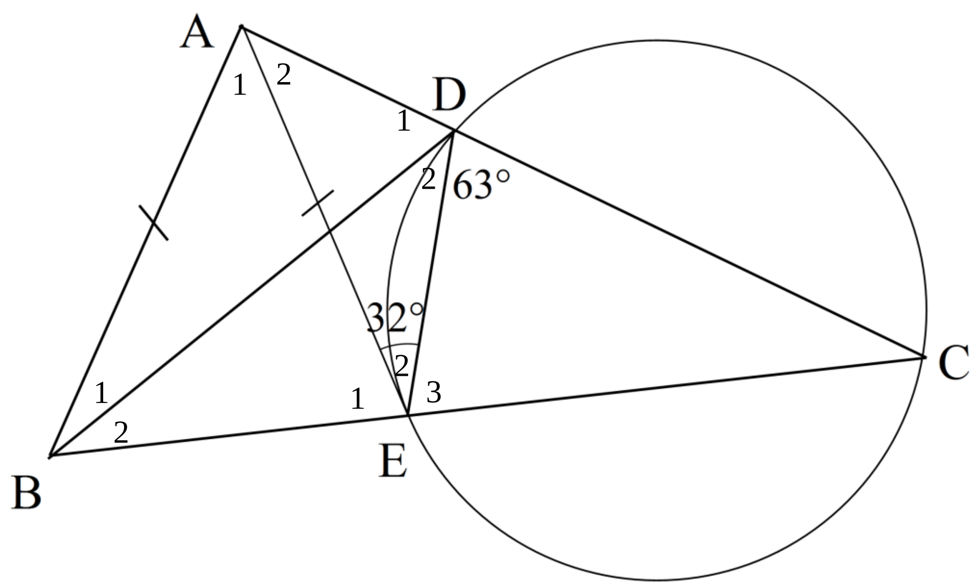
$$\sin w = \frac{\tan x.\sin(50^0 - w)}{\tan y}$$ (7)

8.3 Determine the length of AB if BG = 8 units and GA = 6 units. (2)

[11]

QUESTION 9

9.1 In the diagram below, C, D and E are points on the circle. CD and CE are produced to A and B respectively so that AE is a tangent to thecircle and AB = AE.
$\hat{AED} = 32°$and $\hat{CDE} = 63°$.



9.1.1 Calculate, giving reasons, the size of

a) $\hat{C}$ (2)

