

## Test

**1. The Global Positioning System (GPS) is a space-based satellite navigation ... that provides location and time information in all weather conditions**

- a) station;
- b) system;
- c) device;
- d) material.

**2. The system ... critical capabilities to military, civil, and commercial users around the world.**

- a) provides;
- b) has;
- c) requires;
- d) possesses.

**3. The ... government has created the system, maintains it, and makes it freely accessible to anyone with a GPS receiver.**

- a) Netherlands;
- b) Ukraine;
- c) Russian Federation;
- d) United States.

**4. There are ... parts of GPS.**

- a) 5;
- b) 6;
- c) 3;

d) 4.

**5. Satellites are systems based on a constellation of ... satellites orbiting the earth, twice a day, and emit continuous navigation signals.**

a) 24;

b) 28;

c) 4;

d) 14.

**6. GPS units are made to communicate with GPS ....**

a) receivers;

b) devices;

c) satellites;

d) parts.

**7. Each GPS satellite transmits ... that indicates its location and the current time.**

a) data;

b) ideas;

c) facts;

d) air.

**8. ... GPS satellites synchronize operations so that these repeating signals are transmitted at the same instant.**

a) Every;

b) Not all;

c) All;

d) Only.

**9. The GPS receiver ... the time a signal has transmitted by a satellite with the time it has received.**

- a) compares;
- b) has;
- c) gets;
- d) gives.

**10. The time ... tells the GPS receiver how far away the satellite is.**

- a) data;
- b) resources;
- c) intervals;
- d) difference.

**Answers:**

**1) b; 2) a; 3) d; 4) c; 5) a; 6) c; 7) a; 8) c; 9) a; 10) d**

## Additional tasks



**1. Study some information about capabilities of GPS devices. Discuss with your groupmates some questions:**

1. What do you know about types of GPS devices and its possibilities?
2. Why do we need GPS devices?
3. What do you know about innovations of GPS devices?

**GPS devices may have capabilities such as:**

- maps, including streets maps, displayed in human readable format via text or in a graphical format,
- turn-by-turn navigation directions to a human in charge of a vehicle or vessel via text or speech,

- directions fed directly to an autonomous vehicle such as a robotic probe,
- traffic congestion maps (depicting either historical or real time data) and suggested alternative directions,
- information on nearby amenities such as restaurants, fueling stations, and tourist attractions.

**GPS devices may be able to answer:**

- the roads or paths available,
- traffic congestion and alternative routes,
- roads or paths that might be taken to get to the destination,
- if some roads are busy (now or historically) the best route to take,
- The location of food, banks, hotels, fuel, airports or other places of interests,
- the shortest route between the two locations,
- the different options to drive on highway or back roads.

*([http://en.wikipedia.org/wiki/GPS\\_navigation\\_device](http://en.wikipedia.org/wiki/GPS_navigation_device))*



**2. Discuss with your groupmates satellite navigations in different countries.**

**Comparison of systems**

System	GPS	GLONASS	BeiDou	Galileo	IRNSS
Owner	United States	Russian Federation	China	European Union	India
Coding	CDMA	FDMA	CDMA	CDMA	CDMA
Orbital height	20,180 km (12,540 mi)	19,130 km (11,890 mi)	21,150 km (13,140 mi)	23,222 km (14,426 mi)	36,000 km (22,000 mi)

