Angle types

1 Sketch and label angles that match each of these descriptions:

a Obtuse angle $\angle XYZ$

b Acute $\angle PQR$

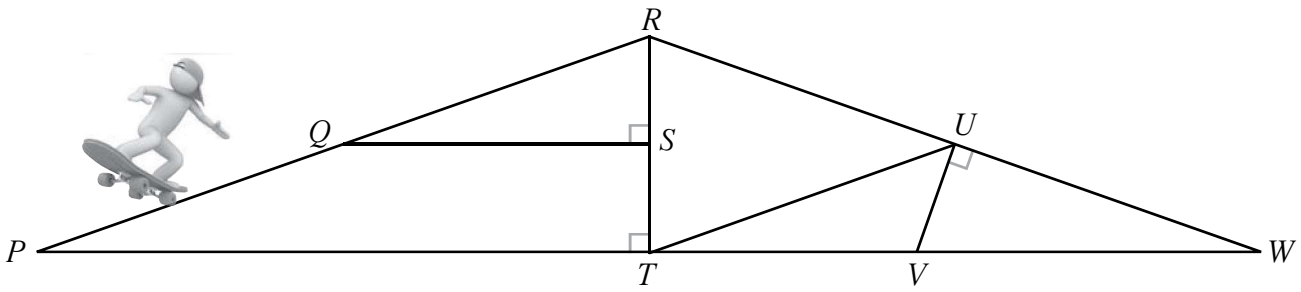
c Right-angle $\angle MLN$
(Hint: remember the box)

d Reflex $\angle GUP$

e Full revolution $\angle JKL$

f Straight $\angle DEF$

2 Fill in the table below with all the angles you can find matching the types in the diagram below:

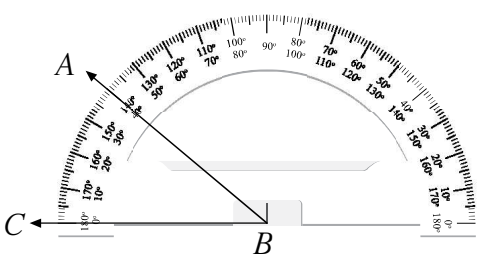


Acute angle	Right angle	Obtuse angle	Straight angle	Reflex angle
$\angle RQS$	$\angle RSQ$	$\angle PRW$	$\angle PQR$	reflex $\angle PRW$

Using a protractor to measure angles

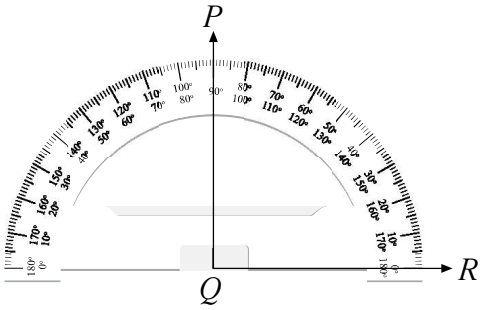
1 Write down the size (amount of turn in degrees) of these measured angles.

a



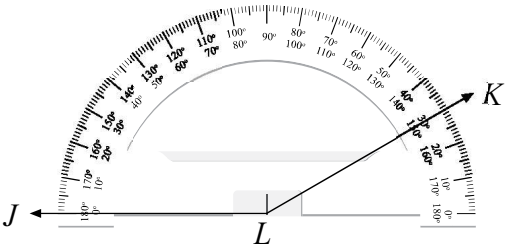
$\therefore \angle ABC =$ ____

b



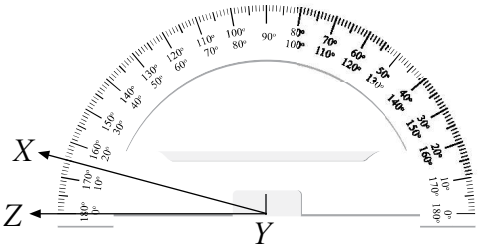
$\therefore \angle PQR =$ ____

c



$\therefore \angle JLK =$ ____

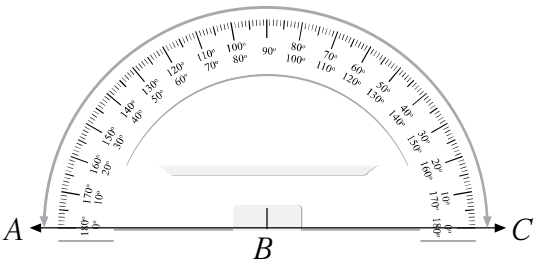
d



$\therefore \angle XYZ =$ ____

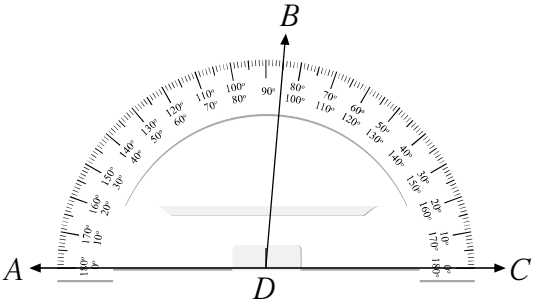
2 Write down the size of the angles indicated below each diagram.

