



Rewarding Learning

General Certificate of Secondary Education  
2019

Centre Number

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Candidate Number

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# Statistics

Unit 2  
Higher Tier



\*GST22\*

[GST22]

THURSDAY 20 JUNE, MORNING

### TIME

2 hours.

### INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Write your answers in the spaces provided in this question paper.

Answer **all ten** questions.

Any working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.

You **may** use a calculator for this paper.

### INFORMATION FOR CANDIDATES

The total mark for this paper is 100.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

You should have a calculator, ruler, compasses and protractor.

The formula sheet is on page 2.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
<b>Total Marks</b>	

## HIGHER TIER FORMULAE SHEET

$$\text{Standard deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2}$$

Spearman's Rank Correlation Coefficient

$$r_s = 1 - \left(\frac{6 \sum d^2}{n(n^2 - 1)}\right)$$



- 2 The table below shows the number of visitors to some visitor attractions in Northern Ireland between 2013 and 2017

**Top ten participating visitor attractions  
(Country Parks/Parks/Forests/Gardens)**

		Number of visitors (thousands)				
		2013	2014	2015	2016	2017
1	Lagan Valley Regional Park (inc. Lagan Towpath)	1397	1257	1296	1375	1427
2	Peace Bridge	1243	1 071	981	981	926
3	Lurgan Park	770	784	n/a	634	702
4	Crawfordsburn Country Park	800	748	585	603	625
5	Kilbroney Park	115	95	122	124	534
6	Slieve Gullion Forest Park & The Giant's Lair	n/a	311	361	388	484
7	Antrim Castle Gardens	168	221	343	451	444
8	Dungannon Park	224	332	291	368	348
9	Sir Thomas & Lady Dixon Park	300	300	270	300	300
10	Roe Valley Country Park	250	250	250	248	273

- (a) How many visitors were there to Lurgan Park in 2014?

Answer \_\_\_\_\_ [1]

**Examiner Only**

**Marks Remark**

(b) What was the total number of visitors to Antrim Castle Gardens between 2013 and 2017?

Answer \_\_\_\_\_ [1]

(c) Suggest a suitable diagram which could be used to illustrate the trend in the number of visitors to Dungannon Park over this five-year period.

\_\_\_\_\_ [1]

Between 2013 and 2016, one of the attractions counted the number of cars coming to the site, whereas in 2017 the number of people visiting was counted.

(d) (i) Which attraction do you think this could have been?

\_\_\_\_\_ [1]

(ii) Give a reason for your answer.

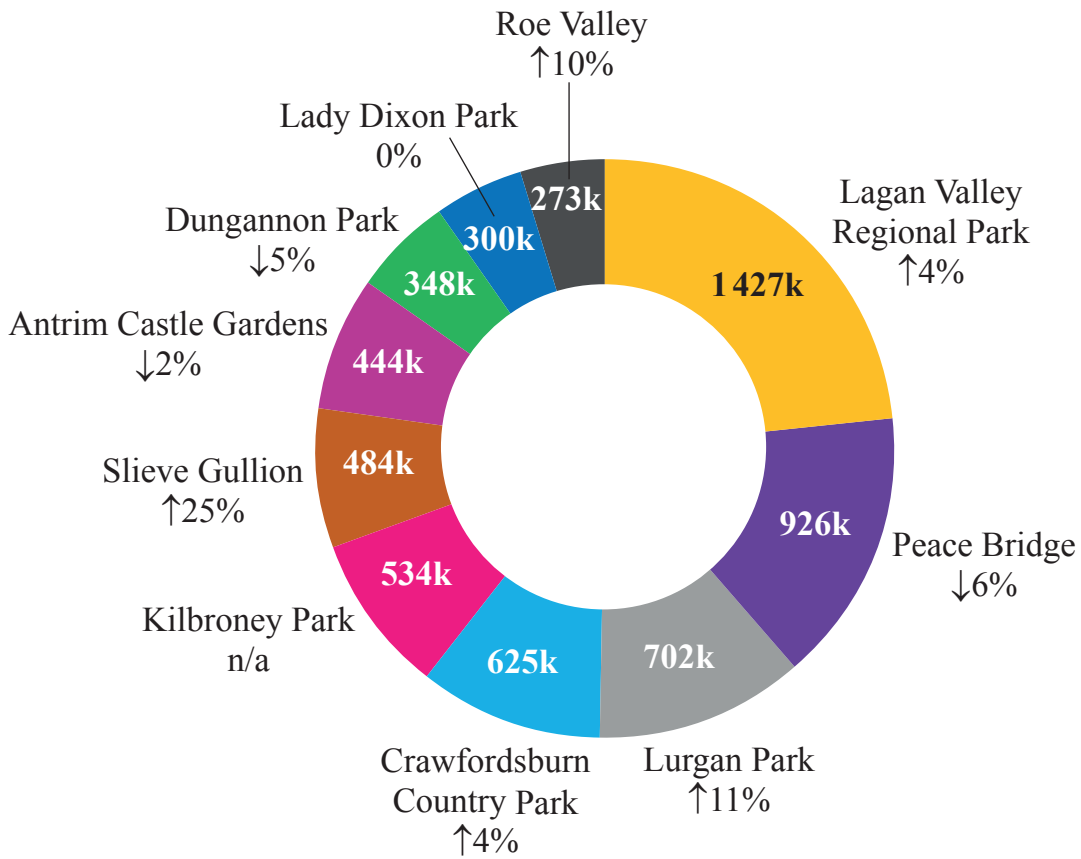
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\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [1]

