



## MATHEMATICS: BRIDGING ACTIVITY

During the holiday, you are required to complete all the questions on the MIND THE GAP worksheet to the best of your ability. You need to hand this in during the first lesson in September. **This is compulsory.** The questions are all on topics that you have covered at GCSE.

If you are struggling to answer any of the questions, use **mathswatch** to help.

Login and search for the topic you wish to go over. Select the lesson to watch or the online homework for practice.

Login:	Password:
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The link below is another website for extra practice of the skills you will be required to know and use in the first few weeks of the A Level course.

<http://www.cimt.org.uk/projects/mepres/step-up/index.htm>



## MIND THE GAP!

### 1.SURDS

1)  $\sqrt{2} \times \sqrt{8}$  2)  $\sqrt{45}$  3)  $5\sqrt{12} + 2\sqrt{18}$

4)  $(5+\sqrt{7})(5-\sqrt{7})$  5)  $\frac{\sqrt{3}}{3\sqrt{6}}$  6)  $\frac{3-\sqrt{7}}{3+\sqrt{7}}$

### 2.FRACTIONS

Work out without a calculator:

1)  $\frac{3}{4} + \frac{1}{3}$  2)  $5\frac{1}{3} - \frac{3}{2}$  3)  $2\frac{2}{3} \times \frac{1}{4}$  4)  $5\frac{1}{3} \div \frac{1}{4}$

### 3.LAWS OF INDICES

Express the following in their simplest form:

1)  $9^{\frac{1}{2}}$  2)  $81^{\frac{1}{4}}$  3)  $64^{\frac{1}{6}}$  4)  $64^{\frac{2}{3}}$  5)  $y^{10} \times y^2 \div y^5$   
6)  $125^{\frac{2}{3}}$  7)  $(\frac{125}{8})^{-\frac{1}{3}}$

### 4.FACTORISING

Factorise the following:

1)  $9x - 21z$  2)  $20x^2 - 4x$  3)  $8x^2y + 28xy^2$   
4)  $3\pi a^2 + \pi ab$  5)  $x^2 + 7x + 10$  6)  $x^3 + 5x^2 - 14x$

### 5.EXPANSION

Expand the following brackets:

1)  $(2x+5)(x-4)$  2)  $(x+5)^2$  3)  $(x+2)(x-5)(2x+3)$  4)  $(x+1)^3$

### 6.ALGEBRAIC FRACTIONS

Cancel these fractions as far as possible:

1)  $\frac{3x^2}{7x}$  2)  $\frac{8x+6}{2x-4}$  3)  $\frac{3x^2+6x}{2x+4}$  4)  $\frac{t^2-3t-70}{t^2-100}$

Express as a single fraction:

3)  $3 + \frac{2}{x}$  2)  $\frac{1}{x+1} + \frac{3}{x-3}$

Simplify these expressions:

1)  $\frac{3x+1}{3} \times \frac{x}{3(x+1)}$  2)  $\frac{x(x-1)}{3} \div \frac{x-1}{x}$

**Solve:**

1)  $\frac{3}{x+1} = \frac{1}{x} + \frac{1}{2}$

### **7.CHANGING THE SUBJECT OF FORMULA**

1) Express  $a$  in terms of  $b$  given  $b(a+2)=4$

2) Make  $t$  the subject of the formula  $s = \sqrt{\frac{t+1}{u}}$

3) Make  $a$  the subject of (i)  $v^2 = u^2 + 2as$  (ii)  $s = ut + \frac{1}{2}at^2$

### **8.QUADRATIC EQUATIONS**

**Solve the following:**

1)  $x^2 + 3x + 2 = 0$  2)  $x^2 - 7x + 10 = 0$  3)  $2x^2 - x - 10 = 0$

**Solve the following:**

1)  $x^2 - 9 = 0$  2)  $9x^2 - 25 = 0$

**Solve the following, giving your answer to two decimal places:**

1)  $x^2 + 3x - 5 = 0$  2)  $x^2 + 11x = -11$

**Prove:**

1)  $x^2 - 3x + 1 = 0$  has a solution between 2 and 3

2) Using  $x_{n+1} = \sqrt{3x_n - 1}$  and  $x_0 = 2$ , find a solution to the equation  $x^2 - 3x + 1 = 0$  to 3 d.p.

