

Imaginary Numbers Worksheet

Simplify each expression completely: (Reduce all powers of i and no i 's in a denominator)

1) $\sqrt{-4}$

Example: $i\sqrt{4} = 2i$

2) $i^{17} = i^{4(4)+1}$
 $= i$

3) $2\sqrt{-25}$
 $= 10i$

4) $i^{92} = i^{4(23)}$
 $= 1$

5) $(-3\sqrt{-8})(\sqrt{5})$
 $= -6i\sqrt{10}$

6) $i^2 = -1$

7) $-\sqrt{49} \cdot \sqrt{-36}$
 $= -42i$

8) $i^{27} = i^{4(6)+3}$
 $= -i$

9) $(5i)^2$

Example: $5i \cdot 5i$
 $= 25i^2$
 $= 25(-1)$
 $= -25$

10) $-(2i)(6i)$
 $= 12$

11) $(2i)^2(-3i)$
 $= 12i$

12) $(i\sqrt{-2})^2$
 $= 2$

13) $(3+2i)+(5+7i)$
Example: $3+2i+5+7i$
 $8+9i$

14) $(5+2i)-(6+2i)$
 $= -1$

15) $2(-1+5i)-3(2+4i)$
 $= -8-2i$

16) $2i(-1+4i)$
 $= -8-2i$

17) $(4+i)(5-3i)$
Example: $20-12i+5i-3i^2$
 $20-7i+3$
 $23-7i$

18) $(6i-4)(3i+2)$
 $= -26$

19) $(4-5i)^2$
 $= (4-5i)(4-5i)$
 $=$

20) $(3+i\sqrt{5})^2$
 $= (3+i\sqrt{5})(3+i\sqrt{5})$
 $=$

21) $-\frac{7}{5i}$

Example: $\frac{-7i}{5i \cdot i} = \frac{-7i}{5i^2} = \frac{-7i}{-5} = \frac{7}{5}i$

22) $\frac{10}{i\sqrt{2}} \cdot \frac{i\sqrt{2}}{i\sqrt{2}} = -5i\sqrt{2}$

23) $\frac{8}{2i} \cdot \frac{i}{i} = -4i$

$$24) \frac{5}{5+4i}$$

$$\frac{5}{5+4i} \cdot \frac{5-4i}{5-4i} = \frac{25-20i}{25-20i+20i-16i^2}$$

$$= \frac{25-20i}{25+16}$$

$$= \frac{25}{41} - \frac{20i}{41}$$

$$25) \frac{5i}{6-2i} \cdot \frac{6+2i}{6+2i}$$

$$= \frac{30i+10i^2}{40} = \frac{3i-1}{4}$$

$$= -\frac{1}{4} + \frac{3i}{4}$$

$$26) \frac{7+i}{3-4i} \cdot \frac{3+4i}{3+4i}$$

$$= \frac{17}{25} + \frac{31i}{25}$$

$$27) \frac{3i-2}{5i-3} \cdot \frac{5+3}{5+3}$$

$$= \frac{21}{34} + \frac{19i}{34}$$

$$28) \frac{6-i\sqrt{2}}{6+i\sqrt{2}} \cdot \frac{6-i\sqrt{2}}{6-i\sqrt{2}}$$

$$= \frac{17}{19} - \frac{6i\sqrt{2}}{19}$$

$$29) \frac{3+7i}{7i} \cdot \frac{i}{i}$$

$$= 1 - \frac{3i}{7}$$

$$30) \frac{1+\frac{3}{i}}{2-\frac{5}{i}} \rightarrow \frac{3+i}{i}$$

$$\frac{3+i}{i} \cdot \frac{i}{i} = \frac{3+i^2}{i^2} = \frac{3-1}{-1} = 2$$

$$31) \frac{4+\frac{3}{i}}{7-\frac{5}{i}} \rightarrow \frac{3+4i}{i}$$

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

$$32) \frac{\frac{3}{2i}-4}{\frac{5}{i}+3i} \rightarrow \frac{3-8i}{2i}$$

$$\frac{3-8i}{2i} \cdot \frac{i}{i} = \frac{3i-8i^2}{2i^2} = \frac{3i+8}{-2} = -\frac{3i}{2} - 4$$

$$= \frac{3+i}{i} \cdot \frac{i}{-5+2i} = \frac{-1+3i}{-2-5i} \cdot \frac{-2+5i}{-2+5i}$$

$$= \frac{-13}{29} - \frac{11i}{29}$$

$$= \frac{13}{74} - \frac{4i}{74}$$

$$= \frac{3}{4} - 2i$$

33) Solve for m and n

$$3+2i = m+5-ni$$

$$3-(-2i) = m+5-ni$$

$$m+5 = 3 \Rightarrow m = -2$$

$$n = -2$$

34) Solve for m and n

$$n+5i = 1+mi+ni$$

$$n+5i = 1+(m+n)i$$

$$m+n = 5$$

$$n = 1$$

$$m = 4$$

35) Solve for m and n

$$(2m+3)+5i = 12-8ni$$

$$(2m+3)-(5i) = 12-8ni$$

$$2m+3 = 12 \Rightarrow m = 9/2$$

$$-5 = -8n \Rightarrow n = -5/8$$

36) Solve for m and n

$$-5+8i = m-7-2ni$$

$$-5-(-8i) = m-7-2ni$$

$$m-7 = -5 \Rightarrow m = 2$$

$$-8 = -2n \Rightarrow n = 4$$

37) Solve for m and n

$$m-n+5i = 3+mi+ni$$

$$m-n+5i = 3+(m+n)i$$

$$m-n = 3$$

$$m+n = 5$$

$$\therefore m = 4 \quad n = 1$$

38) Solve for m and n

$$(2m+7)+5ni = (4m-5)+(3n-2)i$$

$$2m+7 = 4m-5$$

$$m = 6$$

$$5n = 3n-2$$

$$n = -1$$