

A2.N.9: Multiplication and Division of Complex Numbers 1: Perform arithmetic operations on complex numbers and write the answer in the form $a+bi$

- 1 The product of $5 - 2i$ and i is
 - 1) 7
 - 2) $2 + 5i$
 - 3) $5 - 2i$
 - 4) $-2 + 5i$
- 2 The product of $(2 - 2i)$ and $(2 + 2i)$ is
 - 1) 0
 - 2) 8
 - 3) $4 - 4i$
 - 4) 4
- 3 When $-3 - 2i$ is multiplied by its conjugate, the result is
 - 1) -13
 - 2) -5
 - 3) 5
 - 4) 13
- 4 The product of $(3 - 2i)$ and $(7 + 6i)$ is
 - 1) $21 - 12i$
 - 2) $33 + 4i$
 - 3) $9 + 4i$
 - 4) $21 + 16i$
- 5 The product of $(-2 + 6i)$ and $(3 + 4i)$ is
 - 1) $-6 + 24i$
 - 2) $-6 - 24i$
 - 3) $18 + 10i$
 - 4) $-30 + 10i$
- 6 What is the product of the complex numbers $2 + 3i$ and $1 - 2i$ expressed in simplest terms?
 - 1) $8 - i$
 - 2) 8
 - 3) $-4 - i$
 - 4) -4
- 7 The expression $(i^3 - 1)(i^3 + 1)$ is equivalent to
 - 1) -2
 - 2) $2i - 1$
 - 3) $2i + 1$
 - 4) $-2i$
- 8 If $x = 3i$, $y = 2i$, and $z = m + i$, the expression xy^2z equals
 - 1) $-12 - 12mi$
 - 2) $-6 - 6mi$
 - 3) $12 - 12mi$
 - 4) $6 - 6mi$
- 9 The expression $(1 + i)^2$ is equivalent to
 - 1) 1
 - 2) 2
 - 3) i
 - 4) $2i$
- 10 The value of $(1 - i)^2$ is
 - 1) 0
 - 2) 2
 - 3) $-2i$
 - 4) $2 - 2i$
- 11 The expression $(2 + i)^2$ is equivalent to
 - 1) $3 + 4i$
 - 2) $5 + 4i$
 - 3) 3
 - 4) 5
- 12 The expression $(3 - i)^2$ is equivalent to
 - 1) 8
 - 2) $8 - 6i$
 - 3) 10
 - 4) $8 + 6i$

13 The expression $(3 - 7i)^2$ is equivalent to

- 1) $-40 + 0i$
- 2) $-40 - 42i$
- 3) $58 + 0i$
- 4) $58 - 42i$

14 Expressed in $a + bi$ form, $(1 + 3i)^2$ is equivalent to

- 1) $10 + 6i$
- 2) $-8 + 6i$
- 3) $10 - 6i$
- 4) $-8 - 6i$

15 The expression $(2 + 3i)^2$ is equal to

- 1) -5
- 2) 13
- 3) $-5 + 12i$
- 4) $13 + 12i$

16 If $f(x) = x^2$, then $f(2 - 3i)$ equals

- 1) -5
- 2) $-5 - 12i$
- 3) $13 - 12i$
- 4) 13

17 The expression $(-1 + i)^3$ is equivalent to

- 1) $-3i$
- 2) $-2 - 2i$
- 3) $-1 - i$
- 4) $2 + 2i$

18 The expression $(x + i)^2 - (x - i)^2$ is equivalent to

- 1) 0
- 2) -2
- 3) $-2 + 4xi$
- 4) $4xi$

19 The expression $\frac{1}{2 - i}$ is equivalent to

- 1) $2 + i$
- 2) $-2 - i$
- 3) $\frac{2 + i}{5}$
- 4) $\frac{2 + i}{3}$

20 Expressed in $a + bi$ form, $\frac{5}{3 + i}$ is equivalent to

- 1) $\frac{15}{8} - \frac{5}{8}i$
- 2) $\frac{5}{3} - 5i$
- 3) $\frac{3}{2} - \frac{1}{2}i$
- 4) $15 - 5i$

21 The expression $\frac{10}{3 + i}$ is equivalent to

- 1) $3 - i$
- 2) $3 + i$
- 3) $\frac{15 + 15i}{4}$
- 4) $\frac{5}{4}$

22 The expression $\frac{1}{5 + 2i}$ is equivalent to

- 1) $\frac{5 + 2i}{21}$
- 2) $\frac{5 + 2i}{29}$
- 3) $\frac{5 - 2i}{21}$
- 4) $\frac{5 - 2i}{29}$

