GRAVITY WORKSHEETS

Mass vs Weight


My name

Weight on Three Worlds

Find each weight. Write it in the table.

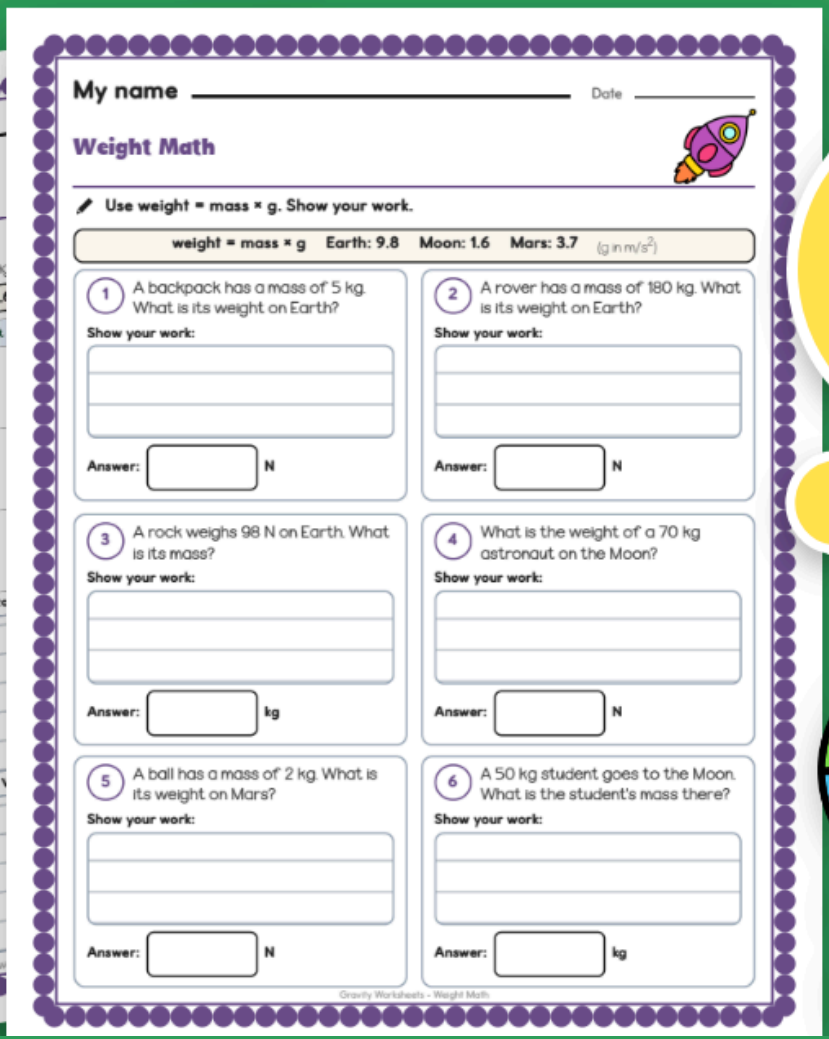
Each world pulls with a different g, in m/s². Multiply weig

Earth: g = 9.8 Moon: g = 1.

Mass	Weight on Earth (N)	Weight
10 kg		
25 kg		
60 kg		

What do you notice about the weights from Earth to

Which world would be the hardest to jump on? W


My name _____ Date _____

Weight Math

Use weight = mass × g. Show your work.

weight = mass × g Earth: 9.8 Moon: 1.6 Mars: 3.7 (g in m/s²)

