2025.M28K
(deferred exam)

2025L003G2EK

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination

Mathematics

Paper 2

Ordinary Level

2 hours 30 minutes

300 marks

Examination number					

Centre stamp

For the Examiner only				
		Section	Question	Mark
Disallowed		A	1	
A			2	
B			3	
Total Disall.			4	
			5	
			6	
		B	7	
Cumulative Check			8	
Running Total			9	
− Total Disall.			10	
= Total		↔	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	4 questions

Answer questions as follows:

- any **five** questions from Section A – Concepts and Skills
- any **three** questions from Section B – Contexts and Applications.

Write your Examination Number in the box on the front cover.

Write your answers in blue or black pen. You may use pencil in graphs and diagrams only.

Write all answers into this booklet. There is space for extra work at the back of the booklet.
If you need to use it, 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.

In general, diagrams are not to scale.

You will lose marks if your solutions do not include relevant supporting work.

You may lose marks if the appropriate units of measurement are not included, where relevant.

You may lose marks if your answers are not given in simplest form, where relevant.

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

Section A — Concepts and Skills — 150 marks

Answer **any five questions** from this section.

Question 1 **(30 marks)**

(a) The line p has a slope of $\frac{3}{2}$ and crosses the y-axis at the point $(0, 4)$.

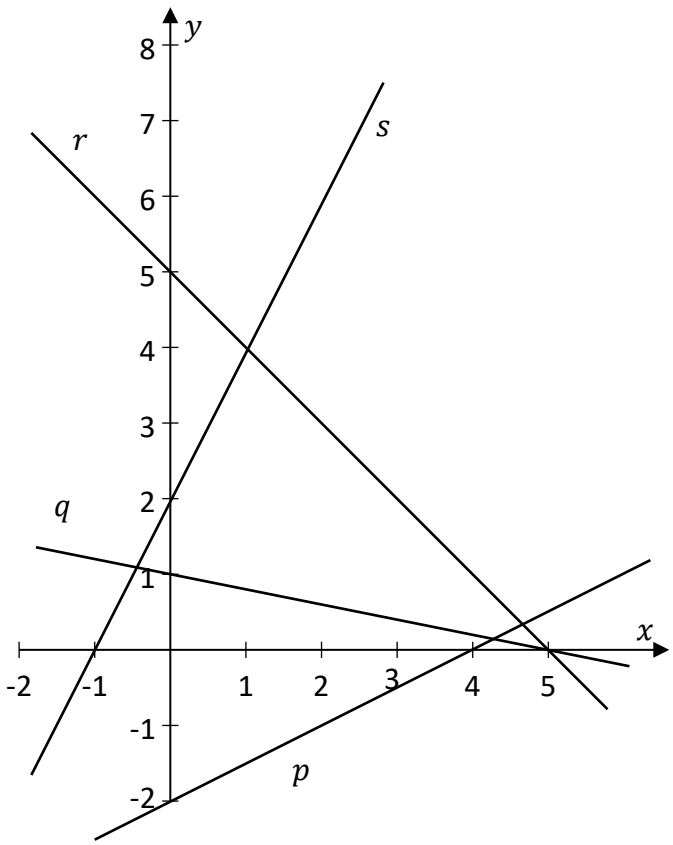
Find the equation of p.

(b) Find the area of the triangle formed by joining the following three points:

$$O(0, 0) \qquad A(3, 4) \qquad B(5, -1)$$

(c) The diagram below shows four lines, labelled p, q, r, and s.
The slope of each of the four lines is given in the table.

Identify each of the lines in the diagram by writing the appropriate label into the space in the table beside the slope.



Slope	**Label** (p, q, r, or s)
$-\frac{1}{5}$	
2	
-1	
$\frac{1}{2}$	

Question 2 **(30 marks)**

(a) The circle c has equation $x^2 + y^2 = 169$.

(i) Find the centre and the radius of the circle c.

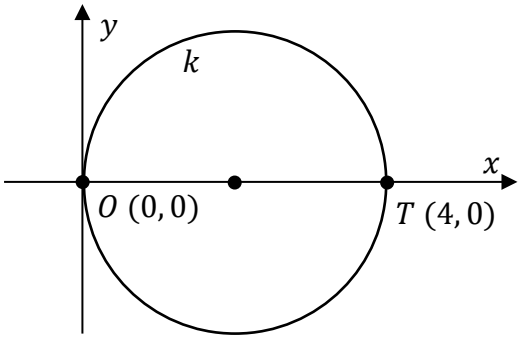
Centre: Radius:

(ii) Is the point $(1, 12)$ on the circle c?
Give a reason for your answer.

Answer:

Reason:

(b) The circle k, shown in the diagram on the right, has its centre on the x-axis and contains the points $O\ (0,0)$ and $T\ (4,0)$.

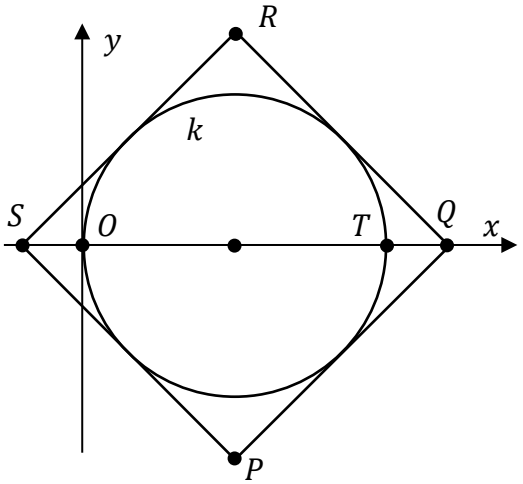


(i) Find the centre **and** the equation of k.

