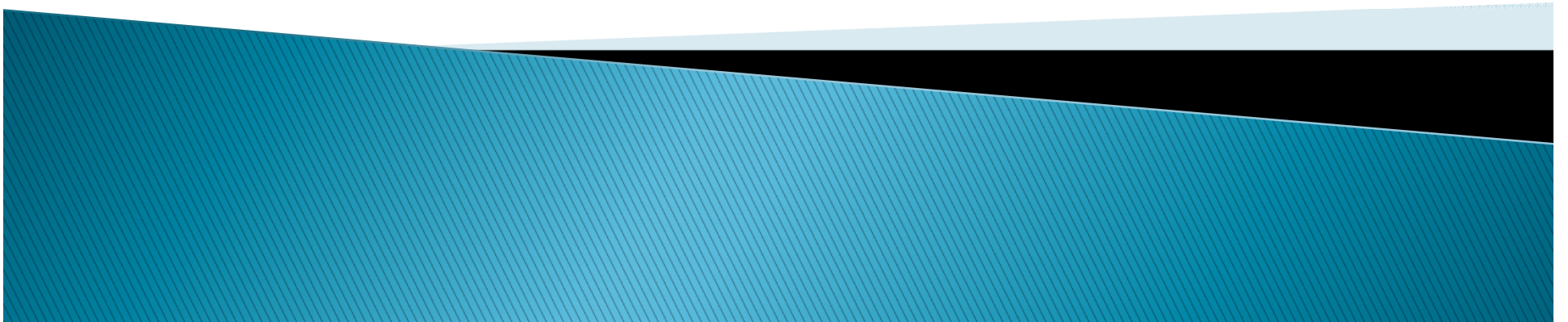


ECG Lead II

Interpretation Answers



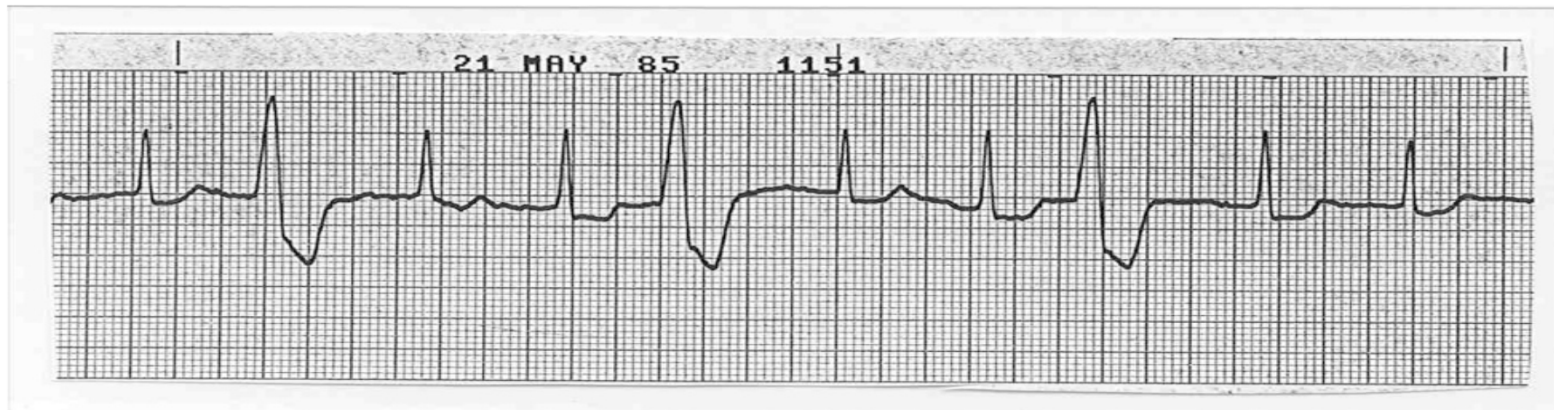
#1. 2nd Degree Block Type 1



Step	Finding
Rate	70
Rhythm	Irregular
P-R Interval	0.160s
QRS Duration	0.080s
P-QRS Ratio	1 to 1

- Every other complex on this strip looks different.
- Looking at the first complex it has a normal P-QRS-T configuration.
- The second complex has a prolonged P-R interval.
- The second complex is followed by a 'dropped beat' (although the P waves preceding these dropped beats are difficult to see).
- A handy saying that may help you recall this rhythm is 'longer, longer, drop one is type one', referring to the incrementally prolonged P-R interval followed by a dropped beat.

#2. Junctional with Premature Ventricular Contractions - Trigeminy



Step	Finding
Rate	90
Rhythm	Irregular
P-R Interval	n/a
QRS Duration	0.080s/0.120s
P-QRS Ratio	n/a

- The underlying rhythm is junctional, based on its regular R-R interval, narrow QRS configuration ($< .120$ s) and no 'P' waves.
- There are also extra, wide complex beats; called PVCs.
- When every third beat is a PVC it is sometimes referred to as 'trigeminy'.

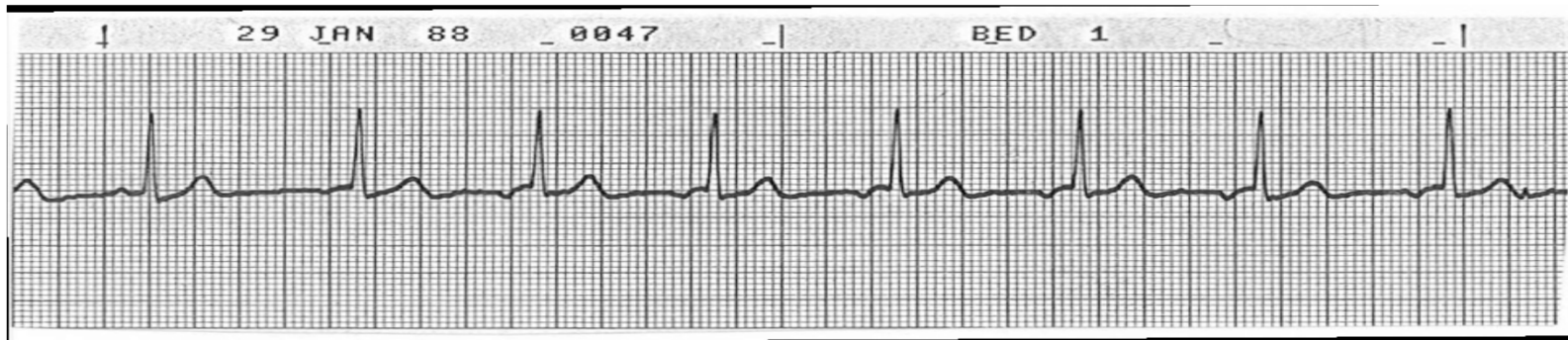
#3. Torsades des Pointes



Step	Finding
Rate	n/a
Rhythm	Irregular
P-R Interval	n/a
QRS Duration	n/a
P-QRS Ratio	n/a

- This rhythm has a distinct increasing then decreasing amplitude in a repeating pattern typical of Torsades des Pointes.
- If the patient is pulseless it should be treated like any other pulseless V-tach or V-fib.

