Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate Examination 2016

Mathematics

Paper 2
Ordinary Level

Monday 13 June – Morning 9:30 to 11:30

300 marks

Examination number

Centre stamp

Running total	

For examiner			
Question	Mark	Question	Mark
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: 10 minutes)**

Shirts in a clothes shop come in the following four sizes:

Small (S)	Medium (M)	Large (L)	Extra Large (XL)

Kristina makes the following list, showing the size of each of the shirts in the shop.

S	S	L	M	L	L	XL	M	XL
L	L	S	M	M	M	M	L	M

(a) Write down the **total** number of shirts in the shop. Total = ☐

(b) Use Kristina's list to fill in the frequency table below.

Shirt size	S	M	L	XL
Frequency				

Kristina picks one shirt at random.

(c) Find the **probability** that it is a large (L) shirt.

Answer = ☐

Kristina puts one of the large (L) shirts on display.
She then picks another shirt at random from those that are left.

(d) Find the **probability** that it is a small (S) shirt.

Answer = ☐

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

Each of the twelve numbers in the table below is written on a piece of paper.
Each student in a class picks a sample of 5 **different** numbers from these.

2	3	5	7	11	13
17	19	23	29	31	37

Ruairí picks the following sample:

3	,	7	,	13	,	29	,	37	.

Ruairí says: "My sample does **not** have a single **mode**."

(a) Explain why Ruairí is correct.

Jen says: "My sample has a median of 19."

(b) Write down a sample of 5 different numbers from the table that has a **median of 19**.

Sample = ☐ , ☐ , ☐ , ☐ , ☐ .

Missy says: "My sample has the biggest possible range."

(c) Write down a sample of 5 different numbers from the table that has the **biggest** possible **range**. **Find** the range of this sample.

Sample = ☐ , ☐ , ☐ , ☐ , ☐ .

Range = ☐

Colum says: "My sample has the smallest possible mean."

(d) Write down the sample of 5 different numbers from the table that has the **smallest** possible **mean**. **Find** the mean of this sample.

Sample = ☐ , ☐ , ☐ , ☐ , ☐ .

Mean = ☐

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

Two companies carried out different surveys.
The results of **Company A**'s survey are shown in the table below.

Company A

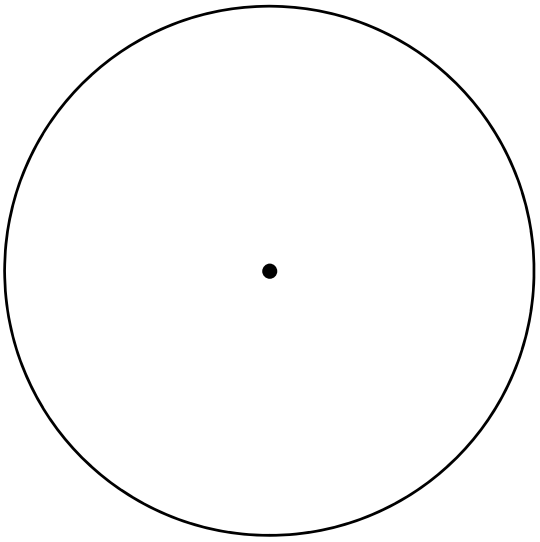
Question: Does your hair feel nicer when you use our shampoo?

Results:

Total number surveyed:	**300**
Number *No*:	**20**
Number *Yes*:	**280**

Calculations:

Pie Chart:



(a) Use the numbers in the table to draw a **pie chart** for **Company A**'s results in the space above.

