



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2013

Mathematics
(Project Maths – Phase 3)

Paper 2

Ordinary Level

Monday 10 June Morning 9:30 – 12:00

300 marks

Examination number

Centre stamp

Running total	
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For examiner	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
Total	

Grade

Instructions

There are **two** sections in this examination paper.

Section A	Concepts and Skills	150 marks	6 questions
Section B	Contexts and Applications	150 marks	2 questions

Answer all eight questions, as follows:

In Section A, answer

Questions 1 to 5 and

either Question 6A **or** Question 6B.

In Section B, answer Question 7 and Question 8.

Write your answers in the spaces provided in this booklet. You may lose marks if you do not do so. You may also ask the superintendent for more paper. Label any extra work clearly with the question number and part.

The superintendent will give you a copy of the *Formulae and Tables* booklet. You must return it at the end of the examination. You are not allowed to bring your own copy into the examination.

Marks will be lost if all necessary work is not clearly shown.

Answers should include the appropriate units of measurement, where relevant.

Answers should be given in simplest form, where relevant.

Write the make and model of your calculator(s) here:

- (b) A game consists of spinning the spinner 3 times. Each time the spinner stops on green the player wins €1; otherwise the player wins nothing. For example, if the outcome of one game is “green, red, green” the player wins €2.

Complete the following table:

Player wins	€0	€1	€2	€3
Required outcomes				

- (c) Is one spin of the spinner above an example of a Bernoulli trial?

Answer: _____

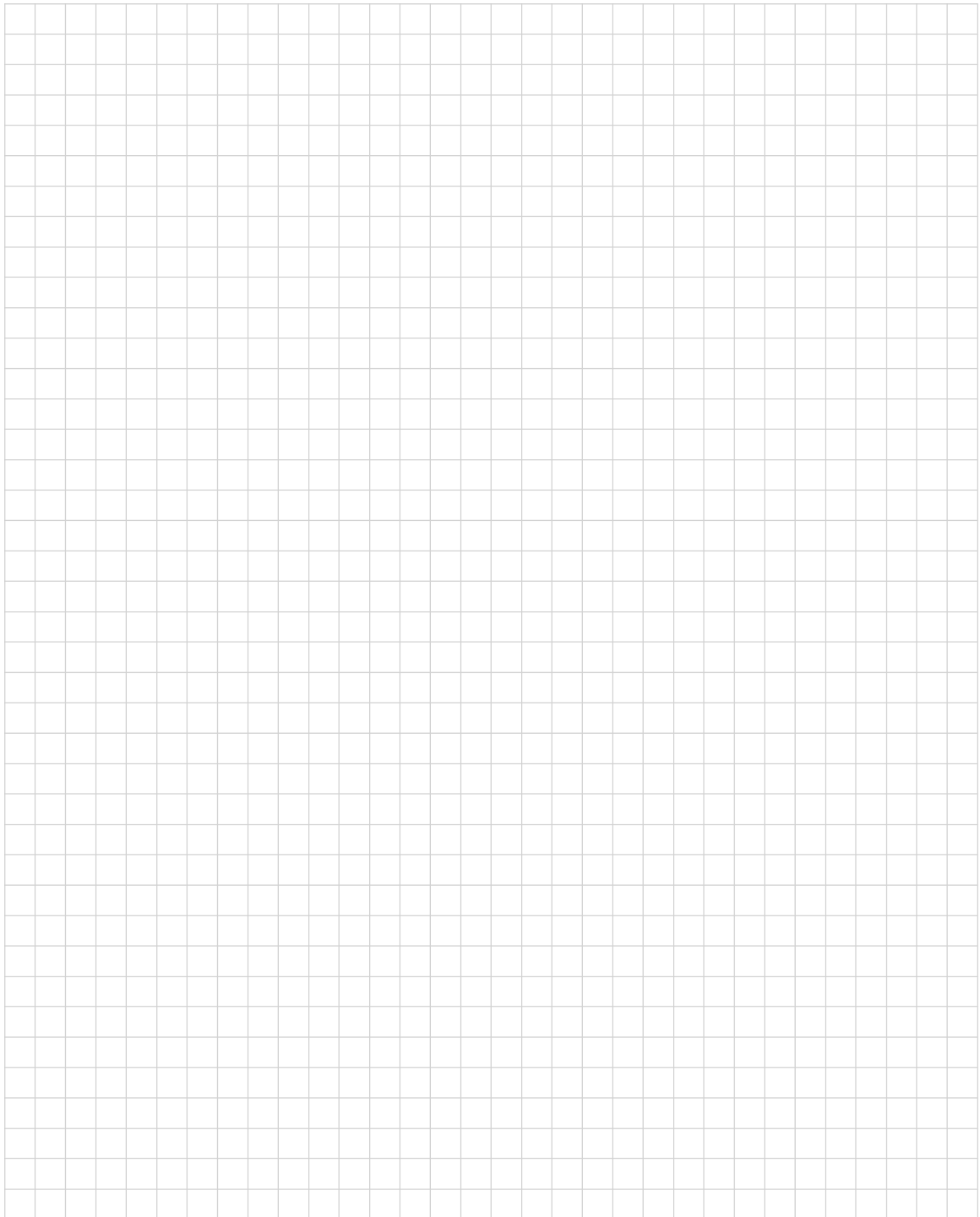
Explain what a Bernoulli trial is.