Examiner Only

Marks Remark

### Top Ten Country Parks/Parks/Forests/Gardens 2017

Examiner Only	
Marks	Remark



Arrows indicate increase or decrease between 2016 and 2017

(e) Explain why this type of diagram was used instead of a bar chart in the ‘Northern Ireland visitor attraction survey 2017’ report.

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[2]

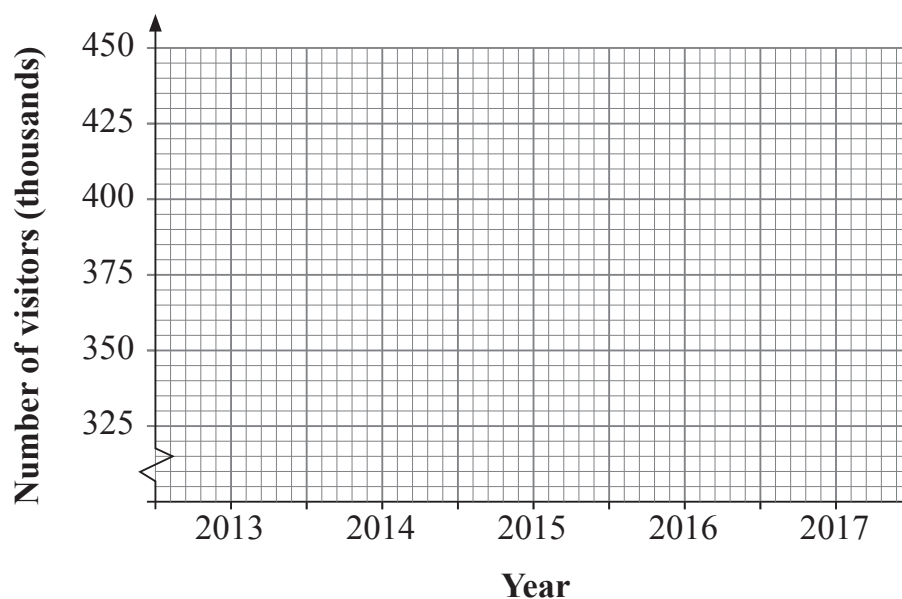


- 3 The table below shows the number of visitors, in thousands, to some visitor attractions in Northern Ireland between 2013 and 2017

**Top ten participating visitor attractions  
(excluding Country Parks/Parks/Forests/Gardens)**

		Number of visitors (thousands)				
		2013	2014	2015	2016	2017
1	Giant's Causeway World Heritage Site	754	788	851	944	1012
2	Titanic Belfast	604	634	622	667	760
3	Dundonald International Ice Bowl	n/a	n/a	n/a	500	536
4	Ulster Museum	416	466	465	460	533
5	Carrick-a-Rede Rope Bridge	263	324	354	440	434
6	Kinnego Marina	326	209	428	430	430
7	Derry's Walls	411	370	381	403	419
8	The Guildhall	269	299	313	334	350
9	W5	270	324	372	370	323
10	SS Nomadic	n/a	n/a	n/a	n/a	269

- (a) Draw a line graph to show the number of visitors to Derry's Walls between 2013 and 2017



[3]

Examiner Only

Marks Remark







Keith wants to analyse the data using diagrams and calculations.

- (b) State one diagram and one calculation he could use and explain the reason for choosing each.