#4. Accelerated Junctional



Step	Finding
Rate	80
Rhythm	Regular after first QRS
P-R Interval	0.160s
QRS Duration	0.080s
P-QRS Ratio	1 to 1

- The first complex on this strip has an upright 'P' wave, the rest are all inverted.
- An inverted complex of any type means the depolarisation is occurring 'backwards' or in the case of a normal lead II, from the bottom upwards.
- An inverted 'P' wave thus means the depolarisation is coming from the bottom of the atria (at the junction).
- A junctional rhythm is usually between 40-60 beats per minute.
- If it is faster than 60 but less than 100 it is considered 'accelerated junctional'. If it is greater than 100 it is considered 'junctional tachycardia'.

#5. Sinus with Premature Atrial Contractions



Step	Finding
Rate	60
Rhythm	Regularly Irregular
P-R Interval	0.160s
QRS Duration	0.120s
P-QRS Ratio	1 to 1

- Every other complex on this strip look different. Looking at the first complex it has a normal P-QRS-T configuration.
- The second complex is premature and also has a 'P' wave that falls right behind the preceding 'T' wave.
- A premature complex with a 'P' wave is a premature atrial complex (PAC).
- When determining the rate of a rhythm all 'extra' beats are counted.

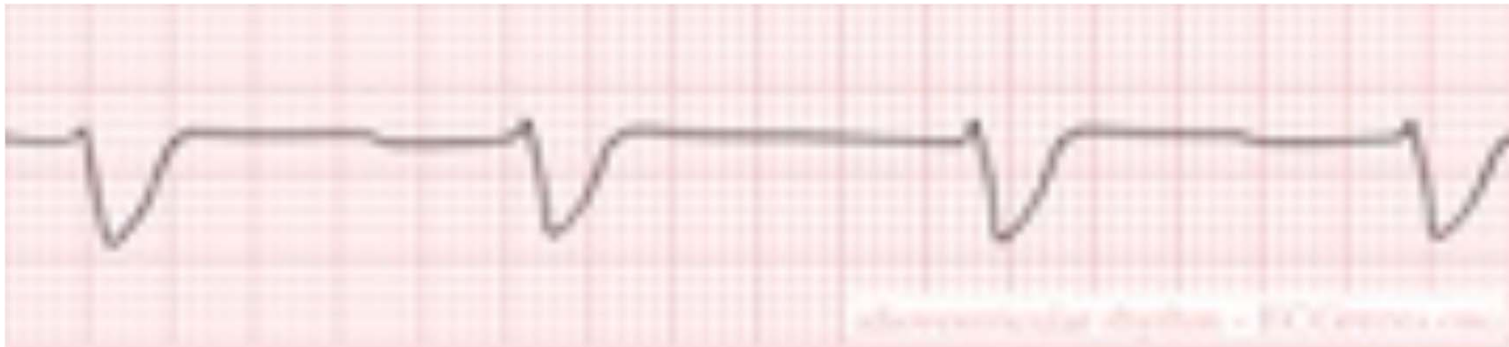
#6. Atrial Flutter with variable conduction



Step	Finding
Rate	100
Rhythm	Irregular
P-R Interval	0.160s
QRS Duration	0.060s
P-QRS Ratio	variable

- The underlying atrial activity is atrial flutter based on its fast rhythm and characteristic appearance. Because some flutter waves are not followed by QRS complexes there is also a second degree, type two, block.
- Because the number of 'F' waves with no associated QRS complex varies, the block can be called 'variable'.
- There are only 25 large boxes visible on the strip and the rhythm is not regular so it is impossible to determine an accurate rate.
- I have estimated it to be close to 100.

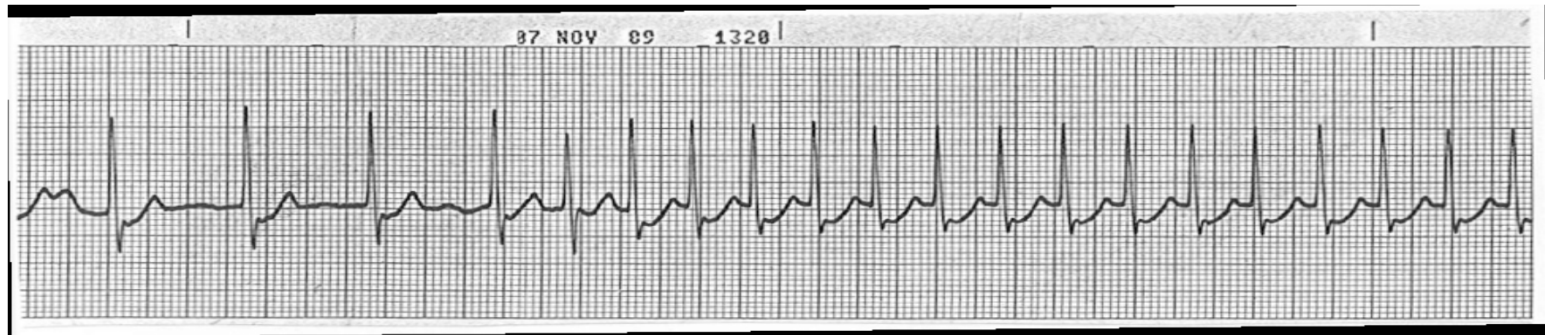
#7. Idioventricular



Step	Finding
Rate	~55
Rhythm	Irregular
P-R Interval	n/a
QRS Duration	0.200s
P-QRS Ratio	n/a

- “Wide and slow and the Ps don’t show, is idio..” is a saying that might help you to remember this rhythm.
- There are not six seconds available to determine the rate, but it looks relatively regular so we can use the 300-150-100... method.

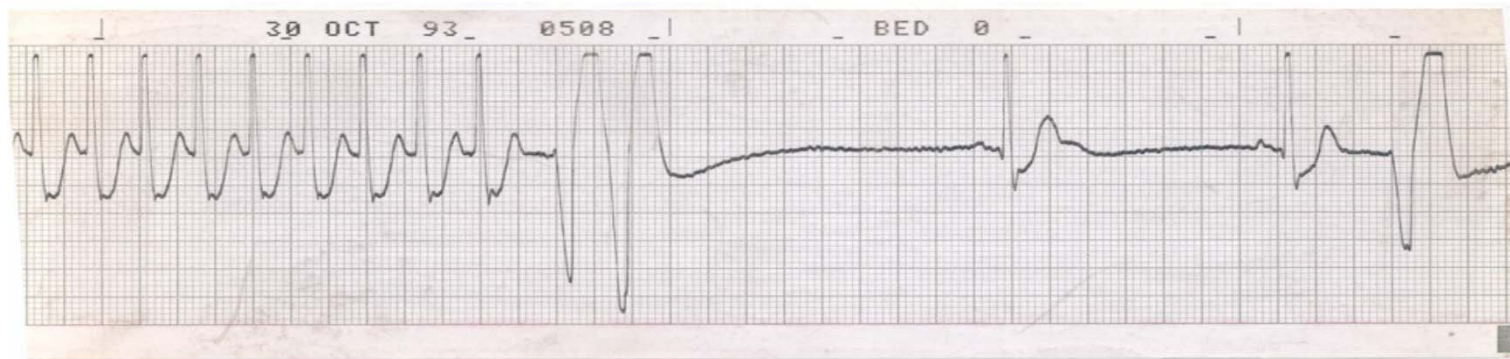
#8. Junctional into a Supraventricular Tachycardia



Step	Finding
Rate	160
Rhythm	Irregular turning regular
P-R Interval	n/a
QRS Duration	0.080s
P-QRS Ratio	n/a

- This strip starts as a narrow complex, regular rhythm with no 'P' waves and then in short order gets faster than 200 beats per minute and very regular (SVT).
- The sudden onset of this rhythm makes it a true 'paroxysmal supra ventricular tachycardia' (PSVT), with the 'paroxysmal' referring to the suddenness.

