

Student: _____

Date: _____

MECHANICAL ADVANTAGE STUDY QUESTIONS (HAULING SYSTEMS)

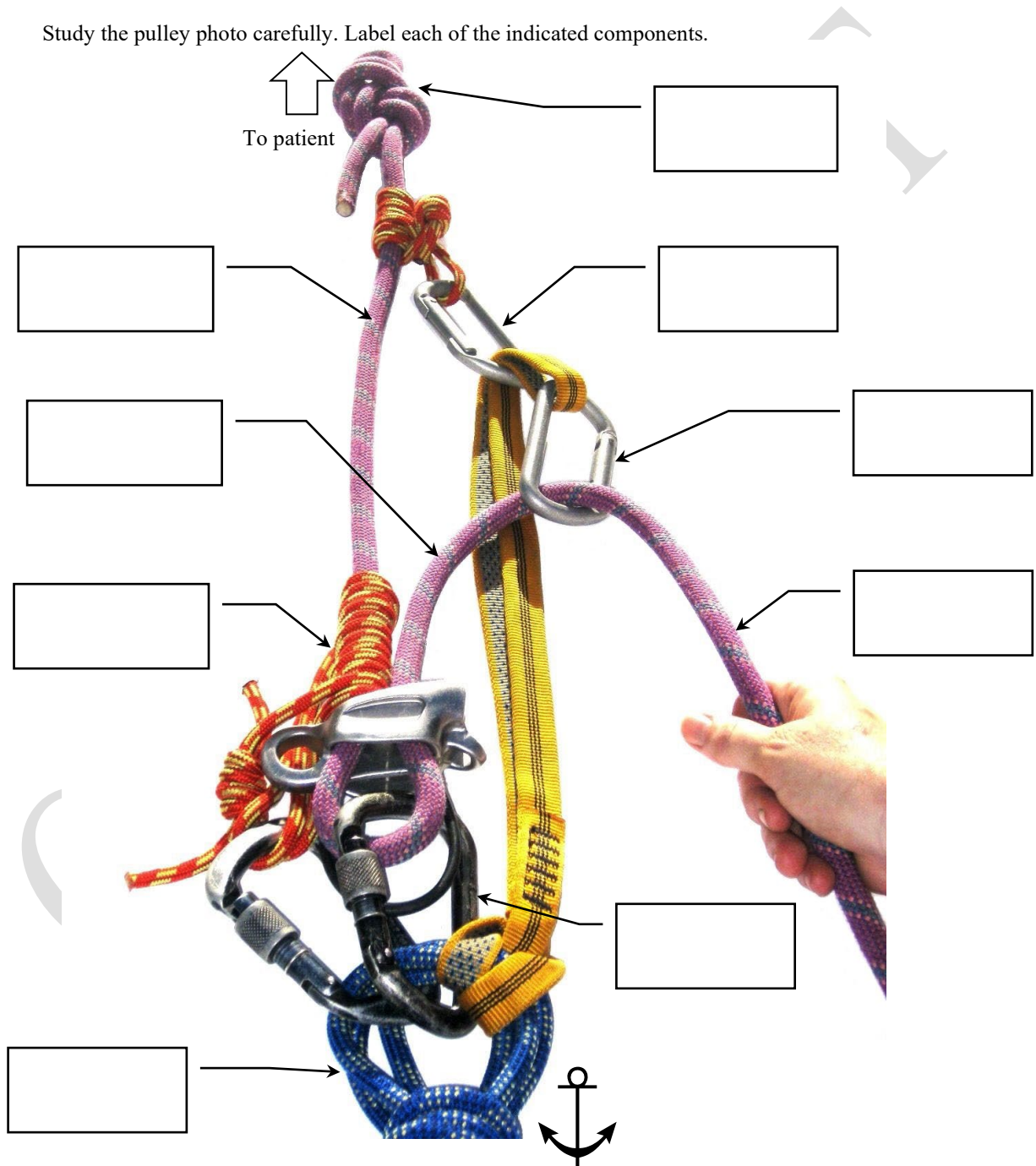
Time limit = 90 min

This series of study questions is designed to identify any gaps that may exist in your knowledge. Missed study questions may indicate that you require specific refresher training. Poor performance indicates that you are not yet ready to gain a qualification. Each missed study question must be thoroughly reviewed until competency is achieved.

Carefully read each question then choose the most correct answer. Your answers must be your own work.

Competency can be demonstrated by initially scoring 100% or by thoroughly reviewing each missed study question until competency is achieved. Write your answers in permanent ink.

Q1. Study the pulley photo carefully. Label each of the indicated components.



