maths@mavis

INTEGRATED MATHEMATICS

GEOMETRY & MENSURATION

For

SECONDARY 1

SAMPLE

ALEX LIM
Master Trainer at
Mavis Tutorial Centre

Integrated Mathematics GEOMETRY & MENSURATION for Secondary 1

New Edition 2018

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Published and Distributed by:

Singapore Asia Publishers Pte Ltd
219 Henderson Road #10-04
Henderson Industrial Park
Singapore 159556
Tel : +65 6276 8280
Fax : +65 6276 8292
Email: info.sg@sapgrp.com
Website: www.sapgrp.com
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ISBN-13 978-981-3210-45-5
ISBN-10 981-3210-45-1

Printed under licence in Australia by Five Senses Education Pty Ltd

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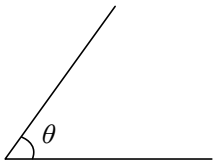
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1 Angles and Triangles

Types of angles

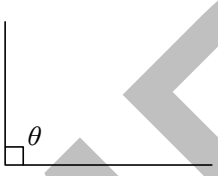
Acute angle

$0^\circ < \theta < 90^\circ$



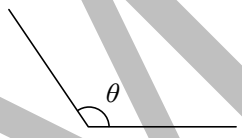
Right angle

$\theta = 90^\circ$



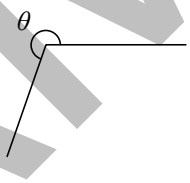
Obtuse angle

$90^\circ < \theta < 180^\circ$



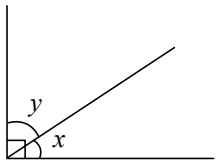
Reflex angle

$180^\circ < \theta < 360^\circ$



Complementary angle

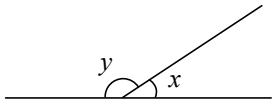
Complementary angles are angles which add up to 90°.
$\angle x + \angle y = 90^\circ$



A clue to remember complementary angles: the letter "*c*" stands for the word "corner".

Supplementary angle

Supplementary angles are angles which add up to 180°.
$\angle x + \angle y = 180^\circ$



A clue to remember supplementary angles: the letter "*s*" stands for the word "straight".

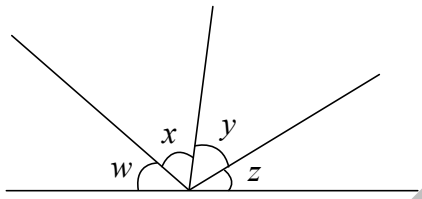
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Properties of angles

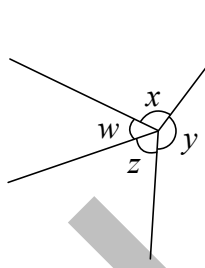
Angles on a straight line

$\angle w + \angle x + \angle y + \angle z = 180^\circ$
($\angle$s on str. line)



Angles at a point

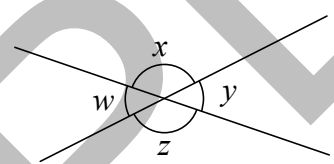
$\angle w + \angle x + \angle y + \angle z = 360^\circ$
($\angle$s at a pt.)



Vertically opposite angles

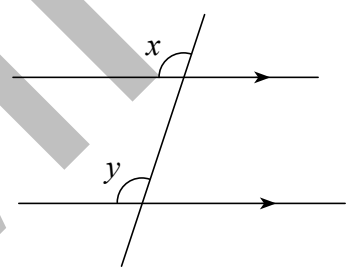
$\angle w = \angle y$ (vert. opp. $\angle$s)

$\angle x = \angle z$ (vert. opp. $\angle$s)



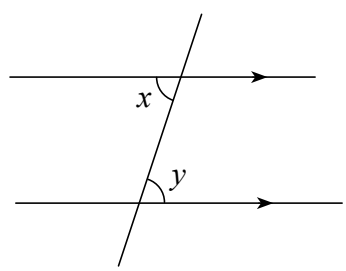
Corresponding angles

$\angle x = \angle y$ (corr. $\angle$s)



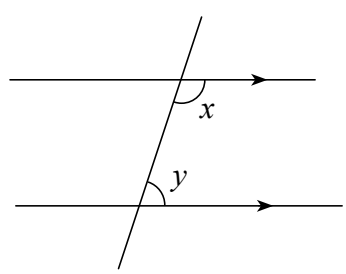
Alternate angles

$\angle x = \angle y$ (alt. $\angle$s)



