Circle Theorems (H)

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

Name:	Mel @ JustMaths
Total Marks:	

1. (a) Calculate the size of the angle marked x.

   You must give a reason for your answer.

② $x = 180 - (120 + 25)$
   $= 35°$

angles in a triangle
add up to 180°

① angles in the same segment are equal
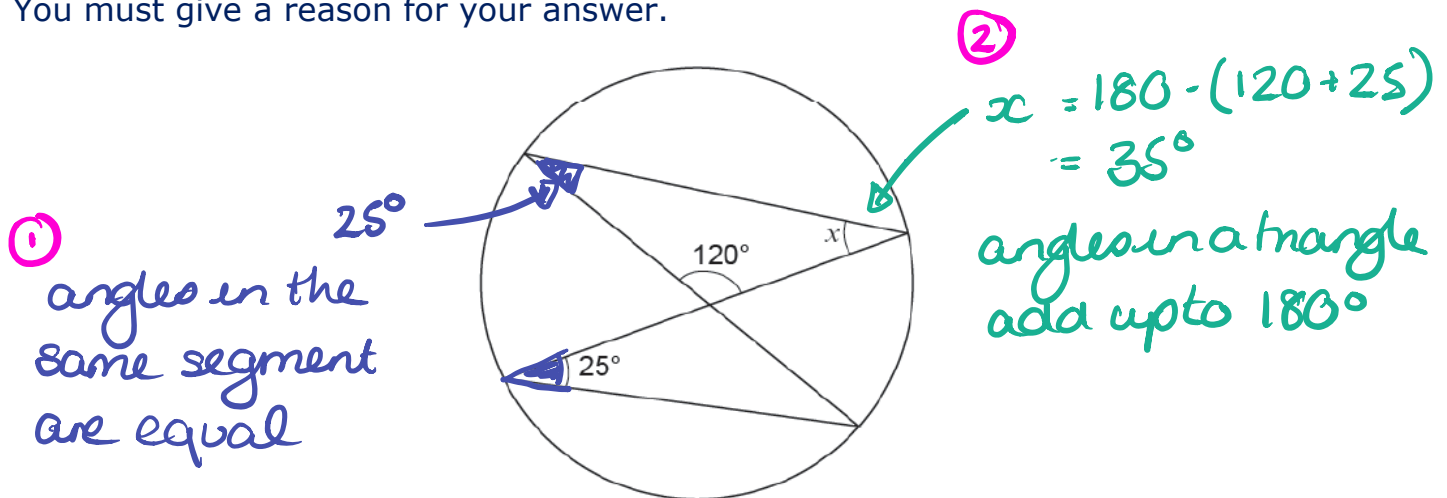
25°

120°

25°

x

Diagram not drawn to scale

[2]

(b) The diagram shows a circle with centre O.

   The tangent PT touches the circle at C.

   The reflex angle at the centre of the circle is 280°.

means > 180°

② BAC = $\frac{80}{2}$
   $= 40°$

angle subtended at the centre is twice the angle at the circumference.

