kutlwanong
centre for maths, science & technology

MATHEMATICS EXAMINATION
GRADE 10
PAPER 2

4 OCTOBER 2022

TIME: 3 HOURS **MARKS: 150**

NAME : _____

SCHOOL: _____

Questions	Maximum Mark	Mark Obtained
Q1	13	
Q2	7	
Q3	22	
Q4	18	
Q5	22	
Q6	15	
Q7	13	
Q8	12	
Q9	4	
Q10	14	
Q11	10	
TOTAL	150	
%	100	

This Question Paper consists of 11 Questions & 19 pages

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 11 questions.

2. Answer ALL the questions.

3. Number the answers correctly according to the numbering system used in this question paper.

4. Clearly show ALL calculations, diagrams, graphs, etc. which you have used in determining your answers.

5. Answers only will NOT necessarily be awarded full marks.

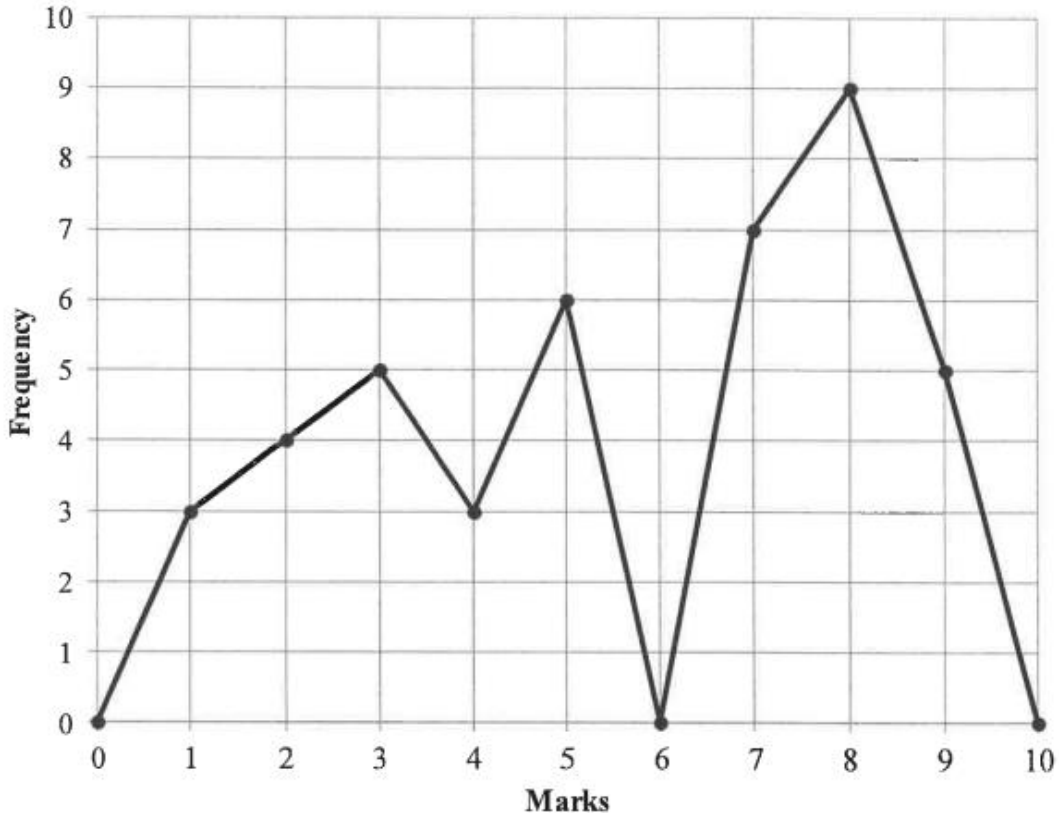
6. You may use an approved scientific calculator (non-programmable and non-graphical), unless otherwise stated.

7. If necessary, round off answers to TWO decimal places, unless stated otherwise.

8. A DIAGRAM SHEET has been provided. Write your name on this sheet and hand it in with your answer booklet.

QUESTION 1

The line graph shows test marks out of 10 by a Grade 10 class.



1.1 Complete the frequency column in the table provided on the DIAGRAM SHEET. (2)

1.2 How many learners wrote the test? (1)

1.3 Calculate:

1.3.1 the range for the data (2)

1.3.2 the mean for the test. (2)

1.4 Determine the median for the data. (3)

1.5 Draw a box and whisker diagram for the data. (3)

[13]

QUESTION 2

The amounts spent by 120 motorists at a petrol station on a certain day were recorded as shown in the table below.

