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Voici ci-après (page 3 et suivantes) un fichier que j'ai obtenu grâce au récepteur GPS de mon téléphone.

On peut y lire des trames NMEA, c'est à dire des données calculées par la puce GPS de mon téléphone et qui ont ensuite été envoyées aux applications qui ont accès à ce récepteur GPS. Répondez aux questions posées ci-dessous.

Questions

Question 1 : Où étais-je à 12h 26min 04s ? Afficher ce lieu sur OpenStreetMap.

Question 2 : Même question à 12h 26min 08s.

Question 2 : Quelle a été ma vitesse maximum ? A quelle heure était-ce et à quelles coordonnées géographiques ? Afficher ce lieu sur OpenStreetMap.

Question 3 : Quelle a été mon altitude maximale ? A quelle heure était-ce et à quelles coordonnées géographiques ? Afficher ce lieu sur OpenStreetMap.

Question 4 : Quelle était la date de cet enregistrement de trame NMEA ?

Question 5 : Combien de temps a duré cet enregistrement de trame NMEA ?

Aides pour faire les questions

- Pour rechercher une suite de caractères dans le fichier :
« Ctrl+F » ou « Édition > Rechercher »
- Pour convertir toutes les données en tableau (c'est plus simple de rechercher certaines informations par colonnes) :
sélectionner les données puis : « Tableau > Convertir > Texte en tableau »
- Pour copier-coller les données dans un tableur (c'est plus simple de rechercher certaines informations par colonnes) :
copier les données, ouvrir un nouveau classeur, puis « Édition > Collage spécial > Texte non formaté > séparateur virgule »
- Pour afficher dans OpenStreetMap le point de latitude 43°3089 et de longitude 5°4372
<https://www.openstreetmap.org/#map=12/43.3089/5.4372>
(« map=12 » : règle le zoom de la carte à 12)

Exemple expliqué de trame GGA

\$GPGGA,064036.289,4836.5375,N,00740.9373,E,1,04,3.2,200.2,M,,,,0000*0E

\$GPGGA : Type de trame

064036.289 : Trame envoyée à 06h 40min 36,289s (heure UTC)

4836.5375,N : Latitude 48,608958° Nord = 48°36'32.25" Nord

00740.9373,E : Longitude 7,682288° Est = 7°40'56.238" Est

1 : Type de positionnement (le 1 est un positionnement GPS)

04 : Nombre de satellites utilisés pour calculer les coordonnées

3.2 : Précision horizontale ou HDOP (Horizontal dilution of precision)

200.2,M : Altitude 200,2, en mètres

,,,,,0000 : D'autres informations peuvent être inscrites dans ces champs

*0E : somme de contrôle de parité, pour détecter certaines éventuelles erreurs de transmission

Exemple expliqué de trame RMC

\$GPRMC,053740.000,A,2503.6319,N,12136.0099,E,2.69,79.65,100106,,,A*53

\$GPRMC : type de trame

053740.000 : heure UTC exprimée en hhmmss.sss : 5h 37min 40s

A : état A=données valides, V=données invalides

2503.6319 : Latitude exprimée en ddmm.mmmm : 25°03.6319' = 25°03'37,914"

N : indicateur de latitude N=nord, S=sud

12136.0099 : Longitude exprimée en dddmm.mmmm : 121°36.0099' = 121°36'00,594"

E : indicateur de longitude E=est, W=ouest

2.69 : vitesse sur le fond en nœuds (2,69 kn = 3,10 mph = 4,98 km/h)

79.65 : route sur le fond en degrés

100106 : date exprimée en qqmmaa : 10 janvier 2006

, : déclinaison magnétique en degrés (souvent vide pour un GPS)

, : sens de la déclinaison E=est, W=ouest (souvent vide pour un GPS)

A : mode de positionnement A=autonome, D=DGPS, E=DR

*53 : somme de contrôle de parité, pour détecter certaines éventuelles erreurs de transmission

