Sect 6.5 & 6.6 - Applications

The key to solve applications with percents is distilling the problem down into a simple sentence like the sentences we solved in section 6.4. We will start by identifying the amount, the percent, and the base and filling in the basic sentence: Amount is a Percent of the Base
Afterwards, we will set-up the percent proportion and solve the problem.

Solve the following:

Ex. 1   A basketball auditorium increased its 19,000 seating capacity by 18%. How many seats were added to the auditorium?
Solution:
We first fill in our simple sentence:
         Seats Added is 18% of the 19000 .
So, in this problem, the base is 19000, the percent is 18%, and we are looking for the amount:

$$\frac{A}{19000} = \frac{18}{100} \quad \text{(cross multiply)}$$

$A \bullet 100 = 19000 \bullet 18$ (simplify)
$100A = 342000$ (divide by 100)
$$\frac{100A}{100} = \frac{342000}{100}$$
$A = 3420.$
So, 3420 seats were added.

Ex. 2   An airline knowingly overbooks flights by selling 12% more tickets than there are seats available. If the airline overbooks a flight by 21 tickets, how many seats are available on the flight?
Solution:
We first fill in our simple sentence:
         21 is 12% of the Seats Available .
The amount is 21, the percent is 12%, so we are looking for the base:

$$\frac{21}{B} = \frac{12}{100} \quad \text{(cross multiply)}$$

$21 \bullet 100 = B \bullet 12$ (simplify)
$2100 = 12B$ (divide by 12)
$$\frac{2100}{12} = \frac{12B}{12}$$
$B = 175.$ There were 175 seats available.

Ex. 3   In a recent city election, 25,400 out of 112,000 registered voters voted. What percent (to the nearest tenth) of the registered voters voted?
Solution:
We first fill in our simple sentence:
        25,400 is a Percent of the 112,000 .
The amount is 25400, the base is 112,000, so we are looking for the percent:

$$\frac{25400}{112000} = \frac{p}{100} \quad \text{(cross multiply)}$$

$$25400 \bullet 100 = 112000 \bullet p \quad \text{(simplify)}$$

$$2540000 = 112000p \quad \text{(divide by 112000)}$$

$$\frac{2540000}{112000} = \frac{112000p}{112000}$$

$$p = 22.67857...\% \approx 22.7\%.$$

Ex. 4   A clerk typist was earning $8.50 an hour before an 8% increase in pay. What is the typist's new hourly wage?
Solution:
We first fill in our simple sentence:
        Increase is   8% of the $8.50 .
So, in this problem, the base is $8.50, the percent is 8%, and we are looking for the amount:

$$\frac{A}{\$8.50} = \frac{8}{100} \quad \text{(cross multiply)}$$

$$A \bullet 100 = 8.50 \bullet 8 \quad \text{(simplify)}$$

$$100A = 68 \quad \text{(divide by 100)}$$

$$\frac{100A}{100} = \frac{68}{100}$$

$$A = 0.68.$$
The increase in salary is $0.68. The new salary = $8.50 + $0.68 = $9.18.

Ex. 5   A computer system that sold for $2,400 one year ago can now be bought for $1,800. What percent change does this represent?
Solution:
We first need to compute the change: $2400 – $1800 = $600
Now, we fill in our simple sentence:
        $600 is a Percent of the $2400 .
The amount is 600, the base is 2400, so we are looking for the percent:

$$\frac{600}{2400} = \frac{p}{100} \quad \text{(cross multiply)}$$

$600 \bullet 100 = 2400 \bullet p$ (simplify)
$60000 = 2400p$ (divide by 2400)
$$\frac{60000}{2400} = \frac{2400p}{2400}$$
$p = 25\%$.   The percent decrease was 25%.

