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education

Department of Education
FREE STATE PROVINCE

LEARNER NAME: _____

SUBJECT	:	MATHEMATICS
CLASS	:	GRADE 9
TASK	:	INFORMAL ACTIVITIES GEOMETRY OF STRAIGHT LINES
DURATION	:	TERM 2
NUMBER	:	15 ACTIVITIES

This document consists of 63 pages including cover page

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ACKNOWLEDGEMENTS

Acknowledgement is made to the following authors, whose books were referred to during the compilation of this document.

MD, Phillips., J, Basson., J, Odendaal. (2015) Mind Action Series Mathematics Grade 8 and 9 3rd edn., Sanlamhof: Allcopy Publishers.

Kevin Smith. (2017) Maths Handbook and Study Guide. Berlut Books CC.

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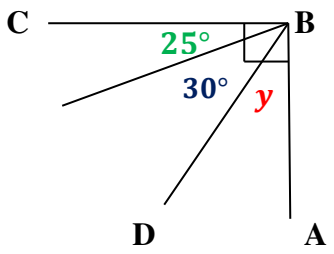
CLASSWORK 1 DATE:

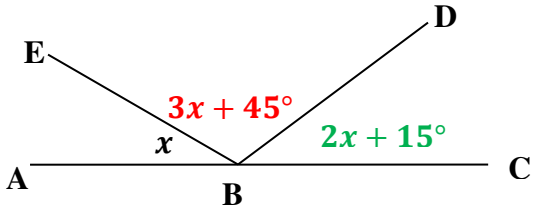
BASELINE ASSESSMENT

Determine with reasons the value of the unknown small letters:

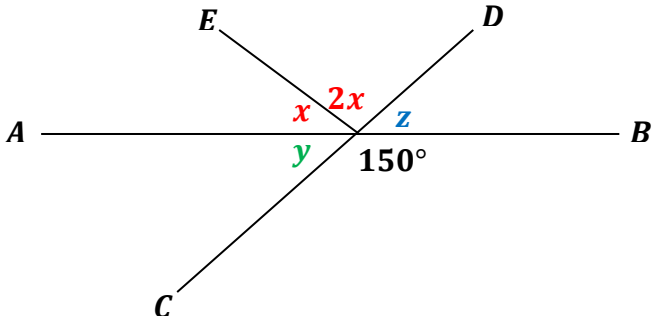
1. **Level 1**



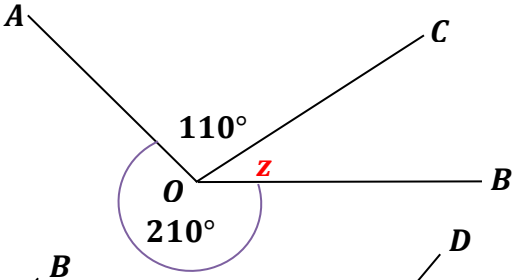
2. **Level 3**



3. **Level 1/2**



4. **Level 1**



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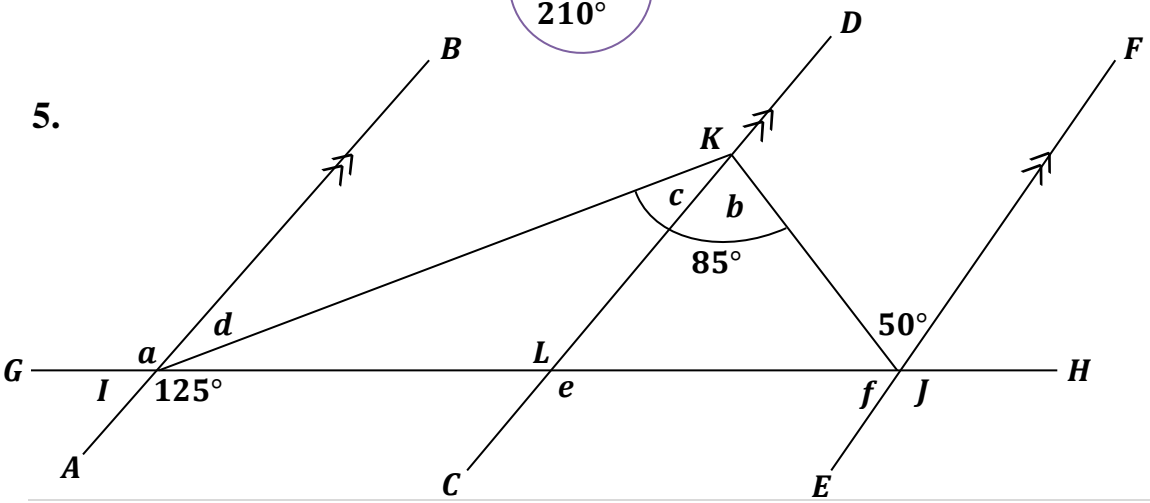

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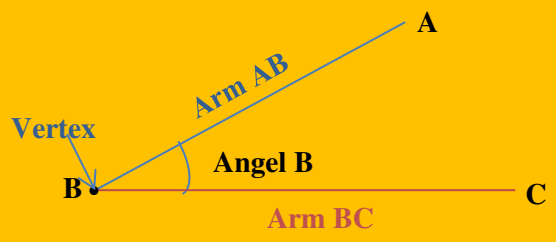
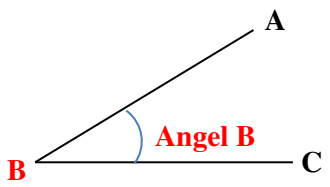
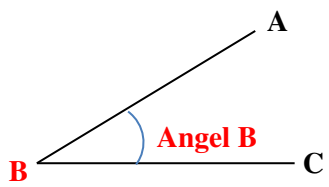
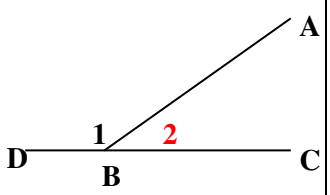
NAMING LINES AND ANGLES

The line segments which join together at the vertex to form an angle are known as arms.



