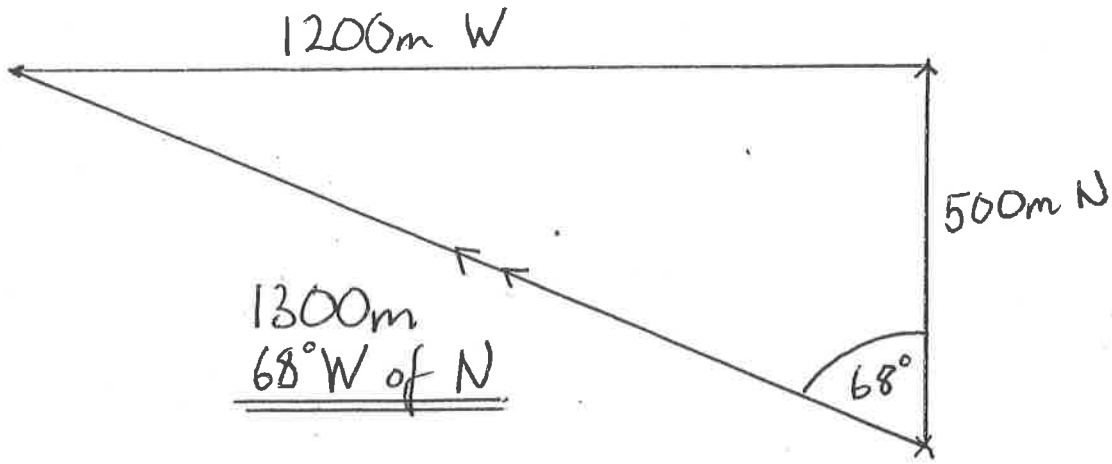
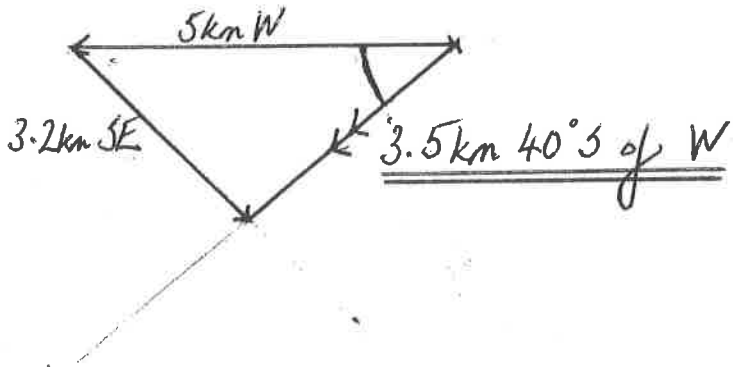
1. 1cm : 100m

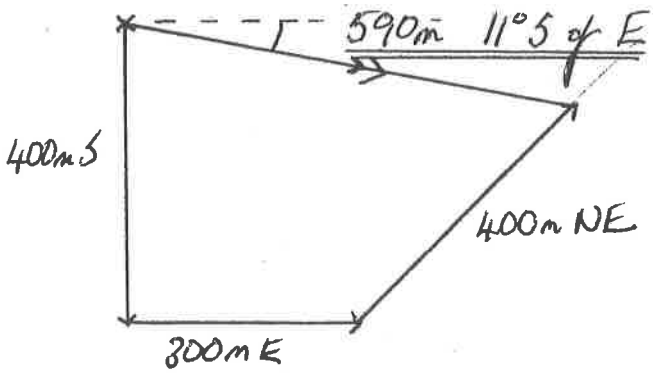
Distance = 1700m



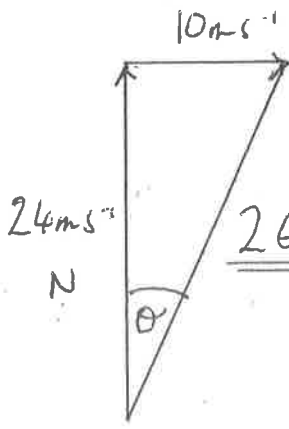
2. 1cm : 1km



3. 1cm : 100m



4.

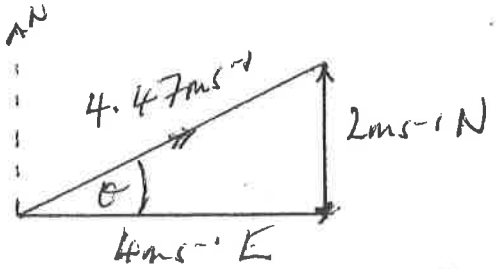


26ms⁻¹ 22.6° E of N

$\tan\theta = \frac{10}{24}$

$\theta = 22.6°$

4.



$\tan\theta = \frac{2}{4}$

$\theta \doteq 26.6°$

Resultant Velocity = $4.47 ms^{-1}$, $63.4°$ E of N

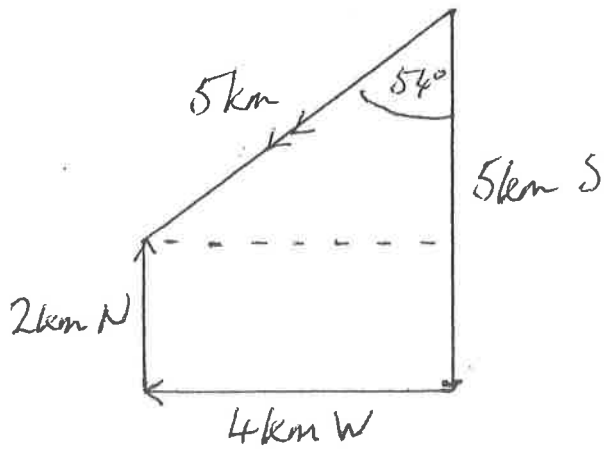
5. (a) distance = 80km

(b) $\bar{v} = \frac{d}{t} = \frac{80\,000}{7200} = 11.1 ms^{-1}$

(c) displacement = 20km N

(d) $v = \frac{s}{t} = \frac{20\,000}{7200} = 2.8 ms^{-1}$, N

7. 1cm : 1km



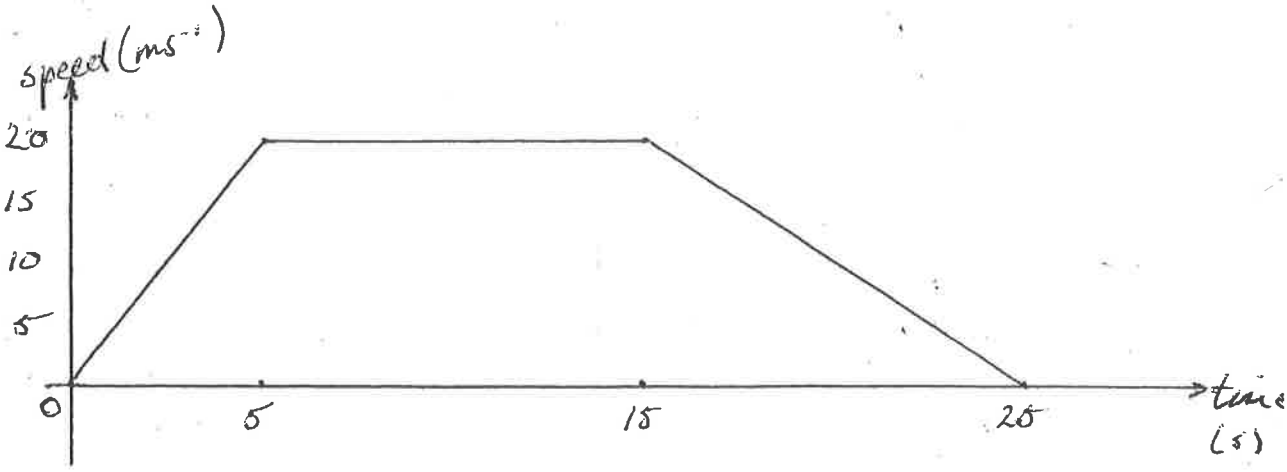
(a) distance = 11km

$v = \frac{d}{t} = \frac{11\,000}{3600} = 3.1 ms^{-1}$

7. (b) displacement = 5 km, 54° W of S

$$v = \frac{s}{t} = \frac{5000}{3600} = \underline{1.4 ms^{-1}, 54° W of S}$$

8.



s = area under graph

$= (\frac{1}{2} \times 5 \times 20) + (10 \times 20) + (\frac{1}{2} \times 10 \times 20)$

