Angles in Polygons (F)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

Name:	*Mel@JustMaths*
Total Marks:	*Solutions*

1. The diagram shows a triangle.

Not to scale

[diagram of triangle with x at top, x at bottom right, 40° at bottom left, tick marks on two sides]

Find the value of x.

Give a reason for each step of your working.

$180 - 40 = 140°$ (angles in a triangle add to 180°)
$140 ÷ 2 = 70°$ (2 angles in an isosceles triangle are equal)

$70°$

x = ... ° [3]

2. PQRS is a rectangle. ← 90° in each corner of the rectangle

A, B, C and D are points on SP, PQ, QR and RS respectively.

AC is the line of symmetry for the diagram.

$45 + 125 = 170$
$180 - 170 = 10$ (angles on a straight line)

$90 - 80 = 10°$

$80°$

$180 - (90 + 10)$
$= 80°$
angles in a triangle
$= 180°$

[diagram of rectangle PQRS with kite ABCD inside; angles marked 45, 125°, 10°, 80°, x, 125°]

Not to scale

(a) Angle ABC = 125°.

Write down the size of angle ADC.

(a) Angle ADC = ...125....... ° [1]

(b) AP is the same length as PB.

Work out the size of angle BCD.

Show your reasoning clearly.

$PBA = \dfrac{180-90}{2} = 45°$

(isosceles triangle and angles in a triangle add to 180°)

$x = 2 \times 10°$

(b) Angle BCD = ...20....... ° [4]

3. ABCD is a trapezium.

$180 - 95 =$ (angles on a straight line = 180)

70° 85° 95°   B   **Not to scale**

70   $186 - 110 = 70$

Co-interior angles add to 180°

25

95 85°   110°

D   C

alternate angle
with AED
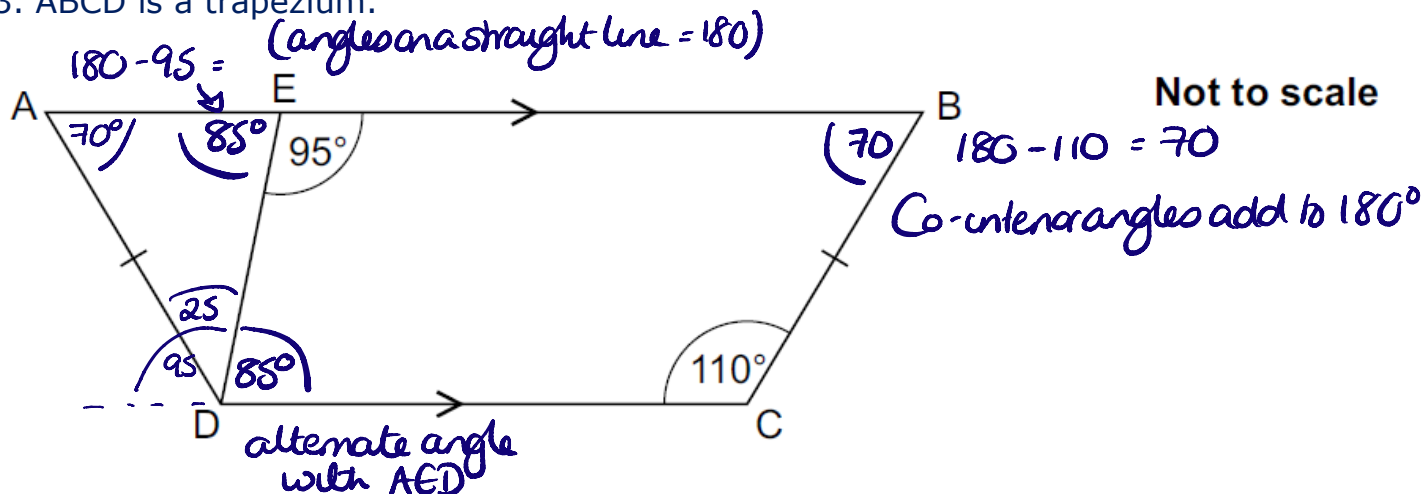
Work out

(a) angle EBC,

(a) ....70°....... ° [1]
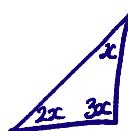
(b) angle ADE.

