BE – Alg. 2/Precalc | Monday 9-28-09

ACT

① The sides of a square are 3 cm long. One vertex of the square is at (2,0) on a square coordinate grid marked in centimeter units. Which of the following points could also be a vertex of the square?

Ⓐ (−4, 0)

Ⓑ (0, 1)

Ⓒ (1, −1)

Ⓓ (4, 1)

Ⓔ (5, 0)

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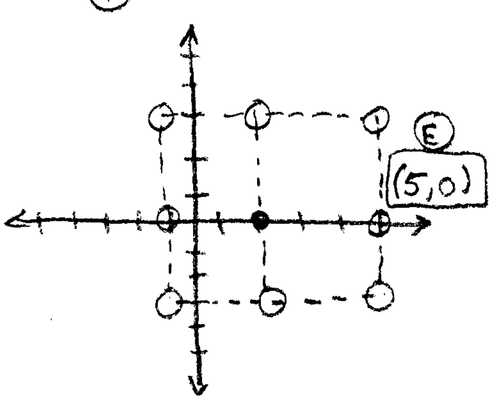
② What is the least common multiple of 70, 60, and 50?

Ⓐ 60 Ⓑ 180 Ⓒ 210 Ⓓ 2100 Ⓔ 210,000

ANS

①



② Use prime factorizations

70: 7 ✓, 10 → 2 ✓, 5 ✓

60: 6, 10 → 2 ×, 3 ✓, 2 ✓, 5 ×

50: 5 ×, 10 → 2 ×, 5 ✓

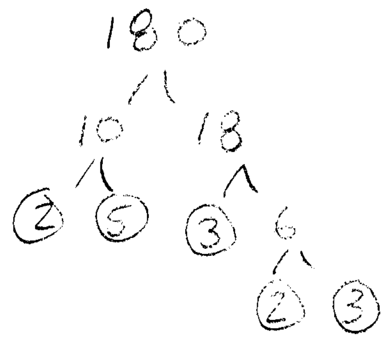
LCM ⇒ $7 \cdot 2 \cdot 5 \cdot 3 \cdot 2 \cdot 5$

$7 \cdot 2 \cdot (10)(15) = 150$

$7 \cdot 300 = \boxed{2100}$

A prime factorization is a fast and easy way to find all pairs of factors of a number — not just the easy ones you can see by "guess and check"!

(Ex) Find all factors (other than $1 \cdot 180$) of 180.
💡 Don't forget this.



$\Rightarrow$ Use all 5 prime factors in all combinations.

$$(2)\cdot(5\cdot3\cdot2\cdot3) \Rightarrow 2\cdot90$$

$$(2\cdot5)\cdot(3\cdot2\cdot3) \Rightarrow 10\cdot18$$

$$(2\cdot5\cdot3)\cdot(2\cdot3) \Rightarrow 30\cdot6$$

$$(2\cdot5\cdot3\cdot2)\cdot3 \Rightarrow 60\cdot3$$

$$\boxed{(5\cdot3)\cdot(2\cdot2\cdot3) \Rightarrow 15\cdot12}$$

Remember THIS ONE?

$$(3\cdot3)\cdot(2\cdot5\cdot2) \Rightarrow 9\cdot20$$

$$(2\cdot2)\cdot(5\cdot3\cdot3) \Rightarrow 4\cdot45$$

$$(5)\cdot(2\cdot3\cdot2\cdot3) \Rightarrow 5\cdot36$$

How do you solve $ax^2 + bx + c = 0$ if it is not a "factorable" trinomial? Is there any way to tell if it can be factored?

$$d = \text{discriminant} = \underbrace{b^2 - 4ac}$$

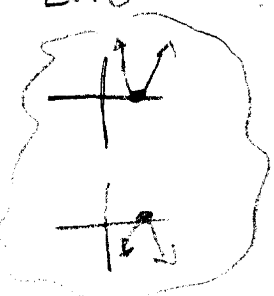
$\uparrow$

"discriminates"

$\Downarrow$

Recognize or perceive the difference

perfect square	$\Rightarrow$ 1. factorable 2. 2 rational roots
NEGATIVE	$\Rightarrow$ NO REAL SOLUTIONS, ONLY COMPLEX
Zero	$\Rightarrow$ 1. factorable 2. Equal factors $\Downarrow$ ax^2+bx+c $\Downarrow$ perfect square $(a \pm b)^2$
OTHERWISE, $\Rightarrow$ POSITIVE BUT NOT perfect square	$\Rightarrow$ 2 real but "irrational" solutions



Perfect Square Trinomials

$$(a+b)^2 = (a+b)(a+b) = a^2 + 2ab + b^2$$
$$(a-b)^2 = (a-b)(a-b) = a^2 - 2ab + b^2$$

$\uparrow$ PS = a $\quad$ $\uparrow$ $2ab$? $\quad$ $\uparrow$ PS = b

Ex) $4x^2 + 12x + 9 = 0$

① PS = $2x$ ✓

② PS = 3 ✓

③ $2 \cdot 2x \cdot 3$? ✓

$$(2x+3)(2x+3) = 0$$
$$x = \left\{-\tfrac{3}{2}\right\}$$

Look: $b^2 - 4ac$

$(12)^2 - 4(4)(9)$

$144 - 144 = 0$ ✓

Lets find d & see WHAT IT tells you about each quadratic equation.

Ex $6x^2 + x - 2 = 0$

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$a = 6$ $\quad b^2 - 4ac$

$b = 1$ $\quad (1)^2 - 4(6)(-2)$

$c = -2$ $\quad 1 + 48 = 49 = d$ Perfect Square

$\Rightarrow$ 2 RATIONAL roots (CAN solve by factoring)

the magic numbers exist.

A smiley ∪ parabola that crosses the x-axis at 2 real and rational numbers

Ex $x^2 - 2x + 5 = 0$

$a = 1$ $\quad b^2 - 4ac$

$b = -2$ $\quad (-2)^2 - 4(1)(5)$

$c = 5$ $\quad 4 - 20 = -16 = d$

$\Rightarrow$
- 2 complex roots
- CANNOT factor

A smiley ∪ parabola that is above the x-axis so it never crosses it $\Rightarrow$ no real "crossing" points.

Ex $r^2 + 4r - 6 = 0$

$a = 1$ $\quad b^2 - 4ac$

$b = 4$ $\quad (4)^2 - 4(1)(-6)$

$c = -6$

$16 + 24 = 40 = d$

- 2 real but irrational roots
- cannot be factored

A smiley parabola that crosses the x axis at 2 real but irrational numbers $r = \{2+\sqrt{10},\ 2-\sqrt{10}\}$

Setup every problem where you calculate the discriminant like this:

$$ax^2 + bx + c = 0$$

*Must put in standard form

$a =$ $\quad b^2 - 4ac$

$b =$ $\quad (\ \ )^2 - 4(\ \ )(\ \ )$

$c =$

Homework: For each problem, find the discriminant and describe what it tells you about the solution to each quadratic equation.
Pg. 219 # 5-10, 12, 16, 19.