

MATHEMATICS

COMPILER: CDE. T. SERETLO

TIME: 2½ hrs

SECTION A

ANSWER ALL QUESTIONS IN THIS SECTION

1(i) The interior angles of a quadrilateral are $(3x-12)^\circ$, $(2x+42)^\circ$, $(x+88)^\circ$ and $(2x-30)^\circ$. Form an equation in x and solve it.

Hence find the angles of the quadrilateral.

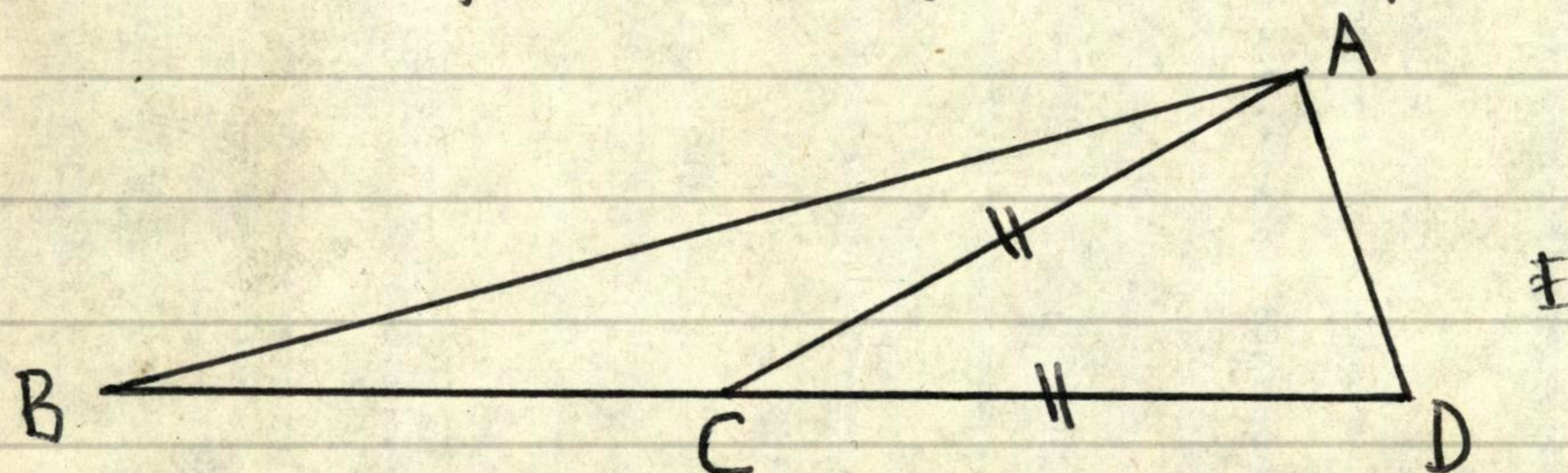


Fig. 1

(ii) In Fig. 1, $AC = CD$ and BCD is a straight line. Given that $\angle ADC = 72^\circ$ and $\angle BAC = 20^\circ$, calculate the size of $\angle ACB$ and $\angle ABC$

(6 marks)

2. Given that $X = \begin{pmatrix} 1 & 0 \\ 3 & 2 \end{pmatrix}$ and $Y = \begin{pmatrix} 2 & -1 \\ -1 & 0 \end{pmatrix}$ find

(a) $X+Y$, (b) Y^2 , (c) the inverse of X

[The inverse of a matrix $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ is

$$\frac{1}{ad-bc} \begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$$

(4 marks)

3. Twenty cards are numbered 1 to 20 and then placed in a box. One card is chosen at random from the box. Find the probability that the number on the card chosen will

- (a) be greater than 15,
- (b) be a multiple of 6,
- (c) not be divisible by 5.

(4 marks)

4. A bicycle wheel has a radius 70 cm.

(a) Calculate, in cm to one decimal place, the circumference of this wheel.

(b) Calculate, to the nearest whole number, the number of revolutions made by the wheel when the bicycle travels a distance of 1 km.

[The circumference of a circle is $2\pi r$] (5 marks)

5. A school contains 675 pupils of whom 56% are girls.

(a) Find the number of girls in the school.

