**A Level Further Maths**

**Transition Work**

**Summer 2024**

Teacher: Miss Jevons

Email: hjevons@delisle.leics.sch.uk

Current specification: OCR Further Mathematics B (MEI)

- Pure Core (50%)
- Statistics Minor (16⅔%)
- Mechanics Minor (16⅔%)
- Modelling with Algorithms (16⅔%)

Exam structure

- Pure Core - 2hrs 40mins
- Statistics Minor - 1hr 15mins
- Mechanics Minor - 1hr 15mins
- Modelling with Algorithms - 1hr 15mins

Section A: Pure Maths

## Sequences

Write the nth term rule for the following sequences:

a) 51, 54, 59, 66, 75, …

b) 3, 12, 27, 48, 75, …

c) 2.5, 4, 6.5, 10, 14.5, …

d) -6, -1, 6, 15, 26, …

e) 6, 13, 24, 39, 58, …

## Simultaneous Equations

Solve the simultaneous equations:

$$\begin{aligned} a+b-c &= 2 \\ a-b+c &= 0 \\ -a+b+c &= 8\,. \end{aligned}$$

Now solve the simultaneous equations:

$$\begin{aligned} ka+b-c &= 2 \\ a-b+c &= 0 \\ -a+b+c &= 8\,. \end{aligned}$$

where $k$ is a fixed but unknown number. Are there any values of $k$ for which the equations have no solution?

**Algebraic Fractions**

Question 1: Fully simplify the following:

$$\frac{x^2+5x+4}{x^2+4x+3} \qquad \frac{x^2+6x+9}{x^2-2x-15}$$

$$\frac{x^2+11x}{x^2-121} \qquad \frac{x^2-1}{x^2+x}$$

$$\frac{10x^2-23x+12}{4x^2+4x-15} \qquad \frac{20x^2+21x+4}{16x^2-1}$$

Question 2

**(i)** Solve the equation:

$$\frac{2}{x+3}+\frac{1}{x+1}=1\,.$$

**(ii)** Find the value(s) of $b$ for which the following equation has a single (repeated) root.

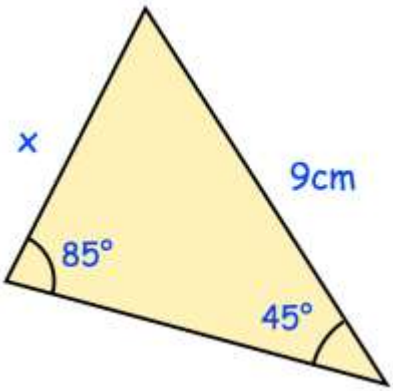
$$9x^2+bx+4=0\,.$$

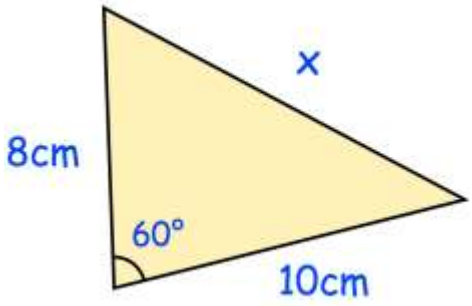
**(iii)** Find the range of (real) values of $c$ for which the following equation has no real roots:

$$3x^2+5cx+c=0\,.$$

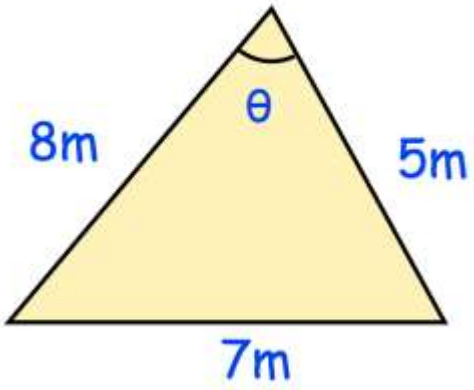
**Trigonometry**

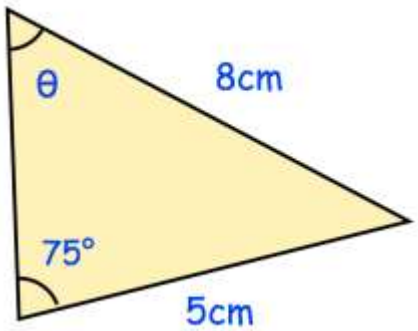
Calculate the missing side x.



