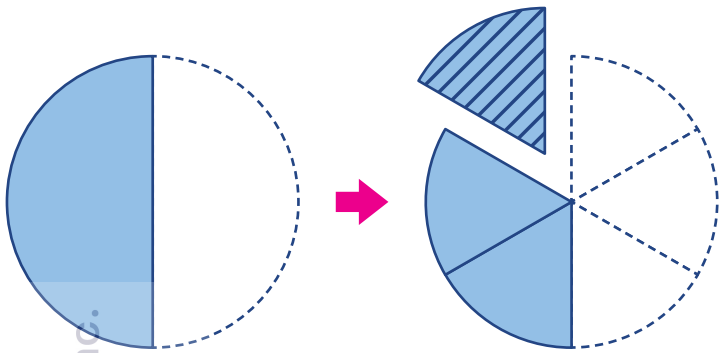
Multiplying Two Proper Fractions

Let's Learn

1 Siti has $\frac{1}{2}$ of an apple tart at first. She gave $\frac{1}{3}$ of it to her friend.
How much of the apple tart did she give her friend?



We can use fraction discs to help us find the fraction of the apple tart Siti gave her friend.

6 parts = 1 apple tart

1 part = $\frac{1}{6}$ of the apple tart

$\frac{1}{3}$ of $\frac{1}{2} = \frac{1}{3} \times \frac{1}{2}$

$= \frac{1 \times 1}{3 \times 2}$

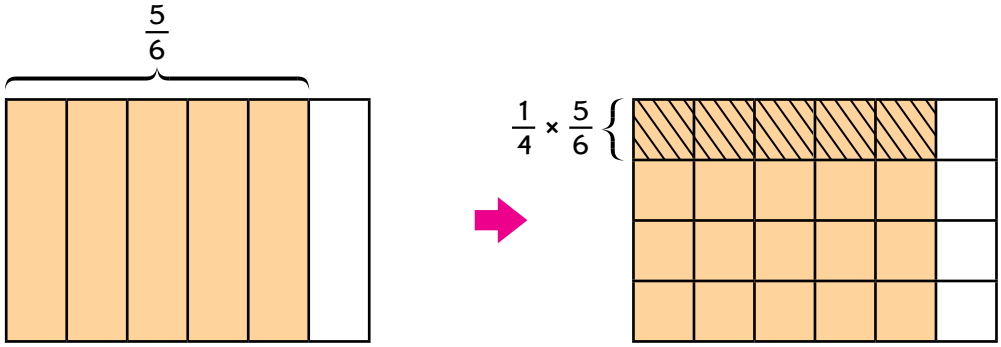
$= \frac{1}{6}$

Multiply the numerators first. Then multiply the denominators.

$\frac{1}{3}$ of $\frac{1}{2}$ is the same as $\frac{1}{2}$ of $\frac{1}{3}$.

Siti gave her friend $\frac{1}{6}$ of the apple tart.

2 Find the value of $\frac{1}{4} \times \frac{5}{6}$.



$\frac{1}{4}$ of $\frac{5}{6} = \frac{1 \times 5}{4 \times 6}$

$= \frac{\mathbf{5}}{\mathbf{24}}$

3 Find the value of $\frac{1}{5} \times \frac{5}{7}$.

Method 1

$\frac{1}{5} \times \frac{5}{7} = \frac{1 \times 5}{5 \times 7}$

$= \frac{5}{35}$

$= \frac{\mathbf{1}}{\mathbf{7}}$

Method 2

$\frac{1}{5} \times \frac{5}{7} = \frac{1 \times 5}{5 \times 7}$ (5 and 5 cancel; 1 and 1)

$= \frac{1 \times 1}{1 \times 7}$

$= \frac{\mathbf{1}}{\mathbf{7}}$

I can also do it this way:

$\frac{1}{5} \times \frac{5}{7} = \frac{1 \times 1}{1 \times 7}$

$= \frac{\mathbf{1}}{\mathbf{7}}$

Let's Practise

1 Find each value.
Give your answer as a fraction in its simplest form.

(a) $\frac{1}{8}$ of $\frac{4}{5} =$ ☐

(b) $\frac{5}{6}$ of $\frac{2}{3} =$ ☐

2 Mrs Roberts had $\frac{5}{8}$ kg of peanuts.
She used $\frac{3}{4}$ of the peanuts to bake some peanut cookies.
How many kilograms of peanuts did she use?

Word Problems

Let's Learn

1 There were 180 people at a exhibition. $\frac{2}{3}$ of the people left after an hour.

(a) How many people left the exhibition after an hour?

(b) How many people remained after an hour?

(a) $\frac{2}{3}$ of 180 $= \frac{2}{3} \times 180$

$= \frac{2 \times \cancel{180}^{60}}{\cancel{3}_{1}}$

$= 2 \times 60$

$= 120$

120 people left the exhibition.

(b) $180 - 120 = 60$

60 people remained.

