



Maths Investigations

Introduction:

How long is a ball of wool? How busy is a farmer? How much does a sheep cost? Can you count sheep without falling asleep? Using the theme of sheep and wool as context, these maths investigations provide a variety of number problems for your class to carry out. Begin the lesson with an introduction discussion to explain how important farms, farmers and the products they produce are to us. Being a farmer is a full-time job and running a farm takes a lot of work. During these number activities, children will not only practise important maths skills but will begin to understand some of the jobs undertaken by a farmer and about some of the products farms produce that we use every day.

Activity One - Time

Question: How busy is a farmer?

Have you ever heard the phrase "There just aren't enough hours in the day"? This phrase is often used by busy people who don't seem to manage to get everything they need to do done in one day. They wish they could have more time in a day. Actually, there are always the same number of hours in each day. There are 60 seconds in one minute, 60 minutes in an hour and 24 hours in one day. This never changes, however hard some people wish!

We usually split our 24 hour day into two halves. AM is the first 12 hours of the day - from midnight to midday (12 noon) and PM is the next twelve hours from midday until midnight. AM is morning and PM is afternoon. After 12 noon. At 7.30am it is morning and at 7.30pm it is evening.

To make telling the time in an hour easier we split it up into halves. We call the first 30 minutes in an hour 'past the hour' and the second 30 minutes 'to the hour'. So we would read a clock showing 12.10am as 'ten past twelve' but a clock showing 12.50pm would be 'ten to one' (rather than 'fifty five minutes past twelve'). We say this to show that there are 10 minutes left until 1 o'clock.

We can work out how long something takes by adding minutes on. If the farmer has lunch at 'half past two' and it takes 45 minutes to make and eat it, what time did the farmer finish lunch? $2.30\text{pm} + 45\text{ minutes} = 3.15\text{pm}$.

Explain to the children that time is very important in many jobs especially for farmers. Farmers have a lot of jobs to fit in during the day and need to follow a routine. Can you help to fill in the farmer's time table for a morning? This table shows the jobs the farmer did in one morning (so all the times are AM) during lambing season in the spring. This is a very busy time of year for the farmer, as you will see!

The table on the **How Busy is a Farmer?** worksheet provided in this document shows a description of the jobs the farmer did, the time taken to do the job, the time started and the time finished. Ask children to work out the times using the information provided in the table and to fill in the blank spaces. The answers are shown here in red.

You might like to ask the children to create their own time table to show the things they do on a typical morning and how long they take to do it (roughly). How many hours and minutes before they wake up does the farmer get up to start his work for the day?

Job Done	Time taken	Start Time	Finish Time
Wake up and get dressed	20 minutes	5.00 am	5.20 am
Check to see if ewes have had lambs over night	30 minutes	5.20 am	5.50 am
Move new lambs and their mums to a special barn	30 minutes	5.50 am	6.50 am
Feed the sheep and make sure they have enough water to drink and hay for bedding	1 hour	6.50 am	7.50 am
Breakfast	15 minutes	7.50 am	8.05 am
Weigh new lambs	40 minutes	8.05 am	8.45 am
Check again for new lambs	30 minutes	8.45 am	9.15 am
Take weak lamb into the farm house to keep warm and bottle feed it to make it strong	30 minutes	9.15 am	9.45 am
Check lambs again	15 minutes	9.45 am	10.00 am
Feed the sheep dog	10 minutes	10.00 am	10.10 am
Fit new lambs with ear tags	1 hour 5 mins	10.10 am	11.15 am
Check for new lambs again	25 minutes	11.15 am	11.40 am



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Activity Two - Money

Question: How much does a sheep cost?

This lesson uses maths to explore, in brief, how money is made and spent on a sheep farm. It helps children to improve their knowledge and understanding of the function of money, budget and to apply basic financial skills. Children will also be required to consider the cost and responsibility involved when keeping animals.

The activity should begin with a class discussion about the animals that might be found on a farm. Livestock is a word we use to describe sheep, cows, horses, chickens and other animals that are kept on a farm but not as pets. All livestock kept on a farm will need to be well looked after by the farmer.