1. A backpack has a mass of 5 kg. What is its weight on Earth?
Show your work:
Answer: _____ N

2. A rover has a mass of 180 kg. What is its weight on Earth?
Show your work:
Answer: _____ N

3. A rock weighs 98 N on Earth. What is its mass?
Show your work:
Answer: _____ kg

4. What is the weight of a 70 kg astronaut on the Moon?
Show your work:
Answer: _____ N

5. A ball has a mass of 2 kg. What is its weight on Mars?
Show your work:
Answer: _____ N

6. A 50 kg student goes to the Moon. What is the student's mass there?
Show your work:
Answer: _____ kg

Gravity Worksheets - Weight Math

24 STUDENT PAGES

GRADES 6-8



Bright Path Sped

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This is a fillable PDF

- Open it in a PDF reader (Adobe Acrobat Reader, Preview, or your browser), click into a line or a box, type, and Save As.
- The name line, every answer box, every ruled work box and every check box on the student pages are type-in fields, and so are the tracker, class grid, team note and family page. You can also print any page and write by hand.
- It works offline. No account, no subscription, no internet connection needed after you download it.

Print at 100 percent

Turn off fit to page and shrink to fit so the ruled lines stay 0.34 inch apart. Every student page is black and white inside a colored border, so it still reads when copied in black and white.

Student work

A filled-in tracker, class grid or team note carries a real student's name. Keep it in the data folder, and use a first name only on any page that leaves your hands.

Need help?

If a field will not behave or a page will not print the way you expect, use Ask a Question on the product page. Every question is read, and a fix ships as a free update.

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PREVIEW

How To Read a Page

The parts of a student page, then the page types in the order they come.

The parts of a page

- **The answer box.** A bordered box for a letter, a number or a unit. Click it to type, or print and write in it.
- **The ruled work box.** Lines 0.34 inch apart. A short answer gets 4 lines; the main idea and example boxes get 3 and the paragraph page gets 18. It types and prints.
- **The check box.** True or false: click or mark one.
- **The reading.** A short passage with its number at the top, then a main idea box, an example box and two checks.
- **The cut line.** Six pieces in a 3 by 2 grid, each 2.4 by 1.25 inches, edge to edge: one cut across and two cuts down.

Page type	What it looks like	What the student does
Before You Read, Words to Know	2 pages, 12 items	True or false on the big picture; match eight words to their meanings.
7 Readings	14 checks	Read, write the main idea and an example, answer two checks with a letter.
Mass or Weight, Weight Math	2 pages, 14 items	Write M or W; use weight = mass × g on six problems with room to show work.
Weight Table, Falling Speed	2 pages, 14 items	Find nine weights on three worlds; fill a speed table and plot it on a graph.
Predict, Think It Through, claim-evidence-reasoning	9 questions, 3 scenarios, 2 organizer pages	4 lines per question; a plan and an 18-line paragraph.
Quiz, Cut and Paste	12 items, 18 pieces	A quiz in two parts and three cut-and-paste mats (words, mass or weight, order).

Untimed, unscored on the page

No student page has a timer or a score on it. The keys and the tracker are for you. The answer keys are on pages 29 to 32.

A short account, not a full textbook

Each reading is a summary of one idea in plain words. It is not a complete physics course, and it is not tied to any particular standard. Add your own textbook, lab or demonstration for more depth.

Printing and the type-in fields

Every page prints clean in black and white. The name line, every answer box, every ruled box and every check box are type-in fields in any PDF reader: click one, type, then save. This is a fillable PDF, not a slideshow or a word-processor file. The graph on the falling-speed page is plotted by hand on the printed page.

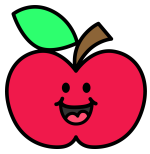
Open answers

Short answers, predictions and the paragraph are open. The keys give a sample and what to look for. Accept any answer that is true to the readings and explains its reason.

PREVIEW

Preview - Bright Path Sped

My name _____ Date _____



Before You Read

Read the big idea. Then check true or false.

Gravity is one of the forces that shape everything around you. Here are the big ideas.

The force	Gravity is a force that pulls objects with mass toward each other. The more mass an object has, the stronger its pull. Earth's pull is the one you feel every day.
The measures	Mass is the amount of matter in an object. It is measured in kilograms (kg). Weight is the pull of gravity on an object. It is measured in newtons (N). Near Earth, $g = 9.8\ m/s^2$.
The formula	weight = mass × g. A 10 kg object on Earth has a weight of 10 × 9.8 = 98 N.
The motion	Falling, air resistance and orbits are all about gravity. You will read about seven ideas, one at a time, on the next pages.

