TIME

A UNITS OF TIME

A.1 CHOOSING APPROPRIATE UNITS OF TIME

MCQ 1: Which unit is most appropriate for measuring the time it takes to run a 100-meter sprint?

- ☒ Seconds
- ☐ Minutes
- ☐ Hours
- ☐ Days
- ☐ Weeks
- ☐ Months
- ☐ Years

Answer:

- A 100-meter sprint is a very fast event.
- Minutes or hours would be too large as units. We need a small unit to be precise.
- The most appropriate unit is **seconds**.

MCQ 2: Which unit is most appropriate for measuring the time it takes to clean your bedroom?

- ☐ Seconds
- ☒ Minutes
- ☐ Hours
- ☐ Days
- ☐ Weeks
- ☐ Months
- ☐ Years

Answer:

- Cleaning a bedroom takes some time, but usually not for many hours.
- Seconds would be too short, and hours would usually be too long.
- The most appropriate unit is **minutes**.

MCQ 3: Which unit is most appropriate for measuring your age?

- ☐ Seconds
- ☐ Minutes
- ☐ Hours
- ☐ Days
- ☐ Weeks
- ☐ Months
- ☒ Years

Answer:

- Age measures all the time since you were born, which is a very long period.
- We need a large unit to describe this long duration easily.
- The standard unit for measuring a person's age is **years**.

MCQ 4: Which unit is most appropriate for measuring the time it takes to watch a movie?

- ☐ Seconds
- ☐ Minutes
- ☒ Hours
- ☐ Days

Answer:

- A movie is a longer activity. It would be many minutes (like 90 or 120), but usually not a full day.
- The most convenient and appropriate unit is **hours**.

MCQ 5: Which unit is most appropriate for measuring the length of a family camping trip?

- ☐ Seconds
- ☐ Minutes
- ☐ Hours
- ☒ Days

Answer:

- A camping trip lasts much longer than just a few hours.
- It typically lasts for several full cycles of day and night.
- The best unit to measure this duration is **days**.

B CONVERTING UNITS OF TIME

B.1 CONVERTING UNITS OF TIME FROM BIGGER TO SMALLER

Ex 6: Convert 2 hours to minutes:

$$2 \text{ h} = \boxed{120} \text{ min}$$

Answer: To convert from hours to minutes, we multiply by 60 (since 1 hour = 60 minutes).

$$\begin{aligned} 2\,\text{h} &= 2 \times 60\,\text{min} \\ &= 120\,\text{min} \end{aligned}$$

So, 2 hours is **120 minutes**.

Ex 7: Convert 3 days to hours:

$$3\text{ d} = \boxed{72}\text{ h}$$

Answer: To convert from days to hours, we multiply by 24 (since 1 day = 24 hours).

$$\begin{aligned}3\,\text{d} &= 3 \times 24\,\text{h}\\ &= 72\,\text{h}\end{aligned}$$

So, 3 days is **72 hours**.

Ex 8: Convert 5 minutes to seconds:

$$5\text{ min} = \boxed{300}\text{ s}$$

Answer: To convert from minutes to seconds, we multiply by 60 (since 1 minute = 60 seconds).

$$\begin{aligned}5\,\text{min} &= 5 \times 60\,\text{s}\\ &= 300\,\text{s}\end{aligned}$$

So, 5 minutes is **300 seconds**.

Ex 9: Convert 2 weeks to days:

$$2\text{ wk} = \boxed{14}\text{ d}$$

Answer: To convert from weeks to days, we multiply by 7 (since 1 week = 7 days).

$$\begin{aligned}2\,\text{wk} &= 2 \times 7\,\text{d}\\ &= 14\,\text{d}\end{aligned}$$

So, 2 weeks is **14 days**.

B.2 CONVERTING UNITS OF TIME FROM SMALLER TO BIGGER

Ex 10: Convert 120 seconds to minutes:

$$120\text{ s} = \boxed{2}\text{ min}$$

Answer: To convert from seconds to minutes, we divide by 60 (since there are 60 seconds in 1 minute).

$$\begin{aligned}120\,\text{s} &= 120 \div 60\\ &= 2\,\text{min}\end{aligned}$$

So, 120 seconds is **2 minutes**.

Ex 11: Convert 24 hours to days:

$$24\text{ h} = \boxed{1}\text{ d}$$

Answer: To convert from hours to days, we divide by 24 (since there are 24 hours in 1 day).

$$\begin{aligned}24\,\text{h} &= 24 \div 24\\ &= 1\,\text{d}\end{aligned}$$

So, 24 hours is **1 day**.

Ex 12: Convert 180 minutes to hours:

$$180\text{ min} = \boxed{3}\text{ h}$$

Answer: To convert from minutes to hours, we divide by 60 (since there are 60 minutes in 1 hour).

$$\begin{aligned}180\,\text{min} &= 180 \div 60\\ &= 3\,\text{h}\end{aligned}$$

So, 180 minutes is **3 hours**.

