Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate Examination 2017

Mathematics

Paper 2
Ordinary Level

Monday 12 June
Morning 9:30 – 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 will lose marks if you do not show all necessary work.

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

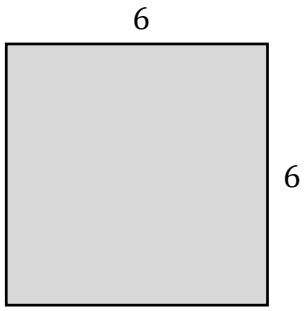
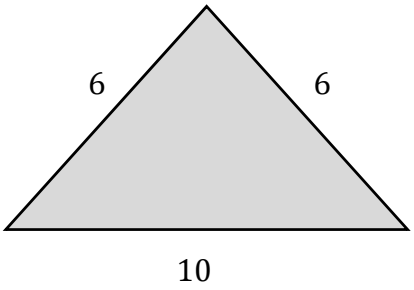
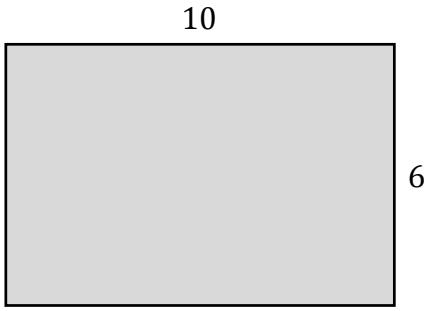
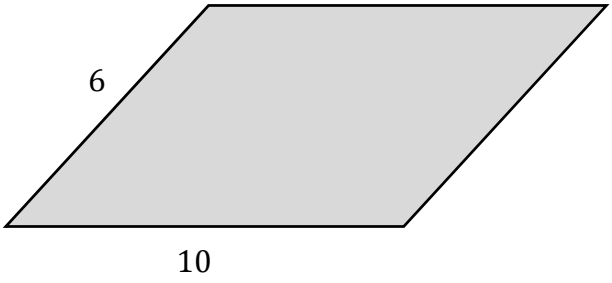
You may lose marks if you do not give your answers in simplest form, where relevant.

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

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

The table below shows diagrams of a number of shapes.
The lengths of some of the sides are marked.

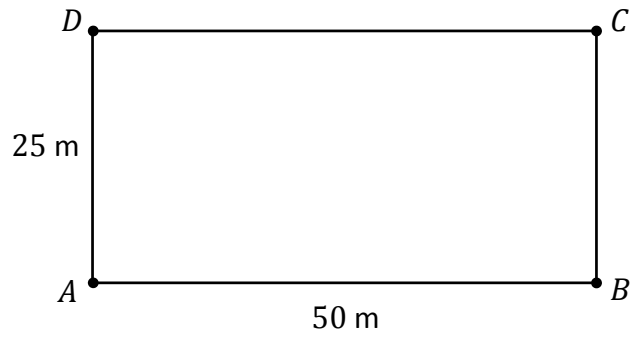
Fill in the table below to show the number of **axes of symmetry** of each shape.

Shape	Diagram	Number of axes of symmetry
Square		Tick (✓) **one** box only: 0 ❑ 1 ❑ 2 ❑ 4 ❑
Isosceles Triangle		Tick (✓) **one** box only: 0 ❑ 1 ❑ 2 ❑ 4 ❑
Rectangle		Tick (✓) **one** box only: 0 ❑ 1 ❑ 2 ❑ 4 ❑
Parallelogram (angles are **not** 90°)		Tick (✓) **one** box only: 0 ❑ 1 ❑ 2 ❑ 4 ❑