Try it. Is each sentence true or false?

1. Gravity pulls objects toward each other. ☐ true ☐ false

2. Only very large objects, like planets, have gravity. ☐ true ☐ false

3. In science, mass and weight mean exactly the same thing. ☐ true ☐ false

4. Gravity can pull on an object without touching it. ☐ true ☐ false

In your own words: what is gravity?

PREVIEW

Preview - Bright Path Sped

My name _____ Date _____

Mass vs Weight



Read the passage. Then write the main idea.

Reading 2 of 7

People often use the words mass and weight as if they mean the same thing, but in science they are different. Mass is the amount of matter in an object. It is measured in kilograms (kg), and a balance can be used to find it. An object's mass is the same everywhere: on Earth, on the Moon or in space. Weight is the force of gravity pulling on an object. Because weight is a force, it is measured in newtons (N), and a spring scale can be used to find it. Weight changes when gravity changes. Near Earth's surface, gravity pulls with 9.8 newtons on every kilogram of mass, so the acceleration due to gravity is $g = 9.8\ m/s^2$. To find weight, multiply: weight = mass × g. In everyday life, people say a bag "weighs" 5 kilograms. A scientist would say the bag has a mass of 5 kilograms and a weight of 5 × 9.8 = 49 newtons on Earth.

Main idea: What is this passage mostly about?

Example: Which fact or example from the passage shows it?

Check what you read. Write the letter in the box.

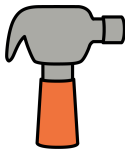
1. Which unit is used to measure weight? ☐
   - **A** Kilogram (kg)
   - **B** Newton (N)
   - **C** Meter (m)

2. What is true about an object's mass? ☐
   - **A** It is the same on Earth and on the Moon.
   - **B** It is zero in space.
   - **C** It gets smaller where gravity is weaker.

PREVIEW

My name _____ Date _____

Free Fall



Read the passage. Then write the main idea.

Reading 4 of 7

An object is in free fall when gravity is the only force acting on it. Near Earth, a falling object speeds up by 9.8 meters per second every second. A change in speed over time is called acceleration, so for falling objects, acceleration is 9.8 m/s^2. A dropped rock is moving at about 9.8 m/s after 1 second, about 19.6 m/s after 2 seconds and about 29.4 m/s after 3 seconds, if air does not get in the way. Many people think that heavy objects fall faster than light ones. If air is not in the way, they do not. A heavier object has more weight, so gravity pulls harder on it, but it also has more mass, which makes it harder to speed up. The two effects cancel out, and every object falls with the same acceleration. In 1971, Apollo 15 astronaut David Scott dropped a hammer and a feather at the same time on the Moon, where there is almost no air. Both hit the ground together. On Earth, a feather falls more slowly than a hammer because of air, not because of its mass.

Main idea: What is this passage mostly about?

Example: Which fact or example from the passage shows it?

Check what you read. Write the letter in the box.

1. Ignoring air, how much does a falling object's speed increase each second?
   - **A** 1.6 m/s
   - **B** 9.8 m/s
   - **C** 98 m/s

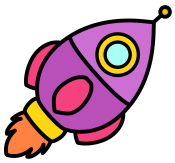
2. What did the hammer and feather show on the Moon?
   - **A** Objects fall at the same rate when there is almost no air.
   - **B** The feather falls faster than the hammer.
   - **C** Heavy objects always fall faster.

PREVIEW

Preview - Bright Path Shed

My name _____ Date _____

Orbits



Read the passage. Then write the main idea.

