

The next three weeks are going to be a maths investigation where you will be designing your own theme park

There are 20 parts to the theme park, some will take longer than others but the idea is to do 2 a day if it a shorter task and 1 a day if it a longer task. By the end of the summer term you should have completed the whole pack.

Week one of this investigation contains parts 1 – 11

You can either print this out and write on it or make a record of each section in your homework book, you will need to constantly refer back to this

Maths B week 4

Any questions please email

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The next two weeks are going to be a maths investigation where you will be designing your own theme park

Theme Park Maths



Welcome to Theme Park Maths, a unique investigation which sees you plan, build and operate a theme park. Your decisions throughout the investigation will be crucial as to whether you make a profit or a loss.

Theme Park Maths

The scenario

A plot of land has become available and you have decided to build a brand new theme park.

You have managed to secure a £500 000 loan from the bank

During this activity you will have a range of tasks to complete, from building your theme park, to working out how much it costs to run and most importantly working out how much profit you can make

Task 1

Your first task is to plan your park. The piece of square paper you will receive will be your park. You must carefully decide what kind of rides you are going to have. You also need to think about the other facilities visitors will need when they come to your theme park. For example, toilets, cafes, shops and paths will all be available for purchase.

Many theme parks have different areas that are 'themed'. Therefore you might like to have an African area, a wild west American area or a Space area. Think carefully about what you would like to include in yours and make your park the best in the UK.



Task 1 - Setting up your theme park.

Your spending limit is £500 000. Design and draw your theme park on the squared paper. You must not go over your spending limit and you must have car parks, toilets, paths to connect all the items, cafes and shops for your visitors. It is not about just having rides. You will need to please all of your visitors

Each attraction comes under a different category. Each category varies in price. Choose carefully from the prices and information page, making sure you have something which appeals to everyone.

Follow the key below when colouring in the plan of your park.

Theme Park Key

Category 1 Rides: Red

Category 2 Rides: Yellow

Category 3 Facilities: Purple

Bins: Orange

Toilets: Pink

Trees: Green

Lakes: Blue

Picnic Benches: Brown

Paths and Car Park: Grey

Prices

Category 1 Attractions - £50 000 each. These attractions take up 12cm²



A rollercoaster



A water ride



A ferris wheel

Category 2 Attractions - £25 000 each. These attractions take up 6cm²



A bouncy castle



Dodgems



A Fun House



A haunted house



Merry-go-round



A Pirate Ship



Spinning Ride



Circus Tent



Train

Category 3 Attractions - £8 000 each. These attractions take up 4cm²



A Cafe



A Shop



Ice Cream



First Aid Centre

Other facilities and attractions - These items are individually price



Path - £200 per 5cm length



Tree - £200 per square
(1 square per tree)



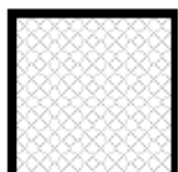
Lake - £1 000 per square



Toilets - £1 000.
4cm² per block of toilets



Rubbish Bin - £50
1cm² per bin



Car Park - £500 per square.
Each square will take 100



Picnic Benches - £100 per
bench

Task 2: Running your theme park

To run your theme park the following costs will apply to each item that you have every day. How much will it cost to run your theme park for one day?

Costs				
Item	Staff Costs	Electricity, Maintenance and Repairs	Number in park	Total Costs per day
Category 1 Ride (per ride)	£40 a day	£50 a day		
Category 2 Ride (per ride)	£30 a day	£30 a day		
Category 3 Facility (per facility)	£20 a day	£20 a day		
Toilets (for all toilets)	£5 a day	£5 a day	NA	
Bins (for all bins)	£31.50 a week	£5.25 a week	NA	
Trees (for all trees)	£91.25 a year	None	NA	
		Totals		

Complete the table above.

How much does it cost to open your park for one day? _____

Extension Activity

What about one week? _____

One year? _____

Task 3 - Entry Fee

How much does it cost to open your park each day? _____ (figure from task 2)

How many visitors do you think you will have each day? (remember it's a brand new park and not many people know about it yet!)

Make an estimate: _____

Give your plan to a partner, you must not tell them anything about your park. They must use the criteria below to decide your entry fee.

Price Category 1 - £20 per person.

- Four or more category 1 rides
- 10 or more rides in total
- 6+ category 3 facilities
- A first aid centre
- A well set out park with carefully placed bins, benches, toilets and paths.

Price Category 2 - £15 per person.

- Two or more category 1 rides
- 7 or more rides in total
- 4 or more category 3 facilities
- A first aid centre
- Some consideration to where bins, toilets, benches and paths are placed.

