MATHEMATICS – P2

LAST PUSH

Province of the EASTERN CAPE EDUCATION

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KWAZULU-NATAL PROVINCE EDUCATION REPUBLIC OF SOUTH AFRICA

LIMPOPO PROVINCIAL GOVERNMENT REPUBLIC OF SOUTH AFRICA

TRIAL PAPERS

ALL PROVINCES – 2026

education MPUMALANGA PROVINCE REPUBLIC OF SOUTH AFRICA

Northern Cape Department of Education

education Department: Education North West Provincial Government REPUBLIC OF SOUTH AFRICA

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Western Cape Government FOR YOU

GAUTENG PROVINCE EDUCATION REPUBLIC OF SOUTH AFRICA

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STATISTICS AND REGRESSION

Eastern Cape

QUESTION 1

The ogive (cumulative frequency curve) below shows the number of social media messages sent by 120 learners in one day.



Use the ogive to answer the following questions.

1.1 How many learners sent less than 50 messages? (2)

1.2 Estimate the median number of messages sent per day. (2)

1.3 Determine the interquartile range (IQR) for the data. (3)

1.4 Draw a box and whisker diagram for the data on the numberline provided in the ANSWERBOOK, if minimum is 0 and maximum is 60. (2)

1.5 The mean number of messages is approximately equal to 37. Comment on the distribution of data. (2)

[11]

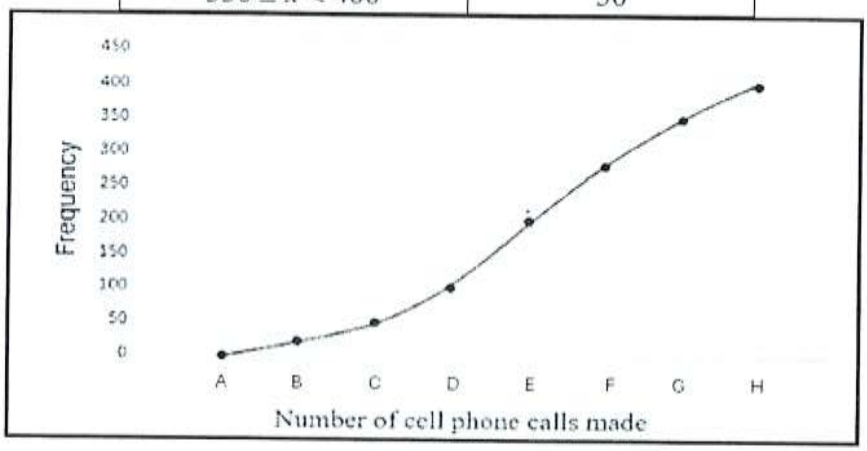
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Free State

QUESTION 1

Several learners were asked how many cell phone calls they made during the day.
The results are summarised in the table and the cumulative frequency curve given below.

Cell phone call made	Frequency
$50 \leq x < 100$	20
$100 \leq x < 150$	30
$150 \leq x < 200$	Q
$200 \leq x < 250$	R
$250 \leq x < 300$	80
$300 \leq x < 350$	70
$350 \leq x < 400$	50



1.1 What is the value of A on the horizontal axis of the cumulative frequency curve? (1)

1.2 How many learners were asked for the information? (1)

1.3 Determine the values of Q and R in the table. (2)

1.4 Calculate the inter-quartile range. (3)

1.5 Calculate the estimate for the mean number of cell phone calls made per day. (2)

1.6 If the cell phone company introduced a contract where you were not allowed to make more than 300 calls per day:

1.6.1 How would this affect the median? Explain. (2)

1.6.2 How would this affect the standard deviation? Explain. (2)

1.6.3 In which direction would the data be skewed? Explain. (2)

[15]

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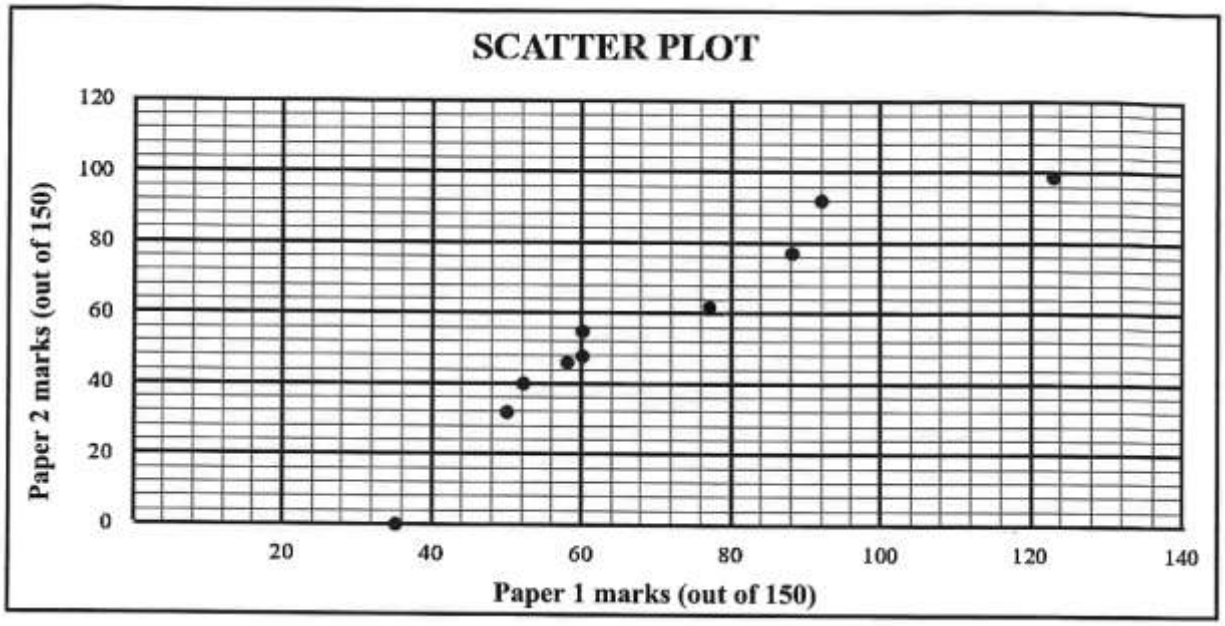
Gauteng

QUESTION 1

The table below shows the marks obtained by 10 Grade 12 learners in Mathematics Paper 1 and Mathematics Paper 2 in their Preparatory Examination. All marks are out of 150.

Paper 1 (out of 150 marks)	35	50	52	58	60	60	77	88	92	123
Paper 2 (out of 150 marks)	0	32	40	46	48	55	62	77	92	99

The data is represented on the scatter plot below.



1.1 Determine the equation of the least squares regression line for the data given in the table above. (3)

1.2 Calculate the correlation coefficient. (1)

1.3 Comment on the strength of the correlation coefficient between the marks of both papers. (1)

1.4 If a learner scored 75 for Paper 1, predict the learner's mark for Paper 2. (2)

1.5 Calculate the value (A) in the table below.

	Mean	**Median**	**Standard deviation**	**Range**
Paper 1	69,5	60	24,41	88
Paper 2	55,1	51,5	**A**	99

(1)

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1.6 All learners received 4 additional marks in Paper 1 due to a technical error.

1.6.1 Calculate the mean for Paper 1 after the mark adjustment. (1)

1.6.2 Explain how the standard deviation of Paper 1 will be affected by this change. (1)

1.6.3 After the marks had been recorded, a new learner John, wrote both papers. John obtained 52 marks in Paper 1 and 51 marks in Paper 2. In which paper did John rank higher? Justify your answer. (2)

[12]

KZN

QUESTION 1

A sports analyst wants to determine the relationship between the number of hours a professional soccer player spends in the gym per week (x) and the number of minutes they can play at maximum intensity (y) before their sprint performance drops. Data collected from 10 players at the 2026 FIFA World Cup is recorded in the table below:

Gym Hours per Week (x)	2	6	7	9	10	12	12	15	16	18
Max Intensity Minutes (y)	55	62	65	74	76	85	83	92	95	88

1.1 Calculate the mean number of gym hours spent per week by one of these soccer players. (2)

1.2 Determine the equation of the least squares regression line. (3)

1.3 Write down the value of the correlation coefficient for this data. (1)

1.4 Comment on the strength of the correlation between the number of gym hours per week and maximum intensity minutes. (1)

1.5 Predict the maximum intensity minutes of a soccer player who spends 4 hours per week in the gym. Round your answer off to TWO decimal places. (2)

1.6 The analyst discovers that the 9th player (16 hours ; 95 minutes) actually only trained for 10 hours to achieve his maximum intensity rating of 95 minutes. If this error is corrected in the data set, state whether the gradient of the regression line will increase, decrease or remain the same. (1)

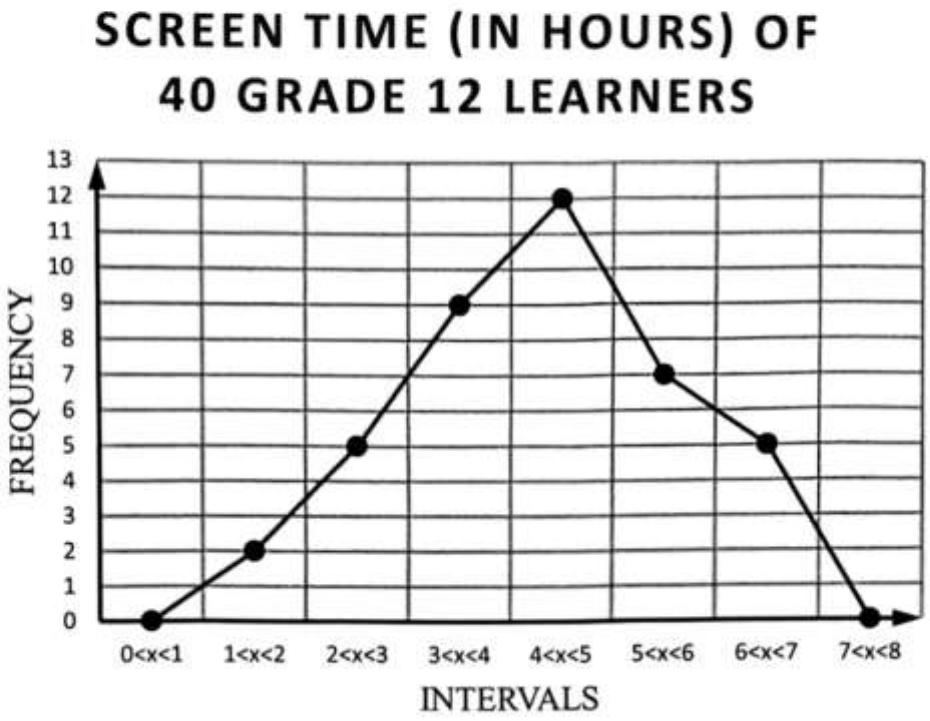
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Limpopo

QUESTION 1

The following diagram shows the daily screen time (in hours) of 40 Grade 12 learners during a weekday.



1.1 Complete the cumulative frequency table in the answer book. (2)

1.2 Draw the ogive in the answer book. (2)

1.3 Find the median value from the graph. (1)

1.4 If the average screen time is 4,04, comment on the skewness of the data. Motivate your answer with a reason. (2)

1.5 The parents of the community stick together and decide to reduce the screen time of the learners spending more than 4 hours to a maximum of 4 hours. What will the new average screen time be? (2)

[9]

Mpumalanga

QUESTION 1

Mr Mabitsela is retired and he supplements his pension by mowing lawns for customers who live in his neighbourhood. As part of a review of his charges for this work, he measures the approximate areas (x) in m^2 of a random sample of 12 lawns and notes the time (y) in minutes, that it takes him to mow these lawns. His results are shown in the table below.

Area (x) in m^2	360	120	845	602	1190	530	245	486	350	1005	320	250
Time (y) in minutes	50	28	130	75	120	95	55	70	48	110	55	60

1.1 Calculate the equation of the least squares regression line. (3)

1.2 Calculate the correlation coefficient for the data. (1)

1.3 Comment on the correlation of the data. (1)

1.4 Given that Mr Mabitsela charges a flat call out fee of R150, as well as R50 per half hour, or part thereof, estimate the charge for mowing a customer's lawn that has an area of 560 m^2. (Note: any part of a half hour is charged as a full half-hour. For example: 100 minutes is charged as 2 hours). (4)

[9]

Northern Cape

QUESTION 1

The table below shows the marks (out of 150) of eleven Grade 10 learners. This was for Paper 1 and Paper 2 for the final examination in 2025.

Paper 1	56	39	62	80	114	109	82	135	130	103	81
Paper 2	29	36	59	35	79	91	76	110	108	96	62

1.1 Determine the equation of the least squares regression line for the data. (3)

1.2 A certain learner wrote Paper 1 and scored a mark of 113. She was unable to write Paper 2 due to illness. Predict the mark she could have scored for Paper 2. (2)

1.3 Use the correlation coefficient to determine whether the prediction in QUESTION 1.2 is valid. (2)

1.4 Determine the number of learners who lie above one standard deviation of the mean for Paper 1. (3)

[10]

North-West

QUESTION 1

A survey was done under 100 members of a gymnasium about the cost of their annual membership contract.
Results showed an average annual payment of R3 240.

AMOUNT (R)	FREQUENCY
$0 \leq x < 1000$	8
$1\,000 \leq x < 2\,000$	12
$2\,000 \leq x < 3\,000$	P
$3\,000 \leq x < 4\,000$	30
$4\,000 \leq x < 5\,000$	Q
$5\,000 \leq x < 6\,000$	12

1.1 How many members payed less than R2 000 for their annual contract? (1)

1.2 Proof by calculation that P = 20 and Q = 18. (5)

1.3 Hence, complete the cumulative frequency table in the ANSWER BOOK. (2)

1.4 Use the cumulative frequency table to draw an ogive to illustrate the information above. (3)

1.5 Use the ogive to determine how many members spent more than R4 200 annually on their contracts. (1)

[12]

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QUESTION 1

The table below shows the fastest lap times (in minutes) and the number of laps for some of the Formula 1 Grand Prix races in the 2024 F1 season.

Fastest lap time: the fastest single lap completed by any driver measured in minutes.
Number of laps: total laps that must be completed to cover the total race distance.

Number of Laps	42	50	52	53	56	60	63	67	70	71	72	74
Fastest Time (min)	1,45	1,34	1,28	1,21	1,19	1,34	1,14	1,26	1,07	1,14	1,18	1,13

1.1 Determine the correlation coefficient, r, correct to two decimal places. (2)

1.2 Based on your result in question 1.1, do you think the number of laps on a circuit influences the fastest lap time completed on that circuit? Give a reason for your answer. (2)

1.3 If the gradient of the least squares regression line is $-0,0084$ determine the y-intercept correctly to four decimal places and write down the equation of the least squares regression line. (2)

1.4 If a circuit were to announce a special event with 55 laps, use your answers to the questions above to predict the fastest lap time and comment on the reliability of the prediction. (3)

[9]

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Western Cape

QUESTION 1

The table below shows the annual absenteeism of 155 Grade 12 students at a particular school.

NUMBER OF DAYS ABSENT	FREQUENCY	CUMULATIVE FREQUENCY
$0 < d \leq 5$	20	
$5 < d \leq 10$	35	
$10 < d \leq 15$	75	
$15 < d \leq 20$	20	
$20 < d \leq 25$	5	

1.1 Complete the cumulative frequency column in your ANSWER BOOK. (2)

1.2 Draw an ogive (cumulative frequency curve) to represent the above information in your ANSWER BOOK. (3)

1.3 Use your graph to estimate the median days absent from school. (1)

1.4 What percentage of learners was absent for more than 15 days. (2)

[8]

Eastern Cape

QUESTION 2

From a school sports team, eight young athletes were chosen. The table below shows their weekly weightlifting hours and the distance (in meters) they could throw a javelin.

Learner	1	2	3	4	5	6	7	8
Number of hours (x)	5	12	15	20	25	30	42	45
Javelin distance (y)	130	118	115	95	88	72	48	30

2.1 Calculate the standard deviation of the javelin distances. (2)

2.2 Calculate the correlation coefficient (r) of the data. (1)

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2.3 Determine the equation of the least squares regression line. (3)

2.4 A learner that was not chosen spent 35 hours per week in weightlifting.

2.4.1 Use your regression equation to predict the javelin distance he can cover. (2)

2.4.2 Is increasing gym hours likely to improve javelin distance? Justify your answer. (2)

[10]

Free State

QUESTION 2

A study was conducted with twelve soccer players on a team to determine the relationsh between the number of rest days allocated in a year and the players' performance.

The results are shown in the table below.

Rest days given	5	2	9	1	3	12	10	4	4	5	8	6
Performance of the player	0,87	0,65	0,9	0,58	0,7	0,91	0,88	0,78	0,72	0,91	0,82	0,62

2.1 Calculate the correlation coefficient. (2)

2.2 Refer to the correlation coefficient and write down the letter that best describes the relationship.

A Fairly strong, negative correlation

B Very weak positive correlation

C Fairly strong positive correlation

D Perfect positive correlation (1)

2.3 If the equation of the least squares regression line is $y = A + Bx$, calculate the values of A and B. Give answers correct to TWO decimal places. (2)

2.4 Should the regression line in QUESTION 2.3 be used to predict the performance of the players if 30 rest days are given to the players in a year? (Explain your answer.) (2)

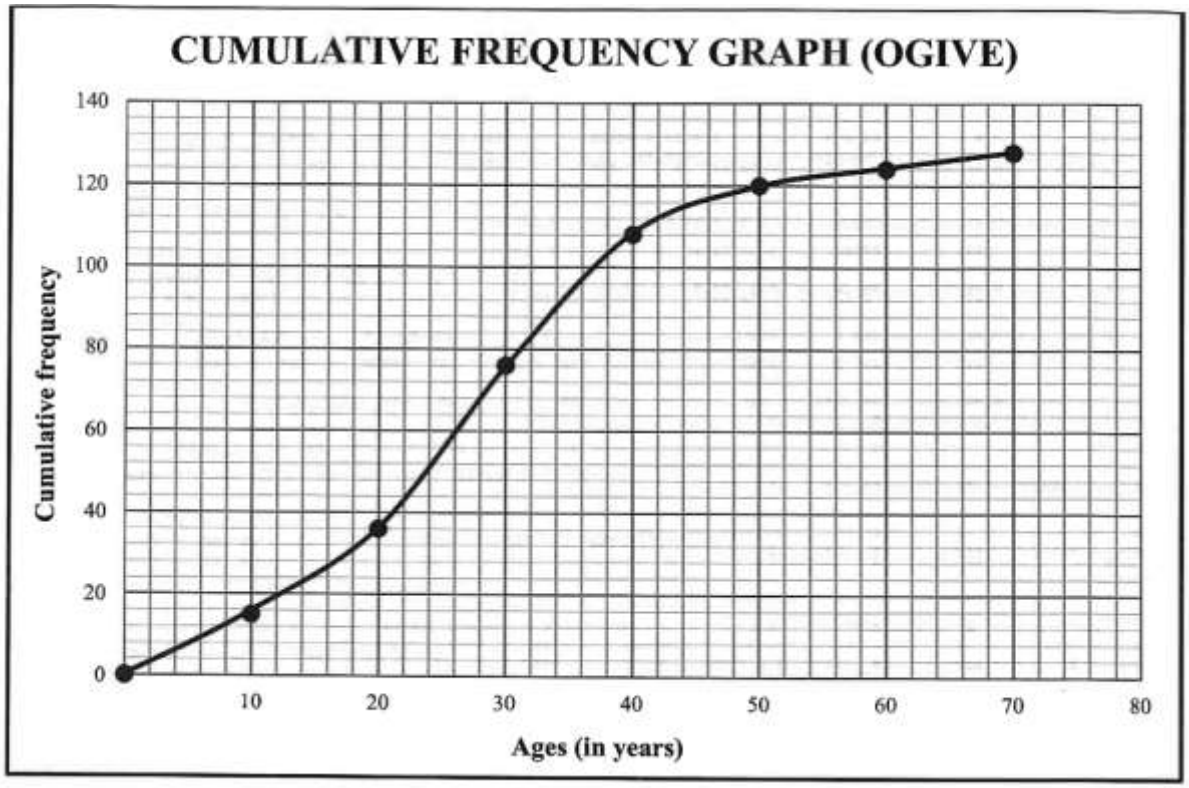
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Gauteng

QUESTION 2

A clothing store recorded the number of T-shirts that have been sold per age group. The data is represented in the ogive (cumulative frequency graph) below.



2.1 Use the ogive above to complete the following table:

AGE GROUPS	NUMBER OF T-SHIRTS SOLD
$0 < x \leq 10$	15
$10 < x \leq 20$	
$20 < x \leq 30$	
$30 < x \leq 40$	
$40 < x \leq 50$	
$50 < x \leq 60$	
$60 < x \leq 70$	

(2)

2.2 Write down the modal class. (1)

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2.3 Determine the interquartile range of the data. (3)

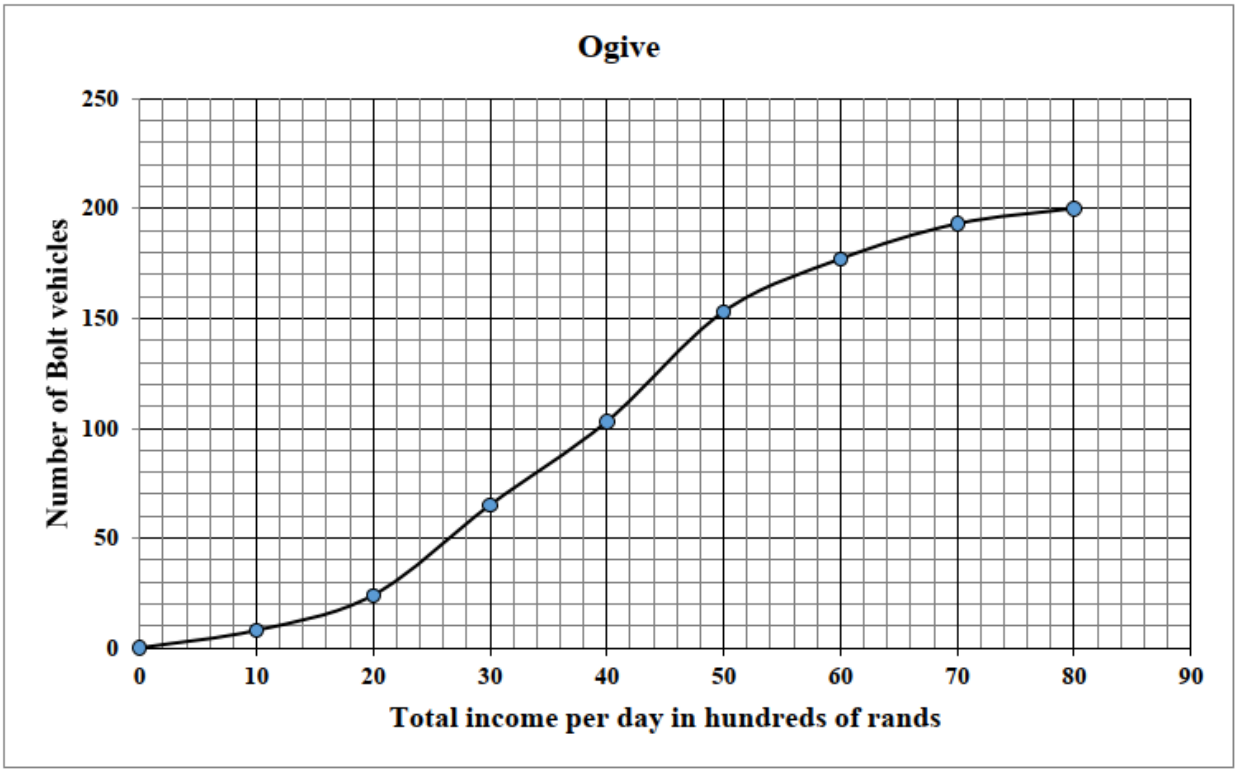
2.4 The owner plans a sale on all T-shirts for adults over 50, which is expected to increase sales in this category. Describe the effect that this will have on the ogive. (2)

[8]

KZN

QUESTION 2

In Durban there are a certain number of Bolt vehicles on call every day. The cumulative frequency curve (ogive) below shows the **total fares** (total income per vehicle per day), in hundreds of rands, taken per Bolt driver on a particular day.



2.1 How many Bolt vehicles were on call in Durban on this day? (1)

2.2 Use the cumulative frequency curve (ogive) to estimate:

2.2.1 the median of total fares per driver on this day. (1)

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2.2.2 the number of Bolt vehicles for which the fares totalled to more than R5000. (3)

2.3 The company charges R25 per kilometre for the distance travelled. There are no other charges. On that particular day, 20% of Bolt vehicles travelled less than x kilometres. Determine the value of x. Round your answer off to the nearest km. (4)

[9]

Limpopo

QUESTION 2

The following dataset was collected at the G20 summit held in South Africa during the year 2025. It represents the Gross Domestic Product (GDP) per capita versus the per capita CO_2 (carbon dioxide) emissions of 8 of the 20 countries. GDP is the total value of all final goods and services produced within a country's geographical boundaries over a period.

Country	GDP per capita (USD)	CO_2 emissions per capita (tonnes/person)
United States	66 682	13,9
Germany	44 109	6,95
Australia	61 212	14,02
India	2 397	2,05
China	13 122	9,4
South Korea	34 121	11,09
Saudi Arabia	24 917	18,48
Italy	34 398	5,18

2.1 Draw a scatterplot with GDP per capita on the $x-$axis and CO_2 emissions per capita on the $y-$axis for these 8 countries. (2)

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2.2 Calculate the equation of the least-squares regression line in the form $y = a + bx$. All digits rounded to 4 decimal places. (3)

2.3 Calculate the correlation coefficient between GDP per capita and CO_2 emissions per capita for these 8 countries. (1)

2.4 Comment about the association between GDP and CO_2. (1)

2.5 Use your regression line to predict what the CO_2 emissions per capita would be for a hypothetical G20 country with a GDP per capita of 40 000 USD. (2)

2.6 Do you think this is a good model for predicting emissions based on GDP per capita? Give a reason for your answer. (1)

[10]

Mpumalanga

QUESTION 2

A group of learners from Mr Malaza's class wrote a Mathematics test which was scored out of 75 marks. The results were represented in the table below.

Marks	Frequency	Cumulative frequency
$5 < x \leq 15$	4	
$15 < x \leq 25$	7	
$25 < x \leq 35$	m	21
$35 < x \leq 45$	11	
$45 < x \leq 55$	11	
$55 < x \leq 65$	8	
$65 < x \leq 75$	n	
Total	**54**	

2.1 Determine the values of m and n. (2)

2.2 Complete the above table. (2)

2.3 Draw a cumulative frequency curve (Ogive) to represent above data on the diagram provided on the answer book. (3)

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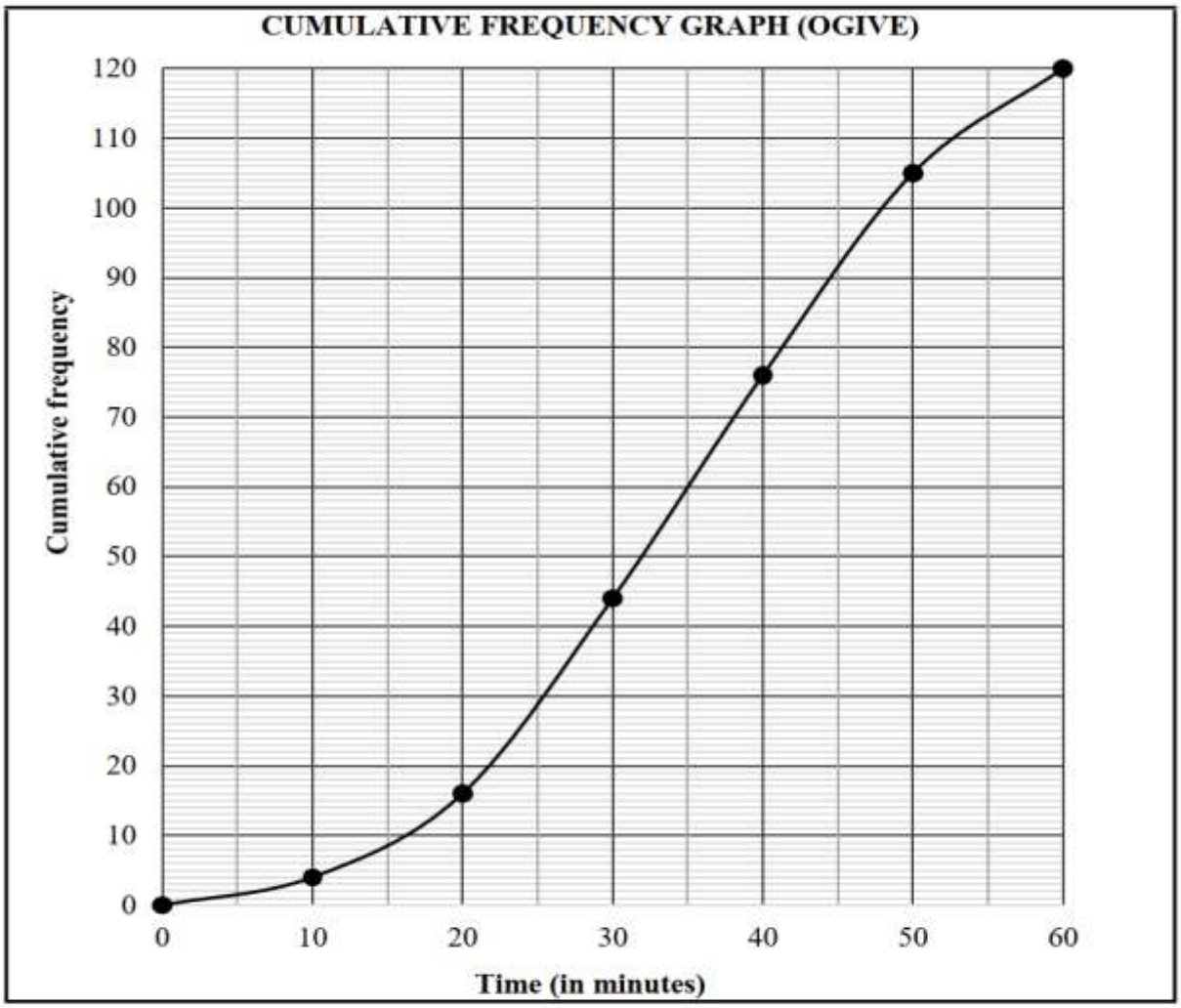
2.4 Use the graph to estimate the 25th percentile of the data. (1)

2.5 Determine the estimated average and the standard deviation of the data. (3)
[11]

Northern Cape

QUESTION 2

The cumulative frequency graph (ogive) below shows the time it takes learners to get to school.



2.1 How many learners were recorded? (1)

2.2 Use the ogive to estimate the interquartile range for the data. (3)

2.3 Estimate the median time taken to travel to school. (2)

2.4 Calculate the number of learners whose travel to school took 40 minutes and more. (2)
[8]

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North-West

QUESTION 2

Eight couples entered a dance competition. Two judges gave marks for their performances. The marks (out of 20) are shown in the table below.

COUPLE	1	2	3	4	5	6	7	8
JUDGE 1	18	4	6	8	5	12	10	14
JUDGE 2	15	6	3	5	5	14	8	15

2.1 Determine the equation of the least squares regression line of the marks given by the two judges. (3)

2.2 A ninth couple had a late entry in the competition and received a mark of 15 by JUDGE 1. Calculate to the nearest integer, the mark they possibly would have received from JUDGE 2. (2)

2.3 Are the judges consistent when allocating marks?
Motivate your answer with appropriate calculations. (3)
[8]

SACAI

QUESTION 2

The following are the five number summaries for the Formula 1 qualifying times in seconds for Max Verstappen and Lando Norris for the 2024 F1 season:

Max:	64,31	75,38	76,84	80,40	89,18
Lando:	69,67	73,40	76,41	80,14	92,33

2.1 Calculate the range of the qualifying times for both drivers. (2)

2.2 Calculate the interquartile range of the qualifying times for both drivers. (2)

2.3 Which one of the measures of dispersion (range or interquartile range) is a more accurate indicator of driver consistency? Give a reason for your answer. (2)

2.4 Determine whether Lando's average lap time is greater or less than 76 seconds.
Show all calculations. (3)

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2.5 The table below gives the average lap times (in seconds) of all the Formula 1 drivers during the 2024 season.

