Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate Examination 2019

Mathematics

Paper 2
Ordinary Level

Monday 10 June
Morning 9:30 to 11:30

300 marks

Examination Number				

Centre Stamp

Running Total	

For Examiner					
Q.	Ex.	Adv. Ex.	Q.	Ex.	Adv. Ex.
1			11		
2					
3					
4					
5					
6					
7					
8					
9					
10			Total		

Grade

Instructions

There are 11 questions on this examination paper. Answer **all** questions.

Questions do not necessarily carry equal marks. To help you manage your time during this examination, a maximum time for each question is suggested. If you remain within these times you should have about 10 minutes left to review your work.

Write your answers in the spaces provided in this booklet. You may lose marks if you do not do so. You may 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.

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

You may lose marks if you do not include the appropriate units of measurement, where relevant.

You may lose marks if you do not give your answers in simplest form, where relevant.

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

Question 1 **(Suggested maximum time: 5 minutes)**

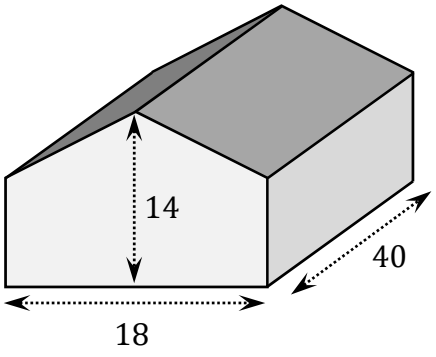
Sofia is estimating the volume of a shed.

(a) She thinks that the base of the shed is roughly a rectangle with a length of 40 m and a width of 18 m. Work out the **area** of this rectangle.

(b) Sofia thinks that the shed is roughly in the shape of a rectangular box with a length of 40 m, a width of 18 m, and a height of 14 m.

Work out the **volume** of this box.

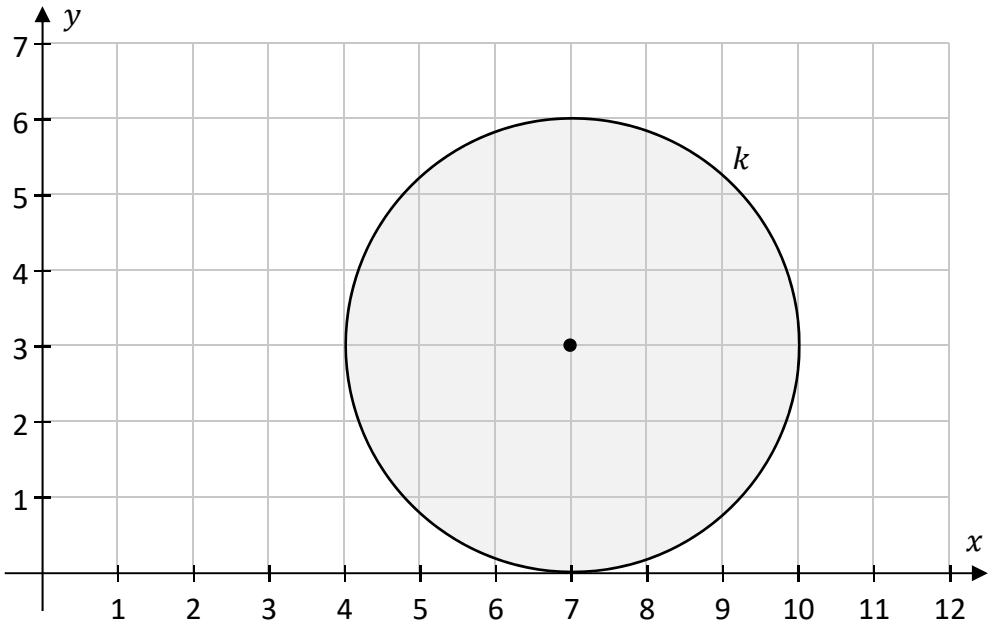
The diagram below shows the actual shed that Sofia is interested in.
All of the measurements are in metres.