Question 5

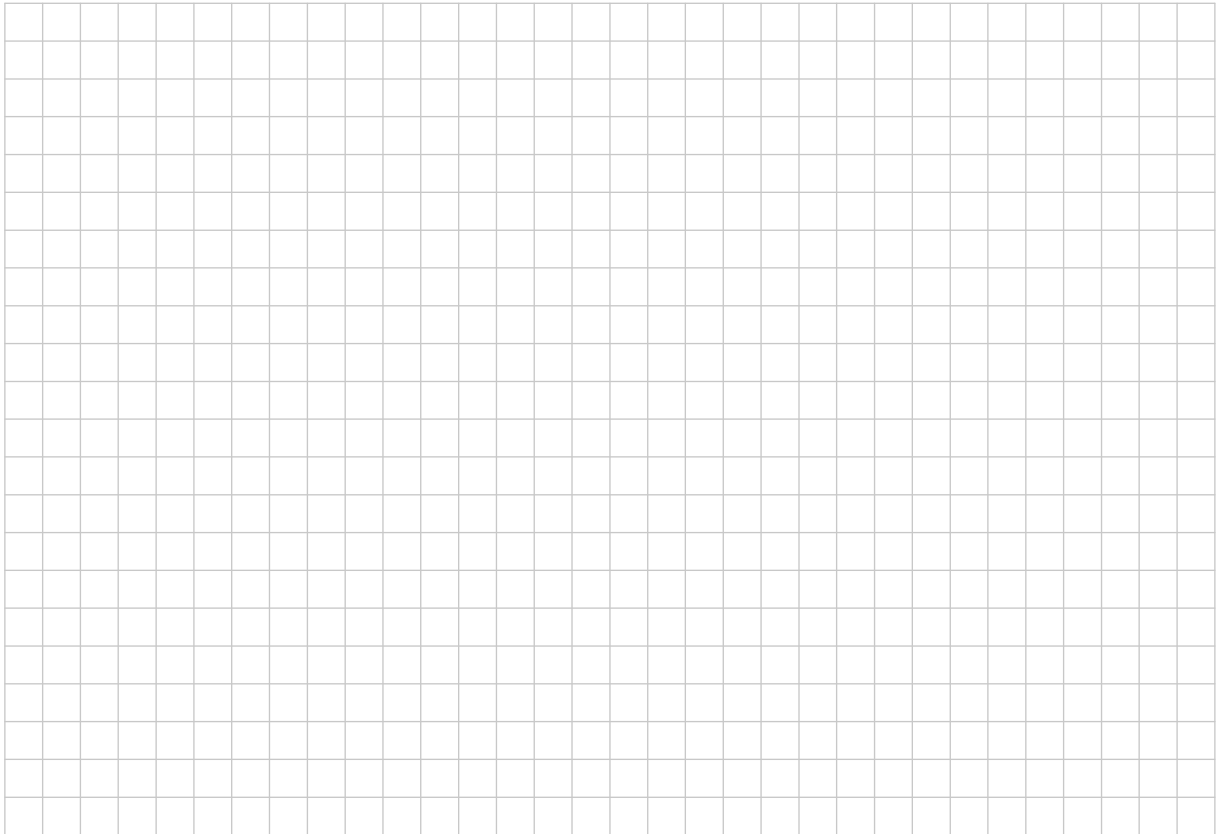
(25 marks)

