90940M

909405

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

QUALIFY FOR THE FUTURE WORLD
KIA NOHO TAKATŪ KI TŌ ĀMUA AO!

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Pūtaiao, Kaupae 1, 2017

90940M Te whakaatu māramatanga ki ngā āhuatanga o te pūhanga manawa

9.30 i te ata Rāapa 15 Whiringa-ā-rangi 2017
Whiwhinga: Whā

Paetae	Kaiaka	Kairangi
Te whakaatu māramatanga ki ngā āhuatanga o te pūhanga manawa.	Te whakaatu māramatanga hōhonu ki ngā āhuatanga o te pūhanga manawa.	Te whakaatu māramatanga matawhānui ki ngā āhuatanga o te pūhanga manawa.

Tirohia mēnā e rite ana te Tau Ākonga ā-Motu (NSN) kei runga i tō puka whakauru ki te tau kei runga i tēnei whārangi.

Me whakamātau koe i ngā tūmahi KATOA kei roto i tēnei pukapuka.

Mēnā ka hiahia whārangi atu anō mō ō tuhinga, whakamahia ngā whārangi wātea kei muri o tēnei pukapuka, ka āta tohu ai i ngā tau tūmahi.

Tirohia mēnā e tika ana te raupapatanga o ngā whārangi 2–23 kei roto i tēnei pukapuka, ka mutu, kāore tētahi o aua whārangi i te takoto kau.

HOATU TE PUKAPUKA NEI KI TE KAIWHAKAHAERE HEI TE MUTUNGA O TE WHAKAMĀTAUTAU.

TAPEKE

MĀ TE KAIMĀKA ANAKE

Tērā pea ka whai hua ēnei tikanga tātai ki a koe.

$$v = \frac{\Delta d}{\Delta t} \qquad a = \frac{\Delta v}{\Delta t} \qquad F_{net} = ma \qquad P = \frac{F}{A} \qquad \Delta E_p = mg\Delta h$$

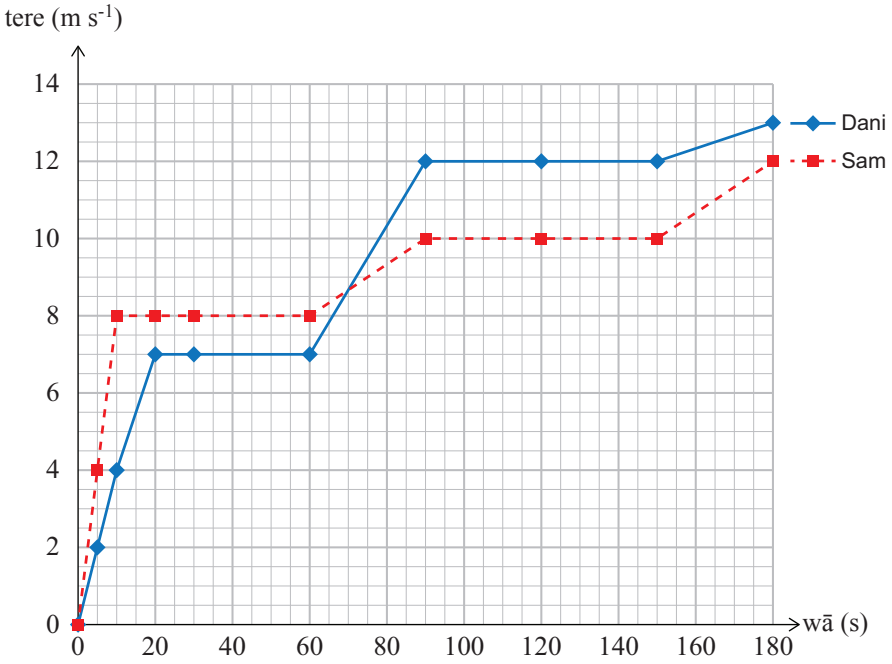
$$E_k = \frac{1}{2}mv^2 \qquad W = Fd \qquad g = 10 \text{ N kg}^{-1} \qquad P = \frac{W}{t}$$

TŪMAHI TUATAHI

E rua ngā hoiho e ekehia ana e Dani rāua ko Sam, ā, kei te rēhi rāua.

www.cambridgejockeyclub.co.nz

E whakaaturia ana i raro ko te kauwhata tere/wā mō ō rāua hōiho.