$= 50 + 200 + 100$

$= \underline{350 m}$

$$\bar{v} = \frac{s}{t} = \frac{350}{25} = \underline{14 ms^{-1}}$$

9.a. $a = \dfrac{v - u}{t}$

$= \dfrac{200 - 0}{0.05}$

$= \underline{4000 ms^{-2}}$

b. $a = \dfrac{v - u}{t}$

$= \dfrac{0 \cdot 30}{60}$

$= \underline{-0.5 ms^{-2}}$

10. $v = u + at$

$= 0 + 0.5 \times 24$

$= 0 + 12$

$\underline{v = 12 ms^{-1}}$

11. $v = u + at$

$= 15 + 1.6 \times 8$

$= 15 + 12.8$

$\underline{v = 27.8 ms^{-1}}$

12. $v = u + at$

$0 = u - 1.2 \times 6$

$0 = u - 7.2$

$u = 7.2 ms^{-1}$

13. $v = u + at$

$35 = 0 + 1.2t$

$35 = 1.2t$

$t = 29.2s$

14. $v = u + at$

$36 = 24 + 0.4t$

$12 = 0.4t$

$t = 30s$

15. $v = u + at$

$0.5 = 2.25 - 0.5t$

$-1.75 = -0.5t$

$t = 3.5s$

16. $u = \frac{l}{t_1} = \frac{0.05}{0.1} = 0.5 ms^{-1}$

$v = \frac{l}{t_2} = \frac{0.05}{0.05} = 1 ms^{-1}$

$a = \frac{v - u}{t_3}$

$= \frac{1 - 0.5}{2.5}$

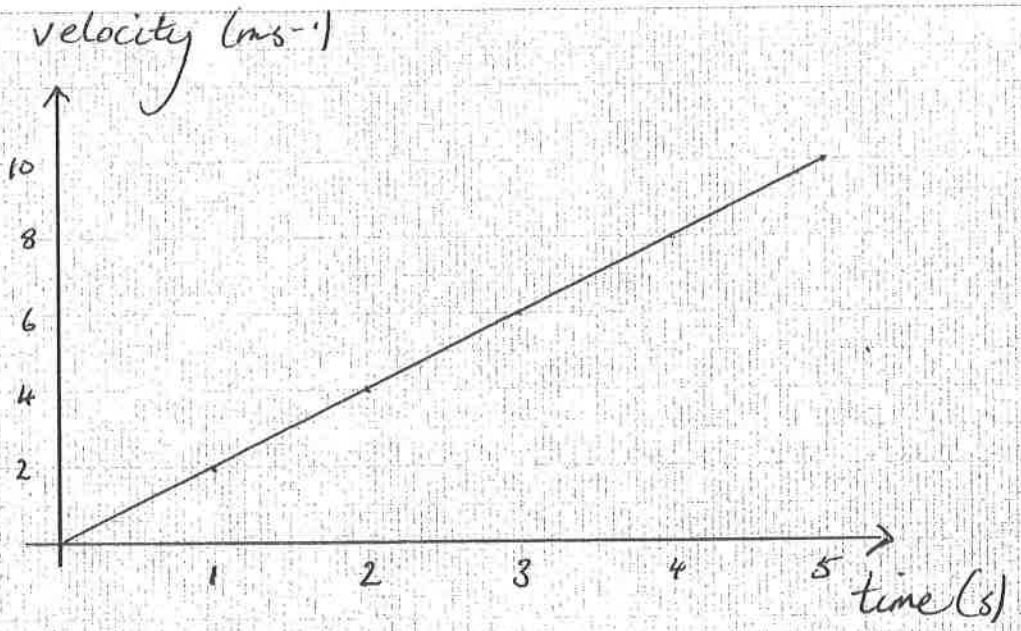
$= 0.2 ms^{-2}$

17. Mean value $= 5.20 ms^{-2}$

Random Uncertainty $= \frac{5.24 - 5.16}{8}$

$= 0.01 ms^{-2}$

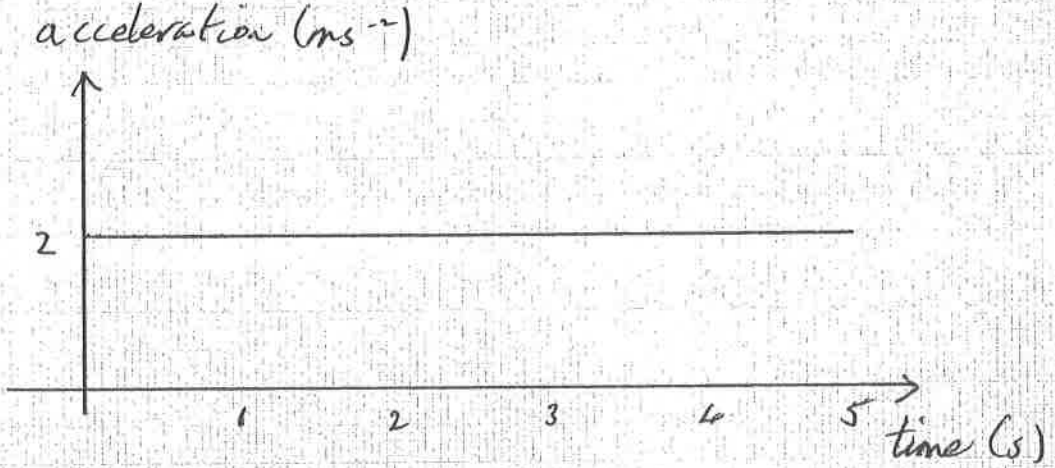
34.



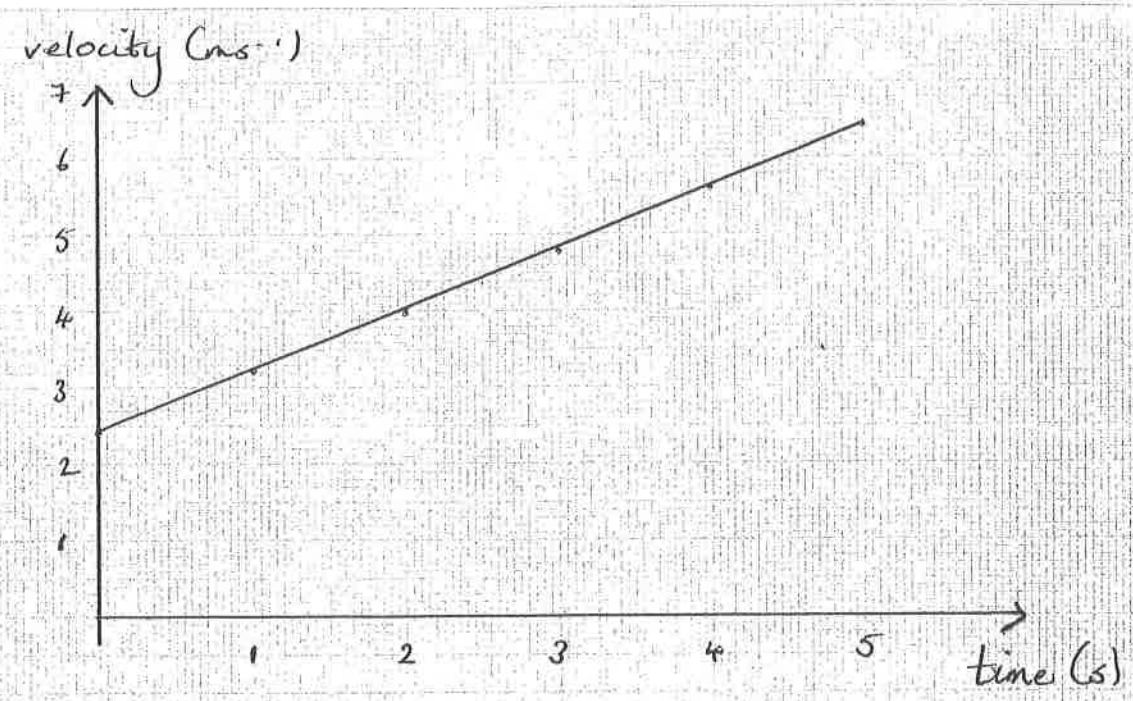
$$a = \frac{v - u}{t}$$

$$= \frac{10 - 0}{5}$$

$$= 2 ms^{-2}$$



13.



$$a = \frac{v - u}{t}$$

$$= \frac{6.4 - 2.4}{5}$$

$$= 0.8 ms^{-2}$$

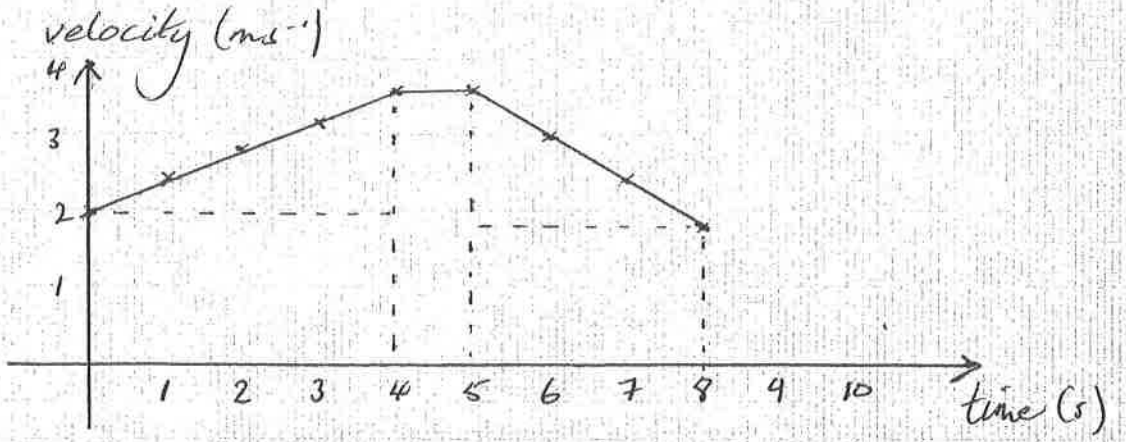
distance = area under graph

$= (2.4 \times 5) + (\frac{1}{2} \times 5 \times 4)$

$= 12 + 10$

$= 22m$

$$\bar{v} = \frac{s}{t} = \frac{22}{5} = 4.4 ms^{-1}$$

25. 

