

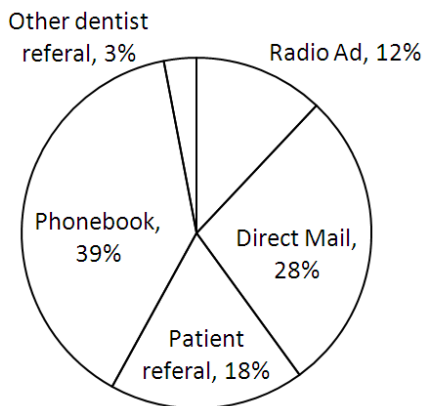
Make business decisions = Summarize, represent, and interpret data on two categorical and quantitative variables

Program Task: Describe and interpret the importance of marketing in dentistry by reading and tracking results using graphs.

Program Associated Vocabulary:
 ADVERTISING, MARKETING, TARGET MAILING, MEDIA, INTERNAL, EXTERNAL, FOCUS GROUP, PATIENT PROFILE, DIRECT MARKETING

Program Formulas and Procedures:
 Dentists keep track of new patient referrals and then they use this information to advertise for new patients. Internal patient referrals come directly from existing patient referrals and other dentists.

Example: The circle graph below represents first quarter new patient profiles. There were 148 new patients in the first quarter. How many came from internal referrals?



- Total the internal resources.
3% and 18% = 21%
- Set up the problem.
 $0.21(148) = 31.08$ round to 31
- 31 new patients came from internal sources.

PA Core Standard: CC.2.4.HS.B.2

Description: Summarize, represent, and interpret data on two categorical and quantitative variables.

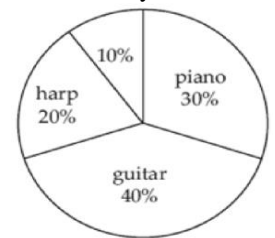
Math Associated Vocabulary:
 CIRCLE, LINE AND BAR GRAPH, RATE OF CHANGE

Formulas and Procedures:
 Predictions can be made from information presented in graphs by estimating or calculating. Common types of graphs include circle (pie) graphs, line graphs, and bar graphs. The process for making predictions depends upon the type of graph. A circle graph requires an understanding of percentages. Bar graphs are used to compare amounts. Line graphs are used to show trends

Making Predictions: Circle Graphs

If 170 students selected the piano as their favorite musical instrument, approximately how many students were surveyed?

- Read and comprehend the graph.
30%, or 170 of the total students surveyed chose the piano
- Translate the problem into an algebraic expression.
30% of the students is 170. →
 $0.30(s) = 170$
- Solve for the unknown variable.

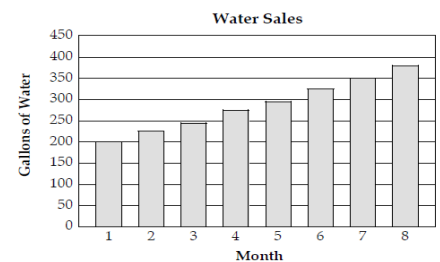


$$0.30s = 170 \rightarrow \frac{0.30s}{0.30} = \frac{170}{0.30} \rightarrow s = 566.\overline{66}$$

Approximately 567 students were surveyed.

Bar Graphs:

By what percentage did water sales increase between the first and eighth months?



- Read and comprehend the graph.
The graph shows the number of gallons of water sold each month over an 8 month period.
- Determine the amount of change.
Month 1 = 200 gallons, Month 8 ≈ 375 gallons
 $375 - 200 = 175$
- Calculate percentage of increase.
 $175/200 = .875$ or 87.5%

Instructor's Script – Comparing and Contrasting

In some text books, the information is frequently presented in a table, rather than a circle graph. Making predictions using circle graphs relies heavily on the ability to perform calculations with percentages.

To increase the rigor of the problem, a teacher may omit the percentage for one of the categories or select from a variety of question stems.

