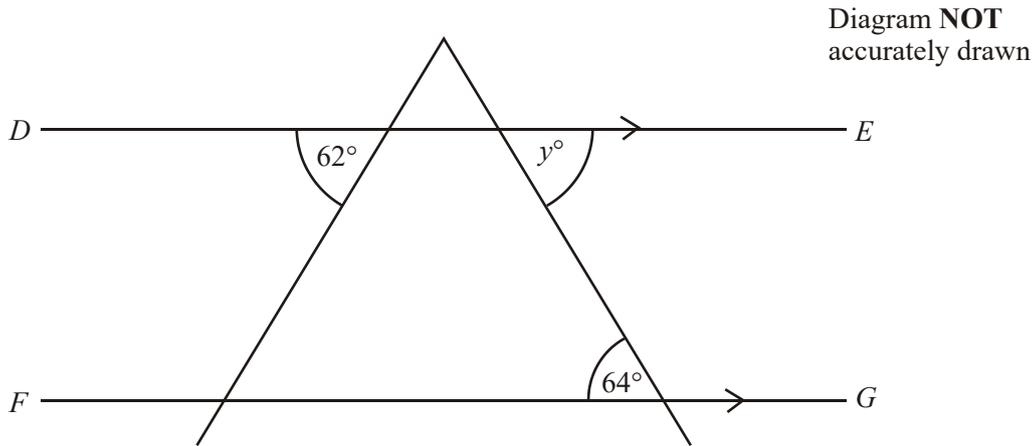


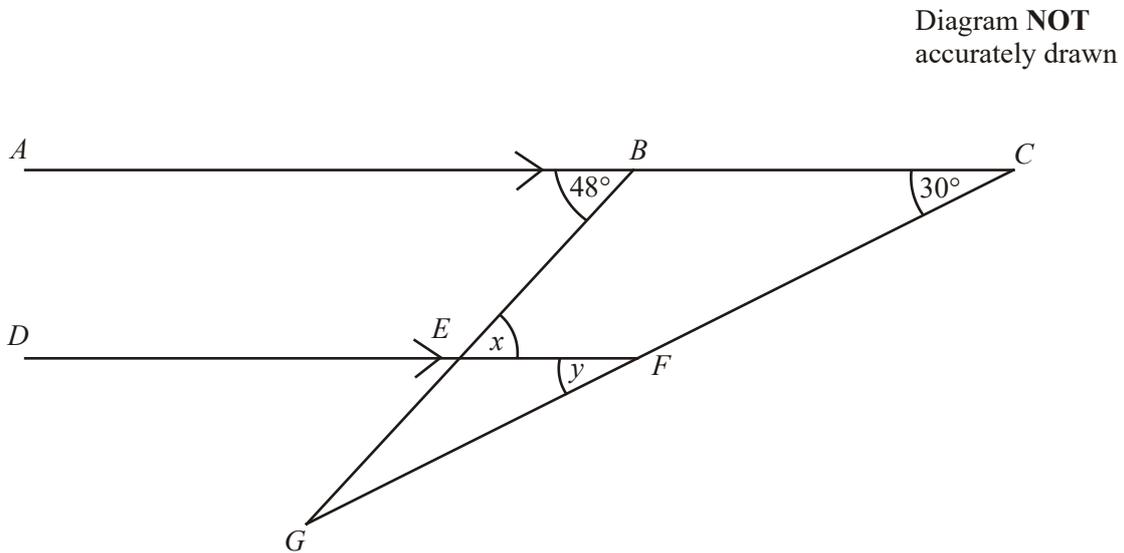
1.



$DE$  is parallel to  $FG$ .  
Find the size of the angle marked  $y^\circ$ .

.....<sup>o</sup>  
(Total 1 mark)

2.



$BEG$  and  $CFG$  are straight lines.  
 $ABC$  is parallel to  $DEF$ .  
Angle  $ABE = 48^\circ$ .  
Angle  $BCF = 30^\circ$ .

- (a) (i) Write down the size of the angle marked  $x$ .

$x = \dots\dots\dots^\circ$

- (ii) Give a reason for your answer.

.....

(2)

- (b) (i) Write down the size of the angle marked  $y$ .

$y = \dots\dots\dots^\circ$

- (ii) Give a reason for your answer.

.....

(2)

(Total 4 marks)

3.