page

Question 2 **(Suggested maximum time: 15 minutes)**

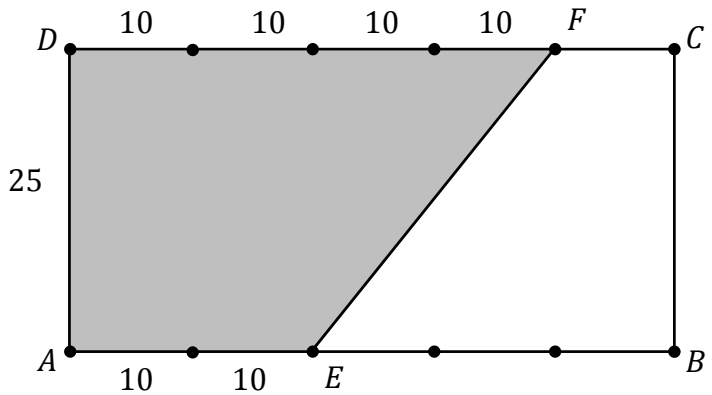
A rectangle $ABCD$ has a length of 50 m and a width of 25 m.



(a) Find the **area** of the rectangle $ABCD$.

(b) Find the length of the **perimeter** of the rectangle $ABCD$.

$[AB]$ and $[CD]$ are each divided into five equal parts of length 10 m. Two of the endpoints of these are joined by a line segment and the quadrilateral $AEFD$ is shaded in, as shown.



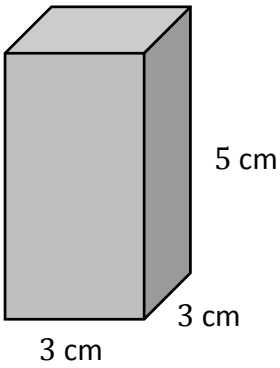
(c) Find the **area** of the **shaded** region $AEFD$. Give your answer in m^2.
It might help you to break the shaded region up into a rectangle and a triangle.

(d) **(i)** Use the theorem of **Pythagoras** to show that $|\boldsymbol{EF}| = \mathbf{32\ m}$, correct to the nearest metre.

(ii) Hence find the length of the **perimeter** of the shaded region $AEFD$.

Question 3 **(Suggested maximum time: 15 minutes)**

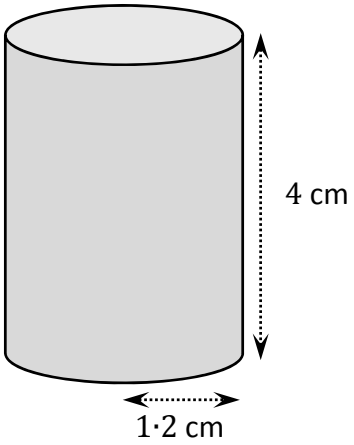
A closed rectangular box has a square base with sides of length 3 cm, and a height of 5 cm.



(a) Find the **volume** of the box.

(b) The diagram below shows part of a **net** of the box.
Complete the net, as accurately as you can.

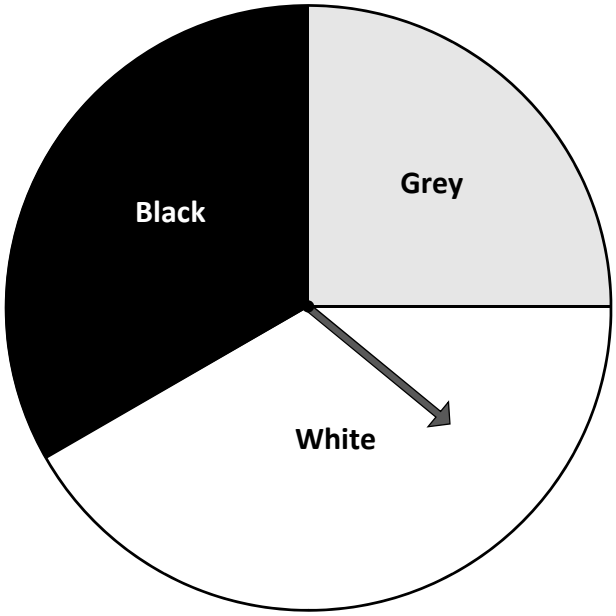
A candle in the shape of a **cylinder** is put into the box.
The candle has a height of 4 cm and a radius of $1{\cdot}2$ cm.



