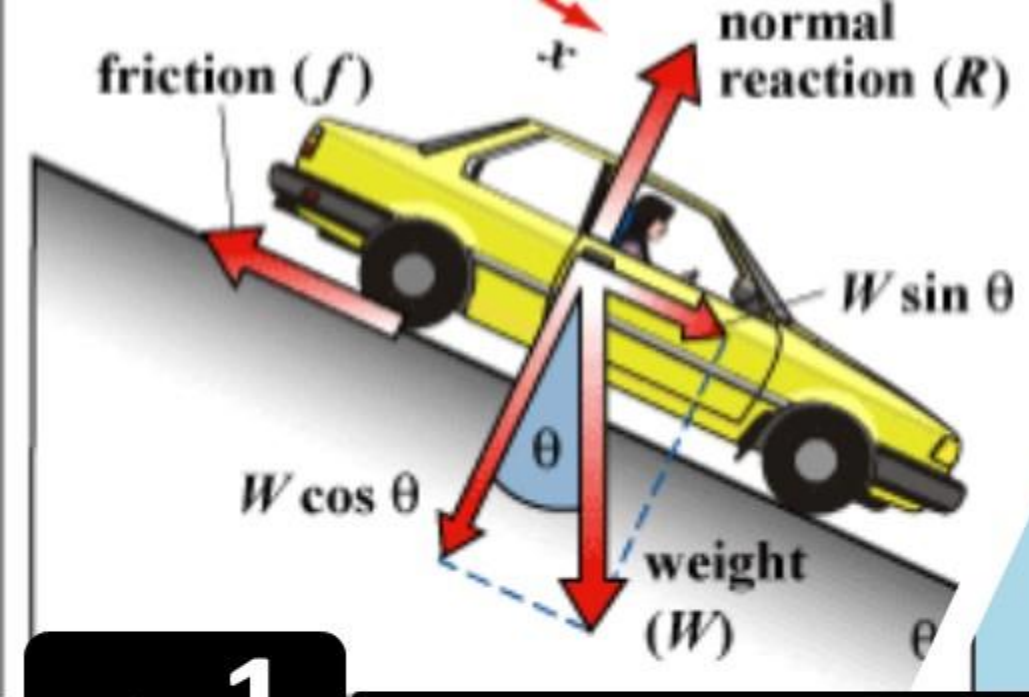
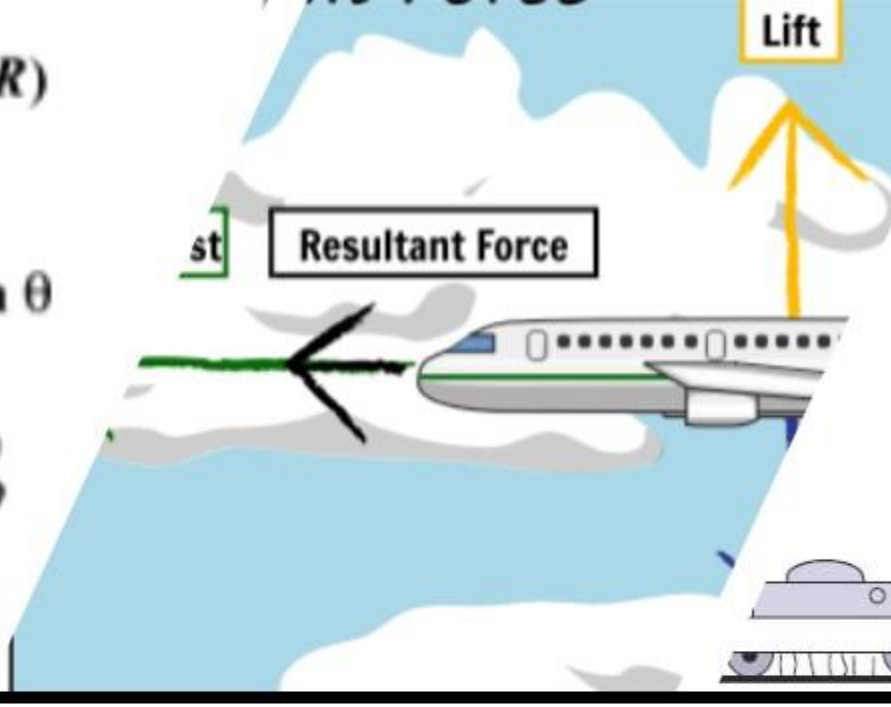
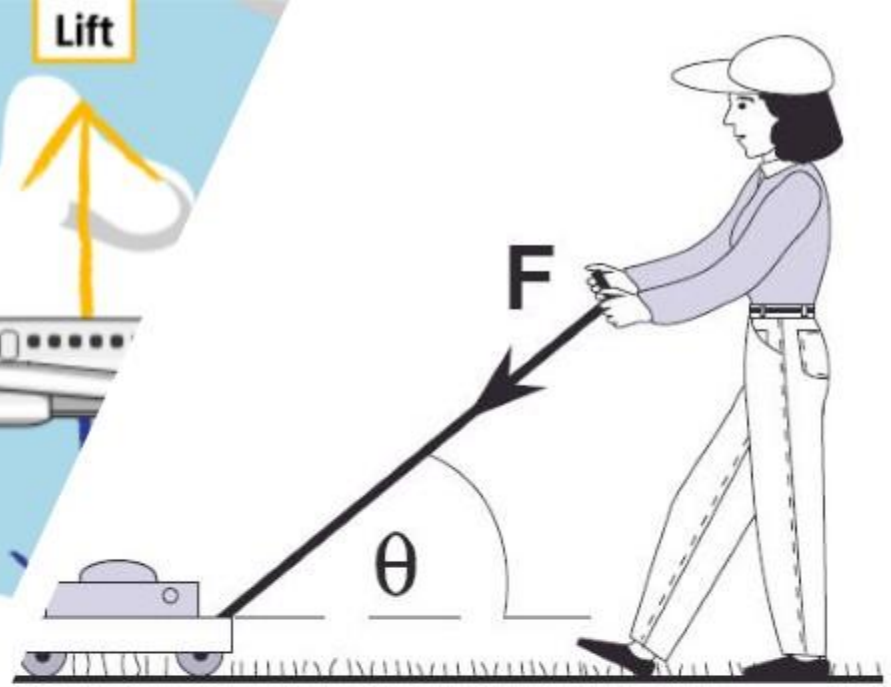
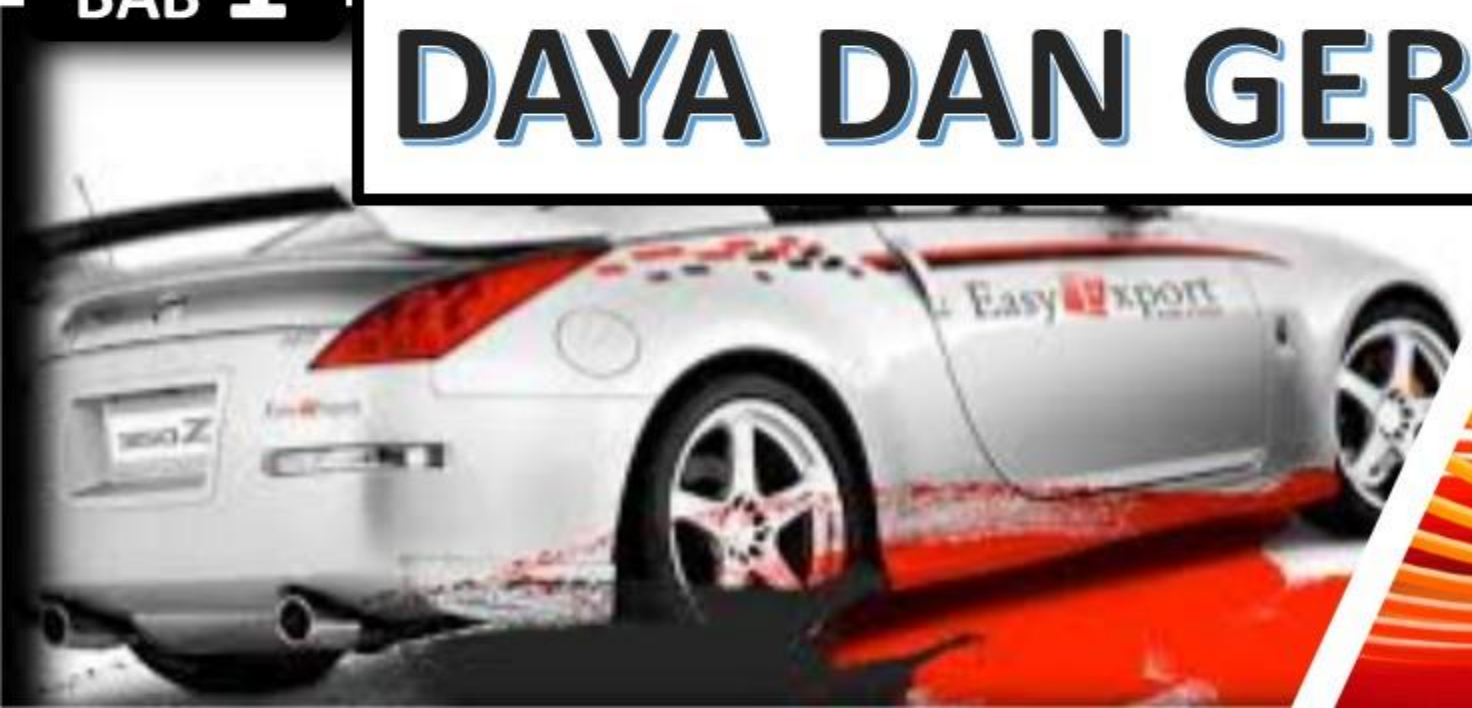






BAB 1

DAYA DAN GERAKAN II



1. DAYA & GERAKAN II

1. FORCE & MOTION II

1.1 Daya Paduan

1.1 Resultant Force

A2015 A2003 A2021 A2006

1.2 Leraian Daya

1.2 Resolution of Forces

A2003 B2010

1.3 Keseimbangan Daya

1.3 Equilibrium of Forces

A2008 A2006 B2019 B2021

1.4 Kekenyalan

1.4 Elasticity

A2004 A2013 C2008

Section A - 2015

Question 2

Diagram 2 shows forces acting on a moving car. The mass of the car is 1000 kg.

Rajah 2 menunjukkan daya-daya yang bertindak pada sebuah kereta yang sedang bergerak. Jisim kereta adalah 1 000 kg.

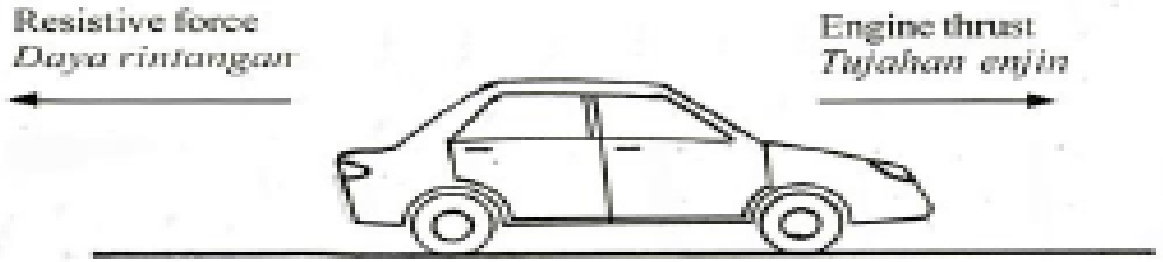


Diagram 2

(a) What is the meaning of balance force?

Apakah yang dimaksudkan dengan daya seimbang?

Resultant force is zero

Daya paduan adalah sifar

[1 mark]

(b) When the engine thrust is 5000 N, the car moves at constant speed.

Apabila tujahan enjin adalah 5 000 N, kereta itu bergerak dengan kelajuan seragam.

(i) State the net force acting on the car.

Nyatakan daya paduan yang bertindak ke atas kereta itu.

Zero / sifar

[1 mark]

(ii) What is the resistive force acting on the car?

Berapakah daya rintangan yang bertindak ke atas kereta itu?

5 000 N

[1 mark]

(c) **When the engine thrust increases to 9 000 N, the car accelerates. Calculate the acceleration of the car.**
Apabila tujahan enjin bertambah kepada 9 000 N, kereta itu memecut. Hitung pecutan kereta tersebut.

[2 marks]

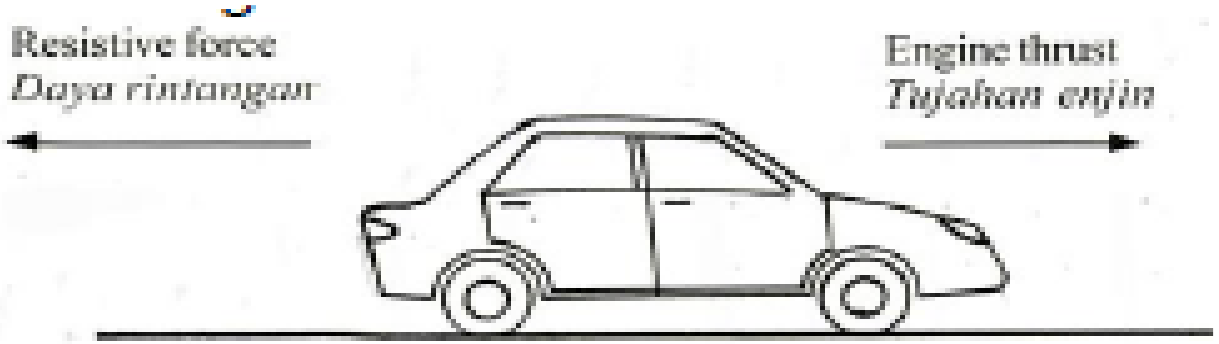


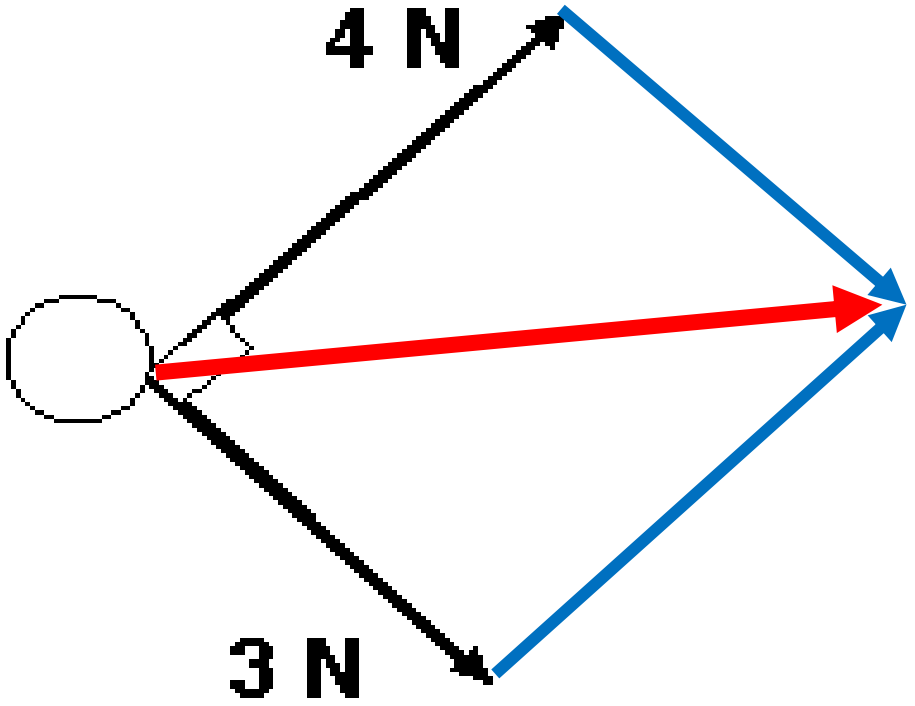
Diagram 2

$$F = ma$$

$$a = \frac{9000 - 5000}{1000}$$

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

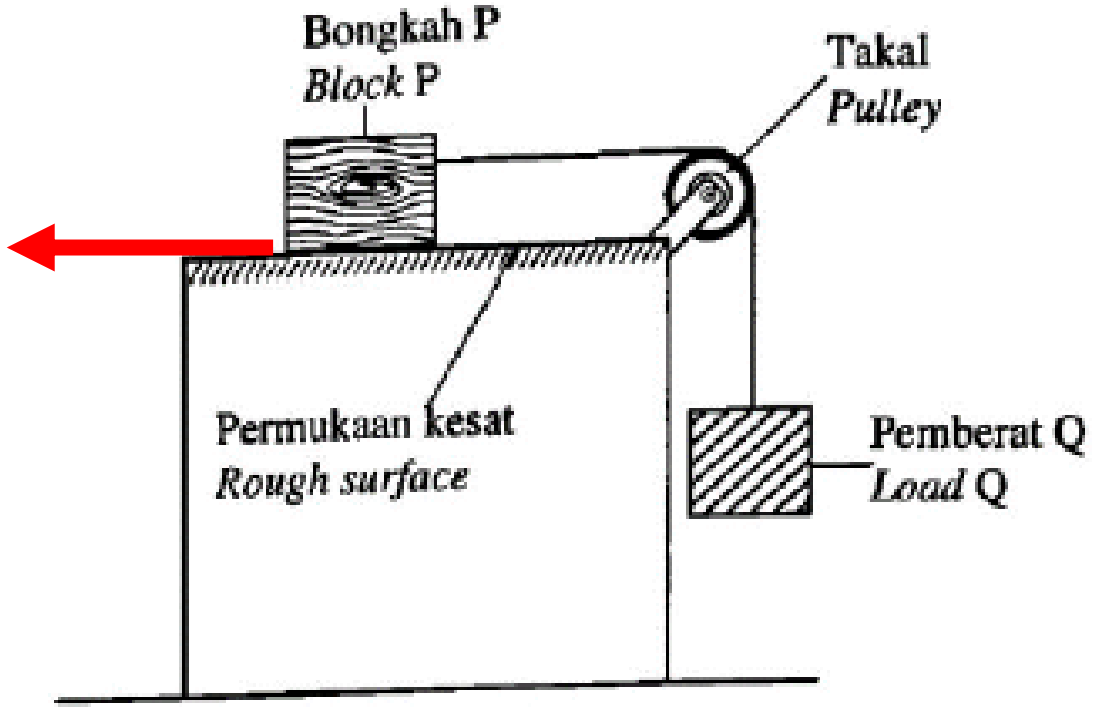
Section A - 2003



Section A - 2021

Soalan 5(2)

Rajah 5.1 menunjukkan sebuah bongkah P yang berada di atas permukaan kesat ditarik oleh pemberat Q melalui sebuah takal.
Daya paduan yang bertindak ke atas sistem itu adalah F.
Diagram 5.1 shows a block P on a rough surface is pulled by a loud Q through a pulley. Resultant force acts on the system is F.



Rajah 5.1
Diagram 5.1

(a) Apakah maksud daya paduan?
What is the meaning of resultant force?

Daya tunggal yang mewakili jumlah dua atau lebih daya
A single force that represent sum of two or more forces.