Centre: Equation:

(ii) $PQRS$ is a square.
S and Q are on the x-axis.
PQ, QR, RS, and SP are tangents to k, as shown.

Find the area of $PQRS$.

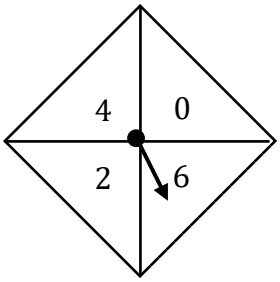


Question 3 **(30 marks)**

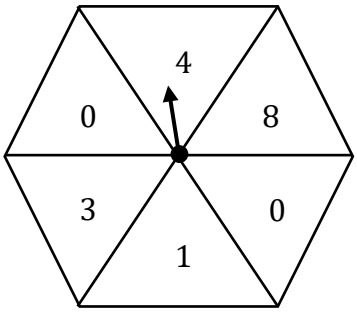
Part of a board game involves gathering tokens.
At certain points in the game a player can choose to spin one of the two fair spinners shown in the diagrams below. They will collect the number of tokens the arrow stops on.

For example, on Spinner **A** shown below a player would collect 6 tokens.

Spinner **A**



Spinner **B**



(a) A player spins Spinner **A** twice and collects a total of 6 tokens.

List the four possible ways this could have happened.

(b) A player spins Spinner **A** once and Spinner **B** once.

What is the **probability** that the player collects a total of 0 tokens?

(c) Spinner **B** is spun a large number of times.

Find the **expected** average number of tokens that a player will collect each time.

(d) Jill is playing a board game that uses both spinners.
She has calculated that the expected average number of tokens for one spin of spinner **A** is 3. At certain points in the game she can choose one of the three options below:

- Option 1. Pay 2 tokens and spin Spinner **A**
- Option 2. Pay 2 tokens and spin Spinner **B**
- Option 3. Do not spin either spinner

Jill decides that she will choose one option at the beginning of the game and will always use that option in the game.

Based on the expected average number of tokens for one spin of each spinner, which option would you advise Jill to choose?

Tick (✓) **one** box only.
Give a reason for your answer.

Option 1 ☐ Option 2 ☐ Option 3 ☐

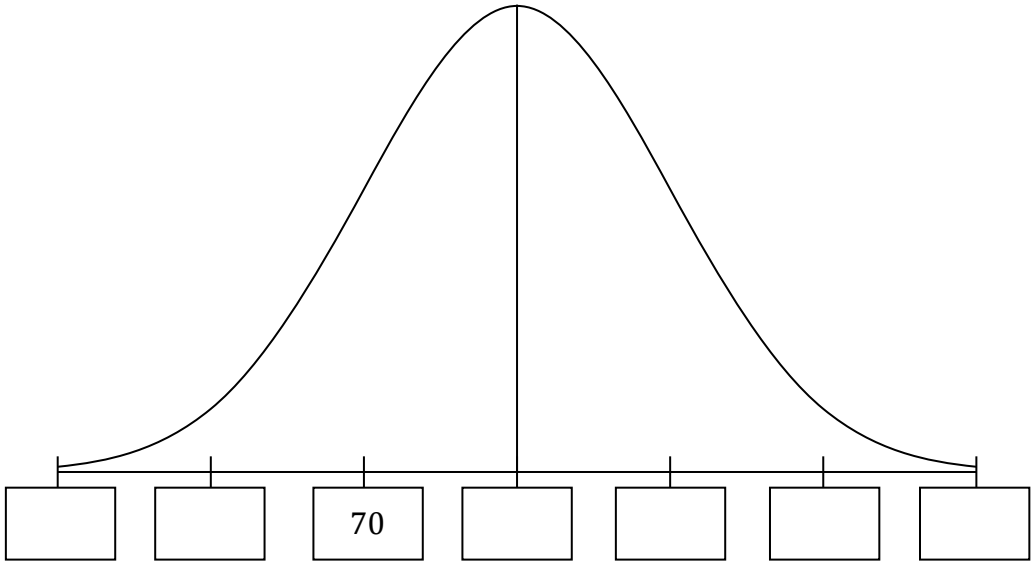
Reason:

Question 4 **(30 marks)**

(a) A sample of 1500 males is selected at random.

For this sample, diastolic blood pressure is normally distributed, with a mean of 80 and a standard deviation of 10.

The normal curve below shows the blood pressure of the 1500 males in this sample.



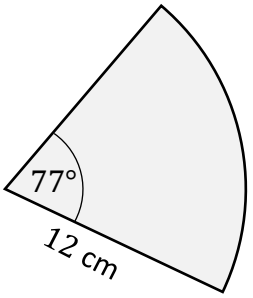
Diastolic blood pressure

(i) Fill in the six missing numbers on the horizontal axis on the diagram above.

(ii) Using the Empirical Rule, or otherwise, find the approximate **number** of males in the sample who have diastolic blood pressure between 70 and 90.

(iii) Use the Empirical Rule to find the approximate percentage of males in the sample who have diastolic blood pressure greater than 90.