Price Category 3 - £10 per person

- One or more category 1 rides.
- 5 or more rides in total.
- 2 or more category 3 facilities.
- Some errors in where bins, toilets, benches and paths are placed which may lead to unhappy customers.

Price Category 4 - £5 per person

- At least 3 rides
- At least 1 category 3 facility.
- Some errors in where bins, toilets and paths are placed which may lead to unhappy customers.

Decide on the entry price and enter it here £ _____

Task 4 - How much do you make on the entry fee?

Calculate how much you make each day based on the entry fee you set on the previous page.

Day	Number of visitors	Income	Day	Number of visitors	Income
1	50		16	89	
2	75		17	104	
3	66		18	130	
4	49		19	209	
5	61		20	143	
6	67		21	99	
7	102		22	111	
8	110		23	206	
9	87		24	350	
10	21		25	300	
11	24		26	278	
12	67		27	453	
13	66		28	294	
14	98		29	367	
15	109		30	359	

Task 5 - Profit and Loss

Each visitor to your theme park will spend;

- £4 at each café you have
- £3 at each shop you have
- £1 at every ice cream stand you have

Work out your total profit from the admission price (gate), cafes and shops. Now take away your total costs that you have already worked out and find your profit or loss for each day.

Day	Number of visitors	Income					Total Costs (b) (Task 2)	Profit (a-b)
		Admission (Task 4)	Café	Shop	Ice Cream	Total (a)		
1	50							
2	75							
3	66							
4	49							
5	61							
6	67							
7	102							
8	110							
9	87							
10	21							
11	24							
12	67							
13	66							

14	98							
15	109							
16	89							
17	104							
18	130							
19	209							
20	143							
21	99							
22	111							
23	206							
24	350							
25	300							
26	278							
27	453							
28	294							
29	367							
30	359							
							Total	

What profit or loss have you made in the first month of opening your theme park?

Task 6 – Finding your Annual Profit

Your monthly profit increases by 10% each month for next 5 months. Calculate your profit for the rest of the year that your park is open for.

Month 1 Profit _____

Month 2 Profit _____

Month 3 Profit _____

Month 4 Profit _____

Month 5 Profit _____

Month 6 Profit _____

First Year Profit _____

Money left over after building your theme park _____ (*figure from task 1*)

Total in the bank at the end of the first year _____

Task 7 - Making improvements

It is the end of your first season you have _____ in the bank. You can now invest 40% of these profits to try and improve your park.

I can spend _____ on improving my park.

Improvements can be done in two ways.

1) Clearing land.

- £10 000 per square to clear land where there is a category 1 or 2 attraction/facility
- £5 000 per square to clear land where there is a category 3 facility
- £1 000 per square to clear a toilet, path, car park, lake or tree.

OR

Buying extra land

- £5 000 per new square.

2) Advertising

You can advertise in three different ways but you can only choose one.

Leaflet

These will cost you £50 000. However you will increase your attendance by 10% a day

Radio

This will cost you £100 000. However you will increase your attendance by 20% a day

TV

This will cost you £250 000. However you will increase your attendance by 30% a day

Decide what improvements you wish to make and record them clearly showing what you have spent and what you have left. Remember you can only spend 40% of what you have in the bank.

I have spent _____ on improvements.

How much do you now have in the bank altogether? _____

Making it even better...

You can now add new features to your park using 1/3 of the money you have left in the bank. (figure above) There are a number of new rides and facilities which have become available. You can add these to your park if you have the space and money to do so. You can also add in the features that were on the original list

Remember to keep clear records of how much money you are spending and most importantly how much money you have in the bank. You will need to update the plan of your park. If you have bought extra land you may need to stick squares onto your paper.

GET READY FOR THE SECOND SEASON!

2nd SEASON - NEW FEATURES

Category 1 Attractions - £50 000 each. These attractions take up 12cm²



Go Karts



Big Dipper Rollercoaster

Category 2 Attractions - £25 000 each. These attractions take up 6cm²



Restaurant



Adventure Playground



Rubber Ring Rapids



Crazy Golf

Category 3 Attractions - £8 000 each. These attractions take up 4cm²



Sweet Shop



A photo kiosk
(per ride). Must
be within 2
squares of the
ride.

Task 8: Running your theme park (season 2)

As with everything, costs increase every year. To run your theme park for the second year the following costs will apply to each item that you have every day. How much will it cost to run your theme park for one day?

