Learning Aid: Technical Terms for Describing Drawings
(How to say what you see)

Youth Explore Trades Skills: Electronics and Robotics
Why Words?

- Tradespeople, Technicians and Engineers use drawings every day
  - Drawings are the “language of technology”
    - A good technical drawing can be understood anywhere around the world!
- Knowing the language helps you communicate clearly
  - Using the correct words makes you sound skilled
- Describing a drawing helps you think about how to create a drawing
  - Complex drawings have to be broken down into simple steps
- The shapes we will describe and draw today are simple
  - But the thought process is not
    - It requires care and attention to detail… important skills in the work world!
You already know many of the words...

• Square

• Rectangle

• Triangle

• Circle

• Line

• Point

• Vertical

• Horizontal
You probably know these ones, too...

• Perpendicular
  • Two lines “at right angles”
  • Also known as 90 degrees

• Parallel
  • Two lines that run in the same direction
    • But don’t overlap

• Concentric
  • Sharing the same centre point

• Collinear
  • Line segments that are “on the same line”
Ellipse

• A distorted circle
  • It has a “Major Axis” (the long side)
  • And a “Minor Axis” (the short side)
Arc

• A section of a circle or ellipse
• Can also be called a curve
  • But curves can be more complex, and made of many arcs.
Tangent

• Where a line touches a curve at only one point
  • It may not cross the line... only touch it!
Fillet

• Rounding the corner where two lines meet
  • Uses a circular arc tangent to the two lines
Chamfer

• Cutting the corner where two lines meet
  • Like a fillet, but with a straight line rather than a circular arc
  • Chamfers and fillets are often used to remove sharp edges from objects
Offset

- Drawing a similar shape, but off to one side of the original
  - Can be applied to lines, curves, circles, squares, ellipses or even PacMan
Angles and Rotation

- Sometimes a shape is rotated or a line is at an angle
  - We use the same “degrees” of rotation that you use in math class
  - There are 360° in a circle
    - 90°, 45° and 30° are all common angles
  - This compass is marked in 5° increments
How would you describe this shape?

• There is a square
  • It is not rotated

• There is a circle
  • Centred on the top left corner of the square
  • It has a radius about one quarter the length of the side of the square

• There is a line
  • It goes from the top right corner of the square to the bottom left corner of the square
Try drawing this shape...

- There is a triangle
  - All the sides are the same length
  - The bottom of the triangle is horizontal
- There is a circle at each corner of the triangle
  - The radius of the circle is about one third of the side of the triangle
- The top circle and left circle are joined with a line
  - The line is tangent to both circles
Try describing this shape...

- There is a rectangle
  - It is about twice as long as it is high
  - The long edge is rotated about 20° from horizontal
- Inside the rectangle is an ellipse
  - The edges of the ellipse are tangent to the sides of the rectangle
- There is a line to the left of the rectangle
  - It is parallel to the short edge of the rectangle
  - It is the same length as the short edge of the rectangle
  - It is offset from the short edge of the rectangle by about one tenth of the length of the long edge of the rectangle
Can you draw this shape?

• There are three concentric circles
  • If the first circle has a radius of 1 unit
    • The second circle has a radius of 1.5 units
    • The third circle has a radius of 2 units

• There is another circle
  • Its centre is about 4 units to the left
  • And 3 units above the centre of the first circles
  • It has a radius of 2 units

• The 2-unit circles are joined by two lines
  • One line is tangent to the tops of the big circles
  • The other line is tangent to the bottoms of the big circles

• The two tangent lines are connected by a line
  • It is perpendicular to the tangent lines
  • It is located at the midpoint of the tangent lines (halfway)
Now find a partner....

• Arrange the desks/chairs so that one partner has their back to the screen
  • The partner with their back to the screen should be able to draw
  • The other partner can see the screen
    • But not what their partner is drawing.
    • Perhaps arrange the chairs to place the partners back-to-back

• The partner who is looking at the screen is going to describe a drawing to their partner, who will attempt to draw it

• Ready?
Try describing this to your partner...

• Start with a square
  • It is rotated 45°

• The top right side of the square forms the base of a triangle
  • One side of the triangle is a vertical line, extending up from the right hand point of the square.
  • The other side of the triangle is a horizontal line, extending to the right from the top of the square
  • The tip of the triangle is filleted, with a radius about 1/3 of the length of the triangle sides

• The bottom left side of the square forms the base of another triangle
  • This triangle points in the opposite direction from the first triangle
  • This triangle is “pointier” than the first triangle
    • The angle of each side of the triangle is about 30° from the base of the triangle
  • The tip of this triangle is chamfered
    • About 1/5 of the way from the tip of the triangle

• Inside this triangle is a circle
  • It is tangent to the two sides of the triangle
  • It doesn’t quite touch the chamfer, but it comes close
Now the partners swap positions....

• Get a fresh sheet of paper for the student doing the drawing.

• Ready?
Try this one...

• There are three circles of equal diameter stacked vertically
  • The top edge of one circle is tangent to the bottom edge of the next circle

• The middle circle has three smaller concentric circles inside it
  • Their diameters are about 75%, 50% and 25% of the larger circle

• The left sides of the three large circles are joined by a line
  • The line is tangent to each of the circles
  • It extends from where it touches to top circle to where it touches the bottom circle

• There is a line that is perpendicular to this line that passes through the centre of the middle circle
  • It begins where the vertical line touches the middle circle
  • It has a length about twice as long as the diameter of the three large circles
Okay... just one more

• It will be easy if you remember what a “tangent” is

• Let the best “drawer” draw, and the best “describer” describe...

• Ready?
The Last One...

• There is a square
  • It is not rotated
  • The top corners are filleted
    • The fillet radius is about 1/5 of the length of the side of the square

• Inside the square is a curve
  • It touches the square at:
    • The bottom left corner
      • It is tangent to the bottom side of the square
    • The midpoint of the top side
      • It is tangent to the top side
    • The bottom right corner
      • It is tangent to the bottom side
How would you like to describe this drawing?

• You could do it ... but it would be a pain!
  • “A picture is worth a thousand words.”
    • More importantly, a picture can be understood in any language

• Knowing the words to describe drawings can help you discuss drawings
  • You can suggest changes ... or understand suggestions to improve your design

• Knowing the process to break a shape into smaller parts can help you create complex drawings

• Using detailed, specific terms can help you produce better instructions
  • Clear, precise communication is an important skill that can be learned!

• We’ve been using simple, abstract shapes because real things become complex quickly.

• This is actually a design for building a simple electric motor
  • It gets cut on a CNC machine and the two end pieces are rotated vertically to fit into the rectangular slots.
  • Bearings and a shaft go into the round holes
  • Magnets and brushes mount to the elongated slots