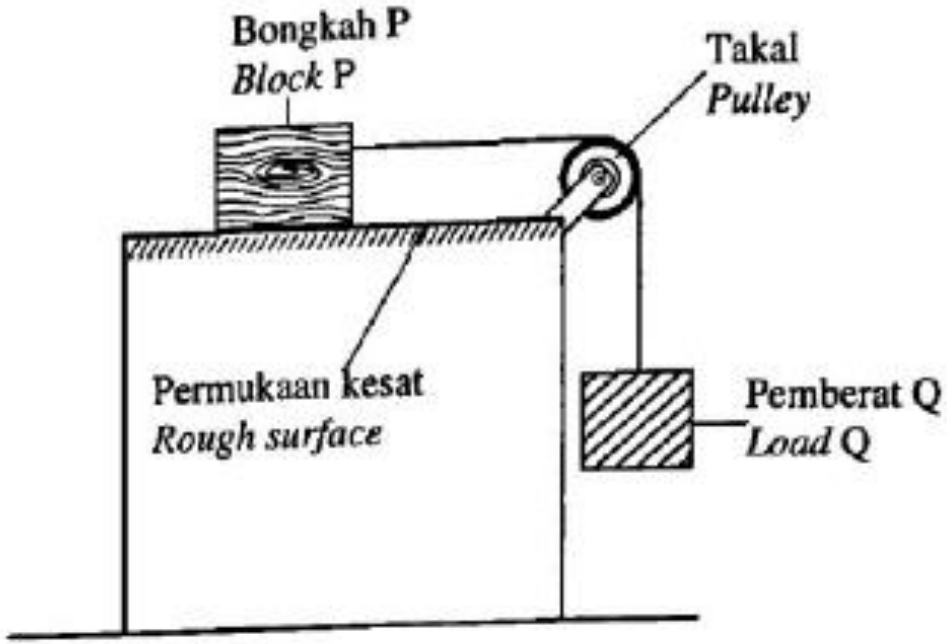
(b)(i) Pada Rajah 5.1, tanda dan label daya geseran antara bongkah P dengan permukaan kesat.
On Diagram 5.1, mark and label the friction force between block P and the rough surface.

[1 markah]

(ii) Nyatakan keadaan gerakan bongkah P dan pemberat Q jika daya paduan adalah sifar.
State the motion of block P and load Q if the resultant force is zero.

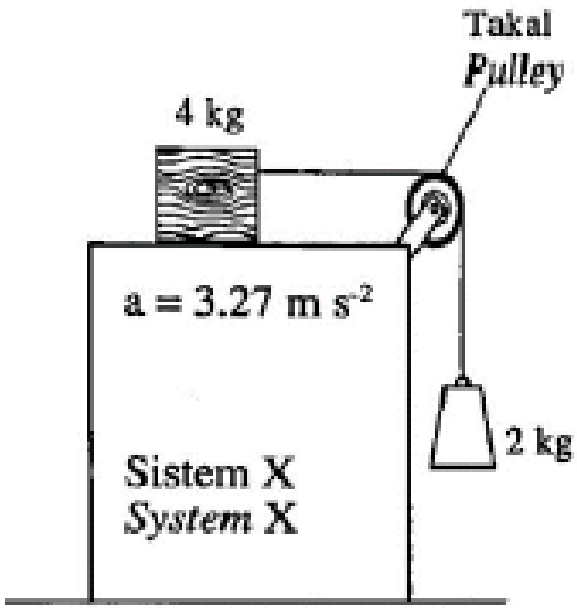
Objek pegun atau halaju seragam / pecutan sifar

Static / at rest or constant velocity / zero acceleration

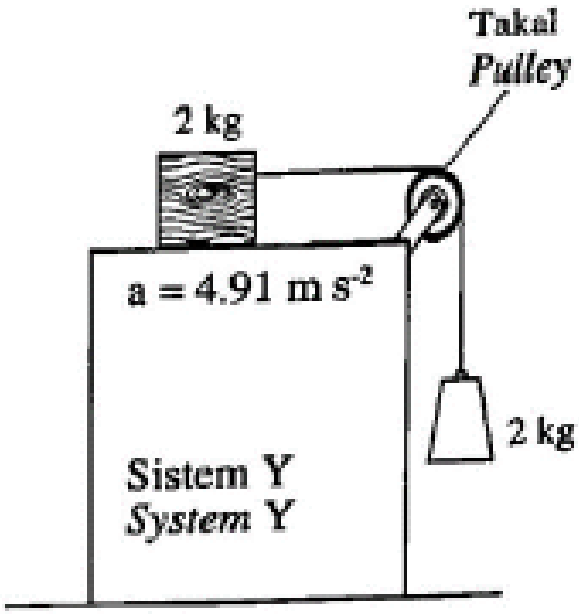


Rajah 5.1
Diagram 5.1

(c) Rajah 5.2 dan Rajah 5.3 menunjukkan sistem X dan sistem Y di atas permukaan licin dan ditarik oleh pemberat yang serupa.
Diagram 5.2 and Diagaram 5.3 shows system X and system Y on smooth surface pulled by identical load.



Rajah 5.2
Diagram 5.2



Rajah 5.3
Diagram 5.3

Berdasarkan Rajah 5.2 dan Rajah 5.3,
Based on Diagram 5.2 and Diagram 5.3,

(i) Bandingkan pecutan yang dihasilkan dalam sistem X dan sistem Y.
Compare the acceleration produced in system X and system Y.

5.3 > 5.2

[1 markah]

(ii) Bandingkan jumlah jisim dalam sistem X dan sistem Y
Compare the total mass in the system X and svstem Y.

5.3 < 5.2

. . . . . .

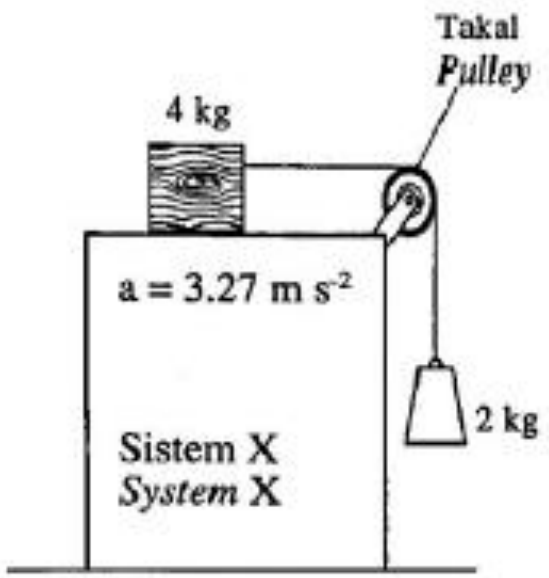
[1 markah]

(iii) Adakah terdapat perbezaan antara daya paduan yang bertindak dalam sistem X dan sistem Y.
Is there any difference between the resultant force acting on system X and

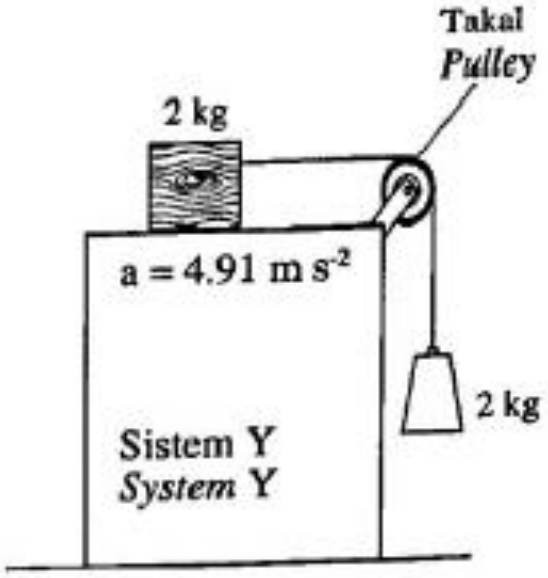
Ya / Yes

. . . . . .

[1 markah]



Rajah 5.2
Diagram 5.2



Rajah 5.3
Diagram 5.3

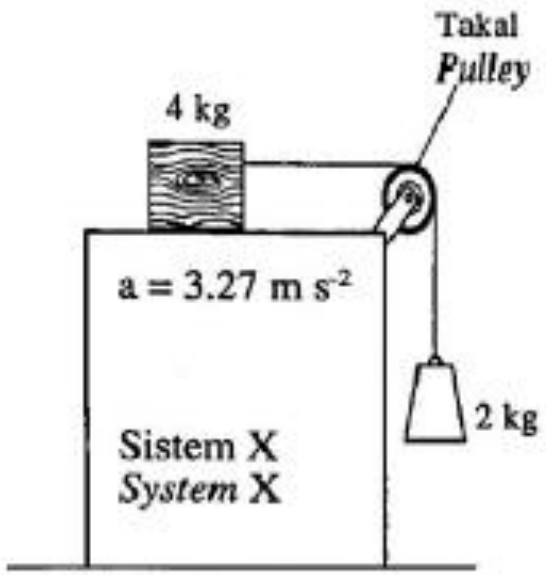
(d) Berdasarkan jawapan anda dalam (c)
Based on your answer in (c)

(i) Berikan satu kesimpulan yang melibatkan daya, jisim dan pecutan.
Give one conclusion involving force, mass and acceleration.

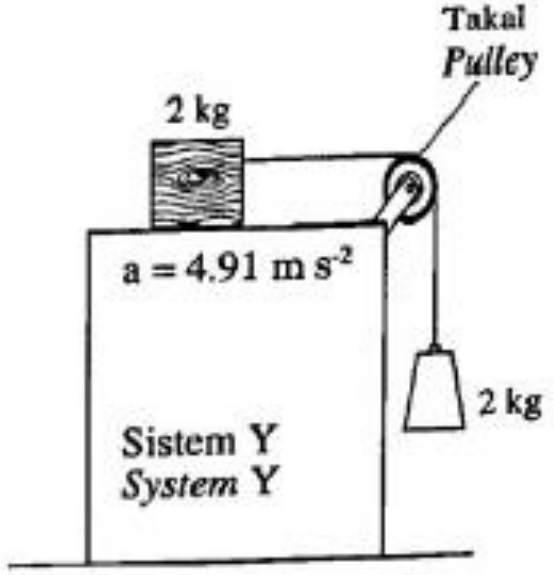
Jisim besar, pecutan rendah / Greater mass, smaller acceleration [1 markah]

(ii) Namakan hukum fizik yang terlibat.
Name the physics law that involved.

Hukum Newton ke dua / Newton's second law [1 markah]



Rajah 5.2
Diagram 5.2



Rajah 5.3
Diagram 5.3

Section A - 2008

5. **Rajah 5.1 menunjukkan dua orang budak lelaki sedang menolak sebuah kotak yang besar. Selepas beberapa ketika, kotak itu masih berada di dalam keadaan pegun.**
Diagram 5.1 shows two boys pushing a large box. After some time, the box still remains stationary.

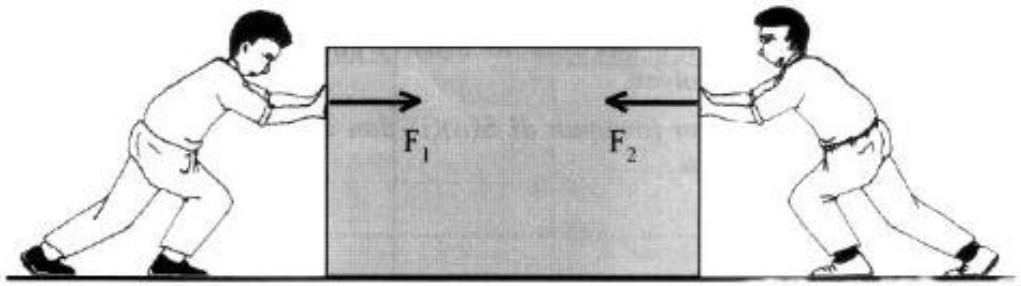


Diagram 5.1

Rajah 5.2 menunjukkan sebuah kapal terbang bergerak ke hadapan dengan halaju seragam pada suatu ketinggian yang tetap.
Diagram 5.2 shows an aircraft moving forward with a uniform velocity at a constant height.

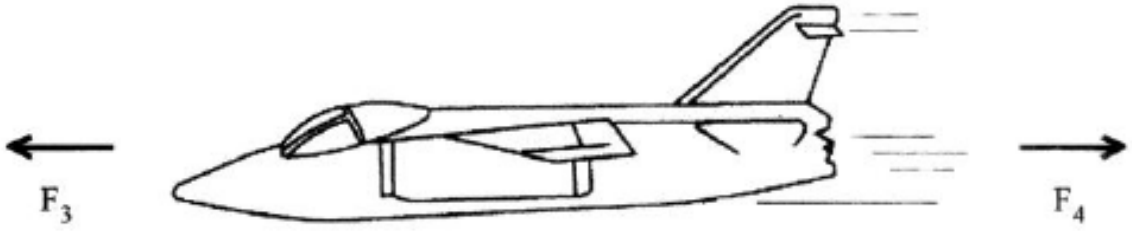


Diagram 5.2

(a) **Berdasarkan situasi dalam Rajah 5.1 dan Rajah 5.2,**
Based on the situation in Diagram 5.1 and situation in Diagram 5.2,

(i) **Nyatakan kesamaan tentang magnitud dan arah bagi daya-daya F_1 dan F_2, F_3 dan F_4.**
State similarities about the magnitudes and directions of the forces $F_1$and F_2 , F_3 and F_4 .

magnitudes : Equal / sama

arah */ directions :* Opposite /bertentangan

[2 marks]

(ii) **Berapakah daya bersih bagi kedua-dua situasi?**
What is the net force in both situations?

zero / sifar

[1 mark]

(iii) **Berdasarkan jawapan di 5(a)(i) dan 5(a)(ii), namakan konsep fizik yang terlibat.**
Based on the answers in 5(a)(i) and 5(a)(ii), name the physics concept involved. *[1 mark]*

Forces in equilibrim

keseimbangan daya

(b) (i) **Suatu kapal terbang lain mempunyai F_3, lebih besar daripada F_4. Terangkan pergerakan kapal terbang itu.**
Another aircraft has F_3 greater than F_4 Describe the motion of this aircraft.

Accelerates / pecutan

[1 mark]

(ii) **Terangkan jawapan di 5(b)(i).**
Explain the answer in 5(b)(i).

F = ma there is resultant force

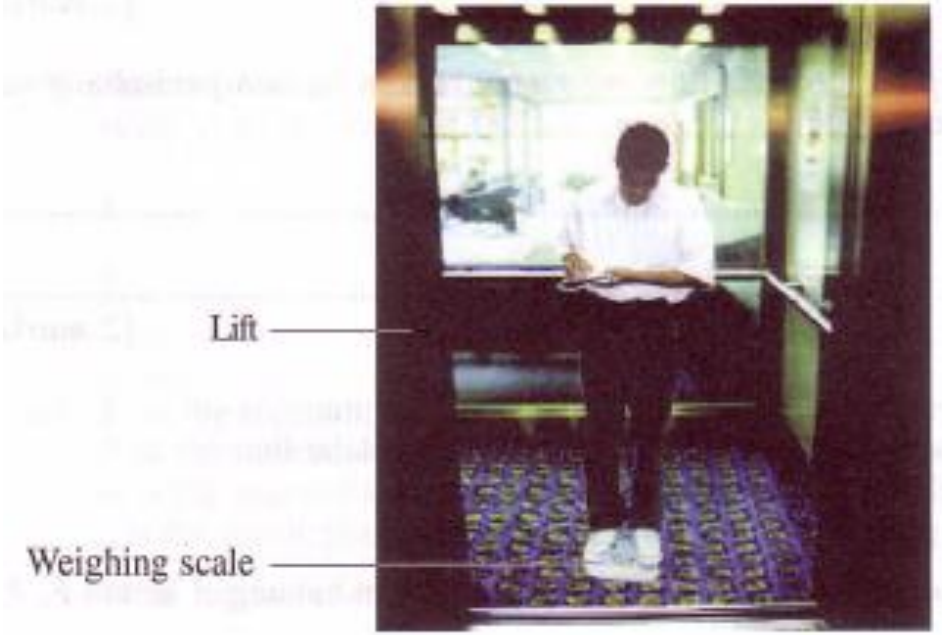
F = ma, terdapat daya paduan

[2 marks]

Section A - 2006

Question 6

A student studies the effect of the movement of a lift on the readings of a weighing scale. The mass of the student is 50 kg. In this study, the student stands on a weighing scale in a lift as show in the following figure.
Seorang pelajar mengkaji kesan gerakan lif terhadap bacaan suatu penimbang. Jisim pelajar itu ialah 50 kg. Dalam kajian ini, pelajar itu berdiri di atas penimbang di dalam lif seperti dtunjukkan dalam rajah.



He records the readings of the weighing scale when the lift is at rest, moving up with acceleration, moving up with uniform velocity, moving down with uniform velocity and moving down with deceleration. The readings of the weighing scale in the study are shown in the following table.
Pelajar itu mencatatkan bacaan penimbang semasa lif itu pegun, bergerak naik dengan pecutan, bergerak naik dengan halaju sekata, bergerak turun dengan halaju sekata dan bergerak dengan nyahpecutan. Bacaan dalam kajian ini ditunjukkan dalam Jadual 6.1.

Movement of the lift *Gerakan lif*	**Reading of the weighing scale/ kg** *Bacaan penimbang / kg*
At rest *Pegun*	**50**
Moving up with acceleration *Bergerak dengan pecutan*	**60**
Moving up with uniform velocity *Bergerak naik dengan halaju sekata*	**50**
Moving down with uniform velocity *Bergerak turun dengan halaju sekata*	**50**
Moving down with deceleration *Bergerak turun dengan nyahpecutan*	**60**

(a) **The mass of the student is 50 kg.**
What is the weight of the student in newtons?
Jisim pelajar itu ialah 50 kg. Berapakah berat pelajar itu dalam unit newton?

500 N

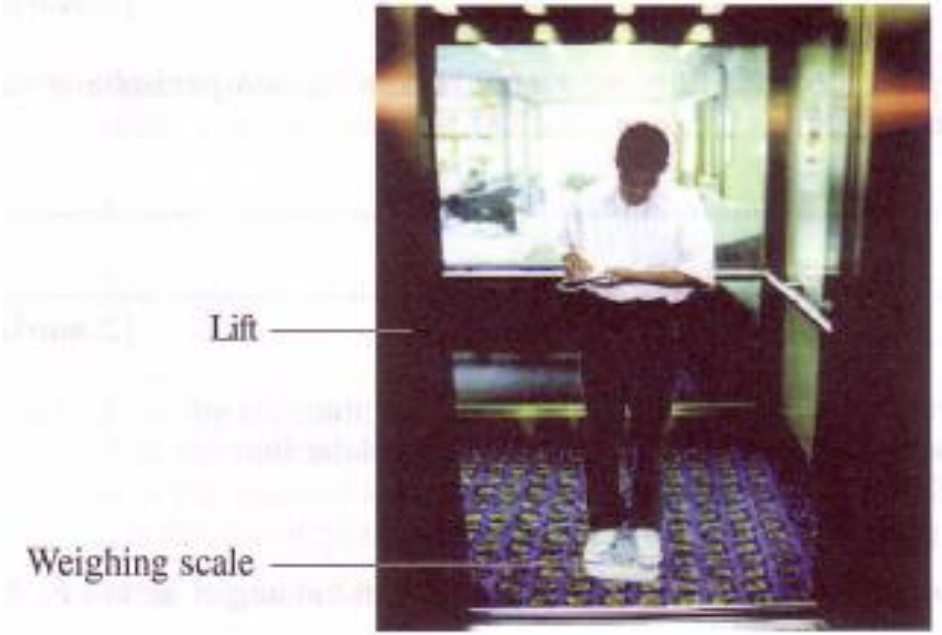
(b) **State two types of movement of the lift when the reading on the weighing scale is equal to the mass of the student.**
Nyatakan dua jenis gerakan lif yang menunjukkan bacaan penimbang sama dengan jisim pelajar itu.

