

## **PERCENT**

### **Lesson 2 More Percent of a Number Word Problems**

These word problems are more complicated and may require several steps. Read carefully to make sure you are answering the question that is asked.

#### **Example 1**

After Halloween, one store puts all bags of Halloween candy on sale for 35% off the regular price. The regular price of the candy ranges from \$4.99 per bag to \$8.99 per bag. What is the range of the sale prices for the bags of candy?

- A. \$1.75 to \$3.15                      B. \$4.99 to \$8.99                      C. \$4.64 to \$8.64  
D. \$3.00 to \$5.00                      E. \$3.24 to \$5.84

The range of something means the distance between the lowest and highest value.

Lowest sale price: Discount is 35% of \$4.99  $\rightarrow 0.35 \times \$4.99 = \$1.7465 \rightarrow \$1.75$   
Sale price = Regular price – Discount  $\rightarrow \$4.99 - \$1.75 = \$3.24$

Highest sale price: Discount is 35% of \$8.99  $\rightarrow 0.35 \times \$8.99 = \$3.1465 \rightarrow \$3.15$   
Sale price = Regular price – Discount  $\rightarrow \$8.99 - \$3.15 = \$5.84$

**Answer: E. \$3.24 to \$5.84**

**OR** – If the discount off the regular price is 35%, the amount remaining to be paid is  $100\% - 35\% = 65\%$  of the regular price.

Lowest sale price:  $0.65 \times \$4.99 = \$3.2435 \rightarrow \$3.24$

Highest sale price:  $0.65 \times \$8.99 = \$5.8435 \rightarrow \$5.84$

**Answer: E. \$3.24 to \$5.84**

**CAREFUL** – A very common mistake with this type of problem is to calculate the range of discounts, which is \$1.75 to \$3.15, and use that as the answer. But, the question does not ask for the range of discounts, it asks for the range of sale prices, so the discounts must be subtracted from the regular prices to get the answer.

The question could have been: What is the range of savings for the bags of candy? If that was the question, then the answer would be \$1.75 to \$3.15.

### **Example 2**

4 years ago, Julian bought some land for \$175,000. There has been a property boom and the value of the land has increased by 45%. What is his land worth now?

- A. \$78,750    B. \$253,750    C. \$96,250    D. \$75,780    E. \$235,750

The increase in value is 45% of \$175,000  $\rightarrow 0.45 \times \$175,000 = \$78,750$

The value of the land now is the original value plus the increase.

$$\$175,000 + \$78,750 = \$253,750$$

**Answer: B. \$253,750**

**OR** – 100% of the land cost plus another 45% for the increase is 145% of the cost.

$$145\% \text{ of } \$175,000 \rightarrow 1.45 \times \$175,000 = \mathbf{\$253,750}$$

**CAREFUL** – A very common mistake with this kind of problem is to calculate the amount of the increase, which is \$78,750, and use that for the answer.

### **Example 3**

Sue rents a booth at the Apex Craft Fair each year to sell her handcrafted jewelry. She will have to pay a booth rental charge of \$250 as well as a sales fee of 9% on all sales after her first \$1,200 of sales. If her total sales are \$4,000, how much in total will she have to pay to the Apex Craft Fair?

- A. \$610    B. \$252    C. \$360    D. \$502    E. \$520

This is a multi-step problem that must be read carefully.

**Step 1** – Calculate the sales that are subject to the sales fee.

It says she will pay 9% on all sales after the first \$1,200. This means that she does not have to pay the sales fee on the first \$1,200 in sales. She will pay the fee on the rest of the sales, which are  $\$4,000 - \$1,200 = \$2,800$ .

**Step 2** – Calculate the sales fee.

$$9\% \text{ of } \$2,800 \rightarrow 0.09 \times \$2,800 = \$252$$

**Step 3** – Calculate the total owed, which is the booth rental charge plus the sales fee.

$$\$250 + \$252 = \$502 \quad \mathbf{\text{Answer: D. } \$502}$$

#### **Example 4**

Ebony budgets to spend 40% of her income on rent and utilities, 25% on food, 5% on transportation, and 20% on other expenses. The rest she sets aside to save for a house down payment. If she makes \$3,000 per month and sticks to her budget, how much can she save each month?