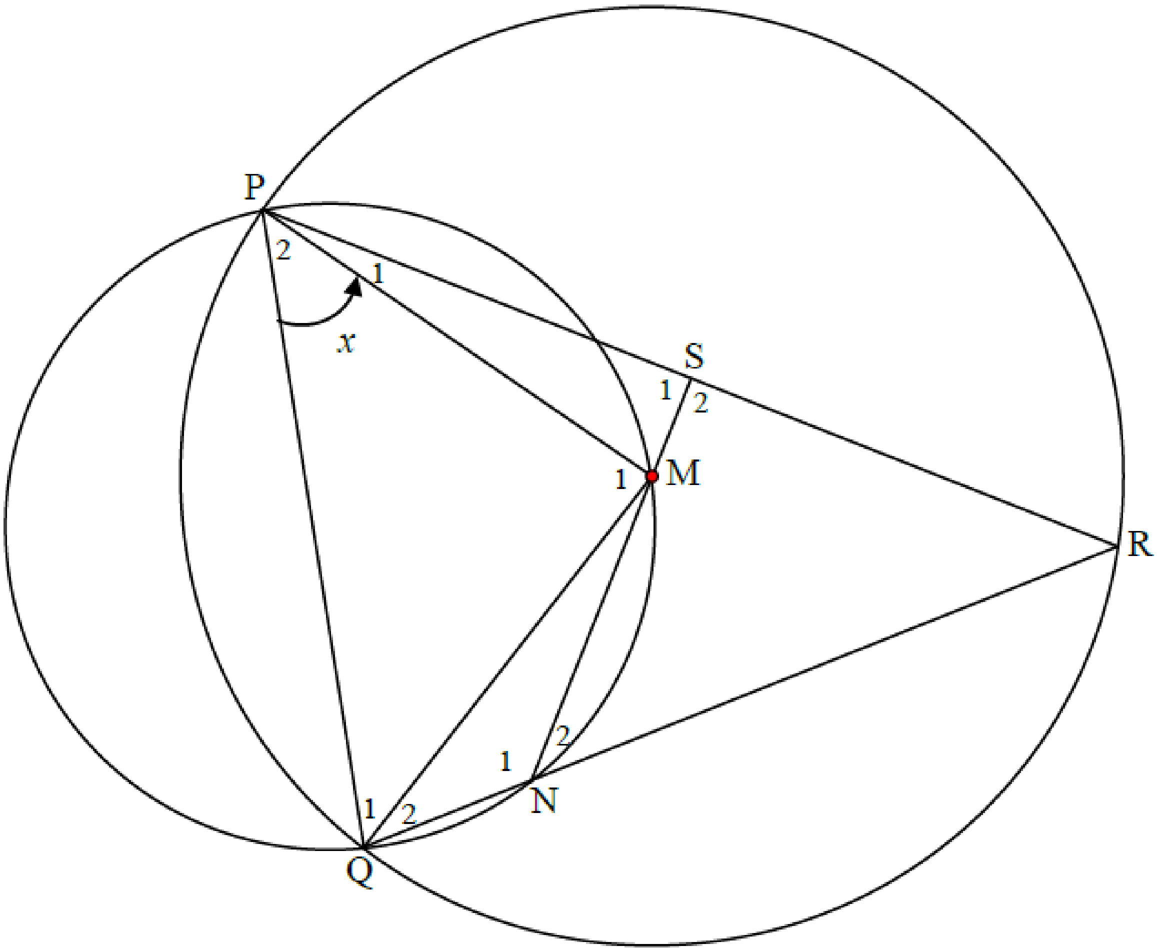
b) $\hat{E}_1$ (3)

9.1.2 Prove that ABED is a cyclic quadrilateral. (3)

9.1.3 Prove that AB is a tangent to the circle through B, D and C.(3)

9.1.4 Calculate, giving reasons, the size of $\hat{A}_1$. (2)

9.2 In the diagram below, PQ is a common chord of the two circles. The centre, M, of the larger circle lies on the circumference of the smaller circle. PMNQ is a cyclic quadrilateral in the smaller circle. QN is to produced to R, a point on the larger circle. NM produced meets the chord PR at S. $\hat{P}_2 = x$.



9.2.1 Name with reasons, TWO other angles each equal to *x*. (4)

9.2.2 Determine the size of $\hat{R}$ in terms of *x*. (3)

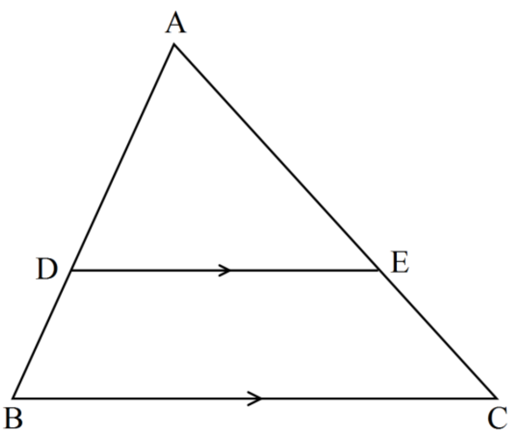
9.2.3 Prove that RS = SP. (3)

[23]

QUESTION 10

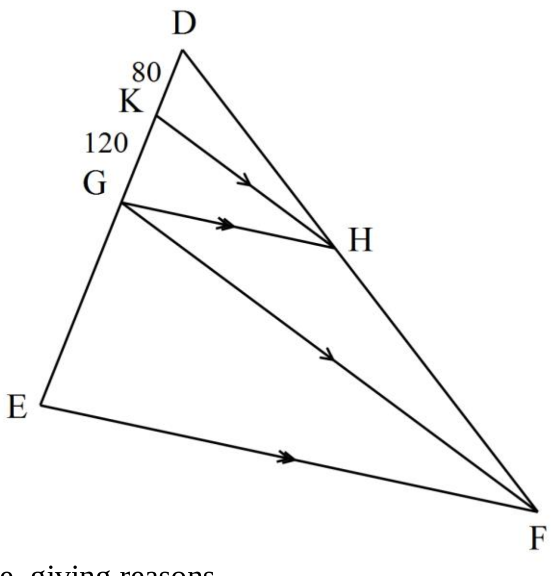
10.1 Use the diagram below to prove the theorem that states that the line drawn parallel to one side of a triangle divides the other two sides proportionally.