1 Pegun / At rest

2 Bergerak ke atas dengan halaju seragam

Bergerak ke bawah dengan halaju seragam moving up with uniform velocity

Moving down with uniform velocity



Movement of the lift *Gerakan lif*	Reading of the weighing scale/ kg *Bacaan penimbang / kg*
At rest *Pegun*	50
Moving up with acceleration *Bergerak dengan pecutan*	60
Moving up with uniform velocity *Bergerak naik dengan halaju sekata*	50
Moving down with uniform velocity *Bergerak turun dengan halaju sekata*	50
Moving down with deceleration *Bergerak turun dengan nyahpecutan*	60

(c) **F is the resultant force that acts on the student. R is the normal reaction of the weighing scale on the student. m is the mass of the student. g is gravitational acceleration**
Write a general equation to show the relationship between F, R, m and g
F ialah daya paduan yang bertindak ke atas pelajar itu. R ialah tindak balas normal penimbang itu ke atas pelajar itu. m ialah jisim pelajar. g ialah pecutan graviti. Tulis satu persamaan umum untuk menunjukkan hubungan antara F, R, m dan g.

F = R - mg

(d) **When the lift moves up with acceleration , the normal reaction is greater than his weight. Explain why?**
Semasa lif itu bergerak naik dengan pecutan, tindak balas normal lebih besar daripada berat pelajar. Jelaskan mengapa?

Daya paduan ke atas, F = ma & R = mg + ma

the resultant force acts upwards, F = ma
normal reaction force = weight + resultant force, R = mg + ma

(e)(i) What is observed on the reading of the weighing scale when the lift moves down with an acceleration?
Apakah yang diperhatikan pada bacaan penimbang itu semasa lif itu bergerak turun dengan pecutan?

Berkurang / *Decreases*

(ii) **Give a reason for your answer in (e)(i).**
Berikan sebab bagi jawapan anda di (e)(i).

mg – R = ma

R = mg - ma

Movement of the lift *Gerakan lif*	**Reading of the weighing scale/ kg** *Bacaan penimbang / kg*
At rest *Pegun*	**50**
Moving up with acceleration *Bergerak dengan pecutan*	**60**
Moving up with uniform velocity *Bergerak naik dengan halaju sekata*	**50**
Moving down with uniform velocity *Bergerak turun dengan halaju sekata*	**50**
Moving down with deceleration *Bergerak turun dengan nyahpecutan*	**60**

Section A - 2006

Question 8

Diagram 8.1 and Diagram 8.2 show two identical mirrors which are hung on the wall using strings, of the same length.

Rajah 8.1 dan Rajah 8.2 menunjukkan dua cermin yang serupa yang digantung pada dindi g menggunakan tali yang sama panjang.

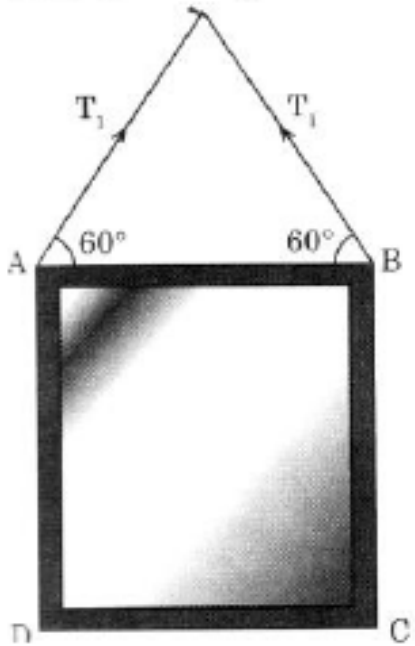


Diagram 8.1

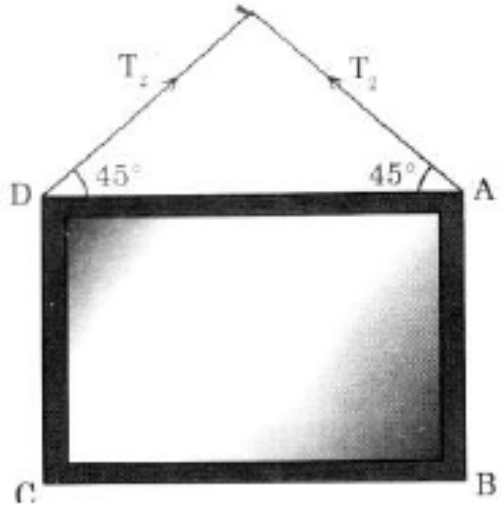


Diagram 8.2

The two mirrors are in equilibrium state. Each mirror has a mass of 2 kg. Each string can withstand a maximum force of 15 N.

Kedua-dua cermin berada dalam keadaan keseimbangan. Setiap cermin mempunyai jisim 2 kg. setosp talk noleh menampung daya maksimum 15 N.

(a) **What is meant by equilibrium state?**
Apakah maksud keadaan kesesimbangan?

.....

(b) **What is the weight of any one of the mirror?**
Berapakah berat salah satu cermin?

.....

(c) **In the space below, draw a diagram of a triangle of forces that acts on the mirrors in Diagram 8.1 and Diagram 8.2.**
Dalam ruang di bawah, lukis satu rajah segitiga daya yang bertindak ke atas cermin-cermkn dalam Rajah 8.1 dan Rajah 8.2.

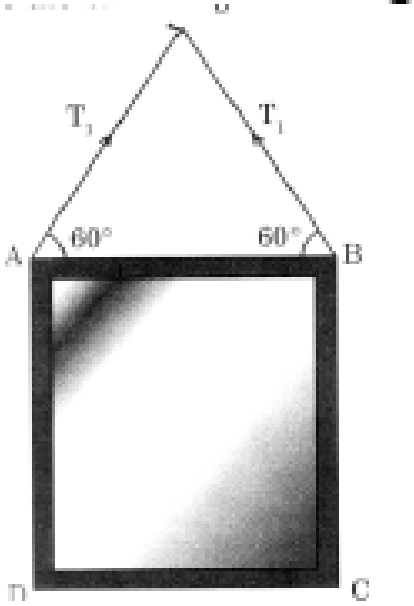


Diagram 8.1

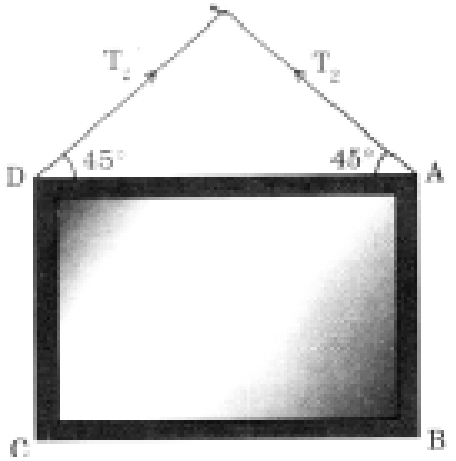


Diagram 8.2

a triangle of forces for Diagram 8.1

a triangle of forces for Diagram 8.2

[2 marks]

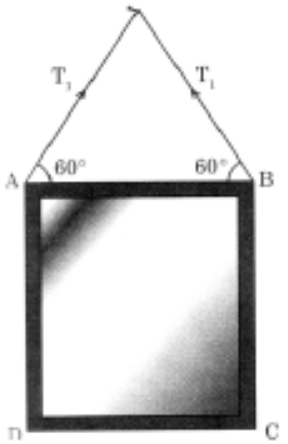


Diagram 8.1

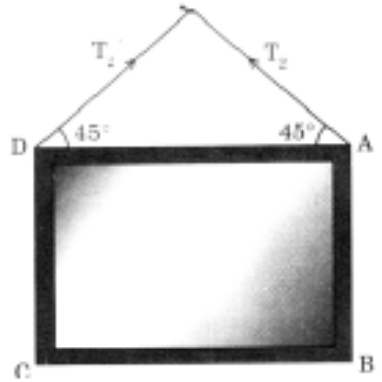
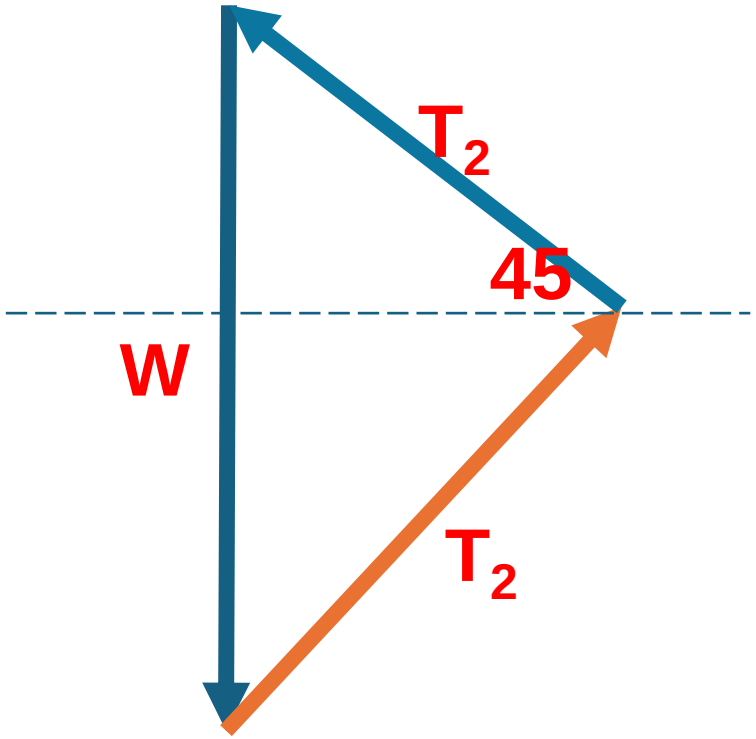
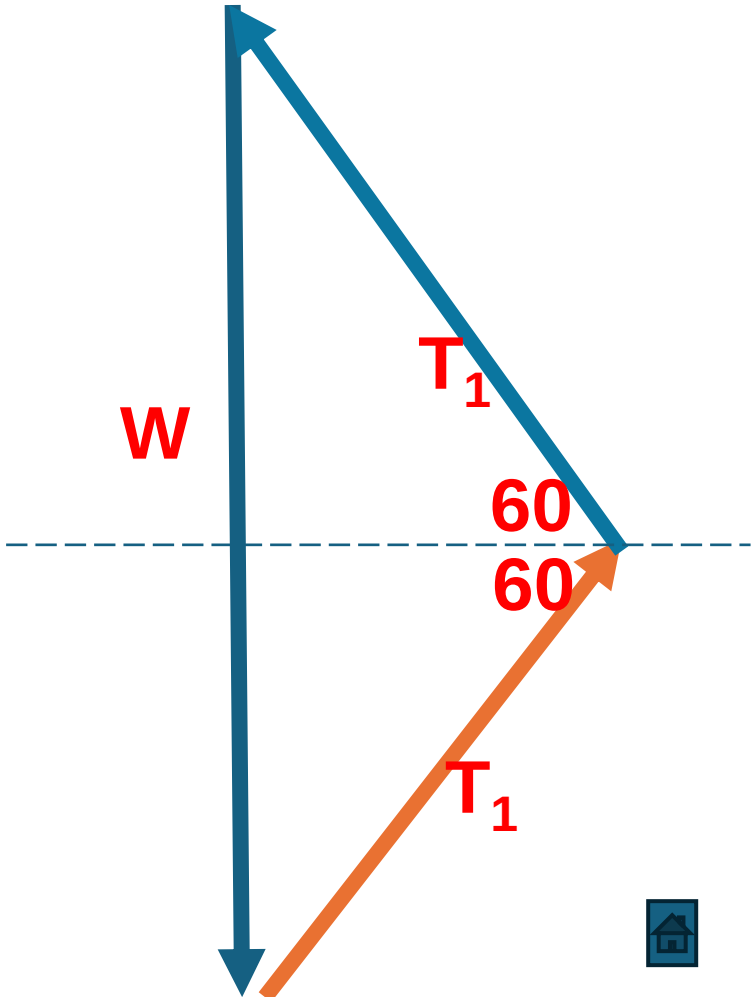
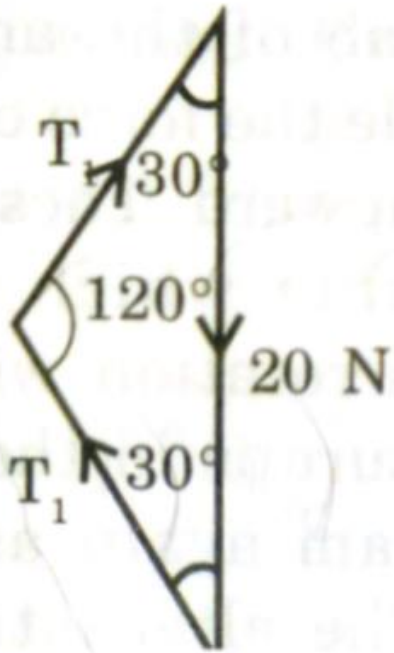
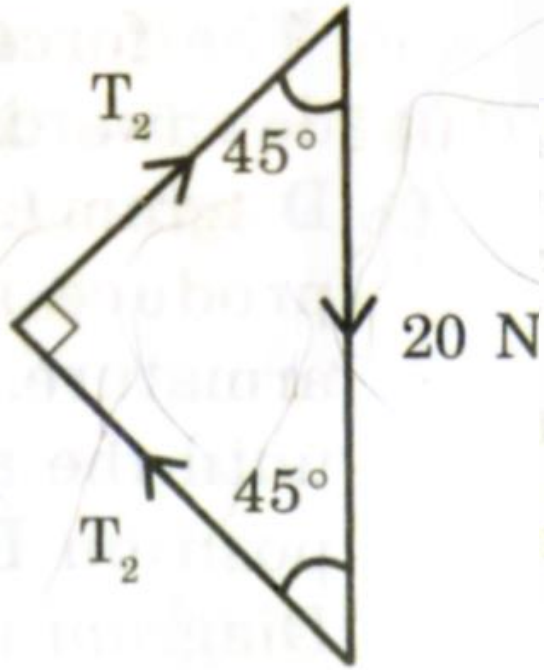


Diagram 8.2

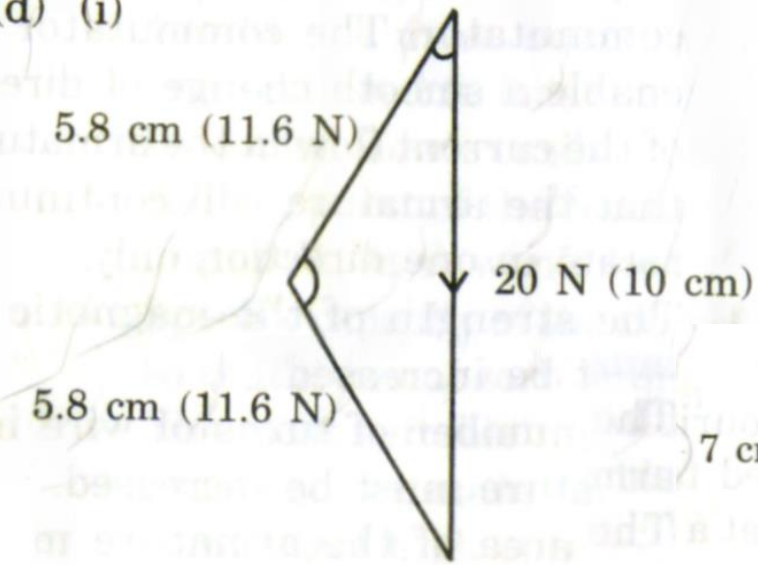




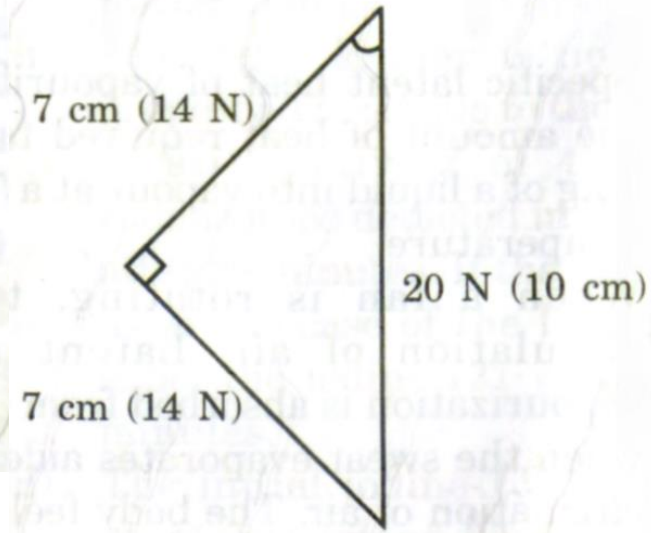




(d) (i)



By scale drawing:
$T_1 = 5.8$ cm
$T_1 = 11.60$ N



By measurement
$T_2 = 7.10$ cm
$T_2 = 14.20$ N

(d) (i) T_1 and T_2 are the tensions of the strings that act on the mirrors in Diagram 8.1 and Diagram 8.2 respectively.

T1 dan T2 merupakan tegangan kedua-dua tali yang bertindak ke atas cermin masing-masing dalam Rajah 8.1 dan Rajah 8.2

T_1 = 5.8 cm = 11.6 N

T_2 = 7.10 cm = 14.20 N

(ii) Based on your answer in 8(d)(i), which is the most suitable method to hang the mirror. Give one reasons for your answer.

Berdasarkan jawapan anda di 8(d)(i), manakah cara yang paling sesuai untuk menggantung cermin. Beri satu sebab untuk jawapan anda.

Diagram 8.1. The tension in the string is lower.

Rajah 8.1. Tegangan tali lebih kecil.

(e) If the string in Diagram 8.1 is cut, the mirror will fall down in 0.6 s. Calculate the final velocity of the mirror before it touches the surface of the floor.

Jika tali dalam Rajah 8.1 dipotong, cermin akan jatuh ke bawah dalam masa 0.6 s. Calculate halaju akhir cermin sebelun ia menyentuh permukaan lantai

[2 marks]

$v = u + gt$

$v = 0 + (10)(0.6)$

$= 6$ m/s

8. **Diagram (a) and Diagram (b) show two ways in which a gardener moves a wheelbarrow on a muddy road.** *Rajah (a) dan Rajah (b) menunjukkan dua cara bagaimana seorang pekebun menggerakkan kereta sorong di jalan yang berlumpur.*

Section A - 2003

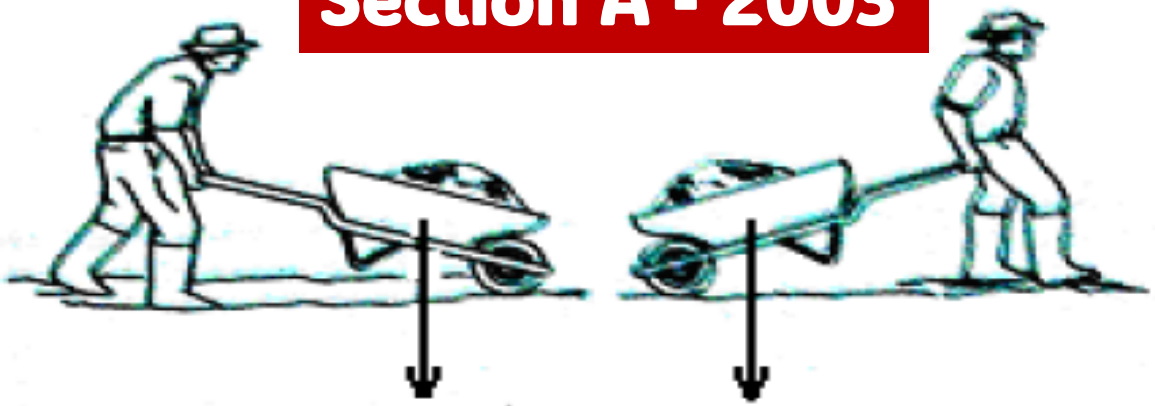


Diagram (a) **Diagram (b)**

(a) On Figure(a) and Figure(b), indicate and label:
Pada Rajah (a) dan Rajah (b), tunjuk dan labelkan:

(i) the direction of force F exerted by the gardener on the handle of each wheelbarrow to make it move.
arah daya F yang dikenakan oleh pekebun ke atas kereta sorong untuk menggerakkannya.

