Name: _____ Date: _____

Waiting time set 1

Waiting times have been grouped into equal width classes. Each lower boundary is included; each upper boundary is excluded.

Time (minutes)	Frequency	Relative frequency
10 <= x < 20	2	0.0667
20 <= x < 30	6	0.2000
30 <= x < 40	14	0.4667
40 <= x < 50	6	0.2000
50 <= x < 60	2	0.0667

(a) Complete the relative frequency column as decimals rounded to four places. State the exact and rounded totals.

Set it up: Whole group: all waiting times. Relative frequency = class frequency / total frequency.

Work: n = 30. 2/30 = 0.0667; 6/30 = 0.2000; 14/30 = 0.4667; 6/30 = 0.2000; 2/30 = 0.0667. The exact fractions sum to 1; displayed rounded values sum to 1.0001.

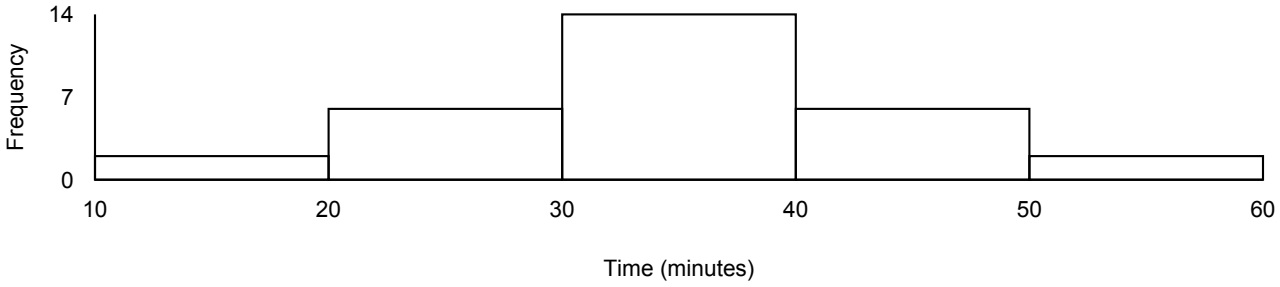
Answer: Relative frequencies: 0.0667, 0.2000, 0.4667, 0.2000, 0.0667. Exact total = 1. Rounded total = 1.0001.

(b) Draw a frequency histogram with touching bars. Label both axes.

Set it up: Horizontal axis: time classes. Vertical axis: frequency. Heights equal the class counts.

Work: Class boundaries: 10, 20, 30, 40, 50, 60. Bar heights: 2, 6, 14, 6, 2.

Answer: The completed histogram has one touching bar for each class, using the stated frequency as its height.



(c) Describe the shape. Which class contains a waiting time of 30 minutes?

Set it up: A class includes its lower boundary and excludes its upper boundary. Shape depends on where the tail extends.

Work: The heights mirror each other around the middle class. The value 30 satisfies 30 <= x < 40.

Answer: Approximately symmetric and unimodal. 30 belongs in the class 30 <= x < 40.

(d) Estimate the mean with class midpoints. Can you recover the exact raw mean or exact median from this table alone?

Set it up: Estimated mean = sum of (class midpoint times frequency) / total count.

Work: Midpoints: 15, 25, 35, 45, 55. Weighted total = (15 x 2) + (25 x 6) + (35 x 14) + (45 x 6) + (55 x 2) = 1050. Estimate = 1050/30 = 35.000.

Answer: Estimated mean = 35.000 minutes. Neither the exact raw mean nor the exact median can be recovered. For the approximately symmetric distribution, a mean is reasonable.

Waiting time set 2

Waiting times have been grouped into equal width classes. Each lower boundary is included; each upper boundary is excluded.

Time (minutes)	Frequency	Relative frequency
20 <= x < 30	15	0.5000
30 <= x < 40	8	0.2667
40 <= x < 50	4	0.1333
50 <= x < 60	2	0.0667
60 <= x < 70	1	0.0333

(a) Complete the relative frequency column as decimals rounded to four places. State the exact and rounded totals.

Set it up: Whole group: all waiting times. Relative frequency = class frequency / total frequency.

Work: n = 30. 15/30 = 0.5000; 8/30 = 0.2667; 4/30 = 0.1333; 2/30 = 0.0667; 1/30 = 0.0333. The exact fractions sum to 1; displayed rounded values sum to 1.0000.

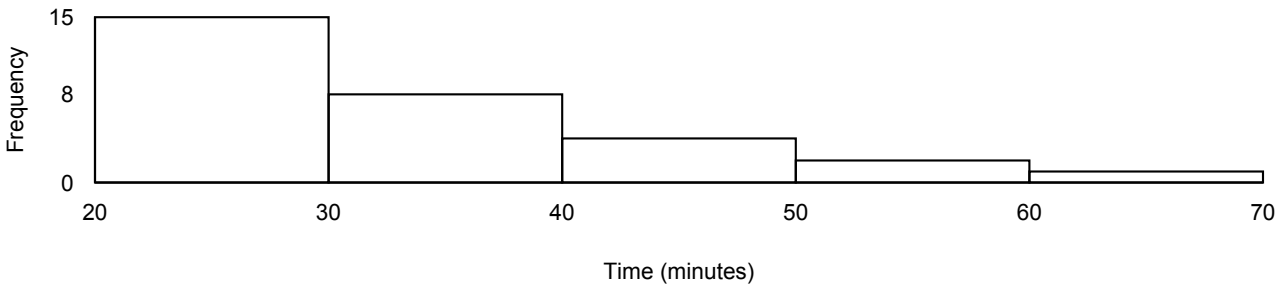
Answer: Relative frequencies: 0.5000, 0.2667, 0.1333, 0.0667, 0.0333. Exact total = 1. Rounded total = 1.0000.