(c) Find the **volume** of the candle. Give your answer correct to the nearest cm^3.

Question 4 **(Suggested maximum time: 10 minutes)**

(a) Lynda spins the spinner shown below. It has three sectors: grey, black, and white.



(i) Measure the **size of the angle** in each sector of Lynda's spinner.
Write your values into the table below.

Sector	Grey	Black	White
Size of angle (degrees)			

Lynda is going to spin her spinner **60 times**.

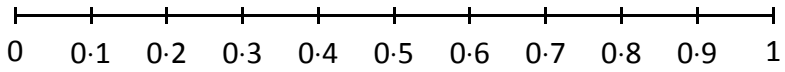
(ii) Use your answer to part **(a)(i)** to estimate how many times you would expect it to land on **grey**.

(b) The table below shows the probability of four events, **A**, **B**, **C**, and **D**.

(i) Fill in the 4 missing values in the table below, to show the probability of each event as a fraction, a percentage, and a decimal. Write the fraction in its simplest form.

Event	Probability		
	Fraction	**Percentage**	**Decimal**
A	$\frac{1}{4}$	25%	0·25
B	$\frac{1}{2}$		0·5
C	$\frac{2}{5}$	40%	
D		2%	

(ii) **Mark** and **label** the probability of each of the events **A**, **B**, **C**, and **D** on the scale below.



Question 5 **(Suggested maximum time: 15 minutes)**

There are 15 boxers in a boxing club. The weight of each boxer (in kg) is shown in the table below.

47	49	49	50	56
57	58	65	67	68
69	69	69	75	79

(a) **(i)** Complete the stem and leaf diagram below to show this data.

4								
5								
6								
7								

Key: 5 | 6 =

(ii) Find the **median** weight of the boxers.

(iii) Find the **range** of the boxers' weights.

(b) The **sum** of the boxers' weights is $\mathbf{927\ kg}$.

(i) Work out the **mean weight** of the 15 boxers.

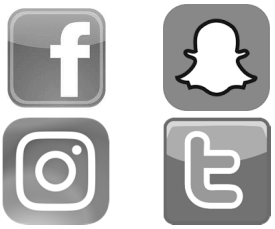
Each boxer **loses $\mathbf{1}$ kg**.

(ii) Find the **new mean weight** of the boxers.

(iii) Work out the **new sum** of the boxers' weights.

Question 6 **(Suggested maximum time: 5 minutes)**

Gerry is carrying out a survey on the students in his class.
His questions are about the apps and social media they use.



(a) Write a question that Gerry could use that would give **numerical** data.

Your question should be about apps or social media.

(b) Gerry is buying a new phone.
He can choose from 3 different memory sizes: 8, 16, or 32.
Each size comes in 3 different colours: Black (**B**), White (**W**), or Silver (**S**).

(i) Write the 9 different options Gerry could choose for his phone into the table below, taking into account memory size and colour. Two are already done for you.

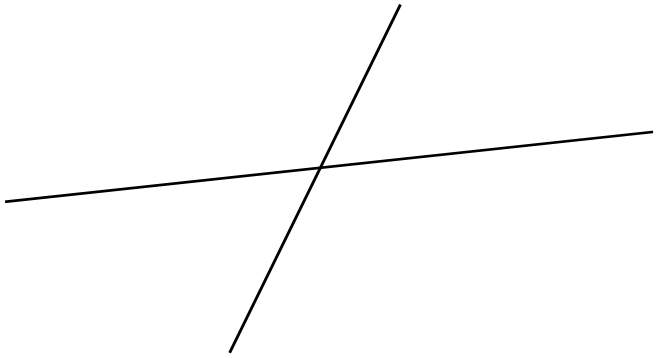
8, **B**		
	16, **W**	

(ii) Each phone also comes in 2 different screen sizes.

Find how many different options Gerry could choose for his phone, taking into account memory size, colour, and screen size.