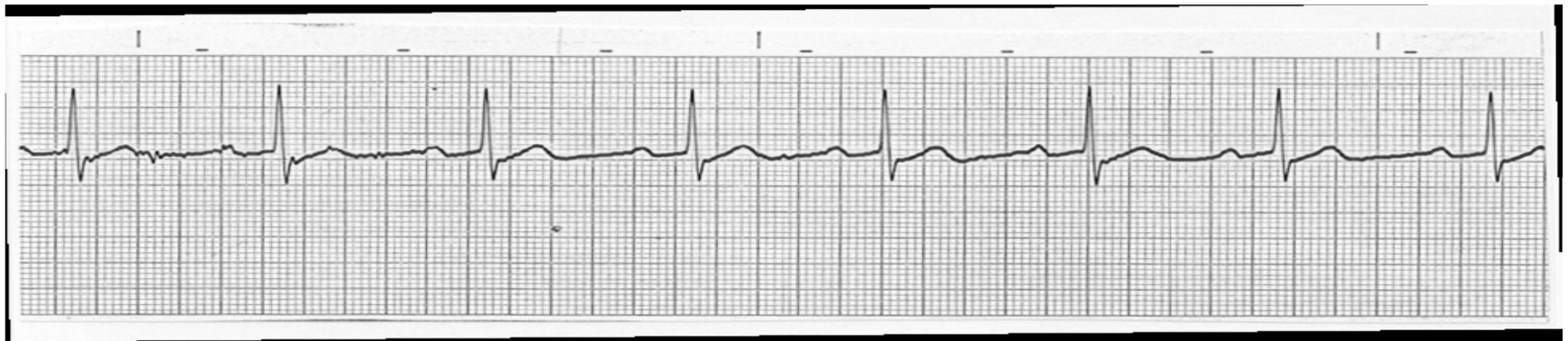
#9. Supraventricular Tachycardia conversion to a Sinus Bradycardia



Step	Finding
Rate	~240
Rhythm	Regular then irregular
P-R Interval	0.160s (once brady)
QRS Duration	0.080s
P-QRS Ratio	1 to 1 (once brady)

- This rhythm is similar to 8 only the other way around.
- It starts off as an SVT at about 240 per minute and then two ventricular beats is followed by a sinus bradycardia.
- It is very possible that this patient had been given adenosine moments prior to this strip being printed.
- Adenosine stops conduction through the AV node for a short period of time thus terminating the out-of-control self depolarisation that occur in these rhythms.

#10. 1st Degree Block



Step	Finding
Rate	60
Rhythm	Regular
P-R Interval	0.240s
QRS Duration	0.080s
P-QRS Ratio	1 to 1

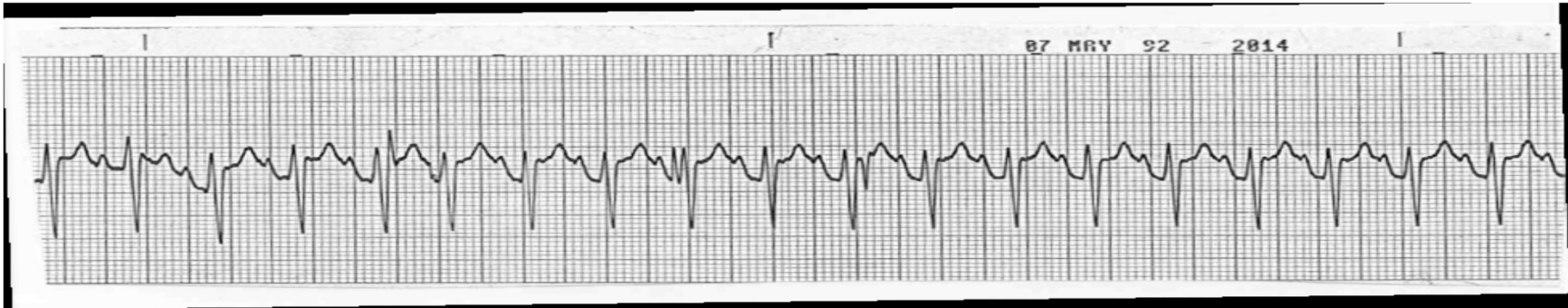
- This rhythm looks normal other than that the prolonged P-R interval.
- If the P-R interval is longer than 0.200 s it is considered a 1st degree A-V block.
- The prolonged interval means that the conduction between the atria and the ventricles is slowed down more than usual.
- Vagal activation, beta blockers and anti-alzheimers meds such as Aricept are common culprits.

#11. Sinus Arrhythmia



Step	Finding
Rate	60
Rhythm	Irregular
P-R Interval	0.160s
QRS Duration	0.080s
P-QRS Ratio	1 to 1

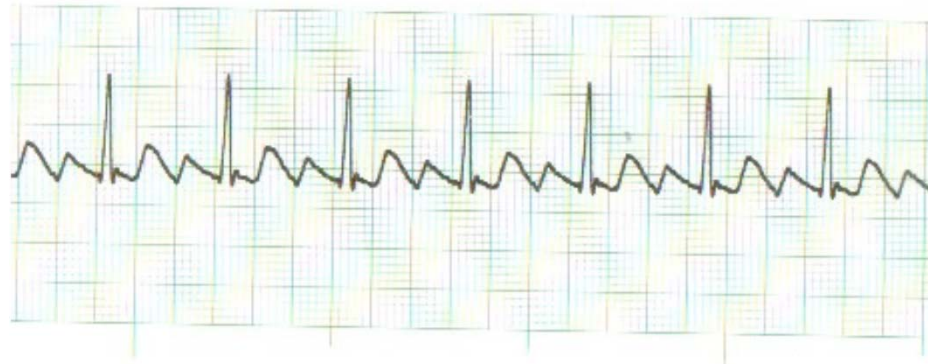
#12. Sinus Tachycardia



Step	Finding
Rate	155
Rhythm	Regular
P-R Interval	0.120s
QRS Duration	0.080s
P-QRS Ratio	1 to 1

- This rhythm looks 'bad' at a first glance, but systematic analysis of its components reveals that it is normal other than being fast.
- Try to determine the cause of sinus tachycardia as it is often a compensatory response to something; fever, pain, blood loss, infection etc.