~~the~~ Given that two-ninths of the girls are over the age of 15 years,

(b) Find the number of girls over the age of 15 in the school.

(4 marks)

6.

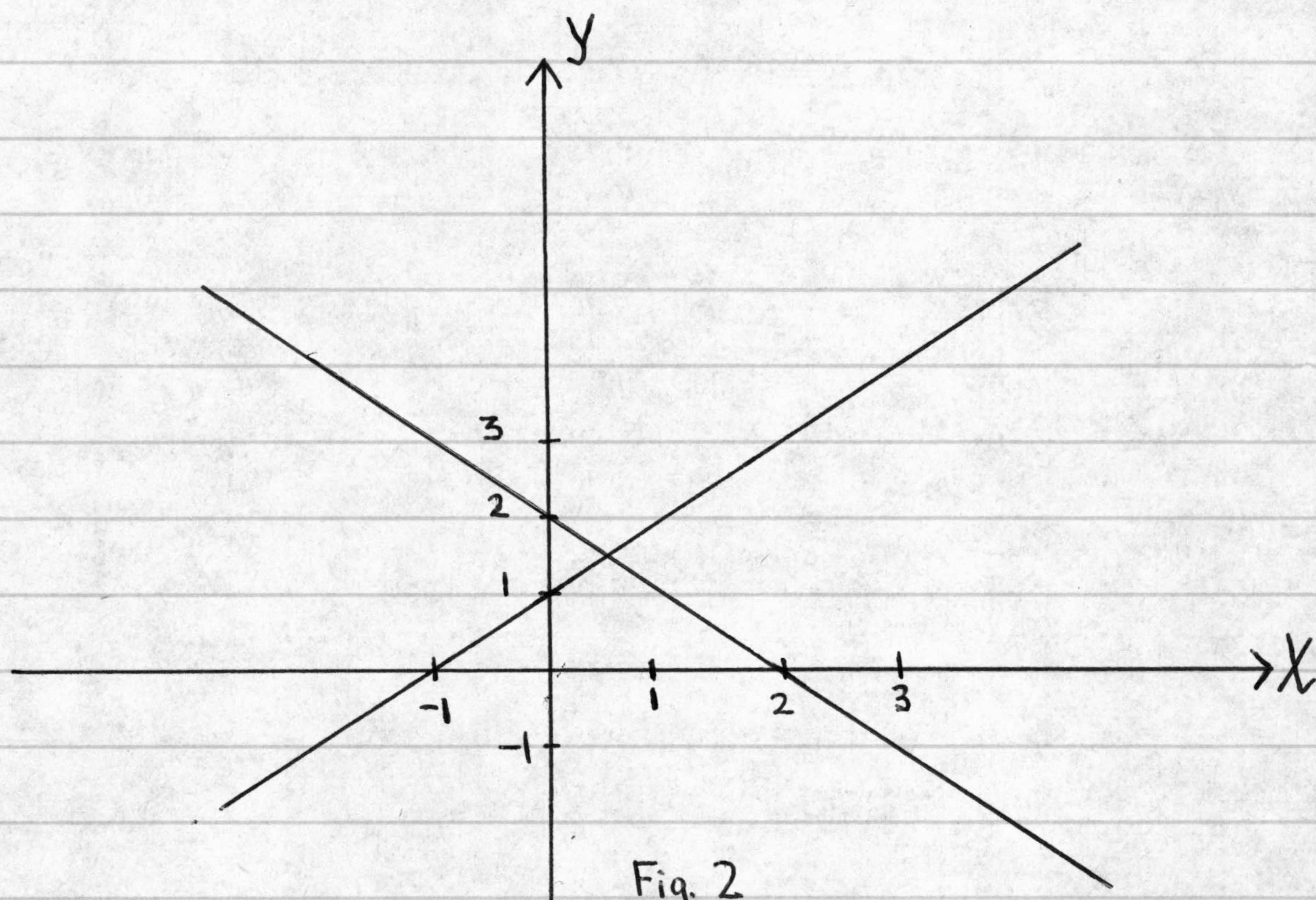


Fig. 2

The diagram shows the two lines $y = x + 1$,
 $y = 2 - x$

Sketch a copy of this diagram and mark clearly which equation belongs to which line.