Lap times in sec	Frequency	Cumulative Frequency
$60 < t \leq 70$	4	4
$70 < t \leq 75$	28	32
$75 < t \leq 80$	96	128
$80 < t \leq 85$	72	200
$85 < t \leq 90$	28	228
$90 < t \leq 95$	12	240

If x is the average lap time for 85% of drivers in the 2024 season, use the data above to determine the interval in which x lies. (3)

[12]

Western Cape

QUESTION 2



An athlete's ability to take in and use oxygen effectively is called his VO_2 −max.

Twelve athletes with pre-recorded VO_2 −max readings ran for one hour.

The VO_2 −max readings and the distances (in kilometres) that they each covered are represented in the table below.

VO_2 −max reading	20	55	30	25	40	30	50	40	35	30	50	40
Distance run (km)	8	18	13	10	11	12	16	14	13	9	15	12

2.1 Using the axes provided in the answer book, draw a scatter plot from the information in the table above. (3)

2.2 Determine the correlation coefficient and then describe the relationship between the two sets of data. (2)

2.3 Determine the equation of the least squares regression line of the athletes. (3)

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2.4 Use your answer to question 2.3 to predict the distance an athlete runs if they have a VO_2 –maximum value of 26. (2)

2.5 It was discovered that the recorded VO_2 - max readings for each athlete were incorrect. To correct the error, x units must be added to every VO_2 - max reading. What effect does the change in the VO_2 – max readings have on the new standard deviation compared to the previous standard deviation? (1)

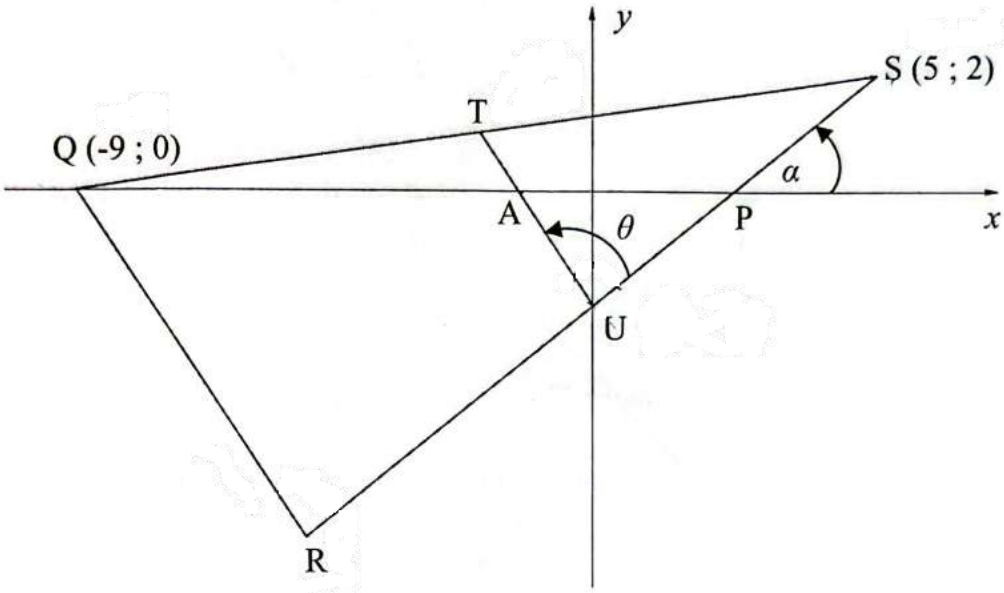
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ANALYTICAL GEOMETRY

Eastern Cape

QUESTION 3

In the diagram below, S (5 ; 2), Q (-9 ; 0) and R are vertices of Δ SQR. Point T is the midpoint of QS. Equation of SR is given by $5y = 4x - 10$. U is the y-intercept of TAU and SPUR. A and P lie on the x-axis. $T\hat{U}S = \theta$. Inclination of SPUR is α.



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3.1 Calculate the coordinates of T, the midpoint of QS. (2)

3.2 Calculate the coordinates of U. (2)

3.3 Calculate length of SU. (2)

3.4 If it is further given that $3x+2y+27=0$ is the equation of QR, show that QR || TU. (3)

3.5 Hence or otherwise, write down the length of QR. (2)

3.6 Determine the size of θ. (4)

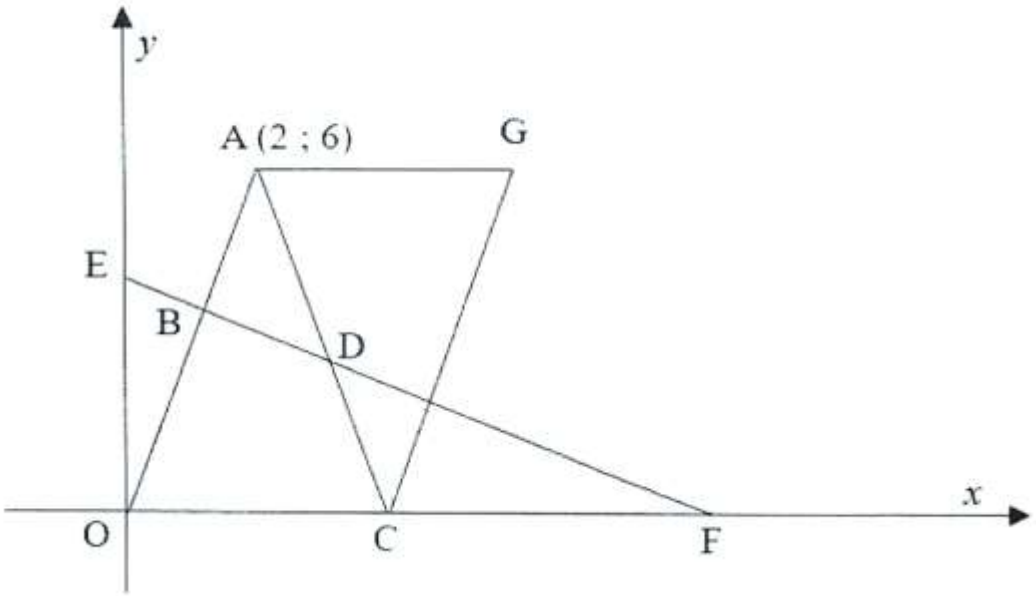
3.7 Determine the area of Δ SQR. (4)
[19]

Free State

QUESTION 3

In the diagram below, ΔAOC with A(2 ; 6) and O(0 ; 0) is drawn.

- C is a point on the x-axis
- AO = AC
- E lies on the y-axis and F on the x-axis
- Line EF goes through the points B and D on OA and CA, respectively
- The equation of EF is given by $2y+x=10$
- OAGC forms a parallelogram



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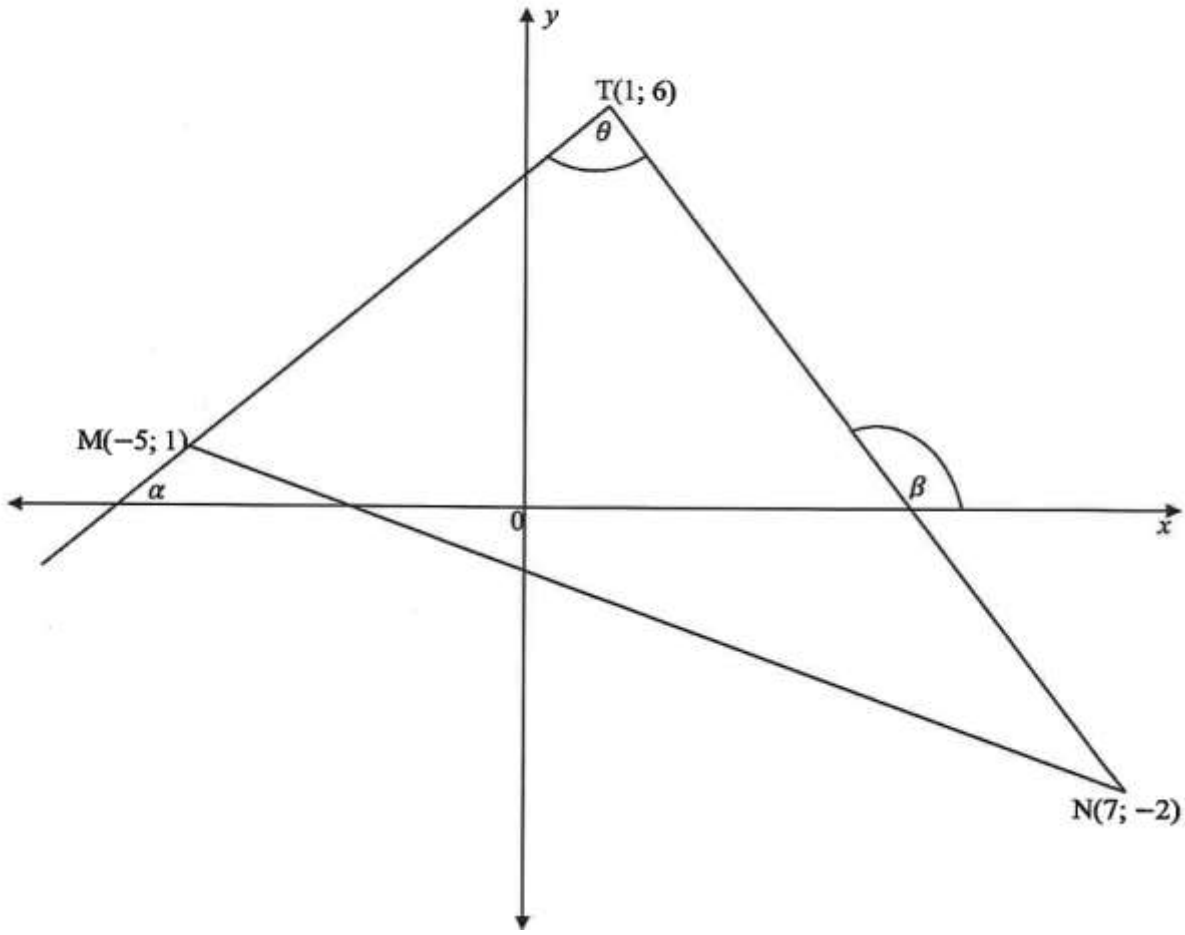
3.1	Calculate the length of AC.	(3)
3.2	Calculate the midpoint of OA.	(2)
3.3	Determine the coordinates of G.	(2)
3.4	Determine the coordinates of B.	(5)
3.5	Hence, or otherwise, determine the area of ΔEBO.	(3)
3.6	If $D\left(x;\frac{18}{5}\right)$, determine the area of ΔDFC.	(4)
		[19]

Gauteng

QUESTION 3

M(−5 ; 1), T(1 ; 6) and N(7 ; −2) are the vertices of ΔMTN, as show in the diagram below.

$\widehat{MTN} = \theta$. The angle of inclination of TN and MT is β and α respectively.



3.1 Calculate the length of MT. (2)

3.2 Calculate the gradient of TN. (2)

3.3 Determine the equation of TN. (2)

3.4 Calculate the size of θ. (4)

3.5 P(r ; 9) is a point in the first quadrant such that TN ⊥ TP. Calculate the value of r. (3)

3.6 Determine the equation of the circle passing through points T, N and P. (4)

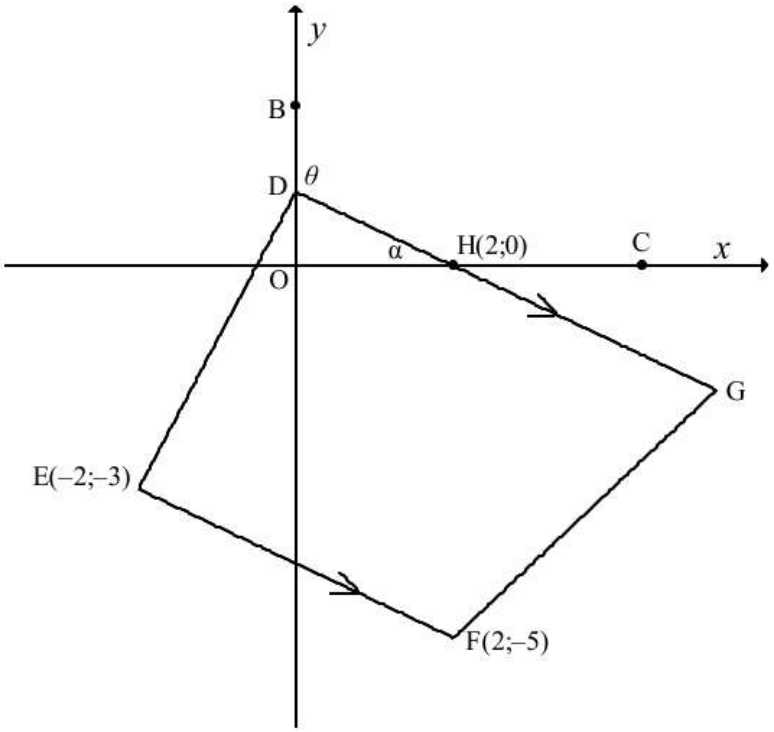
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KZN

QUESTION 3

In the diagram below, D, $E(-2;-3)$, $F(2;-5)$ and G are the vertices of a trapezium with $EF \| DG$. $H(2;0)$ is the x-intercept of DG. C and B lie on the x- and y-axes respectively. $B\hat{D}H = \theta$ and $D\hat{H}O = \alpha$



3.1 Determine:

3.1.1 the midpoint of EH (2)

3.1.2 the gradient of EF (2)

3.1.3 the equation of DG in the form $y = mx + c$. (3)

3.1.4 the size of θ. (3)

3.2 Prove that $DE \perp DG$. (3)

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3.3 The points E, D and H lie on the circumference of a circle. Determine:

3.3.1 the centre of the circle. (1)

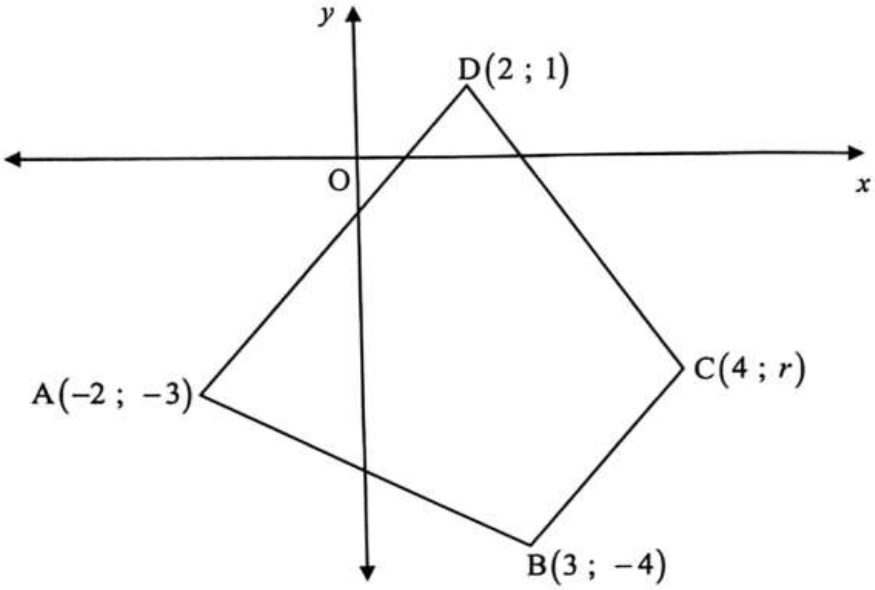
3.3.2 the equation of the circle in the form $(x-a)^2+(y-b)^2=r^2$. (4)

[18]

Limpopo

QUESTION 3

In the diagram $A(-2\ ;\ -3)$, $B(3\ ;\ -4)$, $C(4\ ;\ r)$ and $D(2\ ;\ 1)$ are the vertices of quadrilateral ABCD.



3.1 Calculate the coordinates of M, the midpoint of AD. (2)

3.2 Determine the equation of BM, the median of ΔABD. (3)

3.3 Prove that $BM \perp AD$. (2)

3.4 Determine the value of r if $AD \parallel BC$. (3)

3.5 Calculate the size of the angle that BD forms with the positive $x-$axis. (4)

3.6 Calculate the coordinates of S, the point of intersection of AC and BD. (5)

3.7 Prove that ΔABD is isosceles. (4)

3.8 State, with a reason, what type of quadrilateral is ABCD. (2)

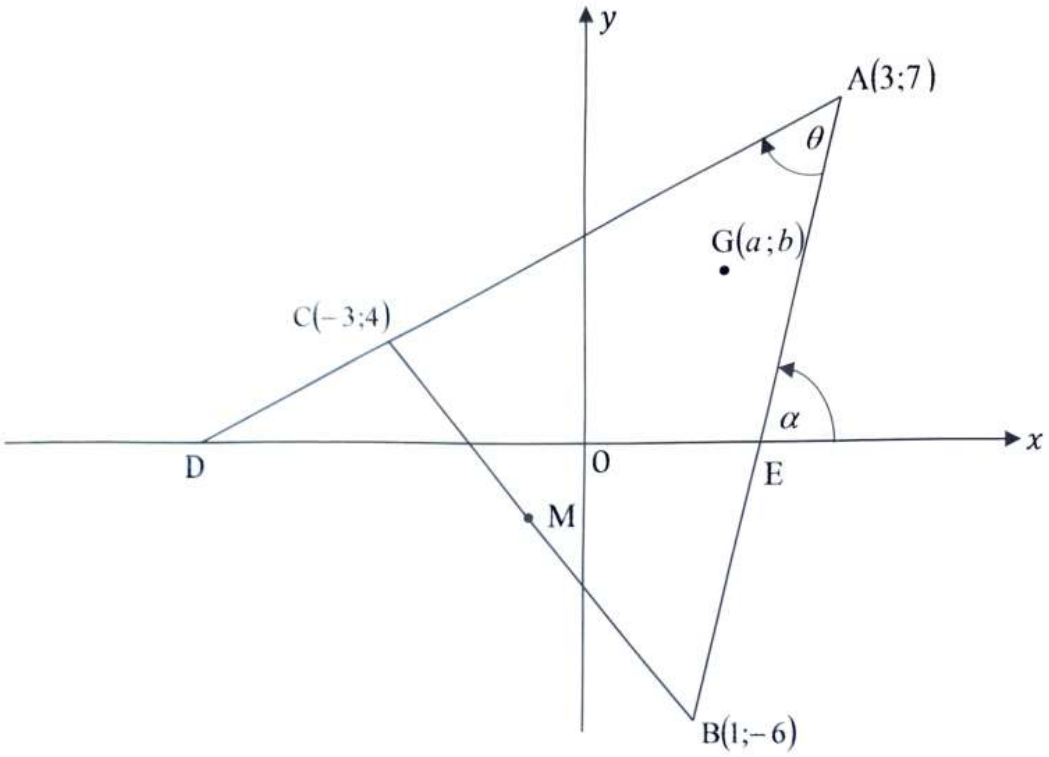
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Mpumalanga

QUESTION 3

In the diagram below, $A(3;7)$, $B(1;-6)$ and $C(-3;4)$ are the vertices of ΔABC.
M is the midpoint of BC, AC is extended to cut the x-axis at D, and AB cuts the x-axis at E. The angles θ and α are shown on the diagram. G is the point $(a;b)$.



3.1 Calculate the gradient of AD. (2)

3.2 Determine the equation of AC. (2)

3.3 Determine the length of AD. Leave your answer in simplest surd form. (4)

3.4 Determine the coordinates of M. (2)

3.5 Calculate the size of θ rounded off to the nearest degree. (5)

3.6 If the points A, G and M are collinear and $CG = \sqrt{17}$, calculate the possible values of a and b. (6)

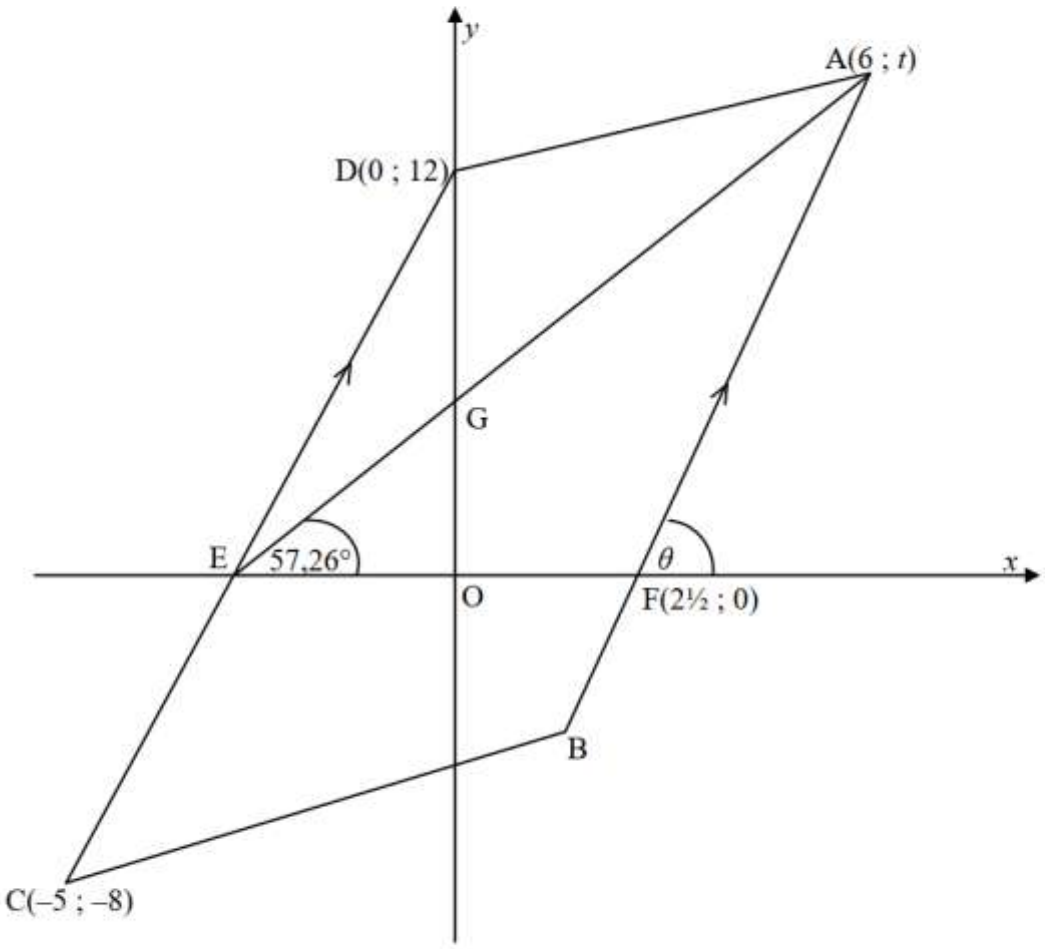
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Northern Cape

QUESTION 3

In the diagram, A(6 ; t), B, C(–5 ; –8) and D(0 ; 12) are the vertices of quadrilateral ABCD. E and F(2½ ; 0) are the x-intercepts of CD and AB respectively. The angles of inclination of AE and AB are 57,26° and θ respectively. AB ∥ CD.



3.1 Calculate the gradient of CD. (2)

3.2 Hence, determine the equation of AB. (3)

3.3 Calculate the value of t. (2)

3.4 Calculate the size θ. (2)

3.5 Calculate the coordinates of E. (3)

3.6 If the equation of CB is $3y - x = -19$, determine the coordinates of B. (4)

3.7 Calculate the area of quadrilateral AGOF (correct to ONE decimal place). (7)

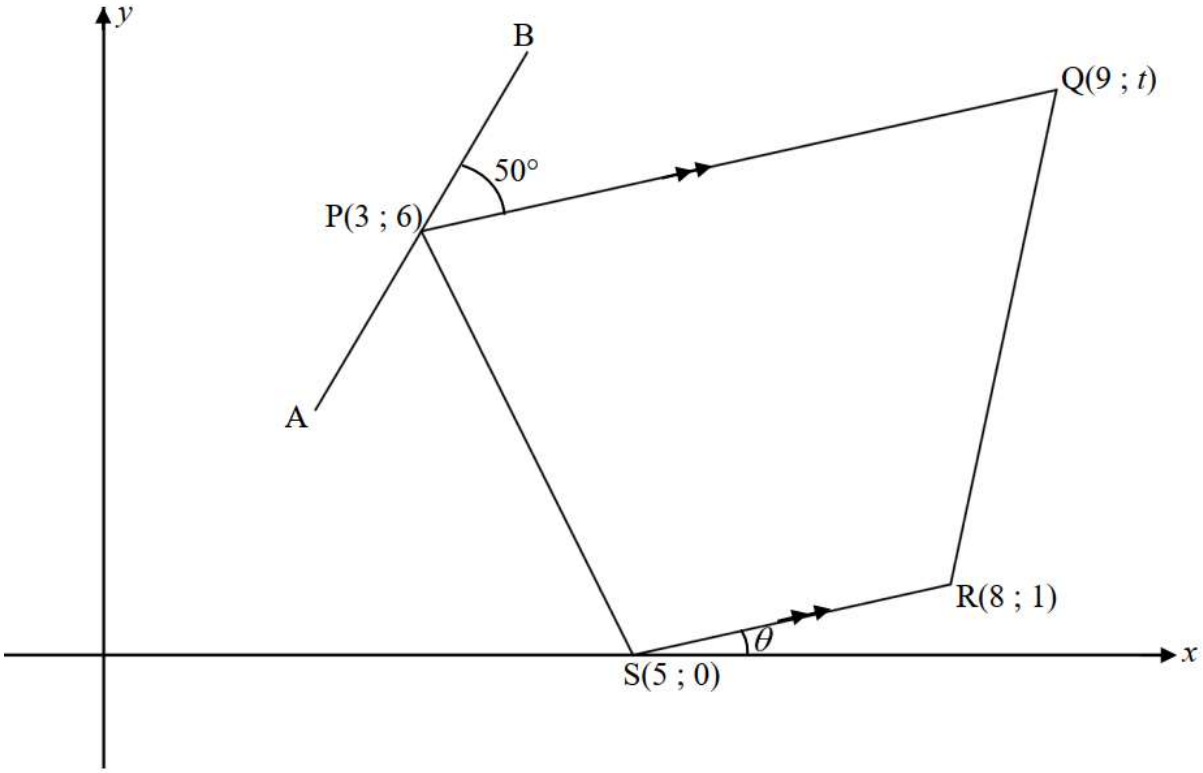
[23]

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North-West

QUESTION 3

In the diagram below PQRS is a quadrilateral with vertices P(3 ; 6), Q(9 ; t), R(8 ; 1) and S(5 ; 0). PQ || SR.
AB is a straight line that touches the quadrilateral at P. $Q\hat{P}B = 50°$



3.1 Calculate the gradient of SR. (2)

3.2 Determine the equation of PQ in the form $y = mx + c$. (3)

3.3 Calculate the value of t. (2)

3.4 Calculate the length of PQ if $t = 8$. (2)

3.5 Proof that PS is perpendicular to SR. (3)

3.6 If PQ = PS, calculate the area of PQRS. (6)

3.7 Calculate the value of θ, the angle of inclination of SR. (2)

3.8 Calculate the equation of AB. Show ALL working. (6)

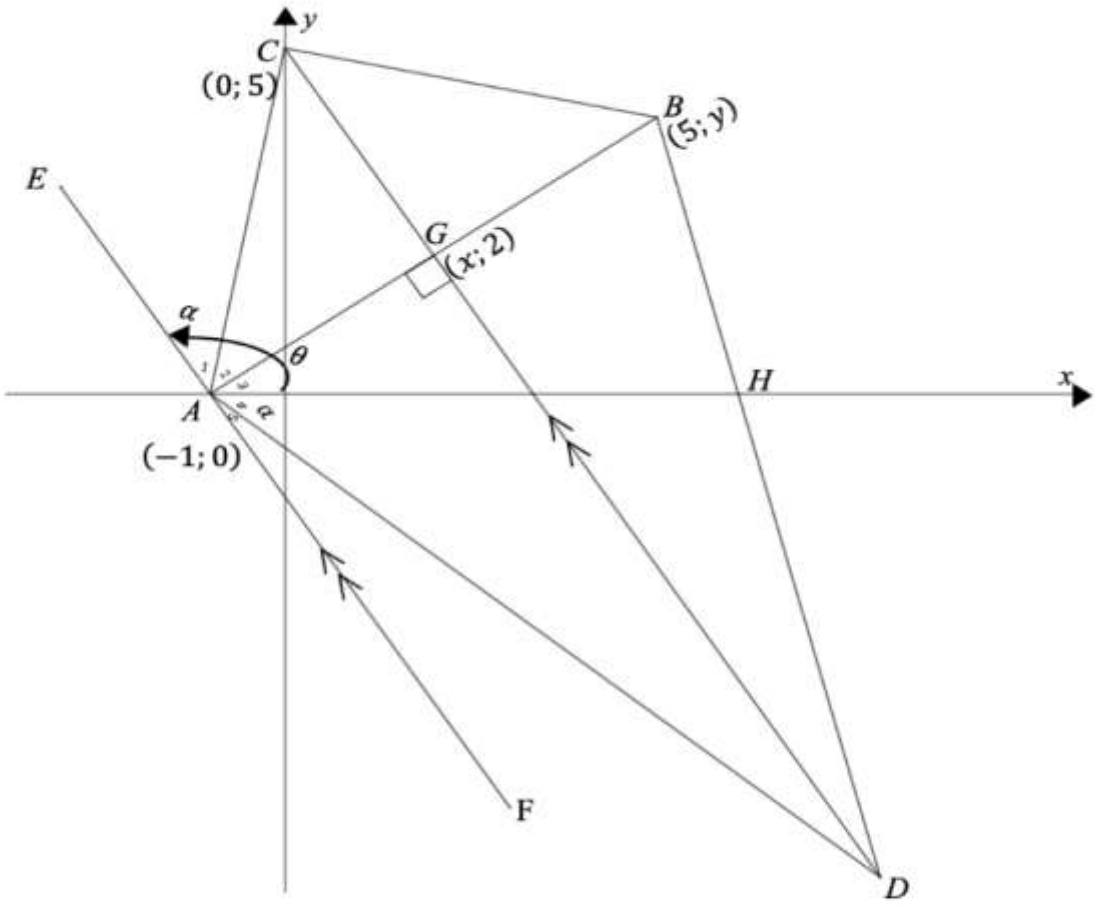
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SACAI

QUESTION 3

In the diagram below, ACBD is a kite with $A(-1;0)$, $B(5;y)$, $C(0;5)$ and $G(x,2)$. $E\hat{A}H = \theta$, EF // CD, AB ⊥ CD and $\hat{A}_1 = \hat{A}_4 = \alpha$. Point C is the *y*-intercept of the lines CD, AC and CB.



3.1 If G is the midpoint of A and B, determine the values of x and y. (3)

3.2 If the gradient of AB $= \frac{2}{3}$, determine the gradient of EF. (2)

3.3 Show that $\theta = 123{,}69°$. (1)

3.4 Determine the gradient of AC. (2)

3.5 Hence, determine the size of α. (3)

3.6 Determine the equation of the tangent to circle ABC at point B (5; 4). (3)

3.7 A circle is drawn through points A, B and C. Determine the coordinates of K, the point where circle ABC intersects line CD in quadrant four. (6)

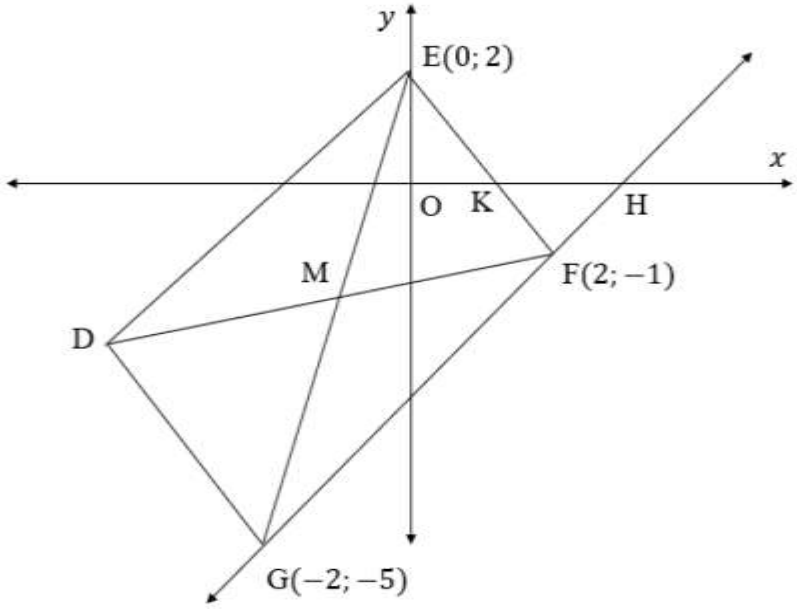
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Western Cape

QUESTION 3

In the diagram below, D, $E(0;2)$, $F(2;-1)$ and $G(-2;-5)$ are the vertices of a parallelogram. EF cuts the x −axis in K. GF produced cuts the x −axis in H. Diagonals DF and GE intersect each other at M.



