Angles in Triangles & Straight Lines

Practice Worksheet (Foundation · Target Grade 5)

I Do

In triangle ABC, $AB = AC$.
BCD is a straight line.
Angle $BAC = 44°$.

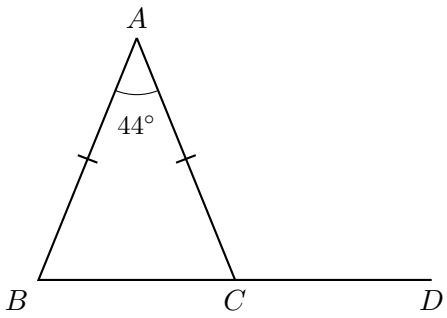


Diagram **NOT** accurately drawn

Work out the size of angle ACD.
Give a reason for each stage of your working.

.....°

(Total for Question is 3 marks)

We Do

In triangle ABC, $AB = AC$.
BCD is a straight line.
Angle $BAC = 52°$.

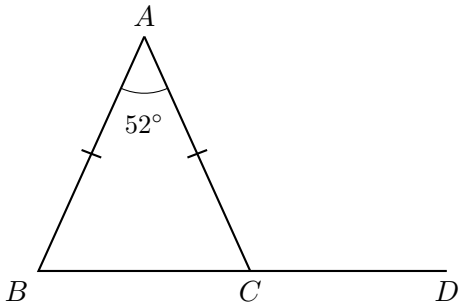


Diagram **NOT** accurately drawn

Work out the size of angle ACD.
Give a reason for each stage of your working.

.....°

(Total for Question is 3 marks)

You Do 1

In triangle ABC, $AB = AC$.
BCD is a straight line.
Angle $ACD = 118°$.

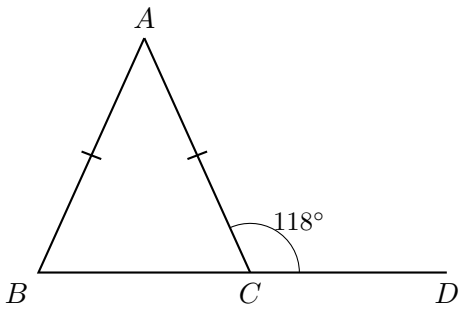


Diagram **NOT** accurately drawn

Work out the size of angle BAC.
Give a reason for each stage of your working.

.....°

(Total for Question is 3 marks)

You Do 2

In triangle PQR, $PQ = PR$.
PRS is a straight line.
Angle $QPR = 68°$.

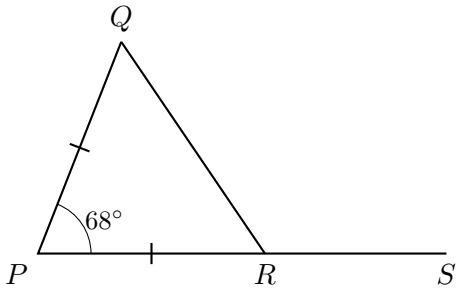


Diagram **NOT** accurately drawn

Work out the size of angle QRS.
Give a reason for each stage of your working.

.....°

(Total for Question is 3 marks)

You Do 3

In triangle ABC, $AB = BC$.
ACD is a straight line.
Angle $BCD = 115°$.

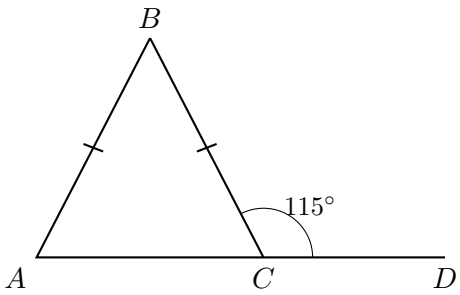


Diagram **NOT** accurately drawn

Work out the size of angle ABC.
Give a reason for each stage of your working.

.....°

(Total for Question is 3 marks)

Challenge 1

BCD is a straight line.
$AB = AC = CD$.
Angle $BAC = 36°$.

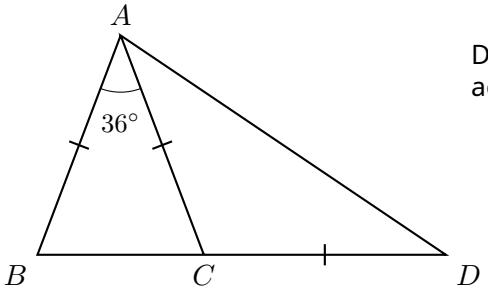


Diagram **NOT** accurately drawn

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

.....°

(Total for Question is 4 marks)

Challenge 2

In triangle ABC, $AB = AC$.
BCD is a straight line.
Angle $BAC = (2x - 10)°$ and angle $ACD = (4x + 10)°$.

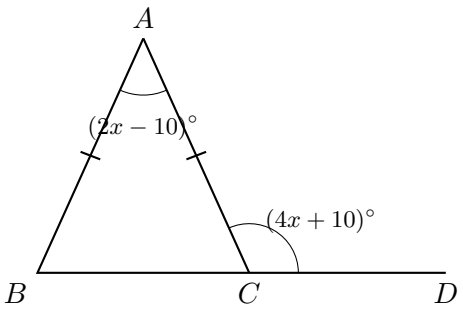


Diagram **NOT** accurately drawn

Work out the value of x, and hence find the size of angle ABC.
You must show all of your algebraic working clearly.