(b) ....25°....... ° [2]

4. The angles in a triangle are in the ratio 1 : 2 : 3.

Neil says

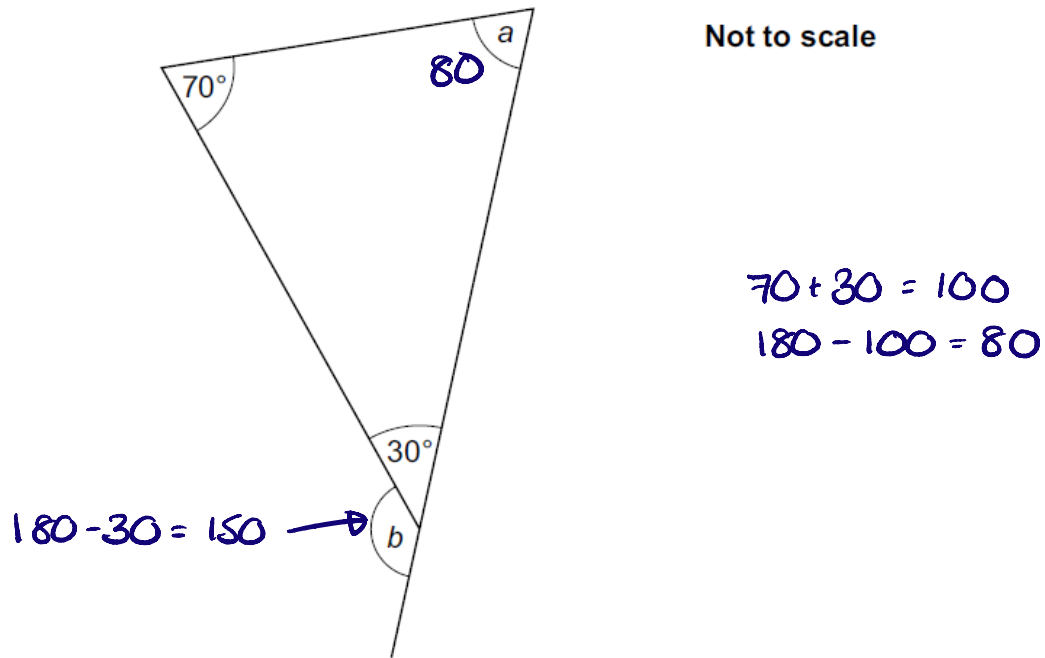*This is a right-angled triangle.*

Is Neil correct?

Show your reasoning.

$6x = 180$
$x = 30°$

size of angles are 30°, 60° and 90°
so yes it is right angled.

[3]

5. Here is a diagram.

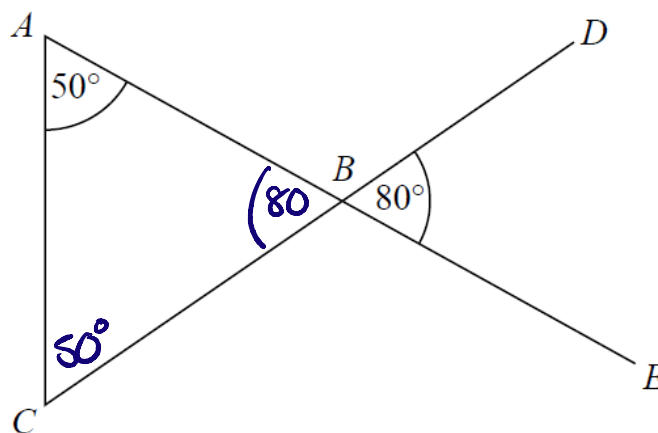**Not to scale**

70°

80

a

30°

180 − 30 = 150 → b

70 + 30 = 100
180 − 100 = 80

(a) Work out angle a.

