

## Post Workshop Assignment

### Advanced Rope Rescue

#### – Anchor, Pulley and Belay

Course number:
Due by:
Workshop location:
Workshop dates:
Student name:
Contact: Hm phone – Cell phone – Email –

**Send completed assignments to:**

SARINZ,  
PO Box 8827,  
Riccarton,  
Christchurch.

**Contact for assistance:**

0800 4 SARINZ  
0800 4 727469  
info@sarinz.com  
www.sarinz.com

Post Workshop

# Introduction

## What is the purpose of this assignment?

This assignment aims to continue the process of applying theory to practical situations, and reflect on your learning from the workshop.

## How long do you get?

This assignment is due for completion 6 months after the practical workshop or as advised by SARINZ. Some of you may find the concepts here to be difficult and therefore be tempted to leave the assignment. It is therefore important that you start this assignment as soon as possible and ask for assistance early.

## How long will it take?

It is expected with reading, research, inquiry and answering the questions you are likely to put in several hours of work to complete this assignment.

## Access to a course instructor?

If you have any questions with regard to this post course assignment please make contact with one of your course instructors or alternately contact SARINZ.

## Assessment instructions

You need to answer every question and follow the instructions given in the tasks. This is an individual assignment and is to be your own work.

This assignment provides exercises for you to show that you are competent in part of the standards SAR3 125: Employ complex pulley systems in advanced rope rescue, SAR3 126: Employ rescue belay systems in advanced rope rescue, and SAR3 127: Employ advanced anchor systems in advanced rope rescue.

You will be assessed as competent (C), not yet competent (NYC) or insufficient evidence (IE). If you are assessed as competent then your pass will be forwarded to Tai Poutini Polytechnic Search and Rescue Programme; if you are assessed as not yet competent an instructor will work with you to achieve competence where possible. If not, the matter will be referred to the SARINZ Administration Officer to process. If there is insufficient evidence, for example not completing an assessment task then it will be dealt with similarly to not yet competent.



*Helping others save lives*



# Scenario 1 Car off the road

## Situation

A car has driven off the side of the road into a gorge. The base of the gorge is around 40m vertical down from the road. There is no access other than on rope. The gorge is too tight and too much loose material for a helicopter.

## Task A

You have been tasked to set up a pulley system for the raise back up the side of the gorge with a stretcher and a patient. Set up the an efficient pulley system with the equipment and space available.

## Resources for pulley system

- Prusik Minding Pulley (PMP) 50mm sheave 36kN
- Rescue Pulley, 50mm sheave x2 (0.85 efficient) 32kN
- Personal Pulley, 35mm sheave x2 (0.7 efficient) 24kN
- Tandem Prusiks x2 sets 8mm 15kN
- Anchor plate 50kN
- A fire truck parked half way across the road.
- 100m mainline 11mm rope 30kN
- Low directional edge protection.
- Cordalette 8mm 15kN
- Webbing 25mm 18kN
- Alloy carabiners 24kN
- 5 haulers

**1. Draw a plan view of the rescue site, the pulley system and rescue belay you intend to build (on the following page)?**

**2. What is the ideal mechanical advantage of the pulley system you have built?**

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**3. What is the practical mechanical advantage of the pulley system you have built using the efficiencies from the resources?**

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**4. How much rope have you used in the pulley system?**