280°

① BOC = 360 - 280
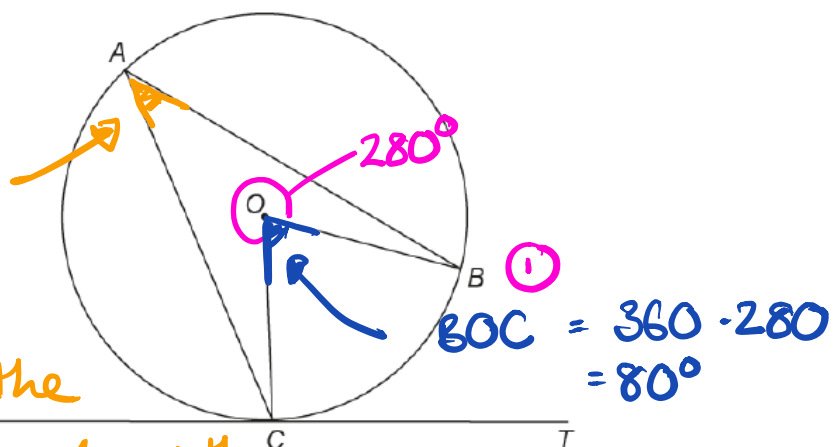 $= 80°$

A

O

B

P   C   T

Diagram not drawn to scale

Diagram not drawn to scale
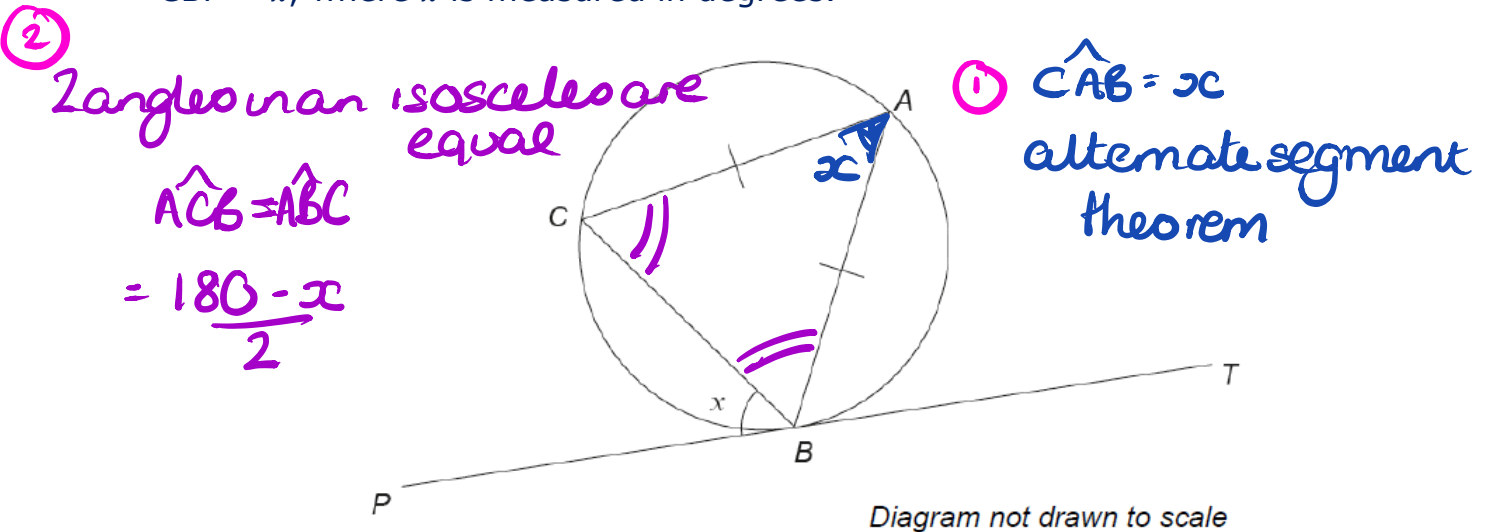
Find the size of $B\hat{A}C$.

You must give a reason for your answer.

[2]

(c) The points A, B and C lie on the circumference of a circle.

The straight line PBT is a tangent to the circle.

CBP = x, where x is measured in degrees.