THE THREE WAYS IN WHICH ANGLES BETWEEN ARMS ARE LABELLED ARE SHOWN

Using a single letter	Using the letters of the arm	Using subscripts
		
The angle between arm AB and BC is labelled as: $\hat{B}$	The angle between arm AB and BC is labelled as: $A\hat{B}C$	The angle between arm AB and BC is labelled as: $\hat{B}_2$ The angle between arm AB and BD is labelled as: $\hat{B}_1$ $\hat{B}_2 = A\hat{B}D$ and $\hat{B}_1 = A\hat{B}C$

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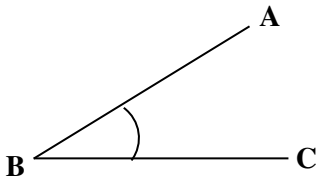
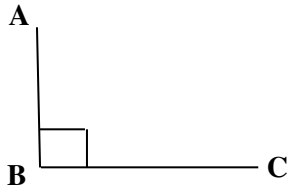
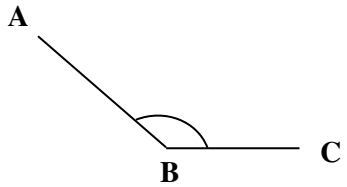
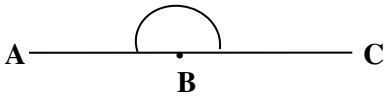
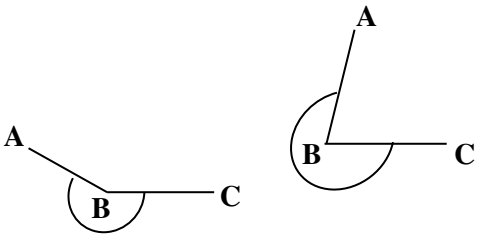
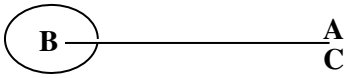
NAMES OF ANGLES

Name of Angle	Diagram	Size of Angle
Acute Angle		**An acute angle is greater than 0° but less than 90°.** $0° < \hat{B} < 90°$
Right Angle		**A right angle is equal to 90°. Arm AB is perpendicular to BC. This is written as $AB \perp BC$.** $\hat{B} = 90°$
Obtuse Angle		**An obtuse angle is greater than 90° but less than 180°.** $90° < \hat{B} < 180°$
Straight Angle		**A straight angle is equal to 180°.** $\hat{B} = 90°$
Reflex Angle		**A reflex is greater than 180° but less than 360°.** $180° < \hat{B} < 360°$
Revolution		**A revolution is equal to 360°** $0° < \hat{B} < 90°$

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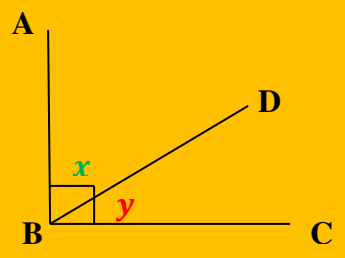
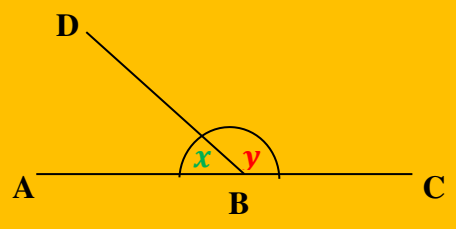
COMPLEMENTARY AND SUPPLEMENTARY ANGLES

Complementary angles add up to 90° Supplementary angles add up to 180°





In the above diagram: $x + y = 90°$

Reason: comp ∠'s

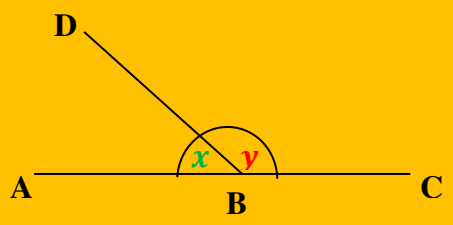
In the above diagram: $x + y = 180°$

∠'s on a str. line

PROPERTIES OF STRAIGHT LINES

ADJACENT ANGLES ON A STRAIGHT LINE

Adjacent angles on a straight line are supplementary.



$$x + y = 180°$$

It is important to be able to identify adjacent angles. Adjacent angles have to share a common vertex and lie on either side of the same arm.

Reason: ∠'s on a str. line

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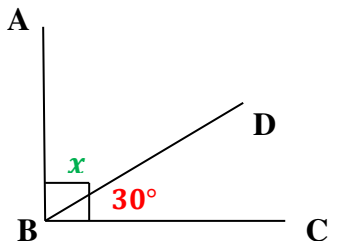
Determine with reason the values of the unknown small letters:

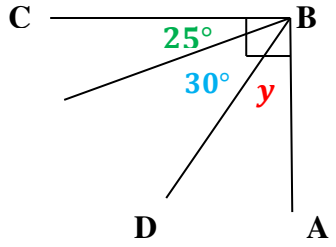
Examples 1:



Solution:

Statement	Reason
$x + 30° = 90°$ $\therefore x = 60°$	comp ∠'s

Examples 2:



Solution:

Statement	Reason
$y + 30° + 25° = 90°$ $y + 55° = 90°$ $\therefore y = 35°$	comp ∠'s

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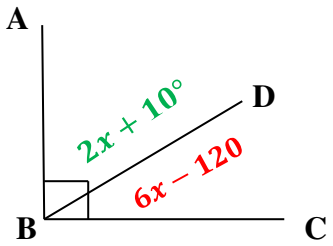
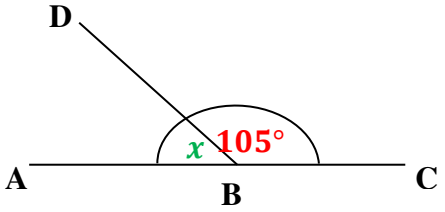
Examples 3:



Solution:

Statement	Reason
$(2x + 10°) + (6x - 120) = 90°$ $8x - 110° = 90°$ $8x = 200°$ $x = 25°$	comp ∠'s

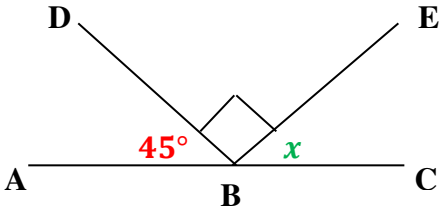
Examples 4:



Solution:

Statement	Reason
$x + 105° = 180°$ $\therefore x = 75°$	∠'s on a str. line

Examples 5:



Solution:

Statement	Reason
$x + 90° + 45° = 180°$ $x + 135° = 180°$ $\therefore x = 45°$	∠'s on a str. line

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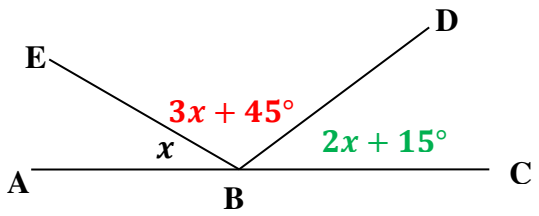
Examples 6:



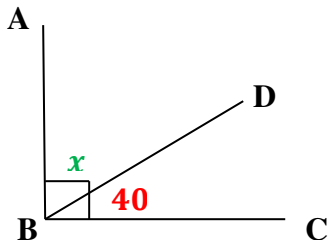
Solution:

Statement	Reason
$x + (3x + 45) + (2x + 15°) = 90°$	∠'s on a str. line
$6x + 60° = 180°$	
$6x = 120°$	
$x = 20°$	

CLASSWORK 2 DATE:

Determine with reason the values of the unknown small letters:

1.



