



Math Olympiad and Problem Solving Programs
E210 - Introductory Math Competitions
Problem Set 13.2 - Percents

Name:

Date:

Here is a trick for doing percent problems. If you have an object whose original price is x , and then we mark it DOWN, say, 30%, then we write the new price of x like this: $(1 - .30)x = .7x$. If the price is marked UP, say 25%, then we write the new price: $(1 + .25)x = 1.25x$. So if it is marked down, you do 1 - percent, and if it was marked up, you do 1 + percent.

1. The camera had original price c , was marked DOWN 30%, and is now \$196, so we can set up an equation. The new price of c is $(1 - .3)c = .7c$, which equals \$196. So we can write $.7c = 196$. Divide both sides by $.7$, and we get the original price c is \$280. So her savings on the camera were $280 - 196 = 84$.

Let's do the same for the TV. Let t be the original price of the TV, and it was marked DOWN 15%, so the new price of the TV is $(1 - .15)t = .85t$, so we make the equation $.85t = 5270$. Divide both sides by $.85$, and we get $t = 6200$. The original price was \$6200, so her savings were $6200 - 5270 = 930$.

So her total savings for the two items is $930 + 84 = \boxed{\$1014}$.

2. Problem omitted: the numbers didn't make sense.

3. $\boxed{\$6.25}$

4. $\boxed{20}$

5. Let's do the calculations step by step.

The tiara is worth \$2000.

The value increases UP by 40%, so now it is $(1 + .40) \times 2000 = 2800$.

She sells it at a discount of 15% DOWN off it's value, so she sells it for $(1 - .15)2800 = 2380$.

She bought a motorcycle that was 20% DOWN in price. Let the original price of the motorcycle be m . The discounted price is $(1 - .2)m = .8m$. Make an equation: $.8m = 2380$. Divide both sides by $.8$, and we get the original price of the motorcycle was $\boxed{\$2975}$

6. Let x be the normal monthly tutoring fees. Then $.3x$ is what she saves every month. Then her income increases by 25% UP in May, so her new tutoring fee is $(1 + .25)x = 1.25x$. She always saves 30% of her fees, so she saves $.3 \times (1.25x) = (.3 \times 1.25)x = .375x$ in May. Her savings increased by \$150, so the difference between May's savings ($.375x$) and her normal savings ($.3x$) is 150. Set up an equation: $.375x - .3x = 150$. Simplify: $.075x = 150$. Divide both sides by $.075$, and we get $x = 2000$. So her normal tutoring earnings is \$2000. Her income in May is $1.25x$, so she earned $1.25 \times 2000 = \boxed{\$2500}$ in May.
7. If a salesman wanted to make 35% profit, then he sells the car for 35% more than he bought it for. Let b be the original price of the car. Then if the salesman wants to make 35% profit, he needs to charge $(1 + .35)b = 1.35b$. If he sells the car at a 10% discount of the $1.35b$ price, then he marks it DOWN $(1 - .1)(1.35b) = .9(1.35b) = (.9 \times 1.35)b = 1.215b$. So his profit is \$1333, meaning $1.215b - b = .215b = 1333$. Divide both sides by $.215$, and we get $b = 6200$. So the dealer bought the car for \$6,200. Now we need to find his original marked up price, which is $1.35b = 1.35 \times 6200 = \boxed{\$8370}$



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8. Let c be the cost price. If he sold 2 at a 35% profit, he sold them for $(1 + .35)c = 1.35c$. The ones at 30% profit are $1.3c$, the ones at 5% profit are $1.05c$, and the one at a 10% loss is $(1 - .1)c = .9c$. He got \$2496 altogether, so we can add up all the prices of the cameras. $2(1.35c) + 3(1.3c) + 2(1.05c) + .9c = 2.7c + 3.9c + 2.1c + .9c = 9.6c = 2496$. Divide both sides by 9.6, and we get $c = \boxed{\$260}$

9. Rewrite the problem in algebraic terms. Let c be the original cost price and let s be the selling price.

"If a necklace is sold at a 20% discount, a profit of \$66 will be made." $(1 - .2)s = c + 66 \Rightarrow .8s = c + 66$.

"If the necklace is sold at a 40% discount, a loss of \$88 will be made." $(1 - .4)s = c - 88 \Rightarrow .6s = c - 88$.

Now let us solve the second equation for c by adding 88 to both sides: $.6s + 88 = c$. Now we will substitute this expression in for the c in the first equation: $.8s = (.6s + 88) + 66$. Now we will solve for s : $.8s = .6s + 154$, $.2s = 154$, $s = 770$. So if the selling price is \$770, we need to find the cost price. We will substitute into the first equation: $.8(770) = c + 66 \Rightarrow 616 = c + 66 \Rightarrow c = \boxed{\$550}$

10. Let a be the number of buttons in Box A, b the buttons in B, and c the buttons in C. Let's create some algebraic sentences based off the instructions of the problem.

"Box A had three times as many buttons as box B." $a = 3b$.

"After 15% of the buttons in box A and 10% of the buttons in box B were transferred to box C, the number of buttons in box C increased by 33%." $.15a + .1b = .33c$

"Box C had 266 buttons in the end." $1.33c = 266$. Divide both sides by 1.33, and we find that $c = 200$, so C originally had 200 buttons.

Now let's replace $3b$ in for the a in the second equation: $.15(3b) + .1b = .45b + .1b = .55b = .33c$. We know C originally had 200 buttons and had 266 in the end, so it had an increase of 66 buttons. So $.33c = 66$, so $.55b = 66$, so $b = 120$. If $a = 3b$, then $a = 3(120) = 360$. So A originally had 360 buttons, but it gave 15% to C, so now it has $(1 - .15)a = .85a = .85(360) = \boxed{306}$