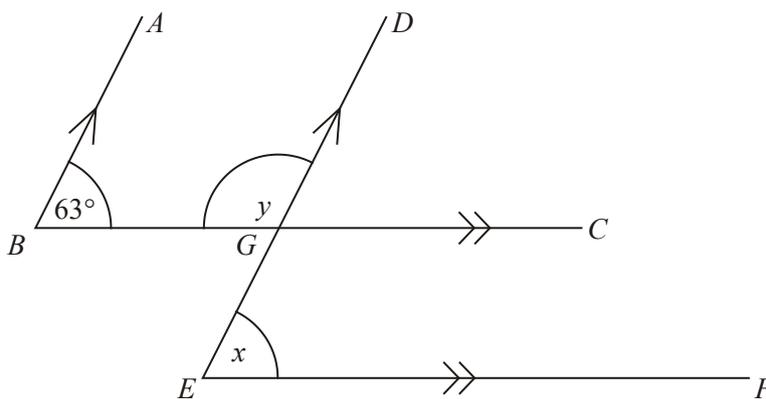


Diagram NOT accurately drawn

$BA$  is parallel to  $EGD$ .  
 $BGC$  is parallel to  $EF$ .  
 Angle  $ABC = 63^\circ$ .

(a) (i) Find the size of angle  $x$ .

.....

(ii) Give a reason for your answer.

.....

.....

(2)

(b) Work out the size of angle  $y$ .

.....

(1)

(Total 3 marks)

4.

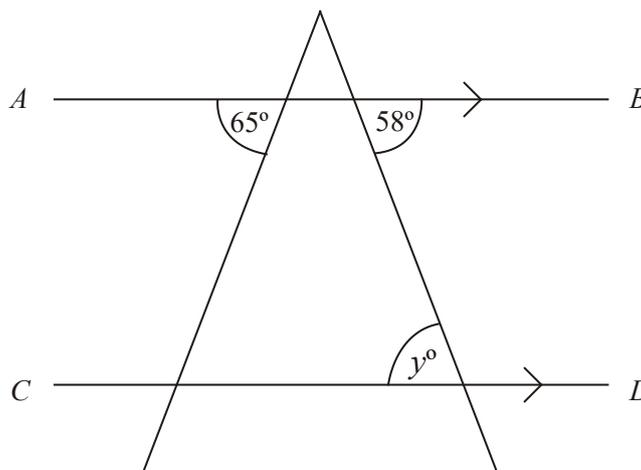


Diagram **NOT** accurately drawn

$AB$  is parallel to  $CD$ .

(i) Write down the value of  $y$ .

.....

(ii) Give a reason for your answer.

.....

(Total 2 marks)

5.

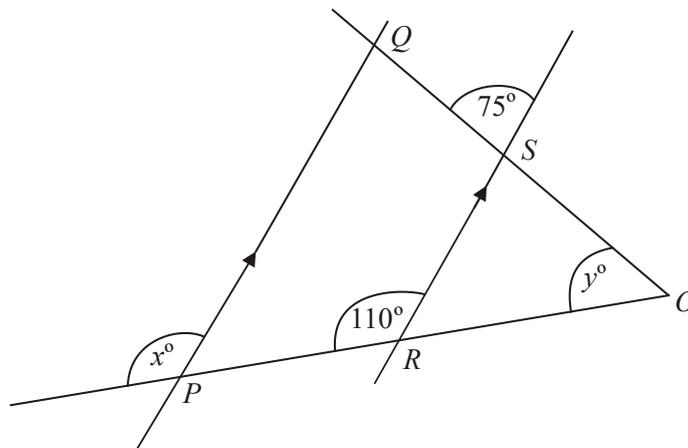


Diagram **NOT** accurately drawn

$PQ$  is parallel to  $RS$ .

$OSQ$  and  $ORP$  are straight lines.

(a) (i) Write down the value of  $x$ .

$x =$  .....

(ii) Give a reason for your answer.

.....

(2)

(b) Work out the value of  $y$ .

$y = \dots\dots\dots$

(2)  
(Total 4 marks)

6.

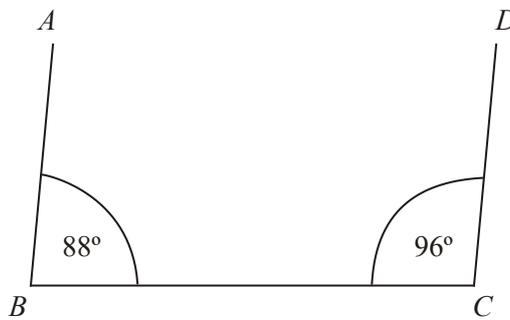


Diagram **NOT** accurately drawn

James says, "The lines  $AB$  and  $DC$  are parallel."  
Ben says, "The lines  $AB$  and  $DC$  are **not** parallel."

Who is right, James or Ben?

.....