i.e. Given that DE || BC



Prove that: $\dfrac{AD}{DB} = \dfrac{AE}{EC}$ (6)

10.2 In ΔDEF, GH || EF and KH || GF. DK = 80 units and KG = 120 units



Determine, giving reasons,

10.2.1 $\frac{DH}{HF}$ in simplest fraction form (3)

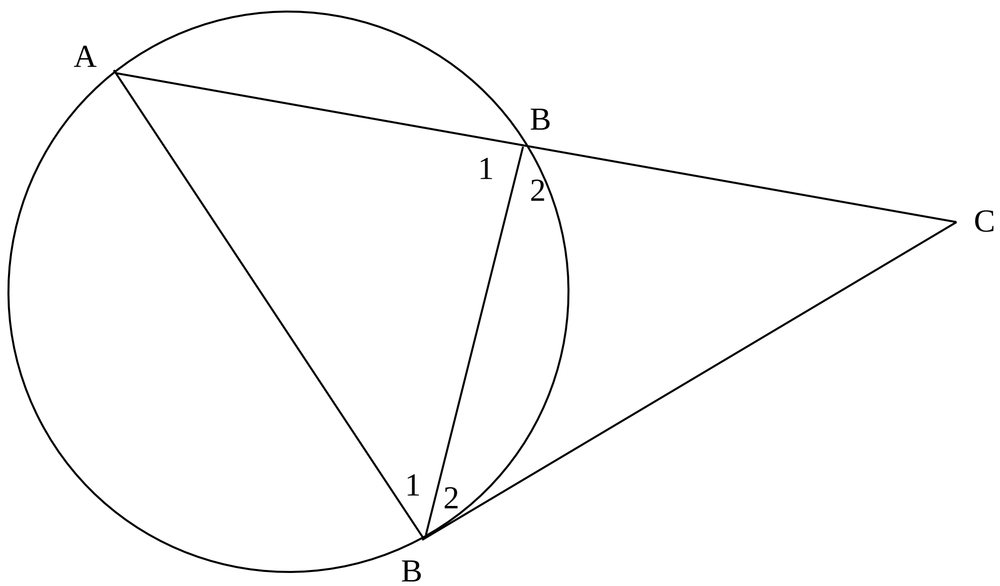
10.2.2 the length of DE (5)

10.2.3 $\frac{\text{Area}\,\Delta\,DHK}{\text{Area}\,\Delta\,DGF}$ (3)

[17]

QUESTION 11

In the figure, a circle passing through A, B and D is drawn. CD is a tangent to the circle at D. ABC is a straight line.



Prove that:

11.1 $\Delta ADC \mid\mid\mid \Delta DBC$ (3)

11.2 $AB.BC = DC^2 - BC^2$ (5)

[8]

TOTAL:[150]

