# Maths Trails at Colchester Zoo

# How to use these Activities

This Maths Trails workbook contains many different activities and worksheets to create a Maths themed visit to Colchester Zoo!

*The worksheets encourage the use of different mathematical skills, particularly estimation, graphing, measuring and real-world problem solving.*

This workbook contains activities for a wide range of ages and learning outcomes. **The top left of the page indicated the target age**. When selecting activities to use with your pupils, please select appropriate ages. Some activities can be completed in the classroom after the trip but require collection of initial data (usually estimating measurements, counting number of animals etc.) at Colchester Zoo.

All the activity worksheets are discrete, and teachers can **pick and print only the pages** that are relevant to their students' learning. Omitting any specific page will not impact on the others.

A beneficial activity before your visit to the zoo is discussing and experimenting with ways to estimate things (length, maths, etc.). Many of the worksheets require estimations and they will be easier to complete with this prior knowledge.

There is not an answer sheet included in this pack, because most of the calculations are based on student observation (so there is not a specific numerical answer, as the answer is dependant on what the students record).

If you would like some guidance for any of the calculations or examples of the calculations completed by other groups, please contact the education department at education@colchesterzoo.org

*If you are visiting Colchester Zoo on a maths trip, why not book a free educational maths sessions for your students? Contact education@colchesterzoo.org to check availability and find out more*!

# Contents

# Colchester Zoo

## Maths Worksheet Locations


More detailed maps available at www.colchesterzoo.org
Or download our App

GET IT ON Google Play
Download on the App Store

# Locations for Maths Worksheets

? Many of these maths worksheets can be completed anywhere at the zoo, as pupils can select which animal they want to study or record.

There are a few sheets which need to be completed in specific locations, please see the previous page for the map of the following locations.

1 **Worlds Apart enclosure**
sloths, monkeys and more!

2 **Sea Lions and Orangutans**
Go through the sea lion tunnel to reach the orangutans

3 **Suricata Sands**
The meerkats, across from the lion and fennec foxes

4 **Kingdom of the Wild**
mixed African paddock including rhino, zebra and giraffe
**Elephant Paddock**
Home of the elephants

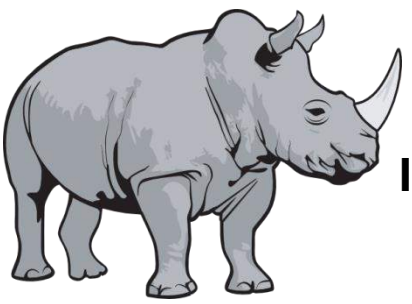
5 **Tiger Taiga**
Amur tigers

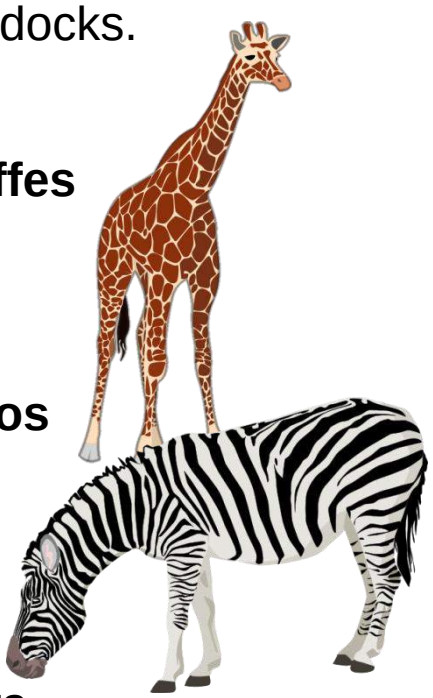
6 A variety of enclosures in this area, home to:
Red panda, gibbons, and anacondas

7 **Chimpanzee Lookout**
chimpanzees and crocodile

# 4 African Paddock Counting

Visit the Kingdom of the Wild, mixed African Paddocks.
Count how many of each animals you.



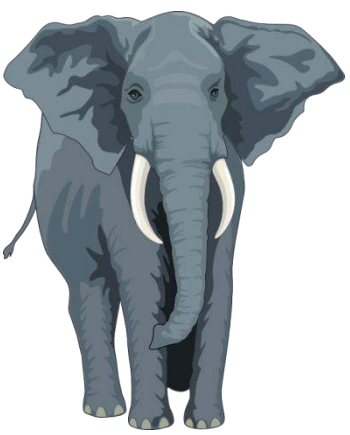


**I saw _____ giraffes**

**I saw _____ rhinos**

**I saw _____ zebra**

**I saw _____ ostriches**

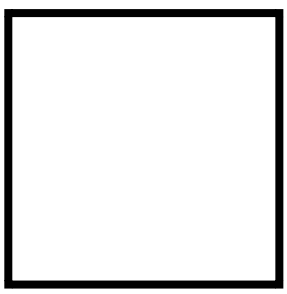


**I saw _____ elephants**

**I saw a total of _____ African animals in the paddock at Colchester Zoo**

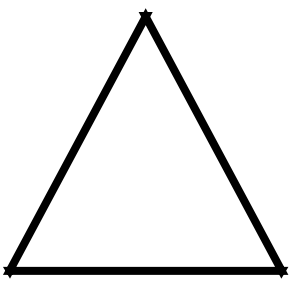
# 4 Searching for Shapes

Look for shapes inside the Giraffe house.
Look at signs, floor tiles, decorations on the walls, inside animal enclosures and anywhere else you can find!