Diagram

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Explanation

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Calculation

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Explanation

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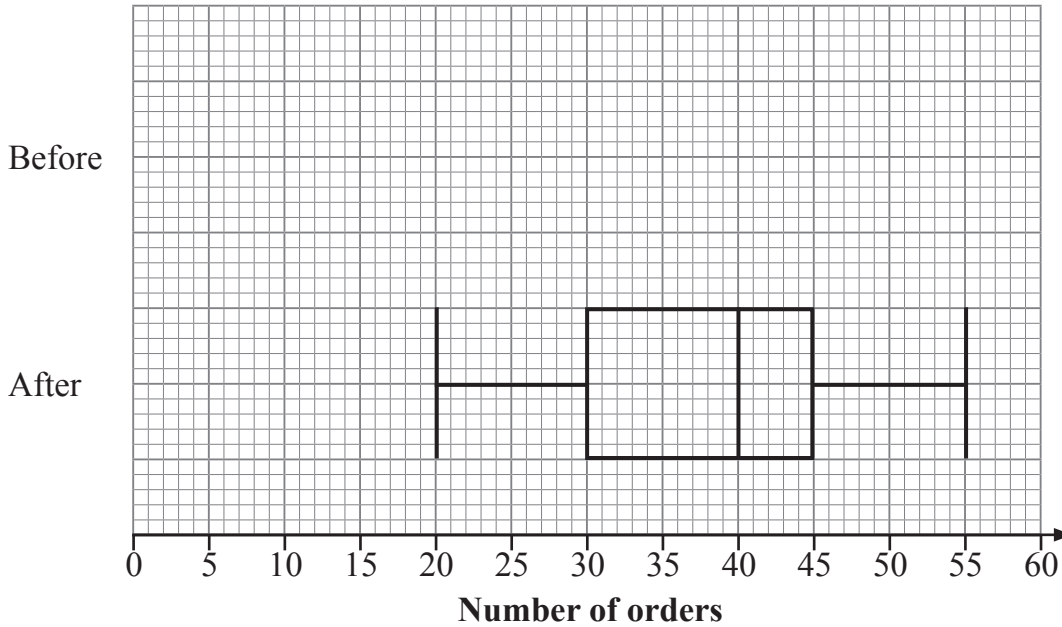
[4]

Examiner Only	
Marks	Remark



The manager decided to advertise her shop on a social media site. She recorded the number of orders she received over the next 15 days and drew a box plot to display her results.

- (b) On the same diagram, draw a box plot to show the number of orders before advertising her shop.



[2]

- (c) Comment on the effectiveness of advertising on the number of orders received.

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[4]

Examiner Only	
Marks	Remark

6 Rob is investigating the relationship between the admission charge and the annual number of visitors to tourist attractions in Northern Ireland.

Rob downloads some data from the internet.

(a) Has Rob collected primary data or secondary data?

Primary data  Secondary data  [1]

(b) State a hypothesis Rob could use for his investigation.

\_\_\_\_\_ [1]  
 \_\_\_\_\_

Rob tries to calculate the product moment correlation coefficient for his data. He says, ' $r = -1.615$ '

(c) How can you tell Rob has made an error in his calculation?

\_\_\_\_\_ [1]  
 \_\_\_\_\_

Rob's data is shown in the table below.

<b>Admission charge</b>	£4.00	£5.30	£2.50	£7.80	£6.20	£9.40	£11.00	£8.30
<b>Number of visitors (thousands)</b>	148	206	251	445	214	197	75	223

(d) Use the statistical functions on your calculator to calculate the product moment correlation coefficient for Rob's data. Give your answer correct to three decimal places.

Answer \_\_\_\_\_ [2]

(e) Give an interpretation, in relation to the hypothesis stated in part (b), to the value you found in part (d).

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[2]

Examiner Only	
Marks	Remark

- 7 The frequency table below shows the masses, in kilograms, of all suitcases weighed at an airport security section before one flight.

Mass, $m$ (kg)	Frequency			
$0 \leq m < 5$	1			
$5 \leq m < 10$	14			
$10 \leq m < 15$	37			
$15 \leq m < 20$	54			
$20 \leq m < 25$	17			
$25 \leq m < 35$	2			

- (a) Give one advantage and one disadvantage of using a grouped frequency table.

Advantage \_\_\_\_\_  
 \_\_\_\_\_ [1]

Disadvantage \_\_\_\_\_  
 \_\_\_\_\_ [1]

- (b) Show that an estimate of the mean mass of a suitcase is 15.66 kg. You may use the blank columns in the table to help you.

Answer \_\_\_\_\_ kg [4]

Examiner Only	
Marks	Remark





(f) Use your histogram to decide whether the assumption made by Carla in part (d) is justified.

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[2]

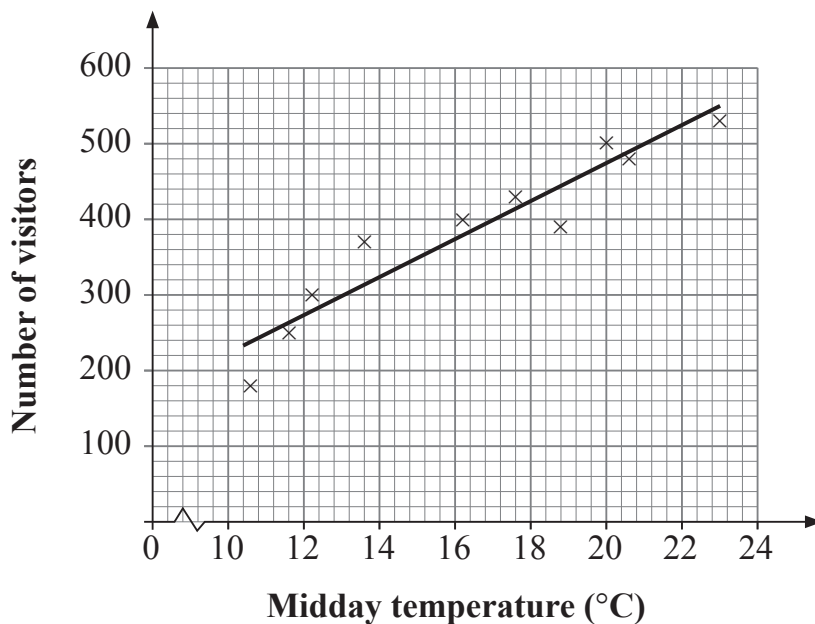
Examiner Only	
Marks	Remark

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**(Questions continue overleaf)**

8 A travel agent recorded the midday temperature,  $x$ , and the number of visitors,  $y$ , to a park over a period of ten Saturdays between April and June.

