I.G.C.S.E. Geometry 01

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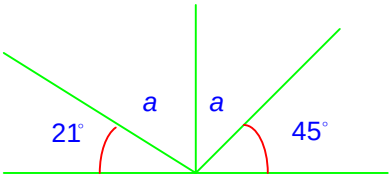
You can access the solutions from the end of each question

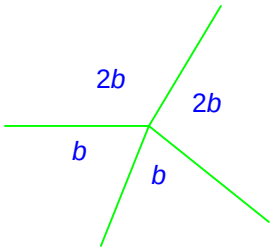
Question 1

Find the angles marked with letters, showing clearly your working out and giving reasons.

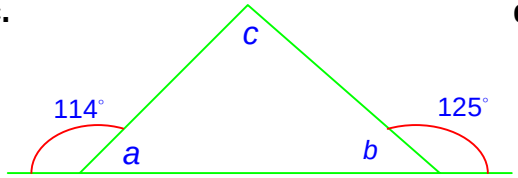
a.



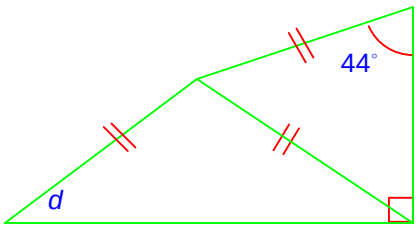
b.



c.



d.



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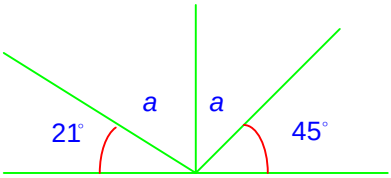
Solution to question 1

a.



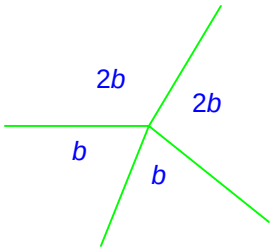
Angles on the straight line are supplementary.

$$2a + 21^\circ + 45^\circ = 180^\circ$$

$$2a = 114^\circ$$

$$a = 57^\circ$$

b.



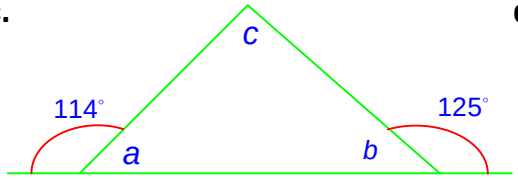
Angles at a point add up to 360°

$$2b + b + b + 2b = 360^\circ$$

$$6b = 360^\circ$$

$$b = 60^\circ$$

c.



$$a = 180^\circ - 114^\circ$$

$$= 66^\circ$$

$$b = 180^\circ - 125^\circ$$

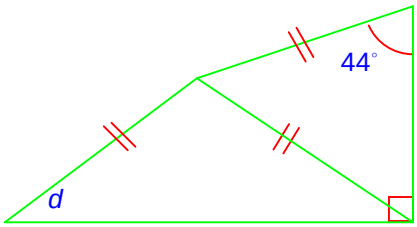
$$= 55^\circ$$

Angle sum of a triangle is 180°

$$c = 180^\circ - 66^\circ - 55^\circ$$

$$= 59^\circ$$

d.



Remembering the properties of an isosceles triangle

$$d = 90^\circ - 44^\circ$$

$$= 46^\circ$$

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Question 2

In the quadrilateral ABCD, $\hat{A} = 107^\circ$, $\hat{B} = 73^\circ$, $\hat{C} = 46^\circ$ and $A\hat{B}D = 24^\circ$. Calculate $A\hat{D}B$ and $B\hat{D}C$.

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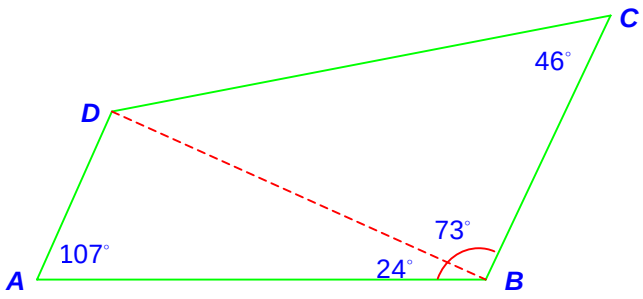
Solution to question 2

Drawing a rough diagram and putting in the following information $\hat{A} = 107^\circ$, $\hat{B} = 73^\circ$, $\hat{C} = 46^\circ$ and $A\hat{B}D = 24^\circ$.