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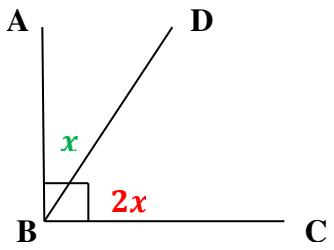

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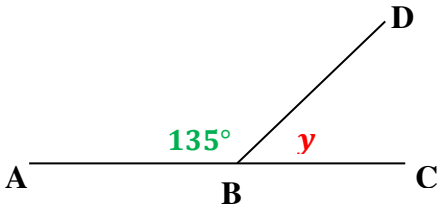

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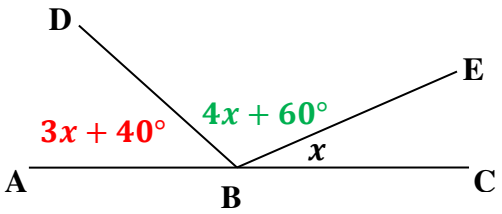

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HOMEWORK 3	DATE:

Determine with reason the values of the unknown small letters:

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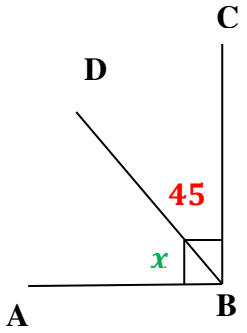
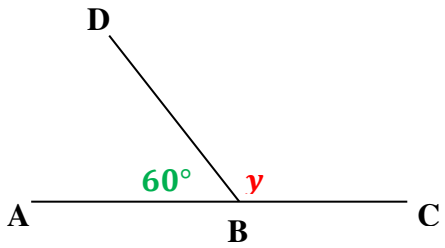
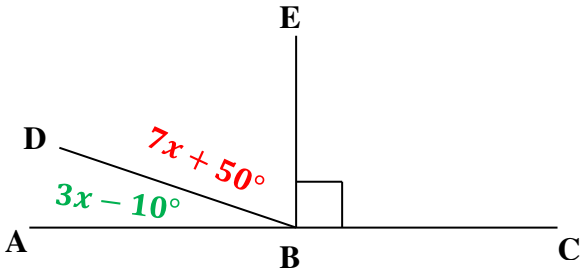


2.



3.



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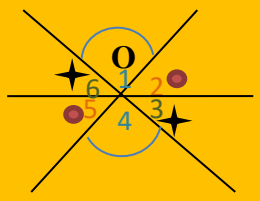
VERTICALLY OPPOSITE ANGLES

If two or more straight lines intersect, the vertically opposite angles are equal.

$\hat{O}_1 = \hat{O}_3$

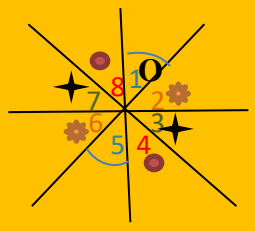
$\hat{O}_2 = \hat{O}_4$



$\hat{O}_1 = \hat{O}_4$

$\hat{O}_2 = \hat{O}_5$

$\hat{O}_3 = \hat{O}_6$



$\hat{O}_1 = \hat{O}_5$

$\hat{O}_2 = \hat{O}_6$

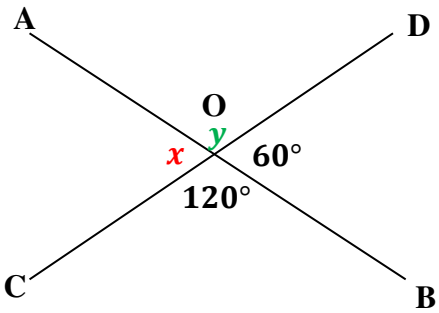
$\hat{O}_3 = \hat{O}_7$

$\hat{O}_4 = \hat{O}_8$

Reason: vert. opp. ∠'s

Determine with reasons the values of the unknown small letters:

Examples 1:



Solution:

Statement	Reason
$x = 60°$	vert. opp. ∠'s
$y = 120°$	vert. opp. ∠'s

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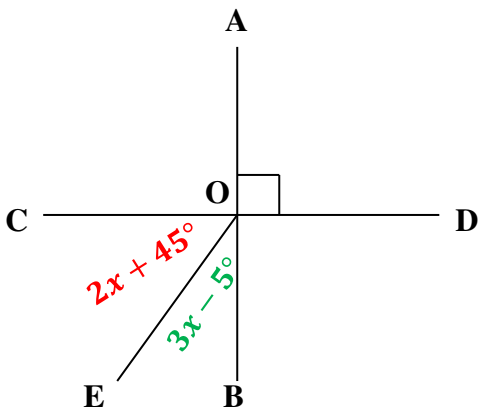
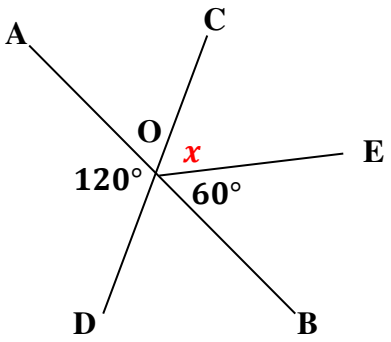
Example 2:



Solution:

Statement	Reason
$(2x + 45°) + (3x - 5°) = 90°$ $2x + 45° + 3x - 5° = 90°$ $5x + 40° = 90°$ $5x = 50°$ $x = 10°$	vert. opp. ∠'s

Example 3



Solution:

Statement	Reason
$x + 60° = 120°$ $x = 60°$	vert. opp. ∠'s

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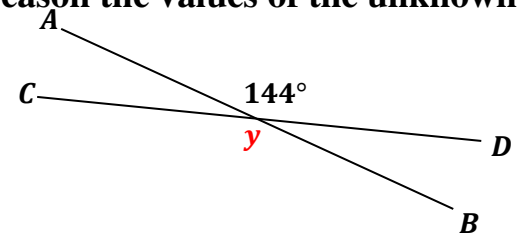
CLASSWORK 4 DATE:

Determine with reason the values of the unknown small letters:

1.