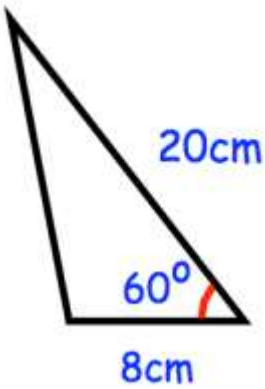




Calculate the missing angle $\theta$

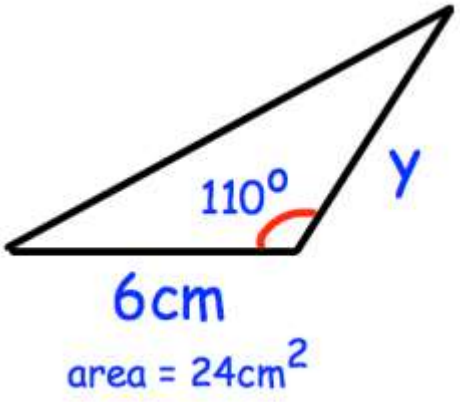



Calculate the area of the triangle



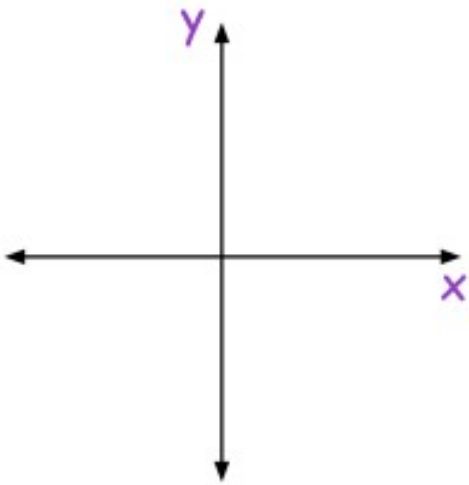

Calculate y



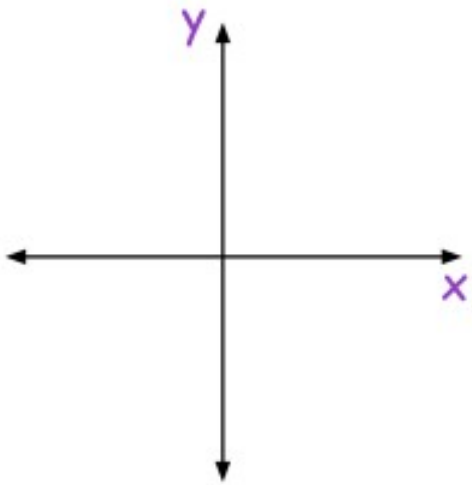
**Graph Sketching**

- Sketch the following graphs
- label any points of intersection with the axes
- Label the turning point

