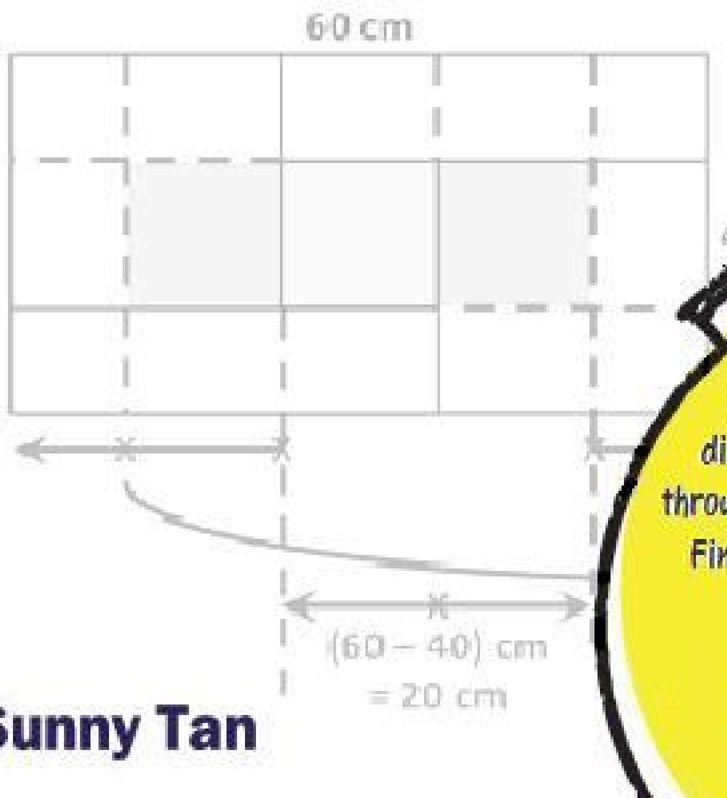
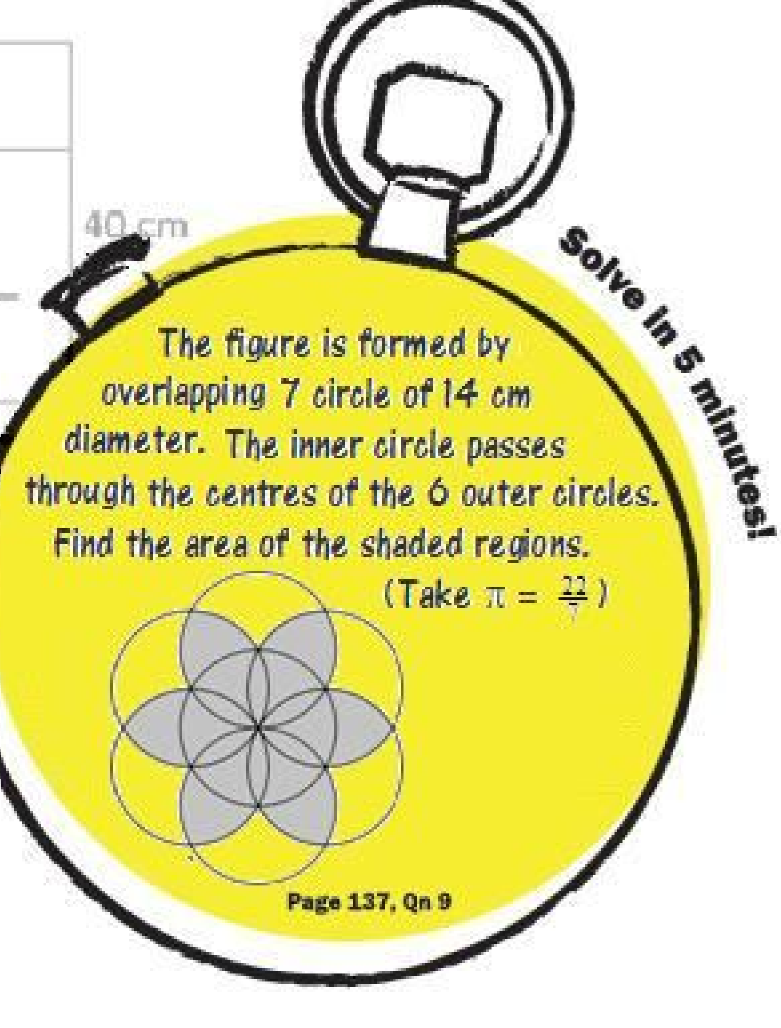
Mastering Heuristics Series
Handbooks for discerning parents

Spatial Visualisation

A Problem-solving Tool

for Challenging Problems in Upper Primary Mathematics (Primary 5 & 6)





Sunny Tan

Spatial Visualisation : A Problem-solving tool for Challenging Upper Primary Mathematics (Primary 5 & 6) Sunny Tan
Maths Heuristics (S) Private Limited

Mastering Heuristics Series
Handbook for discerning parents

Spatial Visualisation

A Problem-solving Tool
for Challenging Problems
in Area and Perimeter
(Primary 5 & 6)

Sunny Tan
Maths Heuristics Private Limited

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195A Thomson Road, Goldhill Centre, Singapore 307634
www.mathsHeuristics.com
Tel: 6255 5941

For orders and enquiries:

Email: enquiry@mathsheuristics.com

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*	**Chapter 2**	Completely involves Circles Scenarios, hence entire chapter is for Primary 6 only.
**	**Chapters 3, 5, 6 and 7**	Problems in Examples and Let's Apply sections are grouped into Non-Circles and Circles Scenarios.

PREFACE

Heuristics in Primary Maths Syllabus

Heuristics is a specialised mathematical problem-solving concept. Mastering it facilitates efficiency in solving regular as well as challenging mathematical problems. The Ministry of Education in Singapore has incorporated 11 Problem-solving Heuristics into all primary-level mathematics syllabuses.

Learning Heuristics Effectively

However, the 11 Problem-solving Heuristics are not taught systematically; they have been dispersed into the regular curriculum. This not only makes it difficult for students to pick up Heuristics skills, but can also make mathematics confusing for them. For us parents, it is difficult to put aside the regular-syllabus mathematical concepts we were brought up on to re-learn Heuristics, much less teach our own children this new concept.

Take the Heuristic technique of Algebraic Equations, for instance. Parents and educators may attempt to teach their children to solve complex mathematical questions using Algebraic Equations. This will only confuse their children as many are too young to grasp the abstract concept. Instead, other Heuristics techniques should be used, according to current primary-level mathematics syllabus.

These and other challenges were what I observed firsthand during my years as a mathematics teacher, and provided me the impetus for my post-graduate studies, mathsHeuristics™ programmes and the Mastering Heuristics Series of guidebooks.

About Mastering Heuristics Series

This series of books is a culmination of my systematic thinking and experience, supported by professional instructional writing and editing, to facilitate understanding and mastery of Heuristics. I have neatly packaged Heuristics into main techniques (series of guidebooks) and mathematical scenarios (chapters within each guidebook). For each mathematical scenario, I offer several examples, showing how a particular heuristics technique may be applied, and then explaining the application in easy-to-follow steps and illustrations – without skipping a beat.

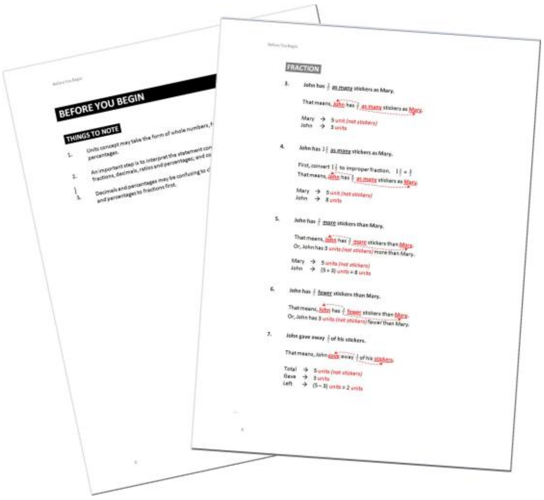
This particular guidebook in the series deals specifically with *Spatial Visualisation Techniques* for *Area and Perimeter* – the use of the mind's eye to manipulate given shapes to solve problems in Area and Perimeter. Mastery of this technique is necessary for solving especially-complex problems involving composite shapes. Spatial Visualisation is a very powerful problem-solving technique because it helps students literally see the solution to the problem posed.

