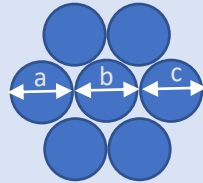


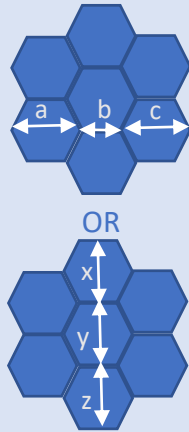
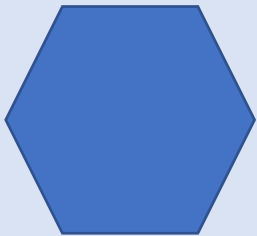
- ☆ The bigger the area of a mirror, the more light a telescope can capture. This allows us to see further, and in greater detail.
- ☆ Your telescope needs to have an **effective diameter of at least 8m** in order to detect the sources of gravitational waves.
- ☆ There are two main choices for you to make: Will you use circular or hexagonal mirrors? Will you use a single mirror or multiple mirrors?

### Using circular mirrors

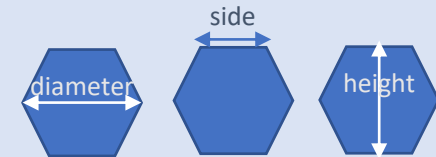


- ☆ Multiple mirrors don't fit together tightly
- ☆ 10% of the light is lost through the gaps between the mirrors
- ☆ So the effective diameter (ED) when using multiple circular mirrors is the total diameter of the mirrors combined multiplied by 0.9
- ☆ **ED = 0.9 x (a + b + c)**

### Using hexagonal mirrors







- ☆ Multiple mirrors do fit together tightly
- ☆ So the effective diameter (ED) when using multiple hexagonal mirrors is the total diameter of the mirrors
- ☆ **ED = a + b + c or x + y + z**
- ☆ For a hexagon:
  - ☆ Side = 0.5 x diameter
  - ☆ Height = 0.87 x diameter




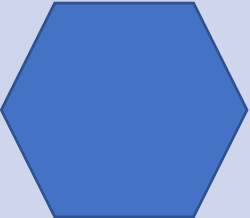


# DESIGNING A TELESCOPE

## ACTIVITY 2: MIRROR SELECTION

| Circular Mirrors | Diameter | 1 m   | 2 m   | 3 m   | 8 m   |
|------------------|----------|---|---|---|---|
|                  | Mirror   |  |  |  |  |
|                  | Cost     | £0.5 million  | £2.5 million  | £7 million  | £60 million   |
|                  | Weight   | 500 kg  | 2,000 kg  | 4,500 kg  | 32,000 kg   |

| Hexagonal Mirrors: | Diameter | 1 m   | 2 m   | 4 m   | 10 m  |
|--------------------|----------|---|---|---|---|
|                    | Mirror   |  |  |  |  |
|                    | Cost     | £1 million  | £5 million  | £15 million   | £100 million  |
|                    | Weight   | 400 kg  | 1,600 kg  | 6,400 kg  | 40,000 kg   |

### You must consider...

- ☆ How the different shaped mirrors fit together and how much light is lost through any gaps.
- ☆ The overall weight of their mirror – the lighter the better – this will affect which materials they can use for the structure.
- ☆ The price of the mirror.
- ☆ The total diameter of the mirror – the larger the mirror the fainter the objects they will be able to see – this means that they will be able to look for objects at greater distances.
- ☆ The overall shape of the mirror - a roughly circular shape will focus the most light onto the detectors.