

# Pre-Calculus Math 11

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1. a)  $x^2 + 7x + 10$   
 $(x+2)(x+5)$

mult = 10  
 add = 7

b)  $5z^2 + 40z + 60$   
 $5(z^2 + 8z + 12)$   
 $5(z+6)(z+2)$

mult = 12  
 add = 8

factor out a monomial

c)  $0.2d^2 - 2.2d + 5.6$   
 $0.2(d^2 - 11d + 28)$   
 $0.2(d-7)(d-4)$

mult = 28  
 add = -11

both must be negative

2. a)  $3y^2 + 4y - 7$   
 $3y^2 - 3y + 7y - 7$   
 $3y(y-1) + 7(y-1)$   
 $(y-1)(3y+7)$

mult = -21 ← one pos/one neg  
 add = 4 ← pos is bigger

b)  $8k^2 - 6k - 5$   
 $8k^2 - 10k + 4k - 5$   
 $2k(4k-5) + 1(4k-5)$   
 $(4k-5)(2k+1)$

mult = -40 ← one pos/one neg  
 add = -6 ← neg is "bigger"

c)  $0.4m^2 + 0.6m - 1.8$   
 $0.2(2m^2 + 3m - 9)$   
 $0.2[2m^2 + 6m - 3m - 9]$   
 $0.2[2m(m+3) - 3(m+3)]$   
 $0.2(m+3)(2m-3)$

mult = -18 ← one pos/one neg  
 add = 3 ← pos is bigger

factor out a monomial

3. a)  $x^2 + x - 20$   
 $(x+5)(x-4)$

mult = -20 ← one pos/one neg  
 add = 1 ← pos is bigger

b)  $x^2 - 12x + 36$   
 $(x-6)(x-6)$

mult = 36 ← both pos or both neg.  
 add = -12 ← both are neg

c)  $\frac{1}{4}x^2 + 2x + 3$   
 $\frac{1}{4}(x^2 + 8x + 12)$   
 $\frac{1}{4}(x+6)(x+2)$

mult = 12  
 add = 8

factor out a monomial

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$$3. d) \begin{aligned} &2x^2 + 12x + 18 \\ &2(x^2 + 6x + 9) \\ &2(x+3)(x+3) \end{aligned}$$

$$\begin{aligned} \text{mult} &= 9 \\ \text{add} &= 6 \end{aligned}$$

$$4. a) \begin{aligned} &4y^2 - 9x^2 \\ &(2y-3x)(2y+3x) \end{aligned}$$

$$b) \begin{aligned} &0.36p^2 - 0.49q^2 \\ &(0.6p-0.7q)(0.6p+0.7q) \end{aligned}$$

perfect squares

$$c) \begin{aligned} &\frac{1}{4}s^2 - \frac{9}{25}t^2 \\ &\left(\frac{1}{2}s - \frac{3}{5}t\right)\left(\frac{1}{2}s + \frac{3}{5}t\right) \end{aligned}$$

$$d) \begin{aligned} &0.16t^2 - 16s^2 \\ &(0.4t-4s)(0.4t+4s) \end{aligned}$$

$$5. a) \begin{aligned} &(x+2)^2 - (x+2) - 42 \\ &m^2 - m - 42 \\ &(m-7)(m+6) \\ &(x+2-7)(x+2+6) \\ &(x-5)(x+8) \end{aligned}$$

$$\begin{aligned} x+2 &= m \\ \text{mult} &= -42 \leftarrow \text{one pos/one neg} \\ \text{add} &= -1 \leftarrow \text{neg is "bigger"} \\ m &= x+2 \end{aligned}$$

$$b) \begin{aligned} &6(x^2-4x+4)^2 + (x^2-4x+4) - 1 \\ &6n^2 + n - 1 \qquad \qquad \qquad \text{mult} = -6 \qquad \qquad \qquad x^2-4x+4 = n \\ &6n^2 + 3n - 2n - 1 \qquad \qquad \qquad \text{add} = 1 \qquad \qquad \qquad \text{one pos/one neg} \\ &3n(2n+1) - 1(2n+1) \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \text{pos is bigger} \\ &(2n+1)(3n-1) \qquad \qquad \qquad n = x^2-4x+4 \\ &\left[2(x^2-4x+4)+1\right] \left[3(x^2-4x+4)-1\right] \\ &\left[2x^2-8x+8+1\right] \left[3x^2-12x+12-1\right] \\ &(2x^2-8x+9)(3x^2-12x+11) \end{aligned}$$

$$c) \begin{aligned} &(4j-2)^2 - (2+4j)^2 \\ &m^2 - n^2 \qquad \qquad \qquad 4j-2 = m, \quad 2+4j = n \\ &(m-n)(m+n) \qquad \qquad \qquad m = 4j-2, \quad n = 2+4j \\ &\left[(4j-2)-(2+4j)\right] \left[(4j-2)+(2+4j)\right] \\ &\left[4j-2-2-4j\right] \left[4j-2+2+4j\right] \\ &-4(8j) \end{aligned}$$

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6. a)  $4(5b-3)^2 + 10(5b-3) - 6$

$5b-3 = t$

$$4t^2 + 10t - 6$$

$$2(2t^2 + 5t - 3)$$

$$2[2t^2 - t + 6t - 3]$$

$$2[t(2t-1) + 3(2t-1)]$$

$$2(2t-1)(t+3)$$

$$2(2(5b-3)-1)(5b-3+3)$$

$$2(10b-6-1)(5b)$$

$$2(5b)(10b-7)$$

$$10b(10b-7)$$

mult = -6    one pos/one neg  
add = 5    pos is bigger

$t = 5b-3$

b)  $16(x^2+1)^2 - 4(2x)^2$

$x^2+1 = m, 2x = n$

$$16m^2 - 4n^2$$

$$(4m-2n)(4m+2n)$$

$$[4(x^2+1)-2(2x)][4(x^2+1)+2(2x)]$$

$$[4x^2+4-4x][4x^2+4+4x]$$

$$(4x^2-4x+4)(4x^2+4x+4)$$

$$4(x^2-x+1)4(x^2+x+1)$$

$$16(x^2-x+1)(x^2+x+1)$$

$m = x^2+1, n = 2x$

factor 4 out of each bracket

c)  $-\frac{1}{4}(2x)^2 + 25(2y^3)^2$

$2x = m, 2y^3 = n$

$$-\frac{1}{4}m^2 + 25n^2$$

$$-1\left(\frac{1}{4}m^2 - 25n^2\right)$$

$$-1\left(\frac{1}{2}m - 5n\right)\left(\frac{1}{2}m + 5n\right)$$

$m = 2x, n = 2y^3$

$$-1\left(\frac{1}{2} \cdot 2x - 5 \cdot 2y^3\right)\left(\frac{1}{2} \cdot 2x + 5 \cdot 2y^3\right)$$

$$-1(x - 10y^3)(x + 10y^3)$$