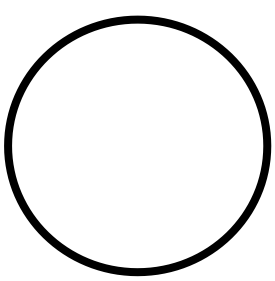


**Squares:_____**

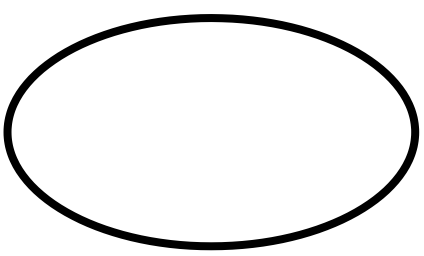
**Rectangles:_____**



**Triangles:_____**



**Circles:_____**

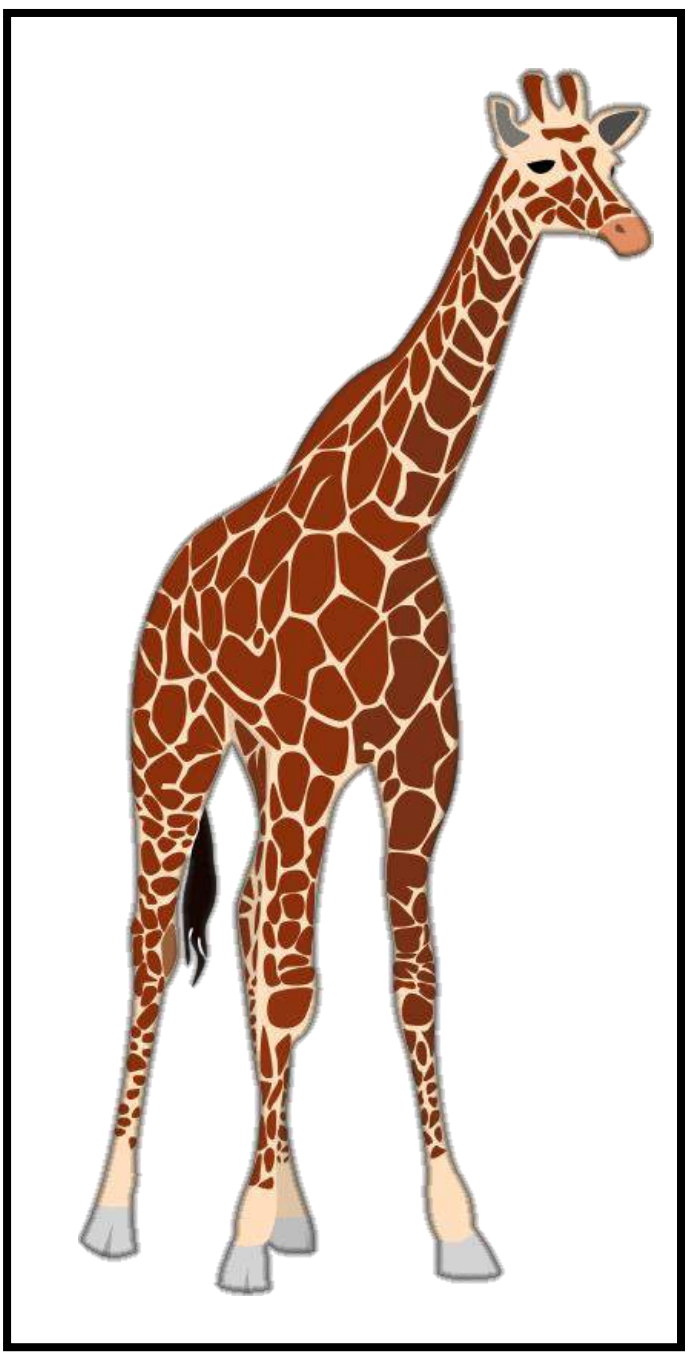


**Ovals:_____**

**Giraffe shapes:_____**

# 4 Drawing Giraffes

Visit the giraffes at the Kingdom of the Wild Paddock
After studying the giraffes, draw your own.



**How many legs does the giraffe have?**_____

**What shape are a giraffe's ears?**_____

**How many spots did you draw on your giraffe?**_____

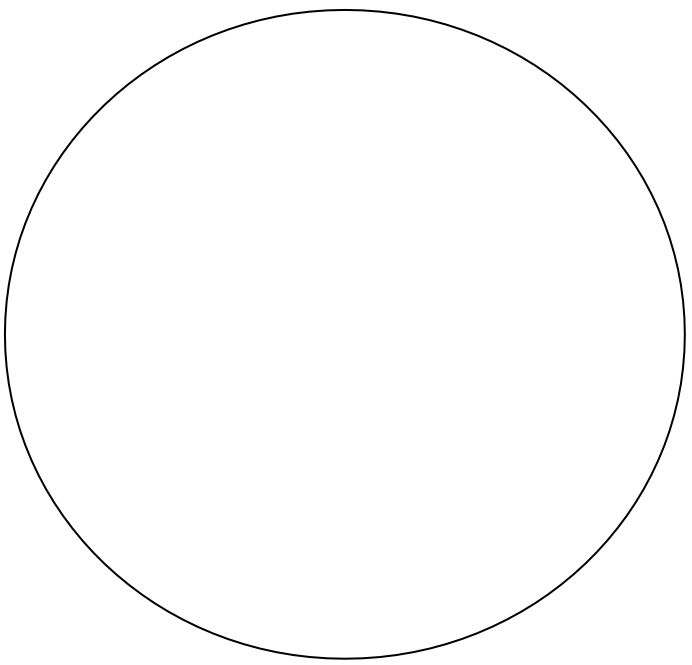
**How many spots do you think a real giraffe has?**_____

**Why do you think that?**_____

# 4 Scales and Fins

**KS1, KS2**
Patterns, shape, observing

Visit the Worlds Apart exhibit.
Select two animal with scales (lizards, snakes, and fish).
Draw the pattern of the scales into the space provides



Animal is a:_____

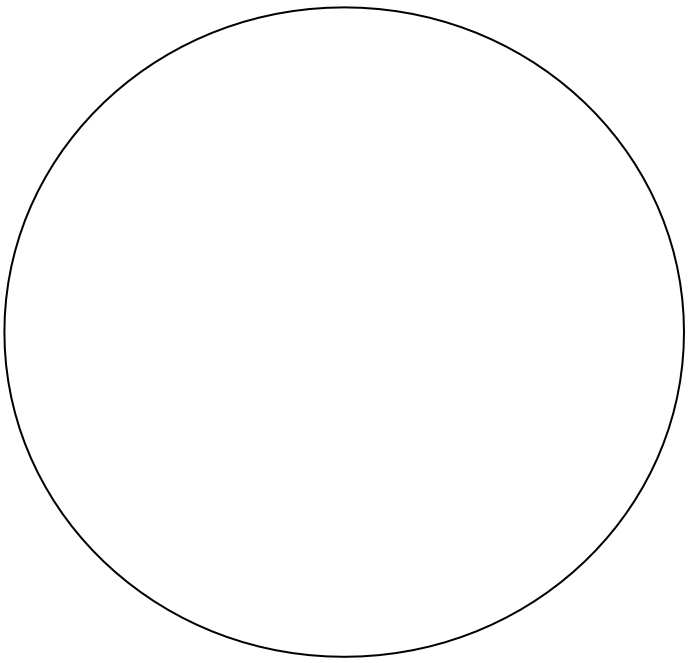
Describe the shape of the scales:

_____

_____

What is this type of pattern called?