**Minimum Points:**

1) By completing the square find the minimum point of  $x^2 + 8x - 2 = 0$

### **9.SIMULTANEOUS EQUATIONS**

**Solve these simultaneous equations:**

1)  $5x + 3y = 17$  and  $4x + 10y = 25$

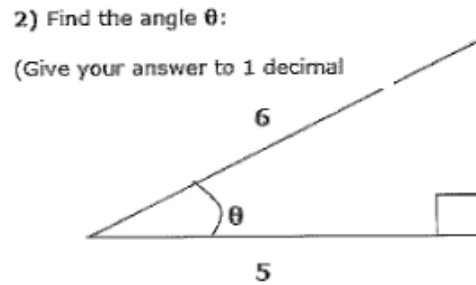
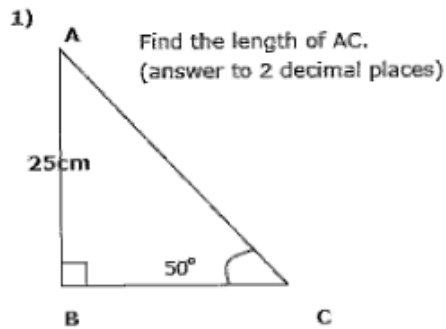
2)  $x = 2y + 1$  and  $3x - 4y = 7$

3)  $x^2 + y^2 = 13$  and  $5y + x = 13$

## 10. STRAIGHT LINE GRAPHS

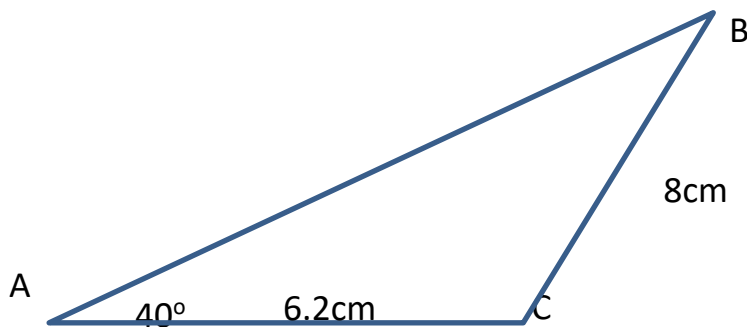
- 1) Find the gradient of the line passing through (2,12) and (4,1)
- 2) Find the equation of the line which passes through (0,-2) and has a gradient of 4
- 3) Find the distance between the points P (2,6) and Q (5,14)
- 4) Find the equation of the line perpendicular to  $y=3x+1$  at the point (0,1)

## 11. BASIC TRIGONOMETRY



## 12. SINE AND COSINE RULE

- 1) Use the cosine rule to find the length of the third side of the triangle with sides  $AB=5\text{cm}$ ,  $AC=7\text{cm}$  and angle BAC is  $35^\circ$ . (Give your answer to two decimal places)
- 2) Use the sine rule to find the size of angle ABC



- 3) Two ships A and B leave Mersey Docks, M, at the same time. Ship A travels at a bearing of  $120^\circ$  and ship B travels at a bearing of  $100^\circ$ . After 1-hour ship A has travelled 25km and angle MBA is  $130^\circ$ . Find the speed of ship B.

### **13.STATISTICS**

- 1) The table below shows how a group of 71 students performed in a test. Find an estimate for the mean.