② 2 angles in an isosceles are equal

$A\hat{C}B = A\hat{B}C$

$= \dfrac{180 - x}{2}$

① $C\hat{A}B = x$
alternate segment theorem

Diagram not drawn to scale

Show that the size of ABC in degrees is $90 - \dfrac{1}{2}x$
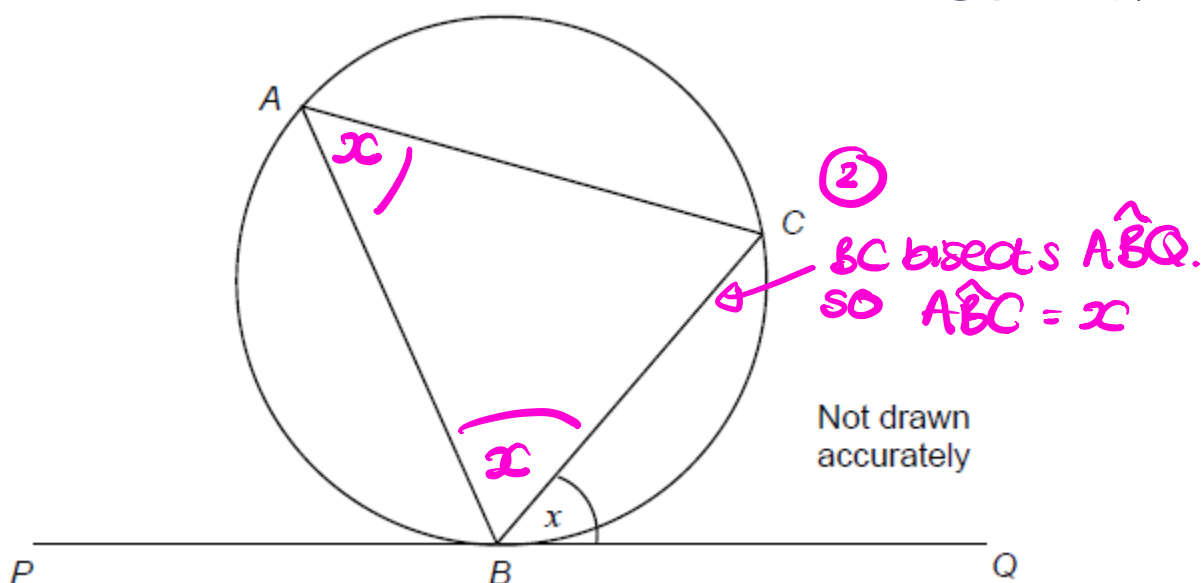
You must give reasons for each step of your answer.

$ABC = \dfrac{180 - x}{2} = 90 - \dfrac{1}{2}x$ as required

[2]

2. A, B and C are points on a circle.

- BC bisects angle ABQ.
- PBQ is a tangent to the circle.

① BÂC = x (alternate segment theorem)

A

x

C

②
BC bisects AB̂Q.
so AB̂C = x

Not drawn
accurately

x

x

P   B   Q

Angle $CBQ = x$

Prove that $AC = BC$

since CÂB = CB̂A then the △ ABC
must be isosceles so AC = BC

[3]

3. A, B, C and D are points on the circumference of a circle, centre O.

    AC is a diameter of the circle.

    Angle ABD = 58°.

    Angle CDB = 22°.

(b)③ 180 - (90 + 22)
= 68°

(b)①

△ ABC is in a
semi-circle so
AB̂C = 90

B

58°

C

(a)①
58° angles in the
same segment
are equal

O

22°

22°

D

A

(b)②
angles in the same segment are
equal
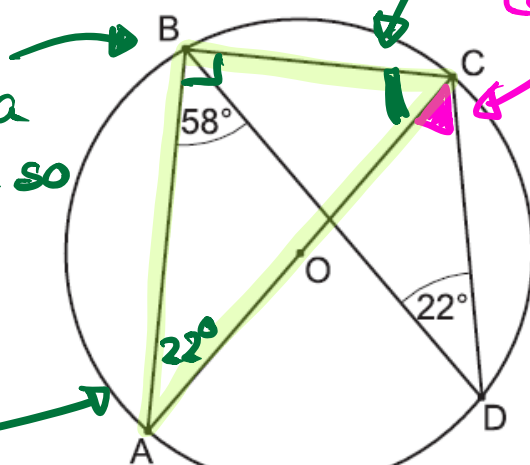
Not to scale

Work out the sizes of angle ACD and ACB, giving reasons for your answers.