_____



Animal is a:_____

Describe the shape of the scales:

_____

_____

What is this type of pattern called?

_____

**Compare the two animals**

Which animal has larger scales:_____

Which animal is larger:_____

# 4 Sea Lion Food

Visit the sea lions.

How many sea lions did you see? _____

Every day, each sea lion eats approximately 7kg of herring.

How many kilograms of herring fish would be needed to feed all the sea lions you saw?

_____

Sometimes, the sea lions get sprats. Up to half of their daily feed could be this type of fish instead of herring.

How much of their diet could be sprats? _____

How many kilograms of sprats would be needed to feed all the sea lions you saw?

_____

If the sea lions you saw at half their food in sprats, how many kilograms of herring would be needed to feel all the sea lions?

_____

(remember, each sea lion should receive a TOTAL of 7kg of food, either all herring or a combined weigh of herring and sprats)

# 4 Chimpanzee Food

Visit the chimpanzees

How many chimpanzees did you see? _____

The chimpanzees receive a wide range of food, including boiled eggs, tree leaves, herbs, edible flowers, and pulses.

Most of the chimps' daily food is the items in the following table.

Based on the number of chimps you saw, and the total weight of food for the entire group, complete the table with the weight each individual chimp receives.

| Food Item | Weight for entire Group | Weight for each individual chimp |
|---|---|---|
| Root vegetables | 3.5 kg | |
| Leafy vegetables | 7 kg | |
| Other vegetable | 6 kg | |
| Nuts and Seeds | 900 g | |
| Primate pellets | 1 kg | |

Look at the chimpanzee enclosure.

How do you think the keepers feed the chimps in a way to make sure each chimp gets their fair share of food?

_____

_____

_____

_____

# 4 Elephants are Big

Visit the elephant paddock and walk around the area.

Colchester Zoo has 4 elephants, Try to spot them all (some may be inside their house).

There are two outside paddocks for the elephants. Usually, one paddock is for two female elephants (Tanya and Opal) and the other paddock is for a female and male (Zola and Tembo).

How many elephants did you see in:
The paddock closer to the giraffe house: _____
The paddock closer to the farm area of the zoo: _____

Male elephants are taller than female elephants.
Which paddock do you think is Zola and Tembo's? _____
.
Tembo is approximately 3.3 m tall.

Based on this information, estimate the height of the other elephants:

Zola (the shortest female): _____
Tanya (the middle height female): _____
Opal (the tallest female): _____

How did you make these estimates?

_____
_____
_____
_____
_____

What is another method you could use to estimate how tall the elephants are?_____
_____
_____
_____

# 4 The Orangutan Tunnel

Visit the Orangutan Forest
Can you calculate the answers to these maths questions

You walk through an underground tunnel to enter the orangutan area.

Estimate how long this tunnel is from the start of the glass doors to the bottom of the ramp on the other end.

_____

Measure the length of your step with a ruler. _____

Walk the length of the tunnel.

How many steps did you take? _____

Based on these measurements, how long is the tunnel? _____

How close was your estimate? _____

How could you have made your estimate more accurate?_____

_____

_____

How close was your estimate? _____

How could you have made your estimate more accurate?_____

_____

_____

Why do you think the tunnel to reach orangutans is this long?
(hint: think about what might be above you, or use a map to check!)

