

# Congruence and Similarity

**Further Exercise****10.1 Congruent Figures**

- 1** Draw the following figures.
- (a) Two isosceles triangles that are not congruent.

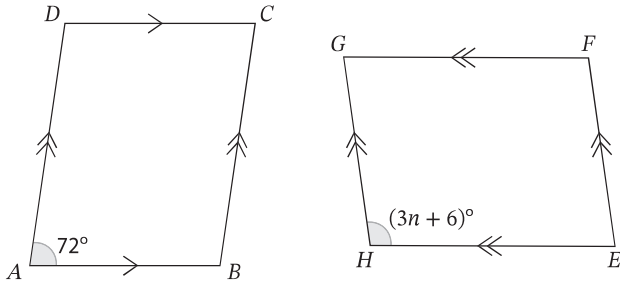
- (b) Two circles that are not congruent.

(c) Two figures with the same area that are not congruent.

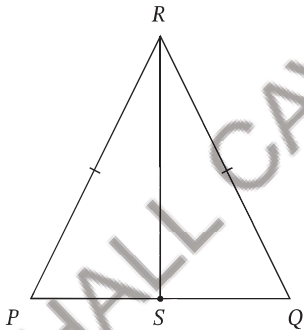
(d) Two figures with the same perimeter that are not congruent.

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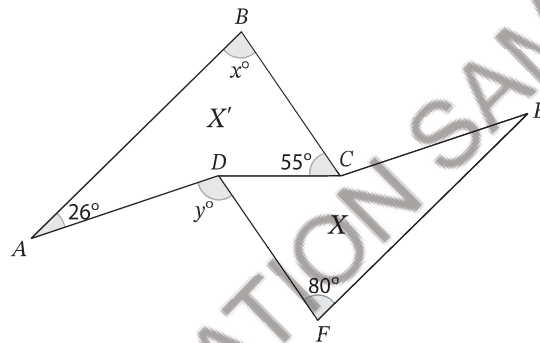
- 2** In the diagram,  $ABCD$  and  $EFGH$  are two congruent diagrams.  
Given that  $\angle DAB = 72^\circ$ , find the value of  $n$ .



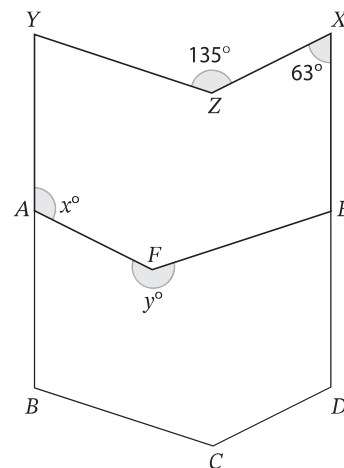
- 3** In the diagram,  $PQR$  is an isosceles triangle and  $S$  is the midpoint of  $PQ$ .  $\triangle PQR$  is divided into two congruent triangles. Name them and explain the congruency using a suitable transformation.



- 4 In the diagram, Quadrilateral  $X'$  is obtained by rotating Quadrilateral  $X$  about the midpoint of  $CD$ ,  $M$ .
- Use vertices to name the two congruent pairs of quadrilaterals.
  - Find the values of  $x$  and  $y$ .



- 5 In the figure,  $ABCDEF$  and  $XEFAYZ$  are two congruent hexagons.  $A$  is the midpoint of  $YB$ .  $YB = 10$  cm,  $\angle YZX = 135^\circ$  and  $\angle ZXE = 63^\circ$ . Find
- $XE$ ,
  - the values of  $x$  and  $y$ .

