13.

Favorite Coffee Flavor

A survey was taken asking the favorite flavor of a coffee drink a person prefers. The responses were V = Vanilla (香草), C = Caramel (焦糖), M= Mocha (摩卡), H = Hazelnut (榛果), and P = Plain (純). Construct a categorical frequency distribution for the data. Which class has the most data values and which class has the fewest data values?

V	C	P	P	M	M	P	P	M	C
M	M	V	M	M	M	V	M	M	M
P	V	C	M	V	M	C	P	M	P
M	M	M	P	M	M	C	V	M	C
C	P	M	P	M	H	H	P	H	P

1 Class	2 Tally (紀錄)	3 Frequency	4 Percent = $\frac{freq}{total}$
V	⁄⁄⁄⁄ ⁄	6	12%
C	⁄⁄⁄⁄ ⁄⁄	7	14%
M	⁄⁄⁄⁄ ⁄⁄⁄⁄ ⁄⁄⁄⁄ ⁄⁄⁄⁄ ⁄⁄	22	44%
H	⁄⁄⁄	3	6%
P	⁄⁄⁄⁄ ⁄⁄⁄⁄ ⁄⁄	12	24%
		Total = 50	100%

The class of mocha has the most data values, the class of hazelnut has the fewest data values.

15.

Eating at Fast Food Restaurants

A survey was taken of 50 individuals. They were asked how many days per week they ate at a fast-food classes restaurant. Construct a the frequency distribution using 8 classes (0-7). Based on the distribution, how often did most people eat at a fastfood restaurant?

1	3	4	0	4
5	2	2	3	1
2	2	2	2	2
2	2	2	2	3
2	2	5	2	4
2	4	5	2	1
4	1	3	2	2
2	0	7	2	3
2	2	2	5	2
3	3	4	1	3

1 Class	2 Tally (紀錄)	3 Frequency	4 Percent = $\frac{freq}{total}$
0	//	2	4%
1	////	5	10%
2	//// //// //// //// ////	24	48%
3	//// ///	8	16%
4	//// /	6	12%
5	////	4	8%
6		0	0%
7	/	1	2%
		Total = 50	100%

The category "twice a week" has more values than any other category.

Maximum Wind Speeds

The data show the maximum wind speeds in miles (英里) per hour recorded for 40 states.

Construct a frequency distribution using 7 classes.

17.

59	78	62	72	67
76	92	77	64	83
64	70	67	75	75
78	75	71	72	93
68	69	76	72	85
64	70	77	74	72
53	67	48	76	59
87	53	77	70	63

$L = 48, \ H = 93 \ \rightarrow \ R = H - L = 45 \ \rightarrow \ Width = \frac{45}{7} = 6.43$ round up to 7

1 Class limits		2 Boundaries		3	4
lower limits	upper limits	lower boundary = lower limits − 0.5	upper boundary = upper limits + 0.5	Tally (紀錄)	Frequency
48	54	47.5	54.5	///	3
55	61	54.5	61.5	//	2
62	68	61.5	68.5	//// ////	9
69	75	68.5	75.5	//// //// ///	13
76	82	75.5	82.5	//// ///	8
83	89	82.5	89.5	///	3
90	96	89.5	96.5	//	2
					Total = 40

	cumulative freq.
less than 47.5	0
less than 54.5	0 + 3 = 3
less than 61.5	3 + 2 = 5
less than 68.5	5 + 9 = 14
less than 75.5	14 + 13 = 27
less than 82.5	27 + 8 = 35
less than 89.5	35 + 3 = 38
less than 96.5	38 + 2 = 40

20.

Salaries of Governors

Here are the salaries (in dollars) of the governors (州長) of 25 randomly selected states. Construct a grouped frequency distribution with 6 classes.

112,895	117,312	140,533	110,000	115,311
95,000	177,500	120,303	139,590	150,000
173,987	130,000	133,821	144,269	142,542
150,000	145,885	105,000	93,600	166,891
130,273	70,000	113,834	117,817	137,092

$L = 70,000, \ H = 177,500 \ \rightarrow \ R = H - L = 107,500 \ \rightarrow \ Width = \frac{107,500}{6} = 17,916.67$ round up to

17,917

1		2		3	4
Class limits		Boundaries		Tally (紀錄)	Frequency
lower limits	upper limits	lower boundary = lower limits − 0.5	upper boundary = upper limits + 0.5		
70,000	87,916	69,999.5	87,916.5	/	1
87,917	105,833	87,916.5	105,833.5	///	3
105,834	123,750	105,833.5	123,750.5	ﬀ //	7
123,751	141,667	123,750.5	141,667.5	ﬀ /	6
141,668	159,584	141,667.5	159,584.5	ﬀ	5
159,585	177,501	159,584.5	177,501.5	///	3
					Total = 25

	cumulative freq.
less than 69,999.5	0
less than 87,916.5	1
less than 105,833.5	4
less than 123,750.5	11
less than 141,667.5	17
less than 159,584.5	22
less than 177,501.5	25

Sec. 2-2 (p.65)

3.

