



Rewarding Learning

Centre Number

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Candidate Number

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General Certificate of Secondary Education
2019

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.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Total Marks	
-------------	--

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

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

Answer **all** questions

1 The Visitor Attraction Survey is a census of all visitor attractions in Northern Ireland.

(a) Explain what is meant by the term census.

[1]

(b) Give one advantage and one disadvantage of taking a census.

Advantage

[1]

Disadvantage

[1]

(c) Suggest a reason why the Visitor Attraction Survey could be incomplete.

[1]

Electronic counters were used by 23% of attractions to record the numbers of visitors to them.

(d) (i) Explain how an electronic counter could over-count the number of visitors.

[1]

(ii) Explain how an electronic counter could under-count the number of visitors.

[1]

Examiner Only	
Marks	Remark

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

		Examiner Only					
		Marks	Remark				

**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]

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

Examiner Only	
Marks	Remark

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?

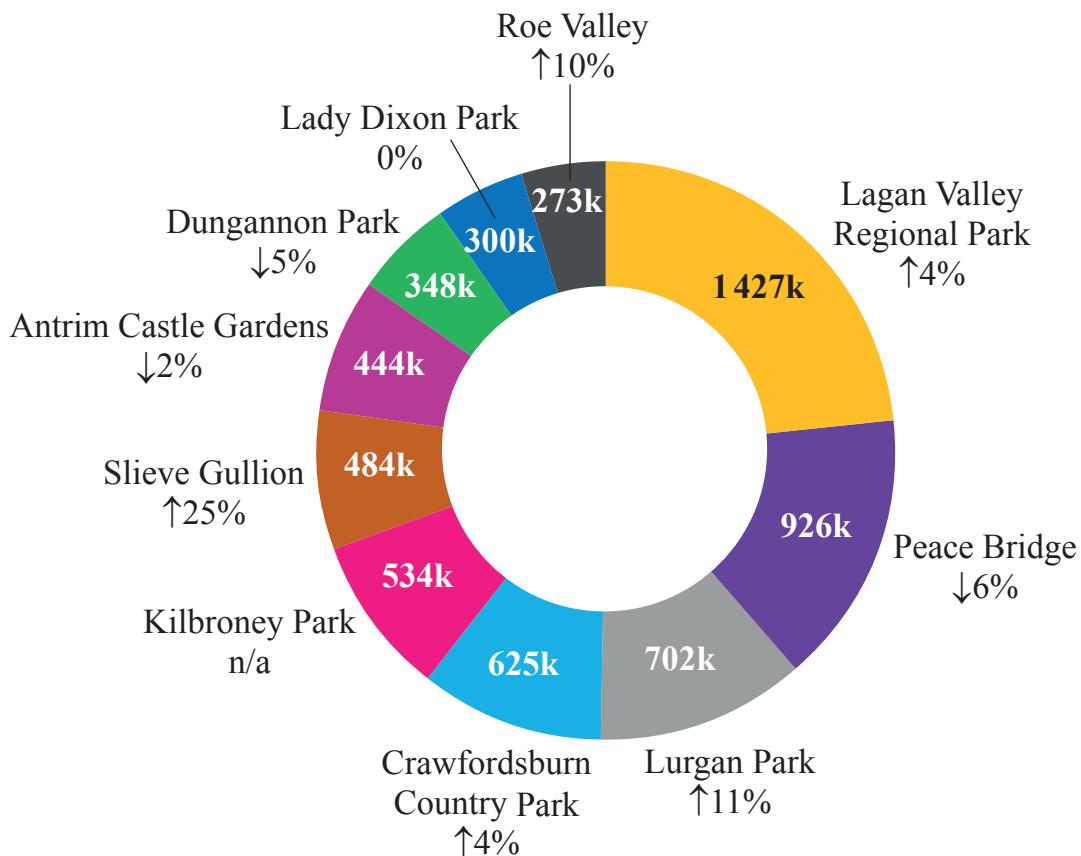
_____ [1]

(ii) Give a reason for your answer.

[1]

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.

[2]

The population of Northern Ireland is approximately 1.852 million.

Kerrie says that half of the population of Northern Ireland visited the Peace Bridge in 2017

(f) (i) Do you think Kerrie is correct?

Yes

No

[1]

(ii) Give two reasons for your answer.