Amount spent (in *x* rands)	**Number of motorists**
$0 < x \leq 50$	12
$50 < x \leq 100$	38
$100 < x \leq 150$	42
$150 < x \leq 200$	20
$200 < x \leq 250$	8

2.1 Write down the interval that has the least number of motorists. (1)

2.2 Draw a histogram to represent the data.
Use the diagram provided on the DIAGRAM SHEET. (2)

2.3 Identify in which interval the 30^{th} percentile lies. (2)

2.4 Calculate the size of the angle that will represent the modal class on a pie chart. (2)
[7]

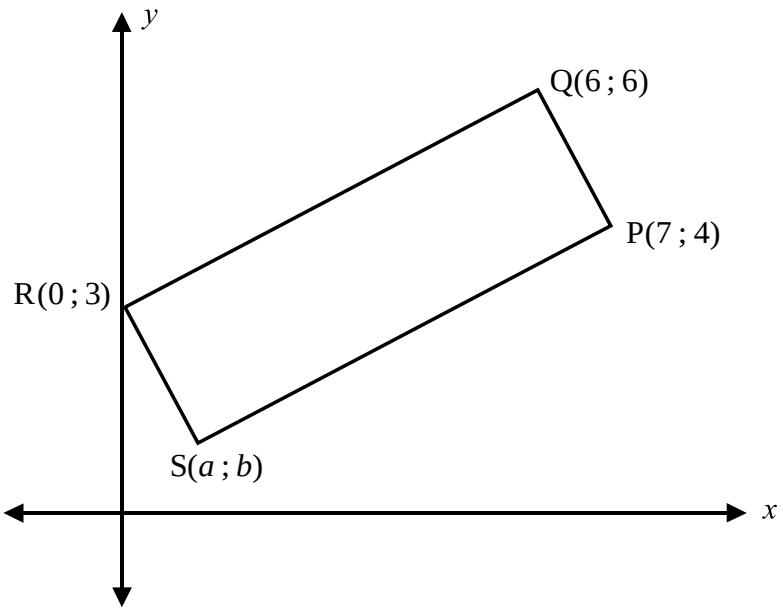
QUESTION 3

3.1 $A(-1;1)$, $B(-2;-1)$, $C(12;6)$ and $D(1;2)$ are the vertices of a quadrilateral.

3.1.1 Determine the gradients of AB, BC, CD and AD. (4)

3.1.2 What type of quadrilateral is ABCD? Motivate your answer. (2)

3.2 In the diagram below, $P(7;4)$, $Q(6;6)$, $R(0;3)$ and $S(a;b)$ are the vertices of a quadrilateral PQRS.



3.2.1 Calculate the length of PQ. Leave your answer in surd form. (2)

3.2.2 If $T\left(\frac{7}{2};\frac{7}{2}\right)$ is the midpoint of QS, determine the coordinates of S. (3)

3.2.3 If the coordinates of S are $(1;1)$, show that $PR = QS$. (2)

3.2.4 Show that $QR \perp RS$. (4)

3.2.5 What type of special quadrilateral is PQRS? Motivate your answer. (2)

3.2.6 Calculate the size of $R\hat{S}Q$. (3)

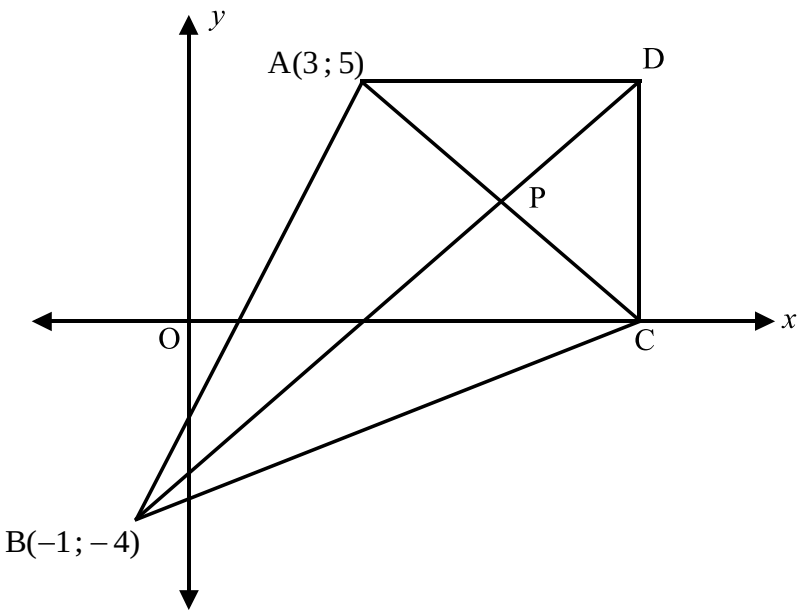
[22]

QUESTION 4

4.1 ΔABC has vertices $A(1;1)$, $B(3;6)$ and $C(6;3)$. Show that ΔABC is an isosceles triangle. (3)

4.2 The points $A(6;3)$, $B(a;0)$ and $C(9;-2)$ are collinear.
Determine the value of a. (4)

4.3 In the diagram below, ADCB is a kite with vertices $A(3;5)$ and $B(-1;-4)$.
$AD = DC$ and $AB = BC$. D is a point such that AD is parallel to the x-axis and $AD = 5$ units. CD is perpendicular to the x-axis. The diagonals intersect at P.