Pupils Per Teacher

The average number of pupils (學生) per teacher in each state is shown. Construct a grouped frequency distribution with 6 classes. Draw a histogram, frequency polygon, and ogive. Analyze the distribution.

16	16	15	12	14
13	16	14	15	14
18	18	18	12	15
15	16	16	15	15
25	19	15	12	22
18	14	13	17	9
13	14	13	16	12
14	16	10	22	20
12	14	18	15	14
16	12	12	13	15

$L = 9, \ H = 25 \ \rightarrow \ R = H - L = 16 \ \rightarrow \ Width = \frac{16}{6} = 2.67$ round up to 3

Class limits		Boundaries		Midpoints = $\dfrac{upper\ boundary + lower\ boundary}{2}$	Frequency
lower limits	upper limits	lower boundary	upper boundary		
9	11	8.5	11.5	10	2
12	14	11.5	14.5	13	20
15	17	14.5	17.5	16	18
18	20	17.5	20.5	19	7
21	23	20.5	23.5	22	2
24	26	23.5	26.5	25	1
					Total = 50

	cumulative freq.
less than 8.5	0
less than 11.5	2
less than 14.5	22
less than 17.5	40
less than 20.5	47
less than 23.5	49
less than 26.5	50

histogram	freq. polygon

ogive
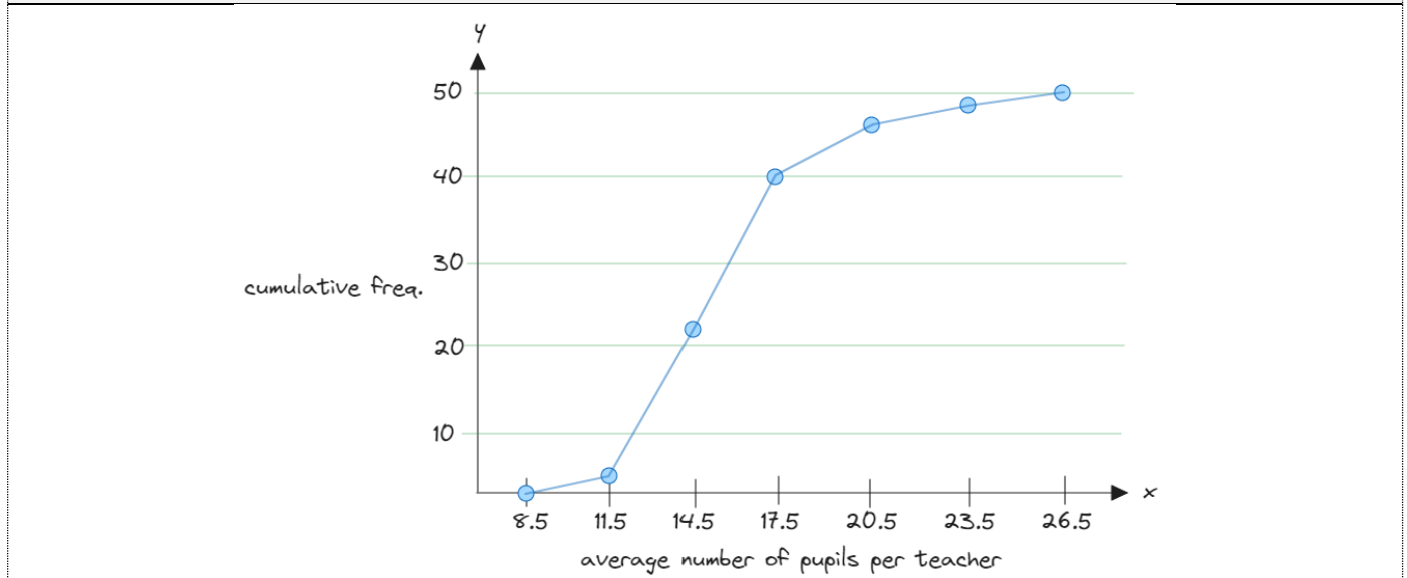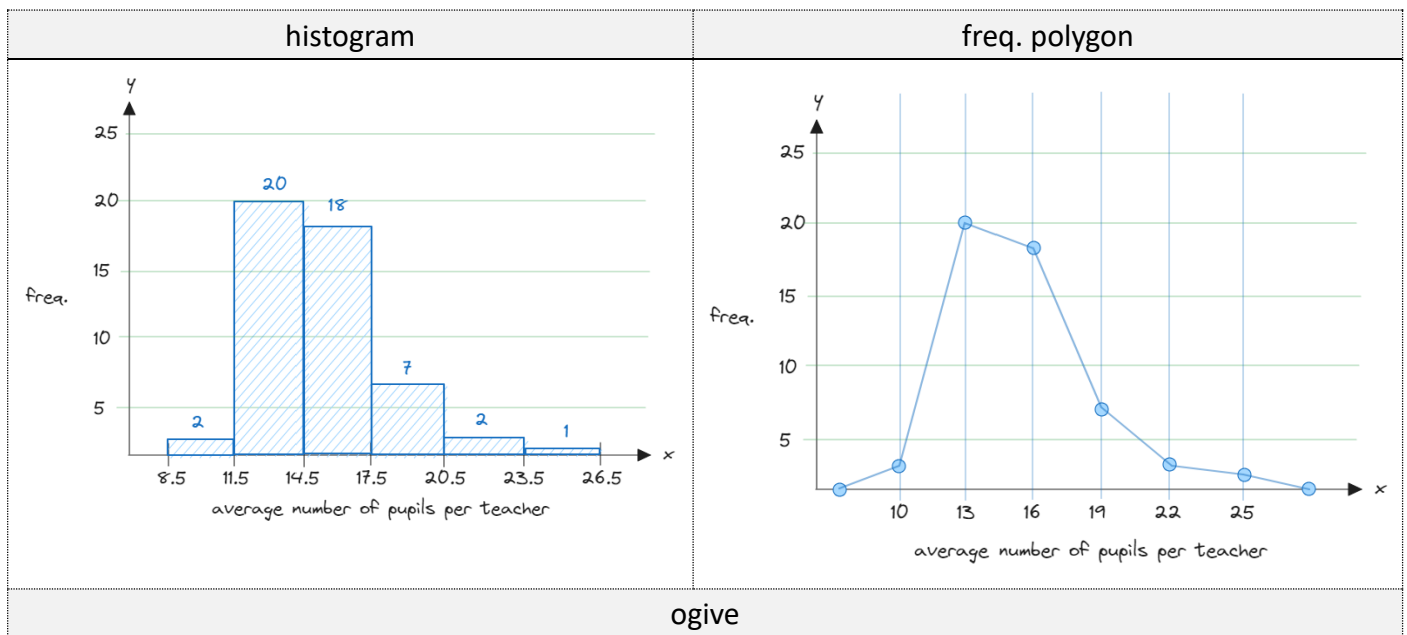
The distribution is positively / right skewed with a peak at the class of 11.5 – 14.5.
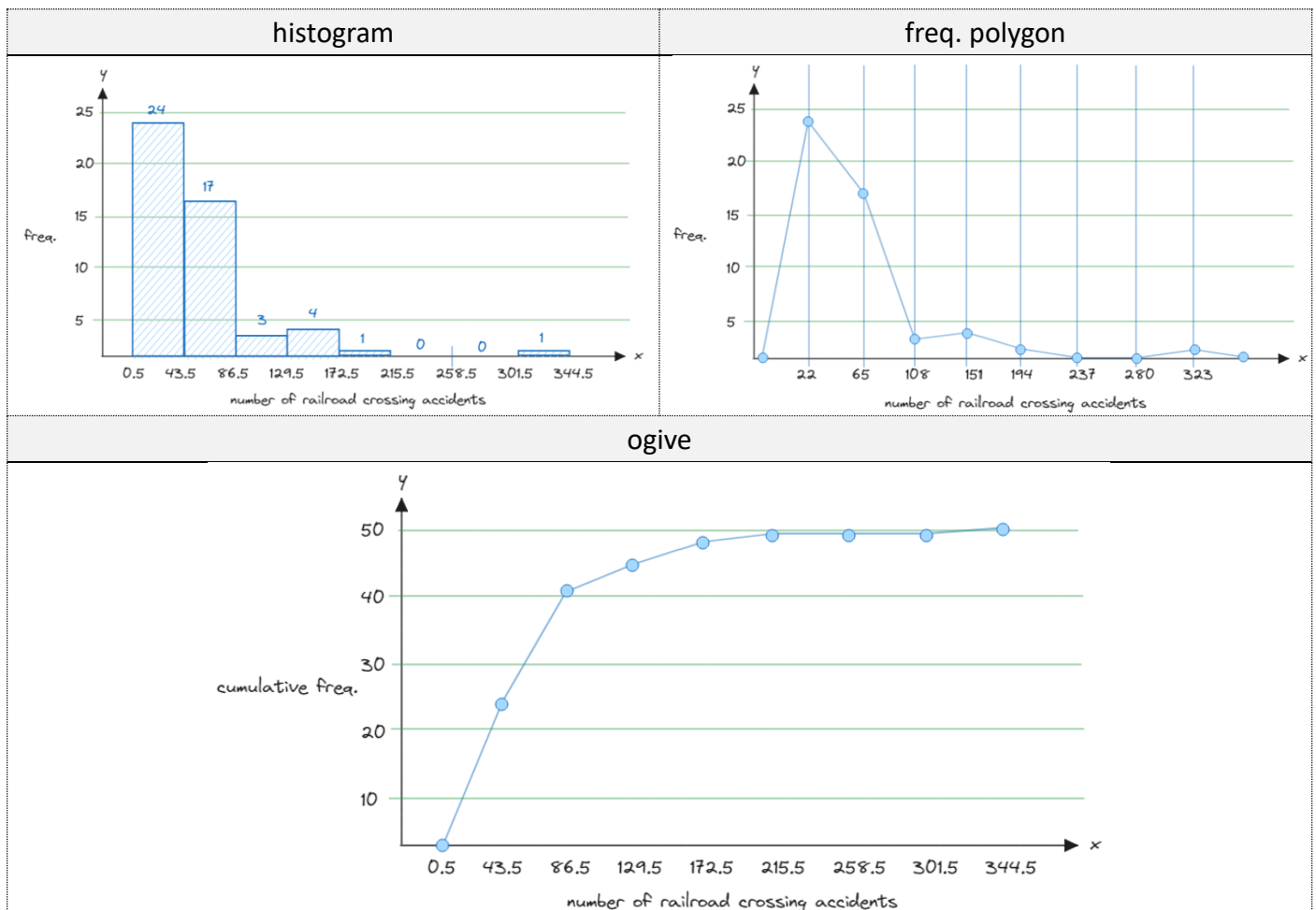
Railroad Crossing Accidents