(b) The diagram shows a sector of a circle of radius 12 cm, with an angle of $77°$.



(i) Find the area of the sector.
Give your answer, in cm^2,
correct to 1 decimal place.

(ii) Find the length of the perimeter of the sector.

Give your answer, in cm, correct to 1 decimal place.

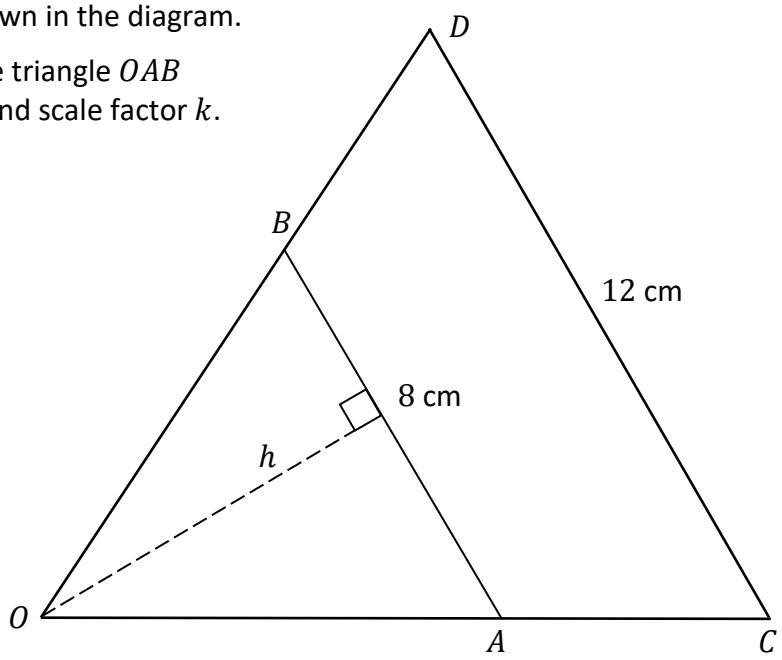
Question 5 **(30 marks)**

The triangles OAB and OCD are shown in the diagram.

The triangle OCD is the image of the triangle OAB under an enlargement of centre O and scale factor k.

$|AB| = 8$ cm.

$|CD| = 12$ cm.



(a) **(i)** Show that $k = 1{\cdot}5$.

(ii) Given that $|OC| = 15$ cm, find $|OA|$, the distance from O to A.

The area of ΔOAB is $36{\cdot}7$ cm^2. Use this to answer part **(b)** and part **(c)**.

(b) Find the area of the triangle OCD. (Remember that $k = 1{\cdot}5$.)

(c) Find the value of h, the perpendicular height of triangle OAB, as shown in the diagram.

Question 6 **(30 marks)**

(a) In the triangle XYZ:

$|XY| = 10$ cm, $|XZ| = 8$ cm, and $|\angle ZXY| = 50°$.

(i) Find the area of the triangle XYZ.
Give your answer, in cm^2, correct to 1 decimal place.

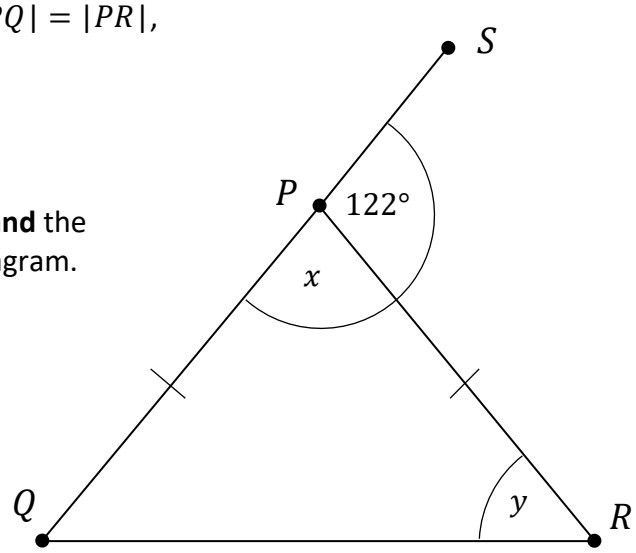
(ii) Construct the triangle XYZ in the box below.
Show all your construction lines clearly.
The point X is shown below.
Part of the line XY is also shown.

(b) The triangle PQR is isosceles with $|PQ| = |PR|$, as shown in the diagram.

P lies on the line QS.

$|\angle SPR| = 122°$.

Find the size of the angle marked x **and** the size of the angle marked y, in the diagram.



$x =$ $y =$

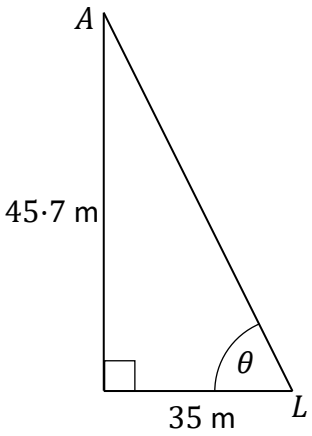
Section B — Contexts and Applications — 150 marks

Answer **any three** questions from this section.

Question 7 **(50 marks)**

(a) As part of the Croke Park experience, it is possible to descend by rope (abseil) from the roof of the stadium to ground level.

