Name: _____

N.CN.A.2: Operations with Complex Numbers 1

1 The expression $3i(ai - 6i^2)$ is equivalent to
1) $3a + 18i$
2) $3a - 18i$
3) $-3a + 18i$
4) $-3a - 18i$

2 The expression $6xi^3(-4xi + 5)$ is equivalent to
1) $2x - 5i$
2) $-24x^2 - 30xi$
3) $-24x^2 + 30x - i$
4) $26x - 24x^2i - 5i$

3 If $A = -3 + 5i$, $B = 4 - 2i$, and $C = 1 + 6i$, where i is the imaginary unit, then $A - BC$ equals
1) $5 - 17i$
2) $5 + 27i$
3) $-19 - 17i$
4) $-19 + 27i$

4 Given that i is the imaginary unit, the expression $(x - 2i)^2$ is equivalent to
1) $x^2 + 4$
2) $x^2 - 4$
3) $x^2 - 2xi - 4$
4) $x^2 - 4xi - 4$

5 Given i is the imaginary unit, $(2 - yi)^2$ in simplest form is
1) $y^2 - 4yi + 4$
2) $-y^2 - 4yi + 4$
3) $-y^2 + 4$
4) $y^2 + 4$

6 Which expression is equivalent to $(3k - 2i)^2$, where i is the imaginary unit?
1) $9k^2 - 4$
2) $9k^2 + 4$
3) $9k^2 - 12ki - 4$
4) $9k^2 - 12ki + 4$

7 The expression $i^2(5x - 2i)^2$ is equivalent to
1) $-25x^2 + 20xi - 4$
2) $-25x^2 + 20xi + 4$
3) $25x^2 + 20xi + 4$
4) $25x^2 + 4$

8 The expression $6 - (3x - 2i)^2$ is equivalent to
1) $-9x^2 + 12xi + 10$
2) $9x^2 - 12xi + 2$
3) $-9x^2 + 10$
4) $-9x^2 + 12xi - 4i + 6$

9 Where i is the imaginary unit, the expression $(x + 3i)^2 - (2x - 3i)^2$ is equivalent to
1) $-3x^2$
2) $-3x^2 - 18$
3) $-3x^2 + 18xi$
4) $-3x^2 - 6xi - 18$

10 Which expression is equivalent to $(2x - i)^2 - (2x - i)(2x + 3i)$ where i is the imaginary unit and x is a real number?
1) $-4 - 8xi$
2) $-4 - 4xi$
3) 2
4) $8x - 4i$

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11 Expressed in simplest $a+bi$ form, $(7-3i)+(x-2i)^2-(4i+2x^2)$ is
1) $(3-x^2)-(4x+7)i$
2) $(3+3x^2)-(4x+7)i$
3) $(3-x^2)-7i$
4) $(3+3x^2)-7i$

12 Which expression is equivalent to $(x+yi)(x^2-xyi-y^2)$, where i is the imaginary unit?
1) x^3+y^3i
2) $x^3-xy^2-(xy^2+y^3)i$
3) $x^3-2xy^2-y^3i$
4) x^3-y^3i

13 Given i is the imaginary unit, which expression is equivalent to $5i(2x+3i)-x\sqrt{-9}$?
1) $15+13xi$
2) $-15+13xi$
3) $15+7xi$
4) $-15+7xi$

14 If $(6-ki)^2=27-36i$, the value of k is
1) -36
2) -3
3) 3
4) 6

15 Simplify $xi(i-7i)^2$, where i is the imaginary unit.

16 Given i is the imaginary unit, simplify $(5xi^3-4i)^2$ as a polynomial in standard form.

17 Express $\left(2xi^3-3y\right)^2$ in simplest form.

18 Express $(1-i)^3$ in $a+bi$ form.

19 Given x is a real number, write the expression in simplest $a+bi$ form: $(x+2i)(3-2xi)+2x^2i$

20 Write $(5+2yi)(4-3i)-(5-2yi)(4-3i)$ in $a+bi$ form, where y is a real number.

21 Write $-\frac{1}{2}i^3\left(\sqrt{-9}-4\right)-3i^2$ in simplest $a+bi$ form.

22 Elizabeth tried to find the product of $(2+4i)$ and $(3-i)$, and her work is shown below.

$$\begin{aligned}&(2+4i)(3-i)\\&=6-2i+12i-4i^2\\&=6+10i-4i^2\\&=6+10i-4(1)\\&=6+10i-4\\&=2+10i\end{aligned}$$

Identify the error in the process shown and determine the correct product of $(2+4i)$ and $(3-i)$.