Costs				
Item	Staff Costs	Electricity, Maintenance and Repairs	Number in park	Total Costs per day
Category 1 Ride (per ride)	£70 a day	£80 a day		
Category 2 Ride (per ride)	£50 a day	£50 a day		
Category 3 Facility (per facility)	£40 a day	£30 a day		
Toilets (for all toilets)	£10 a day	£7 a day	NA	
Bins (for all bins)	£31.50 a week	£5.25 a week	NA	
Trees (for all trees)	£91.25 a year	None	NA	
		Totals		

Complete the table above.

How much does it cost to open your park for one day? _____

Extension Activity

What about one week? _____

One year? _____

Task 9 - Entry Fee

Decide on a price per person to enter your theme park for the second year.

How much does it cost to open your park each day? _____ (figure from task 8)

How many visitors do you think you will have each day during your second season?

Make an estimate: _____

Give your plan to a partner, you must not tell them anything about your park. They must use the criteria below to decide your entry fee. You must choose a different person than you did in season 1.

Price Category 1 - £25 per person.

- Six or more category 1 rides
- 15 or more rides in total
- A first aid centre
- 6 or more category 3 facilities
- A detailed and well set out park with carefully placed bins, benches, toilets and paths.

Price Category 2 - £20 per person.

- Four or more category 1 rides
- 10 or more rides in total
- A first aid centre
- 6 or more category 3 facilities
- A well set out park with carefully placed bins, benches, toilets and paths.

Price Category 3 - £15 per person.

- Two or more category 1 rides
- 7 or more rides in total
- A first aid centre
- 4 or more category 3 facilities
- Some consideration to where bins, toilets, benches and paths are placed.

Price Category 4 - £10 per person

- One or more category 1 rides.
- 5 or more rides in total.
- 2 or more category 3 facilities.
- Some errors in where bins, toilets, benches and paths are placed which may lead to unhappy customers.

Decide on the entry price and enter it here £ _____

Task 10 - How many visitors?

Here are your visitor numbers for each month.

May (31 days): 4 800 visitors

June (30 days): 5 750 visitors

July (31 days): 5 980 visitors

August (31 days) 7 340 visitors

September (30 days) 5 640 visitors

However depending on the improvements you made you may in fact have attracted more people.

If you bought a leaflet your attendance figures increased by 10%

If you bought a radio advert your attendance figures increased by 20%

If you bought a TV advert your attendance figures increased by 30%

Write down your new attendance figures below

May (31 days): _____

June (30 days): _____

July (31 days): _____

August (31 days): _____

September (30 days): _____

Total visitors: _____

Task 11 - What is your profit?



Calculate your season 2 income by completing the task below.

So...

Total number of visitors to your park during season 2 _____ (taken from task 10)

Entry fee £ _____ (taken from task 9)

Total income made on the gate £ _____ (multiply the 2 figures together)

Then..

How much does it cost to open your park every day? £ _____ (taken from task 8)

Your park is open for 153 days this year so you need to multiply the above figure by 153.

Total cost of opening your park for the season. £ _____

- **Total profit made in season 2 so far: £ _____**
(total income on gate - total cost of opening park)

HOWEVER...

$\frac{1}{2}$ of your customers spend £10 at **one** of your restaurants. Total income: _____

Every customer spends £5 at **each** café you have. Total income: _____

Every customer spends £2 at **each** sweet shop you have. Total income: _____

Every customer spends £4 at **each** shop you have. Total income: _____

Every customer spends £1 at **each** ice cream stand you have. Total income: _____

Every customer spends £3 at **each** photo kiosk you have. Total income: _____

What is the total income made on your attractions? _____

Now add this amount to the figure at the top of the page (the figure in bold next to the bullet point)

Total profit in season 2: _____

Task 12: Taxes and Insurance!

At the end of season 2 you receive a letter from the Inland Revenue. These are the people who collect taxes for the government.

As you are in charge of your own company you have to pay tax on the profits you make.

30% of your profits in season 2 now have to be paid to the government in the form of taxes.

Work it out.....

Total profits on season 2: £_____

30% of your profits: £_____

Total amount to be paid in taxes: £_____



New current total profit for season 2: _____

Insurance renewal...

Unfortunately the bad news doesn't end there.

The insurance on your park is up for renewal. Insurance is a legal requirement and you are not allowed to open your park without a certificate. Therefore you have no choice but to renew the insurance certificate at the following costs.

Price Category 1: £200 000

Price Category 2: £175 000

Price Category 3: £150 000

Price Category 4: £125 000



Deduct the above costs from your yearly profits.

What are your final season 2 profits: _____

What money do you now have in the bank: _____

Task 13: Your loan!