_____

_____

_____

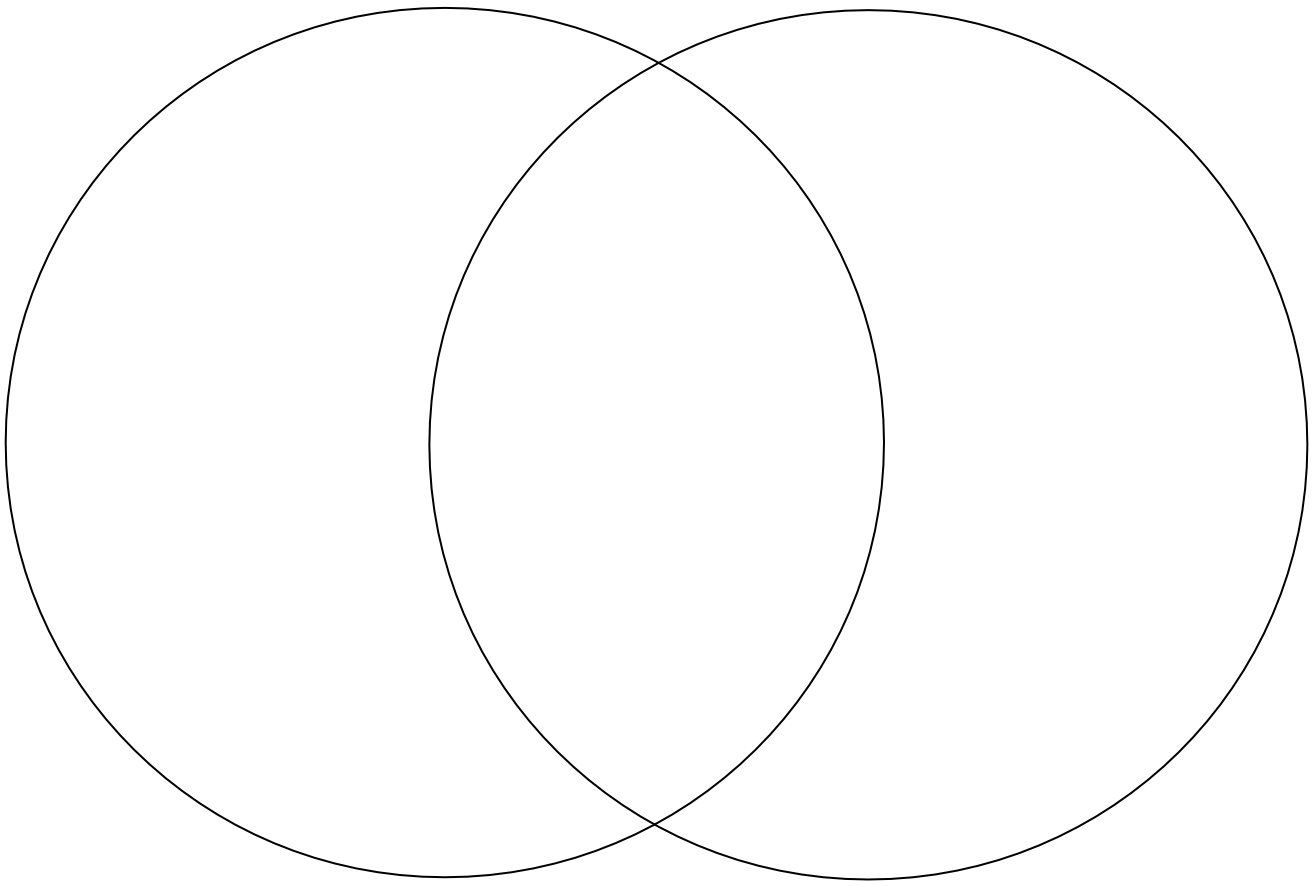
_____

# 4 Animal Diets

Chooses 6 animals at Colchester Zoo. Read the signs at the animals' enclosures to learn what they eat and record the information in the chart.

| Name of Animal | Herbivore (plant eater) | Carnivore (meat eater) | Omnivore (eats both) |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Fill in the Venn Diagram to show this information



Which group has the most animals?_____

Which group has the least animals?_____

# 4 Animal Classification – Page 1

Find five examples of each type of animal. Use the table below to record the number of each individual ty you observed. The first one has been done as an example.

## Mammals *(animals with fur or hair)*

| Species (types of animal) | Lion | | | | |
|---|---|---|---|---|---|
| Number of individual animals | 1 | | | | |

With 5 species (types) of mammals there was a total of:_____ individual animals

## Birds *(animals with feathers)*

| Species (types of animal) | | | | | |
|---|---|---|---|---|---|
| Number of individual animals | | | | | |

With 5 species (types) of birds there was a total of:_____ individual animals

## Fish *(animals that live in water and breathe through gills)*

| Species (types of animal) | | | | | |
|---|---|---|---|---|---|
| Number of individual animals | | | | | |

With 5 species (types) of fish there was a total of:_____ individual animals

## Amphibians *(animals with soft, wet skin that live in most places)*

| Species (types of animal) | | | | | |
|---|---|---|---|---|---|
| Number of individual animals | | | | | |

With 5 species (types) of amphibians there was a total of:_____ individual animals

## Reptiles *(animals with scaly, leathery skin)*

| Species (types of animal) | | | | | |
|---|---|---|---|---|---|
| Number of individual animals | | | | | |

With 5 species (types) of reptiles there was a total of:_____ individual animals

# 4 Animal Classification – Page 2

## Invertebrates *(animals without bones e.g. insects, corals, etc)*

| Species (types of animal) | | | | | |
|---|---|---|---|---|---|
| Number of individual animals | | | | | |

With 5 species (types) of invertebrates there was a total of:_____ individual animals

Using the information you collect about numbers of individual animals of each type of animal group, complete the following table:

| | Number of Species | Total Number of Individual Animals | Fraction of individuals of this type of animal out of all individual animals | Simplified Fraction |
|---|---|---|---|---|
| Mammal | 5 | | | |
| Birds | 5 | | | |
| Fish | 5 | | | |
| Amphibians | 5 | | | |
| Reptiles | 5 | | | |
| Invertebrates | 5 | | | |
| **TOTALS** | 25 | | | |

Which animal group represents the most individual animals out of all the animals you observed? (this is the one with the largest fraction)

_____

# 4 Giraffe Scale

Choose any giraffe statue at Colchester Zoo
*(there are lots of statues, including near the entrance, close to the Hyenas/wallabies, and at the entrance of the Giraffe house)*

1) Which giraffe statue have you chosen? _____

2) Estimate the height of the giraffe statue: _____

3) How did you make this estimate? _____

_____

_____

4) Visit the real giraffes – how tall are they? _____

5) What information did you use to tell the height of the real giraffes?

_____

_____

6) Is the giraffe statue height to scale? _____
*(only think about the height, not the rest of the statue)*

7) Estimate the scale factor of the statue height:_____
*(remember, the statue could be smaller or larger than the real giraffe)*

8) Do you think the rest of the statue follows this same scale? Why or Why not?_____
*(is the statue proportional to a real giraffe?)*

# 4 Paddock Maths

Visit the Kingdom of the Wild Paddock (the mixed African animal paddock). Complete the following calculations from your observations

.1) An average Zebra has up to 50 stripes.
_____ zebras were seen in the paddock today.

How many stripes were in the paddock?

_____
Total estimated stripes

2) Look closely at the ostrich. How many toes do they have? Check the track for a hint. _____ toes.
_____ ostriches were in the paddock today.

How many ostrich toes were in the paddock?
(remember how many legs they have!)

_____
Total Ostrich toes

3) Giraffes have very long necks. However, they have just 7 bones in their neck (the same number of neck bones humans have!)

There were _____ giraffes in the paddock today.
How many giraffe neck bones were in the paddock?

_____
Giraffe neck bones

4) The crowned cranes yellow crowns of feathers.
There were _____ cranes in the paddock.
If each crown has an average of 24 feathers, how many yellow feather were in the paddock?

_____
Yellow Feathers

5) Greater kudu are the large, brown antelopes.
They have two very large ears to listen for predators. How many kudu were in the paddock_____.
How many ears?

_____
Kudu ears

6) Adult White rhinos have one big horn and a smaller one. Rhino horns are made out of keratin, the same material in human fingernails.
How many adult rhinos were in the paddock today?_____
How many big horns?
(pay close attention, it takes a long time for young rhinos to grow their horns, so any young ones might not have them!)

_____
Big rhino horns

# 4 Endangered Maths



Visit the African Paddocks (the mixed species paddock with the giraffe, and the elephant paddock across the path)

1) Elephants are killed for their tusks. People carve the tusks into trinkets, jewellery and decoration. Illegal ivory (tusks) are sold for £100 per cm of ivory.
How many elephants did you see?_____
Estimate the length of their tusks:_____
How much would their tusks be worth?

