

## ACTIVITY 1.1 TIME FOR LAUNCH!

From Chapter 1 of the Principia Space Diary  
<http://principiaspacediary.org/activities/time-for-launch>

### LEARNING LEVEL

KS1, KS2, P1-5

### CURRICULUM LINKS & DIFFERENTIATION IDEAS

View detailed curriculum links for England, Scotland, Northern Ireland and Wales, plus differentiation ideas for your region and year level.

[principiaspacediary.org/curriculum-planner/](http://principiaspacediary.org/curriculum-planner/)



### Resources Required

- Analogue clocks (optional)

### Background to this Activity

This lesson works well as a challenge task for children to make links between analogue and digital time. It also introduces the concept of duration, as children have to calculate the new time using the clues given.

The timings used are those from Tim Peake's 2016 launch and will help children develop an understanding of how long the different stages take.

It is also interesting to note that the time used on the ISS is Coordinated Universal Time (UTC) which is equivalent to GMT. It was originally set to GMT-5 to coincide with the time in Texas, USA but this was not a suitable time for the cosmonauts in Russia – so GMT is also a compromise between the time in Houston and the time in Moscow (the two primary mission control centres).

### Running the Activity

For this activity, children need to convert time between analogue and digital time. They also need to understand the abbreviations a.m. and p.m.

Begin by looking at the times already displayed. Ask the children to indicate which times they have to find out – they will have to do this by adding the correct numbers of minutes to the times already given.

Ensure that children recognise that the first picture in the series is below the title and not to the right. Ask them how they know this. They should be able to explain that 8.33am is earlier in the morning than 11.03am. Using the times given, children should be able to work out how to read the storyboard in the correct order.

Children then continue adding on the minutes to find out the next time. They need to draw in the missing hands to the clock faces.

Remind children that the hour hand moves as well as the minute hand – demonstrate on a real clock how the hour hand moves between the hours as the minute hand rotates around the clock.

Children are also able to draw two of the scenes in the comic - the launch ("lift off") and the last box where Tim boards the ISS for the first time.

Children should be developing an understanding of analogue and digital time. As they are introduced to 24-hour time, they could be asked how to convert and record all the times from the sheet in 24-hour time.

### Questions for the Class

To challenge students further, try asking some extension questions about the durations between different times:

- How long did Tim spend between arriving at the launch site and taking off in the Soyuz?
- How many minutes did Tim spend in the Soyuz before the launch site had to be evacuated?
- What was the total amount of time spent in the Soyuz, from boarding to disembarking?

## ACTIVITY 1.2 8 MINUTES TO SPACE

From Chapter 1 of the Principia  
Space Diary

[http://principiaspacediary.org/  
activities/8-minutes-to-space](http://principiaspacediary.org/activities/8-minutes-to-space)

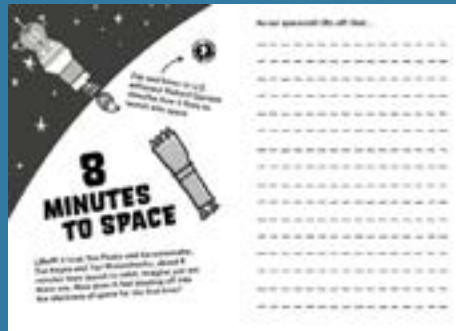
### LEARNING LEVEL

KS1, KS2, P1-5

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curriculum-planner/](http://principiaspacediary.org/curriculum-planner/)



### Resources Required

- Internet access
- Writing materials
- A stopwatch or timer
- Interactive whiteboard (optional)

### Background to this Activity

It took approximately eight minutes for the Soyuz capsule to carry Tim Peake through the Earth's atmosphere and into outer space. This is amazing, given how far Tim travelled in this time (it's around 100 kilometres or 62 miles from Earth to outer space. The ISS itself is around 322 kilometres or 200 miles from Earth). This creative writing activity will help students imagine what it is like to leave Earth, while encouraging personal expression and development of literacy skills.

### Running the Activity

For this activity, it is important that pupils have an understanding of the length of time being considered. Use a timer or stopwatch to help pupils with this. Set the timer for one minute. Ask pupils how long they think they spend travelling to school, brushing teeth, doing homework, eating dinner. Eight minutes is a very short period of time to travel this huge distance.