The farmer must feed and look after livestock to make sure they are safe and healthy. Keeping livestock is the farmer's job. A farmer that keeps cows might sell milk, a farmer that keeps hens might sell eggs, a farmer that keeps sheep might sell the wool coat (fleece) to make money. It is very important to a sheep farmer that a flock of sheep are kept healthy because the better the condition of a sheep, the better coat it will grow and the more money the farmer will get when the fleece is sold.

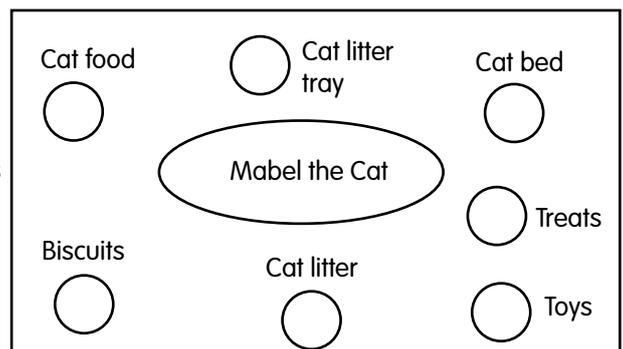
How much do you think a sheep costs? To buy? To keep? The price of a sheep will depend on things such as the breed and condition of the animal. A Scottish farmer paid £231,000 for a ram (male sheep) at auction in 2009. Luckily for most sheep farmers, not all sheep cost this much!

Provide the children with the **How Much Does a Sheep Cost?** worksheet. The worksheet explains that farmers can sell sheep's wool to generate money. In this case the farmer has made £480 from selling wool from some of his flock of sheep (income). Also listed are some of the items the farmer needs to buy (outgoings) to run the farm and to look after the animals over a week. Children should use the information provided to work out the answers to the questions and should show how they worked the answer out in the spaces provided. The answers are: **1.** £280 **2.** £380 **3.** £90 **4.** £1520. Children should also consider what we mean by income, outgoings, earn, budget, cost and spend.

Many children will have pets at home and many of those without would like one. However, children may not be aware of the cost involved in keeping a pet. Explain that the farmer needs to keep track of what he (or she) spends and earns to make sure that the farm runs smoothly and that all the animals (and the farmer's family) are fed and looked after. Like the farmer, we will often need to make decisions about money.

Ask the children if they have a pet and ask how much they think it costs to take care of that pet. For this activity children can use a pet that they have, have had or would like to have. Children could be given an example budget of £50 and using catalogues, leaflets, the internet or by asking friends and family they should research how much food, bedding, treats, cages, hutches etc. cost for their chosen pet. They should create a poster using the information they find. The poster should feature the pet, using a photograph or drawing, and around it they should show how much the items needed for the welfare of the pet might cost. Would their £50 budget be enough to cover the costs for one month? Children should understand that pets need a lot of care, love, and affection from their owner. Our pets depend on us to look after them properly. If we do not look after our pets well they will become poorly or worse!

Once complete, children can use their posters to carry out further money problems. How much does everything on their poster cost all together? How much would it cost to feed their pet for two months or a year? How much would two pets cost? Can they think of any other costs they might incur as a pet owner? Vet bills, somebody to look after their pet when they are on holiday etc. Would they be able to budget to look after a pet properly using just the pocket money they get? Imagine if you had hundreds of cows, pigs or sheep to care for like a farmer.



The posters, when finished, would make an attractive display in the classroom.



Maths Investigations

Activity Three - Measuring

Question: How long is a ball of wool?

This investigation requires children to make estimations, consider methods for problem solving and to read measuring equipment, such as rulers and scales.

Begin by asking the children how long they think a piece of string is. Do they think it is 10 cm? 100 cm? 1000 cm? Or can a piece of string be any length?

Explain that "How long is a piece of string?" is a phrase or saying that some people might use when asked a question about how big something is or how much time something will take that they cannot answer. How long is a piece of wool? How much wool is in a ball of wool? A ball of wool can be small or large and there will be different amounts in each. We can't know the answer to the question because there is no uniform size, however, if we are talking about the length of yarn in just one particular ball of wool we can work it out by measuring.

Length is a measure of how long or wide something is. Rulers or tape measures can be used to help us measure length.

Length is measured in millimetres (mm), centimetres (cm), metres (m) or kilometres (km).