distance = area under graph

$= (4\times2) + (\tfrac{1}{2}\times4\times1.6) + (1\times3.6) + (3\times1.8) + (\tfrac{1}{2}\times1.8\times1)$

$= 8 + 3.2 + 3.6 + 5.4 + 2.7$

$= \underline{22.9\text{m}}$

$\bar{v} = \dfrac{s}{t}$

$= \dfrac{22.9}{8}$

$= \underline{2.86\text{ms}^{-1}}$

$a = \dfrac{v - u}{t}$

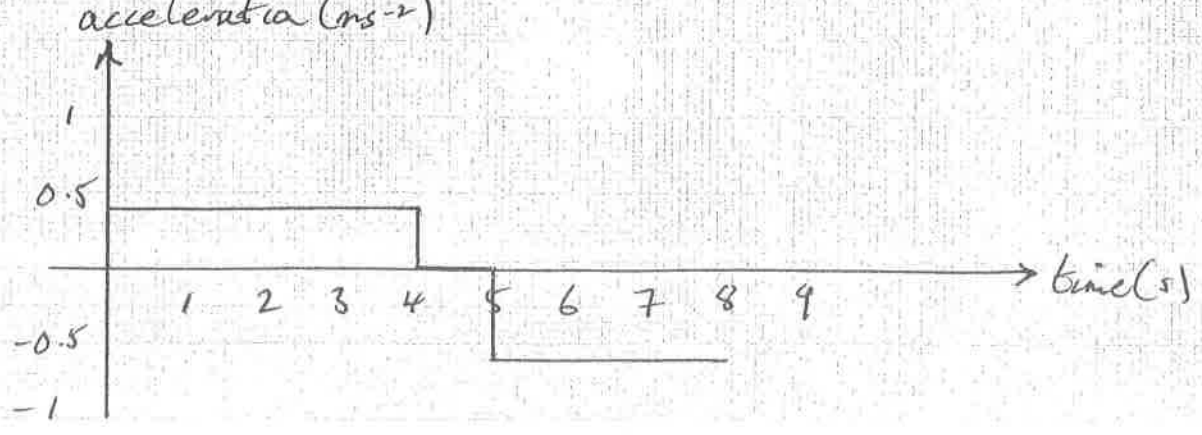
$= \dfrac{3.6 - 2}{4}$

$= 0.4\text{ms}^{-2}$

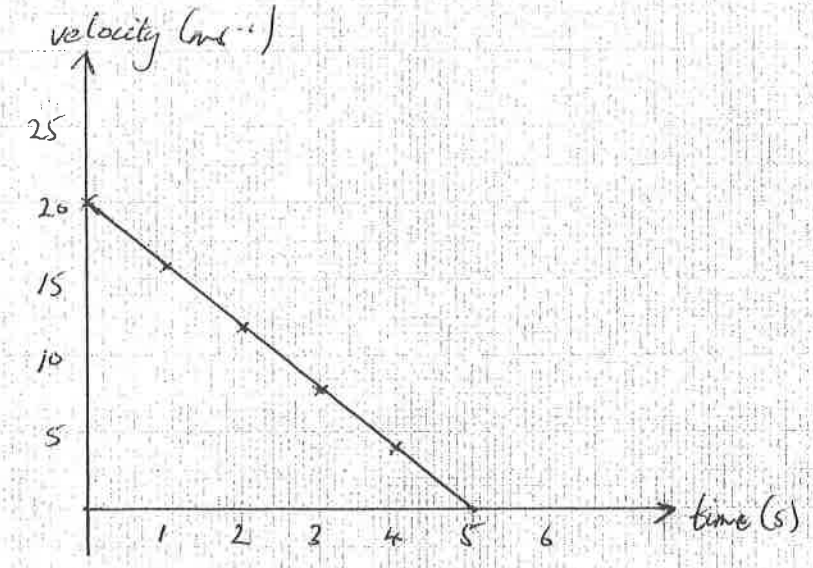
$a = \dfrac{v - u}{t}$

$= \dfrac{1.8 - 3.6}{3}$

$= -0.6\text{ms}^{-2}$



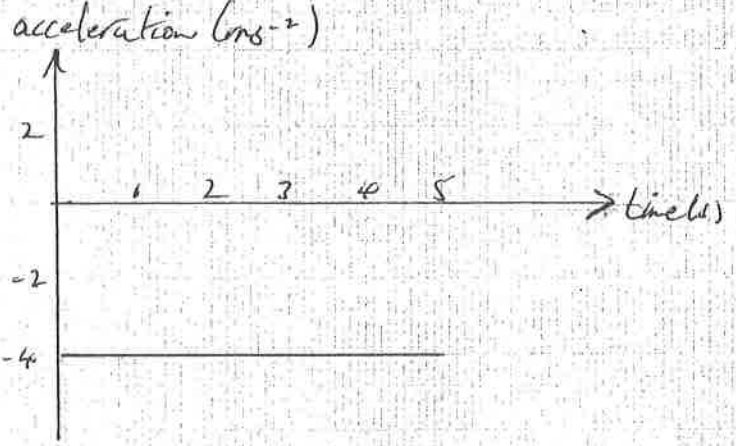
3. a.