On your diagram, shade the region in which all three inequalities

$x \geq 0$, $y > x + 1$, $y < 2 - x$
 are satisfied. (5 marks)

SECTION B

Answer SIX questions in this section

7. The 150 third year pupils in a school had to choose one language to study the following two years. The languages offered were French, German, Spanish, Latin and Italian.

Thirty pupils chose German, 25 chose Spanish, 20 chose Latin, 15 chose Italian and the rest of the pupils chose French.

- (a) Calculate the number of pupils who chose French.
- (b) On graph paper, represent this information on a bar chart using a bar of width 2cm to represent each language and taking 1cm to represent 10 pupils.
- (c) Using a circle of radius 4cm, draw an accurate pie chart to represent the pupils' choice, clearly labelling each sector.

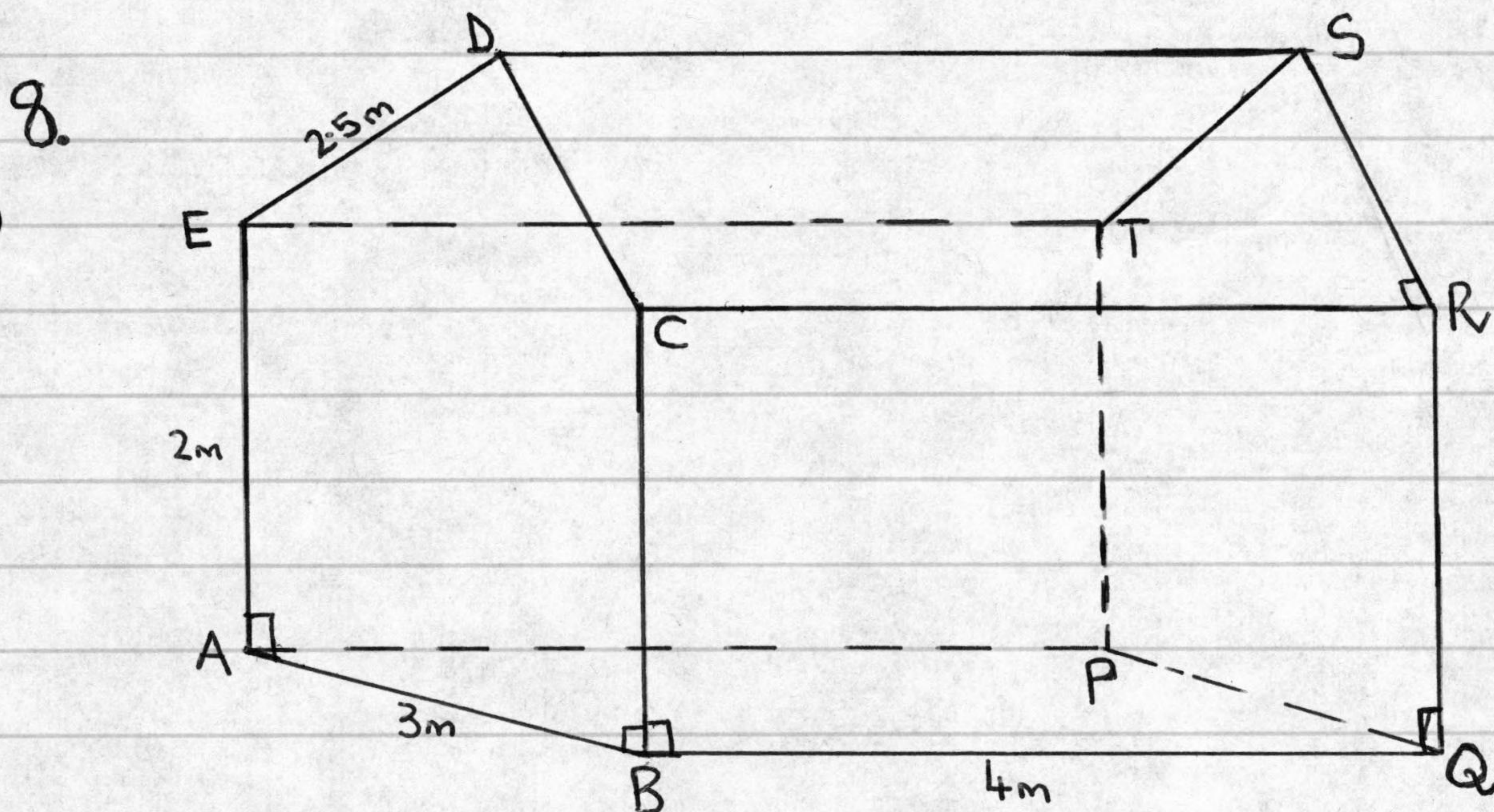
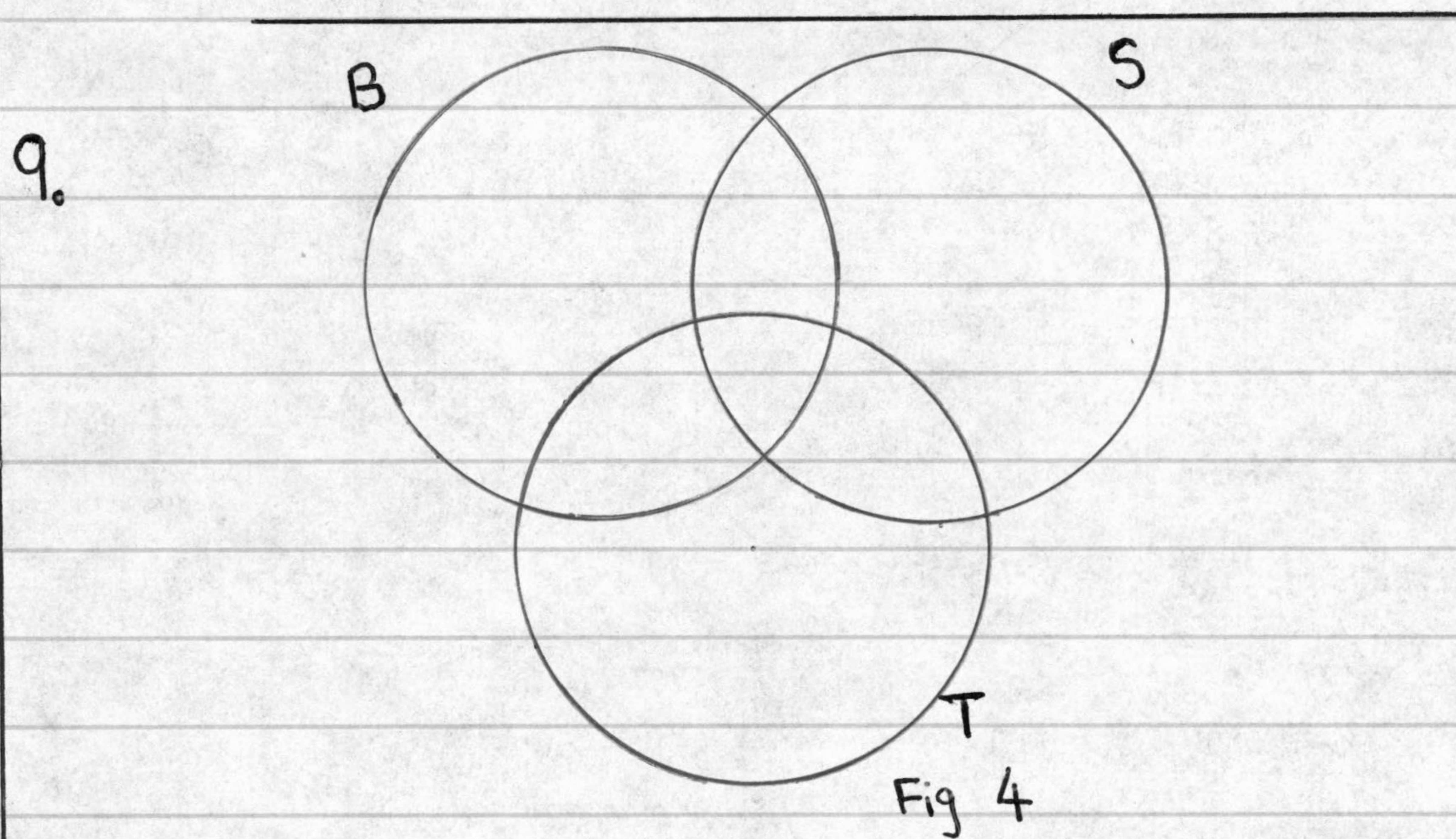


Fig 3

Fig. 3 shows a shed with a rectangular base $ABQP$ which is of length 4m and width 3m .

