A.REI.B.4: Complex Conjugate Root Theorem

1 Which equation has roots of $3 + i$ and $3 - i$?
   1) $x^2 - 6x + 10 = 0$
   2) $x^2 + 6x - 10 = 0$
   3) $x^2 - 10x + 6 = 0$
   4) $x^2 + 10x - 6 = 0$

2 Which quadratic equation has the roots $5 + i$ and $5 - i$?
   1) $x^2 - 10x + 24 = 0$
   2) $x^2 + 10x + 24 = 0$
   3) $x^2 - 10x + 26 = 0$
   4) $x^2 + 10x + 26 = 0$

3 Which quadratic equation has the roots $(1 + 3i)$ and $(1 - 3i)$?
   1) $x^2 + 2x - 10 = 0$
   2) $x^2 - 2x + 10 = 0$
   3) $x^2 + 2x - 8 = 0$
   4) $x^2 - 2x - 8 = 0$

4 Which equation has $1 - i$ as a solution?
   1) $x^2 + 2x - 2 = 0$
   2) $x^2 + 2x + 2 = 0$
   3) $x^2 - 2x - 2 = 0$
   4) $x^2 - 2x + 2 = 0$

5 Which equation has the complex number $4 - 3i$ as a root?
   1) $x^2 + 6x - 25 = 0$
   2) $x^2 - 6x + 25 = 0$
   3) $x^2 + 8x - 25 = 0$
   4) $x^2 - 8x + 25 = 0$

6 If $2 + i$ and $2 - i$ are the roots of the equation $x^2 - 4x + c = 0$, what is the value of c?
   1) -5
   2) 5
   3) -4
   4) 4

7 Write a quadratic equation whose roots are $5 + i\sqrt{2}$ and $5 - i\sqrt{2}$.

8 If the solution set of $x^2 + px + q = 0$ is $\{1 + i, 1 - i\}$, find the value of p.

9 The roots of a quadratic equation are $r_1 = 3 + 2i$ and $r_2 = 3 - 2i$. Find the sum of the roots r_1 and r_2. Find the product of the roots r_1 and r_2. Write a quadratic equation that has roots r_1 and r_2.

10 If $2 + 3i$ is one root of a quadratic equation with real coefficients, what is the sum of the roots of the equation?

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Answer Section

1 ANS: 1

The product of the roots equals $(3+i)(3-i) = 9-i^2 = 10 = \dfrac{c}{a}$. OR

$(x-(3+i))(x-(3-i)) = 0$

$(x-(3+i))(x-(3-i)) = 0$

$(x-3-i)(x-3+i) = 0$

$((x-3)-i)((x-3)+i) = 0$

$(x-3)^2 - i^2 = 0$

$x^2 - 6x + 9 + 1 = 0$

$x^2 - 6x + 10 = 0$

REF: 082208aii

2 ANS: 3   REF: 089325siii
3 ANS: 2   REF: 088620siii
4 ANS: 4

If $1-i$ is one solution, the other is $1+i$. $(x-(1-i))(x-(1+i)) = 0$

$x^2 - x - ix - x + ix + (1-i^2) = 0$

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

REF: 081601aii

5 ANS: 4

If $4-3i$ is one root, the other is $4+3i$. The sum of the roots is $4+3i+4-3i = 8 = -\dfrac{b}{a}$

REF: 080718b

6 ANS: 2

$\dfrac{c}{a} = (2+i)(2-i)$

$\dfrac{c}{1} = 4 - i^2$

$c = 5$

REF: 060719b

7 ANS:

$x^2 - 10x + 27 = 0$

REF: 089442siii

8 ANS:
   –2

   REF: 018411siii
9 ANS:
   6, 13, $x^2 - 6x + 13 = 0$

   REF: 080041siii
10 ANS:
    $2 + 3i + 2 - 3i = 4$

    REF: 010522b