Ex 13: Convert 14 days to weeks:

$$14\text{ d} = \boxed{2}\text{ wk}$$

Answer: To convert from days to weeks, we divide by 7 (since there are 7 days in 1 week).

$$\begin{aligned}14\,\text{d} &= 14 \div 7\\ &= 2\,\text{wk}\end{aligned}$$

So, 14 days is **2 weeks**.

B.3 WORKING WITH FRACTIONS OF TIME

Ex 14: If you divide an hour into two equal parts, how many minutes are in half an hour?

$$\text{Half an hour} = \boxed{30}\text{ minutes}$$

Answer:

- We know that 1 hour has 60 minutes.
- To find half of something, we divide it by 2.
- Therefore, half an hour is **30 minutes**.

$$\begin{aligned}\text{Half an hour} &= 60\,\text{minutes} \div 2\\ &= 30\,\text{minutes}\end{aligned}$$

Ex 15: If you divide an hour into four equal parts, how many minutes are in one quarter of an hour?

$$\text{One quarter of an hour} = \boxed{15}\text{ minutes}$$

Answer:

- We know that 1 hour has 60 minutes.
- To find a quarter of something, we divide it by 4.
- Therefore, a quarter of an hour is **15 minutes**.

$$\begin{aligned}\text{A quarter of an hour} &= 60\,\text{minutes} \div 4\\ &= 15\,\text{minutes}\end{aligned}$$

Ex 16: If you divide a day into two equal parts, how many hours are in half a day?

$$\text{Half a day} = \boxed{12}\text{ hours}$$

Answer:

- We know that 1 full day has 24 hours.
- To find half of the day, we divide by 2.
- Therefore, half a day is **12 hours**.

$$\begin{aligned}\text{Half a day} &= 24\,\text{hours} \div 2\\ &= 12\,\text{hours}\end{aligned}$$

C CONVERTING TO MIXED TIME UNITS

C.1 COMBINING UNITS INTO A SINGLE UNIT

Ex 17: A movie lasts 1 hour and 45 minutes. How many minutes is that in total?

$$1 \text{ h } 45 \text{ min} = \boxed{105} \text{ min}$$

Answer:

- **Step 1: Convert hours to minutes.** We know that $1\,\text{h} = 60\,\text{min}$.
- **Step 2: Add the extra minutes.** We add the remaining 45 minutes to this amount.

$$\begin{aligned} 1\,\text{h}\,45\,\text{min} &= (1 \times 60\,\text{min}) + 45\,\text{min} \\ &= 60\,\text{min} + 45\,\text{min} \\ &= 105\,\text{min} \end{aligned}$$

So, the movie lasts **105 minutes**.

Ex 18: You hold your breath for 2 minutes and 20 seconds. How many seconds is that in total?

$$2 \text{ min } 20 \text{ s} = \boxed{140} \text{ s}$$

Answer:

- **Step 1: Convert minutes to seconds.** We know that $1\,\text{min} = 60\,\text{s}$.
- **Step 2: Add the extra seconds.** We add the remaining 20 seconds.

$$\begin{aligned} 2\,\text{min}\,20\,\text{s} &= (2 \times 60\,\text{s}) + 20\,\text{s} \\ &= 120\,\text{s} + 20\,\text{s} \\ &= 140\,\text{s} \end{aligned}$$

So, you held your breath for **140 seconds**.

Ex 19: Your soccer practice lasts 1 hour and 30 minutes. How many minutes is that in total?

$$1 \text{ h } 30 \text{ min} = \boxed{90} \text{ min}$$

Answer:

- **Step 1: Convert hours to minutes.** We know that $1\,\text{h} = 60\,\text{min}$.
- **Step 2: Add the extra minutes.** We add the remaining 30 minutes.

$$\begin{aligned} 1\,\text{h}\,30\,\text{min} &= (1 \times 60\,\text{min}) + 30\,\text{min} \\ &= 60\,\text{min} + 30\,\text{min} \\ &= 90\,\text{min} \end{aligned}$$

So, your soccer practice lasts **90 minutes**.

Ex 20: A trail running race lasts 1 day and 5 hours. How many hours is that in total?

$$1 \text{ d } 5 \text{ h} = \boxed{29} \text{ h}$$

Answer:

- **Step 1: Convert days to hours.** We know that $1\,\text{d} = 24\,\text{h}$.
- **Step 2: Add the extra hours.** We add the remaining 5 hours.

$$\begin{aligned} 1\,\text{d}\,5\,\text{h} &= (1 \times 24\,\text{h}) + 5\,\text{h} \\ &= 24\,\text{h} + 5\,\text{h} \\ &= 29\,\text{h} \end{aligned}$$

So, the race lasts **29 hours**.

C.2 SEPARATING A SINGLE UNIT INTO MIXED UNITS

Ex 21: You read a book for 100 minutes. How many hours and minutes is that?

$$100 \text{ min} = \boxed{1} \text{ h and } \boxed{40} \text{ min}$$

Answer:

- We need to find how many groups of 60 minutes (hours) are in 100 minutes. We divide 100 by 60.
- The quotient is the number of hours, and the remainder is the number of leftover minutes.

$$\begin{array}{r} 1 \\ 60\overline{)\,100} \\ \underline{60} \\ 40 \end{array}$$

The division shows a quotient of **1** and a remainder of **40**.

$$\begin{aligned} 100\,\text{min} &= (1 \times 60\,\text{min}) + 40\,\text{min} \\ &= 1\,\text{h}\,40\,\text{min} \end{aligned}$$

So, 100 minutes is **1 hour and 40 minutes**.