4.3.1 Show that the coordinates of C are $(8;0)$. (2)

4.3.2 Write down the coordinates of point P. (2)

4.3.3 Calculate the length of BD. (2)

4.3.4 Calculate the length of AC. (2)

4.3.5 Calculate the area of kite ADCB. (3)

[18]

QUESTION 5

5.1 Given: $3\tan\theta + 4 = 0$ and $0° < \theta < 180°$

5.1.1 Use a sketch to determine the value of the following without using a calculator:

(a) $\cos\theta$ (4)

(b) $\dfrac{3\sin\theta\sec\theta}{\tan\theta}$ (4)

5.1.2 Hence, show that $1 - \sin^2\theta = \cos^2\theta$. (3)

5.2 Simplify the following without using a calculator:

$\cos 30°\tan 60° + \text{cosec}^2 45°\sin^2 60°$ (6)

5.3 Solve for *x* correct to two decimal places if *x* is an acute angle:

5.3.1 $\dfrac{4}{3}\sin x = \cos 37°$ (2)

5.3.2 $\cos(x - 50°) + 1,4 = 1,6$ (3)

[22]

QUESTION 6

6.1 Sketch the graphs of the following on the same set of axes for the interval $[0°; 180°]$:

$f(x) = \tan x - 1$ and $g(x) = -2\cos x$

Use the axes provided on the DIAGRAM SHEET. (6)

6.2 Write down the range of *g*. (1)

6.3 Write down the amplitude of *g*. (1)

6.4 Determine graphically the value(s) of *x* for which:

6.4.1 $\tan x + 2\cos x \geq 1$ (2)

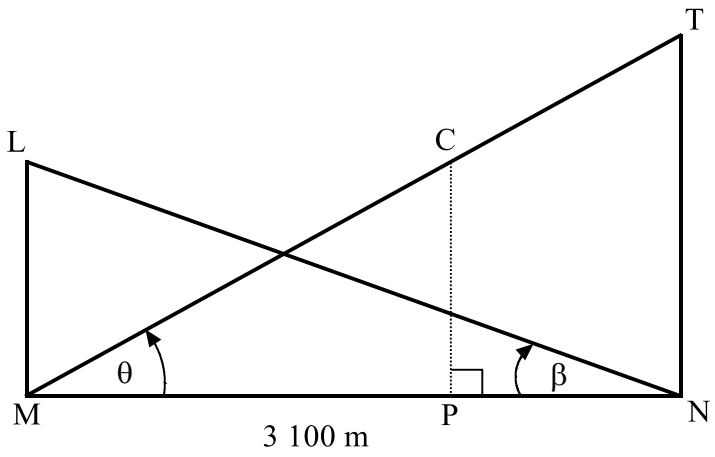
6.4.2 $g(x) - f(x) = 3$ (1)

6.5 The graph of $h(x) = a\sin x + b$ has a turning point at $(90°; 5)$ and cuts the *y*-axis at $(0°; 2)$.
Calculate the value of *a* and *b*. (4)

[15]

QUESTION 7

The diagram below represents a cross-section of the peaks of Table Mountain (T) and Lions Head (L) above sea level. Points M and N are directly below peaks L and T respectively such that MPN lies on the same horizontal plain at sea level and P is directly below C. $MN = 3\,100\text{ m}$. The angle of elevation of L from N is β and the angle of elevation of T from M is θ. It is given that $\tan\theta = 0,35$ and $\tan\beta = 0,21$.



7.1 Calculate the ratio LM : TN. (4)

7.2 A cable car (C) travelling from the top of the mountain (T) follows a path along TCM.

7.2.1 Calculate the angle formed ($M\hat{T}N$) between the cable and the vertical height TN. (3)

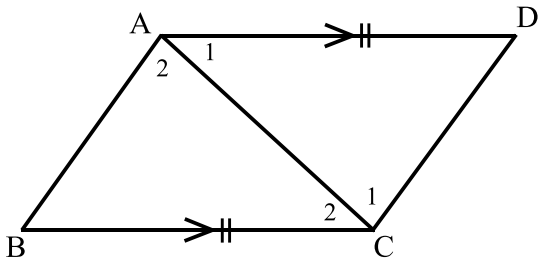
7.2.2 If the cable car (C) travels along the cable such that $TC = 400\text{ m}$, calculate the height of the cable car above sea level at that instant.

