PERCENT

Lesson 5 Circle Graphs

Circle graphs are often the best way to present a visual picture of a whole that is divided into smaller parts. For example, to show the percent of voters in a town that are registered as Democrats, Republicans, or Independents, the whole, or 100% would be all the voters, and the parts the whole is divided into would be the percent of each group.

Example One

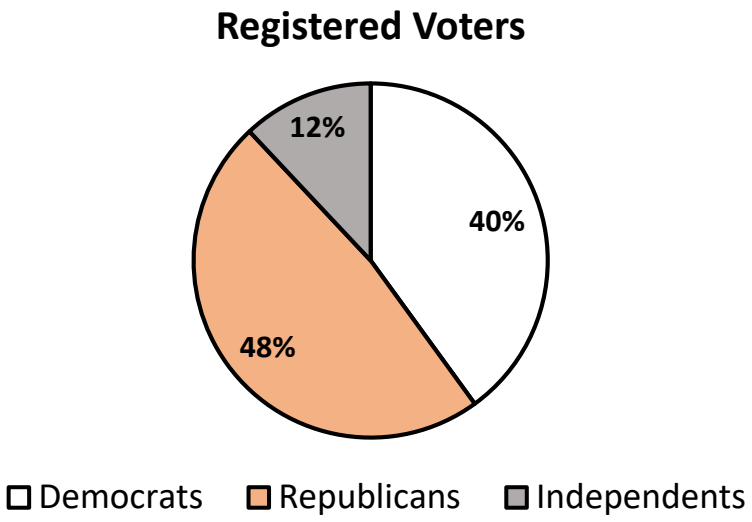
The circle graph below shows that of all the registered voters in a town, 40% are Democrats, 48% are Republicans and 12% are Independents.

Circle graphs are often called pie charts, because they look like a pie cut up into different size slices. This type of graph presents a visual picture where it is easy to see the size of each part and how the sizes compare to each other.

Notice that the 3 segments add up to 100%. The circle represents all of whatever the subject is, in this case, registered voters, so the segments of the circle have to add up to 100%.

This is important. Any circle graph with segments that do not add up to100% is an incorrect circle graph.

Notice that the 48% slice is just a little less than 50%, or half, and you can see the size of the slice is just a little less than half of the circle.



1. If there are 8,500 voters in the town, how many are Republicans?
A. 48 B. 4,800 C. 4,080 D. 3,400 E. 1,020

The orange color segment shows Republicans, and this segment is 48%. The number of Republicans is 48% of the total 8,500 voters. Calculate 48% of 8,500.

48% of 8,500 → 0.48 x 8,500 = 4,080
Answer: C. 4,080

2. If there are 8,500 voters in the town, how many more Democrats are there than Independents?
A. 3,400 B. 2,380 C. 1,020 D. 4,000 E. 2,800

The white segment represents Democrats: 40% of 8,500 → 0.4 x 8,500 = 3,400
The gray segment represents Independents: 12% of 8,500 → 0.12 x 8,500 = 1,020
3,400 – 1,020 = 2,380 more Democrats than Independents
Answer: B. 2,380

OR

40% – 12% = 28%
28% of 8,500 → 0.28 x 8,500 = 2,380
Answer: B. 2,380

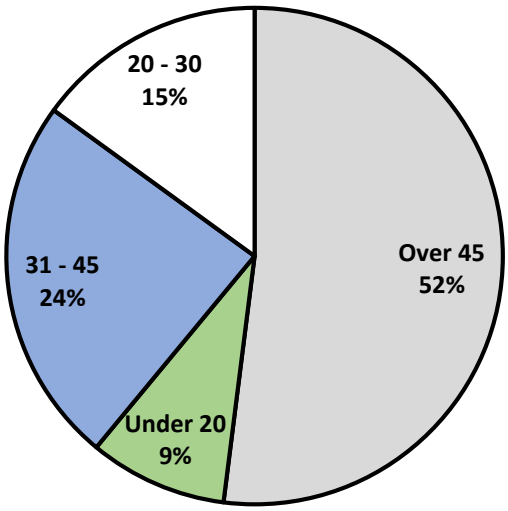
3. Independent voters are shown by which fraction below?
A. $\frac{3}{25}$ B. $\frac{3}{10}$ C. $\frac{25}{3}$ D. $\frac{1}{12}$ E. $\frac{1}{4}$

Set up your fraction with the part on the top and the whole on the bottom.
12% means 12 out of every 100, so the part is 12 and the whole is 100.
$\frac{12}{100}$ reduces to $\frac{3}{25}$
Answer: A. $\mathbf{\frac{3}{25}}$

REMEMBER – To reduce a fraction on the calculator, enter with the abc key and hit the equal sign.
To reduce $\frac{12}{100}$ enter 12 abc key 100 = and $\frac{3}{25}$ is displayed.