A solid cylinder has a radius of 10 mm and a height of 45 mm.

- (a) Draw a sketch of the net of the surface of the cylinder and write its dimensions on the sketch.



(b) Calculate the volume of the cylinder. Give your answer in terms of π .



(c) A sphere has the same volume as the cylinder.
Find the surface area of the sphere. Give your answer in terms of π .



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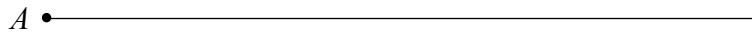
Question 6

(25 marks)

Answer **either** 6A **or** 6B.

Question 6A

- (a) Construct the triangle ABC such that $|AB| = 8$ cm, $|BC| = |AC| = 5$ cm. The point A is given to you.



- (b) On the same diagram, construct the image of the triangle ABC under the axial symmetry in AB .
- (c) Justify the statement “ $AC'BC$ is a parallelogram” where C' is the image of C under the axial symmetry in AB .



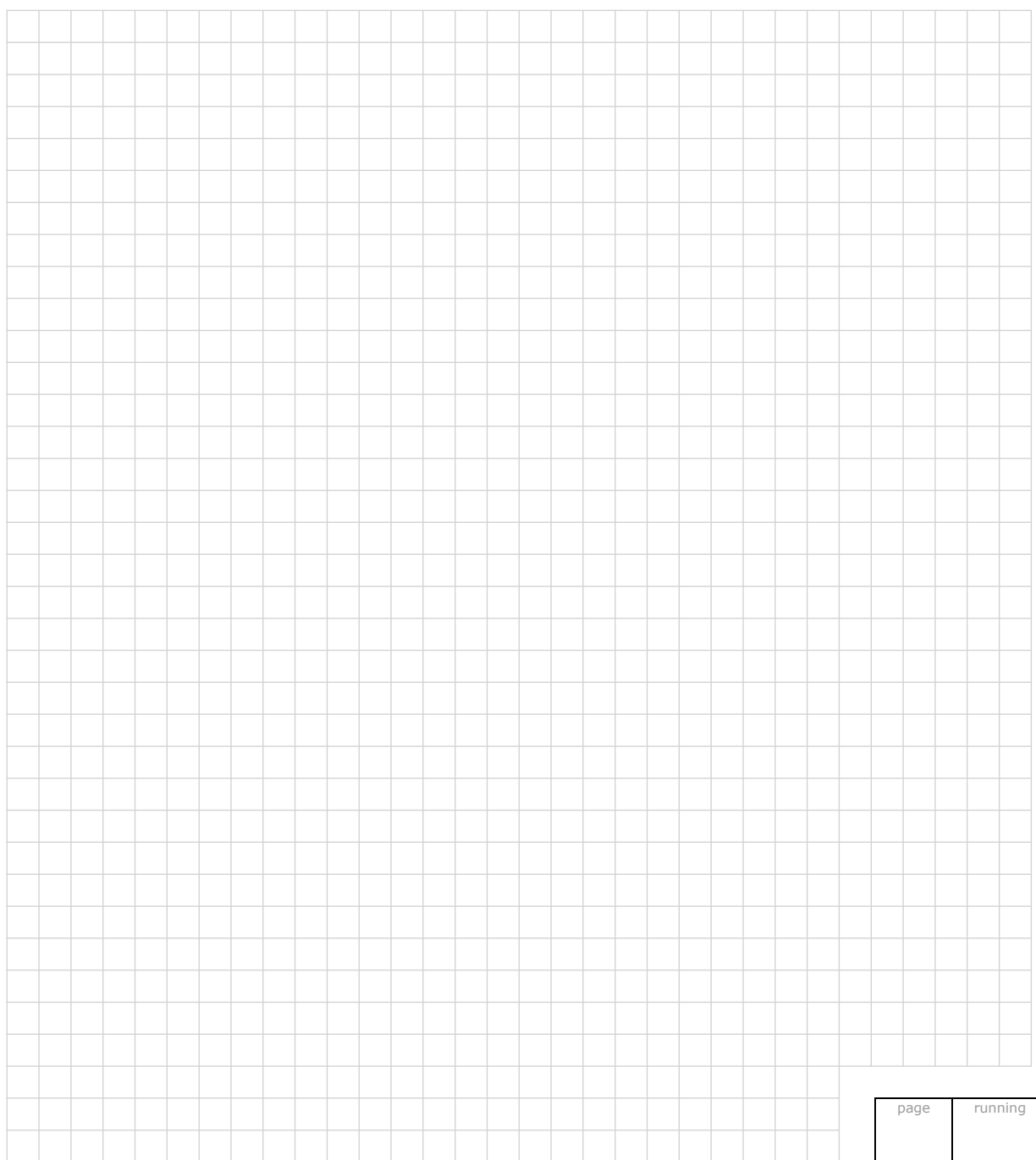
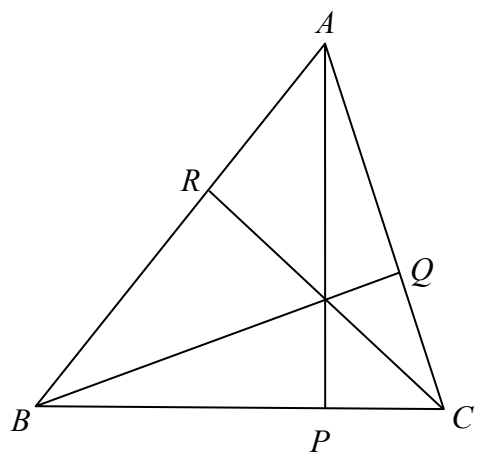
OR

Question 6B

In the acute-angled triangle ABC
 $AP \perp BC$, $BQ \perp AC$ and $CR \perp AB$.

Prove that

$$|\angle ABQ| + |\angle BCR| + |\angle CAP| = 90^\circ.$$



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Answer **both** Question 7 **and** Question 8.