Test Score	Frequency
$0 < x \leq 20$	8
$20 < x \leq 40$	12
$40 < x \leq 60$	20
$60 < x \leq 80$	25
$80 < x \leq 100$	6
Total	

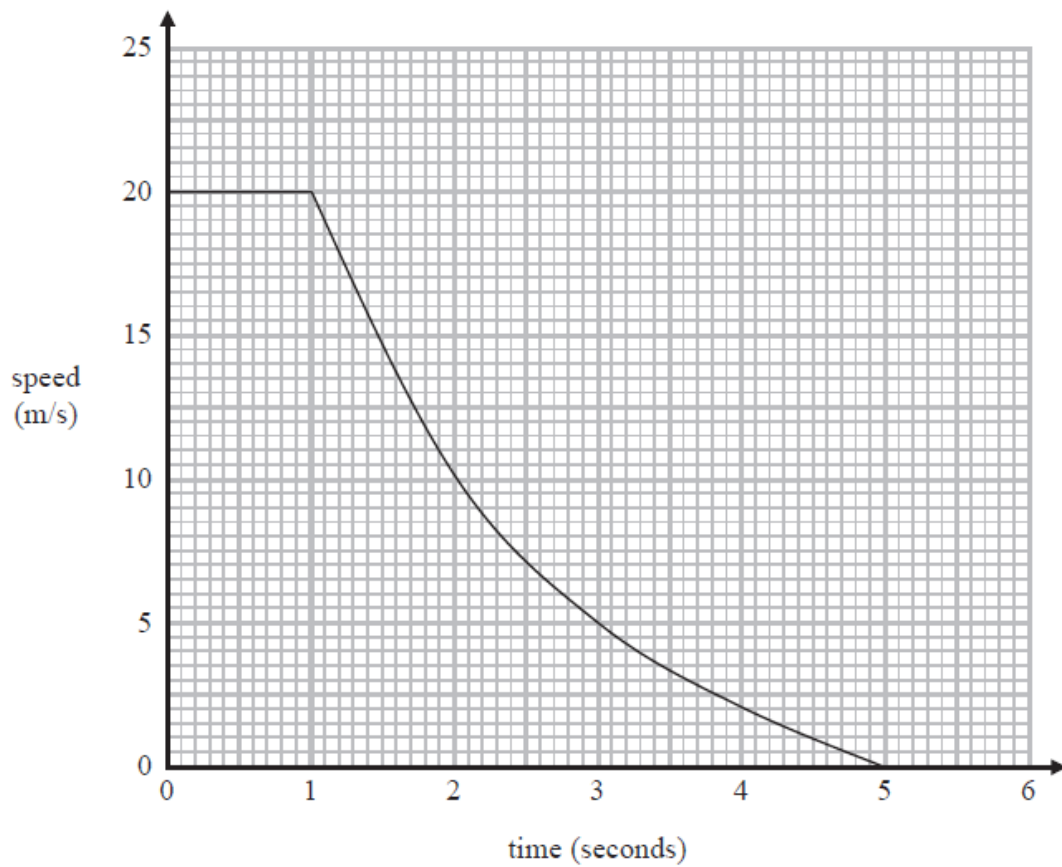
- 2) Draw a Histogram of this data.

### **14.SEQUENCES**

- 1) Find the nth term rule of the following sequences:  
a) 10, 8, 6, 4, 2, ...    b) 2, 7, 14, 23, 34, ...    c) 3, 9, 19, 33, 51, ...

### 15. SPEED-TIME GRAPH

- 1) A car is approaching some traffic lights when they turn red. It takes the car 4 seconds to slow down and stop. The graph shows the speed time graph for the 5 seconds until the car stops.



- Work out an estimate for the distance the car travels in these 5 seconds
- State whether this is an over or under estimate with a reason
- Calculate the acceleration of the car at 3 seconds.

