

Chapter 3 / **Example 17****Operations with complex numbers**

Storing values of complex numbers for ease of calculation.

Given the complex numbers $z_1 = 2 + i$, $z_2 = 2 - 5i$ and $z_3 = -1 + 2i$, find the following.

a $\frac{z_1 - 3z_3}{z_2}$

b $\frac{z_1^2}{z_2 \cdot z_3}$

c $\frac{2z_1 - 3z_2}{z_1 \cdot z_3}$

Check your answers on your GDC.

To store a value press **[sto→]**.

Type $2 + i$ and store it as P .

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

Press **[enter]**.

```
2+i→P
2+i
```

In the same way, store $2 - 5i$ as Q and $-1 + 2i$ as R .

```
2+i→P
2+i
2-5i→Q
2-5i
-1+2i→R
-1+2i
```

To calculate $\frac{z_1 - 3z_3}{z_2}$ type $P \div Q - 3 \times R$ and press **[enter]**.

$$\frac{z_1 - 3z_3}{z_2} = 2.97 - 5.59i$$

```
2+i→P
2+i
2-5i→Q
2-5i
-1+2i→R
-1+2i
P/Q-3*R
2.965517241-5.586206897i
```

To express the real and imaginary part of the result as fractions:

Type **[MATH]** **[>]** **[>]** **CMPLX 2:real(**

Type $P \div Q - 3 \times R$ and close the parenthesis.

Press **[ALPHA]** **[f1]** **4:►F◀D**

```
2-5i→Q
2-5i
-1+2i→R
-1+2i
P/Q-3*R
2.965517241-5.586206897i
real(P/Q-3*R)►F◀D
86
29
```

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Type **MATH** \rightarrow **CMPLX 3:imag(**

Type $P \div Q - 3 \times R$ and close the parenthesis.

Press **ALPHA** **[f1]** **4:►F◀D**

$$\frac{z_1}{z_2} - 3z_3 = \frac{86}{29} - \frac{162}{29}i$$

```

1+2i
P/Q-3*R
2.965517241-5.586206897i
real(P/Q-3*R)►F◀D
86
29
imag(P/Q-3*R)►F◀D
-162
29

```

To calculate $\frac{z_1^2}{z_2 \cdot z_3}$ type $P^2 \div (Q \times R)$ and press **enter**.

$$\frac{z_1^2}{z_2 \cdot z_3} = 0.414 + 0.0345i$$

```

2.965517241-5.586206897i
real(P/Q-3*R)►F◀D
86
29
imag(P/Q-3*R)►F◀D
-162
29
P^2/(Q*R)
.4137931034+.0344827586i

```

To express the real and imaginary part of the result as fractions:

Type **MATH** \rightarrow **CMPLX 2:real(**

Type $P^2 \div (Q \times R)$ and close the parenthesis.

Press **ALPHA** **[f1]** **4:►F◀D**

```

imag(P/Q-3*R)►F◀D
-162
29
P^2/(Q*R)
.4137931034+.0344827586i
real(P^2/(Q*R))►F◀D
12
29

```

Type **MATH** \rightarrow **CMPLX 3:imag(**

Type $P^2 \div (Q \times R)$ and close the parenthesis.

Press **ALPHA** **[f1]** **4:►F◀D**

$$\frac{z_1^2}{z_2 \cdot z_3} = \frac{12}{29} + \frac{1}{29}i$$

```

P^2/(Q*R)
.4137931034+.0344827586i
real(P^2/(Q*R))►F◀D
12
29
imag(P^2/(Q*R))►F◀D
1
29

```

To calculate $\frac{2z_1 - 3z_2}{z_1 \cdot z_3}$ type $(2 \times P - 3 \times Q) \div (P \times R)$ and press **enter**.

$$\frac{2z_1 - 3z_2}{z_1 \cdot z_3} = 2.36 - 2.48i$$

```

.4137931034+.0344827586i
real(P^2/(Q*R))►F◀D
12
29
imag(P^2/(Q*R))►F◀D
1
29
(2*P-3*Q)/(P*R)
2.36-2.48i

```

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To express the real and imaginary part of the result as fractions:

Type **MATH** \rightarrow **CMPLEX 2:real(**

Type $(2 \times P - 3 \times Q) \div (P \times R)$ and close the parenthesis.

Press **ALPHA** **[f1]** 4: \rightarrow **F** \rightarrow **D**

$\frac{2z_1 - 3z_2}{z_1 \cdot z_3}$
 $\frac{1}{29}$
 $(2 * P - 3 * Q) / (P * R)$
 $2.36 - 2.48i$
 $\text{real}((2 * P - 3 * Q) / (P * R)) \rightarrow \text{F} \rightarrow \text{D}$
 $\frac{59}{25}$

Type **MATH** \rightarrow **CMPLEX 3:imag(**

Type $(2 \times P - 3 \times Q) \div (P \times R)$ and close the parenthesis.

Press **ALPHA** **[f1]** 4: \rightarrow **F** \rightarrow **D**

$$\frac{2z_1 - 3z_2}{z_1 \cdot z_3} = \frac{59}{25} - \frac{62}{25}i$$

$\frac{1}{29}$
 $(2 * P - 3 * Q) / (P * R)$
 $2.36 - 2.48i$
 $\text{real}((2 * P - 3 * Q) / (P * R)) \rightarrow \text{F} \rightarrow \text{D}$
 $\frac{59}{25}$
 $\text{imag}((2 * P - 3 * Q) / (P * R)) \rightarrow \text{F} \rightarrow \text{D}$
 $-\frac{62}{25}$