(a) Whakamahia ngā mōhiohio i te kauwhata hei whakataurite i te tere ME te whakahohoro o Dani rāua ko Sam i ngā **60 hēkona tuatahi**.

MĀ TE KAIMĀKA ANAKE

You may find the following formulae useful.

$$v = \frac{\Delta d}{\Delta t} \qquad a = \frac{\Delta v}{\Delta t} \qquad F_{net} = ma \qquad P = \frac{F}{A} \qquad \Delta E_p = mg\Delta h$$

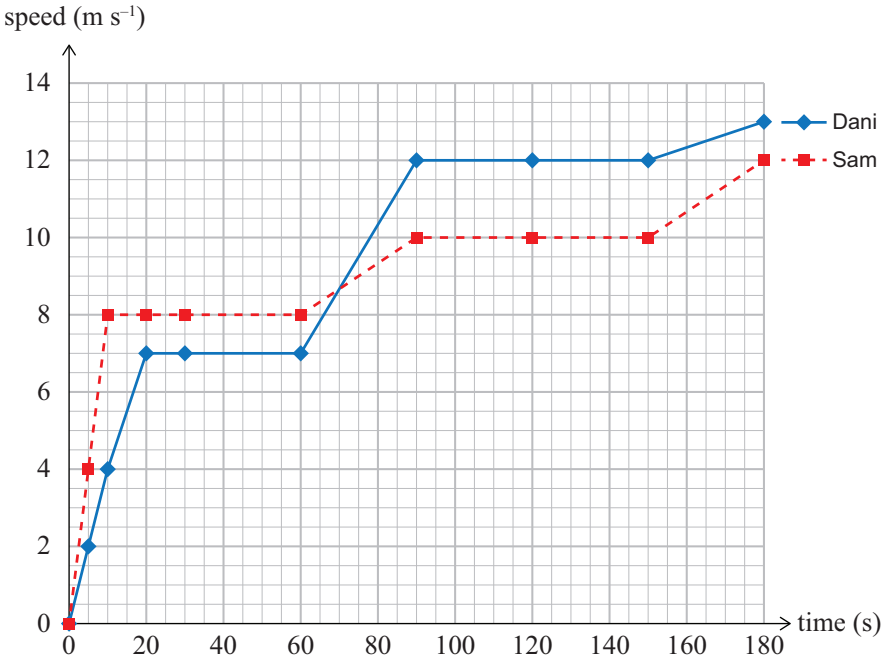
$$E_k = \frac{1}{2}mv^2 \qquad W = Fd \qquad g = 10 \text{ N kg}^{-1} \qquad P = \frac{W}{t}$$

QUESTION ONE

Two horses, ridden by Dani and Sam, are racing against each other.

www.cambridgejockeyclub.co.nz

The speed-time graph of their two horses is shown below.



(a) Use the information in the graph to compare the speed AND acceleration of Dani and Sam in the **first 60 seconds**.

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Ka whakahohoro te hōiho o Sam mō ngā hēkona 10 tuatahi o te rēhi ME te whakaoti i te tawhiti o te 40 m. He 308 kg te papatipu tapeke o Sam me tōna hōiho.

MĀ TE KAIMĀKA ANAKE

(b) Whakamahia te whakahohorotanga hei tātai i te mahi kua oti i a Sam me tōna hōiho i te 40 m tuatahi.

(c) Whakamāramahia te pānga ki te **mahi** ME te **ngoi** mēnā i eke ko tētahi tioke hou, taumaha ake i te hōiho o Sam, ka mutu he ōrite te tere me te whakahohorotanga i roto i te rēhi.

Kāore te tātaitanga i te hiahiatia.

Sam's horse accelerates for the first 10 s of the race AND covers a distance of 40 m. Sam and his horse have a total mass 308 kg.