(a)   Angle ACD = ...**58°**.........° [2]

(b) Angle ACB = ...**68°**...........° [3]

4.

④ 180 - 58
= 122
straight line
= 180°

③ 180 - (90+32)
= 58
△ = 180°

① SO = OT
∴ OŜT = x

② OTP = 90°
angles between
tangent & radius
= 90°

⑤
x = 180 - 122
——
2
= 29°

$x = \dfrac{180-122}{2} = 29°$

S

x

-58

O

x

32°

P

■

T

S and T are points on the circumference of a circle, centre O.

PT is a tangent to the circle.

SOP is a straight line.

Angle OPT = 32°

Work out the size of the angle marked x.

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

$x = 29°$

[4]

5. The diagram shows a circle, centre O.

Points P, Q, R and S lie on the circumference of the circle.

UST is a tangent to the circle.

Angle RPS = 44° and angle PSO = 32°.

opposite angles in a cyclic
quadrilateral = 180

180 - (32+46) =
180 - 78 = 102°

Q

P

44°

x°

272

O

88

y°

48°

R

32°

46°

44°

S

U

T

Not to scale

2 × 44 = 88

180 - 88 = 92
92 ÷ 2 = 46

y = 360 - (44+272+32)
= 12°

alternate segment theorem

a) Work out the value of x .

a) x = ...**102°**.......................... [4]

b) Work out the value of y .

b) y = ...**12°**.................... [3]

6.

