E12.13. *Note to Student:* The purpose of this assignment is to help you to build an understanding of cost-volume-profit relationships by solving for the 'missing pieces of the puzzles.' In this regard, it may be helpful to insert a *Contribution Margin* column or to rearrange the data using the expanded contribution margin model.

Answer:	Sales	Variable Costs	Contribution Margin Ratio	Fixed Costs	Operating Income (Loss)
Firm A	$320,000	**$217,600**	32%	**$64,100**	$38,300
Firm B	**655,000**	465,050	**29%**	118,000	71,950
Firm C	134,000	**99,160**	26%	36,700	**(1,860)**
Firm D	**73,750**	59,000	20%	**19,670**	(4,920)

Calculations:

Firm A VC = Sales * (1 − CM%) = $320,000 * 68% = **$217,600**
CM = Sales − VC = $320,000 − $217,600 = $102,400
or CM = Sales * CM% = $320,000 * 32% = $102,400
FC = CM − Operating Income = $102,400 − $38,300 = **$64,100**
or FC = (Sales * CM%) − Operating Income = ($320,000 * 32%) − $38,300 = **$64,100**

Firm B CM = FC + Operating Income = $118,000 + $71,950 = $189,950
Sales = CM + VC = $189,950 + $465,050 = **$655,000**
CM% = CM / Sales = $189,950 / $655,000 = **29%**

Firm C VC = Sales * (1 − CM%) = $134,000 * 74% = **$99,160**
CM = Sales − VC = $134,000 − $99,160 = $34,840
or CM = Sales * CM% = $134,000 * 26% = $34,840
Operating Loss = CM − FC = $34,840 − $36,700 = **$(1,860)**

Firm D Sales = VC / (1 − CM%) = $59,000 / 80% = **$73,750**
CM = Sales − VC = $73,750 − $59,000 = $14,750
or CM = Sales * CM% = $73,750 * 20% = $14,750
FC = CM + Operating (Loss) = $14,750 + $4,920 = **$19,670**

E12.17.

a.

	Per Unit	*	Volume	=	Total	%
Revenue	$1.25					100%
Variable Expense	0.35					28%
Contribution Margin	$0.90	*	400	=	$ 360	72%
Fixed Expense					(120)	
Operating income from increased volume					$ 240	
Variable expenses of 600 cones given away, @ $0.35					(210)	
Net increase in operating income					$ 30	

b. Yes. Not only does the promotion itself result in increased operating income, but also it is likely that customers will purchase some other products (e.g., food and/or beverages) on which additional contribution margin will be earned.

E12.18.

a.

	Per Unit	*	*Volume*	=	*Total*
Revenue	$11.99				
Variable Expense	4.00				
Contribution Margin	$ 7.99	*	400	=	$3,196

b.

	Per Unit	*	*Volume*	=	*Total*
Revenue[#]	$6.00				
Variable Expense	4.00				
Contribution Margin	$2.00	*	?	=	$3,196

[#] (($11.99 price of one pizza + $0.01) / 2) = $6.00

Required volume = $3,196 / $2.00 = **1,598 pizzas.** Keep in mind, however, that this represents only **799 orders** (1,598 pizzas / 2 pizzas per order).

c. Will customers buy other products such as drinks, salads, etc.? Will this promotion "steal" volume from large and small pizzas? If so, normal contribution margin from those products will be lost. Will fixed expenses really stay the same?

P12.25.

a.

	Per Unit	*	*Volume*	=	*Total*
Revenue	$15				
Variable Expense	9				
Contribution Margin	$ 6	*	?	=	$ 27,000
Fixed Expense					(27,000)
Operating Income					$ 0

At the break-even point, total contribution margin must equal total fixed expenses.
Break-even volume = ($6 contribution margin per unit * ??? volume) = $27,000
Thus, break-even volume = **4,500 units**
Total revenue = (4,500 units * $15 per unit) = **$67,500**

Alternative approach: $27,000 / 40% contribution margin ratio = **$67,500**

b. Margin of safety = Total sales – Break-even sales
   = $75,000 - $67,500
   = $7,500

   Margin of safety ratio = Margin of safety / Total sales
   = $7,500 / $75,000
   = 10%

P12.25.	**(continued)**						
c.		***Per Unit***	*	***Volume***	=	***Total***	
	Revenue	$15					
	Variable Expense	9					
	Contribution Margin	$ 6	*	5,400	=	$32,400	
	Fixed Expense					(27,000)	
	Operating Income					**$ 5,400**	
d.		***Per Unit***	*	***Volume***	=	***Total***	
	Revenue	$13					
	Variable Expense	9					
	Contribution Margin	$ 4	*	8,400	=	$33,600	
	Fixed Expense					(27,000)	
	Operating Income					**$ 6,600**	
e.	Does the increase in volume move fixed expenses into a new relevant range? Are variable expenses really linear?						
f.		***Per Unit***	*	***Volume***	=	***Total***	
	Revenue	$16					
	Variable Expense	9					
	Contribution Margin	$ 7	*	5,400	=	$37,800	
	Fixed Expense					(33,000)	
	Operating Income					**$ 4,800**	
	No, the increase in advertising expense is not justified by the price increase as Operating Income has decreased by $600 ($5,400 - $4,800).						
g.	1. ***Volume of 5,400 units per month:***	***Per Unit***	*	***Volume***	=	***Total***	
	Revenue	$15.00					
	Variable Expense	9.80					
	Contribution Margin	$ 5.20	*	5,400	=	$28,080	
	Fixed Expense#					(22,800)	
	Operating Income					**$ 5,280**	
	#Current fixed expenses……………………………………………					$27,000	
	Decrease in fixed expenses (2 salespersons @ $2,500) ………………					(5,000)	
	Increase in fixed expenses (2 salespersons @ $400) …………………					800	
	Adjusted fixed expenses ……………………………………………					$22,800	
	2. ***Volume of 6,000 units per month:***	***Per Unit***	*	***Volume***	=	***Total***	
	Revenue	$15.00					
	Variable Expense	9.80					
	Contribution Margin	$ 5.20	*	6,000	=	$31,200	
	Fixed Expense					(22,800)	

					$ 8,400
Operating Income					

	Per Unit	*	***Volume***	=	***Total***
h. Revenue	$15				
Variable Expense	9				
Contribution Margin	$ 6	*	6,000	=	$36,000
Fixed Expense ($27,000 + $1,000)					(28,000)
Operating Income					$ 8,000

The sales force compensation plan change in part *g* results in $400 more operating income than does the plan to increase advertising.