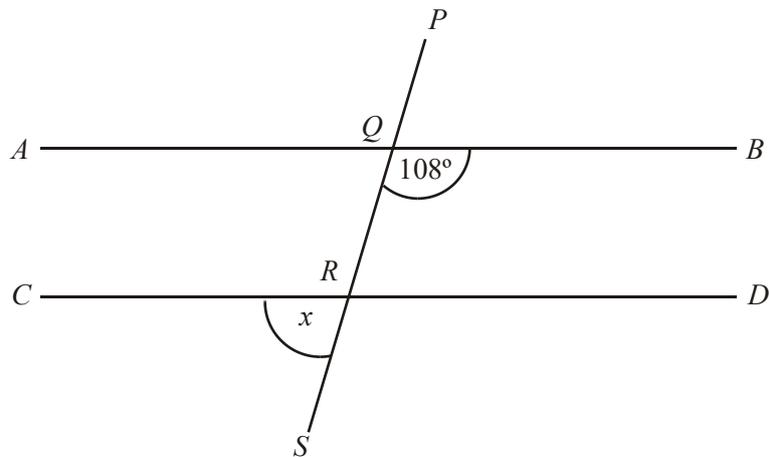
Give a reason for your answer.

.....

.....

(Total 2 marks)

7.

Diagram **NOT** accurately drawn

$AB$  is parallel to  $CD$ .

Explain why angle  $x$  is  $72^\circ$ .

.....

.....

(Total 2 marks)

8.

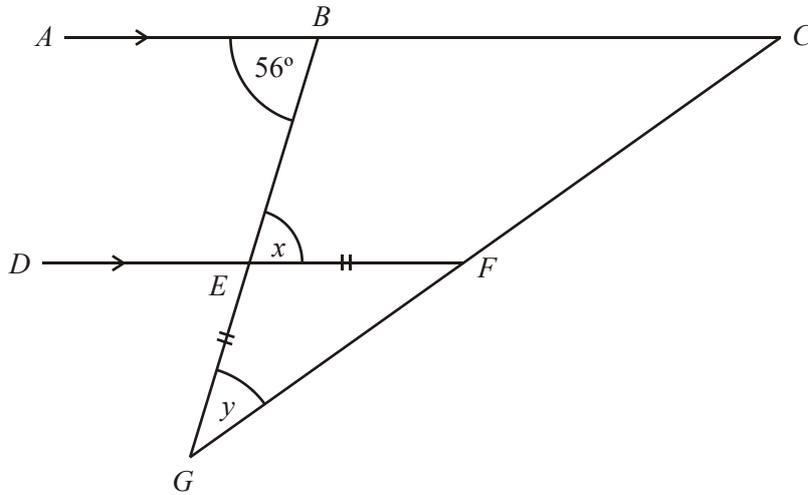


Diagram NOT accurately drawn

*BEG* and *CFG* are straight lines.  
*ABC* is parallel to *DEF*.  
 Angle *ABE* =  $56^\circ$   
 $EF = EG$

(a) (i) Write down the size of the angle marked *x*

$x = \dots\dots\dots^\circ$

(ii) Give a reason for your answer.

.....  
 .....

(2)

(b) Work out the size of the angle marked *y*  
 Give reasons for your answer.

$y = \dots\dots\dots^\circ$

(3)

(Total 5 marks)

9.

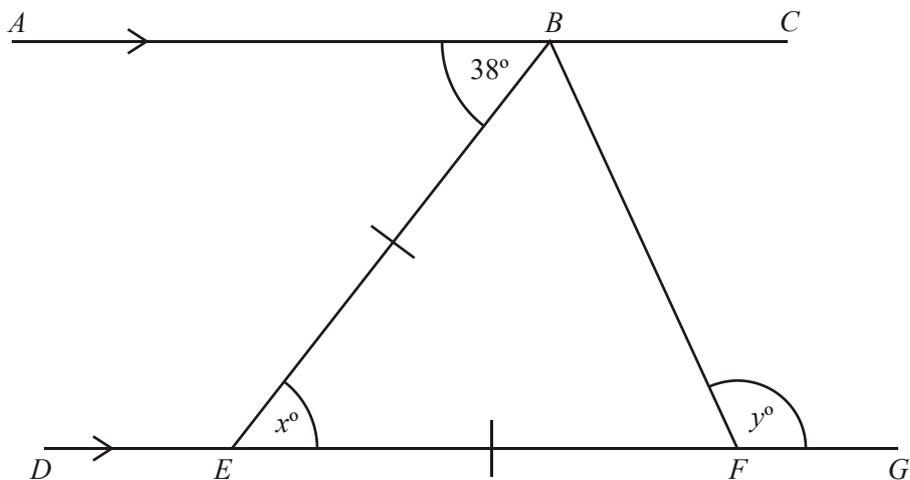


Diagram NOT accurately drawn

$ABC$  is parallel to  $DEFG$ .