Interior angles

$\angle x + \angle y = 180^\circ$ (int. $\angle$s)

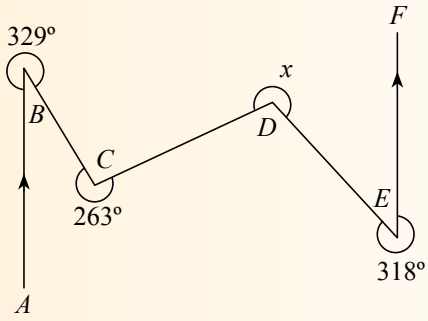


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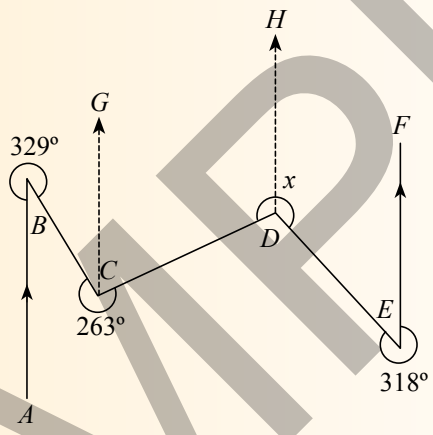
Example 1

Find the value of x.



Solutions:

In similar questions, we draw parallel lines to simplify the questions.



$\angle ABC = 360° - 329°$ ($\angle$s at a pt.)
$= 31°$

$\angle BCG = 31°$ (alt. $\angle$s)

$\angle GCD = 360° - 263° - 31°$ ($\angle$s at a pt.)
$= 66°$

$\angle HDC = 180° - 66°$ (int. $\angle$s)
$= 114°$

$\angle FED = 360° - 318°$ ($\angle$s at a pt.)
$= 42°$

$\angle HDE = 180° - 42°$ (int. $\angle$s)
$= 138°$

$x = \angle HDC + \angle HDE$ (adj. $\angle$s)
$= 114° + 138°$
$= 252°$

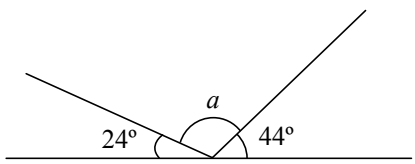
Important to state reasons!

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1 Write the reasons in the blanks to support the statements.

a

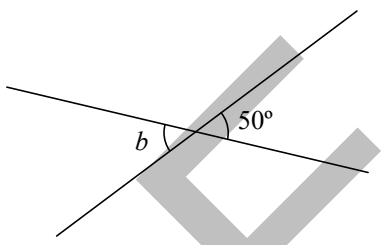


$a + 44° + 24° = 180°$

$a = 112°$

(_____)

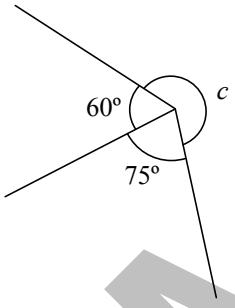
b



$b = 50°$

(_____)

c

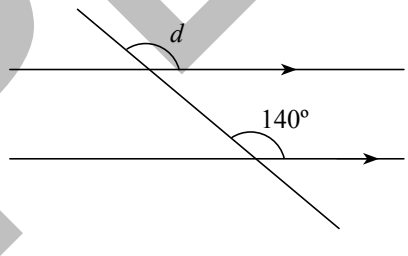


$c + 60° + 75° = 360°$

$c = 225°$

(_____)

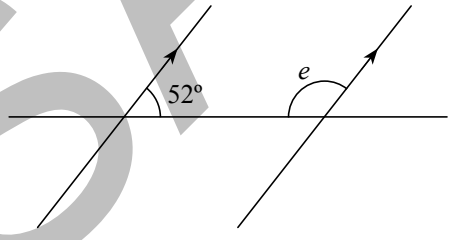
d



$d = 140°$

(_____)

e



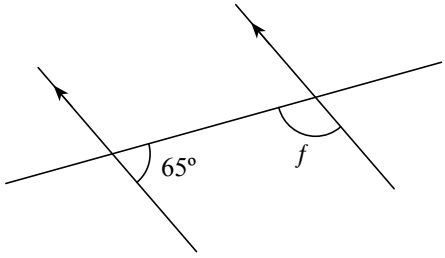
$e + 52° = 180°$

$e = 180° - 52°$

$e = 128°$

(_____)

f



$65° + f = 180°$

$f = 115°$

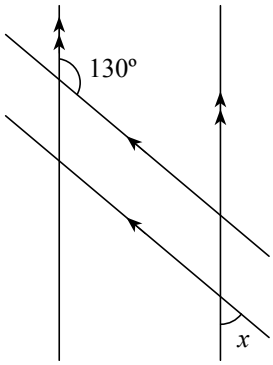
(_____)