(ii) the direction of the vertical component F_y , of the force in (a)(i)
arah komponen daya menegak F_y di (a)(i).
[2 marks]

(b)(i) Based on the answers in (a)(i) and (a)(ii), which of the ways is more suitable on the muddy road?
berdasarkan jawapan di (a)(i) dan (a)(ii), cara manakah yang lebih sesuai untuk jalan berlumpur?

Rajah 13 / Diagram 13

...[1 mark]

(ii) explain the reason for your answer in (b)(i).
terangkan sebab bagi jawapan anda di (b)(i). **[2 marks]**

Komponen F_y ke atas, daya paduan ke bawah lebih kecil / W - F_y

Component F_y upward, so resultant force downward is smaller / W - F_y

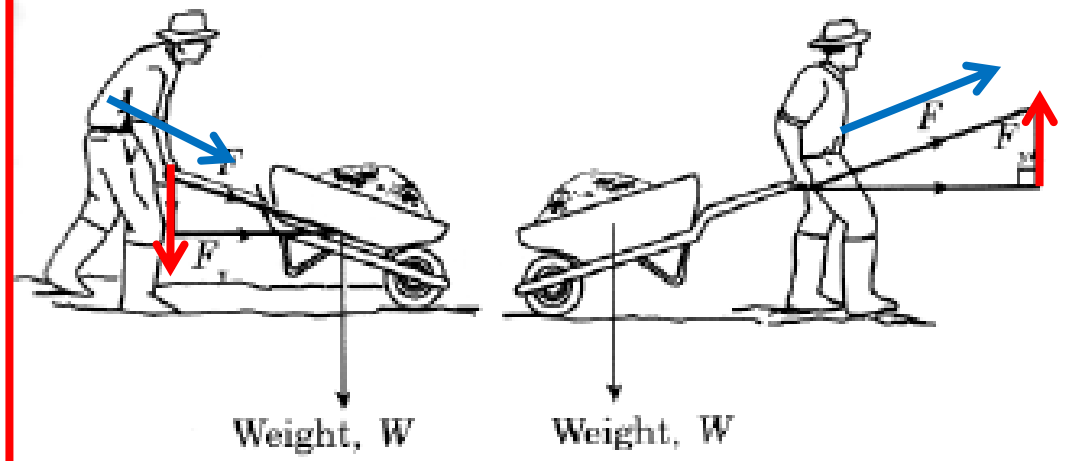


Figure 12 **Figure 13**

(ii) **Calculate the pressure exerted on the surface of the muddy road.**
Hitungkan tekanan yang dikenakan pada permukaan jalan yang berlumpur itu.

[2 marks]

$P = 500 / 2 \times 10^{-3}$
$= 2.5 \times 10^{5}$ Pa

(iii) **State one modification that could be made to the wheelbarrow to reduce the pressure exerted on the road. Explain your answer.**
Nyatakan satu pengubahsuaian yang boleh dilakukan pada kereta sorong itu untuk mengurangkan tekanan pada jalan itu. Jelaskan jawapan anda.

Tambahkan luas tayar / tambah bilangan tayar.
Tekanan berkadar songsang dengan luas

[2 marks]

Increases the area / increase number of tyres.
Pressure is inversely proportional to area

Section A - 2004

Question 3

Diagram 3.1 shows the arrangement of an apparatus in an experiment to determine the relationship between the extension e of a spring T with weight W. The relationship of e with W is shown in the graph in Diagram 3.2.

Rajah 3.1 menunjukkan susunan radas satu eksperimen untuk mengkaji hubungan antara pemanjangan e suatu spring T dengan berat W. Hubungan antara e dengan W ditunjukkan dalam graf pada Rajah 3.2.

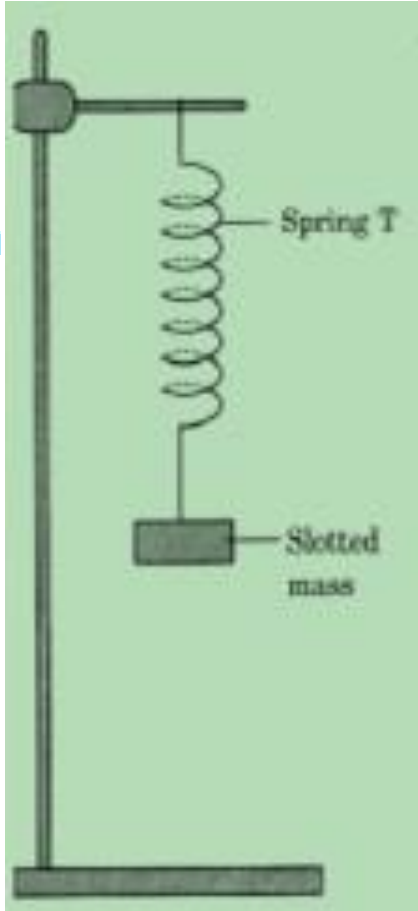


Figure 3.1

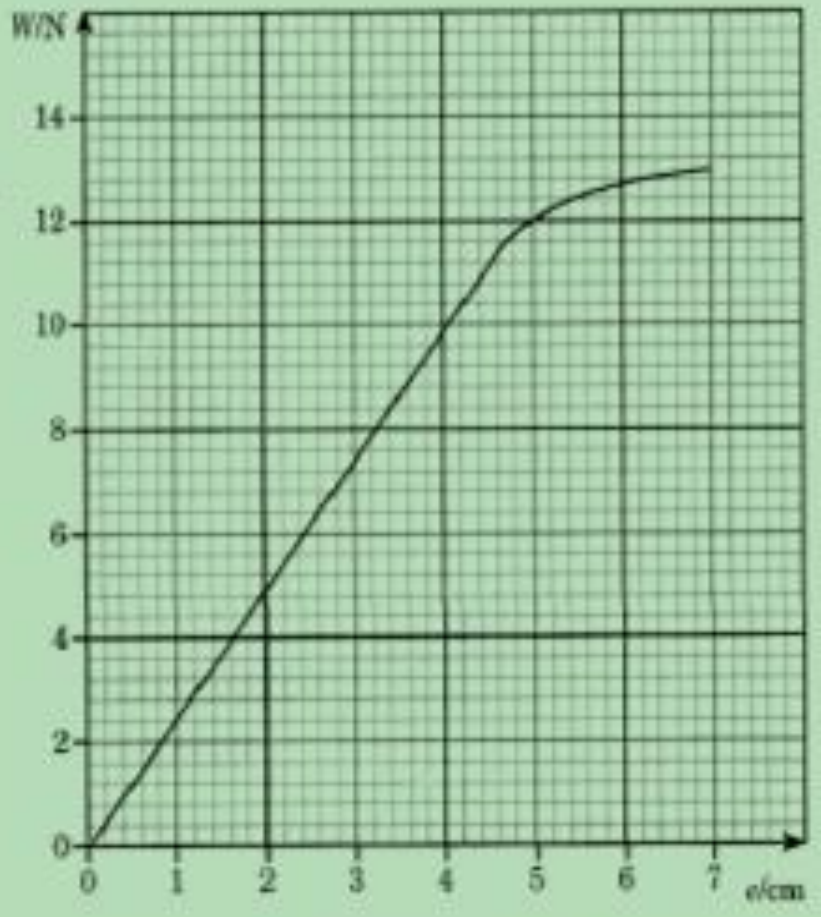


Figure 3.2

(a) A law state that:

Extension of a spring is directly proportional to the force applied if the elastic limit does not exceed.

Suatu hukum menyatakan:

Pemanjangan suatu spring berkadar terus dengan daya yang dikenakan jika had spring itu tidak dilepasi.

(i) Name this law.

Namakan hukum ini.

Hukum Hooke / Hooke's law

[1 m]

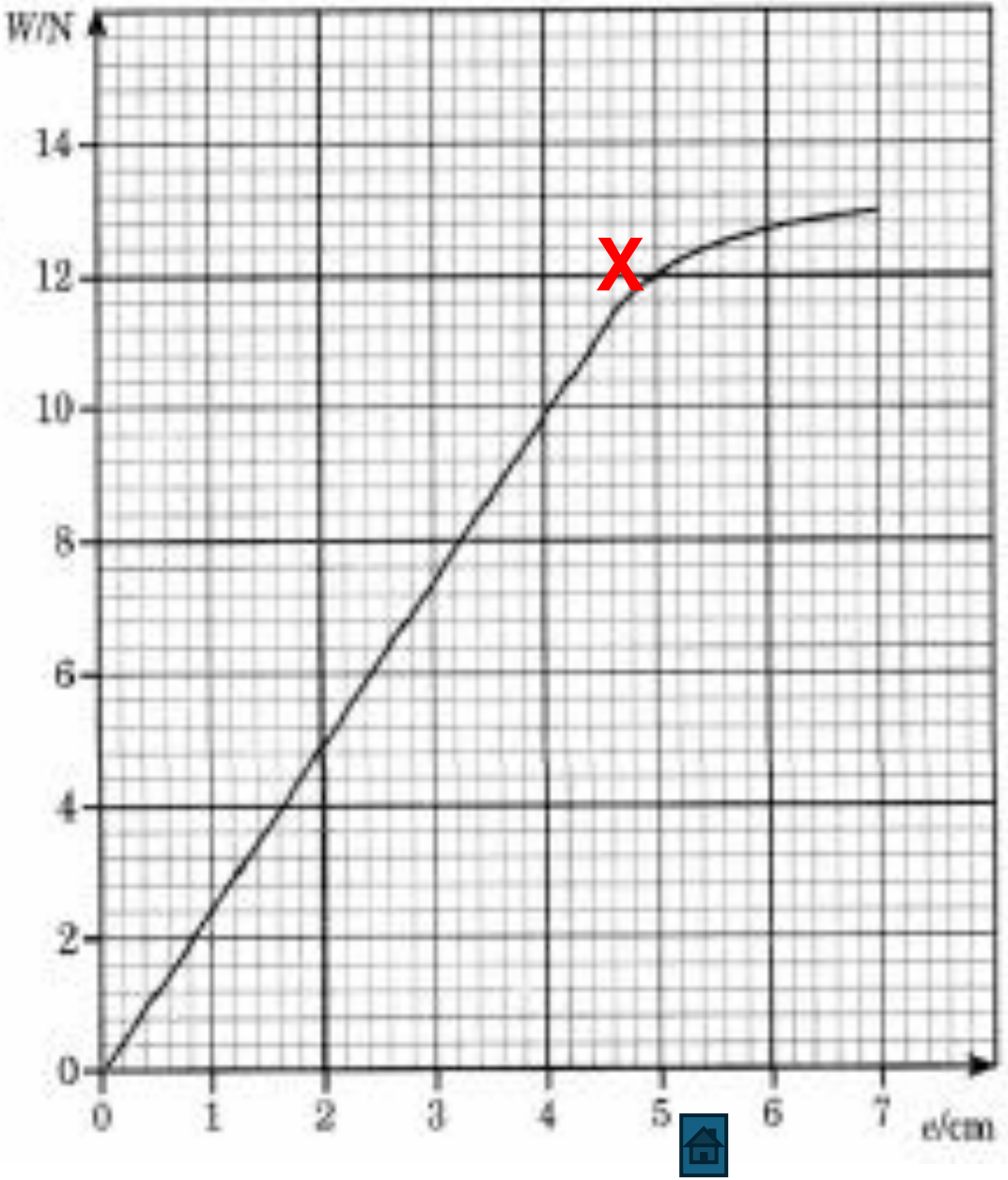
(ii) **On the graph in Figure 3.2, mark with cross (x) the position of elastic limit of the spring.**
Pada graf dalam Rajah 3.2, tandakan dengan silang (x) kedudukan had kenyal spring itu.

[1 m]

(b) **The spring stores energy when it is extended. Calculate the energy stored in the spring when it extend by 4 cm.**
Tenaga tersimpan dalam spring semasa spring itu diregangkan. Hitungkan tenaga yang tersimpan dalam spring itu apabila diregang sebanyak 4 cm.

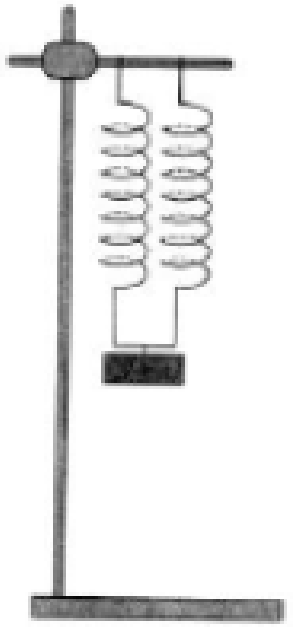
[3 m]

$$E = \frac{1}{2} Fx = \frac{1}{2} (10)(0.04) = 0.2 \text{ J}$$



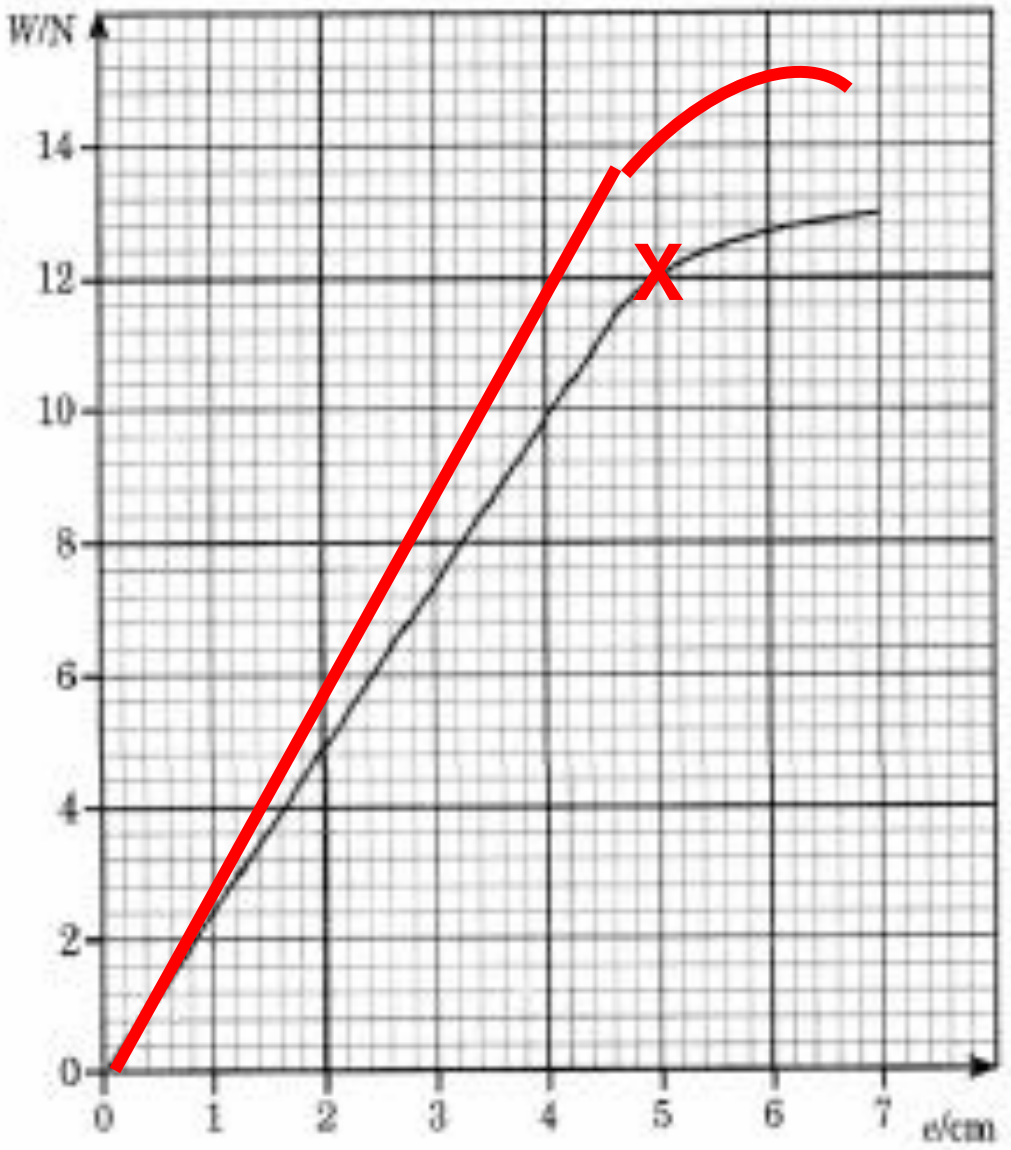
(c) **Another spring, identical to spring T, is added to the arrangement in Diagram 3.1. This new arrangement is shown in Diagram 3.3. The experiment is then repeated.**

Satu spring yang sama dengan spring T ditambahkan kepada susunan radas pada Rajah 3.1. Susunan radas yang baru ini adalah seperti ditunjukkan pada Rajah 3.3. Eksperimen itu diulangi,



Sketch the graph W against e for this experiment in Diagram 3.2.

Lakarkan graf W melawan e bagi eksperimen ini pada Rajah 3.2.



[1 mark]

Section A - 2013

Question 7

Diagram 7 shows a load hung on a spring.
Rajah 7 menunjukkan satu beban digantung pada satu spring.

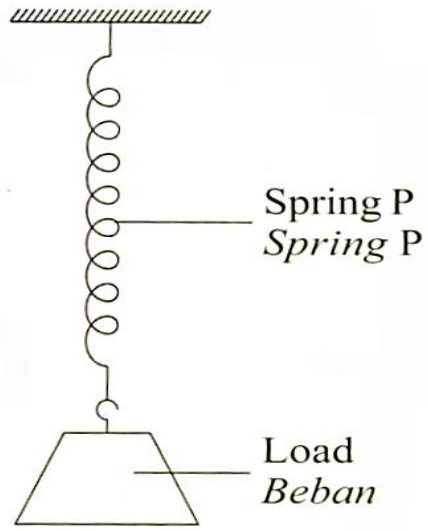


Diagram 7
Rajah 7

(a) The mass of the load can be determined by using the formula F = kx, where F is force, k is spring constant and x is extension of spring.
Jisim beban boleh ditentukan dengan menggunakan formula F = kx, di mana F ialah daya, k ialah pemalar spring dan x ialah pemanjangan spring.

(i) Name the physics law related to the above formula.
Namakan hukum fizik yang berkait dengan formula di atas.

Hooke's law / Hukum Hooke

.....

[1 mark]

(ii) The mass of the load is 1 kg. Calculate the spring constant of spring P when the extension of the spring is 2 cm.
Jisim beban itu ialah 1 kg. Hitung pemalar spring P apabila pemanjangan spring ialah 2 cm.