The Mastering Heuristics Series provides a comprehensive guide to Heuristics. While each guidebook introduces parents to how Heuristics works, students have the opportunity to see the technique applied in different scenarios and to get in some practice. For students enrolled in mathsHeuristics™ programmes, each guidebook serves as a great companion, while keeping parents well-informed of what their children are learning.

Sunny Tan
February 2014

HOW TO USE THIS BOOK

BEFORE YOU BEGIN

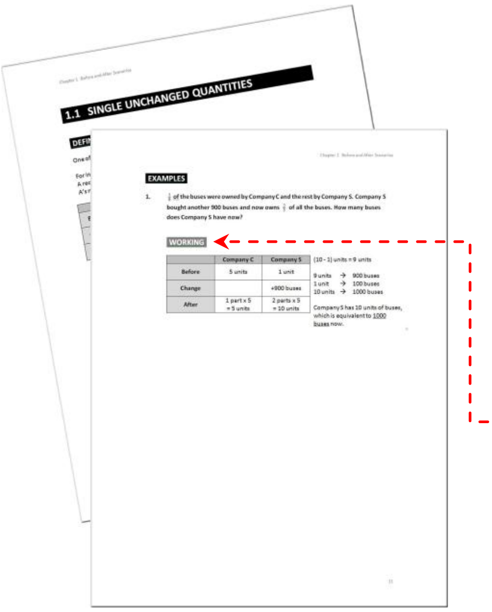


This chapter instills basic but important steps and truths in the heuristics technique that must be applied across every question in the guidebook. This helps to standardise the given information for easy application of the technique being taught.

In this guidebook on Spatial Visualisation, the steps include being familiar with parts and formulae of basic and derivative shapes.

CHAPTERS AND SECTIONS

Various scenarios are neatly separated into different chapters and sections. This allows the heuristics technique to be learnt and applied in a focused manner.



EXAMPLES

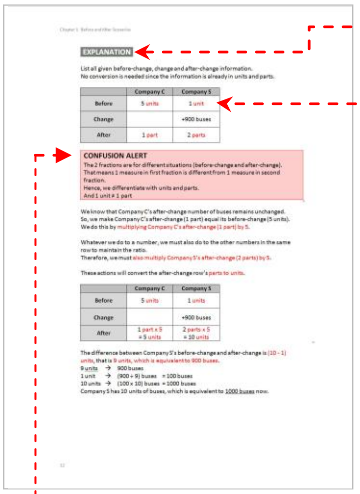
Each example of heuristics application comes with "Working" and "Explanation", and includes "Confusion Alert" and "Alternative" boxes.

In some chapters, the examples are grouped as follows:

- Non-circles Scenarios (for Primary 5 and Primary 6)
- Circles Scenarios (for Primary 6 only).

WORKING

"Working" shows heuristics application in action (how quick it is to solve a question).



EXPLANATION

"Explanation" shows the thought process (the detailed steps) behind the heuristics application. It takes readers through the solution in the following manner:

- step-by-step method so readers can follow what happens at every stage.
- systematic approach so readers begin to see a pattern in applying the technique.
- easy-to-follow steps so readers can quickly understand the technique minus the frustration.

For Spatial Visualisation, readers will see that its application always involves:

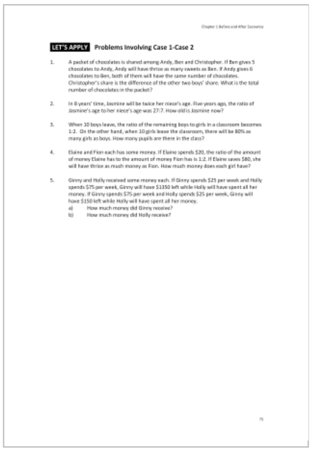
- identifying basic shapes, derivative shapes and parts of shapes,
- analysing how these are inter-related, and how these may be manipulated to arrive at the answer, and
- the application of formulae (as listed in the "Before You Begin" Chapter) to carry out the actual solution.

This quickly helps readers see and understand how to approach each question, including picking out hints often provided in the questions.

"Confusion Alert" boxes highlight areas where students are likely to falter or make mistakes in. It also gives the rationale to help clarify their doubts.

"Alternative" boxes show other approaches to the solution process. This acknowledges the different views that students may have to the problem.

LET'S APPLY



Learning is only effective with practice. Hence, at the end of each chapter/section is a list of questions to hone readers' skills in the heuristics technique.

Where applicable, questions are grouped as follows:

- Non-circles Scenarios (for Primary 5 and Primary 6)
- Circles Scenarios (for Primary 6 only).

ADDITIONAL TIPS

For on-going sharing and discussions on the use of Spatial Visualisation, visit:
www.facebook.com/mathsheuristics

For detailed workings to all the Spatial Visualisation "Let's Apply" sections, visit:
www.mathsheuristics.com/?page_id=472

BEFORE YOU BEGIN

THINGS TO NOTE

1. Where applicable, problems are grouped into Non-circles and Circles Scenarios.
   - **Non-circles Scenarios** are for **Primary 5 and Primary 6**.
   - **Circles Scenarios** are for **Primary 6 only**.

Chapter 2	Completely involves Circles Scenarios, hence entire chapter is for Primary 6 only.
Chapters 3, 5, 6 and 7	Problems in Examples and Let's Apply sections are grouped into Non-Circles and Circles Scenarios.

2. You need to be familiar with the various formulae for different
   basic shapes – rectangle, square, triangle, circle.
   However, the topic on circles is only covered at Primary 6.

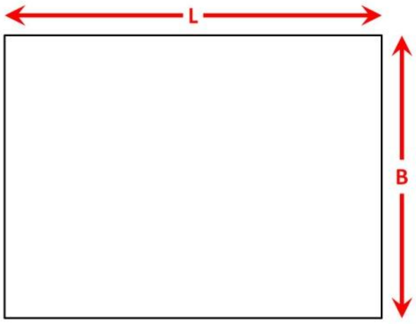
3. These formulae will also be needed when working with
   derivative shapes – semi-circle (half circle), quadrant (quarter circle), etc.

4. Challenging higher-order questions involve a **combination of shapes**.
   The combination sometimes forms a larger **composite shape**.

Examples of **combination of shapes**.	Examples of **composite shape**.
▪ A semi-circle, a $\frac{1}{4}$ circle and a triangle within a square. ▪ A square within a circle.	▪ 2 triangles, forming a square. ▪ Various squares and rectangles of different sizes, forming a square.