(c) Based on the diagram, what do you need to do to your answer to part **(b)** to get a more accurate estimate of the volume of the shed?

Question 2 **(Suggested maximum time: 10 minutes)**

The circle k is shown on the co-ordinate diagram below.
Each small square on the grid has sides of length 1 cm.



(a) **(i)** **Plot** and **label** three points A, B, and C on the diagram so that:

A is **inside** the circle k	Co-ordinates of A:	(,)
B is **outside** the circle k	Co-ordinates of B:	(,)
C is **on** the circle k	Co-ordinates of C:	(,)

(ii) Write the co-ordinates of the points A, B, and C in the appropriate spaces above.

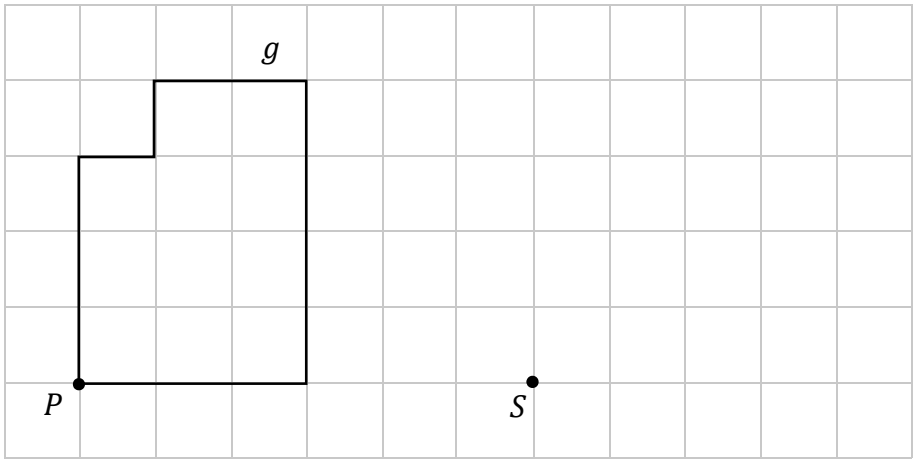
(b) Write down the **radius** of the circle k. Give your answer in cm.

Answer: ____ cm

(c) Hence work out the **area** of the circle k.
Give your answer in cm^2, correct to one decimal place.

Question 3 **(Suggested maximum time: 5 minutes)**

The diagram below shows the shape g on a grid. The points P and S are also marked.
Each small square on the grid has sides of length 1 cm.



(a) Find the length of the **perimeter** of the shape g.

(b) **Draw** the image of the shape g under the **translation** that sends the point P to the point S.

Question 4 **(Suggested maximum time: 5 minutes)**

Each grid below has small squares with sides of length 1 cm.

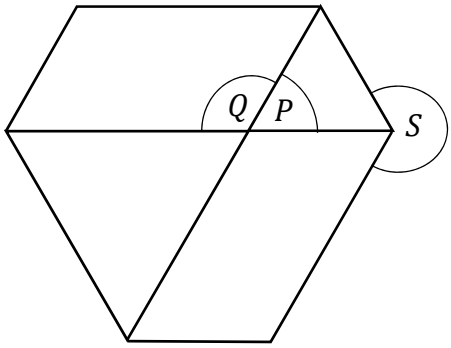
(a) **Draw** a square on the grid below with an area of 16 cm^2.

(b) **Draw** a rectangle on the grid below with an area of 12 cm^2.

(c) **Draw** a triangle on the grid below with an area of 7 cm^2.
Show your working out.

Question 5 **(Suggested maximum time: 10 minutes)**

The diagram below is made up of two **equilateral** triangles and two parallelograms.
Three angles are marked.



(a) Write the correct letter in each space in the table below to show what type of angle each one is.

Type of angle	Acute	Reflex	Obtuse
Angle (P, Q, or S)			

(b) Work out the size of the angles P, Q, and S.