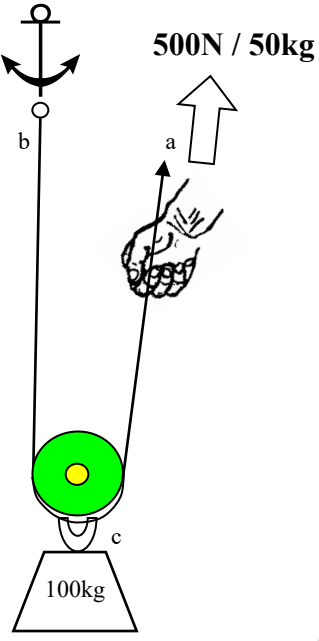
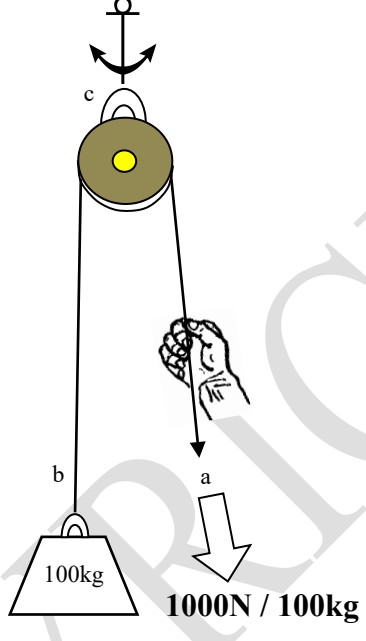
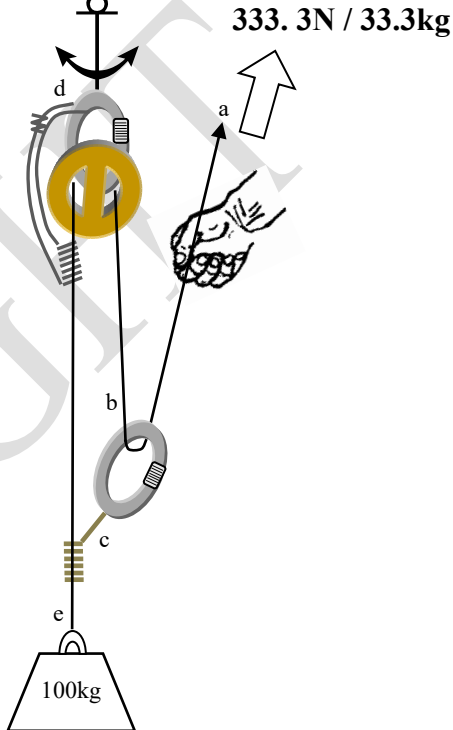
Q2. Study the pulley system above. Calculate the theoretical mechanical advantage (M.A.). Ignore friction.

M.A. = ____ : ____ Simple Compound Reciprocating

Note: You will be asked to explain how you arrived at your answer

Q3. Study the diagrams carefully.

Indicate the force (in Newtons or kilograms) that will occur at each of the anchors when holding the load in equilibrium (ie hovering). Also indicate the M.A. for each diagram. You must show your calculations (various points of interest have been marked with alphabet letters).

Diagram A	Diagram B	Diagram C
<p>_____ N /kg?</p> 	<p>_____ N /kg?</p> 	<p>_____ N /kg?</p> <p style="text-align: right;">333.3N / 33.3kg</p> 
M.A. = <input style="width: 50px; height: 20px;" type="text"/>	M.A. = <input style="width: 50px; height: 20px;" type="text"/>	M.A. = <input style="width: 50px; height: 20px;" type="text"/>

Q4. This question relates to Q3 above.

4a) Why is it important to establish solid and reliable anchors for a hauling system? Explain your answer.

4b) In terms of the forces transmitted through the hauling system, are they constantly fluctuating (ie changing) or remaining the same? Explain your answer.