Hint: A construction line will be useful in this question. (6)

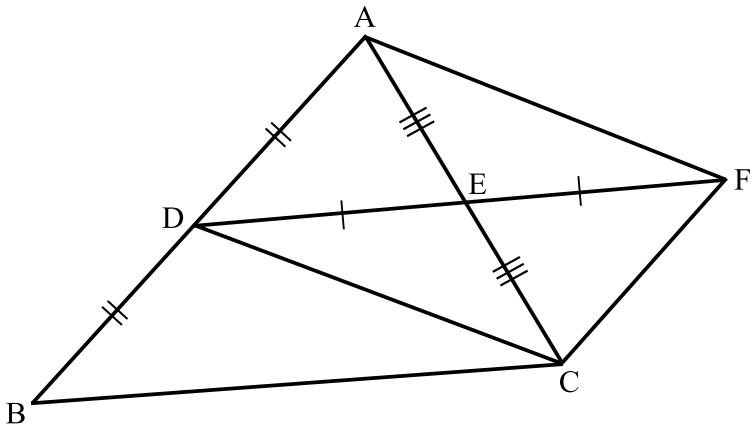
[13]

QUESTION 8

8.1 Prove the theorem which states that if one pair of opposite sides of a quadrilateral are equal and parallel, then the quadrilateral is a parallelogram. (5)



8.2 In the diagram below, D is the midpoint of side AB of ΔABC. E is the midpoint of AC. DE is produced to F such that $DE = EF$. $CF \parallel BA$.



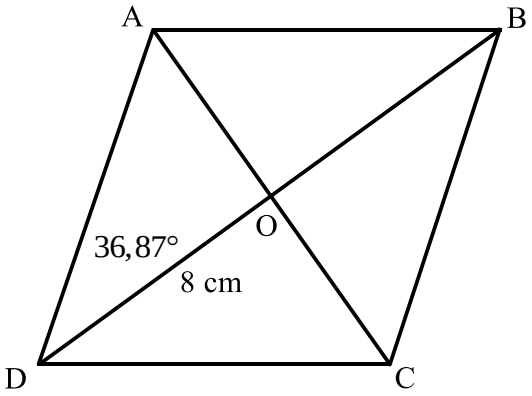
8.2.1 Prove that DBCF is a parallelogram. (4)

8.2.2 Prove that $DE = \frac{1}{2}BC$. (3)

[12]

QUESTION 9

In the diagram below, ABCD is a rhombus having diagonals AC and BD intersecting in O. $A\hat{D}O = 36{,}87°$ and $DO = 8\text{ cm}$.



9.1 Write down the sizes of the following angles:

9.1.1 $C\hat{D}O$ (1)

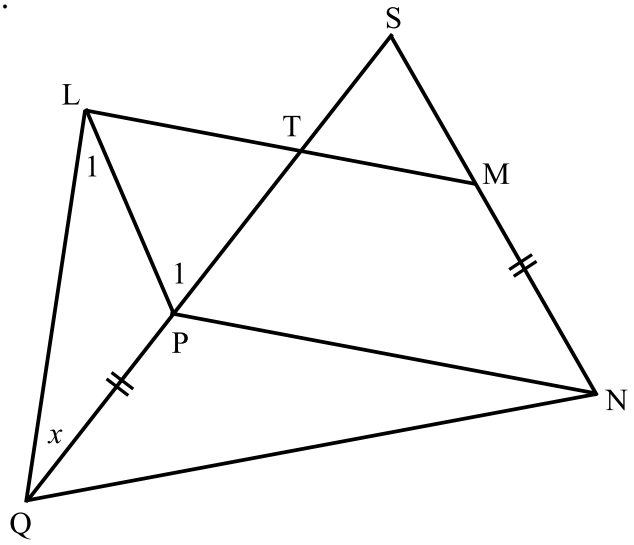
9.1.2 $A\hat{O}D$ (1)

9.2 Calculate the length of AO. (2)
[4]

QUESTION 10

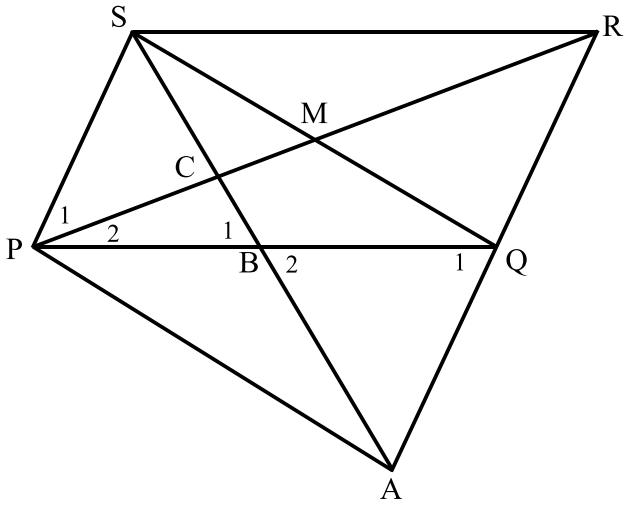
10.1 In the diagram below, LPNM is a parallelogram. QS cuts LM at T and passes through P. NS is produced to S, $PQ = MN$ and LQNM is a quadrilateral.