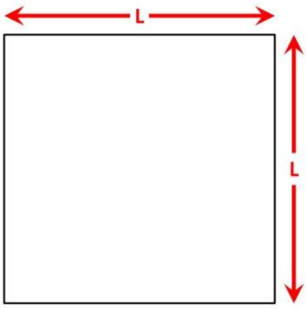
4. **Basic shapes** and their **formulae**.

a) **Rectangle**



Area	=	Length x Breadth
	=	L x B
Perimeter	=	2 Length + 2 Breadth
	=	2L + 2B
	=	2 (L + B)

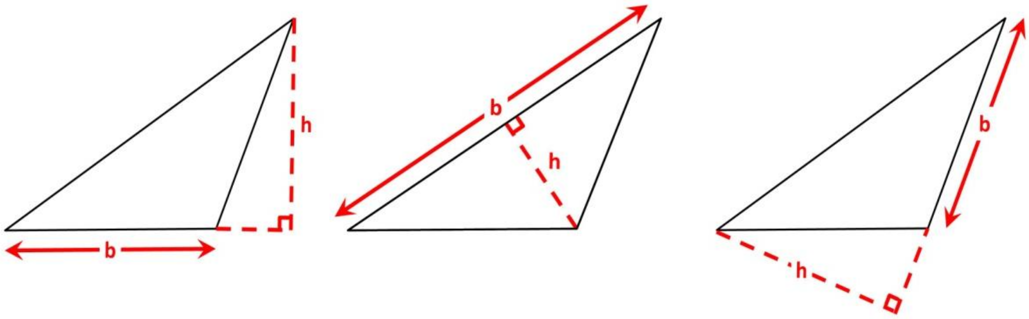
b) **Square**



Length = Breadth

Area	=	Length x Length
	=	L x L
Perimeter	=	4 x Length
	=	4 x L

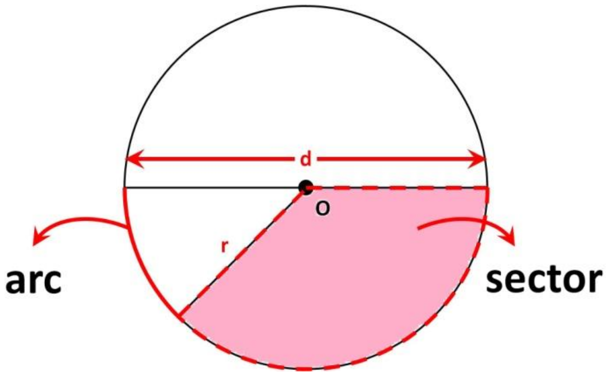
c) **Triangle**



Area	=	$\frac{1}{2}$ x Base x Height
	=	$\frac{1}{2}$ x b x h
Perimeter	=	Sum of 3 sides

($\frac{1}{2}$ bh)

d) **Circle**



Diameter	= 2 x radius	(2r)
Circumference	= π x diameter	(πd)
	= 2 x π x radius	(2πr)
Area	= π x radius x radius	(πr^2)

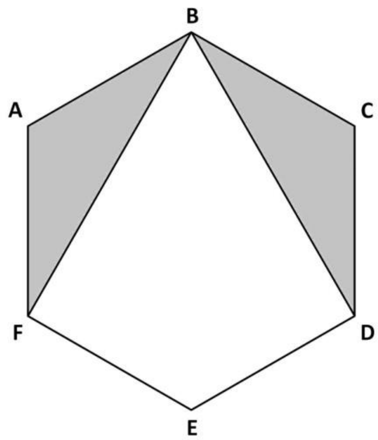
π can assume various forms.
Read the question carefully
to determine which form of π to apply.

- $\pi = 3.14$
- $\pi = \frac{22}{7}$
- Calculator π

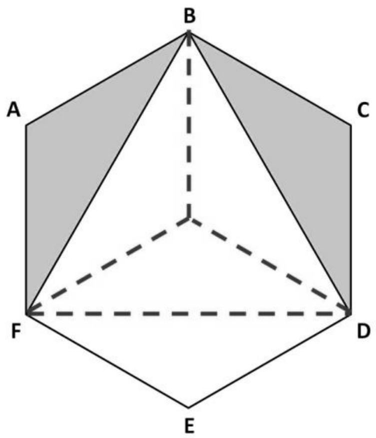
CHAPTER 1 REARRANGING PARTS: NON-CIRCLES

EXAMPLES

1. **In the figure below, AB = BC = CD = DE = EF = FA. The area of the whole figure is 120 cm². Find the area of the shaded part.**



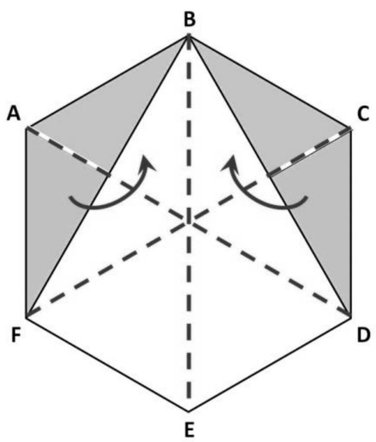
WORKING #1



6 parts = 120
2 parts shaded = $\frac{2}{6}$ x 120
= $\frac{1}{3}$ x 120
= 40

Area of the shaded part is 40cm^2.

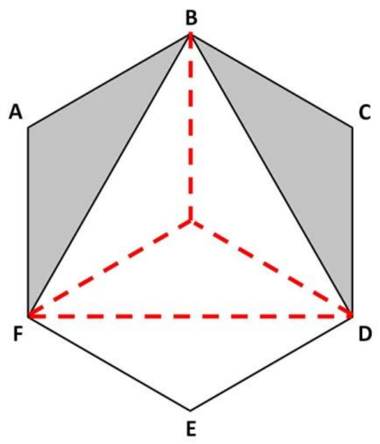
WORKING #2



6 parts = 120
2 parts shaded = $\frac{2}{6}$ x 120
= $\frac{1}{3}$ x 120
= 40

Area of the shaded part is 40cm^2.

EXPLANATION #1

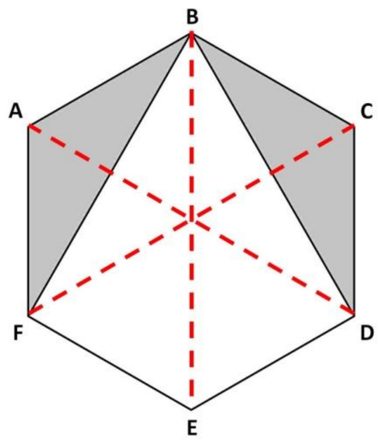


Draw lines as shown.
6 identical triangles are formed.

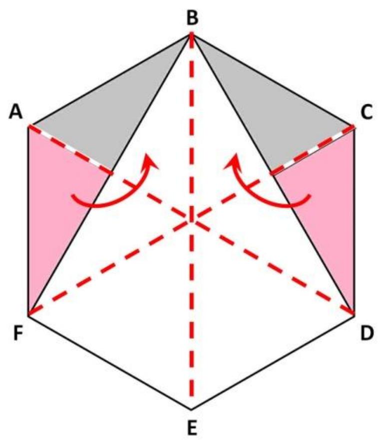
6 identical triangles = 120
2 identical triangles shaded = $\frac{2}{6}$ x 120
= $\frac{1}{3}$ x 120
= 40

Area of the shaded part is <u>40 cm²</u>.

EXPLANATION #2

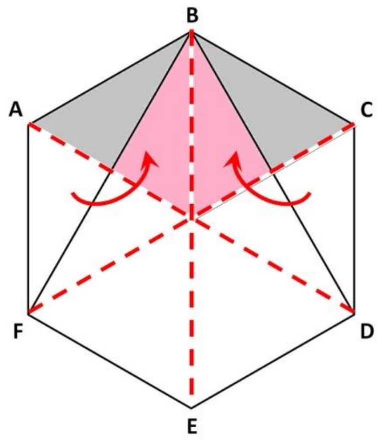


Draw lines as shown.
Looking at the newly-drawn lines,
6 identical segment triangles are formed.



Pay attention to the 2 parts shaded pink.

Each pink-shaded part has
a matching unshaded part.
Switch the corresponding parts.

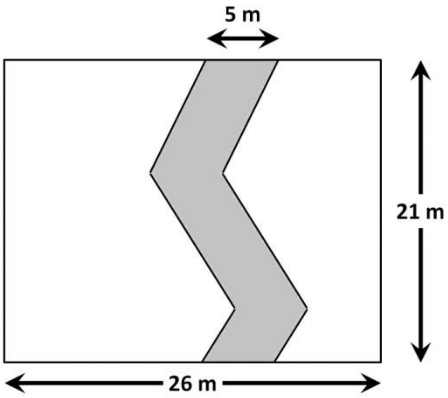


2 of the 6 identical segment triangles are shaded.