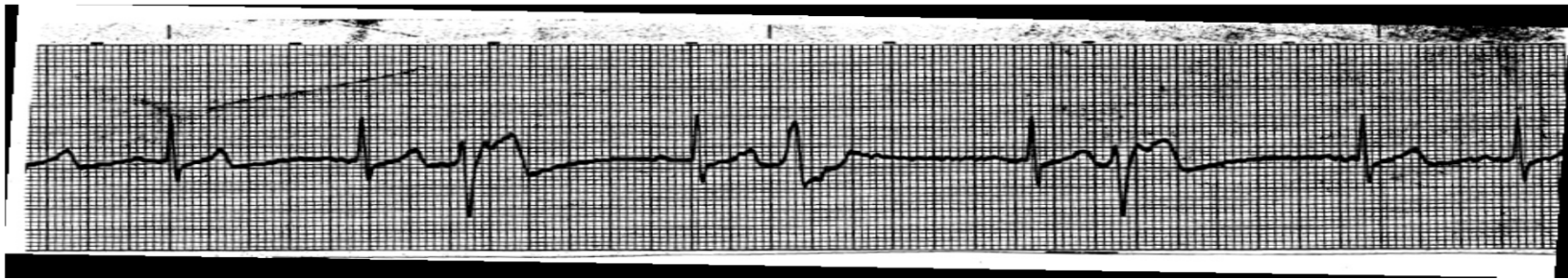
#13. Atrial Flutter 3:1



Step	Finding
Rate	100
Rhythm	Regular
P-R Interval	F waves present
QRS Duration	0.080s
P-QRS Ratio	F-QRS, 3:1

- Atrial flutter is characterised by oddly shaped 'P' waves that are renamed 'F' waves.
- A great hint is that these flutter waves are usually occurring at a rate of 300 per minute.
- To determine the 'conduction ratio', (the number of 'F' waves for each QRS) simply determine the QRS rate, in this case 100.
 - F : QRS
 - $300 : 100 = 3:1$ conduction ratio
- This eliminates the common confusion of miscounting the 'F' waves as there is usually one buried in the QRS complex.
- The above strip is also shorter than six seconds so the 300-150-100... method is the only way of determining the rate.

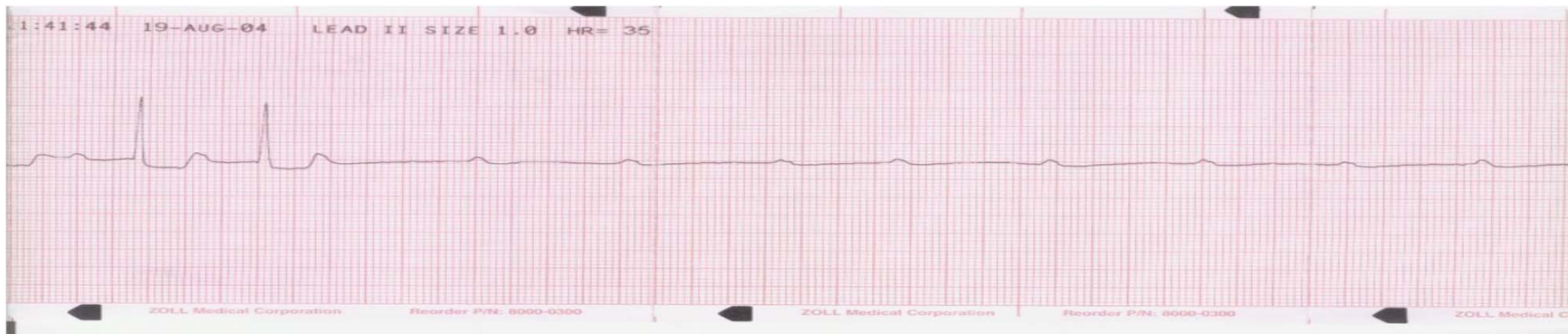
#14. Sinus Rhythm with multifocal Premature Ventricular Contractions



Step	Finding
Rate	~ 75
Rhythm	Irregular
P-R Interval	0.200s
QRS Duration	0.080/0.120s
P-QRS Ratio	1 to 1 (except ectopics)

- This rhythm is an underlying sinus rhythm with some extra beats.
- The beats are wide (ventricular) and premature, hence PVC.
- They also have different shapes, meaning that they originate in different areas of the ventricle (multifocal).
- There is also an episode where every other beat is a PVC (bigeminy).
- So could be called 'underlying sinus with a run of multifocal, ventricular, bigeminy'.
- As a point of interest, the 'T' wave is usually deflected in the opposite direction of the QRS in a PVC, this holds true on the above strip.

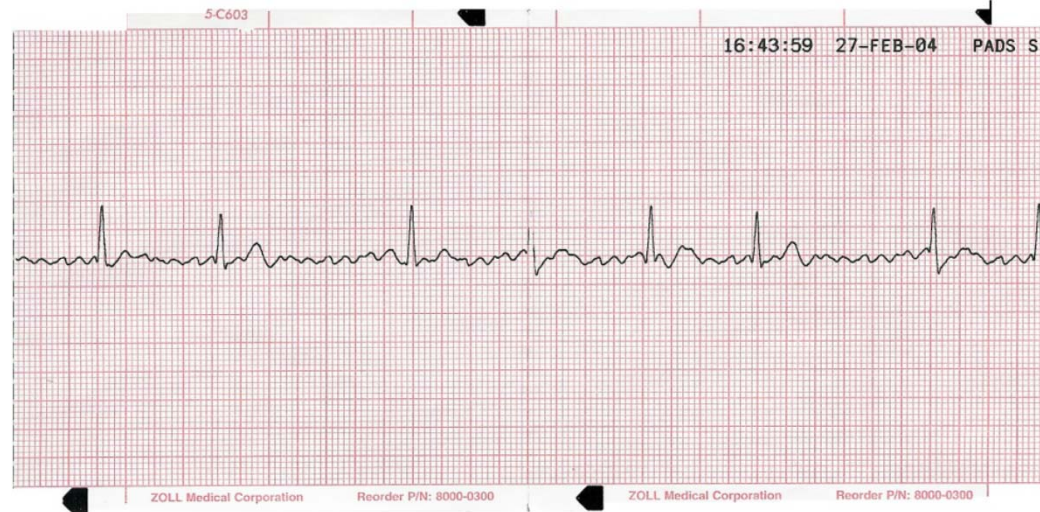
Ventricular Standstill



Step	Finding
Rate	75 (atrial only)
Rhythm	Regular
P-R Interval	n/a
QRS Duration	n/a
P-QRS Ratio	n/a

- This rhythm is sometimes seen in a person who is VSA.
- Basically there are P waves only.
- The ventricles are not depolarizing at all.

