



- 1 In triangle ABC , angle $A = 48^\circ$ and angle $B = 71^\circ$.

Work out the size of angle C .

(1 mark)

Angles in a triangle add to 180°

$$48 + 71 = 119$$

$$C = 180 - 119$$

$$C = 61^\circ$$

- 2 Three of the angles in a quadrilateral are 85° , 110° and 72° .

Work out the size of the fourth angle.

(2 marks)

Angles in a quadrilateral add to 360°

$$85 + 110 + 72 = 267$$

$$360 - 267 = 93$$

$$\text{Fourth angle} = 93^\circ$$

- 3 Ella says, "I can draw a triangle with angles of 65° , 58° and 67° ."

Is Ella correct? You must show your working.

(2 marks)

Angles in a triangle must add to 180°

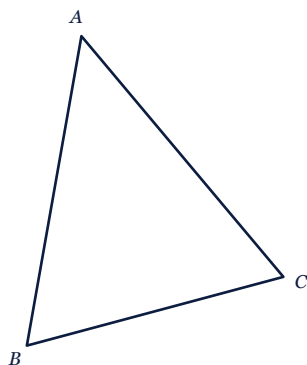
$$65 + 58 + 67 = 190$$

$$190 \neq 180$$

Ella is wrong

- 4 The diagram shows triangle ABC .

- Use a protractor to measure angle ABC .
- Use a protractor to measure angle ACB .
- Write down the special name for this type of triangle. Give a reason for your answer.



(3 marks)

a) Protractor centre on B, zero line along BC

$$\text{angle } ABC = 65^\circ$$

b) Protractor centre on C, zero line along CB

$$\text{angle } ACB = 65^\circ$$

c) Two angles are equal

$$\text{Angle } A = 180 - 65 - 65 = 50^\circ$$

Isosceles (angles B and C equal)

- 5 In triangle ABC , angle $A = 54^\circ$ and angle $B = 67^\circ$.

The side BC is extended to the point D , so that BCD is a straight line.

- a. Work out the size of angle ACB .
b. Work out the size of angle ACD . Give a reason for your answer.

(3 marks)

a)

Angles in a triangle add to 180°

$$54 + 67 = 121$$

$$ACB = 180 - 121 = 59$$

$$ACB = 59^\circ$$

b)

Angles on a straight line add to 180°

$$ACD = 180 - 59$$

$$ACD = 121^\circ$$

- 6 D is a point on the side BC of triangle ABC , so BDC is a straight line.

Angle $ADB = 112^\circ$ and angle $ACB = 35^\circ$.

- a. Work out the size of angle ADC . Give a reason for your answer.
b. Work out the size of angle DAC . Give a reason for your answer.

(4 marks)

a)

Angles on a straight line add to 180°

$$ADC = 180 - 112$$

$$ADC = 68^\circ$$

b)

Angles in a triangle add to 180°

$$68 + 35 = 103$$

$$DAC = 180 - 103$$

$$DAC = 77^\circ$$

- 7 $ABCD$ is a quadrilateral. The diagonal AC splits it into two triangles, ABC and ACD .

In triangle ABC , angle $BAC = 40^\circ$ and angle $ABC = 75^\circ$.

In triangle ACD , angle $CAD = 52^\circ$ and angle $ADC = 84^\circ$.

- a. Work out the size of angle ACB .
b. Work out the size of angle ACD .
c. Work out the size of angle BCD .

(4 marks)

a)

Angles in a triangle add to 180°

$$40 + 75 = 115$$

$$ACB = 180 - 115 = 65$$

b)

$$52 + 84 = 136$$

$$ACD = 180 - 136 = 44$$

c)

Angle BCD is made of ACB and ACD

$$BCD = 65 + 44$$

$$BCD = 109^\circ$$

8 $PQRS$ is a quadrilateral.

Angle $P = 102^\circ$, angle $Q = 64^\circ$ and angle $R = 98^\circ$.

