# Cosford Calculations

# Key Stages 1 and 2
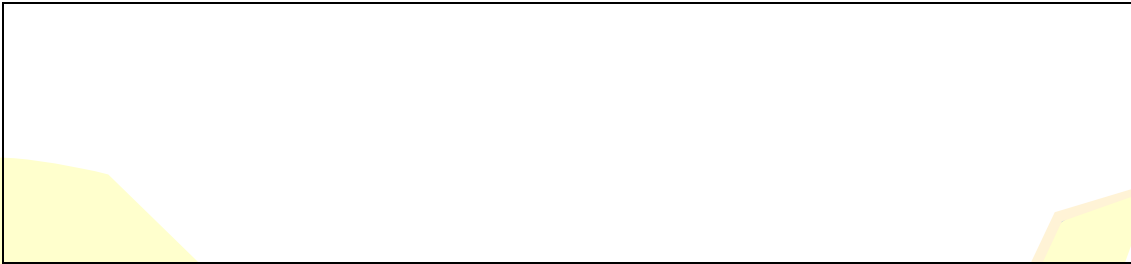
HANGAR 1

TEST FLIGHT

WAR PLANES

ROYAL AIR FORCE museum COSFORD

# Key Stage 1

HANGAR
1

Choose your favorite aeroplane in Hangar 1.  Look at the tail fin design.  Can you draw it in the box below?

How many colours does the tail fin use?

How many wheels does the aeroplane have?

Are they all the same size?

Can you estimate how tall the biggest wheel is?  Is it bigger than you?

What unit could we use to measure the height of the wheel?

How many windows does your aeroplane have?

Are they all the same shape?  What shapes can you see?  Draw some of the shapes below.

As you go through the door look for the silver and black plane on your right. It is called the Short SB5. Look at the tail.  Next to the letters W and G there are three numbers.  Write them below.

|  |  |  |
|---|---|---|

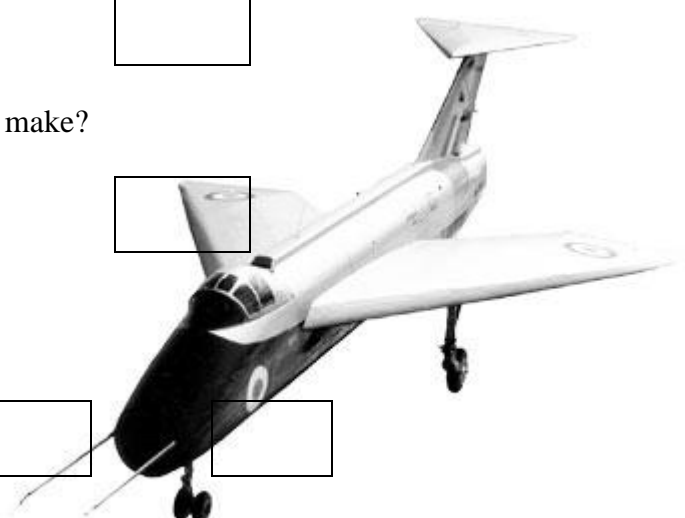Using these three digits what is the smallest number you can make?

|  |  |  |
|---|---|---|

Using these three digits what is the largest number you can make?

|  |  |  |
|---|---|---|

Add the numbers together

|  | + |  | + |  |
|---|---|---|---|---|

### Model room

Estimate the number of models in the Japanese cabinet
**(Clue:  Look for a red circle, the Japanese flag)**

Now count the number of models

Round the number to the nearest 10

Find the Lincoln Bomber and look closely at the wheel.

How tall do you think the wheel is?
Does it reach your nose or your knee?

## Tally ho!

Now look at all of the aeroplanes in the War Planes Hangar.  Count and complete the tally chart below to show the total number of wheels.  Back at school you could create a pictogram or block graph of your information.

| Number of wheels | |
| --- | --- |
| Estimate | Count |
| | |

## Wing spans

Estimate the wing spans of the Spitfire and the Mosquito.  Can you find a way to measure the spans without crossing the barriers?



The Mosquito

Which aeroplane has the wider wing span?

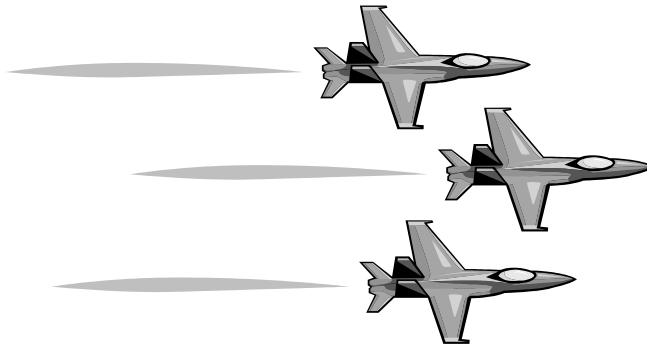Which of the War Planes do you think has the widest wing span?

