## Helix

A helix is a curve traced by a point which moves around and along the circumference of a cylinder with uniform velocity.

Draw a helix given the diameter of 100 mm and a lead of 150 mm .

## N.B: The lead is the height of the cylinder.



1. Draw a circle/ semi-circle 100mm diameter.
2. Divide into 12 equal parts with a $30^{\circ} / 60^{\circ}$ set-square
3. Number the sectors
4. Mark out the pitch 150 mm
5. Divide the lead into 12 equal parts and number
6. Projects lines from the circle/ semi-circle
7. Line in the curve at intersecting points.
N.B. the examiner might ask to show hidden detail. In this case since the helix is on the other side of the cylinder it is marked as hidden.



Step 1: Draw a 55 mm diameter semi-circle (this is in between the inside and the outside diameter)

Step2 : Use a circle template to draw faint $\varnothing 10 \mathrm{~mm}$ circles from each point on the helix

Step 3: Join the helix as showed above and make sure to define whether it is a right or a left-handed helix.

## Square sectioned helical spring

Outside Diameter: 60mm
Inside Diameter: 20mm
Square: 10mm
Lead: 48mm
Turns required: 2
Left-handed spring
Step 1: Construct the helix with the biggest diameter for two turns.
Step 2: Construct the second helix using the same diameter, 10 mm away from the first one (since the square section is that of 10 mm ) You can do this by using your compass and constructing 10 mm arcs from the previously constructed helix onto the lines projected from the semi-circle.
Step 3: construct the inside diameter and project lines intersecting with the $30^{\circ} / 60^{\circ}$ lines
Step 4: Construct the smaller helix for two turns
Step 5: Then construct the second helix 10 mm away for the smaller helix as done in step 2.
N.B.: the above is done on the same 2 pitches so it is important to be careful and be faint when constructing. Here they are drawn separately for clarity.

Finally one has to visualise the spring to define it and use a darker pencil. You must be really careful as it can be easily joined as a right handed spring instead.


Construct a right hand square thread for 3 turns having:

- an internal diameter of 60 mm
- an external diameter of 80 mm
- a lead of 60 mm
- the thickness of the spring is half the lead


Step 1: work out the helix for the external diameter
Step 2: repeat the helix again after ${ }_{2}^{1}$ a lead Step 3: work out the helix for the internal diameter Step 4: repeat the helix again after $\underset{\underset{2}{1} \text { a lead }}{1}$ Step 5: join the form of the right hand square thread as shown below
Step 6: define it well by using a darker pencil


## Vee Thread




5


2

6


Construct a twin start vee thread for two whole revolutions ( 2 leads) given bolt diameter of 60 mm and root diameter of 45 mm , a lead of 40 mm and a pitch $\frac{1}{2}$ the lead.
This means that the second helix (that's why it's called twin) will start from half way through the lead).

Step 1: After you construct the external diameter and divide the two leads in 24 (12 for each lead) start by constructing the helices, one starting ${ }_{2}^{1}$ lead later.

Step 2: Draw the internal diameter and project lines from the sectors intersecting with the smaller diameter. Construct the helix as shown. It is not produced as one whole helix to limit the amount of construction lines.

Step 3: Join the helixes in the form of a zigzag as shown in 4.

Step 4: Define the helix as shown in steps 5 and 6 .