1. _____

_____ [1]

2. _____

_____ [1]

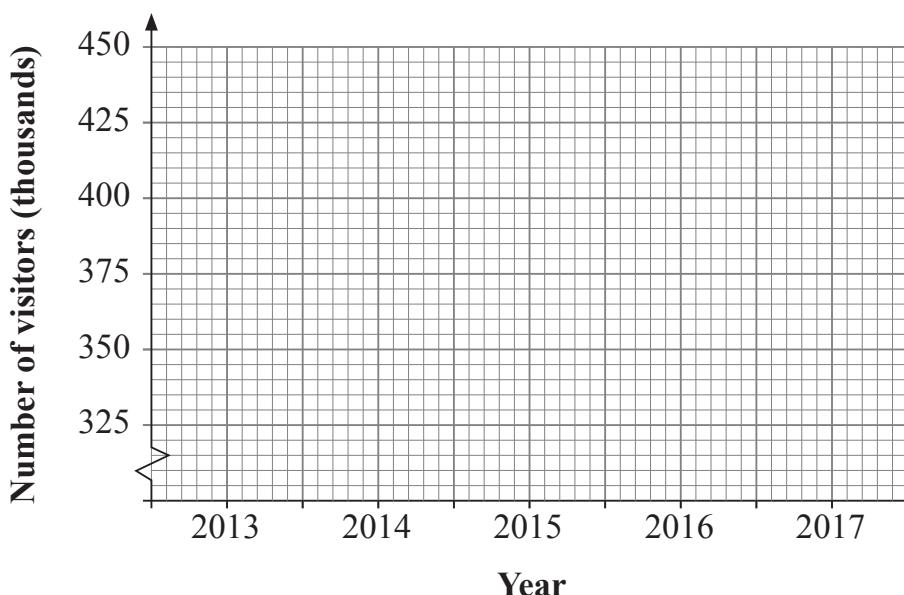
3 The table below shows the number of visitors, in thousands, to some visitor attractions in Northern Ireland between 2013 and 2017

		Examiner Only					
		Marks	Remark				

**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]

(b) (i) In which year did the fewest visitors come to Derry's Walls?

Answer _____ [1]

(ii) Explain how this is shown on the graph.

[1]

(c) Describe briefly the trend in the number of visitors to Derry's Walls over the five-year period.

[2]

Taking 2013 as the base year, Barry calculated index numbers for the number of visitors to Derry's Walls. His results were:

90.0 100 101.9 98.1 92.7

Barry has written these down in the wrong order.

(d) Complete the table below using Barry's values.

Year	2013	2014	2015	2016	2017
No. of visitors (thousands)	411	370	381	403	419
Index number					

[3]

4 Keith reads a report about visits to visitor attractions.

The report says:

- there were an estimated 15.0 million visits to visitor attractions in 2016; and
- there were a reported 19.8 million visits to visitor attractions in 2017 by respondents to a survey.

Keith decides to use the statistical enquiry cycle to investigate if there was an increase in the number of visits to all visitor attractions between 2016 and 2017

(a) Explain how Keith could plan his investigation.

Your answer should include:

- a suitable hypothesis for Keith's investigation
- what data Keith would need to collect
- a possible source for the data
- one problem Keith might encounter with his data collection and how this could be overcome.

[6]

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

Explanation

Calculation

Explanation

[4]

Examiner Only	
Marks	Remark

5 The manager of a gift shop recorded the number of orders she received over a period of 15 days.

The results are shown in the stem and leaf diagram below.

KEY

0 | 2 means 2 orders

0	2	3
1	1	2
2	4	4
3	6	8
4	9	
5	0	1
6	2	3
7	3	7
8	2	

(a) For the orders received over the 15-day period,

(i) find the median;

Answer _____ [1]

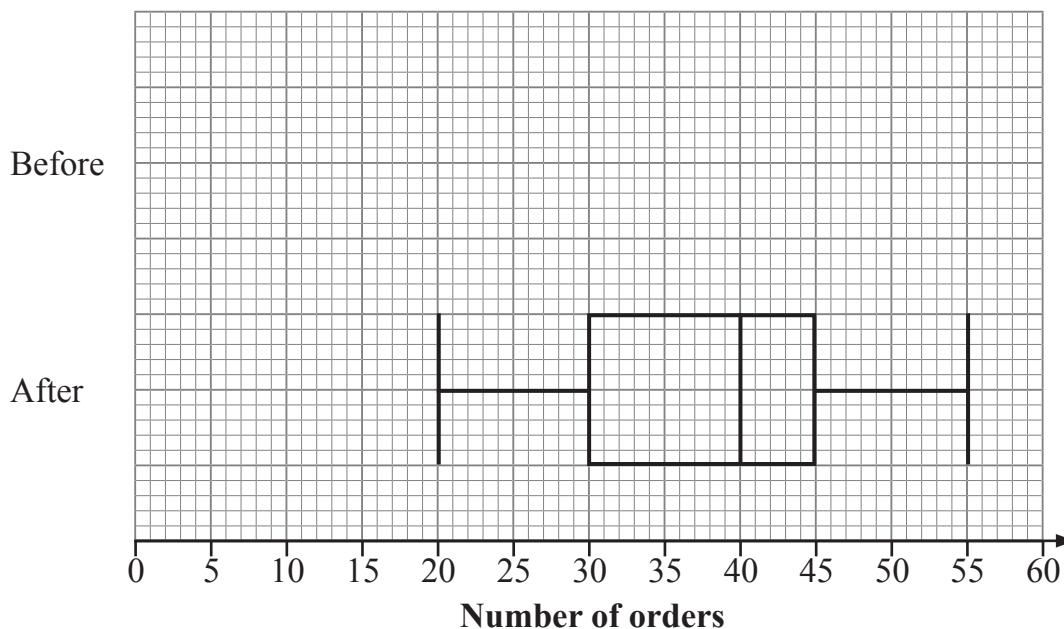
(ii) calculate the interquartile range.