Trames NMEA générées par ma puce GPS

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\$GPGSA,A,3,13,30,07,05,09,28,,,,,,,,1.68,1.42,0.89*0B
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\$GPGSV,3,2,9,28,33,144,20.9,15,12,289,,02,11,221,,09,08,097,16.5*4B
\$GPGSV,3,3,9,21,02,334,*75
\$GPRMC,122617.000,A,4325.8165,N,00523.7602,E,52.903,292.08,261219,,,A*61
\$GPVTG,292.08,T,,M,52.903,N,98.030,K,A*33
\$GPGGA,122618.000,4325.8216,N,00523.7426,E,1,6,1.42,230.1,M,49.2,M,,*52
\$GPGSA,A,3,13,30,07,05,09,28,,,,,,,,1.68,1.42,0.89*0B
\$GPGSV,3,1,9,30,76,059,19.6,05,69,265,20.8,13,43,291,19.2,07,40,053,30.3*43
\$GPGSV,3,2,9,28,33,144,20.6,15,12,289,,02,11,221,,09,08,097,17.3*43
\$GPGSV,3,3,9,21,02,334,*75
\$GPRMC,122618.000,A,4325.8216,N,00523.7426,E,50.632,292.72,261219,,,A*6F
\$GPVTG,292.72,T,,M,50.632,N,93.820,K,A*33
\$GPGGA,122619.000,4325.8264,N,00523.7256,E,1,6,1.42,230.6,M,49.2,M,,*50
\$GPGSA,A,3,13,30,07,05,09,28,,,,,,,,1.68,1.42,0.89*0B
\$GPGSV,3,1,9,30,76,059,19.9,05,69,265,20.6,13,43,291,19.8,07,40,053,30.6*4D
\$GPGSV,3,2,9,28,33,144,20.5,15,12,289,,02,11,221,,09,08,097,17.7*44
\$GPGSV,3,3,9,21,02,334,*75
\$GPRMC,122619.000,A,4325.8264,N,00523.7256,E,48.634,292.18,261219,,,A*69
\$GPVTG,292.18,T,,M,48.634,N,90.119,K,A*30
\$GPGGA,122620.000,4325.8311,N,00523.7093,E,1,6,1.42,231.0,M,49.2,M,,*55
\$GPGSA,A,3,13,30,07,05,09,28,,,,,,,,1.68,1.42,0.89*0B
\$GPGSV,3,1,9,30,76,059,27.2,05,69,265,20.4,13,43,291,20.4,07,40,053,28.9*49
\$GPGSV,3,2,9,28,33,144,24.9,15,12,289,,02,11,221,,09,08,097,17.7*4C
\$GPGSV,3,3,9,21,02,334,*75
\$GPRMC,122620.000,A,4325.8311,N,00523.7093,E,45.843,292.26,261219,,,A*65
\$GPVTG,292.26,T,,M,45.843,N,84.947,K,A*38
\$GPGGA,122621.000,4325.8354,N,00523.6937,E,1,6,1.42,231.5,M,49.2,M,,*56
\$GPGSA,A,3,13,30,07,05,09,28,,,,,,,,1.68,1.42,0.89*0B
\$GPGSV,3,1,9,30,76,059,26.4,05,69,265,23.9,13,43,291,20.7,07,40,053,27.7*42
\$GPGSV,3,2,9,28,33,144,24.6,15,12,289,,02,11,221,,09,08,097,17.6*42
\$GPGSV,3,3,9,21,02,334,*75
\$GPRMC,122621.000,A,4325.8354,N,00523.6937,E,43.932,291.24,261219,,,A*63
\$GPVTG,291.24,T,,M,43.932,N,81.407,K,A*34
\$GPGGA,122622.000,4325.8392,N,00523.6788,E,1,7,1.32,232.0,M,49.2,M,,*55
\$GPGSA,A,3,13,30,15,07,05,09,28,,,,,,,,1.54,1.32,0.79*08
\$GPGSV,3,1,9,30,76,059,26.1,05,69,265,24.1,13,43,291,20.5,07,40,053,26.8*44
\$GPGSV,3,2,9,28,33,144,24.4,15,12,289,21.1,02,11,221,,09,08,097,18.4*51
\$GPGSV,3,3,9,21,02,334,*75
\$GPRMC,122622.000,A,4325.8392,N,00523.6788,E,41.861,290.40,261219,,,A*66
\$GPVTG,290.40,T,,M,41.861,N,77.569,K,A*32
\$GPGGA,122623.000,4325.8430,N,00523.6647,E,1,7,1.32,232.1,M,49.2,M,,*58
\$GPGSA,A,3,13,30,15,07,05,09,28,,,,,,,,1.54,1.32,0.79*08
\$GPGSV,3,1,9,30,76,059,33.4,05,69,265,24.2,13,43,291,20.5,07,40,053,27.1*4E
\$GPGSV,3,2,9,28,33,144,25.3,15,12,289,20.6,02,11,221,,09,08,097,19.0*54
\$GPGSV,3,3,9,21,02,334,*75
\$GPRMC,122623.000,A,4325.8430,N,00523.6647,E,39.821,290.36,261219,,,A*60
\$GPVTG,290.36,T,,M,39.821,N,73.788,K,A*31
\$GPGGA,122624.000,4325.8469,N,00523.6506,E,1,7,1.32,232.2,M,49.2,M,,*56
\$GPGSA,A,3,13,30,15,07,05,09,28,,,,,,,,1.54,1.32,0.79*08
\$GPGSV,3,1,9,30,76,059,33.3,05,69,265,23.7,13,43,291,20.2,07,40,053,26.6*4A
\$GPGSV,3,2,9,28,33,144,24.6,15,12,289,20.2,02,11,221,,09,08,097,19.6*52