$|\angle P| =$ $|\angle Q| =$ $|\angle S| =$

(c) The triangles are **not** the same size as each other.
Fiona says: "The two triangles in the diagram are similar, but they are **not** congruent."

(i) Give a reason why the two triangles are **similar**.

(ii) Give a reason why the two triangles are **not congruent**.

Question 6 **(Suggested maximum time: 15 minutes)**

John looked up the number of men and women in Ireland working in 5 different types of job in 2016. The jobs are labelled **A**, **B**, **C**, **D**, and **E**. All of the numbers were rounded to the nearest 10 000.

John drew the diagram below to show this information. There is space for two bars for job **E**. Use the diagram to answer questions **(a)** to **(d)**.

(a) **(i)** How many **men** had job **A**? Answer:

(ii) How many **women** had job **D**? Answer:

(iii) How many people in **total** had job **B**? Answer:

(b) Complete the following sentences by writing in the correct letter (**A**, **B**, **C**, or **D**) in each case.

(i) The job with the greatest number of men was job ____ .

(ii) Almost all of the people with job ____ were men.

(c) $40\,000$ men had job **E**. $120\,000$ people in **total** had job **E**.

Draw two bars on the diagram to show the number of men and the number of women who had job **E**. Shade your bars in a similar way to the bars for the other jobs.

(d) One person is picked at random from the people with job **C**.
John finds the **probability** that this person is a **woman**.

Put a tick (✓) in the correct box to show which of the following is **closest** to John's answer.
Tick one box only. Give a reason for your answer.

0·1	0·5	0·9
☐	☐	☐

Reason:

(e) The ratio of men to women working in ICT in 2016 was roughly $7{:}3$.

One of the people working in ICT in 2016 is picked at random.
Write down the probability that this person is a woman.

Answer: $\frac{\quad}{\quad}$

Question 7 **(Suggested maximum time: 5 minutes)**

Filip measures the height of seven of the students in his class. Their heights, in cm, are:

166 168 168 169 172 173 177

(a) Work out the **range** of the data, in cm.

(b) Write down the **mode** of the data, in cm. Answer:

(c) Write down the **median** of the data, in cm. Answer:

(d) Work out the **mean** of the data. Give your answer in cm, correct to one decimal place.

Question 8 **(Suggested maximum time: 15 minutes)**

A shop sells chicken wraps.
There are four different sauces and three different types of chicken, as shown in the table.

Sauce		Chicken
BBQ Sauce		Plain
Mayonnaise		Fried
Hot Sauce		Tikka
Sweet Chilli		

Source: www.safefood.eu. Altered.

(a) Margaret picks one of the four sauces at random.
Write down the **probability** that she picks Hot Sauce.

Answer: ____

Margaret picks one sauce and one type of chicken.

(b) **(i)** Fill in the spaces below to show **three** different combinations that Margaret could pick.
One is already done.

Combination 1:	Hot Sauce	and	Plain Chicken
Combination 2:		and	
Combination 3:		and	

(ii) Work out the **total** number of different possible combinations that Margaret could pick.

This question continues on the next page.

The table below shows the calories in a fried chicken wrap.
Margaret is going to draw a pie chart to show this information.
The angles of some of the sectors are shown in the table.

Ingredient	**Number of Calories** (kcal)	**Angle in Pie Chart**
Wrap	150	90°
Fried chicken	240	144°
Cheese	130	
Mayonnaise		
Total	600	

