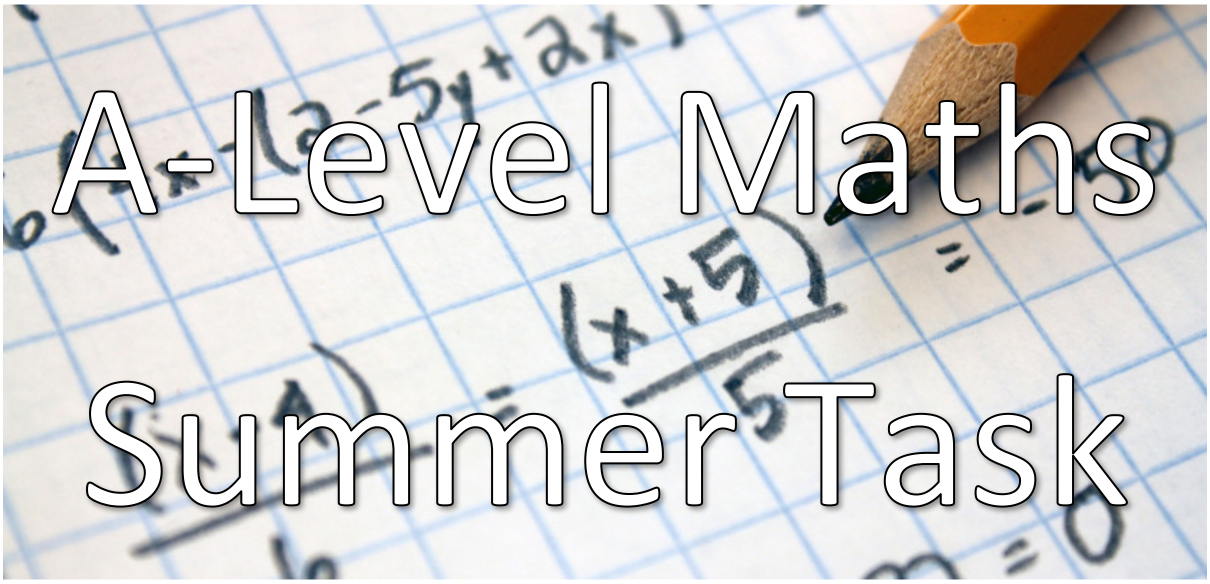


Instructions

This pack consists of 2 sections

The first section:

A set of questions covering the most important topics from GCSE maths when progressing to A Level.

It is expected that you will be able to complete the majority of the questions **confidently**. It is your responsibility to revise and fill in any gaps in the topic areas covered so that you are well prepared to begin in September.

The second section:

A set of extended questions that do not rely on particularly difficult maths but are more about thinking and problem-solving. It is not expected that you will get complete and correct solutions to all questions but you should make an **attempt** at all of the questions.

Guesses at the multiple choice questions without any working will be taken as no attempt.

A Level maths requires a great deal of resilience. If you are immediately put off by these questions and do not have the motivation to make an attempt, maths may not be the right course for you.

Your attempts at **both sections** will be collected in on the first day back in September when you begin your A-Level course.

Algebra

Question 1

Solve $x^2 + 6x + 8 = 0$ (2)

Question 2

Solve the equation $y^2 – 7y + 12 = 0$

Hence solve the equation $x^4 – 7x^2 + 12 = 0$

(4)

Question 3

(i) Express $x^2 – 6x + 2$ in the form $(x-a)^2 – b$

(3)

(ii) State the coordinates of the minimum value on the graph of $y = x^2 – 6x + 2$

(1)

Question 4

Make r the subject of the formula $V = \frac{4}{3} \Pi r^2$

(3)

Question 5

Make c the subject of the formula $P = \frac{c}{c+4}$

(4)

Question 6

Find the coordinates of the point of intersection of the lines y = 3x + 1 and x + 3y = 6

(3)

Question 7

Find the coordinates of the point of intersection of the lines 5x + 2y = 20 and y = 5 - x

(3)

Question 8

Solve the simultaneous equations

$$x^2 + y^2 = 5$$

$$y = 3x + 1$$

(4)

Question 9

Simplify the following

(i) a^0

(1)

(ii) $a^6 \div a^{-2}$

(1)

(iii) $(9a^6b^2)^{-0.5}$

(3)

Question 10

(i) Find the value of $\left(\frac{1}{25}\right)^{-0.5}$

(2)

(ii) Simplify $\frac{(2x^2y^3z)^5}{4y^2z}$

(3)

Question 11

(i) Simplify $(3 + \sqrt{2})(3 - \sqrt{2})$

(2)

(ii) Express $\frac{1+\sqrt{2}}{3-\sqrt{2}}$ in the form $a + b\sqrt{2}$ where a and b are rational

(3)

(iii) Simplify $5\sqrt{8} + 4\sqrt{50}$. Express your answer in the form $a\sqrt{b}$ where a and b are integers and b is as small as possible.