## QLA

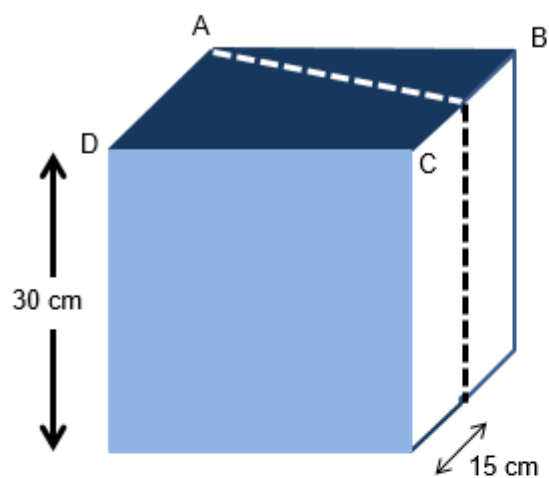
Use the grid below to assess how confident you felt in each topic (R= poor, A= ok, G= Brilliant). This is to be completed before submission. When your teacher marks the booklet, they will put a tick under the same criteria to show how they felt you did and to aid you in which topics you need to revise.

Topic	Student RAG			Teacher RAG		
	R	A	G	R	A	G
1. Surds						
2. Fractions						
3. Laws of Indices						
4. Factorising						
5. Expansion						
6. Algebraic Fractions						
7. Changing the Subject						
8. Quadratic Equations						
9. Simultaneous Equations						
10. Straight Line Graphs						
11. Basic Trigonometry						
12. Sine and Cosine Rule						
13. Statistics						
14. Sequences						
15. Speed-Time Graph						
16. Equations of Motion						

Thinking skills problems:

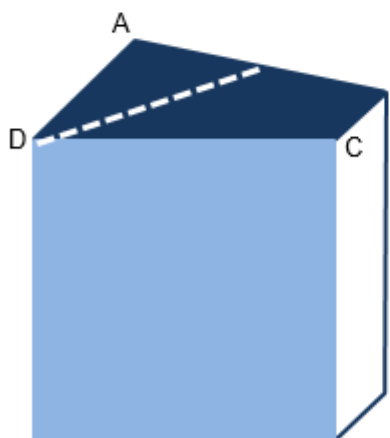
**Cube Slice**

A cube is sliced vertically along the line shown in the diagram and the smaller part is thrown away.



The cube is going to be sliced vertically downwards again by a line going through corner D.

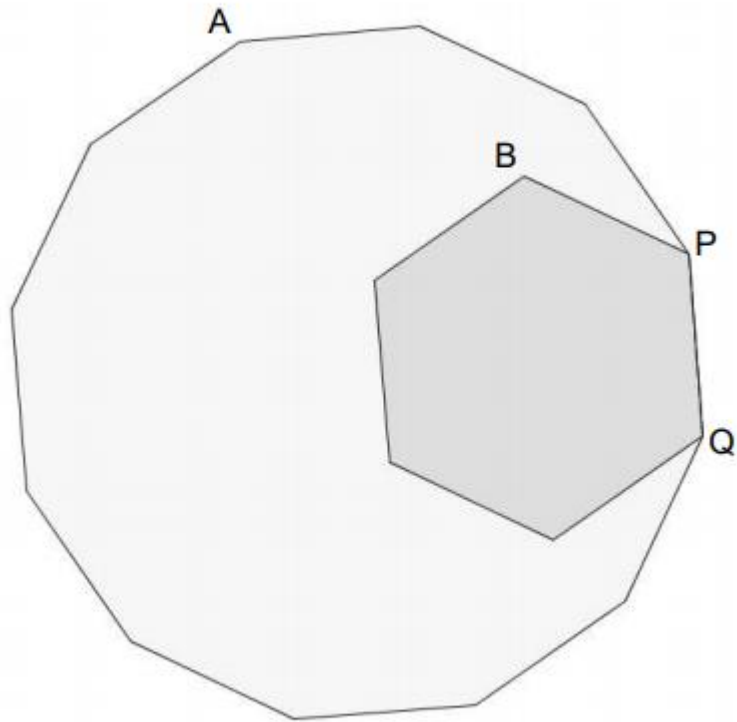
Where would the slice have to be to split the cube into two equal volumes?