Angle sum of a triangle is 180°.

$$A\hat{D}B = 180^\circ - 107^\circ - 24^\circ$$
$$= 49^\circ$$

$$B\hat{D}C = 180^\circ - 46^\circ - (73^\circ - 24^\circ)$$
$$= 85^\circ$$

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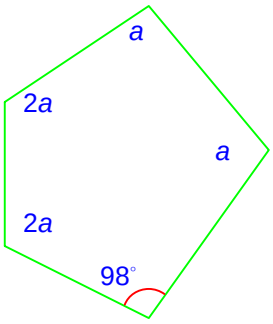
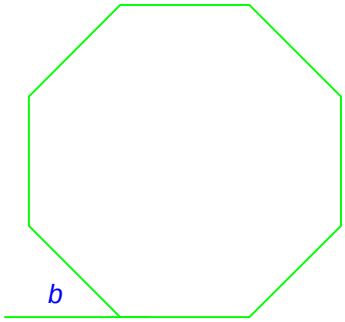
Question 3

For the following polygons find the total angle sum and the missing angles.

a.



b. The polygon is regular.



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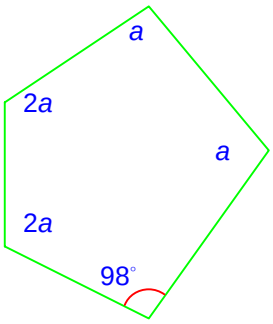
Solution to question 3

a.



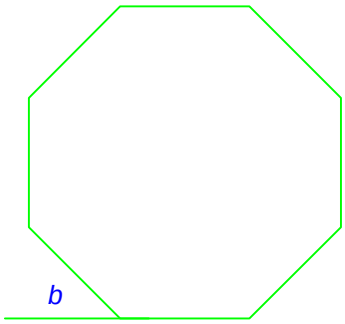
Interior angle sum of any polygon
With n sides is given by:

$$(n-2)\times 180^\circ$$

$$(5-2)\times 180^\circ = 540^\circ$$

$$98^\circ + 6a = 540^\circ$$
$$6a = 442^\circ$$
$$a = 73\tfrac{2}{3}^\circ$$

b. The polygon is regular.



$$(8-2)\times 180^\circ = 1080^\circ$$

Exterior angle sum of any polygon is 360°

$$b = \frac{360^\circ}{8} = 45^\circ$$

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Question 4

Calculate the number of sides of a regular polygon whose interior angles are each 168°.

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Solution to question 4

The exterior angle of the polygon is given by

$$e = 180^\circ - 168^\circ \text{ (angles on a straight line).}$$
$$= 12^\circ$$

The sum of the exterior angles of any polygon is 360°

$$\text{Number of sides} = \frac{360^\circ}{12^\circ} = 30 \text{ sides}$$

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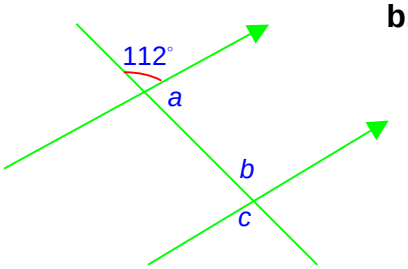
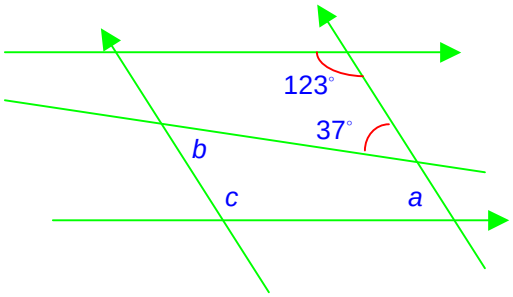
Question 5

Find the angles marked with letters, showing clearly all your working out and giving reasons.

a.



b.



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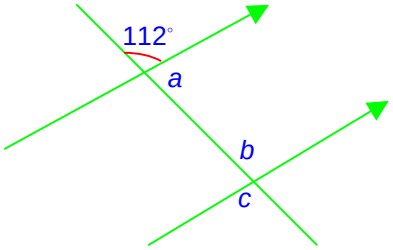
Solution to question 5

a.