Ex 22: A race lasts for 140 seconds. How many minutes and seconds is that?

$$140 \text{ s} = \boxed{2} \text{ min and } \boxed{20} \text{ s}$$

Answer:

- We need to find how many groups of 60 seconds (minutes) are in 140 seconds. We divide 140 by 60.

$$\begin{array}{r} 2 \\ 60\overline{)\,140} \\ \underline{120} \\ 20 \end{array}$$

The division shows a quotient of **2** (the minutes) and a remainder of **20** (the seconds).

$$\begin{aligned} 140\,\text{s} &= (2 \times 60\,\text{s}) + 20\,\text{s} \\ &= 2\,\text{min}\,20\,\text{s} \end{aligned}$$

So, 140 seconds is **2 minutes and 20 seconds**.

Ex 23: You study for 150 minutes. How many hours and minutes is that?

$$150 \text{ min} = \boxed{2} \text{ h and } \boxed{30} \text{ min}$$

Answer:

- We divide 150 minutes by 60 to find the number of full hours.

$$\begin{array}{r} 2 \\ 60\overline{)150} \\ \underline{120} \\ 30 \end{array}$$

The division gives a quotient of **2** (hours) and a remainder of **30** (minutes).

$$\begin{aligned} 150\,\text{min} &= (2 \times 60\,\text{min}) + 30\,\text{min} \\ &= 2\,\text{h}\,30\,\text{min} \end{aligned}$$

So, 150 minutes is **2 hours and 30 minutes**.

Ex 24: You swim for 200 seconds. How many minutes and seconds is that?

$$200\text{ s} = \boxed{3}\text{ min and }\boxed{20}\text{ s}$$

Answer:

- We divide 200 seconds by 60 to find the number of full minutes.

$$\begin{array}{r} 3 \\ 60\overline{)200} \\ \underline{180} \\ 20 \end{array}$$

The division gives a quotient of **3** (minutes) and a remainder of **20** (seconds).

$$\begin{aligned} 200\,\text{s} &= (3 \times 60\,\text{s}) + 20\,\text{s} \\ &= 3\,\text{min}\,20\,\text{s} \end{aligned}$$

So, 200 seconds is **3 minutes and 20 seconds**.

D 24-HOUR TIME FORMAT

D.1 TELLING TIME THE 24-HOUR WAY

Ex 25: Your favorite show starts at 6:15 PM. What time is that in 24-hour format?

$$\boxed{18}:\boxed{15}$$

Answer:

- The time is PM, which means it is after noon.
- To convert PM hours to 24-hour format, we add 12 to the hour.
- The minutes stay the same.
- The time is **18:15**.

$$6 + 12 = 18$$

Ex 26: You wake up at 7:45 AM for school. What time is that in 24-hour format?

$$\boxed{07}:\boxed{45}$$

Answer:

- The time is AM, which means it is in the morning (before noon).
- For AM times, the hour number stays the same.
- In 24-hour format, we write hours less than 10 with a leading zero.
- The time is **07:45**.

Ex 27: Your soccer game starts at 4:30 PM. What time is that in 24-hour format?

$$\boxed{16}:\boxed{30}$$

Answer:

- The time is PM (afternoon).
- We add 12 to the hour.
- The minutes stay the same.
- The time is **16:30**.

$$4 + 12 = 16$$

Ex 28: You eat dinner at 7:00 PM. What time is that in 24-hour format?

$$\boxed{19}:\boxed{00}$$

Answer:

- The time is PM (evening).
- We add 12 to the hour.
- The time is **19:00**.

$$7 + 12 = 19$$

D.2 FINDING EVERYDAY TIME FROM 24-HOUR CLOCKS

Ex 29: You have breakfast at 07:30. What time is this in AM/PM format?

$$\boxed{7}:\boxed{30}\ \boxed{\textbf{AM}}$$

Answer:

- The hour (07) is less than 12, so it is a morning (AM) time.
- The hour number stays the same.
- The time is **7:30 AM**.

Ex 30: Your art class starts at 14:45. What time is this in AM/PM format?

$$\boxed{2}:\boxed{45}\ \boxed{\textbf{PM}}$$

Answer:

- The hour (14) is greater than 12, so it is an afternoon/evening (PM) time.
- To find the 12-hour clock number, we subtract 12 from the hour.

- The time is **2:45 PM**.

$$14 - 12 = 2$$

Ex 31: You go to bed at 20:00. What time is this in AM/PM format?

8 : 00 **PM**

Answer:

- The hour (20) is greater than 12, so it is a PM time.
- We subtract 12 from the hour.
- The time is **8:00 PM**.

$$20 - 12 = 8$$

Ex 32: Your music lesson starts at 15:20. What time is this in AM/PM format?