The data show the number of railroad crossing (路口) accidents for the 50 states of the United States for a specific year. Construct a histogram, frequency polygon, and ogive for the data. Comment on the skewness of the distribution.

5.

Class limits	Frequency
1 – 43	24
44 – 86	17
87 – 129	3
130 – 172	4
173 – 215	1
216 – 258	0
259 – 301	0
302 – 344	1
	Total 50

Boundaries		Midpoints	Frequency
lower boundary	upper boundary		
0.5	43.5	22	24
43.5	86.5	65	17
86.5	129.5	108	3
129.5	172.5	151	4
172.5	215.5	194	1
215.5	258.5	237	0
258.5	301.5	280	0
301.5	344.5	323	1
			Total = 50

	cumulative freq.
less than 0.5	0
less than 43.5	24
less than 86.5	41
less than 129.5	44
less than 172.5	48
less than 215.5	49
less than 258.5	49
less than 301.5	49
less than 344.5	50

histogram	freq. polygon

number of railroad crossing accidents

number of railroad crossing accidents

| ogive |
|---|

number of railroad crossing accidents

The distribution is positively / right skewed.

Making the Grade

The frequency distributions shown indicate the percentages of public school students in fourth-grade reading and mathematics who performed at or above the required <u>proficiency levels</u> (熟練度) for the 50 states in the United States. Draw <mark>histograms</mark> for each, and decide <mark>if there is any difference</mark> in the performance of the students in the subjects.

10.

Class	Reading frequency	Math frequency
17.5 – 22.5	7	5
22.5 – 27.5	6	9
27.5 – 32.5	14	11
32.5 – 37.5	19	16
37.5 – 42.5	3	8
42.5 – 47.5	1	1
	Total 50	Total 50

histogram of reading	histogram of math
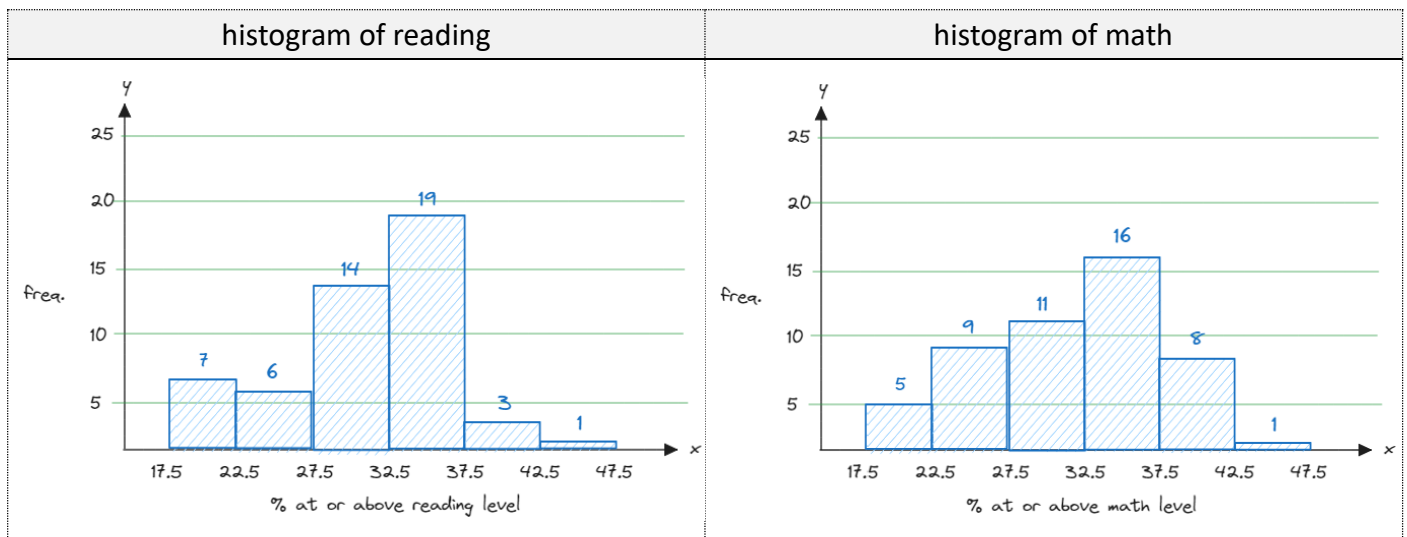
The distribution of math percentages is more bell-shaped than the distribution of reading percentages, and its peak in the class of 32.5 – 37.5 is not as high as the peak of the reading percentage.