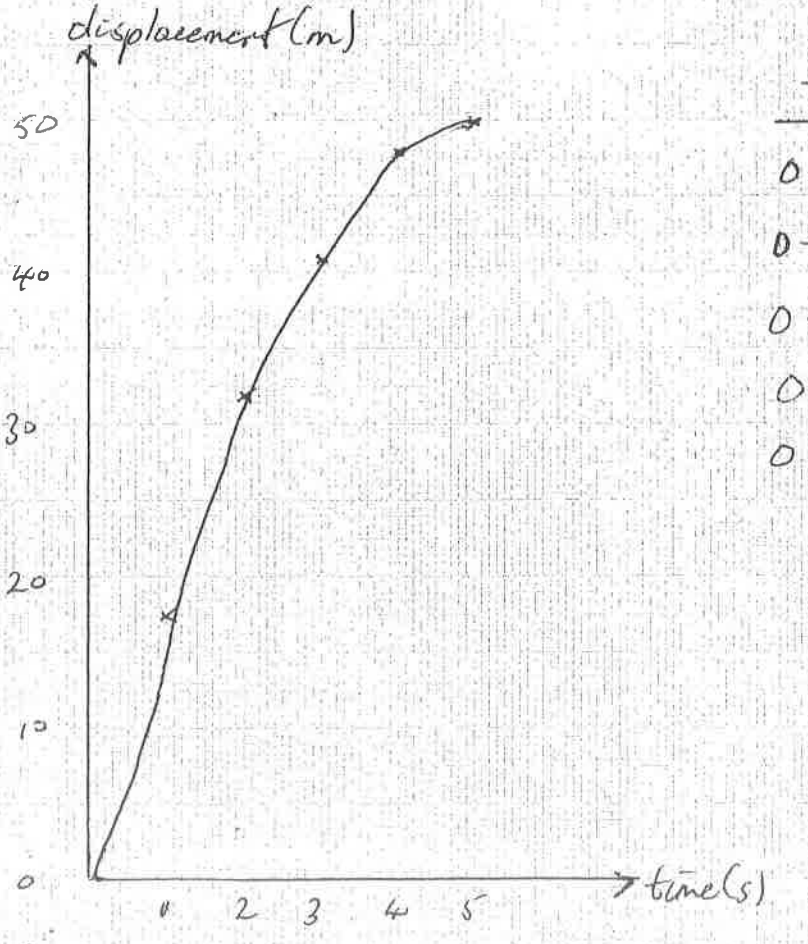


$$a = \frac{v - u}{t}$$

$$= \frac{0 - 20}{5}$$

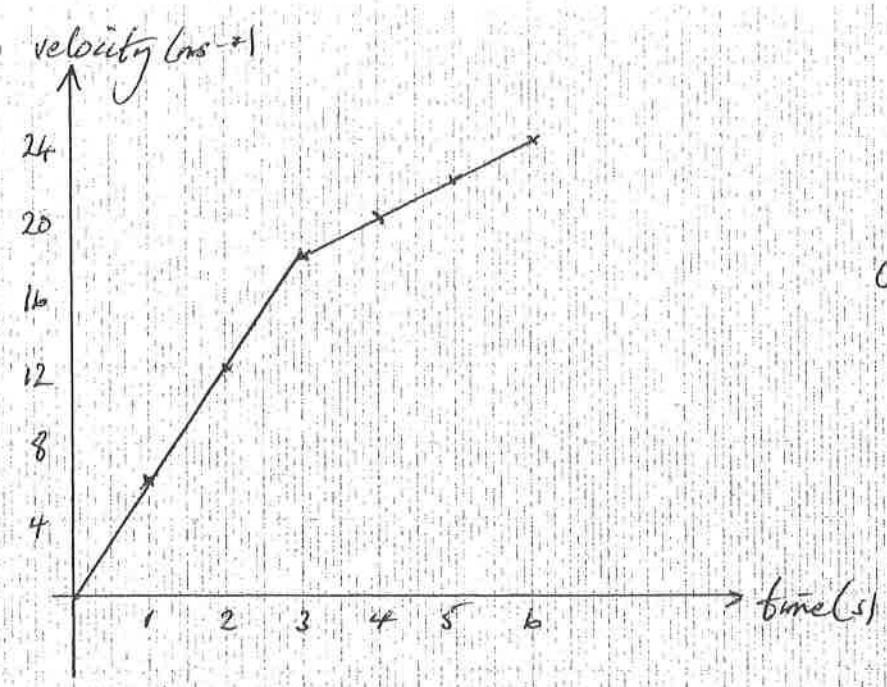
$$= -4 ms^{-2}$$





t (s)	s (m)
0 → 1	18
0 → 2	32
0 → 3	42
0 → 4	48
0 → 5	50

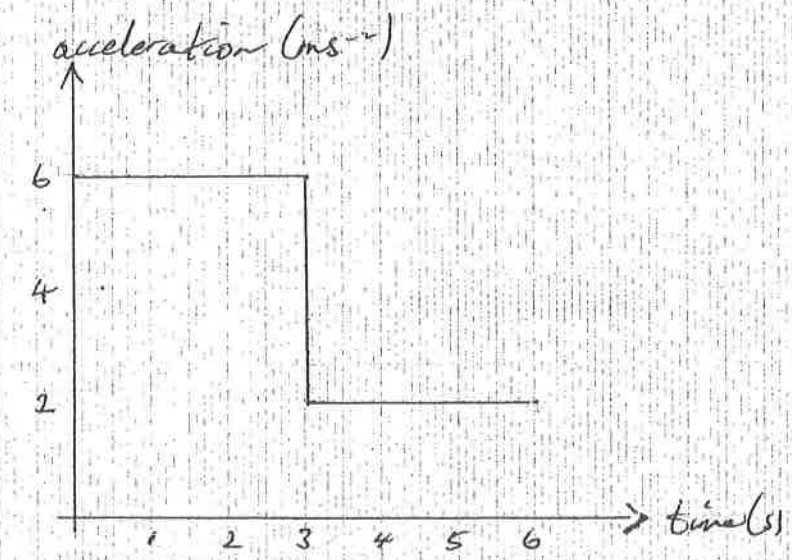
21 b.



$$a = \frac{v - u}{t}$$

$$= \frac{18 - 0}{3}$$

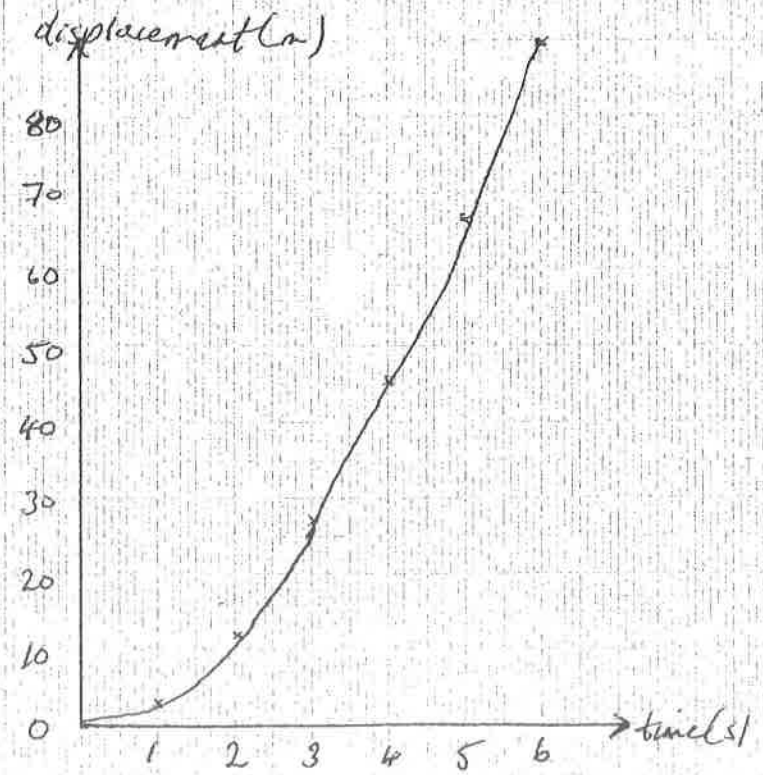
$$= 6 ms^{-2}$$



$$a = \frac{v - u}{t}$$

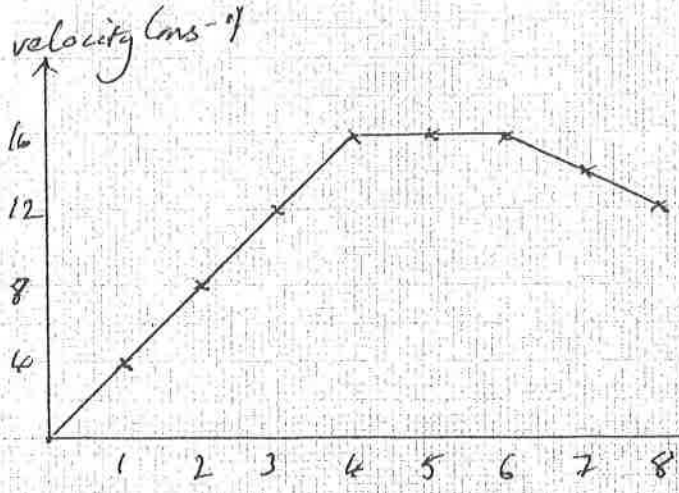
$$= \frac{24 - 18}{3}$$

$$= 2 ms^{-2}$$



t(s)	s(m)
1	3
2	12
3	27
4	46
5	67
6	90

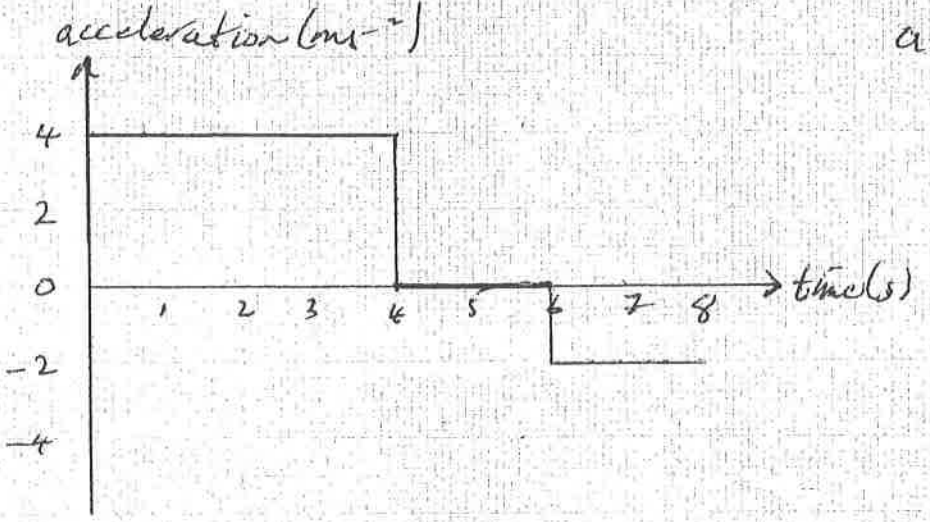
2 * c.