3 : 20 **PM**

Answer:

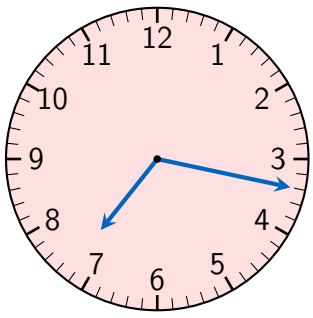
- The hour (15) is greater than 12, so it is a PM time.
- We subtract 12 from the hour.
- The time is **3:20 PM**.

$$15 - 12 = 3$$

E READING CLOCK TIMES

E.1 READING CLOCKS

Ex 33: You leave for school at the time shown on this clock. What time is it?



morning

7 : 17 **AM**

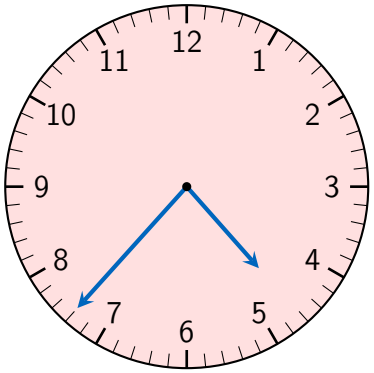
Answer:

- **Hour Hand:** The short hand has passed the 7 but has not yet reached the 8. Therefore, the hour is **7**.
- **Minute Hand:** The long hand has passed the 3. The 3 represents $3 \times 5 = 15$ minutes. It is pointing 2 small marks past the 3.
- **Calculation:** We add the extra minutes to the base of 15.

$$15\,\text{minutes} + 2\,\text{minutes} = 17\,\text{minutes}$$

- The time is **7:17 AM** because it is morning.

Ex 34: Your soccer practice starts at the time shown on this clock. What time is it?



afternoon

4 : 37 **PM**

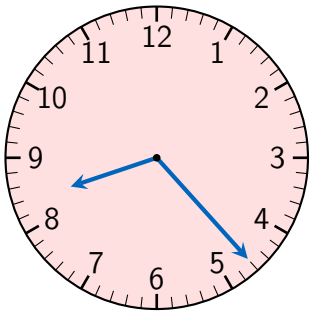
Answer:

- **Hour Hand:** The short hand is past the 4 and is moving towards the 5. The hour is **4**.
- **Minute Hand:** The long hand has passed the 7. The 7 represents $7 \times 5 = 35$ minutes. It is pointing 2 small marks past the 7.
- **Calculation:**

$$35\,\text{minutes} + 2\,\text{minutes} = 37\,\text{minutes}$$

- The time is **4:37 PM** because it is the afternoon.

Ex 35: You eat breakfast at the time shown on this clock. What time is it?



morning

8 : 23 **AM**

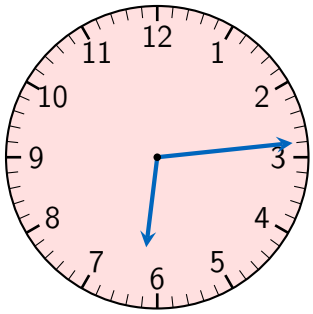
Answer:

- **Hour Hand:** The short hand has passed the 8. The hour is **8**.
- **Minute Hand:** The long hand has passed the 4 ($4 \times 5 = 20$ minutes). It is pointing 3 small marks past the 4.
- **Calculation:**

$$20\,\text{minutes} + 3\,\text{minutes} = 23\,\text{minutes}$$

- The time is **8:23 AM** because it is morning.

Ex 36: You watch a movie at the time shown on this clock. What time is it?



evening

6 : 14 **PM**

Answer:

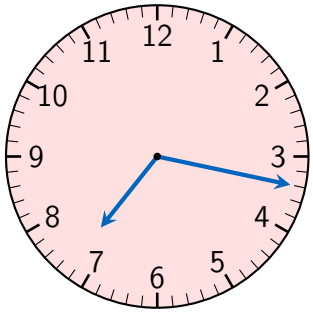
- **Hour Hand:** The short hand has passed the 6. The hour is **6**.
- **Minute Hand:** The long hand has passed the 2 ($2 \times 5 = 10$ minutes). It is pointing 4 small marks past the 2.
- **Calculation:**

$$10\,\text{minutes} + 4\,\text{minutes} = 14\,\text{minutes}$$

- The time is **6:14 PM** because it is the evening.

E.2 READING CLOCKS FOR 24-HOUR TIME

Ex 37: You leave for school at the time shown. What is this time in 24-hour format?



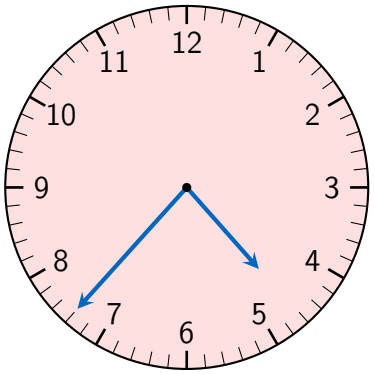
morning

07 : 17

Answer:

- **Step 1: Read the 12-hour time.** The hour is 7 and the minutes are 17. Since it's morning, the time is 7:17 AM.
- **Step 2: Convert to 24-hour format.** Because it is an AM time, the hour number does not change. We write it with a leading zero.
- The final time is **07:17**.

