

# THE BEST ACT PREP COURSE EVER

## PERCENTS

*ACT Math: Problem Set*

1. 60% of a number is 72. What is 130% of that number?
  - A. 56.16
  - B. 92.31
  - C. 120
  - D. 156
  - E. 1560
2.  $x$  is 175% of  $y$ . 35% of  $y$  is what percent of  $x$ ?
  - A. 5%
  - B. 20%
  - C. 25%
  - D. 110%
  - E. 500%
3. There is a basket with 20 apples. 40% of the apples are taken by Jimmy. 25% of the remaining apples are taken away by Joe. How many apples remain in the basket?
  - A. 9
  - B. 11
  - C. 12
  - D. 17
  - E. 18
4. In a group of people, 30% of the people leave, and 10% of the remaining people leave a few hours later. What percent of the original group is left?
  - A. 37%
  - B. 40%
  - C. 60%
  - D. 63%
  - E. 71%
5. The temperature at the beginning of the day is  $x$ . By noon the temperature increased 35%, by the end of the day, the temperature decreased 25% from the temperature at noon. The temperature at the end of the day is what percent of  $x$ ?
  - A. 10%
  - B. 33.75%
  - C. 60%
  - D. 101.25%
  - E. 110%
6. James' commute to work has been increasing every year due to increasing traffic. From 2012 to 2013 his commute time increased by 25%. From 2013 to 2014 his commute time increased by 15%. From 2012 to 2014, by what percent did his commute time increase?
  - A. 3.75%
  - B. 18.75%
  - C. 28.75%
  - D. 40%
  - E. 43.75%
7. In January, Gary could run a mile in 6 minutes. In February, he decreased his time by 15%. In March, Gary decreased his mile by another 12%. His mile time in March is what percent of his original mile time?
  - A. 74.8%
  - B. 73%
  - C. 25.2%
  - D. 10.2%
  - E. 1.8%
8. At a used car dealer, 55% of the cars have 7 or more seats. Of the remaining cars, 40% have 5 or 6 seats. What percent of cars have fewer than 5 seats?
  - A. 5%
  - B. 22%
  - C. 23%
  - D. 27%
  - E. 45%
9. A tennis player plays her first 30 matches and wins 18 of them. Then she loses the next 5 matches in a row. What is the minimum number of matches she would have to win to match or surpass her original winning percentage?
  - A. 7
  - B. 8
  - C. 2
  - D. 6
  - E. 4

10. Matt is playing an online game and has won 30 out of 100 times. If he wins every game from now, what is the least number of games he must win to improve his win percentage to 40%?
- A. 10  
B. 13  
C. 15  
D. 17  
E. 18
11. Ben and Charlotte went to a restaurant and their bill was \$36.21. They decided to leave a tip that would be 18% of their bill. Which of the following is closest to that amount?
- A. \$7.23  
B. \$7.00  
C. \$6.50  
D. \$6.07  
E. \$5.50
12. What is 20% of 10% of 5?
- A. .001  
B. 1  
C. .1  
D. .2  
E. .5
13. What is 3% of  $9.81 \times 10^5$ ?
- A. 32700  
B. 327000  
C. 2943000  
D. 294300  
E. 29430
14. What percent of  $\frac{4}{5}$  is  $\frac{1}{5}$ ?
- A. 25%  
B. 20%  
C. 80%  
D. 16%  
E. 400%
15. Due to inflation, prices have risen by 30%. What does a calculator that previously cost \$80.00 now cost?
- A. \$104.00  
B. \$110.00  
C. \$80.30  
D. \$83.00  
E. \$90.00
16. Every year a car depreciates (loses value). A particular car that was worth  $x$  dollars last year now sells for 20% less. Which of the following calculations gives the current cost, in dollars, of the car?
- A.  $x - .2x$   
B.  $.2x$   
C.  $x - .02x$   
D.  $x - .8x$   
E.  $1.2x$
17. During a sale at a department store, all ties are discounted by 75%. A customer buys a tie that was originally priced at \$135. If an 8% sales tax was added after the discount was taken, about how much money does the customer have to pay?
- F. \$109.35  
G. \$60.75  
H. \$36.45  
I. \$33.75  
J. \$68.00
18. Ms. Murphy gives a quiz to her class of 25 questions. Only one of the following percents is possible for a student to score on this quiz of 25 questions. Which one is it?
- A. 85%  
B. 88%  
C. 90%  
D. 94%  
E. 97%
19. The school took a survey of the student body's favorite flavor ice cream. 20% said they preferred chocolate, 15% said they liked vanilla, 20% said they preferred strawberry, 30% said they preferred cookie dough, and the rest said they liked sorbet. If each student could only pick one flavor and  $n$  number students said they preferred sorbet, how many students, in terms of  $n$ , were surveyed?
- A.  $100n$   
B.  $\frac{100 - n}{15}$   
C.  $\frac{15n}{100}$   
D.  $\frac{100n}{15}$   
E.  $.85n$

