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Course: CA&T Internet (70263)
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Assignment: 7.7 Polar Form of Complex
Numbers; DeMoivre's The

1. Complete the following sentence.

If $z = a + bi$, with $a > 0$, then $|z| = \underline{\hspace{2cm}}$ and $\arg z = \theta = \underline{\hspace{2cm}}$.

If $z = a + bi$, with $a > 0$, then $|z| = \sqrt{a^2 + b^2}$ and $\arg z = \theta = \tan^{-1} \frac{b}{a}$.

2. Select the correct choice that completes the sentence below.

If $|z| = r$ and $\arg z = \theta$, then the polar form of z is $z = r(\cos \theta + i \sin \theta)$.

3. Complete the following sentence.

To multiply two complex numbers in polar form, multiply their $\underline{\hspace{2cm}}$ and $\underline{\hspace{2cm}}$ their arguments.

To multiply two complex numbers in polar form, multiply their moduli $\underline{\hspace{2cm}}$ and add $\underline{\hspace{2cm}}$ their arguments.

4. De Moivre's Theorem states that $[r(\cos \theta + i \sin \theta)]^n = \underline{\hspace{2cm}}$.

De Moivre's Theorem states that $[r(\cos \theta + i \sin \theta)]^n = r^n(\cos n\theta + i \sin n\theta)$.

5. Determine whether the following sentence is true or false.

If $z = r(\cos \theta + i \sin \theta)$ then $\frac{1}{z} = z^{-1} = \frac{1}{r}(\cos \theta - i \sin \theta)$.

Is the sentence true or false?

- True
 False

6. Plot the complex number and determine its absolute value.

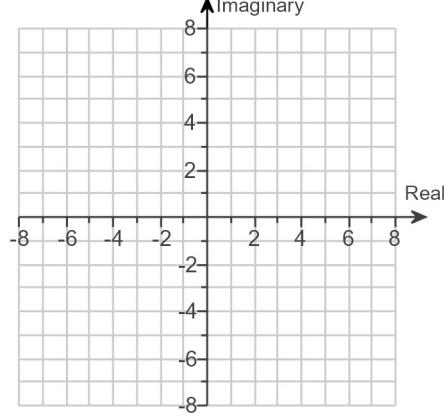
$$z = -4i$$

Plot the complex number on the complex plane to the right.

What is the absolute value of this complex number?

$$|z| = \underline{\hspace{2cm}} 4$$

(Simplify your answer. Type an exact answer, using radicals as needed.)



7. Plot the complex number and find its absolute value.

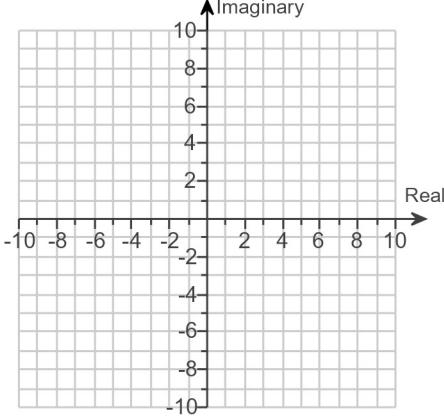
$$-3 - 4i$$

Plot the complex number on the complex plane to the right.

What is the absolute value of this complex number?

$$|-3 - 4i| = \underline{\hspace{2cm}} 5$$

(Simplify your answer. Type an exact answer, using radicals as needed.)



8.

Plot the complex number and find its absolute value.

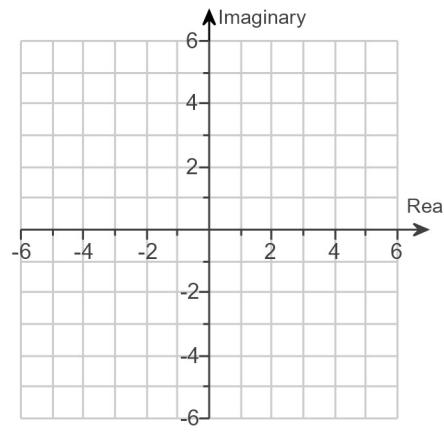
$$-2 - 4i$$

Plot the complex number on the complex plane to the right.

What is the absolute value of this complex number?

$$|-2 - 4i| = \boxed{2\sqrt{5}}$$

(Simplify your answer. Type an exact answer, using radicals as needed.)



9. Write the complex number in polar form. Express the argument θ in degrees, with $0^\circ \leq \theta < 360^\circ$.

$$2\sqrt{2} + 2\sqrt{2}i$$

$$2\sqrt{2} + 2\sqrt{2}i = \boxed{4} (\cos \boxed{45}^\circ + i \sin \boxed{45}^\circ)$$

10. Write the following complex number in polar form. Express the argument θ in degrees, with $0^\circ \leq \theta < 360^\circ$.

$$-4 + 4i$$

$$z = \boxed{4\sqrt{2}} (\cos \boxed{135}^\circ + i \sin \boxed{135}^\circ)$$

(Type an exact answer, using radicals as needed. Type any angle measures in degrees.)

11. Write the following complex number in rectangular form.

$$4(\cos 60^\circ + i \sin 60^\circ)$$

$$4(\cos 60^\circ + i \sin 60^\circ) = \boxed{2 + 2\sqrt{3}i}$$

(Simplify your answer, including any radicals. Use integers or fractions for any numbers in the expression.)