Ex 38: Your soccer practice starts at the time shown. What is this time in 24-hour format?



afternoon

16 : 37

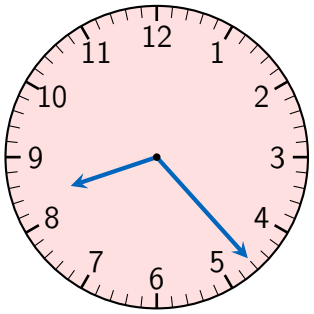
Answer:

- **Step 1: Read the 12-hour time.** The hour is 4 and the minutes are 37. Since it's afternoon, the time is 4:37 PM.
- **Step 2: Convert to 24-hour format.** Because it is a PM time, we add 12 to the hour.

$$4 + 12 = 16$$

- The final time is **16:37**.

Ex 39: You eat breakfast at the time shown. What is this time in 24-hour format?



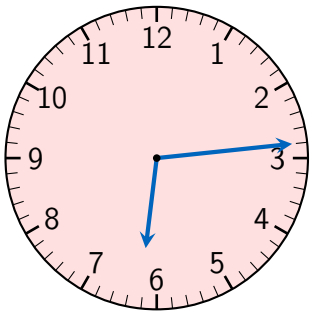
morning

08 : 23

Answer:

- **Step 1: Read the 12-hour time.** The hour is 8 and the minutes are 23. The time is 8:23 AM.
- **Step 2: Convert to 24-hour format.** Since it is AM, the hour does not change. We write it with a leading zero.
- The final time is **08:23**.

Ex 40: You watch a movie at the time shown. What is this time in 24-hour format?



evening

$\boxed{18}:\boxed{14}$

Answer:

- **Step 1: Read the 12-hour time.** The hour is 6 and the minutes are 14. The time is 6:14 PM.
- **Step 2: Convert to 24-hour format.** Because it is PM, we add 12 to the hour.

$$6 + 12 = 18$$

- The final time is **18:14**.

F CALCULATING WITH TIME DURATIONS

F.1 ADDING TIME DURATIONS

Ex 41: You watch a movie for 1 hour 20 minutes and do homework for 1 hour 15 minutes.
How long is that altogether?

$\boxed{2}$ h $\boxed{35}$ min

Answer: **Method:** Add the minutes and the hours separately, starting from the right.

$$\begin{array}{r} 1\,\text{h}\,20\,\text{min} \\ +\,1\,\text{h}\,15\,\text{min} \\ \hline 2\,\text{h}\,35\,\text{min} \end{array}$$

The total time is **2 hours and 35 minutes**. Since the minutes (35) are less than 60, no regrouping is needed.

Ex 42: You ride your bike for 1 hour 25 minutes and play soccer for 1 hour 30 minutes.
How long is that altogether?

$\boxed{2}$ h $\boxed{55}$ min

Answer: **Method:** Add the minutes and the hours separately.

$$\begin{array}{r} 1\,\text{h}\,25\,\text{min} \\ +\,1\,\text{h}\,30\,\text{min} \\ \hline 2\,\text{h}\,55\,\text{min} \end{array}$$

The total time is **2 hours and 55 minutes**.

Ex 43: You spend 1 hour 15 minutes on Math homework and 55 minutes on Science homework.
How long is that altogether?

$\boxed{2}$ h $\boxed{10}$ min

Answer: **Method:** Add the minutes and hours, then regroup the minutes.

$$\begin{array}{r} 1\,\text{h}\,15\,\text{min} \\ +\,0\,\text{h}\,55\,\text{min} \\ \hline 1\,\text{h}\,70\,\text{min} \end{array}$$

Since 70 minutes is more than 60, we regroup: $70\,\text{min} = 1\,\text{h}\,10\,\text{min}$. We add this to our result:

$$1\,\text{h} + (1\,\text{h}\,10\,\text{min}) = 2\,\text{h}\,10\,\text{min}$$

The total time is **2 hours and 10 minutes**.

Ex 44: You play a game for 2 hours 30 minutes and read a book for 1 hour 45 minutes.
How long is that altogether?

$\boxed{4}$ h $\boxed{15}$ min

Answer: **Method:** Add the minutes and hours, then regroup.

$$\begin{array}{r} 2\,\text{h}\,30\,\text{min} \\ +\,1\,\text{h}\,45\,\text{min} \\ \hline 3\,\text{h}\,75\,\text{min} \end{array}$$

Regroup the 75 minutes: $75\,\text{min} = 1\,\text{h}\,15\,\text{min}$.

$$3\,\text{h} + (1\,\text{h}\,15\,\text{min}) = 4\,\text{h}\,15\,\text{min}$$

The total time is **4 hours and 15 minutes**.

F.2 SUBTRACTING TIME DURATIONS

Ex 45: You have 3 hours 40 minutes to finish your chores. You spend 1 hour 25 minutes cleaning your room.
How much time is left?