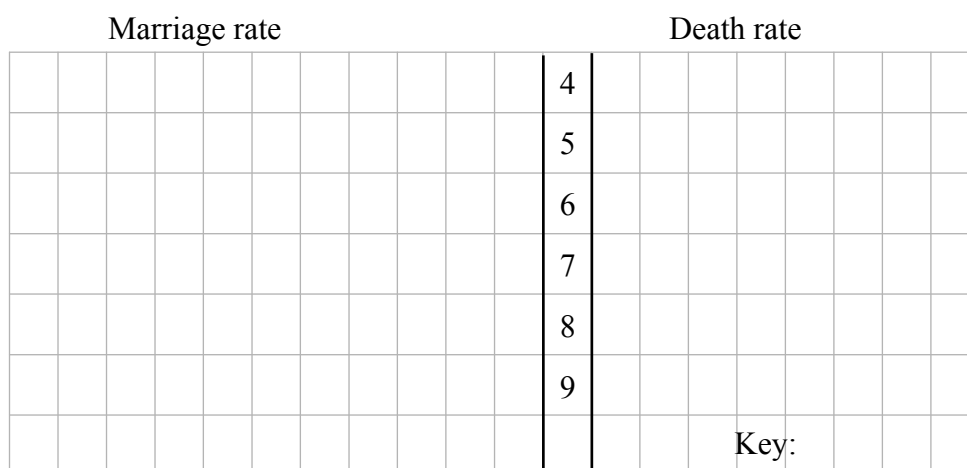
Question 7**(75 marks)**

The table below shows the rates of births, marriages and deaths in Ireland from 1990 to 2010. The rates are per 10 000 of the estimated population.

Number of Births, Marriages and Deaths in Ireland (per 10 000 of the estimated population)			
Year	Births	Marriages	Deaths
1990	151	51	90
1991	150	49	89
1992	144	47	87
1993	138	47	90
1994	135	46	86
1995	135	43	90
1996	140	45	87
1997	144	43	86
1998	146	45	85
1999	144	50	87
2000	145	51	83
2001	150	50	79
2002	155	52	76
2003	155	51	73
2004	153	52	71
2005	148	52	68
2006	154	52	67
2007	163	52	64
2008	168	50	63
2009	167	48	63
2010	165	46	61

(Source: Central Statistics Office, <http://www.cso.ie>)

- (a) Complete the back to back stem and leaf plot below to show the marriage rate and death rate in Ireland during the period covered in the table above.



- (b) State one difference that can be observed between the distributions of the marriage rate and the death rate in your plot.

- (c) Find the median and interquartile range of the yearly marriage rates in Ireland from 1990 to 2010.

Median	Interquartile range

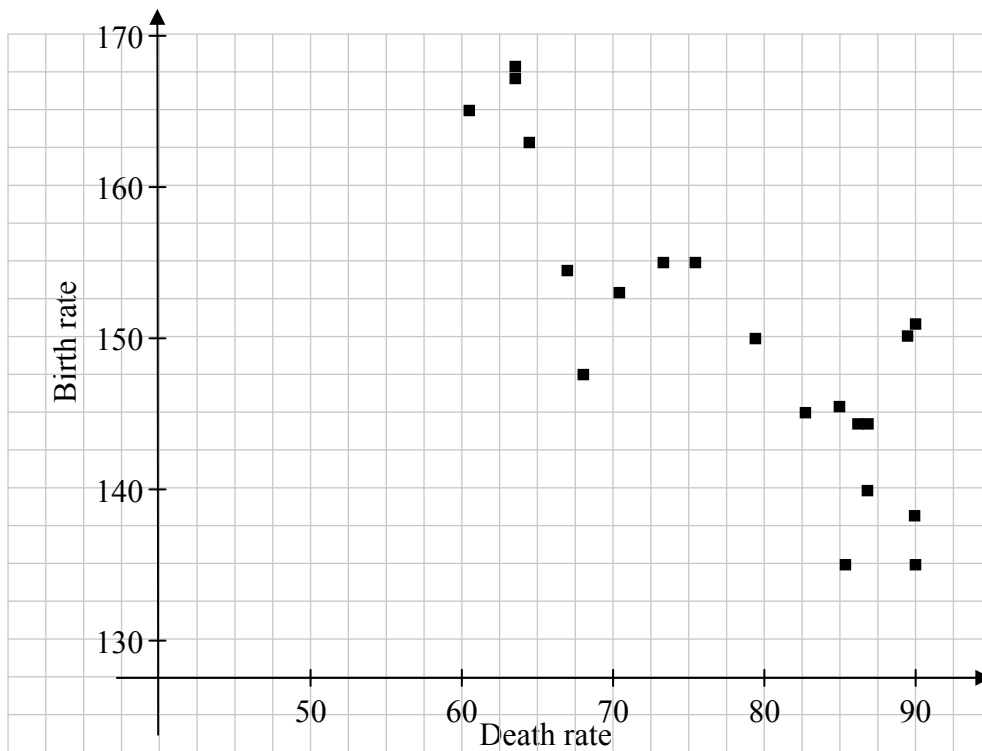
- (d) (i) Find the mean of the death rate in Ireland from 1990 to 2010. Give your answer correct to one decimal place.