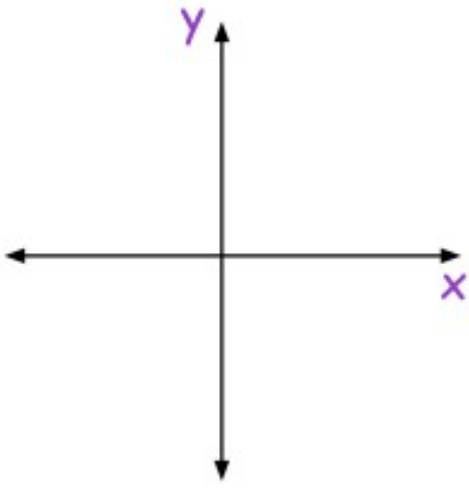
a) $y = x^2 - 7x + 10$



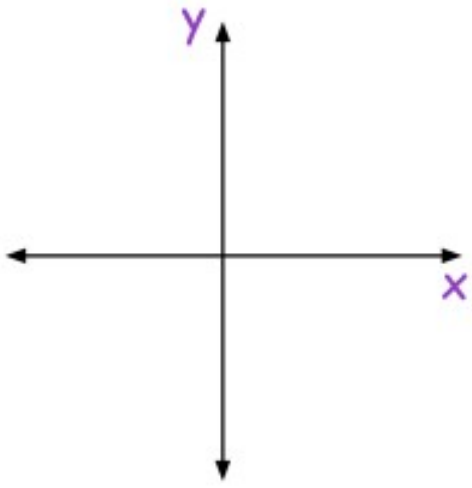

b) $y = x^2 - 2x + 1$




c) $y = x^2 + 4x + 10$

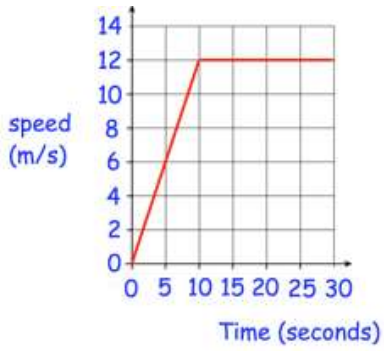


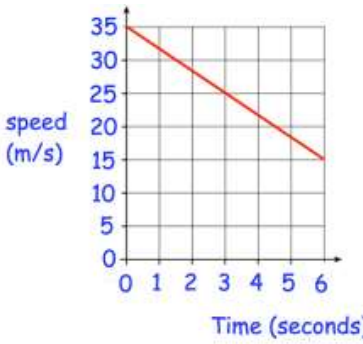

d) $y = -x^2 - 5x - 4$



## Section B: Mechanics

1. Shown below are speed-time graphs for some journeys. For each journey, calculate the total distance travelled.



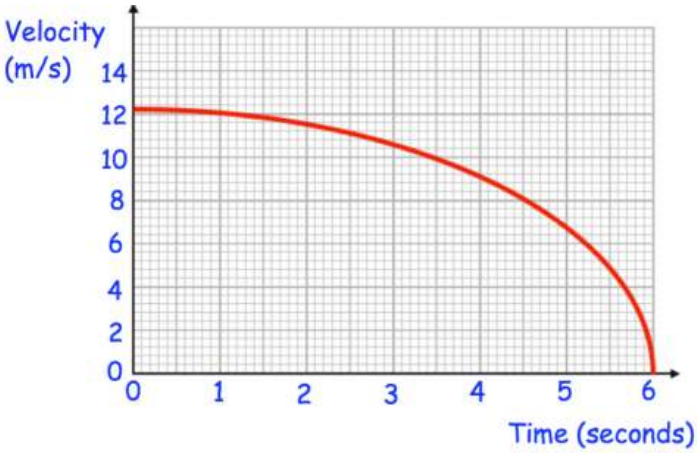





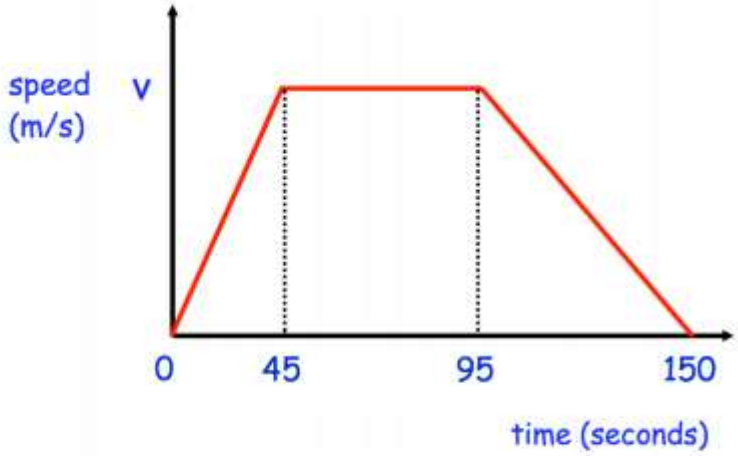
2. Here is a velocity time graph

(a) Work out an estimate for the distance travelled over 6 seconds. Use 3 strips of equal width.

(b) Is your answer to (a) an overestimate or an underestimate of the actual distance travelled?




3. Here is a speed-time graph for a train journey




The journey took 150 seconds.
The train travelled 1.53km in the 150 seconds.

Work out the value of v.

Section C: Statistics

Calculate the following:

a) Estimated mean
b) Median class
c) Modal class

| Lifetime (months) | Frequency |
|---|---|
| $0 < t \leq 12$ | 1 |
| $12 < t \leq 24$ | 9 |
| $24 < t \leq 36$ | 13 |
| $36 < t \leq 48$ | 56 |
| $48 < t \leq 60$ | 21 |

| Time taken | Frequency |
|---|---|
| $0 < t \leq 5$ | 5 |
| $5 < t \leq 10$ | 14 |
| $10 < t \leq 15$ | 10 |
| $15 < t \leq 20$ | 1 |