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

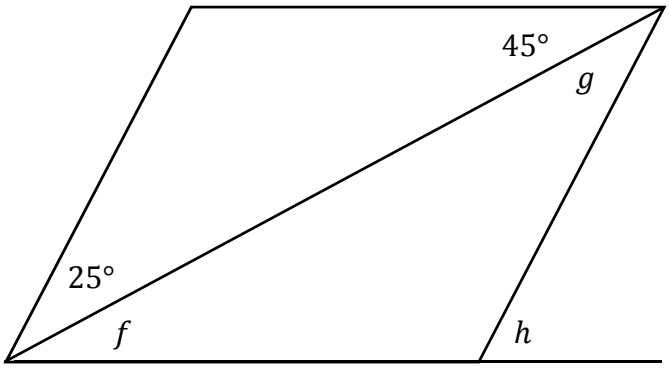
(a) The diagram below shows two line segments.



(i) On the diagram above, write the letter **A** in an **acute** angle.

(ii) On the diagram above, write the letter **O** in an **obtuse** angle.

(b) The diagram below shows a parallelogram. One of the sides has been extended. The sizes of some of the angles are marked.

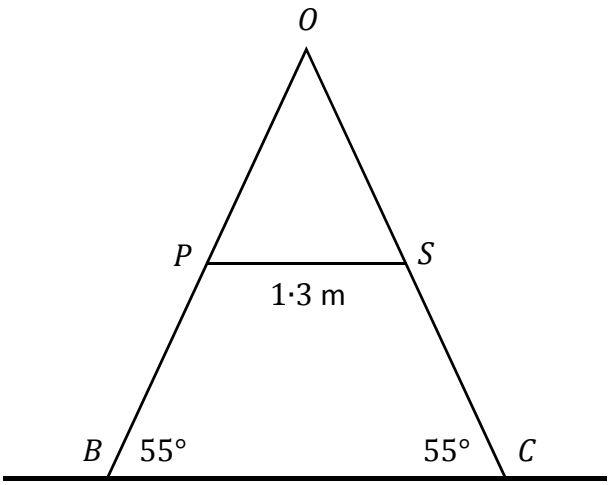


Find the size of the angle f, the angle g, and the angle h, without measuring.

$|\angle f| =$ $|\angle g| =$ $|\angle h| =$

Question 8 **(Suggested maximum time: 10 minutes)**

The diagram below shows part of a climbing frame.
The points B and C are on the ground.
The legs $[OB]$ and $[OC]$ are joined by the horizontal bar $[PS]$.



Ava measures the angle that each of the legs makes with the ground.
She finds that they are both $55°$.

(a) What type of triangle is OBC? Give a reason for your answer.

Type of triangle: (Tick (✓) **one** box only) Equilateral ❑ Isosceles ❑ Scalene ❑

Reason:

(b) Work out the size of the angle at O, the top of the frame.

OBC and OPS are **similar** triangles.

