



Mathematics



Staff members

- I Lewis
- A Buxton
- R Long
- L Laing



Y12 content

Autumn

- Algebraic Expressions
- Equations and Inequalities
- Differentiation and Integration
- Circles

Spring

- Algebraic Methods
- Trigonometry
- Exponentials and logarithms
- Vectors

Summer

- Probability
- Binomial distribution and Hypothesis testing
- Forces and Motion
- Variable Acceleration

Y13 content

Autumn

- Functions and Graphs
- Binomial Expansion
- Forces and Friction
- Conditional Probability

Spring

- Trigonometry
- Parametric Equations
- The Normal Distribution
- Applications of Forces

Summer

- Integration
- Differentiation
- Projectiles
- -



Sample of Year 12 student work.

3.3 Simultaneous Equations on Graphs

The solutions to a pair of simultaneous equations represent the points of intersection of their graphs.

The graph of a linear equation and the graph of a quadratic equation can either:

- intersect twice
- intersect once
- not intersect

You can use the discriminant to determine the number of points of intersection.

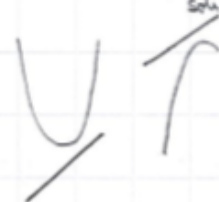
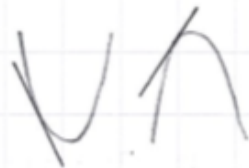
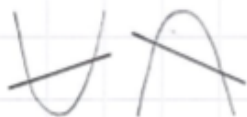
For a pair of simultaneous equations that produce a quadratic equation of the form

$$ax^2 + bx + c = 0$$

$$b^2 - 4ac > 0 \text{ two real solutions}$$

$$b^2 - 4ac = 0 \text{ one real solution}$$

$$b^2 - 4ac < 0 \text{ no real solutions}$$



$$ax^2 + bx + c = 0$$

c = y-intercept

Roots are when $y = 0$

Turning point = Completing the square

$$f(x) = a(x+p)^2 + q \quad \text{turning point} = (-p, q)$$

Sketch the graph of $y = x^2 - 5x + 4$

y intercept = $(0, 4)$

$$\text{Roots} = (x-4)(x-1) = 0$$

$$x = 4 \text{ or } x = 1$$

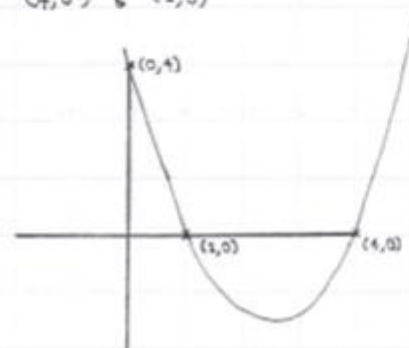
$(4, 0)$ & $(1, 0)$

Turning Point = $(\frac{5}{2}, -\frac{9}{4})$

$$(x - \frac{5}{2})^2 - \frac{25}{4} + 4$$

$$(x - \frac{5}{2})^2 - \frac{9}{4}$$

$$x = \frac{5}{2} \quad y = -\frac{9}{4}$$



Saint Benedict Catholic Voluntary Academy-Sixth Form



Sample of Year 13 student work.

Example
 $X \sim B(8, p)$ $x = 7$ 5% sig level
 $H_0: p = 0.32$ $H_1: p > 0.32$

$\Rightarrow X \sim B(8, 0.32)$ $P(X \geq 7) = 1 - P(X \leq 6) = 0.00198$
 $0.00198 < 0.05$

We have significant evidence to reject the null hypothesis. (which is more likely to occur)
 Accept H_1 + CONTEXT!

Example
 Success rate claimed to be 68%.

a) $X \sim B(n, 0.68)$ ← 'suitable distribution to model...'
 Reasons: - only 2 outcomes - each 'potion' is independent
 - fixed prob. of success - Fixed n of trials.

b) $X \sim B(10, 0.68)$ $X = 3$ 5% significance
 $H_0: p = 0.68$ $0.0155 < 0.05$ ✓
 $H_1: p < 0.68$ ∴ we have sufficient evidence to reject the null hypothesis. So we accept H_1 that the brew had a success rate lower than 68%.

→ $P(X \leq 3) = 0.0155$

Chapter 11: variable acceleration

→ changes with time i.e. expressed as some function of t

$a = f''(t) = \frac{dv}{dt} = \frac{d^2s}{dt^2}$ $s = \int v dt$
 $v = f'(t) = \frac{ds}{dt}$ $v = \int a dt$
 $s = f(t)$

acceleration
 velocity
 displacement

INTEGRATE

Example

• body moves in straight line. Displacement s metres from point O at time t
 $s = 2t^3 - 3t$, $t > 0$

a) Find s when $t = 2$ b) Time taken for body to return to O
 $s = 2(2)^3 - 3(2) = 10$ $0 = 2t^3 - 3t = t(2t^2 - 3)$
 $t = 0$, $t = \pm \sqrt{\frac{3}{2}}$ ∴ $t = \sqrt{\frac{3}{2}}$ secs

Example

Start of straight track $t = 0$, returns to start. Distance, s metres, from start in t secs:
 $s = 4t^2 - t^3$ where $0 \leq t \leq 4$

Explain restriction:

$s \geq 0$ ∴ $4t^2 - t^3 \geq 0$
 $t^2(4 - t) \geq 0$
 since $t \geq 0$, $t = 0$, $t = 4$

$t^2 \geq 0$, $4 - t \geq 0$ } $0 \leq t \leq 4$
 $t \geq 0$, $4 \geq t$ }

Saint Benedict Catholic Voluntary Academy-Sixth Form



Exam board:

Edexcel

Exam specifics

3 Exams- each 2 hours long

2 exams on the core content

1 exam on the stats and mechanics module



Entry requirements

Grade 7 in Mathematics
Grade 6 considered on interview



Career pathway link

There are a huge range of careers that have a level of Mathematical content in them including but not limited to

- Accounting
- Engineering
- Computer Sciences
 - Architect
- Banking and finance
 - Electrician
 - Meteorologist
 - Pharmacist
- Quantity Surveyor
 - Radiographer
 - GP



**Thank you for visiting our subject.
If you have any questions, please contact**

Name: Adam Buxton

Email address: abuxton@saintben.derby.sch.uk

Name: Iain Lewis

Email address: ilewis@saintben.derby.sch.uk