Higher Maths
Unit 3 Specimen NAB
Number 2

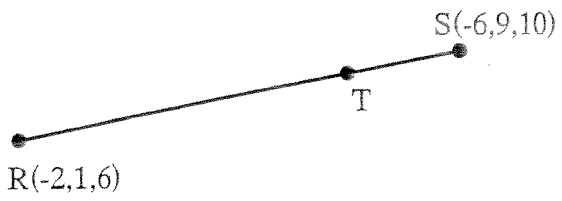
Outcome 1

1. The points P, Q, and R have coordinates (2, -3, 3) , (6, -2, 0) , (14, 0, -6) respectively.

   (a) Write down the components of $\overrightarrow{PQ}$ 1

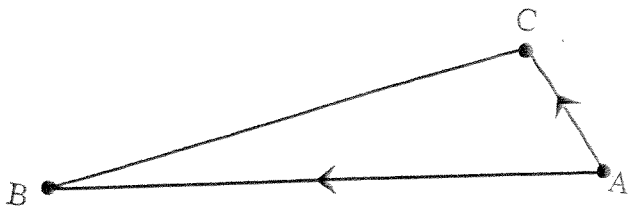
   (b) Hence show that the points P, Q, and R are collinear. 3

2. The point T divides $\overrightarrow{RS}$ in the ratio 3:1, as shown in the diagram. Find the coordinates of T. 3



3. The diagram shows vectors $\overrightarrow{AB}$ and $\overrightarrow{AC}$ where

$$\overrightarrow{AB} = \begin{pmatrix} 5 \\ 0 \\ 12 \end{pmatrix} \quad \text{and} \quad \overrightarrow{AC} = \begin{pmatrix} 2 \\ -2 \\ 1 \end{pmatrix}$$



   (a) Find the value of $\overrightarrow{AB} \bullet \overrightarrow{AC}$ 1

   (b) Hence find the size of angle BAC. 4

Outcome 2

4. (a) Given $y = \frac{1}{3}\sin x$, find $\frac{dy}{dx}$. 1

(b) Differentiate -6cosx, with respect to x. 1

5. Given $g(x) = (x-1)^6$ find $g'(x)$. 2

6. (i) Find $\int 2\sin x dx$.

(ii) Integrate $\frac{1}{2}\cos x$, with respect to x. 3

7. Evaluate $\int_1^2 (x+3)^4 dx$ 4

Outcome 3

8. (a) Simplify $\log_b 8 + \log_b 5$ 1

(b) Simplify $5\log_9 3 - \log_9 27$ 4

9. Solve $e^x = 5.7$ 2

10. Solve $\log_3(x+1) = 2$ 2

Outcome 4

11. Express $4\cos x^0 + \sin x^0$ in the form $k\cos(x-\alpha)^0$ where $k > 0$ and $0 \le \alpha < 360$. 5