# Key Stage 2

# GENERAL MUSEUM ACTIVITIES

## Words and digits

As you view each hangar, look for the largest number that you can find. It might be an engine size, a plane identification number, a top speed or cruising height. Keep your eyes open! Write the largest number you find in both words and digits.

Words

Digits

## Visitor numbers

Estimate, to the nearest thousand how many people visit Cosford Air Museum in a year. (Hint: approximately 50,000 people come to the air show)

Estimate

If one tenth of the people who visit the air show have an ice cream, how many ice creams are sold?

They spend 6 hours at Cosford, what fraction of the day is that?

What fraction of the day are they not at Cosford?

Visitor centre

If you stand and look at the front of the Visitor Centre (do not stand on the car park) you can see
vertical lines, parallel lines, perpendicular lines, horizontal lines and right angles.  Mark some of
these on the picture
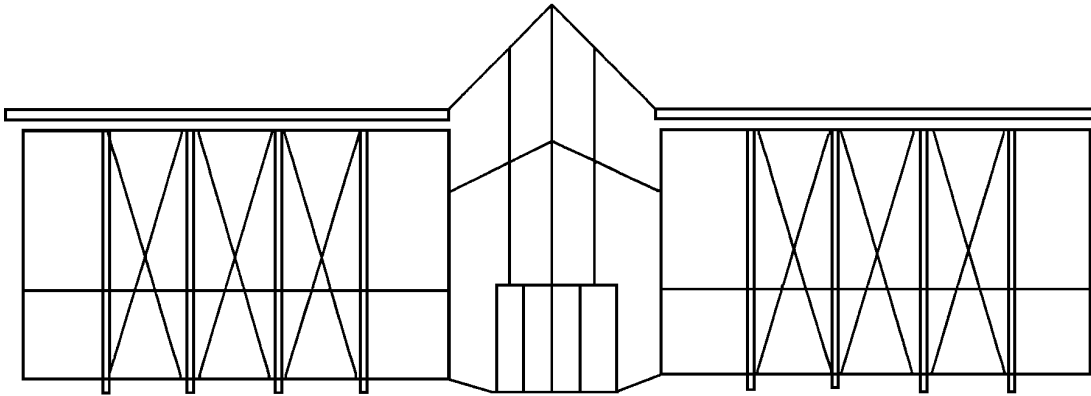


Write down the names, or draw, all of the different polygons you can find in the Visitor Centre.
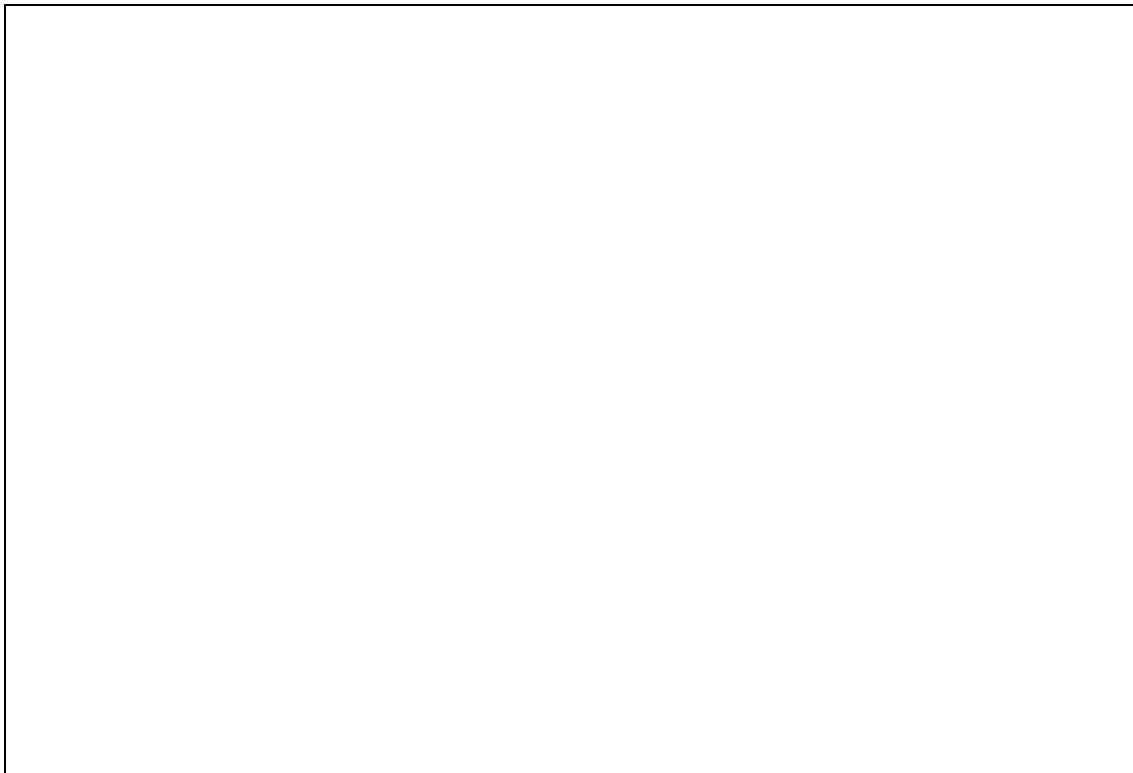
# Pilot's log book