a



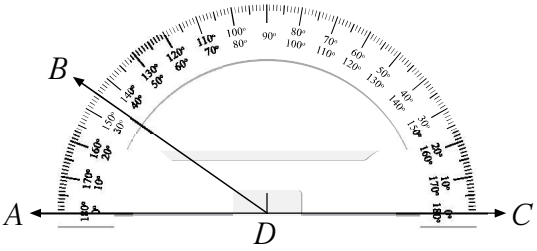
$\therefore \angle ABC =$ ____

b



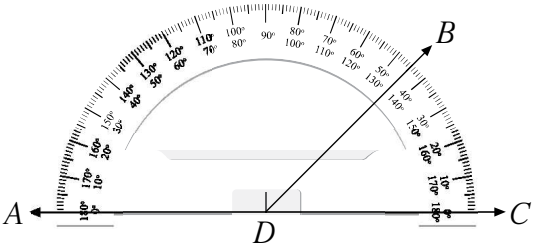
$\therefore \angle BDC =$ ____

c



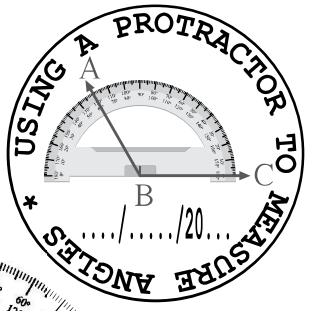
$\therefore \angle CDB =$ ____

d



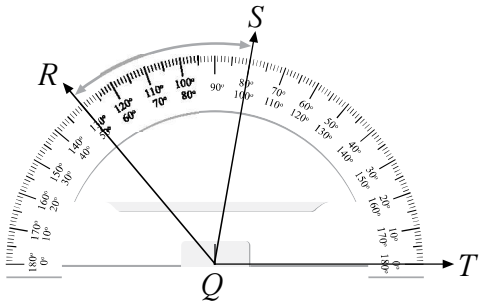
$\therefore \angle ADB =$ ____

Using a protractor to measure angles



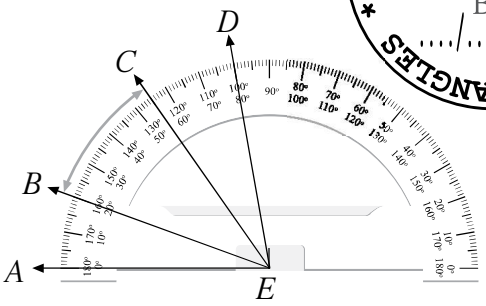
3 Try these trickier ones!

a



$\therefore \angle RQS =$

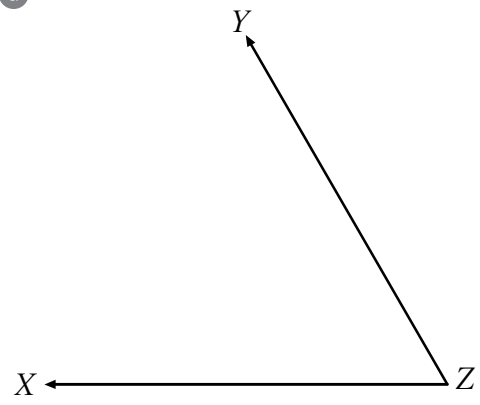
b



$\therefore \angle BEC =$

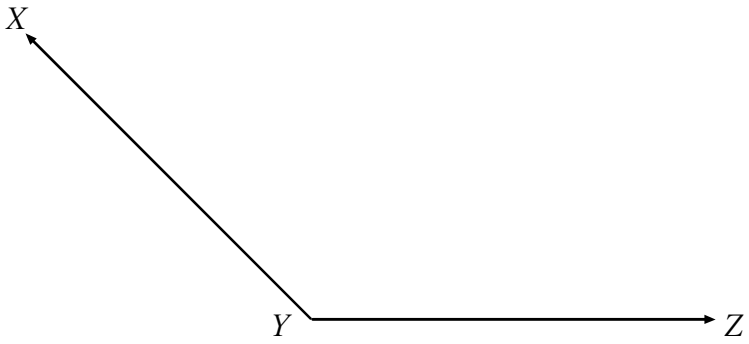
4 Use a protractor to measure the size (amount of turn in degrees) between the arms for these four angles:

a



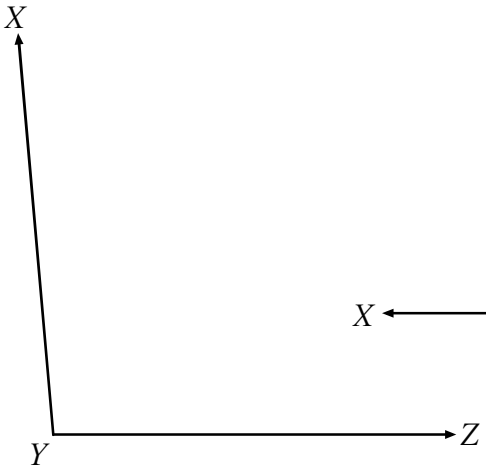
$\therefore \angle XZY =$

b



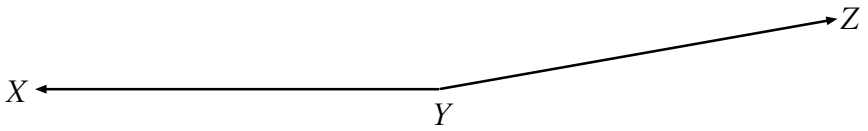
$\therefore \angle XYZ =$

c



$\therefore \angle XYZ =$

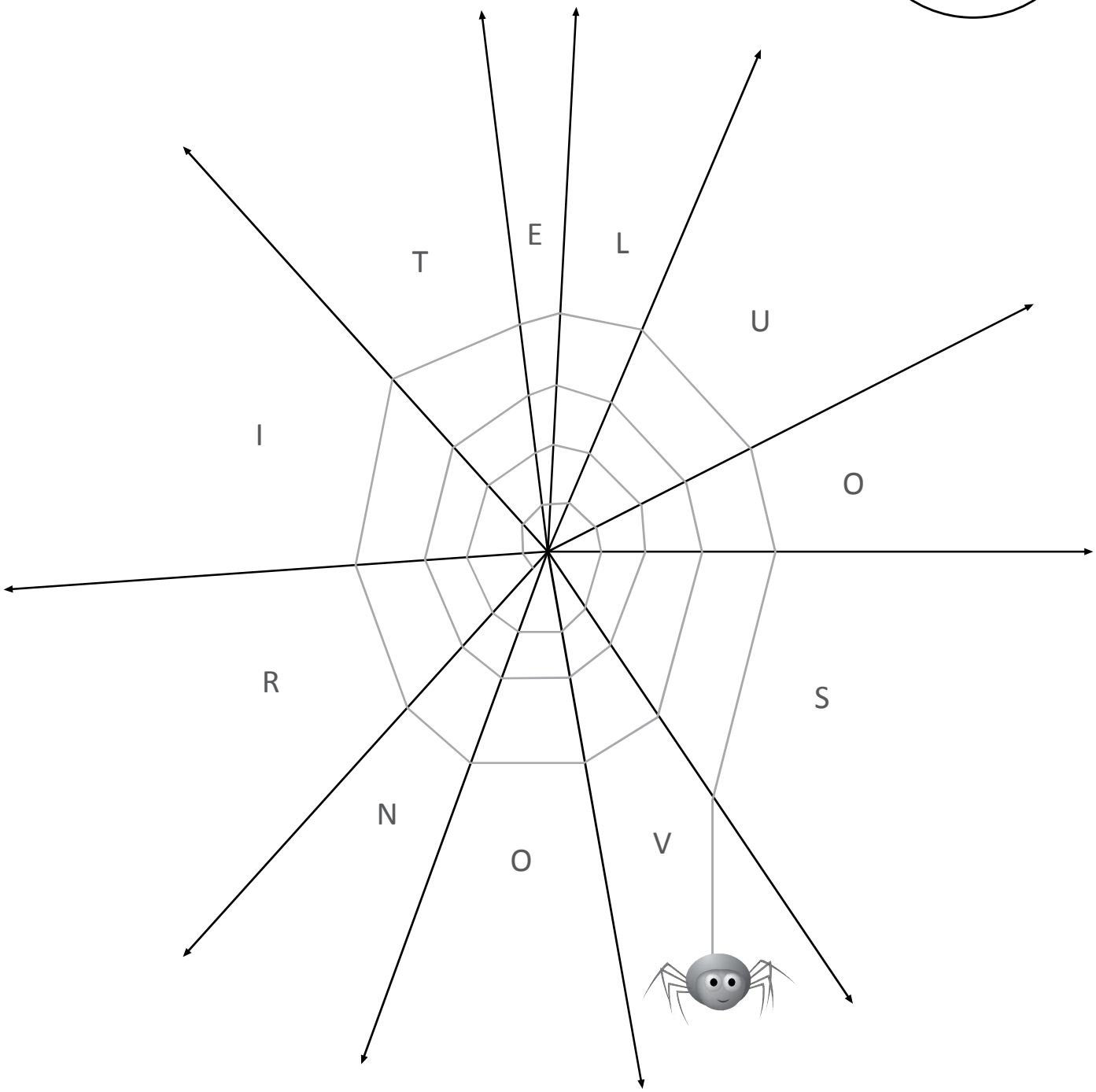
d



$\therefore \angle XYZ =$

Using a protractor to measure angles

5 Measure each acute angle between the straight supports on Bert the spider's web and match the letter with the correct size below.

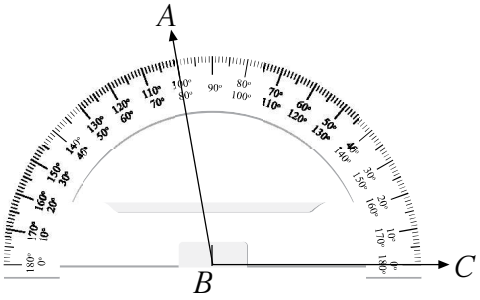


44°	10°	24°	30°	20°	40°	35°	52°	27°	22°	56°

Using a protractor to measure reflex angles

1 Calculate the size of these reflex angles.

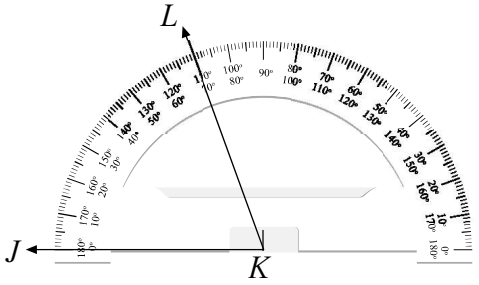
a



$\therefore$ Reflex $\angle ABC = 360^\circ -$ ____

$=$ ____

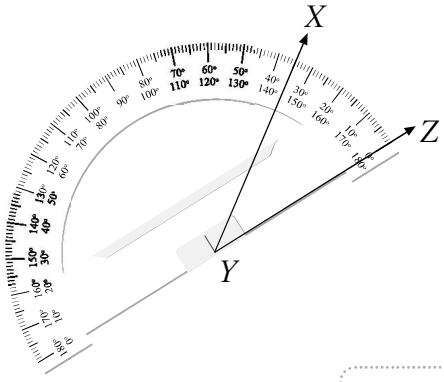
b



$\therefore$ Reflex $\angle JLK = 360^\circ -$ ____

$=$ ____

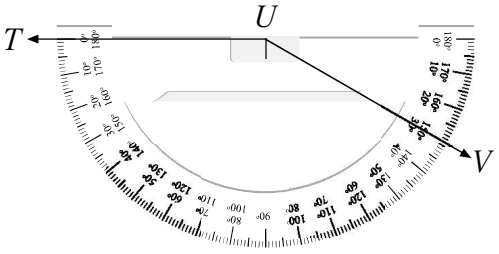
c



$\therefore$ Reflex $\angle XYZ = 360^\circ -$ ____

$=$ ____

d

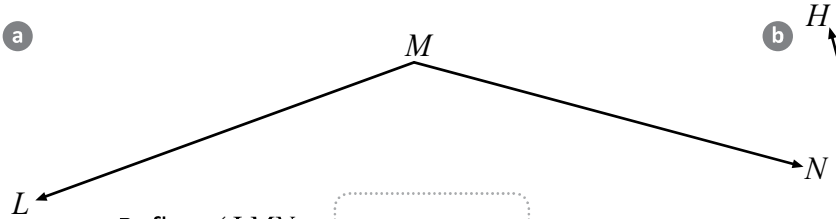


$\therefore$ Reflex $\angle TUV = 360^\circ -$ ____

$=$ ____

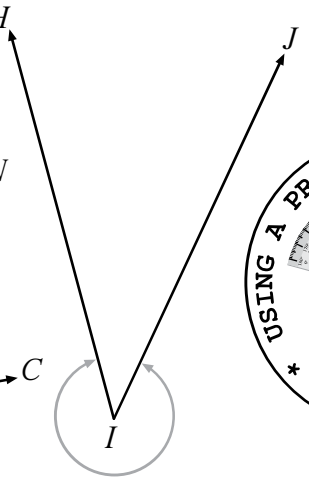
2 Measure and write down the size of the reflex angle for each of these:

a

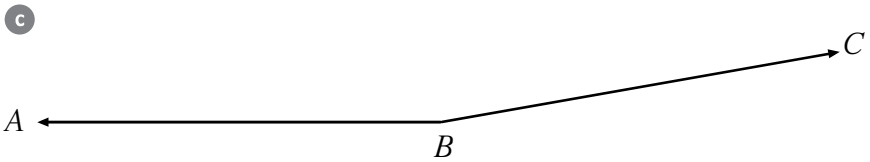


$\therefore$ Reflex $\angle LMN =$ ____

b

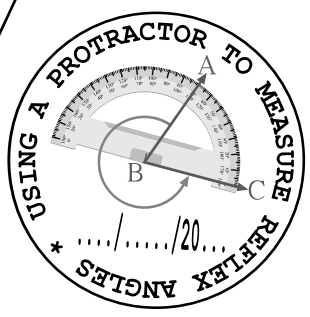


c



$\therefore$ Reflex $\angle ABC =$ ____

$\therefore$ Reflex $\angle HIJ =$ ____



Complementary and supplementary angles

1 Calculate the complement (the angle that makes it $90°$) of these angles:

a $30°$

b $80°$

c $46°$

d $11°$

e $23.5°$

f $18.3°$

2 Calculate the supplementary (the angle that makes it $180°$) of these angles:

a $100°$

b $90°$

c $165°$

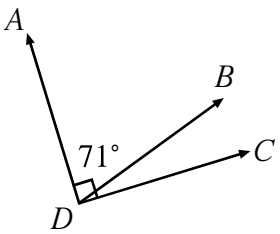
d $109°$

e $19\frac{1}{4}°$

f $121.3°$

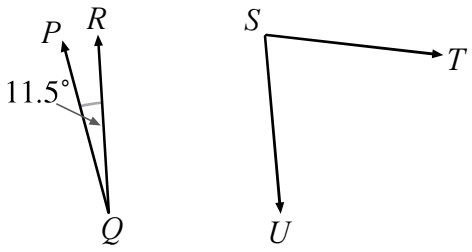
3 Calculate the size of the missing complementary angles below:

a



$\angle BDC =$

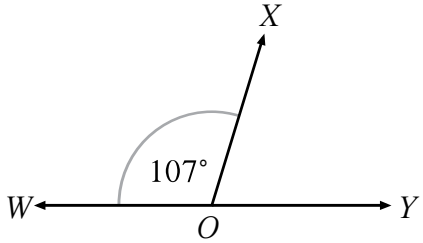
b



$\angle TSU =$

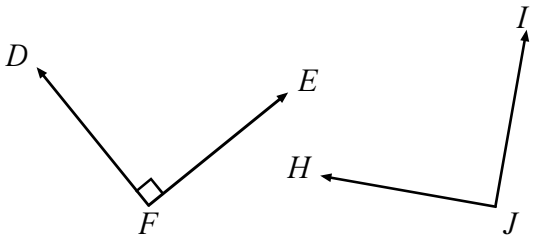
4 Calculate the size of the missing supplementary angles below:

a



$\angle XOY =$

b

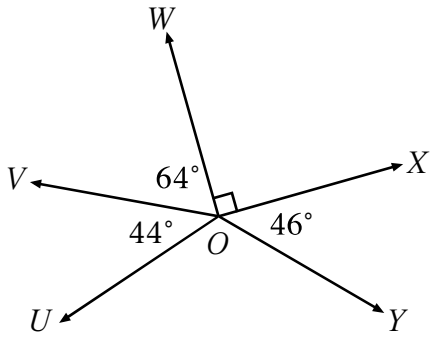


$\angle HJI =$

Complementary and supplementary angles

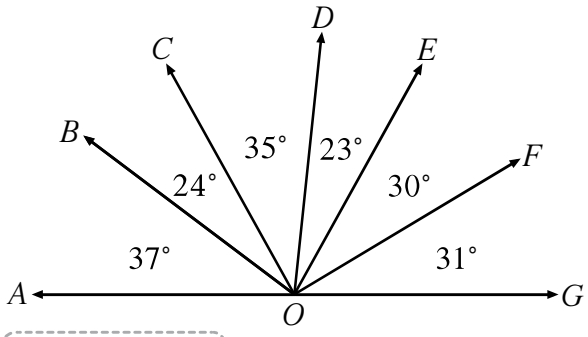
5 Name the pair of supplementary angles in this diagram:

Hint: what is the size of $\angle WOY$



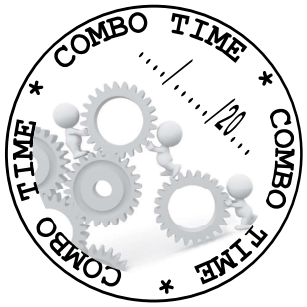
[ ] and [ ] are supplementary angles

6 Name the **two** pairs of complementary angles in this diagram:

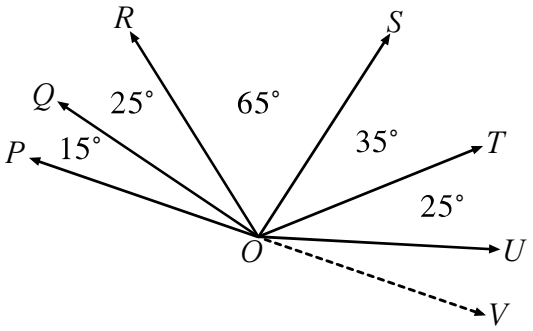


First pair: $\angle DOF$ and [ ] Second pair: $\angle FOG$ and [ ]

It's combo time!