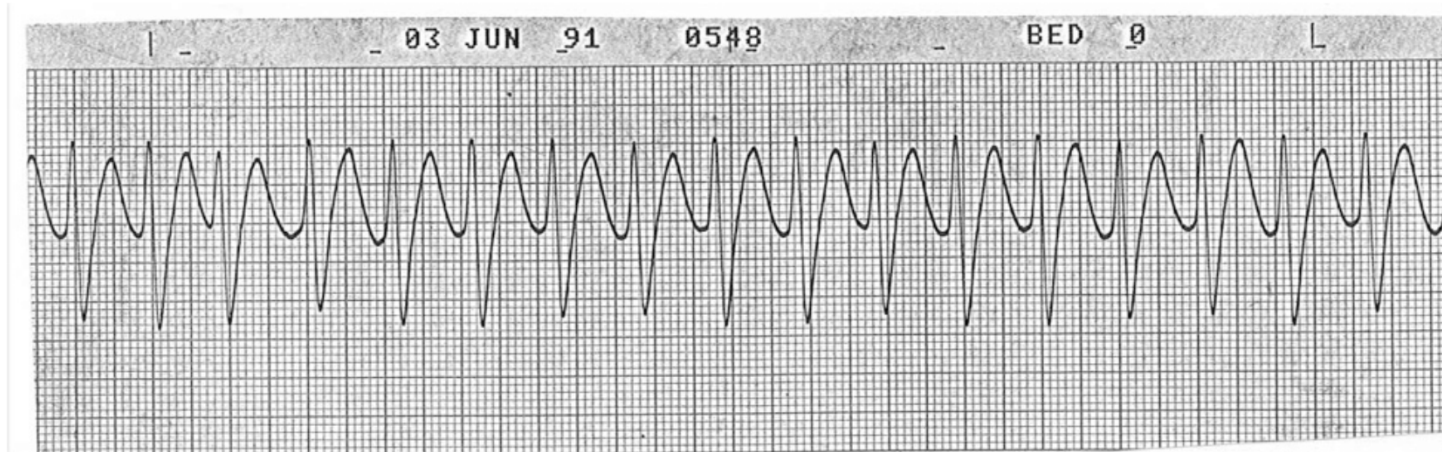
#16. Atrial Fibrillation



Step	Finding
Rate	80
Rhythm	Irregular
P-R Interval	n/a
QRS Duration	0.060s
P-QRS Ratio	n/a

- This is another 'narrow complex, irregularly irregular rhythm with no 'P' waves'.
- Even though these rhythms come in a wide variety of 'looks' they are all atrial fibrillation.
- 15% of people older than 65 years of age have atrial fibrillation.
- Many don't even know that they have it.

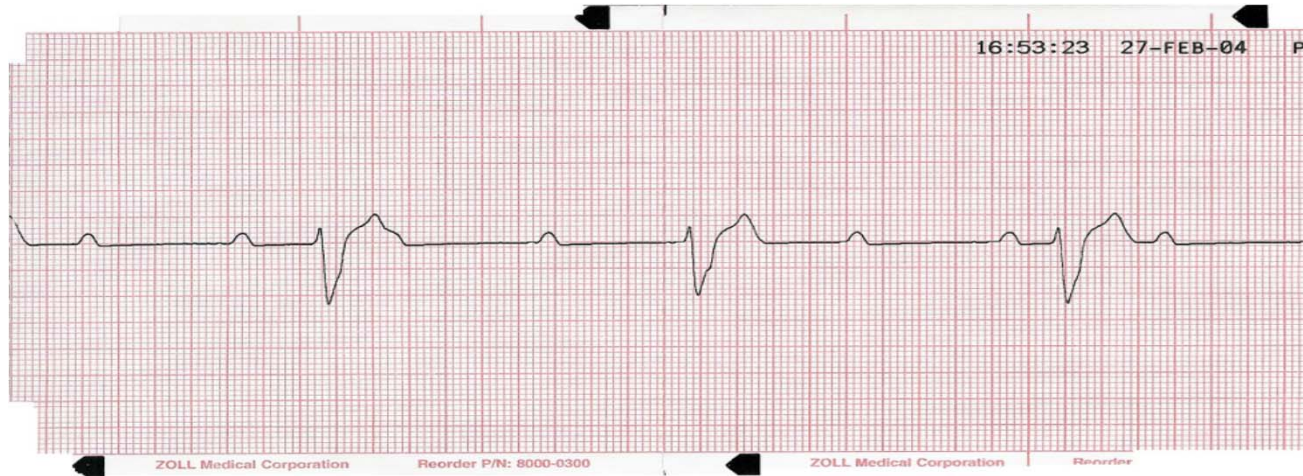
#17. Sinus Tachycardia or Junctional



Step	Finding
Rate	140
Rhythm	Regular (mostly)
P-R Interval	n/a
QRS Duration	0.120s
P-QRS Ratio	n/a

- This one is tricky and might have more than one 'right' answer.
- Because of the rate and the configuration of the complexes it is impossible to know for sure if there are 'P' waves present or not.
- The rate does not seem fast enough to be an SVT nor is it 100% regular (although very close).
- If there are no 'P' waves then it would be a junctional tachycardia (a junctional rhythm >100 / min).
- If there are 'P' waves buried in the 'T' waves then it is a sinus tachycardia.

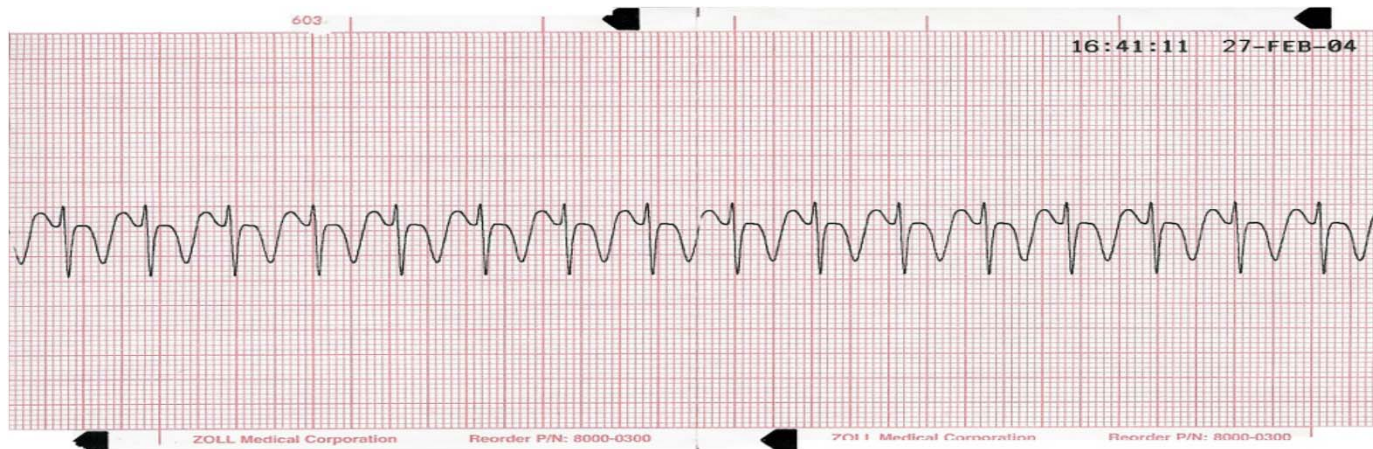
#18. 3rd Degree Block



Step	Finding
Rate	30
Rhythm	Regular
P-R Interval	n/a
QRS Duration	0.160s
P-QRS Ratio	No relation

- This strip has two different regular rhythms on it.
 - 'P' waves are regular at around 65 beats per minute.
 - QRS complexes are regular at 30 beats per minute.
- However, there is no relation between the two rhythms, they are essentially divorced, 'doing their own thing'.
- There is a complete disconnect between the atria and the ventricles.