Look at the copy of this pilots log book from 1939. Use it to answer the questions below.

| Date | Time | Aircraft | Duty | Flying times | |
|------|------|----------|------|------|------|
| | | | | Day | Night |
| 14/04/39 | 13:30 | L1328 | X country | 1hr 30min | |
| 18/04/39 | 09:30 | L1340 | To Wyton | 2hr 50min | |
| 20/04/39 | 08:15 | L1328 | Photographs | 30min | |
| 21/04/39 | 10:00 | L1328 | To Cosford | 1hr 45min | |
| 22/04/39 | 22:30 | L1340 | Night practice | | 1hr 30min |
| 23/04/09 | 23:00 | L1328 | Night practice | | 2hr 15min |
| 25/04/09 | 08:30 | L1340 | Gun practice | 1hr 30min | |
| 26/04/09 | 09:00 | L1340 | Formation | 2hr 30min | |
| 27/04/09 | 14:30 | L1328 | Low level | 1hr 45min | |
| 29/04/09 | 15:00 | L1340 | Formation | 1hr 10min | |

How many days in total did the pilot fly?

What time did he leave for Cosford?

What time did he arrive at Cosford?

What time was his earliest flight?

How many hours in total did he fly at night?

What time did he arrive back from low level flying?

How many hours flying did the pilot do altogether?

If a fighter pilot can complete aerobatic manoeuvers in the following times, what is the total time taken for four laps?

| | |
|------|------|
| Lap 1 | 83.2 seconds |
| Lap 2 | 95.1 seconds |
| Lap 3 | 102.4 seconds |
| Lap 4 | 78.9 seconds |
| Total | |

## School visit timetable

Below is an example of a timetable for a school visit to the Museum.  Look at it and then answer the questions below.

Arrive 10.00                                                      Leave 14.15

| 10.00 | 10.30 | 11.00 | 11.30 | 12.00 | 12.30 | 13.00 | 13.30 | 14.00 |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|

| Group 1 | Fun 'n' Flight | Worksheet | Lunch | Shop | Classroom |
|---------|----------------|-----------|-------|------|-----------|

| Group 2 | Classroom | Fun 'n' Flight | Shop | Lunch | Worksheet |
|---------|-----------|----------------|------|-------|-----------|

| Group 3 | Worksheet | Classroom | Fun 'n' Flight | Lunch | Shop |
|---------|-----------|-----------|----------------|-------|------|

How long does each group have to eat their lunch? _____

How long is the visit altogether? _____

What time does Group 3 go into Fun 'n' Flight? _____

For how long is Group 1 in the shop? _____

What time will Fun 'n' Flight be empty? _____

What will Group 2 do after the classroom? _____

When during the visit will the classroom be empty? _____

Using your site map with grid lines answer the following questions.

Write grid references like this : – the Neptune is in grid **C7**

In which grid did you get off the coach?

How many buildings are in grid E2?

Write down which grids you walk through if you go from the entrance to Hangar 1 to the portacabin.

Write down which grids you walk through if you go from Test Flight to the restaurant.