18.

Protein (蛋白質) Grams in Fast Food

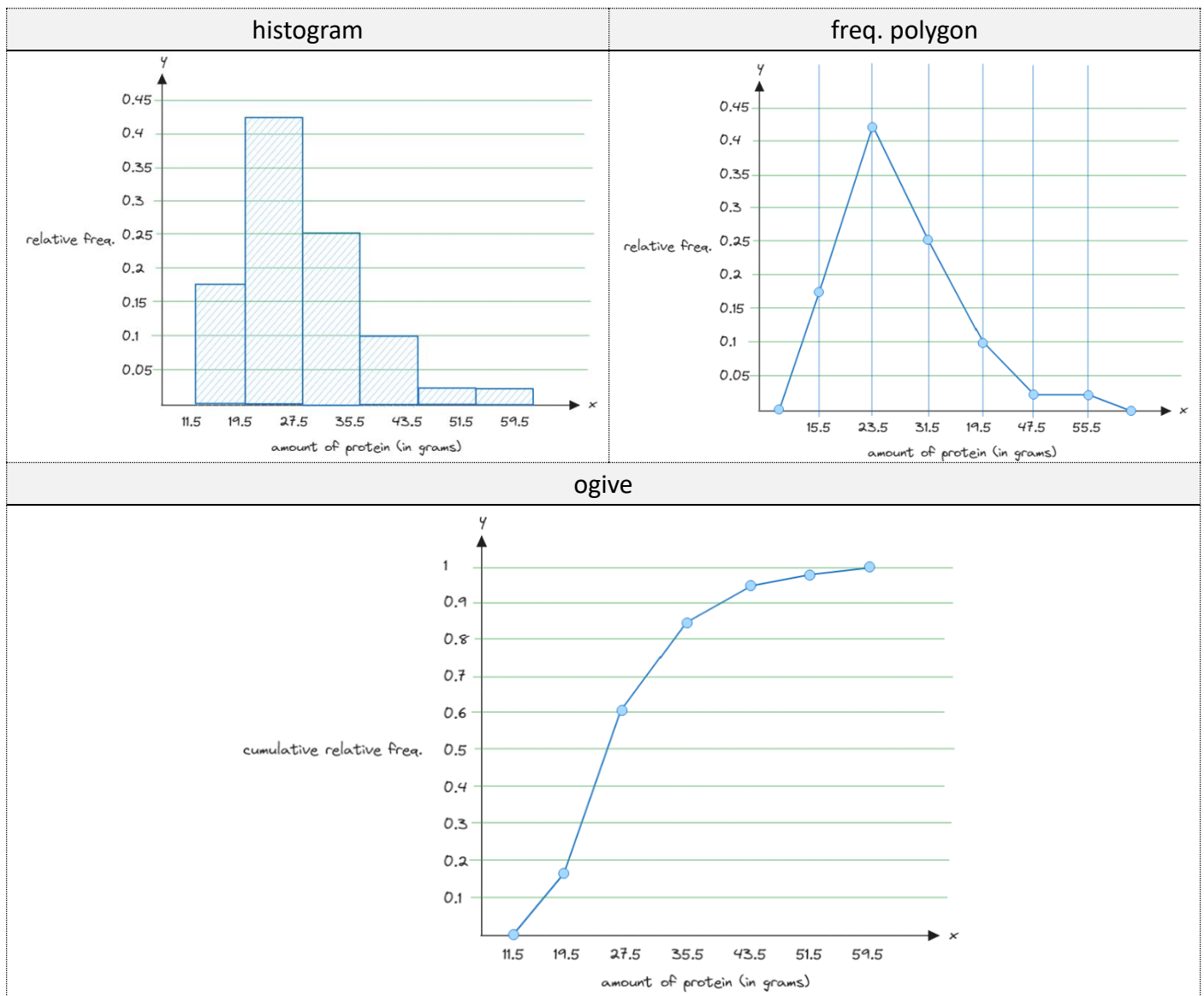The amount of protein (in grams) for a variety of (各種) fast-food sandwiches is reported here.
Construct a frequency distribution, using 6 classes. Draw a histogram, a frequency polygon, and an ogive for the data, using relative frequencies. Describe the shape of the histogram.

