LINKSFIELD

GRADE 12
MATHEMATICS PAPER 2
PRELIMINARY EXAMINATION
SEPTEMBER 2017

Total: 150 marks
Reading Time: 10 minutes **Writing Time: 3 hours**

PLEASE WRITE YOUR NAME IN THE BLOCK BELOW

NAME: _____

The paper consists of a question paper of **21** pages (excluding the cover sheet) and a data sheet
Please check that your paper is complete and **read the following instructions carefully**

1. Number all questions exactly **as** they appear on the question paper.
2. Pay careful attention to time management and mark allocation.
3. Write legibly and not in pencil.
4. Non programmable calculators may be used unless otherwise instructed.
5. **All necessary calculations must be clearly shown. You will NOT receive full credit if you write down only the answers and show no working out.**
6. Give answers **correct to 2 decimal places** where appropriate.
7. All **diagrams are not necessarily drawn to scale.**

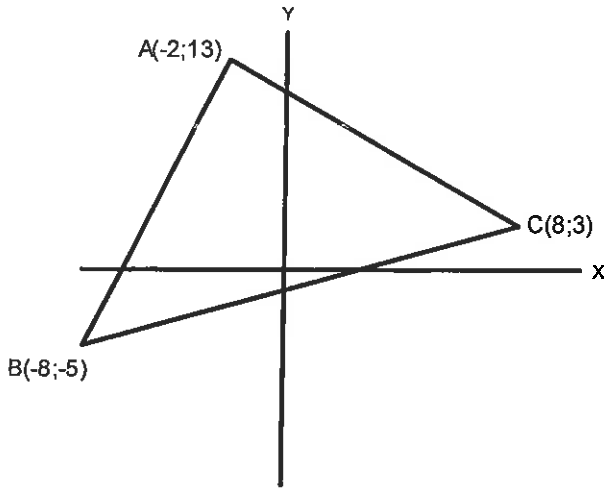
Q1 [21]	Q2 [8]	Q3 [10]	Q4 [9]	Q5 [9]	Q6 [12]	Q7 [10]	Q8 [8]
Q9 [8]	Q10 [13]	Q11 [9]	Q12 [6]	Q13 [13]	Q14 [7]	Q15 [7]	

TOTAL: 150

Section A

Question 1

Points A(−2;13), B(−8;−5) and C(8;3) form a triangle as illustrated below.



Determine

(a) the length of AB in simplest surd form. (3)
(b) the equation of the circle which has AB as a diameter. (5)
(c) the gradient of AB (2)
(d) the value of k if A, B and D(2;k), are collinear points. (3)
(e) the size of $\hat{A}$ correct to two decimal places. (4)
(f) the equation of BE if E is the point on AC which is closest to B. (4)

[21]

Question 2

A gardener plants a seedling and measures it over a 20 day period.

Here are the results

Days after planting	8	11	14	15	18	20
Height(cm)	3	4	6	8	10	11

(a) Determine the equation of the line of best fit. (3)
(b) Determine the correlation coefficient and comment on it. (3)
(c) If the plant has a height of 9cm can you determine the number of days it has been growing since being planted? Justify your answer. (2)

[8]

Question 3

(a) If $\sin 61° = p$, determine the following in terms of p.

(i) $\sin 241°$

(ii) $\cos 122°$

(5)

(b) Prove that $\dfrac{\sin 2x - \tan x}{\cos 2x} = \tan x$ (5)

[10]

