

Tutorial No 1, Semester 1, 2026/27

1. Two trees next to each other are swaying repeatedly from side to side during a storm. The shorter tree completes 10 cycles in the same time during which the taller tree completes 6 cycles. If the taller tree completes 3 cycles in 4 seconds, calculate the frequencies of vibration of each of these two trees. When the storm gets weaker, the frequency of the taller tree decreases to 0.6 Hz. If the frequency of the shorter tree decreases by the same proportion, what would be the frequency of the shorter tree when the storm gets weaker?
2. A girl in a shopping mall sings a note with a frequency of 660 Hz, and a trombone player standing nearby then plays a note which is 3 octaves below the girl's note. What is the frequency of the trombone's note? A soprano singer nearby then sings a note which has a frequency of 1,320 Hz. Calculate the number of octaves between the soprano singer's note and the trombone's note. A clarinet player sitting a short distance away then plays a note which is 2 octaves above the trombone's note. Calculate the frequency of the clarinet's note. What is the interval between the clarinet's note and the soprano's note? If the frequency of the girl's note is 440 Hz instead of 660 Hz, calculate the frequencies of the

trombone's note, the soprano singer's note and the clarinet's note assuming that these notes maintained the same frequency relationships to each other as before.

3. A fire engine passing in front of you registers a siren sound level of 98 dB on a sound level meter you are carrying. The fire engine then stops at a house on fire some distance away, and the sound from its siren is 10,000 times weaker than when it was in front of you. What would the reading on your sound level meter due to the fire engine's siren be? The fire engine then turns off its siren and a police car passing in front of you registers a siren sound level of 78 dB on your sound level meter. How many times more powerful is this sound compared to the fire engine's siren when the fire engine is at the house on fire? (Assume that the readings on the sound level meter are due only to the police car's siren or the fire engine's siren.)
4. A piece of music performed by a solo flute begins with a time signature of $26/8$. A certain bar in this piece begins with a dotted crotchet and ends with three quavers and four semiquavers. Calculate the number of semiquaver notes which could fit into the middle of this bar in accordance with the time signature. If the bar begins with two crotchets instead of a dotted crotchet, how many semiquavers would then fit exactly into the middle of the bar? (If we add a dot to a note or a rest, the duration of the note or rest is increased by 50%.)

5. If you start from any key on a piano keyboard and go up or down to a key which is its immediate neighbour, the interval moved is always that of a semitone. If we start from any key to the next key above or below which has the same letter name (i.e. A, B, C, etc), the interval moved is always 12 semitones or one octave. Starting from the piano key with the letter name of F just above Middle C, how many semitones are there from this F to the D sharp which is just below Middle C? What is this interval in terms of octaves? Give the letter name of the piano key which is the same number of semitones above the starting F. What is the number of octaves from this higher note to the D sharp just below Middle C?
6. The ratio of a musical interval from one musical note to another musical note at a higher pitch is defined as the ratio of the frequency of the higher note to the frequency of the lower note. Starting from a note with a frequency of 440 Hz and moving up by an interval with a ratio of $\frac{25}{8}$, calculate the frequency of the higher note on which we will arrive. Starting from this second note and going down by an interval with a ratio of $\frac{15}{9}$, what is the frequency of the third note on which we will arrive? Calculate the ratio of the interval between the first note and the third note.

Scientific Inquiry discussion points

1. Science seeks to discover and understand the universe through the methodology of scientific inquiry. Scientists observe the universe and formulate hypotheses to

explain what they observe. They test their hypotheses through experiments and further observation. A hypothesis becomes an accepted theory if supported strongly by experimental or observational evidence. Can you think of examples of scientific inquiry which changed our perception and understanding of the universe?

2. Technology seeks to shape and modify the universe in order to improve the quality of life in human society. Technology can include simple objects like chairs and lamps, and complex objects like computers and integrated circuits. Like science, technology dates back to the earliest days of mankind, and technological tools and artefacts can be found in the earliest archeological sites. What are good examples of technological achievements in early societies and in modern civilisation?