$BE = EF$ .

Angle  $ABE = 38^\circ$ .

(a) (i) Find the value of  $x$ .

$x = \dots\dots\dots$

(ii) Give a reason for your answer.

.....

(2)

(b) Work out the value of  $y$ .

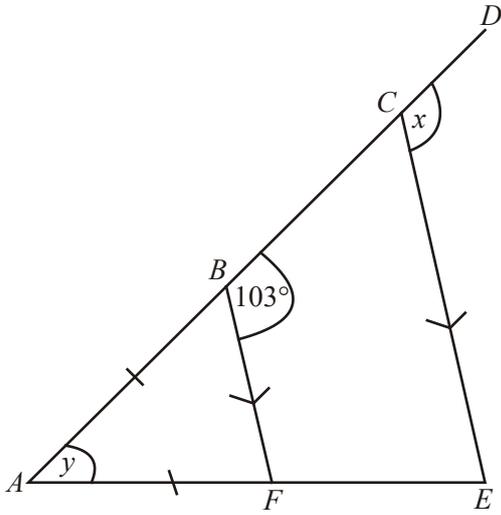
$y = \dots\dots\dots$

(2)

(Total 4 marks)

10.

Diagram **NOT**  
accurately drawn



$ABCD$  and  $AFE$  are straight lines.  
 $BF$  is parallel to  $CE$ .  
 Angle  $CBF = 103^\circ$ .  
 $AB = AF$ .

(a) (i) Find the size of angle  $x$ .

.....<sup>o</sup>

(ii) Give a reason for your answer.

.....  
 .....

(2)

(b) Find the size of angle  $y$ .

.....<sup>o</sup>

(2)

(Total 4 marks)

11.

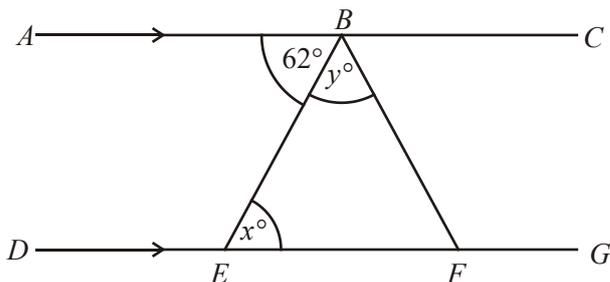


Diagram **NOT** accurately drawn

$ABC$  and  $DEFG$  are straight lines.  
 $AC$  is parallel to  $DG$ .  
 $BE = BF$ .  
 Angle  $ABE = 62^\circ$ .

(a) (i) Find the value of  $x$ .

$x = \dots\dots\dots$

(ii) Give a reason for your answer.

$\dots\dots\dots$

(2)

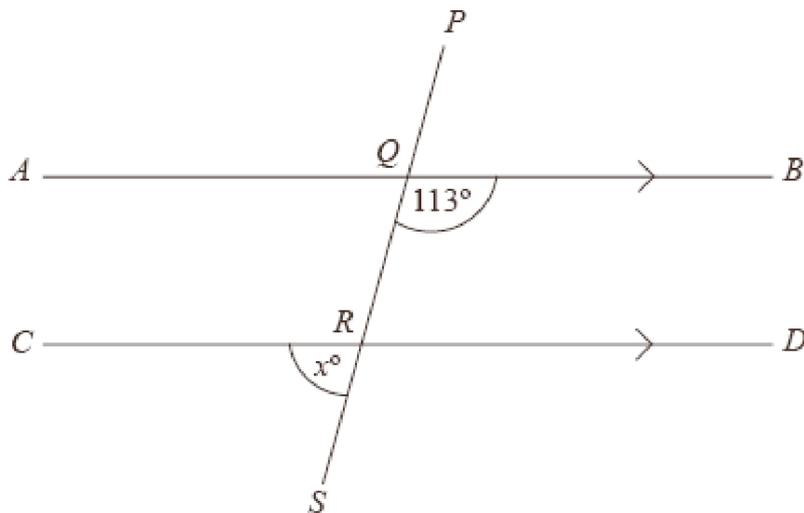
(b) Work out the value of  $y$ .

$y = \dots\dots\dots$

(2)

(Total 4 marks)

12.

Diagram **NOT** accurately drawn

$AQB$ ,  $CRD$  and  $PQRS$  are straight lines.  
 $AB$  is parallel to  $CD$ .  
Angle  $BQR = 113^\circ$ .