Aidan (A) does this abseil, down a vertical height of $45{\cdot}7$ m.
His friend Laura (L) is waiting for him on the ground.
She stands 35 m directly across from where he is due to land, as shown in the diagram.



The angle θ is the angle from the ground at Laura's feet to the roof, at the place where Aidan starts his abseil.

(i) Write down $\tan\theta$, in the form $\frac{a}{b}$, where $a, b \in \mathbb{R}$, **and** hence find the value of θ.

Give your angle correct to the nearest degree.

$\tan\theta =$ $\theta =$

(ii) Work out the distance from A to L.
Give your answer correct to 1 decimal place.

(iii) Some time later Aidan read a review of the Croke Park experience.
He noted that the height of the abseil was given as 150 feet.
Use the two measurements for the height of the abseil (150 feet and $45{\cdot}7$ m) to find a general multiplier which will convert feet to metres.

That is, find the value of $k \in \mathbb{R}$ so that:

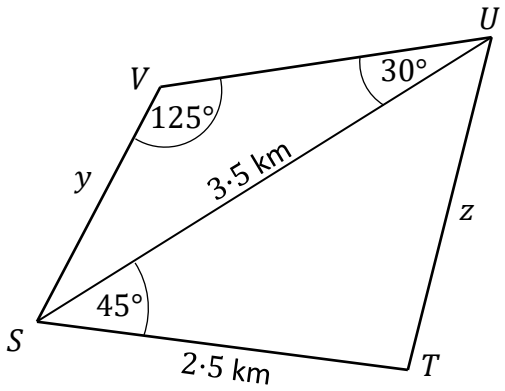
$$\text{Length in feet} \times k = \text{length in metres}$$

Give your answer correct to 3 decimal places.

This question continues on the next page.

(b) Adam is mapping a course for an Adventure Race.
Adam has measurements for some parts of the course. The diagram shows the lengths and the sizes of the angles that Adam knows.

He needs to use these measurements to work out some of the remaining lengths.



(i) In the triangle SUV, $|SU| = 3{\cdot}5$ km.

$|\angle SUV| = 30°$.
$|\angle UVS| = 125°$.

Use the sine rule to find the length of the side marked y.
Give your answer, in km, correct to 2 decimal places.

(ii) In the triangle STU, $|\angle UST| = 45°$.

$|ST| = 2{\cdot}5$ km. $|SU| = 3{\cdot}5$ km.

Use the cosine rule to find the length of the side marked z.
Give your answer, in km, correct to 2 decimal places.

For each race, Adam must place 6 flags labelled A, B, C, D, E, and F at random locations along the course.

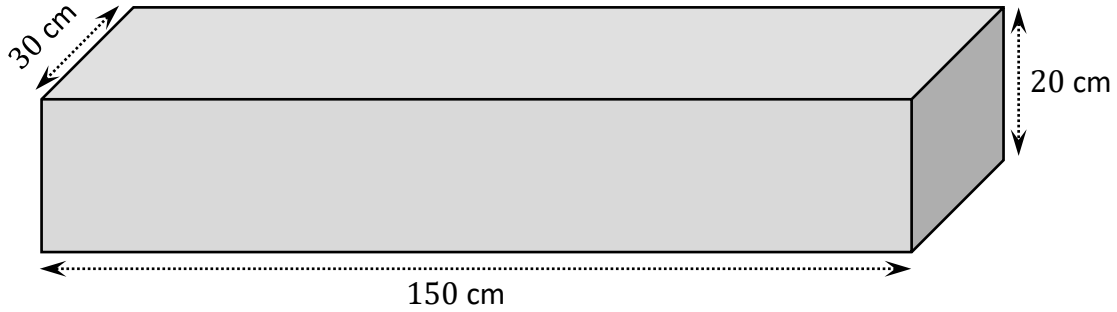
(iii) In the first race, the flags can be arranged in any order along the course.
Find the total number of arrangements of flags that are possible.

(iv) In the second race, the first flag must be either A or F and the last flag must be A or F.
The remaining flags can be arranged in any order along the course.

Find the total number of arrangements of flags that are possible.

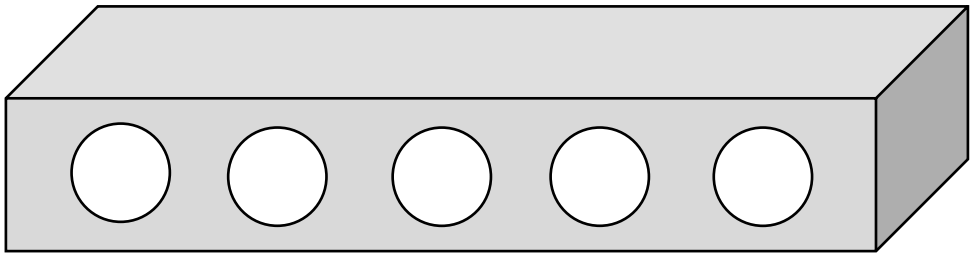
Question 8 **(50 marks)**

(a) A concrete step is 150 cm long, 20 cm high, and 30 cm wide, as shown in the diagram below.



(i) Find the **volume** of the step.
Give your answer in cm^3.