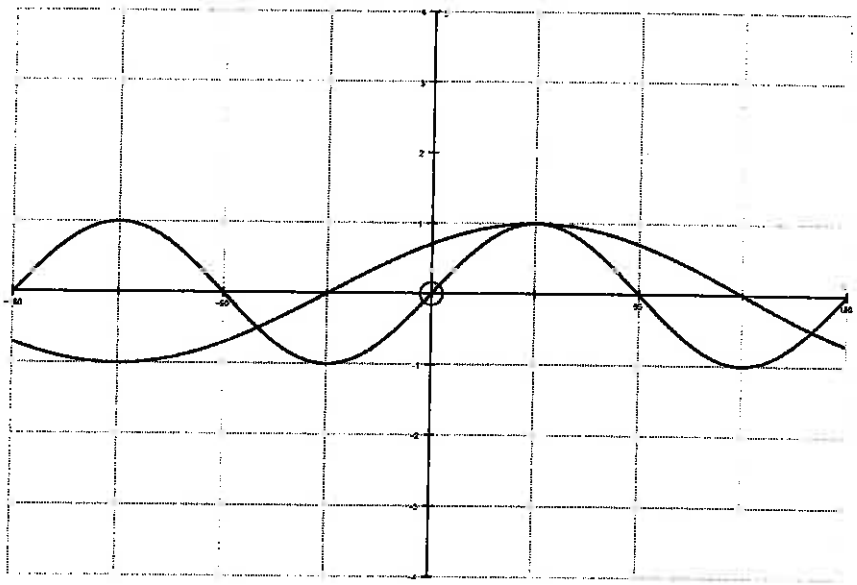
Question 4

(a) Determine x if

$$\cos(x-45^0)=\sin 2x\,;\ x\in[-180^0;180^0]$$

(6)

(b) On the set of axes below the graphs of
$p(x) = \cos(x-45^0)$ and $q(x) = \sin 2x$ are shown.
$x\in[-180°;180°]$



Using your result from (a) find x if $p(x) > q(x)$ (3)

[9]

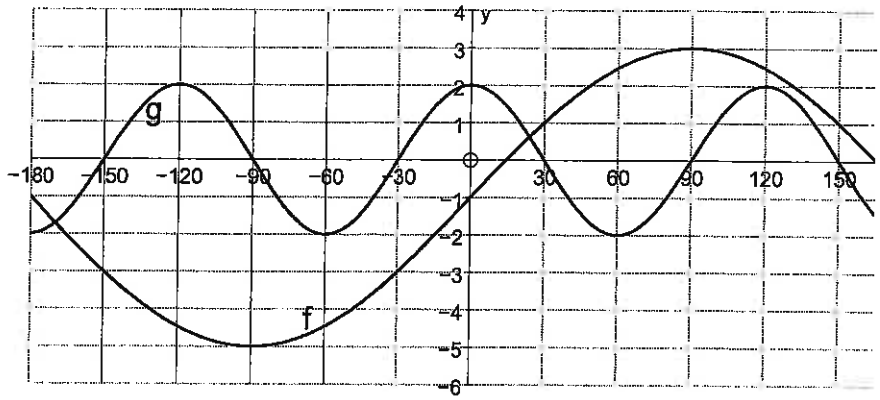
Question 5

The sketch below shows the graphs of the functions

$f(x) = a\sin x + b$

and

$g(x) = p\cos(qx)$ for $x \in [-180^\circ; 180^\circ]$



(a) Determine the period of g. (1)

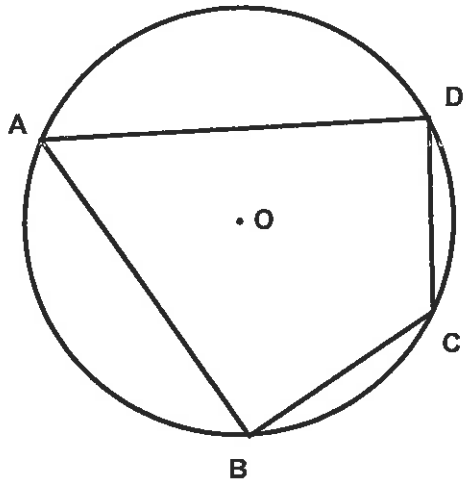
(b) Determine the values of a, b, p and q (4)

(c) Determine the values of x for which $f(x).g(x) \geq 0$ if $x < 0^\circ$ (4)

[9]