N.CN.A.2: Operations with Complex Numbers 1
Answer Section

1 ANS: 3
$3i(ai - 6i^2) = 3ai^2 - 18i^3 = -3a + 18i$

REF: 062307aii

2 ANS: 2
$6xi^3(-4xi + 5) = -24x^2i^4 + 30xi^3 = -24x^2(1) + 30x(-i) = -24x^2 - 30xi$

REF: 061704aii

3 ANS: 3
$-3 + 5i - \left(4 + 24i - 2i - 12i^2\right) = -3 + 5i - (16 + 22i) = -19 - 17i$

REF: 081815aii

4 ANS: 4
$(x - 2i)(x - 2i) = x^2 - 4xi + 4i^2 = x^2 - 4xi - 4$

REF: 082202aii

5 ANS: 2
$(2 - yi)(2 - yi) = 4 - 4yi + y^2i^2 = -y^2 - 4yi + 4$

REF: 061603aii

6 ANS: 3
$(3k - 2i)^2 = 9k^2 - 12ki + 4i^2 = 9k^2 - 12ki - 4$

REF: 081702aii

7 ANS: 2
$i^2(5x - 2i)^2 = -(25x^2 - 20xi - 4)$

REF: 012512aii

8 ANS: 1
$6 - (3x - 2i)(3x - 2i) = 6 - \left(9x^2 - 12xi + 4i^2\right) = 6 - 9x^2 + 12xi + 4 = -9x^2 + 12xi + 10$

REF: 061915aii

9 ANS: 3
$(x + 3i)^2 - (2x - 3i)^2 = x^2 + 6xi + 9i^2 - \left(4x^2 - 12xi + 9i^2\right) = -3x^2 + 18xi$

REF: 061805aii

10 ANS: 1

$(2x-i)^2-(2x-i)(2x+3i)$

$(2x-i)[(2x-i)-(2x+3i)]$

$(2x-i)(-4i)$

$-8xi+4i^2$

$-8xi-4$

REF: 011911aii

11 ANS: 1

$7-3i+x^2-4xi+4i^2-4i-2x^2=7-7i-x^2-4xi-4=3-x^2-4xi-7i=(3-x^2)-(4x+7)i$

REF: 012022aii

12 ANS: 4

$x^3-x^2yi-xy^2+x^2yi-xy^2i^2-y^3i=x^3-xy^2-xy^2(-1)-y^3i=x^3-y^3i$

REF: 062223aii

13 ANS: 4

$5i(2x+3i)-x\sqrt{-9}=10xi+15i^2-3xi=-15+7xi$

REF: 082415aii

14 ANS: 3

$(6-ki)^2=27-36i$

$36-12ki+k^2i^2=27-36i$

$9-k^2-12ki=-36i$

Set real part equal to real part: $9-k^2=0$ Set imaginary part equal to imaginary part: $-12ki=-36i$

$k=\pm 3$ $\dfrac{-12ki}{-12i}=\dfrac{-36i}{-12i}$

$k=3$

REF: 012308aii

15 ANS:

$xi(-6i)^2=xi(36i^2)=36xi^3=-36xi$

REF: 081627aii

16 ANS:

$(5xi^3-4i)^2=(-5xi-4i)^2=25x^2i^2+40xi^2+16i^2=-25x^2-40x-16$

REF: 082329aii

17 ANS:

$\left(2xi^3 - 3y\right)^2 = 4x^2 i^6 - 12xyi^3 + 9y^2 = -4x^2 + 12xyi + 9y^2$

REF: 012431aii

18 ANS:

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

REF: 011725aii

19 ANS:

$3x - 2x^2 i + 6i - 4xi^2 + 2x^2 i = 3x + 6i + 4x = 7x + 6i$

REF: 062425aii

20 ANS:

$(4-3i)(5+2yi-5+2yi)$

$(4-3i)(4yi)$

$16yi - 12yi^2$

$12y + 16yi$

REF: spr1506aii

21 ANS:

$-\frac{1}{2} i^3 (3i-4) - 3i^2 = -\frac{3}{2} i^4 + 2i^3 - 3i^2 = -\frac{3}{2} - 2i + 3 = \frac{3}{2} - 2i$

REF: 081927aii

22 ANS:

$i^2 = -1$, and not 1; $10 + 10i$

REF: 011825aii