7.3 Circle Graphs
Statistical information is often presented in table form or in the form of a line graph, bar graph, or circle graph. These graphs are a way of presenting or visualizing statistical data for easy comparisons. For circle graphs, also known as pie charts, the information is presented in the form of a circle divided into sectors, each sector representing a part of a whole or a percent. The total of items in the pie chart must always come to 100%.

Example 1: A class of 25 students took a mathematics test. The results are presented in the circle graph below.

Use the circle graph above to answer the following questions.

a. How many students earned a C grade?
Answer: 40% of the students earned a C.
Therefore, we calculate 40% of the 25 students who took the test.
40% of 25 = 0.40 × 25 = 10 students.

b. How many students earned an A or a B on the test?
Answer: 20% of the students earned an A, and 32% earned a B.
20% + 32% = 52%
52% of 25 = 0.52 × 25 = 13 students.

c. What percent of the students failed the test? How many failed the test?
Answer: 8% of the students failed test, earning an F.
8% of 25 = 0.08 × 25 = 2. Two students failed the test.

d. How many more students earned a C grade than earned a B grade?
Answer: 40% of 25 = 0.40 × 25 = 10 C students
32% of 25 = 0.32 × 25 = 8 B students
10 – 8 = 2 more students earned a C than a B.

e. What percent of the entire class passed the test?
Answer: Subtract the 8% who failed from 100%.
100% – 8% = 92% passed the test.
Or, 20% + 32% + 40% = 92% passed the test.
Practice 1: A class of 40 students took a mathematics test. The results are presented in the circle graph below.

Use the circle graph above to answer the following questions.

a. How many students earned a C grade?

b. How many students earned an A or a B on the test?

c. What percent of the students failed the test? How many failed the test?

d. How many more students earned a C grade than earned a B grade?

e. What percent of the entire class passed the test? How many students passed?

Answers: a. 18 students, b. 18 students, c. 10% or 4 students, d. 6 students, e. 90% or 36 students

Watch It: [http://youtu.be/2E4mDGaE3dg](http://youtu.be/2E4mDGaE3dg)
Example 2: A student researched expenses to live on campus at a four-year university in Maryland to compare costs to a community college expense for one semester.

Use the circle graph above to answer the following questions.

a. What percent of the costs shown is for tuition? Round to the nearest tenth of a percent.

**Answer:** Determine the total of the costs provided.

\[
2214 + 2830 + 2955 + 174 = 8173
\]

Tuition is what percent of total cost

\[
2830 = P(8173)
\]

0.346262... = P

= 34.6% (Rounded to the nearest tenth of a percent)

b. If the student has financial aid that covers 45% of their total cost for the semester, how much will the student need to pay?

**Answer:** Financial aid is 45% of total cost

Financial aid = (0.45)(8173)

Financial aid = 3677.85

Student pays total cost – financial aid

= 8173 – 3677.85

= $4,495.15
Practice 2: A student research the cost to attend the Community College of Baltimore County for one semester. The following chart shows the breakdown of the costs.

Use the circle graph above to answer the following questions.

a. What percent of the costs provided is for tuition? Round your answer to the nearest tenth of a percent.

b. If the student has financial aid that covers 45% of their total cost for the semester, how much will the student need to pay?

Answers:  
a. 76.0%, b. $1,193.50

Watch It: [http://youtu.be/s1dAcFFwfNU](http://youtu.be/s1dAcFFwfNU)
Example 3: There were 205,187 crimes in the State of Maryland in 2010 broken down by category in the circle graph below.

Use the circle graph above to answer the following questions.

a. What category accounts for the largest number of crimes? What percent does it represent? Round to the nearest tenth of a percent.

**Answer:** Larceny/theft is the largest category.
Larceny is what percent of crimes?
118853 = \( P \) (205187)
0.579242… = \( P \)
57.9% of the crime is larceny/thefts.

b. What percent of the crimes are rapes? Round to the nearest tenth of a percent.

