

Chapter 8 / **Example 5a****Calculating with complex numbers**

Let  $z_1 = 2 + 3i$  and  $z_2 = 3 - i$ .

**a** Calculate each of the following, writing your answers in the form  $a + bi$ .

**i**  $2z_1 + 3z_2$       **ii**  $z_1 z_2$       **iii**  $\frac{z_1 + z_2}{z_1 - z_2}$

Type  $2 + 3i$  and press **STO►** **ALPHA** **[A]** and press **ENTER**.

To enter  $i$  press **2nd** **[.]** **[i]**.

```
2+3i→A
2+3i
-----

```

Type  $3 - i$  and press **STO►** **ALPHA** **[B]** and press **ENTER**.

To enter  $i$  press **2nd** **[.]** **[i]**.

```
2+3i→A
2+3i
-----
3-i→B
3-i
-----

```

$z_1 = A$  and  $z_2 = B$ .

To calculate  $2z_1 + 3z_2$  type  $2A + 3B$  and press **ENTER**.

$2z_1 + 3z_2 = 13 + 3i$ .

```
2+3i→A
2+3i
-----
3-i→B
3-i
-----
2A+3B
13+3i
-----

```

To calculate  $z_1 z_2$  type  $A \times B$  and press **ENTER**.

$z_1 z_2 = 9 + 7i$ .

```
2+3i→A
2+3i
-----
3-i→B
3-i
-----
2A+3B
13+3i
-----
A*B
9+7i
-----

```

To calculate  $\frac{z_1 + z_2}{z_1 - z_2}$  type  $(A+B) \div (A-B)$  and press **ENTER**.

$\frac{z_1 + z_2}{z_1 - z_2} = 0.176 - 1.29i$ .

```
2+3i→A
2+3i
-----
3-i→B
3-i
-----
2A+3B
13+3i
-----
A*B
9+7i
-----
(A+B)/(A-B)
.1764705882-1.294117647i
-----

```

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To view 0.176 as a fraction press **MATH** **▸** **▸** CMPLX 2:real(

Then press **2nd** **[ANS]** ) and **ALPHA** **[F1]** 4:↔F↔D

This converts the decimal to an equivalent fraction.

```

2A+3B
13+3i
A*B
9+7i
(A+B)/(A-B)
.1764705882-1.294117647i
real(Ans)↔F↔D
3/17
  
```

Repeat the calculation by pressing **↑** **↑** **↑** **↑** **ENTER** **ENTER**.

Press **MATH** **▸** **▸** CMPLX 3:imag(

Then press **2nd** **[ANS]** ) and **ALPHA** **[F1]** 4:↔F↔D

This converts the decimal to an equivalent fraction.

```

.1764705882-1.294117647i
real(Ans)↔F↔D
3/17
(A+B)/(A-B)
.1764705882-1.294117647i
imag(Ans)↔F↔D
-22/17
  
```

$$\frac{z_1 + z_2}{z_1 - z_2} = \frac{3}{17} - \frac{22}{17}i$$