£_____ worth of ivory

2) Crowned cranes are threatened by habitat loss as the wetlands they live in are converted to farm land. In 2016 their wild population was estimated as 19,000. It is estimate to decline 25% by 2028. How many cranes will be left in the wild?
How many crowned cranes did you see at the zoo? _____
If the zoo population declined 25% how many would be left at the zoo?

_____ Wild crane population

_____ Zoo crane population

3) Rhinos are threatened due to poaching for their horns. One large horn weighs 3kg. Their smaller horn weighs 0.5kg.
How many rhinos do you see? _____
How many big horns?_____
How many small horns?_____
How much do all the rhino's horns weigh?

_____kg of rhino horn

4) People grind up rhino horn to use in traditional medicine, despite the fact it is made of the same material as your fingernails and has no medicinal value. However, some people believe it will work and are willing pay a lot of money for rhino horn. 1 kg of rhino horn can be worth£60,000. How much would the zoo's rhino horn be worth on the black market?

£_____ worth of rhino horn

5) Wild giraffe populations have declined. The main reason for their decline is habitat loss. In the wild, when looking for food, giraffes require large areas of land, up to 650km$^2$ per giraffe.
How many giraffes do you see? _____
In the wild, how much protected land would these zoo giraffes need in order to find food?

_____ km$^2$

# 4 Sloths Maths



Visit the Worlds Apart Exhibit (next to the main café Penguini's).

Sloths are either two-toed, or three toed. The Colchester Zoo sloths are _____-toed.
How many sloths did you see today?_____
What is the total number of sloth toes?
(remember how many legs they have!)

_____
Sloth toes

Sloths eat approximately 10% of their body weight every day in food. Assume the zoo sloths are an average weight of approximately 7kg.
Based on the number of sloths you saw, how much food do they need?

_____
Food for the sloths per day

Sloths move an average speed of 0.5m per hour. Estimate the width of the outdoor Worlds Apart corridor (between the glass enclosure walls).
How wide is the corridor _____m.
How long would it take a sloth to climb from one side all the way to the other side (assuming it's moving at average speed)?

_____
Hours for the sloth to cross the corridor

The sloths at the zoo enjoy sleeping in their box. Look in the enclosure to find the 'sloth box' (there's no glass on the front, they can climb out if they want!). Estimate the volume of the sloth box (height, width, and depth).
Approximately what percentage of the 'sloth box' was filled with sloth when you saw it?

_____
Volume of the 'sloth box'

_____%
of the box filled with sloth

# 4 Wheelchair Access

There is an extremely steep hill at Colchester Zoo, located leading from the red brick house down past the leopards (and bears) towards the spider monkeys at the bottom.

Due to the steepness of this slope, it is not recommended for pushchairs, wheelchairs, or mobility scouters.

The recommended maximum ramp gradient for wheelchair access is 1:20.

*Make all measurements along the hill starting from where it meets the 'bear ramp' to the bottom leopard viewing window.*

What is the estimated horizontal distance (run) covered by this slope?

_____

How did you make this estimate: _____

_____

What is the estimated vertical elevation (rise) covered by this slope?

_____

How did you make this estimate: _____

_____

Based on your estimates, what is the gradient of this slope (rise:run):

_____

To make the drop of this elevation (the rise) suitable for wheelchair users, how long would the horizontal distance (the run) need to be expanded to bring the slope down to a 1:20 gradient?

_____

# 4 Money and Food



Visit two of Colchester Zoo's Food Outlets (see a map for locations).
Please remember to be polite and stay out of the way of paying customers.

Read the menu sign at both outlets and select the items for one meal. Record the cost for each item and your total cost. Calculate what your change from a £50 note would be.

First food outlet visited:_____

| | Menu Item Chosen | Cost |
|---|---|---|
| Appetiser / Snack | | |
| Main Meal | | |
| Dessert | | |
| Drink | | |
| | Total Cost | £ |
| | Change from £50.00 | £ |

Second food outlet visited:_____

| | Menu Item Chosen | Cost |
|---|---|---|
| Appetiser / Snack | | |
| Main Meal | | |
| Dessert | | |
| Drink | | |
| | Total Cost | £ |
| | Change from £50.00 | £ |

If I had £50.00 to spend on food, I would go to the _____ Outlet, because_____

_____

_____

_____

# 4 Sea Lion Water 1



The sea lion pool was opened in August 2003 and at the time was the largest saltwater sealion pool in the country. It remains one of the biggest, and still had the longest underwater viewing tunnel (24 m long!).

The outside enclosure has a surface area of approximately 456$m^2$

The pool is 4m deep and has a capacity of approximately 2,500,000 litres of water.
Simplifying the pool to a per

The average cost of tap water in the UK is 0.1 pence per litre.

How much did it cost to fill the pool when it was first constructed?_____

Simplifying the pool to a perfect circle (and assuming the entire shape is a cylinder), it has a diameter of approximately 12m.

Surface area = $2\pi rh + 2\pi rh^2$

What is the surface area of the pool? _____

The sea lion pool has a closed water filtration system. This means that water is cleaned by the filters and recirculated back into the pool. The 'waterfall' at the back of the pool is where this cleaned water is added back in. This system is very efficient as it means the pool does not need to be constantly refilled with mains water.

However, the large open surface of water means that water evaporates quickly in the summer months (lowering the pool level). Rainfall on the pool in wetter months increases the water level.

Precipitation is measured in depth of rain (and snow) over 1$cm^2$ of surface area.

Evaporation is measured as a loss of water over 1$cm^2$ of surface area.

# 4 Sea Lion Water 2

**KS3**
Volume capacity, monetary calculations

Using your surface area calculation, and the below climate data for Colchester, complete the table with the amount of water gained (via precipitation) and lost (via evaporation) each month.

| Climate data for Colchester | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| Daily mean °C | 4.5 | 4.7 | 7.1 | 10.9 | 12.8 | 15.6 | 18.3 | 18.1 | 15.4 | 11.5 | 7.5 | 5 |
| Average evaporation (mm) | 6 | 10 | 21 | 41 | 62 | 76 | 78 | 74 | 44 | 29 | 11 | 8 |
| Average precipitation (mm) | 53 | 44 | 44 | 44 | 52 | 54 | 48 | 57 | 52 | 70 | 62 | 57 |

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water lost each month | | | | | | | | | | | | |
| Water gained each month | | | | | | | | | | | | |
| TOTAL water change per month | | | | | | | | | | | | |

Water levels in the pool need to remain relatively constant. When the pool has too much water, excess water needs to be drained. When the pool has too little water it needs to be topped up with water from the mains. Complete the following table to calculate the monthly cost (if any) of additional water to the pool.