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# Rigging worksheet

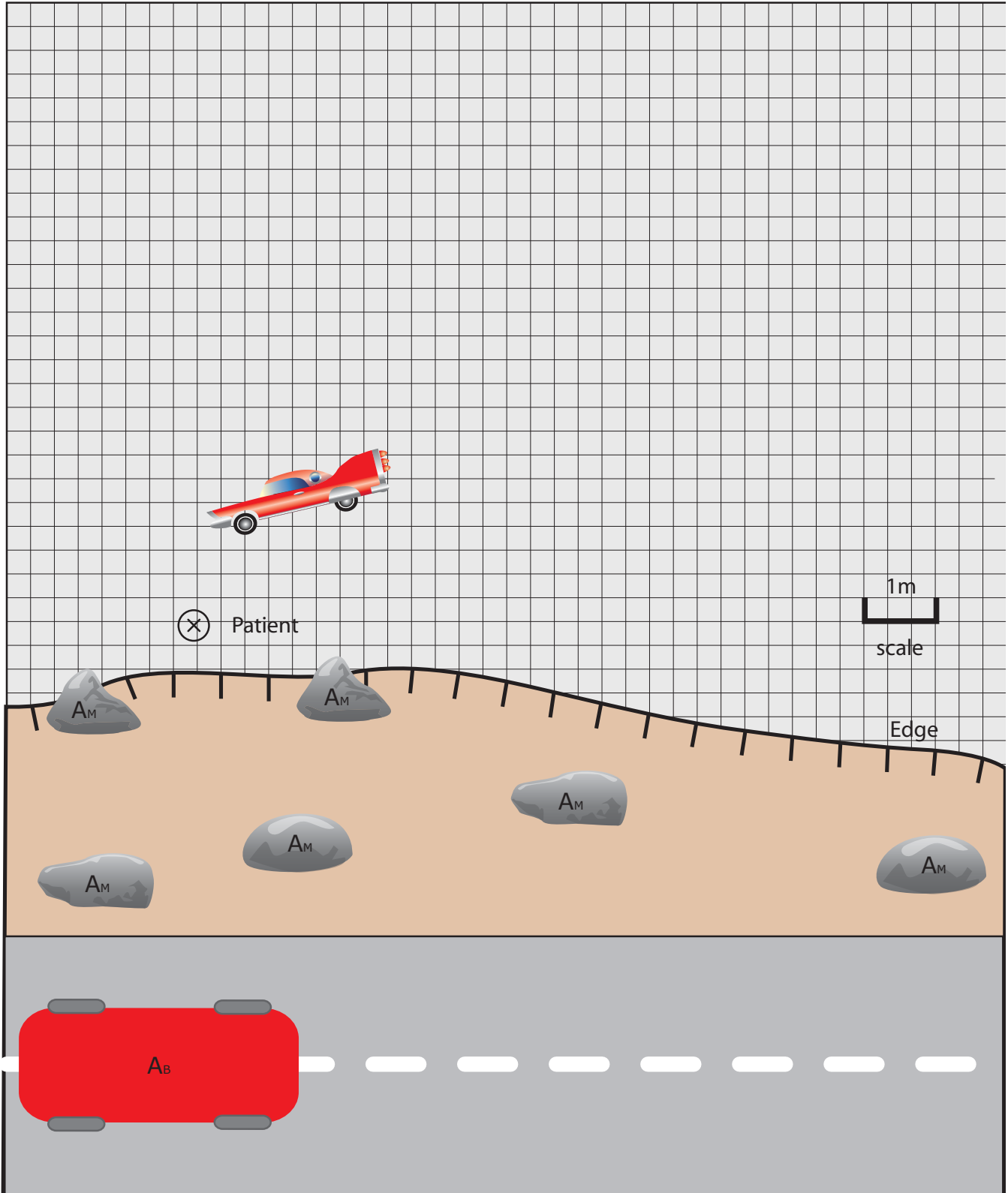
## KEY

- | MAINLINE
- ⋯ BELAYLINE
- ⊕ BELAY
- ┌┐ PRUSIK
- ⚡ BRAKE

- A ANCHOR
- A<sub>M</sub> MARGINAL ANCHOR
- A<sub>B</sub> BOMBPROOF ANCHOR
- A<sub>F</sub> FOCUSED ANCHOR
- A<sub>FT</sub> FRONT-TIE ANCHOR
- FT FRONT-TIE
- BT BACK-TIE

- P PRUSIK
- P<sub>R</sub> RATCHET PRUSIK
- P<sub>H</sub> HAUL PRUSIK
- H HAULER
- LD LOW DIRECTIONAL
- HD HIGH DIRECTIONAL
- R REDIRECT

- △<sub>2</sub> LOAD # PAX
- △ PMP
- ⊕ PULLEY
- ⌋ EDGE



## Task B

You have been tasked to set up a rescue belay system for the lower and raise back up the side of the gorge with a stretcher and a patient. Set up the an efficient rescue belay system that can protect the mainline in case of failure.