His results are shown on the scatter diagram below.



(a) What type of data is shown in the scatter diagram?

Circle the two correct words below.

- |                    |                     |                    |
|--------------------|---------------------|--------------------|
| <b>Qualitative</b> | <b>Univariate</b>   | <b>Bivariate</b>   |
| <b>Ordinal</b>     | <b>Quantitative</b> | <b>Categorical</b> |

[2]

(b) What was the midday temperature on the coldest Saturday?

Answer \_\_\_\_\_ °C [1]

(c) Explain why it is appropriate to draw a line of best fit on this scatter diagram.

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[1]



- 9 The partially completed table below shows the mean children's admission price and chain base index number for some tourist attractions in Northern Ireland.

Year	2013	2014	2015	2016	2017
Mean price	£2.54	£2.88	£3.89		£3.78
Chain base index number	100	113.4		106.4	91.3

The chain base index number for 2014 is 113.4

- (a) Give an interpretation of this number.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [2]

- (b) Calculate the mean price for 2016

Answer £ \_\_\_\_\_ [2]

- (c) Calculate the chain base index number for 2015

Answer \_\_\_\_\_ [2]

- (d) Give one reason for using chain base index numbers instead of simple index numbers.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [1]

Examiner Only	
Marks	Remark

A country park has three levels of membership: bronze, silver and gold.

50% of members have bronze membership

35% of members have silver membership

15% of members have gold membership.

The prices for each level of membership for 2016 and 2017 are given in the table below.

	<b>Bronze</b>	<b>Silver</b>	<b>Gold</b>
<b>2016</b>	£15.99	£17.99	£19.49
<b>2017</b>	£16.49	£18.29	£20.99

- (e) Taking 2016 as the base year, calculate the weighted index number for the income from membership fees for 2017

Give your answer correct to one decimal place.

Answer \_\_\_\_\_ [5]

- (f) Explain why a weighted mean is a more appropriate measure of average than the geometric mean in part (e).

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[1]

<b>Examiner Only</b>	
<b>Marks</b>	<b>Remark</b>





- (a) Explain how the pie charts show that the church had more visitors in 2017 than 2016

\_\_\_\_\_ [1]

In 2016, the number of children who visited the church was 1575

- (b) Calculate the number of adults who visited the church in 2016

Answer \_\_\_\_\_ [3]

- (c) Given that the pie charts are drawn to scale, calculate the number of adults who visited the church in 2017

Answer \_\_\_\_\_ [5]

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**THIS IS THE END OF THE QUESTION PAPER**

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Examiner Only	
Marks	Remark





## Sources

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**General Certificate of Education**

**2019**

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## **Statistics**

Pre-Release Materials for

Unit 2

Foundation and Higher

**[GST21/GST22]**

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**PRE-RELEASE MATERIALS**

## The Visitor Attraction Survey

The Northern Ireland Statistics and Research Agency (NISRA) use the statistical enquiry cycle to produce statistics on Tourism.

The Visitor Attraction Survey is carried out annually by NISRA. The primary purpose of the survey is to give an indication of how the tourism industry is performing in Northern Ireland.

The survey is issued by postal and electronic questionnaire and includes guidelines on how to complete it. The 2017 survey was issued to 400 attractions and 242 responded with data to analyse.

The Visitor Attraction Survey is a census of all Visitor Attractions in Northern Ireland. An attraction is one which is listed on the Discover Northern Ireland website. This means that the survey may be incomplete because if the details of an attraction are not listed on the website, it may not be included in the survey.

The Northern Ireland Visitor Attraction Survey 2017 report presents findings about several aspects of tourism, such as: types of attraction, visitor numbers, residency of visitors and admission charges.

The method used to record visitor numbers varies by attraction.