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- (h) Find the ratio, Birth rate : Death rate, for the two years 1990 and 2010. Based on your answers for the two years, what would you predict about the population of Ireland in future years. Give a reason for your answer.

1990 Ratio	2010 Ratio
Prediction	
Reason	

- (i) The birth rate and death rate over the 21 years are plotted against each other in the scatter plot below. The correlation coefficient between the two sets of data is -0.85 . Describe the relationship between the two sets of data and suggest a reason why this might be the case.

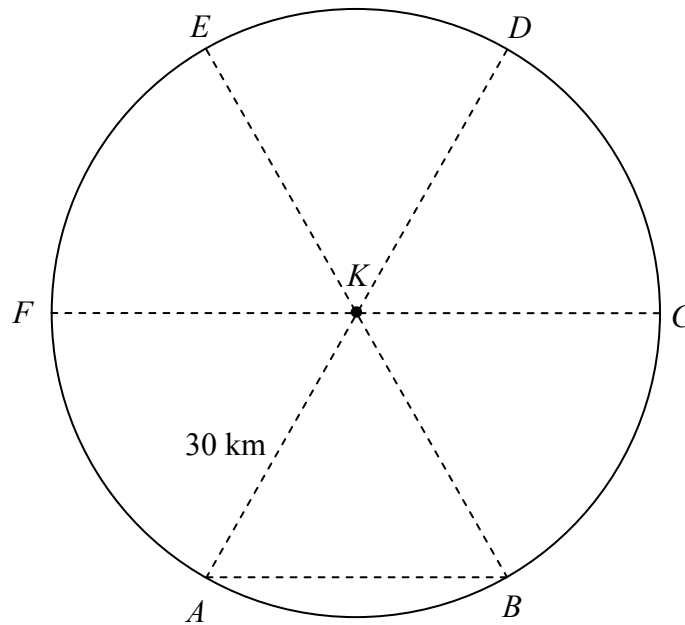


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Question 8

(75 marks)

A search is begun for a buoy that has become detached from its mooring at sea. The area to be searched is a circle of radius 30 km from the last known position, K , of the buoy. The search area is divided into six equal sectors as indicated by the letters A, B, C, D, E and F .

