Unit 11 · Force

WORKSHEET

Full marks 40

Name _____ Class _____ Roll no. _____ Date _____ Marks _____ / 40

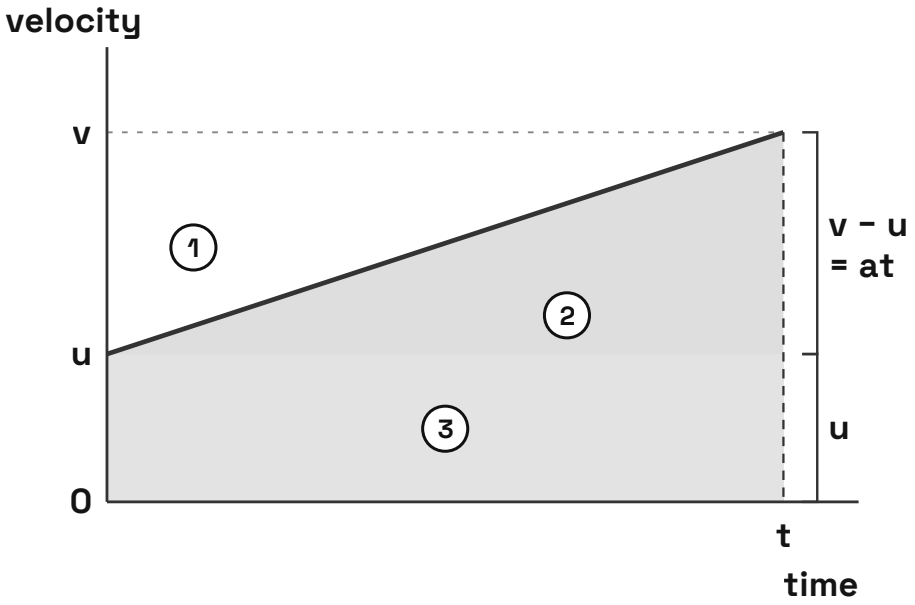
1 Key words [3]

Match each word in Column A with its description in Column B. Write the letter in the box. One description in Column B is not needed. Each match carries 0.5 mark.

Column A		Column B
1. scalar quantity	☐	**a.** force × distance moved along the force
2. vector quantity	☐	**b.** mass × velocity
3. resultant	☐	**c.** has magnitude only
4. moment of a force	☐	**d.** two equal, opposite, parallel forces not in the same line
5. couple	☐	**e.** force × perpendicular distance from the pivot to the line of action
6. linear momentum	☐	**f.** has both magnitude and direction, and adds by the triangle law
		g. the single vector with the same effect as two or more vectors together

2 Label the diagram [3]

The graph shows a body speeding up uniformly from u to v in time t. Write what each numbered label says. Each carries 1 mark.



1. _____ **2.** _____

3. _____

3 Multiple choice [4]

Choose the correct option for each of the following questions.

i. Which group contains only vector quantities? [1]

a. mass, velocity, force
b. displacement, acceleration, weight
c. speed, time, momentum
d. work, force, electric current

ii. Two forces of 5 N and 12 N act at right angles on a body. Their resultant is: [1]

a. 7 N
b. 8.5 N
c. 13 N
d. 17 N

iii. The SI unit of the moment of a force is: [1]

a. N/m
b. N m
c. J
d. kg m/s

iv. A couple acting on a body: [1]

a. moves it along without turning it
b. turns it without moving it from its place
c. neither moves nor turns it
d. always moves it and turns it

4 Very short answers [4]

Write very short answers to the following questions.

a. Why is electric current a scalar, even though it flows in a direction along a wire? [1]

b. What does an area **below** the time axis of a velocity–time graph show? [1]

c. A ball thrown straight up stops for an instant at the top. What is its acceleration at that instant? (Take $g \approx 10\ m/s^2$.) [1]

d. Why is a moment always written in N m and never in joules? [1]

5 Short answers [6]

Write short answers to the following questions.

a. A long wrench loosens a tight nut more easily than a short one. [2]

b. A gun moves backward when a bullet is fired from it. **[2]**

c. Two forces of 6 N and 4 N act on a box. Can their resultant be 12 N? Can it be 3 N? Give a reason. **[2]**

6 Long answer **[4]**

Write a long answer to the following question.

Derive $v = u + at$ and $s = ut + \frac{1}{2}at^2$ from a velocity–time graph.

7 Numerical problems **[13]**

Solve the following problems. Show your working.

a. A car starts from rest and speeds up uniformly to 20 m/s in 8 s. It moves at 20 m/s for 12 s, then stops uniformly in 4 s. Draw its velocity–time graph and find: (i) its acceleration in the first 8 s; (ii) its retardation in the last 4 s; (iii) the total distance traveled; (iv) its average velocity. **[4]**

Answer:

b. An aircraft heads north at 240 km/h through still air. A wind starts to blow toward the east at 70 km/h. Find the aircraft's resultant velocity over the ground. **[3]**

Answer: _____

c. A car of mass 1,500 kg moving at 72 km/h is brought to rest in 4 s. Find the change in its momentum and the average braking force. **[3]**

Answer: _____

d. A 2 kg trolley moving at 3 m/s collides head-on with a 1 kg trolley moving at 2 m/s in the opposite direction. They stick together. Find their common velocity. **[3]**

Answer: _____

8 Think **[3]**

An astronaut of mass 100 kg (with her suit) floats at rest 10 m from her space station, with her safety line loose. She throws a 2 kg tool away from the station at 5 m/s. How long does she take to reach the station? Why would "swimming" with her arms not help?

9 Activity: Finding a resultant by drawing (not marked)

Take a scale of 1 cm = 10 N. Draw a force of 30 N along a line, and from its head a force of 40 N at each angle below, measured from the direction of the first force. Join the first tail to the last head, measure it, and change it back to newtons.

Angle between the forces	Length of the resultant (cm)	Resultant (N)
0°		
60°		
90°		
120°		
180°		

At what angle was the resultant largest? At what angle smallest?