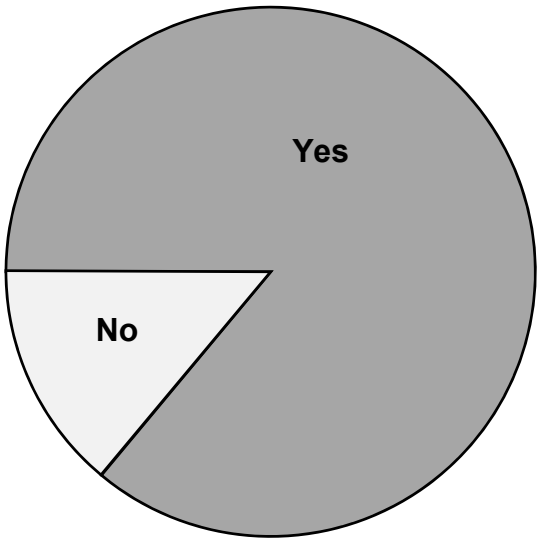
Show your calculations on the grid above.
Label each sector of the pie chart clearly.

(b) In this survey, people had to answer *Yes* or *No*.
Put a tick in the correct box to show what type of data this is.
Give a reason for your answer.

Type of data: Categorical ❑ Numerical ❑
(Tick (✓) **one** box only.)

Reason:

The pie chart in the table on the right shows the results of **Company B**'s survey.

Company B
Question: Does your skin feel softer when you use our moisturiser?
Pie Chart: 

(c) **(i)** Use a protractor to find the size of the angle of each sector in **Company B**'s pie chart.

Size of *No* angle =

Size of *Yes* angle =

Company B surveyed 72 people in total.

(ii) Work out how many people answered *No* and how many people answered *Yes* in **Company B**'s survey.

Number *No* =

Number *Yes* =

(d) Based on the total numbers of people surveyed, which company's results do you think are more reliable? Give a reason for your answer.

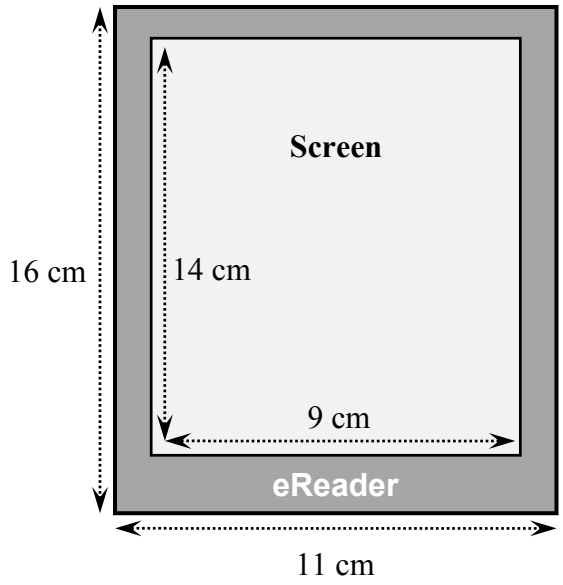
Company whose results are more reliable: (Tick (✓) **one** box only.)

Company A ❑ **Company B** ❑

Reason:

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

Orla has an eReader.
The front of the eReader is in the shape of a rectangle measuring 11 cm by 16 cm.
It has a rectangular screen measuring 9 cm by 14 cm.



(a) Work out the **area** of the **screen** of Orla's eReader.

(b) Orla says: "The screen covers more than 80% of the area of the front of my eReader."
Is Orla correct? Justify your answer fully.

Answer:

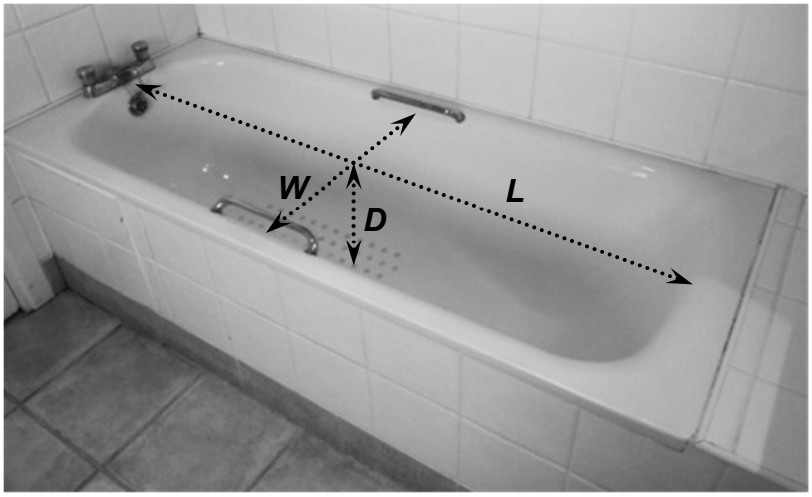
Justification:

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

Aoife wants to find the volume of her bath, shown in the photograph on the right.

She uses a tape measure to find the length, width, and depth of the bath, as shown in the photograph.

The values she gets are shown in the table below.



(a) Complete the table, by **converting** each measurement to centimetres or metres, as appropriate.

	Measurement in **centimetres**	Measurement in **metres**
Length (***L***)	150	1·5
Width (***W***)	55	
Depth (***D***)		0·4

(b) Use the measurements in the table to find the **volume** of the bath.
Assume that the bath is in the shape of a rectangular box.
State whether your answer is in cm^3 or in m^3.

(c) Give a reason why the answer to part **(b)** is probably **not** the **exact** volume of the bath.

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Question 6 **(Suggested maximum time: 10 minutes)**

The triangle BOP has:

one side that is 8 cm long

one angle of $40°$

one angle of $60°$.

(a) Work out the size of the **third angle** in the triangle BOP.

(b) Draw a **sketch** of one such triangle BOP.
On your sketch, **write in** the size of **all** 3 angles, and the length of one of the sides.

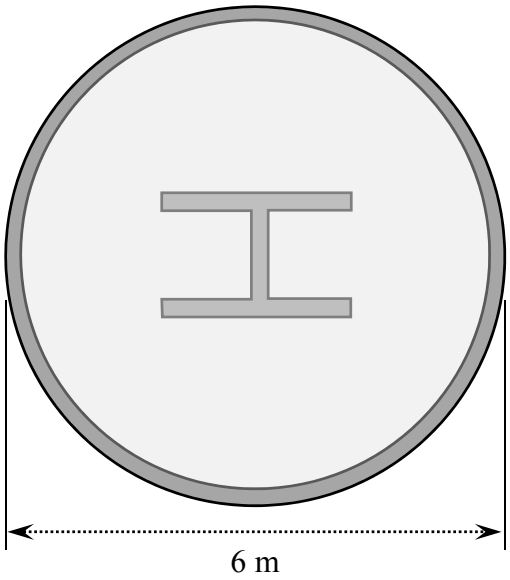
Sketch:

(c) **Construct** the triangle BOP from your sketch.

Construction:

Question 7 **(Suggested maximum time: 10 minutes)**

A landing pad for a helicopter is in the shape of a circle.
It has a diameter of 6 m.



(a) Find the length of the **radius** of the landing pad.

(b) Find the length of the **perimeter** of the landing pad.
Give your answer in m, correct to the nearest metre.

(c) Work out the **area** of the landing pad.
Give your answer in m^2, correct to one decimal place.