Question 6

(a) Use the drawing below to prove the theorem that states the opposite angles of a cyclic quadrilateral are supplementary. O is the centre of the circle.
i.e prove that $\hat{A}+\hat{C}=180^0$ (5)



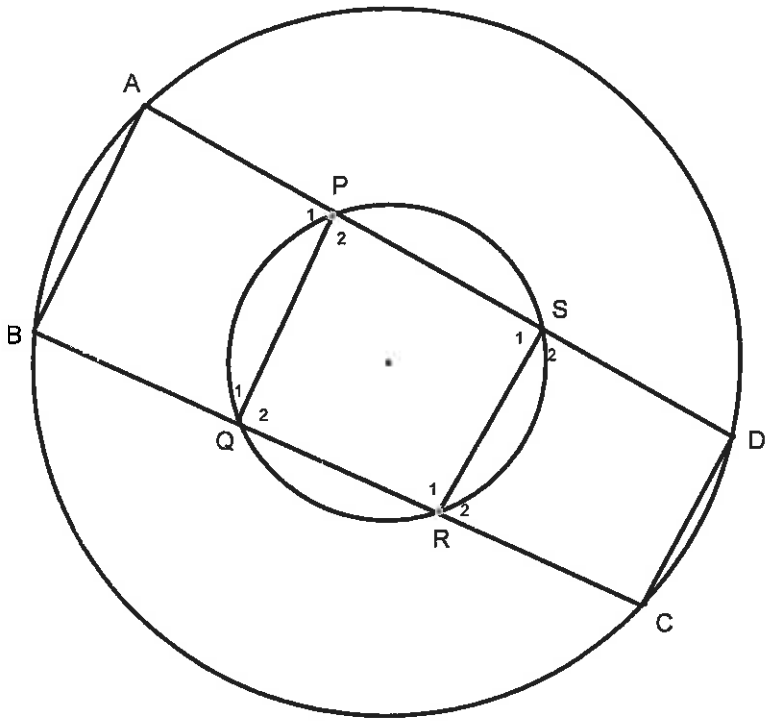
(b) ABCD is a cyclic quadrilateral.
P and Q are points on AD and BC respectively so that
PQ// AB.
PQ is a chord of another circle which intersects AD at S and BC at R.

Prove:

(i) ABRS is a cyclic quadrilateral (4)

(ii) $\hat{R}_1 = \hat{C}$ (3)

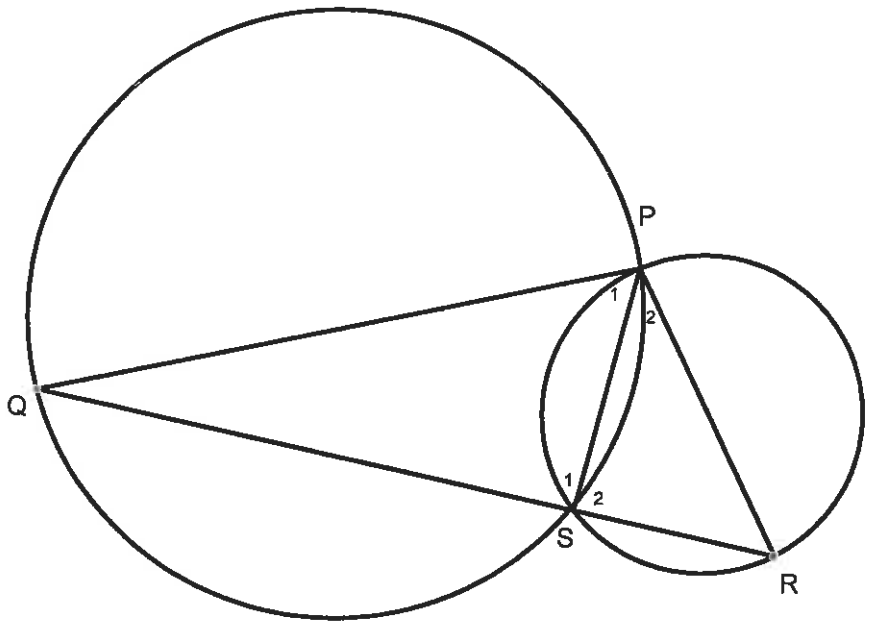
[12]



Question 7

In the figure the two circles intersect at P and S.