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cost of additional water per month | | | | | | | | | | | | |

Examine the pool in front of you. What modifications could be made that would help manage the evaporation loss of the water? (hint, remember the water excess calculated above, could anything be done with that, or is there another way to prevent evaporation?)

# 4 Enclosure Design

Select any small animal at Colchester Zoo (not elephants, giraffe, etc.)
Study its enclosure and make notes.

Which animal are you studying:_____

What is the approximate area of the animals' enclosure: _____$m^2$

The approximate perimeter of the enclosure: __m + __m + ___m + ___m

How many animals are in the enclosure:_____

Do the animals have any obvious special equipment needs (e.g. climbing frames, pools of water, nest boxes, etc.):_____

_____

_____

_____

Imagine you have been asked to designed a new enclosure for this animal with an area of $40m^2$.

Given the number of animals in the current enclosure and their current space, how many animals would be able to comfortable fit into an enclosure that is $40m^2$: _____animals

Design and draw two possible enclosures (either on the back or on separate graph paper). Be sure to include measurements and any other special features which need to be included.
The enclosure does not need to be a regular shape (but if you make it irregular it will make your calculations harder!).

Which of your two enclosures do you think would be best suited for the animal you chose? Explain:_____

_____

_____

_____

_____

# 4 Observing Behaviour

*Type of animal observed:*_____

Observe an animal for 10 minutes (select an animal that is on-show and will be visible.)
Keep a tally of each time it does one of the following:

| | | | |
|---|---|---|---|
| Walks/Runs | Eats | Drinks | Lies Down |
| Sleeps | Yawns | Looks at people | Plays |

After observing, make a graph showing the animals behavior.
Make sure you label the axes and have an appropriate scale.

Which behavior was most frequent:_____

# 4 Giraffe Watcher

Draw a map of the Zoo's giraffe paddock on the back of this sheet.
Divide the map into grids (as shown below)
Show landmarks like their pool, fences, and buildings.
If the giraffes are indoors, select one of the other paddock animals.

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |

Pick a giraffe to observe at the Zoo. Look at the signs nearby to identify the name of your giraffe:_____

Every minute for 5 minutes, record which grid the giraffe is in.
Describe what your giraffe is doing.

| Time | Grid Number | Observations |
|---|---|---|
| 1 minute | | |
| 2 minute | | |
| 3 minute | | |
| 4 minute | | |
| 5 minute | | |

Which grid was the giraffe in most frequently?_____
Calculate the percentage of time it was in that grid:_____

Why do you think the giraffe spent the most time there?

_____

_____

# 4 Chimpanzee Visitors



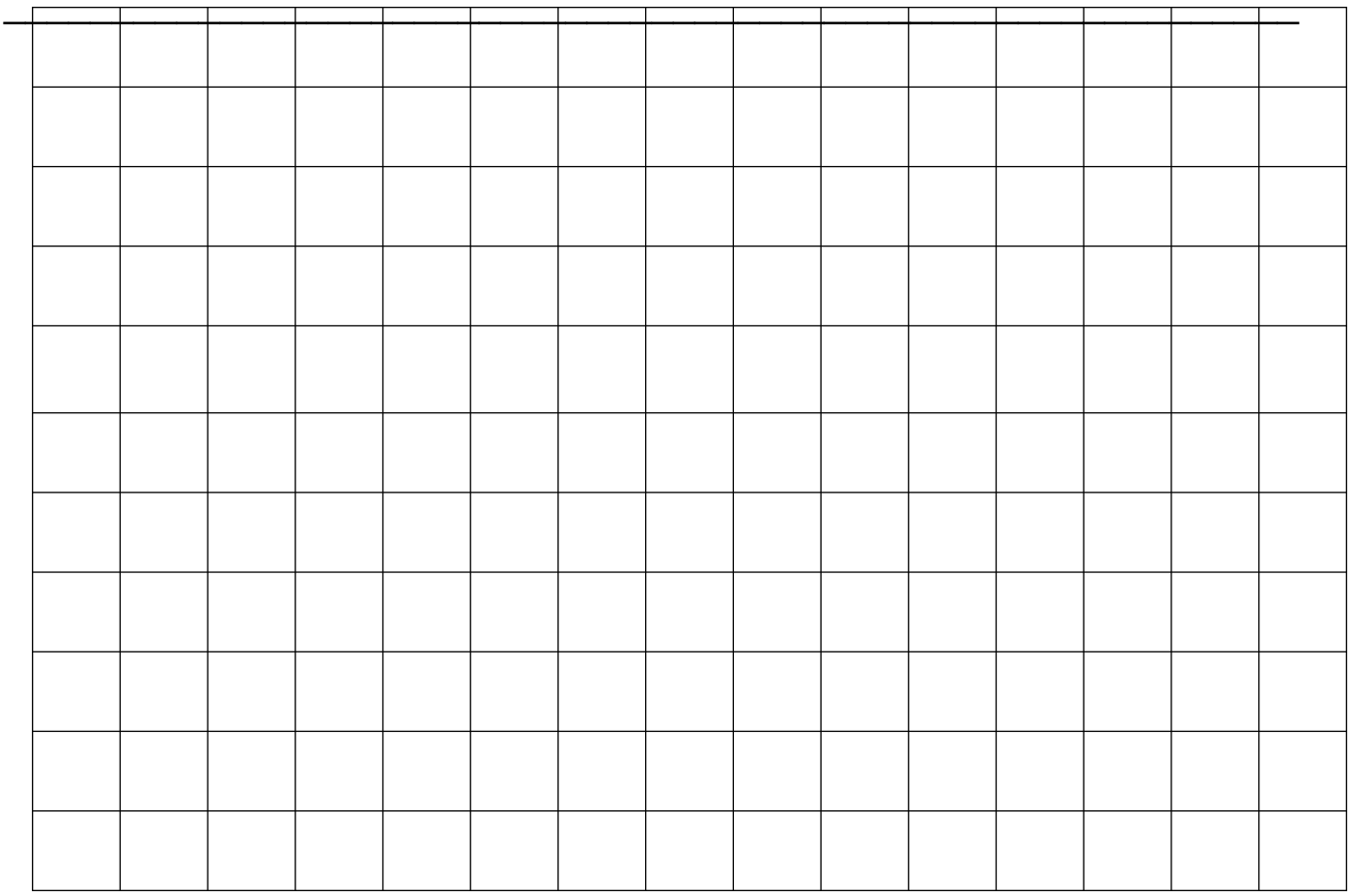
Visit Chimpanzee Lookout three different times throughout the day (at least 30 minutes apart). Each time you visit, record the number of visitors.