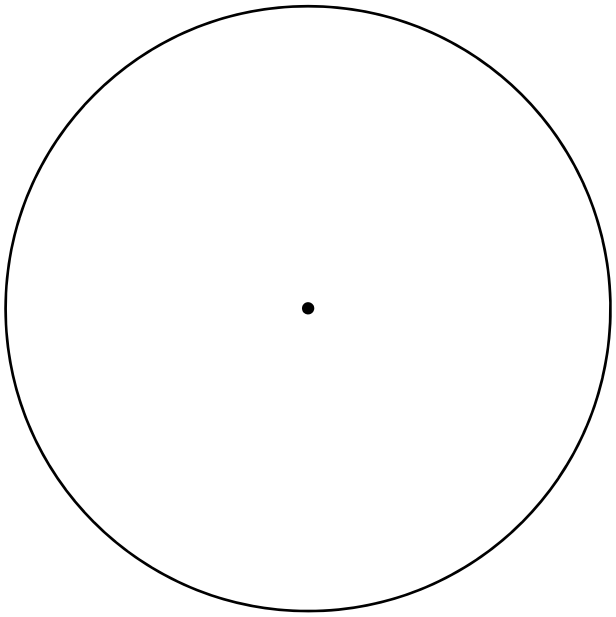
(c) Work out the number of calories in the **mayonnaise** in the wrap.
Write your answer in the appropriate space in the table above.

(d) **(i)** Write the **total** number of degrees in the pie chart in the appropriate space in the table above.

(ii) Work out the sizes of the two missing angles in the pie chart.
Write each answer in the appropriate space in the table above.

(iii) Complete the pie chart below to show the information in the table.
Label each sector clearly with the name of the ingredient **and** the size of the angle.

Fried Chicken Wrap: Calories

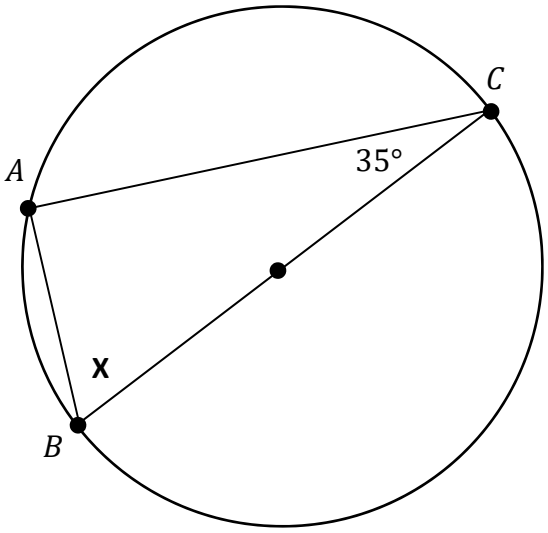


Question 9 **(Suggested maximum time: 5 minutes)**

The diagram on the right shows a circle.
The point A is on the circle.
$[BC]$ is a diameter of the circle.
$|\angle ACB| = 35°$.

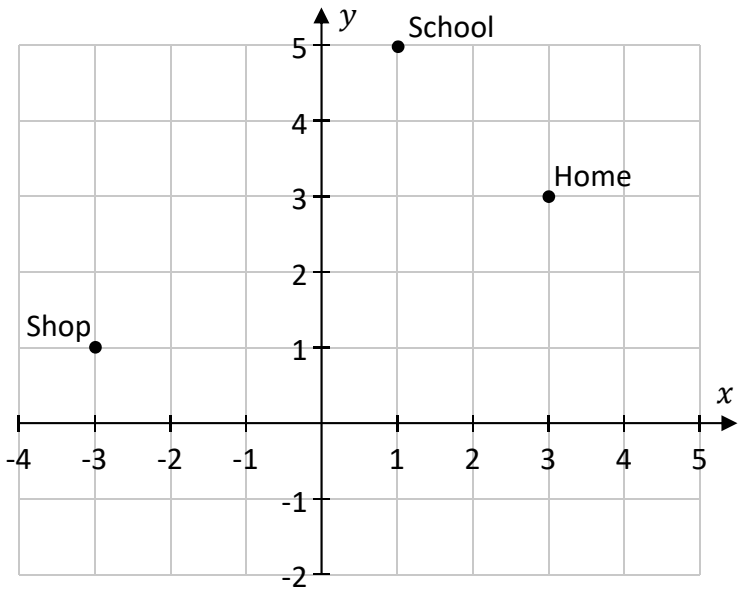
Work out the size of the angle **X**.

