

## Higher Ink Exercise

### Block 3 – Trigonometry

**Only use a calculator when necessary**

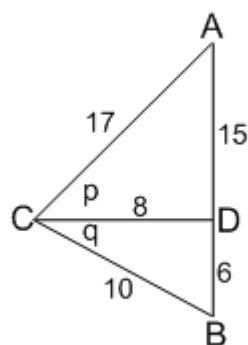
1. Given  $\tan x = \frac{4}{3}$  and  $\tan y = \frac{5}{12}$ , where  $x$  and  $y$  are acute angles, find the exact values of:
  - a)  $\sin(x - y)$  (4)
  - b)  $\sin 2x$  (2)
  
2. Solve the equation  $\sin 2x = \cos x$  in the interval  $0 \leq x \leq 2\pi$ . (4)
  
3.
  - a) Show that  $2\cos 2x - \cos^2 x = 1 - 3\sin^2 x$ . (2)
  - b) Hence, solve the equation  $2\cos 2x - \cos^2 x = 2\sin x$  in the interval  $0 \leq x \leq 360$ . (4)
  
4. Triangles ACD and BCD are right-angled at D with angles  $p$  and  $q$  and lengths as shown in the diagram.

a) Show that the exact value of  $\sin(p + q)$  is  $\frac{84}{85}$ . (3)

b) Calculate the exact values of:

(i)  $\cos(p + q)$

(ii)  $\tan(p + q)$



5. Relative to a suitable coordinate system A and B are the points  $(-2, 1, -1)$  and  $(1, 3, 2)$  respectively. A, B and C are collinear points and C is positioned such that  $BC = 2AB$ . Find the coordinates of C. (4)

6. The amount  $A_t$  micrograms of a certain radioactive substance remaining after  $t$  years decreases according to the formula  $A_t = A_0 e^{-0.002t}$ , where  $A_0$  is the amount present initially.
- a) If 600 micrograms are left after 1000 years, how many micrograms were present initially? **(3)**
- b) The half-life of a substance is the time taken for the amount to decrease to half of its initial amount. What is the half-life of this substance? **(4)**

**Total 33 marks**