(a) a = ... 80° .... ° [1]

(b) Work out angle b .

(b) b = ... 150° .... ° [1]

6. ABE and CBD are straight lines.

A   D
50°
              B
       80   80°

50°
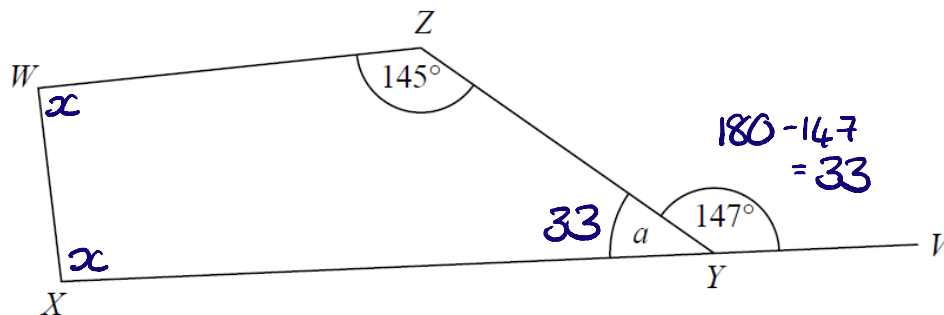C   E

Show that triangle ABC is an isosceles triangle.

Give a reason for each stage of your working.

A B̂C = 80° (vertically opposite angles are equal)
A Ĉ B   50 + 80 = 130
        180 − 130 = 50° (angles in a triangle = 180)
so B Â C = B Ĉ A ∴ the triangle is an isosceles triangle.

[4]

7. WXYZ is a quadrilateral.

XYV is a straight line.

Z

W 145°

x

180 −147
= 33

33 147°
a

x

V

X Y

(a) (i) Find the size of the angle marked a.

33°

.... °

(ii) Give a reason for your answer.

angles on a straight line add up to 180°

[2]

Angle ZWX = angle WXY

(b) Work out the size of angle ZWX.

145   ²³⁶⁶   182 ÷ 2
+ 33   − 178   = 91°
178   182

91°

.... ° [2]

8. ABC is a straight line.

BCD is a triangle.

ABDE is a quadrilateral.

D
y°
30°

E
95°

30 + 35 = 65
180 − 65 = 115

95   360   200 ÷ 2
65 − 160   = 100
160   200

y°   115°
65° x°   35°

A   B   C
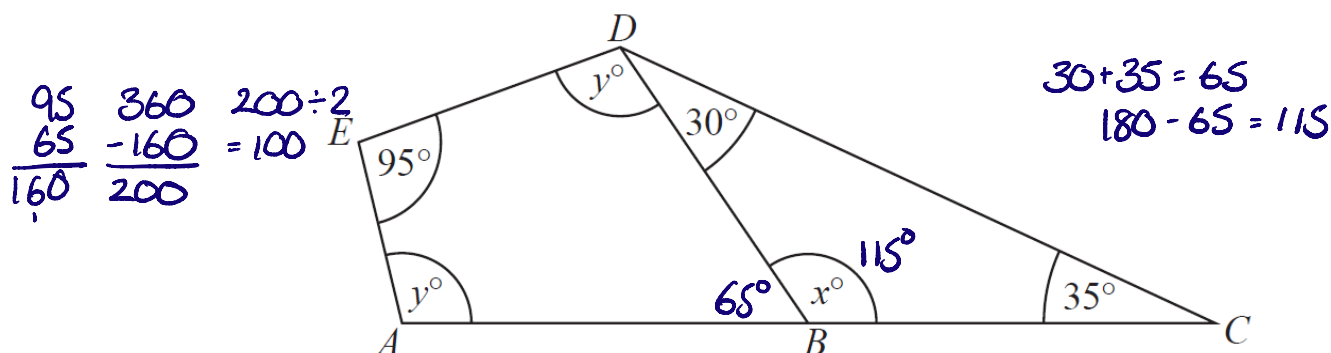
(a) (i) Work out the value of x.