Work out the value of  $x$ .

$x = \dots\dots\dots$   
(Total 2 marks)

13.

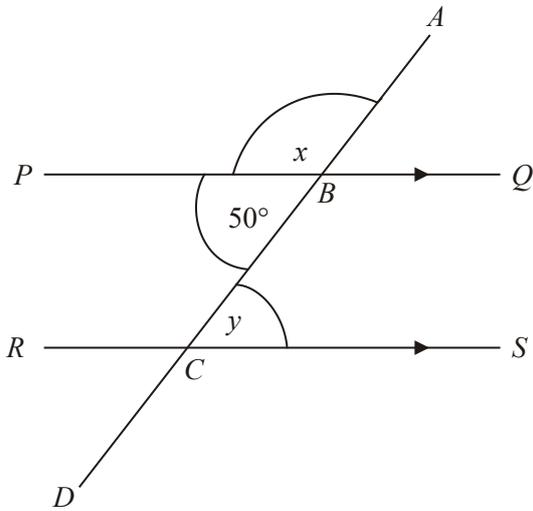


Diagram **NOT** accurately drawn

*ABCD* is a straight line.  
*PQ* is parallel to *RS*.

(a) (i) Write down the size of the angle marked *x*.

.....°

(ii) Give a reason for your answer.

.....  
 .....

(2)

(b) (i) Write down the size of the angle marked *y*.

.....°

(ii) Give a reason for your answer.

.....  
 .....

(2)

**(Total 4 marks)**

14.

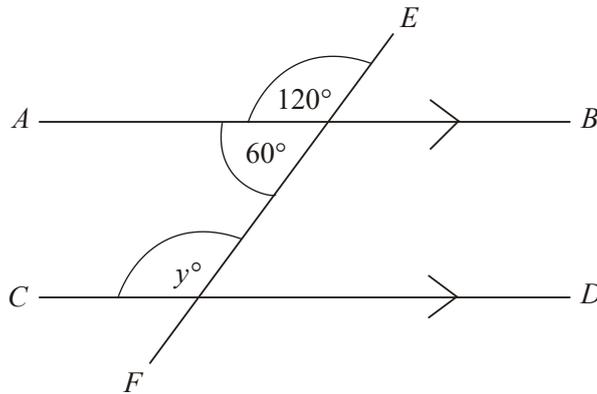


Diagram **NOT** accurately drawn

$AB$  is parallel to  $CD$ .  
 $EF$  is a straight line.

(i) Write down the value of  $y$ .

$y = \dots\dots\dots$

(ii) Give a reason for your answer.

.....

**(Total 2 marks)**

15.

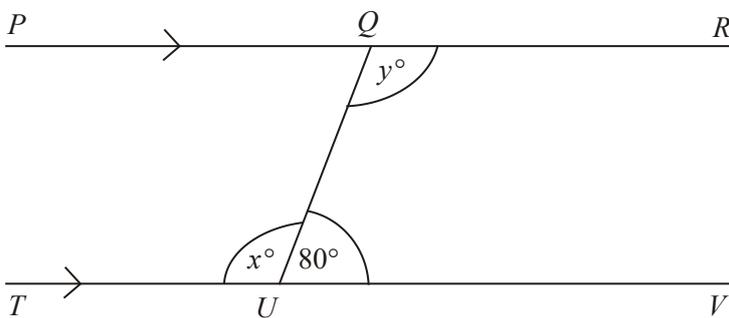


Diagram **NOT** accurately drawn

$PR$  is parallel to  $TV$ .  
 Angle  $QUV = 80^\circ$ .

(a) Work out the size of the angle marked  $x^\circ$ .

.....<sup>o</sup> (1)

(b) Work out the size of the angle marked  $y^\circ$ .

.....<sup>o</sup> (1)  
 (Total 2 marks)

16.

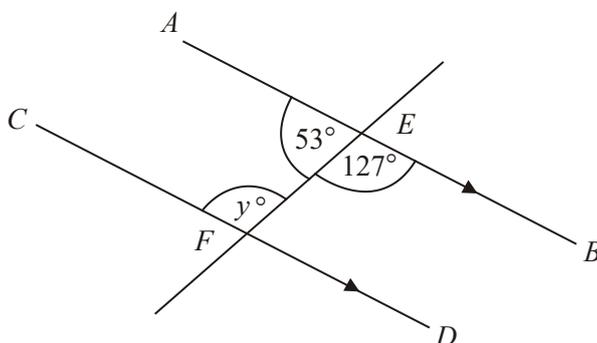


Diagram **NOT** accurately drawn

$AB$  is parallel to  $CD$ .  
 Angle  $BEF = 127^\circ$

- (i) Write down the value of  $y$ .