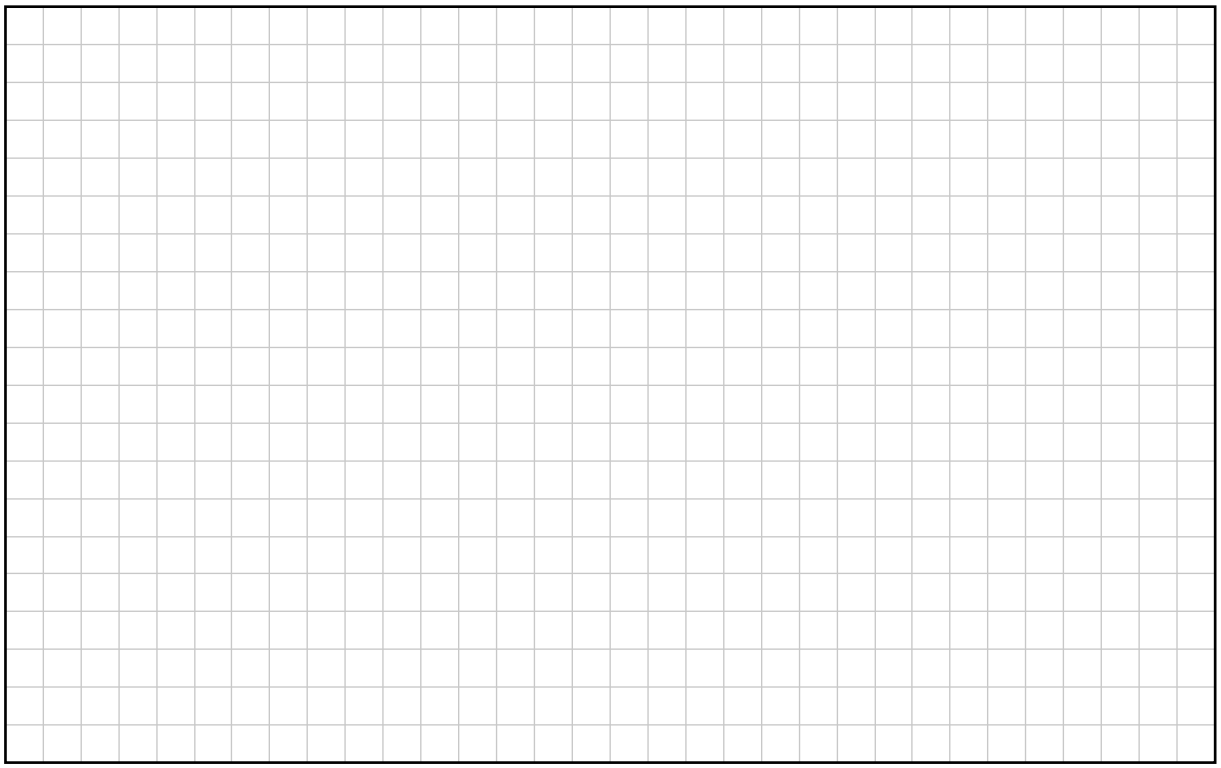
(ii) To reduce the weight of a step, 5 holes are bored through each step, removing 5 cylinders of concrete, as shown in the diagram below.
Each cylinder of concrete that is removed has a radius of 6 cm and a height of 30 cm.



Find the remaining volume of a step when the 5 cylinders of concrete are removed.
Give your answer in cm^3, correct to 1 decimal place.

(b) 50 different steps are needed for a special project.
The volume of concrete in each step is $0{\cdot}125$ m^3.
The cost of the concrete for the steps is €185 per m^3 **before** VAT is added.
VAT at $13{\cdot}5\%$ is then added to the cost.

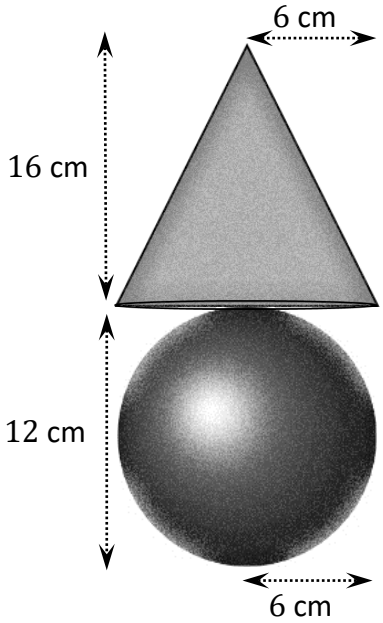
Find the overall cost of the 50 steps **after** VAT is added.
Give your answer correct to the nearest euro.



This question continues on the next page.

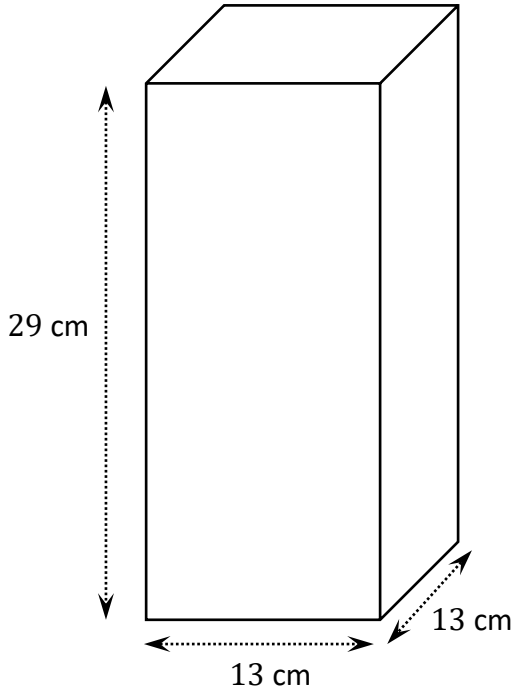
(c) A solid garden ornament consists of a cone on top of a sphere.