3.1 Calculate the coordinates of M. (2)

3.2 Calculate the length of GE (leave your answer in surd form). (2)

3.3 Determine the gradient of DE. (3)

3.4 Determine the equation of line GH in the form $y = mx + c$. (2)

3.5 Write down the coordinates of D, the fourth vertex of parallelogram DEFG. (2)

3.6 Calculate the size of $D\widehat{G}F$. (5)

3.7 Calculate the area of ΔGEF. (5)

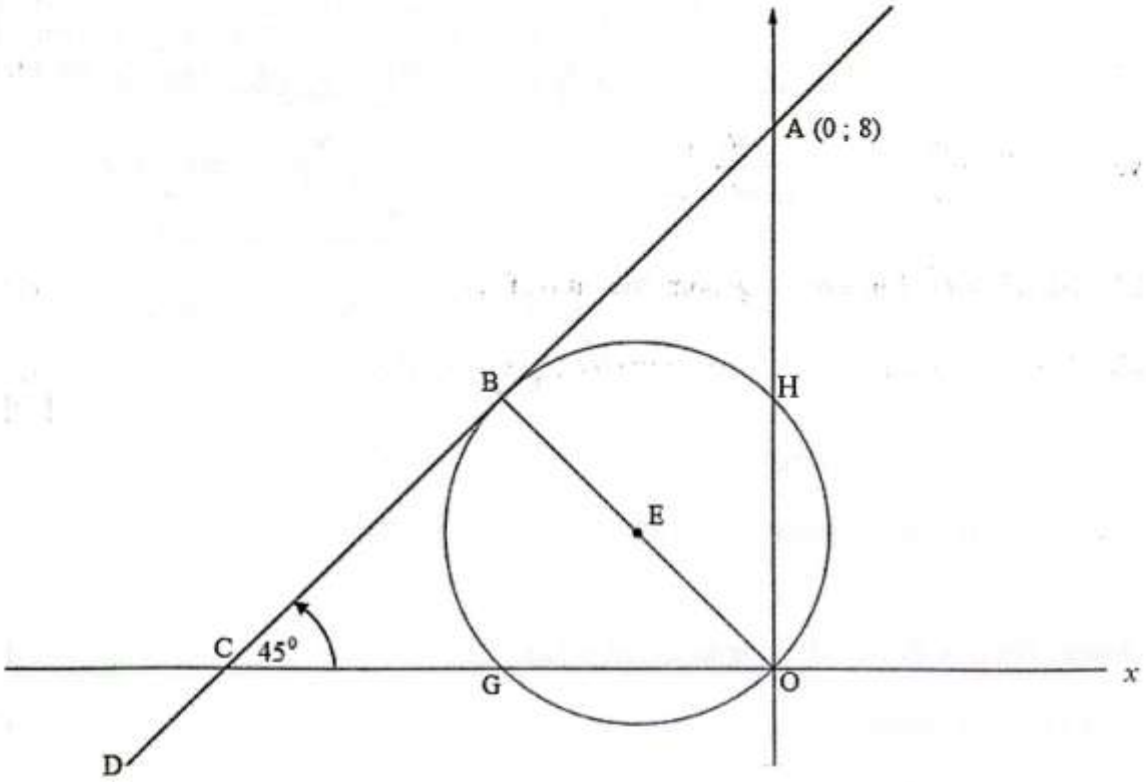
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Eastern Cape

QUESTION 4

A circle with centre E passes through the origin. The circle intersects the x-axis at G and the y-axis at H. The tangent to the circle at B cuts the y-axis at A (0 ; 8) and form an angle of 45° with the x-axis.



4.1 Write down the gradient of AD. (1)

4.2 Determine the equation of OB. (3)

4.3 Determine the coordinates of B, if the equation of the tangent is given by: $y = x+8$. (3)

4.4 Calculate the length of the radius of the circle. (3)

4.5 Determine the equation of the circle in the form $(x-a)^2+(y-b)^2 = r^2$. (4)

4.6 For which values of t will the equation $y = x+t$ be a tangent to the circle? (2)

4.7 Another circle with equation $(x-4)^2+(y-8)^2 = 9$ is given. Determine whether the TWO circles touch each other or not. Justify your answer. (4)

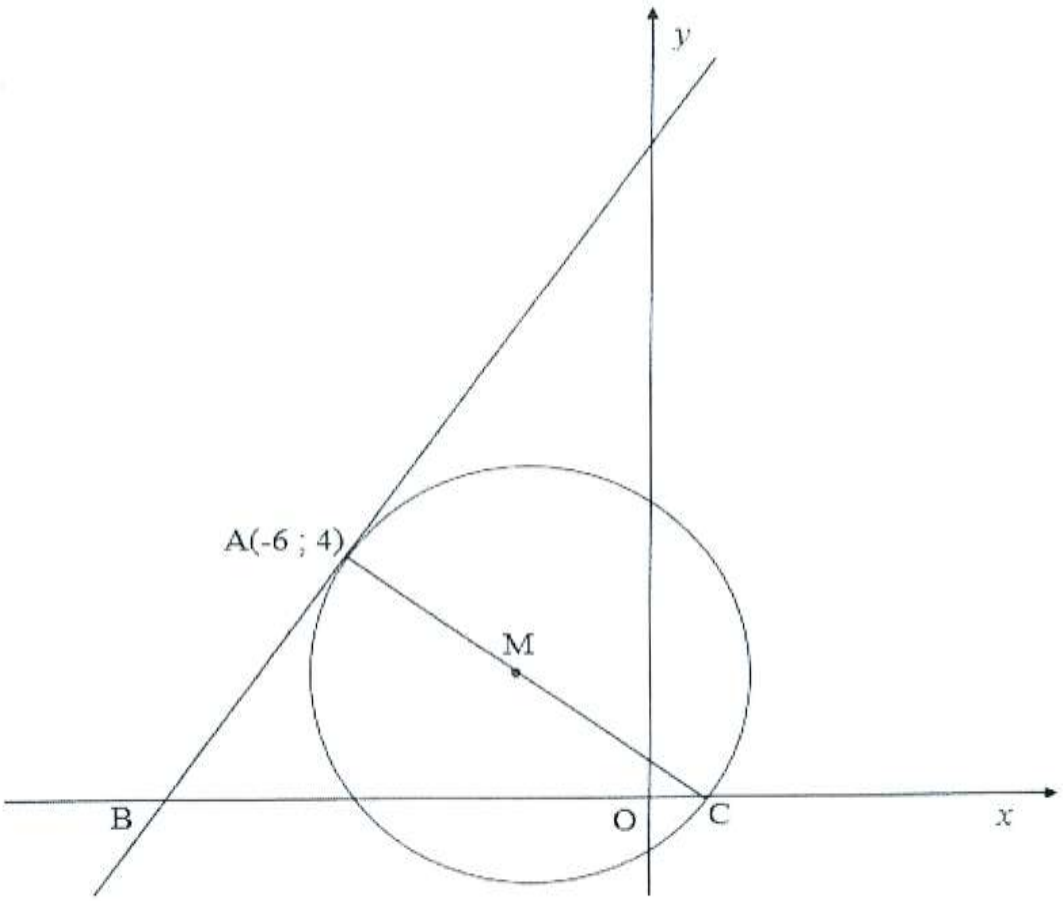
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Free State

QUESTION 4

In the diagram, the circle with centre M and equation $x^2 + y^2 + 4x - 4y - 12 = 0$ is drawn. C is the x-intercept of the circle. AB is a tangent to the circle at A(–6 ; 4) and cuts the x-axis at B.



4.1 Calculate the:

4.1.1 Coordinates of M (2)

4.1.2 Coordinates of C (3)

4.2 Determine the equation of the tangent AB in the form $y = mx+c$ (4)

4.3 Show algebraically that the given circle $x^2 + y^2 + 4x - 4y - 12 = 0$ and the circle $(x+4)^2 + (y+2)^2 = 5$ intersect each other. (5)

4.4 Determine for which values of k the line $y = 2x+k$ will intersect the circle $x^2 + y^2 + 4x - 4y - 12 = 0$ at two points. (5)

[19]

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Gauteng

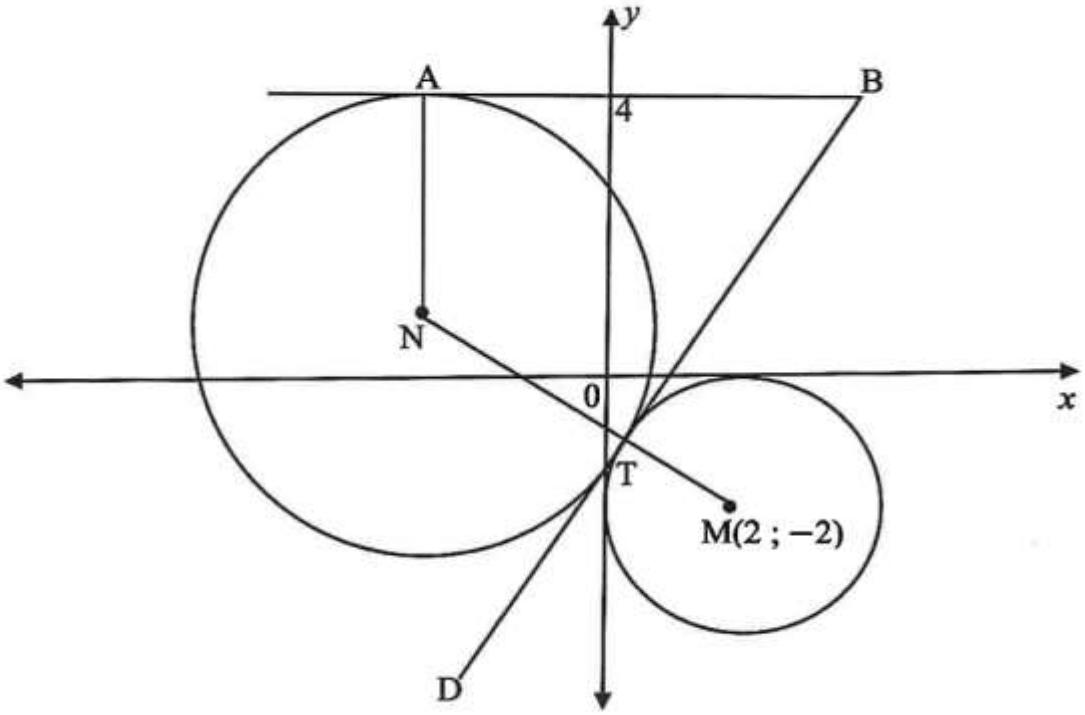
QUESTION 4

In the diagram below, N is the centre of the larger circle defined by $x^2 + y^2 + 4x - 2y + k = 0$.

AB is a tangent to the circle with centre N at point A and is parallel to the x-axis.

A second circle with centre M(2 ; −2) and radius of 2 units is drawn.

Both circles touch externally at point T and DTB is a common tangent to both circles.



4.1 Determine the radius of the circle with centre N in terms of k. (3)

4.2 Write down the coordinates of N. (2)

4.3 Calculate the length of NM. (2)

4.4 Calculate the value of k. (3)

4.5 If the coordinates of T are $\left(\frac{2}{5} ; -\frac{4}{5}\right)$, show that the coordinates of B, are (4 ; 4). (6)

4.6 The circle centred M is translated 3 units up to form circle M′. (5)
Calculate the area of quadrilateral ANM′B.

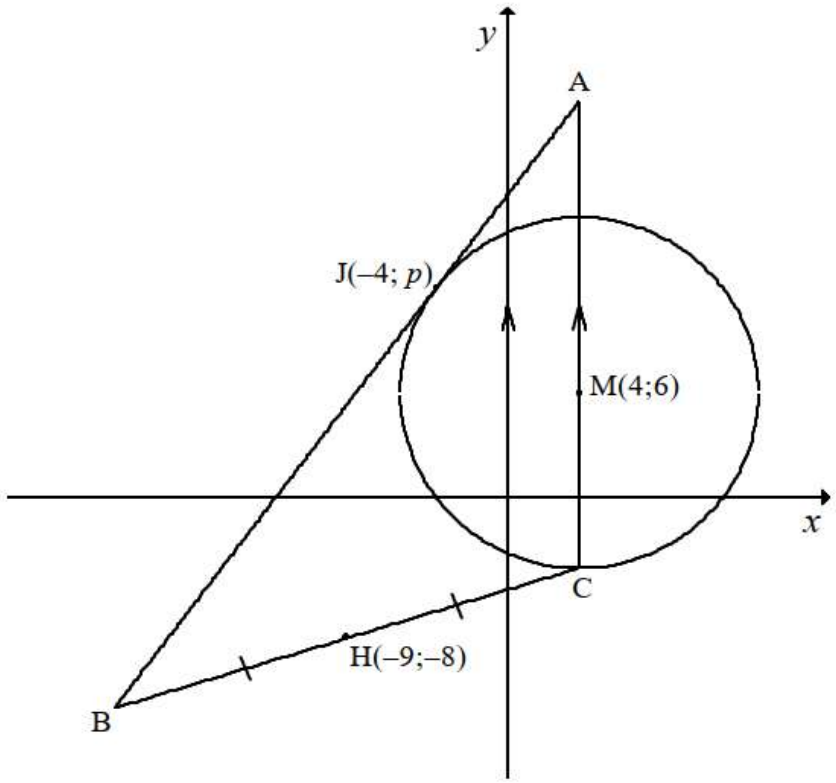
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KZN

QUESTION 4

In the diagram, the circle is centred at $M(4;6)$. Radius CM is produced to A, a point outside the circle, such that CMA is parallel to the y-axis. AJB is a tangent to the circle, at $J(-4;p)$. $H(-9;-8)$ is the midpoint of BC.



4.1 Given that the radius of the circle is 10 units, show that $p = 12$. (4)

4.2 Determine:

4.2.1 the coordinates of C. (2)

4.2.2 the equation of the tangent AJB in the form $y = mx + c$. (4)

4.2.3 the area of ΔABC. (7)

4.3 Another circle with equation $(x-4)^2 + (y-n)^2 = 100$ is drawn. Determine, with explanation, the values of n for which the two circles will touch each other externally. (4)

[21]

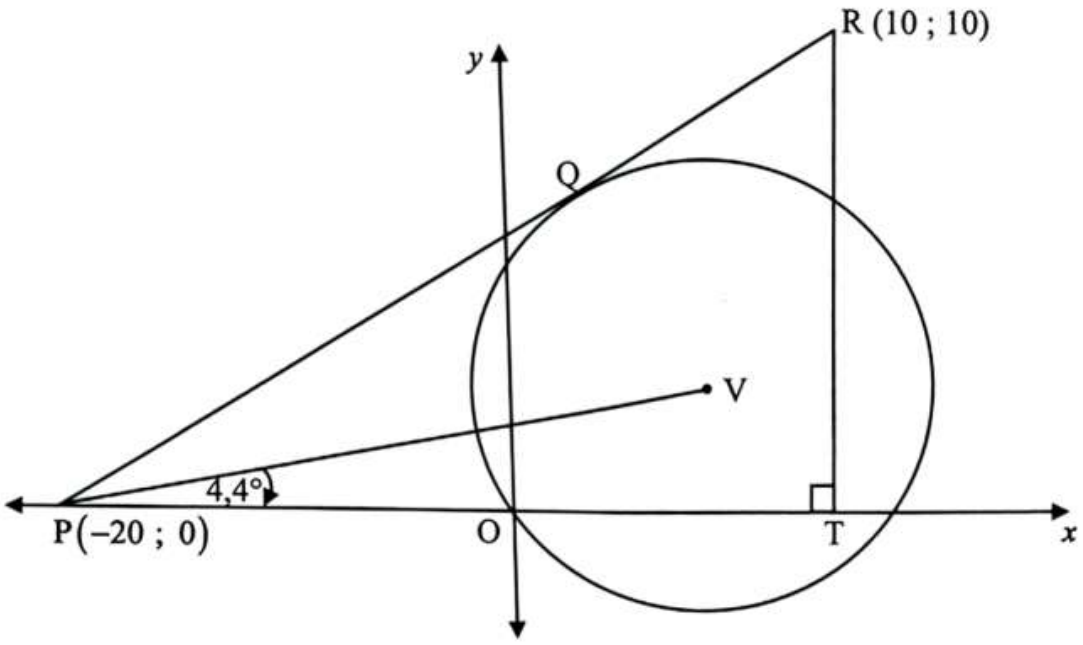
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Limpopo

QUESTION 4

In the diagram, PR is a tangent to circle, with centre V, at Q. The equation of PR is $y=\frac{1}{3}x+\frac{20}{3}$. RT is parallel to the $y-$axis. The circle passes through the origin.

$V\hat{P}T = 4,4°$ and $PQ = 8\sqrt{10}$.



4.1 Determine $Q\hat{P}V$. (4)

4.2 Hence, calculate the length of the radius of the circle. (3)

4.3 The point V is 4 units left of RT. Determine the coordinates of the centre of the circle, rounded off to the nearest whole number. (4)

4.4 Determine the coordinates of S if PVTS is a parallelogram. (2)

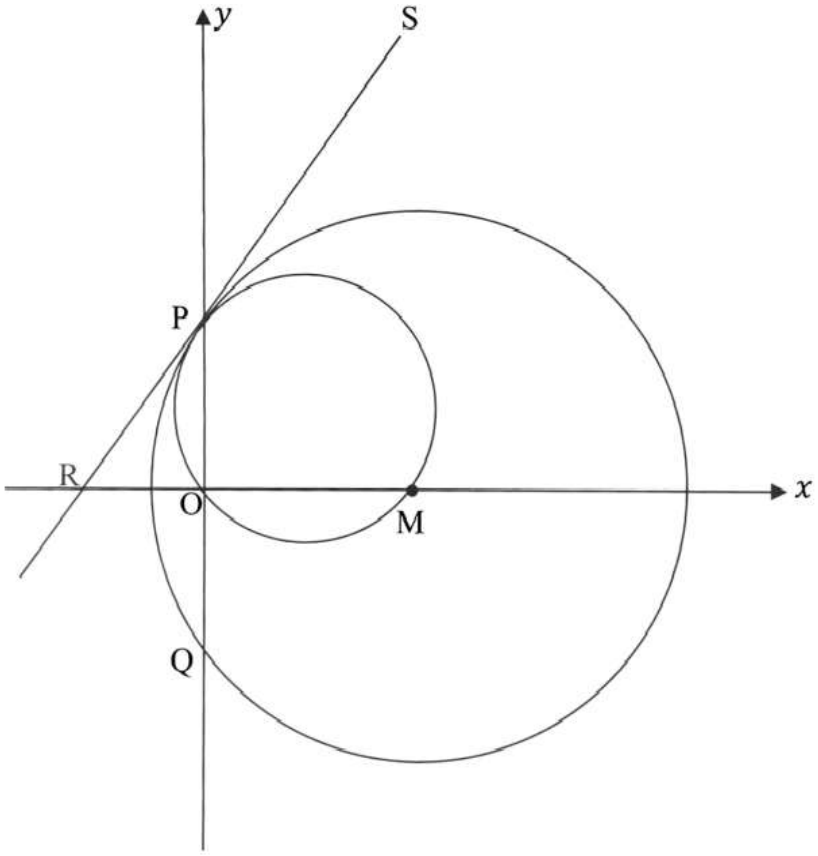
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Mpumalanga

QUESTION 4

A larger circle with equation $x^2 - 8x + y^2 = 9$ cuts the y-axis at P and Q, and has its centre on the x-axis at M. A smaller circle with equation $(x-k)^2 + (y-t)^2 = r^2$ touches the larger circle internally at P and passes through point M, the centre of the larger circle. RPS is a common tangent to both circles at P and cuts the x-axis at R.



4.1 Determine the coordinates of M. (2)

4.2 Determine the length of PQ. (2)

4.3 Determine the equation of the tangent to the circle at P. (5)

4.4 Calculate the area of ΔPRM rounded off to two decimal places. (4)

4.5 Determine the equation of the smaller circle in the form $(x-k)^2 + (y-t)^2 = r^2$. (3)

4.6 Determine the maximum distance between P' and T if P' is the reflection of P along the centre of the smaller circle and T is a point on the larger circle. (3)

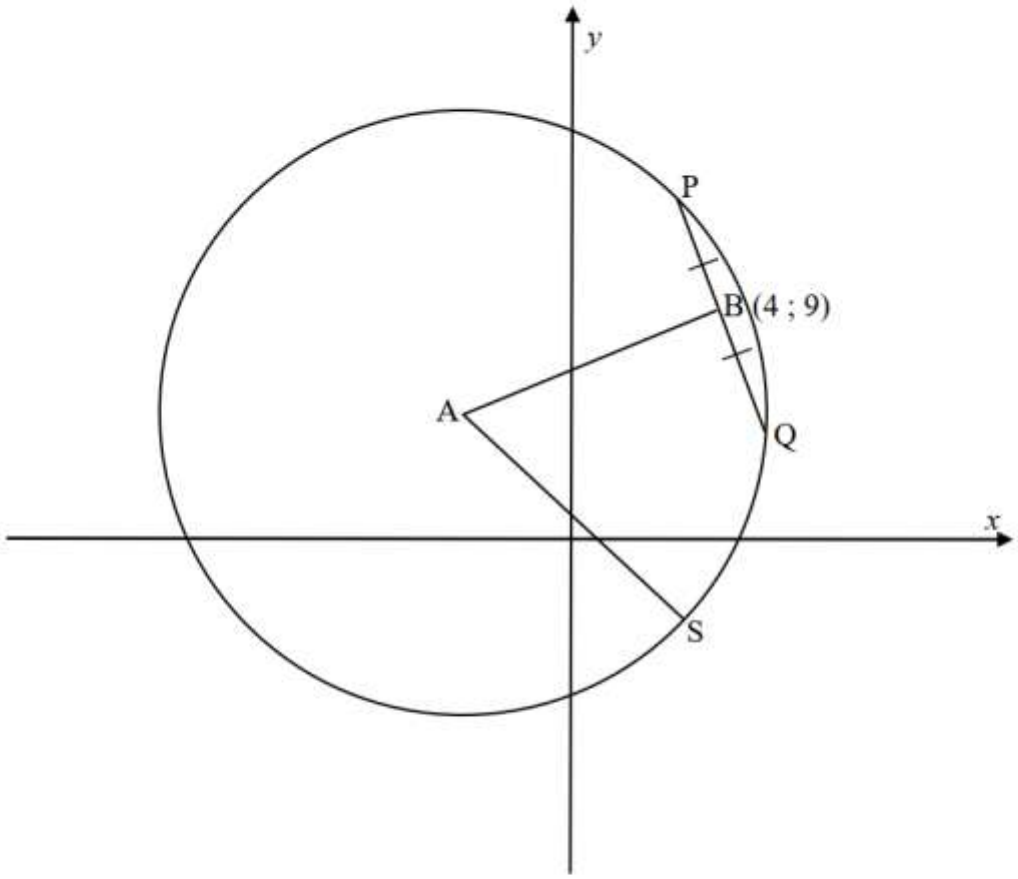
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Northern Cape

QUESTION 4

In the diagram, the equation of the circle with centre A is $x^2 + y^2 + 4x - 12y - 10 = 0$. PQ is a chord of the circle. S, P and Q are points on the circumference. B(4 ; 9) is the midpoint of PQ.



4.1 Write down the coordinates of A. (3)

4.2 Give a reason why AB ⊥ PQ. (1)

4.3 Determine the equation of PQ in the form $y = mx + c$. (4)

4.4 Determine the coordinates of P and Q respectively. (5)

4.5 Determine the value(s) of k such that the line $y = 2x + k$ does NOT intersect the circle centred at A. (7)

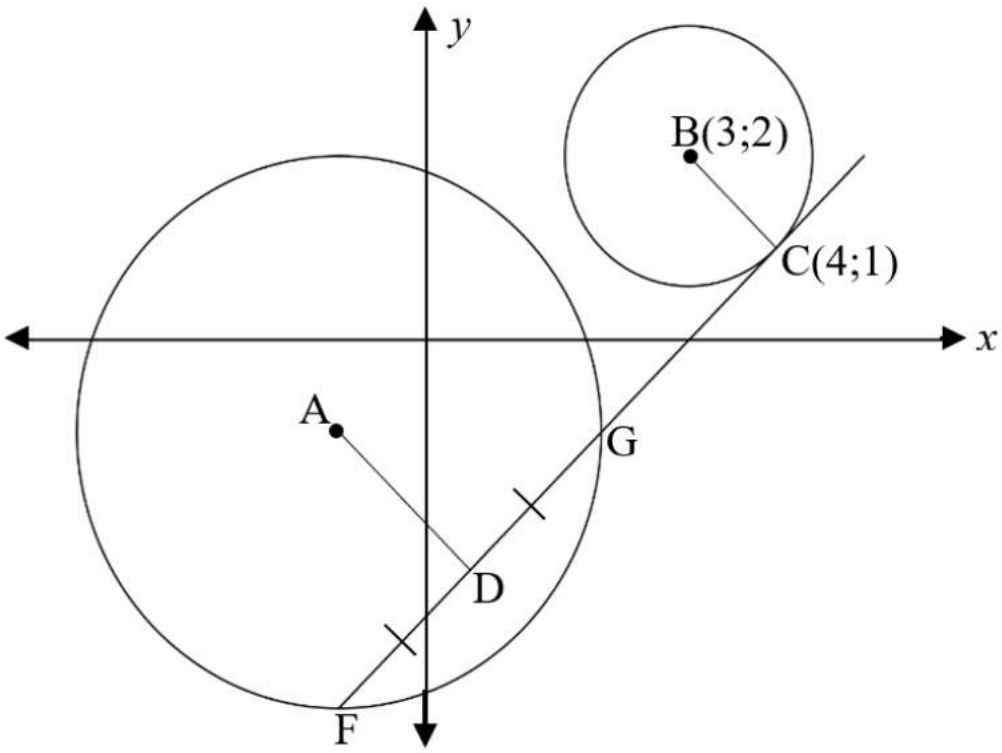
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North-West

QUESTION 4

In the diagram below the circle with centre A has the equation $(x+1)^2+(y+1)^2=9$.
FG is a chord of circle A. AD bisects chord FG.
FGC is a tangent to the circle with centre B$(3\,;\,2)$ at point C$(4\,;\,1)$.



4.1 Write down the coordinates of A. (1)

4.2 Determine the equation of tangent FC, in the form $y=mx+c$. (4)

4.3 Given: AD = $\frac{\sqrt{10}}{2}$ units. Calculate the length of FG. (4)

4.4 Determine the length of AB. (2)

4.5 Another circle with centre B, touches the circle with centre A at K.
Determine the equation of the new circle. (3)
[14]

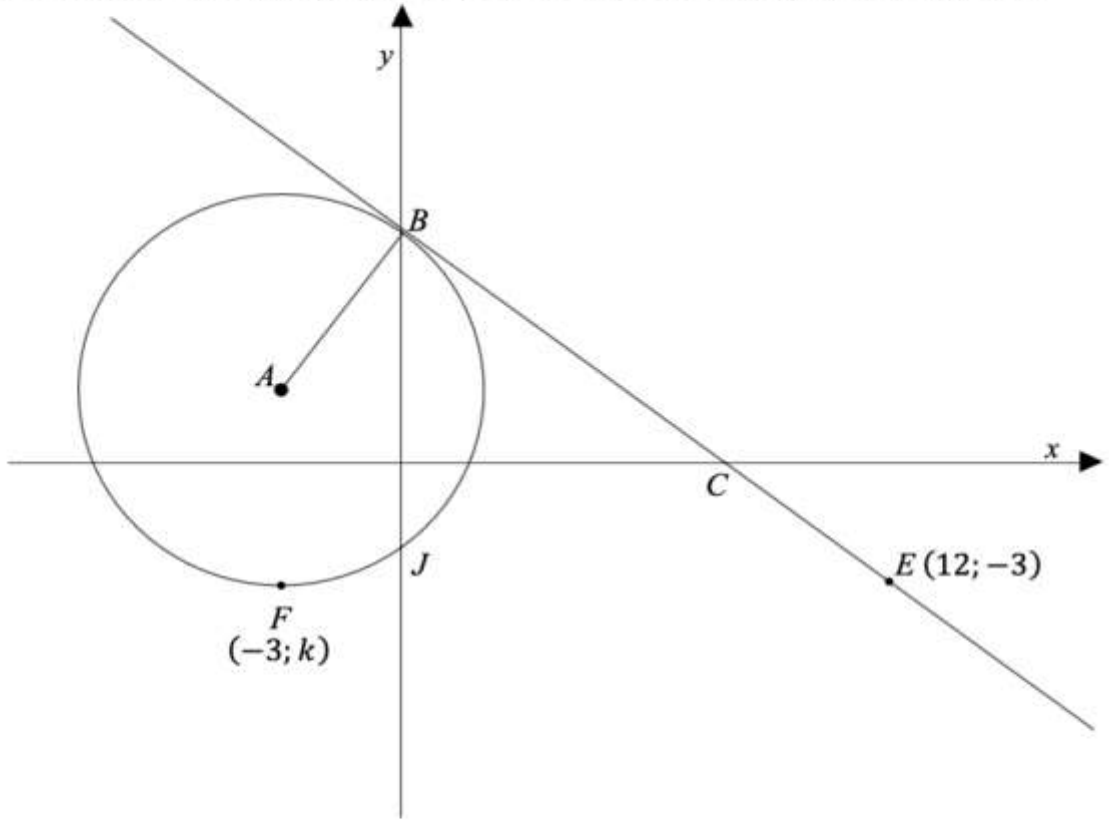
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SACAI

QUESTION 4

The circle with centre A is drawn in the diagram below.

Line BE is a tangent to the circle at point B and E is the point $(12; -3)$.
$F(-3;\ k)$ is a point on the circumference of the circle and AF is parallel to the *y*-axis.
Points B and J are the *y*-intercepts of the circle, and C is the *x*-intercept of line BE.



4.1 If it is given that the equation of the circle is $x^2 + 6x + y^2 - 4y - 12 = 0$, determine the coordinates of A, the centre of the circle, as well as the length of the radius of the circle. (4)

4.2 Determine the gradient of AB. (5)

4.3 Determine the value of *k*, if the radius of the circle is 5 units. (2)

4.4 If FE is a tangent to the circle at point F, determine the length of **BE**. Give a reason for your answer. (3)

4.5 A circle with centre E is drawn so that it touches the circle with centre A externally. Determine the equation of the circle with centre E. (4)

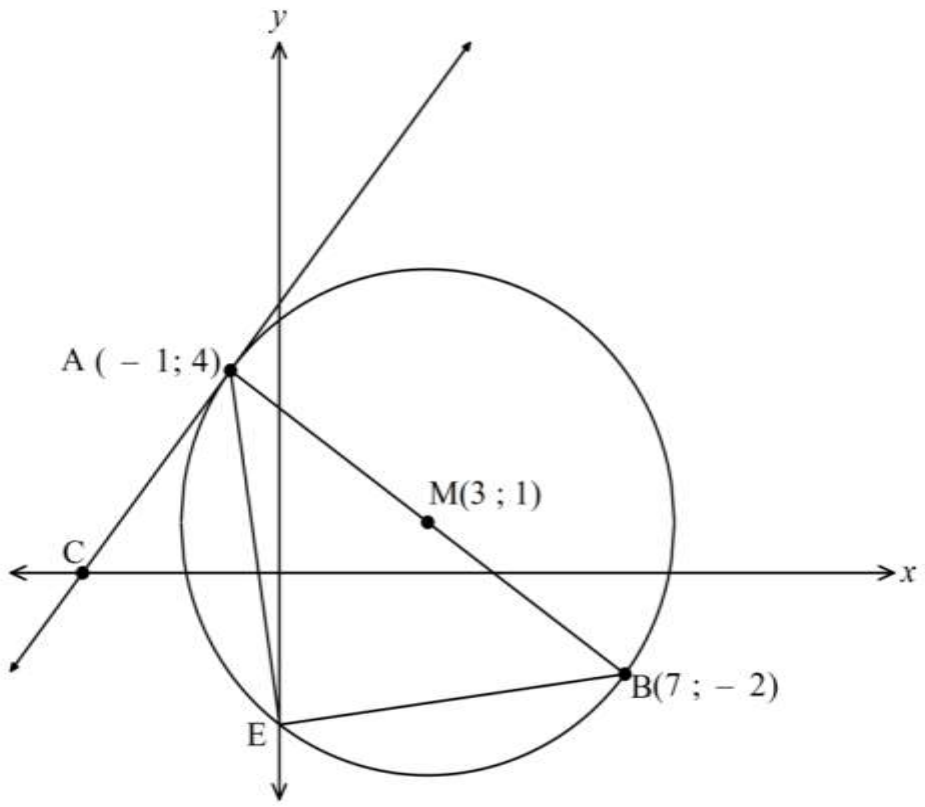
[18]

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Western Cape

QUESTION 4

In the Cartesian plane below, a circle centred at M(3; 1) passes through the point A(−1; 4). B(7; −2) is another point on the circle such that the line segment AB is a diameter of the circle. The tangent to the circle at point A intersects the x – axis at point C. E is a point where the circle intersects the y – axis.