Where do I end up if I make the following journey?  Starting at A1 move:  North 1   East 2   North 3   East 2   South 2   West 1

End in grid

What would you find in the North-West corner of grid E2?
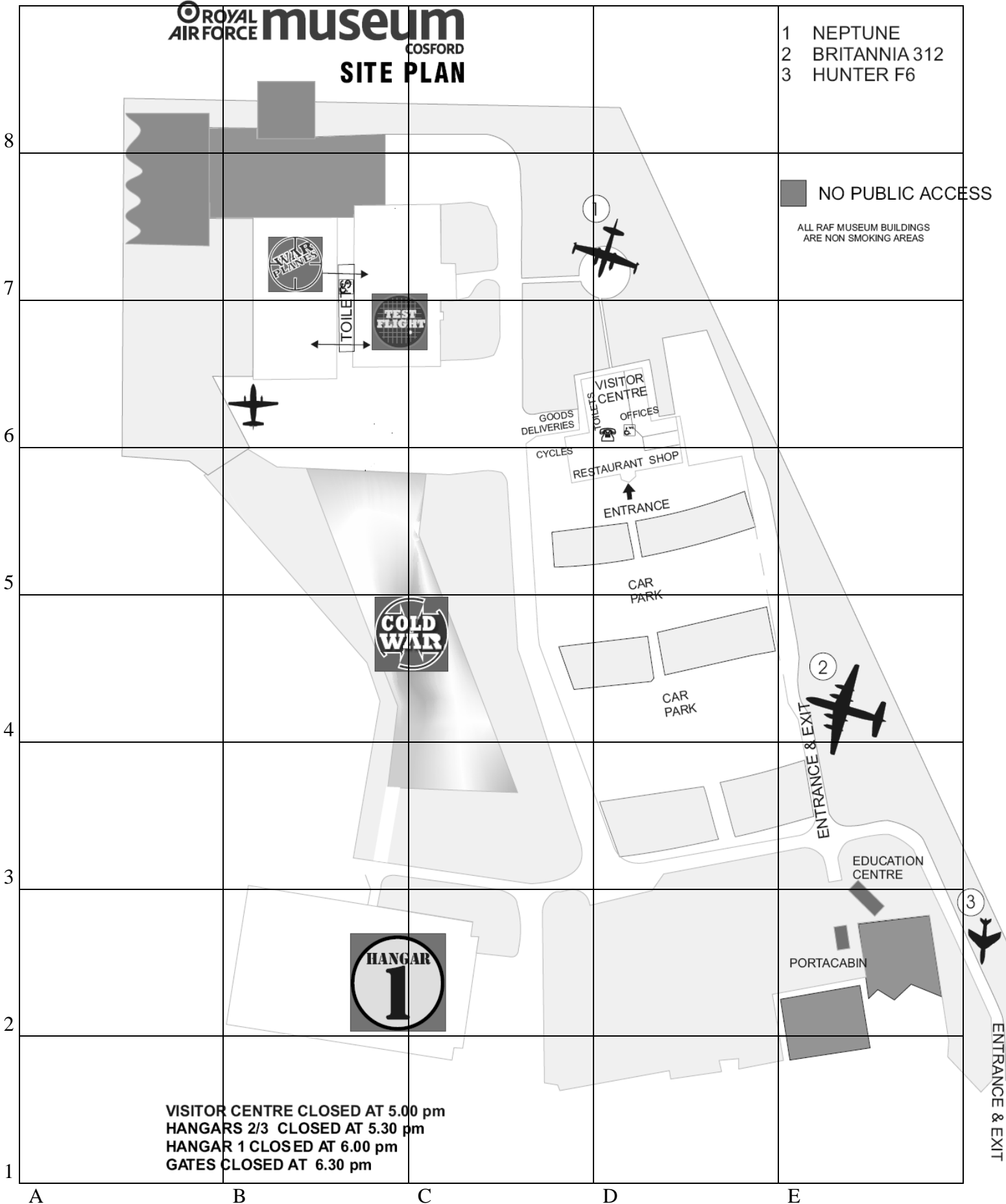
Which grids have toilets in them?

Now plot two routes of your own.

# Site plan with grid lines

**ROYAL AIR FORCE museum** COSFORD

**SITE PLAN**

1 NEPTUNE
2 BRITANNIA 312
3 HUNTER F6

NO PUBLIC ACCESS

ALL RAF MUSEUM BUILDINGS
ARE NON SMOKING AREAS

WAR PLANES

TOILETS

TEST FLIGHT

1

VISITOR CENTRE

GOODS DELIVERIES

TOILETS

OFFICES

CYCLES

RESTAURANT SHOP

ENTRANCE

CAR PARK

COLD WAR

CAR PARK

2

ENTRANCE & EXIT

EDUCATION CENTRE

3

PORTACABIN

HANGAR 1

ENTRANCE & EXIT

VISITOR CENTRE CLOSED AT 5.00 pm
HANGARS 2/3 CLOSED AT 5.30 pm
HANGAR 1 CLOSED AT 6.00 pm
GATES CLOSED AT 6.30 pm

A    B    C    D    E

1  2  3  4  5  6  7  8

## Tail numbers

Look at the tail of the plane on your right as you go into Test Flight.