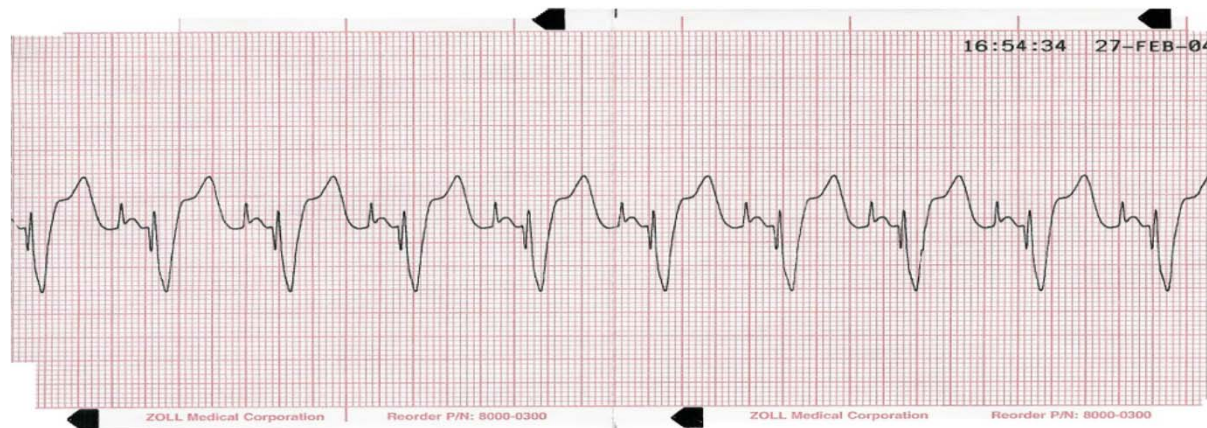
#19. Sinus Tachycardia



Step	Finding
Rate	140
Rhythm	Regular
P-R Interval	0.160s
QRS Duration	0.080s
P-QRS Ratio	1 to 1

- The black markers at the top of this strip are 3 second markers.
 - Because there aren't two of those markers visible on the strip, there are two options to determine the rate.
 - One is to count 30 large boxes (6 seconds).
- Or
- Because the rhythm is regular, you can use the 300-150-100... method.

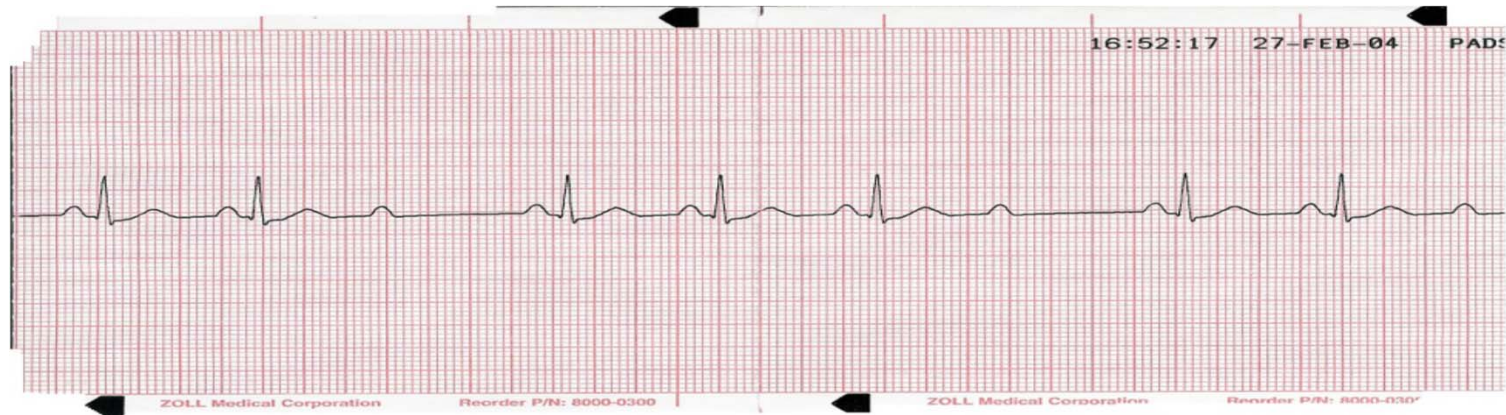
#20. Atrial-Ventricular Sequential Pacemaker



Step	Finding
Rate	90
Rhythm	Regular
P-R Interval	0.160s
QRS Duration	0.160s
P-QRS Ratio	1 to 1

- This strip consists of a pacemaker spike followed by a 'P' wave (atrial pacemaker).
- Right after the 'P' wave there is another pacemaker spike followed by a wide QRS complex (ventricular pacemaker).
- This type of pacemaker is called an A-V sequential pacemaker and has two electrodes, one that triggers the atria and one that triggers the ventricles shortly after, hence the patient retains their atrial kick.

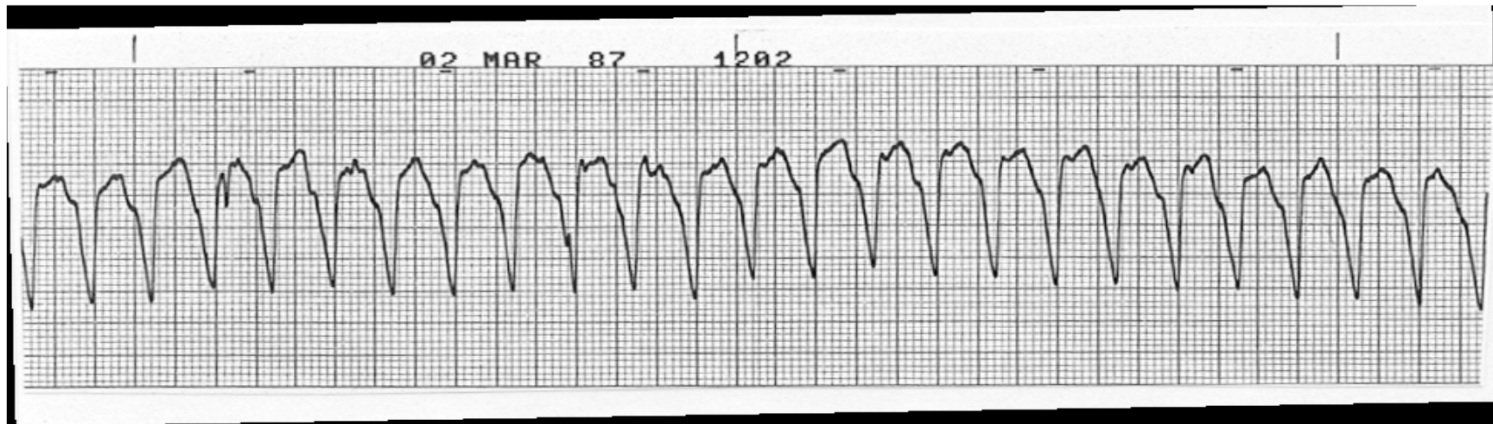
#21. 2nd Degree Block Type 2



Step	Finding
Rate	70
Rhythm	Irregular
P-R Interval	0.160s
QRS Duration	0.080s
P-QRS Ratio	Sometimes no QRS for P

- This strip looks quite normal except that every now and then there is a 'P' wave that is not followed by a QRS complex; sometimes referred to as a 'dropped beat'.
- When a beat is dropped but all other 'P'-QRS relations are normal it is referred to as a second degree, type two, AV block.
- It is concerning as it often deteriorates into a third degree AV block.

