



PUSH IT, PULL IT

DART ACTIVITY



Verse 1:

Jonny: If you're an engineer, designing cars or planes,
How do you know that when they're used, they're gonna be safe?
Engineer: You can make a prediction that's so precise, it's insane,
With equations, calculations and imagination.

Verse 2:

Jonny: What will you need to know?
Engineer: Speed, distance, 1. _____ and time,
Jonny: What are they?
Engineer: 2. _____ quantities, that only have size,
But some quantities are vectors with direction besides.
That's how velocity, acceleration, and 3. _____ are defined,
What's a force?
Push or pull.

Jonny: Like 4. _____ and weight?
Engineer: They are the ones that still can pull, when the objects separate,
But compression and 5. _____, and air resistance relate,
They're contact forces,
Like a 6. _____ force.
Oh yeah.

Both: And friction
Engineer: Add them together to treat them like there's one,
I use 7. _____ forces to predict the outcome.

Chorus

All: Forces
Engineer: Change your shape, your 8. _____ or your direction,
Engineer: When forces balance you won't change momentum,
Engineer: Force is mass times 9. _____,
Jonny: I will pull or push you back in every situation.

Verse 3:

Jonny: Tell me what you know about 10. _____,
Engineer: Bigger, closer, things pull more attractively,
To find the 11. _____, multiply the mass by g,
The field strength on Earth, it's roughly 10 12. _____ per kilo
Jonny: If I'm stretching a spring?
Engineer: Use 13. _____ to see,
That the tension and extension grow proportionally,
Jonny: What's a 14. _____?
Engineer: A turning force, like spanners need,
Force times distance from the pivot perpendicularly,
Jonny: Ok. But how do forces link to something's energy?
Engineer: Force times the distance moved is 15. _____ that's done mechanically,
It's the energy shifted between stores. An example could be,
Shifting by lifting, to be stored in things 16. _____,
Jonny: So, what's momentum?
Engineer: Mass times 17. _____,
And if it's low, then something's motion changes easily with...

Chorus

Verse 4:

Jonny: Is it safe to drive fast?
Engineer: How fast?
Jonny: How fast can I go?
Engineer: That depends if you've enough 18. _____ to slow, Why?
Jonny: You need time to react, which may take longer you know,
Engineer: If you are 19. _____ or if you're drinking alcohol.
Jonny: I can stop really fast,
Engineer: But then the forces felt,
Can cause internal damage.
Jonny: Even with a safety belt?
Engineer: And since brakes will dissipate energy, that's half $m v$ 20. _____,
It takes much longer to stop, when driving fast, beware.

Chorus

Complete the following tasks

1. Fill in the blank keywords - if you are not sure, there are clues on the next page.
2. Circle sections in **red** that are **definitions** of keywords.
3. Circle sections in **green** that describe **equations**.
4. Circle sections in **blue** that describe **real world examples**.



Each of these words is used once.

speed squared velocity scalar newtons tired
tension Hooke's law gravitationally force gravity
acceleration stopping distance normal work
resultant weight magnetism moment

Definitions

1. A quantity measured in kilograms.
2. A quantity that has size but no direction.
3. A push or a pull.
4. A non-contact force between north and south poles.
5. A stretching force.
6. Describes a reaction force such as the ground pushing up on your feet.
7. Describes the outcome of adding things together.
8. The rate at which the distance from something changes.
9. The rate at which speed changes.
10. The tendency of objects to pull on each other because of their mass.
11. The force as a result of a gravitational pull.
12. The unit of force.
13. $\text{Force} = \text{spring constant} \times \text{extension}$
14. A turning force, found by multiplying the force by the perpendicular distance from the pivot.
15. Energy transferred through pushing or pulling.
16. A way to store energy that is dependent on the distance that an object can fall.
17. A quantity that describes an object's speed and direction.
18. The sum of the distances travelled whilst reacting and braking, when bringing a vehicle to rest.
19. A physical state caused by lack of sleep or over-exertion
20. The mathematical operation whereby a number is multiplied by itself.

