Statistics Unit 1 worksheet: Cumulative frequency graphs and percentiles

Name _____ Date _____ Period _____

1. A help desk logged the lengths of 50 phone calls, in minutes. A call on a class boundary goes in the class to its right.

Call length (minutes)	0 to 4	4 to 8	8 to 12	12 to 16	16 to 20	20 to 24
Count	4	9	15	12	7	3

(a) Make a table of the cumulative frequency and the cumulative percent at each upper boundary.

(b) List every point of the cumulative frequency graph, and sketch the graph.

(c) Which segment of the graph is steepest, and what is its slope, with units?

(d) How many calls lasted 12 minutes or more? Is your answer exact or an estimate?

2. After a hailstorm, a weather office measured the diameters of 54 hailstones, in millimeters. A diameter on a class boundary goes in the class to its right.

Diameter (mm)	10 to 15	15 to 20	20 to 25	25 to 30	30 to 35
Count	4	20	13	15	2

Use the cumulative frequency graph of these counts, with straight segments between its points.

(a) Estimate the percentile rank of a diameter of 19 mm.

(b) Estimate the percentile rank of a diameter of 29 mm.

(c) Estimate how many hailstones measured between 19 and 29 mm, and how many measured more than 29 mm.

Give percentile ranks to the nearest tenth of a percent.

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3. The finishing times of the 200 runners in a city marathon, in minutes, are grouped below. A time on a class boundary goes in the class to its right.

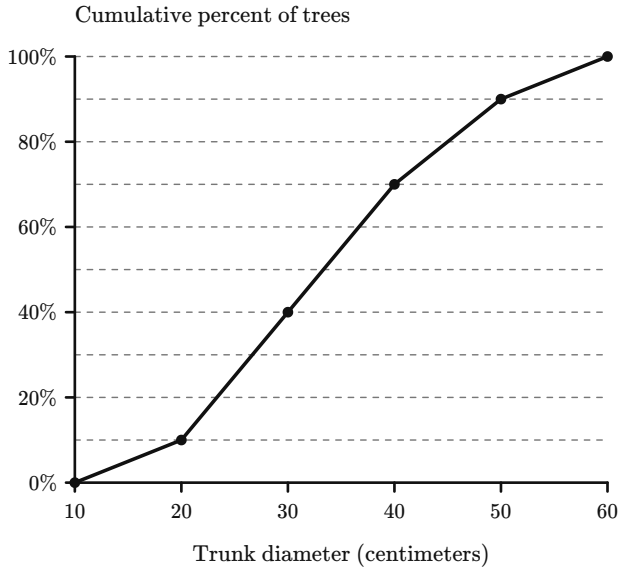
Time (minutes)	180 to 210	210 to 240	240 to 270	270 to 300	300 to 330	330 to 360
Runners	12	34	58	50	30	16

(a) Estimate the median finishing time.

(b) Estimate Q_1, Q_3 and the interquartile range, and say what the interquartile range tells you about the runners.

Give each time to the nearest tenth of a minute.

4. A forest survey measured the trunk diameters of 120 trees in one plot. Its report shows them only as the cumulative relative frequency graph below.



(a) Find the number of trees in each 10 cm class.

(b) Estimate the percentile rank of a trunk 45 cm across.

(c) Estimate the diameter that 60 percent of the trunks are narrower than, to the nearest tenth of a centimeter.

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5. A marathon's 200 finishing times were first grouped into six 30 minute classes from 180 to 360 minutes, with counts 12, 34, 58, 50, 30 and 16. From that table the 10th percentile is about 217.1 minutes. The race website regroups the same times into four classes:

Time (minutes)	180 to 240	240 to 270	270 to 300	300 to 360
Runners	46	58	50	46

(a) Which points of the six-class cumulative frequency graph disappear on the four-class graph? Do the other points move?

(b) Estimate the 10th percentile from the four-class table, to the nearest tenth of a minute.

(c) The race gives a medal to every runner under your time in (b). Use the six-class table to estimate how many runners that is.

(d) Explain why the answer to (c) is far from 20 runners, and which estimate of the 10th percentile you trust more.

6. Two data sets of 30 values each are both grouped into the classes 0 to 10, 10 to 20 and 20 to 30, with counts 6, 18 and 6 in each data set. A value on a boundary goes in the class to its right.

(a) The two data sets have the same cumulative frequency graph. Must they have the same median? Explain, with an example.

(b) Can the graph tell you the largest value in either data set? Explain.

(c) One data set contains a value of exactly 20. Is it counted in the height of the graph at 20? At which plotted point is it first counted?

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