12. Write the complex number in rectangular form.

$$7 \left(\cos \frac{\pi}{2} + i \sin \frac{\pi}{2} \right)$$

$$7 \left(\cos \frac{\pi}{2} + i \sin \frac{\pi}{2} \right) = \boxed{7i}$$

(Simplify your answer, including any radicals. Use integers or fractions for any numbers in the expression.)

13.

Find $z_1 z_2$ and $\frac{z_1}{z_2}$ for $z_1 = 3(\cos 55^\circ + i \sin 55^\circ)$, $z_2 = 2(\cos 16^\circ + i \sin 16^\circ)$. Write each answer in polar form.

$$z_1 z_2 = \boxed{6} [\cos \boxed{71}^\circ + i \sin \boxed{71}^\circ]$$

(Simplify your answer. Type any angle measures in degrees. Use angle measures greater than or equal to 0 and less than 360.)

$$\frac{z_1}{z_2} = \boxed{\frac{3}{2}} [\cos \boxed{39}^\circ + i \sin \boxed{39}^\circ]$$

(Simplify your answer. Type any angle measures in degrees. Use angle measures greater than or equal to 0 and less than 360.)

14.

Find $z_1 z_2$ and $\frac{z_1}{z_2}$ for $z_1 = -4 + 4i$, $z_2 = -4 - 4i$. Write each answer in polar form.

$$z_1 z_2 = \boxed{32} [\cos \boxed{0}^\circ + i \sin \boxed{0}^\circ]$$

(Simplify your answers. Type any angle measures in degrees. Use angle measures greater than or equal to 0 and less than 360.)

$$\frac{z_1}{z_2} = \boxed{1} [\cos \boxed{270}^\circ + i \sin \boxed{270}^\circ]$$

(Simplify your answers. Type any angle measures in degrees. Use angle measures greater than or equal to 0 and less than 360.)

15. Use DeMoivre's theorem to compute the following power in polar form, with θ in degrees, with $0 \leq \theta < 360^\circ$

$$(1 - i\sqrt{3})^{12}(5 + 5i)^{-4}$$

Type the answer in polar form.

$$(1 - i\sqrt{3})^{12}(5 + 5i)^{-4} = \frac{1024}{625} \left(\cos 180^\circ + i \sin 180^\circ \right)$$

(Type an exact answer, using radicals as needed. Round to the nearest degree as needed.)

16. Use DeMoivre's theorem to compute the following power in polar form, with θ in degrees, and $0 \leq \theta < 360^\circ$.

$$\left(\sin \frac{7\pi}{4} + i \cos \frac{7\pi}{4} \right)^{-9}$$

Choose the correct answer below.

- A. $\cos 225^\circ + i \sin 225^\circ$
 B. $\sin 135^\circ + i \cos 135^\circ$
 C. $\sin 225^\circ + i \cos 225^\circ$
 D. $\cos 135^\circ + i \sin 135^\circ$

17. Watch the video and then solve the problem below.

[Click here to watch the video.](#)¹

Find the absolute value of the complex number $24 - 7i$.

$$|24 - 7i| = 25 \quad (\text{Simplify your answer. Type an exact answer, using radicals as needed.})$$

1: http://mediaplayer.pearsoncmg.com/assets/lq_z5t60KQUdLdwIFFKqEvbKsJqypyjz?clip=2

18. Watch the video and then solve the problem below.

[Click here to watch the video.](#)²

Write the complex number $z = 5 \left(\cos \frac{2\pi}{3} + i \sin \frac{2\pi}{3} \right)$ in rectangular form.

$$5 \left(\cos \frac{2\pi}{3} + i \sin \frac{2\pi}{3} \right) = -\frac{5}{2} + 5\frac{\sqrt{3}}{2}i$$

(Simplify your answer. Type an exact answer, using radicals and i as needed.)

2: http://mediaplayer.pearsoncmg.com/assets/lq_z5t60KQUdLdwIFFKqEvbKsJqypyjz?clip=3

19. Watch the video and then solve the problem below.

[Click here to watch the video.³](#)

Let $z_1 = 9(\cos 75^\circ + i \sin 75^\circ)$ and $z_2 = 6(\cos 42^\circ + i \sin 42^\circ)$. Find $z_1 z_2$ and $\frac{z_1}{z_2}$. Leave the answers in polar form.

Find $z_1 z_2$. Choose the correct answer below.

- A. $54(\cos 33^\circ + i \sin 33^\circ)$
- B. $54(\cos 117^\circ + i \sin 117^\circ)$
- C. $54(\cos 117^\circ - i \sin 117^\circ)$
- D. $\frac{3}{2}(\cos 33^\circ + i \sin 33^\circ)$

Find $\frac{z_1}{z_2}$. Choose the correct answer below.

- A. $54(\cos 33^\circ + i \sin 33^\circ)$
- B. $\frac{3}{2}(\cos 33^\circ - i \sin 33^\circ)$
- C. $\frac{3}{2}(\cos 33^\circ + i \sin 33^\circ)$
- D. $\frac{3}{2}(\cos 117^\circ + i \sin 117^\circ)$

3: http://mediaplayer.pearsoncmg.com/assets/lq_z5t60KQUdLdwIFFKqEvbKsJqypyjz?clip=4