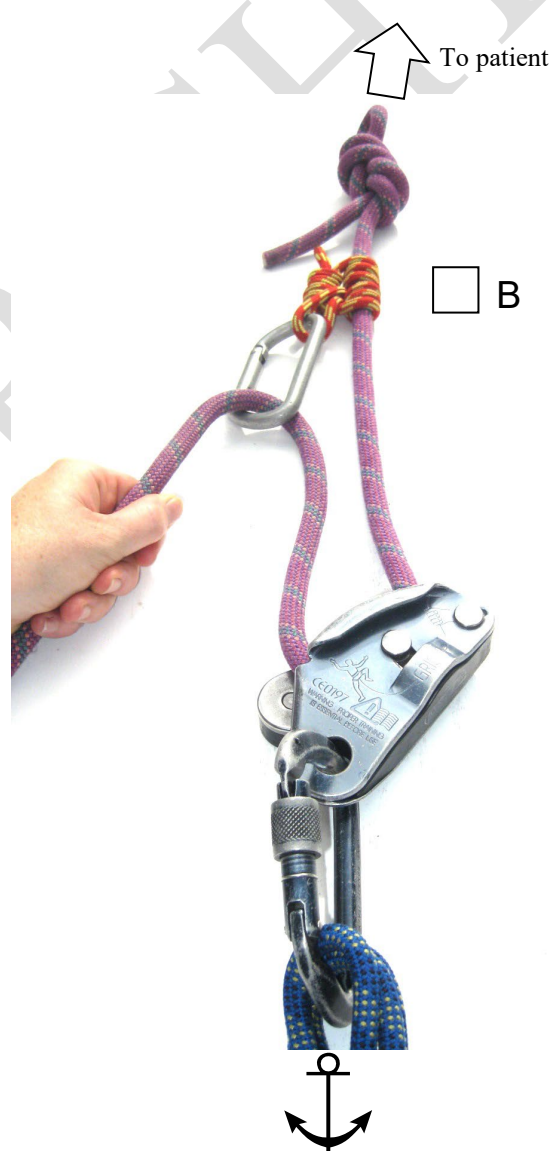
Q5. When discussing mechanical advantage (M.A.), we often use the terms ‘actual’, ‘theoretical’, and ‘ideal’ M.A. What is meant by those terms? Explain your answer...

Actual M.A.

Theoretical M.A.

Ideal M.A.

Q6. Study the photos carefully. Each system is incorporating a Petzl GriGri. Indicate which of the hauling systems will not work.



Explain your answer:

Q7. Study the photo carefully. Would this haul system be *effective* (would you actually be able to successfully haul a person a significant distance)?

Yes No



Explain your answer:

Q8. Study the photo carefully, then answer the questions where indicated...



8.1 What is the M.A. of this system?

8.2 What type of configuration is this system?

- A Simple
- B Compound
- C Reciprocating

8.3 Can this system be reset?

Yes No

Explain:

Q9. Study the photo carefully, and then answer the questions below:



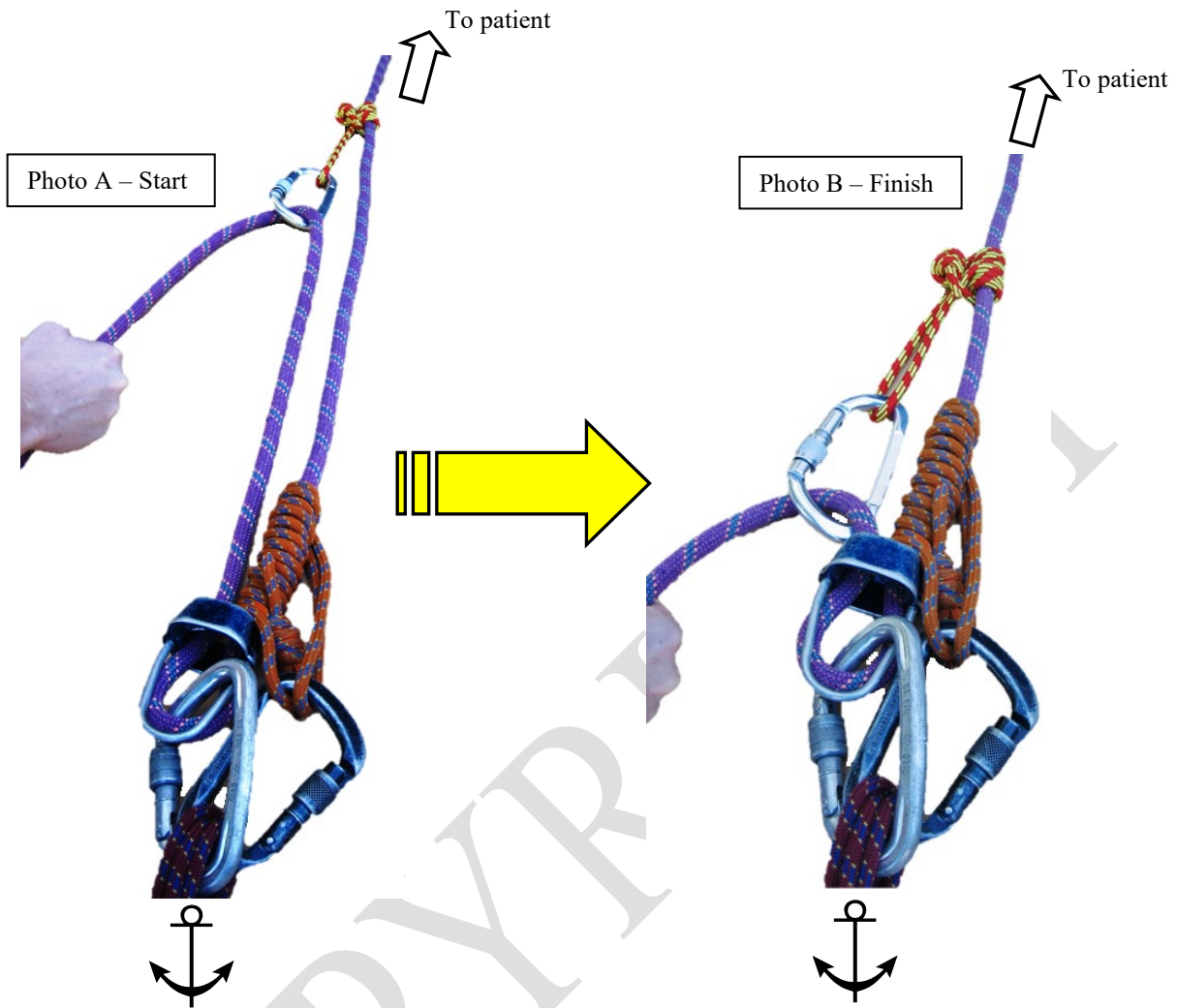
What is the M.A. of this system?

