Physics Revision

• Calculating Speed / Velocity

1. $s = ?$
$d = 1700\ km$
$t = 2\ hrs$

$s = \frac{d}{t}$
$= 1700/2$
$= 850\ km/h.$

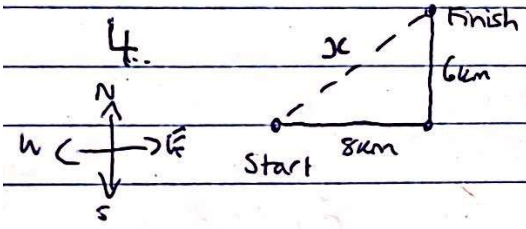
2. $s = ?$
$d = 100m$
$t = 11.7s$

$s = d/t$
$= 100/11.7$
$= 8.5\ m/s$

3. $v = ?$
$d = 1000\ km$
$t = 4\ hrs.$

$v = d/t$
$= 1000/4$
$= 250\ km/h.$

4.



Distance = 6km + 8km
= 14km

Displacement = x
$x^2 = a^2 + b^2$
$= 8^2 + 6^2$
$= 64 + 36$
$= 100$
$x = \sqrt{100}$
$x = 10\ km, NE.$

a) $s = ?$
$d = 14km$
$t = 3hrs$

$s = d/t$
$= 14/3$
$= 4.7\ km/h$

b) $v = ?$
$d = 10km$
$t = 3hrs$

$v = d/t$
$= 10/3$
$= 3.3\ km/h.$

• Calculating Distance / Displacement

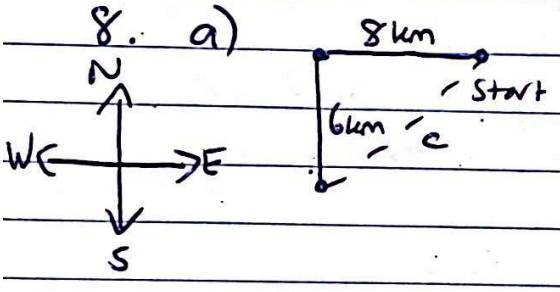
5. $s = 7\ m/s$
$d = ?$
$t = 43\ sec.$

$d = s \times t$
$= 7 \times 43$
$= 301\ m.$

6. $s = 100\ km/h$ $\quad d = s \times t$
$d = ?$ $\quad = 100 \times 6$
$t = 6\ hr$ $\quad = 600\ km.$

7. $s = 12\ m/s$ $\quad d = s \times t$
$d = ?$ $\quad = 12 \times 900$
$t = 15\ min = 900\ sec$ $\quad = 10800\ m\ (10.8\ km).$ Not very realistic!!!
(15×60)

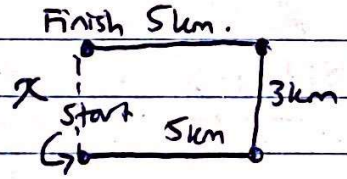
8. a)



distance = 8 + 6
= 14 km, SW

displacement = c
$c^2 = a^2 + b^2$
$= 8^2 + 6^2$
$= 100$
$c = \sqrt{100}$
$c = 10\ km.$

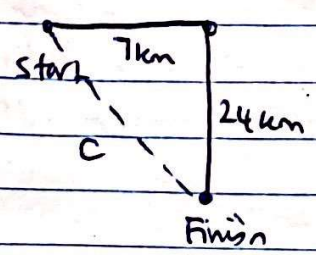
b)



distance = 5 + 3 + 5
= 13km

displacement = x
= 3km, N.

c)



distance = 7km + 24km
= 31km

displacement = C
$c^2 = a^2 + b^2$
$= 7^2 + 24^2$
$= 625$
$c = \sqrt{625}$
$= 25\ km, SE$

• Calculating Time

9. $s = 20 km/h$, $d = 37 km$, $t = ?$

$t = d/s$
$= 37/20$
$= 1.85 hrs.$

10. $s = 90 km/h$, $d = 30 km$, $t = ?$

$t = d/s$
$= 30/90$
$= 0.33 hrs.$

11. $s = 6 m/s$, $d = 330 m$, $t = ?$

$t = d/s$
$= 330/6$
$= 55 sec.$

12. $s = 850 m/s$, $d = 1 km = 1000 m$, $t = ?$

$t = d/s$
$= 1000/850$
$= 1.2 sec.$

• Interpreting Graphs

13. a) constant (moderate) speed, then stopped.
b) constant (moderate) speed, stopped, constant speed (faster than before).
c) accelerating, then stopped.
d) accelerating (quite quickly), then constant speed.

14. a) just over 4 min
b) 4 deliveries (ie: 4 stops) $\therefore 4 \times \$16 = \$64$.
c) just under 3 km.
d) just over 25 min
e) $s = ?$
$d = 3 km = 3000 m.$
$t = 25 min = 0.42 hr = 1500 sec.$

$s = d/t$
$= 3/0.42$
$= 7.1 km/h.$

15. a) A
b) 200m
c) C; stopped approx 4 sec.
d) 10.5 sec.
e) $s = ?$ $\quad s = d/t$
$d = 200m \quad = 200/9$
$t = 9sec \quad = 22.2\ m/s.$

16. a) B
b) A (started at 6 km).
c) B.
d) The objects are passing each other.
e) no.
f) approx 7km.
g) approx 5 km.
h) 2 hrs.