4.1 Determine the equation of the circle in the form:
$(x-a)^2+(y-b)^2=r^2$. (3)

4.2 Determine the coordinates of E. (3)

4.3 Determine the length of the tangent AC. (6)

4.4 Determine the value(s) of k if $k^2+x^2+y^2-35=2(xk+y)$ is a tangent to circle M. (7)

[19]

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TRIGONOMETRY

Eastern Cape

QUESTION 5

5.1 Given: $\sin 49° = q$, determine the following in terms of q:

5.1.1 $\tan 41°$ (2)

5.1.2 $\cos 229°$ (2)

5.1.3 $\sin 4°$ (4)

5.2 Given: $f(x) = \dfrac{\sin(x-180°).\sin(90°+x)}{\sin^2 x - \cos^2(360° - x)}$

5.2.1 Simplify $f(x)$ to a one trigonometric ratio of x. (7)

5.2.2 For which values of $x \in [-180° + 0°]$, is $f(x)$ undefined? (2)

[17]

Free State

QUESTION 5

5.1 If $\sin A = \dfrac{\sqrt{20}}{6}$ and $\hat{A} > 90°$, determine, **without using a calculator**, the value of:

5.1.1 $\sin 2A$ (5)

5.1.2 $\sin\dfrac{A}{2}$ (3)

5.2 Simplify the following expression to a single trigonometric function:

$$\frac{\sin x.\sin(90° + y) - \cos x.\sin(180° + y)}{\cos x.\cos(y - 360°) + \sin(-x).\sin y}$$ (6)

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5.3 Prove that $\tan\theta + \frac{\cos\theta}{\sin\theta} = \frac{2}{\sin 2\theta}$ (5)

5.4 Given: $\sin\theta = m$

5.4.1 Write down the values of m for which $\sin\theta$ is defined. (2)

5.4.2 Determine the general solution for θ if:

$$3\sin\theta - \frac{4}{\sin\theta} + 4 = 0 \quad \text{and} \quad \theta \in [-180°; 180°]$$ (6)

5.5 Find the value of $\tan\theta$, if the distance between A($\cos\theta$; $\sin\theta$) and B(6 ; 7) is $\sqrt{86}$. (4)

[31]

Gauteng

QUESTION 5

Given: $\sin 2\theta = \frac{\sqrt{17}}{9}$, where $2\theta \in [0° ; 90°]$.

Without using a calculator, determine the value of:

5.1.1 $\cos 2\theta$ (2)

5.1.2 $\sin(2\theta - 45°)$ (3)

5.1.3 $\cos\theta$ (3)

5.2 Given: $\sin 18° = p$

Without using a calculator, determine EACH of the following in terms of p:

5.2.1 $\sin 198°$ (2)

5.2.2 $\tan 522°$ (3)

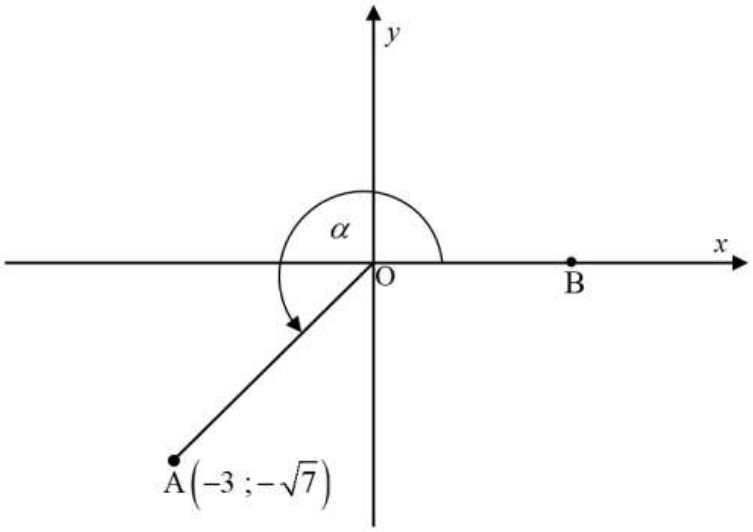
5.2.3 $\sin 9° \cos 9°$ (3)

[16]

KZN

QUESTION 5

5.1 In the diagram, line OA is given with $A\left(-3:-\sqrt{7}\right)$. $B\hat{O}A=\alpha$.



Determine, WITHOUT the use of a calculator the value of:

5.1.1 $\cos\alpha$ (3)

5.1.2 $\sin 3\alpha\cos 2\alpha-\cos 3\alpha\sin 2\alpha$ (2)

5.2 Simplify the following, WITHOUT the use of a calculator:

$$\frac{\sin 290^\circ.\sin\left(90^\circ+x\right).\sin 160^\circ}{\cos\left(-x-360^\circ\right).\sin 220^\circ}$$ (7)

5.3 Given: $$\frac{\frac{1}{4}-\cos\left(\theta-60^\circ\right).\cos\left(\theta+60^\circ\right)}{\sin 2\theta}=\frac{1}{2}\tan\theta$$

5.3.1 Prove the above identity, WITHOUT the use of a calculator. (7)

5.3.2 For which values of θ, in the interval $\theta\in[0^\circ;180^\circ]$, will the identity be undefined? (3)

[22]

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Limpopo

QUESTION 5

5.1 Given: $\tan\theta = -\frac{5}{4}$ and $\theta \in (0° ; 180°)$. Calculate the following without using a calculator:

5.1.1 $\sin(180° + \theta)$ (3)

5.1.2 $\sqrt{41}\cos\theta - 4\sin(-150°).\cos 180°$ (4)

5.2 Complete the following: The equation $\cos\theta = a$ is soluble if a is an element of ..... (1)

5.3 If $\tan 36° = t$, express the following in terms of t:

5.3.1 $\frac{1}{\sin 306°}$ (3)

5.3.2 $\tan 81°$ (5)

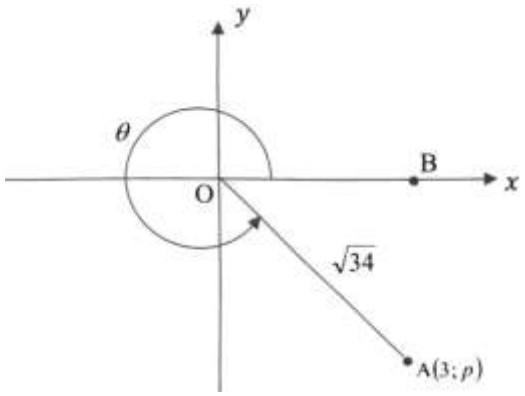
[16]

Mpumalanga

QUESTION 5

5.1 Given: $\sin(P - Q) = \sin P\cos Q - \cos P\sin Q$. Use the formula given to derive a formula for $\cos(P + Q)$. (3)

5.2 In the diagram below, $A(3; p)$ is a point in the Cartesian plane. $OA = \sqrt{34}$ and $B\hat{O}A = \theta$, which is a reflex angle.



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Determine **without using a calculator** the value of:

5.2.1 p (2)

5.2.2 $\cos(60° + \theta)$ (4)

5.3 Determine the value of k:

$\sin 50° = \sin 145° \cos(360° - k) - \cos(k + 90°)\cos(-35°)$ if $0° \leq k \leq 90°$. (5)

5.4 Prove that: $4\cos\theta - \dfrac{1+\cos 2\theta}{\cos\theta} = \dfrac{\sin 2\theta}{\sin\theta}$ (4)

5.5 Determine the general solution of $2\cos x = 3\tan x$ (6)

5.6 Determine the value of $3 - 4\sin^2 22{,}5°$ **without using a calculator**. (4)

[28]

Northern Cape

QUESTION 5

5.1 It is given that $17\sin\theta + 8 = 0$ where $\theta \in (0° ; 270°)$. Determine the value of the following without using a calculator:

5.1.1 $\tan\theta$ (2)

5.1.2 $\cos(180° - \theta)$ (2)

5.1.3 $\sin\left(\dfrac{\theta}{2} - 15°\right).\cos\left(\dfrac{\theta}{2} - 15°\right)$ (6)

5.2 Given: $\dfrac{\tan(180° - x).\cos(-x).\cos(180° + x)}{4\cos(90° + x)}$

5.2.1 Simplify the expression above fully to a single trigonometric ratio. (6)

5.2.2 Hence, determine the values of x in the interval $x \in [0° ; 360°]$ for which $\sqrt{\dfrac{\tan(180° - x).\cos(-x).\cos(180° + x)}{4\cos(90° + x)}}$ will be real. (2)

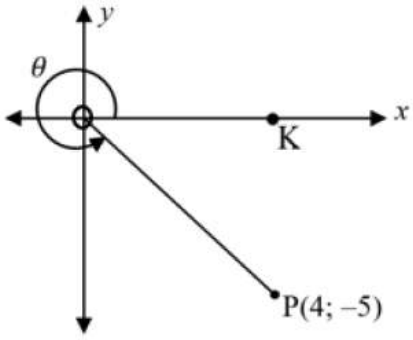
[18]

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North-West

QUESTION 5

5.1 In the diagram below, line OP is given with $P(4;-5)$. $K\hat{O}P = \theta$



Calculate, **without using a calculator**, the numerical value of the following:

5.1.1 $\sin^2(180° + \theta)$ (4)

5.1.2 $\tan(-\theta)$ (2)

5.2 Calculate, **without using a calculator**, the value of the following:

5.2.1 $\cos 15°$ (6)

5.2.2 $$\frac{\cos(90° + x).\cos(180° - x)}{\cos^2(180° + x).\tan(180° - x)}$$ (5)

5.3 Given: $$\frac{\sin 2\theta + 2\cos\theta - 2\cos^3\theta}{1 + \sin\theta} = \sin 2\theta$$

5.3.1 Proof the identity. (5)

5.3.2 For which values of θ in the interval $[-360°;360°]$ is the identity in QUESTION 5.3.1 undefined? (2)

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5.4 Calculate the maximum value of $\frac{4}{2+\cos x}$ (2)

[26]

SACAI

QUESTION 5

5.1 If $\sin 64° = m$, determine the following in terms of m. Simplify answers to a single term.

5.1.1 $2\sin 32°.\cos 32°$ (2)

5.1.2 $\tan 116°$ (3)

5.1.3 $\cos 34°$ (4)

5.2 Simplify the following expression **without the use of a calculator**:

$$\frac{\cos^2 15° - \frac{1}{2}\sin^2 55° - \frac{1}{2}\cos^2 55°}{\sin 73°\cos 317° + \cos 73°\sin 223°}$$ (8)

5.3 Prove the following identity:

$$\frac{2\cos^3 x - 2\sin^3 x}{2+\sin 2x} = \cos x - \sin x$$ (5)

5.4 Given: $\frac{5}{2}\cos x + \frac{5\sqrt{3}}{2}\sin x = -1$

5.4.1 Show that the equation above can be written as:

$$\sin(x + 30°) = -\frac{1}{5}$$ (4)

5.4.2 Hence, determine the general solution of:

$$\sin(x + 30°) = -\frac{1}{5}$$ (4)

[30]

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Western Cape

QUESTION 5

5.1 Given: $\cos 17° = t$. Express each of the following in terms of t **without the use of a calculator.**

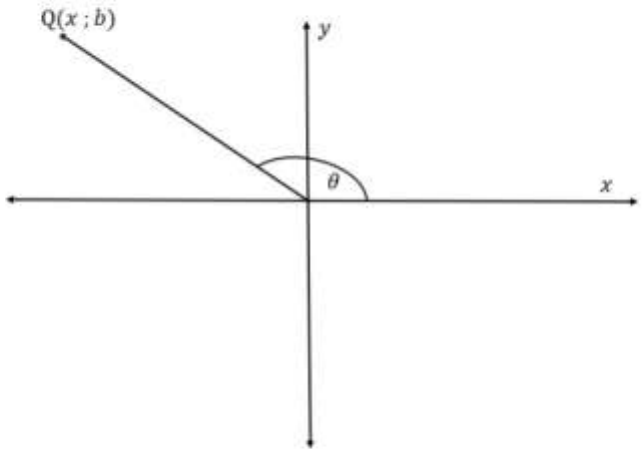
5.1.1 $\cos 163°$ (2)

5.1.2 $\sin 13°$ (3)

5.2 Simplify the following expression to ONE trigonometry term:

$$\frac{\sin x}{\cos x \,.\tan x} + 2\sin(180° - x).\cos(90° + x) \quad (5)$$

5.3 In the diagram below, $Q(x\,;b)$ is a point in the second quadrant and it is given that $\sin\theta = \frac{b}{\sqrt{b^2+4}}$



5.3.1 Determine the value of x. (3)

5.3.2 Write $\tan(360° - \theta)$ in terms of b in its simplest form. (2)

5.3.3 Show that: $\cos 2\theta = \frac{4 - b^2}{b^2 + 4}$ (3)

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5.4 Determine the general solution of $3\cos 2x = 1 + 5\sin x$. (7)

5.5 Determine, without the use of a calculator, the value of:

$$\cos(\theta + 105°).\sin(\theta + 165°) + \cos(\theta + 15°).\sin(\theta + 75°)$$ (4)

5.6 Given: $a + 1 = \frac{3}{2}\cos\theta$ and $a + 2 = \frac{1}{a}$

Determine the value of $\cos 2\theta$, without the use of a calculator. (5)
[34]

Eastern Cape

QUESTION 6

6.1 Given: $\cos(A - B) = \cos A\cos B + \sin A\sin B$

Use the formula given above to derive a formula for $\cos(A + B)$ (3)

6.2 **Without using a calculator**, prove that

$$\frac{\sin 22°.\cos 320° + \sin 40°\sin 68°}{\sin 391°.\cos 31°} = 2$$ (6)

6.3 It is given that $\cos 2x + 5\sin x = 3$. Determine the values of x in the interval where $-360^0 \le x \le 0^0$ (5)
[14]

Gauteng

QUESTION 6

6.1 Simplify the following, **without the use of a calculator**:

$$\frac{\sin 100°\tan^2 225°}{\cos 10°\sin 30°}$$ (4)

6.2 Prove the following identity:

$$\frac{\cos^2\theta - \cos\theta - \sin^2\theta}{2\sin\theta\cos\theta + \sin\theta} = \frac{1}{\tan\theta} - \frac{1}{\sin\theta}$$ (4)

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6.3 If $\sin 76° = x$ and $\cos 76° = y$, show that $x^2 - y^2 = \sin 62°$. (4)

[12]

Limpopo

QUESTION 6

6.1.1 Prove the identity: $2\cos\theta.\cos 2\theta + \dfrac{\sin^2 2\theta}{\cos\theta} = 2\cos\theta$ (6)

6.1.2 For which value(s) of θ will the identity be undefined, if $\theta \in [0° ; 180°]$? (1)

6.2 Find the general solution of $\cos\theta = \dfrac{1}{\cos\theta} + \dfrac{5}{6}$. (6)

6.3 If area Δ PQR $= \dfrac{1}{2}pq\sin R$, show that the area Δ PQR can also be expressed as $\dfrac{q^2 \sin P \sin R}{2\sin Q}$. (2)

[15]

Northern Cape

QUESTION 6

6.1 Given: $f(x) = \dfrac{\sin 2x \,.\, \cos 2x}{2\sin^2 2x - 2\cos^2 2x}$

6.1.1 Simplify $f(x)$ to a single trigonometric ratio. (4)

6.1.2 Hence, write down the equations of the asymptotes of f for $x \in [0° ; 90°]$. (2)

6.2 Determine the general solution for the following if it is a converging geometric series and $\cos x \neq 0$:

$$\sum_{r=0}^{\infty} (\sin x)^{2r} = 2\tan x$$

(7)

[13]

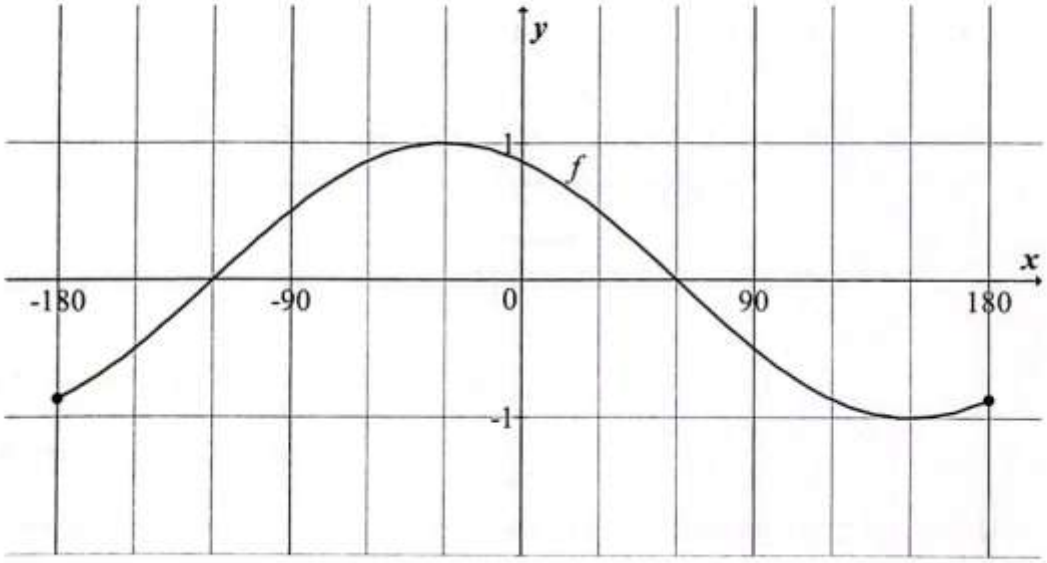
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TRIGONOMETRIC GRAPHS

Eastern Cape

QUESTION 7

Given: $f(x)=a\cos(x+p)$ where $x\in[-180^0;180^0]$



7.1 Determine the values of a and p. (2)

7.2 Write down the period of f (1)

7.3 Sketch the graph of $g(x)=-\sin x$, where $x\in[-180^0;180^0]$ on the grid provided in the ANSWER BOOK. Clearly indicate intercepts with the axes. (3)

7.4 Write down the values of x where $g(x)=f(x)$ in the interval $x\in[-180^0;180^0]$. (2)

7.5 Determine the range of h, if $h(x)=-g(x)-2$. (2)

[10]

Free State

QUESTION 6

Consider: $f(x)=\cos(x-45°)$ and $g(x)=\tan\frac{1}{2}x$ for $x\in[-180°;180°]$

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6.1 On the grid provided in the ANSWER BOOK, draw sketch graphs of f and g on the same set of axes for $x \in [-180°;180°]$. Show clearly all the intercepts on the axes, the coordinates of the turning points and the asymptotes. (6)

6.2 Use the graphs to answer the following questions for $x \in [-180°;180°]$.

6.2.1 Write down the solutions of $\cos(x-45°)=0$ (2)

6.2.2 Write down the equations of the asymptote(s) of g (2)

6.2.3 How many solutions exist for the equation $\cos(x-45°) = \tan\frac{1}{2}x$? (1)

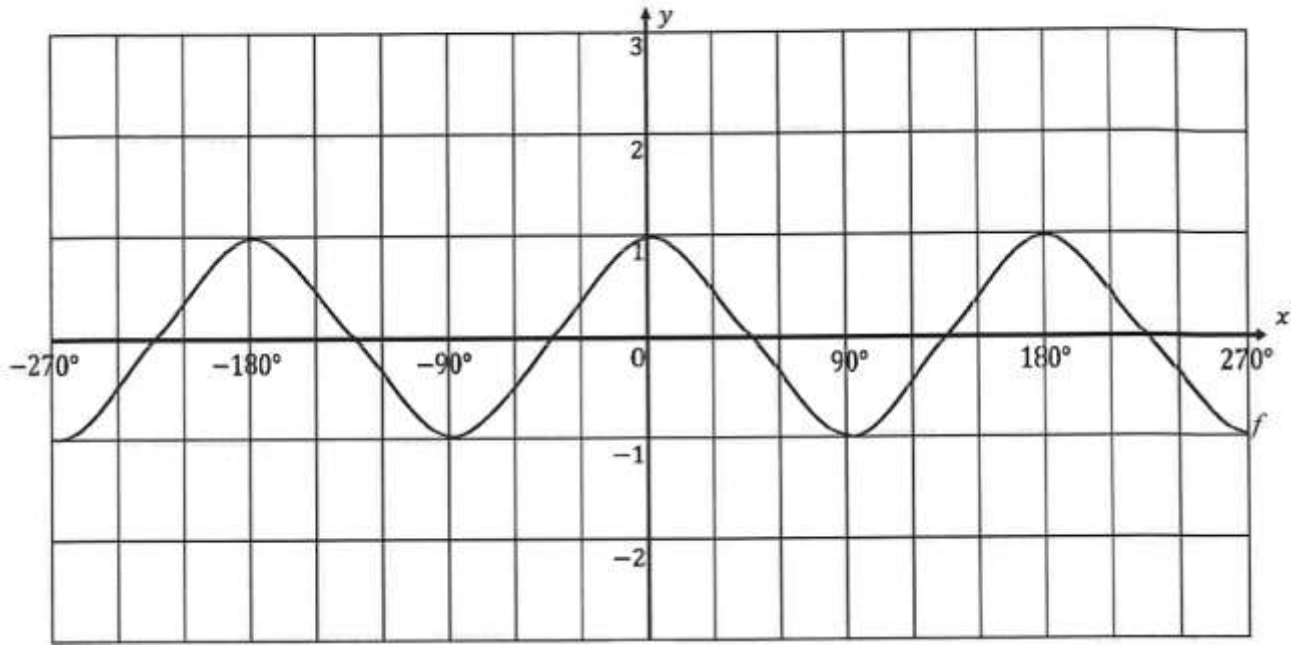
6.2.4 For what value(s) of x is $f(x).g(x) > 0$? (3)

[14]

Gauteng

QUESTION 7

In the diagram below, the graph of $f(x) = \cos 2x$ for the interval $x \in [-270°; 270°]$ is drawn.



7.1 Write down the period of f. (1)

7.2 Write down the range of $3f(x)$. (2)

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7.3 **On the same set of axes as f above**, sketch the graph of $g(x) = 1 - \sin x$. Show ALL turning points and intercepts with the axes. (3)

7.4 Determine the general solution of $f(x) = g(x)$. (6)

7.4 Determine the value(s) of x in the interval $0° < x \leq 270°$ for which:

7.4.1 $f'(x) = 0$ (2)

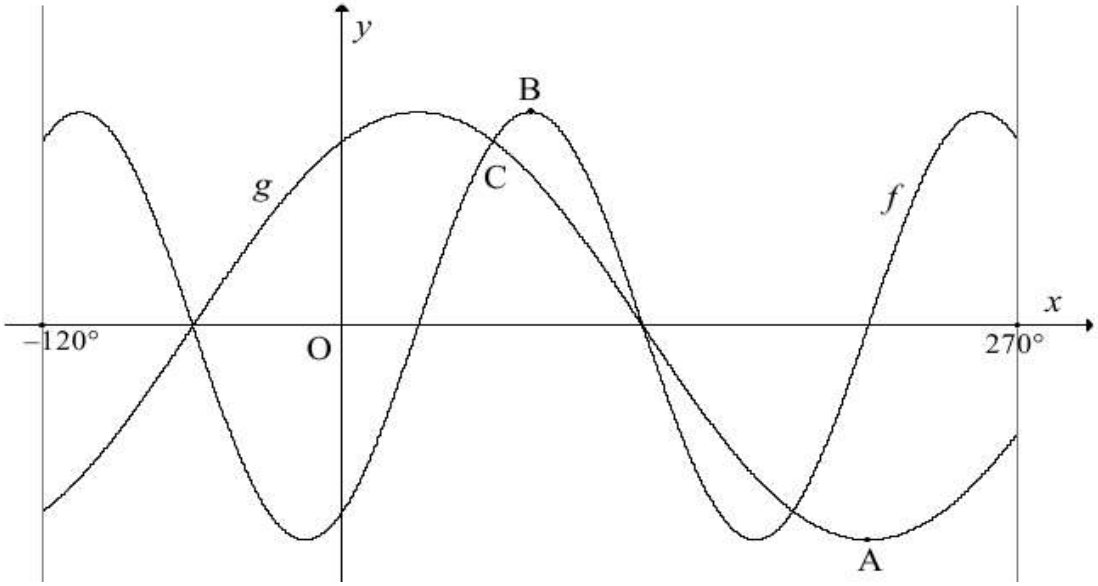
7.4.2 $f(x + 30°) - 1 = 0$ (1)

[15]

KZN

QUESTION 6

In the diagram, the graphs of $f(x) = \sin(2x - 60°)$ and $g(x) = \cos(x - 30°)$ are drawn for the interval $x \in [-120°; 270°]$. C is one of the points of intersection of the two graphs. A is a minimum turning point of g and B is a maximum turning point of f.



6.1 Determine the coordinates of:

6.1.1 A (2)

6.1.2 B (3)

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6.2 Write down the period of g. (1)

6.3 Determine the range of $y = 2^{\cos(x-30°)}$ (3)

6.4 Given: $\frac{1}{2}\sin 2x - \frac{\sqrt{3}}{2}\cos 2x = \cos(x-30°)$

6.4.1 Determine the general solution of $\frac{1}{2}\sin 2x - \frac{\sqrt{3}}{2}\cos 2x = \cos(x-30°)$. Show all your calculations. (6)

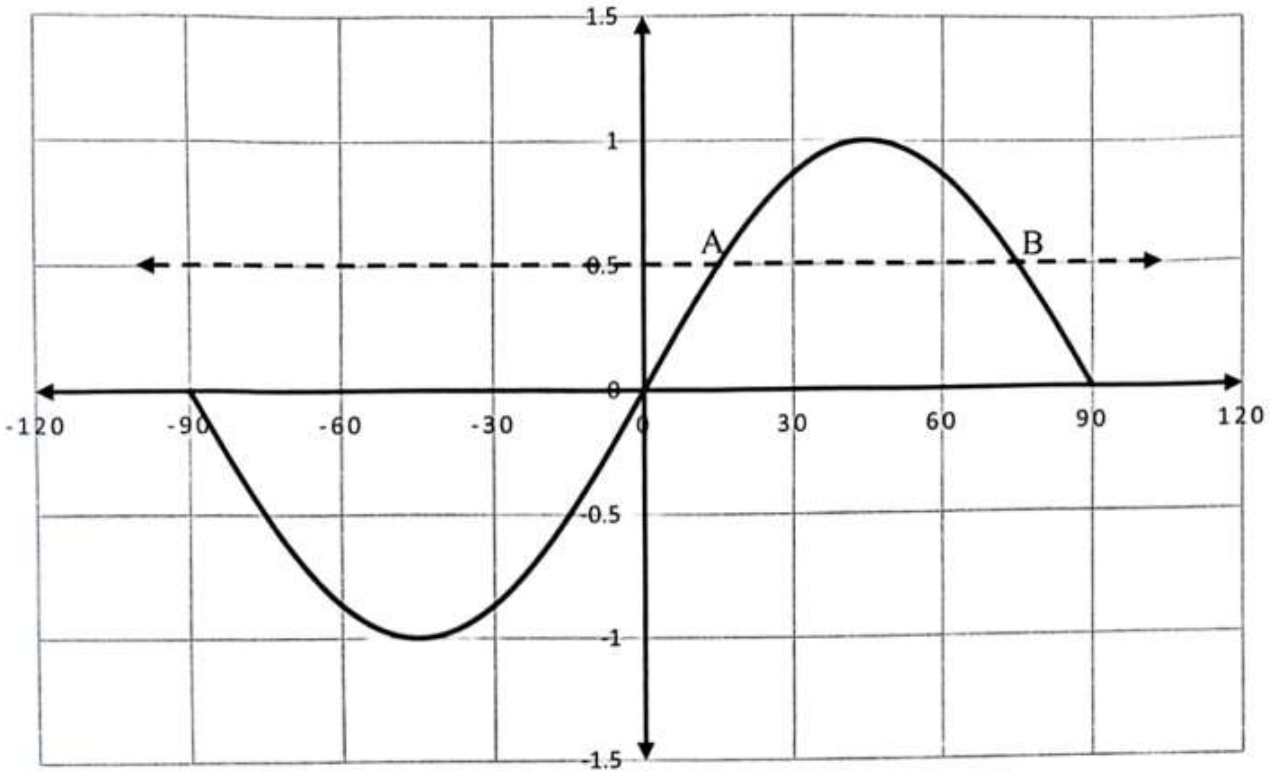
6.4.2 Hence, write down the x-coordinate of C. (1)

[16]

Limpopo

QUESTION 8

The diagram below shows the graph of $f(x) = \sin ax$ for $x \in [-90° ; 90°]$ and $y = \frac{1}{2}$.