Write down the tail numbers

Rearrange these three digits to make the largest and the smallest numbers possible.

Smallest _____        Largest _____

Find the mid point of these two numbers

Round the largest number to the nearest 100

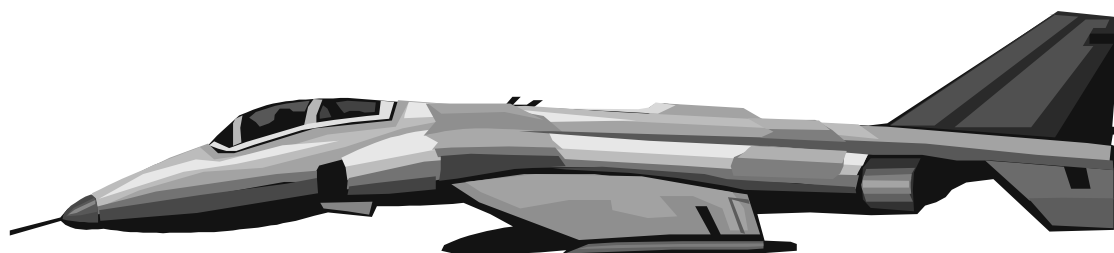Round the smallest number to the nearest 10

<u>Two seaters</u>

What fraction of the planes in the Hangar seat two people or less?

|  |
|--|
|  |

What is the ratio of two seater planes in the hangar?

|  |
|--|
|  |

<u>Speed</u>

| Choose 9 of the aeroplanes in Test Flight and complete the table below. |
|---|

| Name of aeroplane | Maximum speed Km/hr | Speed rounded to nearest 10km/hr |
|---|---|---|
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

When you get back to school, use this information to compile a graph showing the maximum speeds of the different planes.
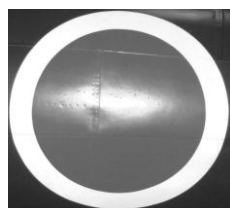
Warplanes

Look at the aeroplanes in War Planes.  Count how many aeroplanes are British, German and Japanese then fill in the chart below.



British



German



Japanese

Where do the largest number of aeroplanes come from?
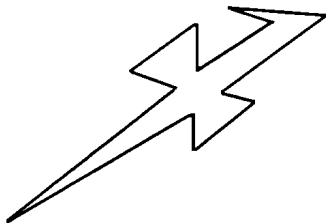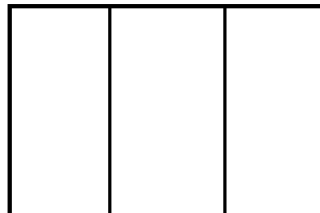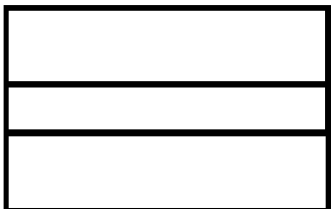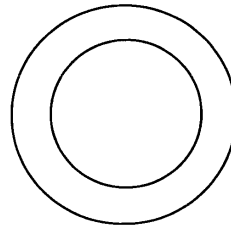
Can you think why this is?

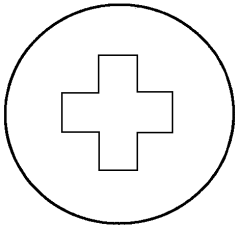## Spitfire

Look for the Spitfire in War Planes.  Write down the letters on the side of the Spitfire in the spaces below.

Can you draw in any lines of symmetry on the letters?

Now look for these shapes in the Hangar and draw in any lines of symmetry.