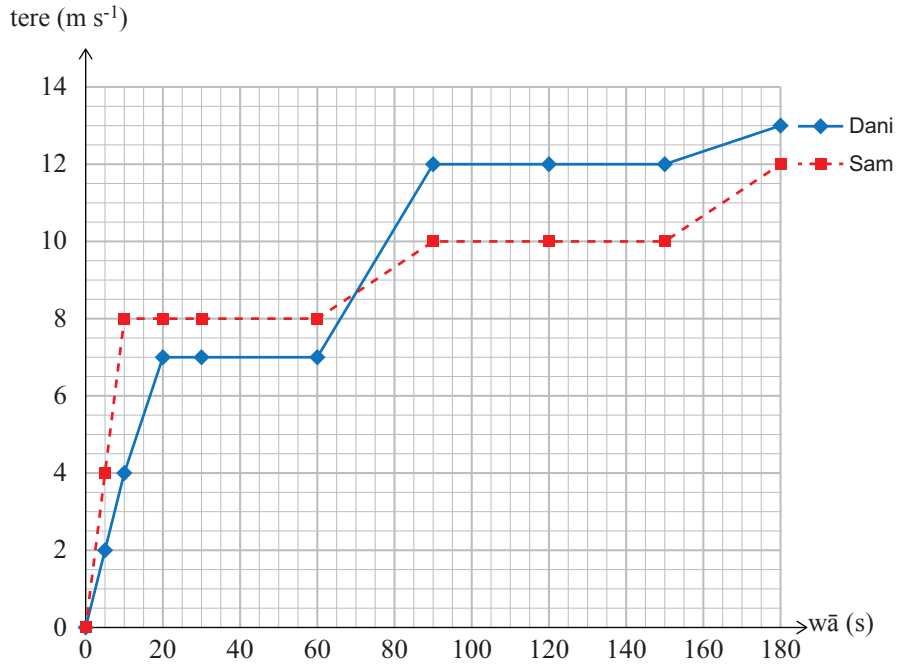
ASSESSOR'S USE ONLY

(b) Use the acceleration to calculate the work that Sam and his horse have done in the first 40 m.

(c) Explain the effect on **work** AND **power** if a new, heavier jockey was on Sam's horse, which had the same speed and acceleration over the race.

Calculations are not required.

(Ka tāruatia i raro nei te kauwhata tere-wā o te whārangi 2.)



(d) I muri i te 90 hēkona, he 710 mita te tawhiti i haerehia e Sam me tōna hōiho.

E hia te tawhiti atu o te haere ki te tawhiti i oti i a Dani me tōna hoiho i tēnei pūwāhi o te rēhi?

Whakamahia ngā mōhiohio i te kauwhata me ngā tātaitanga e hiahiatia ana i tō tuhinga.

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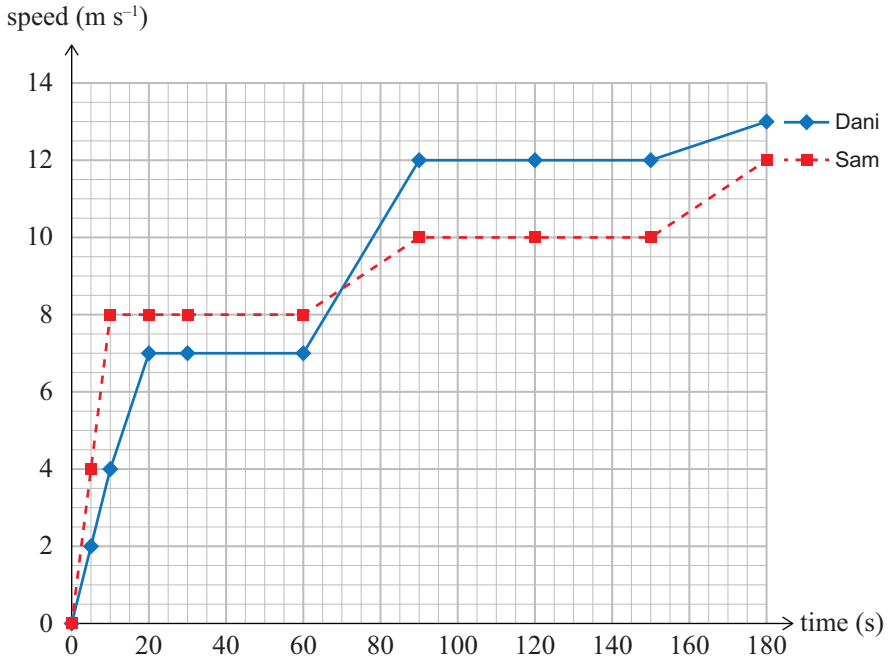
(The speed-time graph from page 4 is repeated below.)