- A. \$150      B. \$1,200      C. \$300      D. \$600      E. \$750

The key to this problem is realizing that all of her expenses and savings have to add up to 100% of her \$3,000 income.

Total the percents for all the listed expenses:  $40\% + 25\% + 5\% + 20\% = 90\%$

This means she spends 90% of her \$3,000 income on the listed expenses.

The amount she has left for savings is her whole income minus 90% of her income.

$$100\% - 90\% = 10\%.$$

Amount of savings = 10% of \$3,000  $\rightarrow 0.1 \times \$3,000 = \$300$

**Answer: C. \$300**

**OR** – You could calculate 90% of \$3,000 to cover all the listed expenses and then subtract from \$3,000 to see how much is left for savings.

$$0.9 \times \$3,000 = \$2,700 \quad \$3,000 - \$2,700 = \mathbf{\$300}$$

**OR** – You could calculate all the expenses separately by multiplying each percent times \$3,000, add them up, and subtract the total from \$3,000.

The amount left would be the savings.

$$0.4 \times \$3,000 = \$1,200$$

$$0.25 \times \$3,000 = \$750$$

$$0.05 \times \$3,000 = \$150$$

$$0.2 \times \$3,000 = \$600$$

$$\text{Total listed expenses} = \$2,700 \quad \$3,000 - \$2,700 = \mathbf{\$300}$$

All three methods work, but the first method is the fastest.

### **Example 5**

The retail price of boots at a shoe store is determined by adding a 95% markup to the wholesale price that the shoe store has to pay its supplier for the boots. If the shoe store pays their supplier a wholesale price of \$65 for a pair of boots, what will the retail price of the boots be in the store?

- A. \$61.75      B. \$126.75      C. \$160.00      D. \$30.00      E. \$162.75

**Wholesale price** is the amount the store pays a supplier to get its merchandise.

**Markup** is the amount the store adds to the wholesale price, to cover the store's expenses and profit.

**Retail price** is the price customers pay for a product.

Retail price = Wholesale price + Markup

Markup: 95% of \$65  $\rightarrow 0.95 \times \$65 = \$61.75$

Retail price: Wholesale price + Markup  $\rightarrow \$65 + \$61.75 = \$126.75$

**Answer: B. \$126.75**

**OR** – 100% of wholesale plus another 95% for the markup is 195% of the cost.  
195% of \$65  $\rightarrow 1.95 \times \$65 = \mathbf{\$126.75}$

### **Practice – More Percent of a Number Word Problems**      *Answers – p. 7*

1. The population in a city has decreased by 15% since the last census. If the population was 187,654 at the last census, what is the population now?

- A. 28,148      B. 159,506      C. 12,510      D. 187,639      E. 28,841

2. The Now or Never Fitness Center has a goal of increasing its number of clients by 7% over their current enrollment of 425 clients. If they reach their goal, how many new clients will they have?

- A. 30      B. 455      C. 298      D. 61      E. 300

3. The amount of surface area covered by an experimental substance is predicted to decrease by 4% over 10 days. If the surface area covered is now 18 ft<sup>2</sup>, how much surface area will the substance cover 10 days from now, assuming the prediction is correct?

- A. 0.72 ft<sup>2</sup>      B. 18.72 ft<sup>2</sup>      C. 17.28 ft<sup>2</sup>      D. 7.2 ft<sup>2</sup>      E. 10.8 ft<sup>2</sup>