Reading 6 of 7

An orbit is the curved path one object takes around another because of gravity. The Moon orbits Earth, Earth and the other planets orbit the Sun, and the International Space Station orbits Earth. Newton imagined firing a cannonball from a very tall mountain. A slow cannonball falls to the ground not far away. A faster one lands farther off. If it moves fast enough sideways, then as it falls, the curved surface of Earth drops away beneath it, and it keeps missing the ground. It is falling all the time but never lands. That is an orbit. So an orbit needs two things: gravity pulling toward the center, and sideways motion. Without gravity, the object would fly off in a straight line. Without sideways motion, it would fall straight in. The space station travels about 400 kilometers above Earth at about 28,000 kilometers per hour and circles Earth about every 90 minutes. Gravity there is still about 90 percent as strong as on the ground. Astronauts float because they and the station are in free fall together, not because gravity is gone.

Main idea: What is this passage mostly about?

Example: Which fact or example from the passage shows it?

Check what you read. Write the letter in the box.

1. What two things keep an object in orbit? ☐
   - **A** Air resistance and friction
   - **B** Mass and temperature
   - **C** Gravity and sideways motion

2. Why do astronauts on the space station float? ☐
   - **A** There is no gravity in space.
   - **B** They and the station are in free fall together.
   - **C** The station spins very fast.

PREVIEW

Preview - Bright Path Sped

My name _____ Date _____



Words to Know

Write the letter of each meaning.

1	acceleration		A	the unit used to measure force
2	weight		B	a force that pulls objects with mass toward each other
3	air resistance		C	a force of air pushing against a moving object
4	gravity		D	the force of gravity pulling on an object
5	orbit		E	the curved path of one object around another
6	newton		F	the amount of matter in an object
7	free fall		G	a change in speed or direction over time
8	mass		H	motion with gravity as the only force acting

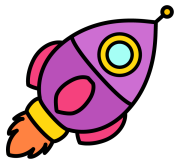
Use two of the words in one sentence about gravity.

PREVIEW

Preview - Bright Path Shed

My name _____ Date _____

Weight Math



Use weight = mass × g. Show your work.

weight = mass × g **Earth: 9.8** **Moon: 1.6** **Mars: 3.7** (g in m/s^2)

1 A backpack has a mass of 5 kg. What is its weight on Earth?

Show your work:

Answer: _____ **N**

2 A rover has a mass of 180 kg. What is its weight on Earth?

Show your work:

Answer: _____ **N**

3 A rock weighs 98 N on Earth. What is its mass?

Show your work:

Answer: _____ **kg**

4 What is the weight of a 70 kg astronaut on the Moon?

Show your work:

Answer: _____ **N**

5 A ball has a mass of 2 kg. What is its weight on Mars?

Show your work:

Answer: _____ **N**

6 A 50 kg student goes to the Moon. What is the student's mass there?

Show your work:

Answer: _____ **kg**

PREVIEW

Preview - Bright Ball Speed

My name _____ Date _____

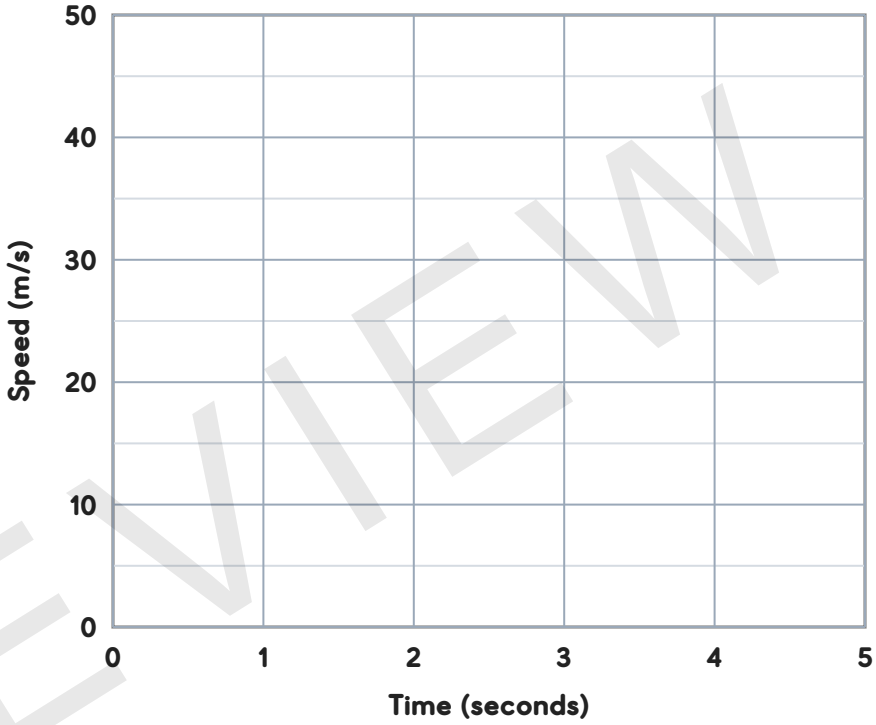
Falling Speed Data



Fill in the table. Then plot each point.

A rock is dropped. Ignore air. It speeds up by 9.8 m/s every second. Speed = 9.8 × time. Then plot each point and draw a line.

Time (s)	Speed (m/s)
0	0
1	
2	
3	
4	
5	



What pattern do you see in the speeds? What does the line look like?

Predict: what would the speed be at 10 seconds, ignoring air? Show how you know.

PREVIEW

Preview - Bright Path Sped

My name _____ Date _____

Think It Through A

Answer each question in full sentences.

Use facts from the readings to answer.

1. What is the difference between mass and weight?

2. Why would you weigh less on the Moon than on Earth?

3. Explain what gravity is, in your own words.

PREVIEW

Preview - Bright Path Sped

My name _____ Date _____

Think It Through C

Answer each question in full sentences.

Use facts from the readings to answer.

7 What two things does an object need to stay in orbit?

8 How does the pull of gravity change when two objects move farther apart?

9 Why do astronauts on the space station float even though gravity is still strong there?

PREVIEW

My name _____ Date _____

My Paragraph

Write your paragraph. Use your plan.

Check your plan first: ☐ **claim** ☐ **evidence** ☐ **reasoning**

Write one paragraph. Start with your claim. Add your evidence. Then explain it. End with a sentence that ties back to the question.

PREVIEW

Preview - Bright Path Sped

My name _____ Date _____

Quiz, Part B

Read each one. Write the letter of the best answer.

Write the letter of the best answer in the box.

7. In free fall, which force is the only one acting on an object?
   - **A** Gravity
   - **B** Air resistance
   - **C** Friction

8. Ignoring air, how fast is a dropped rock moving after 3 seconds?
   - **A** 19.6 m/s
   - **B** 29.4 m/s
   - **C** 39.2 m/s

9. What is terminal velocity?
   - **A** The speed of light
   - **B** The point where a falling object lands
   - **C** The steady speed reached when air resistance equals weight

10. What keeps a satellite in orbit?
    - **A** Gravity and sideways motion
    - **B** A rocket engine that never stops
    - **C** Air pushing it along

11. If two objects move farther apart, the pull of gravity between them...
    - **A** gets stronger.
    - **B** stays the same.
    - **C** gets weaker.

12. Who published the law of universal gravitation in 1687?
    - **A** Galileo Galilei
    - **B** Isaac Newton
    - **C** Albert Einstein

PREVIEW

Preview - Bright Path Sped

My name _____ Date _____

Cut and Paste 2

Cut out the six pieces. Paste each one in the right box.

Mass is the amount of matter. Weight is the pull of gravity. Paste each piece in the right box.

Mass (matter in the object)	Weight (the pull of gravity)

PREVIEW

Cut on the dashed lines: six pieces, one cut across and two cuts down.

Earth pulls the rock with 19.6 N.	The rock is 2 kg.	An astronaut is 70 kg on Earth and on the Moon.
The Moon pulls the astronaut with 112 N.	Earth pulls the box with 98 N.	A box has 10 kg of matter, even in space.