20. A chair that was originally sold for \$150 is discounted to \$135. What is the percent discount on this coat?

A. 90%  
B. 15%  
C. 11%  
D. 10%  
E. 1%

21. The table below shows the age distribution of a student body at a large university.

Age, in years	17	18	19	20	21	22
Percent of students	4%	24%	21%	26%	18%	7%

What percent of students younger than 21?

A. 49%  
B. 74%  
C. 75%  
D. 51%  
E. 26%

**ANSWERS**

1. D    2. B    3. A    4. D    5. D    6. E    7. A    8. D    9. B    10. D    11. C    12. C    13. E    14. A  
 15. A    16. A    17. C    18. B    19. D    20. D    21. C

**ANSWER EXPLANATIONS**

1. **D.** 60% of a number is 72 means that  $0.6x = 72$ . So,  $x = \frac{72}{0.6} = 120$ . 130% of 120 is  $1.3 \cdot 120 = 156$ .
2. **B.**  $x$  is 175% of  $y$  means that  $x = 1.75y$ . So  $y = \frac{x}{1.75}$ . 35% of  $y$  is  $0.35y$  so  $0.35y = \frac{0.35x}{1.75} = 0.2x$ . So, 35% of  $y$  is equal to 20% of  $x$ .
3. **A.** 40% of the 20 apples is equal to  $0.4 \cdot 20 = 8$  apples taken by Jimmy. This means there are  $20 - 8 = 12$  apples remaining. Of these 12 remaining apples, Joe takes 25% or  $0.25 \cdot 12 = 3$  of them. This means there are  $12 - 3 = 9$  apples left in the basket.
4. **D.** Let  $x$  represent the number of people the group started with. So, after 30% of the people leave, we have  $x - 0.3x = 0.7x$  people left. A few hours later, 10% of the  $0.7x$  people leave, leaving  $0.7x - (0.1(0.7x)) = 0.7 - 0.07x = 0.63x$  people left. This is 63% of the original  $x$  people.
5. **D.** After the temperature increases 35%, it is  $1.35x$ . When  $1.35x$  decreases 25%, it is then  $1.35x - 0.25 \cdot 1.35x \rightarrow 0.75 \cdot 1.35x \rightarrow 1.0125x$ . This is 101.25% of the original temperature  $x$ .
6. **E.** Let  $x$  represent the original commute time. From 2012 to 2013, his commute increased by 25%, which means it was  $1.25x$ . Then, from 2013 to 2014, his then commute time of  $1.25x$  increased by 15%, making it  $1.15 \cdot 1.25x = 1.4375x$ . So, in total from 2012 to 2014, his commute time is 143.75% of the original commute time  $x$ , which means that it increased by 43.75%.
7. **A.** In February, Gary's original time of 6 minutes decreased by 15%, which means that his time was then  $6 - 0.15 \cdot 6 \rightarrow 0.85 \cdot 6 \rightarrow 5.1$ . Then, in March, he decreased his time of 5.1 minutes by another 12%, which means that his time in March was  $5.1 - 0.12 \cdot 5.1 \rightarrow 0.88 \cdot 5.1 \rightarrow 4.488$  minutes. This is  $\frac{4.488}{6} = 0.748 = 74.8\%$  of his original time.
8. **D.** Let  $x$  equal the total number of cars. 55% of the cars have 7 or more seats, which means that  $0.55x$  cars have 7 or more seats and  $x - 0.55x = 0.45x$  cars do not have 7 or more seats. Of those  $0.45x$  cars, 40% have 5 or 6 seats. This means that  $0.4 \cdot 0.45x$  cars have 5 or 6 seats and  $0.45x - 0.4 \cdot 0.45x \rightarrow 0.6 \cdot 0.45x \rightarrow 0.27x$  cars have fewer than 5 seats. This is 27% of the original  $x$  cars.
9. **B.** The tennis player wins 18 out of 30 matches, which is  $\frac{18}{30} \cdot 100\% = 60\%$  of her matches. She loses the next 5 in a row, which means that she now has won 18 out of 35 matches. If she wins  $x$  number of games in a row, she can match or surpass her original percentage of 60%. We can calculate her percentage after winning  $x$  games in a row as  $\frac{18+x}{35+x} \cdot 100\%$ . We want to match this with 60%, so we have  $\frac{18+x}{35+x} = 0.6$ . Multiplying both sides by  $35+x$ , we get  $18+x = 0.6(35+x) \rightarrow 18+x = 21+0.6x$ . Subtracting  $0.6x+18$  on both sides, we get  $0.4x = 3$ . So,  $x = 7.5$ . Since she must win at least 7.5 matches in a row, but can't win half a game, winning 8 matches would enable her to surpass her original winning percentage.