Answer _____ [2]

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.

[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.

Admission charge	£4.00	£5.30	£2.50	£7.80	£6.20	£9.40	£11.00	£8.30
Number of visitors (thousands)	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).

[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

Carla estimates the standard deviation for the masses of the suitcases to be 4.79 kg.

She says that two-thirds of the suitcases should have masses between 10.87 kg and 20.45 kg.

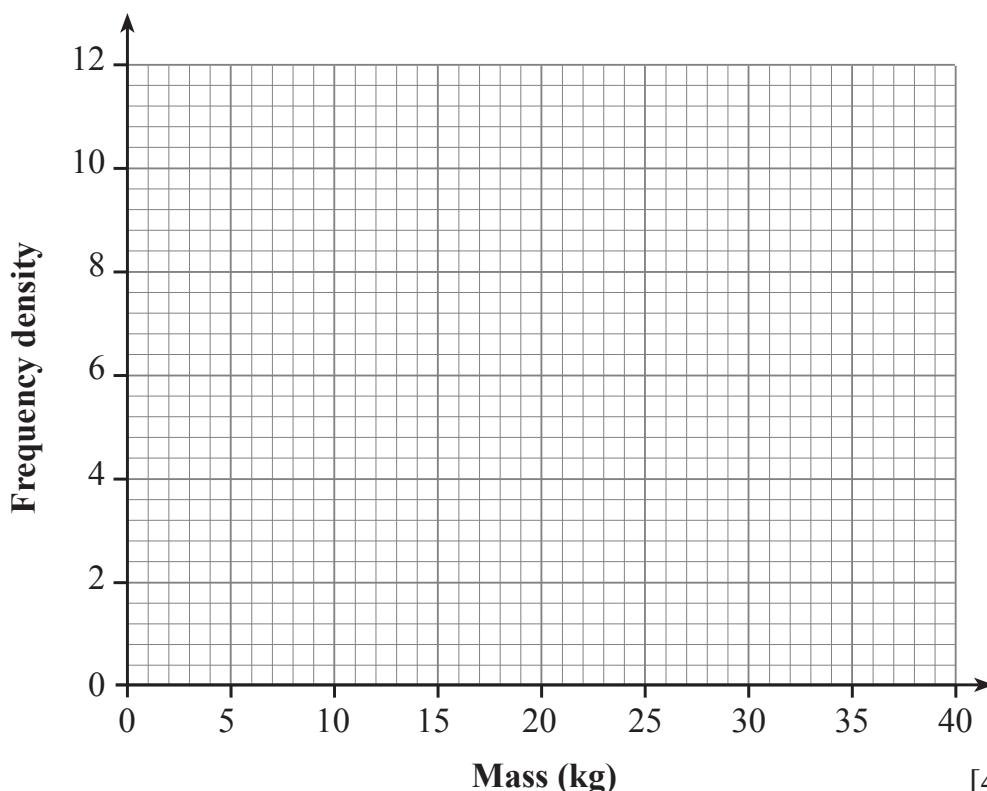
(c) Show how Carla arrived at these numbers.

[2]

(d) What assumption did Carla make about the distribution of masses of the suitcases?

[1]

(e) Draw a histogram to display the data from the frequency table.