The height of the side walls is 2m and each of the two sloping roof sections is a rectangle of length 4m and of width 2.5m

- (a) Calculate the greatest height of the shed.
 - (b) Calculate the area, in m^2 , of the end ABCDE
 - (c) Calculate the volume, in m^3 , of air in the empty shed.
 - (d) Calculate to the nearest degree the size of $\angle EDC$
 - (e) A cable has to run from the point B to the midpoint of DS. Throughout its length, the cable is to be fixed to the walls of the roof. Calculate, to the nearest tenth of a metre, the shortest length of cable that is required
- (12 marks)



At a sports centre, members are able to play badminton (B), squash (S) and table-tennis (T). A survey was made and it produced the following results. The 140 members all play at least one game and some members play all three games; 69 members play badminton and 18 play both badminton and squash; 42 members play table-tennis only

and 16 play squash only;

25 members play both squash and table-tennis;
the number of members who play badminton only is twice the
number who play all three games.

(a) Draw a Venn diagram such as the one shown in Fig. 4
Denote the number of members who play all three games
by x .

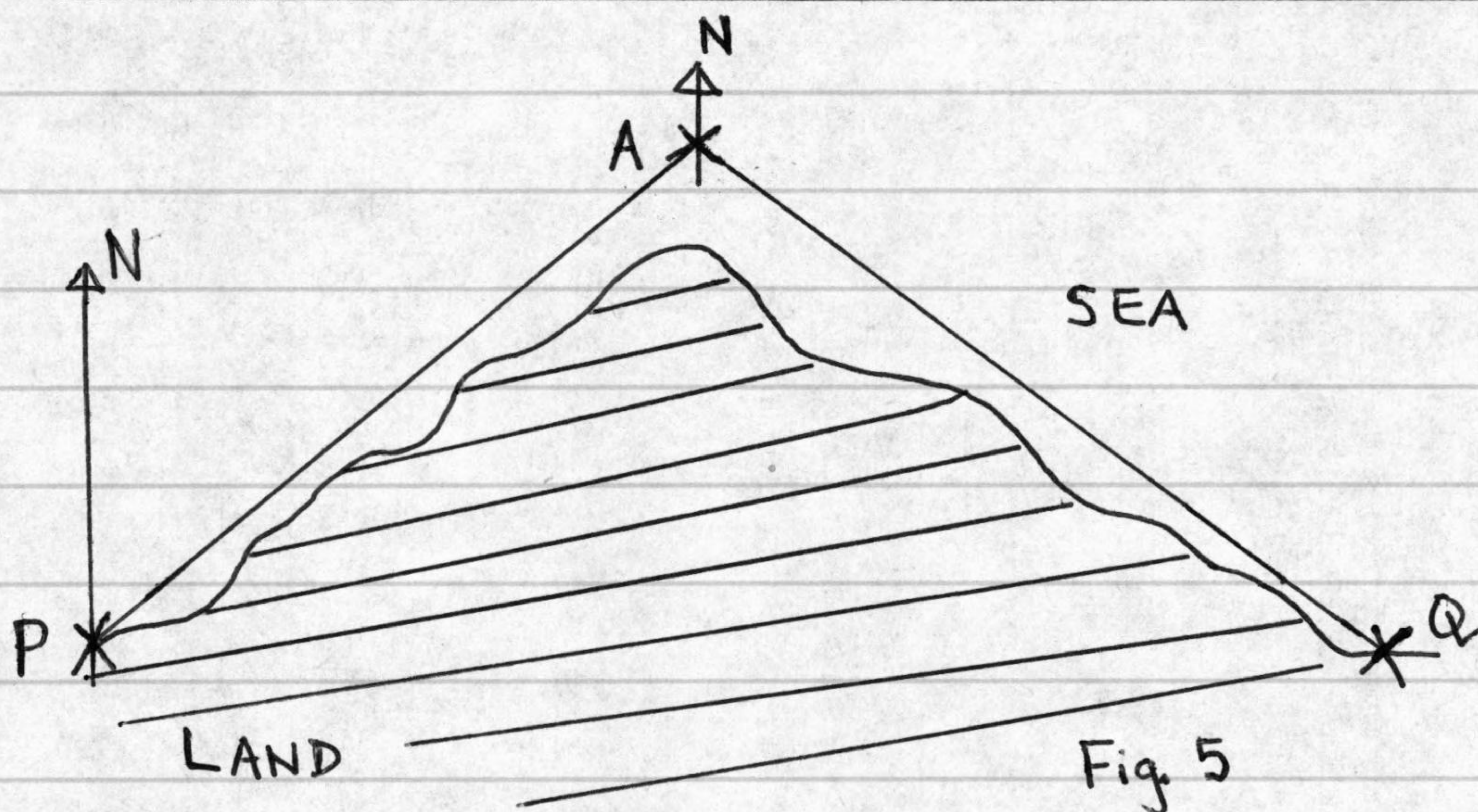
(b) For set S , find, in terms of x where appropriate, and
mark on your diagram, the number of members in each
region of this set.