(2)

Graphs & Functions

Question 12

A (0,2), B (7,9) and C (6,10) are three points.

(i) Show that AB and BC are perpendicular

(3)

(ii) Find the length of AC

(2)

Question 13

Find, in the form $y = mx + c$, the equation of the line passing through A (3,7) and B (5,-1).

Show that the midpoint of AB lies on the line $x + 2y = 10$

(5)

Question 14

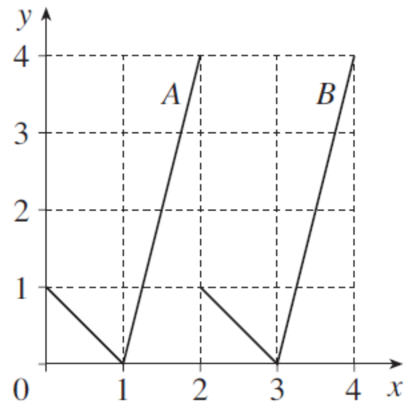
The curve $y = x^2 - 4$ is translated by $\begin{pmatrix} 2 \\ 0 \end{pmatrix}$

Write down an equation for the translated curve. You need not simplify your answer.

(2)

Question 15

This diagram shows graphs A and B.



(i) State the transformation which maps graph A onto graph B

(2)

(ii) The equation of graph A is $y = f(x)$. Write down the equation of graph B.

(2)

Question 16

(i) Describe the transformation which maps the curve $y = x^2$ onto the curve $y = (x+4)^2$

(2)

(ii) Sketch the graph of $y = x^2 - 4$

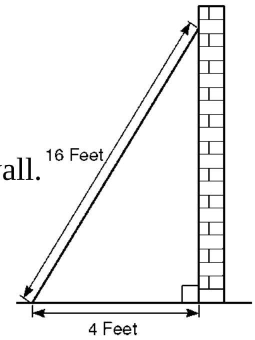
(2)

Trigonometry

Question 17

Sidney places the foot of his ladder on horizontal ground and the top against a vertical wall.

The ladder is 16 feet long and the foot of the ladder is 4 feet from the base of the wall.



(i) Work out how high up the wall the ladder reaches. Give your answer to 3sf.

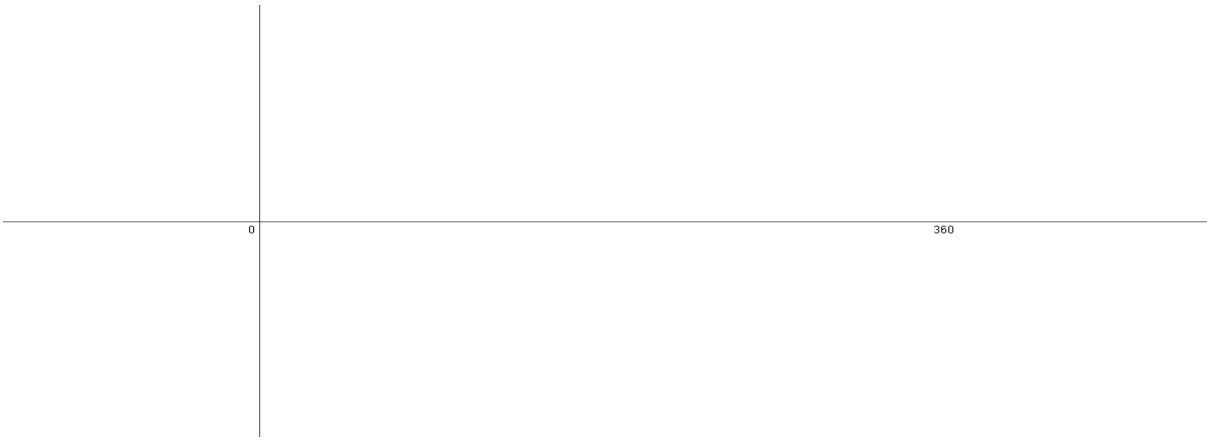
(2)

(ii) Work out the angle the base of the ladder makes with the ground. Give your answer to 3sf.

