

### 3B Transitioning from Vertex to Intercept Form

~~Transition from Vertex Form to Intercept Form~~

Classwork



Why we love vertex form...

1. You and a friend decide to make an Algebra 2E Board Game to help future generations learn and study Algebra 2E... plus you'll make some money. You're not sure how much to charge for it. If it's too cheap, you won't make as much profit, but if it's too expensive, people won't buy it. You talk to Mr. Kase in the business department, who figure out how to maximize your Profits, in  $p$  dollars, as a function of what we could charge for the game, in  $c$  dollars:

$$p(c) = -20(c - 35)^2 + 12,500$$

- a. What is the range of our potential profits?      b. What price for the game maximizes our profit?
- c. What is our profit if we charge \$20?      d. What is our profit if we charge \$75?

Try to do these without actually evaluating or solving:

- e. Selling it for \$25 would yield the same profit as selling it at what other price?      f. Without evaluating, what would yield more profit? Selling the game for \$33 or \$38? Justify your reasoning.

- f. Can a 1\$ change in price make that big of a difference? What's the change in profits between selling it for...  
... \$12 vs. \$13?      ... \$22 vs. 23?      ...\$34 vs \$35?

- g. How much could we sell our product for if we want to profit \$6,000? (Give exact radical answers... and then approximate the decimal because, really, who talks about money in radicals?)

- h. What interval of prices we should we consider if we want to make sure you make a profit?

2. Your friend suggests it may make more sense to sell two versions of the game: a Midterm & Final Edition. Good old Mr. Kase runs the math again and brings back two new profit functions, this time in intercept form:

$$m(c) = -40(c - 10)(c - 25)$$

$$f(c) = -70(c - 20)(c - 60)$$

- a. What price intervals for each board game to keep your profits positive?

Midterm Edition:

Final Edition:

- b. What board game price will maximize your profits for each game?

Midterm Edition:

Final Edition:

- c. What is the most amount of money you could make with the Midterm & Final Edition, combined, for the year?

- d. You and your partner disagree on how many games to offer and what to charge for them. You just want to produce the full-year edition, and want to charge \$50 for it. Your friend says, "Let's just make the two editions and charge \$22.50 for the Midterm Edition and \$22.50 for the Final Edition. That way they're spending the same amount and we're making more, in the long run."

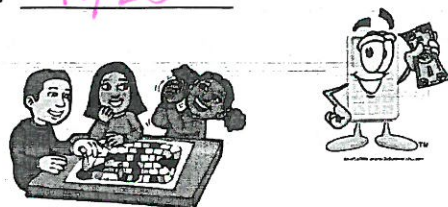
Whose idea earns higher profits?

If equal, state what your profit will be. If one is less or more, state how much.

### 3B Transitioning from Vertex to Intercept Form

Transition from Vertex Form to Intercept Form

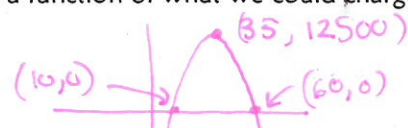
classwork / homework



Why we love vertex form...

1. You and a friend decide to make an Algebra 2E Board Game to help future generations learn and study Algebra 2E... plus you'll make some money. You're not sure how much to charge for it. If it's too cheap, you won't make as much profit, but if it's too expensive, people won't buy it. You talk to Mr. Kase in the business department, who figure out how to maximize your Profits, in  $p$  dollars, as a function of what we could charge for the game, in  $c$  dollars:

$$p(c) = -20(c - 35)^2 + 12,500$$



- a. What is the range of our potential profits?

$0 < p \leq 12,500$  More than \$0, at most \$12,500

- b. What price for the game maximizes our profit?

\$35 per game

- c. What is our profit if we charge \$20?

$p(20) = 8000$  \$8,000

- d. What is our profit if we charge \$75?

$p(75) = -19,500$  Gah! We lose \$19,500

Try to do these without actually evaluating or solving:

- e. Selling it for \$25 would yield the same profit as selling it at what other price?

\$25 is 10 less than \$35. \$45  
 so... 10 more is

- f. Without evaluating, what would yield more profit? Selling the game for \$33 or \$38? Justify your reasoning.

$33 \xleftarrow{(2)} 35 \xrightarrow{(3)} 38$   
\$33 would be more b/c it is closer to the max (vertex)

- f. Can a 1\$ change in price make that big of a difference? What's the change in profits between selling it for...

... \$12 vs. \$13?

$(12, 1920) (13, 2820)$   
\$900 diff

... \$22 vs. 23?

$(22, 9120) (23, 9620)$   
\$500 diff

... \$34 vs \$35?

$(34, 12480) (35, 12500)$   
\$20 diff

- g. How much could we sell our product for if we want to profit \$6,000? (Give exact radical answers... and then approximate the decimal because, really, who talks about money in radicals?)

$-20(x-35)^2 + 12500 = 6000$   
 $-20(x-35)^2 = -6500$   
 $(x-35)^2 = 325$   
 $x = 35 \pm \sqrt{325}$

we could sell it for \$16.97 or \$55.03

- h. What interval of prices we should we consider if we want to make sure you make a profit? any profit

$-20(x-35)^2 + 12500 > 0$   
 $x = 35 \pm \sqrt{625}$   
 $35 \pm 25$

Between \$10 and \$60

2. Your friend suggests it may make more sense to sell two versions of the game: a Midterm & Final Edition. Good old Mr. Kase runs the math again and brings back two new profit functions, this time in intercept form:

$$m(c) = -40(c - 10)(c - 25)$$

$$f(c) = -70(c - 20)(c - 60)$$

- a. What price intervals for each board game to keep your profits positive?

Midterm Edition:

Between \$10 and \$25

Final Edition:

Between \$20 and \$60

- b. What board game price will maximize your profits for each game?

Midterm Edition:

$$\frac{10+25}{2} = \boxed{\$17.50}$$

Final Edition:

$$\frac{20+60}{2} = \boxed{\$40}$$

- c. What is the most amount of money you could make with the Midterm & Final Edition, combined, for the year?

Max of midterm

$$m(17.50) = 2250$$

max of final

$$f(40) = 28000$$

We could make \$30,250!

- d. You and your partner disagree on how many games to offer and what to charge for them. or no!  
 You just want to produce the full-year edition, and want to charge \$50 for it.  
 Your friend says, "Let's just make the two editions and charge \$22.50 for the Midterm Edition and \$22.50 for the Final Edition. That way they're spending the same amount and we're making more, in the long run."

Whose idea earns higher profits?

Mine, obvi!

If equal, state what your profit will be. If one is less or more, state how much.

my idea:

$$f(50) = -70(50-20)(50-60) \\ = 21,000$$

Friend's idea

$$m(22.5) = 1250 \\ f(22.5) = 6562.5 \\ = 7812.5$$

My idea makes \$13,187.5 more!