4. A salesperson earns a base salary of \$400 per week plus a commission of 20% on any sales made after the first \$800 of merchandise sold. If she sold \$2,500 of merchandise last week, what was her total pay?  
 A. \$340      B. \$500      C. \$740      D. \$900      E. \$580
5. Ella's car insurance policy says that for repairs resulting from an accident, it will pay 90% of repair costs after she has met her deductible of \$1,000. If her repair bill is \$2,800, how much of the bill will the insurance company pay?  
 A. \$2,520      B. \$900      C. \$2,800      D. \$1,620      E. \$2,250
6. A company contributes 3% of an employee's salary to a retirement plan, and the employee can also contribute to the retirement plan by payroll deduction. If Raisa's salary is \$36,000 per year, and she contributes \$200 per month via payroll deduction, what is the total amount that is contributed to her retirement plan in 1 year?  
 A. \$1,080      B. \$3,480      C. \$2,400      D. \$10,800      E. \$11,000
7. The number of students at Braden College is expected to increase between 10% and 15% next year. If there are 1,800 students now, the number of students expected to attend Braden College next year falls in which range?  
 A. between 180 and 270      B. between 150 and 300  
 C. between 1,800 and 2,070      D. between 1,800 and 1,980  
 E. between 1,980 and 2,070
8. At a used car lot, customers are required to make a down payment of between 10% and 25% of the car's price, depending on their credit rating. For a car that is priced at \$9,500, the required down payment will fall in which of the following ranges?  
 A. \$950 to \$2,375      B. \$7,125 to \$8,550      C. \$10,450 to \$11,875  
 D. \$380 to \$950      E. \$950 to \$2,950
9. A college recruiter wants to make sure not to run out of information packets when she makes a presentation at a high school, and uses the following formula to determine how many information packets to bring with her.
- Students expected + 15% of students expected = Number of information packets*
- If Central High School has told her to expect 200 students, how many information packets will she bring?  
 A. 215      B. 30      C. 15      D. 230      E. 320

**10.** A grocery store has a 45% markup on Roma spaghetti sauce. If the wholesale cost from the supplier is \$1.75 for a jar of sauce, what will the retail price of the sauce be in the store?

- A. \$0.79      B. \$0.96      C. \$1.30      D. \$3.54      E. \$2.54

Use this chart to answer questions 11 and 12.

Flavor	% of Ice Cream Sales
Chocolate	30%
Vanilla	30%
Strawberry	18%

**11.** What percent of ice cream sales are made from flavors other than chocolate, vanilla, and strawberry?

- A. 22%      B. 78%      C. 18%      D. 13%      E. 30%

**12.** If total ice cream sales were \$5,000, what were the sales of strawberry ice cream?

- A. \$1,500      B. \$1,667      C. \$1,800      D. \$800      E. \$900

**13.** There are 450 students enrolled in an adult ed program. If 20% of students are 30 years old or younger, and 48% are aged 31 – 45, how many students are over 45 years old?

- A. 32      B. 144      C. 90      D. 216      E. 23

## **ANSWER KEY Lesson 2 More Percent of a Number Word Problems**

1. The population in a city has decreased by 15% since the last census. If the population was 187,654 at the last census, what is the population now?

- A. 28,148      **B. 159,506**      C. 12,510      D. 187,639      E. 28,841

Amount of decrease is 15% of 187,654  $\rightarrow 0.15 \times 187,654 = 28,148.1 \rightarrow 28,148$

Current population is original population minus the amount of decrease.

$$187,654 - 28,148 = 159,506 \quad \text{Answer: } \mathbf{B. 159,506}$$

**OR** – You start with 100% of the population, and decrease it by 15%.

The percent of the population that is left is  $100\% - 15\% = 85\%$ .

$$85\% \text{ of } 187,654 \rightarrow 0.85 \times 187,654 = 159,505.9 \rightarrow \mathbf{159,506}$$

2. The Now or Never Fitness Center has a goal of increasing its number of clients by 7% over their current enrollment of 425 clients. If they reach their goal, how many new clients will they have?

- A. 30**      B. 455      C. 298      D. 61      E. 300

The goal number of new clients is 7% of 425  $\rightarrow 0.07 \times 425 = 29.75 \rightarrow 30$

The question asks for the number of new clients, so 30 is the answer.

**Answer: A. 30**

**CAREFUL** – Read the question carefully so you answer exactly what is being asked for. A common mistake would be to calculate the total number of clients ( $425 + 30 = 455$ ) instead of answering with just the number of new clients (30) that the question asks for.

3. The amount of surface area covered by an experimental substance is predicted to decrease by 4% over 10 days. If the surface area covered is now  $18 \text{ ft}^2$ , how much surface area will the substance cover 10 days from now, assuming the prediction is correct?