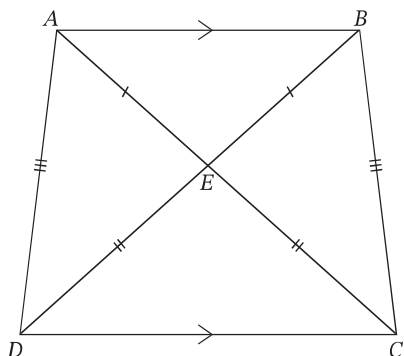


## S

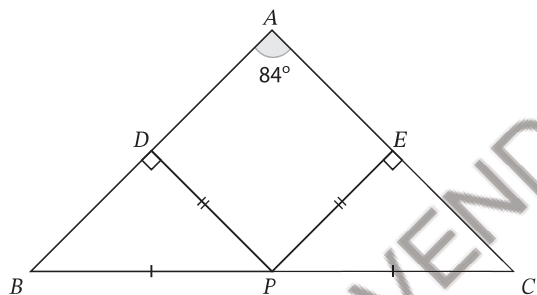
## Further Exercise

## 10.2 Congruency Tests

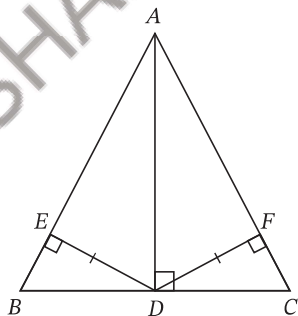
- 1 In the diagram,  $ABCD$  is a quadrilateral. The diagonals  $AC$  and  $BD$  intersect at  $E$ .  $AE = BE$ ,  $DE = CE$ ,  $AD = BC$  and  $AB \parallel DC$ . Name two pairs of congruent triangles and state the reason of congruence.



- 2 In the diagram,  $ABC$  is a triangle.  $P$  is the midpoint of  $BC$  and  $\angle BAC = 84^\circ$ .  $D$  and  $E$  lie on  $AB$  and  $AC$  respectively such that  $\angle BEP = \angle CEP = 90^\circ$  and  $PD = PE$ . Find  $\angle EPC$ .

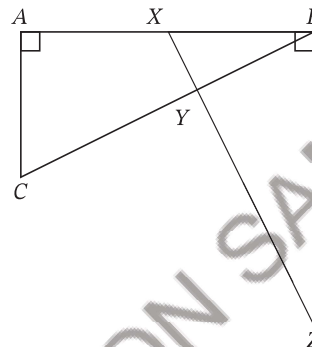


- 3 In the diagram,  $ABC$  is a triangle.  $E$  and  $F$  lie on  $AB$  and  $AC$  respectively such that  $DE$  is perpendicular to  $AB$  and  $DF$  is perpendicular to  $AC$ .  $AD$  is a perpendicular bisector to  $BC$ . Given that  $DE = DF$ , explain why the areas of  $\triangle BDE$  and  $\triangle CDF$  are equal.

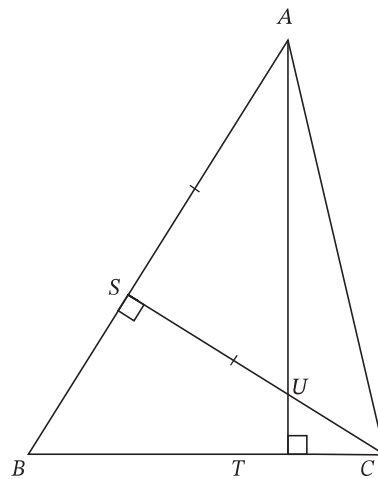


4 In the diagram,  $X$  is the midpoint of  $AB$ .  $AB = BZ$ ,  $AB = 2AC$  and  $\angle CAB = \angle ZBA = 90^\circ$ . Prove that

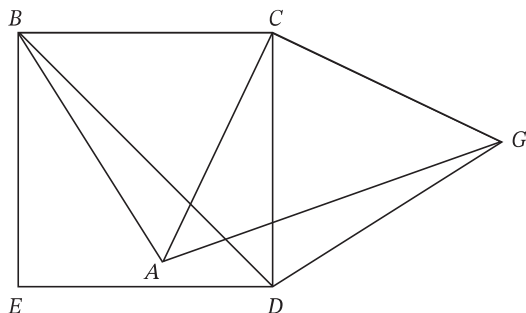
- (a)  $\triangle ABC$  is congruent to  $\triangle BZX$ ,
- (b)  $\angle ZXB = \angle BCA$ ,
- (c)  $\angle XYB = 90^\circ$ .



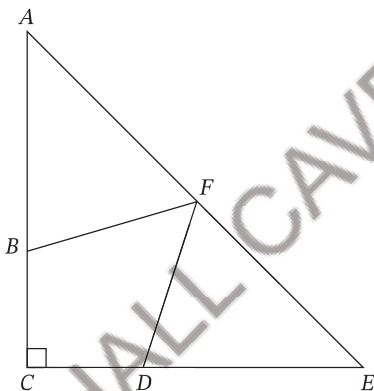
5 In the diagram,  $ABC$  is a triangle.  $S$  and  $T$  lie on  $AB$  and  $BC$  respectively such that  $\angle ASC = \angle ATC = 90^\circ$ . Given that  $AS = CS$ , prove that  $\triangle ASU$  is congruent to  $\triangle CSB$ .