Pick one mass piece and one weight piece. How are they connected?

Answer Key: Reading and Words

Before You Read, the 14 checks that follow the readings, and Words to Know.

Readings: the checks pages 6 to 12

#	Reading	Answer
1	Gravity	B: It pulls objects toward each other.
2	Gravity	C: Earth has far more mass than a pencil.
1	Mass vs Weight	B: Newton (N)
2	Mass vs Weight	A: It is the same on Earth and on …
1	Weight on Other Worlds	C: About one sixth as strong
2	Weight on Other Worlds	B: 80 kg
1	Free Fall	B: 9.8 m/s
2	Free Fall	A: Objects fall at the same rate when there …
1	Air Resistance	C: The speed stops increasing.
2	Air Resistance	A: Its large surface increases air resistance.
1	Orbits	C: Gravity and sideways motion
2	Orbits	B: They and the station are in free fall …
1	Universal Gravitation	C: It gets weaker.
2	Universal Gravitation	A: It doubles.

Before You Read page 5

#	Starts with	Answer
1	Gravity pulls objects toward each other.	True
2	Only very large objects, like planets, …	False
3	In science, mass and weight mean …	False
4	Gravity can pull on an object …	True

Words to Know page 13

#	Word	Letter
1	acceleration	G
2	weight	D
3	air resistance	C
4	gravity	B
5	orbit	E
6	newton	A
7	free fall	H
8	mass	F

How the checks were made

Every reading was written so each check has one best answer that is stated in the passage. If a student picks another letter, point to the sentence that settles it.

PREVIEW

Answer Key: Quiz and Sorts

The quiz and the three cut-and-paste mats.

Quiz pages 24, 25

#	Starts with	Answer
1	Which statement about mass is true?	C: It is the amount of matter in an …
2	What is the formula for weight?	A: weight = mass × g
3	What is the value of g at the surface …	B: 9.8 m/s2
4	A 20 kg object is on Earth. What is …	A: 196 N
5	Which tool measures weight?	B: A spring scale
6	Which of these worlds has the weakest gravity?	C: The Moon
7	In free fall, which force is the only one …	A: Gravity
8	Ignoring air, how fast is a dropped rock moving …	B: 29.4 m/s
9	What is terminal velocity?	C: The steady speed reached when air resistance equals …
10	What keeps a satellite in orbit?	A: Gravity and sideways motion
11	If two objects move farther apart, the pull of …	C: gets weaker.
12	Who published the law of universal gravitation in 1687?	B: Isaac Newton

Cut and Paste 1 page 26

Piece (row, column)	Box
r1 c1: Slows a skydiver after the …	Air resistance
r1 c2: Does not change when you …	Mass
r1 c3: The Moon's curved path around …	Orbit
r2 c1: Pulls a dropped ball toward …	Gravity
r2 c2: A rock speeds up as …	Free fall
r2 c3: Changes with gravity and is …	Weight

Cut and Paste 2 page 27

Piece (row, column)	Box
r1 c1: Earth pulls the rock with …	Weight
r1 c2: The rock is 2 kg.	Mass
r1 c3: An astronaut is 70 kg …	Mass
r2 c1: The Moon pulls the astronaut …	Weight
r2 c2: Earth pulls the box with …	Weight
r2 c3: A box has 10 kg …	Mass

Cut and Paste 3 page 28

Piece (row, column)	Box
r1 c1: Air resistance equals weight: the …	Fourth
r1 c2: The skydiver jumps out and …	First
r1 c3: The skydiver slows down and …	Sixth
r2 c1: Air resistance grows as the …	Third
r2 c2: Gravity makes the skydiver speed …	Second
r2 c3: The parachute opens and air …	Fifth

Reading the sort keys

Read each strip left to right, top row first. On Cut and Paste 3 the boxes are first to sixth, so the box is the step's place in the skydive.