$y = \dots\dots\dots$

- (ii) Give a reason for your answer.

.....

**(Total 2 marks)**

17.

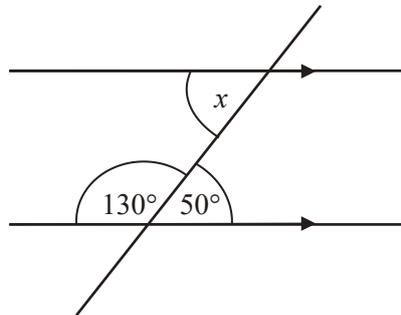


Diagram **NOT** accurately drawn

- (a) Write down the size of the angle marked  $x$ .

.....°

**(1)**

- (b) Give a reason for your answer.

.....

**(1)**

**(Total 2 marks)**

1. 64

*B1 for 64*

1

**[1]**

2. (a) (i) 48 2  
*Bl cao*
- (ii) Alternate angles  
*Bl for alternate angles oe*
- (b) (i) 30 2  
*Bl cao*
- (ii) Corresponding angles  
*Bl for corresponding angles oe*
- [4]**
3. (a) (i) Angle  $x = 63$  2  
 $63^\circ$   
*Bl for  $63^\circ$*
- (ii) (Corresponding angles) and reason  
*(Bl for corresponding or alternate angles mentioned, accept Z angles or F angles)*
- (b) Angle  $y = 117^\circ$  1  
*Bl for  $117^\circ$  cao*
- [3]**
4.  $58^\circ$   
*Bl cao*
- Reason 2  
*Bl (dep) alternate or Z angle (oe)*
- [2]**
5. (a) (i) 110  
*Bl cao*
- (ii) Corresponding angles 2  
*Bl (dep on Bl in (i)) for corresponding angles or F angles*

- (b)  $180 - 70 - 75$   
35  
*M1*  $180 - (180 - 110) - 75$  or  $110 - 75$   
*A1 cao* 2  
**[4]**
6. Ben with a valid reason 2  
*B2 for Ben and a valid reason, eg 'it should be 180' or 'they are not supplementary (allied, co-interior)' oe This could be implied by 184 or 84 or 92 seen*  
*[B1 for Ben and 88 + 96 or 180 - 88 or 180 - 96 seen or for just a valid reason given (eg without Ben or with James)]*  
**[2]**
7. explain 2  
*B1 for alternate, corresponding or co interior*  
*B1 for his straight line 180, or vertically opposite*  
**[2]**
8. (a) (i) 56 2  
*B1*  
(ii) alternate  
*B1 (dep)*
- (b) 28 3  
 $56 \div 2$   
*M1 for '56'  $\div 2$  oe*  
*A1 ft*  
*A1 for 2 correct reasons, one of which must identify  $\triangle EFG$  as isosceles with equal angles*  
**[5]**

9. (a) (i) 38 2  
*BI for 38*
- (ii) alternate  
*BI for alternate (or Z) angles*
- (b) 109 2  
 $(180 - 38) \div 2 = 142 \div 2 = 71$   
*MI for  $(180 - "38") \div 2$  or 71 seen*  
*AI ft from (a)(i)*
- [4]**
- 
10. (a) (i)  $103^\circ$  2  
*BI cao*
- (ii) corresponding  
*BI for corresponding*
- (b)  $180 - 2(180 - 103)$   
 $26^\circ$  2  
*MI for  $180 - 2(180 - 103)$  oe*  
*AI cao*
- [4]**
- 
11. (a) (i) 62 2  
*BI cao (look for answers on diagram)*
- (ii) alternate angle  
*BI accept z angle*
- (b)  $180 - 2 \times 62$   
56 2  
*MI for  $180 - 2 \times "62"$*   
*AI ft (look for answers on diagram)*
- [4]**

12.  $180 - 113$  2  
 $= 67^\circ$

$(360 - 2 \times 113) \div 2$

*M1 for 180 - 113*

*A1 cao*

*OR*

*M1 for  $(360 - 2 \times 113) \div 2$*

*A1 cao*

**Remember to look on the diagram**

*Embedded answers:*

*113 + 67 = 180 with no answer or an incorrect answer on the answer line gets M1A0*

*113 + 57 = 180 with no answer or an incorrect answer on the answer line gets M0A0*

*M1 can be awarded for  $67^\circ$  seen in a correct position on the diagram, if no working or answer shown. If the  $67^\circ$  is where x is the A1 can also be awarded.*

[2]

