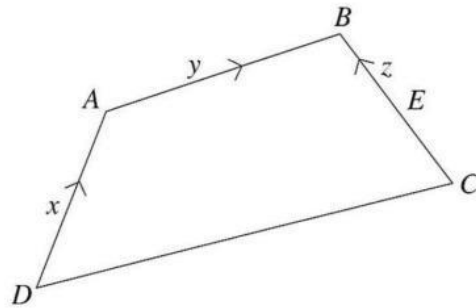


9.  $E$  is the midpoint of  $\overrightarrow{BC}$ .  $\overrightarrow{AB} = y$ ,  $\overrightarrow{EB} = z$  and  $\overrightarrow{DA} = x$ .



NOT TO SCALE

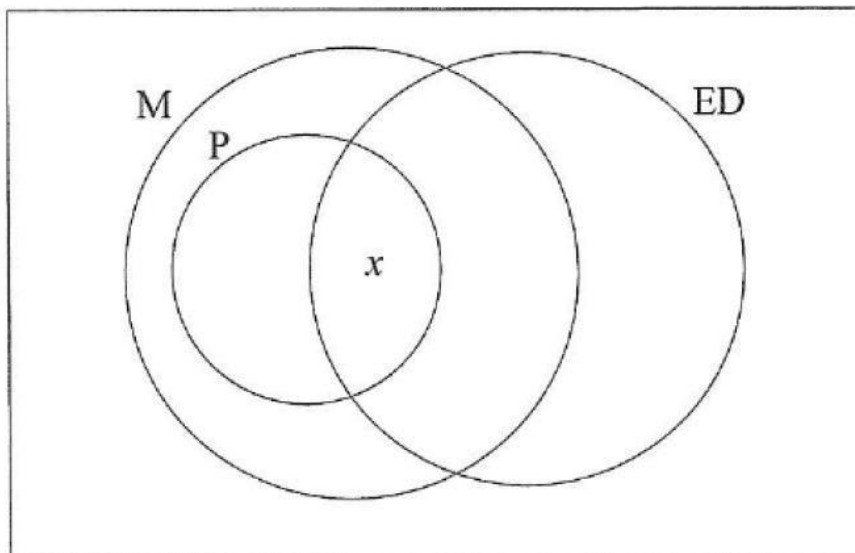
Express in terms of  $x$ ,  $y$  and  $z$ :

- (a)  $\overrightarrow{CB}$  [1]
- (b)  $\overrightarrow{DB}$  [2]
- (c)  $\overrightarrow{CD}$  [2]

9. At the college this semester, there are 85 students enrolled in the Electrical Engineering Programme. The Venn diagram shows three of the courses the students may register for.

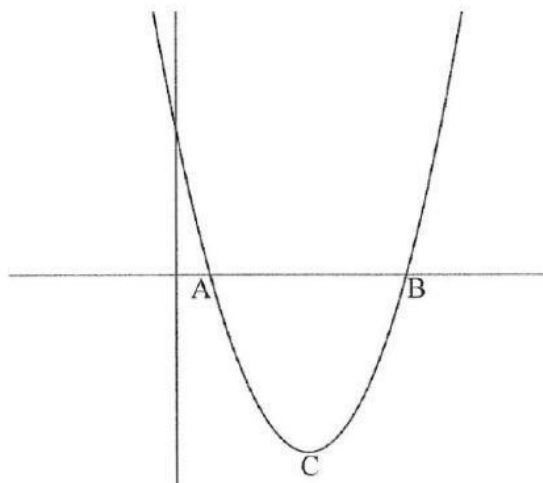
- 40 take Physics (P).  
 All Physics student take Mathematics (M).  
 44 take Electrical Drawing (ED).  
 14 take Mathematics only.  
 6 take Mathematics and Electrical Drawing only.  
 5 take none of the three.

Electrical Engineering Students



- (a) Copy and complete the Venn diagram, in terms of  $x$  where applicable. [5]
- (b) Write an equation in terms of  $x$ , then solve for  $x$ . [3]

9. The diagram shows part of the graph of  $y = x^2 - 6x + 4$  intersecting the  $x$ -axis at  $A$  and  $B$  with the minimum point (vertex) labelled  $C$ .



Calculate (a) the  $x$ -intercepts, giving your answer to 2 d.p. [5]

**$x =$                       or**

(b) the gradient of the tangent at  $C$ . Show working to support your answer. [3]

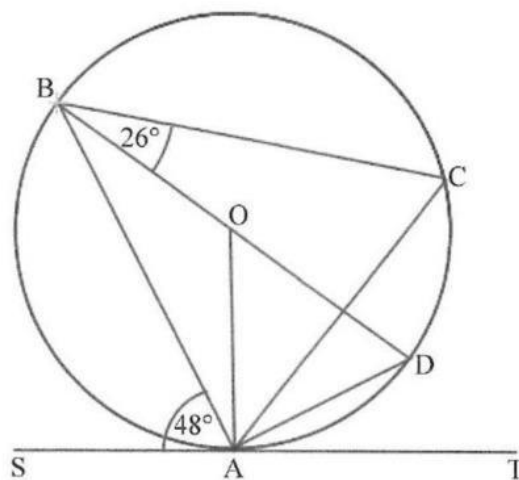
**Derivative of Curve =**

**Coordinate at Point C =**

**Gradient at Point C =**

9. In the diagram, which is not drawn to scale, the points  $A, B, C$  and  $D$  are on the circumference of the circle.  $O$  is the centre of the circle and  $ST$  is the tangent to the circle at the point  $A$ .