$$a = \frac{v - u}{t}$$

$$= \frac{16 - 0}{4}$$

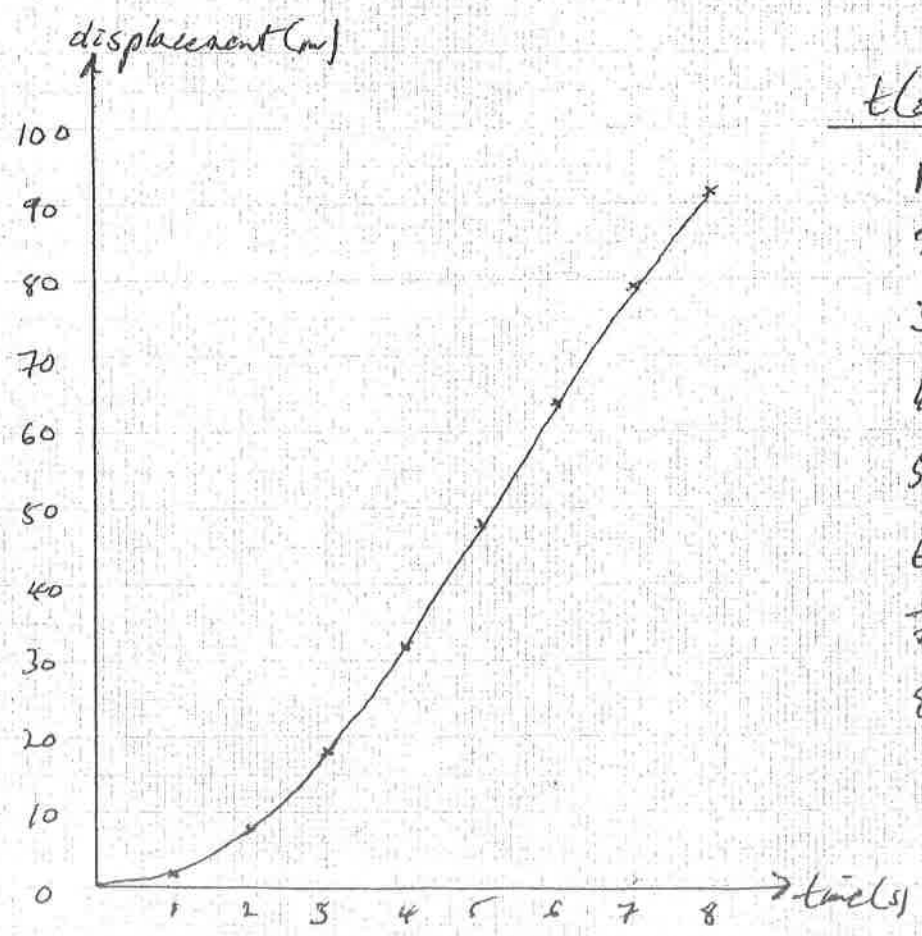
$$= 4 ms^{-2}$$



$$a = \frac{v - u}{t}$$

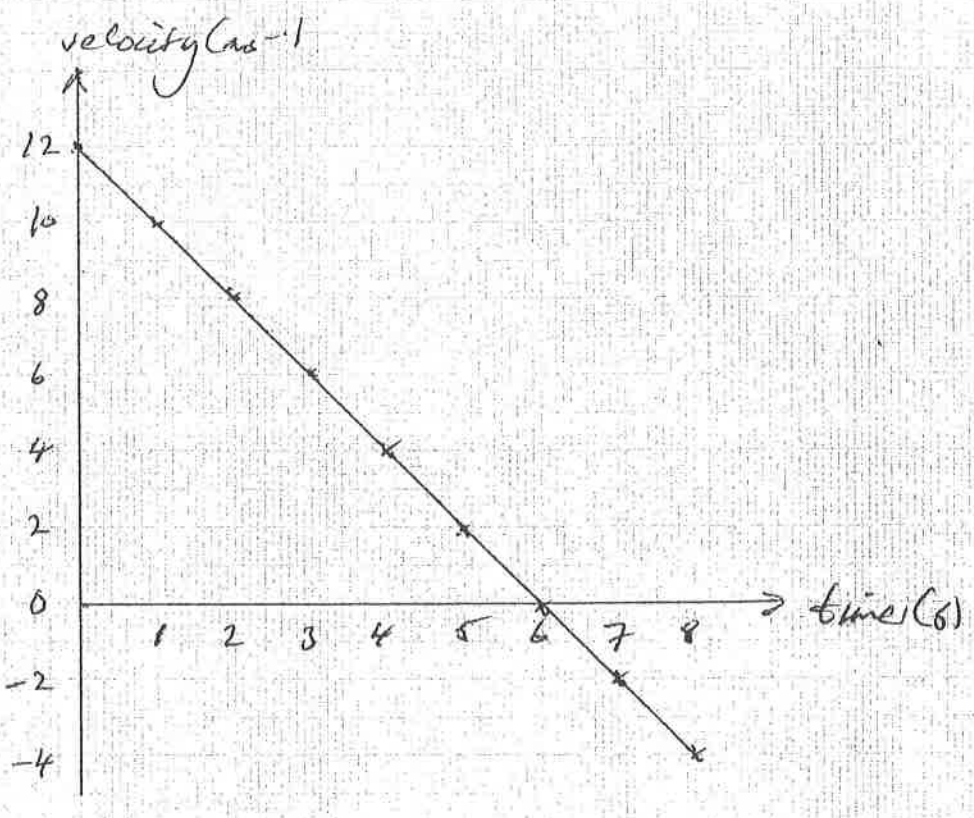
$$= \frac{12 - 16}{2}$$

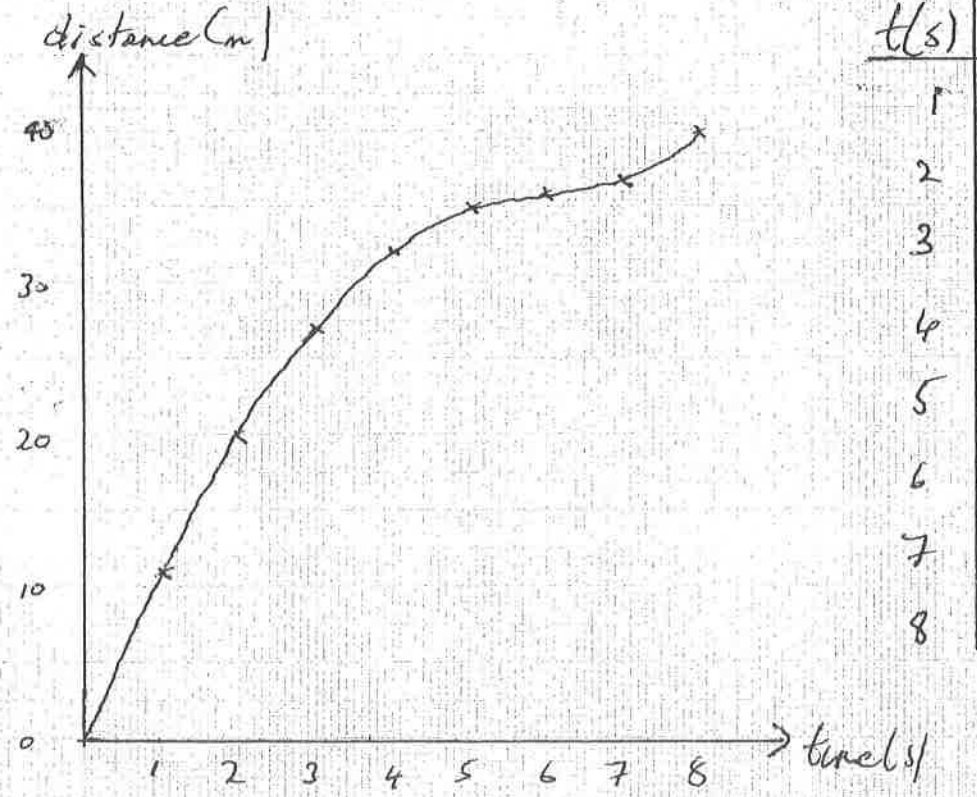
$$= -2 ms^{-2}$$



t(s)	s(m)
1	2
2	8
3	18
4	32
5	48
6	64
7	79
8	92

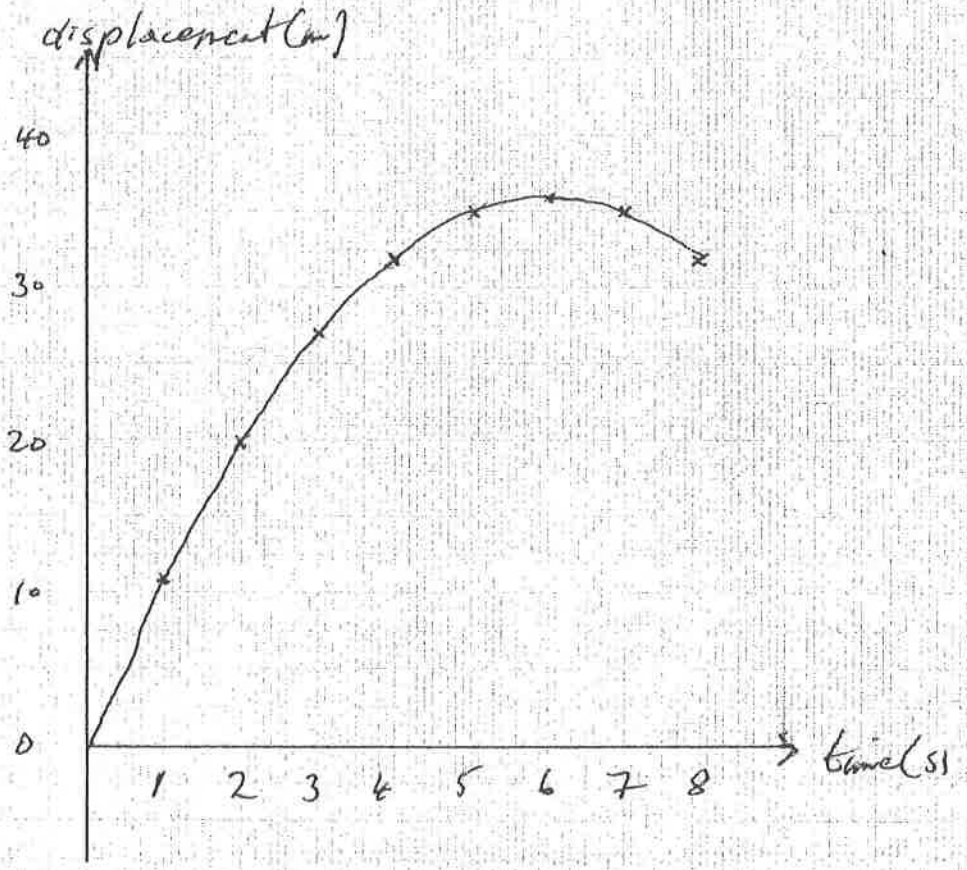
22.





t(s)	s(m)	d(m)
1	11	11
2	20	20
3	27	27
4	32	32
5	35	35
6	36	36
7	35	37
8	32	40

3.7 cont.



23. $v = u + at$

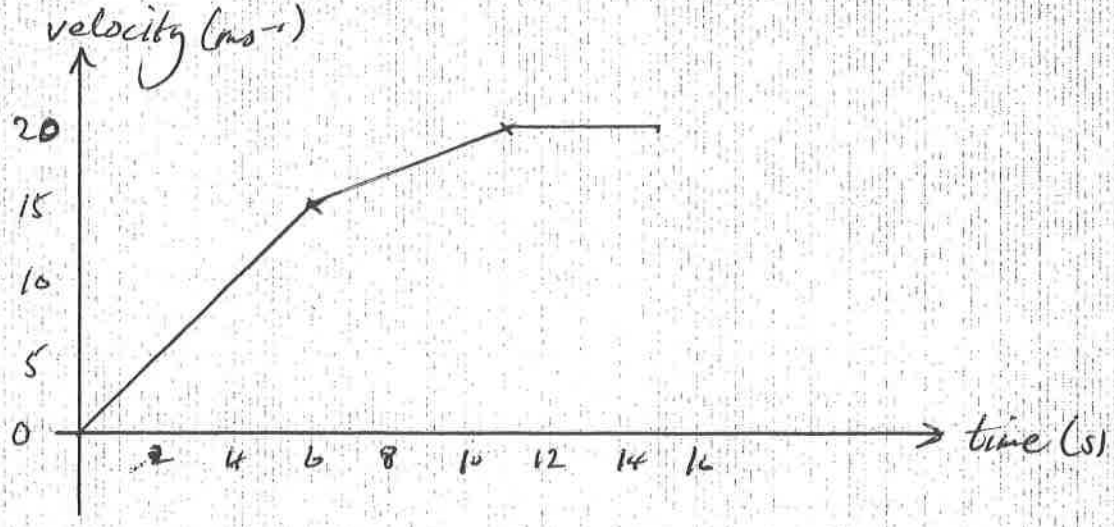
$= 0 + 2.5 \times 6$

$v = 15 ms^{-1}$

$v = u + at$

$= 15 + 1 \times 5$

$= 20 ms^{-1}$