2 Mrs Tan had $\frac{3}{4}$ kg of flour. She used $\frac{1}{3}$ of the flour to make bread.

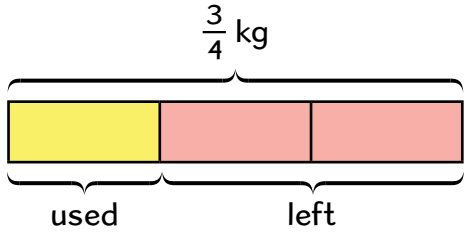
(a) How much flour did she use?

(b) How much flour was left?

Give your answers as fractions in the simplest form.

(a) $\frac{1}{3}$ of $\frac{3}{4}$ kg $= \frac{1}{\cancel{3}_{1}} \times \frac{\cancel{3}^{1}}{4}$ kg

$= \frac{1}{4}$ kg



Mrs Tan used **$\frac{1}{4}$ kg** of flour.

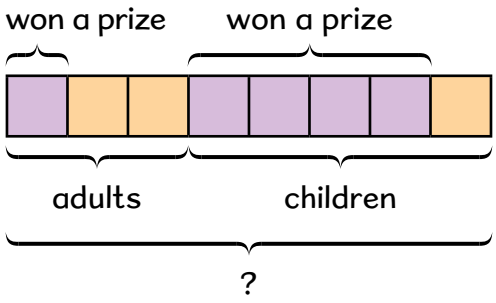
(a) $\frac{3}{4}$ kg $- \frac{1}{4}$ kg $= \frac{2}{4}$ kg

$= \frac{1}{2}$ kg

$\frac{1}{2}$ kg of flour was left.

5 A group of visitors went to a carnival. $\frac{3}{8}$ of the visitors were adults and the rest were children. $\frac{1}{3}$ of the adults and $\frac{4}{5}$ of the children won a prize in the carnival. 50 visitors won prizes at the carnival. How many visitors went to the carnival?

Method 1



1 unit + 4 units = 5 units

5 units represent the total number of visitors who won prizes at the carnival.

5 units = 50

1 unit = 50 ÷ 5
= 10

8 units = 8 × 10
= 80

80 visitors went to the carnival.

Method 2

$\frac{1}{3} \times \frac{3}{8} = \frac{1}{8}$

$\frac{1}{8}$ of the visitors were adults who won a prize.

$1 - \frac{3}{8} = \frac{5}{8}$

$\frac{5}{8}$ of the visitors were children.

$\frac{4}{5} \times \frac{5}{8} = \frac{4}{8}$

$\frac{4}{8}$ of the visitors were children who won a prize.

$\frac{1}{8} + \frac{4}{8} = \frac{5}{8}$

$\frac{5}{8}$ of the visitors won a prize.

$\frac{5}{8}$ of the visitors = 50

$\frac{1}{8}$ of the visitors = 10

$\frac{8}{8}$ of the visitors = 80

80 visitors went to the carnival.

6 Mrs Tay had a box of red, blue, green and yellow buttons.
$\frac{1}{4}$ of the buttons were red and $\frac{1}{3}$ of the buttons were blue.
$\frac{1}{5}$ of the remaining buttons were green. The rest were yellow.

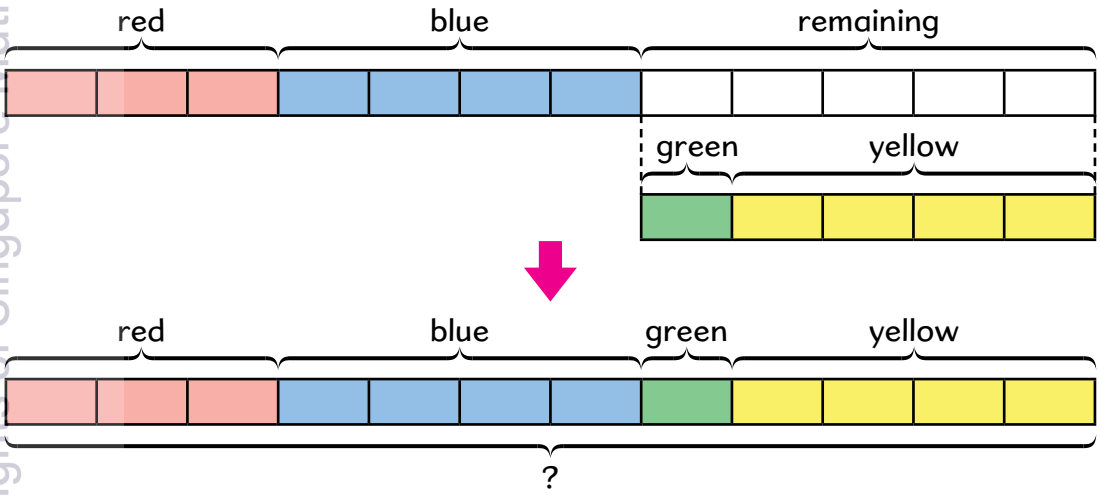
(a) What fraction of the buttons were green?

(b) There were 36 more yellow buttons than green buttons.
How many buttons did Mrs Tay have altogether?