### Method of recording visitor numbers (2017)

<b>Method used</b>	<b>%</b>
Ticket or group bookings	32%
Manual count	22%
Mechanical or electronic	23%
Estimate	19%
Sample count	4%
Other	1%
<b>Total (221 responding attractions)</b>	<b>100%</b>

*Totals may not add to 100% due to rounding.*

## Data Quality Report

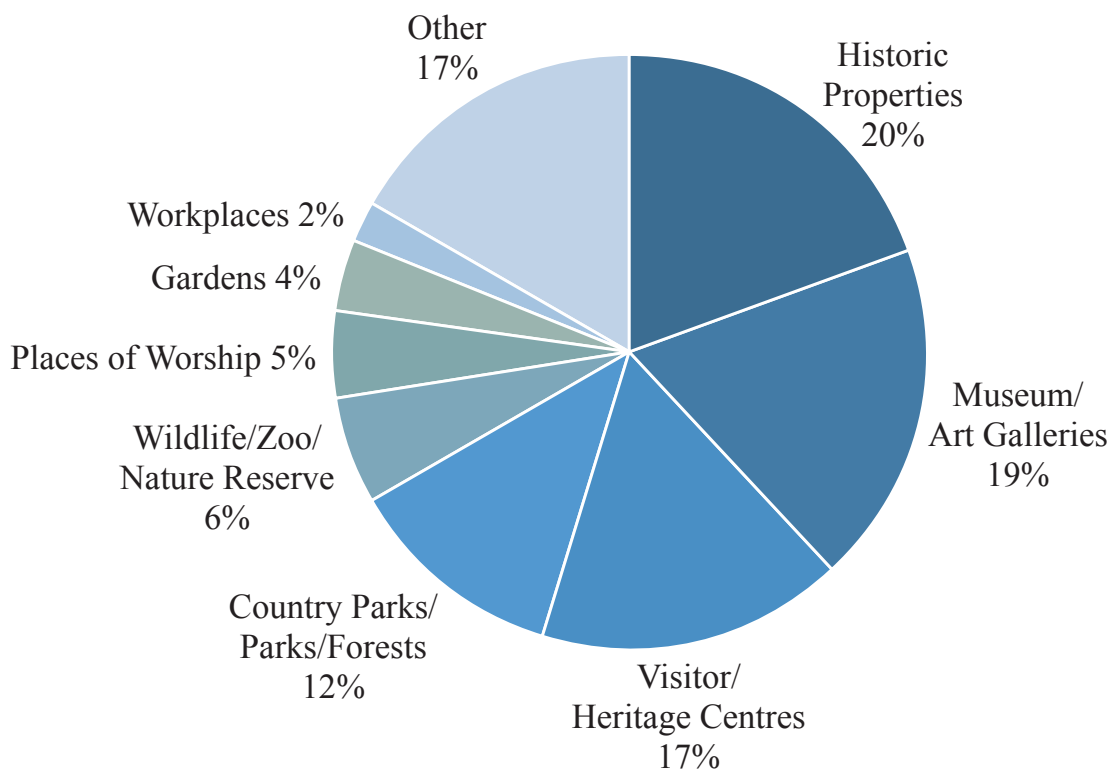
<b>Relevance</b>	<b>Primary Purposes</b>	The primary purpose of the Visitor Attraction Survey is to give an indication on how the tourism industry is performing in Northern Ireland by the number of visits to local attractions.
	<b>Strengths</b>	The Visitor Attraction Survey gives an indication of how tourism is performing locally. The surveys are completed by the attractions themselves so can give indications on external factors influencing tourism.
	<b>Limitations</b>	As the Visitor Attraction Survey is completed by each attraction, the reliability of the figures can vary. Some attractions do use ticket sales, but others provide estimates or use “electronic counters” which may also count commuters or day-to-day use.
	<b>Annual</b>	The results of the survey are published annually and contain estimates relating to the latest year. They are published approximately five to six months after the end of the year.
<b>Content and Development</b>	<b>Questionnaire</b>	The Visitor Attraction Survey is issued by questionnaire both postal and electronically by email. Guidelines for completion and contact details are issued alongside the questionnaire for anyone who has queries or requires assistance to fill out the form.
	<b>Data Validation Methods</b>	NISRA carry out sense checks on the data by comparing yearly data. Quite often changes arise due to different data collection methods or different people filling in the surveys.
<b>Accuracy</b>	<b>Errors</b>	There are likely to be lots of errors in the Visitor Attraction Survey results as each attraction has a different method of counting visitors. Some variations in results may be due to data collection methods. There are some attractions that report visitors by ticket sales. However, there are others who estimate their figures. Other attractions may have “electronic counters” which count the number of people who pass them. There are pros and cons with these counters as they provide an estimate. However, they may over count (if someone passes more than once or if they include people passing the counter who are not visitors) or undercount (if a large group pass the counter at one time they might not all be included).