$\boxed{2}$ h $\boxed{15}$ min

Answer: **Method:** Subtract the minutes and the hours separately.

$$\begin{array}{r} 3\,\text{h}\,40\,\text{min} \\ -\,1\,\text{h}\,25\,\text{min} \\ \hline 2\,\text{h}\,15\,\text{min} \end{array}$$

You have **2 hours and 15 minutes** left.

Ex 46: You have 2 hours 35 minutes before dinner. You spend 1 hour 20 minutes practicing piano.
How much time is left?

$\boxed{1}$ h $\boxed{15}$ min

Answer: **Method:** Subtract the minutes and hours.

$$\begin{array}{r} 2\,\text{h}\,35\,\text{min} \\ -\,1\,\text{h}\,20\,\text{min} \\ \hline 1\,\text{h}\,15\,\text{min} \end{array}$$

You have **1 hour and 15 minutes** left.

Ex 47: You have 4 hours 10 minutes to complete your tasks. You spend 2 hours 45 minutes organizing your books.
How much time is left?

$\boxed{1}$ h $\boxed{25}$ min

Answer: **Method:** Since we cannot subtract 45 from 10, we must regroup first.

1. **Regroup:** Borrow 1 hour from the 4 hours, leaving 3 hours. Add the borrowed 60 minutes to the 10 minutes (10+60 = 70 min). The starting time becomes 3 h 70 min.
2. **Subtract:** Now subtract the hours and the new minutes.

$$\begin{array}{rcr} 4\text{ h }10\text{ min} & \rightarrow & 3\,\text{h}\,70\,\text{min} \\ -\;\;2\text{ h }45\text{ min} & \rightarrow & 2\,\text{h}\,45\,\text{min} \\ \hline & & 1\,\text{h}\,25\,\text{min} \end{array}$$

You have **1 hour and 25 minutes** left.

Ex 48: You have 3 hours 15 minutes to work on a project. You spend 1 hour 40 minutes writing a story.
How much time is left?

$\boxed{1}$ h $\boxed{35}$ min

Answer: **Method:** Regrouping is needed because 15 is less than 40.

1. **Regroup:** Borrow 1 hour from 3 hours, leaving 2 hours. Add 60 minutes to 15 minutes ($15 + 60 = 75$ min). The starting time is now 2 h 75 min.
2. **Subtract.**

$$\begin{array}{rcr} 3\text{ h }15\text{ min} & \to & 2\,\text{h}\,75\,\text{min} \\ -\ 1\text{ h }40\text{ min} & \to & 1\,\text{h}\,40\,\text{min} \\ \hline & & 1\,\text{h}\,35\,\text{min} \end{array}$$

You have **1 hour and 35 minutes** left.

Ex 49: You have 4 hours 15 minutes of free time. You play a game for 1 hour 45 minutes.
How much time is left?

$$\boxed{2}\text{ h }\boxed{30}\text{ min}$$

Answer: **Method:** Regrouping is needed because 15 is less than 45.

1. **Regroup:** Borrow 1 hour from 4 hours, leaving 3 hours. Add 60 minutes to 15 minutes ($15 + 60 = 75$ min). The starting time is now 3 h 75 min.
2. **Subtract.**

$$\begin{array}{rcr} 4\text{ h }15\text{ min} & \to & 3\,\text{h}\,75\,\text{min} \\ -\ 1\text{ h }45\text{ min} & \to & 1\,\text{h}\,45\,\text{min} \\ \hline & & 2\,\text{h}\,30\,\text{min} \end{array}$$

You have **2 hours and 30 minutes** left.

G SOLVING WORD PROBLEMS WITH TIME

G.1 SOLVING WORD PROBLEMS INVOLVING TIME

Ex 50: You work 2 hours 30 minutes on Saturday and 1 hour 20 minutes on Sunday.
How much time do you work altogether?

$$\boxed{3}\text{ h }\boxed{50}\text{ min}$$

Answer: **Analysis:** The word "altogether" tells us to find a total, so the operation is **addition**.

$$\begin{array}{r} 2\,\text{h}\,30\,\text{min} \\ +\,1\,\text{h}\,20\,\text{min} \\ \hline 3\,\text{h}\,50\,\text{min} \end{array}$$

You work **3 hours and 50 minutes** altogether.

Ex 51: A train starts at 8:20 AM and arrives at 1:30 PM.
How long is the train journey?

$$\boxed{5}\text{ h }\boxed{10}\text{ min}$$

Answer: **Analysis:** To find the duration between a start and end time, we **subtract**. To make subtraction easier, first convert the PM time to 24-hour format.

- **Step 1: Convert.** 1:30 PM becomes $1 + 12 = 13 : 30$. The start time is 8:20.
- **Step 2: Subtract.**

$$\begin{array}{r} 13\,\text{h}\,30\,\text{min} \\ -\,8\,\text{h}\,20\,\text{min} \\ \hline 5\,\text{h}\,10\,\text{min} \end{array}$$

The train journey takes **5 hours and 10 minutes**.