(d) After 90 s, Sam and his horse had travelled 710 m.

How much further had they travelled compared to Dani and her horse at this stage in the race?
Use the information in the graph and any necessary calculations to answer.

TŪMAHI TUARUA

MĀ TE KAIMĀKA ANAKE

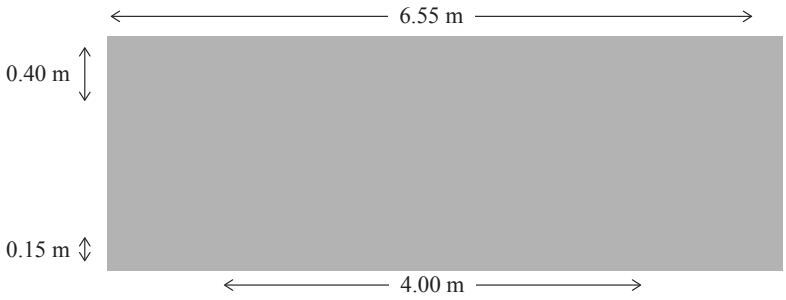
He 9.90 kg te papatipu o tētahi waka ama komāmā.

(a) He aha te rerekētanga i waenga i te **papatipu** me te **taumaha**?

Whakamahia te waka ama hei tauira, me te whakauru i tētahi tātaitanga mō te taumaha.

E whakaaturia ana he tātuhinga o ngā takere o te waka ama i raro i te taha matau.

http://www.tangaroa.school.nz/small-gallery-article/waka-ama-nationals/134766/324377/



www.selway-fisher.com/Opcan17.htm

(b) Tātaitia te pēhanga ka puta i te waka ama (i ngā takere e rua) ki runga i te wai.

Me whakauru ki tō tuhinga:

- he tātaitanga horahanga (me kī he tapawhā hāngai ngā takere e rua o te waka ama, ā, e whakaatu ana ngā ine i runga ake i te horahanga ka pā ki te wai)
- he tātaitanga o te pēhanga.

QUESTION TWO

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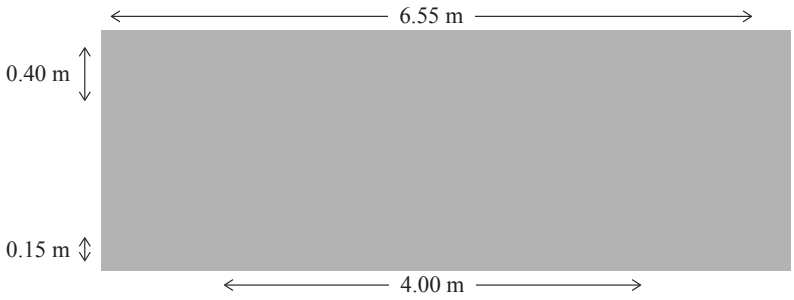
A lightweight waka ama (outrigger canoe) has a mass of 9.90 kg.

(a) What is the difference between **mass** and **weight**?

Use the waka ama as an example, and include a calculation for weight.

A sketch of the waka ama hulls is shown below right.

http://www.tangaroa.school.nz/small-gallery-article/waka-ama-nationals/134766/324377/



www.selway-fisher.com/Opcan17.htm

(b) Calculate the pressure exerted by the waka ama (both hulls) on the water.

Your answer should include:

- an area calculation (assume both waka ama hulls are rectangular in shape, and the measurements above show the area in contact with the water)
- a calculation of the pressure.