$F = kx$

$mg = kx$

$k = mg/x = 10/2 = 5\ Ncm^{-1}$

[2 marks]

(b) **Spring P breaks when it is used to hang a heavy load. Suggest a modification that can be made to hang the heavy load through these aspects:**
Spring P putus apabila ia digunakan untuk menggantung beban yang berat. Cadangkan satu pengubahsuaian yang boleh dibuat untuk menggantung beban berat melalui aspek-aspek berikut:

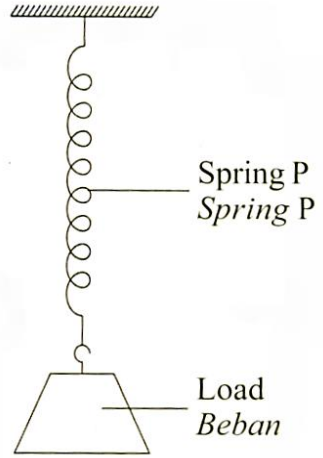


Diagram 7
Rajah 7

(i) **Stiffness of the spring**
Kekerasan spring

High stiffness / kekerasan tinggi

Reason / *sebab*

Bigger force result smaller extension / Spring won't break easily
Spring tidak mudah putus / daya besar diperlukan , pemanjangan kecil

(b) **Spring P breaks when it is used to hang a heavy load. Suggest a modification that can be made to hang the heavy load through these aspects:**
Spring P putus apabila ia digunakan untuk menggantung beban yang berat. Cadangkan satu pengubahsuaian yang boleh dibuat untuk menggantung beban berat melalui aspek-aspek berikut:

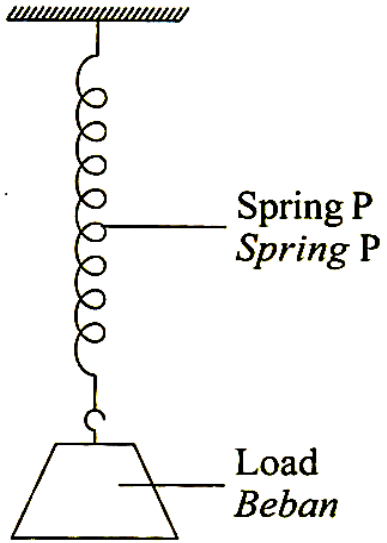


Diagram 7
Rajah 7

(ii) Thickness of the wire
Ketebalan wayar

Thicker wire / wayar tebal

Reason / *sebab*

[2 marks]

High stiffness /high k // big force // low elasticity // not break // strong // Kekerasan tinggi / k besar / daya besar / pemanjangan kecil / tidak putus

(iii) Type of material
Jenis bahan

Steel / iron / keluli / besi

.....

Reason / *sebab*

Spring not break easily // high stiffness / k // big force // low elasticity // strong // small extension / spring tidak putus / k besar / daya besar / kekenyalan rendah / kuat / pemanjangan kecil

(c) Another identical spring, Q is used to hang the heavy load. Suggest the arrangement of these springs to hang the heavy load without breaking the springs.
Satu spring yang serupa, Q digunakan untuk menggantung beban berat. Cadangkan susunan spring-spring ini untuk menggantung beban berat tanpa memutuskan kedua-dua spring.

Parallel / selari

.....

[1 marks]

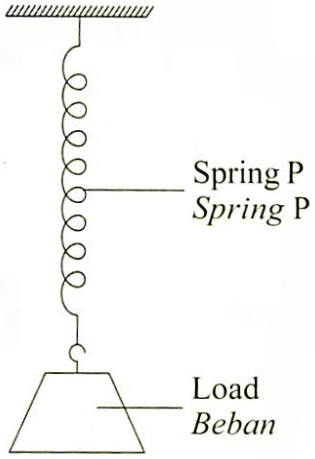


Diagram 7
Rajah 7

SECTION B - 2010

Rajah11.1 menunjukkan seorang budak lelaki berjisim 40 kg meluncur turun dalam dua terowong luncur yang sama , satu persatu.
Diagram 11.1 shows a boy of mass 40 kg sliding in two identical flumes, one after another.

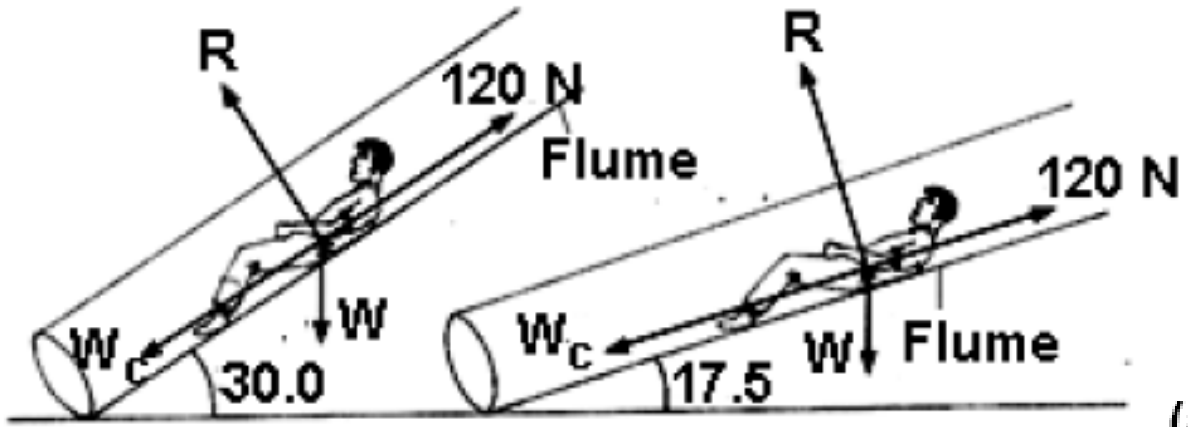


Diagram 11.1(a) Diagram 11.1(b)

W_C = komponen berat yang selari dengan cerun
Component of weight parallel to slope

Rajah 11.1(a) menunjukkan budak lelaki itu meluncur turun terowong dalam keadaan pegun apabila terowong luncur dicondongkan 30.0° dari ufuk. Rajah 11.1(b) menunjukkan budak lelakiitu beraa dalam keadaan pegun apabila terowong luncur dicondongkan 17.5° dari ufuk. Daya geseran yang bertindak pada budak itu dalam kedua-dua terowong luncur ialah 120 N.
Diagram 11.1 (a) shows the boy sliding down the flume, which is inclined at 30.0° to the horizontal. Diagram 11.1(b) shows the boy stationary in the flume when the flume is inclined at 17.5° to the horizontal. The frictional force acting on the boy in both flumes is 120 N.

(a) Apakah maksud daya geseran?
What is the meaning of frictional force?

[1 mark]

Force that oppose motion
Daya yang menentang pergerakan

(b) **Berdasarkan Rajah 11.1(a), hitung:**
Based on Diagram 11.1(a), calculate:

(i) **Komponen berat yang selari dengan cerun terowong luncur, W_C.**
The component of the weight parallel to the slope of the flume, W_C.

[2 marks]

(ii) **Daya paduan yang bertindak pada budak lelaki.**
The resultant force acting on the boy.

[1 mark]

(iii) **Pecutan budak lelaki itu.**
The acceleration of the boy.

[2 marks]

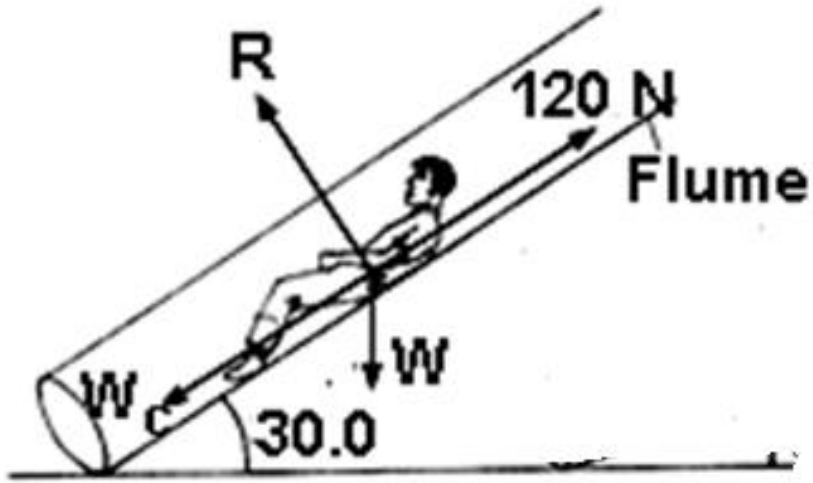


Diagram 11.1(a)

(i) $400 \sin 30^0 = 200$ N

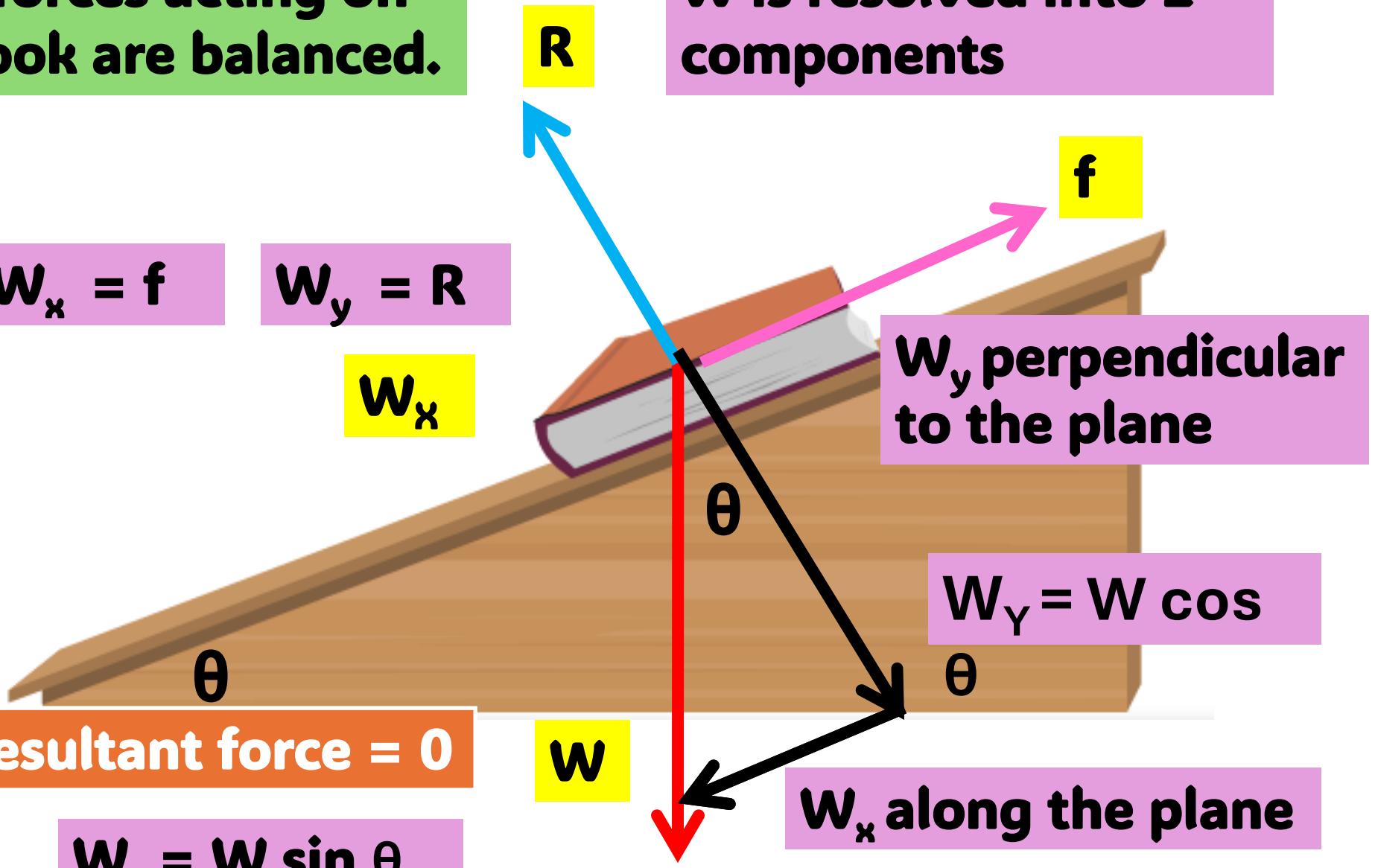
(ii) $200 - 120 = 80$ N

(iii) $F = ma$
$a = 80 / 40$
$= 2\ ms^{-2}$

Why doesn't the book slide down?

The forces acting on the book are balanced.

W is resolved into 2 components



$W_x = f$

$W_y = R$

W_x

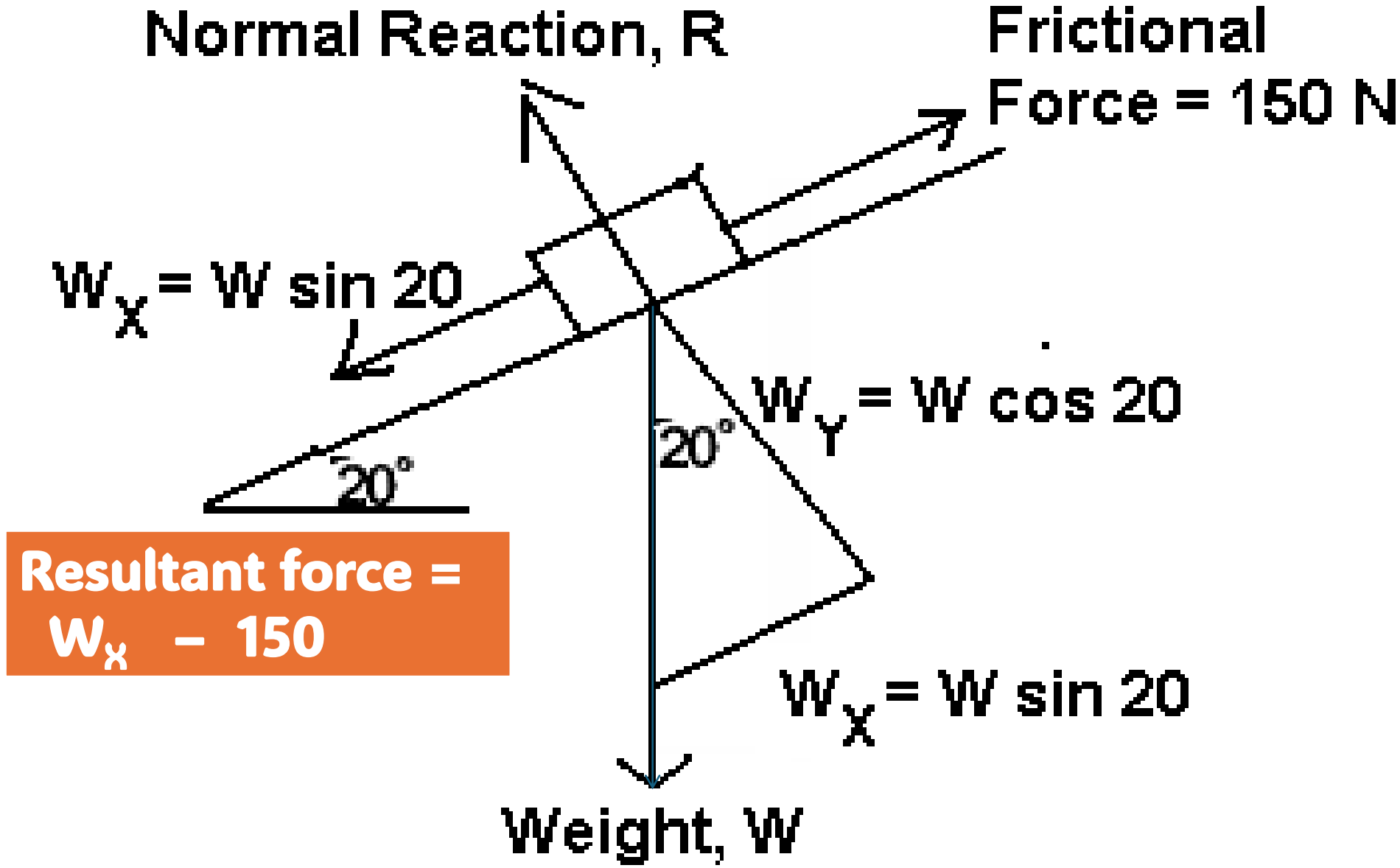
W_y perpendicular to the plane

$W_Y = W \cos \theta$

W_x along the plane

Resultant force = 0

$W_x = W \sin \theta$



Resultant force = W_x – 150

(c) Dengan menggunakan konsep daya, terangkan mengapa budak lelaki itu meluncur turun terowong luncur apabila sudut kecondongan 30.0° dan berada dalam keadaan pegun apabila sudut kecondongan 17.5°.

Using the concept of force, explain why the boy slides down the flume when the angle of inclination is 30.0° and remains stationary when the angle of inclination is 17.5°.

[4 marks]

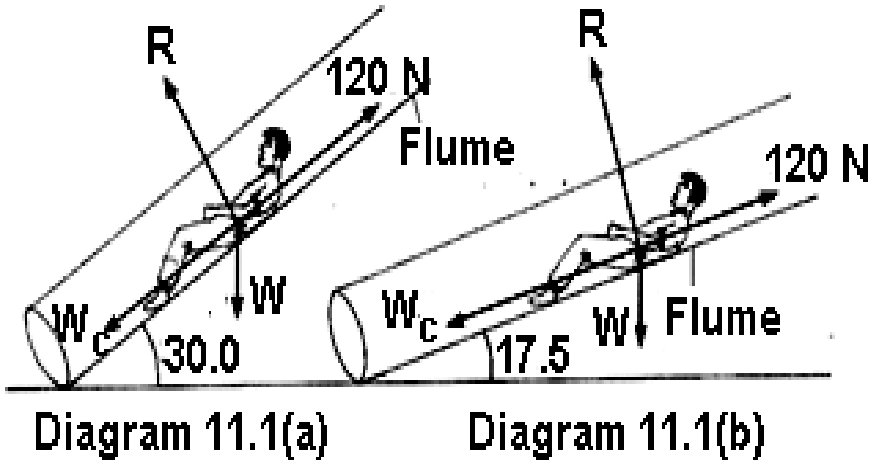


Diagram 11.1(a) Diagram 11.1(b)

1st : Wc > frictional force / daya geseran

2nd : unbalanced force or Resultant force acting
daya paduan bertindak / daya tak seimbang

3rd : Wc = frictional force / daya geseran

4th : Resultant force is zero / force in equilibrium
daya paduan sifar / daya seimbang

(d) **Rajah 11.2 menunjukkan empat buat mesin rumput, J,K, L dan M dengan spesifikasi yang berbeza. Anda dikehendakki untuk menentukan mesin rumput yang paling sesuai untuk memotong rumput dengan berkesan.**

Diagram 11.2 shows four lawnmowers, J, K, L and M with different specifications. You are required to determine the most suitable lawnmower to cut grass effectivel

Kaji spesifikasi keempat-empat mesin rumput berdasarkan aspek-aspek berikut:

Study the specifications of the four lawnmowers based on the following aspects:

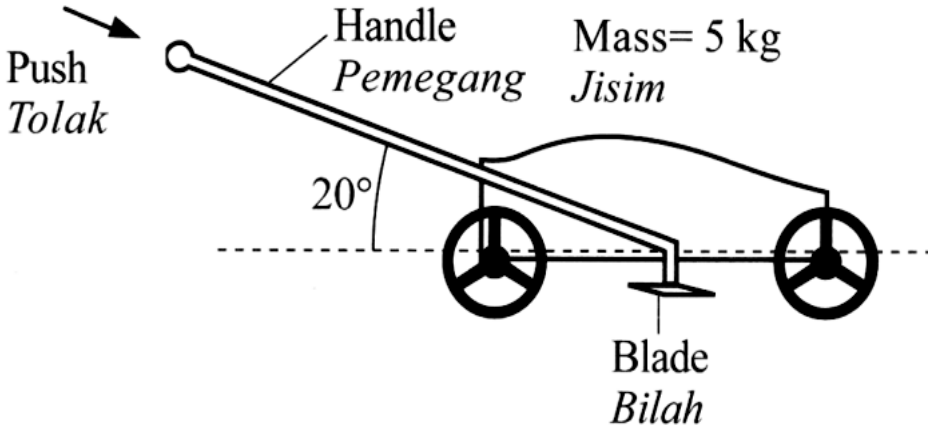
a. **Kaedah menggerakkan mesin rumput**
   Method of moving the lawnmower.
b. **Jisim mesin rumput**
   Mass of the lawnmower
c. **Saiz bllah pemotong**
   Size of the cutter blade.
d. **Sudut antara pemegang dengan garis ufuk**
   The angle between the handle and the horizontal line.

