2018.S33

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate Examination 2018

Mathematics

Paper 2
Ordinary Level

Monday 11 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					
2					
3					
4					
5					
6					
7					
8					
9					
10			Total		

Grade

Instructions

There are 10 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. There is space for extra work at the back of the booklet. 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.

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

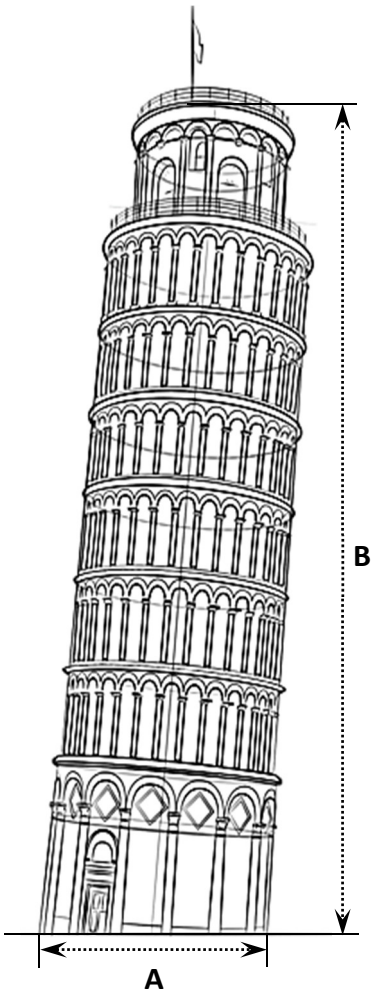
You may lose marks if you do not include the appropriate units of measurement, where relevant.

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: 10 minutes)**

On the right is a scaled diagram of the Leaning Tower of Pisa.



(a) Measure the width and the vertical height of the tower, marked **A** and **B** on the diagram. Give each answer in cm, correct to the nearest cm.

A = ☐ **B** = ☐

(b) The diagram is to a scale of $\mathbf{1\ cm = 5\ m}$.

Use this fact to work out the actual width and actual vertical height of the tower.

Actual width = ☐

Actual vertical height = ☐

(c) Claire estimates that the original tower was roughly in the shape of a **cylinder** with a radius of 7 m and a height of 60 m.

Use Claire's estimate to work out the **volume** of the original tower.
Give your answer in m^3, correct to one decimal place.

Source of the image: www.supercoloring.com. Altered.

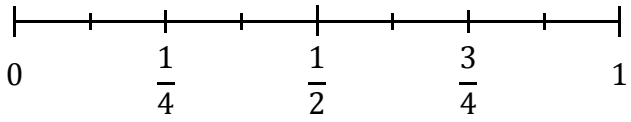
Question 2 **(Suggested maximum time: 10 minutes)**

Barry has one of each coin in the euro currency in his pocket.
He puts his hand in his pocket and picks one coin at random.

(a) Fill in the table below to show the probability of each of the events **P**, **S**, and **T**.

Event	Description	Probability
P	Barry picks a €2 coin.	Answer =
S	Barry picks a coin worth less than 50 cent.	Answer =
T	Barry picks a €3 coin.	Answer =

(b) Write each of the letters **P**, **S**, and **T** in the correct place on the probability scale below to show the probability of each event.



(c) Barry buys a bus ticket from a machine which does not give change.
It costs €1·75.

Barry pays the exact amount, using only the coins in his pocket.
Which coins does Barry use?

(d) How much money will Barry have left after paying for his ticket?

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

The table below shows the percentage of internet users in each of four age groups, **A**, **B**, **C**, and **D**, who used the internet to store files in 2014.

Age group	**A**	**B**	**C**	**D**
Percentage in 2014 (%)	42	39	27	15

(a) What percentage of internet users in group **B** used the internet to store files in 2014?

Answer:

(b) Work out the **range** of the four percentages in the table above.

(c) Work out the **mean** of the four percentages in the table above.

(d) The four age groups in the table above are in order, with the **youngest** people in **A** and the **oldest** people in **D**.

What does the table tell us about the way a person's age affects how likely they are to use the internet to store files?

(e) The table below shows these figures for **2014**, and the same figures for **2015**.

Display this data **graphically** in a way that allows you to compare the data for these two years. Label your graph(s) clearly.