The side PS is extended to the point T , so that PST is a straight line.

a. Work out the size of angle PSR . Give a reason for your answer.

b. Work out the size of angle RST . Give a reason for your answer.

(4 marks)

a)

Angles in a quadrilateral add to 360°

$$102 + 64 + 98 = 264$$

$$PSR = 360 - 264$$

$$PSR = 96^\circ$$

b)

Angles on a straight line add to 180°

$$RST = 180 - 96$$

$$RST = 84^\circ$$

9 In triangle ABC ,

angle $A = 2x^\circ$, angle $B = (3x + 10)^\circ$ and angle $C = (90 - x)^\circ$.

Work out the size of the largest angle in the triangle.

(3 marks)

Angles in a triangle add up to 180°

$$2x + 3x + 10 + 90 - x = 180$$

$$4x + 100 = 180, \text{ so } 4x = 80 \text{ and } x = 20$$

$$\text{Angle } A = 40^\circ, \text{ angle } B = 3 \times 20 + 10 = 70^\circ, \text{ angle } C = 90 - 20 = 70^\circ$$

The largest angle is 70°

$$70^\circ$$

10 $PQRS$ is a parallelogram.

Angle $P = (3x + 15)^\circ$ and angle $Q = (2x - 10)^\circ$. Angles P and Q are next to each other on the same side of the parallelogram.

Work out the value of x . Give a reason for each stage of your working.

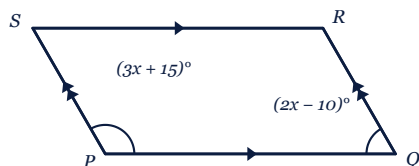


Diagram NOT accurately drawn

(3 marks)

Adjacent angles in a parallelogram add up to 180° (co-interior angles between parallel sides)

$$3x + 15 + 2x - 10 = 180$$

$$5x + 5 = 180, \text{ so } 5x = 175 \text{ and } x = 35$$

Check

$$\text{angle } P = 120^\circ \text{ and angle } Q = 60^\circ, \text{ and } 120 + 60 = 180$$

$$x = 35$$

- 11 The four angles of a quadrilateral are 74° , 101° , $2t^\circ$ and $(t + 5)^\circ$.

Work out the size of the largest angle of the quadrilateral.

(3 marks)

Angles in a quadrilateral add up to 360°

$$74 + 101 + 2t + t + 5 = 360$$

$$3t + 180 = 360, \text{ so } 3t = 180 \text{ and } t = 60$$

The four angles are 74° , 101° , 120° and 65°

Check

$$74 + 101 + 120 + 65 = 360. \text{ The largest angle is } 120^\circ$$

$$\boxed{120^\circ}$$

- 12 $ABCD$ is a square.

Triangle CDE is an equilateral triangle drawn on the side CD , outside the square.

a. Work out the size of angle ADE .

b. $DA = DE$, so triangle ADE is isosceles. Work out the size of angle DAE .

(4 marks)

a.)

Angle of square = 90°

Angle of equilateral triangle = 60°

$$ADE = 90 + 60$$

$$\boxed{ADE = 150^\circ}$$

b.)

Isosceles, so the two base angles are equal

$$180 - 150 = 30$$

$$DAE = 30 \div 2$$

$$\boxed{DAE = 15^\circ}$$

- 13 ABC is a straight line. The point D lies above the line.

Triangle BCD is isosceles with $BD = CD$.

Angle $DBA = 134^\circ$.

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

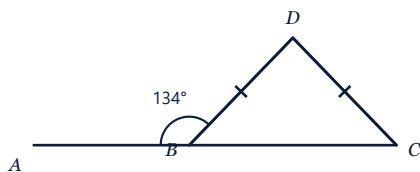


Diagram NOT accurately drawn

(4 marks)

Angle $DBC = 180 - 134 = 46^\circ$ (angles on a straight line add up to 180°)

Angle $DCB = \text{angle } DBC = 46^\circ$ (base angles of an isosceles triangle are equal, since $BD = CD$)

Angle $BDC = 180 - 46 - 46 = 88^\circ$ (angles in a triangle add up to 180°)

$$\boxed{88^\circ}$$

- 14 The angles of a triangle are in the ratio $2 : 3 : 7$.