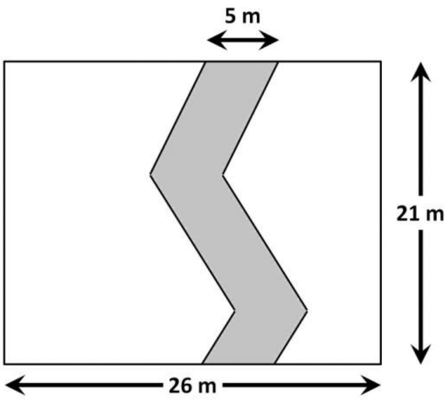
6 identical triangles	=	120
2 identical triangles shaded	=	$\frac{2}{6}$ x 120
	=	$\frac{1}{3}$ x 120
	=	40

Area of the shaded part is <u>40 cm^2</u>.

2. **A rectangular garden measuring 21 m by 26 m has a 5-m walking path running through it. Find the area of the walking path.**



WORKING



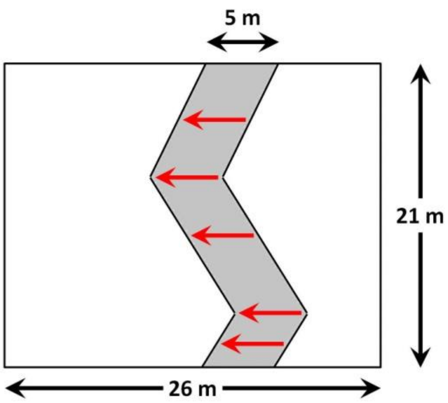
Garden and path = L x B
= 26 x 21
= 546

Garden only = L x B
= (26 – 5) x 21
= 21 x 21
= 441

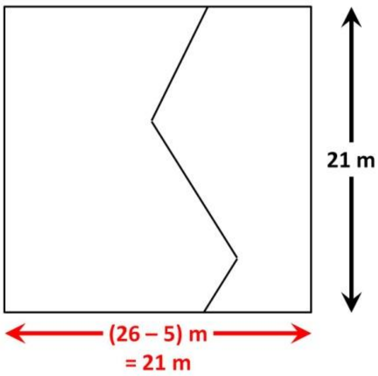
Path = 546 – 441
= 105

Area of the walking path is <u>105 m^2</u>

EXPLANATION



Remove the path and join the 2 garden parts.



This forms a shorter rectangle measuring 21 m by (26 – 5) m, that is 21 m by 21 m.

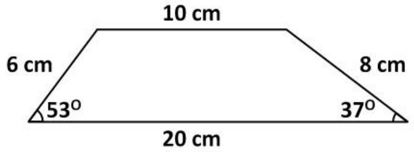
Longer rectangle = L x B
= 26 x 21
= 546

Shorter rectangle = L x B
= 21 x 21
= 441

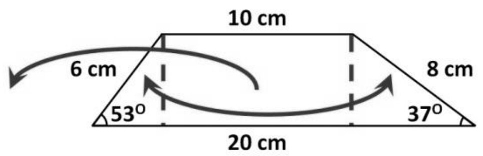
Path = Longer rectangle – Shorter rectangle
= 546 – 441
= 105

Area of the walking path is <u>105 m^2</u>.

3. **Find the area of the trapezium shown in the figure below.**



WORKING



The 2 triangles
= $\frac{1}{2}$ x B x H
= $\frac{1}{2}$ x 6 x 8
= 24

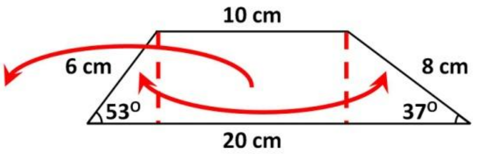
Base of the
2 triangles together
= 20 – 10
= 10
= Base of rectangle

Rectangle
= 2 x The 2 triangle
= 2 x 24
= 48

Trapezium
= The 2 triangles
+ Rectangle
= 24 + 48
= 72

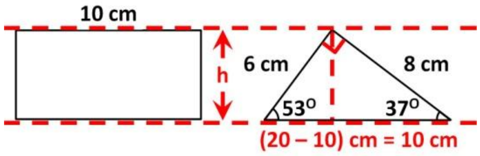
Area of the
trapezium is <u>72 cm^2</u>.

EXPLANATION



Draw lines as shown.

Separate the rectangle, and join the 2 triangles.



There are now 2 figures – the rectangle and a larger triangle.

Let's work on the larger triangle.

In the larger triangle, the angle at the top is $180^\circ - 53^\circ - 37^\circ$, that is 90°.

So, B = 6 and H = 8.

Larger triangle
$= \frac{1}{2} \times B \times H$
$= \frac{1}{2} \times 6 \times 8$
$= 24$

Let's work on the rectangle.

Larger triangle $= \frac{1}{2} \times B \times H$
$= \frac{1}{2} \times 10 \times h$
$= 5 \times h$

We already know that the larger triangle is 24 cm^2.

$5 \times h = 24$
$h = 24 \div 5$
$= 4.8$

Rectangle $= B \times H$
$= 10 \times 4.8$
$= 48$

Let's combine.

Trapezium
= Larger triangle + Rectangle
= 24 + 48
= 72

Area of the trapezium is <u>72 cm^2</u>.

ALTERNATIVE

Length of the rectangle
= Base of the larger triangle = 10

Breadth of the rectangle
= Height of the larger triangle = h

Larger triangle $= \frac{1}{2} \times B \times H$
$= \frac{1}{2} \times 10 \times h$

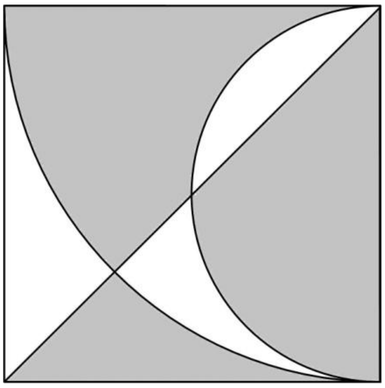
Rectangle $= L \times B$
$= 10 \times h$

So, rectangle = 2 x Larger triangle
= 2 x 24
= 48

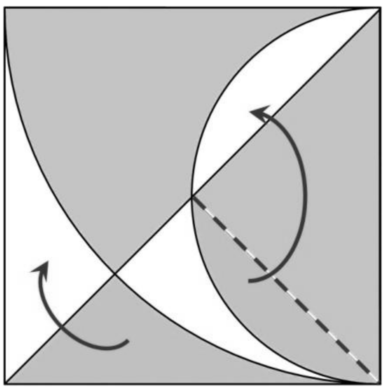
CHAPTER 2 REARRANGING PARTS: CIRCLES
(For Primary 6 only)

EXAMPLES

1. **The figure below shows a square, a quadrant and a semi-circle.**
The area of the square is 240 cm². Find the area of the shaded parts.
(Take π = 3.14)



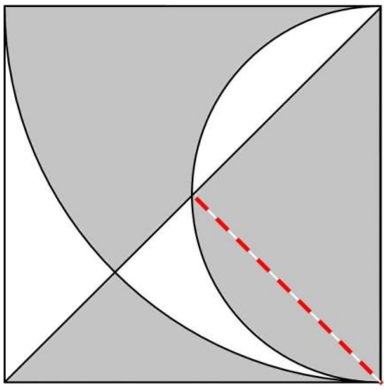
WORKING



$\frac{3}{4}$ square = $\frac{3}{4}$ x 240
= 180

Area of the shaded parts is <u>180 cm²</u>.

EXPLANATION

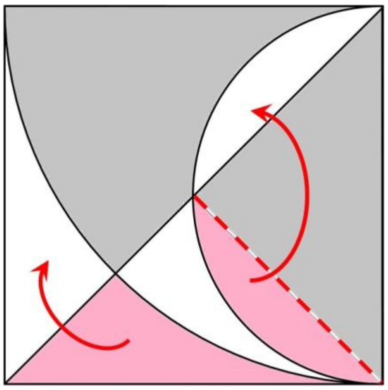


HINT

Clues are always in the question itself. Focus only on shapes mentioned in the question.