distance = area under graph

$= (\frac{1}{2} \times 6 \times 15) + (5 \times 15) + (\frac{1}{2} \times 5 \times 5) + (4 \times 20)$

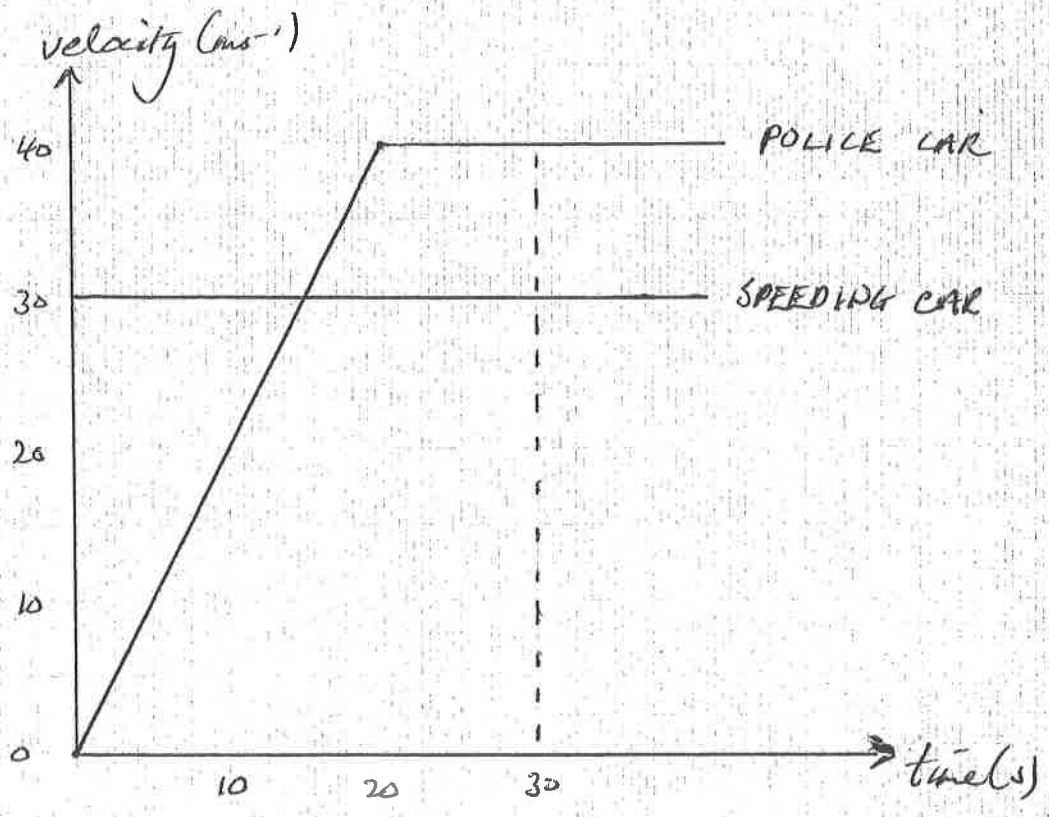
$= 45 + 75 + 12.5 + 80$

$= \underline{212.5 m}$

24. $v = u + at$

$= 0 + 2 \times 20$

$= 40 ms^{-1}$



$d_{SPEEDING} =$ area under graph

$= 30 \times 30$

$= 900m$

$d_{POLICE} =$ area under graph

$= (\frac{1}{2} \times 20 \times 40) + (10 \times 40)$

$= 400 + 400$

$= 800m$

The police car is 100m behind after 30s.

The police car is covering 10m extra every second.

∴ it will take 10 further seconds to catch up — 40s.