7 a Name the pair of adjacent complementary angles in this diagram:



[ ] and [ ]

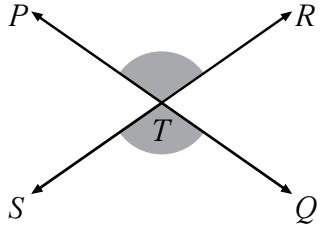
b If $\angle UOV$ is drawn adjacent to $\angle TOU$ as shown, what size must it be to make $\angle POV$ a straight angle? Hint: the angles must all add to $180°$

$\angle UOV =$ [ ]

Vertically opposite angles

1 Name and shade all the pairs of vertically opposite angles below:

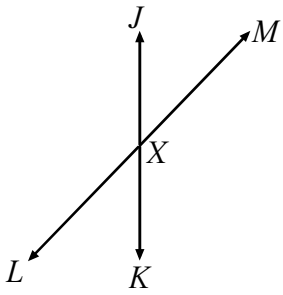
a



$\angle PTR$ and $\angle QTS$

and

b



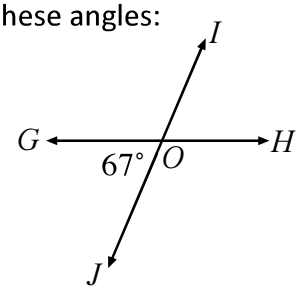
First pair: and

Second pair: and

2 Calculate the size of these angles:

a (i) $\angle IOH$

(ii) $\angle JOH$

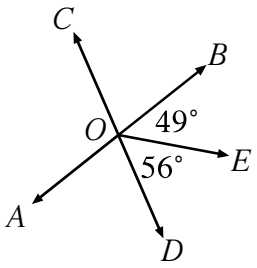


(i)

(ii)

b (i) $\angle COA$

(ii) $\angle AOD$

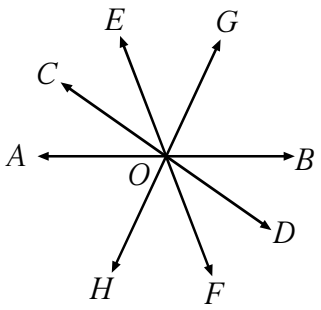


AB and CD are straight lines

(i)

(ii)

3 This diagram is made up of four straight lines AB, CD, EF and GH intersecting at the same point O. Name ten different pairs of vertically opposite angles.



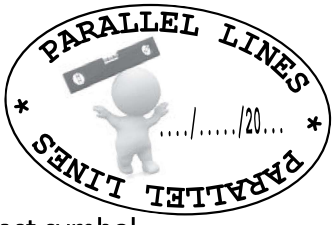
(i) and (ii) and

(iii) and (iv) and

(v) and (vi) and

(vii) and (viii) and

(ix) and (x) and

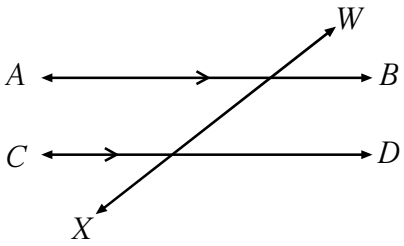


Parallel lines

1 For each of these diagrams: (i) Name the transversal.

(ii) Name the pair of parallel lines using the correct symbol.

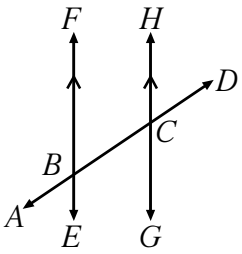
a



(i) _____

(ii) _____

b

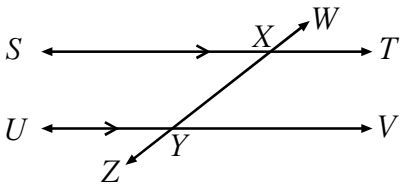


(i) _____

(ii) _____

2 Name all the pairs of Zangles, Fangles and Cangles in these diagrams:

a



Zangles (alternate angles)

(i) _____ and _____

(ii) _____ and _____

Fangles (corresponding angles)

There are four pairs of this type

(i) _____ and _____

(ii) _____ and _____

(iii) _____ and _____

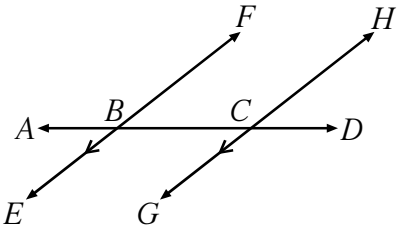
(iv) _____ and _____

Cangles (cointerior angles)

(i) _____ and _____

(ii) _____ and _____

b



Zangles (alternate angles)

(i) _____ and _____

(ii) _____ and _____

Fangles (corresponding angles)

There are four pairs of this type

(i) _____ and _____

(ii) _____ and _____

(iii) _____ and _____

(iv) _____ and _____

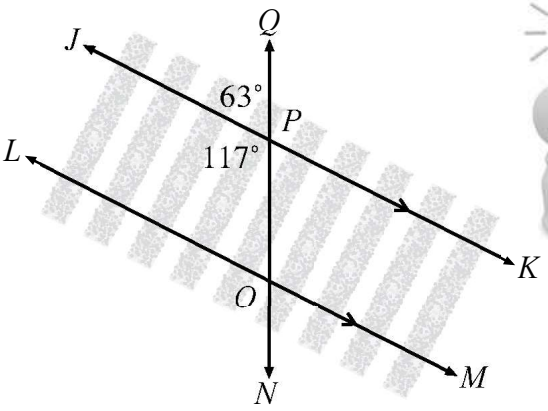
Cangles (cointerior angles)

(i) _____ and _____

(ii) _____ and _____

Parallel lines

3 A straight cable QN, runs underneath a railway track as shown. Use the Zangles and Fangles properties to complete the table with all the other angles that are the same size as the two given.

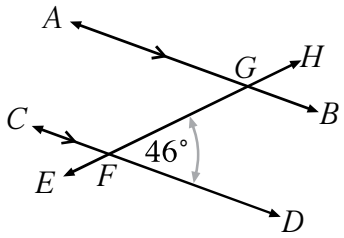


Remember you can look for vertically opposite angles too as they are also equal.