Example Two

AGES OF HEALTH INSURANCE APPLICANTS IN BOWER COUNTY



1. What percent of applicants are over 30 years old?
A. 24% B. 52% C. 76% D. 28% E. 15%

You want all of the applicants that are over 30, which includes two of the pie slices. 24% are 31 – 45 and 52% are over 45. Both groups are over 30, so add the percents together.
24% + 52% = 76%
Answer: C. 76%

2. If there are a total of 1,200 applicants, how many of them are over 45?
A. 624 B. 288 C. 642 D. 52 E. 912

52% of applicants are over 45, so calculate 52% of 1,200.
52% of 1,200 → 0.52 x 1,200 = 624
Answer: A. 624

3. Which age group represents approximately ½ of all applicants?
A. 20 – 30 B. Over 45 C. 31 – 45
D. Under 20 E. Over 30

½ of the applicants is the same as 50% of the applicants, so look for an age group that is very close to 50%. This would be the Over 45 age group at 52%.
Answer B: Over 45

4. What fraction represents the applicants that are 30 or under?

A. $\frac{3}{20}$ B. $\frac{9}{100}$ C. $\frac{25}{6}$ D. $\frac{7}{20}$ E. $\frac{6}{25}$

Determine which segments make up the applicants that are 30 or under.
The 20 – 30 segment (15%) and the Under 20 segment (9%) both fall into the 30 or under range.

Add the percents together: 15% + 9% = 24%

Set up your fraction with the part on the top and the whole on the bottom.
24% means 24 out of every 100, so the part is 24 and the whole is 100.

$\frac{24}{100}$ reduces to $\frac{6}{25}$

Answer: E. $\frac{6}{25}$

5. Which age group represents approximately ¼ of all applicants?

A. 20 – 30 B. Over 45 C. 31 – 45
D. Under 20 E. Over 30

¼ of the applicants is the same as 25% of the applicants, so look for an age group that is very close to 25%. This would be the 31 – 45 age group at 24%.
Answer C: 31 – 45

NOTE – The 30 or Under group includes the 20 – 30 segment (15%) and the Under 20 segment (9%). Added together, this is 24%, so "30 or Under" could also be a correct answer to this question, but it was not given as an answer choice.

Example Three

You would use a circle graph to illustrate which of the following data sets?

A. A pet store sells dogs, cats, birds, gerbils, and fish and wants to show the percent of each type of animal sold last month.
B. The percent of test scores that increased, decreased, or stayed the same in each of the last 6 years.
C. The average temperatures of various cities.
D. The dollar amount of sales each month for a 2 year time period.
E. The number of students enrolled at 6 elementary schools.

Think about what a circle graph shows.
It shows the percent that different pieces are of a whole. You will have different size pie slices to show the percents for the pieces, and all the pie slices will add up to 100 %, or the whole circle.

A circle graph does not show changes over time.
So, you are looking for two main things to determine if information would be best shown in a circle graph:

1. Data that shows parts of a whole that can be expressed in percents.

AND

2. The data is not intended to show changes over multiple time periods.

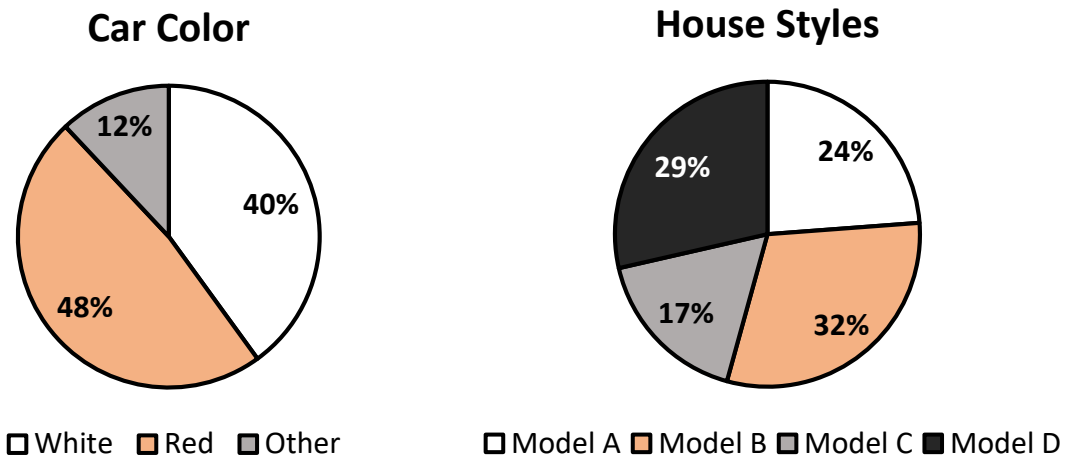
The correct answer is A, because the whole, all the animals sold, will be broken into 5 parts with a percent for each type of animal, AND, the information is provided for a single time period.