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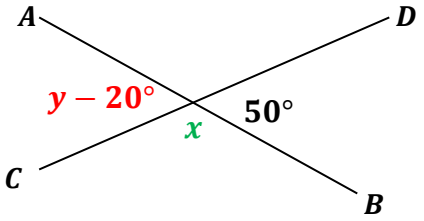
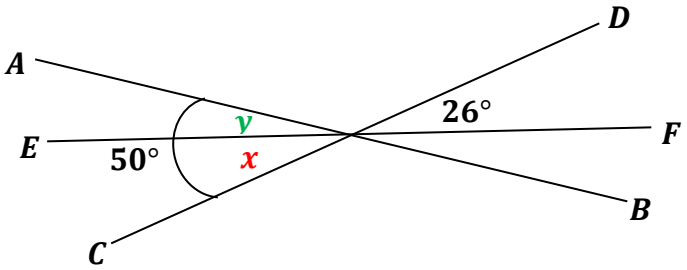


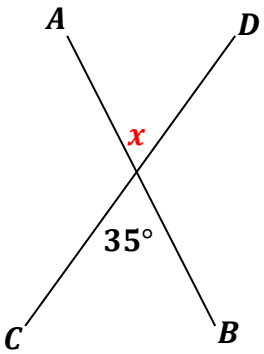
3.



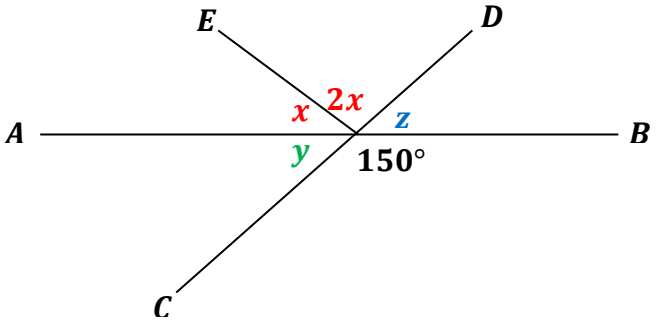
HOMEWORK 5 DATE:

Determine with reasons the values of the unknown small letters:

1.



2.



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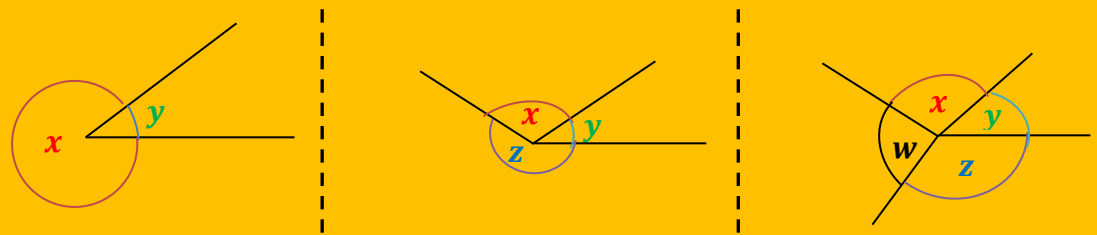
ANGLES AROUND A POINT (REVOLUTION)

The angles around a point add up to 360°

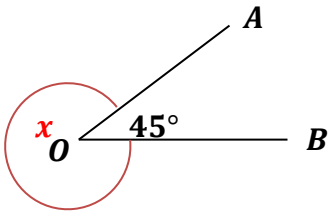


$x + y = 360°$ | $x + y + z = 360°$ | $x + y + z + w = 360°$

Reasons: ∠'s around a point

Determine with reason the values of the unknown small letters:

Examples 1:



Solution:

Statement	Reason
$x + 45° = 360°$ $x + 45° - 45° = 360° - 45°$ $x = 315°$	∠'s around a point

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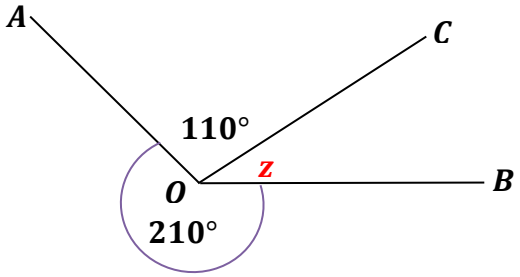
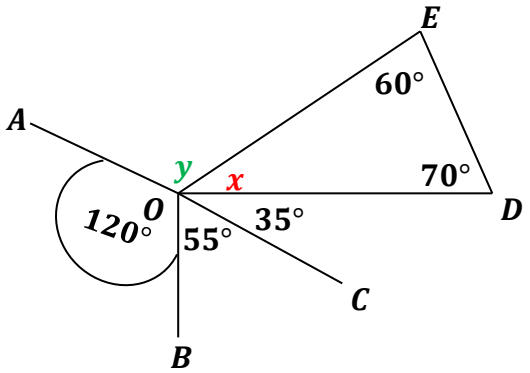
Examples 2:



Solution:

Statement	Reason
$z + 110° + 210° = 360°$	∠'s around a point
$z + 320° = 360°$	
$z + 320° - 320° = 360° - 320°$	
$z = 40°$	

Examples 3:



Solution:

Statement	Reason
$x + 60° + 70° = 180°$	sum of ∠'s of Δ
$x + 130° = 180°$	
$x = 50°$	
$y + 120° + 55° + 35° + 50° = 360°$	∠'s around a point
$y + 260° = 360°$	
$y = 100°$	

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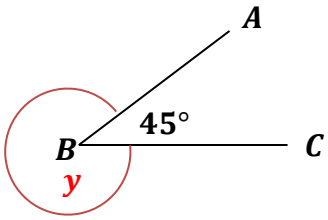
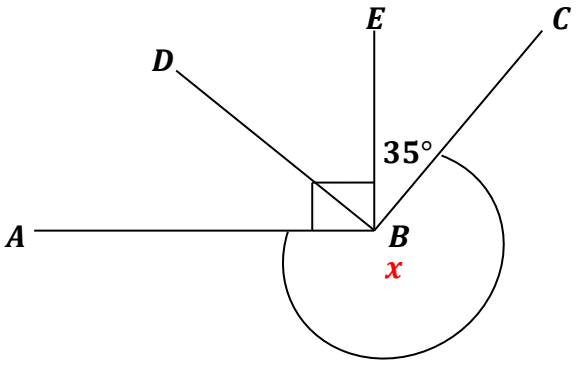
CLASSWORK 6 DATE:

Determine with reason the values of the unknown small letters:

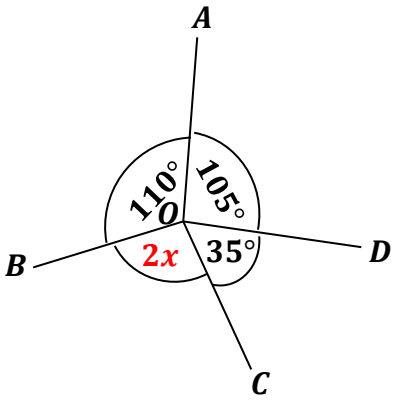
1.