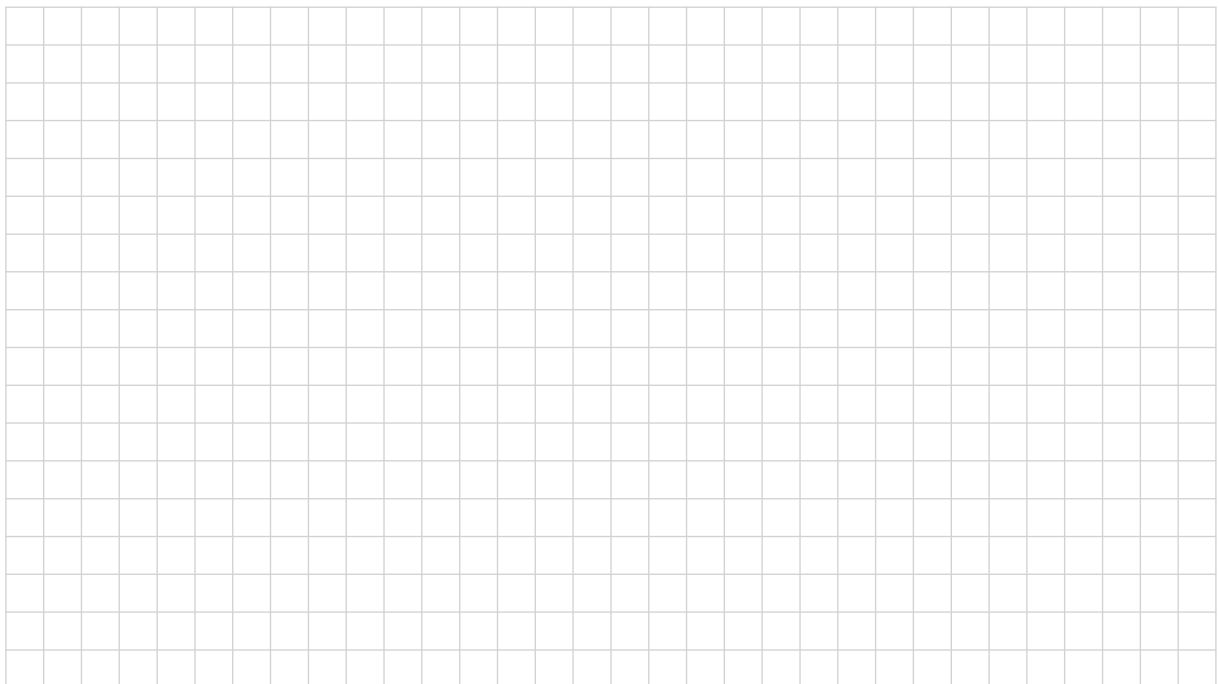


(a) Fishing boats search the triangular area KAB .

(i) Find $|\angle BKA|$.

Answer: _____

(ii) Find the area of the triangle KAB .



(iii) Write the area of the triangle KAB as a percentage of the area of the sector KAB .

(iv) Use the cosine rule to find the length of $[AB]$.

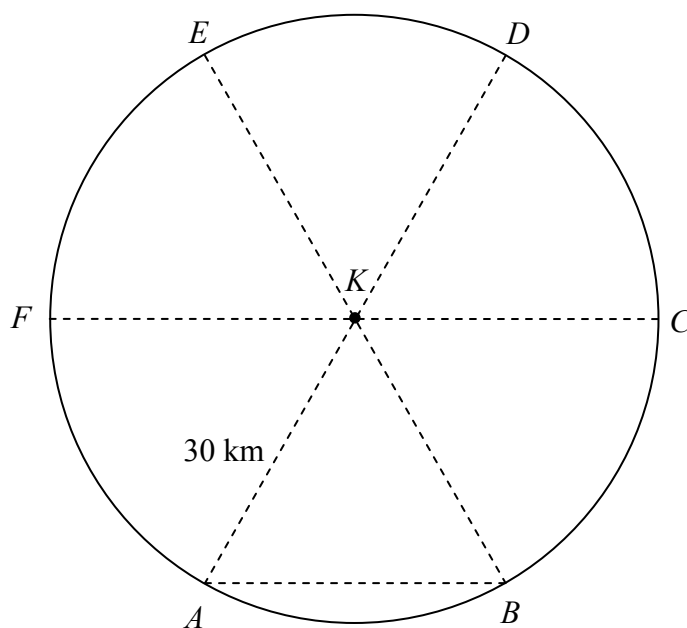
(v) What does your answer to **(iv)** above show about the triangle KAB ?

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(b) A helicopter took part in the search.

(i) The helicopter flew from the point F around the perimeter of the search area. What distance did the helicopter fly, correct to the nearest km?

(ii) The helicopter then flew in a straight line from F to D and from D on to C , also in a straight line. Draw the path of the helicopter on the diagram.



(iii) A theorem on your course can be used to find $|\angle FDC|$. Write down $|\angle FDC|$ and state the theorem.

$|\angle FDC| = \underline{\hspace{4cm}}$

Statement of theorem:

(iv) The helicopter flew at a speed of 80 km/h. How long did it take to fly from F to D and on to C ?

(c) A lifeboat taking part in the search sailed, in a straight line, from the point K until it reached a point X , the midpoint of $[ED]$.