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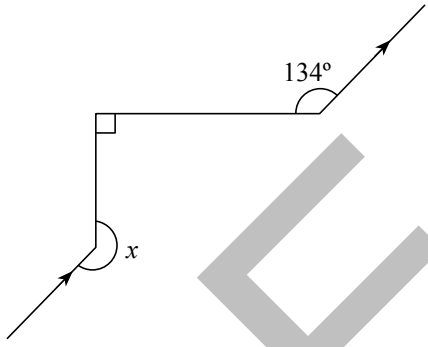
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2 Find the unknown angles, x and/or y.

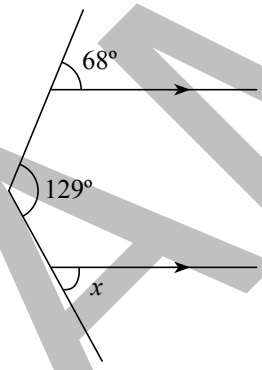
a



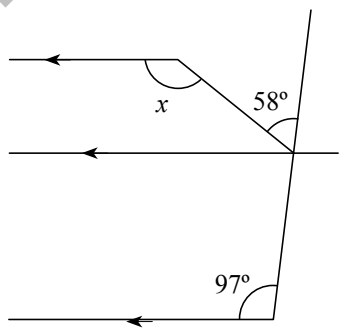
b



c

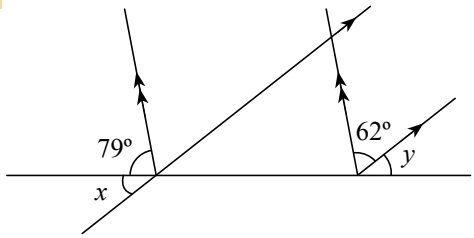


d

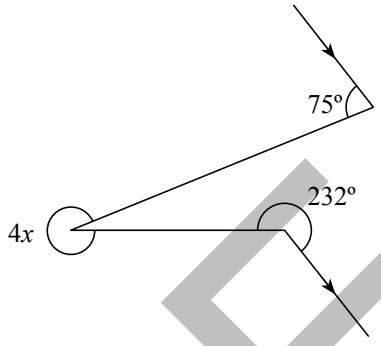


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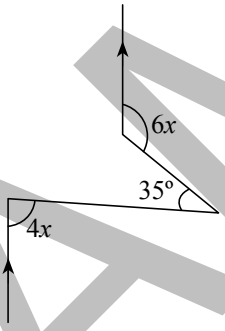
e



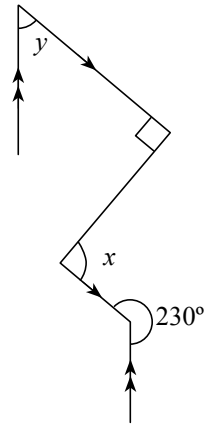
f



g

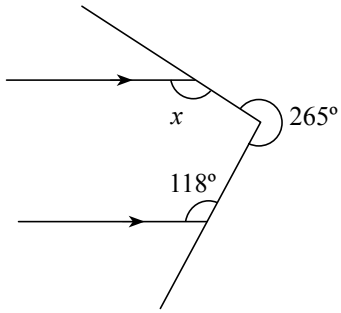


h

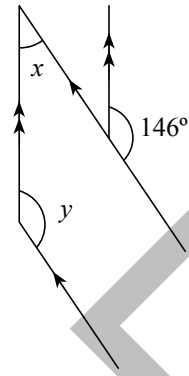


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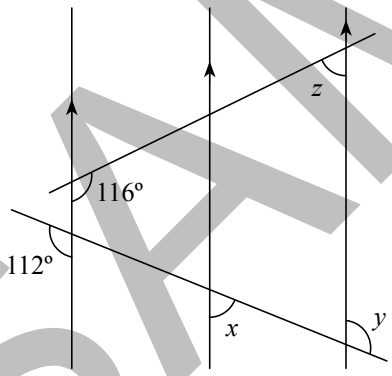
i



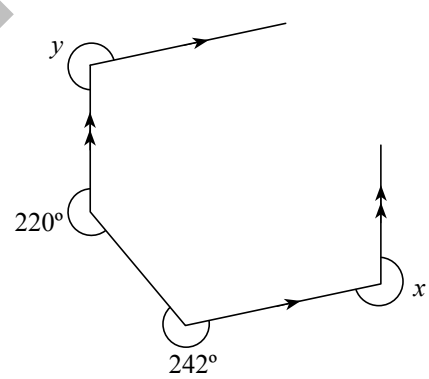
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l



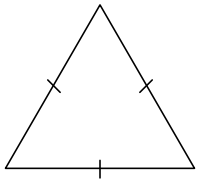
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Types of triangles

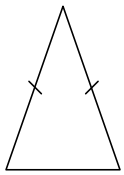
Equilateral triangle

(a) All 3 sides are equal.
(b) Every angle is equal to 60º.