PREVIEW

Gravity Tracker

One student, every scored page. Filled example: page 37.

Student _____ Teacher _____ Month _____

Page	Page type and set	Items	Right	Date	Notes
5	Before You Read	4			
6	What Is Gravity?	2			
7	Mass vs Weight	2			
8	Weight on Other Worlds	2			
9	Free Fall	2			
10	Air Resistance and Terminal Velocity	2			
11	Orbits	2			
12	Newton's Law of Universal Gravitation	2			
13	Words to Know	8			
14	Mass or Weight?	8			
15	Weight Math	6			
16	Weight on Three Worlds	9			
17	Falling Speed Data	5			
24	Quiz, Part A	6			
25	Quiz, Part B	6			
26	Cut and Paste 1	6			
27	Cut and Paste 2	6			
28	Cut and Paste 3	6			

How to fill this in

Write how many items the student got right with no prompt, and the date. A blank means not tried yet, never wrong. There are 84 items on the 18 scored pages. Answer keys: pages 29 to 32. Filled example: page 37.

This month we are working on (your own standard or wording)

PREVIEW

Team Note

Use this page between team meetings or when a student moves classes, to hand off what changed without writing a note from scratch. Everything below is observable, with a blank for the number or the wording your team already uses.

Student _____ Team member _____ Date _____

Page type	Covered since last note (Y/N)	Items right	Still blank
Before You Read			
Readings			
Words to Know			
Mass or weight, math, data			
Quiz			
Cut and paste			

What I saw (observable, not a conclusion)

- Wrote the main idea of ___ of ___ readings without a prompt.
- Sorted ___ of ___ statements as mass or weight (page 14).
- Used weight = mass × g correctly on ___ of ___ problems (page 15): yes / no / with a reminder.
- Explained the difference between mass and weight in their own words: yes / no.

Next step

- Next page or set: ___, because ___ (what you saw).
- What to try in another class or at home: ___.
- What to keep doing because it is working: ___.
- Anything for the team meeting to decide: ___ (this page records what happened, never a label or a plan).

Summary, in one or two sentences, for whoever reads this next

A filled-in line, for reference

"Matched 6 of 8 words on Words to Know with no prompt on 10/1. Next step: sort the words on Cut and Paste 1 with a partner and say each meaning aloud." That is the level of detail this page is built for. It matches the filled example on page 37.

PREVIEW

Marcus's Tracker (Invented Student)

Marcus T. is invented; nothing on this page describes a real student. The blank tracker is on page 33.

Student	Teacher	Month
Marcus T. (an invented student)	Ms. Okafor (invented)	September to October

Page	Page type and set	Items	Right	Date	Notes
5	Before You Read	4	4	9/22	-
6	What Is Gravity?	2	2	9/24	-
7	Mass vs Weight	2	1	9/25	Mixed up mass and weight
8	Weight on Other Worlds	2	2	9/29	-
9	Free Fall	2	-	-	-
10	Air Resistance and Terminal Velocity	2	-	-	-
11	Orbits	2	-	-	-
12	Newton's Law of Universal Gravitation	2	-	-	-
13	Words to Know	8	6	10/1	Mixed up weight and newton
14	Mass or Weight?	8	6	10/3	Marked a kg item W twice
15	Weight Math	6	4	10/6	Divided when it should multiply
16	Weight on Three Worlds	9	-	-	-
17	Falling Speed Data	5	-	-	-
24	Quiz, Part A	6	-	-	-
25	Quiz, Part B	6	-	-	-
26	Cut and Paste 1	6	-	-	-
27	Cut and Paste 2	6	-	-	-
28	Cut and Paste 3	6	-	-	-

PREVIEW

How to read it

Marcus T. has done **7 of 18** scored pages and got **25 of 32** items right with no prompt. **3** pages were all right and **4** carry a note. Every number comes from the table.

What the table points to

The lowest page is Mass vs Weight (1 of 2). That is where the next practice goes. The 11 pages left blank are not tried yet, never wrong.