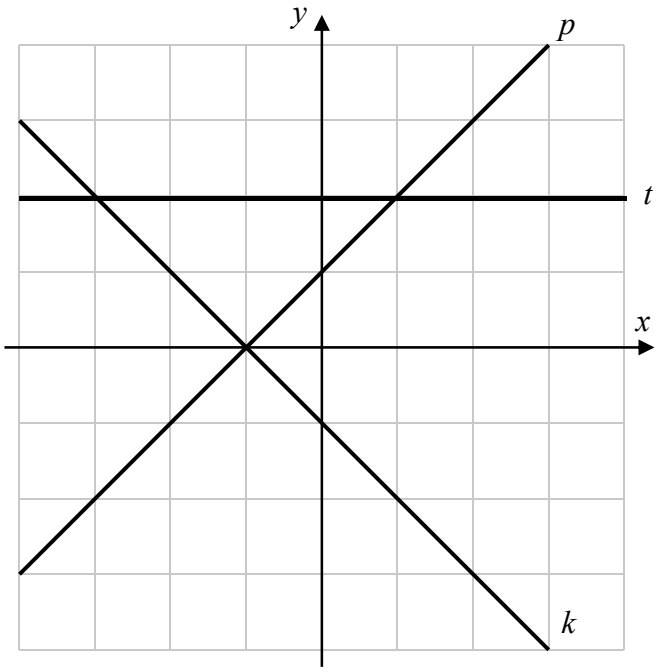
A helicopter leaves Shannon at 9:30 a.m. and arrives in Limerick at 9:45 a.m. the same morning.
It travels 25 km during this journey.

(d) Find its mean **speed** on the journey, in km per hour.

Question 8 **(Suggested maximum time: 5 minutes)**

(a) The co-ordinate diagram below shows the lines k, t, and p.
The table shows the slope of each line.

Write the letters k, t, and p into the table to match each line to its slope.



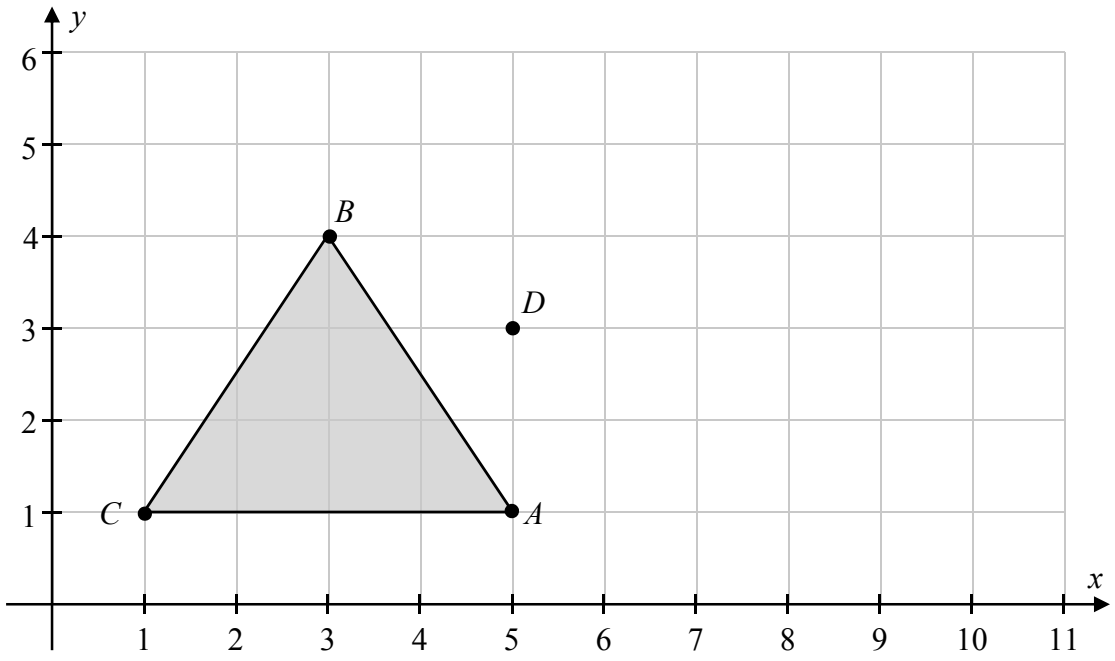
Slope	**Line** k, t, or p
0	
1	
-1	

(b) The line l has a slope of 3. It goes through the point $(0, 5)$.

Write down the **equation** of the line l, in the form $y = mx + c$.

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

The triangle ABC and the point D are shown on the co-ordinate diagram below.