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

[2]

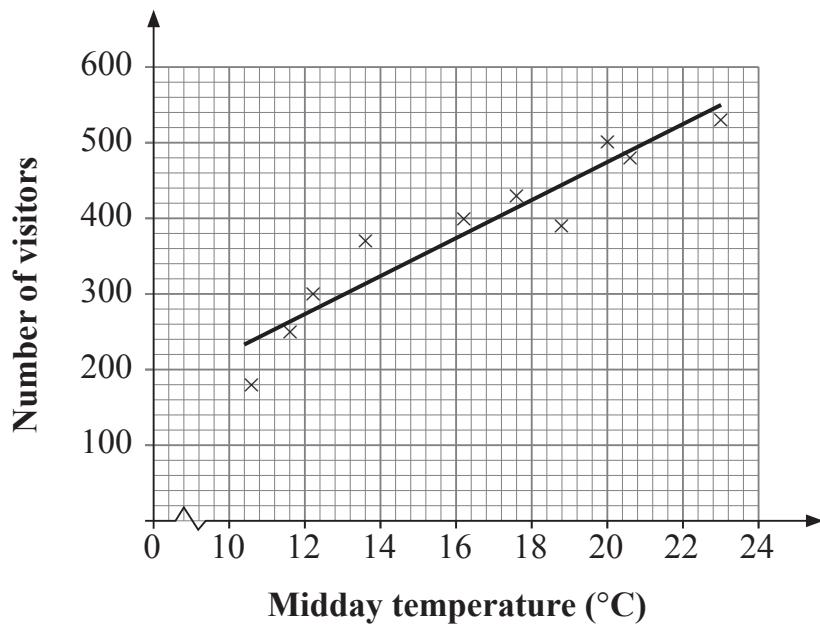
Examiner Only	
Marks	Remark

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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.

Qualitative

Univariate

Bivariate

Ordinal

Quantitative

Categorical

[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.

[1]

The equation of the line of best fit is $y = -25.5 + 24.9x$

(d) Give an interpretation, in context, of the number 24.9 in the equation.

[2]

(e) Use the equation of the line of best fit to estimate the number of visitors to the park when the midday temperature is 16°C

Answer _____ [2]

One Saturday in January, the midday temperature was 0°C

Kieran used the equation of the line of best fit to estimate the number of visitors to the park.

(f) Write down Kieran's result.

Answer _____ [1]

(g) Give two reasons why Kieran's use of the line of best fit was inappropriate.

1. _____

[1]

2. _____

[1]

Examiner Only	
Marks	Remark

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]

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.

	Bronze	Silver	Gold
2016	£15.99	£17.99	£19.49
2017	£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.

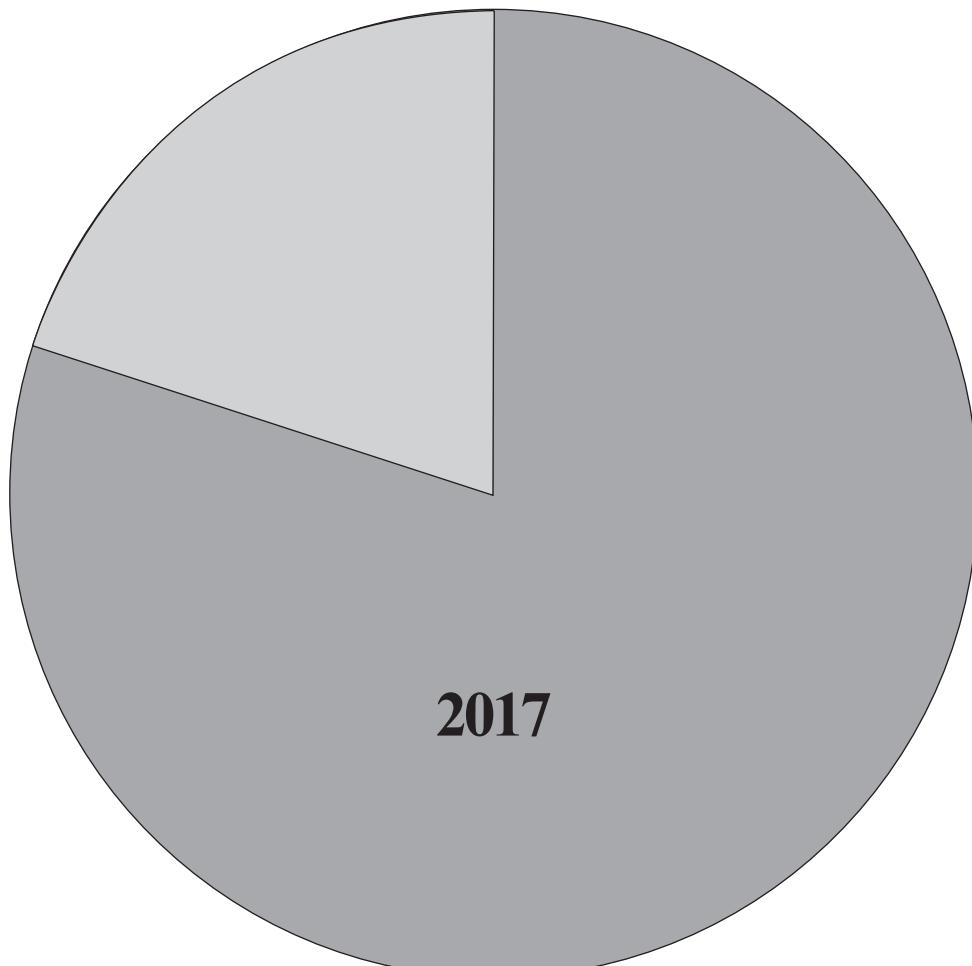
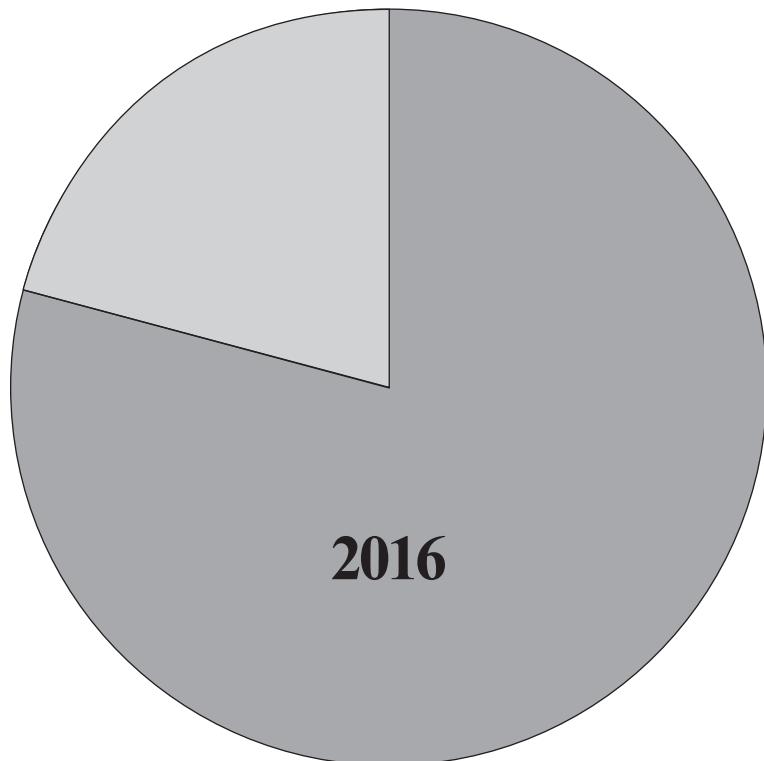
Answer _____ [5]