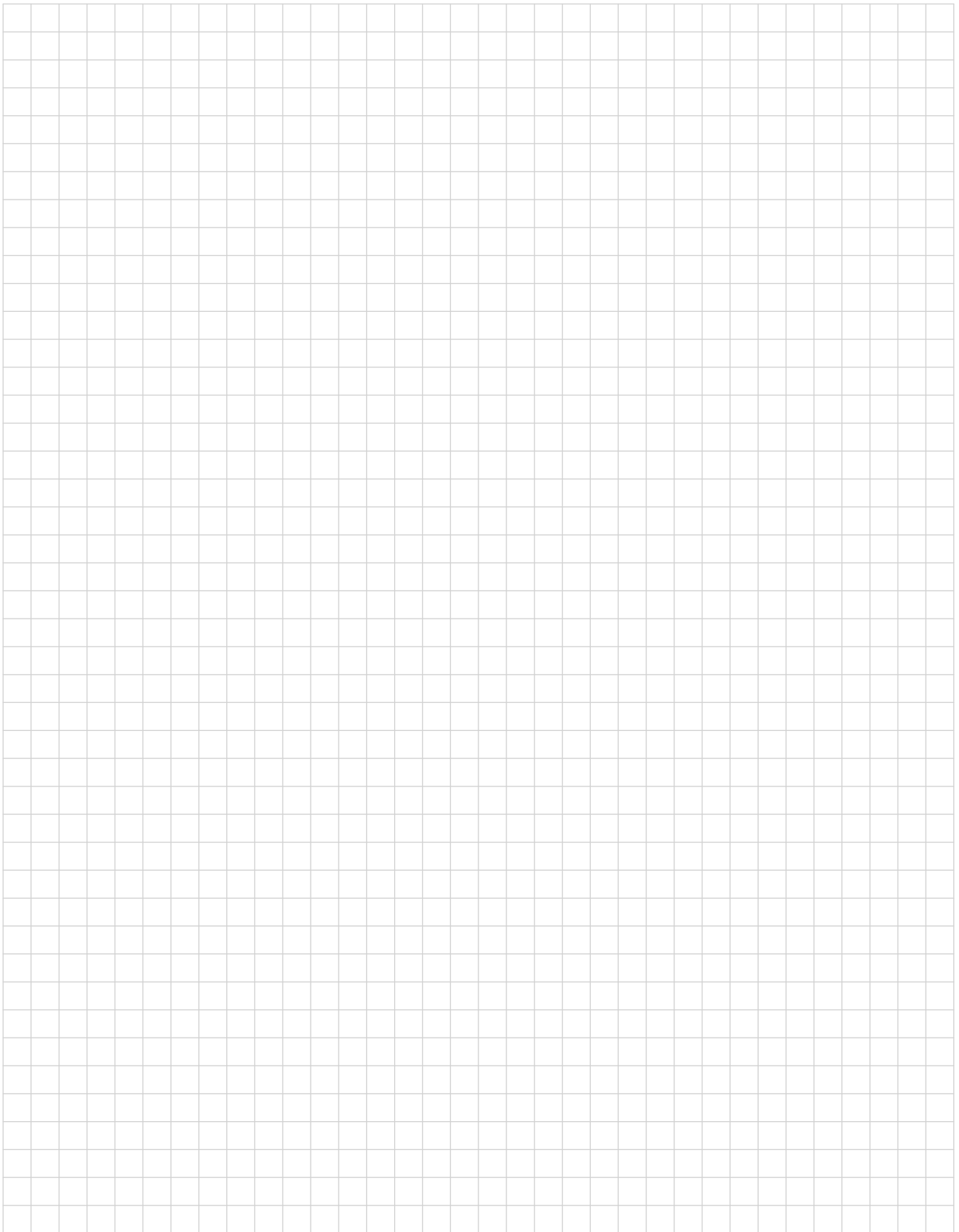
(i) Calculate $|KX|$.



(ii) The buoy was located at the point where the path KX , of the lifeboat, crossed the path FD of the helicopter. How far was the buoy from X ?



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