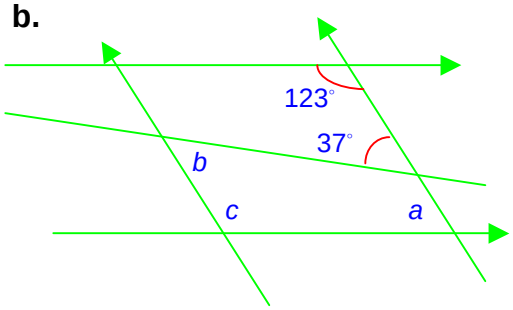
$a = 180^\circ - 168^\circ$

$= 12^\circ$

$b = 112^\circ$ (corresponding angles)

$c = 112^\circ$ (vertically opposite angles)

b.



$123^\circ + a = 180^\circ$ (allied angles)

$a = 57^\circ$

$b = 37^\circ$ (alternate angles)

$c = 123^\circ$ (vertically opposite angles)

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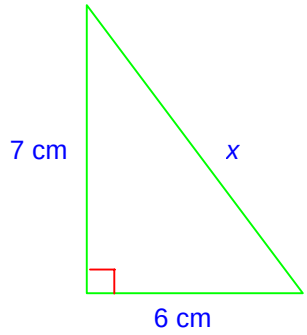
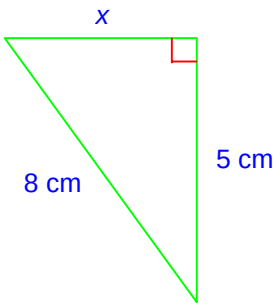
Question 6

Find the value of x in the following

a.



b.



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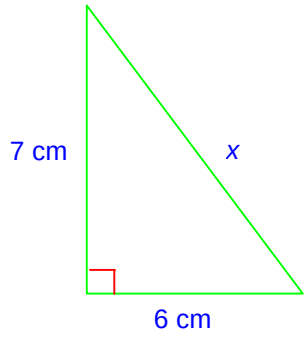
Solution to question 6

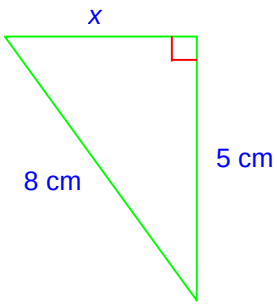
a.



Using Pythagoras' theorem

$$x^2 = 6^2 + 7^2$$
$$x = \sqrt{6^2 + 7^2}$$
$$= \sqrt{85}\ \text{cm} \approx 9.22\ \text{cm}$$

b.



$$8^2 = x^2 + 5^2$$
$$x^2 = 8^2 - 5^2$$
$$x = \sqrt{8^2 - 5^2}$$
$$= \sqrt{39}\ \text{cm} \approx 6.24\ \text{cm}$$

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Question 7

Find the length of diagonal of a rectangle length 8 cm and width 3 cm.

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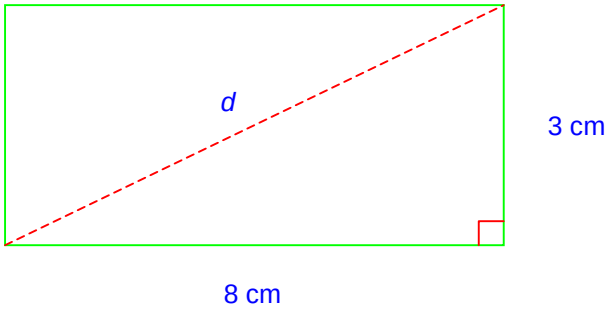
Solution to question 7

Drawing a diagram



By Pythagoras' theorem we have

$$d^2 = 8^2 + 3^2$$
$$d = \sqrt{8^2 + 3^2}$$
$$= \sqrt{73}\ \text{cm} \approx 8.54\ \text{cm}$$