The height of the cone is 16 cm.
The radius of the cone is 6 cm.
The radius of the sphere is also 6 cm.



Find the volume of the garden ornament.
Give your answer in cm^3, in terms of π.

(d) The ornament is put into a closed rectangular box with dimensions 13 cm, 13 cm, and 29 cm, as shown.



Find the surface area of this closed rectangular box.

Question 9 **(50 marks)**

(a) In a Youth Club, the ages of children, in years, are recorded in the following table.

Age (years)	12	13	14	15	16
Number of Children	13	10	8	5	4

(i) In the grid below, draw a suitable chart or graph to represent the data in the table. If you use a pie chart, show all your calculations clearly.

(ii) Find the median age of the children in the table.

(iii) One child is picked at random from the children in the youth club.

What is the probability that this child is 13 years of age?

(iv) Three children are picked at random from the children in the youth club.

What is the probability that the 3 children were born on the same day of the week?
You may assume that the probability of being born on each day is the same.
Give your answer correct to 2 decimal places.

This question continues on the next page.

(b) A random sample of 250 youth club members in Connaught were asked their age.

160 of these were 14 years or older.

(i) Find the percentage of members in this sample who were 14 years or older.

(ii) Show that, for this sample, the margin of error for a population proportion is $6{\cdot}3\%$, correct to 1 decimal place.

(iii) In Ireland, 60% of youth club members are 14 years or older.

Use your answers to parts **(b)(i)** and **(b)(ii)** to test the claim that the percentage of youth club members in Connaught who are 14 years or older is different from the population percentage, at the 5% level of significance.

Show relevant calculations, state your conclusion, and give a reason for your conclusion.

Calculations:

Conclusion:

Reason for the conclusion:

Question 10 **(50 marks)**

(a) The students in a PE class are divided into two groups, Team A and Team B.
In a speed test, the time that each student took to sprint 50 metres was recorded.
The results, in seconds, are shown below.

Team A

5·9	6·3	6·9	6·9	7·1	7·1	7·2	7·3	7·5	7·7	7·7	8·2	8·4	8·5	9·1

Team B

6·3	6·5	6·8	6·8	6·9	7·6	7·6	8·1	8·3	8·4	9·3	9·4	9·5	9·6	9·6

(i) Complete the back to back stem and leaf diagram below to show the recorded data.

Team A								**Team B**						
							5							
						3	6							
							7	6						
							8							
							9							
Key: $3 \mid 6 = 6{\cdot}3$ seconds								Key: $7 \mid 6 = 7{\cdot}6$ seconds						

(ii) Find the range of the sprint times for both teams.

Range of Team A sprint times:

Range of Team B sprint times:

(iii) Find the median sprint time for both Team A and Team B.

Median sprint time for Team A:

Median sprint time for Team B:

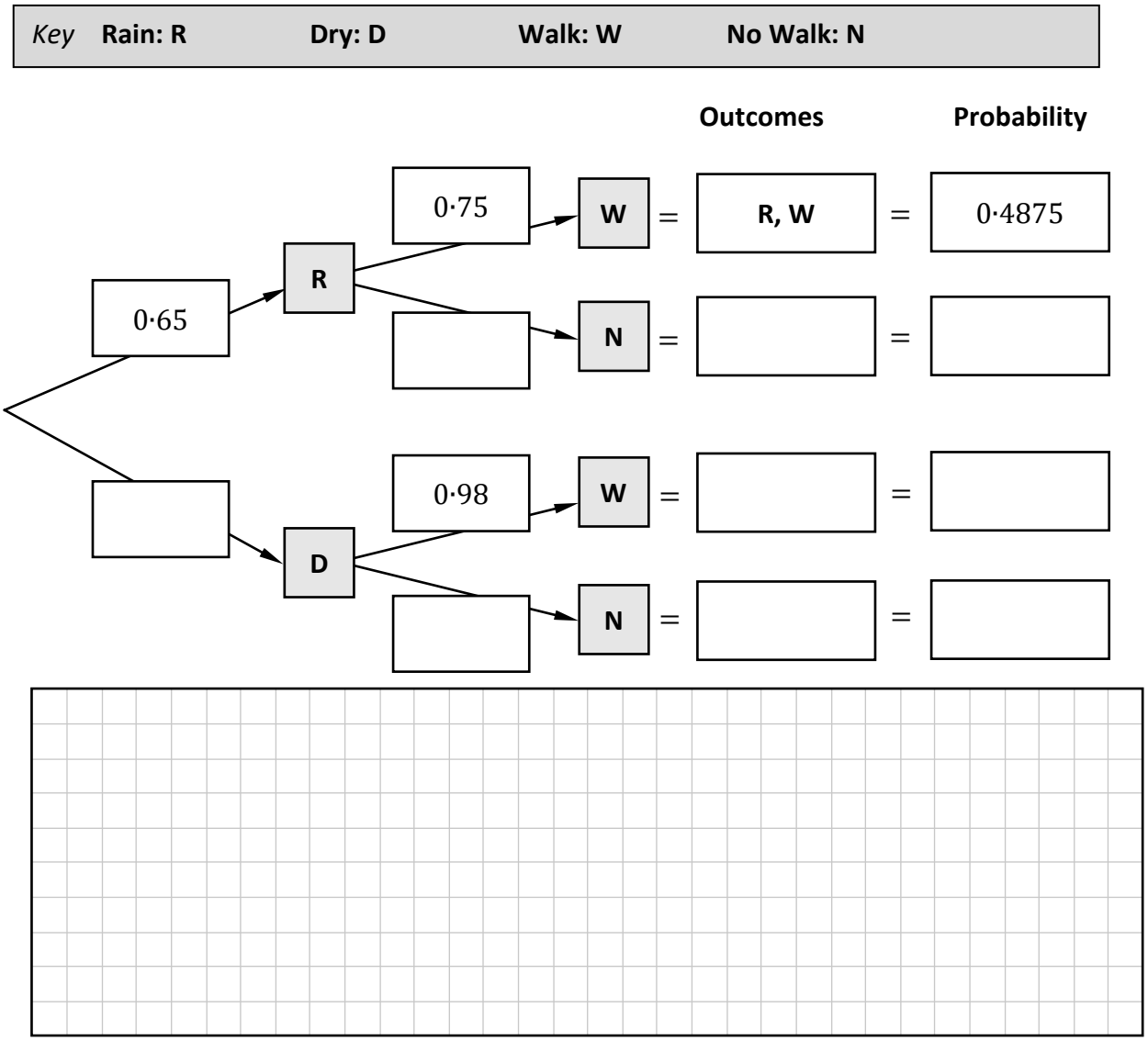
(iv) Use your answers from parts **(a)(i)**, **(a)(ii)**, and **(a)(iii)** above to write a sentence to compare the performance of Team A and Team B in the speed test.