\$GPGSV,3,3,9,21,02,334,*75
\$GPRMC,122624.000,A,4325.8469,N,00523.6506,E,38.924,290.68,261219,,,A*63
\$GPVTG,290.68,T,,M,38.924,N,72.127,K,A*3D
\$GPGGA,122625.000,4325.8504,N,00523.6368,E,1,7,1.32,232.3,M,49.2,M,,*52
\$GPGSA,A,3,13,30,15,07,05,09,28,,,,,1.54,1.32,0.79*08
\$GPGSV,3,1,9,30,76,059,33.3,05,69,265,23.4,13,43,291,20.0,07,40,053,25.2*4C
\$GPGSV,3,2,9,28,33,144,22.8,15,12,289,21.7,02,11,221,,09,08,097,20.1*53
\$GPGSV,3,3,9,21,02,334,*75
\$GPRMC,122625.000,A,4325.8504,N,00523.6368,E,38.507,289.23,261219,,,A*6C
\$GPVTG,289.23,T,,M,38.507,N,71.353,K,A*35
\$GPGGA,122626.000,4325.8537,N,00523.6233,E,1,7,1.32,232.5,M,49.2,M,,*58
\$GPGSA,A,3,13,30,15,07,05,09,28,,,,,1.54,1.32,0.79*08
\$GPGSV,3,1,9,30,76,059,32.8,05,69,265,23.6,13,43,291,19.0,07,40,053,24.3*4E
\$GPGSV,3,2,9,28,33,144,21.8,15,12,289,21.0,02,11,221,,09,08,097,20.5*53
\$GPGSV,3,3,9,21,02,334,*75
\$GPRMC,122626.000,A,4325.8537,N,00523.6233,E,37.963,288.30,261219,,,A*62
\$GPVTG,288.30,T,,M,37.963,N,70.346,K,A*32
\$GPGGA,122627.000,4325.8569,N,00523.6099,E,1,7,1.32,232.7,M,49.2,M,,*52
\$GPGSA,A,3,13,30,15,07,05,09,28,,,,,1.54,1.32,0.79*08
\$GPGSV,3,1,9,30,76,059,31.5,05,69,265,28.8,13,43,291,18.8,07,40,053,23.2*4A
\$GPGSV,3,2,9,28,33,144,21.1,15,12,289,21.0,02,11,221,,09,08,097,12.3*5D
\$GPGSV,3,3,9,21,02,334,*75
\$GPRMC,122627.000,A,4325.8569,N,00523.6099,E,37.608,287.87,261219,,,A*6B
\$GPVTG,287.87,T,,M,37.608,N,69.688,K,A*3C
\$GPGGA,122628.000,4325.8602,N,00523.5965,E,1,7,1.32,233.1,M,49.2,M,,*5D
\$GPGSA,A,3,13,30,15,07,05,09,28,,,,,1.54,1.32,0.79*08
\$GPGSV,3,1,9,30,76,059,30.2,05,69,265,27.4,13,43,291,18.0,07,40,053,23.8*4D
\$GPGSV,3,2,9,28,33,144,22.0,15,12,289,20.0,02,11,221,,09,08,097,12.3*5E
\$GPGSV,3,3,9,21,02,334,*75
\$GPRMC,122628.000,A,4325.8602,N,00523.5965,E,37.375,288.54,261219,,,A*6D
\$GPVTG,288.54,T,,M,37.375,N,69.256,K,A*35
\$GPGGA,122629.000,4325.8634,N,00523.5829,E,1,7,1.32,233.4,M,49.2,M,,*55
\$GPGSA,A,3,13,30,15,07,05,09,28,,,,,1.54,1.32,0.79*08
\$GPGSV,3,1,9,30,76,059,30.6,05,69,265,26.3,13,43,291,17.5,07,40,053,24.2*48
\$GPGSV,3,2,9,28,33,144,22.6,15,12,289,19.3,02,11,221,,09,08,097,12.3*51
\$GPGSV,3,3,9,21,02,334,*75
\$GPRMC,122629.000,A,4325.8634,N,00523.5829,E,37.899,288.01,261219,,,A*69
\$GPVTG,288.01,T,,M,37.899,N,70.227,K,A*32
\$GPGGA,122630.000,4325.8663,N,00523.5691,E,1,7,1.32,233.6,M,49.2,M,,*50
\$GPGSA,A,3,13,30,15,07,05,09,28,,,,,1.54,1.32,0.79*08
\$GPGSV,3,1,9,30,76,059,31.4,05,69,265,20.8,13,43,291,17.9,07,40,053,24.3*4B
\$GPGSV,3,2,9,28,33,144,23.1,15,12,289,17.0,02,11,221,,09,08,097,13.5*5D
\$GPGSV,3,3,9,21,02,334,*75
\$GPRMC,122630.000,A,4325.8663,N,00523.5691,E,37.979,287.06,261219,,,A*69
\$GPVTG,287.06,T,,M,37.979,N,70.374,K,A*32
\$GPGGA,122631.000,4325.8686,N,00523.5553,E,1,7,1.32,234.0,M,49.2,M,,*56
\$GPGSA,A,3,13,30,15,07,05,09,28,,,,,1.54,1.32,0.79*08
\$GPGSV,3,1,9,30,76,059,29.5,05,69,265,20.8,13,43,291,18.2,07,40,053,23.4*47
\$GPGSV,3,2,9,28,33,144,23.6,15,12,289,15.4,02,11,221,,09,08,097,16.6*5A
\$GPGSV,3,3,9,21,02,334,*75
\$GPRMC,122631.000,A,4325.8686,N,00523.5553,E,37.107,284.94,261219,,,A*67
\$GPVTG,284.94,T,,M,37.107,N,68.759,K,A*39
\$GPGGA,122632.000,4325.8712,N,00523.5416,E,1,7,1.32,234.3,M,49.2,M,,*5A
\$GPGSA,A,3,13,30,15,07,05,09,28,,,,,1.54,1.32,0.79*08
\$GPGSV,3,1,9,30,76,059,29.5,05,69,265,20.8,13,43,291,11.8,07,40,053,22.1*40
\$GPGSV,3,2,9,28,33,144,24.8,15,12,289,14.4,02,11,221,,09,08,097,18.2*58