13. (a) (i) 130 2  
*B1 cao*

- (ii) Sum of the angles on a straight line = 180  
*B1 for "sum of the angles on a straight line = 180°" oe*  
*Note: The reason must contain 'angles' and 'line' OR 'line' and '180°'*

(b) (i) 50 2  
*B1 cao*

- (ii) Alternate angles on parallel lines are equal  
*B1 for "alternate angles on parallel lines are equal" oe*  
*(accept 'Z' angles)*

[4]

14. (i) 120 1  
*B1 cao*

- (ii) Corresponding angles 1  
*Bl dep on 120 in (i) for corresponding angles (or F angles)  
 or alternate angles (or Z angles) with angles on a straight line  
 or co-interior angles  
 or any other fully correct reason* [2]
15. (a) 100 1  
*Bl cao*
- (b) 100 1  
*Bl for 100° or f.t. from (a)  
 [If no answer on the answer line, check the diagram]* [2]
16. (i) 127 1  
*Bl for 127*
- (ii) Alternate angles 1  
*Bl for alternate angles (accept Z angles)  
 or allied angles (co-interior angles) (= 180)  
 or corresponding angles (accept F angles) and (vertically)  
 opposite angles  
 or corresponding angles (accept F angles) and angles on  
 a straight line (= 180°)  
 or allied angles (co-interior angles) and angles on  
 a straight line (= 180°)* [2]
17. (a) 50 1  
*Bl for 50 cao*
- (b) Alternate (angles) 1  
*Bl for alternate (angles) or co-interior (angles) or allied  
 (angles) or any complete reason.  
 (accept Z angles)* [2]

### 1. Paper 1

In this part the correct answer was only seen in 14% of cases. The majority of candidates wrote down 62°, which was the size of the angle marked on the other side of the diagram. One can only assume that candidates thought the diagram was symmetrical.

**Paper 3**

More than half of the candidates recognised the alternate angles and answered correctly but a large number assumed the diagram to be symmetrical and gave an answer of  $62^\circ$ .

2. Most candidates were able to give answers of  $48^\circ$  and  $32^\circ$  in parts (a) and (b) respectively although some gave  $48^\circ$  for both parts. Candidates were much less successful at providing reasons. About 30% identified the reason as “alternate” or “Z” angles in part (a), but fewer mentioned “corresponding” or “F” angles in part (b). Many candidates mentioned “opposite” angles, often alongside a correct reason, and some confused alternate and corresponding. The candidates who used other methods to reach the correct answer in part (b) generally failed to list all the reasons for their working.

**3. Foundation Tier**

Candidates could often give the correct answer for (a) (i) but it was extremely rare to find a correct reason for their answer. Many realised it was to do with parallel lines but rarely was the correct reason given. Many candidates stated they had used a protractor, or even a compass. This was even more worrying as it often demonstrated their inability to measure correctly. Some judged the size compared with angle ABC (usually as a bit smaller) or a right angle. Part (b) was also poorly answered.

**Intermediate Tier**

More than 85% of candidates found the correct size of angle x in part (a) but only a fifth of these went on to give a correct reason. Too few candidates mentioned corresponding or alternate angles and many explanations focused on parallel lines or even parallel angles.

4. A surprising number of students could not identify the angle as being  $58^\circ$ , but gave either  $65^\circ$ , the other angle in the diagram, or  $122^\circ$ , the supplement of the  $58^\circ$ . Attempts at a reason varied from the technical ‘alternate angles’, the casual ‘Z angles’, the wrong ‘corresponding angles’, to the vague ‘opposite angles on parallel lines’. Just quoting ‘parallel lines’ was insufficient to score the mark.
5. The angles of 110 and 35 were often correct but few gave the correct reason. Many just stated that the lines PQ and RS were parallel. Candidates had more success with part (b).
6. This question was very poorly answered, with many candidates realising that the lines were not parallel but unable to give acceptable explanations as to the reason. “Because the two angles are not the same” was the modal incorrect explanation given. Only a very few candidates carried out any calculation to justify their conclusion.

