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

8 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) $-3x^2-6xi-18$

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9 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) $8x-4i$

10 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) $(3+3x^2)-7i$

11 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

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

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

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

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

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

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

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

19 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: 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

8 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

9 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

10 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

11 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

12 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: $9-k^2=0$

$k=\pm 3$

Set imaginary part equal to imaginary part: $-12ki=-36i$

$\frac{-12ki}{-12i}=\frac{-36i}{-12i}$

$k=3$

REF: 012308aii

13 ANS:

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

REF: 081627aii

14 ANS:

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

REF: 082329aii

15 ANS:

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

REF: 012431aii

16 ANS:
$(1-i)(1-i)(1-i) = (1-2i+i^2)(1-i) = -2i(1-i) = -2i+2i^2 = -2-2i$

REF: 011725aii

17 ANS:
$(4-3i)(5+2yi-5+2yi)$

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

$16yi-12yi^2$

$12y+16yi$

REF: spr1506aii

18 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

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

REF: 011825aii