Let $L\hat{Q}S = x$.



Use the diagram to prove, with reasons, that $Q\hat{S}N = 2L\hat{Q}S$. (4)

10.2 In the diagram below, PQRS is a parallelogram having diagonals PR and QS intersecting in M. B is a point on PQ such that SBA and RQA are straight lines and $SB = BA$. SA cuts PR in C and PA is drawn.



10.2.1 Prove that $SP = QA$. (4)

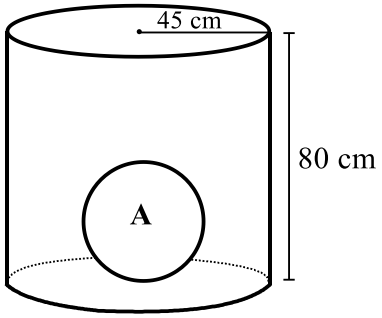
10.2.2 Prove that SPAQ is a parallelogram. (2)

10.2.3 Prove that $AR = 4MB$. (4)

[14]

QUESTION 11

11.1 The diagram below shows a metal sphere, with a diameter of 30 cm, placed inside an empty cylindrical tank of radius 45 cm and height 80 cm. The cylinder is then filled with water.



Volume of sphere $= \frac{4}{3}\pi r^3$

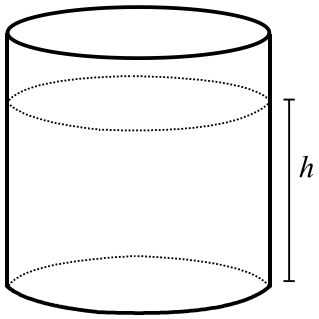
Volume of cone $= \frac{1}{3}\pi r^2 h$

Volume of cylinder $= \pi r^2 h$

11.1.1 Calculate the volume of the metal sphere, indicated on the diagram as A. (2)

11.1.2 Calculate the volume of water required to fill the tank. (3)

11.1.3 The sphere is removed from the tank as shown in the diagram below.



Calculate the height of the water remaining in the tank. (3)

11.2 The sphere is then melted down and the metal is made into a solid cone of height 25 cm. Calculate the radius of the cone. (2)

[10]