• Calculating Acceleration

17. $a = ?$ $\quad a = \frac{\Delta v}{t}$
$v_1 = 1\ m/s \quad = \frac{23-1}{9}$
$v_2 = 23\ m/s \quad = \frac{22}{9}$
$t = 9s \quad = 2.4\ m/s^2$

18. $a = ?$ $\quad a = \frac{\Delta v}{t}$
$v_1 = 0\ m/s \quad = \frac{56-0}{6}$
$v_2 = 56\ m/s \quad = 9.3\ m/s^2.$
$t = 6\ sec.$

19. $a = ?$ $\quad a = \frac{\Delta v}{t}$

$v_1 = 6 m/s$ $\quad = \frac{24-6}{3}$

$v_2 = 24 m/s$ $\quad = 6 m/s^2$.

$t = 3$ sec

CAR

20. $a = ?$ $\quad a = \frac{\Delta v}{t}$

$v_i = 0 m/s$ $\quad = \frac{32-0}{12}$

$v_2 = 32 m/s$ $\quad = 2.7 m/s^2$

$t = 12$ sec

MOTORBIKE

$a = ?$ $\quad a = \frac{\Delta v}{t}$

$v_i = 12 m/s$ $\quad = \frac{26-12}{3}$

$v_2 = 26 m/s$ $\quad = 4.7 m/s^2$

$t = 3$ sec

→ The motorbike has the greate acceleration.

- Newton's Laws

21. 1st ⇒ an object will stay at rest or continue its current motion unless acted on by a force (inertia).

2nd ⇒ $F = ma$.

3rd ⇒ For every action, there is an equal + opposite reaction.

22. $F = ?$ $\quad F = ma$

$m = 1 kg$ $\quad = 1 \times 10$

$a = 10 m/s$ $\quad = 10 N$.

23. $F = 300000 N$ $\quad a = F/m$

$m = 20000 kg$ $\quad = 300000/20000$

$a = ?$ $\quad = 15 m/s^2$.

24. $F = 7.5\ N$ $\quad m = F/a$
$m = ?$ $\quad = 7.5 \div 10$
$a = 10\ m/s^2$ $\quad = 0.75\ kg\ (750\ g)$.

25. a) The inertia of the dining setting will prevent it from moving, as it will remain at rest, since the force has only been applied to the tablecloth being pulled out quickly. (Force on tablecloth is not enough to overcome the inertia of the dining setting)

b) Newton's 1st Law - moving objects will keep moving until acted on by a force ∴ loose objects in a car will keep moving after the car stops, until they are acted on by a force to stop them. (They will fly forward as the car stops, until they hit something)

c) Stationary truck - it has greater mass.

• Kinetic Energy + Potential Energy

26. $KE = ?$ $\quad KE = \frac{1}{2}mv^2$
$m = 5\ g\ (0.005\ kg)$ $\quad = 0.5 \times 0.005 \times 100^2$
$v = 100\ m/s$ $\quad = 25\ J$

27. $PE = ?$ $\quad PE = mgh$
$m = 80\ kg$ $\quad = 80 \times 10 \times 8$
$g = 10\ m/s^2$ $\quad = 6400\ J$
$h = 8\ m$

28. $KE = 216\ J$, $m = 48\ kg$, $v = ?$

$KE = \frac{1}{2}mv^2$

$216 = 0.5 \times 48 \times v^2$

$216 = 24 \times v^2$

$\frac{216}{24} = v^2$

$9 = v^2$

$\sqrt{9} = v$

$3\ m/s = v$

29. $PE = 294\ J$, $m = 15\ kg$, $g = 10\ m/s^2$, $h = ?$

$PE = mgh$

$294 = 15 \times 10 \times h$

$294 = 150h$

$\frac{294}{150} = h$

$1.96\ m = h.$

30. $KE = 50\ J$, $m = ?$, $v = 4\ m/s$

$KE = \frac{1}{2}mv^2$

$50 = 0.5 \times m \times 4^2$

$50 = 0.5 \times m \times 16$

$50 = 8m$

$\frac{50}{8} = m$

$6.25\ kg = m.$

31. a) $PE = ?$, $m = 1000\ kg$, $g = 10\ m/s^2$, $h = 45\ m$

$PE = mgh$

$= 1000 \times 10 \times 45$

$= 450000\ J.$

b) $PE = 0$

$KE = 450000$ (assume all PE is converted to KE)

c) KE = 450000 J
m = 1000 kg
v = ?

$KE = \frac{1}{2}mv^2$

$450000 = 0.5 \times 1000 \times v^2$

$450000 = 500v^2$

$\frac{450000}{500} = v^2$

$900 = v^2$

$\sqrt{900} = v$

$30 m/s = v$.