### Resources for rescue belay

- Cordalettes 8mm x 10m 15kN
- Tandem Prusiks x2 sets 15kN
- Anchor plate 50kN
- A fire truck parked half way across the road
- 60m belayline 11mm rope 30kN
- Edge protection
- Webbing 25mm 18kN
- Steel carabiners x2 50kN
- Alloy carabiners 30kN

**1. In placing the rescue belay where you have what consideration did you take into account? Why have you placed it where you did?**

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**2. Describe the rescue belay system you intend to set up. What are the elements?**

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## Task C

You have been tasked to undertake a systems analysis, estimate the load on the anchors and static system safety for the mainline.

- 3. On the rigging worksheet undertake a systems analysis showing all your working.**
- 4. If the load was 2kN what would the estimated static system safety factor be when the haulers are pulling on the rope? (Use the minimum breaking strengths from the equipment listed in the resources).**

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# Scenario 2 Crevasse rescue

## Situation

A climber has fallen 40m into a crevasse high on a mountain glacier. You have been dropped into site in two helicopter loads. The snow is soft and you are sinking in to your knees. There is a large parallel crevasse 10m from the crevasse with the fallen climber.

## Task A

You have been tasked to set up a pulley system for the raise back up the crevasse with a stretcher, attendant and a patient. Set up the an efficient pulley system with the equipment and space available (different to the pulley system in Scenario 1).

## Resources for pulley system

- Prusik Minding Pulley (PMP) 50mm sheave 36kN
- Rescue Pulley, 50mm sheave x4 (0.80 efficient) 32kN
- Tandem Prusiks x2 sets 15kN
- Anchor plate 50kN
- Standard snow stakes x6 (rate at 7kN strength each in the snow type).
- 80m mainline 11mm rope 30kN
- Low directional edge protection
- Cordalette 8mm 15kN
- Webbing 25mm 18kN
- Alloy carabiners 24kN
- 3 haulers

**5. Draw a plan view of the rescue site, the pulley system and rescue belay you intend to build (on the following page)?**

**6. What is the ideal mechanical advantage of the pulley system you have built?**

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**7. What is the practical mechanical advantage of the pulley system you have built using the efficiencies from the resources?**










