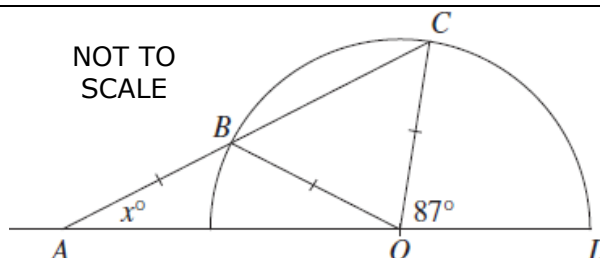


Plane Geometry

- 16 12** The diagram shows a semicircle with centre O . It is given that $AB = OB$, $\angle COD = 87^\circ$ and $\angle BAO = x^\circ$.
- b**
- (i) Show that $\angle CBO = 2x^\circ$, giving reasons.
- (ii) Find the value of x , giving reasons.



[Solution](#)

1

2

- 16 15** Maryam wishes to estimate the height, h metres, of a tower, ST , using a square, $ABCD$, with side length 1 metre.

She places the point A on the horizontal ground and ensures that the point D lies on the line joining A to the top of the tower T .

The point F is the intersection of the line joining B and T and the side BC . The point E is the foot of the perpendicular from B to the ground. Let CF have length x metres and AE have length y metres.

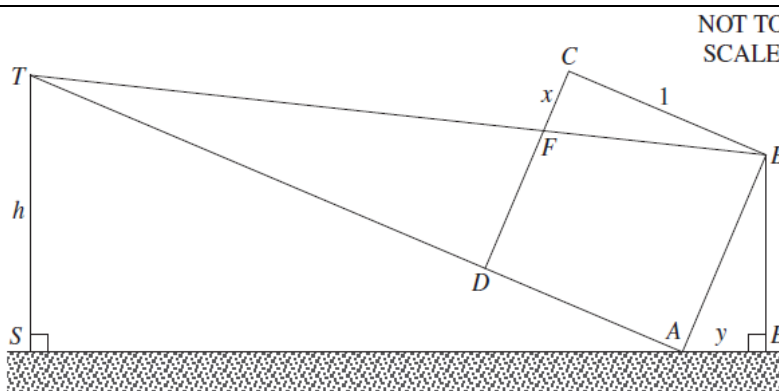
Copy and trace the diagram into your writing booklet.

- (i) Show that $\triangle FCB$ and $\triangle BAT$ are similar.
- (ii) Show that $\triangle TSA$ and $\triangle AEB$ are similar.
- (iii) Find h in terms of x and y .

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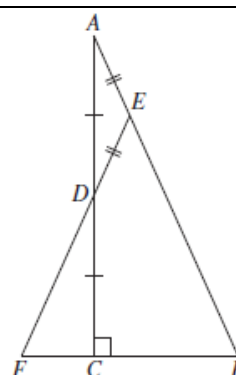
2



[Solution](#)

- 15 15** The diagram shows $\triangle ABC$ which has a right angle at C . The point D is the midpoint of the side AC . The point E is chosen on AB such that $AE = ED$. The line segment ED is produced to meet the line BC at F . Copy or trace the diagram into your writing booklet.

- (i) Prove that $\triangle ACB$ is similar to $\triangle DCF$.
- (ii) Explain why $\triangle EFB$ is isosceles.
- (iii) Show that $EB = 3AE$.



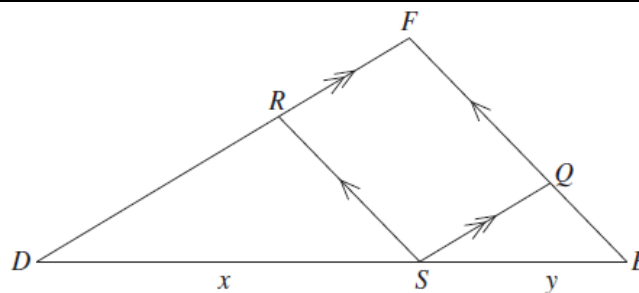
[Solution](#)

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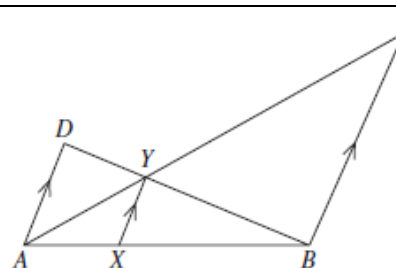
2

- 14 15** In $\triangle DEF$, a point S is chosen on the side DE . The length of DS is x , and the length of ES is y . The line through S parallel to DF meets EF at Q . The line through S parallel to EF meets DF at R . The area of $\triangle DEF$ is A . The areas of $\triangle DSR$ and $\triangle SEQ$ are A_1 and A_2 respectively.