TOTAL MARKS: 150

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DIAGRAM SHEET

NAME: _____

QUESTION 1

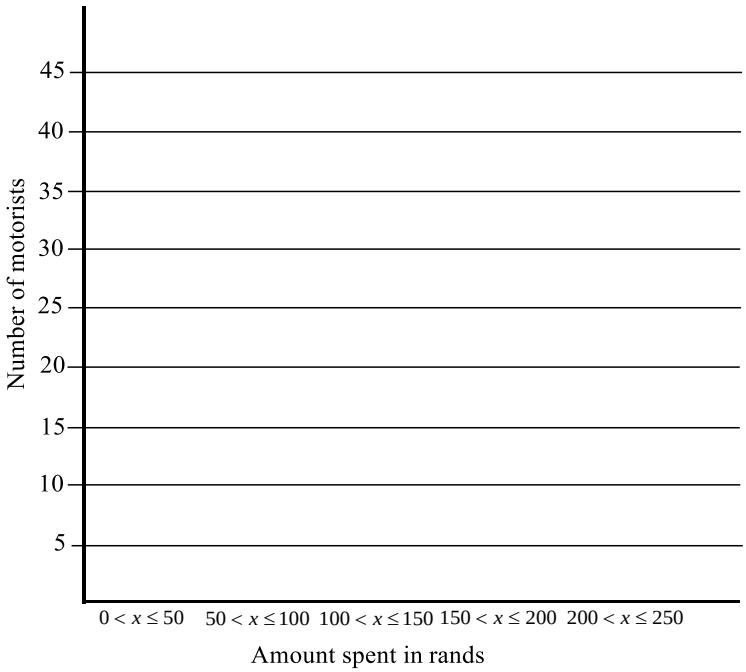
1.1

Marks	Frequency
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

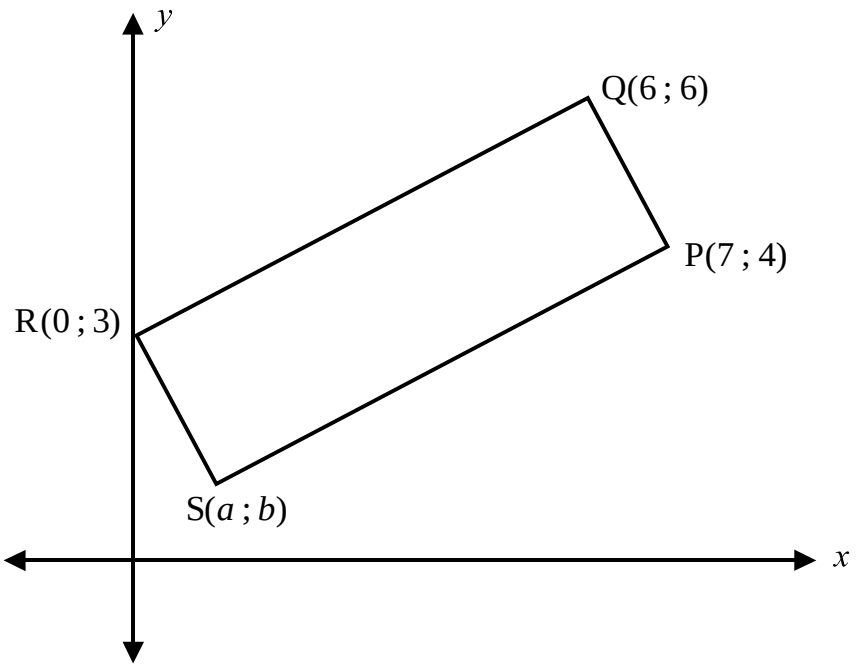
1.5