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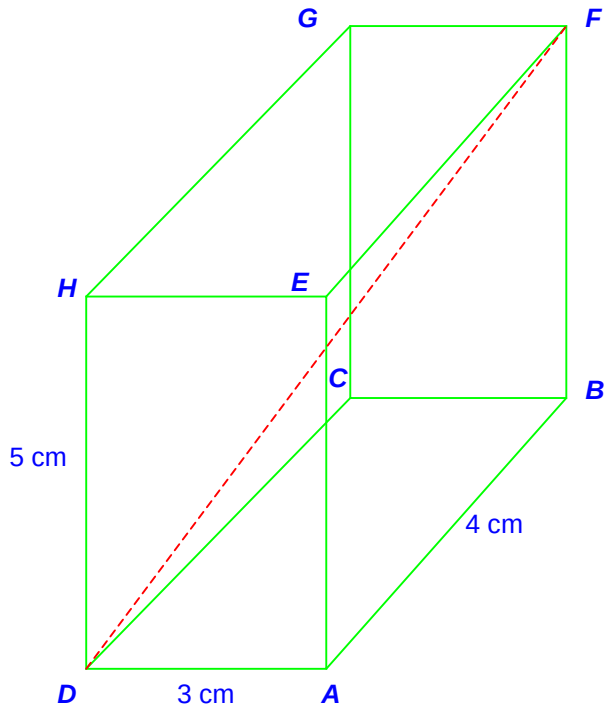
Question 8

Find the length of a diagonal of a rectangular box length 4 cm, width 3 cm and height 5 cm.



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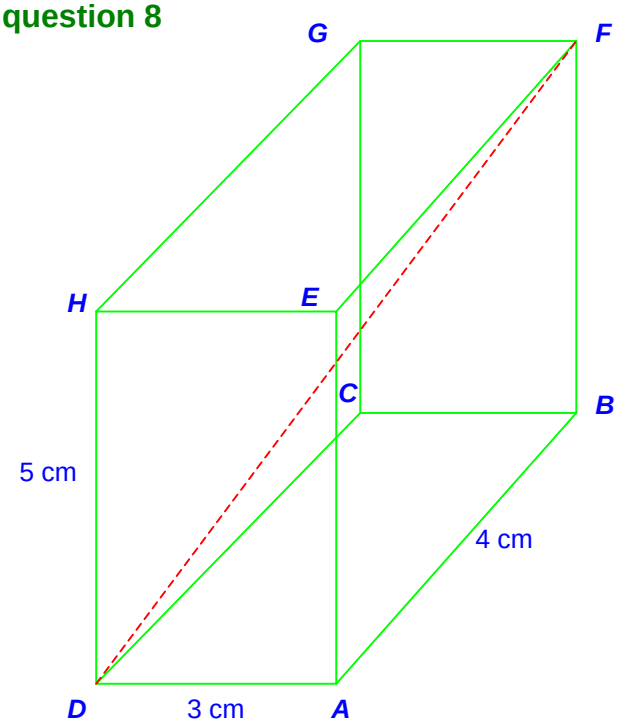
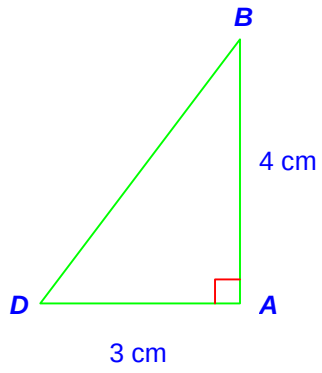
Solution to question 8

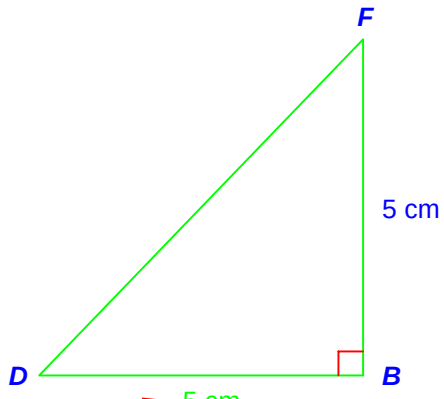


Considering triangle *DAB* we have



$$DB^2 = 3^2 + 4^2$$
$$DB = \sqrt{3^2 + 4^2}$$
$$= 5 \text{ cm}$$

Now considering triangle *DAF* we have



$$DF^2 = 5^2 + 5^2$$
$$DF = \sqrt{5^2 + 5^2}$$
$$= \sqrt{50}$$
$$= 5\sqrt{2} \text{ cm} \approx 7.07 \text{ cm}$$

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