What type of system configuration is this? Simple Compound Reciprocating

What is the Velocity ratio? _____ : _____

Discuss the relationship between M.A. and *velocity ratio* (include information about the speed of the haul procedure):

Q10. Study the photos carefully, then answer the questions. Photo A is representing the starting position for the haul procedure.



Q10.1 When the position in photo B is reached, is it possible to continue hauling by pulling harder?
 Yes No

Q10.2 When the position in photo B is reached, what action must be taken?

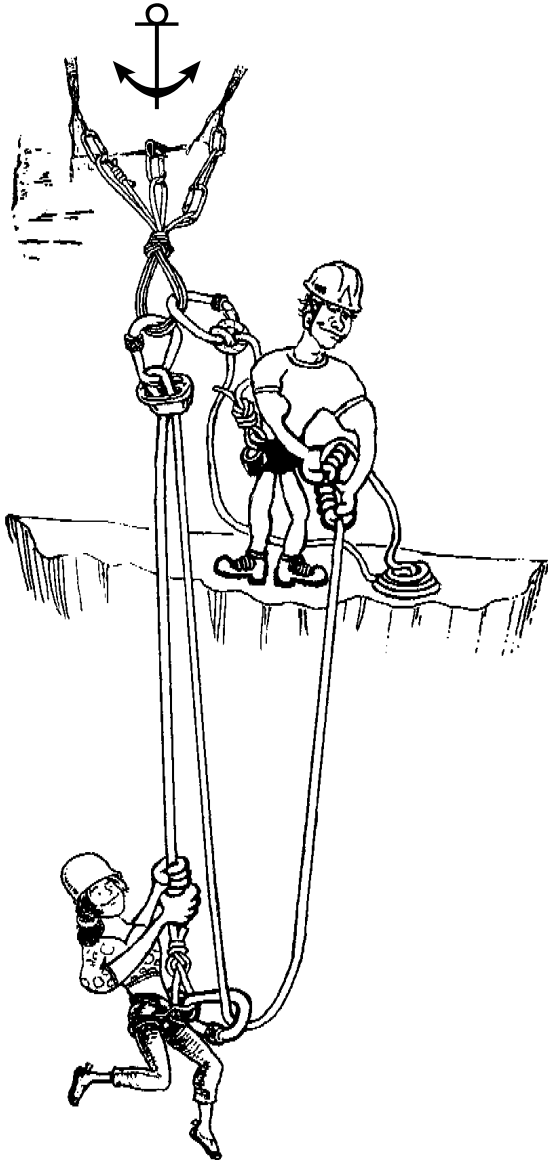
Q10.3 What is the M.A. of this system? M.A. =

Q11. You are climbing a 40m route using a *top managed* belay procedure. There is *no foot access* to the bottom of the cliff. The only way to access the start of the route is via an abseil descent. The climber found the crux section too difficult and could not complete the route. There are no alternative routes anywhere nearby. There is no way to walk back up to the top! You had to use an *assisted hoist* procedure.

Study the diagram carefully and identify any errors in the procedure (there may be more than one error).

Write your answers in the space provided.

Errors identified (list as many as you can identify):



Q11a. What is the M.A. of this system?