$Q\hat{P}R = 90^0$ and PS ⊥ QR



(a) Prove that ΔSPR /// Δ PQR (2)
(b) HENCE prove that PR is a tangent to circle PQS (2)
(c) Prove that $PS^2 = QS.SR$ (4)
(d) If QS = 45 units and SR = 31,25 units. Calculate the length of PS (2)

[10]

TOTAL Section A = 79

Section B

Question 8

(a) The following information is given about the test results of a class:

$\sum_{k=1}^{20}(x_k - \bar{x})^2 = 156$ and $\sum_{k=1}^{20} x_k = 1220$

Determine

(i) The number of pupils in the class (1)

(ii) The mean mark (1)

(iii) The standard deviation (2)

(b) In a certain data set the interval that is one standard deviation from the mean is [350;380]

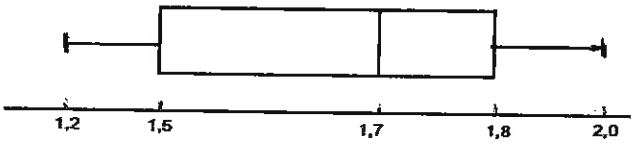
Calculate the mean and the standard deviation for this data. (4)

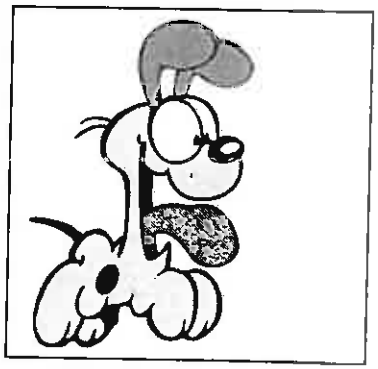
[8]

Question 9

The mass of 60 small dogs is summarised in the box and whisker diagram below.

Mass (in kilograms)





(a) Fill in the missing values in the table below:

Mass interval	Frequency	Midpoint
$1,2 \leq x < 1,3$		1,25
$1,3 \leq x < 1,4$	6	1,35
$1,4 \leq x < 1,5$	7	
$1,5 \leq x < 1,6$	7	
$1,6 \leq x < 1,7$		
$1,7 \leq x < 1,8$		
$1,8 \leq x < 1,9$		
$1,9 \leq x < 2,0$	2	

(4)

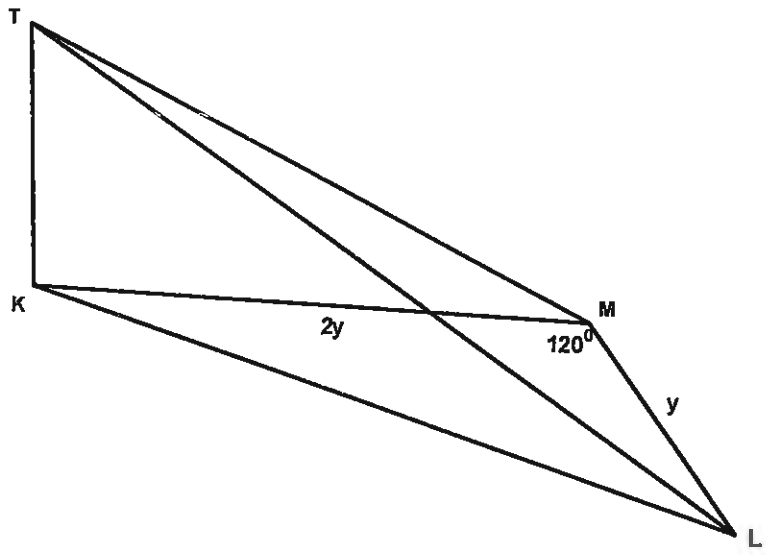
(b) Determine the estimated mean mass of the dogs. (2)

(c) Discuss the skewness of the graph. Give a reason for your answer. (2)

[8]

Question 10

(a) In the figure K,M and L are 3 points in the same horizontal plane.
$K\hat{M}L = 120°$ T represents the position of a point directly above K.
ML = y and MK = 2y. The angle of elevation of T from L is θ.