115°
....

(ii) Give a reason for your answer.

angles in a triangle add up to 180°
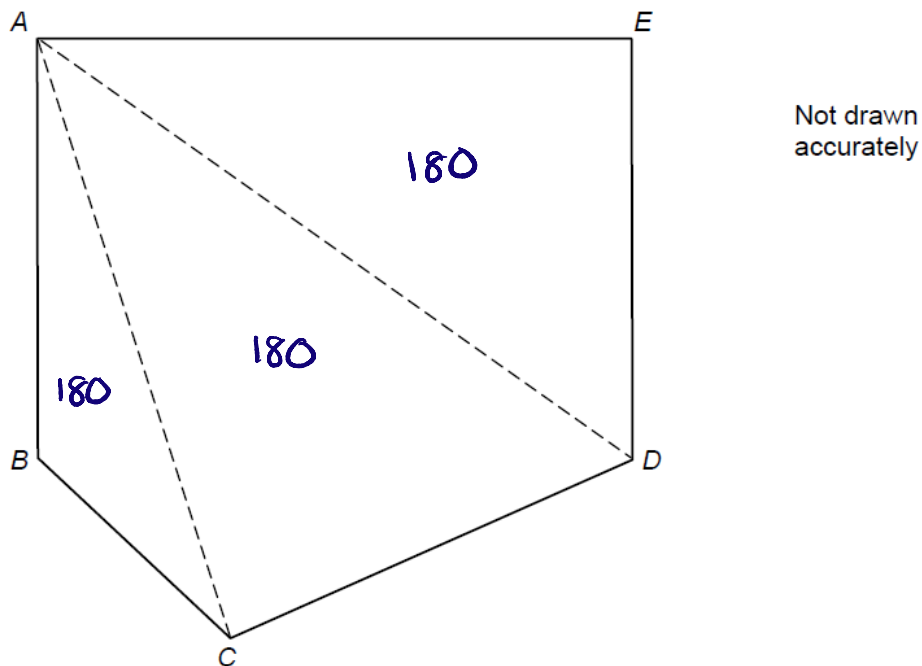
[2]

(b) Work out the value of y.

100°

.... [2]

9. AB is a straight line.

Not drawn
accurately

27°   x   41°

A   B

$+\begin{array}{r}27\\41\\\hline 68\end{array}$ $\begin{array}{r}1\!\!\!\!^{7}8^{1}0\\-68\\\hline 112\end{array}$
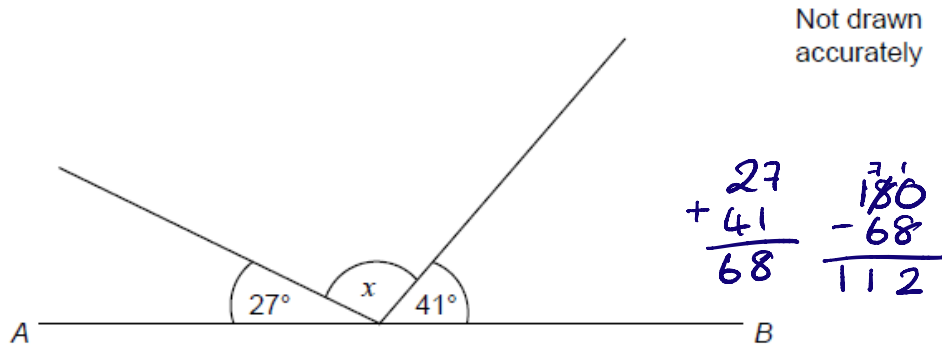
Work out the size of angle x. $x = 112°$

[2]

10. Polygon ABCDE is divided into triangles as shown.

A   E

Not drawn
accurately

180

180

180   180

B   D

C

Use the triangles to work out the sum of the interior angles of polygon ABCDE.

You must show your working.

sum of interior angles = 180 × 3
                        = 540°

[2]

11. In the diagram, DC is parallel to AB.

Show that triangle ABD is isosceles.