Terangkan kesesuaian setiap aspek dan seterusnya tentukan mesin rumput yang paling sesuai. Beri sebab untuk pilihan anda.

Explain the suitability of each aspect and then determine the most suitable lawnmower.

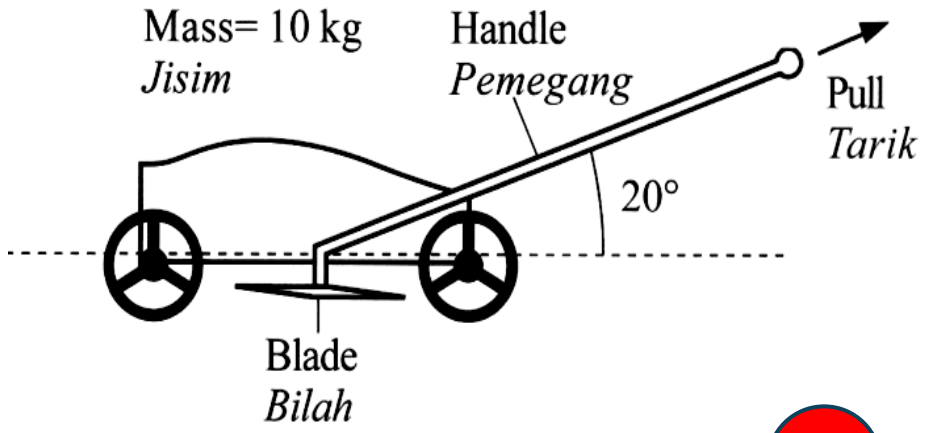
[10 marks]

Lawnmower J



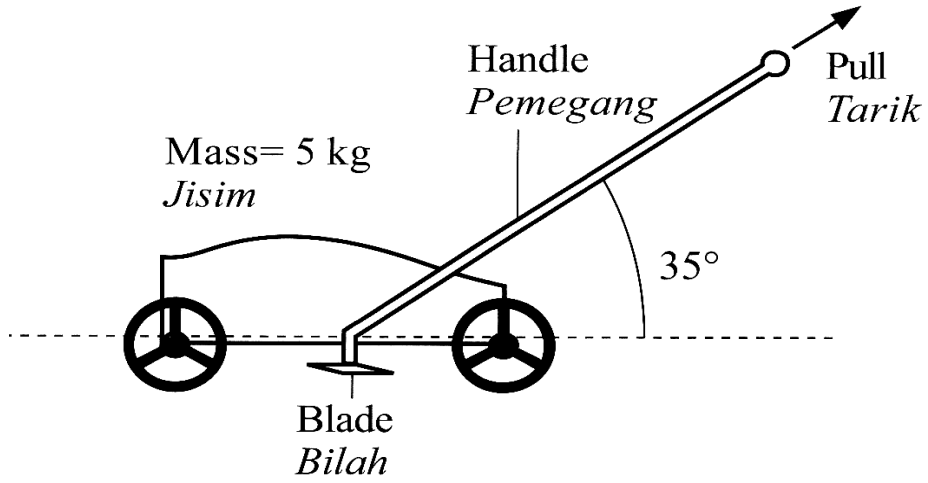
Small size cutter blade

Lawnmower K



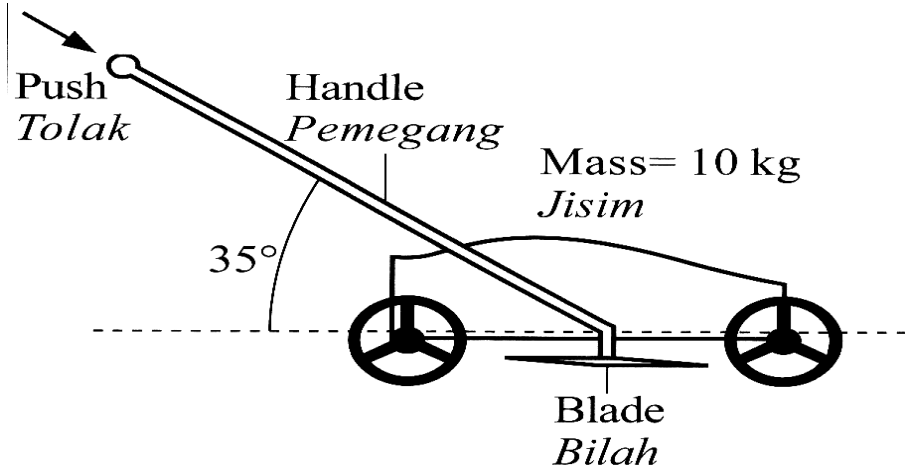
Big size cutter blade

Lawnmower L



Small size cutter blade

Lawn-mower M



Big size cutter blade

Characteristics	Reason
Push / tolak	Bigger force / daya besar
Large mass Jisim besar	Down force bigger / More stable Daya ke bawah besar / stabil
Size of cutter is large Pisau besar	Cut more grass/ efficient / faster Potong lebih banyak rumput
Angle between handle is large / sudut antara pemegang besar	Force exert to ground bigger / daya dikenakan ke bawah besar
Choose M because pushing, large mass, size of cutter is large and angle between handle is large. / tolak, jisim besar, pisau besar dan sudut antara pemegang besar	

Figure below shows a worker cutting grass by pushing and pulling a lawn mower.

Q 1

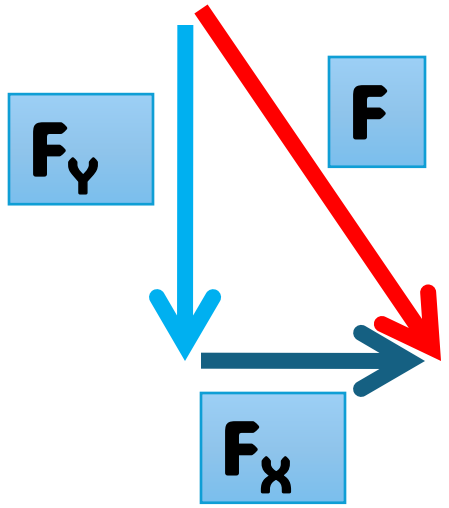
Using Physics concepts, compare the difficulty of the job when the worker :

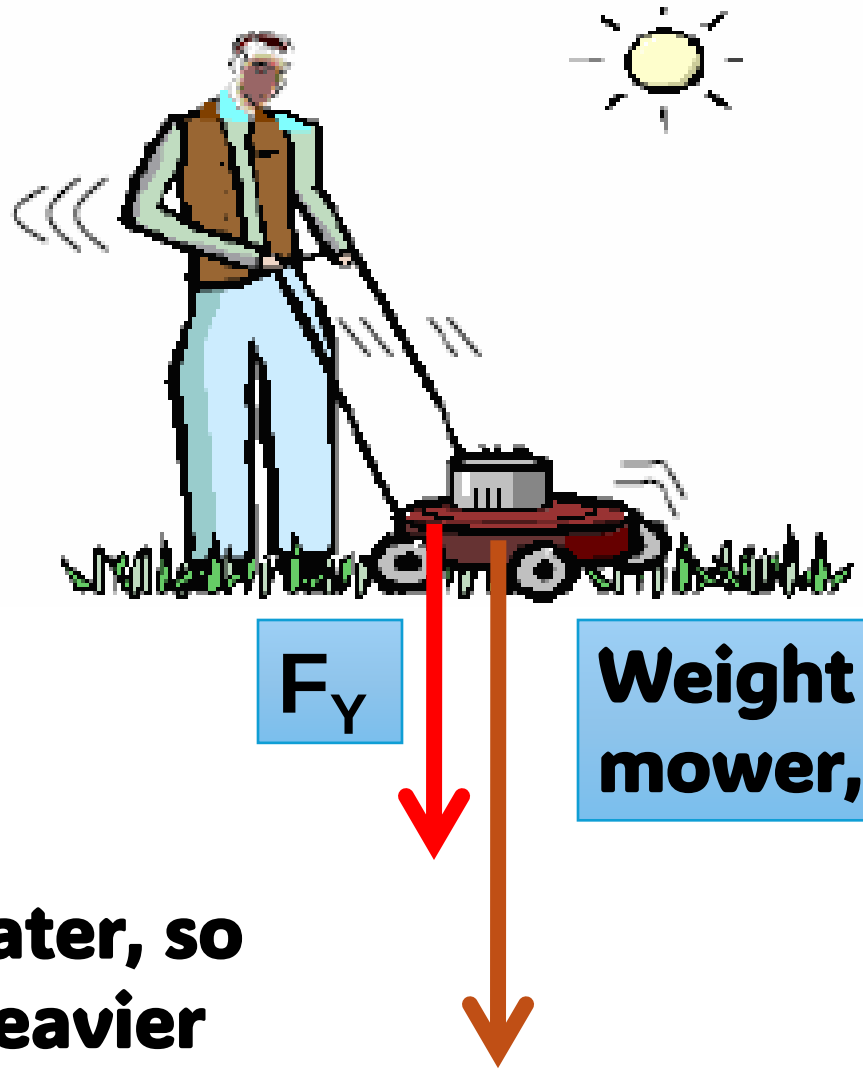
(i) pushes the lawn mower.

(ii) pulls the lawn mower.

You may use diagrams in your answer.

(i) pushes the lawn mower.

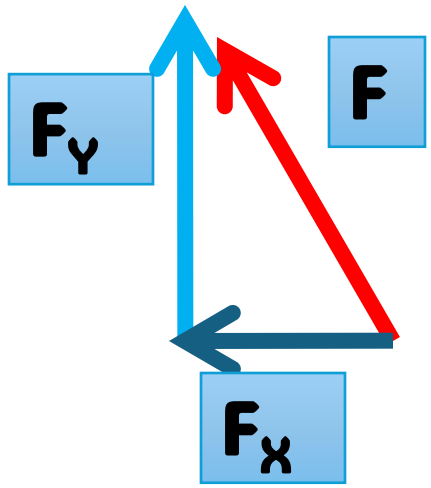


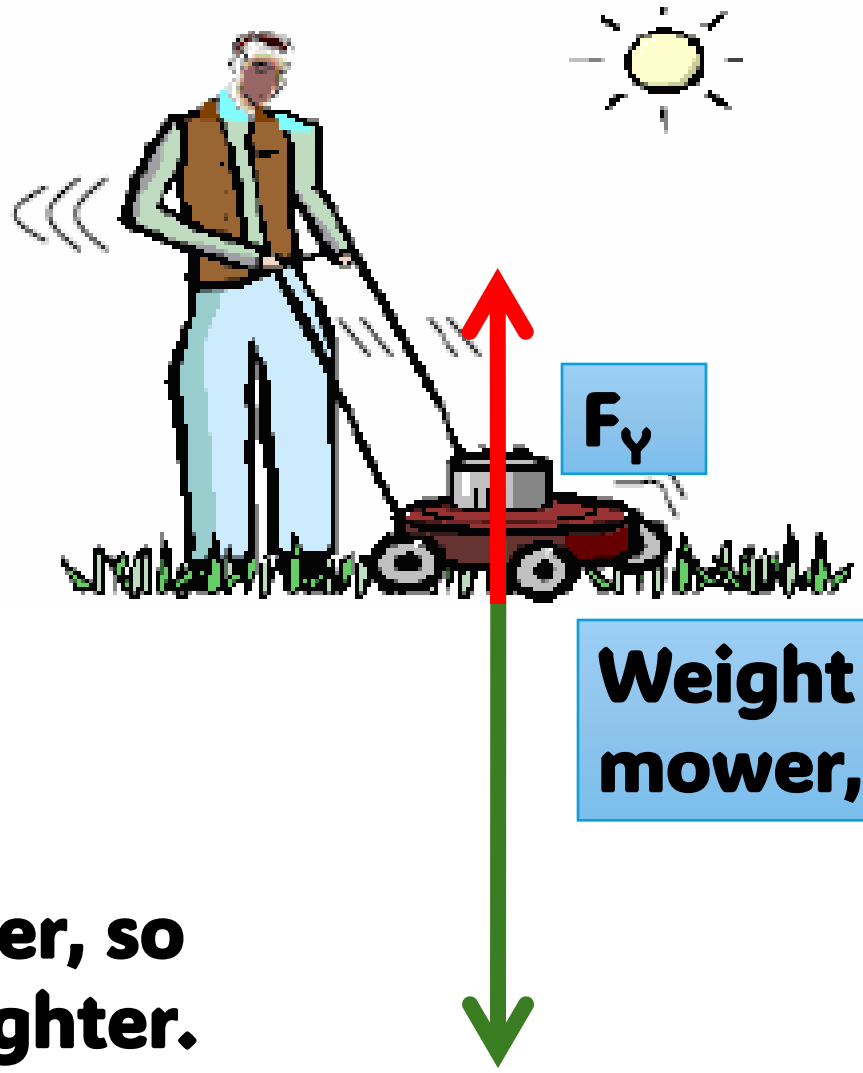


Total downward force:
$= W + F_Y$

Downward force is greater, so the lawn mover feels heavier

(i) Pull the lawn mower.





Total downward force:
= W - F_Y

Downward force is lower, so the lawn mover feels lighter.

SECTION B - 2019

(a) Diagram 11.1 shows a paraglider flying with uniform acceleration at the same height.
Rajah 11. 1 menunjukkan seorang 'paraglider' terbang dengan pecutan seragam pada ketinggian yang sama.

(i) What is the meaning of drag?
Apakah yang dimaksudkan dengan seretan?

[1 mark]

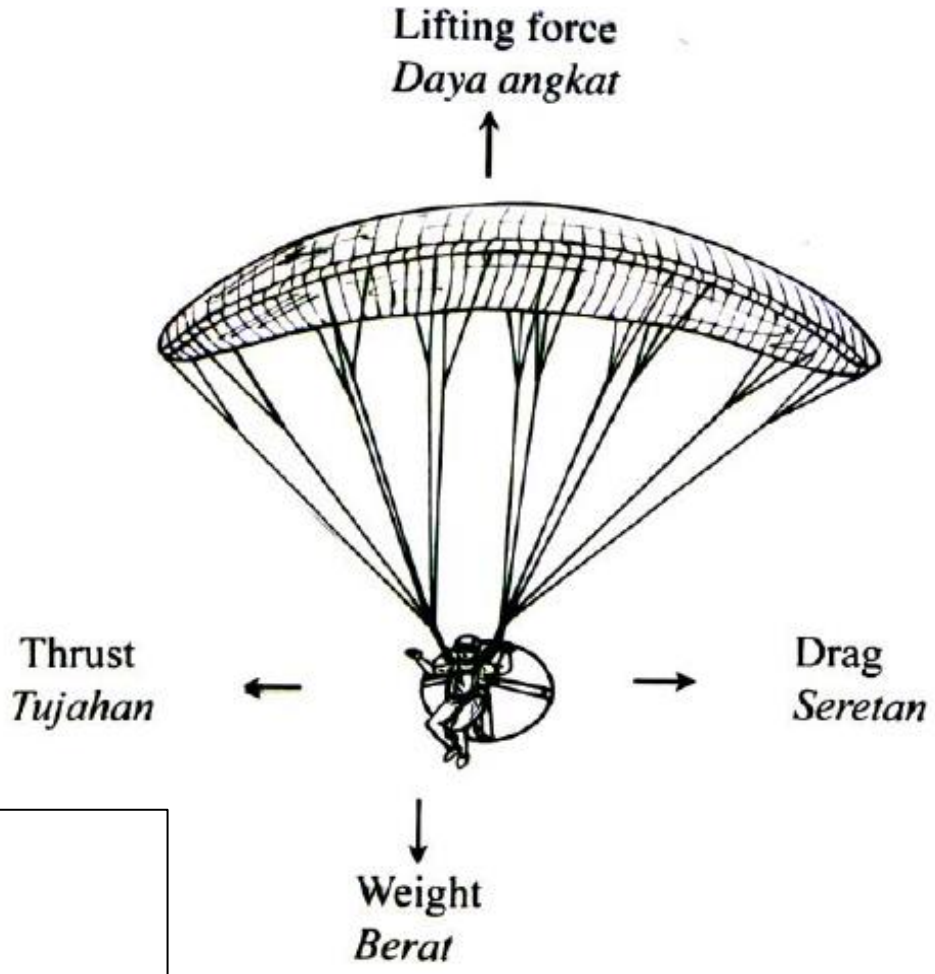


Diagram 11.1 / *Rajah 11.1*

Force that oppose the direction of motion
Daya yang menentang arah Gerakan

(ii) **Explain** why the paraglider can fly forward with uniform acceleration at the constant height.

Terangkan mengapa 'paraglider' boleh terbang ke hadapan dengan pecutan seragam pada ketinggian yang malar.

[4 marks]

Thrust > Drag // Tujah > Seretan

Force not in equilibrium / a α F // Resultant force // Daya paduan // unbalanced force / F ≠ 0

Weight, W = Lifting force / Berat = Daya angkat

Resultant force = 0 // Net force = 0 // Daya bersih = 0 // No net force / Balance force / force in equilibrium / Daya seimbang

(b) Diagram 11.2 shows a traffic light with mass of 15 kg is hung by using two cables in front of a tunnel.
Rajah 11.2 menunjukkan lampu isyarat berjisim 15 kg digantung dengan menggunakan dua kabel di hadapan sebuah terowong.