23	30	20	27	44	26	35	20	29	29
25	15	18	27	19	22	12	26	34	15
27	35	26	43	35	14	24	12	23	31
40	35	38	57	22	42	24	21	27	33

$L = 12, \ H = 57 \ \rightarrow \ R = H - L = 45 \ \rightarrow \ Width = \frac{45}{6} = 7.5$ round up to 8

Class limits		Boundaries				Relative frequency =
lower limits	upper limits	lower boundary	upper boundary	Midpoints	Frequency	$\frac{freq}{total}$
12	19	11.5	19.5	15.5	7	0.175
20	27	19.5	27.5	23.5	17	0.425
28	35	27.5	35.5	31.5	10	0.25
36	43	35.5	43.5	19.5	4	0.1
44	51	43.5	51.5	47.5	1	0.025
52	59	51.5	59.5	55.5	1	0.025
					Total = 40	total = 1

		cumulative freq.	cumulative relative freq.
less than	11.5	0	0
less than	19.5	7	0.175
less than	27.5	24	0.6
less than	35.5	34	0.85
less than	43.5	38	0.95
less than	51.5	39	0.975
less than	59.5	40	1

histogram	freq. polygon

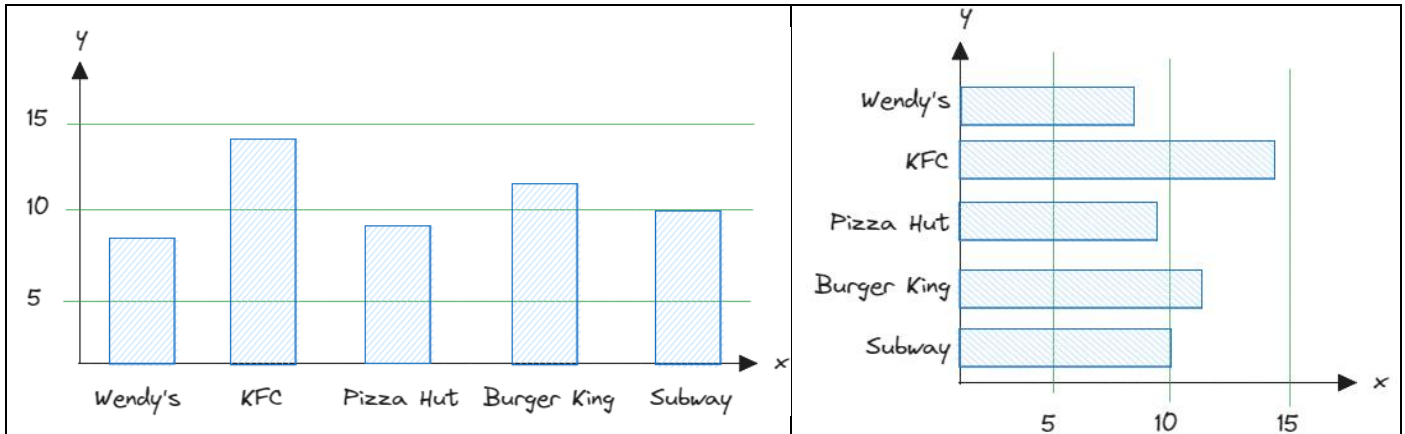| ogive |
|---|

The histogram is positively / right skewed.

2.

Worldwide Sales of Fast Foods

The worldwide sales (in billions of dollars) for several fast-food franchises for a specific year are shown. Construct a vertical bar graph and a horizontal bar graph for the data.

Wendy's	$ 8.7
KFC	14.2
Pizza Hut	9.3
Burger King	12.7
Subway	10.0

6.

Violent Crimes

The number of all violent crimes murder, nonnegligent homicide, manslaughter, forcible rape, robbery, and aggravated assault) in the United States for each of these years is listed below. Represent the data with a time series graph.

2000	2001	2002	2003	2004	2005
1,425,486	1,439,480	1,423,677	1,383,676	1,360,088	1,390,745