- A.  $0.72 \text{ ft}^2$       B.  $18.72 \text{ ft}^2$       **C.  $17.28 \text{ ft}^2$**       D.  $7.2 \text{ ft}^2$       E.  $10.8 \text{ ft}^2$

Amount of decrease is 4% of  $18 \text{ ft}^2 \rightarrow 0.04 \times 18 \text{ ft}^2 = 0.72 \text{ ft}^2$

Surface area covered in 10 days is current surface area minus amount of decrease.

$$18 - 0.72 = 17.28 \text{ ft}^2$$

**Answer: C.  $17.28 \text{ ft}^2$**

**OR** – Current surface area covered is 100%, area covered after 10 days is 4% less, so calculate  $100\% - 4\% = 96\%$  of current area.

$$96\% \text{ of } 18 \text{ ft}^2 \rightarrow 0.96 \times 18 \text{ ft}^2 = \mathbf{17.28 \text{ ft}^2}$$

4. A salesperson earns a base salary of \$400 per week plus a commission of 20% on any sales made after the first \$800 of merchandise sold. If she sold \$2,500 of merchandise last week, what was her total pay?

- A. \$340      B. \$500      C. **\$740**      D. \$900      E. \$580

Total pay = Base salary + Commission

**Step 1** – Calculate the sales that earn commission.

$$\$2,500 - \$800 = \$1,700$$

**Step 2** – Calculate the commission

$$20\% \text{ of } \$1,700 \rightarrow 0.2 \times \$1,700 = \$340$$

**Step 3** – Calculate total pay, which is base salary plus commission.

$$\$400 + \$340 = \$740$$

**Answer: C. \$740**

5. Ella's car insurance policy says that for repairs resulting from an accident, it will pay 90% of repair costs after she has met her deductible of \$1,000. If her repair bill is \$2,800, how much of the bill will the insurance company pay?

- A. \$2,520      B. \$900      C. \$2,800      D. **\$1,620**      E. \$2,250

**Step 1** – Calculate how much of the repair bill the insurance company will make payment on. Deductible of \$1,000 means insurance will not pay any part of the first \$1,000 of repair expense, so Ella will have to pay the first \$1,000. So, the insurance company will make payment on the total repair cost minus the deductible  $\rightarrow \$2,800 - \$1,000 = \$1,800$ .

**Step 2** – Calculate the amount the insurance company is responsible for. The policy says the company will pay 90%.

$$90\% \text{ of } \$1,800 \rightarrow 0.9 \times \$1,800 = \$1,620$$

**Answer: D. \$1,620**

**NOTE** – Instead of asking how much the insurance company will pay, the question might have been: How much of the repair bill will Ella have to pay?

She has to pay the deductible of \$1,000.

She has to pay 10% of the rest of the bill, or  $0.1 \times \$1,800 = \$180$ .

Her total cost is  $\$1,000 + \$180 = \$1,180$ .

When answering insurance questions, be sure to read carefully, so you know whether to calculate how much the person pays or how much the insurance company pays.

6. A company contributes 3% of an employee's salary to a retirement plan, and the employee can also contribute to the retirement plan by payroll deduction. If Raisa's salary is \$36,000 per year, and she contributes \$200 per month via payroll deduction, what is the total amount that is contributed to her retirement plan in 1 year?
- A. \$1,080      **B. \$3,480**      C. \$2,400      D. \$10,800      E. \$11,000

Total contribution is the amount from the company + the amount from Raisa.

Amount contributed by the company: 3% of \$36,000  $\rightarrow 0.03 \times \$36,000 = \$1,080$

Amount contributed by Raisa:  $\$200 \times 12 \text{ months} = \$2,400$

Total contribution:  $\$1,080 + \$2,400 = \$3,480$

**Answer: B. \$3,480**

7. The number of students at Braden College is expected to increase between 10% and 15% next year. If there are 1,800 students now, the number of students expected to attend Braden College next year falls in which range?
- A. between 180 and 270      B. between 150 and 300  
C. between 1,800 and 2,070      D. between 1,800 and 1,980  
**E. between 1,980 and 2,070**

Lowest number of expected students:

Increase is 10% of 1,800  $\rightarrow 0.1 \times 1,800 = 180$

Number of students expected next year is current number plus increase.