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

[1]

10 The comparative pie charts below show the proportions of adults and children who visited a church in 2016 and 2017

Examiner Only	
Marks	Remark



Adult  Child 

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

_____ [1]

Examiner Only	
Marks	Remark

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]

THIS IS THE END OF THE QUESTION PAPER

Sources

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General Certificate of Education
2019

Statistics

Pre-Release Materials for
Unit 2
Foundation and Higher

[GST21/GST22]

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)

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

Totals may not add to 100% due to rounding.

Data Quality Report

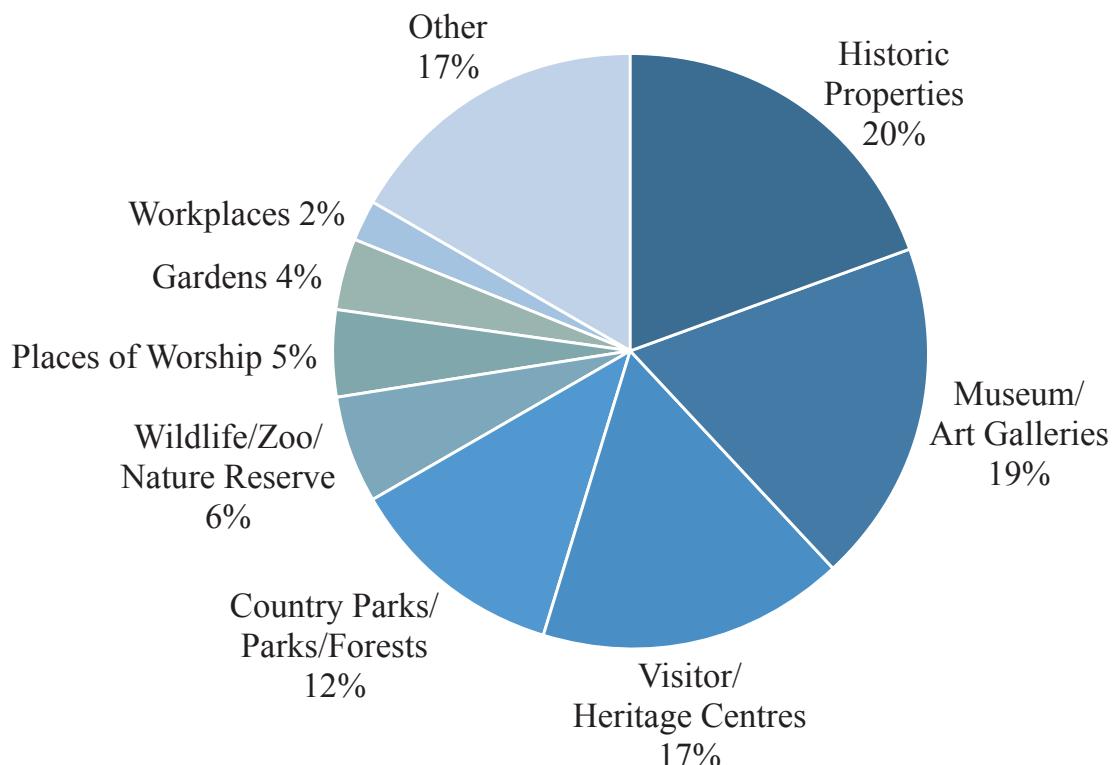
Relevance	Primary Purposes	The primary purpose of the Visitor Attraction Survey is to give an indication on how the tourism industry is performing in Northern Ireland by the number of visits to local attractions.
	Strengths	The Visitor Attraction Survey gives an indication of how tourism is performing locally. The surveys are completed by the attractions themselves so can give indications on external factors influencing tourism.
	Limitations	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.
	Annual	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.
Content and Development	Questionnaire	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.
	Data Validation Methods	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.
Accuracy	Errors	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%
Total	242	100%