(i) Show that $KL = \sqrt{7}y$ (5)

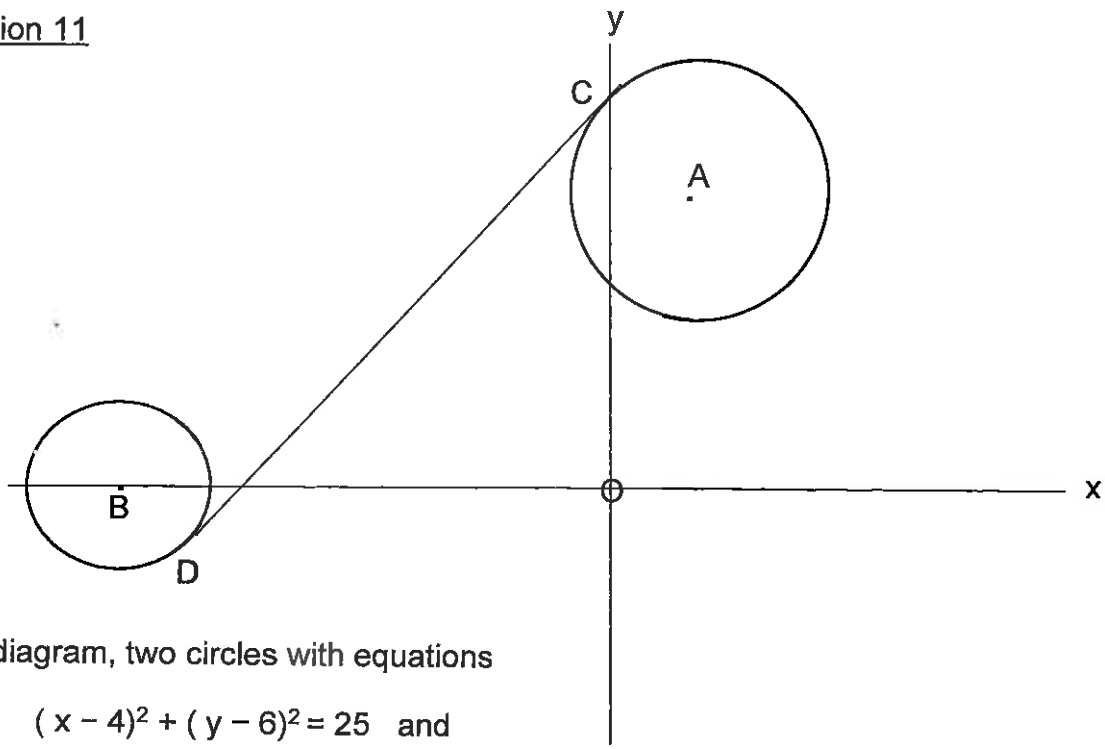
(ii) Hence, or otherwise determine TL in terms of y and θ (2) [7]

(b) Show that $\frac{\cos 330°}{1+\sin(90°-\theta)} - \frac{\cos 150°}{1-\cos(360°-\theta)} = \frac{\sqrt{3}}{\sin^2\theta}$

(6)

[13]

Question 11



In the diagram, two circles with equations

$(x - 4)^2 + (y - 6)^2 = 25$ and

$(x + 10)^2 + y^2 = 1$ are drawn.

CD is a common tangent to the circles with centres A and B at C and D respectively. C is a point on the y axis.