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<b>Period</b>	<b>11.97 hours (11 h 58 m)</b>	<b>11.26 hours (11 h 16 m)</b>	<b>12.63 hours (12 h 38 m)</b>	<b>14.08 hours (14 h 5 m)</b>	<b>N/A</b>
<b>Evolution per <u>sider</u> <u>eal day</u></b>	<b>2</b>	<b>17/8</b>	<b>17/9</b>	<b>17/10</b>	<b>N/A (geostationar y)</b>
<b>Number of satellites</b>	<b>At least 24</b>	<b>31, including 24 operation al 1 in preparati on 2 on maintena nce 3 reserve 1 on tests<sup>[8]</sup></b>	<b>5 geostationary orbit (GEO) satellites, 30 medium Earth orbit (MEO) satellites</b>	<b>4 test bed satellites in orbit, 22 operation al satellites budgeted</b>	<b>3 geostationar y orbit (GEO) satellites, 4 geosynchron ous orbit satellites</b>
<b>Accuracy (free access)</b>	<b>Position: 3.5-7.8 m<sup>[9]</sup></b>	<b>Position: 5–10 m Speed: 0.1 m/s Clock: 200 ns</b>	<b>Position: 10 m Speed: 0.2 m/s Clock: 20 ns</b>	<b>Position: 1 m</b>	<b>Position: 10 m (mainland India), 20 m (Indian Ocean)</b>
<b>Accuracy (licensed)</b>	<b>Position: better</b>		<b>Position: 10 cm</b>	<b>Position: 1 cm</b>	

	than 3.5-7.8 m with ionospheric correction				
Frequency	1.57542 GHz (L1 signal) 1.2276 GHz (L2 signal)	Around 1.602 GHz (SP) Around 1.246 GHz (SP)	1.561098 GHz (B1) 1.589742 GHz (B1-2) 1.20714 GHz (B2) 1.26852 GHz (B3)	1.164–1.215 GHz (E5a and E5b) 1.260–1.300 GHz (E6) 1.559–1.592 GHz (E2-L1-E11)	N/A
Status	Operational	Operational	15 satellites operational, 20 additional satellites planned	In preparation	4 satellites launched, 3 additional satellites planned to be launched by Early 2016

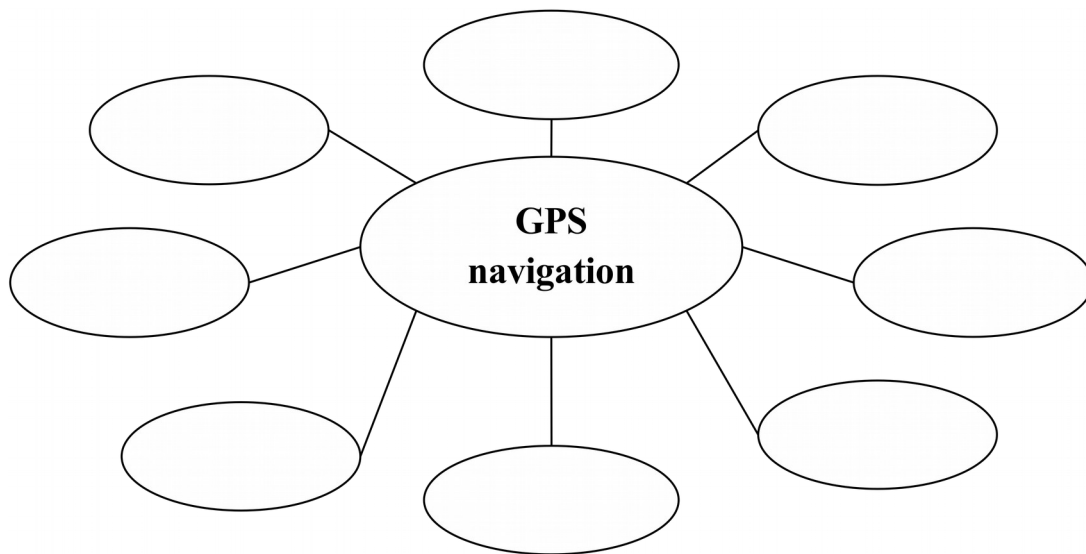
([http://en.wikipedia.org/wiki/Satellite\\_navigation](http://en.wikipedia.org/wiki/Satellite_navigation))

### 3. Give definitions to the terms.

<b>global standard of living</b>	<b>satellite navigation</b>
<b>Global Positioning System</b>	<b>Compass navigation system</b>
<b>environmental management</b>	<b>medium Earth orbit</b>
<b>GPS reciever</b>	<b>sustainability economics</b>



**4. Fill in the spidergram with the words associated with GPS navigation.**



**5. Discuss with your groupmates using figure 1. What are applications of hand-held receivers nowadays?**

Figure 1.