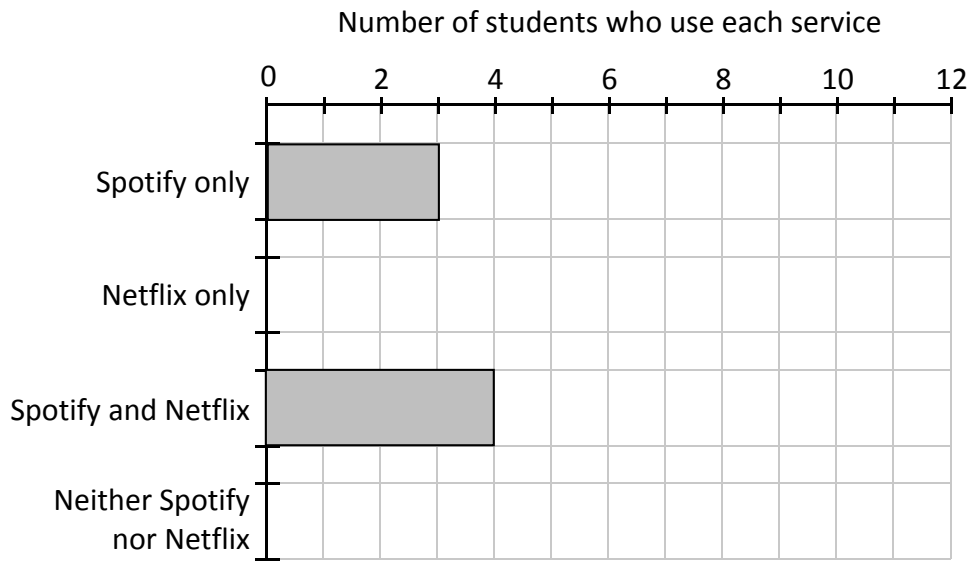
Age group	**A**	**B**	**C**	**D**
Percentage in 2014 (%)	42	39	27	15
Percentage in 2015 (%)	56	48	33	22

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

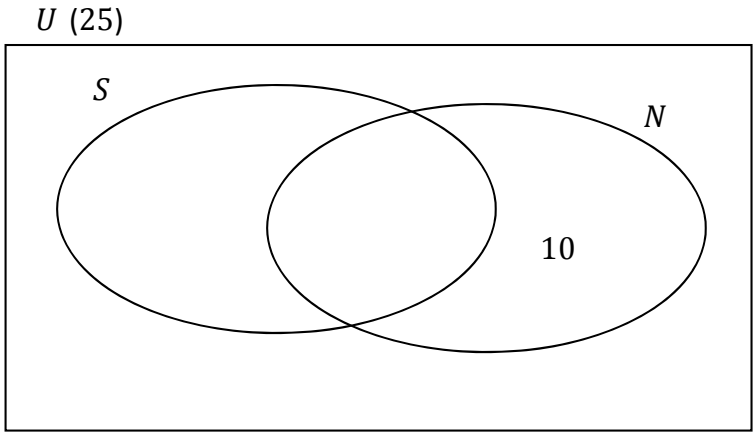
Ella carries out a survey on the **25 students** in her class to see how many use Spotify (S) and how many use Netflix (N). Some of her results are shown in the bar chart below and some more are shown in the Venn diagram below, where U is the set of all the students in the class.

(a) Use the results shown to complete the bar chart and the Venn diagram.

Bar chart



Venn diagram



(b) Work out the **total** number of students in the class who use **Spotify**.

(c) Explain what the following statement means, in the context of Ella's survey:

$$\#(N \backslash S) = 10.$$

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

The table below shows the colour of 15 cars in a car park.

Grey	Black	Grey	Red	Black
Grey	Grey	Red	Black	Red
Red	Grey	White	Grey	Black

(a) Which average can you find for this data? Tick (✓) **one** box only.

mean	median	mode
☐	☐	☐

(b) Using the average you picked in part **(a)**, find the average for this data.

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

Hager plays a chess competition. In each game, she can win (**W**), draw (**D**), or lose (**L**).