### Number of attractions by Attraction Category

Attraction Category	Number of Attractions	(%)
Country Parks/Parks/Forests	30	12%
Gardens	9	4%
Historic Properties	48	20%
Museum/Art Galleries	45	19%
Visitor/Heritage Centres	40	17%
Wildlife/Zoo/Nature Reserve	14	6%
Workplaces	4	2%
Places of Worship	11	5%
Other	41	17%
<b>Total</b>	<b>242</b>	<b>100%</b>

*Totals may not add to 100% due to rounding.*

### Responding attractions by category type



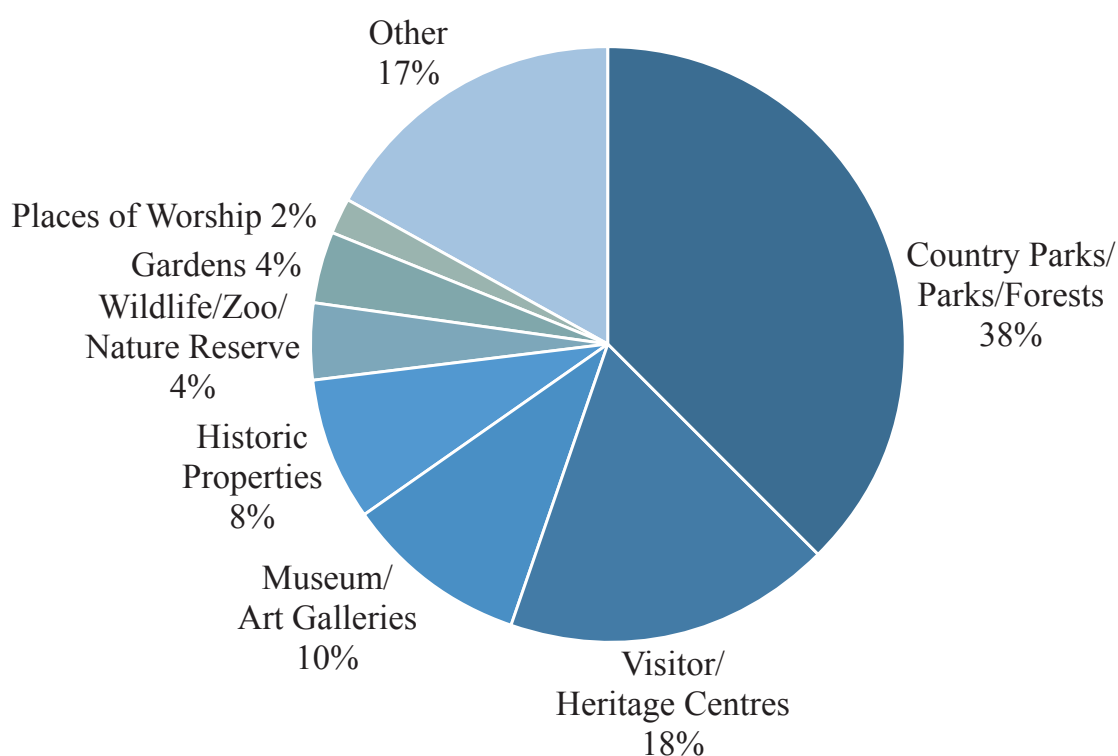


### Number of visits by Attraction Category

Attraction Category	Number of Visitors	(%)
Country Parks/Parks/Forests	7 449 056	38%
Gardens	710 917	4%
Historic Properties	1 487 281	8%
Museum/Art Galleries	1 988 766	10%
Visitor/Heritage Centres	3 573 844	18%
Wildlife/Zoo/Nature Reserve	785 290	4%
Workplaces	17 737	<1%
Places of Worship	444 191	2%
Other	3 303 241	17%
<b>Total (242 responding attractions)</b>	<b>19 760 323</b>	<b>100%</b>

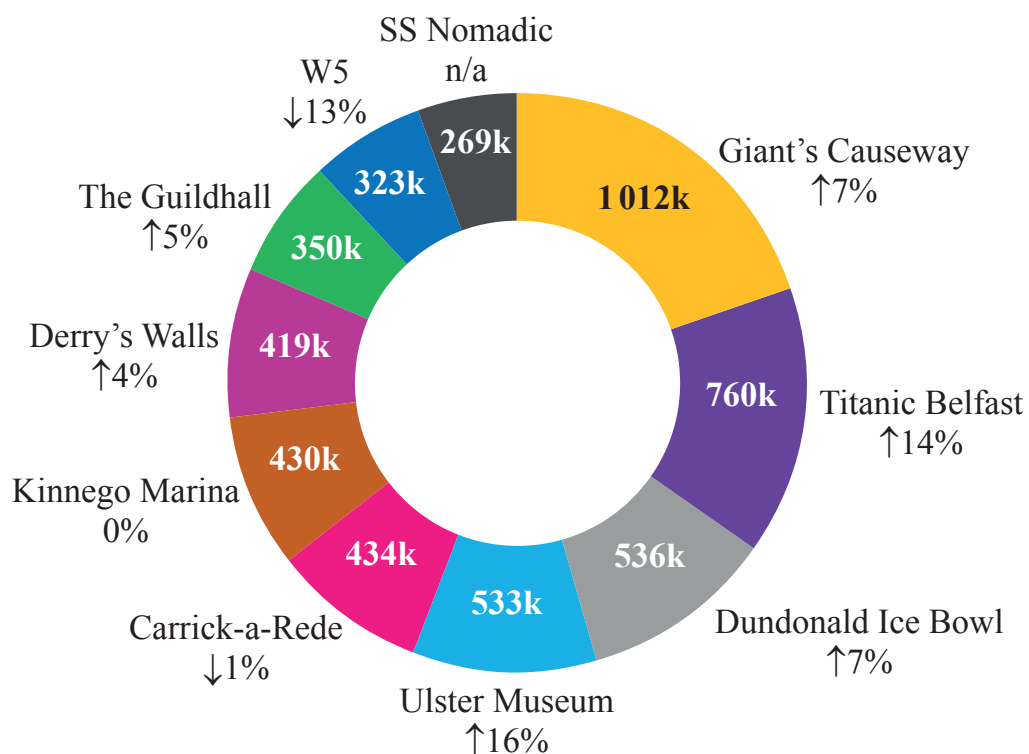
*Totals may not add to 100% due to rounding.*