Ex 52: Liam has to wrap 12 gift boxes for a charity event. It takes him 3 minutes to wrap each box.
How long will it take to wrap all the gift boxes?

$$\boxed{36}\text{ min}$$

Answer: **Analysis:** The same action (wrapping for 3 minutes) is repeated 12 times. For repeated addition, we **multiply**.

$$12\,\text{boxes} \times 3\,\text{minutes per box} = 36\,\text{minutes}$$

It will take Liam **36 minutes** to wrap all the boxes.

Ex 53: A teacher has 36 minutes to grade tests. Each test takes 3 minutes to grade.
How many tests can the teacher grade?

$$\boxed{12}\text{ tests}$$

Answer: **Analysis:** We need to find how many equal groups of 3 minutes fit into a total of 36 minutes. This is a **division** problem.

$$36\,\text{minutes} \div 3\,\text{minutes per test} = 12\,\text{tests}$$

The teacher can grade **12 tests**.

Ex 54: You spend 1 hour 40 minutes mixing cookie dough and 1 hour 25 minutes decorating the cookies.
How long do you spend baking altogether?

$$\boxed{3}\text{ h }\boxed{5}\text{ min}$$

Answer: **Analysis:** The word "altogether" tells us to find a total, so we **add**.

$$\begin{array}{r} 1\,\text{h}\,40\,\text{min} \\ +\,1\,\text{h}\,25\,\text{min} \\ \hline 2\,\text{h}\,65\,\text{min} \end{array}$$

Since 65 minutes is more than an hour, we regroup: $65\,\text{min} = 1\,\text{h}\,5\,\text{min}$.

$$2\,\text{h} + (1\,\text{h}\,5\,\text{min}) = 3\,\text{h}\,5\,\text{min}$$

You spend **3 hours and 5 minutes** baking.

Ex 55: Sofia needs to bake 15 cupcakes for a school event. Each cupcake takes 5 minutes to prepare.
How long will it take to prepare all the cupcakes?

$$\boxed{1}\text{ h }\boxed{15}\text{ min}$$

Answer: **Analysis:** This is a two-step problem. First, we find the total minutes by **multiplying**, then we **convert** the minutes to hours and minutes.

- **Step 1: Multiply.**

$$15\,\text{cupcakes} \times 5\,\text{minutes per cupcake} = 75\,\text{minutes}$$

- **Step 2: Convert.** 75 minutes is more than one hour.

$$\begin{aligned} 75\,\text{min} &= 60\,\text{min} + 15\,\text{min} \\ &= 1\,\text{h}\,15\,\text{min} \end{aligned}$$

It will take Sofia **1 hour and 15 minutes**.

Ex 56: To plant the vegetables, it takes you 20 hours. You work over 4 days.
How many hours do you work per day?

$\boxed{5}$ hours per day

Answer: **Analysis:** We are sharing a total amount of time (20 hours) equally over 4 days. This is a **division** problem.

$$20\,\text{hours} \div 4\,\text{days} = 5\,\text{hours per day}$$

You work **5 hours per day**.

Ex 57: In a library, you begin to work at 8:30 AM. You finish at 10:20 AM.
How much time do you work?

$\boxed{1}$ h $\boxed{50}$ min

Answer: **Analysis:** To find the duration between a start and end time, we **subtract**. We need to regroup because 20 is less than 30.

1. **Regroup:** Borrow 1 hour from 10 hours, leaving 9 hours. Add 60 minutes to 20 minutes ($20 + 60 = 80$ min). The end time becomes 9 h 80 min.
2. **Subtract.**

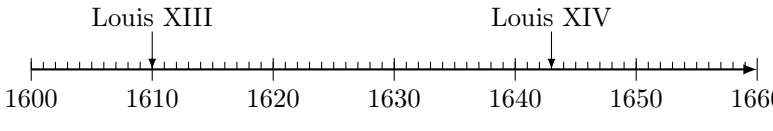
$$\begin{array}{rcr} 10\text{ h }20\text{ min} & \rightarrow & 9\,\text{h}\,80\,\text{min} \\ -\ 8\text{ h }30\text{ min} & \rightarrow & 8\,\text{h}\,30\,\text{min} \\ \hline & & 1\,\text{h}\,50\,\text{min} \end{array}$$

You work for **1 hour and 50 minutes**.

H TIMELINES

H.1 READING DATES ON A TIMELINE

Ex 58: This timeline shows monarchs of France in the 17th century:



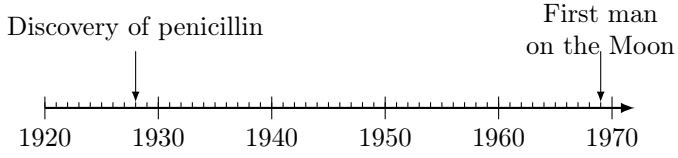
When did Louis XIII begin his reign?

In the year $\boxed{1610}$

Answer:

- Find the label for "Louis XIII" on the timeline.
- Follow the line from the label to the point on the timeline.
- This point aligns exactly with a major tick mark labeled with the year **1610**.