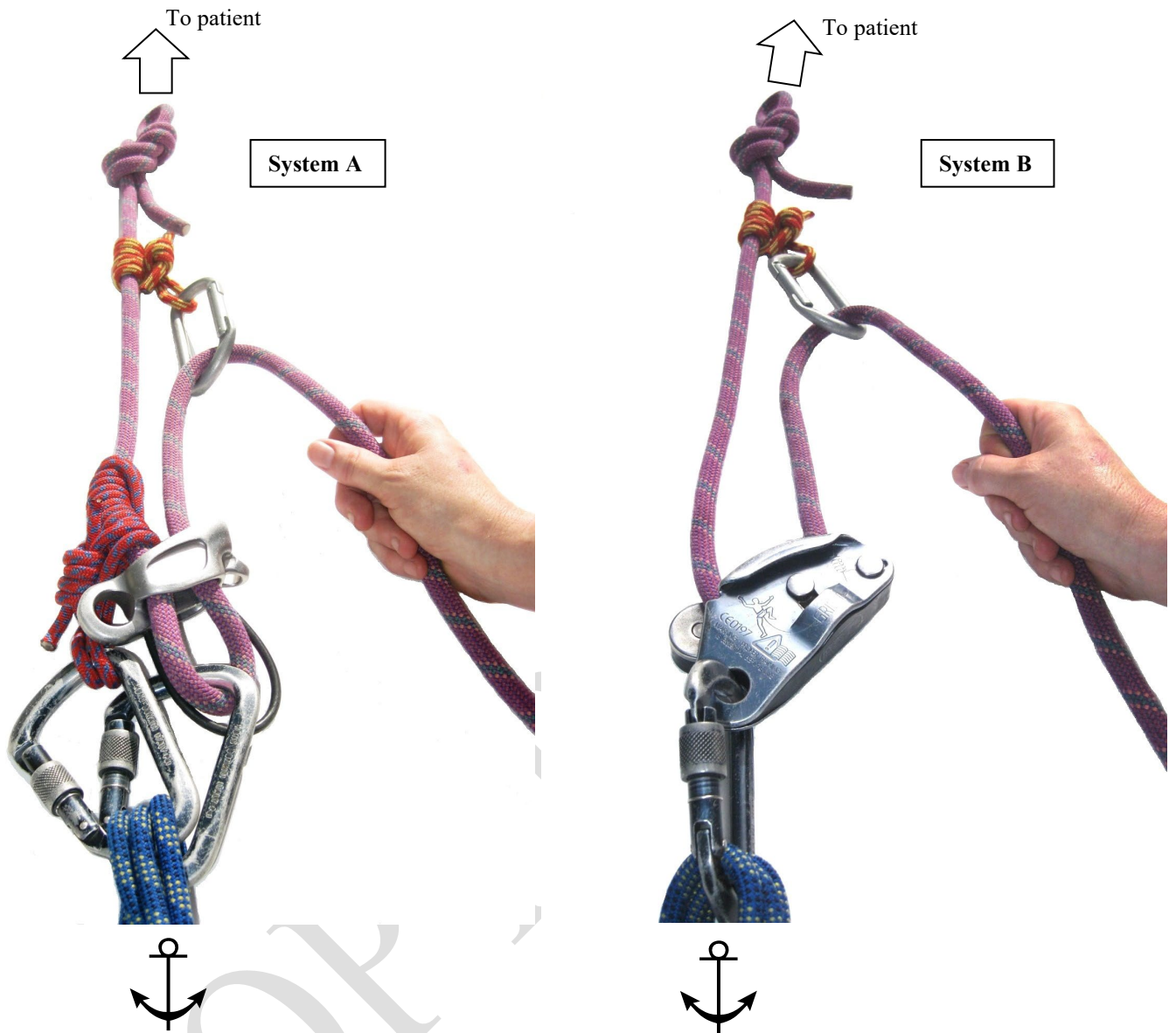
Q11b. What (if any) are the limitations of this particular hauling procedure?

Q12. Study the photos carefully. Which photo indicates the *correct* configuration?



Explain your answer:

Q13. Study the systems carefully. Discuss the advantages and disadvantages of each system (relative to each other).



System A:

Advantage: _____

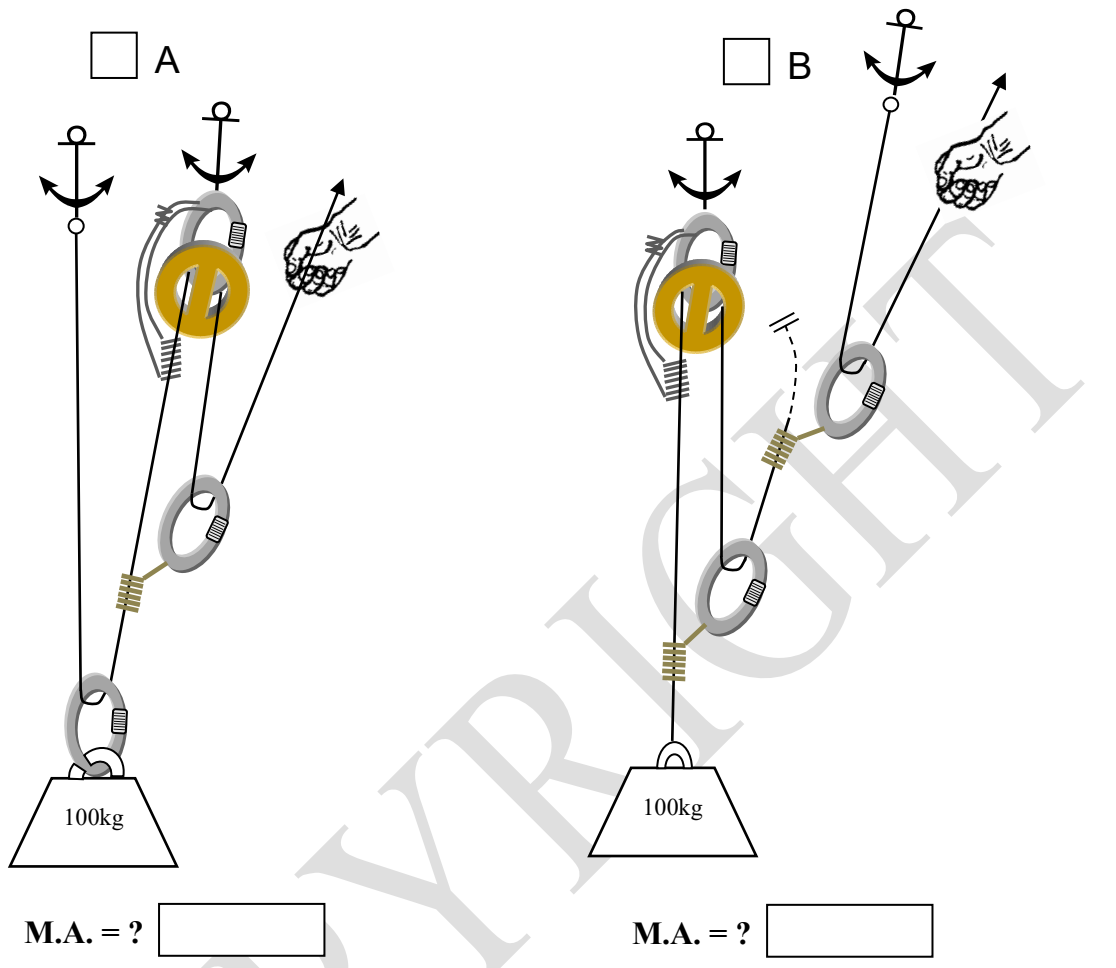
Disadvantage: _____

System B:

Advantage: _____

Disadvantage: _____

Q14. Study the diagrams carefully. Which system configuration will require fewer resets over the same haul distance (and hence be more efficient)? Indicate your answer (A or B). Also calculate the M.A. of each system. Indicate your answers in the spaces provided.



Explain your answer:

Q15. Study the diagrams carefully and compare their respective configurations. Answer each of the following questions and indicate your answers in spaces provided.

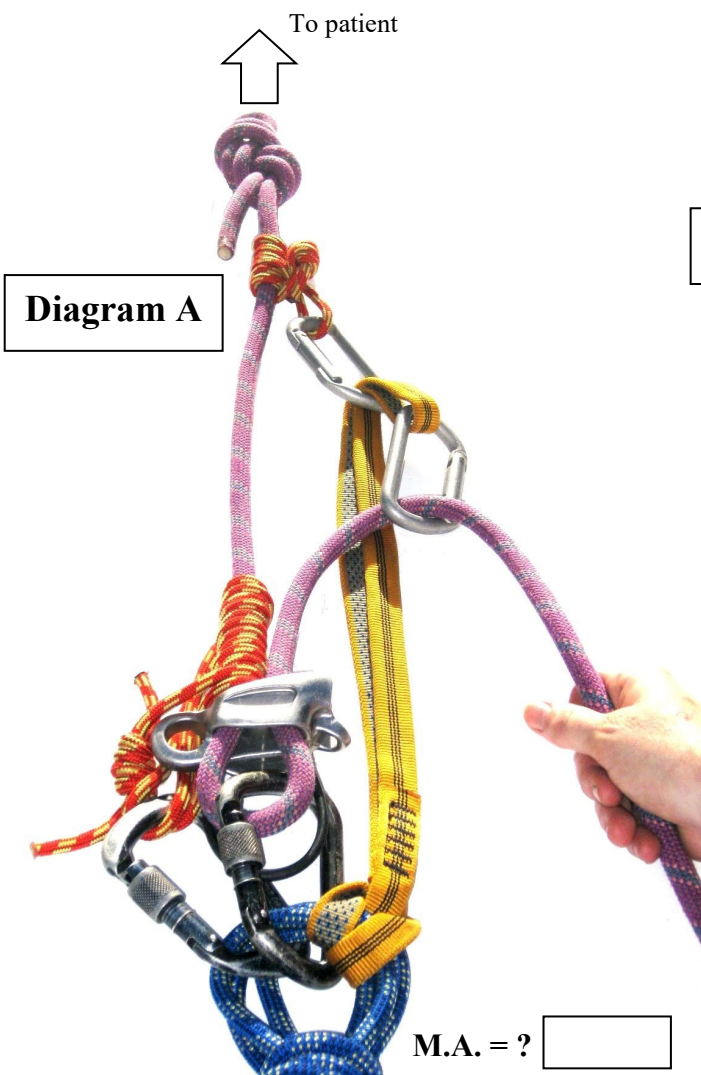
15.1 Which system will be more *efficient* (in terms of number of resets over same distance)?

