Hello Trees Resource Sheet

An outdoor game to play all year

Opposites vs Alternates

Car journeys used to be dreary for youngsters before there were videos to watch or games to play on smart phones.

We used to compete to see whose car colour was seen the most,

When energy flags outdoors, especially on a walk, an adaptation of the car-journey game can encourage us to keep going - and keep looking around us.

Each person or team chooses 'alternate' or 'opposite'.
Everyone helps spot whether leaves are alternate or opposite along shoots.

The 'opposite' team gets a point every time anyone spots a tree or plant with leaves opposite each other. Likewise, the 'alternate' team gets a point every time anyone spots a plant or tree with alternate leaves: leaves not opposite each other.

Points are for each tree, not for every shoot on the tree!
For a tangled hedge, you might need a referee to decide whether shoots are on the same tree or not!

If you have chosen 'opposite', you can get points for leaves that are in whorls, where more than 2 leaves are arranged around the same level of the shoot.

Cleavers leaves are in whorls. Cleavers are the strands we love to throw at each other's clothes because they cling. You will always find them in hedgerows.

Cleavers' close relatives, hedge bedstraw (white) and ladies bedstraw (yellow and fragrant) are worth looking out for. Some of their whorls of tiny leaves fold down in an interesting cuff. And check out their tiny 4-petalled flowers.

Conifer branching is in whorls around the main stem. A point for that?
Larch and cedar leaves are in whorls but the whorls arranged in spirals. A point each!
What about spruce, fir and pine needles? Each needle is a leaf. 'Opposite' or not?

What is this about 'spirals'?
Strictly, 'alternate' leaves are those arranged so that each leaf is set on the opposite side from the leaf below it and the leaf above it: a half turn from each other.
For our game, we can include in 'alternate' those leaves arranged in a spiral around the shoot: the leaves set in spirals, in turns other than ½, from the ones above and below.

In winter, when leaves have fallen, you can play the game with buds instead of leaves: whether buds are alternate or opposite.

Leaf arrangement is a clue to the identity of the tree.
Want to know which tree is which?
The following 3 pages will help you put names to common hedge and other trees.

For even more about leaf arrangement, see page 5.

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<u>Common hedge trees with alternate or spiral leaves or buds</u> are

hawthorn,




hazel





elm




Feel how rough elm leaves are to the touch.

holly



It is difficult to see the buds of holly shoots because it is an evergreen tree.

blackthorn




Blackthorn leaves are only the size of a child's thumb.
The tiny, light brown, rounded buds even grow along the thorns.

Which other alternate or spiral hedge trees did you find?

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<u>Common hedge trees with opposite leaves or buds</u> are

dogwood




field maple




Note how each pair of buds is at right angles to the pair above and below.

elder




Elder leaves are opposite, and so too are its leaflets. 2 points?

Did you find any other hedge trees with opposite leaves or buds?

<u>Some common trees with opposite buds or leaves</u> are

ash





Ash leaves and leaflets are both opposite. 2 points?

sycamore and other Acers (maples)




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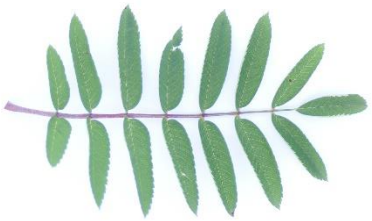
<u>Some common trees with alternate or spiral buds or leaves</u> are

rowan (the mountain ash).




See how hairy the rowan bud is!
Rowan leaves are alternate, but their leaflets opposite. A point each?

birch




oak





beech

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There is a whole lot more to leaf arrangement than you might think.
There is even a botanical name for it!

phyllotaxis is the botanical name for the arrangement of leaves on a plant stem (from Ancient Greek *phýllon* 'leaf' and *taxis* 'arrangement').

Oak leaves look as if they are arranged on one side, then top, other side, bottom, first side …

If you look closely, it should be possible to see that oak leaves are not exactly arranged at right angles to the leaves above and below. That would be leaves arranged at ¼ turns to each other.

Oak (and apricot) leaves are in fact arranged in 2/5 turns from each other.

Beech and hazel leaves are arranged in 1/3 turns from each other.

Poplar and pear leaves are arranged in 3/8 turns from each other.

Willow and almond leaves are arranged in 5/13 turns from each other.

Does this mean that every 3rd beech and hazel leaves line up with each other?

And every 10th oak leaf?

You tell me.

You really do have to look closely!
Leaf stalks (petioles) tend to bend so that its leaf gets the right amount of light.
It takes a close look to determine exactly where on the shoot the petiole started.

Mathematicians have fun with the fractions, engineers use phyllotaxy to optimise systems, and artists and architects are inspired by the patterns.

What will phyllotaxis inspire you to get up to?

Arranging pebbles in interesting spirals?
Or twigs in whorls?

We would love to hear how you get on with looking at leaf or bud arrangement – and whether you found the game encouraged your group onwards on your walks.

Let us know on the Hello Trees Facebook page or Hello Trees website.

For more about how to identify trees, see the clear photographs of the clues to a tree's identity in Hello Tree books.

For tons of stuff to look for and do outdoors, find Hello Trees discovery sheets on the Resources page.