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8.1 Determine the value of a. (1)

8.2 Write down the period of $f\left(\frac{3x}{2}\right)$. (2)

8.3 Write down the maximum value of $\sqrt{\sin ax - 1}$. (1)

8.4 If the $x-$axis is shifted to $y=\frac{1}{2}$ to form a new graph $h(x)$, determine the equation of $h(x)$. (1)

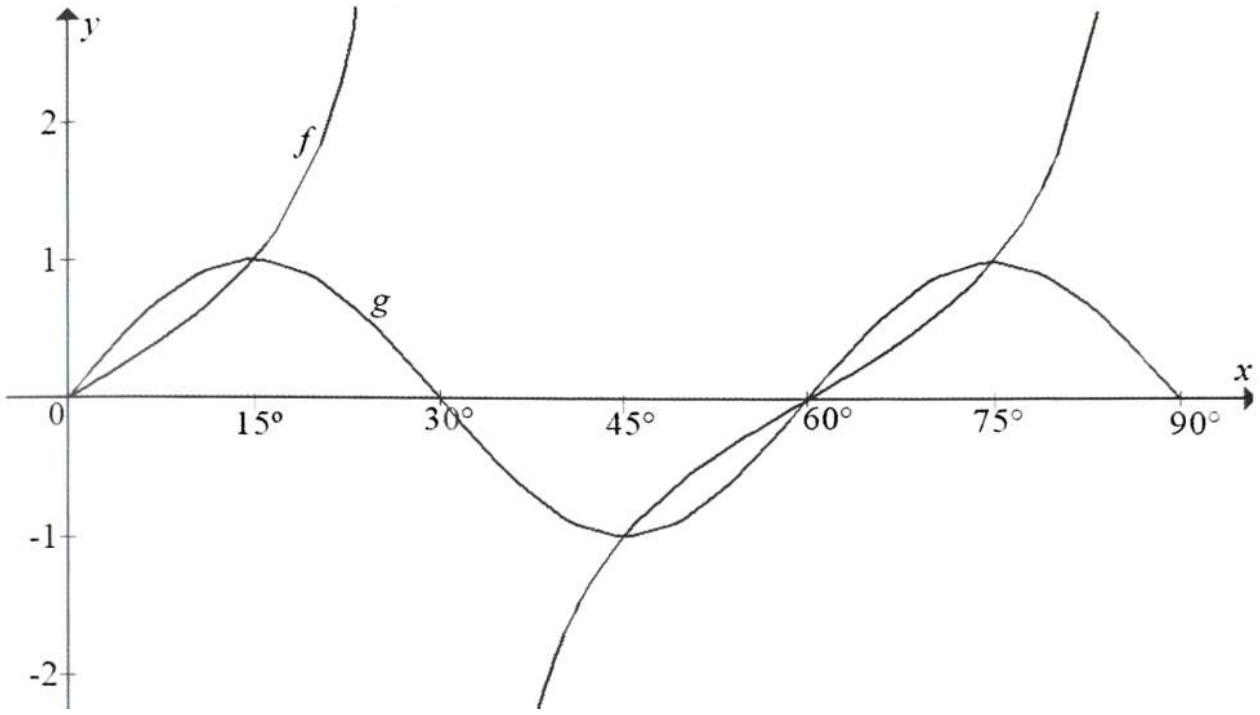
8.5 The $x-$intercepts of $h(x)$ is at A and B. Determine the coordinates of A and B without the use of a calculator. (2)

[7]

Mpumalanga

QUESTION 6

6.1 On the set of axes, the graphs of $f(x)=\tan 3x$ and $g(x)=\sin 6x$ are shown for the interval $x\in[0°;90°]$.



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6.1.1 Write down the period of f. (1)

6.1.2 Write down the equations of the asymptotes of f, in the interval $x \in [0°;90°]$. (2)

6.1.3 Determine using the graphs the values of x for which $f(x) \leq g(x)$ in the interval $x \in [0°;60°]$. (2)

6.2 Given: $h(x) = \sin(6x - 60°)$

6.2.1 Describe how the graph of h is obtained by translating the graph of $y = \sin 6x$. (2)

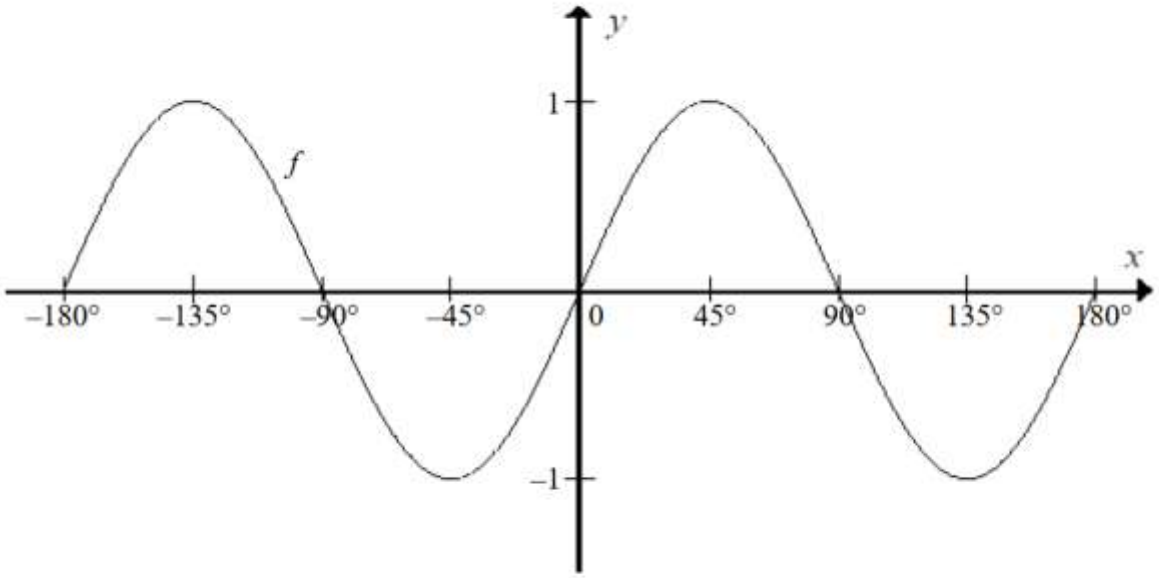
6.2.2 Write down the range of $p(x) = -2h(x) + 1$ (3)

[10]

Northern Cape

QUESTION 7

In the diagram, the graph of $f(x) = \sin 2x$ is drawn for $x \in [-180° ; 180°]$.



7.1 Write down the period of f. (1)

7.2 Write down the range of $\frac{1}{2}f(x) + 1$. (2)

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7.3 On the set of axes provided in the ANSWER BOOK, draw the graph of $g(x) = -\cos(x - 45°)$ for $x \in [-180° ; 180°]$. Clearly show ALL the intercepts with the axes and the coordinates of the turning point. (4)

7.4 Determine the maximum difference of $f(x) - g(x)$ for $x \in [-180° ; 180°]$ (2)

7.5 Determine the number of solutions to the equation $f(x) - g(x) = 0$ for $x \in [-180° ; 180°]$. (2)

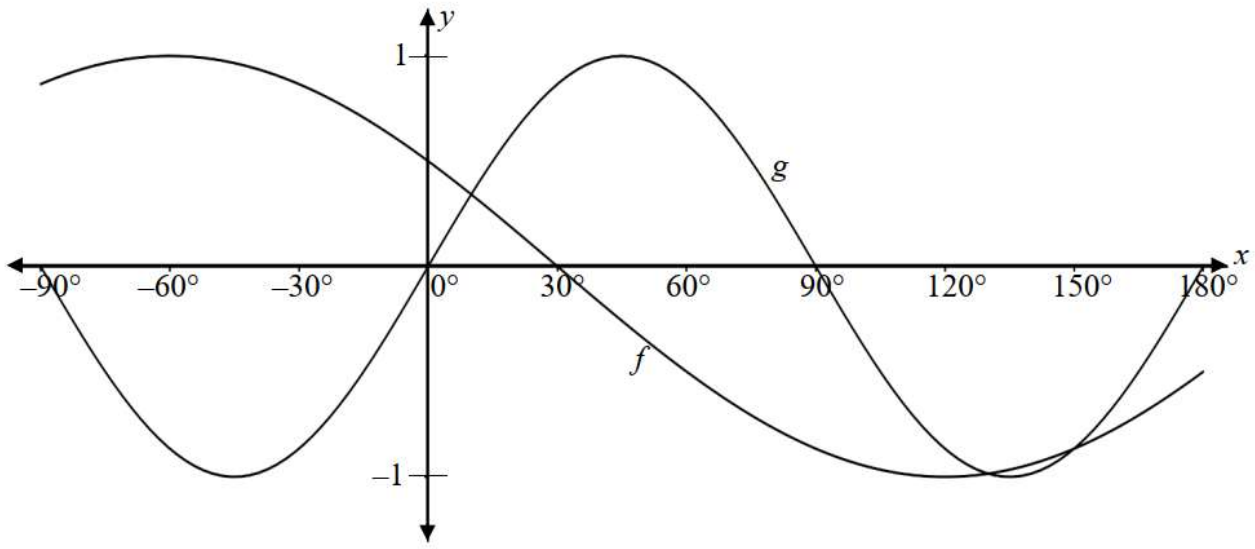
7.6 Determine the values of x for which $\cos(90° + 2x) \cdot \cos(x - 45°) \geq 0$ in the interval $x \in [-180° ; 180°]$. (4)

[15]

North-West

QUESTION 6

In the diagram below, the graphs of $f(x) = \cos(x + 60°)$ and $g(x) = \sin 2x$ are drawn for the interval $x \in [-90°; 180°]$.



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6.1 Calculate the values of x, in the interval $x \in [-90° ; 180°]$ for which $f(x) = g(x)$. (7)

6.2 Write down the period of $g(x)$. (1)

6.3 Use your answer in question 6.1 to determine the value(s) of x where $g(x) \geq f(x)$. (2)

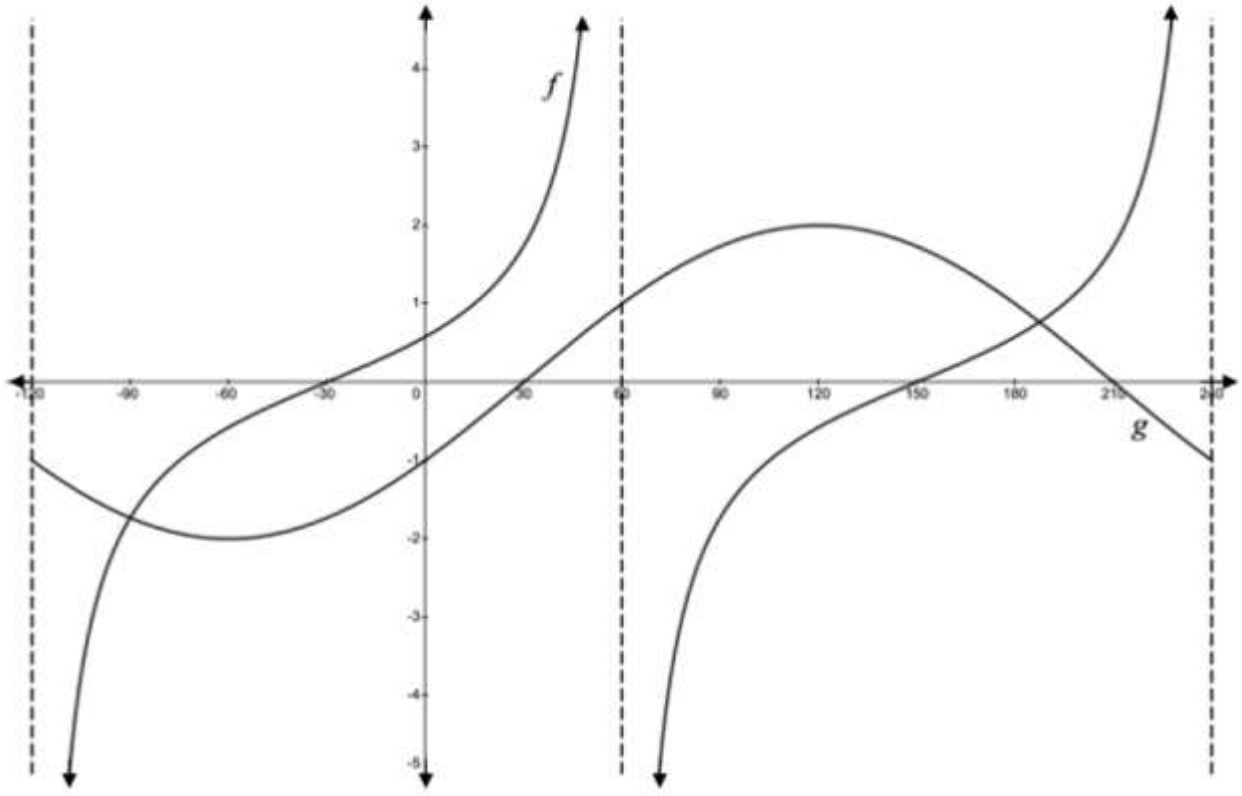
6.4 Describe the transformation from h to p if $h(x) = \sin x$ and $p(x) = \sin(x - 30°)$. (3)

[13]

SACAI

QUESTION 6

The graphs of $f(x) = \tan(x + p)$ and $g(x) = a\sin(x + b)$ are drawn below for $x \epsilon (-120; 240)$.



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6.1 Write down the values of a, b and p. (3)

6.2 Write down the range of $3g(x) - 1$. (2)

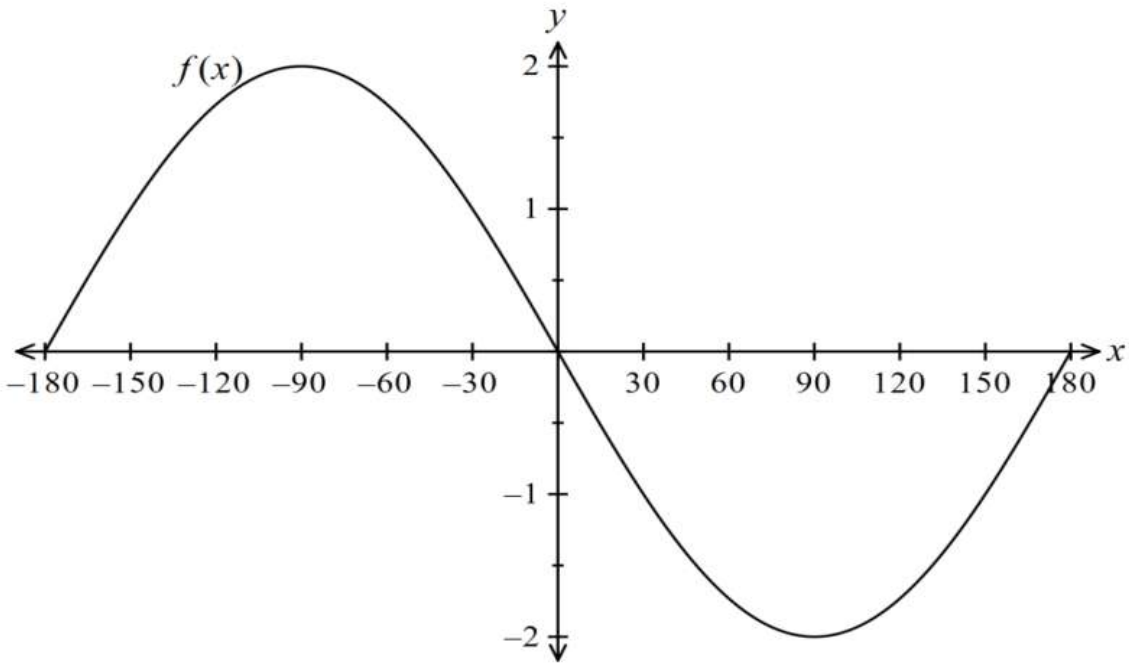
6.3 Use your graph to write down the values of x in the interval $-120 < x < 240$ for which $f(x).g(x) \geq 0$ (4)

[9]

Western Cape

QUESTION 6

The graph of $f(x) = -2\sin x$ is drawn below for $x \in [-180°; 180°]$.



6.1 Write down the period $f\left(\frac{1}{2}x\right)$ (2)

6.2 Draw the graph of $g(x) = \cos(x - 30°)$ for $x\epsilon[-180°; 180°]$ on the same grid provided in your ANSWERBOOK. (3)

6.3 For which value(s) of x is $f'(x) < 0$ and $g'(x) > 0$? (3)

[8]

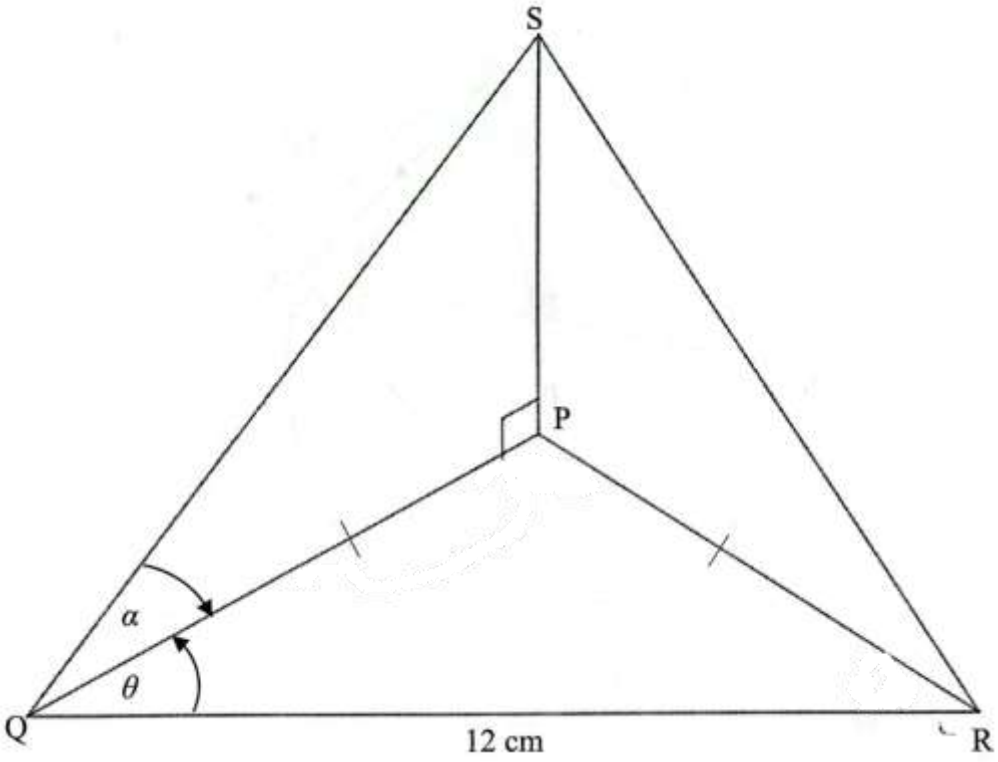
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2D & 3D TRIGONOMETRY

Eastern Cape

QUESTION 8

In the diagram, Q, P and R are points on the same horizontal plane. S is the top of a vertical tower. $QR = 12\text{cm}$, $S\hat{Q}P = \alpha$ and $P\hat{Q}R = \theta$. $PQ = PR$



8.1 Show that $SQ = \dfrac{6}{\cos\theta\cos\alpha}$ (6)

8.2 If it is further given that $\theta = 50°$ and $\alpha = 35°$, calculate the length of SQ. **[Round off your answer to 2 decimal places.]** (2)

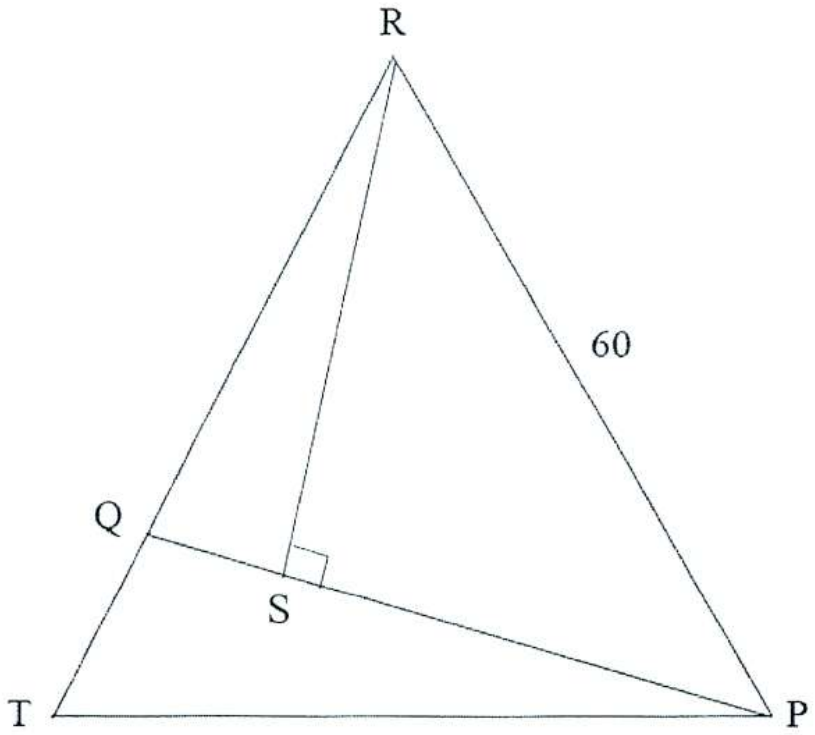
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Free State

QUESTION 7

In the diagram below, ΔTPR is equilateral with PR= 60 units. Q is a point on RT such that RQ : QT = 5:1. It is given that S is any point on the straight line PQ. RS is perpendicular to QP.



7.1 Show by calculation that PQ = 55,68 units. (4)

7.2 Calculate the distance QS. (4)

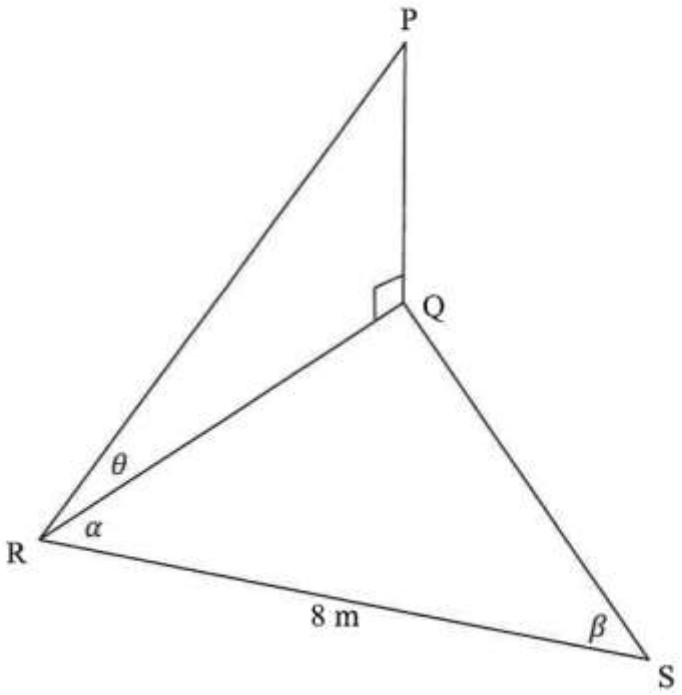
[8]

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Gauteng

QUESTION 8

PQ is a vertical tower and the angle of elevation of P from R is θ. Points Q, R and S are in the same horizontal plane. $Q\widehat{R}S = \alpha$, $Q\widehat{S}R = \beta$ and RS = 8 metres



8.1 Express PQ in terms of QR and θ. (2)

8.2 Show that $QR = \frac{8\sin\beta}{\sin(\alpha+\beta)}$. (2)

8.3 It is further given that $\alpha = \beta$. (4)
Prove that $PQ = \frac{4\sin\theta}{\cos\beta\cos\theta}$.

8.4 If $\beta = 67°$ and $\theta = 25°$, determine the length of PQ. (2)

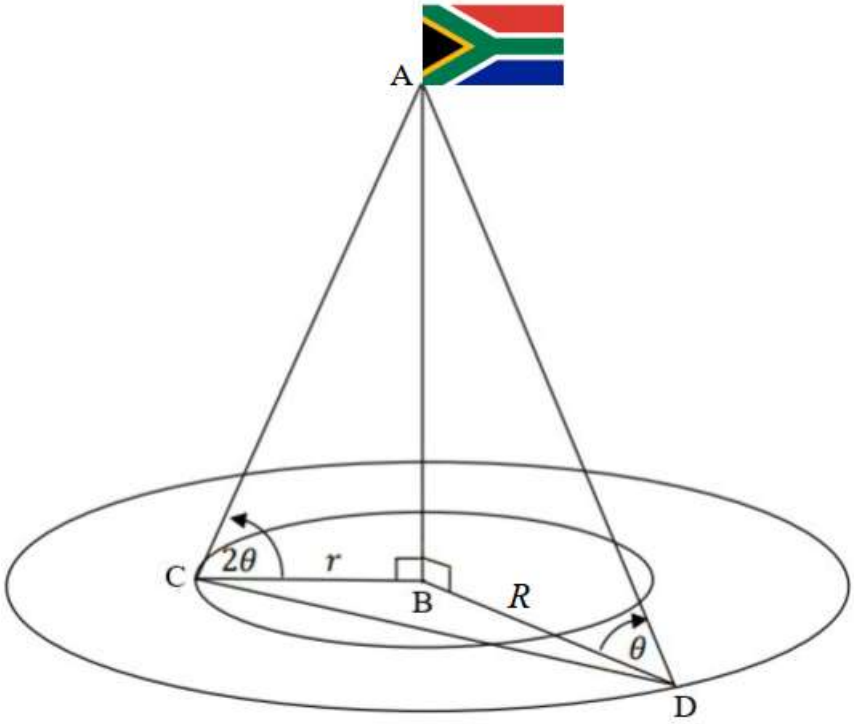
[10]

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KZN

QUESTION 7

In support of Bafana Bafana during the 2026 FIFA World Cup, the South African flag was erected at the Moses Mabhida Stadium in Durban. In the diagram below, AB is a vertical flag pole positioned at the common centre B of two concentric circles which lie in the same horizontal plane. Point C lies on the inner circle and point D lies on the outer circle. The angle of elevation of A from C is 2θ, while the angle of elevation of A from D is θ. The radius of the inner circle is r units and the radius of the outer circle is R units.



7.1 Show that the radius of the outer circle is given by the expression $R = \dfrac{2r\cos^2\theta}{2\cos^2\theta - 1}$. (6)

7.2 If $CD = 7$ m, $\theta = 30°$, $r = 2$ m, calculate the area of ΔBCD, correct to ONE decimal place. (6)

[12]

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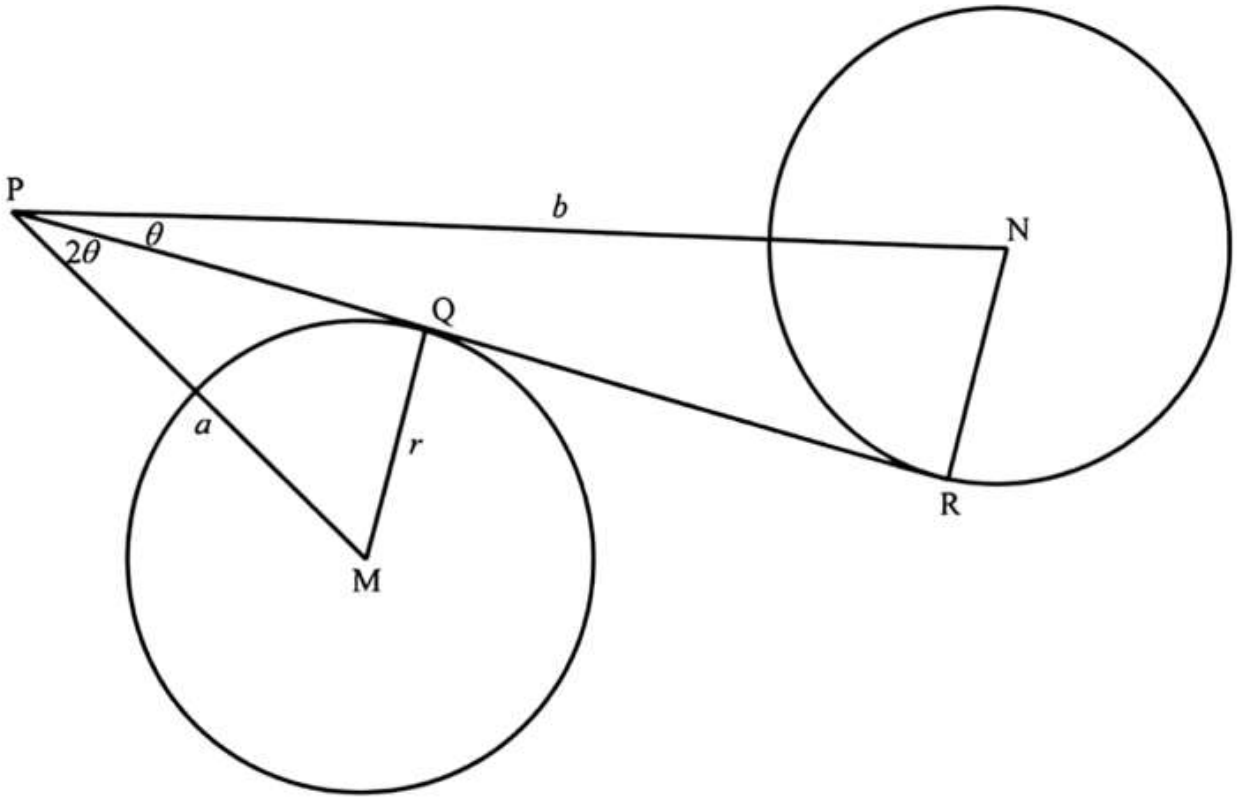
Limpopo

QUESTION 7

7.1 7.1.1 Complete: $\cos(\alpha-\beta)=...$ (1)

7.1.2 Hence, derive a formula for $\sin 2\alpha$. (3)

7.2 PQR is a common tangent at Q and R to circles with centres M and N. Each circle has a radius of r units. $M\hat{P}Q=2\theta$, $R\hat{P}N=\theta$, $PM=a$ and $PN=b$.



7.2.1 Express r in terms of b and θ. (2)

7.2.2 If it is also given that $r=a\sin 2\theta$, express b in terms of a and θ. Leave the answer in the simplest form. (3)

7.2.3 Hence, prove that $QR=a$. (4)

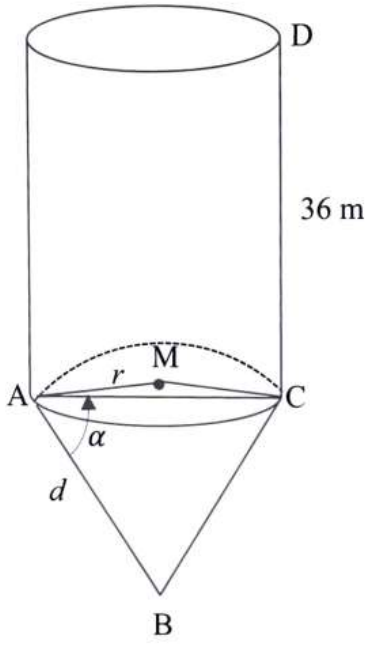
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Mpumalanga

QUESTION 7

The diagram represents a right cylindrical silo. M is the centre of the circular base with BA and BC tangents to the base at A and C. MA, the radius of the circular base is r. A, M and C lie on the same horizontal plane. DC represents the vertical height of the cylindrical part of the silo.
$B\hat{A}C = \alpha$, $DC = 36$ metres and AB = d.



7.1 Express $\hat{B}$ in terms of α (2)

7.2 Show that $AC = 2d\cos\alpha$ (4)

7.3 If AMCB is a cyclic quadrilateral, $AC = 12{,}22$ m and $A\hat{B}C = 72°$. Show that $r = 7{,}55$ metres. (3)

7.4 Calculate the volume of the cylindrical part of the silo correct to the nearest cubic metre. (2)

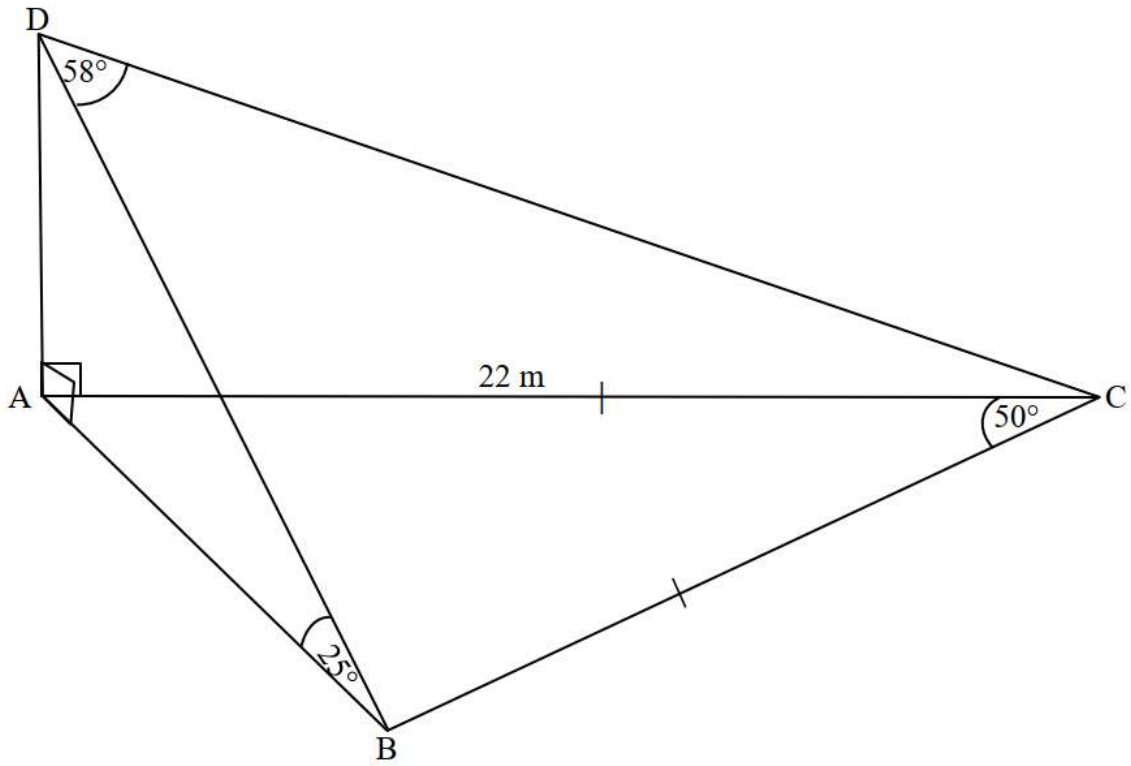
[11]

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Northern Cape

QUESTION 8

In the diagram, A, B and C are points in the same horizontal plane. AD is a vertical tower anchored at B and C. The angle of elevation of D from B is 25°, $A\hat{C}B = 50°$ and $B\hat{D}C = 58°$.
AC = BC = 22 metres.