\$GPGSV,3,3,9,21,02,334,*75
\$GPRMC,122632.000,A,4325.8712,N,00523.5416,E,36.995,284.61,261219,,,A*60
\$GPVTG,284.61,T,,M,36.995,N,68.552,K,A*38
\$GPGGA,122633.000,4325.8736,N,00523.5278,E,1,7,1.32,234.7,M,49.2,M,,*57
\$GPGSA,A,3,13,30,15,07,05,09,28,,,,,1.54,1.32,0.79*08
\$GPGSV,3,1,9,30,76,059,20.1,05,69,265,10.8,13,43,291,18.2,07,40,053,21.3*4C
\$GPGSV,3,2,9,28,33,144,24.8,15,12,289,10.0,02,11,221,,09,08,097,18.2*58
\$GPGSV,3,3,9,21,02,334,*75
\$GPRMC,122633.000,A,4325.8736,N,00523.5278,E,37.046,284.15,261219,,,A*6C
\$GPVTG,284.15,T,,M,37.046,N,68.647,K,A*3A
\$GPGGA,122634.000,4325.8745,N,00523.5140,E,1,7,1.32,235.2,M,49.2,M,,*58
\$GPGSA,A,3,13,30,15,07,05,09,28,,,,,1.54,1.32,0.79*08
\$GPGSV,3,1,9,30,76,059,20.1,05,69,265,10.8,13,43,291,18.2,07,40,053,20.9*47
\$GPGSV,3,2,9,28,33,144,19.3,15,12,289,10.0,02,11,221,,09,08,097,18.2*5D
\$GPGSV,3,3,9,21,02,334,*75
\$GPRMC,122634.000,A,4325.8745,N,00523.5140,E,36.543,280.10,261219,,,A*67
\$GPVTG,280.10,T,,M,36.543,N,67.714,K,A*32