**Answer:** \( P \) (205187) = 1228
\( P = 0.00598478… \)
\( P = 0.6\% \) of the crimes are rapes.
**Practice 3:** There were 37,917 crimes in the City of Baltimore, Maryland in 2010 broken down by category in the circle graph below.

![Circle Graph](image)

Use the circle graph above to answer the following questions. Make certain that answers are rounded to the nearest whole number or the nearest tenth of a percent for the final answer.

a. What category accounts for the most amount of crimes? What percent does it represent?

   **Answers:** a. larceny and theft 43.0%, b. 20.0%

b. What percent of the crimes are burglaries?

**Watch It:** [YouTube Link]

**Watch All:** [YouTube Link]
7.3 Circle Graphs Exercises

Questions 1 – 4  Ms. Blossom is a school teacher. She earns $3,500 per month for her hard work as a teacher. Her monthly expenses are represented by the circle graph below.

![Circle Graph](image)

1. How much does Ms. Blossom spend on rent?
2. How much does she save every month?
3. What percent of her monthly income does Ms. Blossom spend on utilities and transportation? What is the amount?
4. What is Ms. Blossom’s total expenditure other than rent?
Questions 5 – 9  A company called Compassion International employs people of many different ages, from twenty-year-olds to seventy-year-olds. The circle graph below shows the number of employees in each age group.

5. Find the total number of employees at this company.

6. What age group has the greatest number of employees?

7. What percent of employees are in their sixties or seventies? How many are they?

8. How many employees are under fifty years of age?

9. What age group makes up 16% of the total number of employees?
Questions 10 – 16 A certain country has a population of 24 million. This country is divided into six ethnic groups: Akan, European, Ewe, Ga, Gurma, and Moshi. This information is presented in the circle graph below.

10. Which is the predominant ethnic group?

11. What percent is the largest ethnic group?

12. How many people are in the largest ethnic group?

13. Which ethnic groups have the same percentage of people?

14. How many people are in each group of people with the same percent?

15. The Ewe group is larger than the Ga group by what percent?

16. How many more people belong to the Ewe group than the Ga group?
Questions 17 – 20  A survey asked 160 mathematics students what they thought were the most pertinent factors that contributed to their success in mathematics education. Among the factors considered were the role of the instructor, taking responsibility for their homework assignments, study skills, being tutored on a one-on-one basis, and study groups. The results of the survey are presented in the circle graph below.

17. What did students consider most important in successfully learning math?

18. How many students thought instructors play a major role in getting them to be successful in mathematics?

19. What percent of the students believed that study skills are very important in their mathematics education?

20. How many students chose study skills?
Questions 21 – 25  Crime Statistics for 2010 for Baltimore County were recorded and are a matter of public record. The statistics are presented in the circle graph below.

2010 Crime Statistics - Balto. County

- larceny/thefts, 18,129
- robberies, 1,341
- breaking & entering, 4,119
- aggravated assaults, 2,862
- rapes, 126
- homicides, 20
- motor vehicle thefts, 1,880

21. What was the total number of crimes in Baltimore County for 2010?

22. What percentage of the crimes were larceny/thefts? Is this consistent with the percentage of larceny/thefts for the State of Maryland (see Example 3)? Round to the nearest tenth of a percent if necessary.

23. What is the total for breaking & entering, aggravated assaults, and rapes?

24. What percentage of the total crime is accounted for in those listed in #23? Round to the nearest tenth of a percent, if necessary.

25. What percent of the crimes are robberies? Round to the nearest tenth of a percent, if necessary.
### 7.3 Circle Graph Exercise Answers

1. $1,575
2. $350
3. 20%, $700
4. $1,925
5. 75
6. 30 year-olds
7. 28%, 21
8. 44
9. 20 year-olds
10. Akan
11. 44%
12. 10,560,000
13. European and Moshi
14. 3,840,000
15. 5%
16. 1,200,000
17. Taking responsibility in doing homework assignments
18. 40
19. 15%
20. 24
21. 28,477
22. 63.7%, this is larger than the State of Maryland’s percentage of 57.9%.
23. 7,107
24. 25.0%
25. 4.7%