2006	2007	2008	2009	2010	
1,435,123	1,422,970	1,394,461	1,325,896	1,246,248	
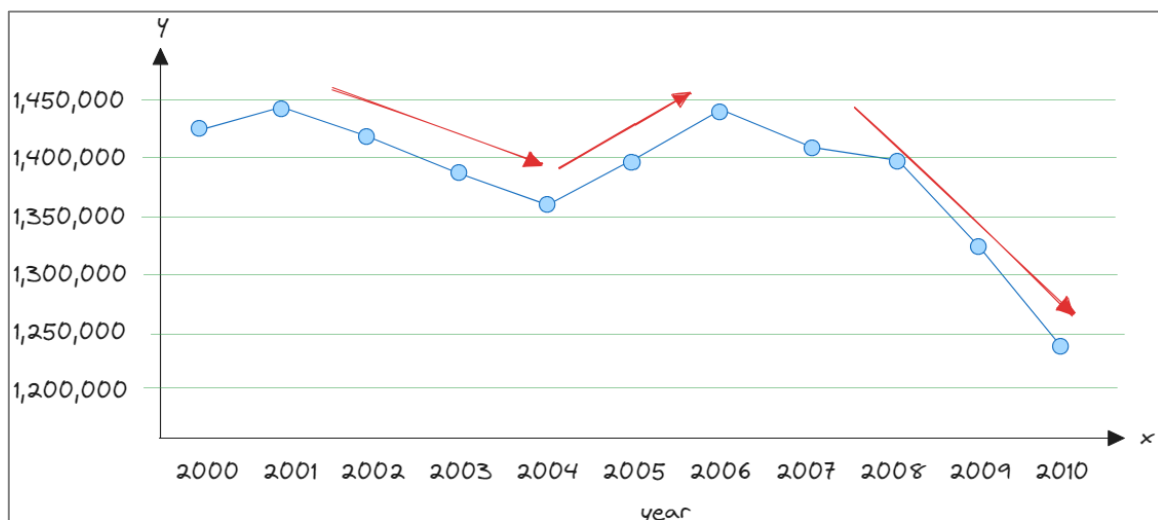
Crime decreased between 2001 and 2004, increased between 2004 and 2007, then decreased steadily from 2007 to 2010.

10.	**Reasons We Travel**
	The following data are based on a survey from American Travel Survey on why people travel. Construct a pie graph for the data and analyze the results.

Purpose	Number
Personal business	146
Visit friends or relatives	330
Work-related	225
Leisure (休閒)	299

Purpose	Number	%=f/n*100	Degrees=f/n*360
Personal business	146	14.6%	52.56°
Visit friends or relatives	330	33%	118.8°
Work-related	225	22.5%	81°
Leisure	299	29.9%	107.64°
Total	1000	100%	360°
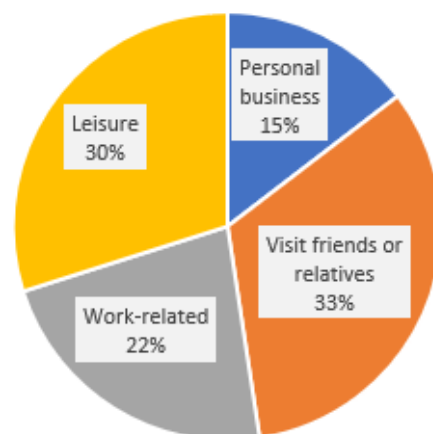
About $\frac{1}{3}$ of the travelers visit friends or relatives, with the fewest travelling for personal business.

17.	**50 Home Run Club**
	There are 43 Major League (大聯盟) baseball players (as of (截至) 2015) that have hit 50 or more home runs in one season. Construct a stem and leaf plot and analyze the data.

50	51	52	54	59	51	53	54
50	58	51	54	53	56	58	56
70	54	52	58	54	64	52	73
57	50	60	56	50	66	54	52
51	58	63	57	52	51	50	61
52	65	50					

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

Most players in the club have hit 50 to 54 home runs in one season. The maximum number of home runs hit is 73.

19.	**Length of Major Rivers**
	The data show the lengths (in hundreds of miles) of major rivers in South America and Europe.

Construct a back-to-back stem and leaf plot, and compare the distributions.

South America					Europe				
39	21	10	10	11	5	12	7	6	8
10	2	10	10	14	5	5	4	6	18
10	12	17	15	10	5	13	9	14	6
15	25	16			6	11	8	6	3
					4				

South America		Europe
2	0	3 4 4
	0	5 5 5 5 6 6 6 6 7 8 8 9
4 2 1 0 0 0 0 0 0 0	1	1 2 3 4
7 6 5 5	1	8
1	2	
5	2	
	3	
9	3	

The majority of rivers are longer in South America.

State which graph (Pareto chart, time series graph, or pie graph) would most appropriately represent the given situation.