Calculate the following:

8.1 The area of ΔABC (3)

8.2 The length of AB (2)

8.3 The length of DB (2)

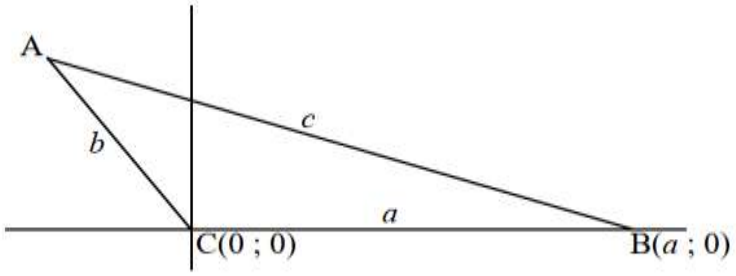
8.4 The magnitude of $D\hat{B}C$ (3)
[10]

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North-West

QUESTION 7

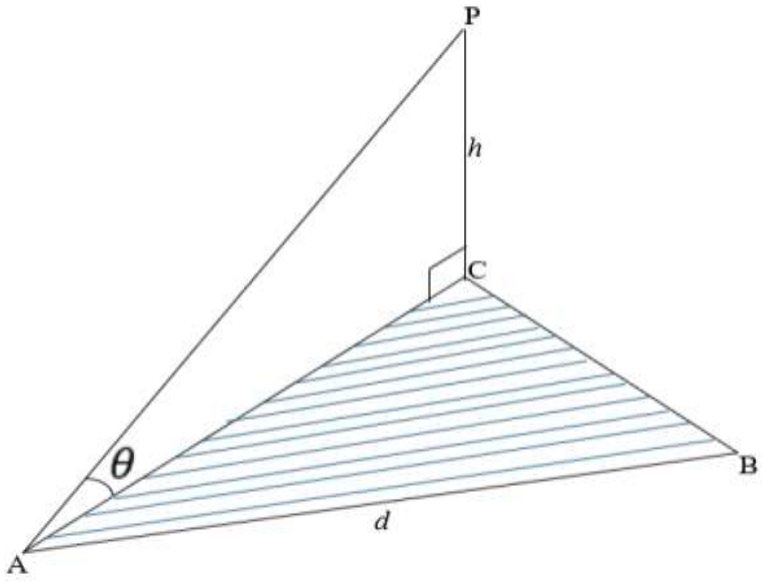
7.1 In the diagram below, ΔABC is $90° \leq C \leq 180°$.



Proof: $c^2 = a^2 + b^2 - 2ab\cos C$. (4)

7.2 In the diagram below, A, B and C are three points in the same horizontal plane.

- P is the image of a balloon vertically above C
- The angle of elevation to P from A is θ
- $A\hat{B}C = 90° - \alpha$
- $BC = \frac{1}{2}AB$
- $AB = d$ units



7.2.1 Prove that $h = \frac{d.\tan\theta.\sqrt{5 - 4\sin\alpha}}{2}$, where h is the height of the balloon above the ground. (4)

7.2.2 Determine the value of h if $d = 300\,m$, $\alpha = 32°$ and $\theta = 63°$. (3)

[11]

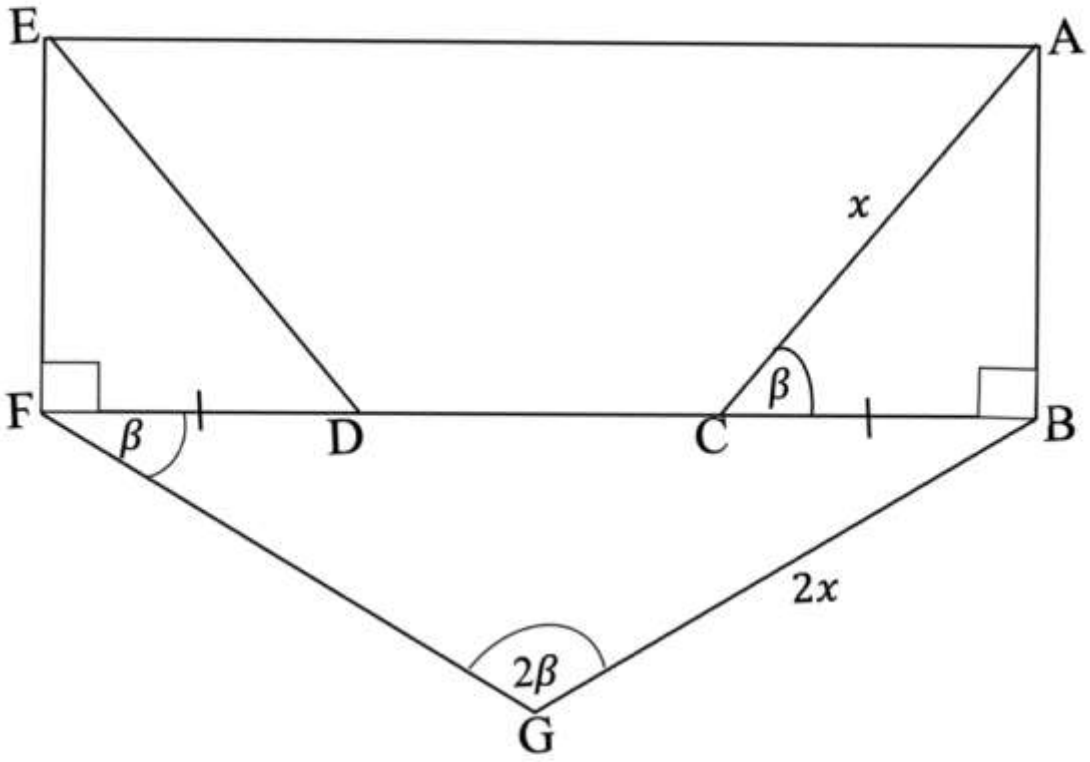
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SACAI

QUESTION 7

In the diagram below, EABF is a rectangle. Points D and C lie on FB with FD = CB. ED and AC are slanted supports from E and A to FB, forming ΔEDF and ΔACB. $A\hat{C}B = \beta$ and AC = x units.

ΔFBG lies on the horizontal plane with $\hat{G} = 2\beta$, $B\hat{F}G = \beta$ and GB = $2x$ units.



7.1 Show that $CB = x\cos\beta$ (1)

7.2 Show that $CD = 2x\cos\beta$ (5)

7.3 Determine the area of trapezium EACD in terms of x and β. Leave your answer as a single trigonometric ratio. (5)

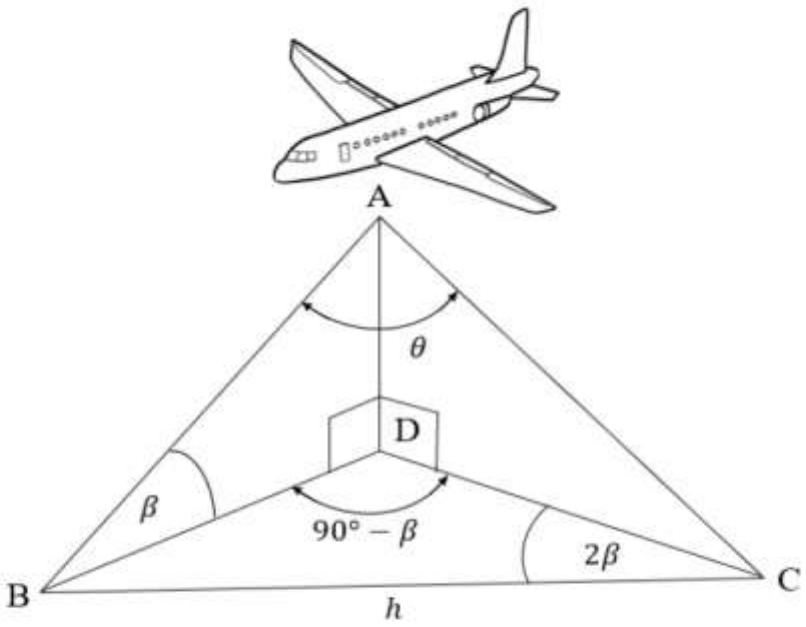
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Western Cape

QUESTION 7

A FlySafair airplane at point A flies directly above point D. Two observers are standing at point B and point C. The two observers standing at point B and C are in the same horizontal plane as point D. The angle of elevation from B to A is β. $B\hat{C}D = 2\beta$ and $B\hat{D}C = 90° - \beta$. The distance between the two observers is h metres.



7.1 Show that $BD = 2h \sin \beta$. (3)

7.2 Hence, show that the length of $AB = 2h \tan \beta$. (2)

7.3 If $h = 55m$, $\beta = 28°$ and $AC = 28m$, calculate θ, the angle between AB and AC. (4)

[9]

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EUCLIDEAN GEOMETRY

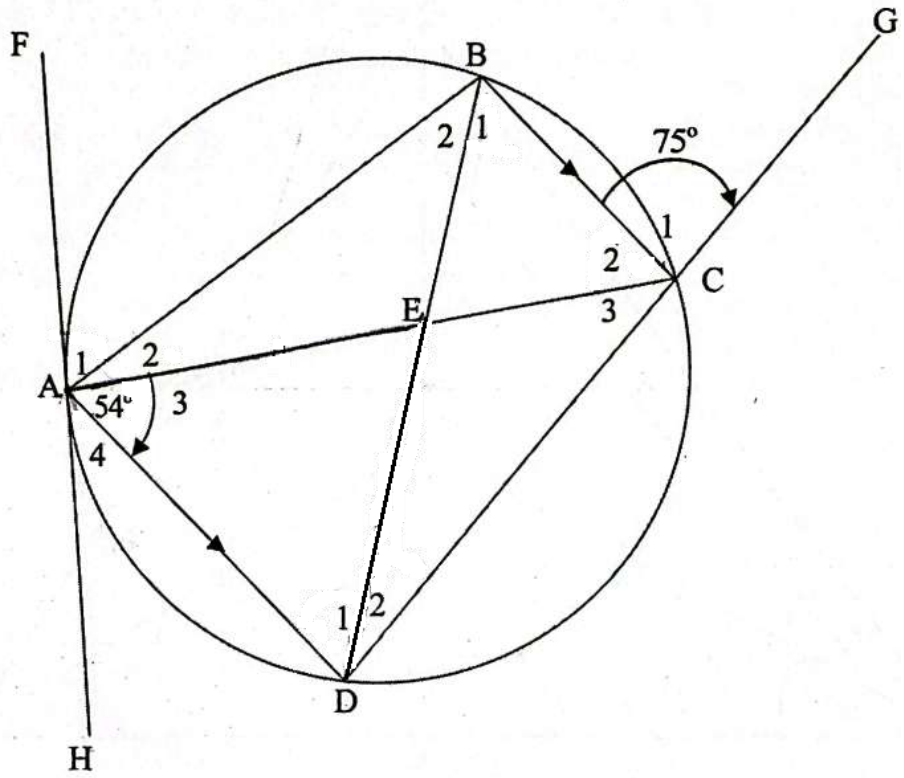
Eastern Cape

QUESTION 9

9.1 Complete the theorem below:

Exterior angle of a cyclic quadrilateral … (1)

9.2 In the diagram below, ABCD is a cyclic quadrilateral. DC is extended to G. FAH is a tangent to the circle at point A. BC ∥ AD, $\hat{C}_1 = 75°$ and $\hat{A}_3 = 54°$.



Determine the size of the following angles with reasons:

9.2.1 $\hat{A}_2$ (2)

9.2.2 $\hat{D}_2$ (2)

9.2.3 $\hat{A}_1$ (3)

9.2.4 Give a reason why AE = ED. (3)

[11]

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Free State

Provide reasons for your statements in QUESTIONS 8 and 9.

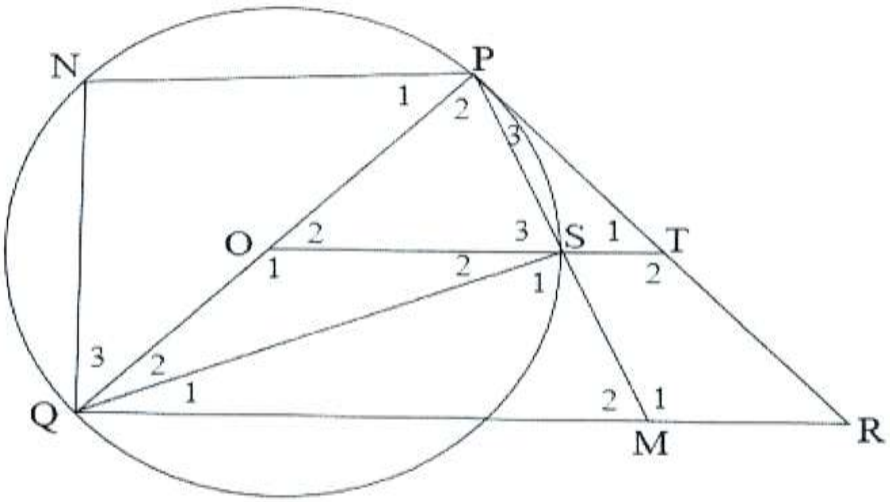
QUESTION 8

8.1 Complete the following statements:

8.1.1 The angle subtended by the diameter at the circumference of a circle is ... (1)

8.1.2 The line segment joining the midpoints of two sides of a triangle is ... to the third side and ... (2)

8.2 In the diagram below, ΔPQR is drawn with $\hat{R} = 25°$ and $P\hat{Q}M = 75°$. O and T are midpoints of PQ and PR, respectively. POQ is a diameter of the circle with centre O. The points S, Q, N, and P lie on the circumference of the circle.



Determine, with reasons, the size of the following angles:

8.2.1 $Q\hat{P}R$ (2)

8.2.2 $P\hat{T}O$ (2)

8.2.3 $Q\hat{N}P$ (2)

8.2.4 $Q\hat{S}M$ (2)

8.3 Show that PS = SM (2)

8.4 Prove that $\Delta PQS \equiv \Delta MQS$ (4)

8.5 Hence, show that QM = 2PO (2)

[19]

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Gauteng

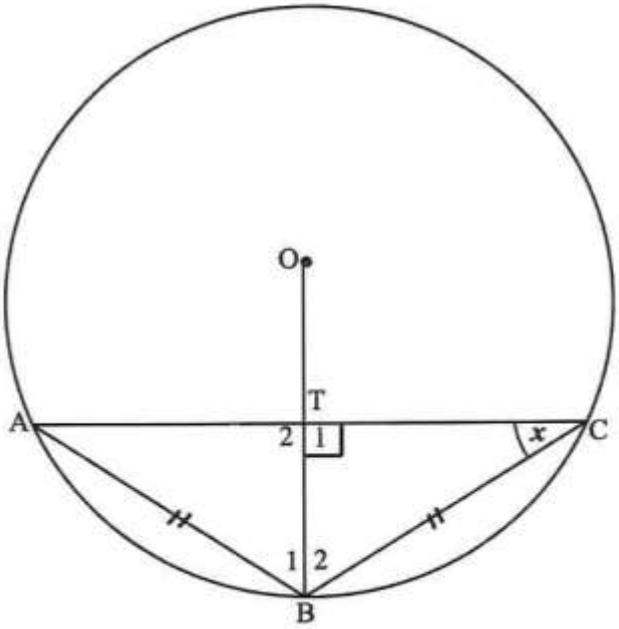
Provide reasons for your statements in QUESTIONS 9, 10 and 11.

QUESTION 9

In the diagram below, O is the centre of the circle A, B and C.

T is a point on OB such that OB ⊥ AC.

AB = BC and $T\hat{C}B = x$.



9.1 Write down the size of $\hat{B}_2$ in terms of x. (2)

9.2 Prove that OB bisects $A\hat{B}C$. (2)

9.3 It is further given that OA = r and the ratio of OT : TB is 1 : 3. Determine the length of AC in terms of r. (4)

[8]

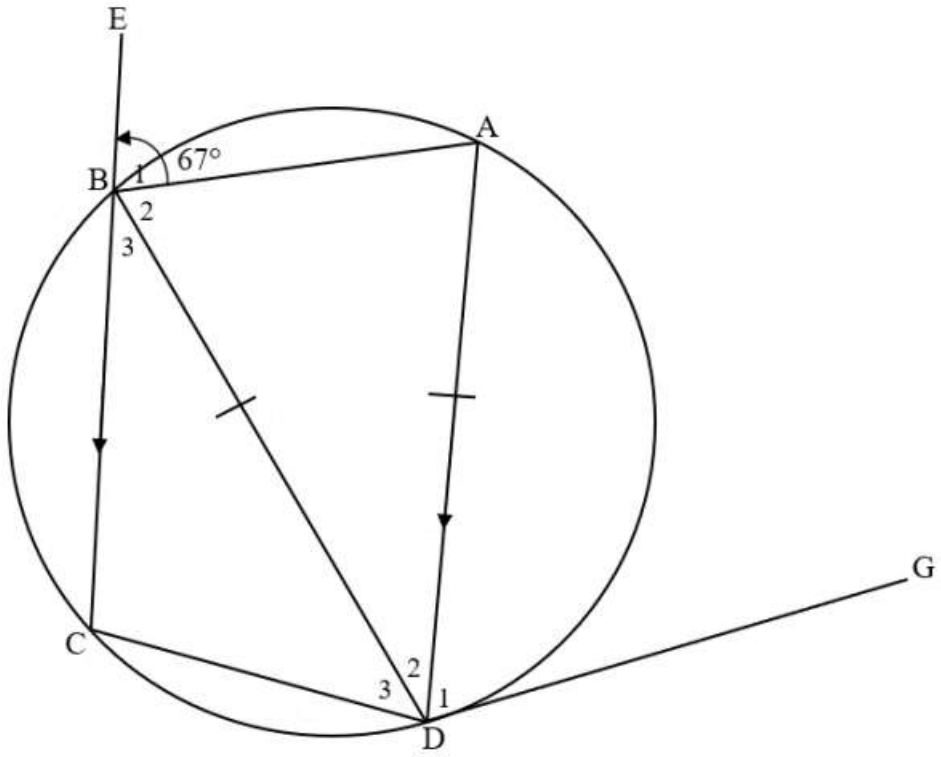
KZN

GIVE REASONS FOR YOUR STATEMENTS IN QUESTIONS 8, 9 AND 10.

QUESTION 8

In the diagram below, points A, B, C and D lie on the circumference of a circle with BC || AD. CB is produced to E and DG is a tangent to the circle at D. AD = BD and $E\hat{B}A = 67°$.

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8.1 Calculate, giving reasons, the size of the following angles:

8.1.1 $A\hat{D}C$ (2)

8.1.2 $\hat{A}$ (2)

8.1.3 $\hat{C}$ (2)

8.1.4 $\hat{D}_1$ (3)

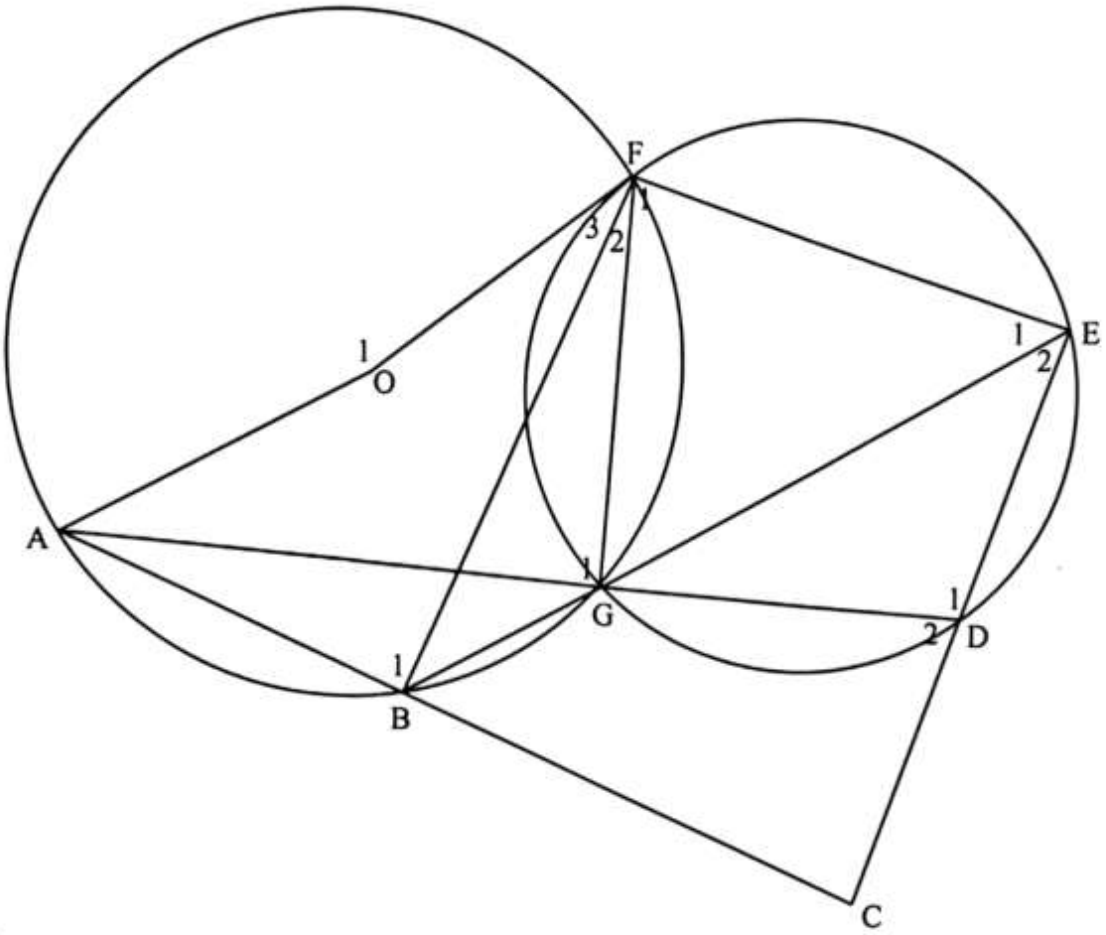
8.2 Prove, giving reasons, that $AB = CD$. (3)

[12]

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QUESTION 9

The diagram shows 2 circles. O is the centre of the circle drawn through ABGF, and the points E, F, G and D lies on the circumference of the other circle.



If $\hat{O}_1 = 162°$ and $F\hat{E}D = \hat{D}_1$, calculate the following angles, providing reasons:

9.1 $\hat{B}_1$ (2)

9.2 $\hat{G}_1$ (2)

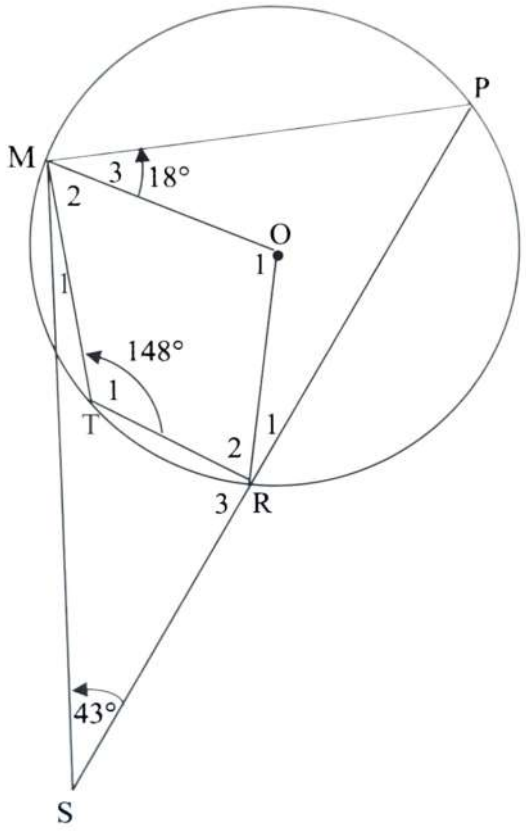
9.3 $\hat{D}_1$ (3)

[7]

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QUESTION 8

In the diagram below, P, M, T and R are points on a circle with centre O.
PR produced meets MS at S. Radii OM and OR and the chords MT and TR are drawn. $\hat{T}_1 = 148°$, $P\hat{M}O = 18°$ and $\hat{S} = 43°$.



Calculate with reasons, the size of:

8.1 $\hat{P}$ (2)

8.2 $\hat{O}_1$ (2)

8.3 $O\hat{M}S$ (2)

8.4 $\hat{R}_3$ if it is given that $T\hat{M}S = 6°$. (2)

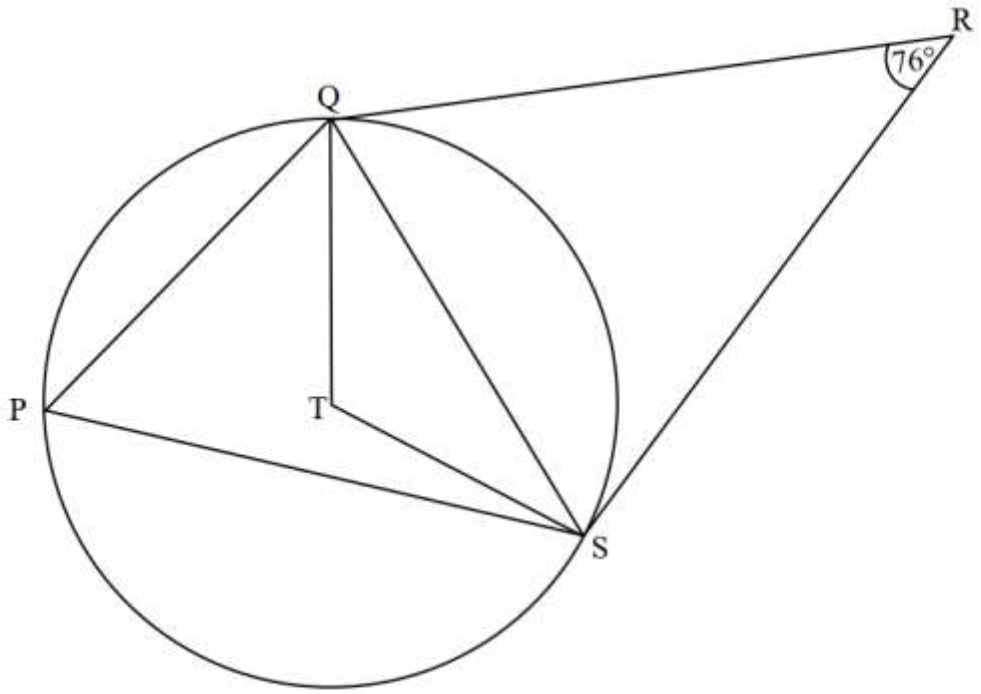
[8]

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Provide reasons for your statements in QUESTIONS 9, 10 and 11.

QUESTION 9

In the diagram, T is the centre of the circle. QR and RS are tangents to Q and S respectiviley. $Q\hat{R}S = 76°$



Calculate, with reasons, the size of:

9.1 $R\hat{Q}S$ (4)

9.2 $Q\hat{P}S$ (2)

9.3 $Q\hat{T}S$ (2)

[8]

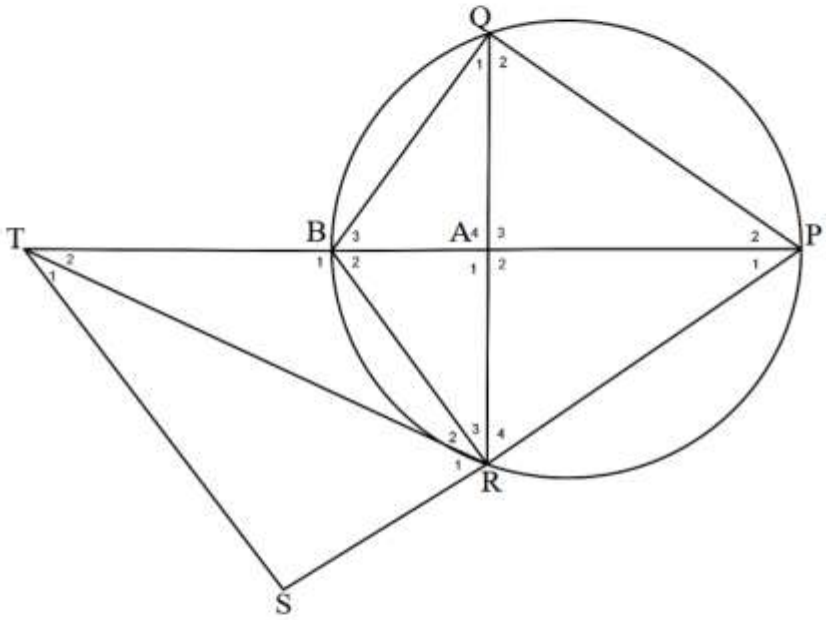
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Provide reasons for your statements in QUESTION 8, 9 and 10.

QUESTION 8

In the diagram below PQBR is a cyclic quadrilateral.

- BP is a diameter of the circle. PR is produced to S, and PB to T
- PBT intersects QR at A and the circle at B
- RT bisects $Q\hat{R}S$, TS ⊥ SP
- PQ = PR



8.1 If $\hat{Q}_2 = 55°$, calculate with reasons the size of:

8.1.1 $\hat{R}_4$ (2)

8.1.2 $\hat{B}_3$ (2)

8.1.3 $B\hat{R}P$ (2)

8.1.4 $\hat{A}_1$ (3)

8.2 Give a reason why AQ = AR. (1)

8.3 Prove that AT = TS. (4)

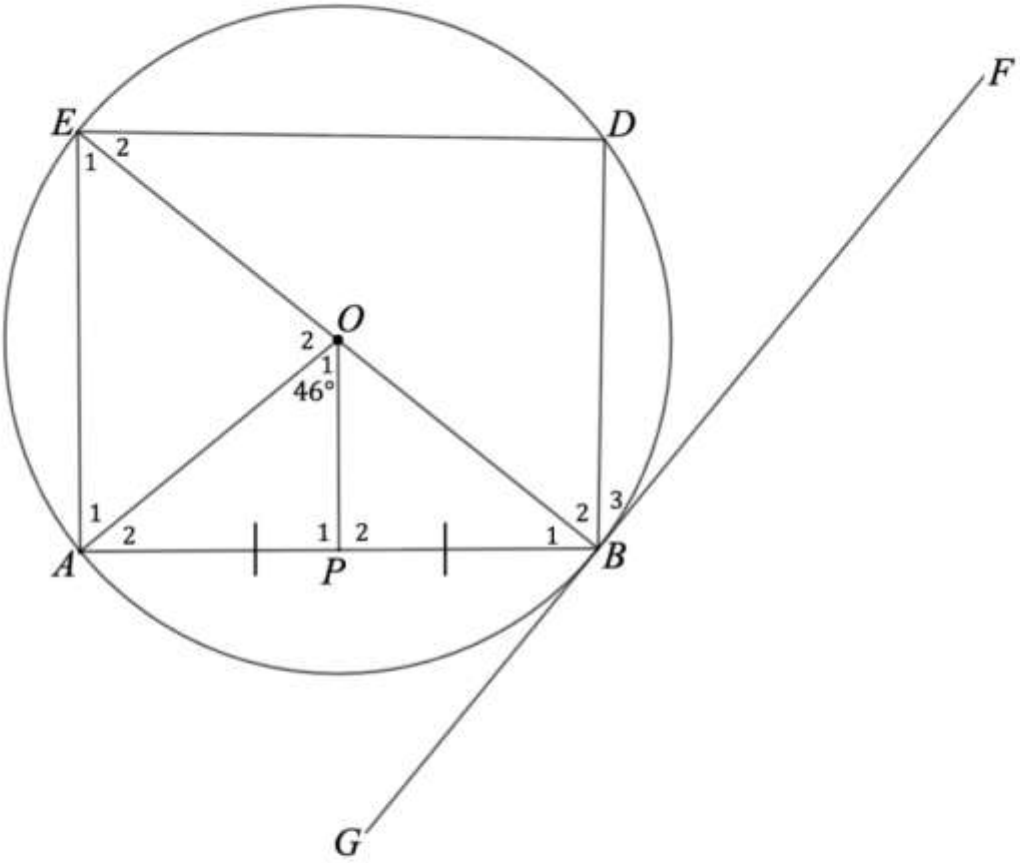
[14]

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SACAI

QUESTION 8

In the diagram below, a circle with midpoint O and parallelogram AEDB is given. AP = PB. $\widehat{O}_1 = 46°$. FG is a tangent to circle O at point B.