QUESTION 2

2.2

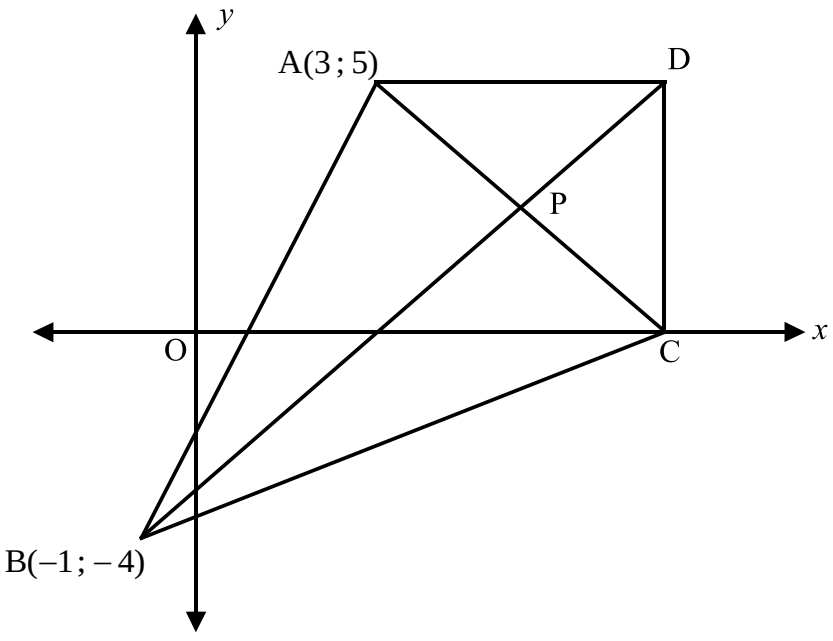


QUESTION 3



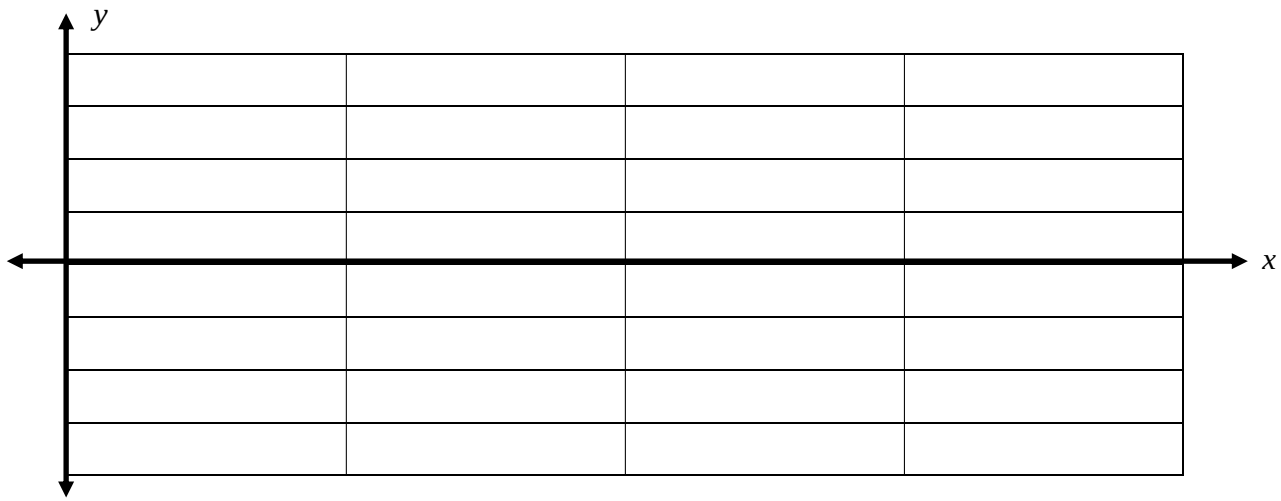
QUESTION 4

4.3

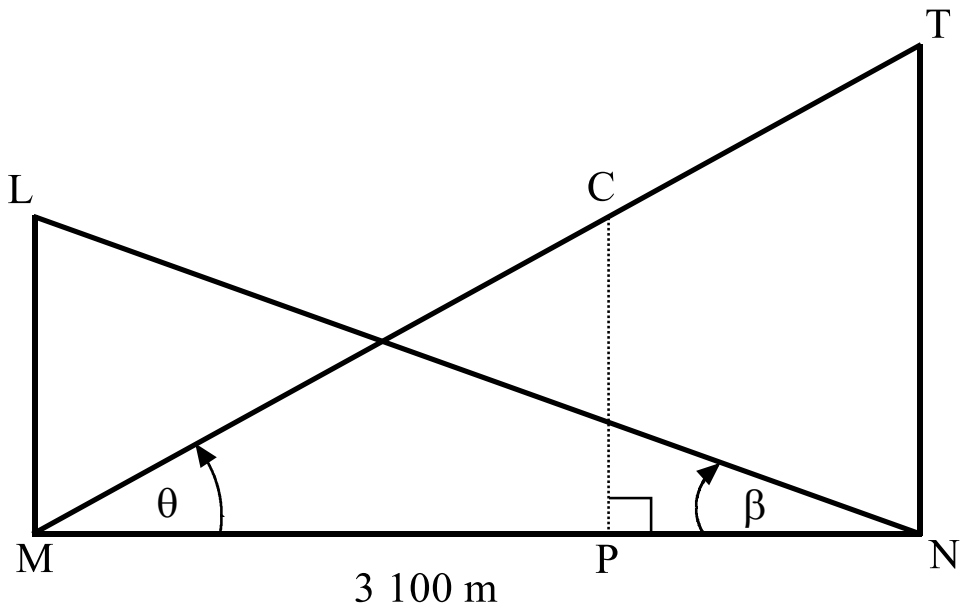


QUESTION 6

6.1

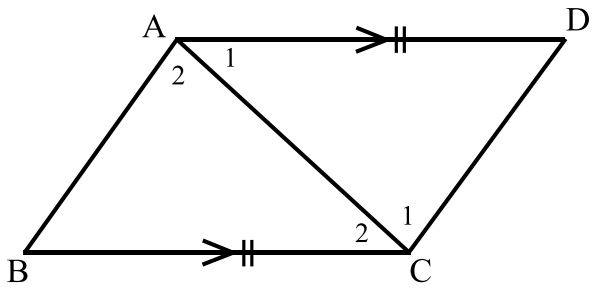


QUESTION 7

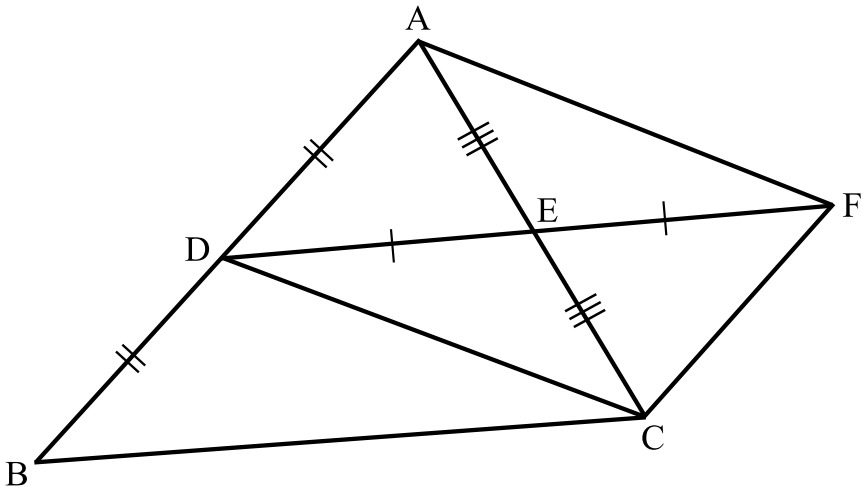