a. The number of students enrolled at a local college for each year during the last 5 years
   (過去 5 年每年本地大學註冊的學生人數)
b. The budget for the student activities department at a certain college for a specific year
   (某個大學學生活動部門特定年份的預算)
22. c. The means (手段;方法) of transportation the students use to get to school
   (學生上學所使用的交通工具)
d. The percentage of votes each of the four candidates received in the last election
   (四位候選人在上次選舉中獲得的選票百分比)
e. The record temperatures of a city for the last 30 years
   (一座城市過去 30 年的最高氣溫紀錄)
f. The frequency of each type of crime committed in a city during the year
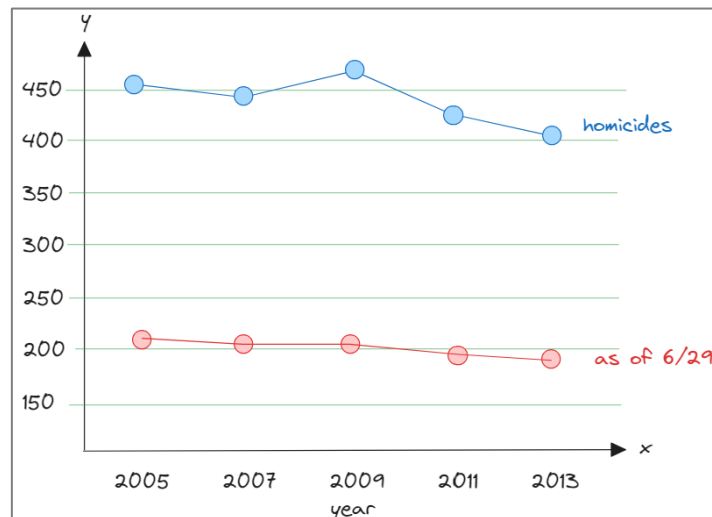   (一座城市一年內各類犯罪的頻率)

a. Time series graph
b. Pie graph (預算是固定的，所以不在意它實際花多少，比較在意都花在哪)
c. Pareto chart
d. Pie graph
e. Time series graph
f. Pareto graph

27.

Chicago Homicides

Draw and <mark>compare two time series graphs</mark> for the number of homicides (凶殺案) in the Chicago area.

Year	Homicides	As of June 29
2005	451	207
2007	448	204
2009	459	204
2011	435	187
2013	414	180

There is no way to tell if the crime rate is decreasing by looking at the graph.
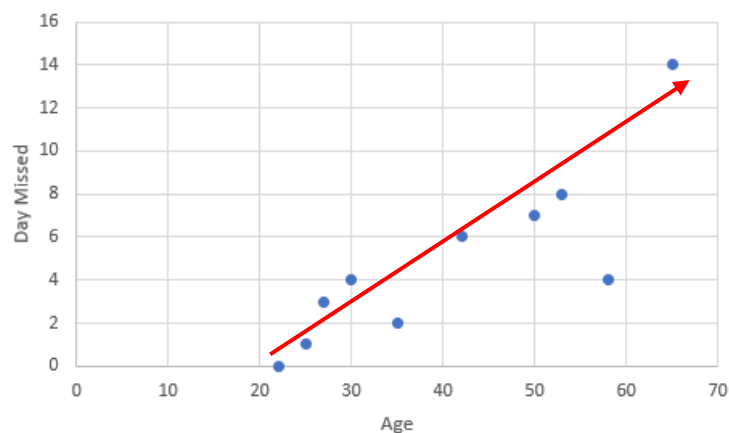
Sec. 2-4 (p.102)

8.

Employee Absences

A researcher wishes to determine if there is a relationship between the number of days an employee missed a year and the person's age. Draw a scatter plot and comment on the nature of the relationship.

| Age, x	22	30	25	35	65	50	27	53	42	58
Days Missed, y	0	4	1	2	14	7	3	8	6	4

There appears to be positive linear relationship between an employee's age and the number of days missed per year.

13

13.

Absences and Final Grades

An educator wants to see if there is a relationship between the number of absences a student has and his or her final grade in a course. Draw a scatter plot and comment on the nature of the relationship.

Numeber of abscences, x	10	12	2	0	8	5
Final grade, y	70	65	96	94	75	82
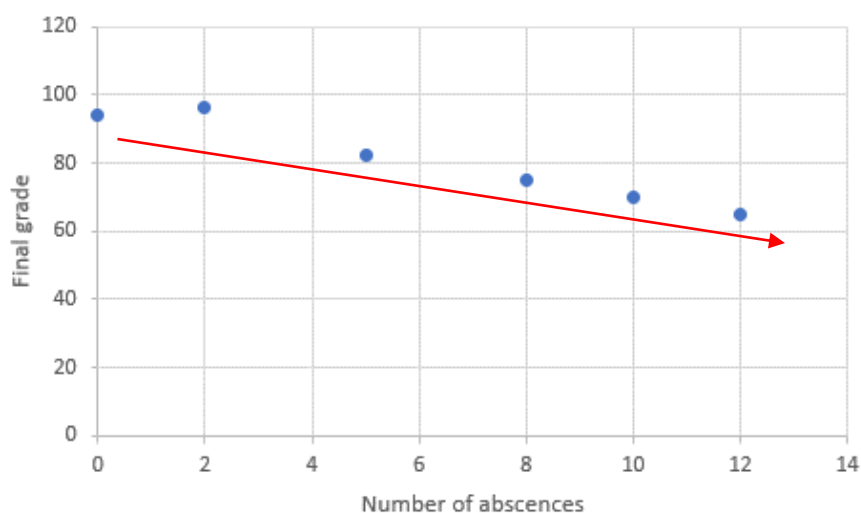
There appears to be a negative linear relationship between the number of abscences and student's final grade in a course.