Determine the size of the following angles. Give reasons for your answers:

8.1 $\widehat{D}$ (1)

8.2 $\hat{A}_2$ (3)

8.3 $\hat{E}_1$ (3)

8.4 $\hat{B}_3$ (4)

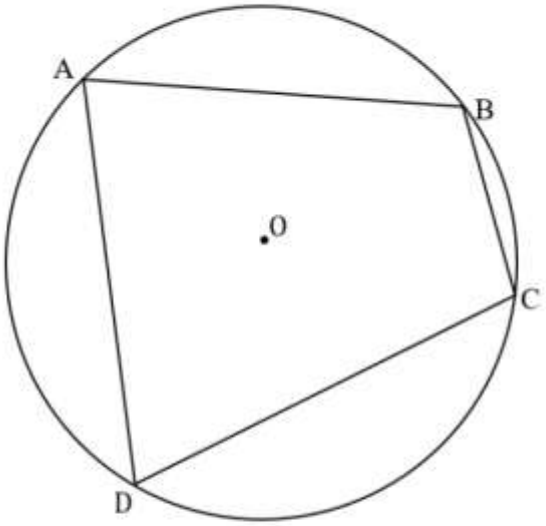
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Western Cape

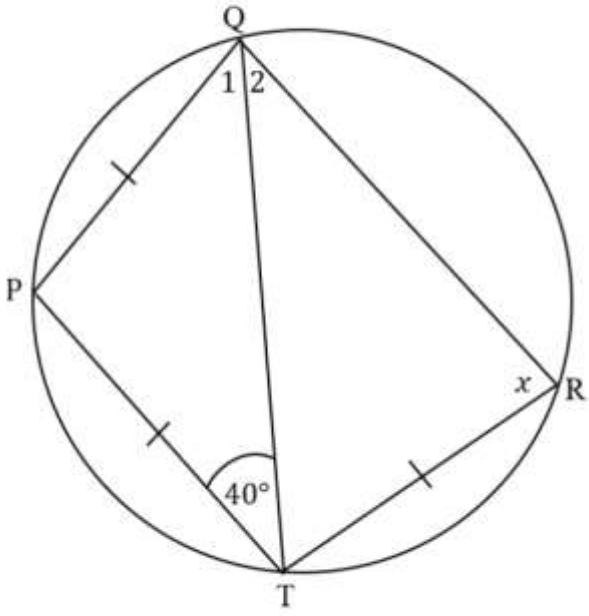
QUESTION 8

8.1 In the figure below, A, B, C and D are points on the circumference of the circle with centre O. Use the given sketch to prove the theorem which states that $\hat{A} + \hat{C} = 180°$.



(4)

8.2 The following shape has points P, Q, R and T on the circumference of the circle. PQ = PT = TR.



8.2.1 Calculate the size of x, giving reasons for your answer. (3)

8.2.2 Calculate the size of $\hat{Q}_2$. (2)

[9]

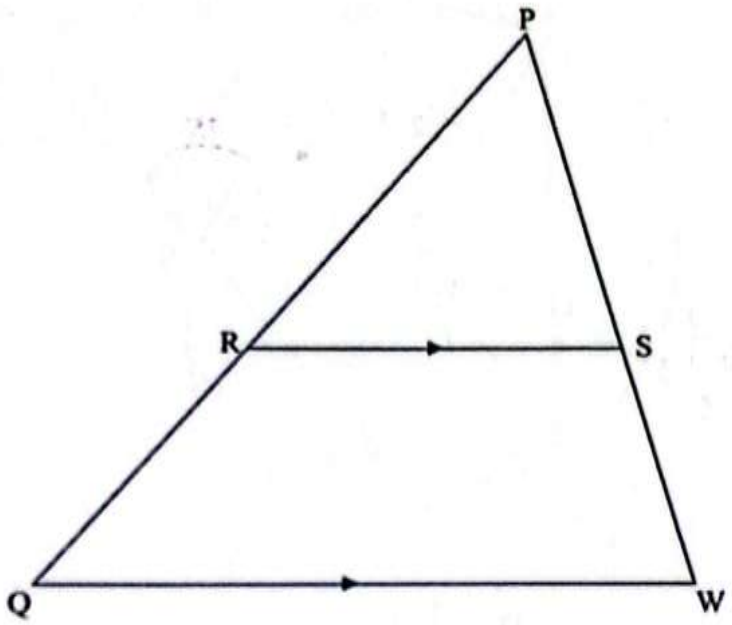
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Eastern Cape

QUESTION 10

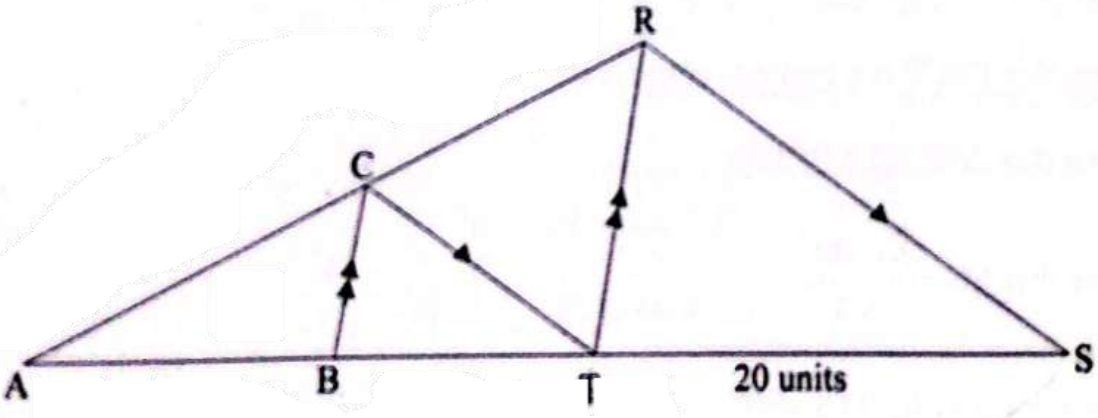
10.1 In the diagram below, ΔPQW is drawn with R on side PQ and S on side PW. RS is joined such that RS ∥ QW. Prove the theorem which states that a line drawn parallel to one side of a triangle divides the other two sides proportionally,

i.e. prove that: $\frac{PR}{RQ} = \frac{PS}{SW}$



(5)

10.2 In the diagram below, ΔARS is drawn with C on line AR and B and T on line AS. BC ∥ TR and CT ∥ RS. TS = 20 units and AC : AR = 3 : 8.



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Calculate the length of:

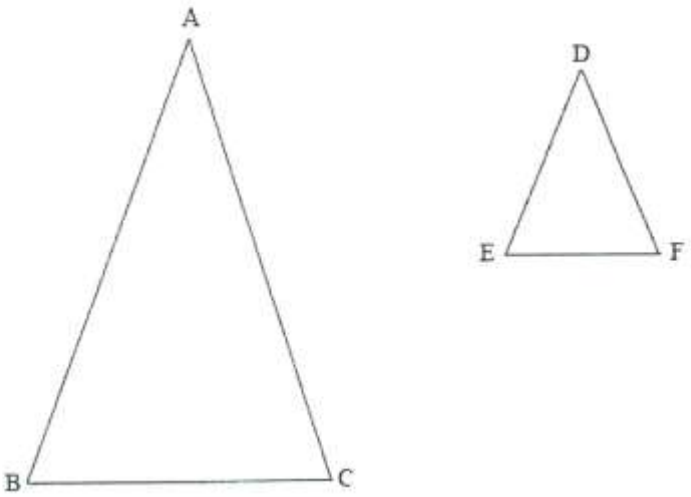
10.2.1 AT **(4)**

10.2.2 AB **(3)**
[12]

Free State

QUESTION 9

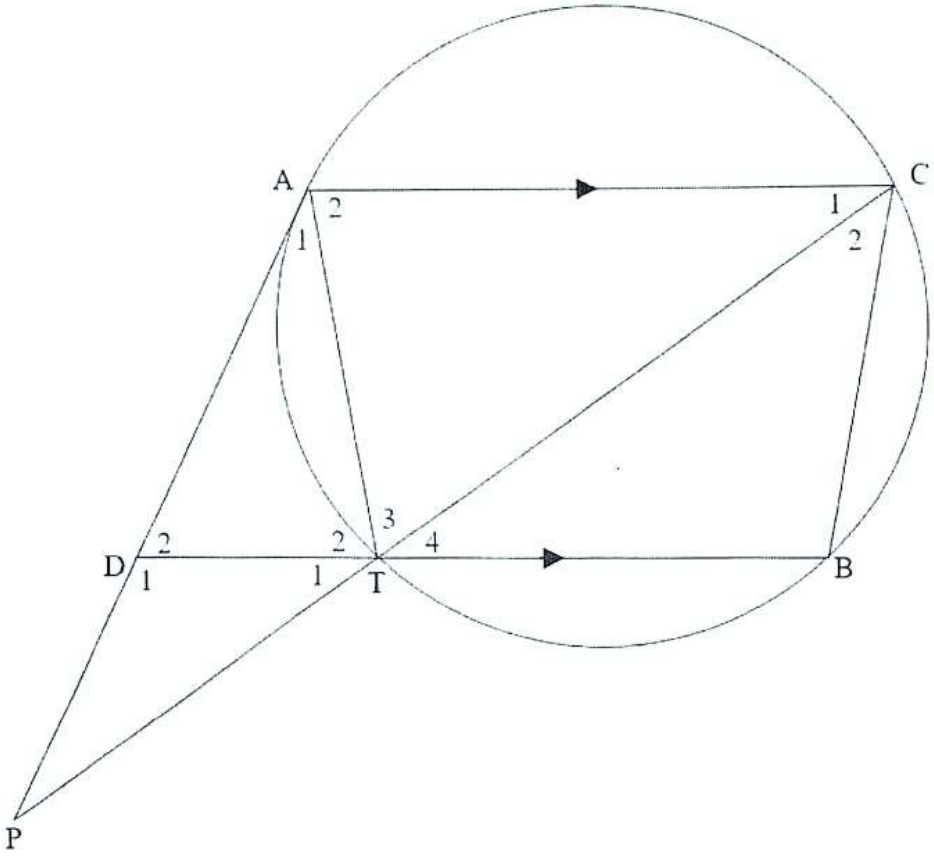
9.1 In the diagram, ΔABC and ΔDEF are given.
Prove the theorem that states that:
If $\hat{A} = \hat{D}$, $\hat{B} = \hat{E}$ and $\hat{C} = \hat{F}$ then $\frac{AB}{DE} = \frac{AC}{DF}$



(7)

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9.2 In the diagram below, ACBT is a cyclic quadrilateral. BT is produced to meet tangent AP at D. CT is produced to P. AC // DB.



9.2.1 Prove that $PA^2 = PT.PC$ (5)

9.2.2 If PA = 6 units, TC = 5 units and PT = x, show that $x^2 + 5x - 36 = 0$ (2)

9.2.3 Calculate the length of PT. (2)

9.2.4 Calculate the length of PD. (2)
[18]

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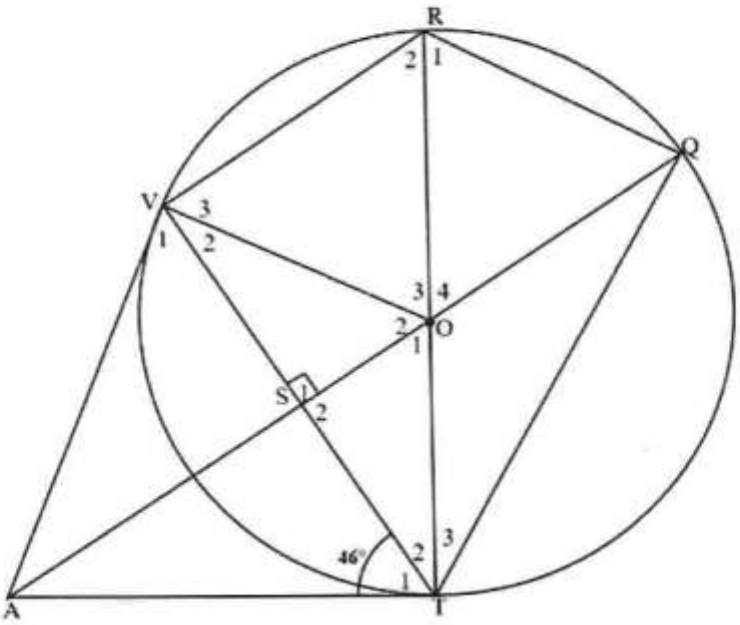
Gauteng

QUESTION 10

In the diagram below, R, Q, T and V are points on the circle with centre O.

AT is a tangent to the circle at T. QO is produced to A. S is a point on chord VT such that OS ⊥ VT.

OV and OT are joined. $\hat{T}_1 = 46°$.



10.1 Calculate, with reasons, the size of the following angles:

10.1.1 $\hat{R}_2$ (2)

10.1.2 $\hat{T}_3$ (5)

10.2 Prove that TAVO is a cyclic quadrilateral (4)

10.3 Prove that AV is a tangent to the circle passing through V, O and S at V (2)

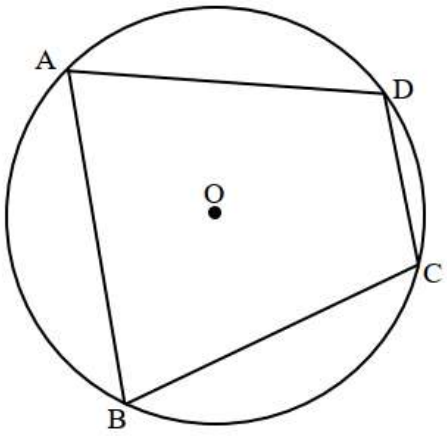
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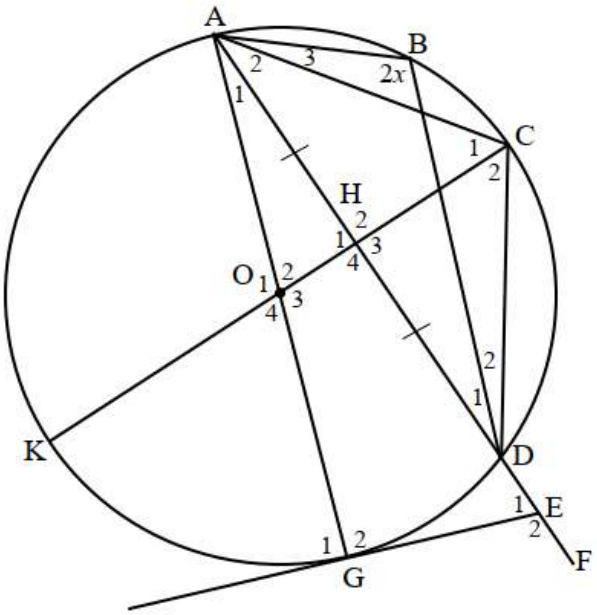
QUESTION 9

9.1 A, B, C and D are points on the circumference of the circle with centre O.



Use the diagram in the ANSWER BOOK to prove the theorem which states that $\hat{A} + \hat{C} = 180°$. (5)

9.2 In the diagram below, O is the centre of a circle. A, B, C, D, G and K are points on the circle. Diameter KC is drawn to bisect chord AD at H. AG is a diameter of the circle. A tangent is drawn to the circle at G. Chord AD is extended to F and meets the tangent at E. Let $\hat{B} = 2x$.



9.2.1 Prove that OGEH is a cyclic quadrilateral. (4)

9.2.2 Prove that KC bisects $A\hat{C}D$. (3)

9.2.3 Determine $\hat{E}_1$ in terms of x. (6)

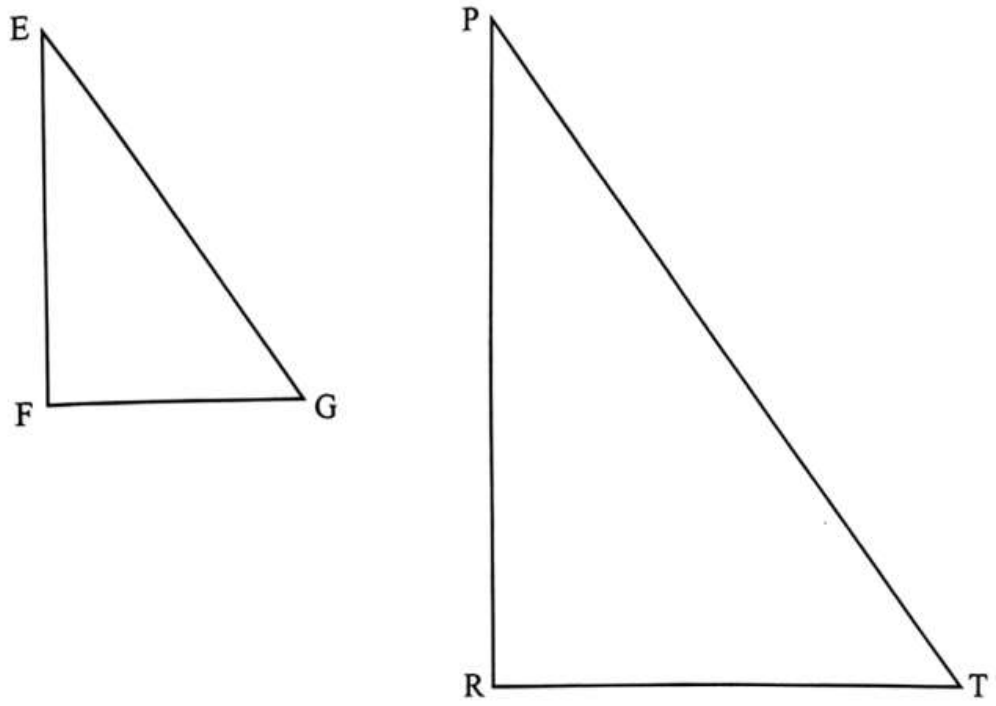
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Limpopo

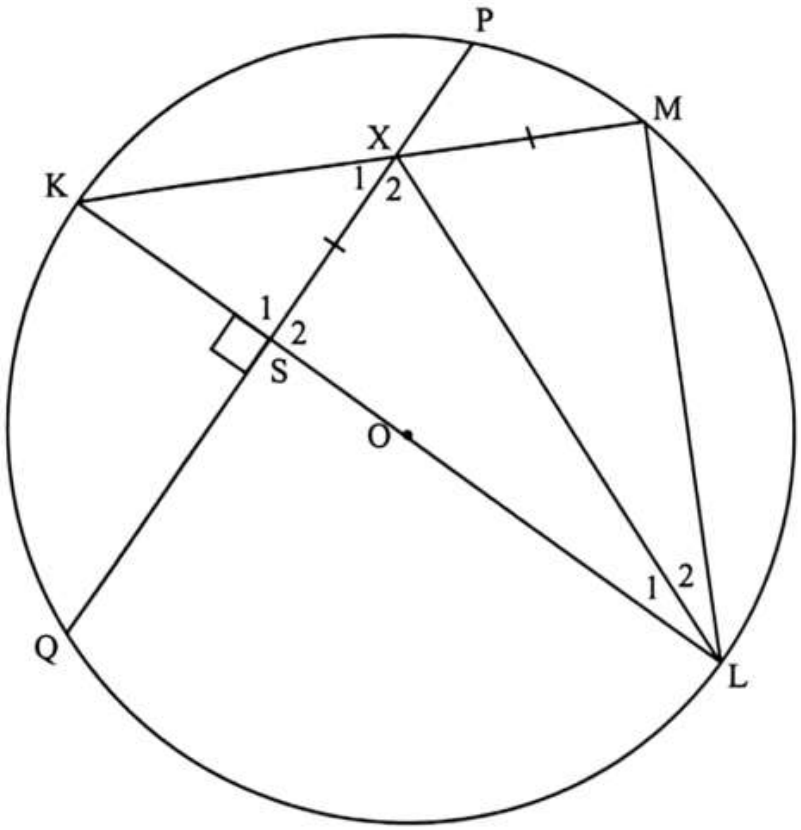
QUESTION 10

10.1 In ΔEFG and ΔPRT in the diagram, $\hat{E} = \hat{P}$ and $\hat{F} = \hat{R}$.



Use the diagram to proof the theorem stating that $\frac{EF}{PR} = \frac{EG}{PT}$ (6)

10.2 In the diagram KL is a diameter of the circle with centre O. The radius is 10 units, and M is a point on the circumference such that $ML = 12$ units. The bisector of $K\hat{L}M$ meets KM at X. $\Delta KSX \,|||\, \Delta KML$ and the chord PXQ cuts KL at S such that $PXQ \perp KL$.



10.2.1 Name 2 congruent triangles. (1)

10.2.2 Calculate, with reasons:

(a) KM (3)

(b) $\frac{KX}{XS}$ (3)

(c) XM (5)

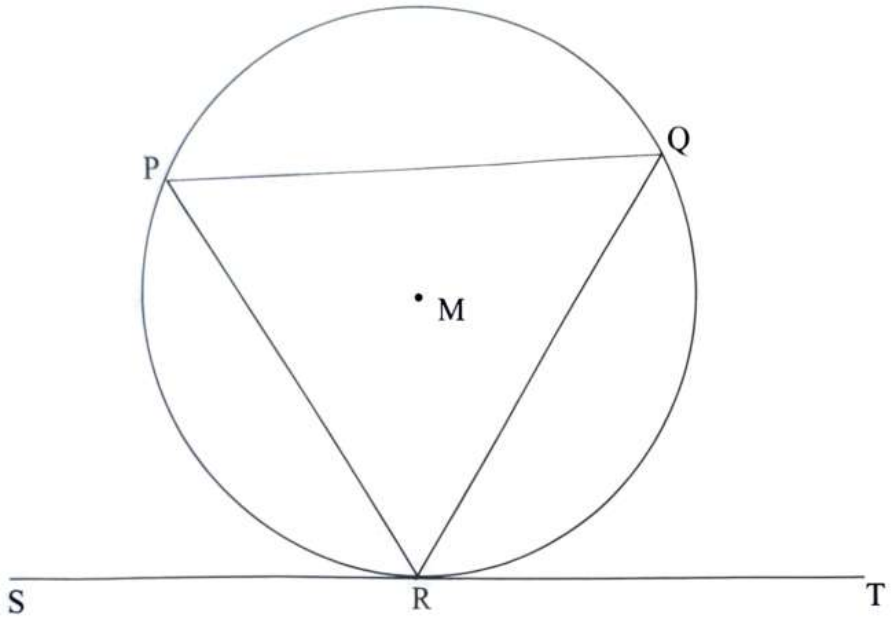
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Mpumalanga

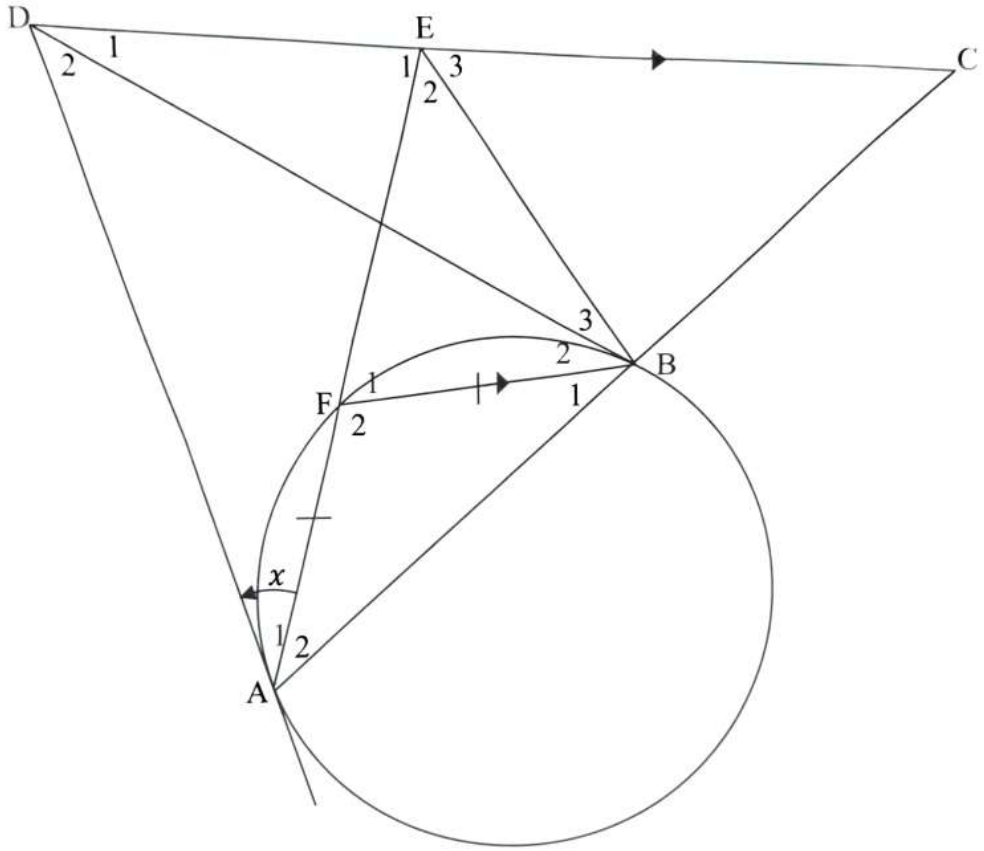
QUESTION 9

9.1 In the diagram below, M is the centre of a circle and SRT is a tangent to the circle at R. PQ, PR and QR are chords.



Prove the theorem which states that $P\hat{R}S = P\hat{Q}R$. (5)

9.2 In the diagram below, DA and DB are tangents to the circle at A and B. AF = FB. AB produced cuts the line through D, which is parallel to FB, at C and $D\hat{A}E = x$.



9.2.1 Determine with reasons, FIVE other angles each equal to x. (6)

9.2.2 Prove that ABED is a cyclic quadrilateral. (2)

9.2.3 Prove that $A\hat{B}E = 3\hat{A}_1$ (2)

9.2.4 Prove that AD = BC. (3)

9.3 Calculate the numerical value of $\frac{\text{Area of } \Delta AFAB}{\text{Area of } \Delta EAC}$ if it is given that AF : FE = 2 : 3. (4)

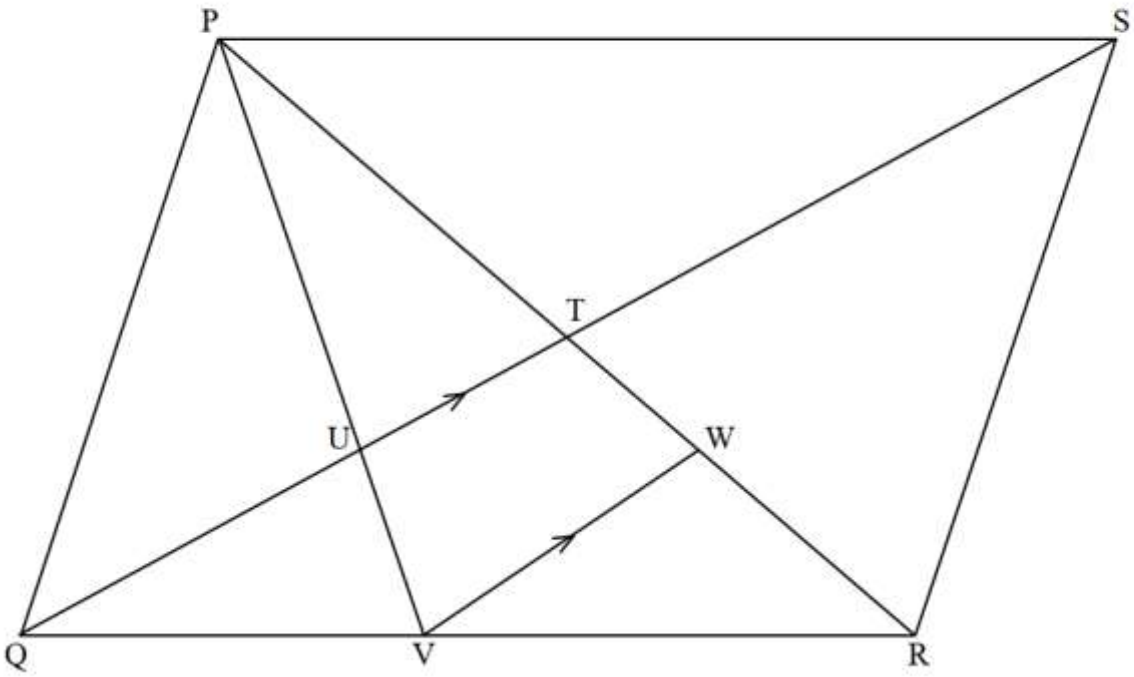
[22]

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Northern Cape

QUESTION 10

In the diagram, PQRS is a parallelogram with UT∥VW and $\frac{QV}{VR} = \frac{2}{3}$.



Determine, with reasons, the value of:

10.1 $\frac{TR}{WR}$ (2)

10.2 $\frac{PU}{UV}$ (3)

10.3 $\frac{\text{Area of } \Delta PUT}{\text{Area of } \Delta PVW}$ (3)

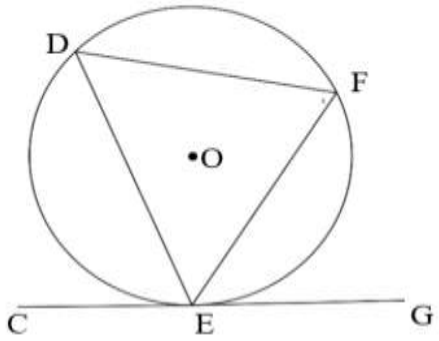
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North-West

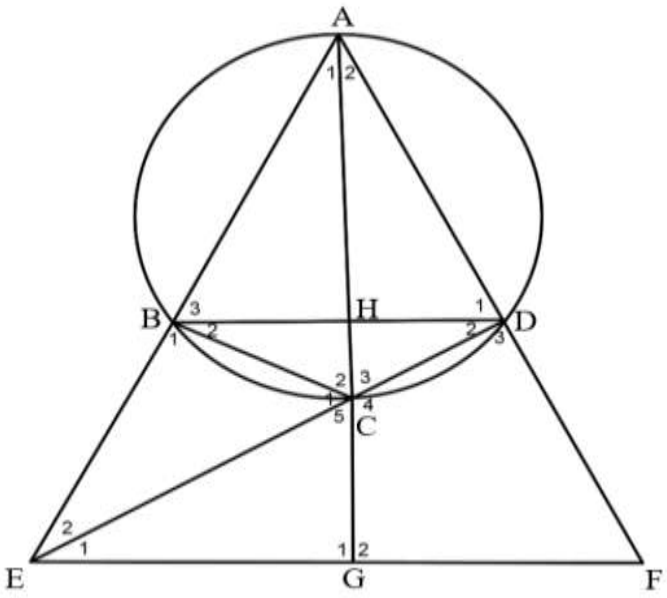
QUESTION 9

In the diagram O is the centre of the circle, with CEG a tangent to the circle.