63°	117°
$\angle JPQ$	$\angle JPO$

4 Find the size of each of these angles and include one of the properties below you used to find them:
Properties: alternate , corresponding , cointerior , vertically opposite , straight

a



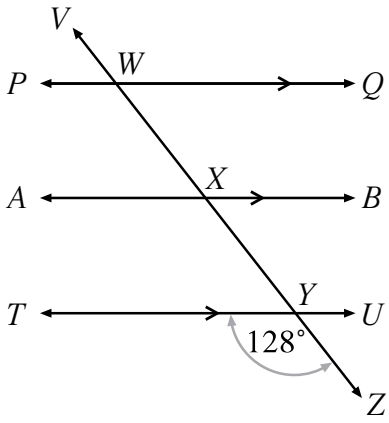
$\angle BGH =$ ____ Property used: Corresponding angles

$\angle AGF =$ ____ Property used: ____ angles

$\angle CFE =$ ____ Property used: ____ angles

$\angle BGF =$ ____ Property used: ____ angles

b Try this one with 3 parallel lines! (psst! You will need to use more than one property)



$\angle WXB =$ 128°

Property used:
Corresponding angle to $\angle TYZ$, $(\angle AXY) = 128°$
$\angle WXB$ is vertically opposite to $\angle AXY = 128°$

$\angle AXW =$ ____

Property used:

$\angle BXY =$ ____

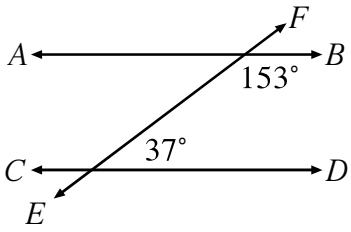
Property used:

Parallel lines

Since the rules for Zangles, Fangles and Cangles only work when lines are parallel, you can use them to find out whether a pair of lines are parallel or not!

5 For each of these: (i) circle 'parallel' or 'not parallel' for the lines drawn
(ii) write a reason why you circled the one you did!

a



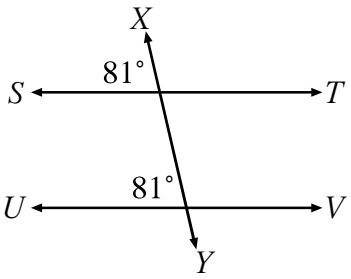
(i) The line AB and CD are:

PARALLEL NOT PARALLEL

(ii) Reason:

The cointerior angles do not add up to $180°$
or
The cointerior angles are not supplementary

b

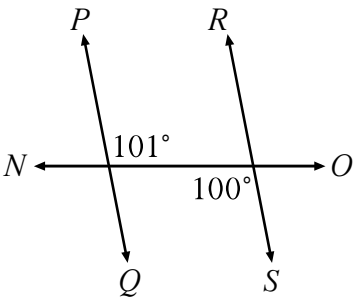


(i) The line ST and UV are:

PARALLEL NOT PARALLEL

(ii) Reason:

c

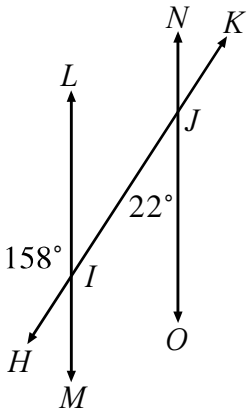


(i) The line PQ and RS are:

PARALLEL NOT PARALLEL

(ii) Reason:

d

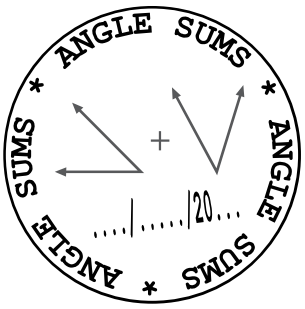


(i) The line LM and NO are:

PARALLEL NOT PARALLEL

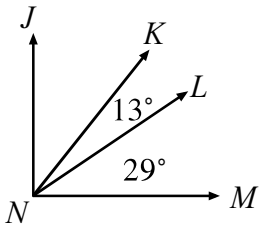
(ii) Reason: (write all the properties used here)

Angle sums



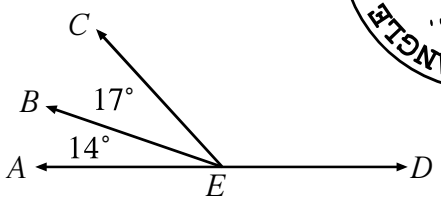
1 For each of these diagrams, calculate the size of the missing angle:

a



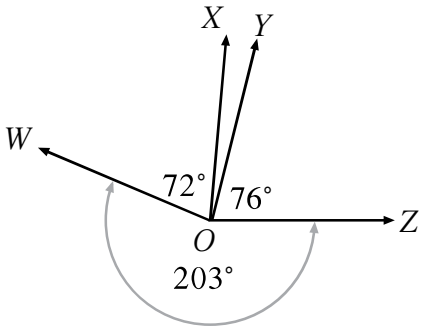
$\angle JNK =$

b



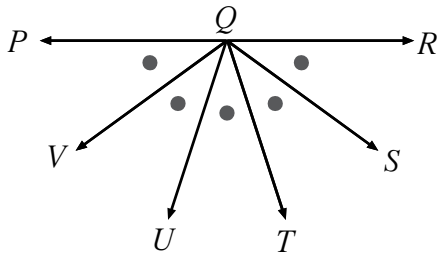
$\angle CED =$

c



$\angle XOY =$

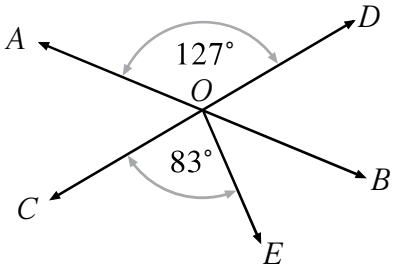
d Small dots can be used to show equal sized angles



Each angle =

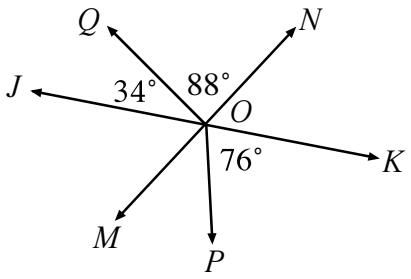
2 Vertically opposite angles can be used to help find the unknown angles for these.

