HIGHER

3.6 Percentiles and Interpercentile Range: 1-hour Pack

Total Marks

Calculator allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Here are marks scored by 19 candidates.

93, 73, 27, 32, 76, 61, 42, 46, 24, 95, 83, 72, 75, 58, 14, 40, 38, 92, 64

Use position (n + 1) x p/100 for the pth percentile, where n is the number of values.

(a) Find the 10th percentile.

(b) Find the 40th percentile.

(c) Work out the interpercentile range between the 10th and 40th percentiles.

(d) The value 61 is in the data. What percentile is it?

(Total for Question 1 is 5 marks)

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2 The table shows the heights, in centimetres, of young trees. There are 68 trees altogether. The cumulative frequency graph is drawn by plotting the upper class boundary against the cumulative frequency and joining the points with straight lines.

Class (cm)	Frequency
$10 < x \leq 30$	20
$30 < x \leq 50$	20
$50 < x \leq 70$	12
$70 < x \leq 90$	6
$90 < x \leq 110$	6
$110 < x \leq 130$	4

(a) Work out the cumulative frequency for each class.

(b) Use linear interpolation between the plotted points to estimate the median. Give your answer to 1 decimal place.

(c) Estimate how many values are less than 40.

(Total for Question 2 is 7 marks)

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3 Here are daily visitors to a shop on 19 days.

92, 42, 22, 88, 37, 14, 98, 82, 95, 44, 83, 50, 71, 62, 76, 34, 99, 77, 84

Use position (n + 1) x p/100 for the pth percentile, where n is the number of values.

(a) Find the 40th percentile.

(b) Find the 60th percentile.

(c) Work out the interpercentile range between the 40th and 60th percentiles.

(d) The value 99 is in the data. What percentile is it?

(Total for Question 3 is 5 marks)

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4 Here are daily visitors to a shop on 19 days.

63, 53, 47, 91, 40, 76, 93, 45, 83, 90, 26, 89, 87, 49, 60, 81, 54, 29, 20

Use position (n + 1) x p/100 for the pth percentile, where n is the number of values.

(a) Find the 30th percentile.

(b) Find the 70th percentile.

(c) Work out the interpercentile range between the 30th and 70th percentiles.

(d) The value 89 is in the data. What percentile is it?

(Total for Question 4 is 5 marks)

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5 The table shows the amounts, in pounds, that shoppers spent. There are 60 shoppers altogether. The cumulative frequency graph is drawn by plotting the upper class boundary against the cumulative frequency and joining the points with straight lines.

Class (pounds)	Frequency
$0 < x \leq 10$	8
$10 < x \leq 20$	12
$20 < x \leq 30$	20
$30 < x \leq 40$	16
$40 < x \leq 50$	4

(a) Work out the cumulative frequency for each class.
(b) The median is the value at position n/2, where n is the total frequency. Write down this position in the cumulative frequency list, and the class that contains the median.

(Total for Question 5 is 4 marks)

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6 Here are times in seconds of 19 runners.

50, 37, 12, 19, 82, 86, 95, 43, 68, 62, 30, 38, 90, 40, 23, 87, 65, 70, 44

Use position (n + 1) x p/100 for the pth percentile, where n is the number of values.

(a) Find the 20th percentile.

(b) Find the 80th percentile.

(c) Work out the interpercentile range between the 20th and 80th percentiles.

(d) The value 50 is in the data. What percentile is it?

(Total for Question 6 is 5 marks)

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7 Here are times in seconds of 19 runners.

88, 11, 79, 68, 19, 26, 45, 74, 99, 85, 48, 98, 24, 38, 35, 60, 84, 33, 56

Use position (n + 1) x p/100 for the pth percentile, where n is the number of values.

(a) Find the 40th percentile.

(b) Find the 80th percentile.

(c) Work out the interpercentile range between the 40th and 80th percentiles.

(d) The value 35 is in the data. What percentile is it?

(Total for Question 7 is 5 marks)

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8 The table shows the masses, in grams, of apples picked. There are 68 apples altogether. The cumulative frequency graph is drawn by plotting the upper class boundary against the cumulative frequency and joining the points with straight lines.

Class (g)	Frequency
$0 < x \leq 10$	6
$10 < x \leq 20$	20
$20 < x \leq 30$	10
$30 < x \leq 40$	16
$40 < x \leq 50$	16

(a) Work out the cumulative frequency for each class.

(b) Use linear interpolation between the plotted points to estimate the median. Give your answer to 1 decimal place.

(c) Estimate how many values are less than 35.

(Total for Question 8 is 7 marks)

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9 Here are daily visitors to a shop on 19 days.

93, 74, 72, 19, 11, 73, 78, 57, 26, 80, 38, 42, 77, 75, 27, 69, 37, 44, 25

Use position (n + 1) x p/100 for the pth percentile, where n is the number of values.

