FORMULAE LIST

Circle:
The equation \( x^2 + y^2 + 2gx + 2fy + c = 0 \) represents a circle centre \((-g, -f)\) and radius \( \sqrt{g^2 + f^2 - c} \).
The equation \((x-a)^2 + (y-b)^2 = r^2\) represents a circle centre \((a, b)\) and radius \(r\).

Scalar Product: \( \mathbf{a} \cdot \mathbf{b} = \| \mathbf{a} \| \| \mathbf{b} \| \cos \theta \), where \( \theta \) is the angle between \( \mathbf{a} \) and \( \mathbf{b} \)

or \( \mathbf{a} \cdot \mathbf{b} = a_1b_1 + a_2b_2 + a_3b_3 \) where \( \mathbf{a} = \begin{pmatrix} a_1 \\ a_2 \\ a_3 \end{pmatrix} \) and \( \mathbf{b} = \begin{pmatrix} b_1 \\ b_2 \\ b_3 \end{pmatrix} \).

Trigonometric formulae:
\[ \sin (A \pm B) = \sin A \cos B \pm \cos A \sin B \]
\[ \cos (A \pm B) = \cos A \cos B \mp \sin A \sin B \]
\[ \sin 2A = 2 \sin A \cos A \]
\[ \cos 2A = \cos^2 A - \sin^2 A \]
\[ = 2 \cos^2 A - 1 \]
\[ = 1 - 2 \sin^2 A \]

Table of standard derivatives:

<table>
<thead>
<tr>
<th>( f(x) )</th>
<th>( f'(x) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \sin ax )</td>
<td>( a \cos ax )</td>
</tr>
<tr>
<td>( \cos ax )</td>
<td>( -a \sin ax )</td>
</tr>
</tbody>
</table>

Table of standard integrals:

<table>
<thead>
<tr>
<th>( f(x) )</th>
<th>( \int f(x)dx )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \sin ax )</td>
<td>( -\frac{1}{a} \cos ax + c )</td>
</tr>
<tr>
<td>( \cos ax )</td>
<td>( \frac{1}{a} \sin ax + c )</td>
</tr>
</tbody>
</table>
Essential Skills 10

The skills in this series of worksheets appear frequently.

These are the GIFTS you must take to succeed

Section Formula

Find the coordinates of P on each:

1. A (5, 6,-1) and C (8, -3, 8) split in the ratio 1:2
2. A (-2, 3, 1) and C (6, -1, 13) split in the ratio 1:3
3. A (2, 5, 3) and C (5, -1, 9) split in the ratio 2:1
4. A (3, 1, 7) and C (8, 11, 12) split in the ratio 2:3
5. A (6, 4, 1) and C (-4, 19, 6) split in the ratio 1:4
6. A (-3, 2, 3) and C (-6, -4, -6) split in the ratio 1:2
7. A (7, -2, 3) and C (2, 13, 18) split in the ratio 2:3
8. A (2, 5, -10) and C (-5, 12, 4) split in the ratio 5:2
9. A (-1, -3, -5) and C (3, 1, 3) split in the ratio 3:1
10. A (-4, -2, 4) and C (2, 1, 7) split in the ratio 2:1

APPLYING QUESTION

P splits \( \overrightarrow{AC} \) in the ratio 5:2

Calculate the value of k and find the coordinates of P.