② tangent . SQRO = PTO = 90°

① exterior angle of pentagon
$= \dfrac{540}{5} = 108$

③ ROT =
540 − (108+108
+90+90)
= 540 − 396
U = 144

⑥ RST = 360 − (216+18+18)
= 108

= 144 ÷ 2 = 72
angle at centre
is twice angle at
the circumference

R

18

Q 108

108

144 O 216 72

S

72

72 U = 144

360 − 144

18

108

18

P

108

T
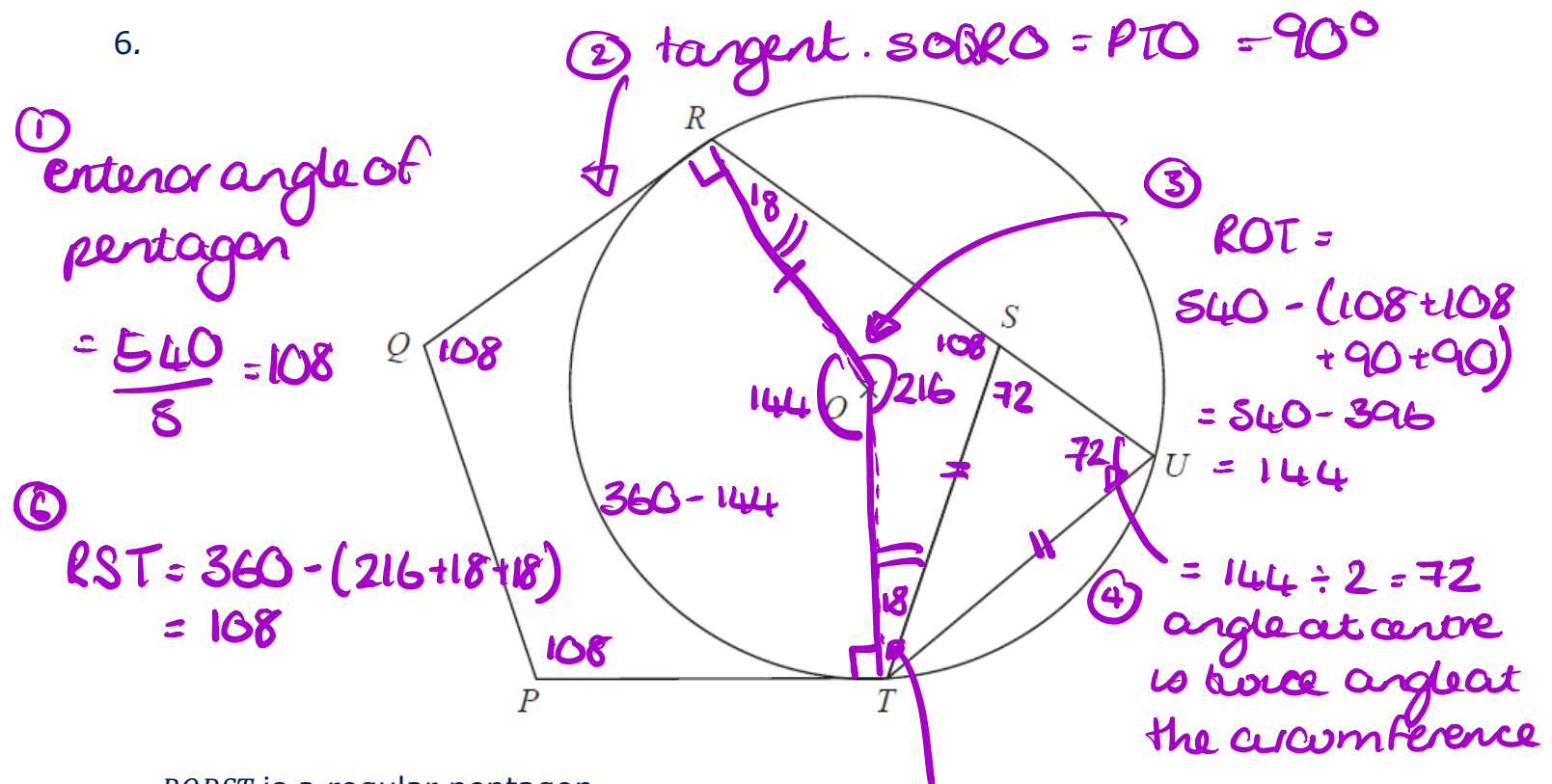
PQRST is a regular pentagon.

R, U and *T* are points on a circle, centre *O*.

QR and *PT* are tangents to the circle.

RSU is a straight line.

Prove that *ST = UT*.

⑤ = 108 − 90
= 18°

⑦ TSU = 180 − 108 = 72
∴ ST = UT (triangle STU is isosceles)

[5]

7. A, B and C are points on the circumference of a circle centre O.

LOOK.

$BAC = x + y$

A

x y

O

x

y

B

C
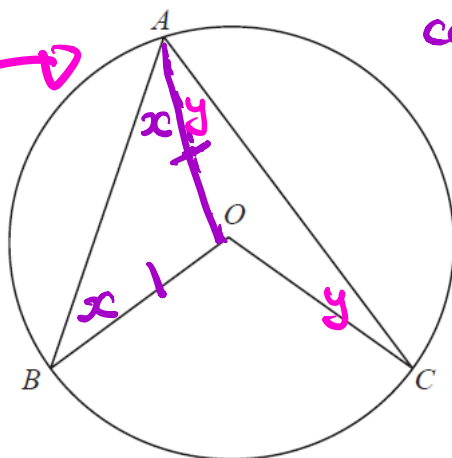
consider △'s AOB and AOC as shown

AO = BO = CO (radii)

forming two isosceles △'s.

let same angles in AOB = x AOC = y

Prove that angle BOC is twice the size of angle BAC.