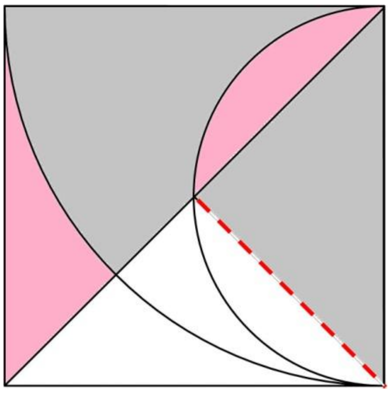
In this example, we can see triangles.
However, since the question does not mention anything about triangles,
we ignore the triangles.
Instead, we focus on the square,
quadrant and semi-circle
which are mentioned in the question.

Draw half a diagonal line as shown.

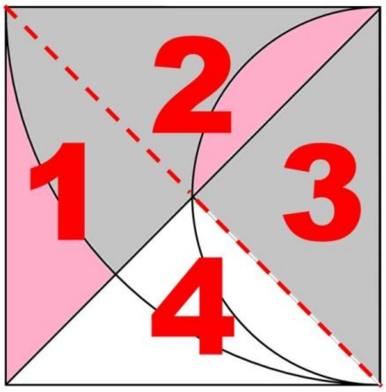


Pay attention to the 2 parts shaded pink.

Each pink-shaded part has
a mirror unshaded part.
Switch the corresponding parts.



This is what you will get.



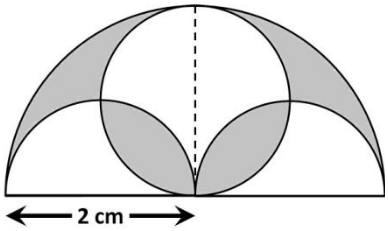
Extend the half diagonal into a full diagonal.
The square is now cut into 4 equal parts.

3 parts are shaded, while 1 part is unshaded.
$\frac{3}{4}$ of the square is shaded.

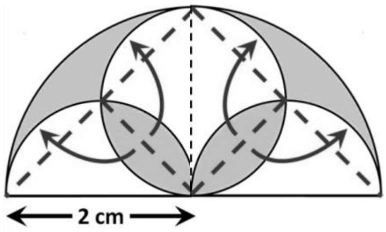
Whole square = 240
$\frac{3}{4}$ square = $\frac{3}{4}$ x 240
= 180

Area of the shaded parts is <u>180 cm²</u>.

2. **The figure below shows a big semi-circle, with a circle and 2 identical smaller semi-circles within it. Find the area of the shaded parts. (Take π=3.14)**



WORKING #1



$\frac{1}{2}$ shaded parts = Quadrant – Triangle

= $(\frac{1}{4} \times \pi r^2) - (\frac{1}{2} \times B \times H)$

= $(\frac{1}{4} \times 3.14 \times 2 \times 2) - (\frac{1}{2} \times 2 \times 2)$

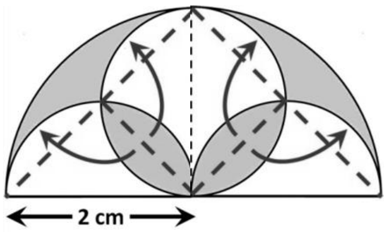
= 1.14

Shaded parts = 1.14 x 2

= 2.28

Area of the shaded parts is 2.28 cm^2.

WORKING #2



Shaded parts = Semi-circle – Triangle

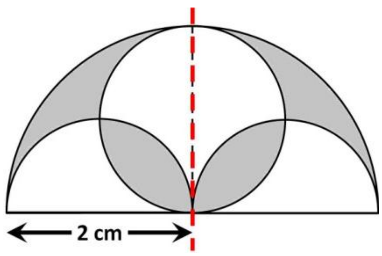
= $(\frac{1}{2} \times \pi r^2) - (B \times H)$

= $(\frac{1}{2} \times 3.14 \times 2 \times 2) - (4 \times 2)$

= 2.28

Area of the shaded parts is 2.28 cm^2.

EXPLANATION

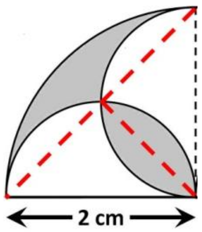


HINT

Clues are always in the question itself. Focus only on shapes mentioned in the question.

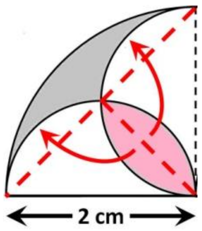
In this example, we focus on the big semi-circle, circle and 2 identical smaller semi-circles which are mentioned in the question.

Note how the semi-circle is made up of 2 quadrants which are mirror image of each other.



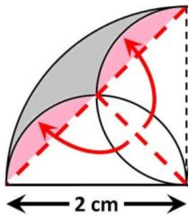
Let’s look at one of the quadrants.

Draw lines as shown.



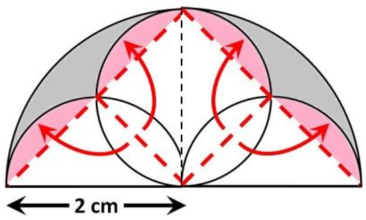
Pay attention to the 2 parts shaded pink.

Each pink-shaded part has
a matching unshaded part.
Switch the corresponding parts.



This is what you will get.

Shaded parts = Quadrant – Triangle
= $(\frac{1}{4} \times \pi r^2) - (\frac{1}{2} \times B \times H)$
= $(\frac{1}{4} \times 3.14 \times 2 \times 2) - (\frac{1}{2} \times 2 \times 2)$
= 1.14



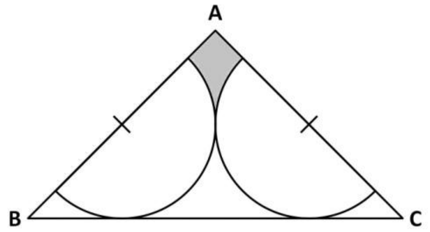
Remember there are 2 identical quadrants.
Total shaded parts = 1.14 x 2
= 2.28

ALTERNATIVE

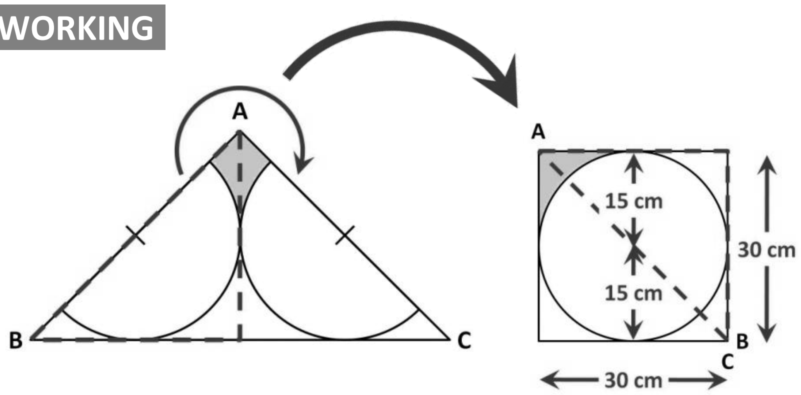
Shaded parts = Semi-circle – Triangle
= $(\frac{1}{2} \times \pi r^2) - (B \times H)$
= $(\frac{1}{2} \times 3.14 \times 2 \times 2) - (4 \times 2)$
= 2.28

Area of the shaded parts is 2.28 cm^2.

3. **The diagram below shows an isosceles triangle ABC with 2 semi-circles within it. The semi-circles have a radius of 15 cm. Find the area of the shaded part. (Take π as 3.14)**



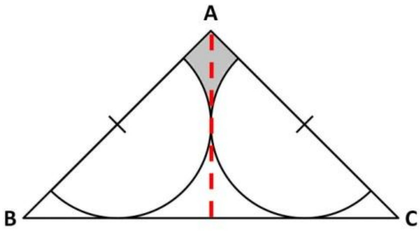
WORKING



Square	=	L x B
	=	30 x 30
	=	900
Circle	=	πr^2
	=	(3.14 x 15 x 15)
	=	706.5
4 corners	=	Square – Circle
	=	900 – 706.50
	=	193.50
1 corner	=	$\frac{1}{4}$ x 193.50
	=	48.375

The shaded area is <u>48.475 cm^2</u>.