$x =$ ..... Angle $ABC =$ .....°

(Total for Question is 4 marks)

Extreme Challenge

In triangle ABC, D is a point on AC such that $AB = BD = DC$.
BCE is a straight line.
Angle $DCE = 148°$.

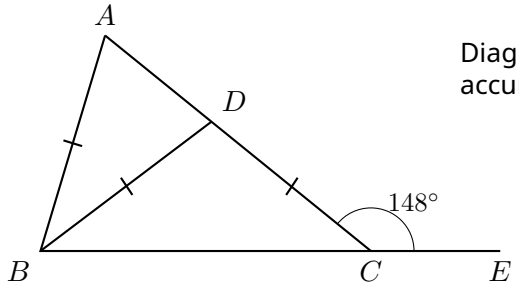


Diagram **NOT** accurately drawn

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

.....°

(Total for Question is 5 marks)

Worked Answers

I Do

1. Since $AB = AC$, triangle ABC is isosceles *(base angles of an isosceles triangle are equal, and angles in a triangle add up to* $180°$*)*:
$\angle ACB = (180° - 44°) \div 2 = 136° \div 2 = 68°$.
2. BCD is a straight line *(angles on a straight line add up to* $180°$*)*:
$\angle ACD = 180° - 68° =$ **112**°.

We Do

1. $\angle ACB = (180° - 52°) \div 2 = 128° \div 2 = 64°$ *(base angles of an isosceles triangle are equal; angles in a triangle sum to* $180°$*).*
2. $\angle ACD = 180° - 64° =$ **116**° *(angles on a straight line add up to* $180°$*).*

You Do 1

1. $\angle ACB = 180° - 118° = 62°$ *(angles on a straight line add up to* $180°$*).*
2. Since $AB = AC$, $\angle ABC = \angle ACB = 62°$ *(base angles of an isosceles triangle are equal).*
3. $\angle BAC = 180° - 62° - 62° =$ **56**° *(angles in a triangle add up to* $180°$*).*

You Do 2

1. Since $PQ = PR$, $\angle PQR = \angle PRQ$ *(base angles of an isosceles triangle are equal)*:
$\angle PRQ = (180° - 68°) \div 2 = 112° \div 2 = 56°$ *(angles in a triangle add up to* $180°$*).*
2. PRS is a straight line:
$\angle QRS = 180° - 56° =$ **124**° *(angles on a straight line add up to* $180°$*).*

You Do 3

1. $\angle BCA = 180° - 115° = 65°$ *(angles on a straight line add up to* $180°$*).*
2. Since $AB = BC$, $\angle BAC = \angle BCA = 65°$ *(base angles of an isosceles triangle are equal).*
3. $\angle ABC = 180° - 65° - 65° =$ **50**° *(angles in a triangle add up to* $180°$*).*

Challenge 1

1. In isosceles triangle ABC ($AB = AC$):
$\angle ACB = (180° - 36°) \div 2 = 144° \div 2 = 72°$ *(base angles of an isosceles triangle are equal; angles in a triangle sum to* $180°$*).*
2. Since BCD is a straight line:
$\angle ACD = 180° - 72° = 108°$ *(angles on a straight line add up to* $180°$*).*
3. In isosceles triangle ACD ($AC = CD$):
$\angle ADC = (180° - 108°) \div 2 = 72° \div 2 =$ **36**° *(base angles of an isosceles triangle are equal; angles in a triangle sum to* $180°$*).*

Challenge 2

1. Angles on a straight line BCD add up to $180°$:
$\angle ACB = 180° - (4x + 10)° = (170 - 4x)°$.
2. Since $AB = AC$, $\angle ABC = \angle ACB = (170 - 4x)°$.
3. Angles in triangle ABC add up to $180°$:
$(2x - 10) + (170 - 4x) + (170 - 4x) = 180$
$330 - 6x = 180$
$6x = 150 \implies$ **x** $= 25$.
4. Substitute $x = 25$ into $\angle ABC = (170 - 4x)°$:
$\angle ABC = 170 - 4(25) = 170 - 100 =$ **70**°.

Extreme Challenge

1. Since BCE is a straight line:
$\angle DCB = 180° - 148° = 32°$ *(angles on a straight line add up to* $180°$*).*
2. In triangle BCD, $BD = DC$, so it is isosceles:
$\angle DBC = \angle DCB = 32°$ *(base angles of an isosceles triangle are equal).*
3. Angles in triangle BCD sum to $180°$:
$\angle BDC = 180° - 32° - 32° = 116°$.
4. Since ADC is a straight line:
$\angle BDA = 180° - 116° = 64°$ *(angles on a straight line add up to* $180°$*).*
(Alternatively, exterior angle $\angle BDA = 32° + 32° = 64°$*.)*
5. In triangle ABD, $AB = BD$, so it is isosceles:
$\angle BAD = \angle BDA = 64°$ *(base angles of an isosceles triangle are equal).*
6. Angles in triangle ABD sum to $180°$:
$\angle ABD = 180° - 64° - 64° = 52°$.
7. Combine $\angle ABD$ and $\angle DBC$:
$\angle ABC = 52° + 32° =$ **84**°.