(a) $\frac{1}{4} + \frac{1}{3} = \frac{3}{12} + \frac{4}{12}$

$= \frac{7}{12}$

$\frac{7}{12}$ of Mrs Tay's buttons were red and blue.



$\frac{1}{12}$ of the buttons were green.

(b) 4 units – 1 unit = 3 units

3 units = 36

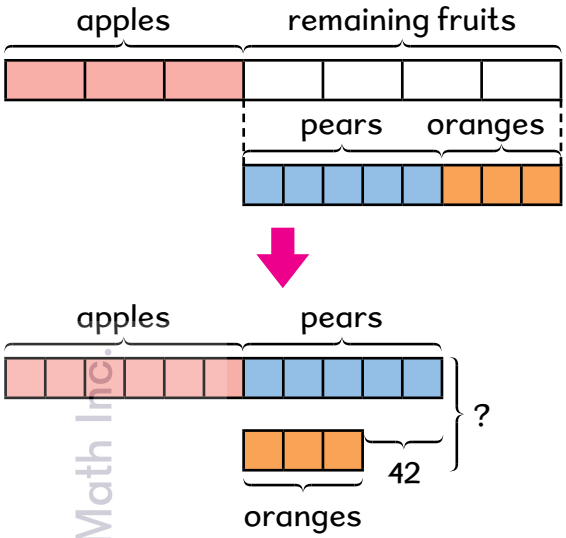
1 unit = 36 ÷ 3
= 12

12 units = 12 × 12
= 144

Mrs Tay had **144** buttons altogether.

7 There were some fruits in a crate. $\frac{3}{7}$ of them were apples and $\frac{5}{8}$ of the remainder were pears. The rest were oranges. There were 42 more pears than oranges. How many fruits were there in the crate?

Method 1



5 units – 3 units = 2 units

2 units = 42

1 unit = 42 ÷ 2
= 21

14 units = 14 × 21
= 294

There were **294** fruits in the crate.

Method 2

$1 - \frac{3}{7} = \frac{4}{7}$

$\frac{4}{7}$ of the fruits were pears and oranges.

$\frac{5}{8} \times \frac{4}{7} = \frac{5}{14}$

$\frac{5}{14}$ of the fruits were pears.

$\frac{4}{7} - \frac{5}{14} = \frac{3}{14}$

$\frac{3}{14}$ of the fruits were oranges.

$\frac{5}{14} - \frac{3}{14} = \frac{2}{14}$

Difference in fraction between the number of pears and oranges is $\frac{2}{14}$.

$\frac{2}{14}$ of the fruits = 42

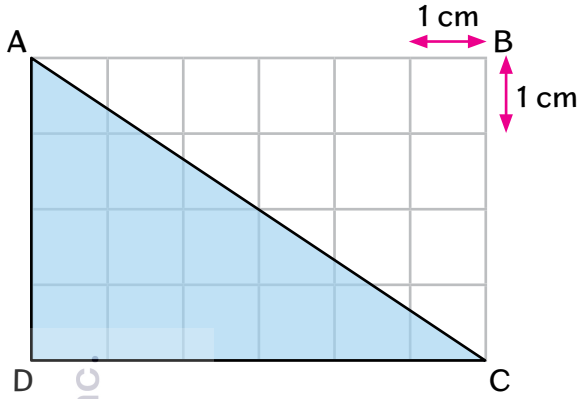
$\frac{14}{14}$ of the fruits = 7 × 42
= 294

There were **294** fruits in the crate.

Area of Triangle

Let's Learn

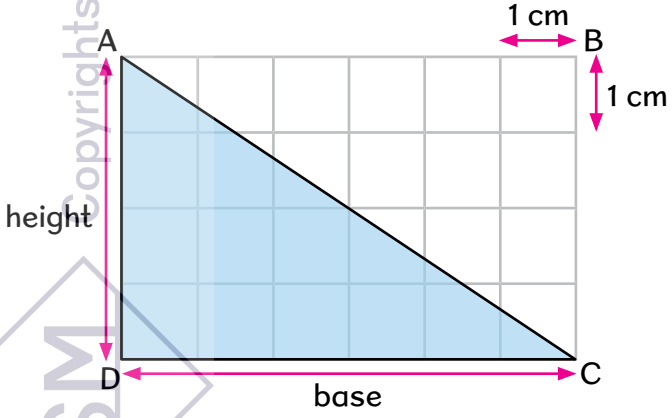
1 Triangle ACD is shown on 1-cm square grids.
Let us find the area of triangle ACD.