X = ☐ °



Question 10 **(Suggested maximum time: 15 minutes)**

The co-ordinate diagram below shows part of the town where Ben lives.



(a) Ben's bike is half way between the Shop and the School (that is, the midpoint).
Plot a point on the diagram to show where Ben's bike is. **Label** this point B.

(b) Work out the **distance** from Home to the Shop on the diagram.
Give your answer correct to one decimal place. Show your working out.

(c) Each small square in the grid has sides of length 1 cm.
The distance on the diagram from the Shop to the School is roughly $\mathbf{5{\cdot}7}$ **cm**.
The diagram is to a scale of $\mathbf{1 : 2500}$.

Work out the **actual** distance from the Shop to the School. Give your answer in metres.

(d) Show that the **slope** of the line from the Shop to Home is $\frac{1}{3}$.

(e) H is an angle, and

$$\tan H = \frac{1}{3}$$

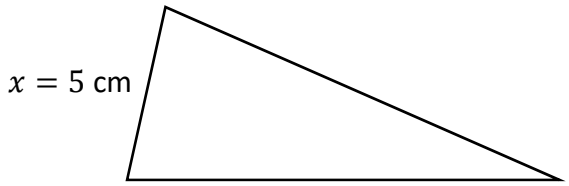
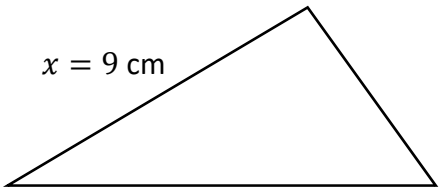
Use this fact to work out the **size** of the angle H, correct to the nearest degree.

Answer:

Question 11 **(Suggested maximum time: 20 minutes)**

A triangle has one side of length 10 cm and another side of length x cm.
The **perimeter** of this triangle is $\mathbf{26}$ **cm**.

(a) The two diagrams below show different possible values of x.
Fill in the length of the third side in each case.

