

Angle Facts

Solutions

For Pearson Edexcel GCSE Mathematics (1MA1) • Foundation tier

Each question is shown in grey, followed by the working, one step per line. The final answer is in a box. *Marks* shows how the marks are usually given in the exam, and **Tip** points out a common mistake.

1 (1 mark)

Here is an angle.

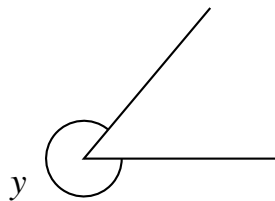


Diagram **NOT** accurately drawn

What type of angle is angle y ?

Choose from acute, right angle, obtuse and reflex.

Angle y is more than 180° (more than a straight line).

An angle between 180° and 360° is called reflex.

Answer: Reflex

Tip: Many students write “obtuse”. Obtuse angles are between 90° and 180° . Anything bigger than 180° is reflex.

2 (2 marks)

Here is a triangle.

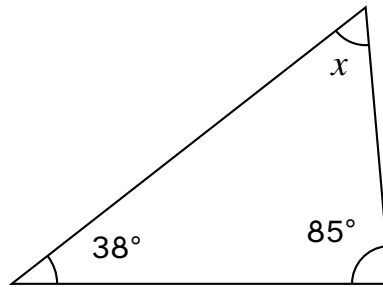


Diagram **NOT** accurately drawn

- (a) Work out the size of the angle marked x .

Angles in a triangle add up to 180° .

$$38 + 85 = 123$$

$$x = 180 - 123 = 57^\circ$$

Answer: 57°

- (b) Give a reason for your answer.

Write the angle fact you used, in words.

Answer: Angles in a triangle add up to 180°

Tip: Give the fact, not the sum. “I did $180 - 38 - 85$ ” is not a reason. Include the word “angles”: “angles in a triangle add up to 180° ”.

3 (3 marks)

The diagram shows three angles on a straight line.

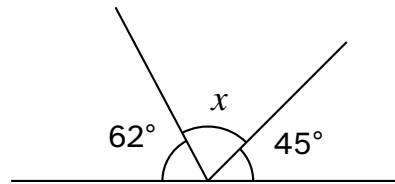


Diagram **NOT** accurately drawn

- (a) Work out the size of the angle marked x .

The three angles lie on a straight line.

Angles on a straight line add up to 180° .

$$45 + 62 = 107$$

$$x = 180 - 107 = 73^\circ$$

Answer: 73°

Marks: 1 mark for $180 - 45 - 62$. 1 mark for 73.

- (b) Give a reason for your answer.

Write the angle fact you used, in words.

Answer: Angles on a straight line add up to 180°

Tip: "A straight line is 180° " loses the mark. Say "**angles** on a straight line add up to 180° ".

4 (3 marks)

Three angles meet at a point.

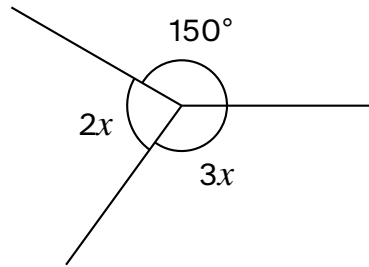


Diagram **NOT** accurately drawn

Work out the value of x .

Angles around a point add up to 360° .

$$2x + 3x + 150 = 360$$

Collect the x terms: $5x + 150 = 360$

Subtract 150 from both sides: $5x = 210$

Divide both sides by 5: $x = 42$

Check: $2 \times 42 + 3 \times 42 + 150 = 84 + 126 + 150 = 360$ ✓

Answer: $x = 42$

Tip: Angles around a point add up to 360° , not 180° .

Marks: 1 mark for $2x + 3x + 150 = 360$. 1 mark for $5x = 210$. 1 mark for $x = 42$.

5 (4 marks)

PR and QS are straight lines that cross at T .

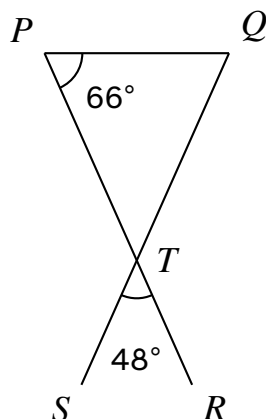


Diagram **NOT** accurately drawn

Show that triangle PQT is isosceles.

Give a reason for each stage of your working.

Angle PTQ and angle RTS are vertically opposite.

Angle $PTQ = 48^\circ$

Reason: vertically opposite angles are equal.

Angle $PQT = 180 - 66 - 48 = 66^\circ$

Reason: angles in a triangle add up to 180° .

So angle QPT and angle PQT are both 66° .

Two angles are equal, so triangle PQT is isosceles.

Answer: Angles P and Q are both 66°

Tip: Finish with a sentence that says which two angles are equal. The final mark is for that conclusion.

Marks: 1 mark for angle $PTQ = 48^\circ$. 1 mark for angle $PQT = 66^\circ$. 1 mark for the conclusion (two equal angles, so isosceles). 1 mark for both reasons.

6 (4 marks)

$ABCD$ is a quadrilateral.