a AB and CD are straight lines



$\angle BOE =$

b JK and MN are straight lines

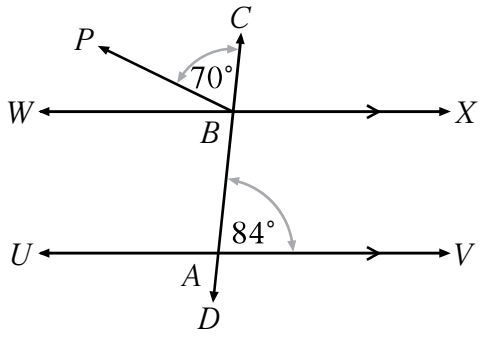


$\angle MOP =$

Angle sums

3 Use the parallel line angle properties to help find the size of these angles:

a



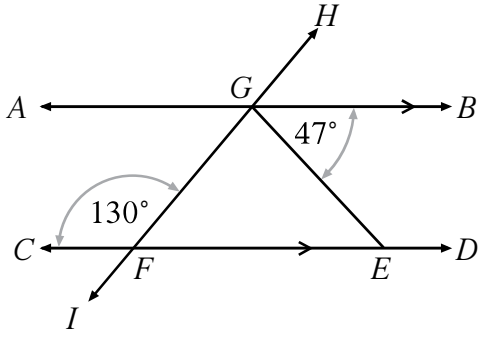
$\angle WBA =$

$\angle CBX =$

$\angle ABX =$

$\angle PBW =$

b



$\angle AGH =$

$\angle AGF =$

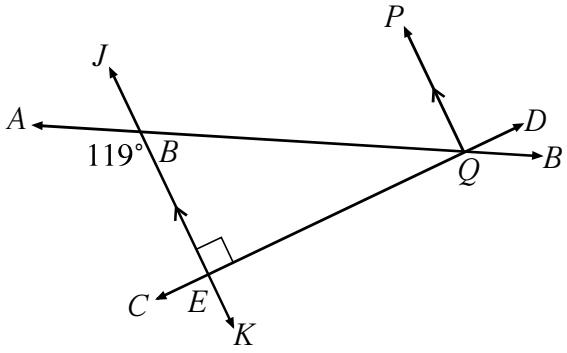
$\angle HGB =$

$\angle EGF =$

Combo Time!

4 Give these tricky ones a go! You have the skills now to use a few different angle properties for each one.

a JK and PQ are straight, parallel lines. AB and CD are straight lines.

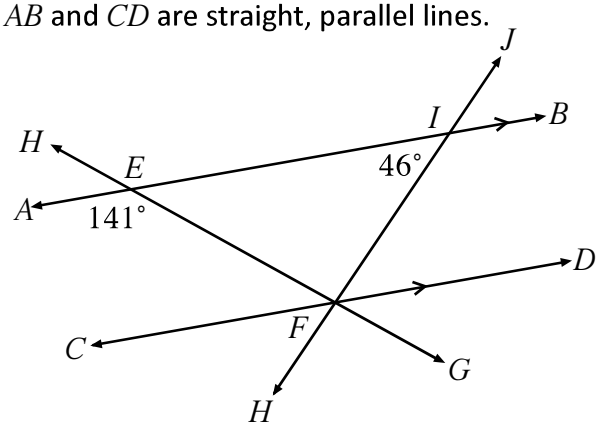


$\angle PQB =$

$\angle PQD =$

$\angle DQB =$

b AB and CD are straight, parallel lines.



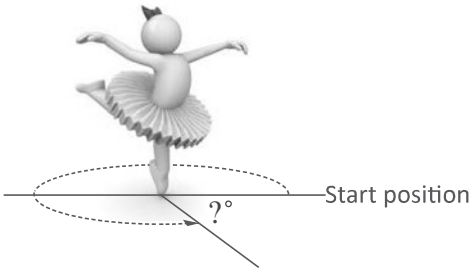
$\angle DFG =$ Hint: find $\angle EFC$ first

$\angle EFI =$ Hint: find $\angle IFD$ first

Angle problems

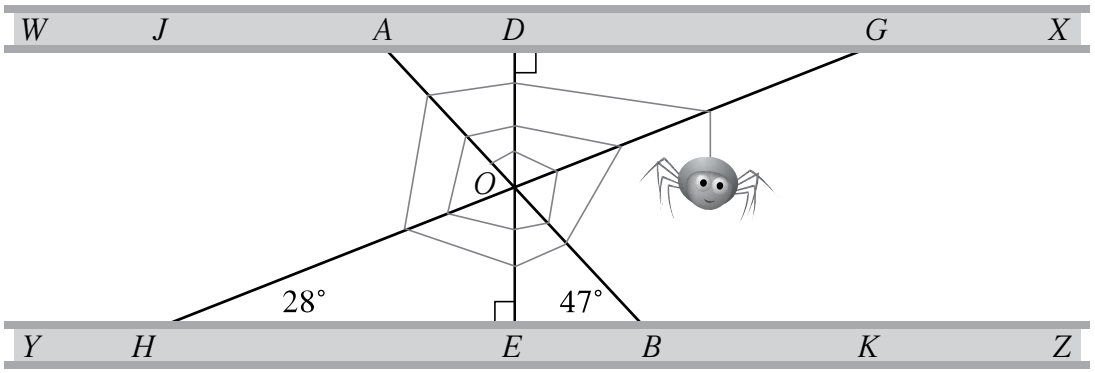
1 While performing a circular ballet move, Janet turned the first half easily and then with some extra effort, made it $\frac{5}{6}$ of the remaining way around.

a How many degrees was Janet away from completing the full circle?



b She immediately recovers and starts her second move facing where she had stopped. If she successfully turns another 180° in the same direction, how many degrees away from the start position is Janet now?

2 Bert is building another web, this time between two straight, parallel beams $WX \parallel YZ$.
His web has three straight supports: AB, DE and GH.



Bert wants to put in another straight support JK that passes through O, starting at J (between W and A) and finishing at K (between B and Z).

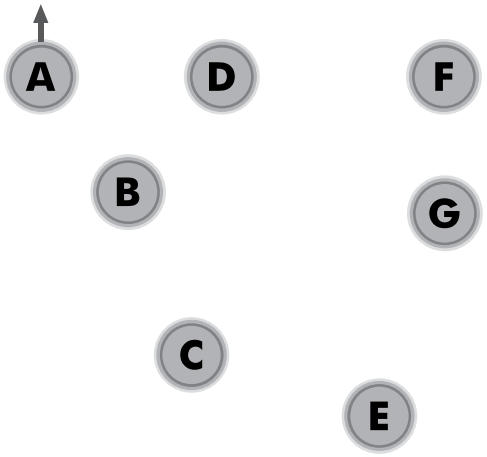
a Draw in the support JK that matches Bert's wishes.

b What is the size of $\angle OJA$ if all the acute angles against the beam WX are complementary?

