

APPLIED SCIENCE

USING MATHS IN FORENSIC SCIENCE

SUMMER PROJECTS
YEAR 11 STUDENTS

THE USE OF ALGEBRA
FORMULA IN FORENSICS



HEART OF
WORCESTERSHIRE
COLLEGE

KICK START YOUR STUDY AT HOW COLLEGE WITH ONE OF OUR CURRICULUM BRIDGING PROJECTS

Background

In applied science and forensics numeracy skills are essential to analyse data and form valid conclusions. In this task you will be investigating if glass fragments collected from a hit and run come from the suspects' car. You will develop and demonstrate the use of algebra and unit conversions that can be applied in forensics but also in applied science.

What you should hand-in: You will need to read over the information and complete the tasks in The L3 Forensics Maths Booklet- Use of Formulae in Forensics.

Resources: The L3 Forensics Maths Booklet - Use of Algebra Formula in Forensics

Objective:

Know how to apply formulae in Forensics.

Outcomes:

MUST:

Carry out Maths calculations using formulae (Pass).

SHOULD:

Rearrange formulae to carry maths calculations (Merit).


COULD:

Explain and show your working out clearly (distinction).


Glass in crime scenes



- Windows are often broken in burglaries
- Car headlights are often broken in car accidents (e.g. hit and run incidents)
- Spectacles, bottles and glasses can be broken in a variety of circumstances
- There are many different types of glass manufactured for different purposes. Useful properties for comparison are
 - Colour
 - Density
 - Refractive Index



Measuring density of glass



The police believe that a burglar entered a house by smashing the kitchen window.

Three suspects were arrested as suspicious looking glass was found on their shoes/clothing.

The density of the different glass pieces was investigated by displacement of water

Calculate the missing numbers from the results table below. SHOW WORKING OUT:

Glass	Mass of glass piece (cm ³)	Increase in volume (cm ³)	Density of glass (g/cm ³)
Suspect 1	2.00	1.50	
Suspect 2	3.00	2.00	
Suspect 3	5.00		2.00
Window of house burgled		3.01	1.33

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Which suspect would you place at scene of the crime?

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Hairs and Fibres

- According to the exchange theory, criminals always leave and take away traces at the crime scene.
- Fibres and hairs are easily shed or picked up from crime scenes.
- Fibres and hairs from suspects can be analysed using a microscope
- When using microscopes you need to be able to calculate the **magnification** used in the microscope and the actual size of the specimen (size of fibres and hair strands)

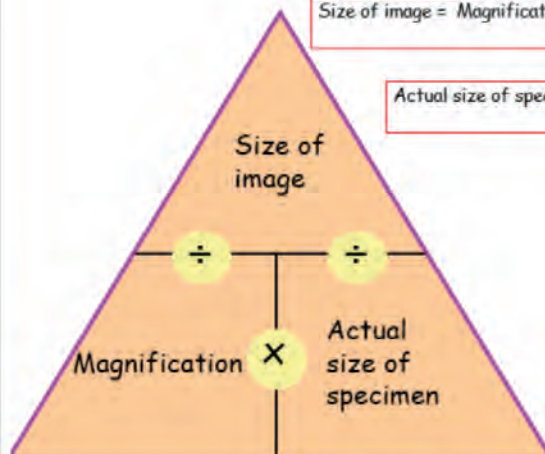


Magnification formula

$$\text{Magnification} = \frac{\text{size of image}}{\text{Actual size of specimen}}$$

$$\text{Size of image} = \text{Magnification} \times \text{Actual size of specimen}$$

$$\text{Actual size of specimen} = \frac{\text{size of image}}{\text{Magnification}}$$



Converting Units

If you want to convert the units below...	Into the following units.....	You need to multiply the number by
cm	mm	10
mm	µm	1000

If you want to convert the units below..	Into the following ..	You need to divide the number by
µm	mm	1000
mm	cm	10

Section 2: Magnification

Formula to calculate magnification:

$$\text{Magnification} = \frac{\text{Size of image (Qm)}}{\text{Actual size of specimen (Qm)}}$$