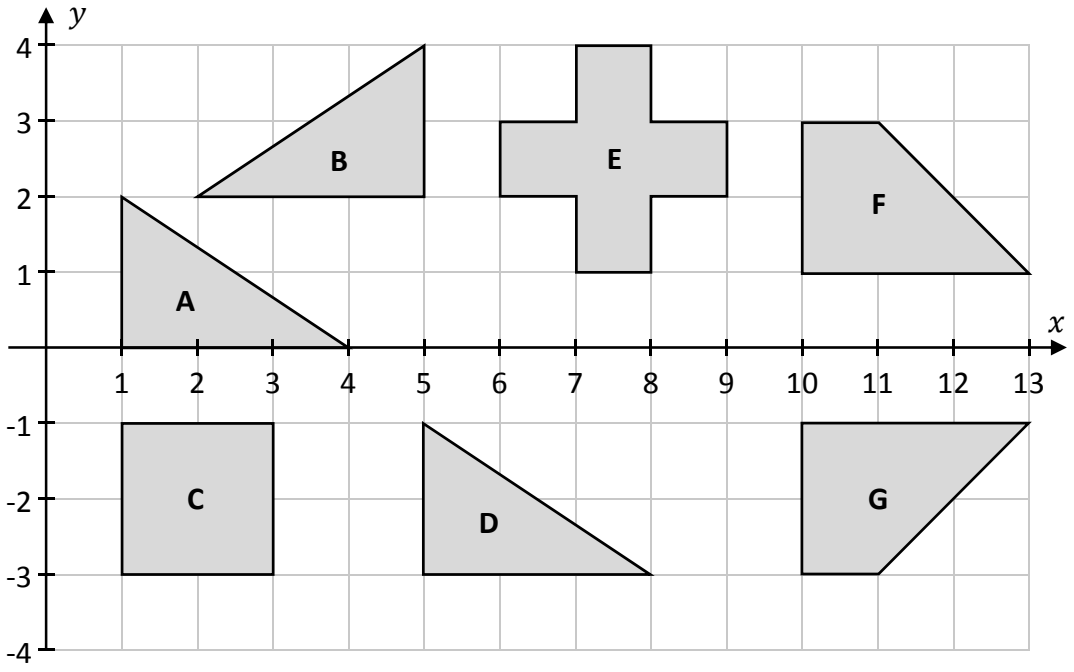
(a) Fill in the table below to show the 9 possible outcomes for Hager's first two games.
Two are already done. L W means that she lost Game 1 and won Game 2.

		Game 2		
		W	**D**	**L**
Game 1	**W**			
	D		D D	
	L	L W		

(b) Hager plays 3 games in the competition.
Work out the total number of different possible outcomes for her 3 games.

Question 7 **(Suggested maximum time: 20 minutes)**

Seven shapes are shown on the co-ordinate diagram below.
They are labelled **A**, **B**, **C**, **D**, **E**, **F**, and **G**.



(a) Write down the co-ordinates of the vertices (i.e. corners) of shape **B**.

Answer: (,) , (,) , and (,) .

(b) Find the **area** of shape **C** and the **area** of shape **D**.

Area of shape **C**:

Area of shape **D**:

(c) Find the length of the **perimeter** of shape **E**.

(d) Complete each of the following statements correctly.

(i) Shape **C** has exactly ☐ axes of symmetry.

(ii) Shape **G** is the image of shape ☐ under axial symmetry.

(iii) Shape **A** is the image of shape ☐ under a translation.

(e) Find the **slope** of the **hypotenuse** of shape **B**.

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

The table below gives some information about the four lines l, k, r, and t.

(a) Fill in the three missing entries in the table.

Line	Slope	Point where the line crosses the y-axis	Equation
l	3	$(0, 4)$	$y = 3x + 4$
k		$(0, -1)$	$y = 2x - 1$
r	-5		$y = -5x + 8$
t	7	$(0, -6)$	

(b) Which of these lines is the **steepest**? Tick (✓) **one** box only. Give a **reason** for your answer.

l ☐ k ☐ r ☐ t ☐

Reason:

(c) Is the point $(2, 10)$ on the line l $(y = 3x + 4)$? **Justify** your answer.

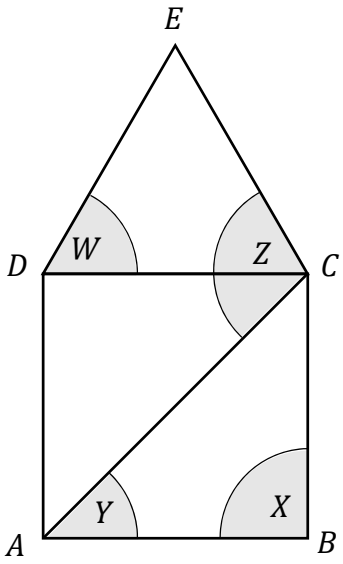
The point $(2, 10)$: **is** on l ☐ is **not** on l ☐

(tick (✓) **one** box only)

Justification:

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

(a) In the diagram below, $ABCD$ is a square and DCE is an equilateral triangle.
Some of the angles are marked.



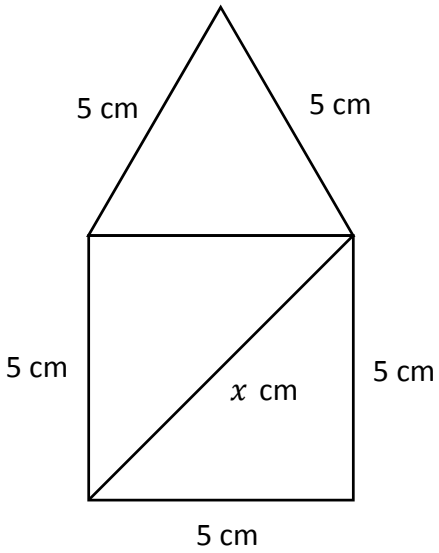
(i) Find the size of the angles W, X, and Y.