EXPLANATION

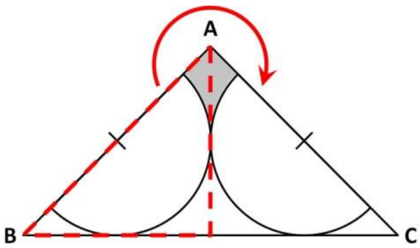


HINT

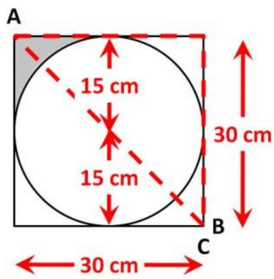
Clues are always in the question itself. Focus only on shapes mentioned in the question.

In this example, we focus on the triangle and 2 semi-circles which are mentioned in the question.

Note how the triangle is made up of 2 smaller triangles which are mirror image of each other.



Rotate the left smaller triangle clockwise on Point A, until Point B touches Point C.



This is what you will get.

Square	=	L x B
	=	30 x 30
	=	900
Circle	=	πr^2
	=	(3.14 x 15 x 15)
	=	706.5
4 corners	=	Square – Circle
	=	900 – 706.50
	=	193.50
1 corner	=	$\frac{1}{4}$ x 193.50
	=	48.375

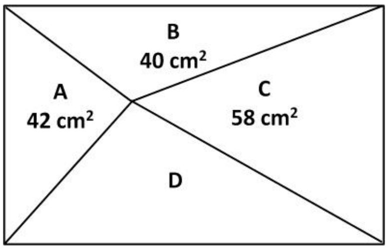
The shaded area is <u>48.475 cm^2</u>.

CHAPTER 3 DRAWING LINES

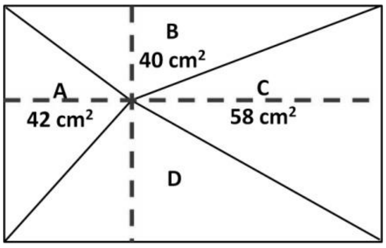
EXAMPLES

NON-CIRCLES SCENARIOS

1. The figure below shows a rectangle that is cut into 4 triangles A, B, C and D. Find the area of triangle D.



WORKING

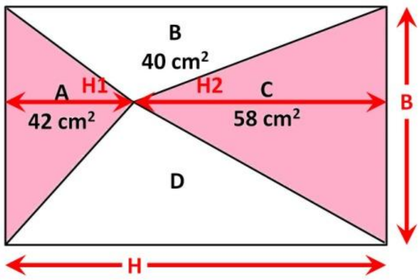


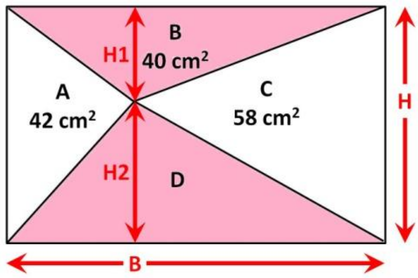
A + C = $\frac{1}{2}$ rectangle
B + D = $\frac{1}{2}$ rectangle

B + D = A + C
40 + D = 42 + 58
40 + D = 100
D = 100 – 40
D = 60

Area of triangle D is <u>60 cm^2</u>.

EXPLANATION #1





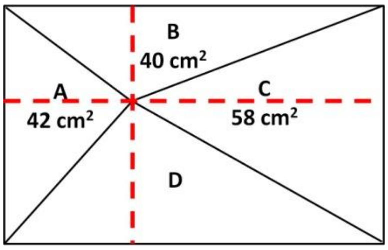
A + C = $(\frac{1}{2} \times B \times H1) + (\frac{1}{2} \times B \times H2)$
= $\frac{1}{2} \times B \times (H1 + H2)$
= $\frac{1}{2} \times B \times H$ ← Since H = H1 + H2
= $\frac{1}{2}$ rectangle

B + D = $(\frac{1}{2} \times B \times H1) + (\frac{1}{2} \times B \times H2)$
= $\frac{1}{2} \times B \times (H1 + H2)$
= $\frac{1}{2} \times B \times H$ ← Since H = H1 + H2
= $\frac{1}{2}$ rectangle

That means B + D = A + C
40 + D = 42 + 58
40 + D = 100
D = 100 – 40
D = 60

Area of triangle D is <u>60 cm^2</u>.

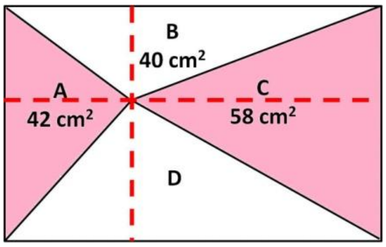
EXPLANATION #2

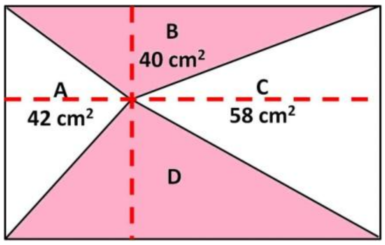


Draw lines as shown.
The rectangle is divided into
4 small rectangles of different sizes.

Within each small rectangle is a diagonal line.
Each diagonal line cuts its
respective small rectangle into 2 equal parts.
That means, any 1 part is $\frac{1}{2}$ its
respective small rectangle.

Logically, if we take $\frac{1}{2}$ of every small rectangle and
combine those areas, we get $\frac{1}{2}$ the rectangle.
You can take $\frac{1}{2}$ of every small rectangle as follows.





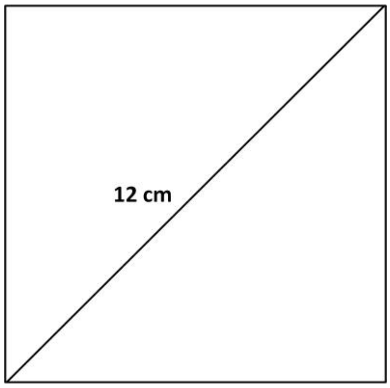
A + C = $\frac{1}{2}$ rectangle

B + D = $\frac{1}{2}$ rectangle

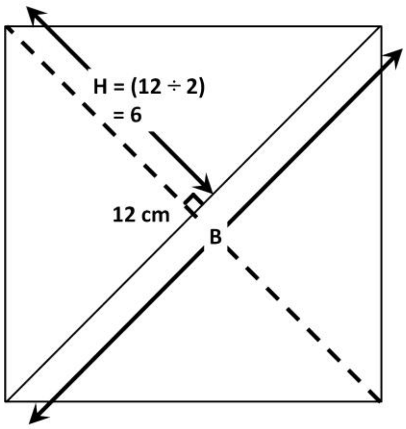
That means B + D = A + C
40 + D = 42 + 58
40 + D = 100
D = 100 – 40
D = 60

Area of triangle D is <u>60 cm^2</u>.

2. **Find the area of a square whose diagonal is 12 cm.**



WORKING

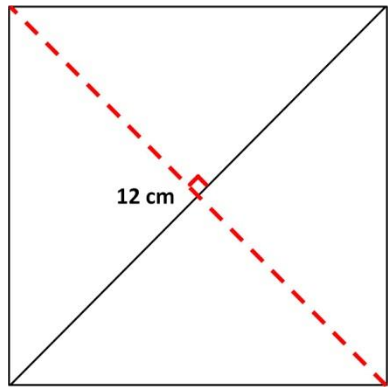


Triangle = $\frac{1}{2}$ x 12 x 6
= 36

Square = 2 x 36
= 72

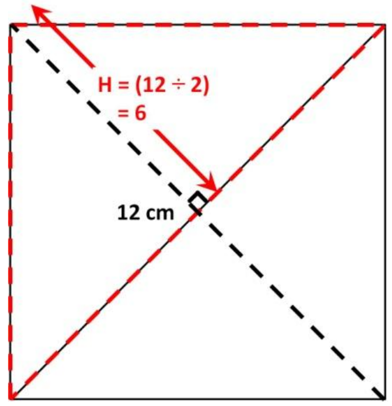
Area of the square is <u>72 cm^2</u>.