At the beginning of season 1 you took out a £500,000 loan with Barclays Bank.

In season 1 it was interest free which meant at the end of season 1 you still owed £500,000 to the bank.

However in season 2 and 3 the loan is subject to 11% interest. This means that 11% is added onto the loan at the end of every season.

Work out how much you now owe:

Season 1: £500,0000

Season 2: £_____ (add 11% onto £500,000)



So...

You are now at the end of season 2.

What is the total amount in your bank? £_____

How much loan do you owe? £ _____

Task 14: Your final season!

You can now make a number of improvements to your park for its final year!

This can be done in two ways. You have unlimited spending this year but spend wisely and remember you can only spend what you have in the bank.

Making Improvements to your park

1) Clearing land you already have

- £10 000 per square to clear land where there is a category 1 or 2 attraction/facility
- £5 000 per square to clear land where there is a category 3 facility
- £1 000 per square to clear a toilet, path, car park, lake or tree.

OR

Buying extra land

- £5 000 per new square. (You may like to invest in making some extra space in your park as there are some exciting new additions in your final season which could make you quite a lot of income.)

2) Advertising

You can advertise in up to four ways. However you can only choose a website and/or one other.

Website

Setting up a website will cost you £15 000. It will enable you to have special offers to your park and therefore attract more people. More will be explained later!

Leaflet

These will cost you £50 000. However you will increase your attendance by 10% a day

Radio

This will cost you £100 000. However you will increase your attendance by 20% a day

TV

This will cost you £250 000. However you will increase your attendance by 30% a day

Decide what improvements you wish to make and record them clearly in table.

Making it even better...

You can now add new features to your park. There are a number of new rides and facilities which have become available. You can add these to your park if you have the space and money to do so. You can also add in the features that were on the original list. Remember to keep clear records of how much money you are spending and most importantly how much money you have in the bank. You will need to update the plan of your park. If you have bought extra land you may need to stick squares onto your paper. Get ready for the final season!

3rd SEASON - NEW FEATURES



A hotel

Yes it's finally arrived.

To build a hotel it will cost you £150 000 and you must have 16 squares (4 squares by 4 squares) free in your park.

You may only have 1 hotel in your park.



A swimming pool

Build a swimming pool with water slides and a fantastic wave machine.

To build a swimming pool will cost you £95 000 and you must have 12 squares (4 squares by 3 squares) free in your park.

You may only have 1 swimming pool in your park.



A cinema

Build an amazing 3D cinema spectacular.

To build a cinema will cost you £75 000 and you must have 9 squares (3 squares by 3 squares) free in your park.

You may only have 1 cinema in your park.

Task 15: Running your theme park (season 3)

Again the costs have gone up for the third season. To run your theme park for the final year the following costs will apply to each item that you have every day. How much will it cost to run your theme park for one day?

Item	Costs			
	Staff Costs	Electricity, Maintenance and Repairs	Number in park	Total Costs per day
A Hotel	£180	£140		
A swimming pool	£140	£120		
A cinema	£90	£100		
Category 1 Ride (per ride)	£80 a day	£80 a day		
Category 2 Ride (per ride)	£60 a day	£50 a day		
Category 3 Facility (per facility)	£50 a day	£30 a day		
Toilets (for all toilets)	£10 a day	£7 a day	NA	
Bins (for all bins)	£31.50 a week	£5.25 a week	NA	
Trees (for all trees)	£91.25 a year	None	NA	
Website	£46,000 a year	£25 a day		
		Totals		

Your park is open for 153 days again this year. How much does it cost for the season to open your park?

However your hotel is open for 180 days of the year. How much extra will it cost to open your hotel this year? _____

Furthermore your swimming pool is open for 350 days of the year. How much extra expenditure is this?

Total cost of opening your park this season: _____ (add three figures above)

.....

Task 16 - Entry Fee

Decide on a price per person to enter your theme park for the third year.

How much money does it cost to open your park each day? _____

How many visitors do you think you will have each day during your third season?

Make an estimate: _____

Give your plan to a partner, you must not tell them anything about your park. They must use the criteria below to decide your entry fee. You must choose a different person than you did in season 1 and 2

Price Category 1 - £35 per person.

- A swimming pool and or 3D cinema
- Six or more category 1 rides
- 15 or more rides in total
- A first aid centre
- 6+ category 3 facilities
- A detailed and well set out park with carefully placed bins, benches, toilets and paths.

Price Category 2 - £25 per person.