A Explain your answer... _____

B Explain your answer... _____

15.2 Calculate the M.A. for each system (indicate your answers below).

15.3 List an advantage & disadvantage for each configuration (indicate your answers in the boxes below)?



Advantage:

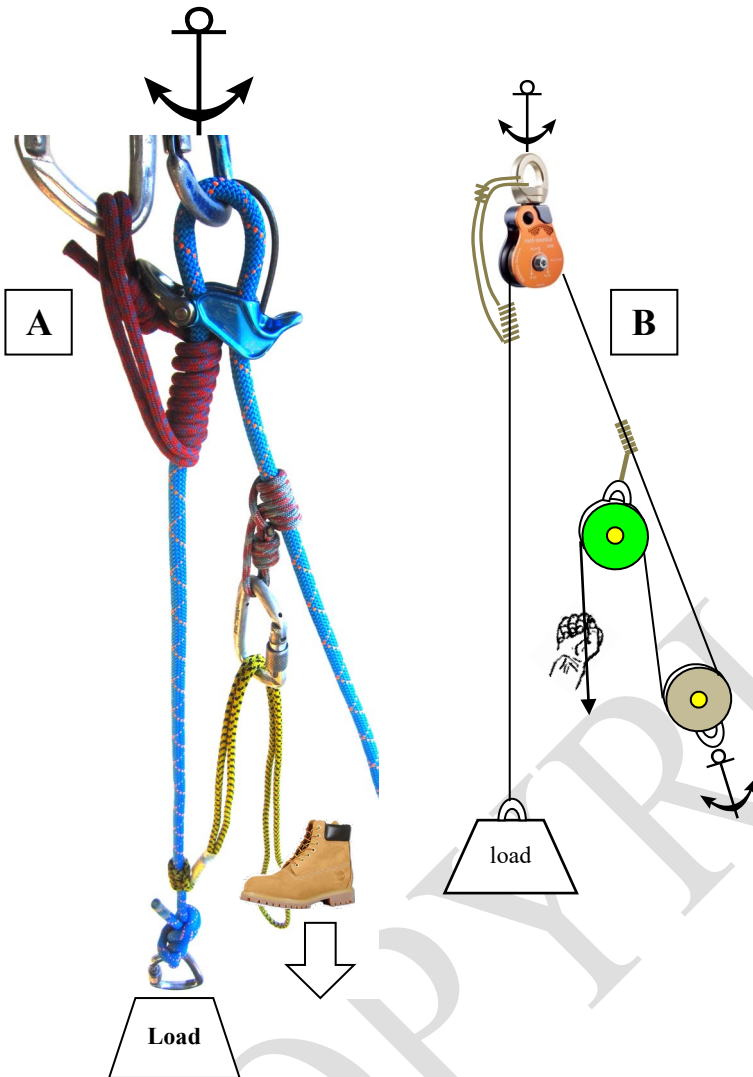
Disadvantage:



Advantage:

Disadvantage:

Q16. Study the photo carefully, then answer the questions where indicated.