EXPLANATION



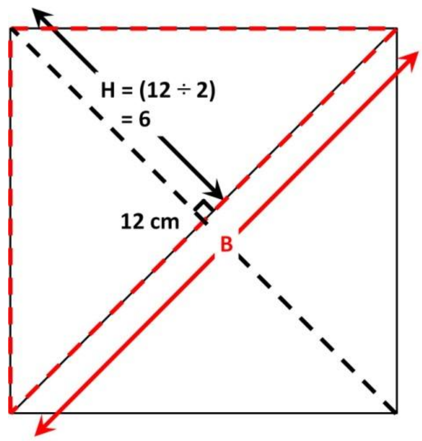
The diagonal divides the square into
2 identical triangles.

Draw line as shown.
This line is also a diagonal of the square, measuring 12 cm.



Let's look at one of the triangles.

Height of triangle = $\frac{1}{2}$ diagonal
= 12 ÷ 2
= 6



Triangle = $\frac{1}{2}$ x B x H
= $\frac{1}{2}$ x 12 x 6
= 36

Square = 2 x Triangles
= 2 x 36
= 72

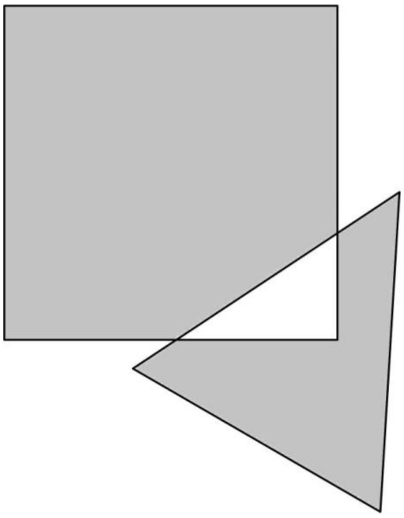
Area of the square is <u>72 cm^2</u>.

CHAPTER 5 DIFFERENCE IN AREA

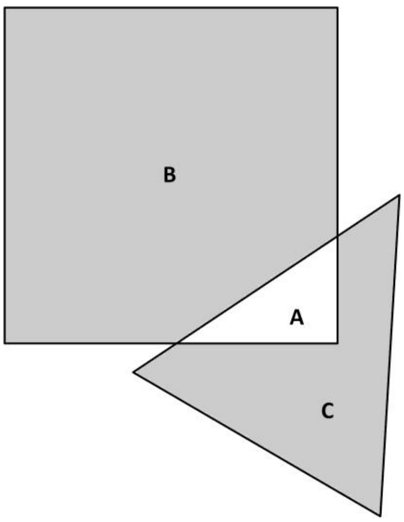
EXAMPLES

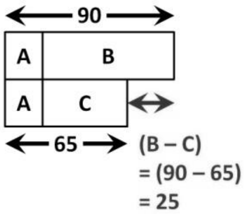
NON-CIRCLES SCENARIOS

1. **The figure below shows a square and a triangle overlapping each other partially. The area of the square and triangle is 90cm² and 65cm² respectively. Find the difference between the two shaded areas.**



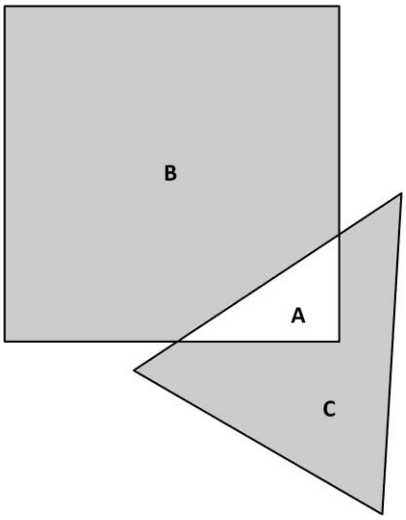
WORKING





The difference between the two shaded areas is <u>25 cm^2</u>.

EXPLANATION

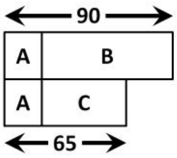


Label the parts as shown.

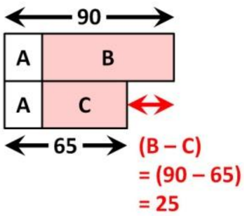
Using the model method,
draw all the information.

Square: A + B = 90

Triangle: A + C = 65



Visually, it is obvious that we can find out what is (B – C), which is what we want – the difference between B and C.



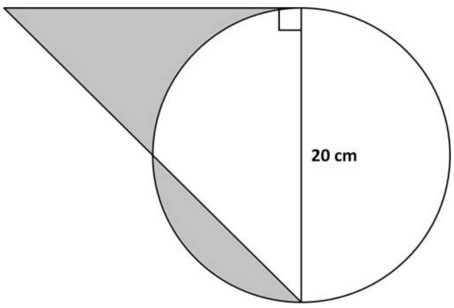
ALTERNATIVE

Square:	A + B	=	90
Triangle:	A + C	=	65
Square – Triangle:	(A + B) – (A + C)	=	(90 – 65)
	B – C	=	25

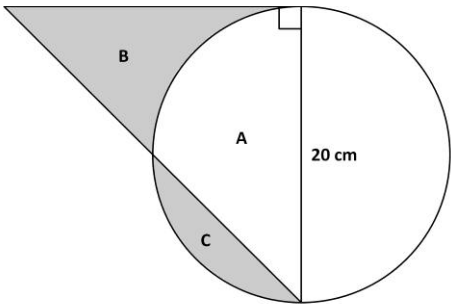
The difference between
the two shaded areas is <u>25 cm^2</u>.

CIRCLES SCENARIOS ***(For Primary 6 only)***

2. **The figure is formed by a circle of diameter 20 cm and a right-angled isosceles triangle. Find the difference in the area between the two shaded parts. (Take π = 3.14)**

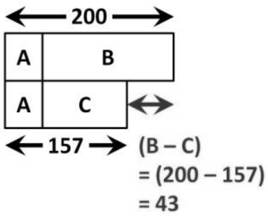


WORKING



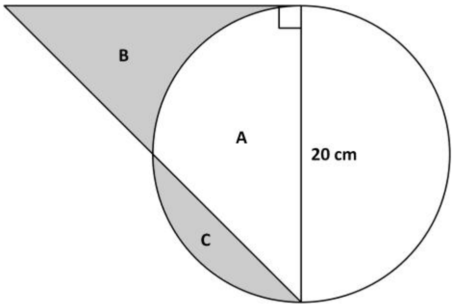
$$A + B = \frac{1}{2} \times B \times H$$
$$= \frac{1}{2} \times 20 \times 20$$
$$= 200$$

$$A + C = \frac{1}{2} \times 3.14 \times 10 \times 10$$
$$= 157$$



The difference between
the two shaded areas is <u>43 cm^2</u>.

EXPLANATION



Label the parts as shown.

Triangle: A + B $= \frac{1}{2} \times B \times H$

$= \frac{1}{2} \times 20 \times 20$

$= 200$

Radius of circle $= 20 \div 2$

$= 10$

Semi-circle: A + C $= \frac{1}{2} \times \pi r^2$

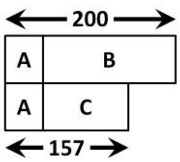
$= \frac{1}{2} \times 3.14 \times 10 \times 10$

$= 157$

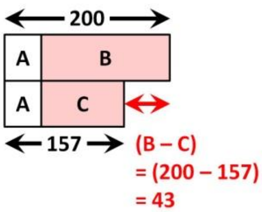
Using the model method,
draw all the information.