## Symbols

Below are two symbols that can be seen in War Planes. They show only one half of the whole shape. Complete the drawings by filling in the missing quadrants. Both shapes can be completed by 90° clockwise rotation but only one by reflection. Can you see which one can be reflected and mark in the mirror lines.
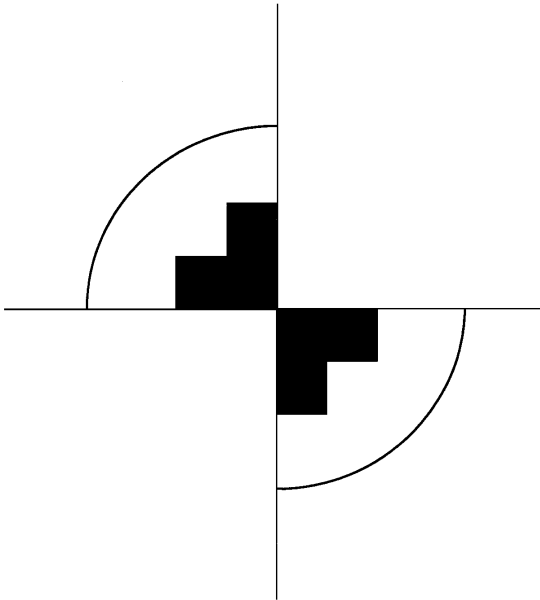
This is a regular shape.
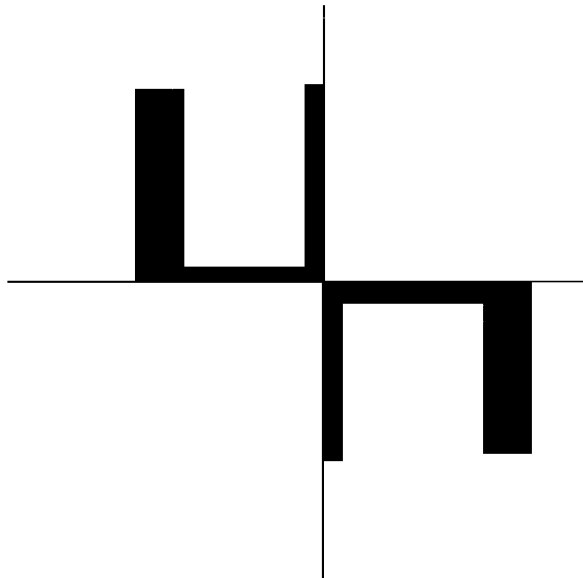
This is an irregular shape.

## Propellers

Look round War Planes.  Count the number of propellers on the
aeroplanes and fill in the chart below.

| Name of aeroplane | Number of propellers |
| --- | --- |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
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|  |  |

# SCHOOL BASED ACTIVITIES

## Engines

Look at the following information showing the power of some of the engines in the Royal Air Force Museum's collection. The plane's power is given in units of horse-power.

| Engine | Horse Power |
|--------|-------------|
| Junkers Jumo 205 | 550hp |
| Bristol Hercules 763 | 2300hp |
| Anzani | 50hp |
| Pratt & Whitney Twin Wasp | 1200hp |
| Rolls-Royce Tyne | 5000hp |
| Alvis Leonides 128 | 540hp |
| Wright Cyclone 18 | 2000hp |
| Alvis Leonides Major | 780hp |
| Turbomec Astazou | 1020hp |
| Blackburn Cirrus Minor 11 | 100hp |
| Pratt & Whitney Wasp Junior | 450hp |
| de Havilland Gipsy Queen 11 | 340hp |
| Nakajima Sakae | 950hp |
| Rolls-Royce Kestrel | 745hp |
| Bristol Hercules | 1150hp |

Can you find the mean, mode and median of the power of these engines?

The mean is:

The mode is:

The median is:

Now can you use the data to produce a bar graph?
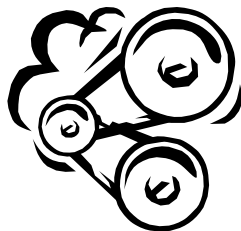
Helicopters

Using your templates to make helicopters, following these instructions.
1. Cut round the four outside lines of your template.
2. Cut along the solid line dividing the two RAF Museum logos. These will make your rotor blades.
3. Fold the two blades in opposite directions, along the dotted lines.
4. Cut along the two remaining solid lines on the template.
5. Fold along the dotted lines to make a T – shaped body for your helicopter.
6. Fasten the body at the bottom with a paper clip. This will help to weigh the bottom end down so it flies properly.
7. Now test your helicopter to make sure it flies. You will need to launch your helicopters from a safe height. Ask your teacher for a good place to launch the helicopters from

With a friend, measure the time your helicopter takes to drop to the floor and complete the chart below.

