From SAT Math Subj

1. What is the value of x^2 if $x = \sqrt{15^2 - 12^2}$?

a) $\sqrt{3}$ b) 3 c) 9 d) 81 e) 81^2

3-4-5

$X^2 = 15^2 - 12^2$

$= (15+12)(15-12)$

$= 27 \cdot 3 = 81$

$x^2 = 15^2 - 12^2$

$x = 9$

2. Let a be a nonzero constant. If $2x^2 - 4 = a$, then $x^2 - 2 =$

a) ½ b) $\frac{a}{2}$ c) $\frac{2}{a}$ d) 2 e) $2a$

$2(x^2 - 2) = a$

From math competitions,

3. Suppose that b and c are constants and $(x+2)(x+3) = x^2 + cx + 6$. What is c?

a) -5 b) -3 c) -1 d) 3 e) 5

$(x^2+6x-5)(x^3-2x^2+4x-5)$

$4x^3 - 12x^3 - 5x^5$

⇒ when expanded & combined by like terms, one term is kx^3.

Find k. $-13x^3$, $k=-13$

4. Suppose that 1998 is written as a product of two positive integers whose difference is as small as possible. What is the difference?

a) 8 b) 15 c) 17 d) 47 e) 93

100
↑
10 · 10

$1998 = 2000 - 2$

$= 2(1000 - 1)$

$= 2(10^3 - 1^3)$

$= 2(10-1)(10^2 + 10 + 1)$

$= 2 \cdot 9 (111) = 2 \cdot 3^2 \cdot 3 \cdot 37$

$54 \cdot 37$

5. Suppose that a and b are integers such that $x^2 - x - 1$ is a factor of $ax^3 + bx^2 + 1$. What is b?

a) -2 b) -1 c) 0 d) 1 e) 2

$(x^2 - x - 1)(mx + k) = ax^3 + bx^2 + 0x + 1$

$1 \quad -1$

$-1(k) = 1 \rightarrow k = -1$

$-x^2 - x^2 = -2x^2$

$b = -2$

$x - mx = 0x$

$m = 1$

6. The product of four positive integers a, b, c, and d is 8!, and they satisfy the equations

$$ab + a + b = 524$$
$$bc + b + c = 146$$
$$cd + c + d = 104$$

What is $a - d$?

a) 4 b) 6 c) 8 d) 10 e) 12

$a(b+1)+(b+1)$

$ab+a+b+1 = 524+1$

$(a+1)(b+1) = 525$

$(b+1)(c+1) = 147$

$(c+1)(d+1) = 105$