(a) Determine the co-ordinates of C. (4)

(b) Determine the length of the common tangent. **HINT: Join BD.** (5)

[9]

Question 12

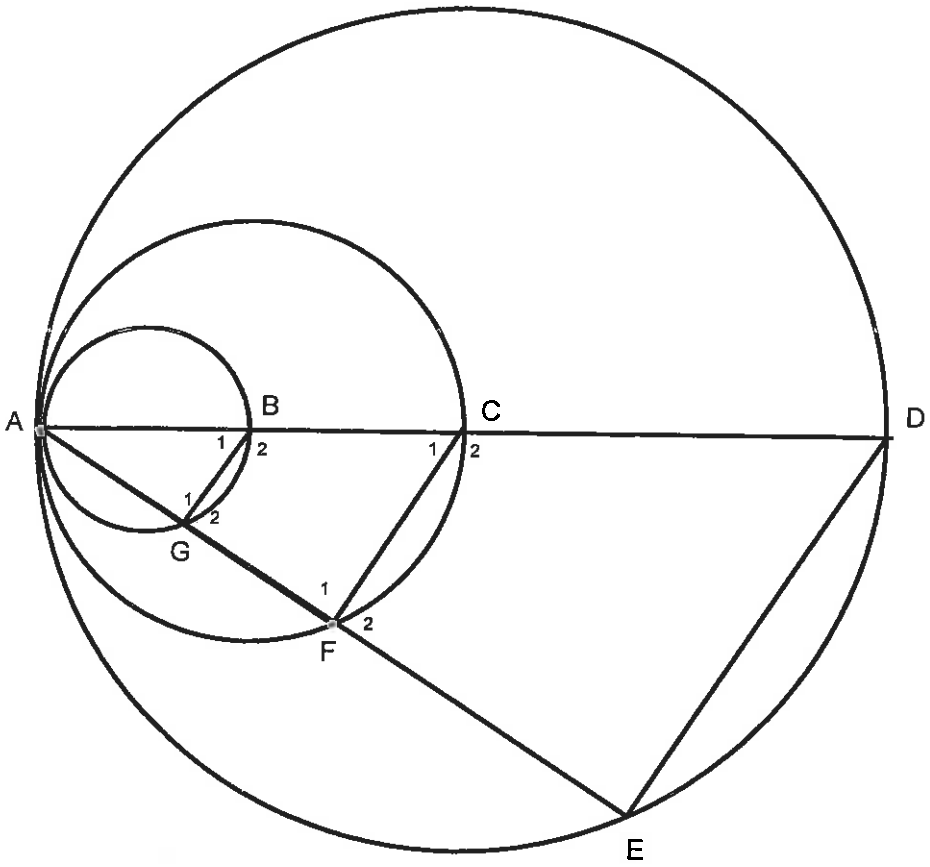
Prove that the radius of the circle having the equation

$$x^2 + y^2 + 4x\cos\theta + 8y\sin\theta + 3 = 0$$

can never exceed $\sqrt{13}$ for any value of θ. [6]

Show all your calculations.

Question 13



Three circles touch internally at A and have diameters AB, AC and AD respectively.

AC = 2AB and AD= 4AB.

