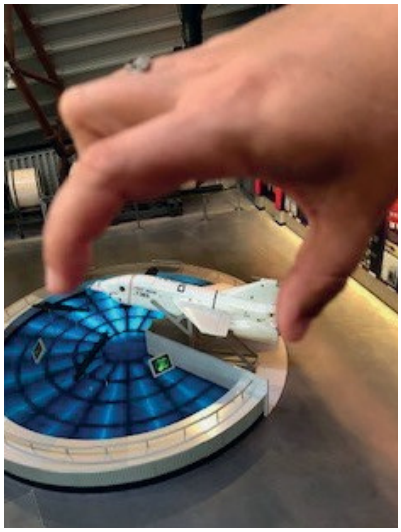
Forced Perspective



By completing this hands-on activity, learners will grasp a better understanding of forced perspective by utilising scientific knowledge, maths skills and spatial awareness to create a range of fun images.

Suitable for Ages 7 +

Curriculum links Art and Design and Maths

Have you seen films like Harry Potter, Lord of the Rings or even Honey I Shrunk The Kids and wondered how the filmmakers made the actors appear small like a hobbit or tall like Hagrid?

They could use very tall or very short actors as a stand in or maybe even computer graphics - but a popular method of achieving the effect is to use the concept of forced perspective.

Resources
• A camera – this can be on a smart phone or a tablet, or you can use a digital camera. (Make sure you have a parents/guardians permission before you take photos.)
• Your home and or garden.
• A tape measure.
Pen and paper for your calculations.

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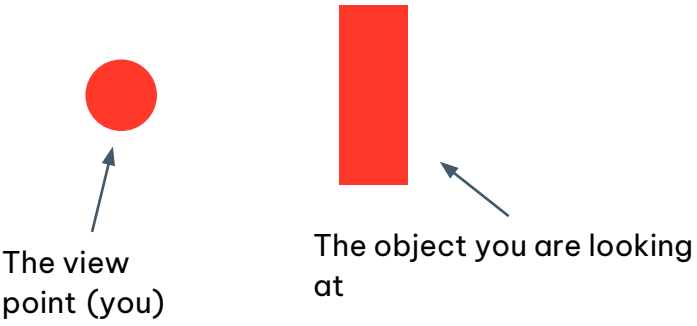
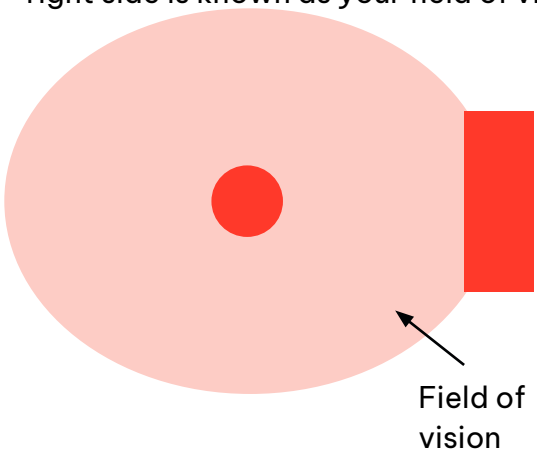
What is forced perspective?

‘Forced perspective is a technique that uses an optical illusion to make an object appear further away, closer, larger or smaller than it actually is. It manipulates our visual perception by using scaled objects and the correlation between them and the vantage point of the spectator or camera.’

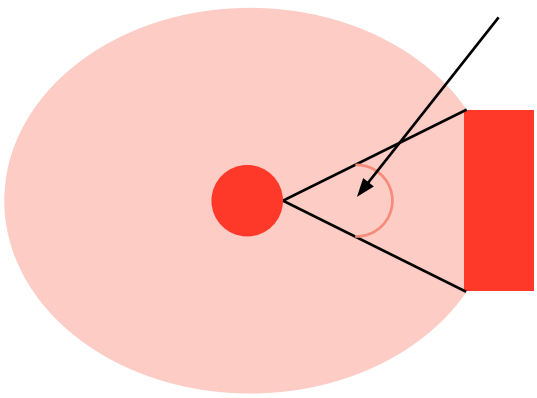
How does it work? Our field of vision: imagine you are looking at an object in your home e.g a television or dining table.



The distance from the bottom to the top and from the left to the right side is known as your field of vision.



Smaller things closer to your eye and large things that are further away can take up the same amount of space in your visual field. Think about using your thumb to cover up an object when you see it in the distance.



The angle between the two lines is how much of your visual field the object takes up.

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What about the maths?

- There are lots of directions you can take forced perspective in depending on the ability and mathematical understanding both you and your learners have. There are for example sources online that bring in trigonometry, but this is very advanced.
- The rest of this resource will provide some challenges and activities that use basic maths and measuring skills.