You can access an audio writing prompt using the Zappar App. This is a recording of US astronaut Richard Garriott describing his first few minutes after launch. If you prefer the video version you can find it here: <https://www.youtube.com/watch?v=o7xK8XDtlkY>

Share learning objectives and success criteria for writing with the class. These will vary depending on the age and ability of students (see ideas for differentiation in your region's curriculum planner). Students will write about an imagined journey through space. Encourage pupils to think about their senses to describe the experience, as well as writing about their thoughts and feelings.

Ask pupils to share their writing with the class. There are opportunities for peer and self-assessment here.

### Questions for the Class

- What are the different ways you can travel to school? How long does it take you to travel to school if you walk, take public transport or drive? Where can you travel in eight minutes from your home or school?
- Tim Peake spent seven months away from his family, friends and home, while on his Principia Mission. What do you think it would feel like to be away for so long? How would you feel?

### Extensions & Digital Resources

**ZAP!** Use the Zappar app to listen to an audio recording of US private astronaut, Richard Garriott, describing the first few minutes after launching into space. See Zappar instructions at the link below and note that the mobile/tablet will need to be connected to the internet: <http://principiaspacediary.org/using-zap-codes-to-strengthen-digital-literacy/>

### ACTIVITY 1.3 FAST-TRACK RENDEZVOUS

From Chapter 1 of the Principia Space Diary

<http://principiaspacediary.org/activities/fast-track-rendezvous>

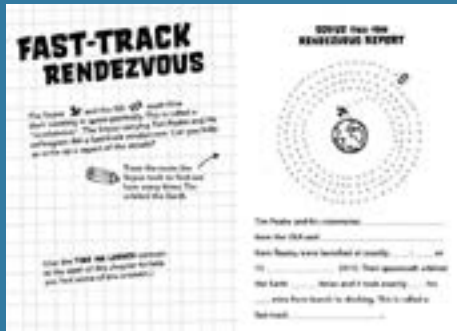
#### LEARNING LEVEL

KS1, KS2, P1-5

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#### Resources Required

- No additional resources required

#### Background to this Activity

This activity works alongside Time For Launch (Activity 1.1). Children can use the information they researched in that task to fill in the gaps to complete this task.

When transferring astronauts to and from the International Space Station, a capsule must be accurately piloted to dock with the ISS. This is called a 'rendezvous'. A space rendezvous is a complex process because the capsule must catch up to the ISS, which orbits the Earth at 17,500 miles per hour.

In 2015, the Soyuz capsule travelled through space for approximately six hours, before it reached the ISS. The capsule docked at the ISS, allowing Tim and his fellow astronauts to enter the spacecraft.

So how did the Soyuz capsule dock on the ISS? Once the capsule had left the Earth's atmosphere, astronauts fired the capsule's rockets parallel to Earth, to get the capsule in an orbit going around Earth. They had to increase the size of their orbit bit by bit, until they found the ISS's path around Earth. This is called a Hohmann Transfer, and involved firing the Soyuz's engines twice, once on each side of the Earth. Each blast increased the Soyuz's orbit. After a few short correctional burns, the Soyuz caught up to the ISS.

To get the Soyuz capsule on the same orbital path as the ISS, the astronauts performed another Hohmann Transfer right as the capsule passed the ISS. This pushed the Soyuz ahead of the ISS and onto its orbital path. The astronauts then performed a U-turn so they were facing the ISS.

This is quite scary, because the ISS weighs 925,000-pounds. Docking only takes about 30 minutes, but it may take several hours to complete the rendezvous process.

#### Running the Activity

Children need to find the information to complete the fast-track Rendezvous by filling in the gaps.

Start by reading the background information above to the class – perhaps pointing out that rendezvous is a French word meaning 'meeting'.

Ask students to trace the route of the Soyuz in the activity as it orbits Earth. This will help them to fill in one of the blanks on the activity sheet.

Then ask the children to fill in the remaining blanks by referring to Activity 1.1 Time for Launch and Activity 1.2 8 Minutes to Space in the Space Diary, or researching Tim's docking individually or as a group.

#### Answers

Tim Peake and his crewmates, Tim Kopra from the USA and Yuri Malenchenko from Russia, were launched at exactly 11:03 on 15 December 2015. Their spacecraft orbited the Earth 4 times and it took exactly 6 hrs 10 mins from launch to docking. This is called a fast-track rendezvous.

#### Questions for the Class

- Why do you think this is called a fast-track rendezvous?
- Why do you think the Soyuz had to orbit the earth so many times before rendezvousing with the ISS?
- At what time did the Soyuz dock with the ISS? How do you know this? How did you work this out?