This question continues on the next page.

(b) Kim has a dog called Max.
When it is raining, the probability of Kim taking Max for a walk is $0{\cdot}75$.
When it is dry the probability of her taking Max for a walk is $0{\cdot}98$.
On a particular Saturday, the weather forecast is showing a $0{\cdot}65$ chance of rain.

This information is shown in the tree diagram below.

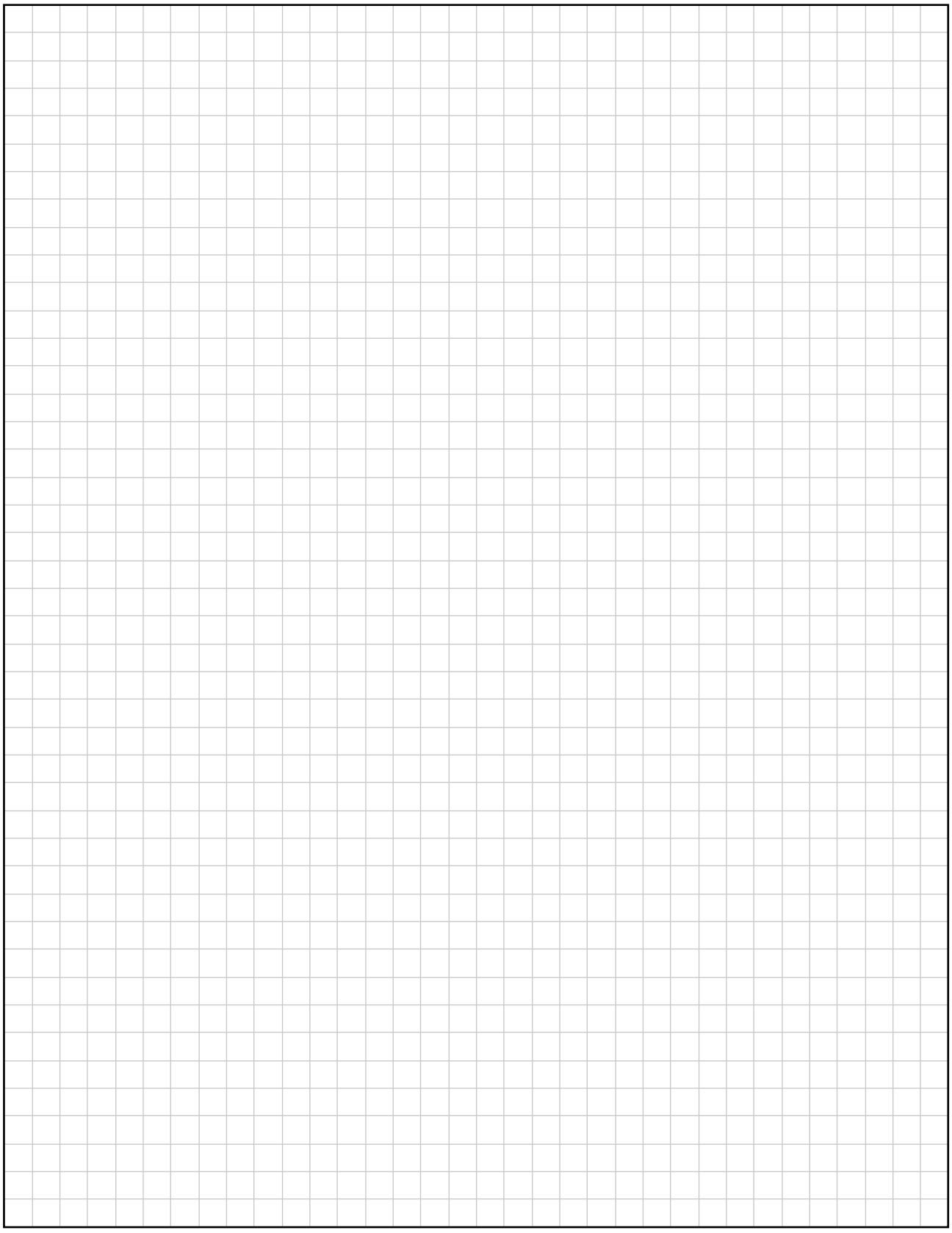
(i) Complete the diagram below by filling in the 3 missing outcomes **and** the 6 missing probabilities.
For example, the probability that it is raining and Kim takes the dog for a walk is $0{\cdot}4875$, as shown.