(c) Find, and mark also on your diagram, the number of
members in each of the three regions of the Venn diagram.

(d) Form an equation in x and solve it.

(e) State the numerical value of, and the meaning in words
of $n(T \cup S)$.

10.



A ship leaves port P and travels a distance of 12 km on a
bearing of 037° to buoy A. The ship then changes course
and travels 25 km on a bearing of 140° to the port Q.
Calculate, in km, to 2 decimal places,

- (a) how far A is to the north and to the east of P,
 (b) how far Q is to the south and to the east of A,
 (c) the shortest distance from P to Q,
 (d) Calculate, to the nearest degree,
 the bearing of Q from P. (12 marks)

11. Six functions are defined by

$$\begin{aligned} i: x \mapsto x, & \quad f: x \mapsto 1-x, & \quad g: x \mapsto \frac{1}{x} \\ h: x \mapsto 1-\frac{1}{x}, & \quad j: x \mapsto \frac{1}{1-x}, & \quad k: x \mapsto \frac{x}{x-1} \end{aligned}$$

- (a) Copy and complete the combination table below.
 [Note that for fg , f appears in the left column and g in the top row and $fg = h$]

	i	f	g	h	j	k
i	i	f	g	h	j	k
f	f	i	h	g		
g	g	j	i	k		
h	h	k	f	j		
j	j	g	k	i		
k	k	h	j	f		

- (b) State the identity function
 (c) State the inverse function for (i) j (ii) k
 (d) Use the table to simplify
 (i) $(fg)h$ (ii) $f(gh)$ (12 marks)

12.