10 mm = 1 cm

100 cm = 1 m

1000 m = 1 km

Show the children a single ball of wool. What is a ball of wool, how is it used and where does it come from? Ask the children for suggestions. How could we measure the length of the yarn of wool that makes up the ball? Ask the children to come up with their own methods of how they think a whole ball of wool could be measured.

Provide the children with the **How Long is a Piece of Wool?** worksheet and ask them to use a ruler to answer the questions. This sheet can give us a clue as to how we might measure a whole ball of wool.

As a class activity, ask the children to use a meter stick to measure one meter of wool. The wool can then be carefully folded a meter at a time, remembering to keep note of the number of times the wool is folded. When we have measured out the amount of yarn needed (approx 10m) we can cut the yarn. How many centimeters or millimeters is this? How many more meters would we need to have 1 km of wool?

Although the length of wool is important for knitting, most balls of wool yarn are measured in grams. What do the children know about grams?

Mass is measured in grams (g), kilograms (kg) and tonnes. We use scales to measure mass.

1000 g = 1 kg

1000 kg = 1 tonne

Can we measure our ball of wool using mass? How might we investigate the length of the yarn in the ball by weighing it? Can the children think of any ideas of how this can be done? Can they devise an investigation to carry out?

One way to measure the length of the yarn in a ball of wool using mass would be to weigh the whole ball (including the length measured earlier) and to make a note of this weight. Then, weigh the length cut from the ball on its own. These measurements can then be used to find the approximate length of the wool in the ball.

The children could create a table or chart to record the results of the investigations and could write a brief method, list of equipment and draw a diagram of how the investigation was carried out. What else could be measured in this way or a similar way?



Maths Investigations

Activity Four - Counting

Question: Can you count sheep without falling asleep?

We love sleep! As adults, we know the important role sleep plays in helping us to 'recharge our batteries.' Children do not always share our enthusiasm for bedtime!

This is not strictly a maths investigation but it is an engaging activity and children can finish the exercise with some fun, fast-paced counting practice.

Begin this lesson by discussing the idea of counting sheep. Have children heard of this method of getting to sleep? A good night's sleep encourages good health and helps us to wake up feeling refreshed and ready to face the day. It is also believed that, for children, sleep is very important to aid concentration and learning.

Our fortunes were once founded on sheep, farmers, shepherds and merchants so it is no surprise that sheep are often found as the origin of many historical British phrases or sayings. An example might be: "More Than You Can Shake a Stick At" which we may say if we have more of something than we need. It is thought that the origin of this saying comes from a time when farmers controlled their sheep by shaking a staff (shepherd's stick) to indicate where the animals should go. When farmers had more sheep than they could control, it was said they had "more than you can shake a stick at."

It has been suggested over the ages that counting something in our heads will help us fall asleep. The most popular thing to count is usually sheep. Counting sheep is a visualisation exercise to create a gentle, slow rhythm that helps our brain to relax as the sheep replace thoughts and worries. The origins of why people count sheep is uncertain; some people think it might have to do with a tallying system devised by shepherds in ancient Britain.

Falling asleep at their desks might not be ideal, but learning how to count sheep is fun and might help as a relaxation technique for children. At the very least it might offer you a few minutes of quiet!

Use this technique with the children:

- Relax and close your eyes.
 - In your head, imagine a fence or wall.
 - Now imagine sheep slowly jumping over the wall one by after another without stopping.
- Alternatively, some people chose to imagine a field full of sheep and count them each in turn.

Counting Sheep has 3 levels to play; the easy level is ideal for early years and for children that find counting difficult. Levels 2 and 3 become gradually harder and much more skill is needed to be able to spot and count the sheep in the allotted time. A timer will count the seconds down. What is the best score the children can achieve?

Extension Activities

There are many more number investigations that can be created using the same context as these investigative activities.

An activity investigating the design and build of a sheep farm could include questions such as:

- What would the sides of a square sheep pen with an area of 400m^2 measure? What would its perimeter be?
- A field is 64m wide and 100m long, what is the perimeter?
- The barn is 22m wide and 10m long. What is the area of the barn?

2 weeks after lambs are born, some are ready to take to market. The best lambs will be kept by the farmer to replace his stock or sold later to other farms for breeding. Questions on this theme might include:

- A farmer takes four sheep to market. They weigh 30.25kg, 31.5kg, 29.75kg and 29.75kg. What is the average weight?
- A farmer buys five sheep at market. They weigh 33.25kg, 30.5kg, 25.02kg, 32.75kg, 36.1kg. What is the average weight?