(a) Find the 10th percentile.

(b) Find the 20th percentile.

(c) Work out the interpercentile range between the 10th and 20th percentiles.

(d) The value 26 is in the data. What percentile is it?

(Total for Question 9 is 5 marks)

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10 Here are times in seconds of 19 runners.

72, 67, 97, 43, 17, 30, 52, 38, 63, 22, 20, 92, 60, 94, 84, 27, 91, 88, 59

Use position (n + 1) x p/100 for the pth percentile, where n is the number of values.

(a) Find the 25th percentile.

(b) Find the 60th percentile.

(c) Work out the interpercentile range between the 25th and 60th percentiles.

(d) The value 20 is in the data. What percentile is it?

(Total for Question 10 is 5 marks)

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11 The table shows the speeds, in km/h, of cars on a road. There are 68 cars altogether. The cumulative frequency graph is drawn by plotting the upper class boundary against the cumulative frequency and joining the points with straight lines.

Class (km/h)	Frequency
$20 < x \leq 40$	8
$40 < x \leq 60$	15
$60 < x \leq 80$	12
$80 < x \leq 100$	9
$100 < x \leq 120$	8
$120 < x \leq 140$	16

(a) Work out the cumulative frequency for each class.

(b) Use linear interpolation between the plotted points to estimate the median. Give your answer to 1 decimal place.

(c) Estimate how many values are less than 110.

(Total for Question 11 is 7 marks)

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Mark scheme · 3.6 Percentiles and Interpercentile Range: 1-hour Pack

Question 1

values in order; position 2 used	**M1**
24	**A1**
46	**A1**
22	**B1**
50th percentile (position 10 of 20)	**B1**

Answer: (a) 24; (b) 46; (c) 22; (d) 50th percentile

Question 2

running totals of the frequencies	**M1**
20, 40, 52, 58, 64, 68 cao	**A1**
uses 34 on the cumulative frequency axis	**M1**
linear interpolation within the class	**M1**
44 cao (accept values within 1 of this)	**A1**
reads or interpolates the cumulative frequency at 40	**M1**
30 cao	**A1**

Answer: (a) 20, 40, 52, 58, 64, 68; (b) 44; (c) 30

Question 3

values in order; position 8 used	**M1**
62	**A1**
82	**A1**
20	**B1**
95th percentile (position 19 of 20)	**B1**

Answer: (a) 62; (b) 82; (c) 20; (d) 95th percentile

Question 4

values in order; position 6 used	**M1**
47	**A1**
83	**A1**
36	**B1**
80th percentile (position 16 of 20)	**B1**

Answer: (a) 47; (b) 83; (c) 36; (d) 80th percentile

Question 5

running totals of the frequencies	**M1**
8, 20, 40, 56, 60 cao	**A1**
position 30	**B1**
$20 < x \leq 30$	**B1**

Answer: (a) 8, 20, 40, 56, 60; (b) position 30; class $20 < x \leq 30$

Question 6

values in order; position 4 used	**M1**
30	**A1**
86	**A1**
56	**B1**
50th percentile (position 10 of 20)	**B1**

Answer: (a) 30; (b) 86; (c) 56; (d) 50th percentile

Question 7

values in order; position 8 used	**M1**
45	**A1**
85	**A1**
40	**B1**
30th percentile (position 6 of 20)	**B1**

Answer: (a) 45; (b) 85; (c) 40; (d) 30th percentile

Question 8

running totals of the frequencies	**M1**
6, 26, 36, 52, 68 cao	**A1**
uses 34 on the cumulative frequency axis	**M1**
linear interpolation within the class	**M1**
28 cao (accept values within 1 of this)	**A1**
reads or interpolates the cumulative frequency at 35	**M1**
44 cao	**A1**

Answer: (a) 6, 26, 36, 52, 68; (b) 28; (c) 44

Question 9

values in order; position 2 used	**M1**
19	**A1**
26	**A1**
7	**B1**
20th percentile (position 4 of 20)	**B1**

Answer: (a) 19; (b) 26; (c) 7; (d) 20th percentile

Question 10

values in order; position 5 used	**M1**
30	**A1**
67	**A1**
37	**B1**
10th percentile (position 2 of 20)	**B1**

Answer: (a) 30; (b) 67; (c) 37; (d) 10th percentile

Question 11

running totals of the frequencies	**M1**
8, 23, 35, 44, 52, 68 cao	**A1**
uses 34 on the cumulative frequency axis	**M1**
linear interpolation within the class	**M1**
78.3 cao (accept values within 1 of this)	**A1**
reads or interpolates the cumulative frequency at 110	**M1**
48 cao	**A1**

Answer: (a) 8, 23, 35, 44, 52, 68; (b) 78.3; (c) 48

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