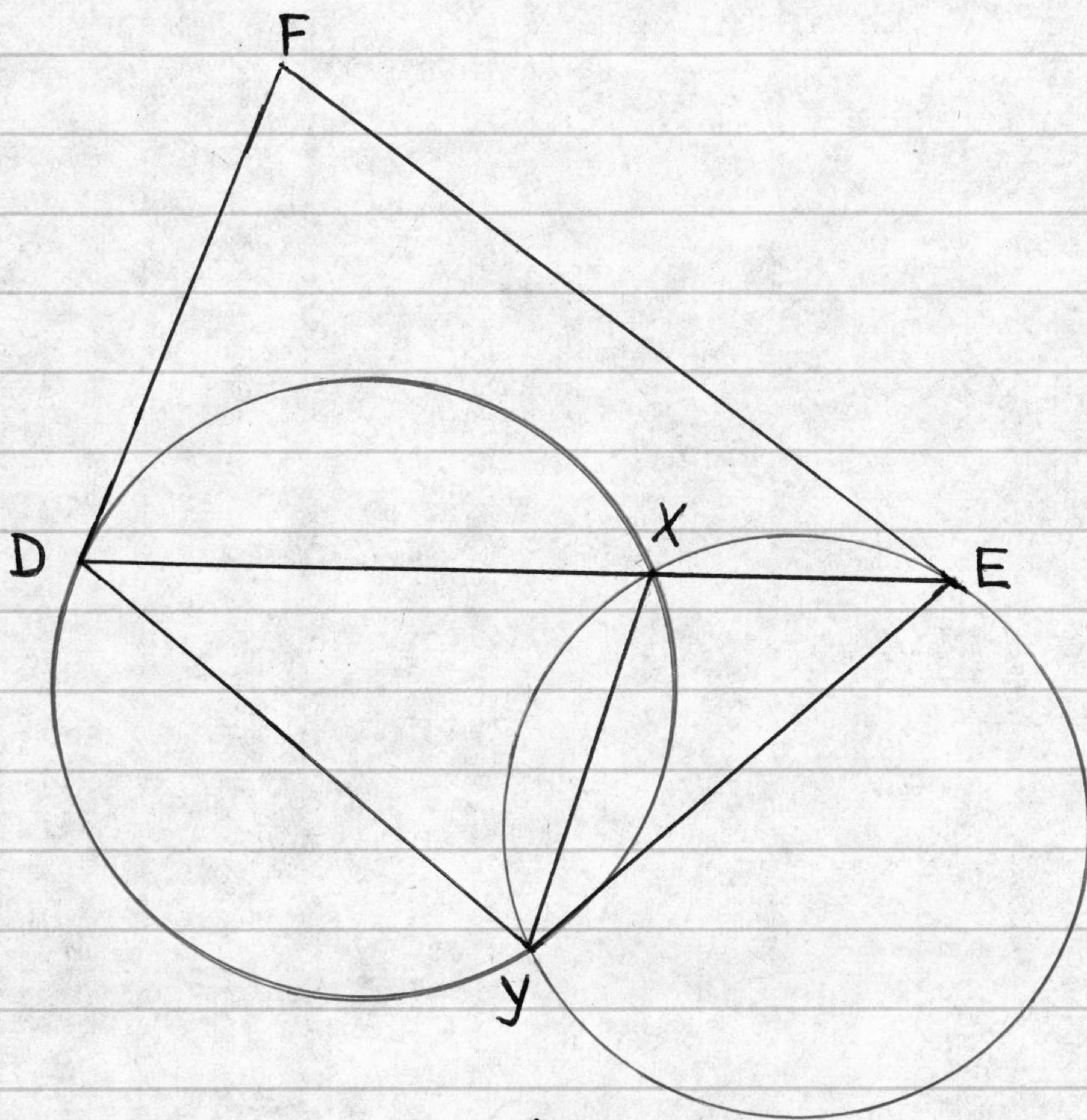


Fig. 6

In Fig. 6, the circles DXY , EXY cut at X and Y , and DXE is a straight line. The tangents to the circles at D and E meet at F . Given that $\angle FDE = 74^\circ$ and $\angle DYE = 118^\circ$,

(a) Calculate the sizes, in degrees, of $\angle DYX$, $\angle DEF$ and $\angle DFE$, giving brief reasons for your answers

~~(12 marks)~~

(b) Explain why $FDYE$ is a cyclic quadrilateral.

(c) Calculate the sizes, in degrees, of $\angle F\hat{Y}D$ and $\angle F\hat{Y}X$, giving brief reasons for your answers.

(12 marks)

13. Alan and Brenda fire shots alternately at a target.

Alan fires first

The probability that Alan will hit the target with any shot is $\frac{2}{5}$.

The probability that Brenda will hit the target with any shot is $\frac{1}{3}$

Calculate the probability that

- (a) Alan will miss the target with his first shot,
- (b) they both will hit the target with their first shot,
- (c) they both will miss the target with their first shot,
- (d) Brenda, with her second shot, will be the first to hit the target,
- (e) Alan will hit the target at least once with his first three shots. (12 marks)

14(a)

x	-3	-2	-1.5	-1	0	1	1.5	2	3
x^2	9						2.25		
$2x$	-6		-3				3		
-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
y	1						3.25	6	

Using a scale of 2cm for one unit on the x -axis, and 1cm for one unit on the y axis, draw the graph of $y = x^2 + 2x - 2$, for $-3 \leq x \leq 3$

(b) Draw the tangent to the curve at the point on the curve for which $x=1$

(c) Using your tangent, estimate the gradient of the curve where $x=1$

(d) On the same axes, draw the graph of $y=-1$

(e) State clearly the range of values for which $x^2 + 2x - 2 \leq -1$

THE VERY BEST TO YOU !!!