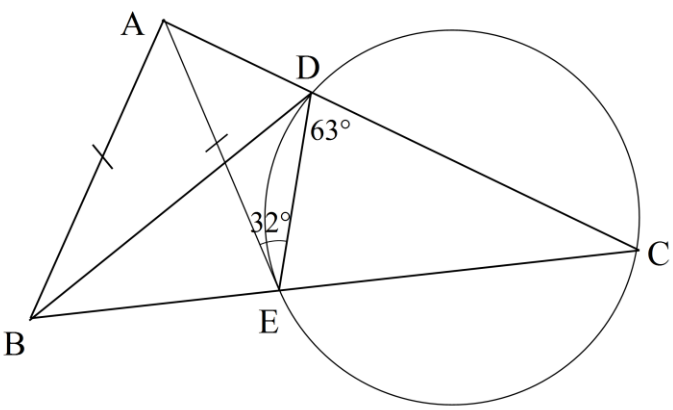
DIAGRAM SHEET

NAME: ……………………………………………………………… CLASS:………

QUESTION 2.1

Number	**(number – mean)^2**
4	36
8	4
10	*a*…
x	*b*…
y	*c*…

QUESTION 9.1



QUESTION 9.2

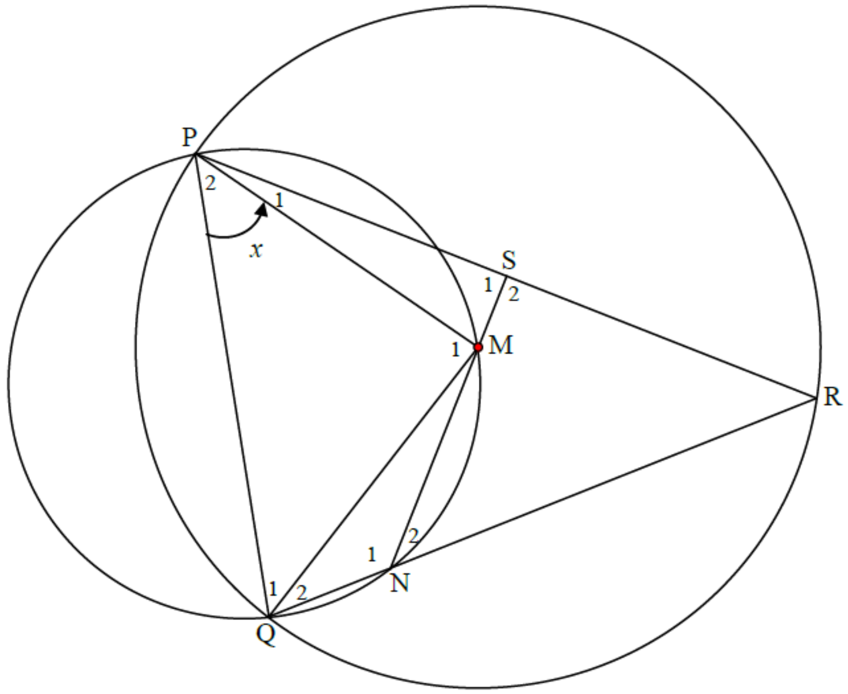
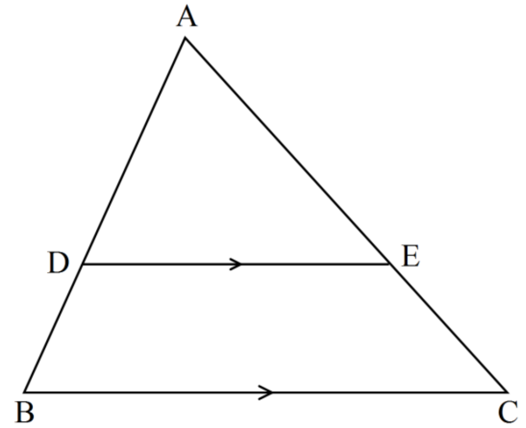