9.1 Prove the theorem that states that $C\hat{E}D = \hat{F}$. (5)

9.2 In the diagram below, ABCD is a cyclic quadrilateral. EF || BD.
ACG and DCE are straight lines.



Prove that:

9.2.1 $\hat{E}_1 = \hat{A}_1$ (3)

9.2.2 EF is a tangent to the circle EAC (1)

9.2.3 $\Delta ABC \,|||\, \Delta EDF$ (4)

9.2.4 $\dfrac{BE.AH}{GH} = \dfrac{ED.BC}{DF}$ (6)

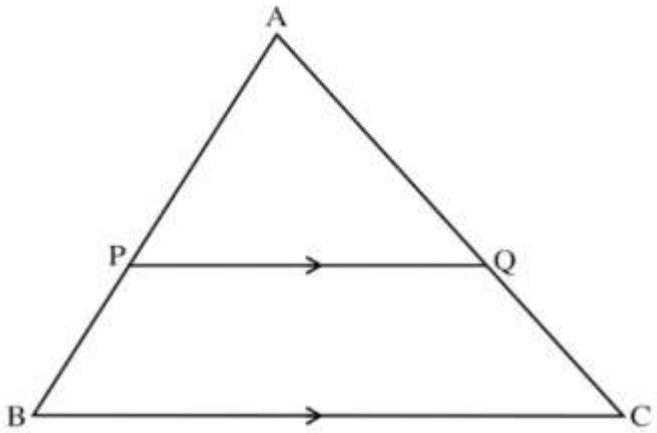
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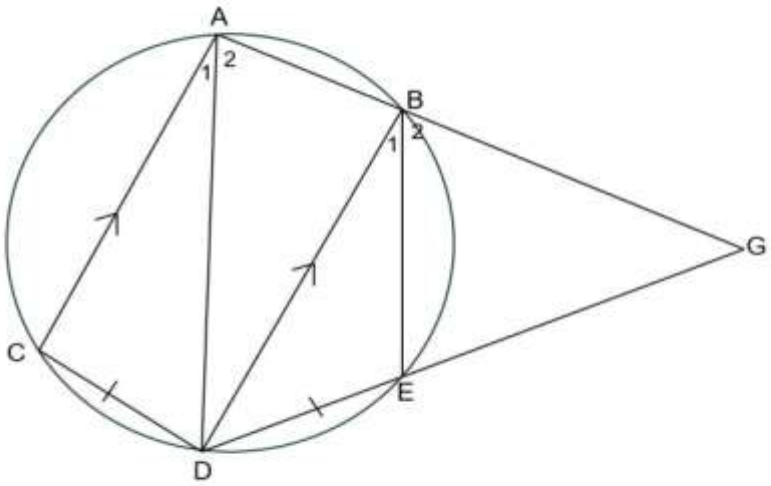
QUESTION 9

9.1 In the diagram below, ΔABC is given with PQ // BC.



Prove that $\frac{AP}{PB} = \frac{AQ}{QC}$ (6)

9.2 In the diagram below it is given that CD = DE, CA // DB.
AG and DG are straight lines. $CD = \sqrt{k}\,.EG$



9.2.1 Prove, with reasons, that AD // BE. (3)

9.2.2 If $\frac{\text{Area of } \Delta ABD}{\text{Area of } \Delta AGD} = \frac{3}{4}$, determine the numerical value of k. (7)

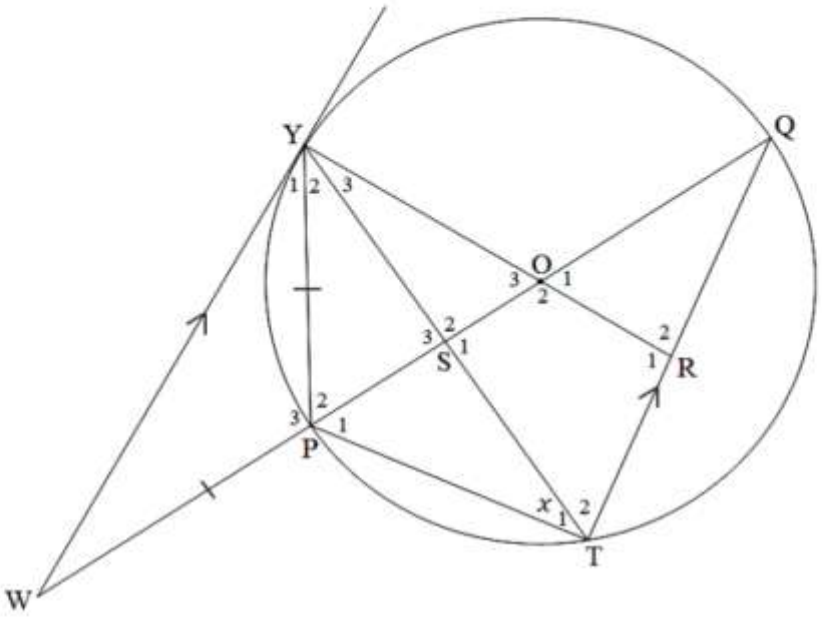
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Western Cape

QUESTION 9

In the figure below, WY is a tangent to the circle with centre O.
WPQ, YOR, YST are straight lines. PW = PY, WY ∥ TQ and $\hat{T}_1 = x$.



9.1 Provide reason(s) why each of the following angles are equal to x.

9.1.1 $\hat{Y}_1$ (1)

9.1.2 $\hat{W}$ (1)

9.1.3 $\hat{Q}$ (1)

9.1.4 $\hat{Y}_2$ (1)

9.2 Prove that $\hat{T}_2 = 2\,\hat{T}_1$. (2)

9.3 Prove that SORT is a cyclic quadrilateral. (2)

9.4 Determine the value of x. (2)

9.5 Show that TR = RQ. (3)

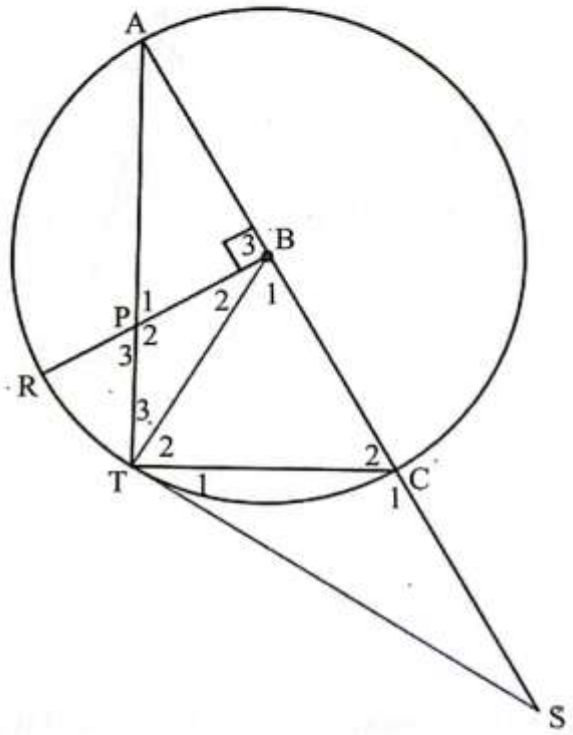
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Eastern Cape

QUESTION 11

In the diagram below, A, R, T and C are points on the circumference of the circle. B is centre of the circle. ABC the diameter of the circle is produced to S. TS is the tangent of the circle at T. BPR is perpendicular to ABC.



11.1 Name TWO other angles each equal to $\hat{T}_1$, giving reasons. (3)

11.2 Prove that PBCT is a cyclic quadrilateral. (3)

11.3 Prove that $\Delta SCT \,|||\, \Delta BPT$ (4)

11.4 Prove that $SC = \dfrac{ST.BP}{AB}$ (2)

11.5 Give a reason why $B\hat{T}S = 90^0$ (1)

11.6 If it is further given that $BR = CS$, prove that $TS = 3BP$. (5)

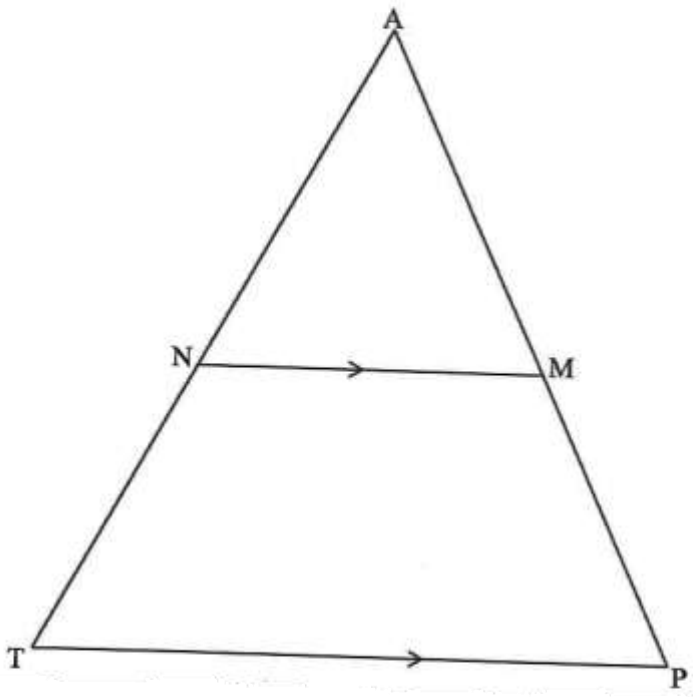
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Gauteng

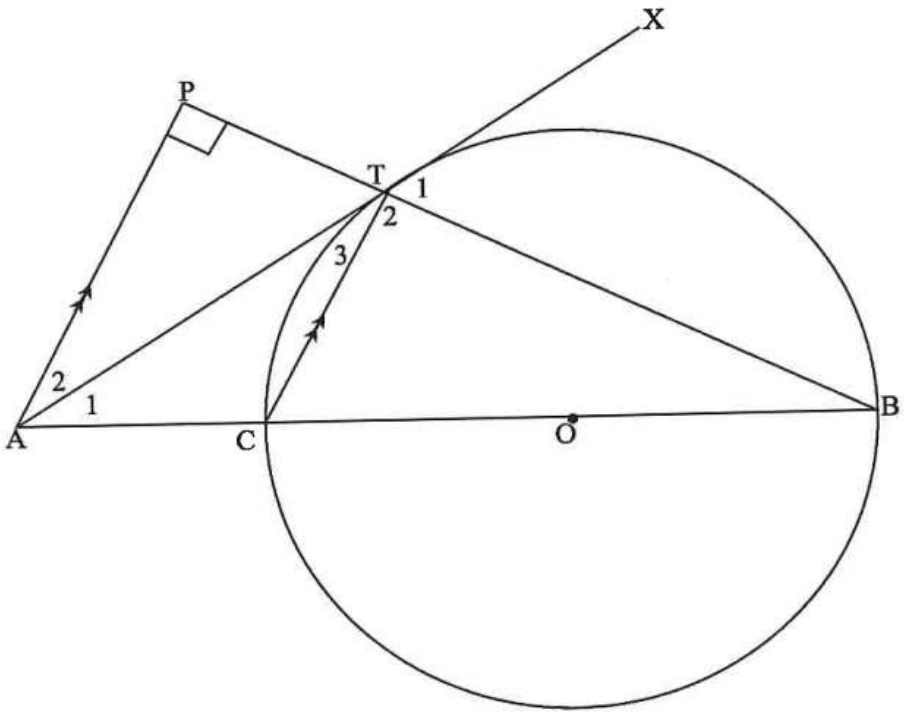
QUESTION 11

11.1 In the diagram below ΔATP is drawn. Line NM intersects AT and AP at N and M respectively such that NM || TP.



Use the diagram above to prove the theorem that states that a line drawn parallel to one side of a triangle divides the other two sides proportionally, that is, prove that $\frac{AN}{NT} = \frac{AM}{MP}$.

11.2 In the diagram below, BC is a diameter of the circle with centre O. ATX is a tangent to the circle at T. BT is produced to P such that BP ⊥ PA. BC is produced to A.
PA || TC.



11.2.1 Prove that ΔAPT ||| Δ BPA. (4)

11.2.2 Prove that $AC = \sqrt{\frac{PT.CB}{3}}$, if BT = 3AC. (3)

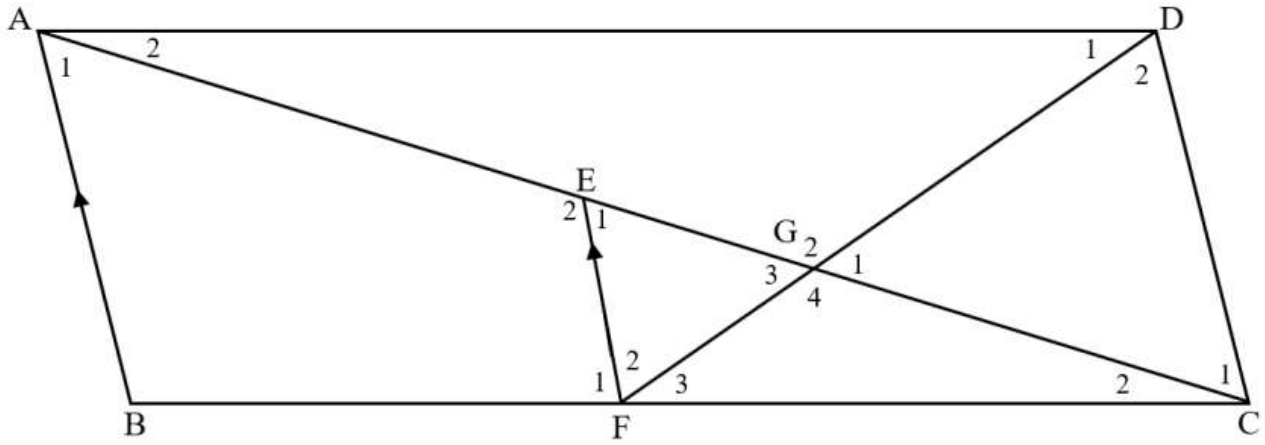
11.2.3 Given that Δ TBC ||| Δ PBA, prove that $PT = \frac{PB.TC^2}{TB^2}$. (6)

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QUESTION 10

ABCD is a parallelogram. AC is joined and EF||AB, where E and F are points on AC and BC, respectively. FD cuts AC in G. $BF : FC = 2 : 3$.



10.1 Determine, with reasons, the value of:

10.1.1 $\frac{CE}{EA}$ (2)

10.1.2 $\frac{EF}{AB}$ (5)

10.2 Prove that $EG = \frac{CG.EF}{AB}$ (5)

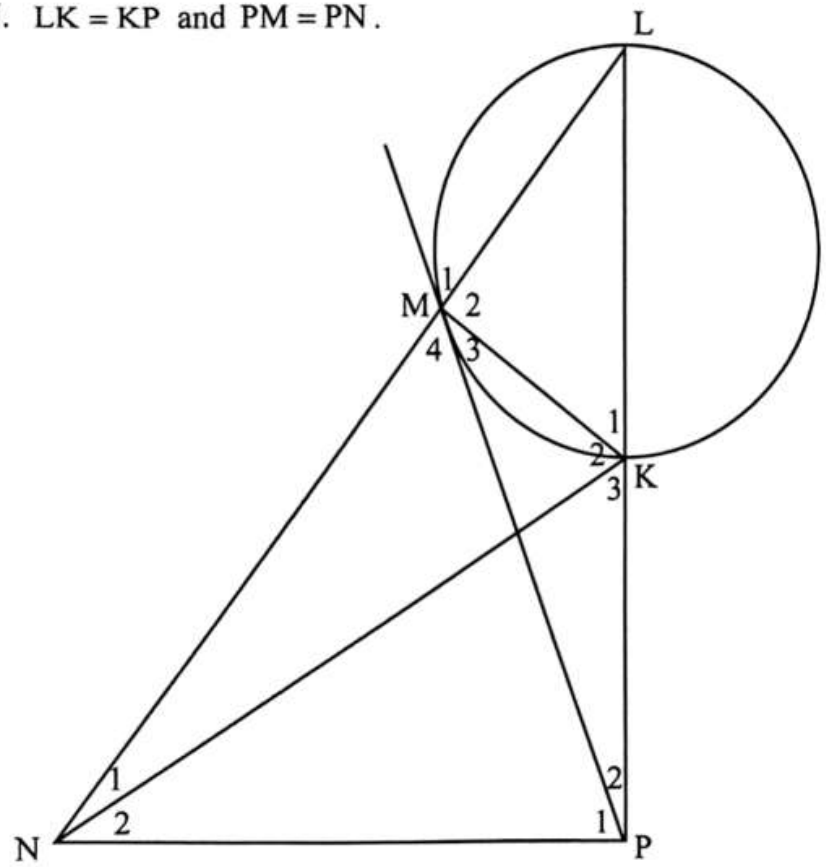
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QUESTION 11

In the diagram PM is a tangent to the circle through L, M and K. LP ⊥ NP. LM produced meets NP in N. LK = KP and PM = PN.



Prove that:

11.1 KMNP is a cyclic quadrilateral. (4)

11.2 LK is the diameter of the circle. (2)

11.3 $\Delta MKP \text{ III } \Delta LMP$ (3)

11.4 $PM^2 = PK.PL$ (1)

11.5 $LN = \sqrt{6}.PK$ (4)

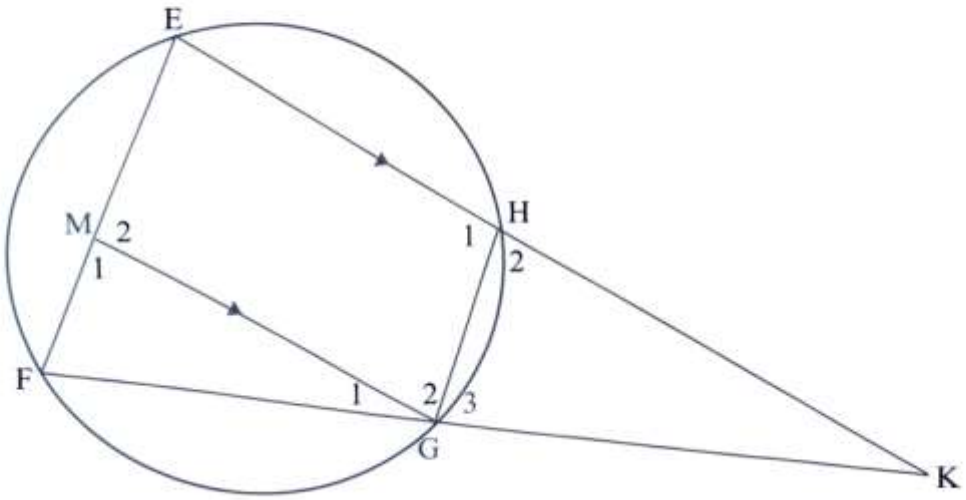
11.6 If it is further given that $\Delta NLP \text{ III } \Delta KLM$, prove that $PN = \sqrt{6}.MK$ (3)

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QUESTION 10

In the diagram, E, F, G and H lie on the circle. EH and FG are produced to K.
M is a point on EF such that MG || EK and KG = EF.



10.1 Prove that:

10.1.1 $\Delta KGH \equiv \Delta KEF$ (3)

10.1.2 $EF^2 = KE.GH$ (3)

10.1.3 $KG^2 = EM.KF$ (2)

10.2 If it is given that EK = 20 units, FK = 16 units and GH = 4 units, calculate the length of EM. (3)

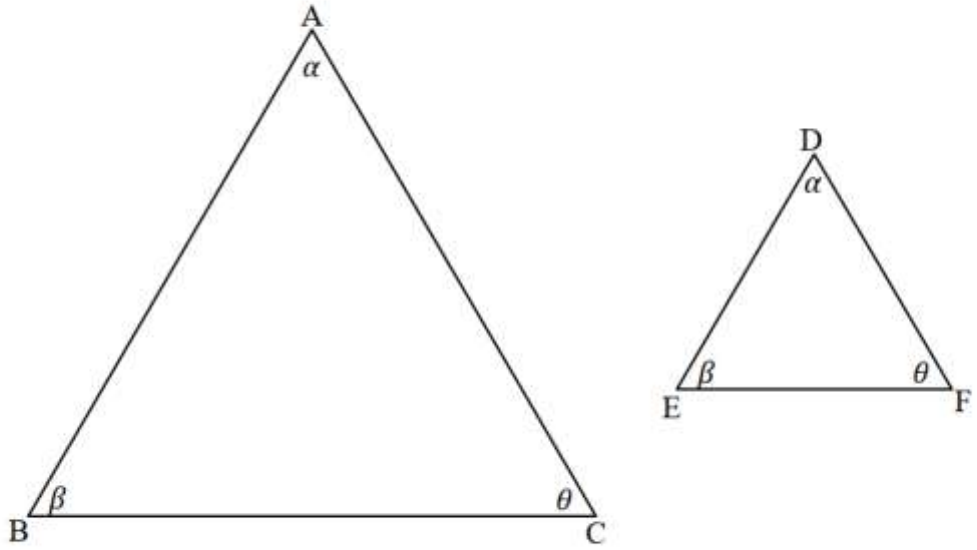
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Northern Cape

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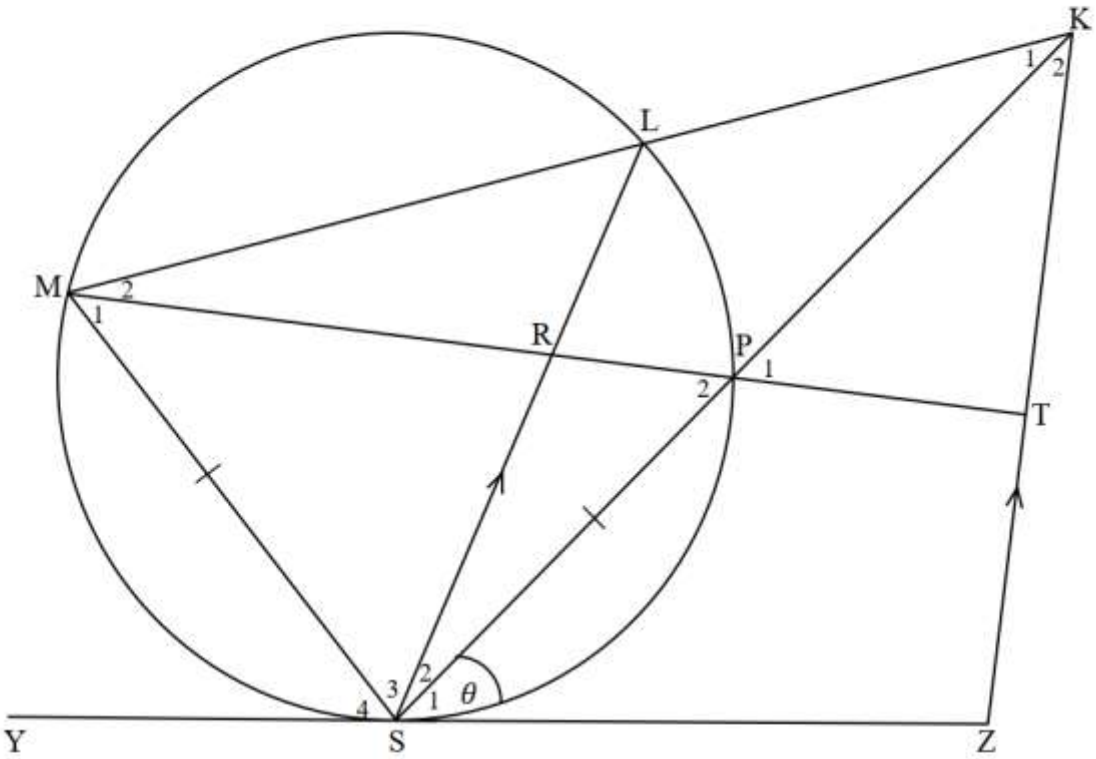
QUESTION 11

11.1 In the diagram below, ΔABC and ΔDEF are drawn with $\hat{A} = \hat{D}$, $\hat{B} = \hat{E}$ and $\hat{C} = \hat{F}$.



Use the diagram to prove the theorem which states that, if two triangles are equiangular, then the corresponding sides are proportional, i.e. $\frac{DE}{AB} = \frac{DF}{AC}$. (6)

11.2 In the diagram, YSZ is the tangent to the circle at S. SL||KZ and MS = PS. It is further given that $\hat{S}_1 = \theta$.



11.2.1 Determine the value of $M\hat{S}P$ in terms of θ. (3)

11.2.2 Prove that $\Delta KZS \Vert\Vert\Vert \Delta SRP$. (3)

11.2.3 Prove that $KT = \dfrac{TZ \cdot KP}{MS}$. (5)

[17]

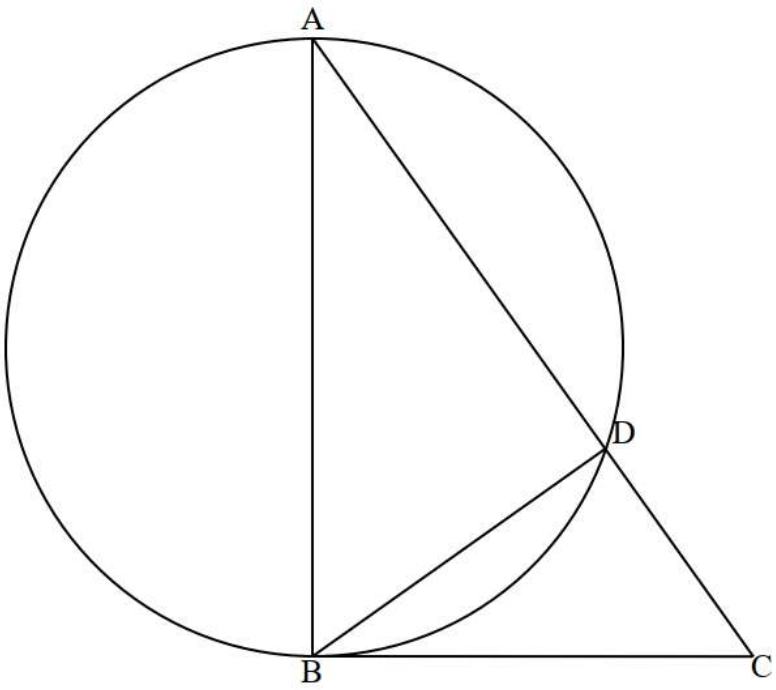
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North-West

QUESTION 10

In the diagram below, AB is a diameter of the circle. CB is a tangent to the circle at B. AC intersect the circle at D.

- DC = x
- DC = $\frac{1}{2}$AD



10.1 Prove that $\frac{BD}{DC} = \sqrt{2}$ (4)

10.2 Calculate the perimeter of ΔABC if AD = 10 mm. (3)

[7]

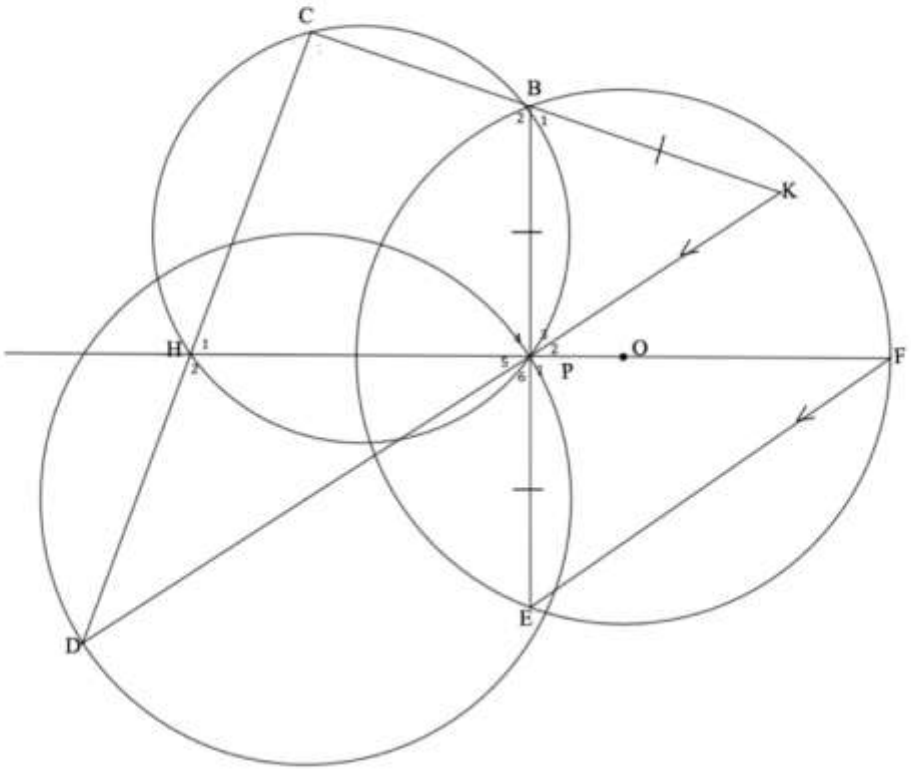
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QUESTION 10

In the following diagram, O is the midpoint of the circle with points B, E and F on its circumference. CBPH is a cyclic quadrilateral.

KB = BP = PE and KD // FE. BE, KD, KC and FH are straight lines.



10.1 Prove that $\hat{P}_1 = D\hat{C}K$ (3)

10.2 Prove that $\Delta KCD \;|||\; \Delta EPF$. (4)

10.3 Prove that $KC.EF = KD.EP$ (2)

10.4 Prove that $KD = \frac{BC.EF}{KB} + EF$ (5)

[14]

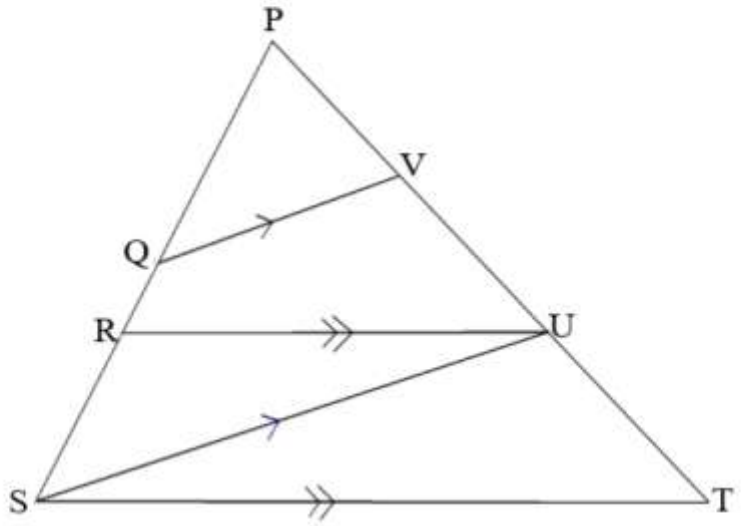
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Western Cape

QUESTION 10

10.1 In ΔPST, $QV \parallel SU$ and $RU \parallel ST$.

$PU = 30cm$ and $PU : UT = 3 : 2$.



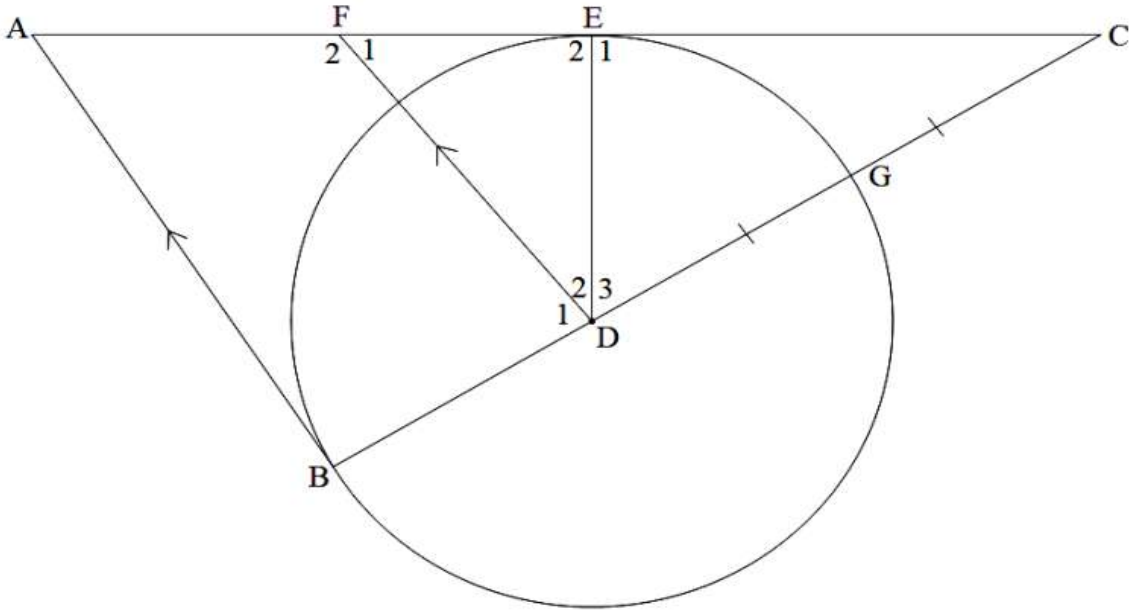
Determine, with reasons:

10.1.1 The length of UT. (2)

10.1.2 If it is further given that $PV : VU = 7 : 8$, determine value of $\frac{QR}{RS}$ (4)

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10.2 In the diagram below, D is the centre of a circle. AB and AC are tangents to the circle at B and E respectively. The diameter BG is produced and meets tangent AC at C. DG = CG. F is a point on AC such that FD || AB.



10.2.1 Find, with reasons, the ratio of $\frac{AC}{FC}$. (2)

10.2.2 Prove, giving reasons, that $\Delta ABC \,|||\, \Delta DEC$. (3)

10.2.3 Prove that $DE^2 = \frac{AE \,.EC}{3}$. (4)

10.2.4 Find the ratio of $\frac{\text{Area of } \Delta FDC}{\text{Area of } \Delta ABC}$. (3)

[18]

The end

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