Omit the percentage for one of the categories

- Because the percentage is omitted, students must recognize that a circle graph depicts part of a whole and all of the percentages must add up to 100%.

Select from a variety of question stems

- What amount is allocated for (name of category)?
- How many (subject of the graph) selected or are allocated for ___ and ___? (combine two categories)
- If the total (subject of graph) was unknown, but category ___ was (value), what would be the total?
- If category ___ increased from ___% to ___%, what would be the increase of (subject of graph)?

Common Mistakes Made By Students

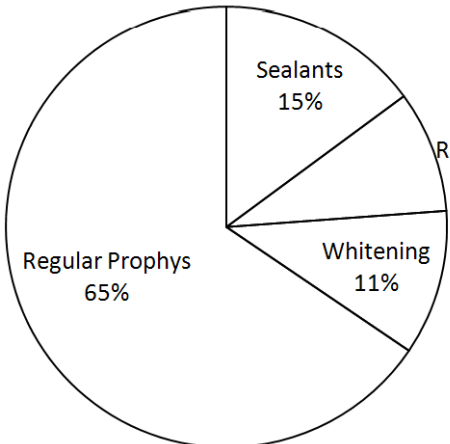
Incorrectly converting percents to decimals:

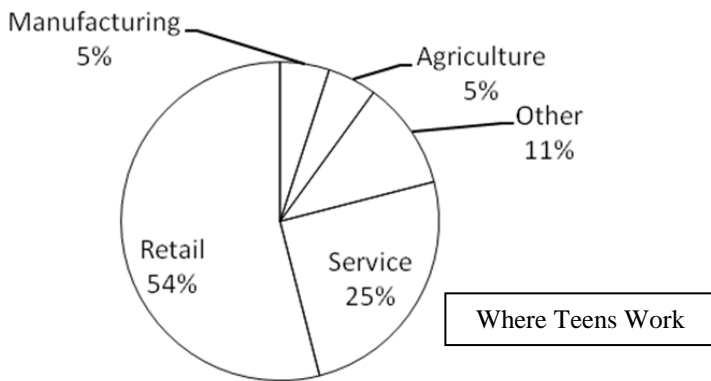
Many of the mistakes students make when converting percentages to decimals involve one or 3 digit numbers. For instance, students mistakenly write 6% as 0.6 instead of 0.06 or they write 125% as 0.125 instead of 1.25.

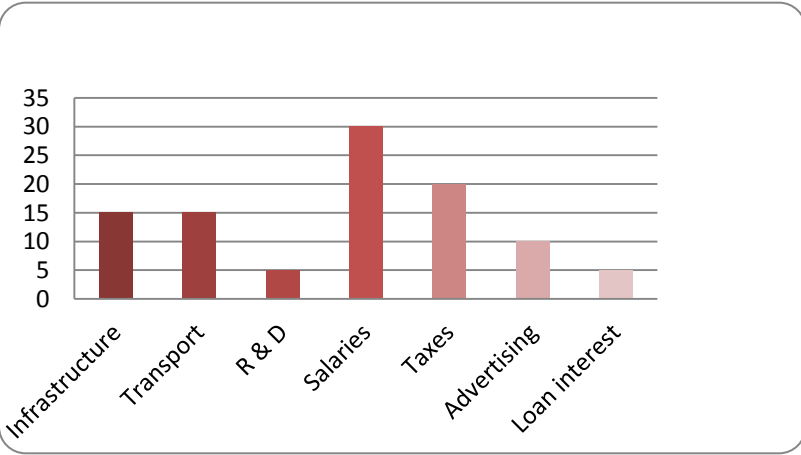
Incorrect computation with percentages: Write an algebraic expression from the information provided. Use key words to determine the appropriate operation. For instance, “of” means “x”; “is” means “=.” Students who do not write algebraic expressions have a tendency to divide when they should multiply and vice versa.