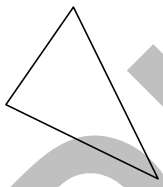
Isosceles triangle

(a) There are 2 equal sides.
(b) The 2 base angles are equal.



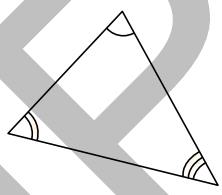
Scalene triangle

(a) All sides are not equal.
(b) All angles are not equal.



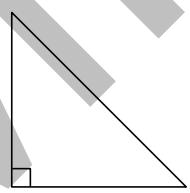
Acute-angled triangle

All 3 angles are acute.



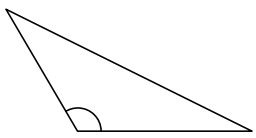
Right-angled triangle

One angle is a right angle.



Obtuse-angled triangle

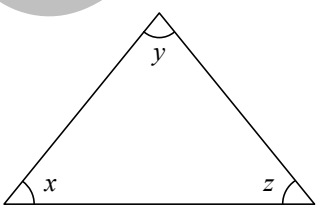
One angle is obtuse.



Angle properties of triangles

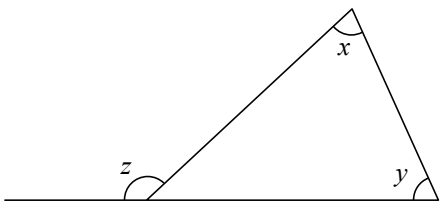
Sum of angles in a triangle

$\angle x + \angle y + \angle z = 180^\circ$ (sum of $\angle$s in Δ)



Exterior angles of a triangle

$\angle x + \angle y = \angle z$ (ext. $\angle$s of Δ)

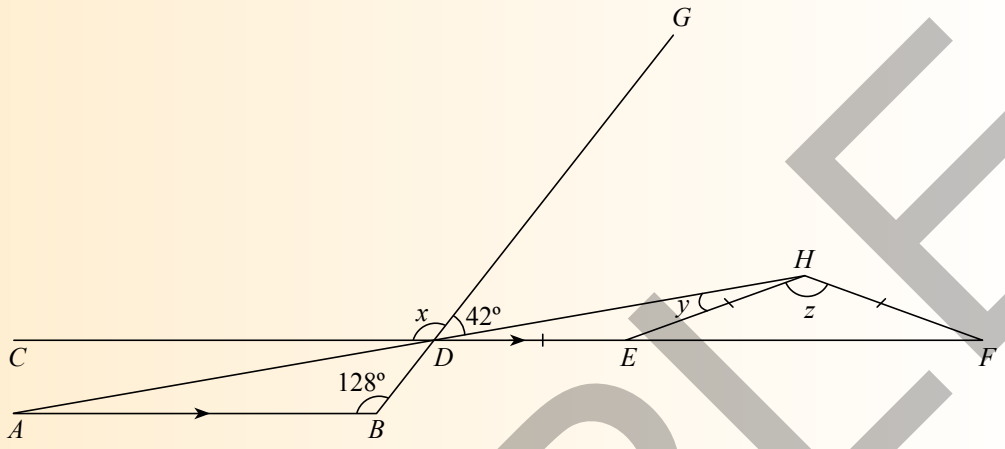


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Example 2

In the diagram, AB is parallel to $CDEF$, $ED = EH = HF$, $\angle ABD = 128^\circ$ and $\angle GDH = 42^\circ$. Find the values of x, y and z.