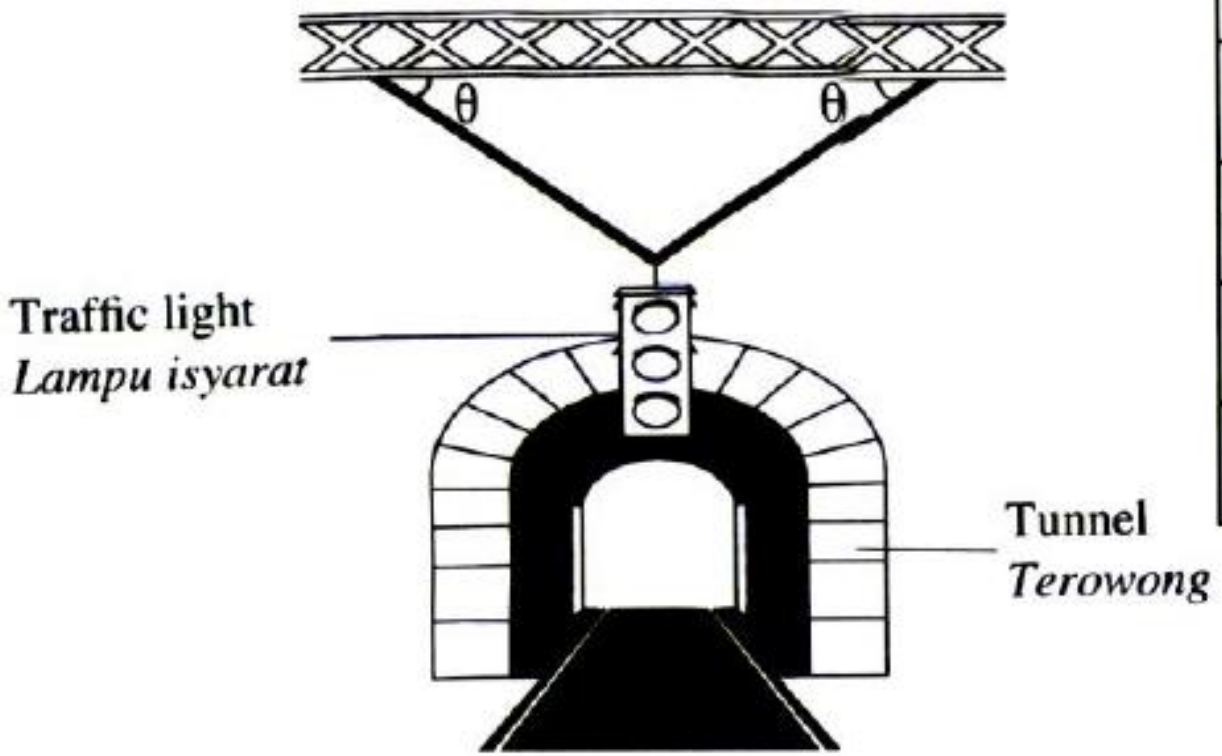


Diagram 11.2 / *Rajah 11.2*

You are required to study the characteristics and the suitable angle, θ of the cable shown in Table 4.
Anda dikehendaki mengkaji ciri-ciri dan sudut yang sesuai, θ bagi kabel yang ditunjukkan dalam Jadual 4.

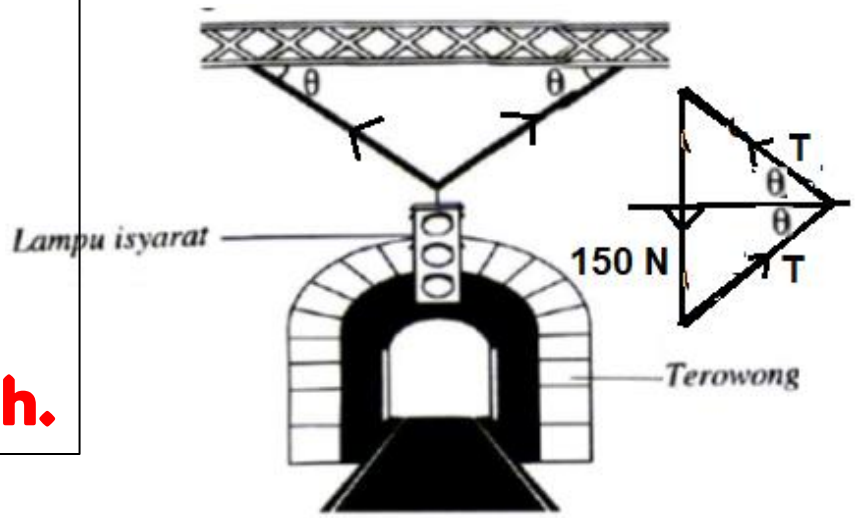
Cable *Kabel*	**P**	**Q**	**R**	**S**
Angle, θ *Sudut, θ*	30°	60°	60°	30°
Maximum tension *Tegangan maksimum*	80 N	80 N	90 N	90 N
Material of cable *Bahan kabel*	steel *keluli*	iron *besi*	steel *keluli*	iron *besi*
Rate of oxidation *Kadar pengoksidaan*	low *rendah*	high *tinggi*	low *rendah*	high *tinggi*

Explain the suitability of each characteristics and angle, θ of the cable. Determine the most suitable cable to be used so that the cable would not break easily when supporting the traffic light.

Terangkan kesesuaian setiap ciri dan sudut, θ bagi kabel tersebut. Tentukan kabel yang paling sesuai untuk digunakan supaya kabel itu tidak mudah putus ketikan menyokong lampu isyarat tersebut.

[10 marks]

Jika sudut tinggi, tegangan kable rendah.
Jadi tegangan yang wujud masa itu menunjukkan daya yang tarik kabel itu untuk tegang rendah.
Jadi bagus la sebab kabel tak mudah putus. Bila gantung lampu isyarat, kabel tu tak la tegang sangat. (ie tegangan bertindak ke atas kabel rendah.

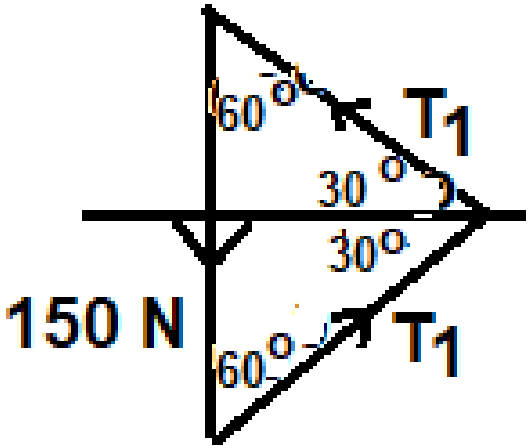


$\theta = 30^0$

$\sin 30^0 = 75/T_1$

$T_1 = 75/\sin 30^0$

$= 150$ N



$$@ \quad \frac{150}{\text{Sin } 60} = \frac{T_1}{\sin 60}$$

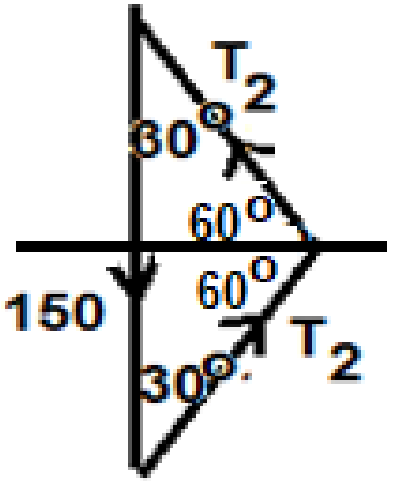
$$T_1 = \frac{150 \sin 60}{\text{Sin } 60} = 150 \text{ N}$$

$\theta = 60^0$

$\sin 60^0 = 75/T_2$

$T_2 = 75/\sin 60^0$

$= 86.7$ N



$$\frac{50}{\sin 120} = \frac{T_2}{\sin 30}$$

$$T_2 = \frac{150 \sin 30}{\sin 120} = 86.7 \text{ N}$$

θ high / tinggi

Ketegangan kabel rendah / Small tension of the cable

High maximum tension / Tegangan maksima tinggi

Strong / support more weight/ kuat / sokong berat lebih

Untuk ciri kable itu sendiri, kita harapkan maximum tension yang mampu cable itu tampung is high. Jadi walaupun tinggi mana daya tarik kabel, kabel masih tak putus sebab tegangan maksimum yang mampu kabel tu tahan adalah tinggi.

Steel // keluli

Strong / not rust / long lasting / kuat / tidak berkarat / tahan lama

Low rate of oxidation / kadar pengoksidaan rendah

Not rust / long lasting / tidak berkarat / tahan lama

R: high θ, high maximum tension, steel and low rate of oxidation

R: θ tinggi, tegangan maksima tinggi, keluli dan kadar pengoksidaan rendah

(c) Diagram 11.3 shows a lorry stuck in mud ground which is being pulled by two four-wheel drive vehicles. Each four-wheel drive vehicle pulls the lorry with 3 000 N force at an angle of 30° as shown in the diagram.
Rajah 11. 3 menunjukkan sebuah lori tersangkut dalam lumpur dan sedang ditarik oleh dua buah kenderaan pacuan empat roda. Setiap kenderaan pacuan empat roda menarik lori dengan daya 3 000 N pada sudut 30° seperti ditunjukkan dalam rajah.

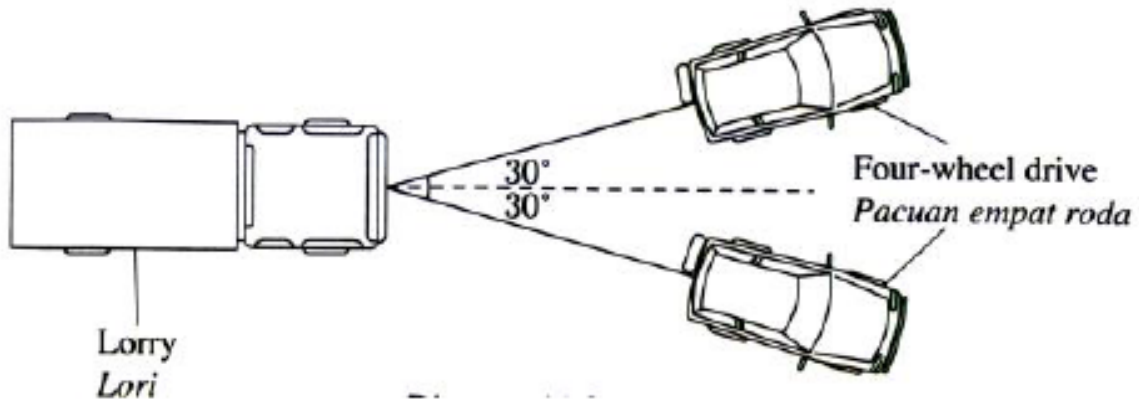
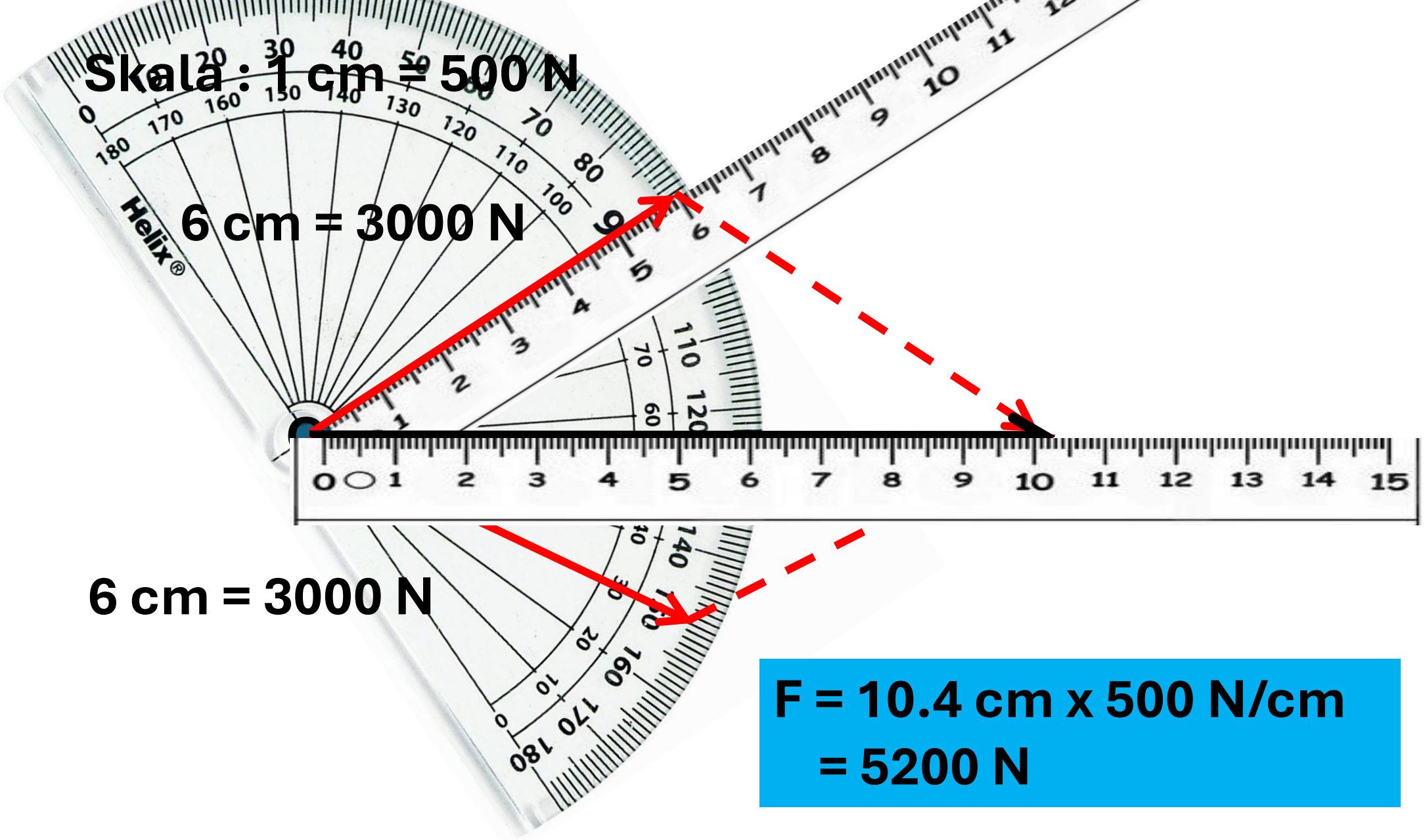


Diagram 11.3 / *Rajah 11.3*

Calculate the net pulling force to move the lorry forward.
Hitung daya tarikan bersih untuk menggerakkan lori tersebut ke hadapan.

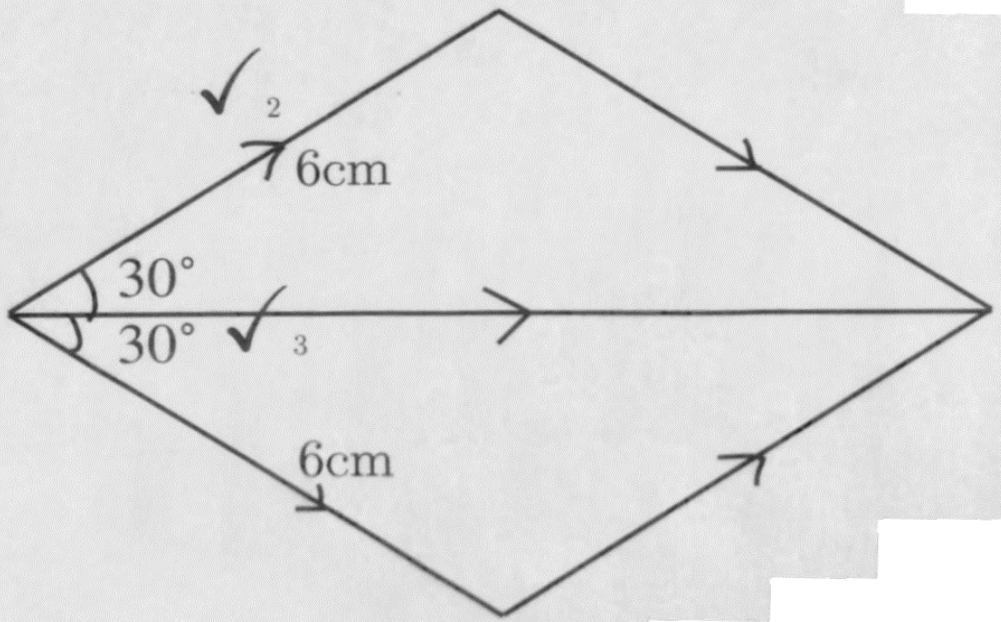
[5 marks]



F = 10.4 cm x 500 N/cm
= 5200 N

Alternative 1

Skala 1 cm : 500 N ✓ 1



✓ 2

✓ 3

F = 10.4 x 500 ✓ 5

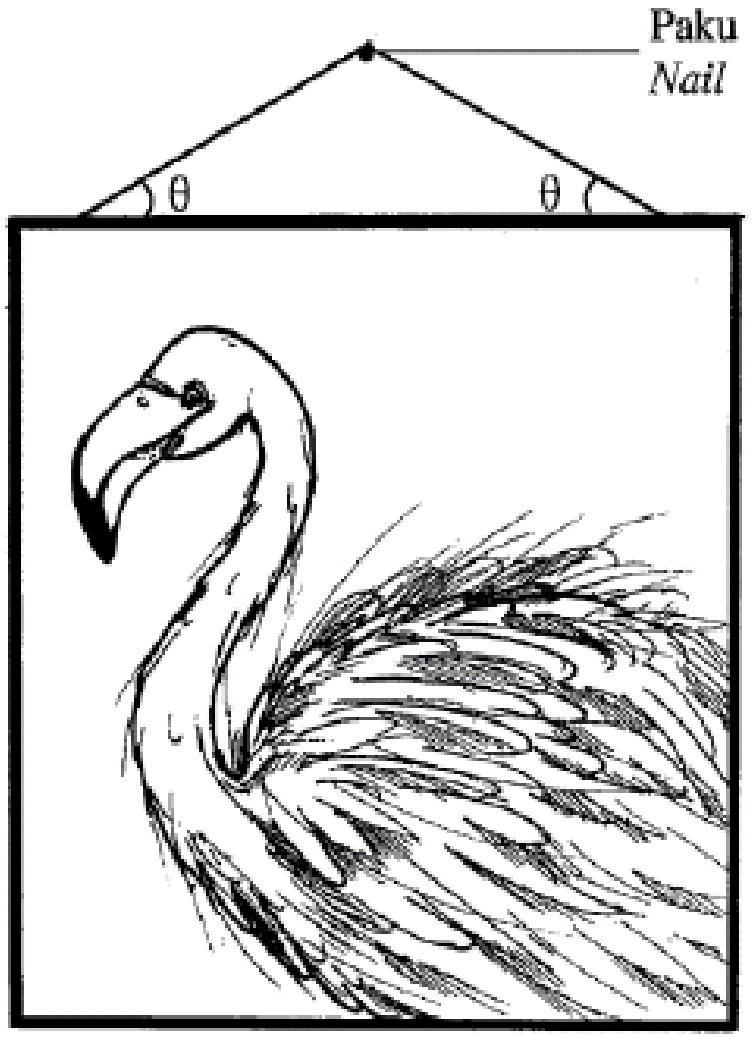
= 5200 N ✓ 4

SECTION B - 2021

Soalan 9

Rajah 9.1 menunjukkan sebuah lukisan digantung pada dinding dengan menggunakan tali. Berat lukisan tersebut ialah 15 N. Setiap tali dapat menampung daya maksimum 10 N.

Diagram 9.1 shows a painting is hung on a wall with strings. The weight of the painting is 15 N. Each string can withstand a maximum force of 10 N.



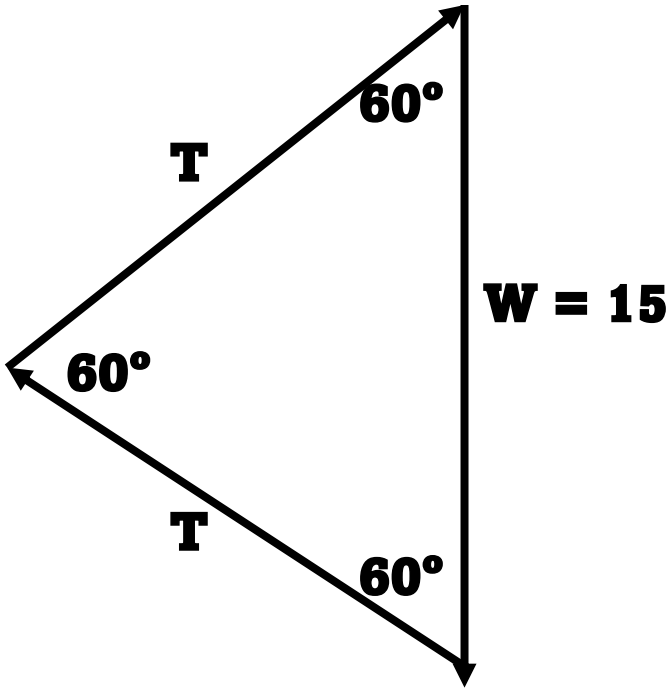
(a) Apakah yang dimaksudkan dengan berat?
What is the meaning of weight?