Area of rectangle ABCD = Length × Breadth
= 6 cm × 4 cm
= **24 cm²**

Area of triangle ACD = $\frac{1}{2}$ × 24 cm²
= **12 cm²**

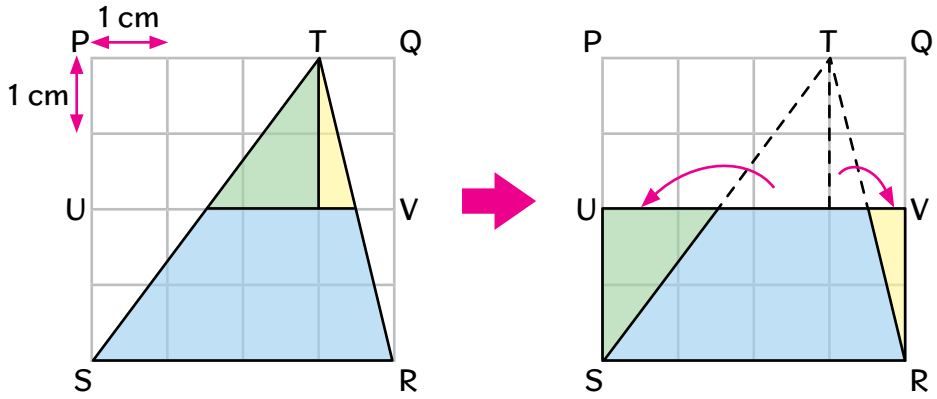
CD is the length of rectangle ABCD. CD is also the base of triangle ACD.
AD is the breadth of the rectangle. AD is also the height of triangle ACD.



ABCD is the **related rectangle** of the triangle ACD.

Area of triangle ACD = $\frac{1}{2}$ × Base × Height
= $\frac{1}{2}$ × 6 cm × 4 cm
= $\frac{1}{2}$ × 24 cm²
= **12 cm²**

2 Triangle STR is shown on 1-cm square grids.
Find the area of triangle STR.



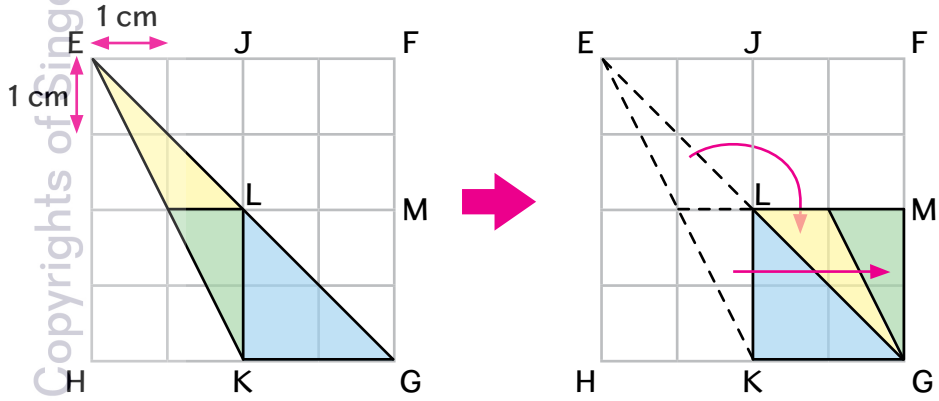
Area of triangle STR is $\frac{1}{2}$ the area of its related square PQRS.

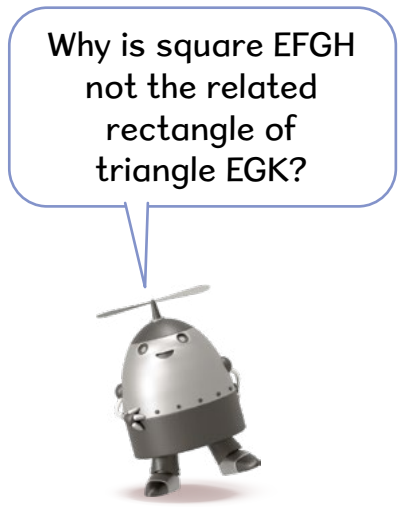
Area of triangle STR $= \frac{1}{2} \times 4 \text{ cm} \times 4 \text{ cm}$

$= \frac{1}{2} \times 16 \text{ cm}^2$

$= \mathbf{8 \text{ cm}^2}$

3 Triangle EGK is shown on 1-cm square grids.
Find the area of triangle EGK.





Area of triangle EGK is $\frac{1}{2}$ the area of its related rectangle JFGK.

Area of triangle EGK $= \frac{1}{2} \times 2 \text{ cm} \times 4 \text{ cm}$

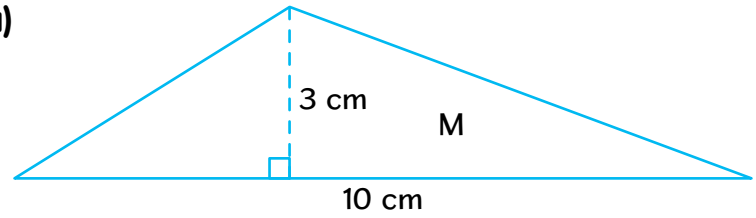
$= \frac{1}{2} \times 8 \text{ cm}^2$

$= \mathbf{4 \text{ cm}^2}$

Area of triangle $= \frac{1}{2} \times$ Base $\times$ Height

4 We can find the area of a triangle when we know its base and height.

(a)