Answer B also shows percents, but the information is provided for six time periods. Data that covers multiple time periods is best shown by bar graphs or line graphs.

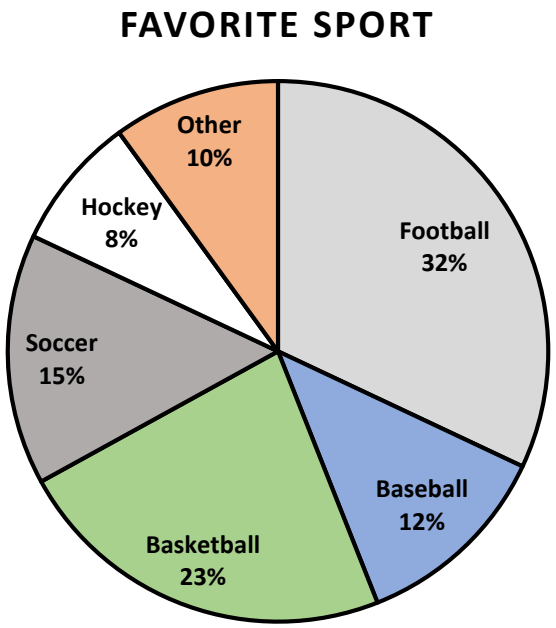
C, D, and E do not show parts of a whole that add up to 100%, so would not be best illustrated with a circle graph.

Practice – Circle Graphs *Answers – p. 9*

1. Which of the circle graphs below is incorrect?



Questions 2 – 9 refer to the Favorite Sport circle graph below.



2. What percent of people chose soccer as their favorite sport?
A. 8% B. 15% C. 10% D. 32% E. 12%

3. What percent of people chose football or baseball as their favorite sport?
A. 32% B. 12% C. 20% D. 44% E. 42%

4. If 3,000 people were surveyed, how many of them said football was their favorite sport?
A. 960 B. 94 C. 320 D. 96 E. 690

5. If 3,000 people were surveyed, how many more people chose soccer as their favorite sport than chose hockey?
A. 7 B. 450 C. 210 D. 240 E. 690

6. Which fraction represents the people who chose baseball as their favorite sport?
A. $\frac{3}{25}$ B. $\frac{3}{10}$ C. $\frac{25}{3}$ D. $\frac{1}{12}$ E. $\frac{1}{4}$

7. Which sport was chosen by approximately ¼ of the people surveyed?
A. Baseball B. Hockey C. Football D. Hockey E. Basketball

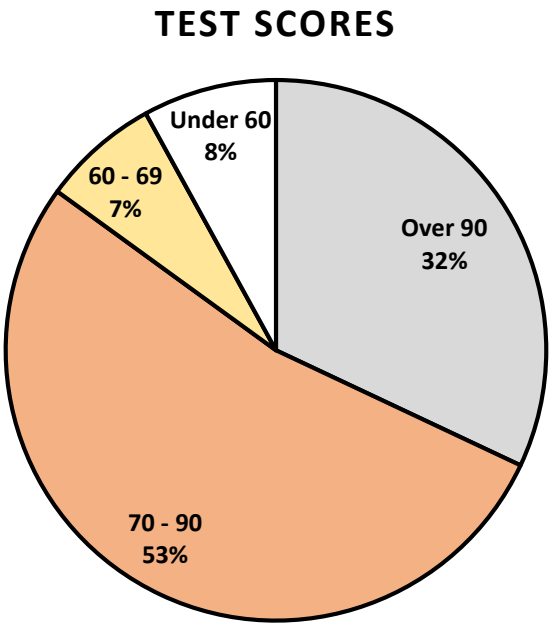
8. If 3,000 people were surveyed, how many of them chose basketball or baseball as their favorite sport?

A. 35 B. 690 C. 360 D. 1,050 E. 330

9. What fraction represents the people who chose football or basketball as their favorite sport?

A. $\frac{8}{25}$ B. $\frac{23}{100}$ C. $\frac{9}{100}$ D. $\frac{11}{20}$ E. $\frac{1}{2}$

Questions 10 – 13 refer to the TEST SCORES circle graph below.