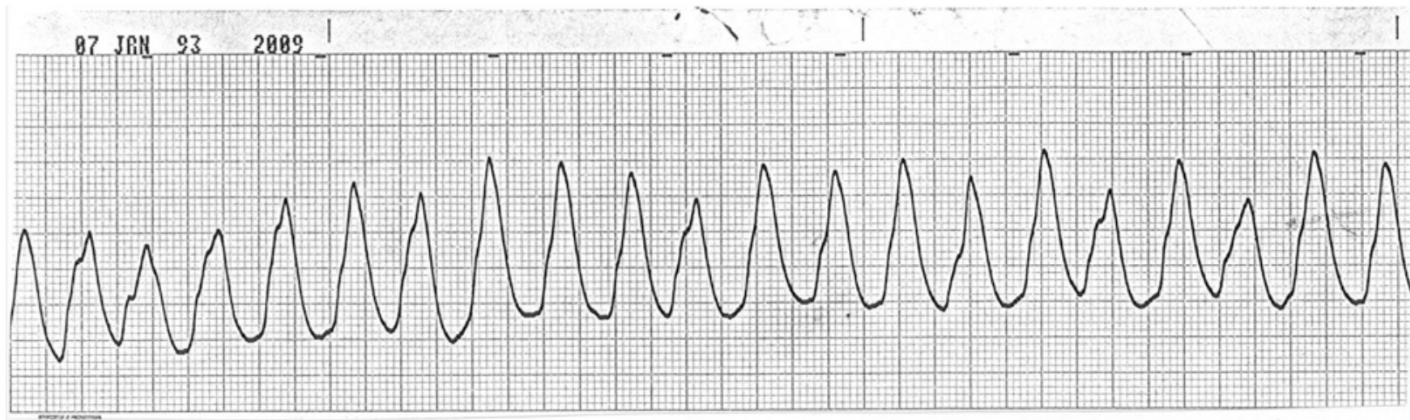
#22. Ventricular Tachycardia



Step	Finding
Rate	200
Rhythm	Regular
P-R Interval	n/a
QRS Duration	0.160s
P-QRS Ratio	n/a

- The wide complex and fast rate makes this rhythm quite easy to recognize.
- Keep in mind v-tach might or might not have a pulse.

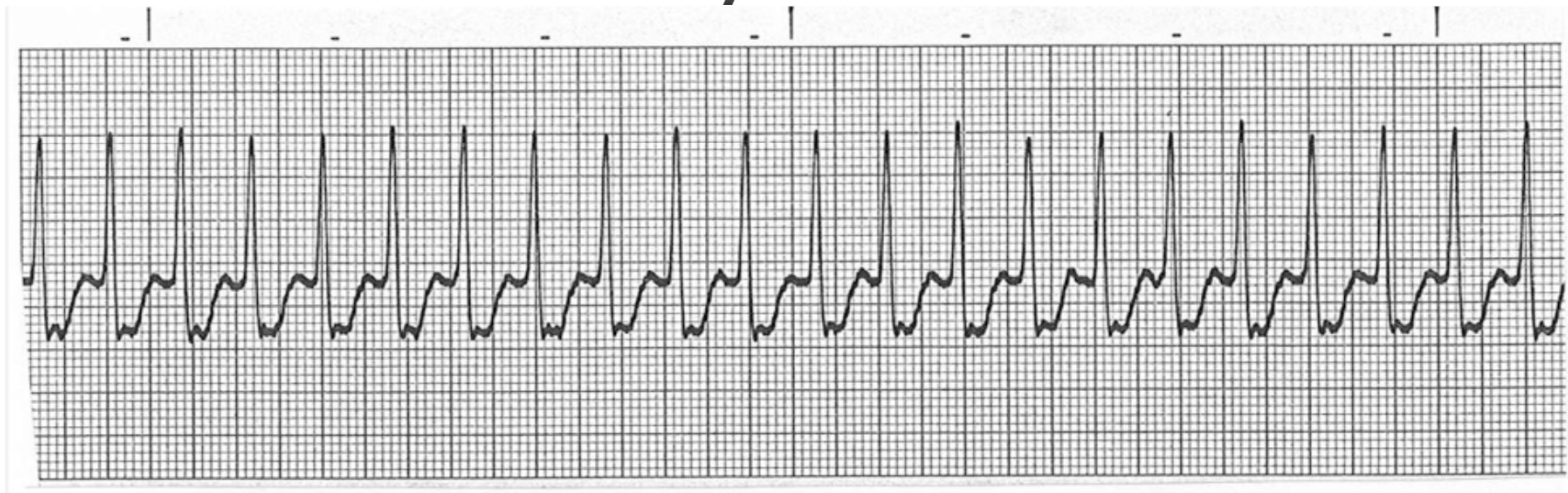
#23. Ventricular Tachycardia



Step	Finding
Rate	160
Rhythm	Mostly regular
P-R Interval	n/a
QRS Duration	0.240s
P-QRS Ratio	n/a

- This is another example of ventricular tachycardia.
- The Laerdal Heartstart 3000 SAED that many paramedics started using as their first defibrillator was programmed to only shock v-tach faster than 180 beats per minute.
- The newer monitors (Zoll and LP12) will shock much slower v-tach in their semi-automatic modes.
- It is important to check for a pulse, especially in slower v-tachs.