$AB = AD$

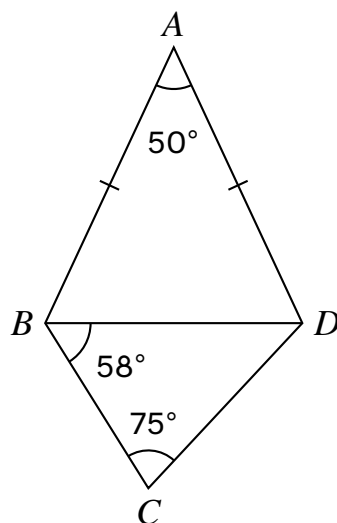


Diagram **NOT** accurately drawn

Work out the size of angle ADC .

Give a reason for each stage of your working.

$AB = AD$, so triangle ABD is isosceles.

Angle $ABD =$ angle ADB

Reason: base angles of an isosceles triangle are equal.

Angle $ADB = (180 - 50) \div 2 = 65^\circ$

Reason: angles in a triangle add up to 180° .

In triangle BCD : angle $BDC = 180 - 58 - 75 = 47^\circ$

Reason: angles in a triangle add up to 180° .

Angle $ADC =$ angle $ADB +$ angle $BDC = 65 + 47 = 112^\circ$

Answer: 112°

Tip: Angle ADC is made of two parts, one in each triangle. Find both parts and add them.

Marks: 1 mark for 65. 1 mark for 47. 1 mark for 112. 1 mark for all the reasons.

7 (3 marks)

Two straight lines cross.

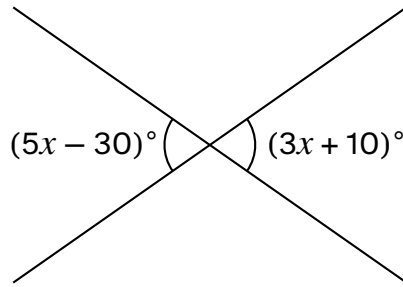


Diagram **NOT** accurately drawn

Work out the value of x .

The two angles are vertically opposite, where the lines cross.

Vertically opposite angles are equal.

$$5x - 30 = 3x + 10$$

Subtract $3x$ from both sides: $2x - 30 = 10$

Add 30 to both sides: $2x = 40$

Divide by 2: $x = 20$

Check: $5 \times 20 - 30 = 70$ and $3 \times 20 + 10 = 70$ ✓

Answer: $x = 20$

Marks: 1 mark for $5x - 30 = 3x + 10$. 1 mark for a correct step towards solving it, e.g. $2x = 40$. 1 mark for $x = 20$.

8 (2 marks)

The sizes of the angles in a triangle are in the ratio 2 : 3 : 4

Work out the size of the largest angle.

Angles in a triangle add up to 180° .

Total parts: $2 + 3 + 4 = 9$

One part: $180 \div 9 = 20^\circ$

Largest angle: $4 \times 20 = 80^\circ$

Answer: 80°

Tip: Divide by the total number of parts (9), not by 3.

Marks: 1 mark for $180 \div 9$ or 20. 1 mark for 80.

9 (3 marks)

Here is an isosceles triangle.

$AB = BC$

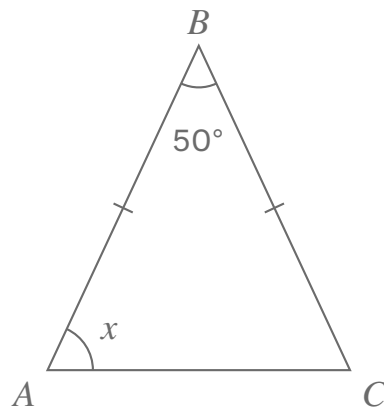


Diagram **NOT** accurately drawn

Oskar works out the size of angle x .

He writes

$$x = 180 - 50 \div 2 = 155^\circ$$

- (a) Explain the mistake Oskar has made.

Oskar has worked out $50 \div 2$ first, because division comes before subtraction.

But the base angles share what is left **after** taking 50 from 180.

He should work out $180 - 50$ first, then divide by 2: $(180 - 50) \div 2$

Answer: He divided 50 by 2 first. He should subtract first: $(180 - 50) \div 2$

- (b) Work out the size of angle x .

Angles in a triangle add up to 180° .

The two base angles add up to $180 - 50 = 130^\circ$

Base angles of an isosceles triangle are equal.

$$x = 130 \div 2 = 65^\circ$$

Answer: 65°

Tip: Check your answer: $65 + 65 + 50 = 180$. Oskar's answer fails this check, because $155 + 155 + 50$ is much more than 180.

Marks: 1 mark for $180 - 50$ or 130. 1 mark for 65.

10 (4 marks)

In triangle PQR

angle Q is 20° more than angle P

angle R is twice the size of angle Q .

Work out the size of each angle in triangle PQR .

Let angle P be p .

Angle Q is $p + 20$.

Angle R is $2(p + 20) = 2p + 40$.

Angles in a triangle add up to 180° .

$$p + (p + 20) + (2p + 40) = 180$$

$$4p + 60 = 180$$

$$4p = 120$$

$$p = 30$$

$$\text{Angle } Q = 30 + 20 = 50^\circ$$

$$\text{Angle } R = 2 \times 50 = 100^\circ$$

Check: $30 + 50 + 100 = 180$ ✓

Answer: $P = 30^\circ$, $Q = 50^\circ$, $R = 100^\circ$

Tip: Angle R is twice angle Q , so it is $2(p + 20)$, not $2p + 20$.

Marks: 1 mark for writing the angles using one letter, e.g. p , $p + 20$, $2(p + 20)$. 1 mark for $4p + 60 = 180$. 1 mark for $p = 30$. 1 mark for all three angles.