7. Nearly all candidates found it too complex to explain why angle  $x$  was  $72^\circ$  although a good number knew that it was something to do with  $180^\circ$  and/or a straight line. Few candidates identified which angles on the diagram were involved in their explanation.
8. Most candidates gained 1 mark for a correct answer of  $56^\circ$  in part (a) although correct reasons were few and far between, many referring to opposite angles or simply saying that it looked the same as angle ABE. A few used protractors to compare size of angles. In part (b) the correct angle was often seen, without explanation or with merely a verbal description of their method. More than one reason was required for this final mark.
9. This proved to be a good discriminator. Many candidates obtained the  $38^\circ$  in part (a) and were then unable to give a satisfactory reason, often confusing corresponding or opposite angles with alternate or “Z” angles. The most common answers in part (b) were  $142^\circ$  ( $180 - 38$ ) or  $104^\circ$  ( $180 - 38 - 38$ ). It was therefore only the more able candidates (18%) who gained even a single mark.
10. No report available.
11. Candidates understood what was expected of them in this question but although 35% were able to give the correct answer in part (a) only 11% of candidates were able to give the correct reason. Many candidates used the correct nomenclature often we had Z angles and alternating or alteration or in part (b) about 35% of candidates were able to calculate the missing angle in the isosceles triangle.
12. This question was often answered correctly, however many candidates gave an answer of  $113^\circ$ , thinking that  $x^\circ$  was either alternate or corresponding to the given angle. Other errors usually resulted from poor arithmetic;  $180 - 113 = 77$  or  $87$  were not uncommon. Some, using angles at a point, correctly calculated  $360 - 226$ , then failed to divide their answer by 2.
13. **Foundation**
- In both parts of this question, the correct angles in the first parts were often seen but rarely accompanied by correct reasons. In general candidates would describe their calculations rather than quoting any geometric theory. Those candidates that did try to explain their angles often showed confusion in their understanding, particularly relating to angles on the parallel lines.

**Higher**

In part (a), most candidates found the correct value for  $x$ . However a significant number clearly were distracted by other parts of the diagram, failing to recognise and use the 'sum of the angles on a straight line equal to 180 degrees'. Answers of  $50^\circ$  and  $65^\circ$  (finding 130 and then dividing by 2) were common errors made. Part (ii) was less well done with many candidates still describing their calculation rather than quoting geometric theory.

Again, in part (b), the correct angle of  $50^\circ$  was found in (i) by the majority of candidates. Many lost the mark in (ii) by referring to  $y$  and  $50^\circ$  as opposite or corresponding rather than alternate angles.

**14. Foundation**

Many candidates (57%) recognised that the required angle was  $120^\circ$  but then failed to explain why this was the case. A few got muddled with the degree sign and last 0 digit writing 12 as their answer to (i).

Recognition of parallel lines alone was insufficient to explain the size of the angle. Only 5% scored both available marks even though  $F$  angles or  $Z$  angles with angles on a straight line =  $180^\circ$  was acceptable.

**Higher**

There is now more confidence in tackling a geometry question than there has been in the past. The majority (over 90%) recognised that the required angle was  $120^\circ$  and then continued to try to explain the geometrical reason for it to be this value. The idea of a corresponding angle or 'F' angle was much in evidence as well as alternate or 'Z' angle; the latter reason requiring an association with  $180^\circ$  to gain the mark. Many candidates did use the reason as 'Supplementary, co-interior or allied.' all of which gained credit. Recognition of parallel lines alone was insufficient to explain the size of the angle.

Very few tried to argue for the size of the angle through an arithmetical process which is a step in the right direction for this type of question. 42% scored both marks.

- 15.** Full marks was the modal score on this question, however a significant number of candidates gave 80 as their value for  $x$  followed by the same value for  $y$ . In such cases one mark was awarded for recognising that  $x$  was equal to  $y$ .

**16. Foundation**

Fully correct answers to this question were only seen in 8% of cases. One mark was obtained in 35% of cases, almost always for giving the answer of  $127^\circ$ . The most common wrong answers in part (a) was of course  $53^\circ$  and in part (b) corresponding or  $F$  angles. Candidates found this question difficult because the alternate angles were not in the usual  $Z$  format but in the reverse  $Z$  orientation

**Higher**

84% of candidates gained the mark available in the first part of this question although it was surprising to see a significant number of candidates giving  $53^\circ$  as their answer. Whilst the diagram was not accurately drawn, it should have been fairly clear to candidates that  $y$  was not an acute angle. A full and complete reason, for example alternate (or Z) angles was required in order for the mark in part (ii) to be awarded. Many candidates gave “corresponding angles” as their reason without linking to either opposite angles or angles on a straight line. They could not be awarded this mark. Only 37% of candidates were awarded both marks in this question.

17. Nearly all candidates were successful in part (a) of this question.

However, although a good proportion of candidates were able to state that  $50^\circ$  and  $x^\circ$  were alternate or Z angles, many reasons were expressed too vaguely. For example, some candidates stated the angles were “opposite” to each other or that the two angles were “between parallel lines”. Some candidates quoted “corresponding angles” or “angles on a straight line add up to  $180^\circ$ ”, reasons which are incorrect by themselves. In this type of question the correct use of mathematical terms is needed. 96% of candidates scored at least one mark but only just over a half of the candidates could be awarded full marks in this question.