$1,800 + 180 = \mathbf{1,980}$

Highest number of expected students:

Increase is 15% of 1,800  $\rightarrow 0.15 \times 1,800 = 270$

Number of students expected next year is current number plus increase.

$1,800 + 270 = \mathbf{2,070}$

**Answer: E. between 1,980 and 2,070**

**OR**

For lowest number, 100% plus 10% more is 110% of 1,800.  $1.1 \times 1,800 = \mathbf{1,980}$

For highest number, 100% plus 15% more is 115% of 1,800.  $1.15 \times 1,800 = \mathbf{2,070}$

**8.** At a used car lot, customers are required to make a down payment of between 10% and 25% of the car's price, depending on their credit rating. For a car that is priced at \$9,500, the required down payment will fall in which of the following ranges?

- A. **\$950 to \$2,375**      B. \$7,125 to \$8,550      C. \$10,450 to \$11,875  
D. \$380 to \$950      E. \$950 to \$2,950

Lowest down payment: 10% of \$9,500  $\rightarrow 0.1 \times \$9,500 = \$950$

Highest down payment: 25% of \$9,500  $\rightarrow 0.25 \times \$9,500 = \$2,375$

**Answer: A. \$950 to \$2,375**

**9.** A college recruiter wants to make sure not to run out of information packets when she makes a presentation at a high school, and uses the following formula to determine how many information packets to bring with her.

*Students expected + 15% of students expected = Number of information packets*

If Central High School has told her to expect 200 students, how many information packets will she bring?

- A. 215      B. 30      C. 15      **D. 230**      E. 320

Extra packets: 15% of students expected  $\rightarrow 0.15 \times 200 = 30$

Total packets needed:  $200 + 30 = 230$

**Answer: D. 230**

**OR** – 100% of students plus another 15% is 115% of the number of students.

115% of 200  $\rightarrow 1.15 \times 200 = \mathbf{230}$

**10.** A grocery store has a 45% markup on Roma spaghetti sauce. If the wholesale cost from the supplier is \$1.75 for a jar of sauce, what will the retail price of the sauce be in the store?

- A. \$0.79      B. \$0.96      C. \$1.30      D. \$3.54      **E. \$2.54**

Markup: 45% of \$1.75  $\rightarrow 0.45 \times \$1.75 = \$0.7875 \rightarrow \$0.79$

Retail price = Wholesale price + Markup  $\rightarrow \$1.75 + \$0.79 = \$2.54$

**Answer: E. \$2.54**

**OR** – 100% of wholesale plus another 45% for the markup is 145% of the cost.

145% of \$1.75  $\rightarrow 1.45 \times \$1.75 = \$2.5375 \rightarrow \mathbf{\$2.54}$

Use this chart to answer questions 11 and 12.

Flavor	% of Ice Cream Sales
Chocolate	30%
Vanilla	30%
Strawberry	18%

11. What percent of ice cream sales are made from flavors other than chocolate, vanilla, and strawberry?

- A. 22%      B. 78%      C. 18%      D. 13%      E. 30%

Sales of chocolate, vanilla, and strawberry:  $30\% + 30\% + 18\% = 78\%$

Total ice cream sales: 100%

Sales from all other flavors:  $100\% - 78\% = 22\%$

**Answer: A. 22%**

12. If total ice cream sales were \$5,000, what were the sales of strawberry ice cream?

- A. \$1,500      B. \$1,667      C. \$1,800      D. \$800      E. \$900

Strawberry is 18% of the total, or 18% of \$5,000  $\rightarrow 0.18 \times \$5,000 = \$900$

**Answer: E. \$900**

13. There are 450 students enrolled in an adult ed program. If 20% of students are 30 years old or younger, and 48% are aged 31 – 45, how many students are over 45 years old?

- A. 32      B. 144      C. 90      D. 216      E. 23

It may be helpful to make a simple chart to organize all the percents and numbers.

<u>Age</u>	<u>Percent of Total</u>
30 and under	20%
31 – 45	48%
Over 45	?

Percent of students over age 45:  $100\% - 20\% - 48\% = 32\%$

Number of students over age 45: 32% of 450  $\rightarrow 0.32 \times 450 = 144$

**Answer: B. 144**