Bergen County Mathematics League

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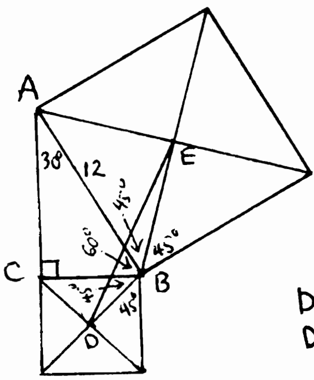
Brief Contest Solutions #4 **2010-2011**

4-1) $\frac{bx-ay+by-ax}{mb+an-am-bn} = \frac{b(x+y)-a(x+y)}{b(m-n)-a(m-n)} = \frac{(x+y)\cancel{(b-a)}}{(m-n)\cancel{(b-a)}} = \boxed{\frac{(x+y)}{(m-n)}}$.

not = to 0
because of initial conditions

4-2)



$BC = 6 \Rightarrow BD = 3\sqrt{2}$
$AB = 12 \Rightarrow BE = 6\sqrt{2}$ By the law of cosines,

$DE^2 = BE^2 + BD^2 - 2(BE)(BD)\cos\angle DBE$, so

$DE^2 = (6\sqrt{2})^2 + (3\sqrt{2})^2 - 2(6\sqrt{2})(3\sqrt{2})(\cos 150°)$

$DE^2 = 90 + 36\sqrt{3}$ so $a+b = 90+36 = \boxed{126}$.

4-3) The fraction is undefined if any denominator is 0. For this fraction, there are three ways a denominator can be 0: if $x-4=0$, if $\frac{x}{x-4} = -1$, or if $1+\frac{x}{x-4} = -1$. The inadmissable values of x are $\boxed{4, 2, \frac{8}{3}}$.

4-4) There are $5 \times 5 \times 5 = 5^3$ combos of weekdays that can be selected, but $5 \times 4 \times 3 = 60$ of these involve different selections of different play days, so Prob $= \frac{60}{125} = \boxed{\frac{12}{25}}$.

4-5) If $\frac{x}{r} = \frac{y}{s} = \frac{z}{t}$, then each fraction also equals $\frac{x+y+z}{r+s+t}$.
Therefore $\frac{a+b+c}{24-(a+b+c)} = 3$, so $a+b+c = \boxed{18}$.

4-6) Note that $3(n-3) > n$ for $n \geq 5$, and $3+3 = 2+2+2 = 6$, but $3 \times 3 > 2 \times 2 \times 2$, so use as many 3s as possible until $n \leq 4$, when we use 2s as factors. The largest product is $\boxed{3^{16} \times 2}$.