(c) Ka hōhonu atu te totohu o te waka ki te wai ina noho ana he kaihoe e 67 kg te taumaha ki roto.

Whakamāramahia mai he aha i hōhonu atu ai te totohu o te waka ama i te nohohanga o te kaihoe i roto.

Whakamahia he tātaitanga hei tautoko i tō tuhinga.

MĀ TE KAIMĀKA ANAKE

(c) The waka ama sinks further into the water when a 67 kg paddler sits in it.

Explain why the waka ama sinks further into the water when the paddler sits in it.
Use calculations to support your answer.

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TŪMAHI TUATORU

MĀ TE KAIMĀKA ANAKE

www.turbosquid.com/3d-models/3d-model-port-container-crane-industrial/689347

(a) I hīkina e te wakahiki e whakaaturia ana i runga tētahi paepae kia 30 mita i roto i te 15 hēkona. Ko te taumaha o te paepae he 60 000 N.

(i) Tātaihia te mahi ka oti i te wakahiki ki te hiki i te paepae kia 30 mita.

(ii) Tātaihia te ngoi o te wakahiki ina hīkina ana te paepae ki te 30 mita i roto i te 15 hēkona.

(b) Whakamāramahia mai he aha te mahi e mahia ana ki te paepae ina tārere ana i te hau takiwā me te kore nekeneke.

QUESTION THREE

ASSESSOR'S USE ONLY

www.turbosquid.com/3d-models/3d-model-port-container-crane-industrial/689347

(a) The crane shown above lifted a container 30 m in 15 s. The weight of the container is 60 000 N.

(i) Calculate the work done by the crane in lifting the container 30 m.

(ii) Calculate the power of the crane while lifting the container 30 m in 15 s.

(b) Explain what work is being done on the container when it is hanging in the air without moving.

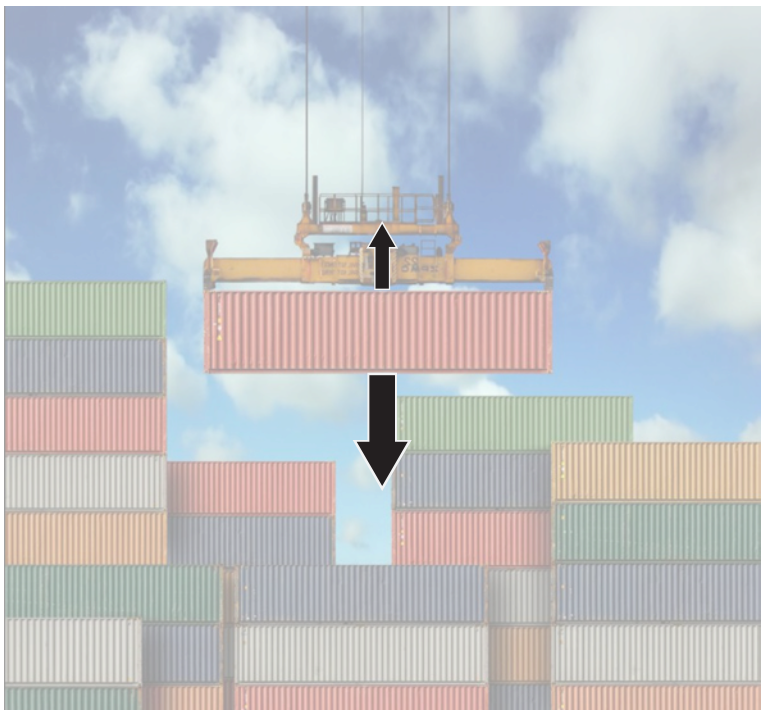
(c) E ai ki te hoahoa tōpana i raro, whakamāramahia te hono i waenga i te tōpana tapeke poutū ka pā ki te paepae, me te momo nekehanga ka puta, i te wā e **whakahekea** ana te paepae.

I tō tuhinga, me:

- whakamārama he aha te tikanga o te tōpana tapeke
- whakamārama i te hono i waenga i te ahunga o te tōpana tapeke poutū me te nekehanga.

MĀ TE KAIMĀKA ANAKE

Hoahoa tōpana



Ka haere tonu te Tūmahi Tuatoru i te whārangi 18.