Ex. 6   A car dealer advertises a 6% markup rate on the cost of a car. If the mark-up is $870, what is the selling price of the car?
Solution:
We first fill in our simple sentence:
    870 is 6% of the Cost of the Car .
The amount is 870, the percent is 6%, so we are looking for the base: $\dfrac{870}{B} = \dfrac{6}{100}$ (cross multiply)

$870 \bullet 100 = B \bullet 6$ (simplify)
$87000 = 6B$ (divide by 6)
$$\frac{87000}{6} = \frac{6B}{6}$$
$B = 14,500$. The cost of the car is $14,500.
The selling price is $14,500 + $870 = $15,370.

Ex. 7   A tennis racket that regularly sells for $96 is on sale for 25% off the regular price. Find the sale price.
Solution:
We first fill in our simple sentence:
    Discount is 25% of the $96 .
So, in this problem, the base is 96, the percent is 25%, and we are looking for the amount:
$$\frac{A}{96} = \frac{25}{100}$$ (cross multiply)

$A \bullet 100 = 96 \bullet 25$ (simplify)
$100A = 2400$ (divide by 100)
$$\frac{100A}{100} = \frac{2400}{100}$$
$A = 24$. The discount was $24, so the sale price is $96 – $24 = $72.
But there is another way to do this problem; if you get a 25% discount, then you will pay 100% – 25% = 75%. So, we can calculate the sale price directly using the simple sentence:
    Sale Price is 75% of the $96 .

So, in this problem, the base is 96, the percent is 75%, and we are looking for the amount:

$$\frac{A}{96} = \frac{75}{100}$$ (cross multiply)

A•100 = 96•75 (simplify)

100A = 7200   (divide by 100)

$$\frac{100A}{100} = \frac{7200}{100}$$

A = 72. So, the sale price is $72. This technique we just used will be important in later problems.

Ex. 8   If Juan paid $31.50 in sales tax on a $400 stereo system, what was the sales tax rate?
Solution:
We first fill in our simple sentence:
     $31.50 is a Percent of the $400.
The amount is 31.50, the base is 400, so we are looking for the percent:

$$\frac{31.50}{400} = \frac{p}{100}$$ (cross multiply)

31.50•100 = 400•p   (simplify)

3150 = 400p   (divide by 400)

$$\frac{3150}{400} = \frac{400p}{400}$$

p = 7.875%. The sales tax rate is 7.875%.

Ex. 9   If Joe received a 4.5% commission on the sale of $180,000 home in Canyon Lake, how much was his commission?
Solution:
We first fill in our simple sentence:
     Commission is 4.5% of the $180000.
So, in this problem, the base is 180000, the percent is 4.5%, and we are looking for the amount:

$$\frac{A}{180000} = \frac{4.5}{100}$$ (cross multiply)

A•100 = 180000•4.5 (simplify)

100A = 810000 (divide by 100)

$$\frac{100A}{100} = \frac{810000}{100}$$

A = 8100.

So, his commission was $8,100.

Ex. 10   As part of a buyout program, Leroy is offered 80% of his salary of $65,000 for each year for the next five years if he retires this year. How much will he receive per year if he retires this year?

Solution:

We first fill in our simple sentence:

<u>Buyout Salary</u> is <u>80%</u> of the <u>$65000</u>.

So, in this problem, the base is 65000, the percent is 80%, and we are looking for the amount:

$$\frac{A}{65000} = \frac{80}{100}$$ (cross multiply)

A•100 = 65000•80   (simplify)

100A = 5200000   (divide by 100)

$$\frac{100A}{100} = \frac{5200000}{100}$$

A = 52,000. So, he will receive $52,000 per year.

Ex. 11   The Coyote (carniverious eatti) needs $2880 to buy a pair of Acme® Super Jet Powered Roller Skates to catch the Road Runner (incredious Superious Speeddi). If he decides to withdraw some money from his IRA where he will receive a 10% penalty for early withdraw, how much should he withdraw so that he gets $2,880 after the penalty?