Not drawn
accurately

D 28°   28°) C 100°

124°   (28°   52°

A B

$\hat{CDB} = 180 - (100+52)$
$= 28°$ (angles in a triangle = 180°)

$\hat{DBA} = 28°$ (alternate angles are equal)

$\hat{ADB} = 180 - (124+28)$ $\hat{ADB} = \hat{ABD}$ [3]
$= 28°$

12. In the diagram below, ABD is a straight line.

$A\hat{C}B = 80°$ and $C\hat{B}D = 130°$.

C

80°

50°   50°   130°

A B D

Diagram not drawn to scale

Show that triangle ABC is an isosceles triangle.

You must explain your reasoning.

$\hat{CBA} = 180 - 130 = 50°$ (angles on a straight line = 180°)

$\hat{CAB} = 180 - (80+50)$
$= 50°$

$\hat{CBA} = \hat{CAB}$ [4]

∴ the triangle is isosceles

13. The diagram shows a regular octagon and a regular hexagon.

$3 \rightarrow 180°$
$4 \rightarrow 360°$
$5 \rightarrow 540°$
$6 \rightarrow 720°$
$7 \rightarrow 900°$
$8 \rightarrow 1080°$

135   135

135

8 sides

1080 ÷ 8

x

120

135   120

6 sides

720 ÷ 6

120

120

135

135   120

120

120

135   135

120
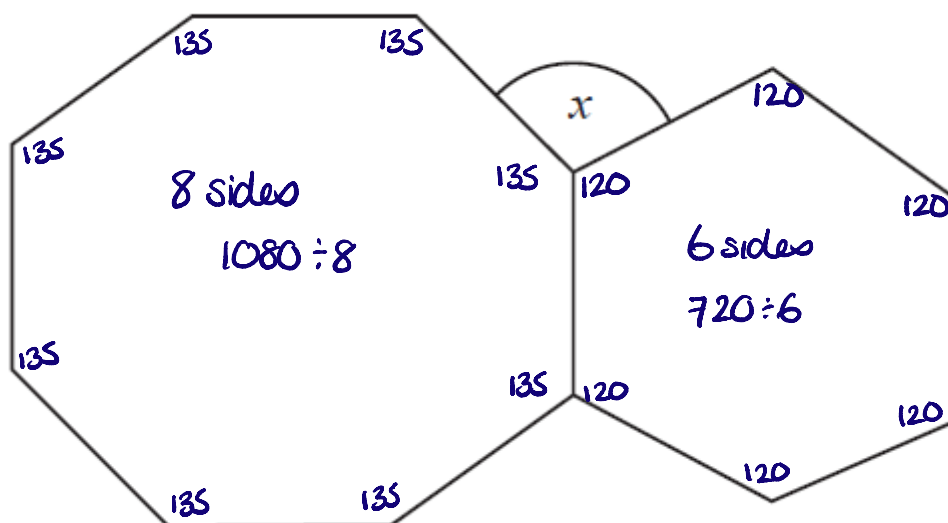
Find the size of the angle marked x

You must show all your working.

$8 \overline{)1080} = 135$

$6 \overline{)720} = 120$

$120 + 135 = 255$
$360 - 255 = 105°$

$x = 105°$ [3]

14. ABC is an isosceles triangle with BA = BC. ← this is important!
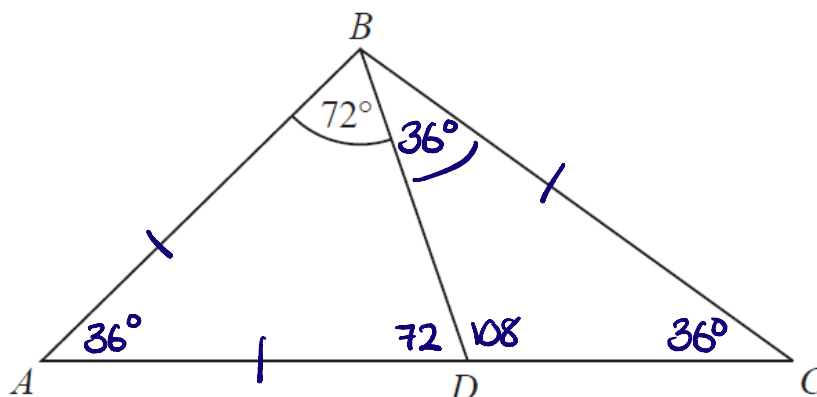
D lies on AC.