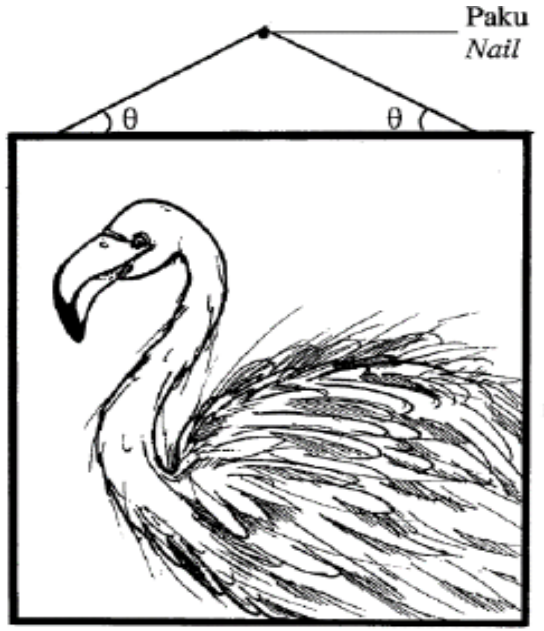
[1 markah]

Daya gravity yang bertindak ke atas objek / Gravitational force that acts on an object

(b) Selepas beberapa saat digantung, didapati tali pada lukisan itu terputus. Dengan menggunakan nilai sudut $\theta = 30^{o}$, hitung tegangan tali dan daya paduan. Terangkan mengapa tali pada lukisan itu putus.
A few second after the painting is hung, it is found that the string of the painting is snapped. By using the value of the angle $\theta = 30^{o}$, calculate the tension of the string and resultant force. Explain why the string of the painting snaps.

[4 markah]


60°
T
W = 15
60°
T
60°


Paku
Nail
θ
θ

M1: 2T sin 30° / 2T cos 60°

M2: 2T sin 30° = 15 / 2T cos 60 = W

2T sin 30 = W / 2T cos 60 = 15 N

M3: T = 15 N

M4: T > T max / T > 10 / T > daya maksimum

M5: Daya paduan tali = 5 (15 – 10 = 5)

M6: Daya paduan (lukisan) = Berat

Daya paduan (lukisan) = 15

(c) Lukisan itu pecah apabila terjatuh dari ketinggian 4 m. Dengan mengabaikan rintangan udara, hitung:
The painting is broken when it drops from a height of 4 m. By ignoring the air resistance, calculate:

(i) Masa untuk lukisan itu mencecah ke lantai.
The time taken for the paint to reach the floor.

[2 markah]

M1 Penggantian yang betul //

$(s = ut + \frac{1}{2} gt^2)$

$4 = \frac{1}{2} (9.81) t^2$

$t = \sqrt{8/9.81}$

M2: t = 0.903 s minimum 2 tp

(ii) Halaju lukisan itu sebelum mencecah lantai.
The velocity of the painting before it reaches the floor.

[2 markah]

(iii) Nyatakan satu sebab lukisan itu pecah.
State one reason mengapa lukisan itu pecah.

[1 markah]

M1: Penggantian yang betul

(v = u + gt)

v = 9.81 x 0.903

M2: Jawapan dengan unit betul

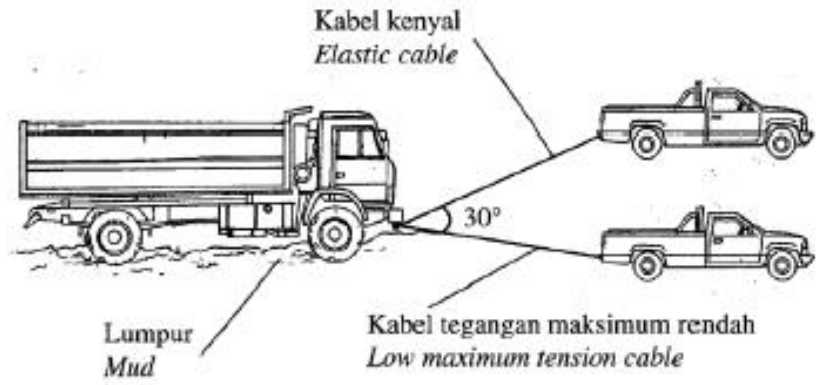
v = 8.86 m s^{-1}

julat (8.82 – 8.89) m s^{-1}

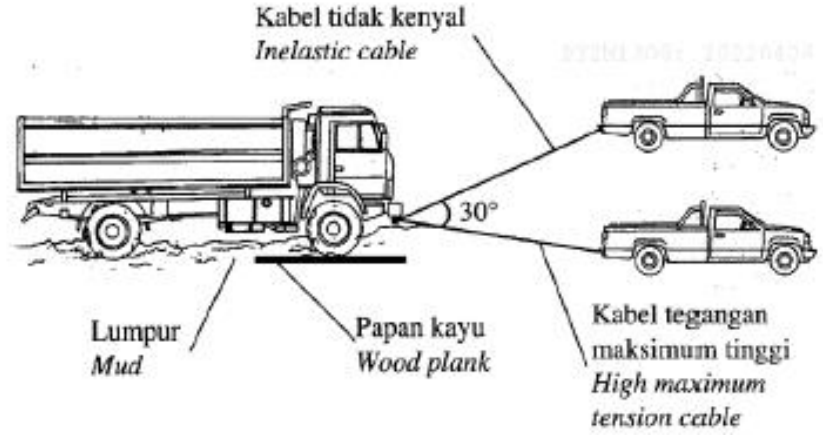
(d) Rajah 9.2 menunjukkan empat kaedah R, S, T dan U untuk menarik sebuah lori yang tersangkut dalam lumpur oleh dua buah kenderaan pacuan empat roda.

Table 9.2 shows four methods R, S, T and U to pull a lorry which is stucked in mud by two four-whell drive vehicles.

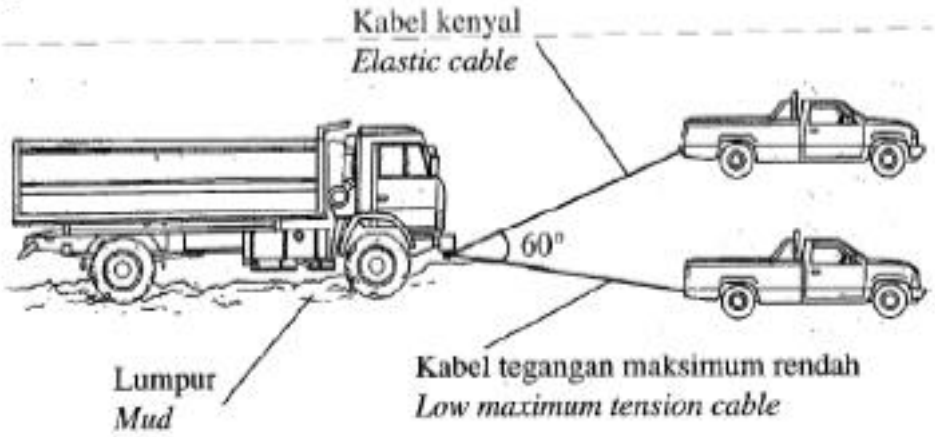
R



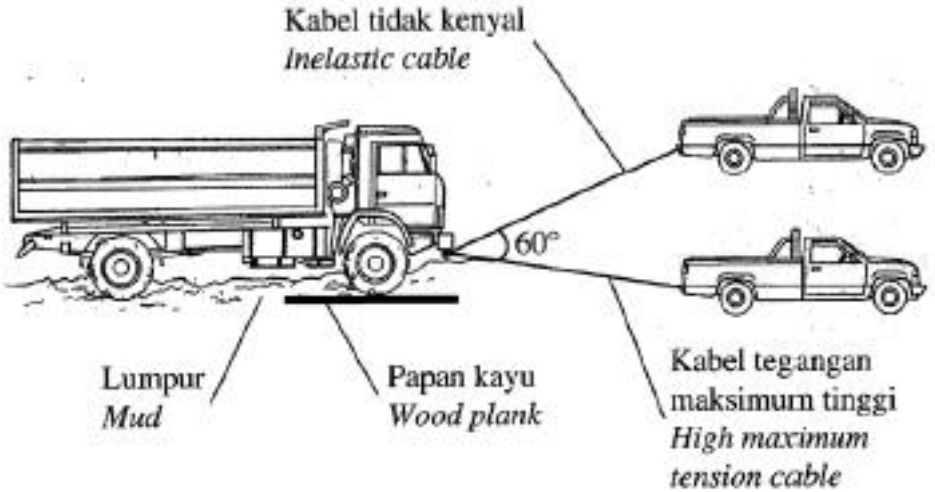
S



T



U



Anda dikehendaki menentukan kaedah yang paling sesuai untuk menarik lori yang tersangkut dalam lumpur dengan lebih berkesan daripada aspek yang berikut:
You are required to determine the most suitable method to pull the lorry that is stucked in mud effectively from the following apects:

- Sudut antara kabel
  Angle between the cables
- Jenis kabel
  Types of cable
- Tegangan maksimum pada kabel
  Maximum tension of the cable
- Bahan sokongan di bawah tayar lori
  Supported material below the tyre of the lorry.

Terangkan kesesuaian aspek-aspek itu dan tentukan kaedah yang paling sesuai untuk menarik lori dengan berkesan. Beri sebab untuk pilihan anda.
Explain the suitability of the aspects and determine the most suitable method to pull the lorry effectively. Give reasons for your choice.

[10 markah]

M1: sudut kecil // small angle

M2: Daya tinggi / F tinggi / high force

M3: kabel tidak kenyal / inelastic cable

M4: Daya seragam / Panjang kabel tetap / kabel tidak memanjang / uniform force

M5: Tegangan maksimum tinggi / High maximum tension

M6: menampung daya tinggi / tahan daya tinggi / kuat / tahan lasak / tidak putus / not snap / strong / not break / durable

M7: ada papan kayu di bawah tayar / papan / kayu / wood / plank under the tyre / wood / plank

M8: Kurangkan tekanan / tambah uas / Reduce pressure / increase area

M9: Pilih S

M10: sudut kecil, kabel tidak kenyal, tegangan maksimum tinggi, ada papan bawah tayar

Small angle, inelastic cable, high maximum tension, wood under the tyre

SECTION C - 2008

a. Rajah 9.1 menunjukkan dua bebola keluli yang serupa diletakkan di atas spring M dan spring N. Kedua-dua spring adalah kenyal dan dipasang pada permukaan mendatar. Spring-spring itu ditekan sehingga panjang spring M dan spring N sama. Rajah 9.2 menunjukkan tinggi maksimum yang dicapai oleh bebola-bebola itu apabila tangan dilepaskan.
[Andaikan spring M dan spring N adalah daripada bahan yang sama, diameter gegelung yang daa dan panjang asal yang sama].
Diagram 3.1 shows two identical steel balls placed onto spring M and spring N. Both springs are elastic and fixed to a horizontal surface. The springs are pushed down until the lengths of spring M and spring N are the same.
[Assume spring M and spring N are of the same material, same coil diameter and same original length]

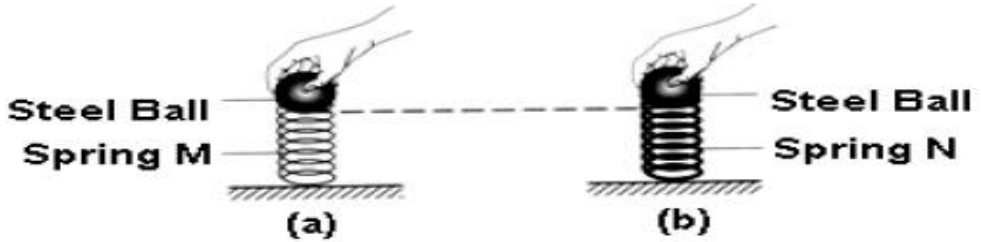


Diagram 9.1

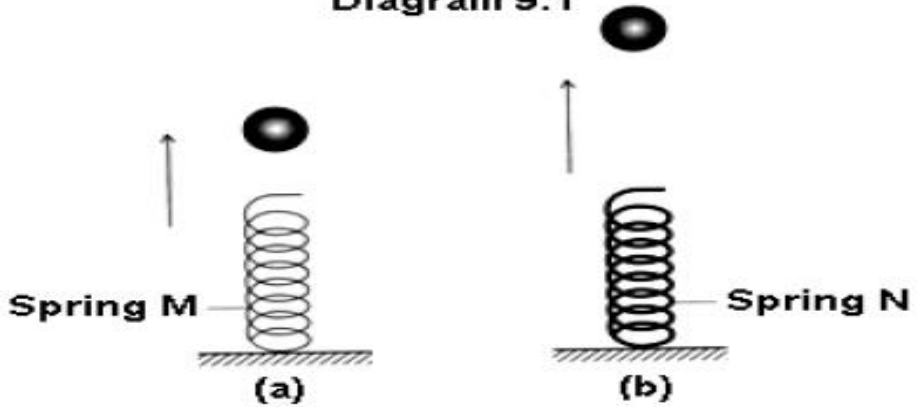


Diagram 9.2

(i) Apakah maksud kekenyalan?
What is the meaning of elasticity?

[1 mark]

The property of a spring that enables it to return to its original length when the force acting on it is removed. Sifat spring boleh kembali ke Panjang asal apabila daya yang bertindak dilepaskan.

(ii) Menggunakan Rajah 9.1 dan Rajah 9.2, bandingkan ketebalan dawai spring dengan ketinggian maksimum yang dicapai oleh bebola-bebola itu. Hubungkaitkan ketebalan dawai spring dengan dengan tenaga keupayaan kenyal bagi spring.

Using Diagram 3.1 and Diagram 3.2, compare the thickness of the spring wire and the maximum height reached by the balls.Relate the thickness of the spring wire with the maximum height of the ball to make a deduction regarding the relationship between the thickness of the spring wire and the elastic potential energy of the spring.

[5 marks]

The elastic potential energy of the spring increases as the thickness of spring wire. Tenaga keupayaan kenyal spring bertambah bila ketebalan dawai spring bertambah

Thicknes of the spring: N > M
Ketebalan dawai spring

Maximum height: N > M
Tinggi maksimum 9.2(b) > 9.2(b)

The height of the ball increases as the thickness of the spring wire increases. Tinggi bola bertambah bila dawai spring semakin tebal

Thickness of the spring wire directly proportional to spring constant, k / Ketebalan dawai spring berkadar terus dengan pemalar spring, k

(b) **Daya-daya yang digunakan untuk memampatkan spring dalam Rajah 9.1(a) dan Raja 9.1(b) adalah masing-masing F_1 dan F_2.**
The forces used to compress the springs in Diagram 3.1(a) and Diagram 3.1(b) are F_1 and F_2 respectively.

(i) **Bandingkan F_1 dan F_2. Beri satu sebab bagi jawapan ini.**
Compare F_1 and F_2. Give one reason for this answer. **[2 marks]**

(ii) **Berdasarkan Rajah 9.1 dan Rajah 9.2, nyatakan perubahan tenaga yang berlaku dari ketika spring dimampatkan sehingga bebola mencapai ketinggian maksimum.**
Using Diagram 3.1 and Diagram 3.2, state the energy changes that take place from the moment the spring is compressed until the ball reaches its maximum height.

[2 marks]

F2 > F1

N has thicker wire / higher spring constant / N is stiffer spring / N has bigger elastic potential energy / dawai spring N lebih tebal / spring N ada pemalar spring lebih tinggi / spring N lebih keras / tenaga keupayaan kenyal spring N lebih tinggi

Elastic potential energy to kinetic energy to gravitational potential energy / tenaga keupayaan kenyal ke tenaga kinetik ke tenaga keupayaan gravity.

(c) **Rajah 9.3 menunjukkan seorang atlet lompat bergalah sedang membuat lompatan.**
Diagram 9.3 shows a pole vaulter performing a jump.

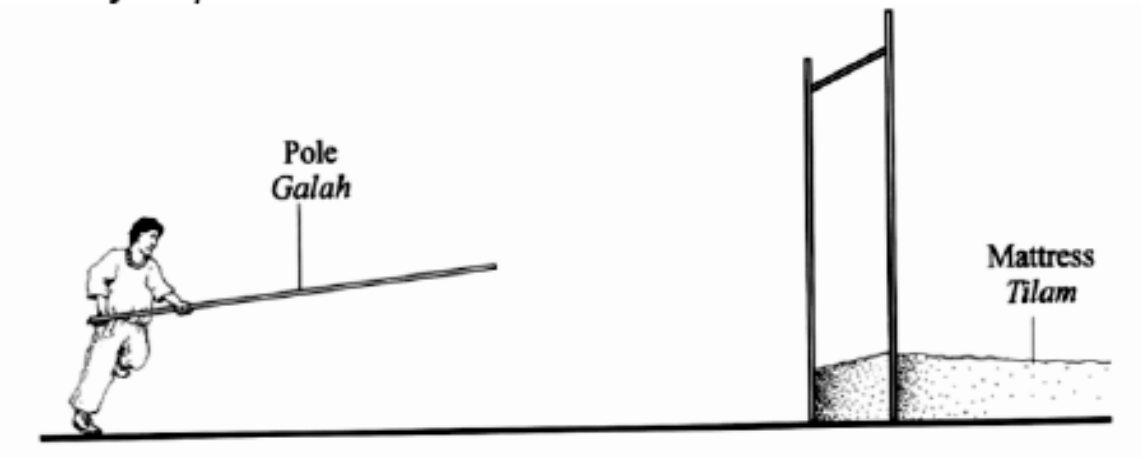


Diagram 3.3

Using appropriate physics concepts, explain the use of suitable equipment and techniques to improve his performance. Your answer should include the following aspects:
Menggunakan konsep fizik yang sesuai, terangkan kegunaan peralatan dan teknik yang sesuai untuk memperbaiki pencapaian lompatan atlet itu. Jawapan anda mesti termasuk aspek-aspek berikut:

(i) **Vaulter's attire** */ pakaian atlet*
(ii) **Vaulter's movement** */pergerakan atlet*
(iii) **Pole used** */ Galah yang digunakan*
(iv) **Safety** */ keselamatan*

[10 marks]

Tight attire / light attire
Pakaian ketat / pakaian ringan

Less air resistance / small mass
Kurang rintangan udara / jisim kecil

Spike shoes
Kasut spike

Increase grip / prevent from skidding /
Tambah cengkaman / elak tergelincir

Increase speed / accelerate
Tambah laju / pecutan

Increases kinetic energy / momentum
Tambah tenaga kinetik / momentum

Elastic / flexible poles
Galah kenyal

Bend easily / high elastic potential energy / mudah melentur / tenaga keupayaan kenyal tinggi

Strong pole
Galah yang kuat

Does not break easily
Tidak mudah patah

Thick mattress
Tilam tebal

Low impulsive force
Daya impuls rendah