(2)

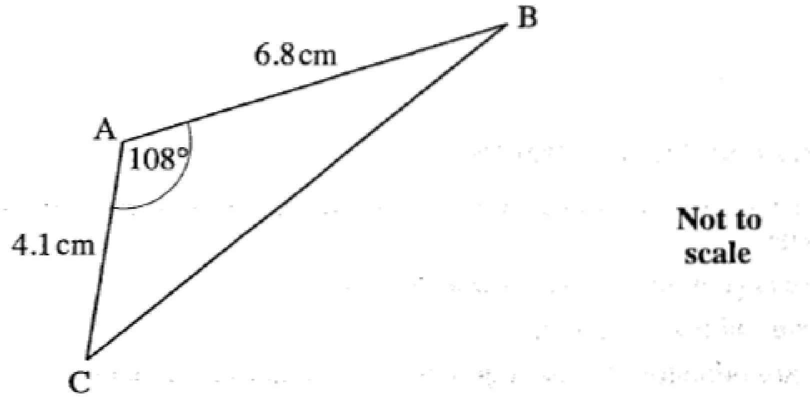
Question 18

Sketch the graph of $y = \cos x$ for $0 \leq x \leq 360°$



(3)

Question 19



For triangle ABC, calculate

(i) the length of BC (3)

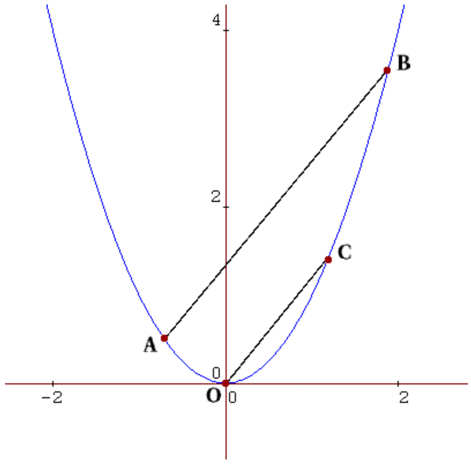
(ii) the angle ABC (3)

(iii) the area of triangle ABC (3)

Extended Problems

Question 1

Given that A=(a,a^2), B=(b,b^2), and C=(c,c^2), and that the lines AB and OC are parallel, prove that a+b=c.



Question 2

Albert Einstein is experimenting with two unusual clocks which both have 24-hour displays. One clock goes at twice the normal speed. The other clock goes backwards, but at the normal speed. Both clocks show the correct time at 13:00.
What is the correct time when the displays on the clocks next agree?

A 05:00 B 09:00 C 13:00 D 17:00 E 21:00

Question 3

Supergran walks from her chalet to the top of the mountain. She knows that if she walks at a speed of 6 mph she will arrive at 1 pm, whereas if she leaves at the same time and walks at 10 mph, she will arrive at 11 am.
At what speed should she walk if she wants to arrive at 12 noon?

A 7.5 mph B $7\frac{1}{7}$ mph C 7.75 mph D $\sqrt{60}$ mph E 8 mph

Question 4

Last year Gill's cylindrical 21st birthday cake wasn't big enough to feed all her friends. This year she will double the radius and triple the height. What will be the ratio of the volume of this year's birthday cake to the volume of last year's cake?

A 12:1 B 7:1 C 6:1 D 4:1 E 3:1

Question 5

Given that $4x - y = 5$, $4y - z = 7$ and $4z - x = 18$, what is the value of $x + y + z$?

A 8 B 9 C 10 D 11 E 12

Question 6

A new taxi firm needs a memorable phone number. They want a number which has a maximum of two different digits. Their phone number must start with the digit 3 and be six digits long. How many such numbers are possible?

A 288 B 280 C 279 D 226 E 225

Question 7

The diagram shows a pattern of eight equal shaded squares inside a circle of area π square units. What is the area (in square units) of the shaded region?

A $1\frac{1}{3}$ B $1\frac{3}{5}$ C $1\frac{2}{3}$ D $1\frac{7}{9}$ E 2