AOB = 180 - 2x
AOC = 180 - 2y

BOC = 360 - (180 - 2x + 180 - 2y)
     = 360 - (360 - 2x - 2y)
     = 360 - 360 + 2x + 2y
     = 2x + 2y := 2(x + y)

∴ BOC = 2 × BAC

[4]

8. B, C and D are points on a circle.

Angle ABC = 92°

Angle ACB = 38°

Angle ACD = 50° ① 180 - (92 + 38)

Angle CDE = 32°

③ 88 - 50

B

92°

Not drawn accurately

A

50°

38°

88°

E

38°
50° C

98

32°

D
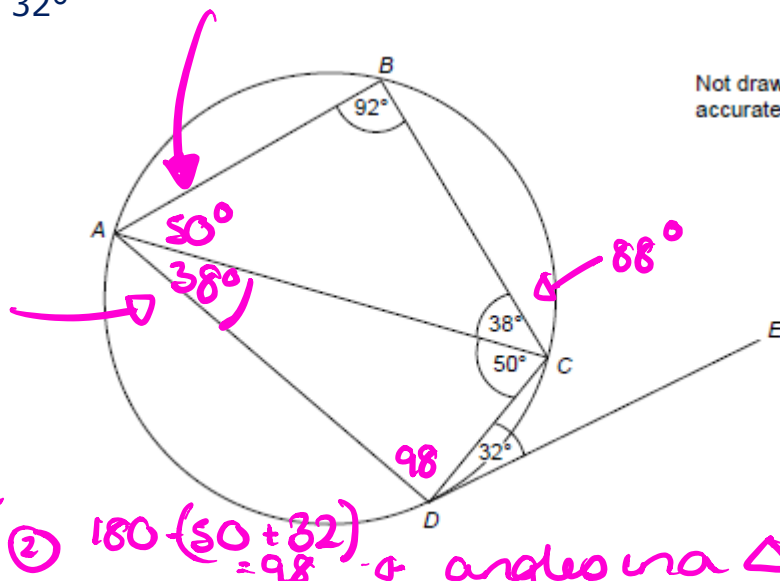
② 180 - (50 + 32) = 98 ← angles in a △ = 180

Tick whether each statement is true or false.

Give a reason for each answer.

Statement	True	False
AC is a diameter	☐	✓

Reason   *ADC or ABC are not 90°*

Statement	True	False
Angle ADC = 88°	✓	☐

Reason   *opposite angles in a cyclic quadrilateral add to 180°*

Statement	True	False
ABCD is a trapezium	✓	☐

Reason   *AB&CD are parallel*
ABC and ACD are alternate angles.

Statement	True	False
DE is a tangent to the circle	☐	✓

Reason   *CÂD ≠ CD̂E*

[4]

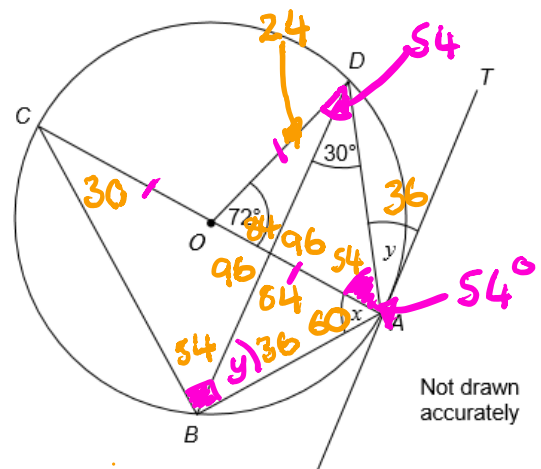9. A, B, C and D are points on a circle, centre O.

AC is a diameter of the circle.

AT is a tangent to the circle.

180 − 72 = 108

108 ÷ 2 = 54°

180 − (72 + 24) = 84

180 − (84 + 36)

= 60°

Not drawn accurately

Work out the size of angle *x* and the size of angle *y*.

$x = 60°$

$y = 36°$

[4]

CREDITS AND NOTES

Question	Awarding Body
1	WJEC Eduqas
2	AQA
3	OCR
4	Pearson Edexcel
5	OCR
6	Pearson Edexcel
7	Pearson Edexcel
8	AQA
9	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