Area of triangle M

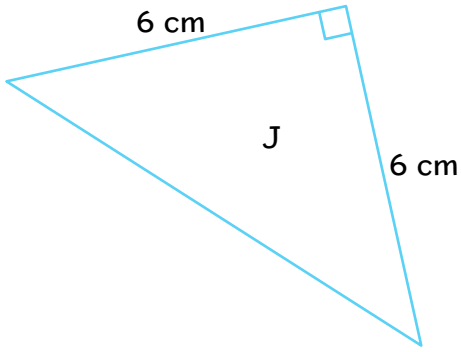
$= \frac{1}{2} \times$ Base $\times$ Height

$= \frac{1}{2} \times 10 \text{ cm} \times 3 \text{ cm}$

$= \frac{1}{2} \times 30 \text{ cm}^2$

$= \mathbf{15 \text{ cm}^2}$

(b)



Area of triangle J

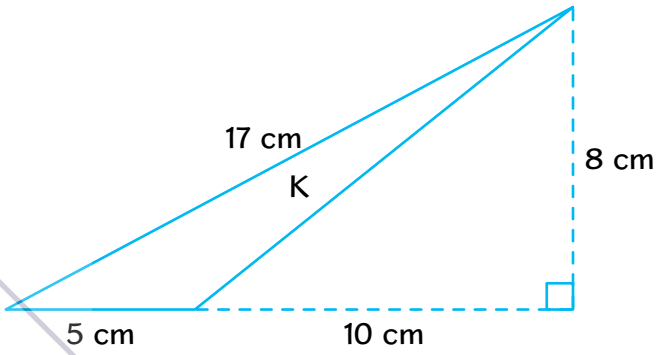
$= \frac{1}{2} \times$ Base $\times$ Height

$= \frac{1}{2} \times 6 \text{ cm} \times 6 \text{ cm}$

$= \frac{1}{2} \times 36 \text{ cm}^2$

$= \mathbf{18 \text{ cm}^2}$

(c)



Area of triangle K

$= \frac{1}{2} \times$ Base $\times$ Height

$= \frac{1}{2} \times 5 \text{ cm} \times 8 \text{ cm}$

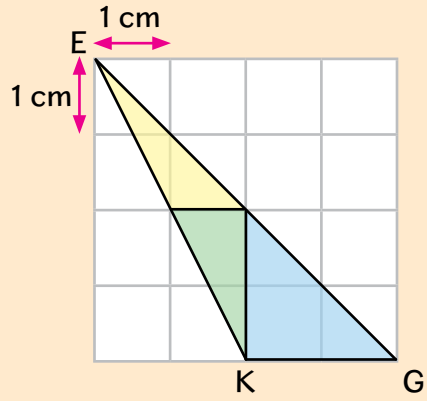
$= \frac{1}{2} \times 40 \text{ cm}^2$

$= \mathbf{20 \text{ cm}^2}$

Hands-on Activity

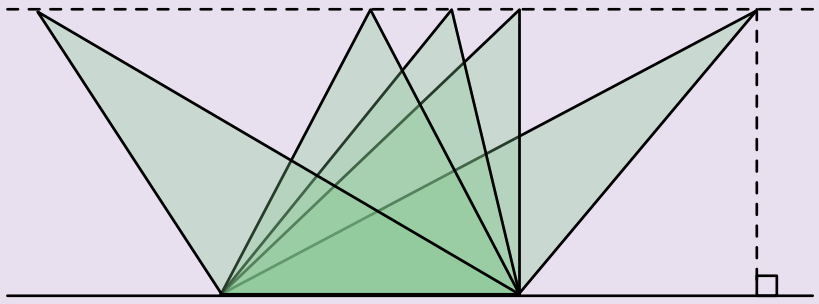
Draw triangle EGK on a 1-cm square grid. Cut out the coloured parts and show how they make up half the area of the related rectangle. Then use the formula to find the area of the triangle.

Is the answer the same as the total area of the cutouts?

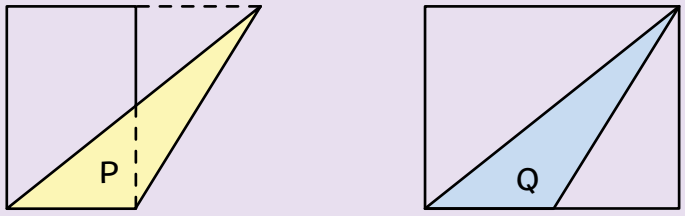


Maths Talk

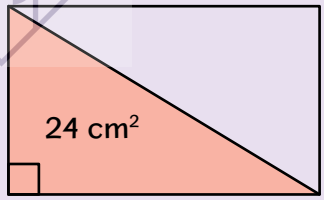
1. Do the triangles below have the same area or different areas?



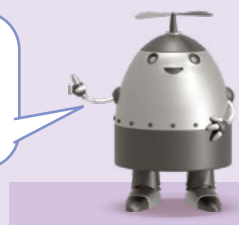
2. Does each of the triangles show that its base and height are related to the length and breadth of its related rectangle? Discuss.