To convert units:

$$\text{Size of image in Qm} = \text{size of image in mm} \times 1000$$

$$\text{Size of image in Qm} = \text{size of image in cm} \times 10000$$

1. Rearrange the formula for magnification to make Actual size of specimen the main subject:

$$\text{Actual size of specimen (Qm)} =$$

2. Rearrange the formula for magnification to make Size of image the main subject:

$$\text{Size of image (Qm)} =$$

3. YOU MUST SHOW YOUR WORKING OUT FOR THE QUESTIONS BELOW:

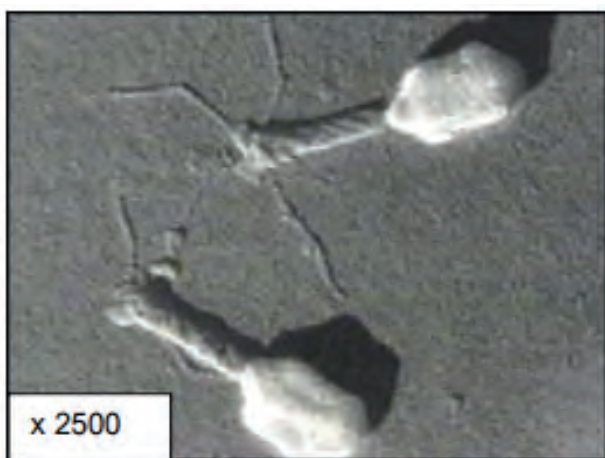
a. Convert 2mm into Qm

b. Convert 14cm into Qm

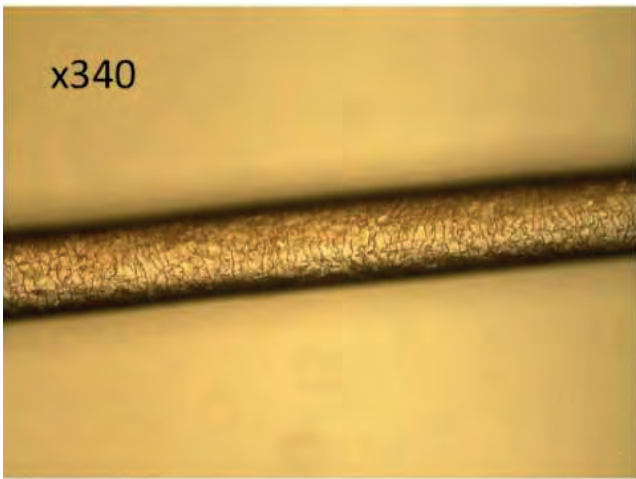
c. Convert 5000Qm into mm

d. Convert 6000Qm into cm

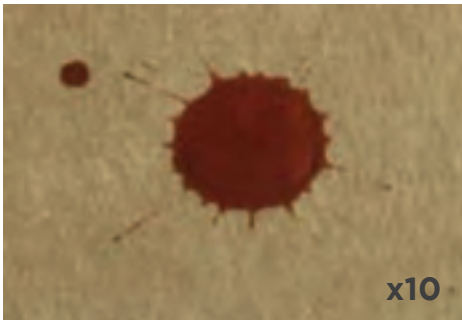
4. What is the actual length of the head of this virus.
Don't forget to show your working out and to include units



5. What is the actual width of the hair stand below:
Don't forget to show your working out and to include units



6. What is the actual diameter of the larger blood stain below.
Don't forget to show your working out and to include units



7. A sperm cell has a tail 40 Qm long and a student draws it 40 mm long. Calculate the magnification.
Don't forget to show your working out and to include units
8. A red blood cell is 7.5Qm in diameter. It is magnified 2000 times. Calculate the diameter of the image seen through the microscope in millimetres.
Don't forget to show your working out and to include units

Indicative time for this project:

Up to 3 hours.

Instructions on how to submit this:

Please submit all work to:

Neil Tabram

Curriculum, Resource & Quality (CRQ) Leader – Hospitality and Applied Science

e. science@howcollege.ac.uk

t. 01905 743515

How will I benefit from this project:

The project will help you understand what to expect when you come to College and also give you a head start in working on topics and content that will be relevant when you begin your journey with us.

What can I expect to get back after I submit my project work:

The receipt of your work will be acknowledged and a member of the team will give you some feedback.

Key information you should include:

Your name

Your email address

A contact telephone number