### Visits by category type



**Top ten participating visitor attractions (excluding Country Parks/Parks/Forests/Gardens)**

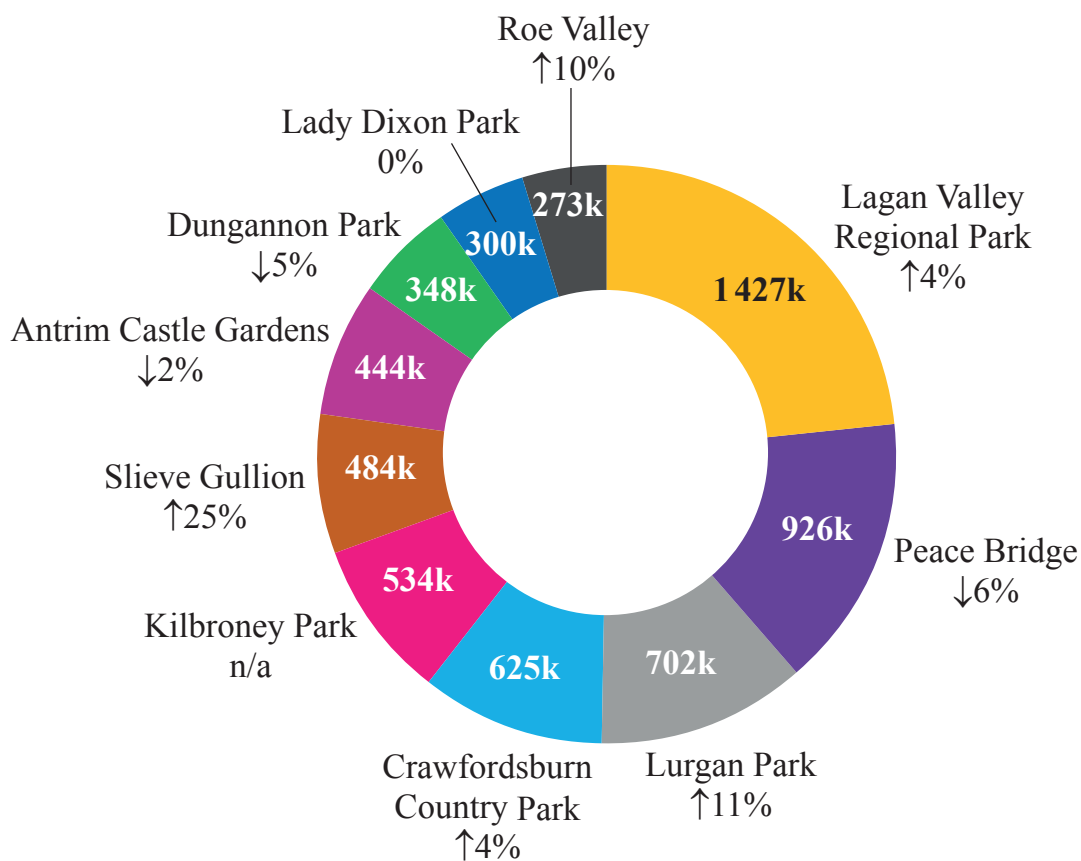
		Number of visitors (thousands)				
		2013	2014	2015	2016	2017
1	Giant's Causeway World Heritage Site	754	788	851	944	1 012
2	Titanic Belfast	604	634	622	667	760
3	Dundonald International Ice Bowl	n/a	n/a	n/a	500	536
4	Ulster Museum	416	466	465	460	533
5	Carrick-a-Rede Rope Bridge	263	324	354	440	434
6	Kinnego Marina	326	209	428	430	430
7	Derry's Walls	411	370	381	403	419
8	The Guildhall	269	299	313	334	350
9	W5	270	324	372	370	323
10	SS Nomadic	n/a	n/a	n/a	n/a	269



*Arrows indicate increase or decrease between 2016 and 2017.*

### Top ten participating visitor attractions (Country Parks/Parks/Forests/Gardens)

		Number of visitors (thousands)				
		2013	2014	2015	2016	2017
1	Lagan Valley Regional Park (inc. Lagan Towpath)	1 397	1 257	1 296	1 375	1 427
2	Peace Bridge	1 243	1 071	981	981	926
3	Lurgan Park	770	784	n/a	634	702
4	Crawfordsburn Country Park	800	748	585	603	625
5	Kilbroney Park	115	95	122	124	534
6	Slieve Gullion Forest Park & The Giant's Lair	n/a	311	361	388	484
7	Antrim Castle Gardens	168	221	343	451	444
8	Dungannon Park	224	332	291	368	348
9	Sir Thomas & Lady Dixon Park	300	300	270	300	300
10	Roe Valley Country Park	250	250	250	248	273



Arrows indicate increase or decrease between 2016 and 2017.