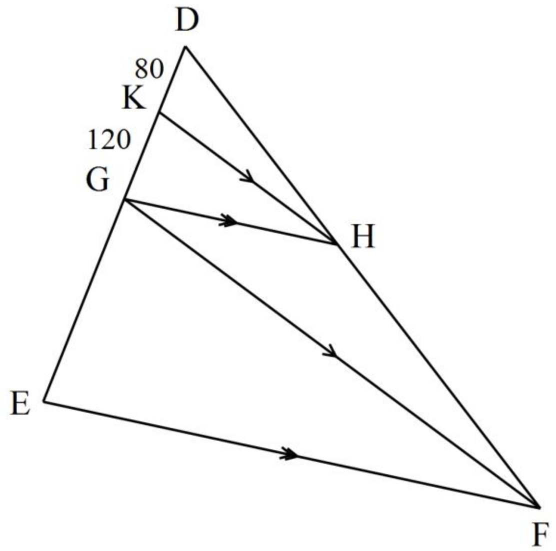
DIAGRAM SHEET

NAME: ………………………………………………………………… CLASS:………

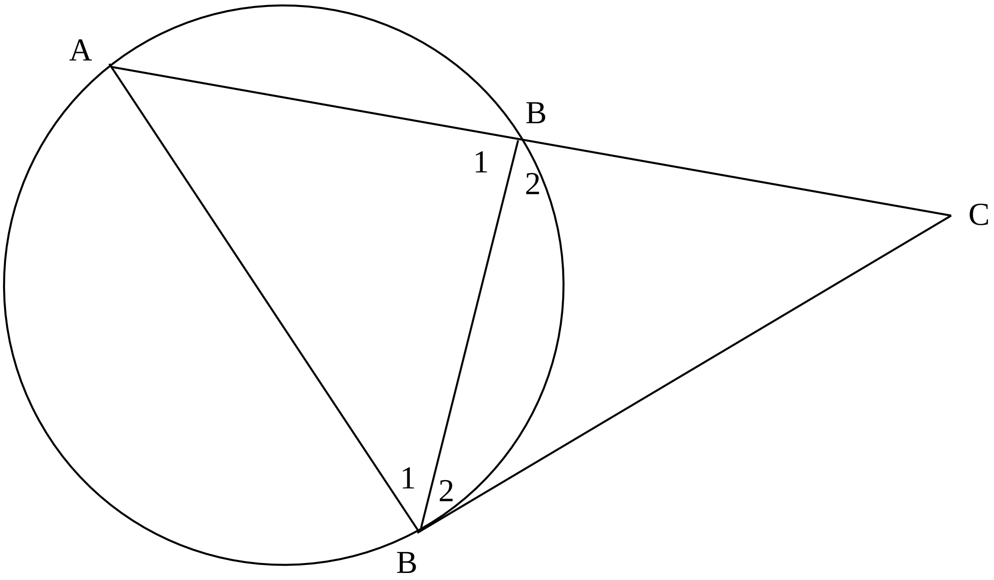
QUESTION 10.1



QUESTION 10.2



QUESTION 11



INFORMATION SHEET: MATHEMATICS

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $A = P(1+ni)$ $A = P(1-ni)$ $A = P(1-i)^n$ $A = P(1+i)^n$

$\sum_{i=1}^{n} 1 = n$ $\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$ $\sum_{i=1}^{\infty} ar^{i-1} = \frac{a}{1-r}$

$\sum_{i=1}^{n} \left(a + (i-1)d\right) = \frac{n}{2}\left(2a + (n-1)d\right)$ $\sum_{i=1}^{n} ar^{i-1} = \frac{a\left(r^n - 1\right)}{r-1}$; $r \neq 1$; $-1 < r < 1$ $F = \frac{x\left[(1+i)^n - 1\right]}{i}$

$P = \frac{x[1-(1+i)^{-n}]}{i}$ $f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$ $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ M

$\left(\frac{x_1 + x_2}{2} ; \frac{y_1 + y_2}{2}\right)$ $y = mx + c$ $y - y_1 = m(x - x_1)$ $m = \frac{y_2 - y_1}{x_2 - x_1}$ $m = \tan\theta$

$(x-a)^2 + (y-b)^2 = r^2$

$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ $a^2 = b^2 + c^2 - 2bc.\cos A$ $area\,\Delta ABC = \frac{1}{2} ab.\sin C$

$\sin(\alpha + \beta) = \sin\alpha.\cos\beta + \cos\alpha.\sin\beta$ $\sin(\alpha - \beta) = \sin\alpha.\cos\beta - \cos\alpha.\sin\beta$

$\cos(\alpha + \beta) = \cos\alpha.\cos\beta - \sin\alpha.\sin\beta$ $\cos(\alpha - \beta) = \cos\alpha.\cos\beta + \sin\alpha.\sin\beta$

$$\cos 2\alpha = \begin{cases} \cos^2\alpha - \sin^2\alpha \\ 1 - 2\sin^2\alpha \\ 2\cos^2\alpha - 1 \end{cases}$$

$$\sin 2\alpha = 2\sin\alpha.\cos\alpha \qquad \bar{x} = \frac{\sum fx}{n}$$

$$\sigma^2 = \frac{\sum_{i=1}^{n}\left(x_i - \bar{x}\right)^2}{n} \qquad P(A) = \frac{n(A)}{n(S)}$$

$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$$\hat{y} = a + bx \qquad b = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sum(x - \bar{x})^2}$$