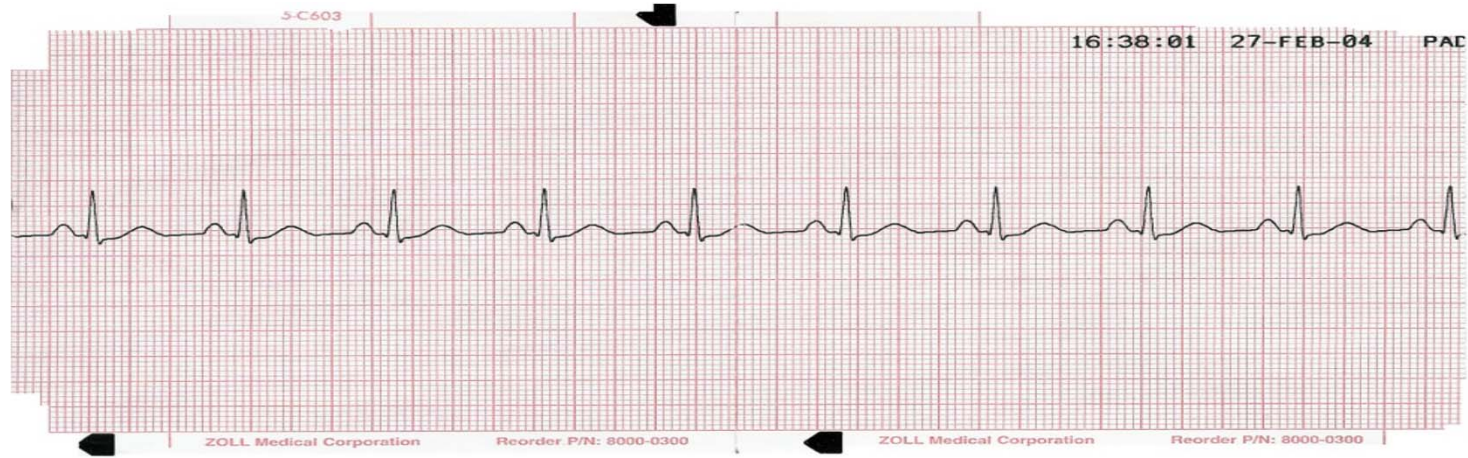
#24. Supraventricular Tachycardia



Step	Finding
Rate	180
Rhythm	Regular
P-R Interval	Difficult to discern
QRS Duration	0.080s
P-QRS Ratio	1 to 1 (if present)

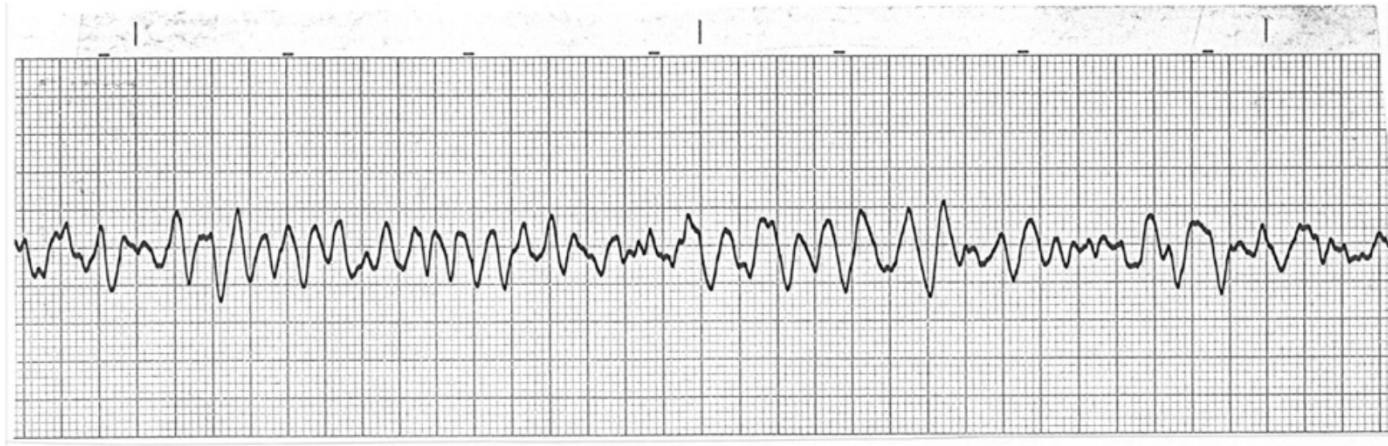
- The rate of this rhythm can be determined either by counting the number of beats in 6 seconds (the vertical lines at the top of the paper are 3 second markers)
OR
- By the 300-150-100... method.
- On a fast rhythm like this the second method is much faster than counting 18 beats over the 6 seconds.

#25. Normal Sinus Rhythm



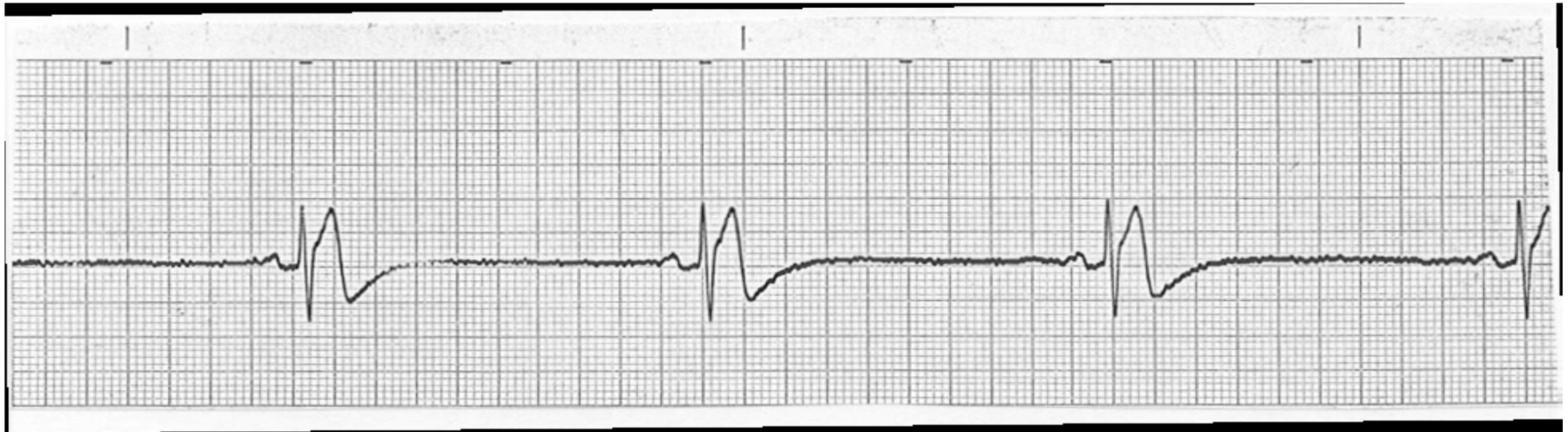
Step	Finding
Rate	80
Rhythm	Regular
P-R Interval	0.160s
QRS Duration	0.080s
P-QRS Ratio	1 to 1

#26. Ventricular Fibrillation



Step	Finding
Rate	n/a
Rhythm	Irregular
P-R Interval	n/a
QRS Duration	n/a
P-QRS Ratio	n/a

Sinus Bradycardia



Step	Finding
Rate	30
Rhythm	Regular
P-R Interval	0.160s
QRS Duration	0.080s
P-QRS Ratio	1 to1

- This strip is totally normal except for the rate.
- Usually this slowing is caused by vagal nerve stimulation.
- If the patient is suffering a potential myocardial infarction consider the potential of a inferior wall MI as these often lead to vagal nerve irritation and bradycardia.
- Nausea, vomiting, GI upset, neurocardiogenic syncope are other causes of vagal stimulation.