$|\angle W| =$ $|\angle X| =$ $|\angle Y| =$

Z is the obtuse angle ACE.

(ii) Work out the size of the angle Z.

(b) The square and the equilateral triangle in the diagram have sides of length 5 cm, as shown on the right.



(i) Use the theorem of **Pythagoras** to find the value of x, the length of the **diagonal** of the square.

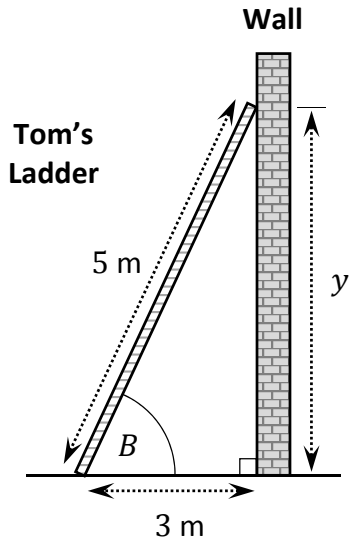
Give your answer correct to two decimal places.

(ii) **Construct** this diagram in the space below.

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

The diagram below shows Tom's ladder leaning against a vertical wall.

The ladder is 5 m long. It makes an angle of B with the horizontal ground.
The distance from the base of the ladder to the wall is 3 m.
The vertical height of the top of the ladder is y.



(a) Use the theorem of **Pythagoras** to find the value of y.

(b) **(i)** Below are three statements about the angle B in the diagram.
Put a tick (✓) in the correct box to show which one is true. Tick **one** box only.

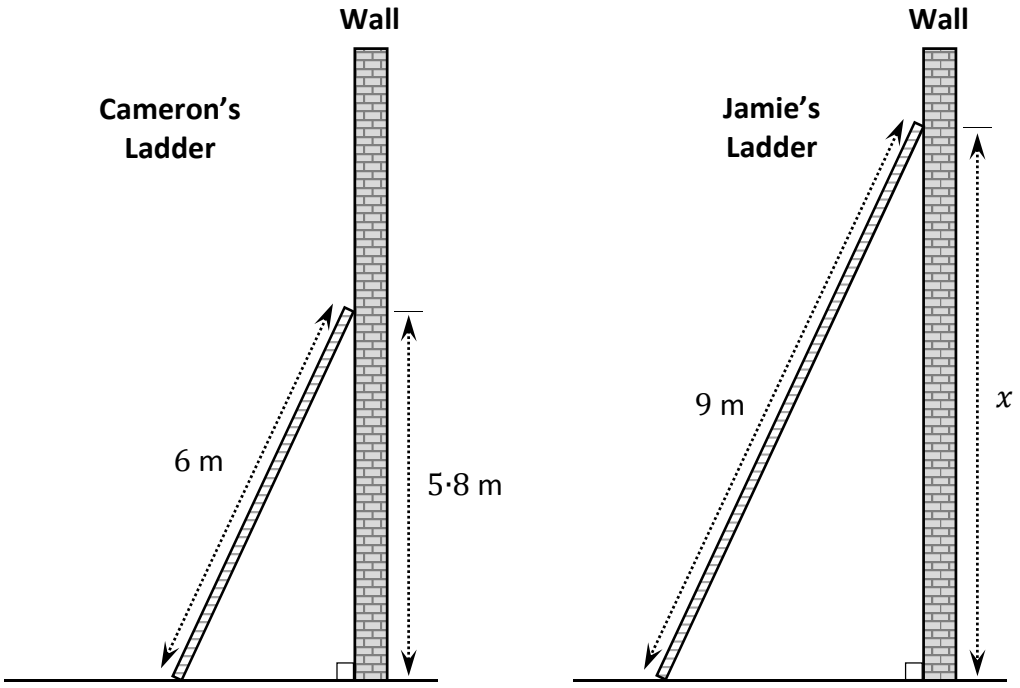
$\cos B = \frac{3}{5}$ ☐ $\sin B = \frac{3}{5}$ ☐ $\tan B = \frac{3}{5}$ ☐

(ii) Hence work out the **size** of the angle B.
Give your answer correct to one decimal place.

This question continues on the next page.

(c) The diagrams below show Cameron's ladder and Jamie's ladder.
Both of these ladders make the same angle with the horizontal ground.

Use **similar triangles** to find the value of x, the vertical height of Jamie's ladder.



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

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