Totals may not add to 100% due to rounding.

Responding attractions by category type

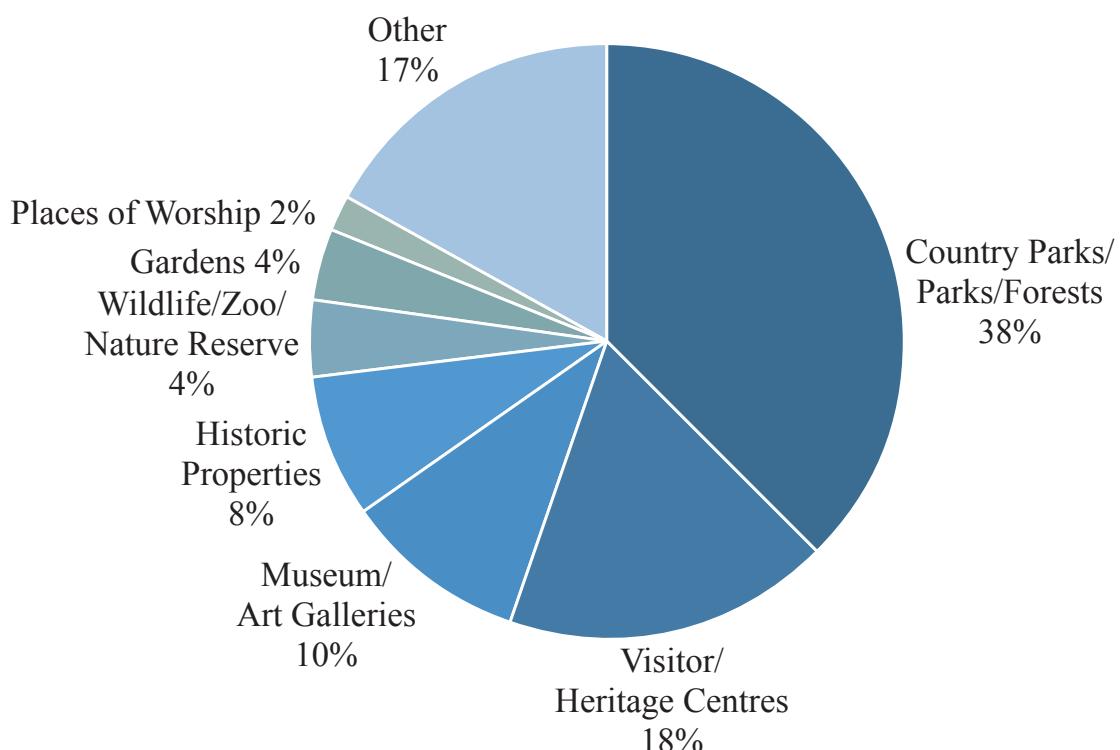


Number of visits by Attraction Category

Attraction Category	Number of Visitors	(%)
Country Parks/Parks/Forests	7 449 056	38%
Gardens	7 109 17	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%
Total (242 responding attractions)	19 760 323	100%