2.



3.



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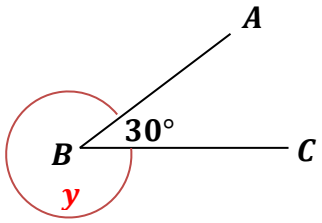
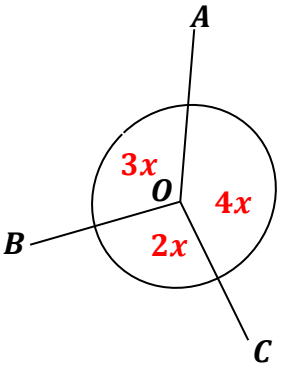
HOMEWORK 7	DATE:

Determine with reason the values of the unknown small letters:

1.



2.



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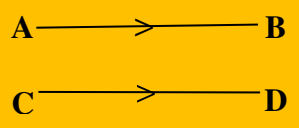
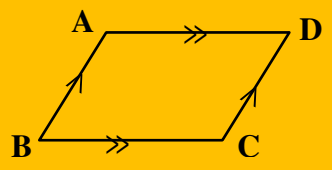
PROPERTIES OF PARALLEL LINES

Parallel lines are two or more lines which are always the same distance apart and never intersect each other. Parallel lines are shown on the diagram by placing arrowheads on the lines. Lines with the same number of arrowheads are parallel. This is shown in the diagram below. The mathematical symbol used to indicate parallel lines is //.



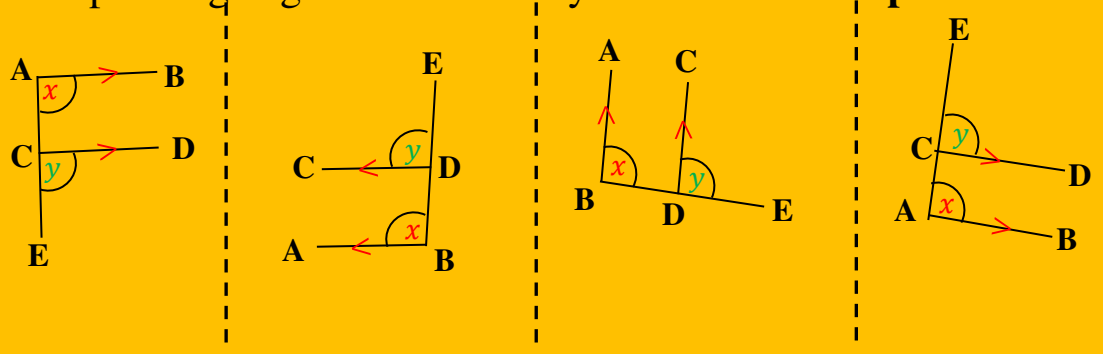


AB // CD **AB // CD and AD // BC**

CORRESPONDING ANGLES

Corresponding angles formed by parallel lines are equal.

Corresponding angles occur when you have an **F-shape**.



$x = y$ $x = y$ $x = y$ $x = y$

Reason: corr. ∠'s (AB // CD)

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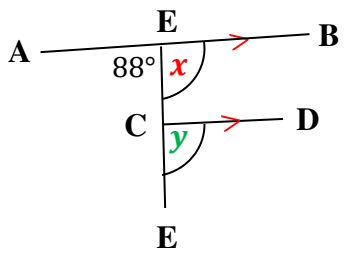
Determine with reason the values of the unknown small letters:

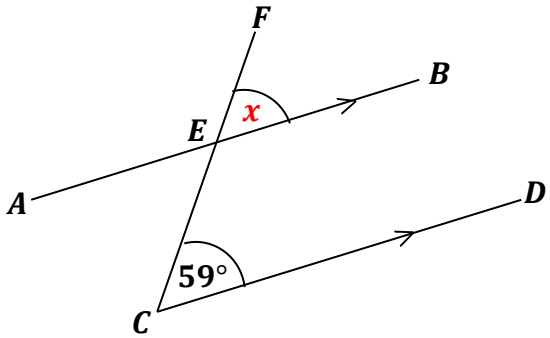
Examples 1:



Solution:

Statement	Reason
$x + 88° = 180°$	∠'s on a str. line
$x + 88° - 88° = 180° - 88°$	
$x = 92°$	
$y = 92° = x$	corr. ∠'s (AB // CD)

Examples 2:



Solution:

Statement	Reason
$x = 92°$	corr. ∠'s (AB // CD)

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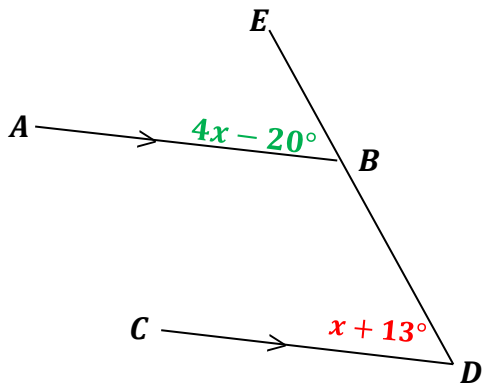
Examples 3:



Solution:

Statement	Reason
$4x - 20° = x + 13°$ $4x - 20° + 20° = x + 13° + 20°$ $4x = x + 33°$ $4x - x = x - x + 33°$ $3x = 33°$ $x = 11°$	corr. ∠'s (AB // CD)

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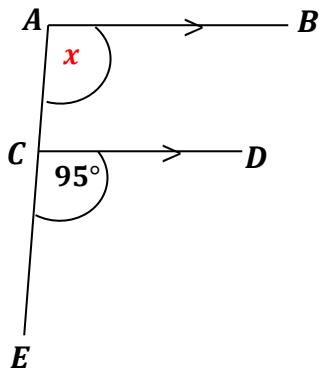
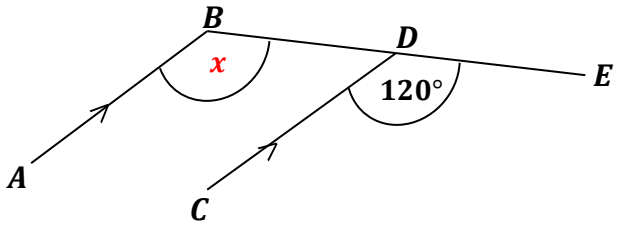
CLASSWORK 8 DATE:

Determine with reason the values of the unknown small letters:

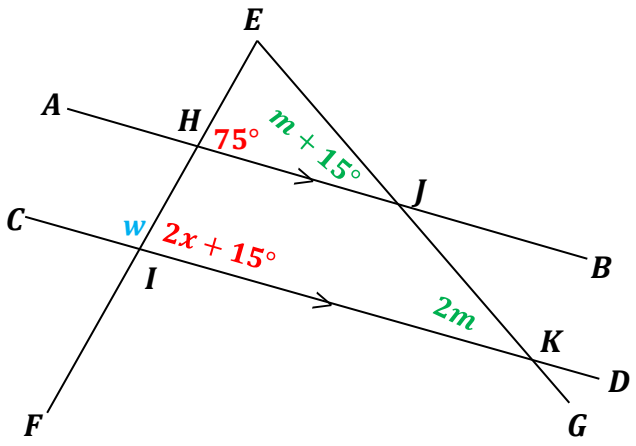
1.



2.



3.



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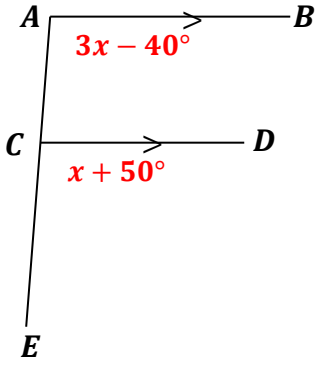
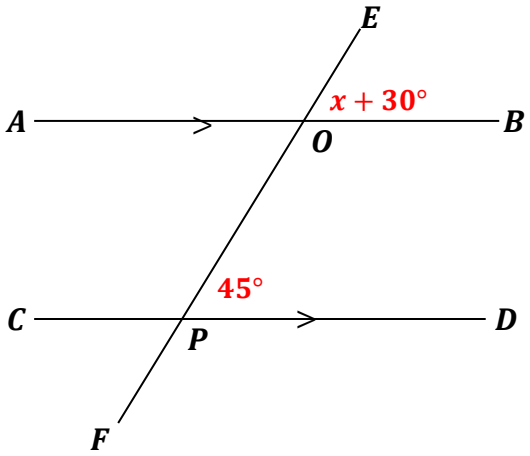
HOMEWORK 9	DATE:

Determine with reason the values of the unknown small letters:

1.



2.



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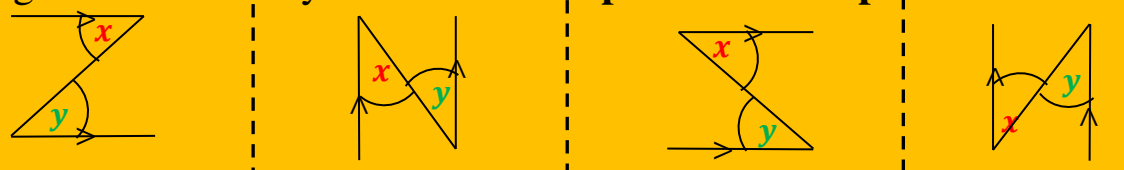
ALTERNATING ANGLES

Alternate angles formed by parallel lines are equal. Co-interior angles occur when you have a **Z-shape** or an **N-shape**.

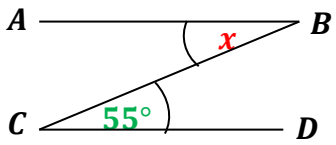


$x = y$ $x = y$ $x = y$ $x = y$

Reason: alt. ∠'s (AB // CD)

Determine with reason the values of the unknown small letters:

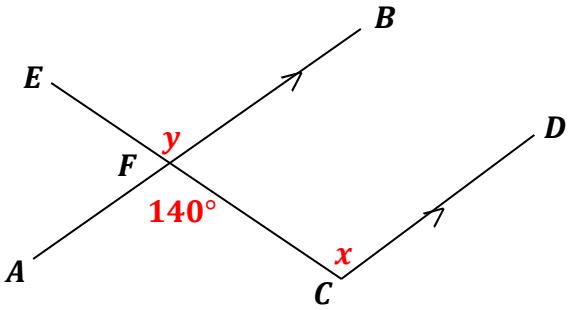
Examples 1:



Solution:

Statement	Reason
$x = 55°$	alt. ∠'s (AB // CD)

Examples 2:



Solution:

Statement	Reason
$x = 140°$	alt. ∠'s (AB // CD)
$y = 140° = x$	corr. ∠'s (AB // CD)

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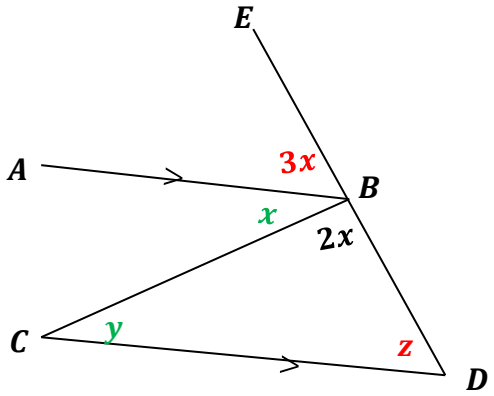
Examples 3:



Solution:

Statement	Reason
$x + 3x + 2x = 180°$	∠'s on a str. line
$6x = 180°$	
$x = 30°$	
$y = 30° = x$	alt. ∠'s (AB//CD)
$z = 3x$	corr. ∠'s (AB//CD)
$z = 3(30°)$	
$z = 90°$	

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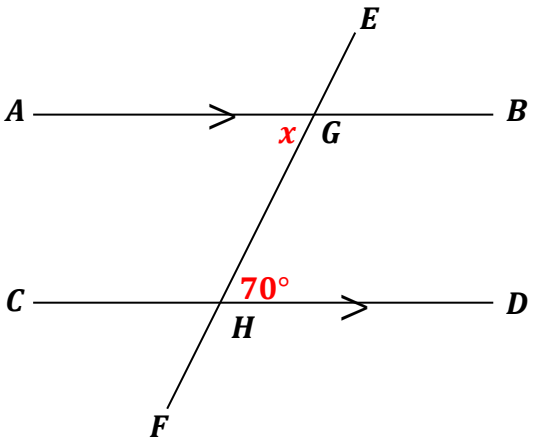
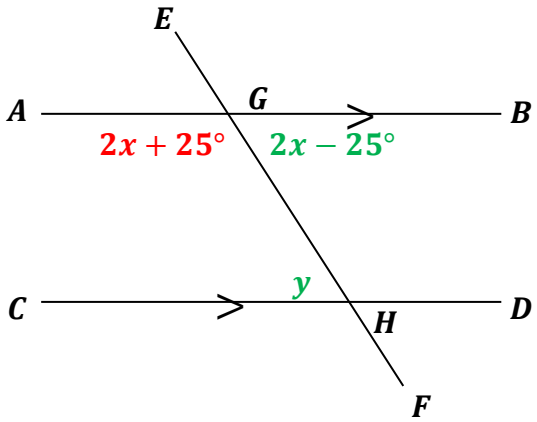
CLASSWORK 10 DATE:

Determine with reason the values of the unknown small letters:

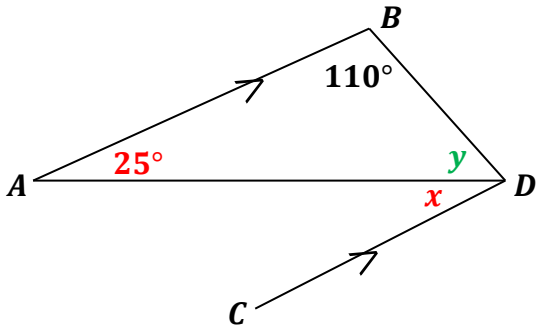
1.



2.



3.



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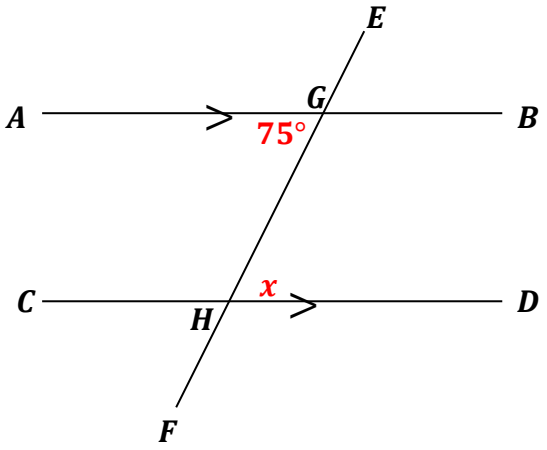
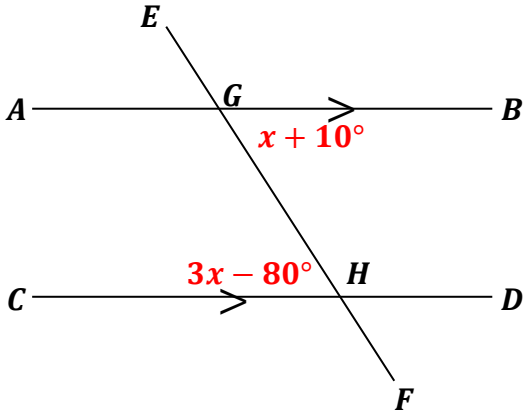
HOMEWORK 11 DATE:

Determine with reason the values of the unknown small letters:

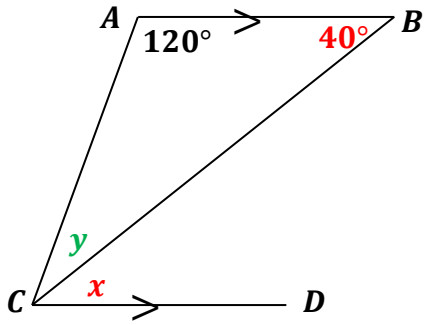
1.



2.



3.



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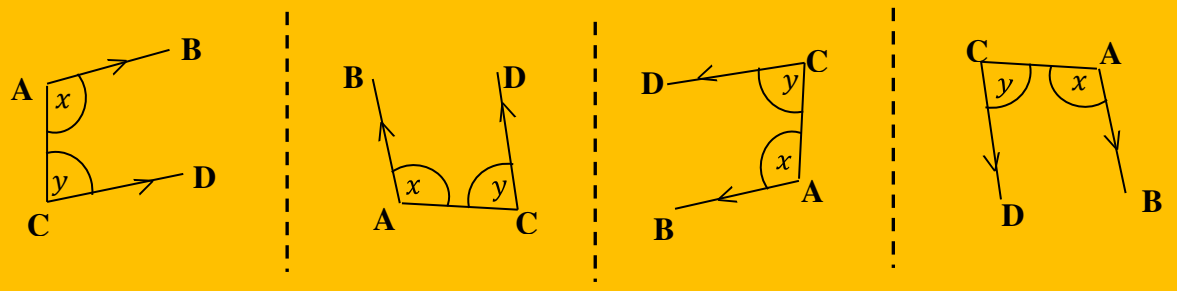
CO – INTERIOR ANGLES

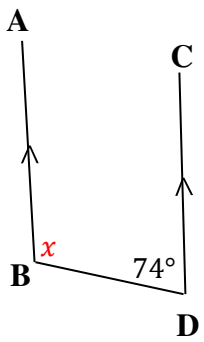
Co-interior angles are supplementary. Co-interior angles occur when you have a **U-shape** formed between parallel lines.



Reason: co - int. ∠'s (AB // CD)

Determine with reason the values of the unknown small letters:

Examples 1:



Solution:

Statement	Reason
$x + 74° = 180°$ $x + 74° - 74° = 180° - 74°$ $x = 106°$	co - int. ∠'s (AB // CD)

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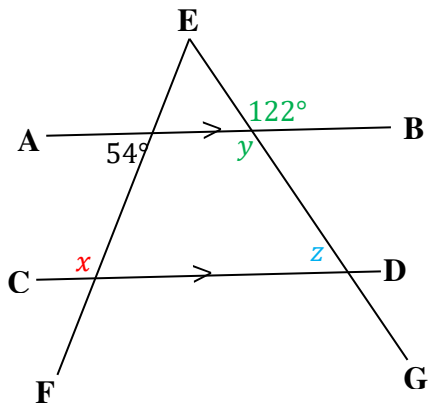
Examples 2:



Solution:

Statement	Reason
$x + 54° = 180°$	co - int. ∠'s (AB // CD)
$x + 54° - 54° = 180° - 54°$	
$x = 126°$	
$y = 122°$	vert. opp. ∠'s
$z + y = 180°$	co - int. ∠'s (AB // CD)
$z + 122° = 180°$	
$z + 122° - 122° = 180° - 122°$	
$z = 58°$	