25. a) $v = \frac{s}{t}$

$= \frac{4}{1}$

$= \underline{4 ms^{-1} N}$

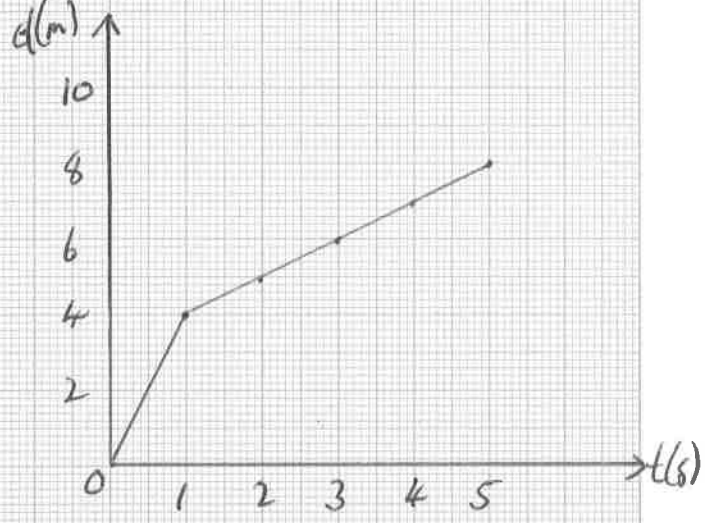
b) $v = \frac{s}{t}$

$= \frac{4}{4}$

$= \underline{1 ms^{-1} S}$

c)

t(s)	d(m)
1	4
2	5
3	6
4	7
5	8

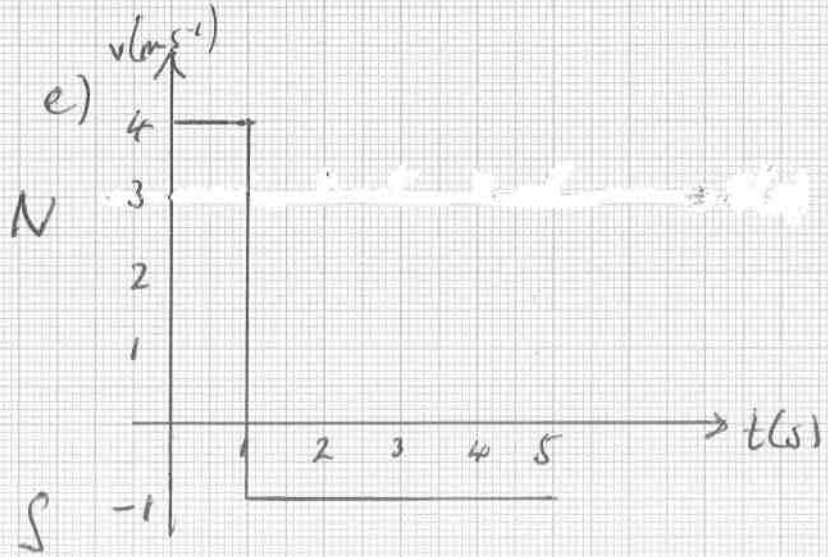


d) $v = \frac{d}{t}$

$= \frac{8}{5}$

$= \underline{1.6 ms^{-1}}$

e)



f) $s = 2m\ N$

$v = 4 ms^{-1} N$

g) $s = 2m\ N$

$v = 1 ms^{-1} S$

26. a) $v = \frac{s}{t}$

$= \frac{2}{2}$

$= \underline{1 ms^{-1} N}$

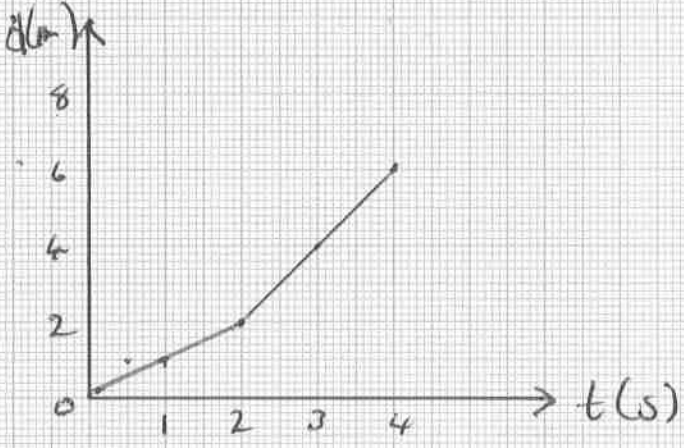
b) $v = \frac{s}{t}$

$= \frac{-4}{2}$

$= \underline{2 ms^{-1} S}$

c.)

t(s)	d(m)
1	1
2	2
3	4
4	6

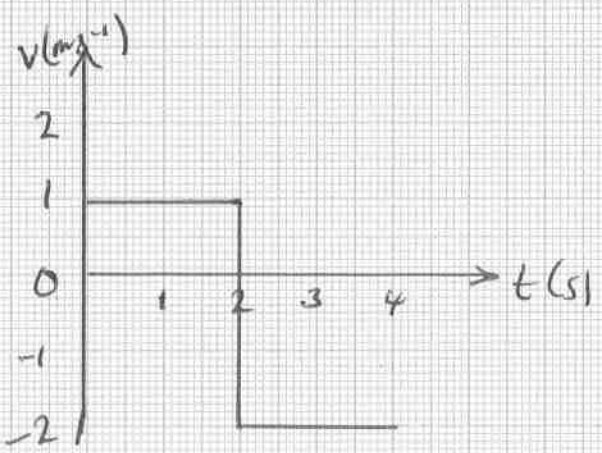


d) $v = \frac{d}{t}$

$= \frac{6}{4}$

$= \underline{1.5 ms^{-1}}$

e)



f) $0.5m N$, $1ms^{-1} N$

g) $0m$, $2ms^{-1} S$

27. (a) $a = \frac{v - u}{t}$

$= \frac{2 - 0}{1}$

$= \underline{2\ ms^{-2}\ N}$

(b) $a = \frac{v - u}{t}$

$= \underline{0 ms^{-2}}$

(c) s = area under graph

$= \frac{1}{2} \times 2 \times 4$

$= \underline{4m\ N}$

(d) s = area under graph

$= (\frac{1}{2} \times 2 \times 4) + (2 \times 4) + (4 \times 4) + (\frac{1}{2} \times 4 \times 2)$

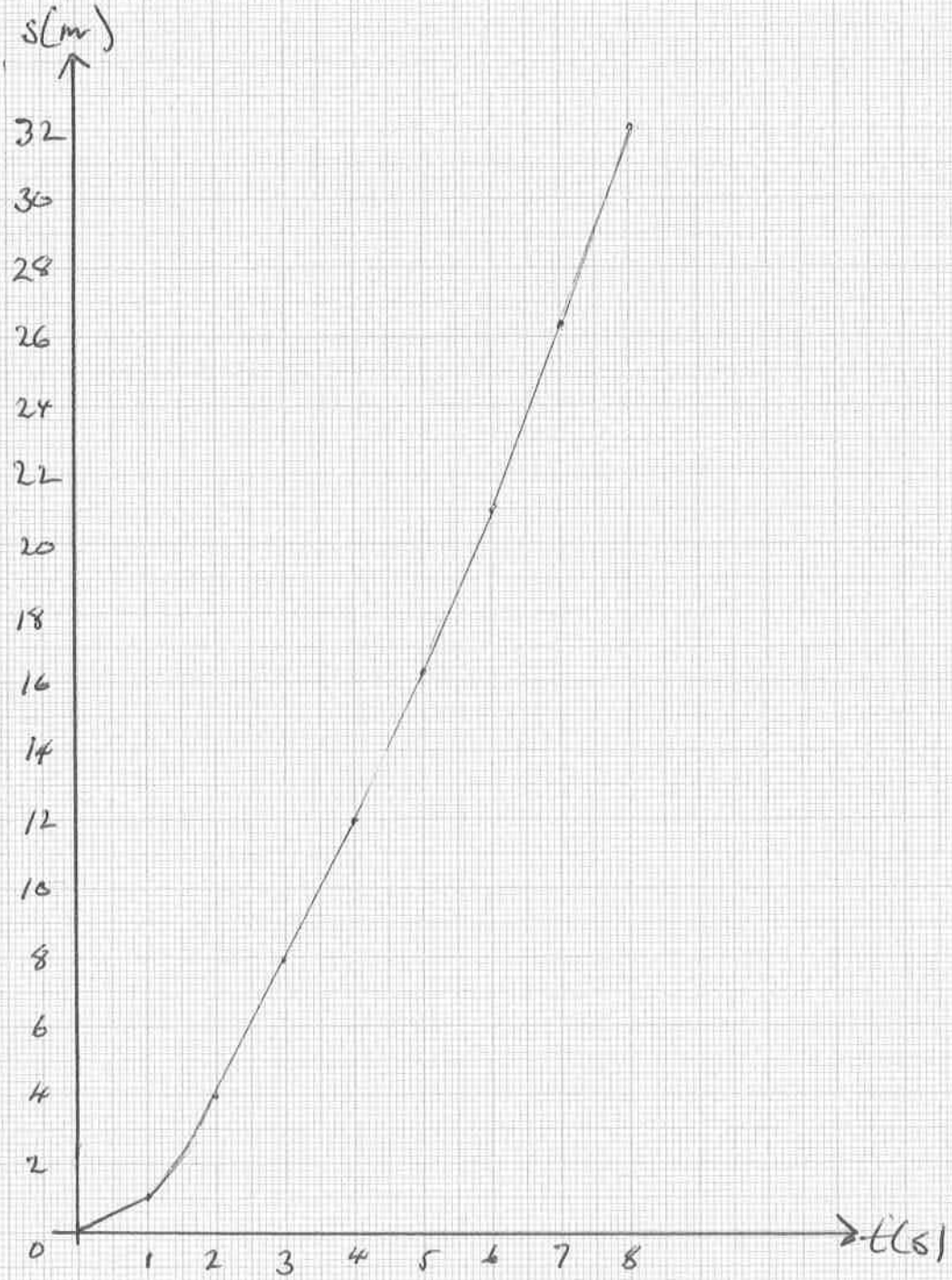
$= 4 + 8 + 16 + 4$

$= \underline{32m\ N}$

(e)

$t(s)$	$s(m)$
1	1
2	4
3	8
4	12
5	16.25
6	21
7	26.25
8	32

27 (e) cont.