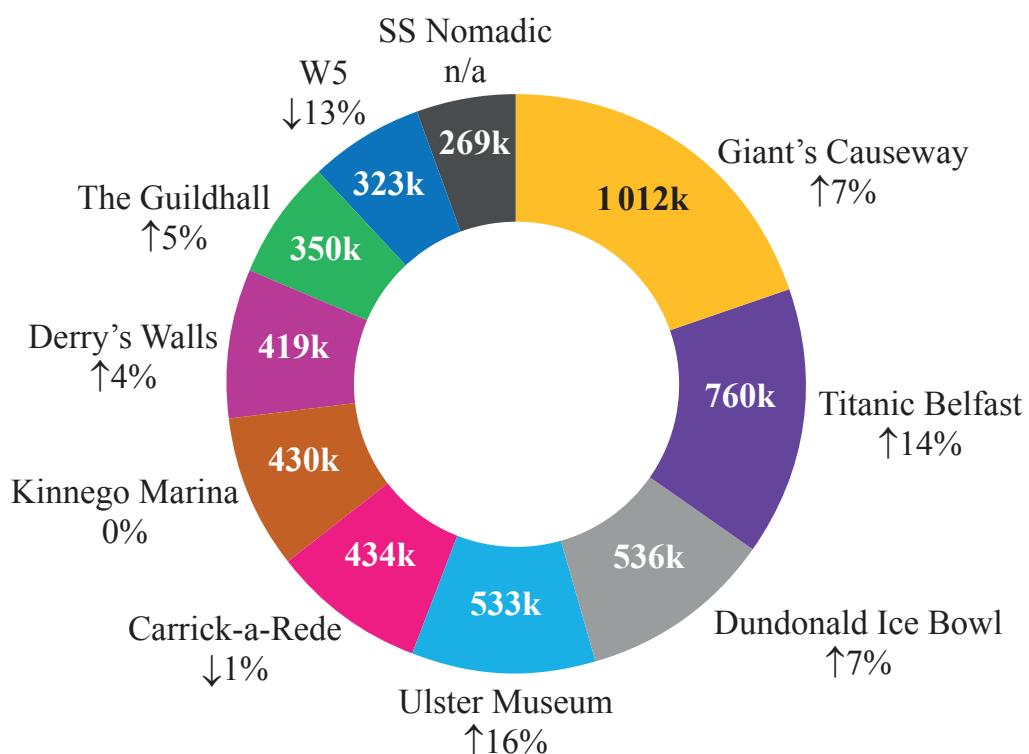
Totals may not add to 100% due to rounding.

Visits by category type



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

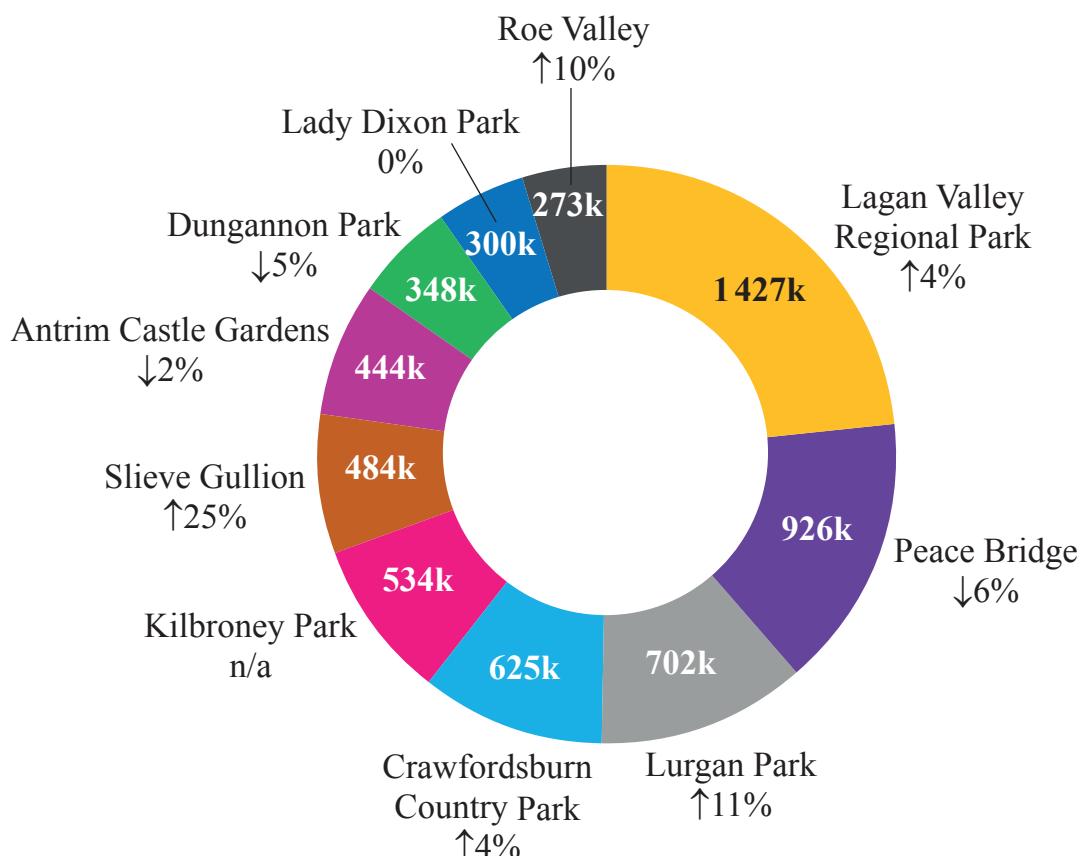
		Number of visitors (thousands)				
		2013	2014	2015	2016	2017
1	Giant's Causeway World Heritage Site	754	788	851	944	1 012
2	Titanic Belfast	604	634	622	667	760
3	Dundonald International Ice Bowl	n/a	n/a	n/a	500	536
4	Ulster Museum	416	466	465	460	533
5	Carrick-a-Rede Rope Bridge	263	324	354	440	434
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
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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.