ABD is an isosceles triangle with AB = AD.

Angle ABD = 72°

Show that the triangle BCD is isosceles.

You must give a reason for each stage of your working.

$B\hat{D}A = A\hat{B}D$ (ABD) is isosceles

$B\hat{D}C = 180 - 72 = 108$

(angles on a straight line = 180°)

$B\hat{A}D = 180 - (72+72) = 180 - 144 = 36$
$B\hat{C}D = 36°$ (same as $B\hat{A}D$)
$D\hat{B}C = 180 - (108+36) = 36°$

$D\hat{B}C = D\hat{C}B = 36°$ ∴ it is an
isosceles triangle   [5]

15. The diagram shows a right-angled triangle.

$7 \times 6 = 42°$

$7x$

$5x + 18$

$5 \times 6 + 18$
$48°$
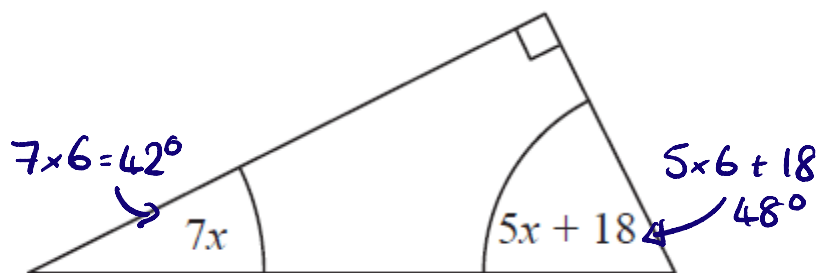
All the angles are in degrees.

Work out the size of the smallest angle of the triangle.

$$7x + 5x + 18 + 90 = 180°$$
$$12x + 108 = 180$$
$$12x = 180 - 108$$
$$12x = 72$$
$$x = \frac{72}{12} = 6$$

The smallest angle = 42°

[3]

16. ABC is a right-angled triangle.

P is a point on AB.

Q is a point on AC.

AP = AQ.

Work out the size of angle AQP.
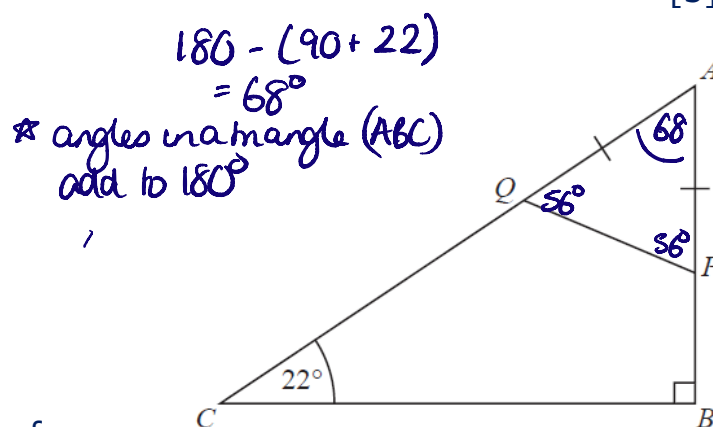
You must give a reason for each stage of your working.