10. What percent of scores are under 70?

A. 7% B. 15% C. 53% D. 61% E. 8%

11. If there are a total of 450 scores, how many scores are over 90?

A. 32 B. 414 C. 53 D. 144 E. 72

12. What fraction represents the number of scores that are under 60?

A. $\frac{2}{25}$ B. $\frac{8}{25}$ C. $\frac{3}{20}$ D. $\frac{7}{100}$ E. $\frac{2}{15}$

13. Which range of scores represents approximately ½ of all the scores?

A. Over 90 B. 90 and Under C. 60 – 69
D. Under 60 E. 70 – 90

14. Which of the following data sets would be best illustrated by a circle graph?

A. The temperature at 7 am every day for three months.
B. The inflation rate over the last 10 years.
C. The percent of credit scores issued by a bank in January that are below 500, between 500 and 700, and above 700.
D. The number of credit applications received each month for the last year.
E. The percent of high school graduates that are male and female in each of the last 5 years.

15. You would use a circle graph to illustrate which of the following?

I. A company makes socks in 6 colors and wants to show the percent of sales in each color.

II. The percent of college students with ages under 18, 18 – 30, or over 30.

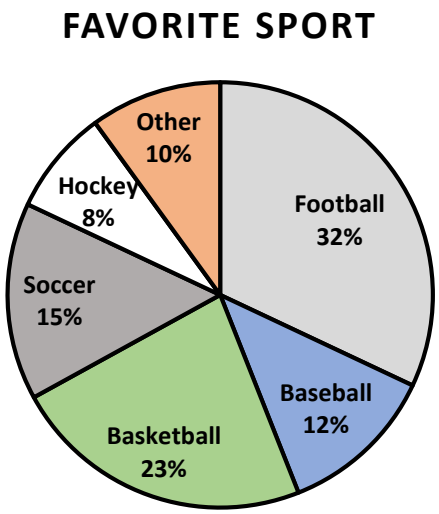
III. The percent of UT students who live off campus vs. on campus in each of the last 9 years.

A. I only B. II only C. III only D. all of the above E. I and II

ANSWER KEY Lesson 5 Circle Graphs

1. The **House Styles** circle graph is incorrect because the segments don't add up to 100%.

Questions 2 – 9 refer to the Favorite Sport circle graph below.



2. What percent of people chose soccer as their favorite sport?

A. 8% **B. 15%** C. 10% D. 32% E. 12%

Read the graph to see that the soccer slice is labeled 15%.

Answer: B. 15%

3. What percent of people chose football or baseball as their favorite sport?

A. 32% B. 12% C. 20% **D. 44%** E. 42%

Read the graph to see that 32% chose football and 12% chose baseball, and add the 2 groups together. 32% + 12% = 44%

Answer: D. 44%

4. If 3,000 people were surveyed, how many of them said football was their favorite sport?

A. 960 B. 94 C. 320 D. 96 E. 690

32% said football was their favorite sport. Calculate 32% of 3,000.

32% of 3,000 → 0.32 x 3,000 = 960

Answer: A. 960

5. If 3,000 people were surveyed, how many more people chose soccer as their favorite sport than chose hockey?

A. 7 B. 450 **C. 210** D. 240 E. 690

Soccer is 15% and hockey is 8%.
15% of 3,000 → 0.15 x 3,000 = 450
8% of 3,000 → 0.08 x 3,000 = 240
Subtract to get how many more chose soccer than hockey. 450 – 240 = **210**

OR

Subtract 15% – 8% = 7%. 7% of 3,000 → 0.07 x 3,000 = 210
Answer: C. 210

6. Which fraction represents the people who chose baseball as their favorite sport?

A. $\frac{3}{25}$ B. $\frac{3}{10}$ C. $\frac{25}{3}$ D. $\frac{1}{12}$ E. $\frac{1}{4}$

12% chose baseball.
Set up your fraction with the part on the top and the whole on the bottom.
12% means 12 out of every 100, so the part is 12 and the whole is 100.