Ex 59: This timeline shows major scientific discoveries in the 20th century:



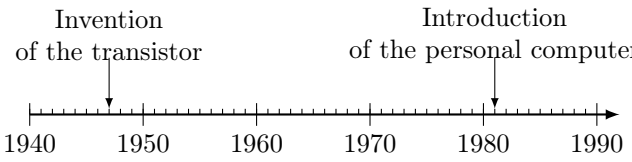
When was penicillin discovered?

In the year $\boxed{1928}$

Answer:

- The line for the "Discovery of penicillin" points between the main labels for 1920 and 1930.
- The small tick marks between the decades each represent one year.
- The event is marked at the 8th tick mark after 1920.
- Therefore, the year is calculated as $1920 + 8 =$ **1928**.

Ex 60: This timeline shows key computing advancements in the 20th century:



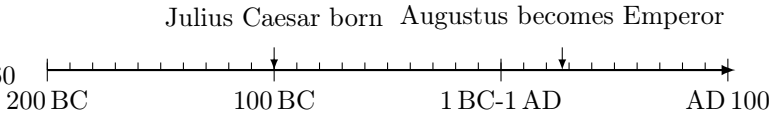
When was the transistor invented?

In the year $\boxed{1947}$

Answer:

- The line for the "Invention of the transistor" points to a position between 1940 and 1950.
- The timeline's scale shows that each small tick mark represents one year.
- The event is marked at the 7th tick mark after 1940.
- Therefore, the year is $1940 + 7 =$ **1947**.

MCQ 61: This timeline shows key dates in Roman history:



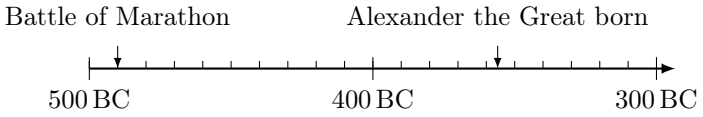
When was Julius Caesar born?

- ☐ 200 BC
- ☒ 100 BC
- ☐ 27 AD
- ☐ 500 AD

Answer:

- Find the label "Julius Caesar born" on the timeline.
- The line points directly to the major tick mark labeled **100 BC**.

MCQ 62: This timeline shows key events in ancient Greek history:



When was Alexander the Great born?

☐ 500 BC

☐ 490 BC

☒ 356 BC

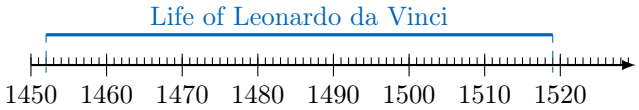
☐ 245 BC

Answer:

- Find the event "Alexander the Great born" on the timeline.
- The line points to a location between 400 BC and 300 BC.
- Remember that BC years count backwards, so the year must be a number between 400 and 300.
- Of the choices provided, only **356 BC** fits in this range.

H.2 CALCULATING DURATIONS ON A TIMELINE

Ex 63: This timeline shows the lifespan of the famous artist Leonardo da Vinci.



Using the timeline, calculate how old Leonardo da Vinci was when he died.

67 years

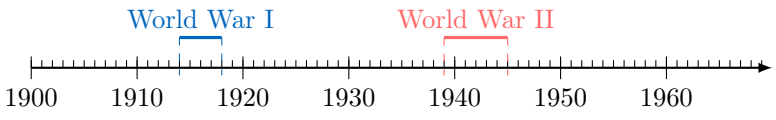
Answer:

- The timeline indicates that Leonardo da Vinci was born in the year **1452**.
- It shows that he died in the year **1519**.
- To find his age at death, we subtract his birth year from his death year.

$$1519 - 1452 = 67 \text{ years}$$

Leonardo da Vinci was **67 years old** when he died.

Ex 64: This timeline shows the duration of the First and Second World Wars.



How many years passed between the end of World War I and the beginning of World War II?

21 years

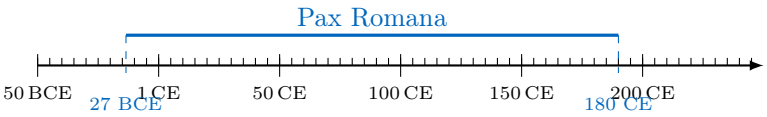
Answer:

- The timeline shows that World War I ended in **1918**.
- It shows that World War II began in **1939**.
- To find the number of years between these two events, we subtract the earlier year from the later year.

$$1939 - 1918 = 21 \text{ years}$$

There were **21 years** of peace between the two wars.

Ex 65: This timeline shows the period of the Roman Empire's greatest peace and prosperity, known as the Pax Romana.



Using the timeline, calculate the total duration of the Pax Romana.

206 years

Answer:

- The Pax Romana started in **27 BCE** and ended in **180 CE**.
- To find the duration across the BCE/CE divide, we must be careful because there is **no year 0**. Time goes directly from 1 BCE to 1 CE.
- First, add the years from each era, then subtract 1 year to account for the missing year 0.

$$27 \text{ years (BCE)} + 180 \text{ years (CE)} - 1 \text{ year} = 206 \text{ years}$$

The Pax Romana lasted for **206 years**.