(ii) What is the probability that Kim will bring Max for a walk on Saturday?

(iii) Assume that it will rain for the next three days.
What is the probability that, during these three days, Kim will bring Max for a walk for the first time on the third day?
Give your answer correct to 4 decimal places.
Remember that when it is raining, the probability of Kim taking Max for a walk is $0{\cdot}75$.

Page for extra work.
Label any extra work clearly with the question number and part



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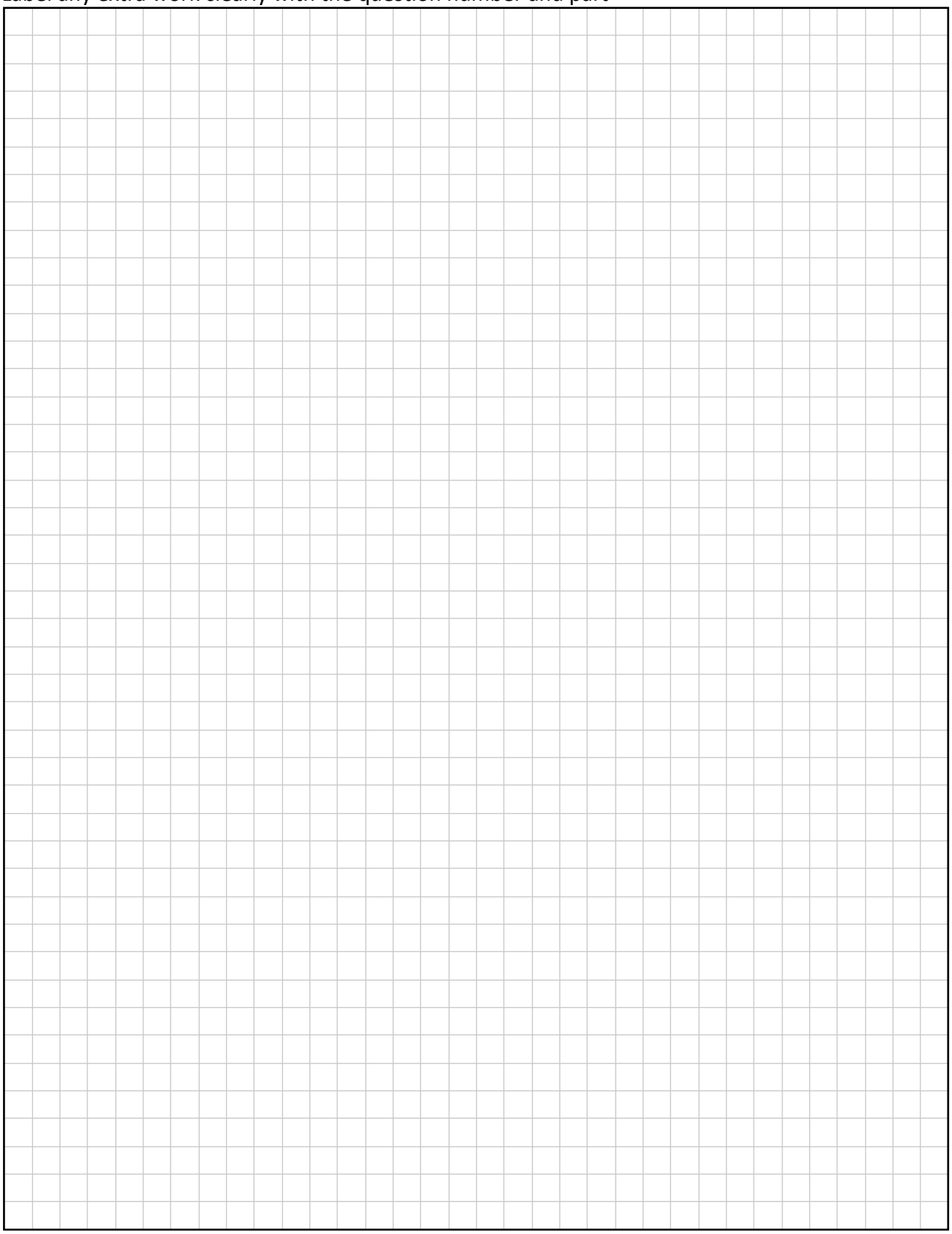

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Leaving Certificate – Ordinary Level

Mathematics Paper 2

2 hours 30 minutes