CTE Instructor's Extended Discussion

Have students create graphs to represent other things in dentistry that need to be tracked such as types of crowns and bridges, or types of patients the hygienist is seeing.

Problems	Career and Technical Math Concepts	Solutions
1. How many patients seen in the hygiene room were regular prophys? The total number of patients seen is 235.		<p style="text-align: center;">Patients Seen in Hygiene in May</p> 
2. The doctor would like at least 20% of the patients seen to be scale and root plane patients. How many more patients does the hygiene department need to see to reach 20%?		
3. How many more sealant patients were seen, compared to whitening patients?		

Problems	Related, Generic Math Concepts	Solutions
4. If there are 2,825 teenagers enrolled in your school, how many would you expect to be employed in retail?		<p style="text-align: center;">Where Teens Work</p> 
5. If approximately 25,000 teenagers work in the service industry, how many working teenagers are there?		
6. If there are 2,825 teenagers enrolled in your school, how many teenagers work in manufacturing or agriculture?		

Problems	PA Core Math Look	Solutions
7. The total amount of expenditures of the company is how many times that spent on taxes?		
8. If \$250,000 is spent on advertising, then what is the difference in expenditure between taxes and transport?		
9. If the loan interest is \$275,000, then what is the total amount of expenditure on advertisement, taxes, and research and development?		

Dental Technology (51.0601) T-Chart

Problems	Career and Technical Math Concepts	Solutions
1. How many patients seen in the hygiene room were regular prophys? The total number of patients seen is 235.	$0.65(235) = 152.75$	The approximate number of regular prophys is 152.
2. The doctor would like at least 20% of the patients seen to be scale and root plane patients. How many more patients does the hygiene department need to see to reach 20% ?	Figure 9% first $0.09(235) = 21$ Figure 20% next $0.20(235) = 47$ Subtract the 2 numbers = 26	The Hygiene Department needs to see an additional 26 patients to reach the goal.
3. How many more sealant patients were seen, compared to whitening patients?	Sealant patients $0.15(235) = 35.25$ Whitening patients $0.11(235) = 25.85$ Subtract = $35.25 - 25.85 = 9.4$	Approximately 9 more sealant patients were seen.
Problems	Related, Generic Math Concepts	Solutions
4. If there are 2,825 teenagers enrolled in your school, about how many would you expect to be employed in retail?	54% of 2,825 is the number employed in retail. $0.54(2,825) = x \rightarrow 1,525.5$ or 1,526 students.	
5. If approximately 25,000 teenagers work in the service industry, about how many working teenagers are there?	25,000 is 25% of the number of working teenagers $25,000 = 0.25x \rightarrow \frac{25,000}{0.25} = \frac{0.25x}{0.25}$ $x = 100,000$ working teens.	
6. If there are 2,825 teenagers enrolled in your school, about how many teenagers work in manufacturing or agriculture?	Manufacturing = 5%, agriculture = 5% 10% of 2,825 is the number of teens who work in manufacturing or agriculture $0.10(2,825) = 282.5$ or 283 students.	
Problems	PA Core Math Look	Solutions
7. The total amount of expenditures of the company is how many times that spent on taxes?	Taxes =20%. $5 \times 20\% = 100\%$ (total expenditures)	Total expenditures are 5 times the amount of taxes.
8. If \$250,000 is spent on advertising, then what is the difference in expenditure between taxes and transport	Advertising = 10% = \$250,000 Taxes (20%) – Transport (15%) = 5% , which would be half of \$250,000	\$125,000 is the difference between taxes and transport.
9. If the loan interest is \$275,000, then what is the total amount of expenditure on advertisement, taxes, and research and development?	Loan interest = 5% = \$275,000. Advertising = 10%, taxes = 20%, and R & D = 5% $\$550,000 + \$1,100,000 + \$275,000 = \$1, 925,000$ $\$1,925,000$	