At summer agricultural shows, farmers are given the chance to show their very best animals. Questions could include:

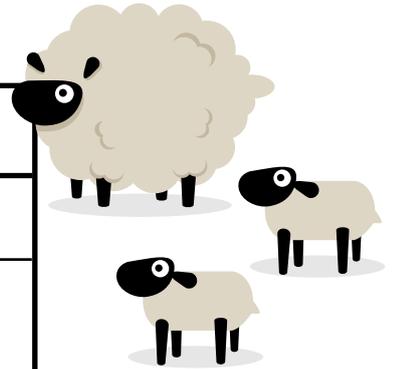
- A farmer shows 200 ewes. 60% of them had 2 lambs, 35% had 3 lambs, 5% had 4 lambs. How many lambs in total?
- A farmer shows a large ram. The ram wins 80% of the 16 awards he was entered for. How many awards did the ram win?



British Wool LEARNING

Time How Busy is a Farmer?

This time table shows the work the farmer did in one morning.
Complete the table below by working out the missing times.



Job Done	Time taken	Start Time	Finish Time
Wake up and get dressed		5.00 am	5.20 am
Check to see if ewes have had lambs over night	30 minutes	5.20 am	5.50 am
Move new lambs and their mums to a special barn	30 minutes		6.50 am
Feed the sheep and make sure they have enough water to drink and hay for bedding	1 hour	6.50 am	
Breakfast	15 minutes		8.05 am
Weigh new lambs	40 minutes	8.05 am	
Check again for new lambs	30 minutes	8.45 am	9.15 am
Take weak lamb into the farm house to keep warm and bottle feed it to make it strong	30 minutes	9.15 am	9.45 am
Check lambs again	15 minutes	9.45 am	
Feed the sheep dog	10 minutes		10.10 am
Fit new lambs with ear tags		10.10 am	11.15 am
Check for new lambs again	25 minutes	11.15 am	





British Wool LEARNING

Money

How Much Does a Sheep Cost?

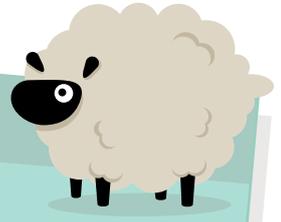
Selling wool from sheep can help the farmer to pay for other things that are needed to run the farm. Can you help the farmer work out how much it costs to run this part of his farm? Show your workings.

The farmer has:

- 28 x Sheep
- 2 x Sheep dog
- 1 x Tractor



Income	
Sheep's wool	£480
Outgoings	
Sheep feed	£10 per bag
Dog food	£5 per tin
Fuel for tractor	£10 per week



One sheep eats one bag of food per week. How much does it cost to feed all the farmer's sheep for one week?

One dog eats 10 tins of dog food in one week. How much does it cost to feed all of the sheep and the dogs for a week?

When the farmer has fed his animals and filled the tractor up with fuel, how much will he have left from the sale of his sheep's wool?

How much would it cost the farmer to feed all of these animals and run the tractor for 4 weeks (one month)?





British Wool LEARNING

Measuring How Long is a Piece of Wool?

Knitting is done by using long needles to loop and stitch yarn of sheep's wool into rows to make a whole fabric, often used for blankets or clothes. When knitting to a pattern a knitter will need to know that they have enough wool to finish it. They can check this by measuring it.

1. Estimate the length of this piece of wool in cm and in mm.

cm	mm
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2. What is the actual size of this piece of wool? How many pieces of wool this length would you need to have 170cm of wool in total?

	170cm =
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3. Without using a ruler draw a mark to estimate where you would need to cut the piece of wool in half. Then, using a ruler find the exact half way mark to see how close your estimation was.

4. Using a ruler draw marks where you would need to cut this piece of wool for it to be in 4 equal parts.

5. How long would 2, 4 and 6 of these pieces of this wool be?

x2 =	x4 =	x6 =
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6. How long would 2 of these pieces of this wool be? How long would half be?

x2 =	1/2 =
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7. How long would 10 and 20 of these pieces of wool be?

x10 =	x20 =
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