10. **D.** We can calculate Matt's percentage after winning  $x$  games in a row as  $\frac{30+x}{100+x} * 100\%$ . We want to match this with 40%, so we have  $\frac{30+x}{100+x} = 0.4$ . Multiplying both sides by  $100+x$ , we get  $30+x = 0.4(100+x) \rightarrow 30+x = 40+0.4x$ . Subtracting  $0.4x+30$  on both sides, we get  $0.6x=10$ . So,  $x=16.667$ . Since he must win at least 16.667 games in a row, winning 17 games would enable him to improve his winning percentage to 40%.
11. **C.** Tip is just a percent of the total. Rewriting the percent as a decimal,  $\$36.21(.18) = 6.5178 \approx 6.50$ , answer (C). Answer (A) is the result of rounding  $\$36.21$  to  $\$36.00$  and 18% to 20%, which is relatively far from the correct answer.
12. **C.**  $\left(\frac{20}{100}\right)\left(\frac{10}{100}\right)(5) = \left(\frac{1}{5}\right)\left(\frac{1}{10}\right)(5) = .1$ , answer (C).
13. **E.**  $9.81 \times 10^5 (.03) = 29430$ , answer (E).
14. **A.** Fractions are not any different when finding what percent.  
 $\frac{1}{5} \div \frac{4}{5} = \frac{1}{4} \rightarrow 25\%$ , answer (A).
15. **A.**  $\$80(1.3) = \$104$ , answer (A).
16. **A.** The current value is the past year's values minus 20% of the past year's value. Since the past year's value was  $x$ , the current value is  $x - .2x$ , answer (A).
17. **C.** A 75% discount means the ties are 25% of the original price. The sales tax will increase the price by 8%. Since both these operations are multiplication, and multiplication is commutative, they can be done in one step.  
 $\$135(.25)(1.08) = \$36.45$ , which is answer (C).
18. **B.** Instead checking every possible score on the test, look at the expression.  $\frac{1n}{25} = .04n$ , which is 4%( $n$ ). Every possible score must be a multiple of 4. Looking at the answer provided, the only multiple of 4 is 88%, answer (B).
19. **D.**  $100\% - 20\% - 15\% - 20\% - 30\% = 15\%$  of students who prefer sorbet. People who prefer sorbet are 15% of the total number of students, which we can call  $S$ , as modeled by the equation:  $\frac{n}{S} = \frac{15}{100}$ . Solve, and we see that  $S = \frac{100n}{15}$ . All the other answers are expression that use  $n$  and the correct numbers, but have no significance.
20. **D.** To avoid silly mistakes, set up a quick equation.  $135 = 150x$ , where  $x$  is a decimal that represents a percent.  $\frac{135}{150} = .9$ , which means that \$135 is 90% of the original price, or that there is a 10% ( $100\% - 90\%$ ) discount, answer (D).
21. **C.** Sum the percent of students at age twenty and below.  $4\% + 24\% + 21\% + 26\% = 75\%$ , answer (C).