

It's time to celebrate that A on your first Math 1050 exam! You've been looking at a new pair of running shoes for several months and today's newspaper has a \$15 off coupon for purchases over \$50 at *Runners Are Us*. The sales clerk is helpful in locating the chartreuse design with aqua trim you've had your eye on, and is kind enough to advise you of the current 20% off sale the store is running on shoe purchases. The price of the shoes is \$100, not too bad for good quality running shoes. All is good until you get to the cash register and want to get the best possible price using the \$15 coupon discount along with the 20% sale discount. Should you request the 20% discount first, or use your \$15 coupon before the 20% is deducted? Does the order in which discounts are taken make any difference?

1. What will you pay for the shoes (before taxes) if the 20% discount is applied first?

$$100 \times 20\% = 20$$

$$100 - 20 = 80$$

$$80 - 15 \text{ coupon} = 65$$

2. What will you pay for the shoes (before taxes) if the \$15 discount is applied first?

$$100 - 15 = 85$$

$$85 \times 20\% = 17$$

$$85 - 17 = 68$$

3. Does applying one discount before the other make a difference? If it does, which discount would you prefer that the sales clerk apply first?

yes. I would prefer the sales clerk apply the 20% off first, then subtract the \$15 off coupon.

4. Letting  $x$  represent the original price of the shoes, find a function  $P(x)$  that calculates the amount you pay for the shoes after a 20% discount (before taxes).

$$x = 100$$

$$P(x) = x - (.2x)$$

5. Letting  $x$  represent the original price of the shoes, find a function  $D(x)$  that calculates the amount you pay for the shoes after a \$15 discount (before taxes).

$$D(x) = x - 15$$

6. Letting  $x$  represent the original price of the shoes, find and simplify the composite function  $P_F(x)$  that calculates the amount you will pay, before taxes, if a 20% discount is applied first, followed by a \$15 discount.

$$P(x) = x - (.2x) \quad D(x) = x - 15 \quad (D \circ P)(x)$$

$$P_F(x) = [x - (.2x)] - 15$$

7. Letting  $x$  represent the original price of the shoes, find and simplify the composite function  $D_F(x)$  that calculates the amount you will pay, before taxes, if a \$15 discount is applied first, followed by a 20% discount.

$$D_F(x) = (x - 15) - (.2(x - 15)) \quad (P \circ D)(x)$$

8. Using the composite functions  $P_F(x)$  and  $D_F(x)$ , determine the order of discounts that is more beneficial to the customer when one discount is 15% and the other is \$20?

$$100 \times 15\%$$

$$100 - 15 = \$85 \quad \$20 = \$65$$

$$100 - \$20 = \$80 \quad 80 \times 12\%$$

$$80 - 12 = \$68$$

% first, then \$20 off

9. What order of discounts is more beneficial to the customer if both discounts are percentages (for example, 15% and 20%)? Support your answer.

$$100 \times 15\% \quad 100 - 15 = 85 \times 20\% \quad 85 - 17 = \$68$$

$$100 \times 20\% \quad 100 - 20 = 80 \times 15\% \quad 80 - 12 = \$68$$

It would be the same whichever discount is applied first.

10. a) If you are offered the choice of either a \$20 discount or a 20% discount on the purchase of a pair of shoes that have already been discounted to \$120, would you choose \$20 or 20%?

20% because 20% of \$120 is more than \$20 would be \$96 instead of \$100

- b) If the discounted shoes are \$60, would you choose an additional discount of \$20 or 20%?

$$60 \times 20\% = \$48 \quad 60 - 20 = \$40 \quad \boxed{\$20}$$

- c) For what price of shoes would the discounts be equivalent?

Assuming you mean a discount of \$20 or 20%, if the shoes were  $\boxed{\$100}$ , the respective discounts would be equivalent