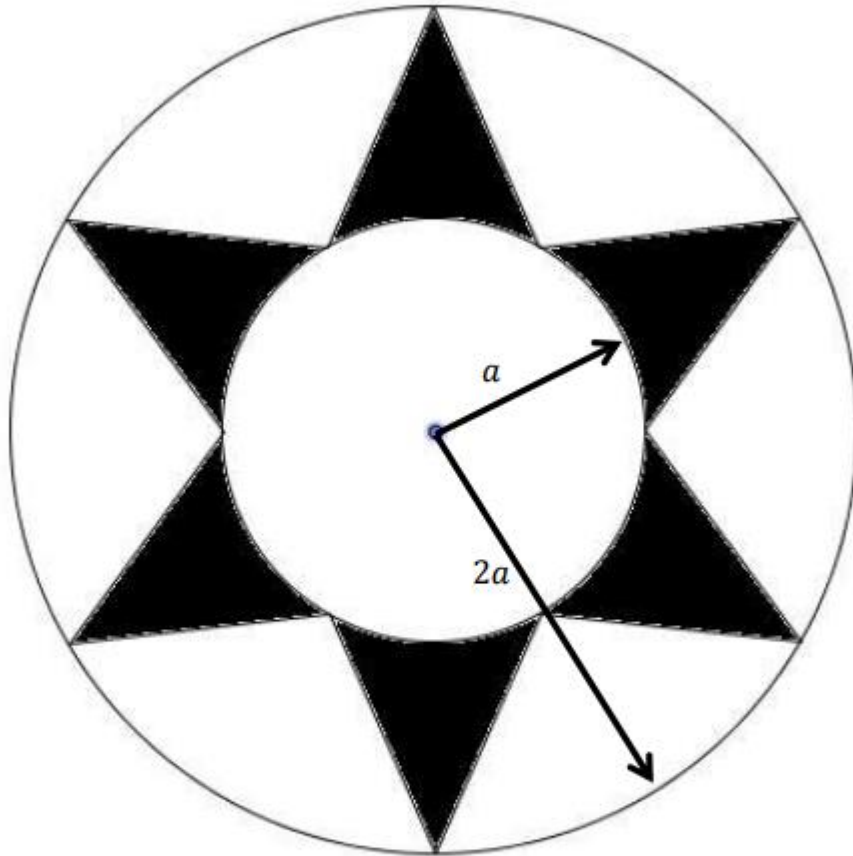
## Dodecagon and Hexagon

This diagram shows a regular dodecagon and a regular hexagon with a common side PQ.



Show that the points A, B and P all lie on the same straight line.

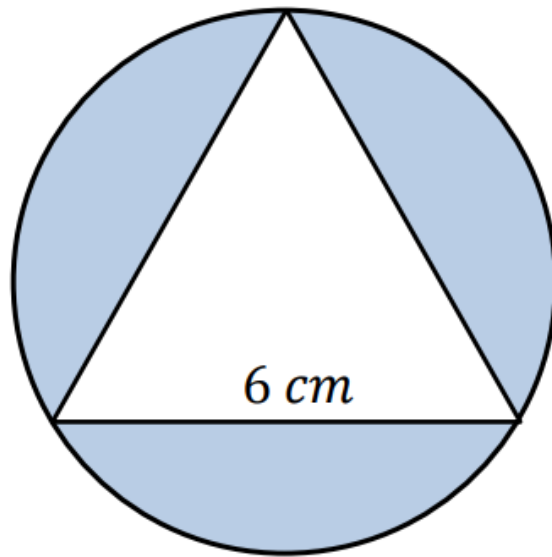
**Shaded circle 1**



What proportion of the larger circle is shaded?

### Circle area 1

This diagram shows an equilateral triangle of side length 6 cm drawn inside a circle so that each corner touches the circumference of the circle.



What area of the circle is shaded?