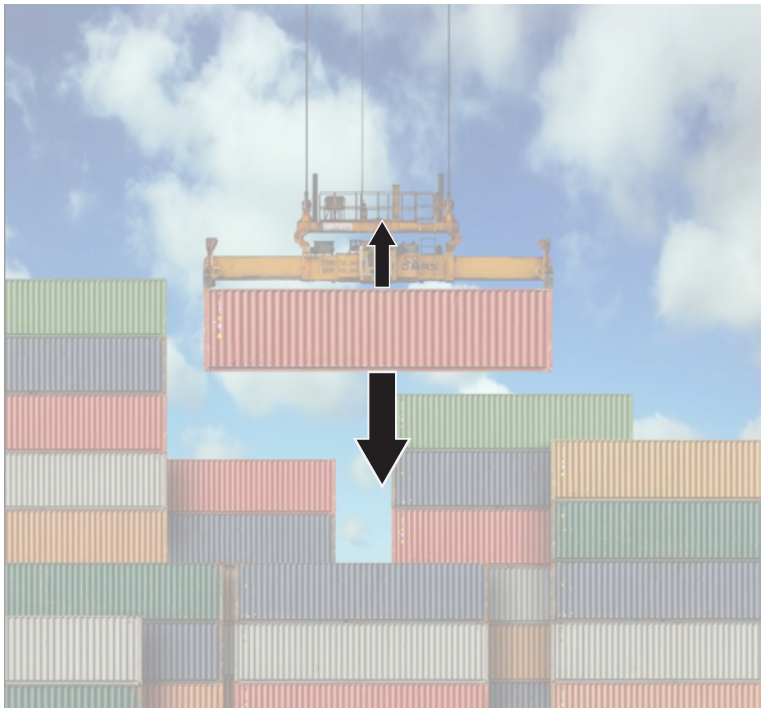
ASSESSOR'S USE ONLY

(c) Referring to the force diagram below, explain the link between the vertical net force acting on the container, and the type of motion produced, while the container is **being lowered**.

In your answer, you should:

- describe what is meant by net force
- explain the link between the direction of the vertical net force and motion.

Force diagram



Question Three continues on page 19.

(d) I te hiki te wakahiki i tētahi atu paepae, ā, ka motu te taura. He 15 mita te takahanga atu o te paepae 6500 kg ki te papa. E 970 000 J te pūngao neke o te paepae i mua tonu iho i te taunga ki te papa.

Tātaihia te pūngao o te paepae i mua i te momotutanga o te taura.

ME TE

Whakamārama he aha i rerekē ai te pūngao o te paepae i te wā e tāiri ana i te wakahiki ki te pūngao i mua tonu iho i te taunga atu ki te whenua.

MĀ TE KAIMĀKA ANAKE

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(d) The crane was lifting another container and the cable broke. The 6500 kg container fell 15 m to the ground below. The container had 970 000 J of kinetic energy just before it hit the ground.

Calculate the energy the container had before the cable broke.

AND

Explain why there is a difference in the energy of the container when it was hanging from the crane compared to just before it hit the ground.

He whārangi anō ki te hiahiatia.
Tuhia te (ngā) tau tūmahi mēnā e tika ana.

TAU TŪMAHI

MĀ TE KAIMĀKA ANAKE

Extra paper if required.
Write the question number(s) if applicable.

QUESTION NUMBER

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He whārangi anō ki te hiahiatia.
Tuhia te (ngā) tau tūmahi mēnā e tika ana.

TAU TŪMAHI

MĀ TE KAIMĀKA ANAKE

Extra paper if required.
Write the question number(s) if applicable.

QUESTION NUMBER

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English translation of the wording on the front cover

Level 1 Science, 2017

90940 Demonstrate understanding of aspects of mechanics

9.30 a.m. Wednesday 15 November 2017
Credits: Four

90940M

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of aspects of mechanics.	Demonstrate in-depth understanding of aspects of mechanics.	Demonstrate comprehensive understanding of aspects of mechanics.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

If you need more room for any answer, use the extra space provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–23 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.