28. (a) $a = \frac{v-u}{t}$

$= \frac{2-0}{2}$

$= \underline{1 ms^{-2} N}$

(b) $a = \frac{v-u}{t}$

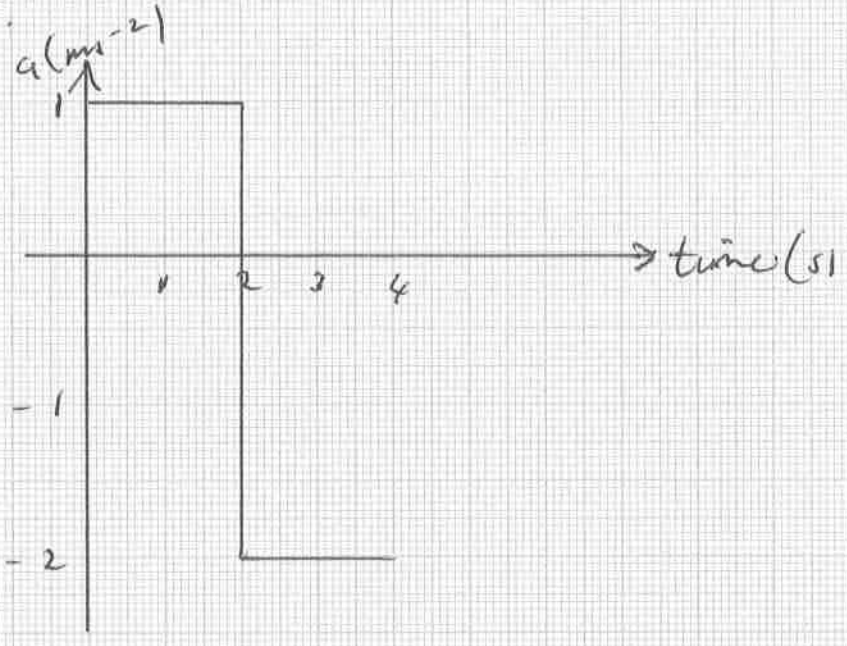
$= \frac{-2--2}{2}$

$= -2 ms^{-2}$

$= \underline{2 ms^{-2} S}$

28. cont.

(c)

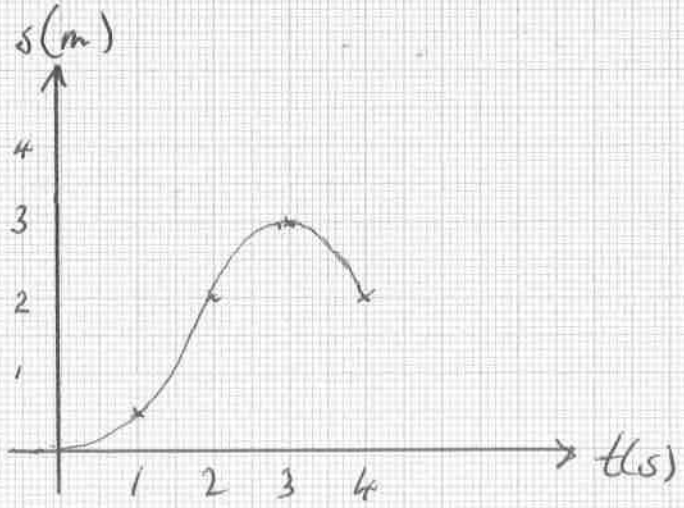


(d) 3m N, 0ms⁻¹

(e) 2m N, 2ms⁻¹ S

(f)

t(s)	s(m)
1	0.5m
2	2m
3	3m
4	2m



29. $v = u + at$

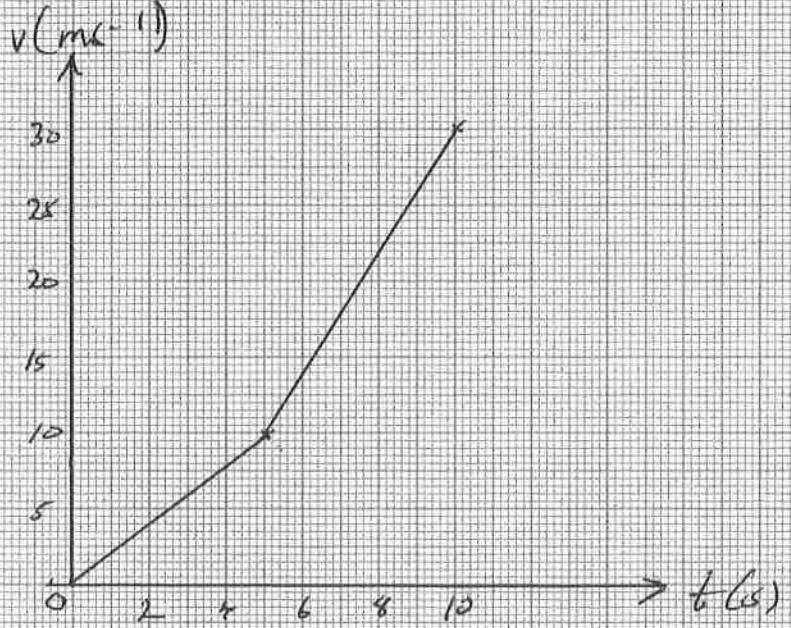
$= 0 + 2 \times 5$

$= 10 ms^{-1}$

$v = u + at$

$= 10 + 4 \times 8$

$= 30 ms^{-1}$



30 (a) Towards the ground.

(b) The speed is increasing

(c) The ball bounces

(d) The ball is travelling up.

(e) The speed is decreasing

(f) The ball is travelling down to the ground.

(g) The speed is increasing

(h) The ball strikes the ground.

(i) The ball is leaving the ground.

(j) The ball is at its maximum height after the first bounce

(k) The speed of the ball is less after the bounce

31. A

32. D

33. $v = u + at$

$25 = u + 0.8 \times 15$

$25 = u + 12$

$u = 13 ms^{-1}$

34. $v = u + at$

$= 240 + 8 \times 40$

$= 240 + 320$

$v = 560 ms^{-1}$

35. $v = u + at$

$20 = 50 - 0.6t$

$0.6t = 50 - 20$

$t = 50s$

36. $a = \frac{v - u}{t}$

$= \frac{-18 - 12}{60}$

$a = -0.5 ms^{-2}$

37. $s = ut + \frac{1}{2}at^2$

$= 0 \times 6 + \frac{1}{2} \times 1.2 \times 36$

$= 0 + 21.6$

$s = 21.6m$

38. $s = ut + \frac{1}{2}at^2$

$= 20 \times 5 + \frac{1}{2} \times 4 \times 2$

$= 100 + 5$

$s = 105m$

39. $s = ut + \frac{1}{2}at^2$

$= 25 \times 20 + \frac{1}{2} \times -0.25 \times 400$

$= 500 - 50$

$s = 450m$

40. $s = ut + \frac{1}{2}at^2$

$320 = 0 \times 16 + \frac{1}{2} \times a \times 256$

$320 = 0 + 128a$

$a = 2.5 ms^{-2}$

41. $s = ut + \frac{1}{2}at^2$

$0.8 = 0 \times 0.05 + \frac{1}{2} \times a \times (0.05)^2$

$0.8 = 0 + 1.25 \times 10^{-3} a$

$a = 640 ms^{-2}$

42. $s = ut + \frac{1}{2}at^2$

$112 = 12 \times 8 + \frac{1}{2} \times a \times 64$

$112 = 96 + 32a$

$16 = 32a$

$a = 0.5 ms^{-2}$

43. $s = ut + \frac{1}{2}at^2$

$10.8 = 0 \times t + \frac{1}{2} \times 2.4 \times t^2$

$10.8 = 1.2t^2$

$t^2 = 9$

$t = 3s$

44. $v^2 = u^2 + 2as$

$v^2 = 225 + 2 \times 0.5 \times 64$

$v^2 = 225 + 64$

$= 289$

$v = 17 ms^{-1}$

45. $v^2 = u^2 + 2as$

$13^2 = 5^2 + 2 \times a \times 36$

$169 = 25 + 72a$

$144 = 72a$

$a = 2 ms^{-2}$

46 $v^2 = u^2 + 2as$

$20^2 = 32^2 + 2 \times -2.4s$

$400 = 1024 - 4.8s$

$-624 = -4.8s$

$s = 130m$

47. $a = \frac{v - u}{t}$

$= \frac{100 - 40}{6}$

$a = 10ms^{-2}$

$s = ut + \frac{1}{2}at^2$

$= 40 \times 6 + \frac{1}{2} \times 10 \times 36$

$= 240 + 180$

$s = 420m$