16.1 What is the M.A. of system 'A'?

16.2 What is the M.A. of system 'B'?

16.3 What type of configuration is system A?
 A Simple
 B Compound
 C Reciprocating

16.4 What type of configuration is system B?
 A Simple
 B Compound
 C Reciprocating

16.5 How many moving pulleys does system 'A' have?

16.6 How many moving pulleys does system 'B' have?

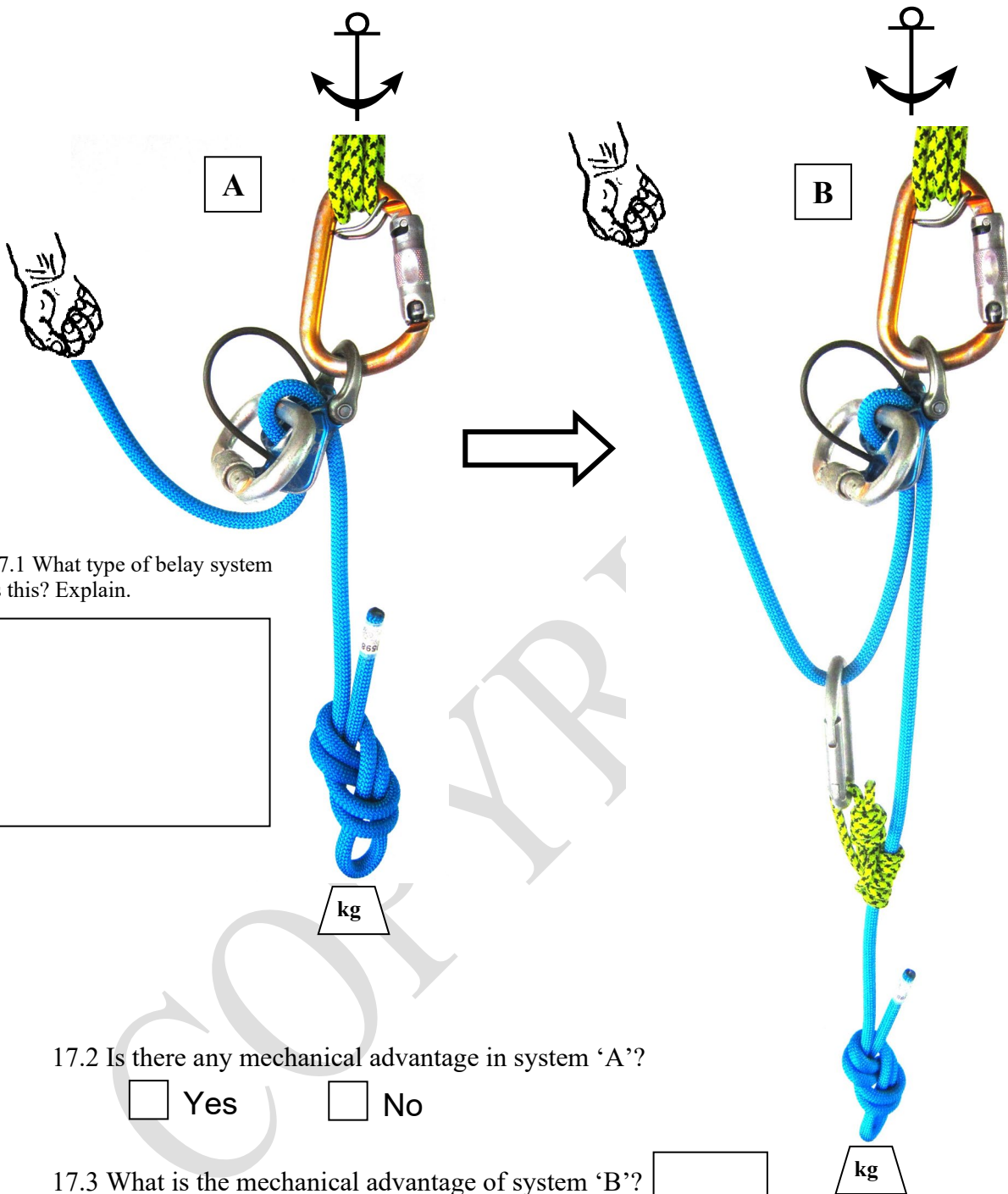
16.7 Which part is the moving pulley(s) attached to in system 'A'?

16.8 Which part is the moving pulley(s) attached to in system 'A'?

16.9 Describe a situation / context where system 'A' would be useful.

16.10 Could these systems be regarded as the same type or are they completely different? Explain:

Q17. Study the photo carefully, then answer the questions where indicated.



17.1 What type of belay system is this? Explain.

17.2 Is there any mechanical advantage in system 'A'?

Yes No

17.3 What is the mechanical advantage of system 'B'?

17.4 Is it possible to haul with system 'B', or will it jam? Would it be efficient? Explain.

Student statement:

I declare that I completed these study questions without the assistance of others. My answers represent my own work and not the work of someone else. I realise that I may owe a duty of care to others and that my knowledge and skill may be critical in implementing a successful rescue procedure. I further accept and realise that regular practice will be required to maintain my currency and that if I don't practice what I have learnt my capability will deteriorate.

Student signature: _____

Date: _____

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