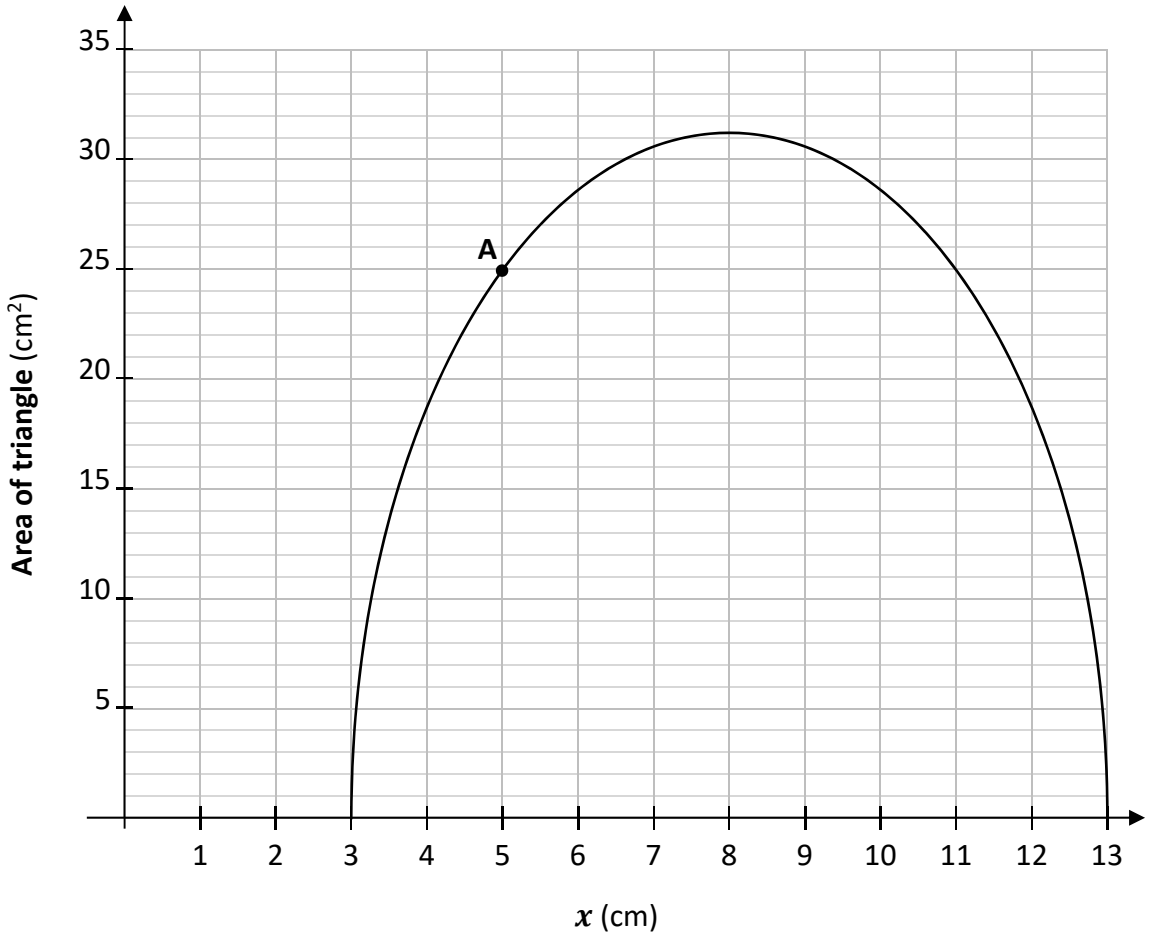
Diagram A	**Diagram B**
	
Perimeter $= 26$ cm Length of third side $=$ _____ cm	Perimeter $= 26$ cm Length of third side $=$ _____ cm

(b) What type of triangle is shown in **Diagram A**? Tick (✓) one box only.
Give a reason for your answer.

isosceles ☐ equilateral ☐ scalene ☐

Reason:

(c) The graph below shows the **area** of the triangle for any value of x between 3 cm and 13 cm. The point **A** is marked.



(i) **Draw** the **axis of symmetry** of the graph.

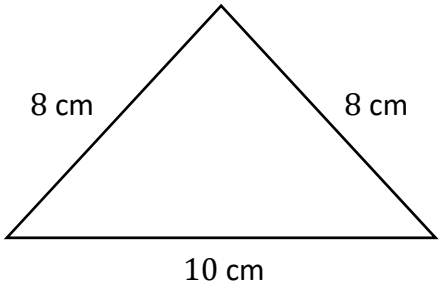
(ii) **A** is the point on the graph with $x = 5$, so it represents the triangle in **Diagram A**. Use the point **A** on the graph to estimate the **area** of the triangle in **Diagram A**.

Answer: ☐ cm²

(iii) **Plot** the point **B** on the graph to represent the triangle in **Diagram B**. **Label** the point **B**. Remember that $x = 9$ for this triangle.

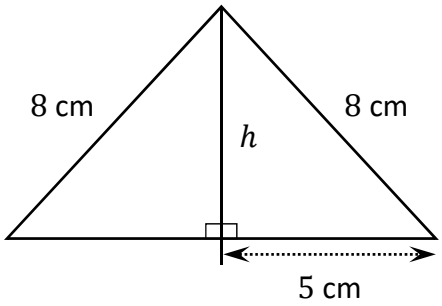
This question continues on the next page.

(d) The diagram below shows the triangle with the biggest area.
The diagram is **not** to scale.



Construct this triangle in the space below.
Show all of your construction lines clearly.

(e) Use the theorem of **Pythagoras** to find the value of h, the perpendicular height of the isosceles triangle shown in the diagram below. Give your answer in cm, correct to one decimal place.



Junior Certificate – Ordinary Level

Mathematics – Paper 2

Monday 10 June
Morning 9:30 to 11:30