QUESTION 8

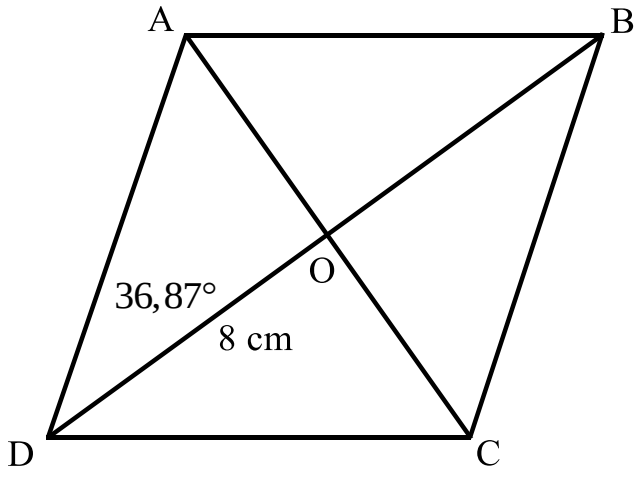
8.1



8.2

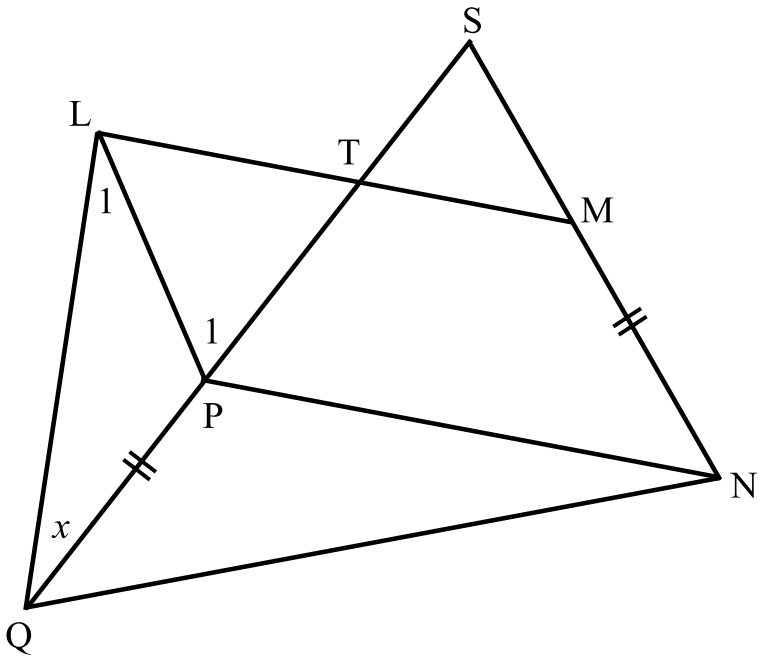


QUESTION 9

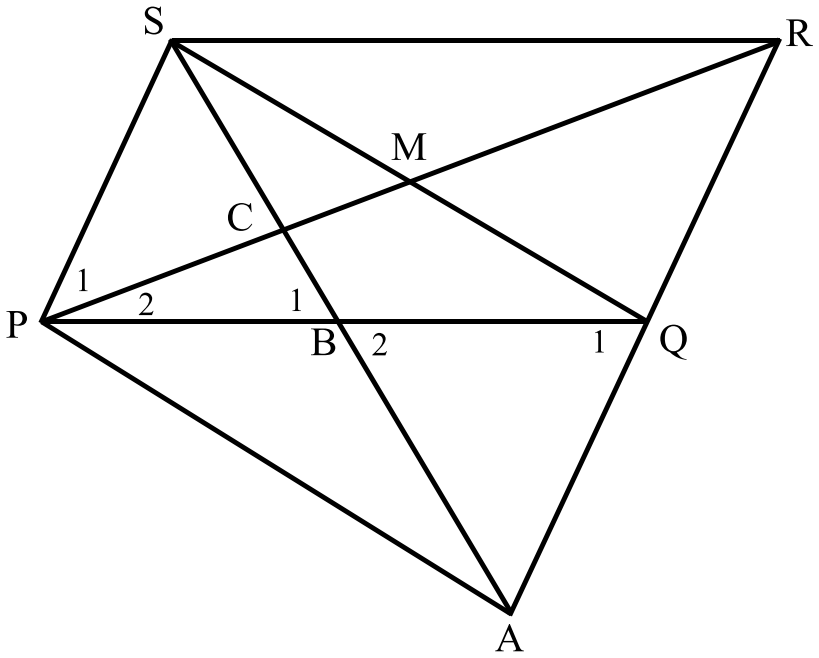


QUESTION 10

10.1

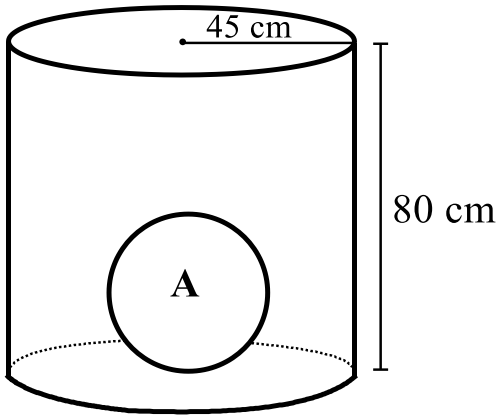


10.2



QUESTION 11

11.1



11.2