- Four or more category 1 rides
- 10 or more rides in total
- A first aid centre
- 6 or more category 3 facilities
- A well set out park with carefully placed bins, benches, toilets and paths.

Price Category 3 - £15 per person.

- Two or more category 1 rides
- 7 or more rides in total
- A first aid centre
- 4 or more category 3 facilities
- Some consideration to where bins, benches, toilets and paths are placed.

Price Category 4 - £10 per person

- One or more category 1 rides.
- 5 or more rides in total.
- 2 or more category 3 facilities.
- Some errors in where bins, toilets and paths are placed which may lead to unhappy customers.

Decide on the entry price and enter it here £ _____

Task 17 - How many visitors?

Here are your visitor numbers for each month.

May (31 days): 45 602 visitors

June (30 days): 49 891 visitors

July (31 days): 54 512 visitors

August (31 days) 87 003 visitors

September (30 days) 64 768 visitors

However depending on the improvements you made you may have attracted more people.

- If you bought a leaflet your attendance figures increased by 10%
- If you bought a radio advert your attendance figures increased by 20%
- If you bought a TV advert your attendance figures increased by 30%

BUT...

- If you purchased a website then you managed to get companies to pay for adverts on your website. You managed to raise £250 000 through this.
- You also managed to increase your attendance over the year by 15%. Each of these extra visitors paid a special price of £15 through offers on your website.

Write down your new attendance and money taken figures below

May (31 days): _____

Money taken this month: _____

June (30 days): _____

Money taken this month: _____

July (31 days): _____

Money taken this month: _____

August (31 days): _____

Money taken this month: _____

September (30 days): _____

Money taken this month: _____

Total number of visitors: _____

Total Money taken: _____

Number of extra visitors through owning a website: _____

Money made through owning a website (each visitor pays £15): _____

Total Money taken on the gate this year: _____

Task 18 - What are your profits?

Calculate your season 3 profits by completing the task below.

Here we go then...

Total income made on admissions/website £ _____

How much does it cost for you to open your park every day? £ _____

Your park is open for 153 days so you need to multiply the above figure by 153.

Total cost of opening your park for the season £ _____

- Total profit made in season 3 so far: £ _____
(total profit on admissions/website - total cost of opening park)

However....

$\frac{1}{2}$ of your customers spends £10 at one of your restaurants. Total income: _____

Every customer spends £5 at each café you have. Total income: _____

Every customer spends £4 at each shop you have. Total income: _____

Every customer spends £3 at each sweet shop you have. Total income: _____

Every customer spends £1 at each ice cream stand you have. Total income: _____

Every customer spends £3 at each photo kiosk you have. Total income: _____

Every customer spends £5 at the cinema. Total income: _____

Every customer spends £5.50 at the swimming pool. Total income: _____

AND....

15% of your total visitors also stayed at your hotel. How many people was this? _____

Each one of these customers paid £75 to stay 2 nights. How much was raised through your hotel? _____

What is the total profit made on all of your attractions? _____

Now add this amount to the figure at the top of the page (the figure next to the bullet point)

Current total profit in season 3: _____

Task 19: Taxes and Insurance!

At the end of season 3 you receive another letter from the inland revenue. These are the people who collect taxes for the government.

As you are in charge of your own company you have to pay tax on the profits you make.

30% of your profits in season 3 now have to be paid to the government.

Work it out.....

Total profits on season 3: £ _____

30% of your profits: £ _____

Total amount to be paid in taxes: £ _____



New current total profit for season 3: _____

Insurance renewal...

The insurance on your park is up for renewal. Insurance is a legal requirement and you are not allowed to open your park without a certificate. Therefore you have no choice but to renew the insurance certificate at the following costs.

Price Category 1: £250 000

Price Category 2: £200 000

Price Category 3: £175 000

Price Category 4: £150 000



Deduct the above costs from your yearly profits.

What are your final season 3 profits: _____

What money do you now have in the bank in total: _____

Task 20: Your loan!

At the beginning of season 1 you took out a £500 000 loan with Barclays Bank.

In season 1 it was interest free which meant at the end of season 1 you still owed £500 000 to the bank.

However in season 2 and 3 the loan is subject to 11% interest. This means that 11% is added onto the loan at the end of every season.

Work out how much you now owe:

Season 1: £500 000

Season 2: £555 000

Season 3: _____ (add 11% onto £555 000)



So...

You are now at the end of season 3.

What is the total amount in your bank? £_____

How much loan do you owe? £_____

You must now pay back the loan to the bank. (subtract the above two figures)

How much are you left with? _____

Total Money in the bank at the end of the Theme Park Maths: _____