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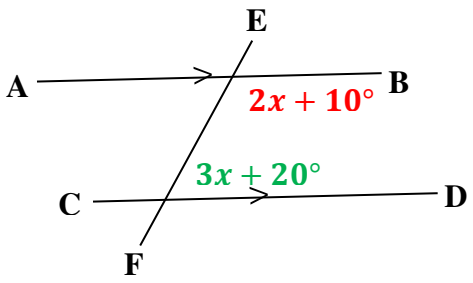
Examples 3:



Solution:

Statement	Reason
$(2x + 10°) + (3x + 20) = 180°$ $5x + 30° - 30° = 180° - 30°$ $5x = 150°$ $x = 30°$	co - int. ∠'s (AB // CD)

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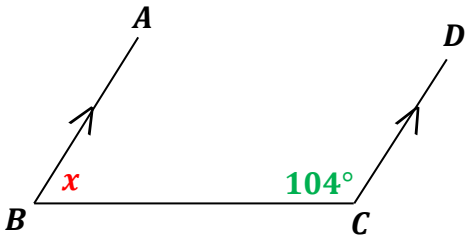
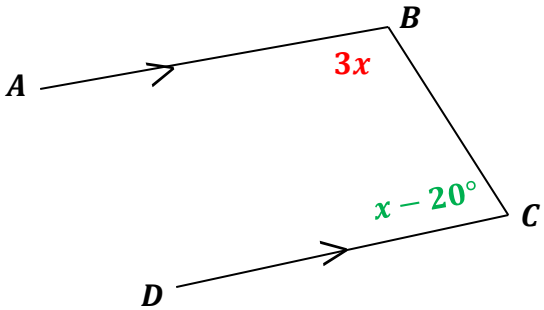
CLASSWORK 12 DATE:

Determine with reason the values of the unknown small letters:

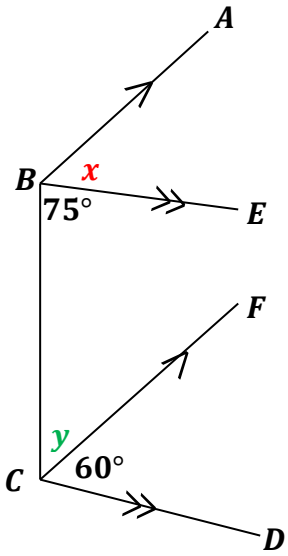
1.



2.



3.



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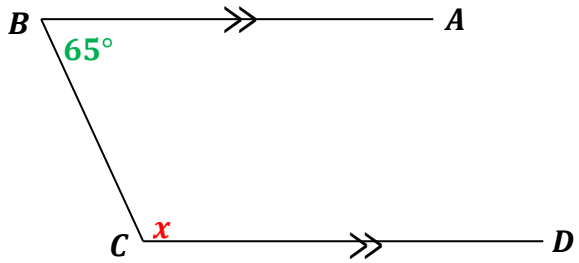
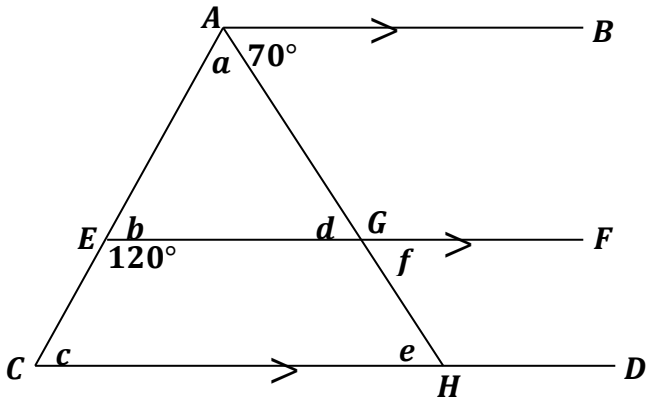
HOMEWORK 13 DATE:

Determine with reason the values of the unknown small letters:

1.

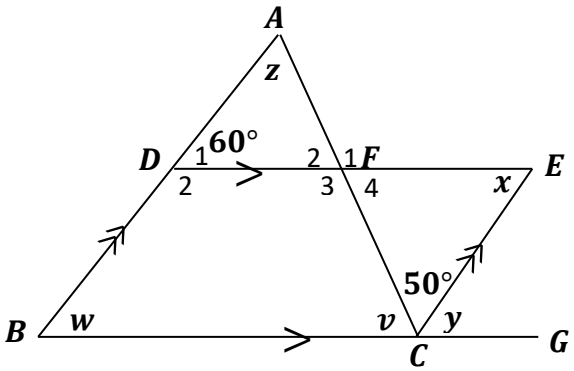


2.



CLASSWORK 14 DATE:

Determine with reason the values of the unknown small letters:



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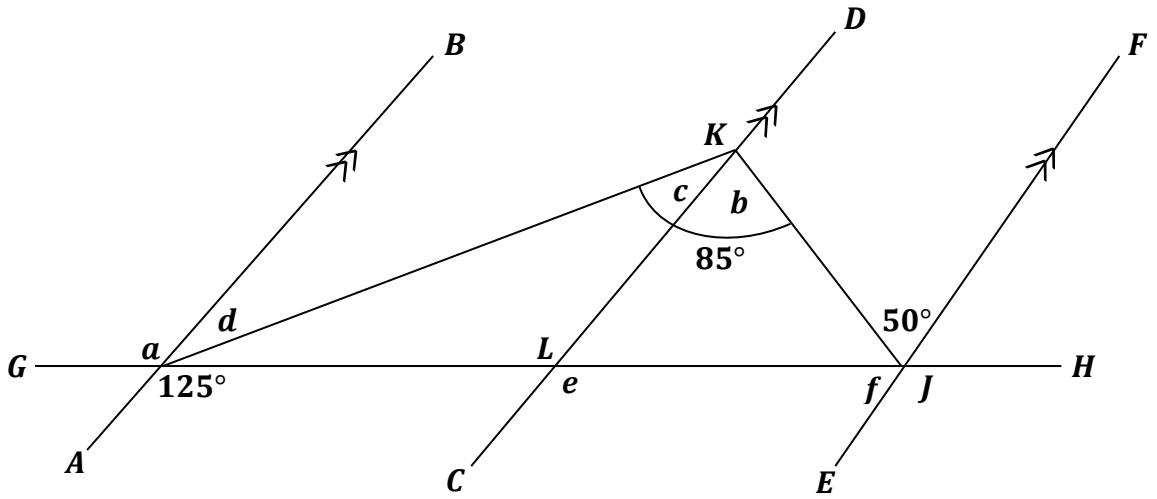
HOMEWORK 15 DATE:

Determine with reason the values of the unknown small letters:



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