(b) Draw a frequency histogram with touching bars. Label both axes.

Set it up: Horizontal axis: time classes. Vertical axis: frequency. Heights equal the class counts.

Work: Class boundaries: 20, 30, 40, 50, 60, 70. Bar heights: 15, 8, 4, 2, 1.

Answer: The completed histogram has one touching bar for each class, using the stated frequency as its height.



(c) Describe the shape. Which class contains a waiting time of 40 minutes?

Set it up: A class includes its lower boundary and excludes its upper boundary. Shape depends on where the tail extends.

Work: Most counts are at the lower times, with a tail toward larger times. The value 40 satisfies 40 <= x < 50.

Answer: Right skewed. 40 belongs in the class 40 <= x < 50.

(d) Estimate the mean with class midpoints. Can you recover the exact raw mean or exact median from this table alone?

Set it up: Estimated mean = sum of (class midpoint times frequency) / total count.

Work: Midpoints: 25, 35, 45, 55, 65. Weighted total = (25 x 15) + (35 x 8) + (45 x 4) + (55 x 2) + (65 x 1) = 1010. Estimate = 1010/30 = 33.667.

Answer: Estimated mean = 33.667 minutes. Neither the exact raw mean nor the exact median can be recovered. For this skewed distribution, the median is a suitable resistant center, though its exact value is unavailable here.

Waiting time set 3

Waiting times have been grouped into equal width classes. Each lower boundary is included; each upper boundary is excluded.

Time (minutes)	Frequency	Relative frequency
30 <= x < 40	1	0.0333
40 <= x < 50	2	0.0667
50 <= x < 60	4	0.1333
60 <= x < 70	8	0.2667
70 <= x < 80	15	0.5000

(a) Complete the relative frequency column as decimals rounded to four places. State the exact and rounded totals.

Set it up: Whole group: all waiting times. Relative frequency = class frequency / total frequency.

Work: n = 30. 1/30 = 0.0333; 2/30 = 0.0667; 4/30 = 0.1333; 8/30 = 0.2667; 15/30 = 0.5000. The exact fractions sum to 1; displayed rounded values sum to 1.0000.

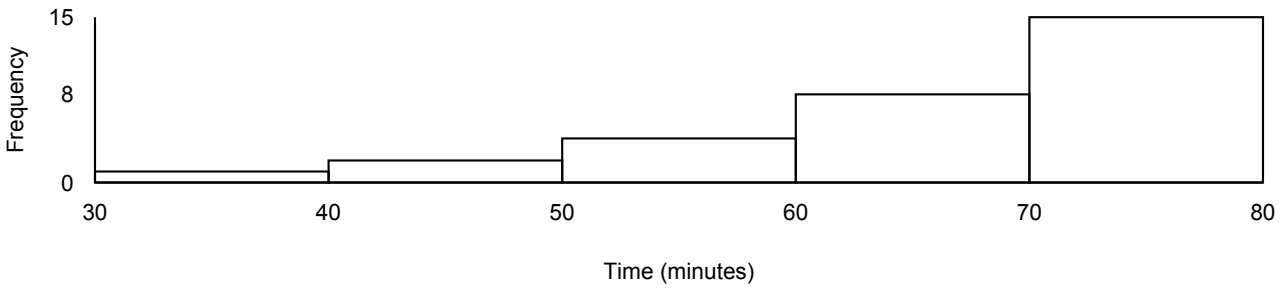
Answer: Relative frequencies: 0.0333, 0.0667, 0.1333, 0.2667, 0.5000. Exact total = 1. Rounded total = 1.0000.

(b) Draw a frequency histogram with touching bars. Label both axes.

Set it up: Horizontal axis: time classes. Vertical axis: frequency. Heights equal the class counts.

Work: Class boundaries: 30, 40, 50, 60, 70, 80. Bar heights: 1, 2, 4, 8, 15.

Answer: The completed histogram has one touching bar for each class, using the stated frequency as its height.



(c) Describe the shape. Which class contains a waiting time of 50 minutes?

Set it up: A class includes its lower boundary and excludes its upper boundary. Shape depends on where the tail extends.

Work: Most counts are at the higher times, with a tail toward smaller times. The value 50 satisfies 50 <= x < 60.

Answer: Left skewed. 50 belongs in the class 50 <= x < 60.

(d) Estimate the mean with class midpoints. Can you recover the exact raw mean or exact median from this table alone?

Set it up: Estimated mean = sum of (class midpoint times frequency) / total count.

Work: Midpoints: 35, 45, 55, 65, 75. Weighted total = (35 x 1) + (45 x 2) + (55 x 4) + (65 x 8) + (75 x 15) = 1990. Estimate = 1990/30 = 66.333.

Answer: Estimated mean = 66.333 minutes. Neither the exact raw mean nor the exact median can be recovered. For this skewed distribution, the median is a suitable resistant center, though its exact value is unavailable here.