3. A right-angled triangle shown below has an area of 24 cm^2. What are the possible measurements of its height and base?



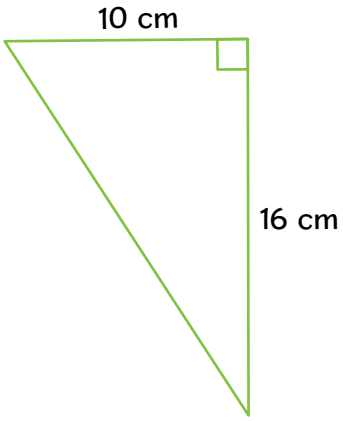
How would you use the idea of factors to find each possible height and base?



Let's Practise

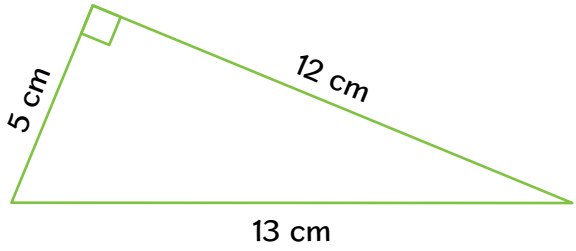
Find the area of each triangle.

(a)



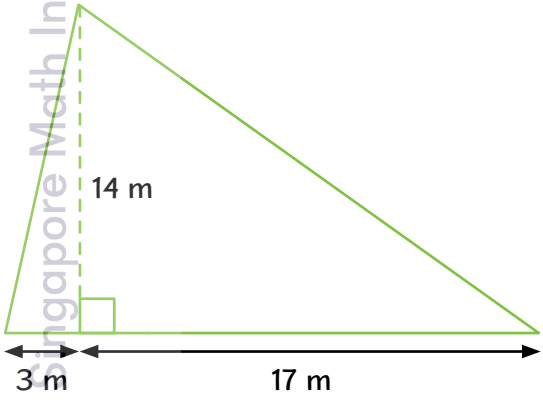
☐ cm^2

(b)



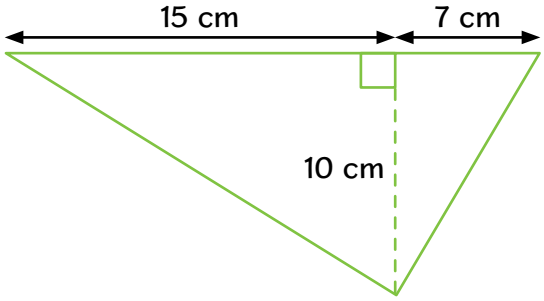
☐ cm^2

(c)



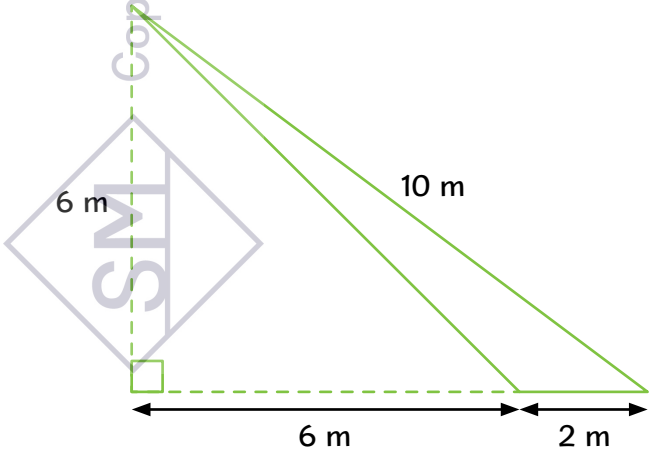
☐ m^2

(d)



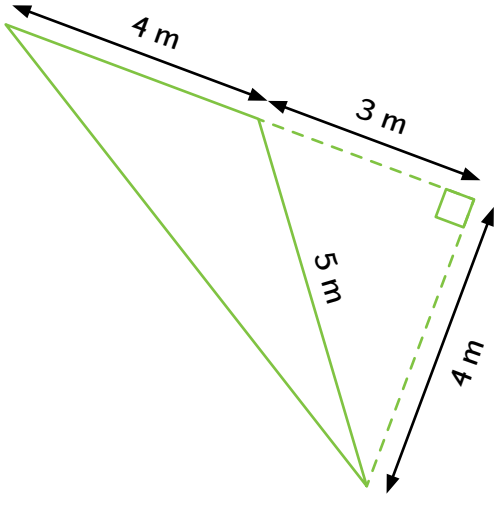
☐ cm^2

(e)



☐ m^2

(f)