Show that the triangle contains an obtuse angle.

(4 marks)

The ratio has $2 + 3 + 7 = 12$ parts

Angles in a triangle add up to 180° , so one part = $180 \div 12 = 15^\circ$

The angles are $2 \times 15 = 30^\circ$, $3 \times 15 = 45^\circ$ and $7 \times 15 = 105^\circ$

105° is greater than 90° and less than 180° , so it is an obtuse angle

- 15 $ABCD$ is a quadrilateral with $AB = AD$ and $CB = CD$. So $ABCD$ is a kite.

Angle $BAD = 76^\circ$ and angle $BCD = 118^\circ$.

Work out the size of angle ABC . Give reasons for your answer.

(4 marks)

A kite has one pair of equal angles: B and D

Angles in a quadrilateral add to 360°

$$76 + 118 = 194$$

$$360 - 194 = 166$$

B and D share the 166° equally

$$ABC = 166 \div 2$$

$$ABC = 83^\circ$$

- 16 PQR is a triangle. The side PQ is extended to the point S .

Angle $RQS = 112^\circ$ and angle $QPR = 44^\circ$.

Show that triangle PQR is isosceles. Give a reason for each stage of your working.

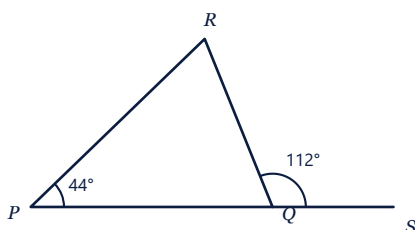


Diagram NOT accurately drawn

(4 marks)

Angle $PQR = 180 - 112 = 68^\circ$ (angles on a straight line add up to 180°)

Angle $PRQ = 180 - 44 - 68 = 68^\circ$ (angles in a triangle add up to 180°)

Angle $PQR = \text{angle } PRQ = 68^\circ$, so triangle PQR has two equal angles

A triangle with two equal angles is isosceles, so triangle PQR is isosceles

- 17 Triangle ABC is isosceles with $AB = AC$.

angle A : angle $B = 2 : 5$

Work out the size of angle A .

(4 marks)

Since $AB = AC$, the base angles are equal: angle $B = \text{angle } C$ (base angles of an isosceles triangle)

Let angle $A = 2k$ and angle $B = 5k$, so angle $C = 5k$ as well

Angles in a triangle add up to 180°

$$2k + 5k + 5k = 180, \text{ so } 12k = 180 \text{ and } k = 15$$

$$\text{Angle } A = 2 \times 15 = 30^\circ. \text{ Check: } 30 + 75 + 75 = 180$$

$$30^\circ$$

- 18 Triangle ABC is isosceles with $AB = AC$. Angle $BAC = 48^\circ$.

D is a point on AC such that $BD = BC$.

Work out the size of angle ABD . Give a reason for each step of your working.

(5 marks)

Triangle ABC is isosceles ($AB = AC$)

$$180 - 48 = 132$$

$$ABC = ACB = 132 \div 2 = 66$$

Triangle BCD is isosceles ($BD = BC$)

$$BDC = BCD = 66$$

$$DBC = 180 - 66 - 66 = 48$$

ABD is the part of ABC left over

$$ABD = 66 - 48$$

$$ABD = 18^\circ$$

19

One angle of an isosceles triangle is 40° .

Work out the possible sizes of the other two angles of the triangle.

You must show that you have considered every possible case.

(5 marks)

Case 1

40° is the angle between the two equal sides. The other two angles are equal, so each is $(180 - 40) \div 2 = 70^\circ$.

Case 2

40° is one of the two equal base angles. The other base angle is also 40° , and the third angle is $180 - 40 - 40 = 100^\circ$.

So the other two angles are either 70° and 70° , or 40° and 100° .