Angle problems

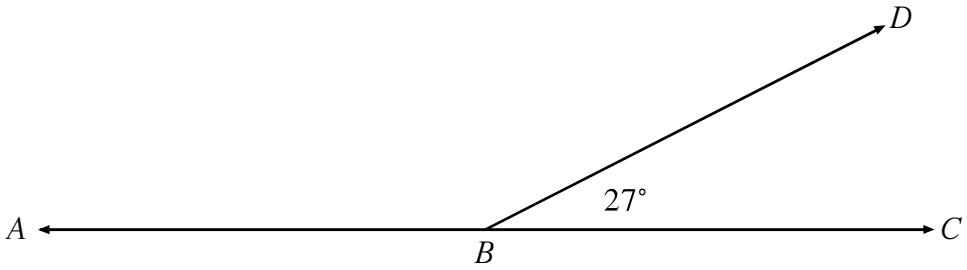
3 A toy robot is programmed to move to all of the discs shown below.
It starts on disc A facing in the direction of the arrow.
When it reaches each disc, the robot remains facing the direction it was during the previous move.
Name the order of the discs it moves to if it follows these instructions in order:

- Turn a right-angle clockwise ↻ and travel forward to the next disc.
- Complete a full revolution and then travel forward to the next disc.
- Turn counter-clockwise ↺ 200° and travel forward to the next disc.
- Turn clockwise 270° and travel forward to the next disc.
- Turn clockwise 80° then travel in reverse (backwards) to the next disc.
- Turn counter-clockwise an acute angle and travel forward to the last disc.



Disc order:

4 As part of a treasure hunt, participants must complete puzzles to receive the name of the next destination. At one stop, the puzzle is this:



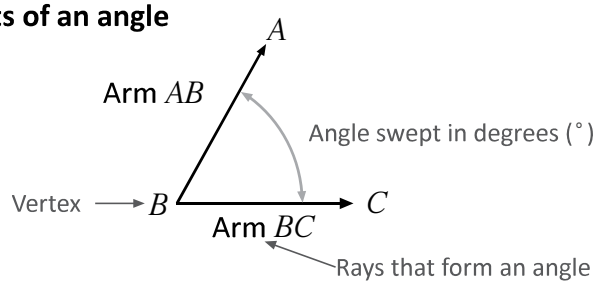
Step 1: If $\angle ABC$ is a straight angle, calculate the complement of $\angle DBC$ and add it to one of the angles formed when $\angle ABD$ is divided into nine equal sized parts.

Step 2: Calculate the size of reflex $\angle ABD$, subtract the value of step 1 from it and then add the supplement of $\angle DBC$ to the answer.

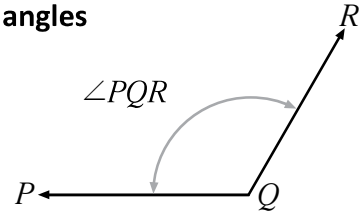
What answer will win you the name of the next destination?

Here is a summary of the important things to remember for angles

Parts of an angle



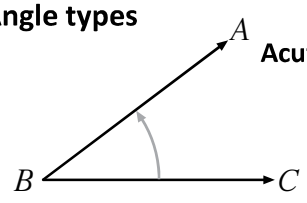
Naming angles



The letter at the vertex is **always** written in the middle

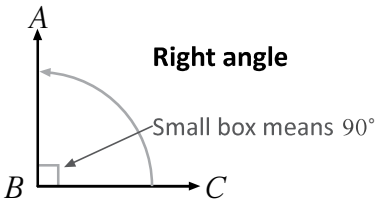
Angle types

Acute angle



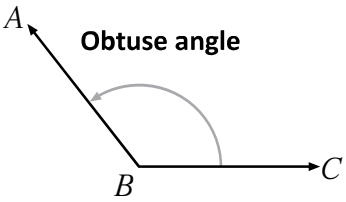
$0° < \angle ABC < 90°$

Right angle



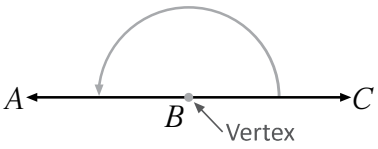
$\angle ABC = 90°$

Obtuse angle



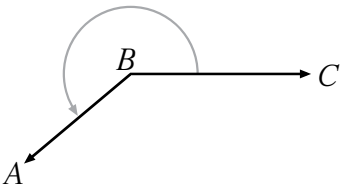
$90° < \angle ABC < 180°$

Straight angle



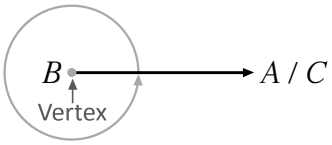
$\angle ABC = 180°$

Reflex angle



$180° <$ reflex $\angle ABC < 360°$

Full revolution or Full rotation



$\angle ABC = 360°$

Complementary and supplementary angles

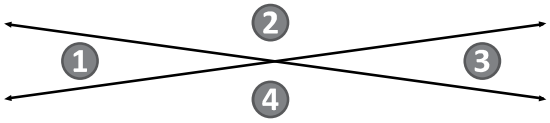
Complementary: a pair of angles whose sum $= 90°$

Together they form a right-angle

Supplementary: a pair of angles whose sum $= 180°$

Together they form a straight-angle

Vertically opposite angles



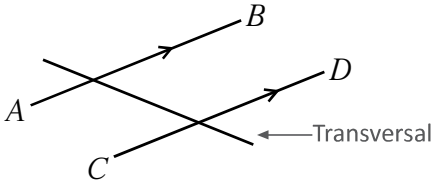
Angle 1 = Angle 3

and

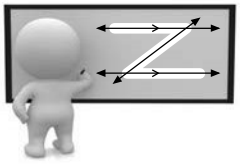
Angle 2 = Angle 4

Parallel lines

- $AB \parallel CD$: means the line AB is parallel to the line CD
- Arrows indicate parallel lines

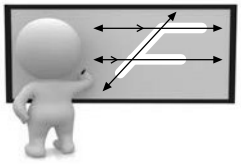


Alternate angles



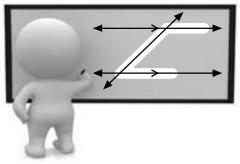
Equal on parallel lines

Corresponding angles



Equal on parallel lines

Cointerior angles



Supplementary on parallel lines