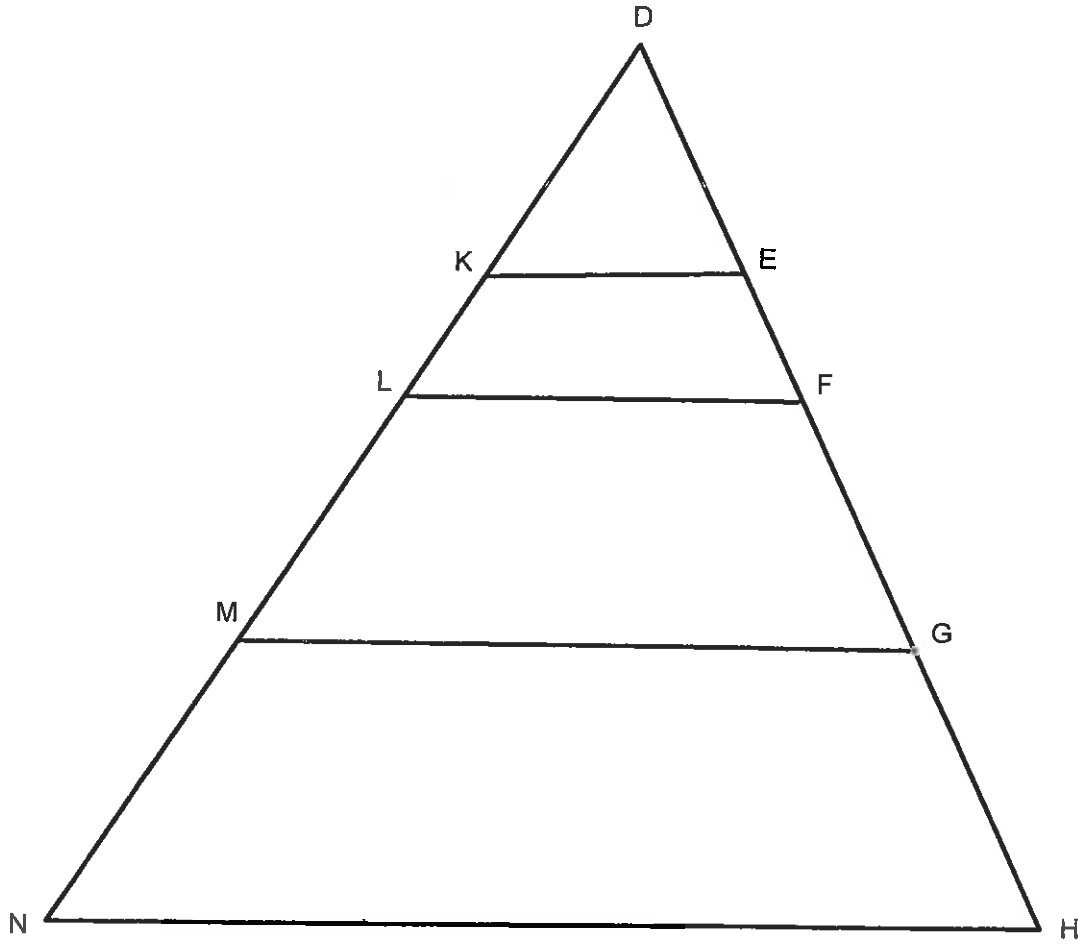
(a) Prove: GB//FC//ED (3)

(b) Calculate the value of the ratio FC:GB. Show all working (5)

(c) Calculate the value of the ratio $\frac{\text{Area}\Delta AFC}{\text{Area}\Delta AED}$ (5)

[13]

Question 14



ΔDNH is not drawn to scale.

KE//LF//MG//NH

DK:KL = 2:1

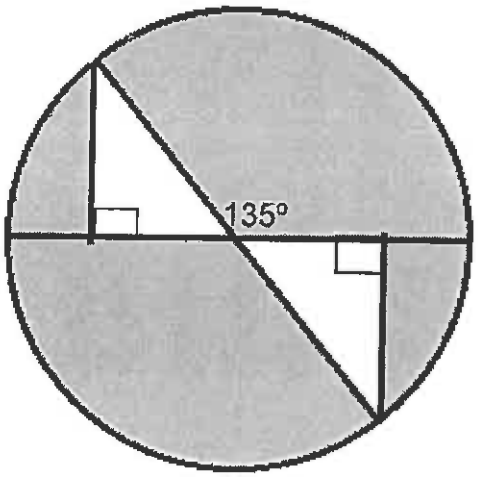
DL:LM=2:1

DM:MN=2:1 etc

If KE =2 units and NH is the 4th parallel line, calculate the length of the 10th parallel line, rounded off to one decimal digit. [7]

Question 15

The diameter of the circle is $8\sqrt{2}$ cm and the angle at the centre of the circle is 135° as indicated on the diagram. Determine the shaded **area** in terms of π. [7]



Total section B = 71