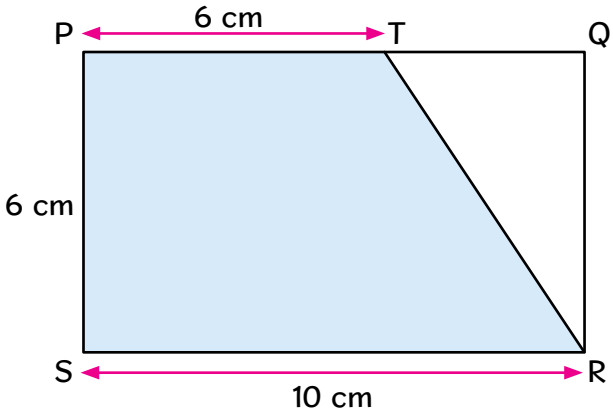


☐ m^2

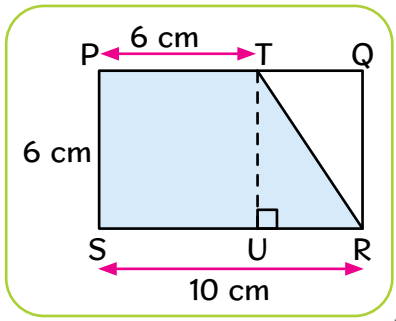
Area of Composite Figures

Let's Learn

1 PQRS is a rectangle. Find the area of the shaded part, PTRS.



Method 1: Split and Add



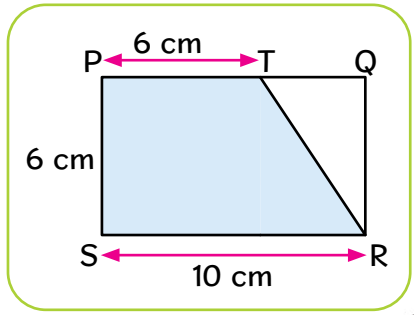
Area of square PTUS = 6 cm × 6 cm
= 36 cm^2

RU = 10 cm − 6 cm
= 4 cm

Area of triangle TRU = $\frac{1}{2}$ × 4 cm × 6 cm
= 12 cm^2

Area of PTRS = 36 cm^2 + 12 cm^2
= **48 cm^2**

Method 2: Take Away



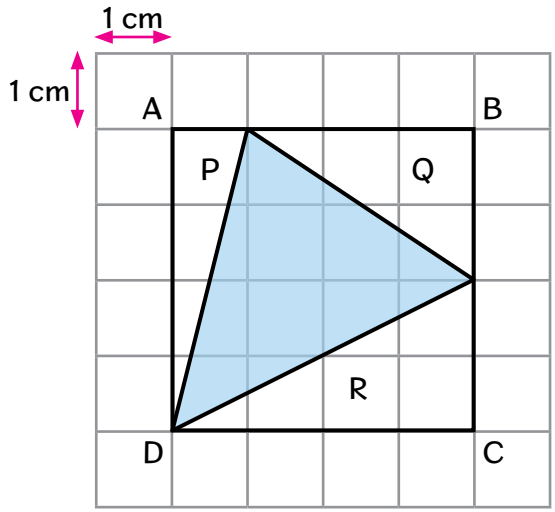
Area of rectangle PQRS = 10 cm × 6 cm
= 60 cm^2

TQ = 10 cm − 6 cm
= 4 cm

Area of triangle TQR = $\frac{1}{2}$ × 4 cm × 6 cm
= 12 cm^2

Area of PTRS = 60 cm^2 − 12 cm^2
= **48 cm^2**

4 Find the area of the shaded triangle.



Area of square ABCD = 4 cm × 4 cm
= 16 cm²

Area of triangle P = $\frac{1}{2}$ × 1 cm × 4 cm
= 2 cm²

Area of triangle Q = $\frac{1}{2}$ × 3 cm × 2 cm
= 3 cm²

Area of triangle R = $\frac{1}{2}$ × 4 cm × 2 cm
= 4 cm²

Area of the shaded triangle = (16 – 2 – 3 – 4) cm²
= **7 cm²**

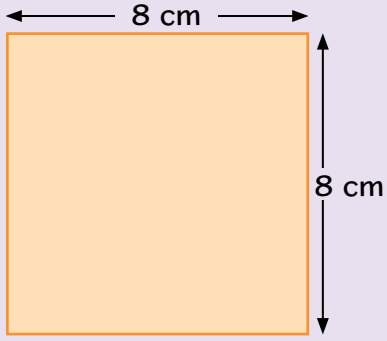
Maths Talk

Jayden is given two squares, A and B.

He covers $\frac{1}{2}$ of the small square with the big square as shown in Figure C.

Jayden is asked to find the area of Figure C.


