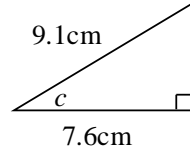
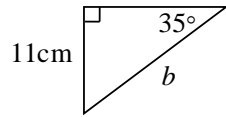
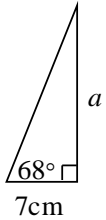


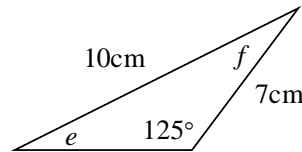
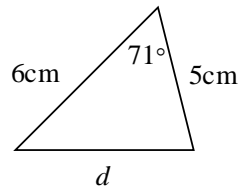
A-Level Mathematics Induction Assignment

Trigonometry (12 marks)

1. Find the lettered lengths and angles in these triangles.



2. Find the lettered lengths and angles in these triangles.



Indices (12 marks)

3. Simplify the following

a) $3x^4 \times 7x^6$ b) $(3x^2)^3$ c) $8x^7 \div 4x^3$

d) $\frac{(6pq)^3}{(2p^2q)^2}$

4. Without using a calculator, find the value of the following, showing sufficient working to make your method clear.

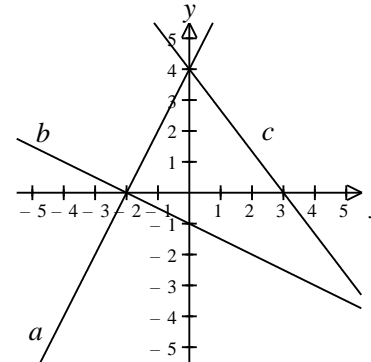
a) 5^0 b) 4^{-2} c) $9^{\frac{1}{2}}$ d) $8^{\frac{2}{3}}$ e) $25^{-\frac{3}{2}}$

Coordinate Geometry (12 marks)

5. Find the gradient and the y-intercept of these lines.

a) $y = 3x - 8$ b) $4x - 2y = -7$ c) $\frac{x}{4} + \frac{y}{3} = 1$

6. Find the equations of these lines.



Algebraic Manipulation (30 marks)

7. Simplify the following.

a) $x^2 + 3x^2$ b) $2a \times 5b$ c) $5a - 3b - a + 2b$
 d) $5a - 2(2a + 3)$ e) $2x - (2x - 1)$

8. Expand and simplify.

a) $(2y - 1)(y - 4)$ b) $(3x - 2)^2$ c) $(2x - 3y)(5x + 2y)$

9. Factorise.

a) $9y^2 - 3y$ b) $8x^2y + 12xy^2$ c) $x^2 - 6x - 16$
 d) $4x^2 - 9$ e) $2x^2 - 18x + 28$ f) $ab - 2a + 3b - 6$

10. Rearrange these formulas to make x the subject.

a) $a = \frac{2xy}{3b}$ b) $a = b + \sqrt{\frac{x}{c}}$ c) $y = \frac{2x-1}{3x+2}$

11. Express as a single fraction.

a) $\frac{x}{4} + \frac{2x}{3}$ b) $\frac{5}{x-1} - \frac{2}{2x+3}$

Equations (16 marks)

12. Solve the following simultaneous equations.

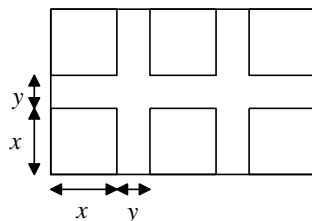
a) $\begin{cases} 5x - 2y = 7 \\ 3x - y = 5 \end{cases}$ b) $\begin{cases} u = 2v + 7 \\ 7u + v = 4 \end{cases}$ c) $\begin{cases} x + 2y = 7 \\ x^2 + y^2 = 10 \end{cases}$

13. Solve the following quadratic equations.

a) $2x^2 - 7x + 3 = 0$ b) $2x^2 - 7x + 4 = 0$

Applications of Algebra (18 marks)

14. A large window consists of six square panes of glass as shown. Each pane is x metres by x metres, and all the dividing wood is y metres wide.



- Write down expressions for the length, width and hence the total area of the whole window in terms of x and y .
- Show that the total area of the dividing wood is $7xy + 2y^2$.
- The total area of glass is 1.5 m^2 , and the total area of the wood is 1 m^2 . Find the values of x and y .

15. Fred cycled from home to his friend's house and back again. The distance between their houses is 20km. On his way to his friend's house, Fred cycled at x km/h. On the way back, Fred cycled 2 km/h slower. It took Fred 4 hours altogether to cycle to his friend's house and back.

- Write down an equation for x .
- Show that the equation can be written as $x^2 - 12x + 10 = 0$.
- Solve the equation in b), giving your answers to 1 decimal place.
- Only one of these answers can be Fred's speed. Explain.

And Finally...

There are no marks for the question that follows, so relax! However, we are very interested to see what ideas you have.

Carl Friedrich Gauss (German, 1777-1855) was one of the greatest mathematicians of all time. His ability was shown at a very early age when his schoolteacher set his class the task of adding up all the whole numbers from 1 to 100. His classmates wearily started working on the problem, but Gauss came up with the answer in just a few seconds. How did he do it?

Don't worry if you find this problem difficult : we will meet it again when we look at *arithmetic series* in unit C1.