Using the data you gather, and the additional time data provided, construct a graph showing the attendance at Chimpanzee Lookout throughout the day. Project the attendance at other times of day by connecting your data points with lines.

What time of day is the busiest?_____

Why do you think this is?_____

What could you do to make this data more accurate?_____



**Chimpanzee Lookout Visitor Numbers:**

| | | |
|---|---|---|
| 9:45 - 2 visitors | 4:30 - 20 visitors | 16:00 - 12 visitors |
| 10:15 - 10 visitors | 15:45 - 7 visitors | 16:45 - 30 visitors |

**Number of visitors during your visit:** (make sure to record the time)

__:__ - ____ visitors  __:__ - ____ visitors  __:__ - ____ visitors

# 4 Map Maths

Collect a Colchester Zoo map from the entrance building.

The zoo map does not include a scale.
Determine the scale by measuring an identifiable building near the entrance.

Identifiable buildings include: Southern Kitchen, Administrative building (red brick house), or Penguini's (the main café).

Selected identifiable building:_____

Buildings' length on map, measured with string/ruler: _____cm

Buildings' real length, measured with footsteps: _____footsteps

Map scale: _____cm: _____footsteps

Measure the distance between locations on the map (using a piece of string to curve along the paths then measure the string compared to a ruler).

Distance from tiger enclosure to warty pig enclosure: _____cm
Length of the outdoor elephant enclosure (along the middle): _____cm
Distance from lion enclosure to mangeby monkey enclosure: _____cm

Based on your scale, estimate how many footsteps will there be:

Distance from tiger enclosure to warty pig enclosure: _____footsteps
Length of the outdoor elephant enclosure (along the middle): _____footsteps
Distance from lion enclosure to mangeby monkey enclosure: _____footsteps

Now walk the actual distance recording the number of footsteps:

Distance from tiger enclosure to warty pig enclosure: _____footsteps
Length of the outdoor elephant enclosure (along the middle): _____footsteps
Distance from lion enclosure to mangeby monkey enclosure: _____footsteps

How accurate was your estimated scale?_____

# 4 Meerkat Maths 1



Visit the meerkats.
Meerkats are mainly insectivores, but they also eat other types of meat and some vegetation.

How many meerkats can you see in the mob (a group of meerkats is called a mob)?_____

Calculate the cost per week per meerkat (remember to pay attention to the daily diet quantity and what the unit the cost is in).
Calculate the cost per week for the entire mob of meerkats.

| Daily diet / meerkat | Cost / kg or per item | Cost / week /meerkat | Cost / week / mob |
|---|---|---|---|
| 10g mealworms | £15.00 per kilo | | |
| 2 Egg (raw or cooked) | 20p each | | |
| 20 g grapes | £1 per 100g | | |
| 1 Herring (fish) | £1.20 for 12 | | |
| 1 Chick | 40p each | | |
| 1 Mouse | 60p each | | |
| 100 crickets | £30 per 1000 crickets | | |
| | | **Total weekly cost to feed the entire mob:** | |

Look at the enclosure. Besides nutrition, what other reasons do you think the zookeepers have for feeding such a variety of food each day? (hint: are there any signs, or any special experiences involving the meerkats? Can you see any differences in their enclosure which would make feeding specific food easier).

_____
_____
_____
_____
_____

# 4 Meerkat Maths 2



Each day, each meerkat must eat 7 food item servings. For example, this could be 60g of mealworms (6 food item servings) and 100 cricket (1 food item serving).

Every day, each meerkat requires a minimum of 1 serving of mealworms, and 1 serving of crickets. Every week, they must have a minimum of 1 serving of each of the other food items.

Focusing on just value for money (not nutrition), based on the above criteria, adjust the meerkat feeding schedule below to have the cheapest weekly cost.

| **Food Item Serving** | **Cost / kg or per item** | **Number of Servings Per Day** | | | | | | | **Cost / week / meerkat** |
|---|---|---|---|---|---|---|---|---|---|
| | | Mon | Tues | Wed | Thur | Fri | Sat | Sun | |
| 10g mealworms (min 1 serving / day) | £15.00 per kilo | | | | | | | | |
| 2 Egg (min 1 serving / week) | 20p each | | | | | | | | |
| 20 g grapes (min 1 serving / week) | £1 per 100g | | | | | | | | |
| 1 Herring (fish) (min 1 serving / week) | £1.20 for 12 | | | | | | | | |
| 1 Chick (min 1 serving / week) | 40p each | | | | | | | | |
| 1 Mouse (min 1 serving / week) | 60p each | | | | | | | | |
| 100 crickets (min 1 serving / day) | £30 per 1000 crickets | | | | | | | | |
| | | | | | | | | **Total weekly costs to feed one meerkat:** | |

What is your new total weekly cost to feed the entire mob of meerkats?_____

On this new feeding schedule, how much money would you save per year? (remember to calculate the original yearly cost!) _____

# 4 Wage Calculations

**KS3, KS4**
Problem solving, monetary calculations

There are over 300 staff members employed at Colchester Zoo in summer.
These staff are employed across 11 different departments.