$BD$  is a diameter,  $\angle SAB = 48^\circ$  and  $\angle CBD = 26^\circ$ .



NOT TO SCALE

Find:

(a)  $\angle ACB$  [1]

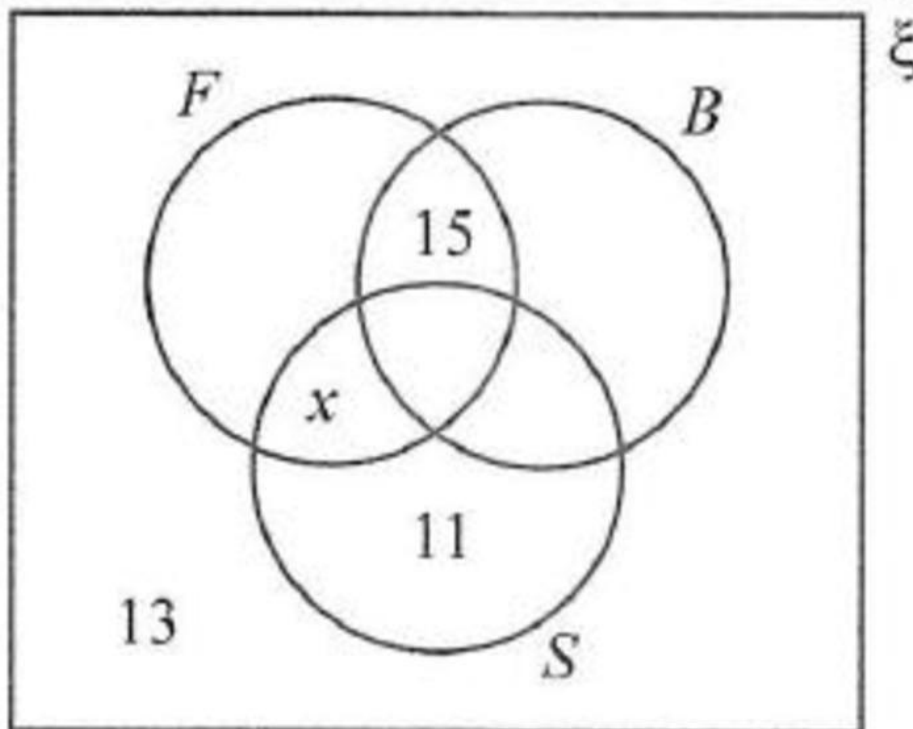
- (b)  $\angle AOB$  [1]
- (c)  $\angle CAD$  [1]
- (d)  $\angle DAT$  [1]
- (e)  $\angle OAD$  [1]

9. A group of 110 students of Grade 12 were asked which sports they played. The results are below.

$F = \{ \text{students who play football} \}$   
 $B = \{ \text{students who play basketball} \}$   
 $S = \{ \text{students who play softball} \}$

14 students play football only.  
 11 students play softball only.  
 15 students play football and basketball only.  
 21 students play all three sports.  
 13 students play none of these sports.  
 $x$  students play football and softball only.  
 $2x$  students play basketball and softball only.  
 $3x$  students play basketball only.

- (a) Copy and complete the Venn diagram using the above information. [4]



- (b) Form an equation and solve it to find the value of  $x$ . [2]
- (c) Find
- (i) the number of students who play basketball, [1]

(ii)  $n(B \cap S)$ , [1]

(iii)  $n(F')$ , [1]

(iv)  $n[S' \cap (F \cup B)]$ , [1]

9. Express as a single fraction in lowest terms:

(a)  $\frac{6x}{(x+3)(x-3)} - \frac{3}{x-3} \left( \frac{\quad}{\quad} \right)$  [4]

Fraction after Factorizing

$$\frac{6x - 3(\quad)}{(\quad)(\quad)}$$

Fraction after Simplifying

$$\frac{6x - 3(\quad)}{(\quad)(\quad)}$$

(b)  $\frac{x^2 - 16}{x + 4} \times \frac{4xy}{3xy - 12y}$  [4]

Fractions after Factorizing

$$\frac{(\quad)(\quad)}{(\quad)} \times \frac{\quad}{(\quad)}$$

Expression after Simplifying =

9. Given the curve with equation  $y = 3x^2 - 4x + 1$  and the point  $P(2, 5)$  on the curve, find

(a) the gradient of the curve at  $P$ , [2]

(b) the equation of the tangent to the curve at  $P$ . [3]

$$y = \quad x$$