[Solution](#)

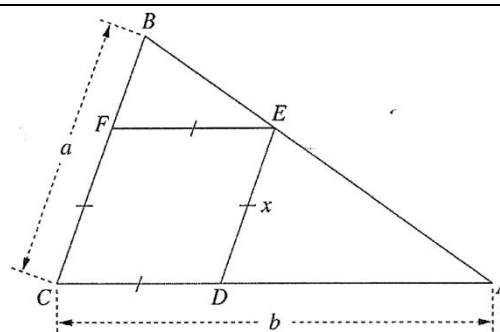
- (i) Show that $\triangle DEF$ is similar to $\triangle DSR$. 2
- (ii) Explain why $\frac{DR}{DF} = \frac{x}{x+y}$. 1
- (iii) Show that $\sqrt{\frac{A_1}{A}} = \frac{x}{x+y}$. 2
- (iv) Using the result from part (iii) and a similar expression for $\sqrt{\frac{A_2}{A}}$, deduce that 2
- $$\sqrt{A} = \sqrt{A_1} + \sqrt{A_2}.$$

- 13 16** The diagram shows triangles ABC and ABD with AD parallel to BC . The sides AC and BD intersect at Y . The point X lies on AB such that XY is parallel to AD and BC .


[Solution](#)

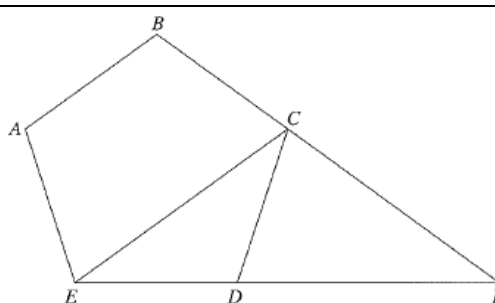
- (i) Prove that $\triangle ABC$ is similar to $\triangle AXY$. 2
- (ii) Hence, or otherwise, prove that 2
- $$\frac{1}{XY} = \frac{1}{AD} + \frac{1}{BC}.$$

- 12 16** The diagram shows a triangle ABC with sides $BC = a$ and $AC = b$. The points D , E and F lie on the sides AC , AB and BC , respectively, so that $CDEF$ is a rhombus with sides of length x .


[Solution](#)

- (i) Prove that $\triangle EBF$ is similar to $\triangle AED$. 2
- (ii) Find an expression for x in terms of a and b . 2

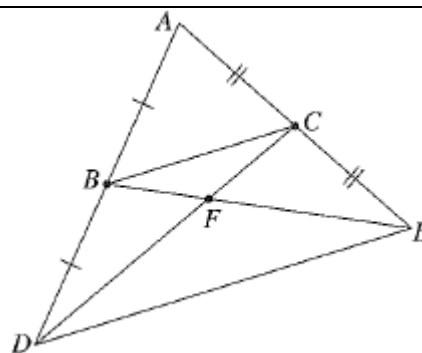
- 11 6a** The diagram shows a regular pentagon $ABCDE$. Sides ED and BC are produced to meet at P . Copy or trace the diagram into your writing booklet.


[Solution](#)

- (i) Find the size of $\angle CDE$. 1
- (ii) Hence, show that $\triangle EPC$ is isosceles. 2

- 11 9a** The diagram shows $\triangle ADE$, where B is the midpoint of AD and C is the midpoint of AE . The intervals BE and CD meet at F .

- Explain why $\triangle ABC$ is similar to $\triangle ADE$.
- Hence, or otherwise, prove that the ratio $BF:FE = 1:2$.

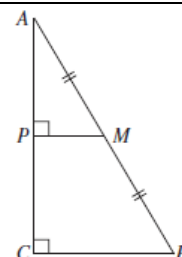

[Solution](#)

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- 09 4c** In the diagram, $\triangle ABC$ is a right-angled triangle, with the right angle at C .

The midpoint of AB is M , and $MP \perp AC$.