Solutions:

$x = 128^\circ$ (corr. $\angle$s)

$\angle HDE = 180^\circ - 42^\circ - x$ ($\angle$s on str. line)
$= 10^\circ$

$y = 10^\circ$ (base $\angle$s of isos. Δ)

$\angle HEF = 10^\circ + 10^\circ$ (ext. $\angle$s of Δ)
$= 20^\circ$

$\angle HFE = 20^\circ$ (base $\angle$s of isos. Δ)

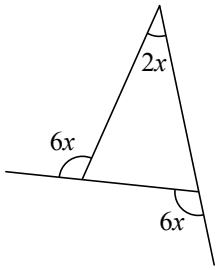
$z = 180^\circ - \angle HEF - \angle HFE$ (sum of $\angle$s in Δ)
$= 140^\circ$

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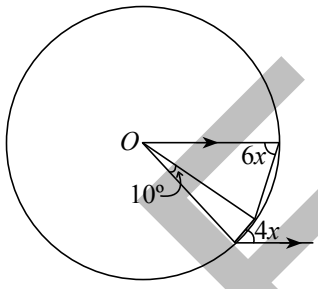
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3 Find the values of x, y and/or z in the following figures.

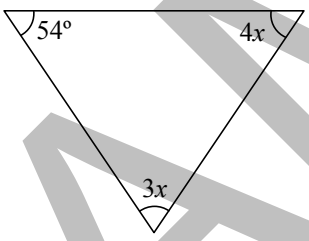
a



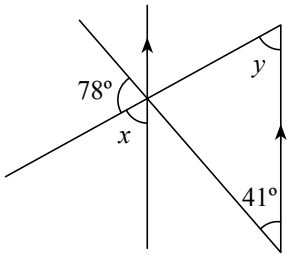
b



c



d



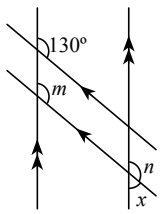
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TOPIC 1

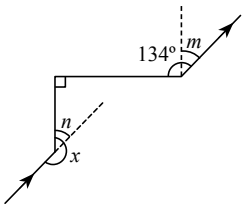
1. (a) ∠s on str. line
   (b) vert. opp. ∠s
   (c) ∠s at a pt.
   (d) corr. ∠s
   (e) int. ∠s
   (f) int. ∠s

2. (a)



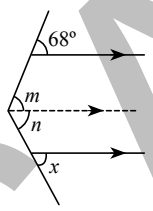
$m = 130°$ (corr. ∠s)
$n = 130°$ (corr. ∠s)
$x = 180° - 130°$ (∠s on str. line)
$= 50°$

(b)



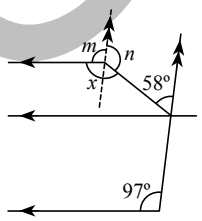
$m = 134° - 90°$ (adj. ∠s)
$= 44°$
$n = 44°$ (corr. ∠s)
$x = 180° + 44°$ (adj. ∠s)
$= 224°$

(c)



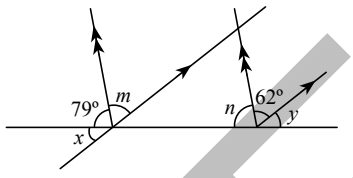
$m = 68°$ (corr. ∠s)
$n = 129° - 68°$ (adj. ∠s)
$= 61°$
$x = 61°$ (corr. ∠s)

(d)



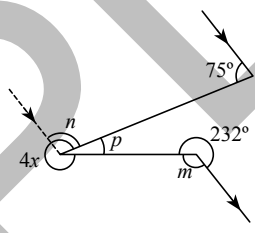
$m = 97°$ (corr. ∠s)
$n = 180° - 58°$ (int. ∠s)
$= 122°$
$x = 360° - 97° - 122°$ (∠s at a pt.)
$= 141°$

(e)



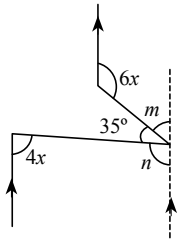
$m = 62°$ (corr. ∠s)
$x = 180° - 79° - 62°$ (∠s on str. line)
$= 39°$
$n = 79°$ (corr. ∠s)
$y = 180° - 79° - 62°$ (∠s on str. line)
$= 39°$

(f)



$m = 360° - 232°$ (∠s at a pt.)
$= 128°$
$n = 180° - 75°$ (int. ∠s)
$= 105°$
$p = 128° - 105°$ (adj. ∠s)
$= 23°$
$4x = 360° - 23°$ (∠s at a pt.)
$4x = 337°$
$x = 84.25°$

(g)



$m = 180° - 6x$ (int. ∠s)
$n = 180° - 4x$ (int. ∠s)
$m + n + 35° = 180°$ (∠s on str. line)
$180° - 6x + 180° - 4x + 35° = 180°$
$395° - 10x = 180°$
$-10x = -215°$
$x = 21.5°$

SAMPLE

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