Square A



Square B

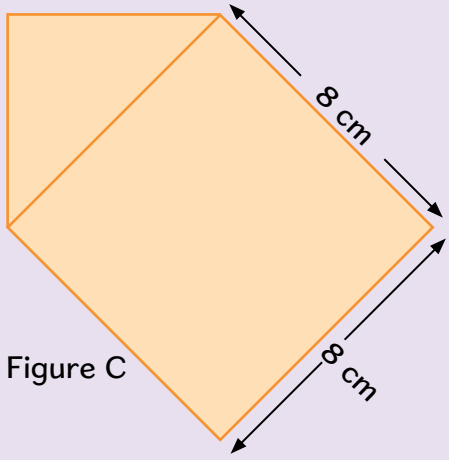
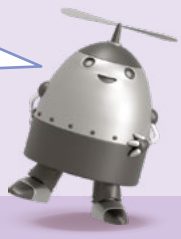


Figure C


Jayden

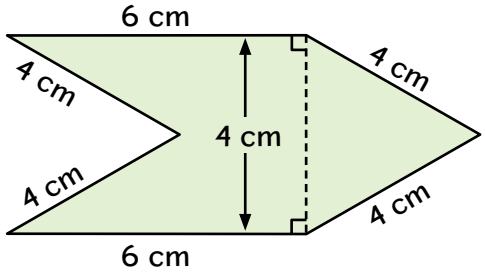
It's not possible to find the area of Figure C because the sides of Square A are not given.

Do you agree with Jayden?

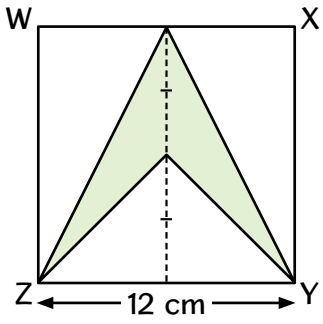


4 Find the area of the shaded part of each figure.

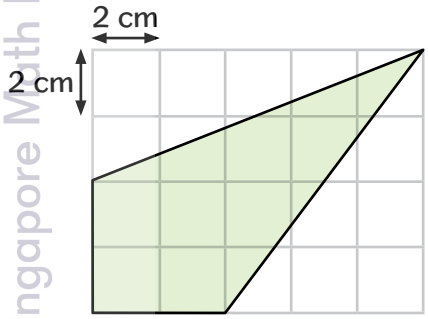
(a)



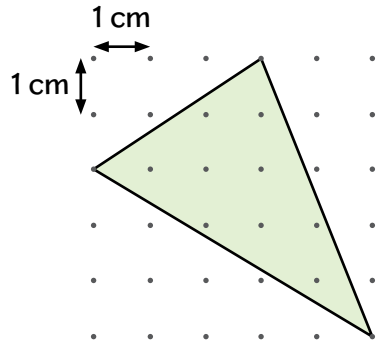
(b) WXYZ is a square.



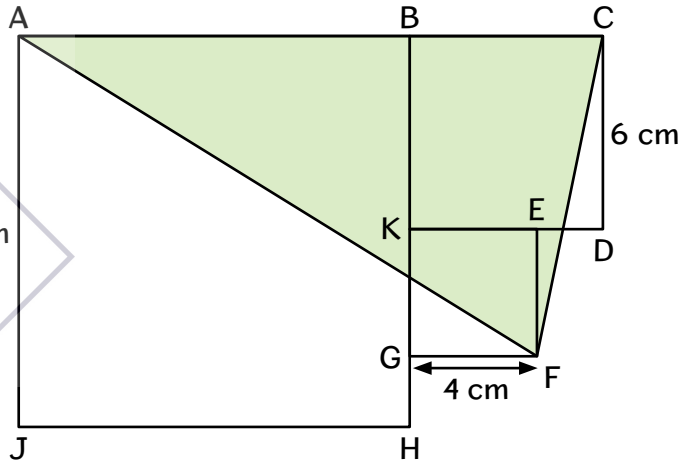
(c) The shaded figure is drawn on 2-cm square grid.



(d) The shaded triangle is drawn on 1-cm dot grid.



5 ABHJ, BCDK and KEFG are squares.
Find the area of the shaded triangle ACF using two different methods.



Mathematics Around Us

A small sailboard is shown below. Its sails are triangular in shape to catch the wind more efficiently. This helps the sailboat move faster and makes it easier to steer.

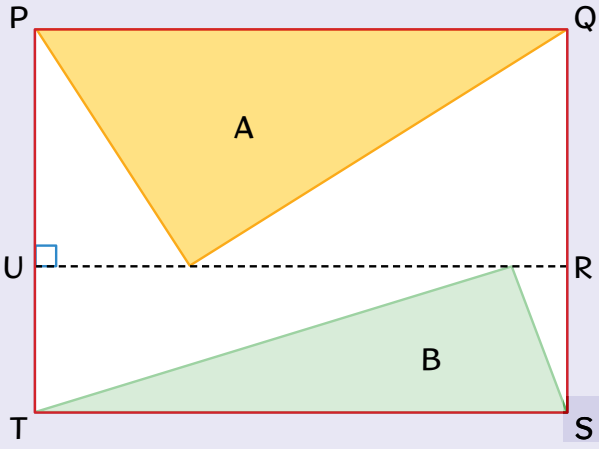
How much material is needed to make the bigger sail with a base of 3 m and a height of 7 m?

Thinking Aloud

Two triangles, A and B, are drawn in a rectangle as shown. What is the total area of triangles A and B?

The total area of triangles A and B is half the total area of the rectangle PQST.

Daniel



Do you agree with Daniel? Explain.