- 6 In the diagram,  $ABC$  and  $CDG$  are equilateral triangles and  $BCDE$  is a square. Prove that  $\triangle BCD$  is congruent to  $\triangle ACG$ .



- 7 In the diagram,  $ACE$  is a right-angled triangle with  $\angle ACE = 90^\circ$ .  $\triangle FAB$  is congruent to  $\triangle FED$ . Prove that  $BFDC$  is a kite.



*Workbook pages for Section 10.3 Similar Figures,  
Section 10.4 Areas of Similar Figures and Section 10.5  
Volumes of Similar Figures are not included in this  
submission.*

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## Chapter Opener Revisit

Let's take a look at the original questions in the Chapter Opener of the Student Book:

An architect wants to create a blueprint for a square piece of land to build a resort. The resort consists of a hotel building, a theme park, a shopping arcade and a swimming pool. He comes up with two proposals on how to divide the land to build the facilities.

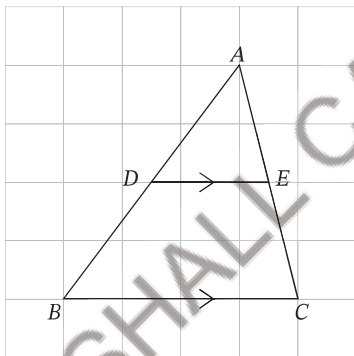
**Proposal 1:** The land is cut into two identical rectangles and two similar squares, which areas are in the ratio 4 : 1.

**Proposal 2:** The land is cut into four identical quadrilaterals that are not rectangles or squares.

How would you decide if the proposals are feasible?

## Fun with Maths!

Use a graphing software or graph paper, construct  $\triangle ABC$  such that  $AB = 5$  cm,  $BC = 4$  cm and  $AC = 4.1$  cm. Draw any line  $DE$  that is parallel to  $BC$ .

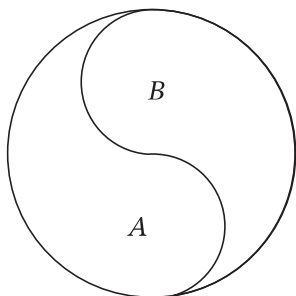


What do you observe about the ratio  $AD : DB$  and  $AE : EC$ . Repeat this using another triangle of your own. Prove that your observation is true for any triangle.

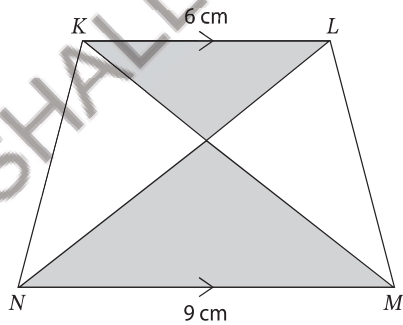
CHAPTERS  
**10-12**

# Revision Exercise

- 1** In the diagram, a circle is divided into two congruent figures,  $A$  and  $B$ , each bounded by two small semicircles and one large semicircle. Given that the radius of the circle is 7 cm, calculate
- the area of Figure  $A$ ,
  - the perimeter of Figure  $B$ .



- 2** **5** In the diagram,  $KLMN$  is a trapezium with  $NM \parallel KL$ .  $NM = 9$  cm and  $KL = 6$  cm. The area of the larger shaded triangle is  $18$  cm<sup>2</sup>. Find
- the area of the smaller triangle,
  - the area of the trapezium  $KLMN$ .



- 3 S** In the diagram,  $ABC$ ,  $BDE$  and  $EFG$  are triangles.  $AE = DB$ ,  $EF = BE$  and  $EF \parallel BD$ .
- Name the triangle congruent to  $\triangle AEF$  and state the reason of congruence.
  - Prove that  $\triangle AEG$  is similar to  $\triangle DCG$ .
- (c)  $AE = 9$  cm,  $EG = 3$  cm,  $CD = 5$  cm and  $EF = x$  cm.
- Calculate  $CG$ .
  - Prove that  $\triangle AEF$  is similar to  $\triangle ABC$ .
  - Hence, form an equation in  $x$  and show that it reduces to  $x^2 + 9x - 36 = 0$ .