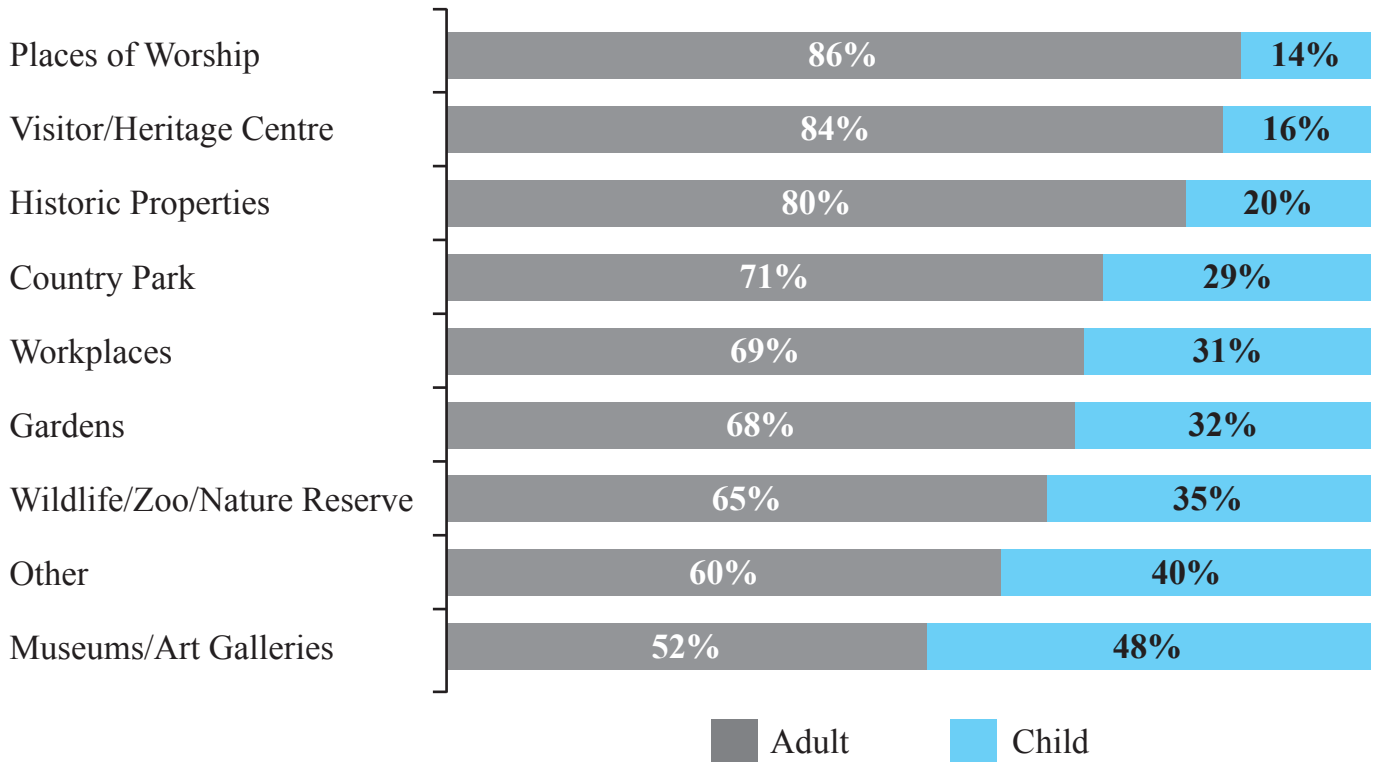
### Admission charges to responding attractions

Price of admission	Adult						
	2011	2012	2013	2014	2015	2016	2017
Maximum	£11.20	£17.50	£14.75	£15.50	£15.50	£20.00	£18.00
Minimum	£2.00	£1.00	£1.00	£1.60	£1.00	£2.00	£1.60
Mean	£4.60	£5.50	£4.75	£5.13	£5.74	£6.45	£5.93

Price of admission	Child						
	2011	2012	2013	2014	2015	2016	2017
Maximum	£5.70	£7.00	£7.25	£7.25	£8.50	£10.00	£8.00
Minimum	£1.50	£0.00	£0.00	£0.00	£1.00	£2.00	£0.50
Mean	£3.50	£2.80	£2.54	£2.88	£3.89	£4.14	£3.78

Total number of attractions supplying information (N=51).

### Adult/Child ratios of responding attractions



Total number of attractions supplying information (N=129).

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