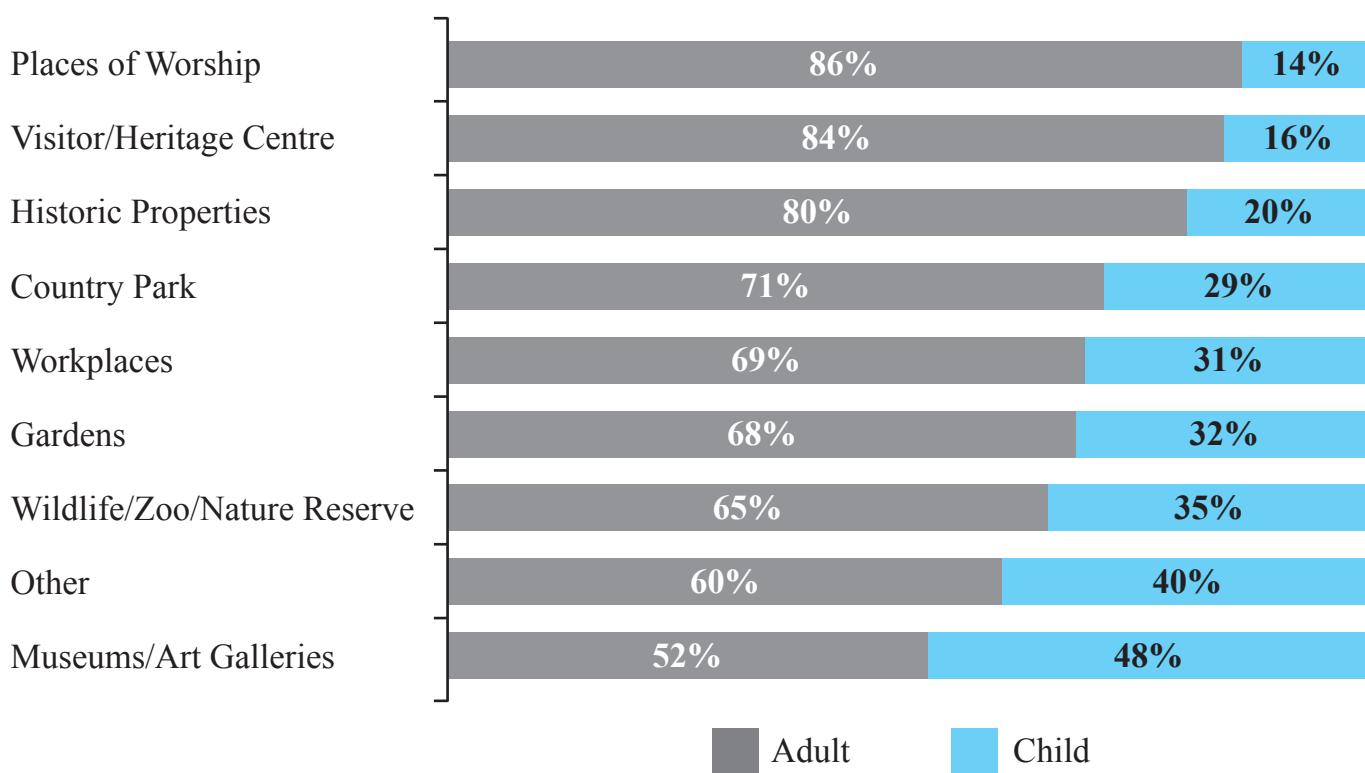
Admission charges to responding attractions

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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