$180 - (90 + 22)$
$= 68°$
* angles in a triangle (ABC)
add to 180°

A
68
Q $56°$
56
P
$22°$
C B

$A\hat{Q}P = A\hat{P}Q$ $180 - 68 = 112$
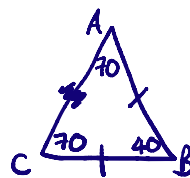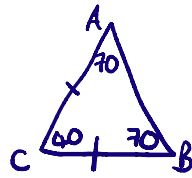$112 \div 2 = 56$ (in an isosceles triangle 2 angles are equal)

$A\hat{Q}P = 56°$
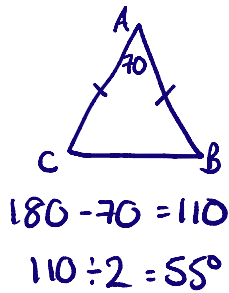
[4]

17. ABC is an isosceles triangle.

When angle A = 70°, there are 3 possible sizes of angle B.

(a) What are they?

180 - 70 = 110

110 ÷ 2 = 55°

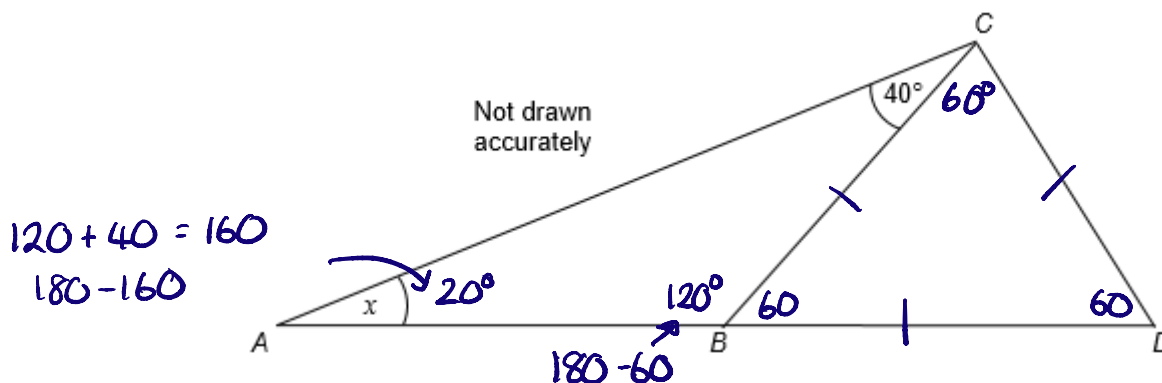.............55............° , ...40............ ° , ...70..................... °

[3]

When angle A = 120°, there is only one possible size of angle B.

(b) Explain why.

A cannot be the angle that is equal to another angle as angles in a triangle cannot be bigger than 180°

[1]

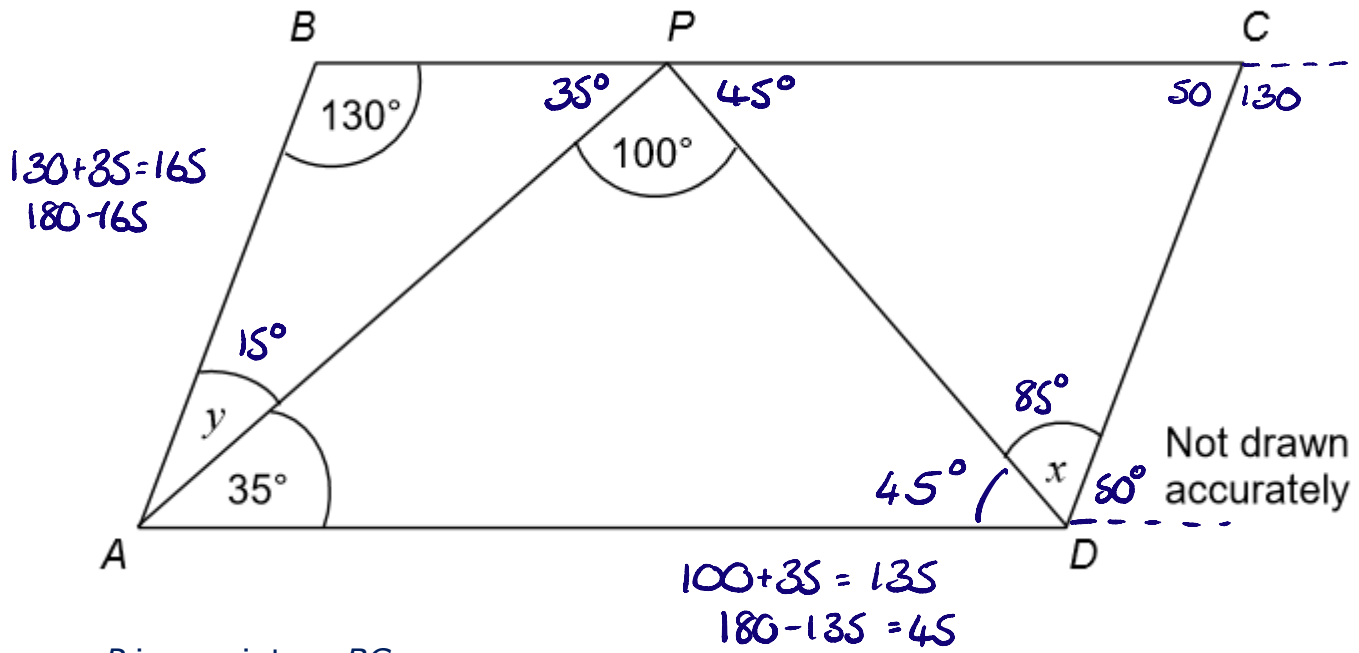18. The diagram shows a triangle ACD and an equilateral triangle BCD.