Triangle: A + B = 200

Semi-circle: A + C = 157



Visually, it is obvious that we can
find out what is (B – C),
which is what we want
– the difference between B and C.



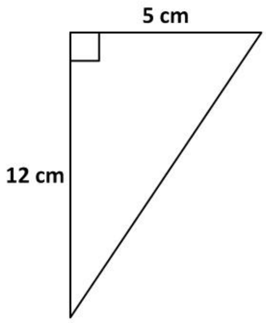
The difference between
the two shaded areas is <u>43 cm²</u>.

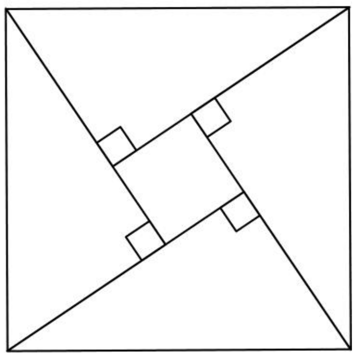
CHAPTER 7 VISUAL CLUES

EXAMPLES

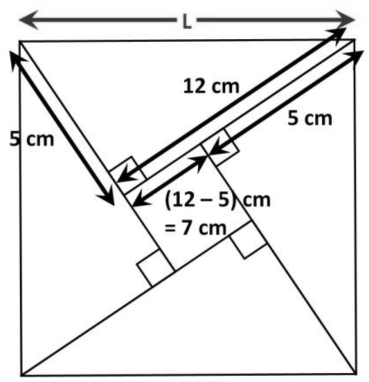
NON-CIRCLES SCENARIOS

1. **The diagram below shows 4 right-angled triangles arranged to form a big square.**
Each triangle has a base of 5 cm and height of 12 cm.
Find the perimeter of the big square.





WORKING



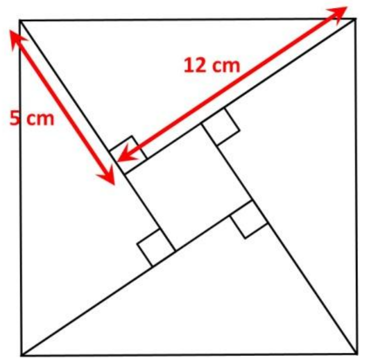
4 triangles:	$4 \times (\frac{1}{2} \times 5 \times 12)$	=	120
Small square:	7 x 7	=	49
Big square:	120 + 49	=	169

L x L = 169
If L = 12 12 x 12 = 144
If L = 13 13 x 13 = 169
Hence, L = 13.

Perimeter of big square = 4 x L
= 4 x 13
= 52

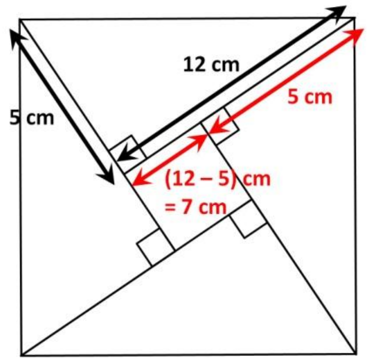
Perimeter of the big square if <u>52 cm</u>.

EXPLANATION



1 triangle: $\frac{1}{2}$ x B x H = $\frac{1}{2}$ x 5 x 12
= 30

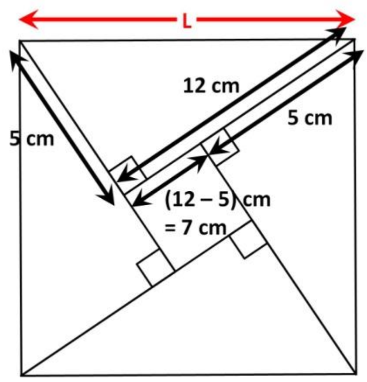
4 triangles: 4 x 30 = 120



Side of small square: 12 – 5 = 7

Small square: L x L = 7 x 7
= 49

Big square: 4 triangles + Small square
= 120 + 49
= 169



Let's look at the big square.

Big square = L x L
So, L x L = 169
Use Guess-and-Check method to find out what is L.
If L = 12 12 x 12 = 144 ➔ Need bigger number.
If L = 13 13 x 13 = 169
Hence, L = 13

Perimeter of big square = 4 x L
= 4 x 13
= 52

Perimeter of the big square if 52 cm.

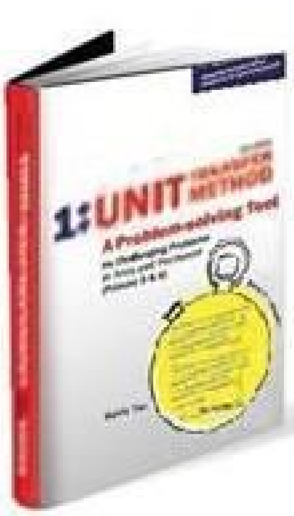
The Series

The Mastering Heuristics Series was conceptualised by Sunny Tan, Principal Trainer of mathsHeuristics™, to give parents and students a comprehensive guide to Heuristics. The Series neatly packages Heuristics techniques into a series of guidebooks with well-defined application scenarios. It offers many examples, showing the efficiency and step-by-step application of Heuristics techniques, plus opportunities to get in some practice.

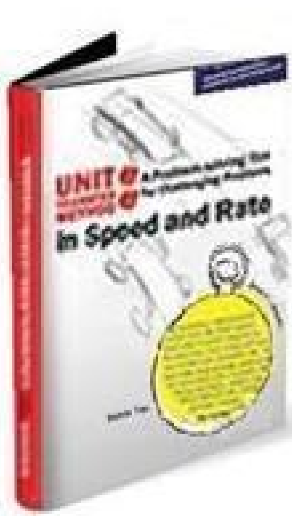
This particular guidebook, Spatial Visualisation teaches the use of visualisation techniques to effectively analyse, manipulate and solve challenging problems in Area & Perimeter.

Each guidebook in the series is a standalone publication. For students enrolled in mathsHeuristics™ programmes, each book serves as a study companion, while keeping parents well-informed of what their children are learning.

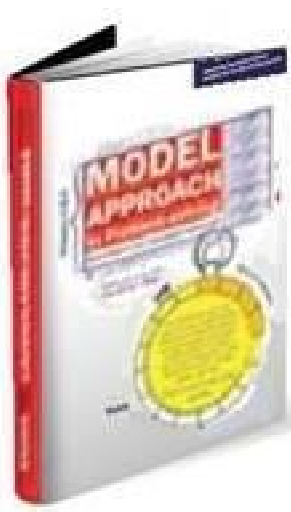
Other Titles in the Series



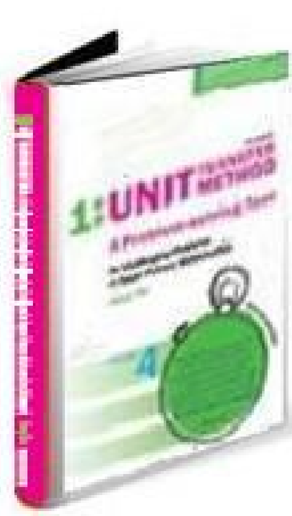
Unit Transfer Method @ P5 & P6



Unit Transfer Method (Speed & Rate) @ P6



Model Approach to Problem-solving



Unit Transfer Method @ P4

Author

Sunny Tan trains students, especially those in the PSLE year, in the use of various Heuristics techniques. He also conducts Heuristics workshops for parents and educators.

In the 1990s, NIE-trained Sunny taught primary and secondary Maths in various streams. He observed how the transformed primary Maths syllabus stumped children, parents and, sometimes, even teachers. How do you teach young children to accurately choose and sequentially apply different situational logic in solving non-routine problems? Sunny resolved to simplify the learning and application of such skills. After a few years of research and development, Sunny eventually established the mathsHeuristics™ programme – and now the Mastering Heuristics Series – which has achieved consistent success and effectiveness.

Sunny's ingenious methodology has attracted much media interest – The Straits Times, The Business Times, The New Paper, TODAY, FM938 LIVE and major parenting magazines – as well as raving reviews by academia and parents.

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