Calculate the mean by adding together both times and dividing by two.

| Test | Time |
| --- | --- |
| 1 | |
| 2 | |
| Mean | |

**Example**      If time 1 = 1.3 seconds, time 2 =1.5 seconds
                 1.3 + 1.5 = 2.8 ÷ 2 = 1.4

therefore the mean time for the helicopter to fall is 1.4 seconds.
        Test  1  =
        Test  2  =
        Mean = _____  + _____  =  _____ ÷ 2 = _____

What could you do to make the helicopter fall faster or slower?
Test your ideas.

## Helicopters

In your groups make a set of helicopters with different blade lengths (as detailed below) and see how long it takes for each helicopter to fall to the floor.

Which helicopter do you think will fall the fastest? [              ]

Which helicopter do you think will fall the slowest? [              ]

Use your helicopters to complete the chart below.

| Blade length | Test 1 | Test 2 | Mean |
|---|---|---|---|
| 10 cm | | | |
| 8 cm | | | |
| 6 cm | | | |
| 4 cm | | | |
| 2 cm | | | |

Calculate the mean by adding together both timings and dividing by two.

Mean = _____ + _____ = _____ ÷ 2 = _____

Now use your results to create a line graph.

ROYAL
AIR FORCE museum

ROYAL
AIR FORCE museum

ROYAL
AIR FORCE museum

ROYAL
AIR FORCE museum

# Teachers Notes
# and
# Curriculum
# Overview

## Hangar 1

- **The children are asked to complete various activities involving their favourite aeroplane in Hangar 1. They will count the number of wheels and windows, estimate sizes and identify different shapes.**

## Test Flight

- **Tail numbers**:  The children are asked to identify the tail numbers on an aeroplane and rearrange them to make both the smallest and largest numbers possible. They are also asked to add the numbers together.
- **Model room:  The children are asked to estimate the number of models in one of the cabinets.  They are then asked to count them and round their answer to the nearest 10.**

## War Planes

- **Tyres**:  This task asks the children to estimate the size of the wheel on the Lincoln Bomber.
- **Tally ho!**:  The children need to complete a tally chart, counting the total number of wheels in the hangar. Before completing the chart they need to estimate the number of wheels they expect to find.
- **Wing spans**:  This task involves estimating and measuring the wing spans on two of our War Planes.  The children then need to estimate which aeroplane in the hangar has the largest wing span.

## Key Stage 1: Curriculum Overview

### Numbers and the Number System

- Count reliably up to 10 everyday objects
- Recognise numerals 1 to 9
- Use language such as more or less, greater or smaller, to compare two numbers
- Order a given set of selected numbers
- Count reliably at least 20 objects
- Understand and use the vocabulary of comparing and ordering numbers
- Understand and use the vocabulary of estimation
- Give a sensible estimation of a number that can be checked by counting

### Solving Problems

- Use everyday words to solve practical problems
- Use developing mathematical ideas and methods to solve practical problems
- Choose and use appropriate number operations and mental strategies to solve problems
- Use mental strategies to solve simple problems set in real life measurement context using counting, addition, subtraction doubling and halving, explaining methods and reasoning orally
- Solve a given problem by sorting, classifying and organising information in a simple way.

### Calculations

- Begin to use the vocabulary involved in adding and subtracting
- Begin to relate addition to combining two groups of objects and relating subtraction to taking away.
- Understand the operation of addition and subtraction and use the related vocabulary
- Begin to recognise that more than two numbers can be added together
- Extend understanding of the operations of addition and subtraction
- Use knowledge that addition can be done in any order to do mental calculations more efficiently

### Measures, Shape and Space

- Use language such as more or less, longer or shorter, heavier or lighter to compare two quantities
- Compare two lengths, masses ot capacities by direct comparison
- Suggest suitable standard or uniform non-standard units and measuring equipment to estimate then measure length

## General museum activities

- **Words and digits**:  The children are asked to find the largest number they can during their visit to the museum and write it in both words and digits.
- **Visitor numbers**:  The children are asked to estimate the number of visitors the Museum receives in a year (approximately 250, 000).  Using this figure the children then perform a series of tasks involving fractions.
- **Visitor centre**:  For this activity children need to identify the various shapes within the visitor centre building.
- **Pilot's log book**:  The worksheet shows a simplified page from a pilot's logbook. (An original can be seen in the Model Gallery). Ask the children to look carefully at the details then answer the questions. They will need to know how to read the 24-hour clock and how to calculate the total in hours and minutes.
- **School visit timetable**:  The worksheet uses a school visit timetable.   There are a number of questions for the children to answer using the information given on the timetable.
- **Site plan**:  The children are asked to read and plot co-ordinates, using a site plan of the Museum site.