Solution:

If we try to fill in our simple sentence, we run into problems:

<u>Penalty</u> is <u>10%</u> of the <u>Withdraw</u>.

The $2880 is not the amount of withdraw, but the amount the Coyote takes home after the penalty. The problem is we have two unknowns in this situation. We need to approach this problem another way. If 10% of the withdraw is taken for the penalty, then the coyote will receive 100% – 10% = 90% of the withdraw. So, the

<u>$2880</u> is <u>90%</u> of the <u>Withdraw</u>.

The amount is 2880, the percent is 90%, so we are looking for the base:

$$\frac{2880}{B} = \frac{90}{100}$$ (cross multiply)

2880•100 = B•90   (simplify)

288000 = 90B   (divide by 90)

$$\frac{288000}{90} = \frac{90B}{90}$$

B = 3200. He should withdraw $3200.

Ex. 12   Bugs Bunny's stock in Acme Corporation increased by 35% to $10,125 over the past year. What was the value of the stock last year?

Solution:

If we try to fill in our simple sentence, we run into the same problem as before:

Increase is 35% of the Last Year's Value .

Again, we need to approach this problem from another angle. If Last Year's Value represents 100% and the value increased by 35%, then this year's value is 100% + 35% = 135% of last year's value. So, our simple sentence becomes:

$10,125 is 135% of the Last Year's Value .

The amount is 10125, the percent is 135%, so we are looking for the base:

$$\frac{10125}{B} = \frac{135}{100} \text{ (cross multiply)}$$

10125•100 = B•135   (simplify)

1012500 = 135B   (divide by 135)

$$\frac{1012500}{135} = \frac{135B}{135}$$

B = 7500. Last Year's Value was $7500.

Ex. 13   Oscar the Grouch had to take a 7% pay cut since the Federal Government is cutting back on its financial support of PBS. If his new salary is $19.53 per hour, what was his salary before the pay cut?

Solution:

If 100% represents his old salary, then his new salary is 100% – 7% = 93% of his old salary. So, our simple sentence is

$19.53 is 93% of the Old Salary .

The amount is 19.53, the percent is 93%, so we are looking for the base:

$$\frac{19.53}{B} = \frac{93}{100} \text{ (cross multiply)}$$

19.53•100 = B•93   (simplify)

1953 = 93B   (divide by 93)

$$\frac{1953}{93} = \frac{93B}{93}$$

B = 21. His old salary was $21 per hour.

Ex. 14   Sandy Cheeks purchases a deluxe nutcracker from BargainMart that is on sale for 25% off the regular price. She also has a coupon that entitles her to receive an additional 15% off of the sale price. If she paid $25.50 for the nutcracker, what was the regular price of the nutcracker?

Solution:

We need to first find the sale price of the item before the 15% discount. If 100% represents the sale price, then sale price after the second discount is 100% – 15% = 85% of the original price. So, our simple sentence is

$\underline{\$25.50}$ is $\underline{85\%}$ of the $\underline{\text{Original Price}}$.

The amount is 25.50, the percent is 85%, so we are looking for the base:

$$\frac{25.50}{B} = \frac{85}{100} \quad \text{(cross multiply)}$$

25.50•100 = B•85   (simplify)
2550 = 85B   (divide by 85)

$$\frac{2550}{85} = \frac{85B}{85}$$

B = 30. The sale price was $30.

Now, let's find the regular price

If 100% represents the original price, then sale price is 100% – 25% = 75% of the original price. So, our simple sentence is

$\underline{\$30}$ is $\underline{75\%}$ of the $\underline{\text{Original Price}}$.

The amount is 30, the percent is 75%, so we are looking for the base:

$$\frac{30}{B} = \frac{75}{100} \quad \text{(cross multiply)}$$

30•100 = B•75   (simplify)
3000 = 75B   (divide by 75)

$$\frac{3000}{75} = \frac{75B}{75}$$

B = 40. The original price was $40.