Distance

Pick two objects you have at home – one should be bigger than the other. We will call one of them Object A and the other Object B. Your challenge is to take a photograph where Object A looks ¾ smaller than Object B.

How do we achieve this? The bigger object needs to be closer to the camera, but how much closer?

The maths

If Object A is 10 metres away from the camera, Object B needs to be ¾ closer to the camera. We can calculate this distance with some simple multiplication.

Multiply the distance Object A is away from the camera by the scale your aiming to achieve in this case:

10 (m) x 0.75 (3/4) = 7.5 (m)

Object B should therefore be 7.5m away from the camera to achieve the scale you're looking for.

Activity time

Work out the maths for these scenarios:

- Scenario: Object A is 25m away from the camera and you want Object B to look ¼ the size of A. How far away does Object B need to be from the camera?
- Scenario: Object A is 8m away from the camera and you want Object B to look ½ the size of A. How far away does Object B need to be from the camera?

- Now using the objects you picked, try to work out the maths for your own pictures. Check if it works by putting the maths into use and taking photographs.

Top Tip: If you're taking pictures of people, make sure they aren't looking directly at one another as this may spoil the illusion.

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Height

Sometimes when creating forced perspective knowing the height of an object can be helpful, especially when working out the best vantage point for the camera to create the most effective optical illusion.
If you have a garden, take a look out of the window. How could you measure the height of a building or any trees you may see?

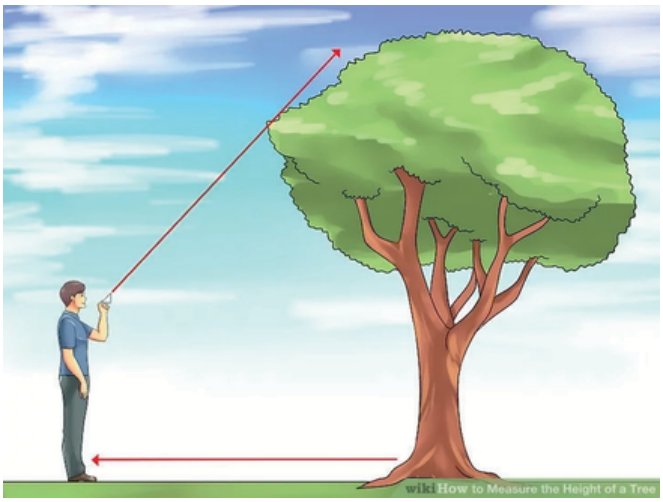

Image source wikihow.com/Measure-the-Height-of-a-Tree

You will need the following resources

- A square piece of paper
- A tape measure
- A basic understanding of trigonometry.

Trigonometry basics

If you view the top of the object in question at a 45-degree angle, then the height of the object is equivalent to the distance that you are from the object.

- Fold your square piece of paper into a triangle. The triangle you make will have 2 x 45-degree angles and 1 x 90-degree angle.

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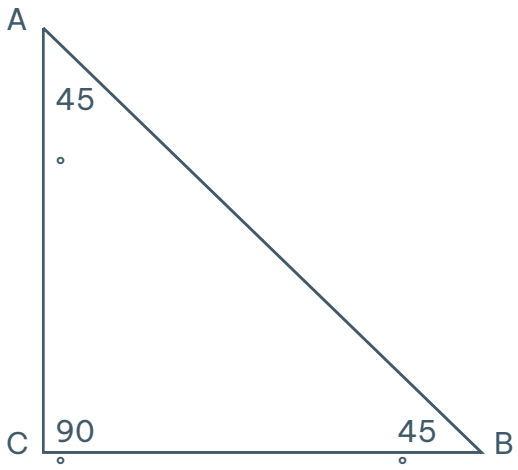

• Hold the triangle in front of one eye by holding a corner opposite from the 90-degree right angle. The longest side, the one you'll look up is called the hypotenuse of the triangle (the long line from A – B on the diagram above).
• Move back from the building/object until you can sight the top of it at the tip of the triangle. Close one eye and use the other to look directly along the hypotenuse until you see the exact top of the object and mark the spot on the ground.
• Measure the distance from it to the base of the object but don't forget to add on your own height.
• This combined measurement is roughly the height of the building or object you're looking at.

Now it's time for the fun bit!

Choose objects in and around your home, use family members and take some forced perspective photographs! Here are some ideas:
• Take a picture where you look taller than your parents/guardians
• Make it look like you are standing on top of a bottle or on the handle of a saucepan.
• What about a picture where it looks like you are squashing something that's much bigger than you?

If you search for forced perspective images online, you will find lots of inspiration and as a starting point here are some images taken by Museum staff.

Share your work with us on social media!

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