## Hangar 2

- **Tail numbers**:  The children are asked to identify the tail numbers on aeroplane and rearrange them to make the both the smallest and largest numbers possible.
- **Two seaters**:  The worksheet asks the children to identify the number of two seater planes in Hangar 2 and express these as a ratio.
- **Speed**:  The children are asked to complete a table showing the maximum speed of 9 aeroplanes in Hangar 2.  They are then asked to compile a graph of the information once they got back to school.

## Hangar 3

- **Warplanes**:  The children are asked to walk around Hangar 3 looking for British, German and Japanese planes, completing the chart provided. These planes can be identified through their symbols and from the details on the information boards. Can the children offer an explanation as to why we have more British planes?
- **Spitfire**:  The children need to find the Spitfire located near the entrance to Hangar 3. They are to note down the letters on the side of the plane and mark down any lines of symmetry within these letters – some have no symmetry. Then they can look for the symbols on their worksheet and draw lines of symmetry.
- **Symbols**:  This task asks the children to complete two symbols by rotating the image provided by 90°. This activity can be extended by asking the children to consider which symbol also has reflected symmetry.
- **Propellers**:  This task requires the children to identify and count the propellers on different aircraft within Hangar 3.

## School based activities

- **Engines**:  This task involves finding the mean, mode and median of the capacities of aeroplane engines in our collection.  The children are also asked to produce a bar graph using the data provided.
- **Helicopters**:  The children are asked a variety of questions relating to helicopters that they have made in class. Instructions for making the helicopters are provided on the worksheets.

# Key Stage 2:  Curriculum Overview

## Numbers and the Number System
- Read and write whole numbers to at least 1000 in figures and in words
- Know what each digit represents, and partition three-digit numbers into a multiple of 100, a multiple of 10 and ones (HTU)
- Round any two-digit number to the nearest 10 and any three-digit number to the nearest 100
- Round any positive integer less than a 1000 to the nearest 10 or 100
- Use known number facts and place value to add or subtract mentally, including any pair of two-digit whole numbers
- Add several numbers e.g. four or five single digits
- Extend written methods to column addition/subtraction of two integers less than 10000
- Order a mixed set of numbers or measurements with up to three decimal places
- extend written methods to column addition and subtraction of numbers involving decimals

## Solving Problems
- Choose and use the appropriate operations ( including multiplication and division) to solve word problems
- Choose and use appropriate number operations and appropriate ways of calculating (mental, mental with jottings, pencil  and written methods with calculators) to solve problems
- Explain methods and reasoning about numbers orally and in writing
- Use all four operations to solve word problems involving numbers in 'real life' situations, using one or more steps
- Explain methods and reasoning

## Handling Data
- Solving a given problem by organising and interpreting numerical data in simple lists, tables and graphs
- Solve a problem by collecting quickly, organising, representing and interpreting data in tables, charts and diagrams
- Solve a problem by representing and interpreting data in tables, charts, graphs and diagrams including bar line charts where intermediate points have meaning
- Begin to find the mode and range of a set of data
- Begin to find the median and mean set of data

## Measures
- Use, read and write standard metric units including their abbreviations
- Suggest suitable units and measuring equipment to estimate or measure length, mass or capacity
- Use units of time and know the relationships between them: read the 24-hour digital clock and use 24 hour clock notation. Use, read and write the vocabulary related to time
- Read and use  timetables
- Measure and calculate the perimeter and are of rectangles and other simple shapes using counting methods and standard units
- Understand area measured in square centimetres
- Understand and use the formula in words 'length x breadth' for the area of a rectangle
- Record estimates and readings from scales to a suitable degree of accuracy
- Calculate the perimeter and area of simple compound shapes that can be split into rectangles

## Shape and Space
- Classify and describe 3-D and 2-D shapes
- Identify and sketch lines of symmetry in simple shapes and recognise shapes with no line of symmetry
- Read and write the vocabulary related to position, direction and movement
- Identify right angles in 2-D shapes and the environment
- Classify polygons using criteria such as number of right angles, whether or not they are regular and properties of symmetry
- Recognise position and directions
- Use the eight compass directions
- Begin to know that angles are measured in degrees
- Recognise the properties of rectangles
- Recognise reflective symmetry in regular polygons
- Recognise position and direction: read and plot co-ordinates in the first quadrant
- Recognise perpendicular and parallel lines
- Describe and visualise properties of solid shapes such as parallel or perpendicular faces or edges
- Recognise where a shape will be after reflection in a mirror line touching the shape at a point
- Recognise where a shape will be after a rotation of 90 ° about one of its vertices