$\frac{12}{100}$ reduces to $\frac{3}{25}$
Answer: A. $\frac{3}{25}$

7. Which sport was chosen by approximately ¼ of the people surveyed?

A. Baseball B. Hockey C. Football D. Hockey **E. Basketball**

¼ of the applicants is the same as 25% of the applicants, so look for a sport that is very close to 25%. This would be basketball at 23%.
Answer E: Basketball

8. If 3,000 people were surveyed, how many of them chose basketball or baseball as their favorite sport?

A. 35 B. 690 C. 360 **D. 1,050** E. 330

Add together the two percents. 23% + 12% = 35%
Calculate 35% of 3,000 35% of 3,000 → 0.35 x 3,000 = 1,050
Answer: D. 1,050

9. What fraction represents the people who chose football or basketball as their favorite sport?

A. $\frac{8}{25}$ B. $\frac{23}{100}$ C. $\frac{9}{100}$ **D.** $\mathbf{\frac{11}{20}}$ E. $\frac{1}{2}$

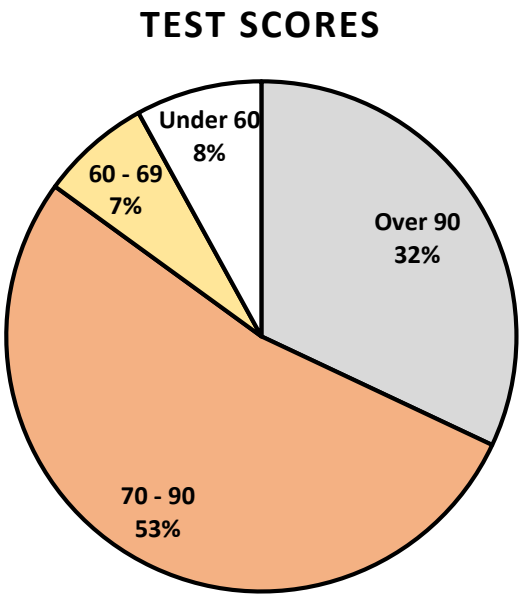
32% chose football and 23% chose basketball.
32% + 23% = 55%

Set up your fraction with the part on the top and the whole on the bottom.
55% means 55 out of every 100, so the part is 55 and the whole is 100.

$\frac{55}{100}$ reduces to $\frac{11}{20}$

Answer: D. $\mathbf{\frac{11}{20}}$

Questions 10 – 13 refer to the TEST SCORES circle graph below.



10. What percent of scores are under 70?

A. 7% **B. 15%** C. 53% D. 61% E. 8%

The scores from 2 segments, 60 – 69 and Under 60, are all under 70.
7% + 8% = 15%

Answer: B. 15%

11. If there are a total of 450 scores, how many scores are over 90?

A. 32 B. 414 C. 53 **D. 144** E. 72

Only 1 segment has scores over 90, the 32% segment, so calculate 32% of 450.
32% of 450 → 0.32 x 450 = 144

Answer: D. 144

12. What fraction represents the number of scores that are under 60?

A. $\frac{2}{25}$ B. $\frac{8}{25}$ C. $\frac{3}{20}$ D. $\frac{7}{100}$ E. $\frac{2}{15}$

Only 1 segment has scores under 60, the 8% segment.

Set up your fraction with the part on the top and the whole on the bottom.
8% means 8 out of every 100, so the part is 8 and the whole is 100.

$\frac{8}{100}$ reduces to $\frac{2}{25}$

Answer: A. $\frac{2}{25}$

13. Which range of scores represents approximately ½ of all the scores?

A. Over 90 B. 90 and Under C. 60 – 69
D. Under 60 **E. 70 – 90**

½ of the scores is the same as 50% of the scores, so look for a segment that is very close to 50%. This would be the 70 – 90 segment at 53%.

Answer: E. 70 – 90

14. Which of the following data sets would be best illustrated by a circle graph?

A. The temperature at 7 am every day for three months.
B. The inflation rate over the last 10 years.
C. The percent of credit scores issued by a bank in January that are below 500, between 500 and 700, and above 700.
D. The number of credit applications received each month for the last year.
E. The percent of high school graduates that are male and female in each of the last 5 years.

Answer: C The whole, all the credit scores, will be broken into 3 parts with a percent for each of the 3 credit score ranges, AND, the information is provided for a single time period.

Answer E also shows percents, but the information is provided for five time periods. Data that covers multiple time periods is best shown by bar graphs or line graphs.

A, B, and D do not show parts of a whole that add up to 100%, so would not be best illustrated with a circle graph.

15. You would use a circle graph to illustrate which of the following?

I. A company makes socks in 6 colors and wants to show the percent of sales in each color.

II. The percent of college students with ages under 18, 18 – 30, or over 30.

III. The percent of UT students who live off campus vs. on campus in each of the last 9 years.

A. I only B. II only C. III only D. all of the above **E. I and II**

Answer: E. I and II

I. The whole, all the socks, will be broken into 6 parts with a percent for each color, AND, multiple time periods are not given.

II. The whole, all the students, will be broken into 3 parts with a percent for each age range, AND, multiple time periods are not given.

III also shows percents, but the information is provided for nine time periods. Data that covers multiple time periods is best shown by bar graphs or line graphs.