The total cost daily cost of staff wages is (approximately) £15,000. As you walk around Colchester Zoo, observe the staff and record which department you think they work in. After you have observed a number of staff jobs, estimate the total number of staff in each department and use this to calculate the estimated wages and departmental wages. (Hint: consider what percentage of the staff you observed each department makes up, and how this would relate to the total 300 staff across the entire zoo)

| Staff Department | Number of Staff Observed | Estimated number of Staff in Department | Estimate appropriate wage for job role | Estimate total daily wage cost for department |
|---|---|---|---|---|
| Zookeepers | | | | |
| Catering | | | | |
| Retail | | | | |
| Play Area | | | | |
| Grounds | | | | |
| Gardens | | | | |
| Maintenance / Development | | | | |
| Guest Services | | | | |
| Office Based Staff Departments (you don't need to keep track of how many you observe) | | | | |
| Communication (Marketing) | Not applicable | 8 staff | | |
| Education | Not applicable | 5 staff | | |
| HR and Accounts | Not applicable | 4 staff | | |
| | | | **TOTAL** | £15,000 |

# 4 Activity vs Interest

**KS3, KS4**
Problem solving, data analysis, graphing, scatter diagram

Observe an animal and assess its activity level (scale 1-10) (1 being inactive and 10 being highly active).

While at the enclosure, observe how interested visitors are in the animal (use a scale of 1-10) (if no other visitors are present, assess your own interest.

Record the data in the following table. Repeat this for 10 different animals.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Type of Animal | | | | | | | | | | |
| Activity Level | | | | | | | | | | |
| Visitor Interest Level | | | | | | | | | | |

Plot your data on a scatter diagram to compare how activity level and visitor interest interact with each other.

Describe what you notice from your graph. Considering the animals you observed, how does that relate to your observations?

Some things you might notice include:

- Relationship between interest and activity. This would be reflected by the data points forming a general slope along a line. If there is a relationship, is it positive or negative?

- Clusters. Data points might be grouped together (e.g. a group of animals with varying activity levels by all similar visitor interest level). Thinking about these specific animals,

- Outliers. If many of your data points are along a slope or cluster together, are there any points that deviate from this trend? If there are outliers, consider what animal these data points are from, can that explain this deviation?

# 4 Tiger Enclosure

**Teaching suggestion:** this activity requires careful observation, diagrams, notes and estimates as well as mathematical calculation. It can work well as a group task. The initial data could be collected during a zoo visit, but the final calculations could be completed back at school.

## Visit the Amur Tiger enclosure

This enclosure was built in 2003 and is home to the zoo's Amur Tigers. The tiger facility has two main enclosures (on each side of the tunnel). The tigers have a large amount of space as well as swimming facilities with a pools and a stream.

This enclosure was built using labour from employed zoo staff, so you do not need to consider labour costs in your calculations.

**Your task is to estimate the total cost of materials for this enclosure based on the following approximate cost information.**

Make sure you take detailed notes about what you observe at the enclosure as well as your estimates about lengths, heights, etc. Show your work in all final calculations.

| Item | Cost |
|---|---|
| Thicker upright beams | £45 / item |
| Thinner upright beams | £30 / item |
| Enclosure mesh | £20 per $m^2$ |
| Electric wire holder | £3 each |
| Clumps of bamboo (inside and along fence) | £4 each |
| Metal reinforcement for fence | £10 / m |
| Paint | £3 / L (covers approximately 10 $m^2$) |
| Benches | £80 each |

| Item | Cost |
|---|---|
| Concrete base for fence | £10 per fence post |
| Wooded boards for tunnel | £3 each |
| Metal tiger tunnel | £1000 each |
| Concrete base for stream/pool | £10/$m^2$ |
| Door from cat tunnels | £600 each |
| Visitor fence (to keep visitors away from mesh) | £ 8 /m |
| Windows (in tunnel and viewing area) | £25 each |
| Educational sign/ entrance sign | £145 each |

# 4 Aquarium Maths

Visit the orangutan house, or the giraffe house.
Both have large cylindrical aquariums housing tropical fish.

1. Estimate the cylindrical aquarium circumference by walking around the aquarium and counting your footsteps.
The aquarium has a circumference of:_____

2. Visually estimate the aquarium's radius:_____

3. Estimate how tall the aquarium is:_____
How did you make this estimate? _____
_____
_____

4. What is the volume of the aquarium?_____
$cm^3$ ($V = \pi r^2 h$ ) (assume the entire aquarium is water)

5. What is the volume in litres? _____ ($1\ cm^3 = .001$ L)

6. How many fish do you see? _____fish

7. What is the average (mean) length of the fish? _____cm

8. Assuming that each fish requires a minimum of 10 liters of water per 10 cm of fish, how many fish could be in the tank?_____

9. What is the maximum number of fish that could be added to the tank? (assume the entire volume is water and any new fish are average length)
_____ new fish

# 4 Rhino Herd Management

**Background:** When zoos and other institutions breed animals, they need to plan for where the young will go when they have reached sexual maturity and most are moved away from their parents and opposite sex siblings.

For some species, females are easier to place than males. These are species where one dominant male breeds with a number of females. If extra males are in these groups, the males fight. Males of these species needs to be kept alone in these enclosures.

With white rhinos, there is one dominant male and a herd of females. Females reach sexual maturity at the age of 6-7 and males reach sexual maturity at the age of 10-12.

Rhino gestation (pregnancy) can last for up to 16 months.

Rhinos in captivity can live for ~40-50 years, and can breed up to ages ~30.

There are methods of 'birth control' for female rhinos if they are living with a male relative to prevent inbreeding.

On average, most rhinos can be assumed to have a 50-50 percent change of having a male or female offspring.

Answer the questions on the following page to complete this activity.

# 4 Rhino Herd Management

How many rhinos are at Colchester Zoo:_____

How many are female:_____ How many are male:_____

What are their ages? (look at enclosure signs or attend feeds to find out)

_____

If the mature female rhinos have a calf (baby rhino) approximately ever four years, in 20 years, approximately how many rhinos could there be?_____

(average = females have 6 calves per lifetimes)

Calculate the probability that all those young are female (who could stay with the herd):
(1/2 chance per calf multiplied across all the calves. It may be useful to draw a diagram of probability)

Calculate the probability that half the calves will be male and half female:
(1/2 chance per calf multiplied across all the calves. It may be useful to draw a diagram of probability)

How would you manage this rhino population, to ensure the group has appropriate social structure, is breeding at a young age to contribute to this threatened species, and prevent potential inbreeding?_____

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

(Use the back of the page if you need more space to show any calculations)