120 + 40 = 160

180 - 160

180 - 60

Work out the size of angle x.

$x = 20°$

[2]

19. The diagram shows a parallelogram *ABCD*.

B   P   C

130°   35°   45°   50 / 130

130+85=165
180-165

100°

15°

85°

y

35°   45° (x / 80°   Not drawn
                               accurately
A   D

100+35 = 135
180-135 =45

P is a point on *BC*.

a) Work out the size of angle x.

   You must show your working, which may be on the diagram.

   x = 85°   [3]

b) Work out the size of angle y.

   y = 15°   [1]

CREDITS AND NOTES

Q	Awarding Body	Q	Awarding Body	Q	Awarding Body
1	OCR	10	AQA	19	AQA
2	OCR	11	AQA		
3	OCR	12	WJEC Eduqas		
4	OCR	13	Pearson Edexcel		
5	OCR	14	Pearson Edexcel		
6	Pearson Edexcel	15	Pearson Edexcel		
7	Pearson Edexcel	16	Pearson Edexcel		
8	Pearson Edexcel	17	Pearson Edexcel		
9	AQA	18	AQA		

Notes:

These questions have been retyped from the original sample/specimen assessment materials and whilst every effort has been made to ensure there are no errors, any that do appear are mine and not the exam board s (similarly any errors I have corrected from the originals are also my corrections and not theirs!).

Please also note that the layout in terms of fonts, answer lines and space given to each question does not reflect the actual papers to save space.

These questions have been collated by me as the basis for a GCSE working party set up by the GLOW maths hub - if you want to get involved please get in touch. The objective is to provide support to fellow teachers and to give you a flavour of how different topics "could" be examined. They should not be used to form a decision as to which board to use. There is no guarantee that a topic will or won't appear in the "live" papers from a specific exam board or that examination of a topic will be as shown in these questions.

Links:

AQA http://www.aqa.org.uk/subjects/mathematics/gcse/mathematics-8300

OCR http://ocr.org.uk/gcsemaths

Pearson Edexcel http://qualifications.pearson.com/en/qualifications/edexcel-gcses/mathematics-2015.html

WJEC Eduqas http://www.eduqas.co.uk/qualifications/mathematics/gcse/

Contents:

This version contains questions from:

AQA – Sample Assessment Material, Practice set 1 and Practice set 2

OCR – Sample Assessment Material and Practice set 1

Pearson Edexcel – Sample Assessment Material, Specimen set 1 and Specimen set 2

WJEC Eduqas – Sample Assessment Material