(a) Write down the co-ordinates of the points A and B.

$A =$ (,) $B =$ (,)

(b) Write down the co-ordinates of the **midpoint** of $[AB]$.

Midpoint = (,)

(c) Work out $|AB|$, the **length** of $[AB]$.

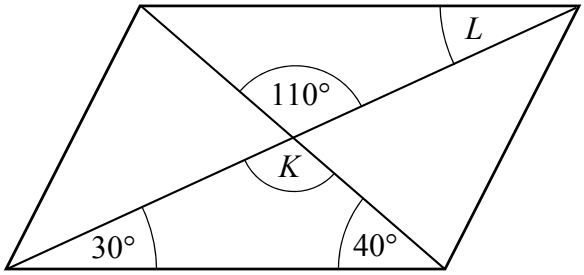
(d) Work out the **area** of the triangle ABC.

(e) On the co-ordinate diagram, **draw** the image of the triangle ABC under **central symmetry** in the point D.

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

(a) The diagram below shows a parallelogram and its two diagonals.
Some of the angles in the diagram are marked.

Write down the size of the angle K and the size of the angle L.



$|\angle K| =$ $|\angle L| =$

(b) There are four statements in the table below.

(i) Put a tick (✓) in the correct box on each line to show whether each statement is always true, sometimes true, or never true.

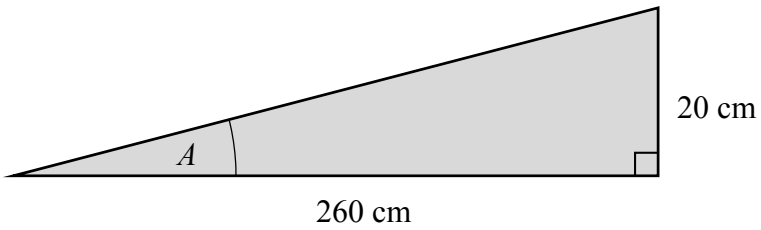
	Tick **one** box for each statement		
Statement	**Always true**	**Sometimes true**	**Never true**
1. In a rectangle, the opposite sides are equal.			
2. The sum of the four angles in a rectangle is 180°.			
3. A square has 4 axes of symmetry.			
4. Each of the angles in a parallelogram is 90°.			

Statement 2 in the table above says that the sum of the four angles in a rectangle is 180°.

(ii) **Justify** your answer to statement 2.

Question 11 **(Suggested maximum time: 15 minutes)**

(a) Séamus is making an access ramp for a building.
The ramp is in the shape of a right-angled triangle.
A diagram of the ramp is shown below.
The lengths of two of the sides are shown. The angle A is marked.



(i) Write down the length of the side **adjacent** to the angle A.

Adjacent = ☐ cm

(ii) Write down the value of **tan** A as a fraction.

tan A = ☐/☐

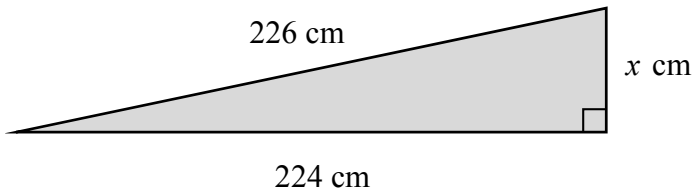
(iii) Use your answer to part **(a)(ii)** to find the **size** of the angle A.
Give your answer correct to the nearest degree.

The angle A must be **less than 5°** for the ramp to be acceptable.

(iv) Is Séamus's ramp acceptable? (Tick (✓) **one** box only.) Yes ❑ No ❑
Give a **reason** for your answer.

Reason:

(b) Cillian is making a ramp for a different building.
His ramp is also in the shape of a right-angled triangle.
A diagram of his ramp is shown below.



Use the **Theorem of Pythagoras** to find the value of x.

You may use this page for extra work.

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