23 The expression $\frac{3}{2+3i}$ is equivalent to

- 1) $\frac{-6+9i}{13}$
- 2) $\frac{6+9i}{13}$
- 3) $\frac{-6-9i}{13}$
- 4) $\frac{6-9i}{13}$

24 The expression $\frac{5}{4+3i}$ is equivalent to

- 1) $\frac{4-3i}{5}$
- 2) $\frac{4+3i}{5}$
- 3) $\frac{20+15i}{7}$
- 4) $\frac{20-15i}{7}$

25 The expression $\frac{2+i}{3+i}$ is equivalent to

- 1) $\frac{6+5i}{8}$
- 2) $\frac{6+i}{8}$
- 3) $\frac{7-5i}{10}$
- 4) $\frac{7+i}{10}$

26 What is the multiplicative inverse of $3i$?

- 1) $-3i$
- 2) -3
- 3) $\frac{1}{3}$
- 4) $-\frac{i}{3}$

27 What is the multiplicative inverse of $3-i$?

- 1) $\frac{3-i}{8}$
- 2) $\frac{3+i}{8}$
- 3) $\frac{3-i}{10}$
- 4) $\frac{3+i}{10}$

28 The relationship between voltage, E , current, I , and resistance, Z , is given by the equation $E = IZ$. If a circuit has a current $I = 3 + 2i$ and a resistance $Z = 2 - i$, what is the voltage of this circuit?

- 1) $8+i$
- 2) $8+7i$
- 3) $4+i$
- 4) $4-i$

29 Impedance measures the opposition of an electrical circuit to the flow of electricity. The total impedance in a particular circuit is given by the formula $Z_T = \frac{Z_1 Z_2}{Z_1 + Z_2}$. What is the total impedance

of a circuit, Z_T , if $Z_1 = 1 + 2i$ and $Z_2 = 1 - 2i$?

- 1) 1
- 2) 0
- 3) $\frac{5}{2}$
- 4) $-\frac{3}{2}$

30 What is the product of $5 + \sqrt{-36}$ and $1 - \sqrt{-49}$, expressed in simplest $a + bi$ form?

- 1) $-37 + 41i$
- 2) $5 - 71i$
- 3) $47 + 41i$
- 4) $47 - 29i$

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Answer Section

1 ANS: 2 REF: 089726siii

2 ANS: 2 REF: 068022siii

3 ANS: 4

$$(-3 - 2i)(-3 + 2i) = 9 - 4i^2 = 9 + 4 = 13$$

REF: 011512a2

4 ANS: 2 REF: 019035siii

5 ANS: 4 REF: 069620siii

6 ANS: 1 REF: 080322siii

7 ANS: 1 REF: 010235siii

8 ANS: 3

$$(3i)(2i)^2(m + i)$$

$$(3i)(4i^2)(m + i)$$

$$(3i)(-4)(m + i)$$

$$(-12i)(m + i)$$

$$-12mi - 12i^2$$

$$-12mi + 12$$

REF: 061319a2

9 ANS: 4 REF: 089519siii

10 ANS: 3 REF: 019932siii

11 ANS: 1 REF: 018421siii

12 ANS: 2 REF: 019622siii

13 ANS: 2 REF: fall0901a2

14 ANS: 2 REF: 069719siii

15 ANS: 3 REF: 018923siii

16 ANS: 2 REF: 088923siii

17 ANS: 4 REF: 010219b

18 ANS: 4

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

REF: 011327a2

19 ANS: 3

TI-84 Plus calculator screen showing the calculation of $\frac{1}{2-i}$ and its simplified form $\frac{2+i}{5}$. The screen displays the input $1/(2-i)$, the result $.4+.2i$, and the simplified fraction $2/5+1/5i$.

$$\frac{1}{2-i} \cdot \frac{2+i}{2+i} = \frac{2+i}{4-i^2} = \frac{2+i}{5}.$$

REF: 061014b

20 ANS: 3

REF: 069722siii

21 ANS: 1

REF: 010811b

22 ANS: 4

REF: 019522siii

23 ANS: 4

REF: 019414siii

24 ANS: 1

REF: 010128siii

25 ANS: 4

REF: 060513b

26 ANS: 4

REF: 060614b

27 ANS: 4

REF: 068521siii

28 ANS: 1

REF: 060304b

29 ANS: 3

REF: 060509b

30 ANS: 4

$$(5 + \sqrt{-36})(1 - \sqrt{-49}) = (5 + 6i)(1 - 7i) = 5 - 35i + 6i - 42i^2 = 5 - 29i - 42(-1) = 47 - 29i$$

REF: 080314b