- Prove that $\triangle AMP$ is similar to $\triangle ABC$.
- What is the ratio of AP to AC ?
- Prove that $\triangle AMC$ is isosceles.
- Show that $\triangle ABC$ can be divided into two isosceles triangles.
- Copy or trace this triangle into your writing booklet and show how to divide it into four isosceles triangles.


[Solution](#)

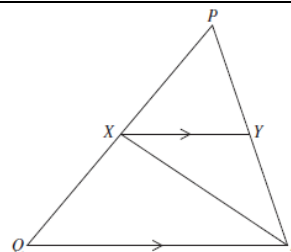
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- 08 4a** In the diagram, XR bisects $\angle PRQ$ and $XY \parallel QR$.

Copy or trace the diagram into your writing booklet.

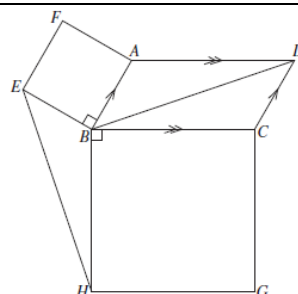
Prove that $\triangle XYR$ is an isosceles triangle.



2 [Solution](#)

- 08 8b** In the diagram, $ABCD$ is a parallelogram and $ABEF$ and $BCGH$ are both squares. Copy or trace the diagram into your writing booklet.

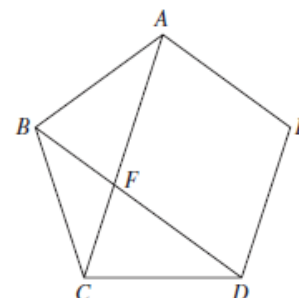
- Prove that $CD = BE$.
- Prove that $BD = EH$.


[Solution](#)

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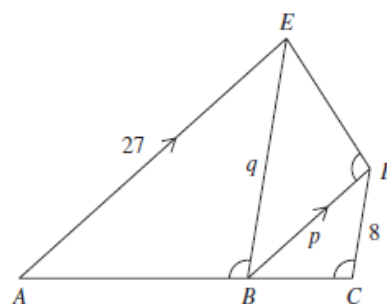
- 07 5a** In the diagram, $ABCDE$ is a regular pentagon. The diagonals AC and BD intersect at F . Copy or trace this diagram into your writing booklet.

- Show that the size of $\angle ABC$ is 108° .
- Find the size of $\angle BAC$.
Give reasons for your answer.
- By considering the sizes of angles, show that $\triangle ABF$ is isosceles.


[Solution](#)

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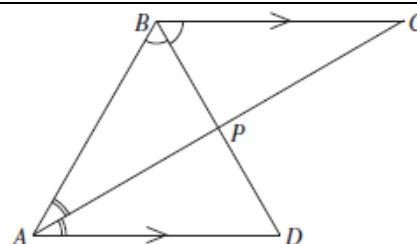
- 07 8b** In the diagram, AE is parallel to BD , $AE = 27$, $CD = 8$, $BD = p$, $BE = q$ and $\angle ABE$, $\angle BCD$ and $\angle BDE$ are equal. Copy or trace this diagram into your writing booklet.
- (i) Prove that $\triangle ABE \parallel \triangle BCD$.
- (ii) Prove that $\triangle EDB \parallel \triangle BCD$.



2
2

[Solution](#)

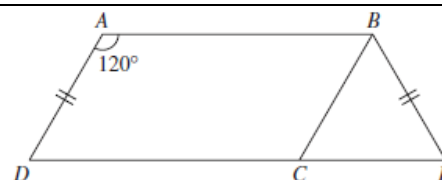
- 06 6a** In the diagram, AD is parallel to BC , AC bisects $\angle BAD$ and BD bisects $\angle ABC$. The lines AC and BD intersect at P . Copy or trace the diagram into your writing booklet.
- (i) Prove that $\angle BAC = \angle BCA$.
- (ii) Prove that $\triangle ABP \cong \triangle CBP$.
- (iii) Prove that $ABCD$ is a rhombus.



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[Solution](#)

- 05 5b** The diagram shows a parallelogram $ABCD$ with $\angle DAB = 120^\circ$. The side DC is produced to E so that $AD = BE$. Copy or trace the diagram into your writing booklet.
- Prove that $\triangle BCE$ is equilateral.



3

[Solution](#)