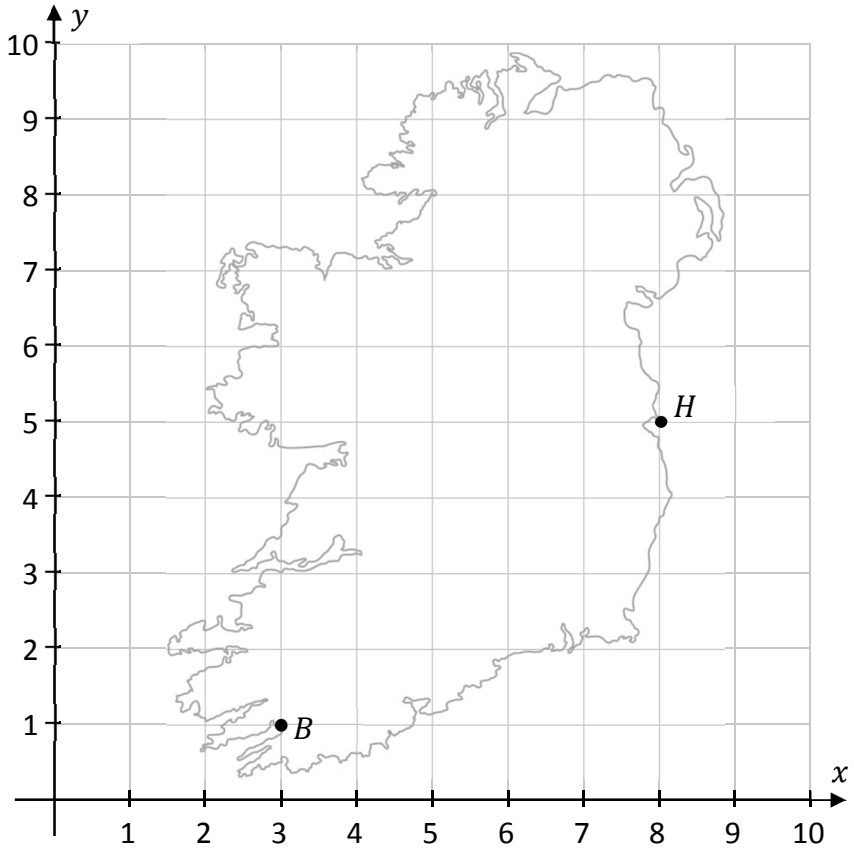
(c) **Explain** what this means.

$|PS| = 1{\cdot}3$ m, as shown in the diagram.
The point P is **half way** between B and O.

(d) Find the length $|BC|$.

Question 9 **(Suggested maximum time: 15 minutes)**

The diagram below shows a map of Ireland on a co-ordinate grid.
Each unit on the grid is 1 cm. The point B represents Bantry and the point H represents Howth.



(a) **(i)** Write down the co-ordinates of the point B and the point H.

$B =$ (,) $H =$ (,)

(ii) **Draw** the line segment $[BH]$ on the diagram above.

(iii) **Construct** the **perpendicular bisector** of $[BH]$ on the diagram, using only a compass and straight edge. Show all of your construction lines clearly.

(iv) Hence, or otherwise, find the co-ordinates of the **midpoint** of $[BH]$.

Midpoint = (,)

(b) Work out the distance on the diagram from Wicklow $(8, 4)$ to Westport $(3, 6)$.
Give your answer in centimetres in the form $\sqrt{n}$, where $n \in \mathbb{N}$.

(c) The distance from Dublin to Galway **on the diagram** is 4 cm.
The **actual** distance from Dublin to Galway is 180 km.

Work out how many kilometres each centimetre on the grid represents.

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

(a) Put a tick (✓) in the correct box to show which point is on the line $y = 3x + 8$.
Justify your answer.

The point that is on $y = 3x + 8$ is:	$(0, 3)$	$(8, 0)$	$(0, 8)$
(Tick (✓) **one** box only)	❑	❑	❑

Justification:

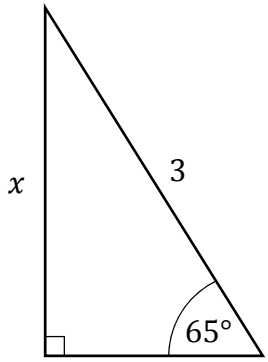
(b) Find the point of intersection of the following two lines.

$$y = 2x + 7$$

$$y = 5x - 11$$

Question 11 **(Suggested maximum time: 5 minutes)**

The diagram below shows a right-angled triangle.
One side has a length of x units, and the hypotenuse is 3 units in length.
One of the angles is $65°$, as shown.



(a) Using the diagram, write $\sin 65°$ as a fraction in terms of x.

$$\sin 65° = \frac{\square}{\square}$$

(b) Use a **calculator** to find the value of $\sin 65°$.
Give your answer correct to one decimal place.

(c) Use your answers from part **(a)** and part **(b)** to find the value of x.

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