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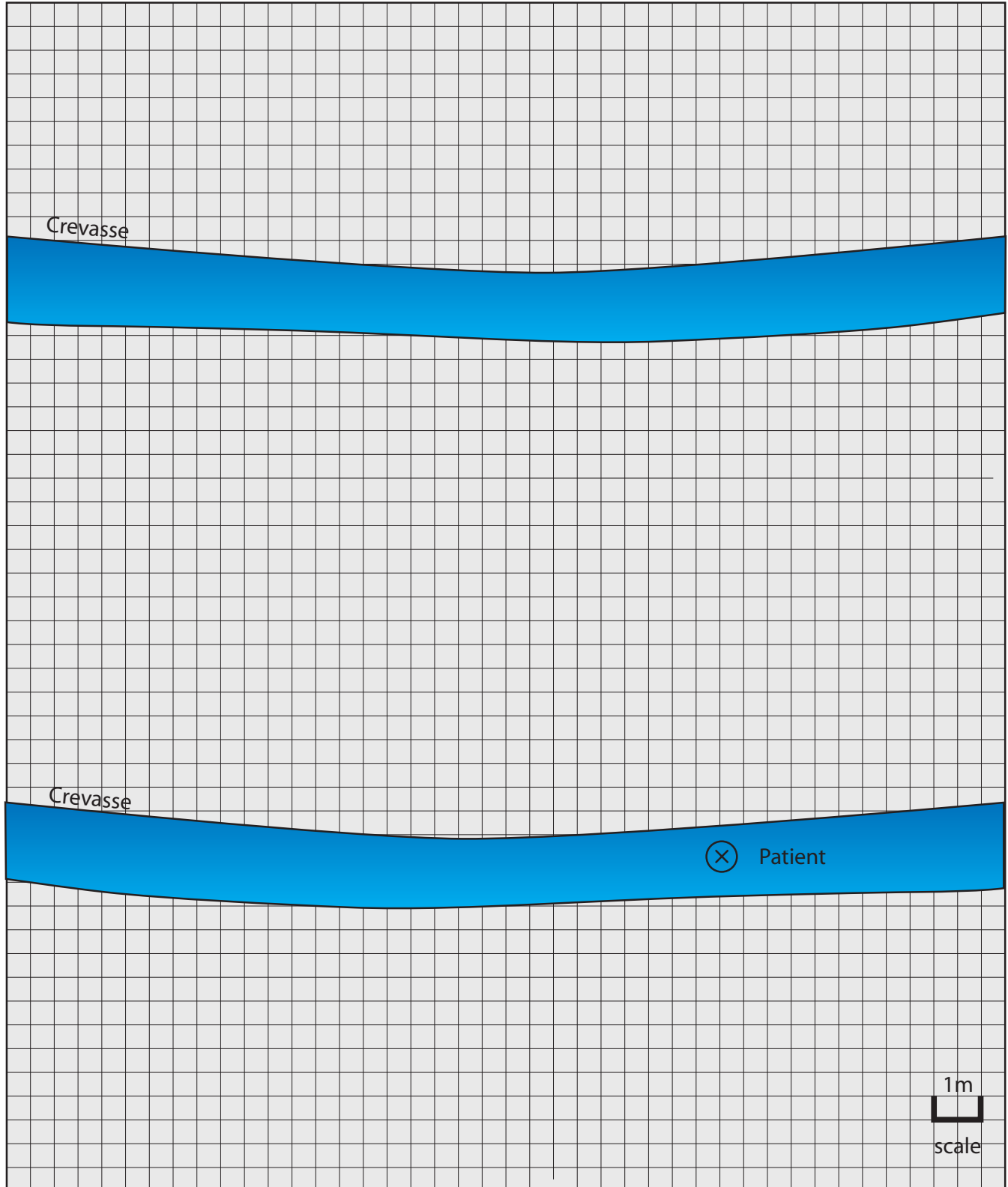
**8. How much rope have you used in the pulley system?**

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# Rigging worksheet

## KEY

	MAINLINE	<b>A</b>	ANCHOR	<b>P</b>	PRUSIK		LOAD # PAX
	BELAYLINE	<b>A<sub>M</sub></b>	MARGINAL ANCHOR	<b>P<sub>R</sub></b>	RATCHET PRUSIK		PMP
	BELAY	<b>A<sub>B</sub></b>	BOMBPROOF ANCHOR	<b>P<sub>H</sub></b>	HAUL PRUSIK		PULLEY
	PRUSIK	<b>A<sub>F</sub></b>	FOCUSED ANCHOR	<b>H</b>	HAULER		EDGE
	BRAKE	<b>A<sub>FT</sub></b>	FRONT-TIE ANCHOR	<b>LD</b>	LOW DIRECTIONAL		
		<b>FT</b>	FRONT-TIE	<b>HD</b>	HIGH DIRECTIONAL		
		<b>BT</b>	BACK-TIE	<b>R</b>	REDIRECT		



## Task B

You have been tasked to set up a rescue belay system for the lower and raise back up the crevasse with a stretcher and a patient. Set up the an efficient rescue belay system that can protect the mainline in case of failure.

### Resources for rescue belay

- Jigger 24kN
- Tandem Prusik set 15kN
- Standard snow stakes x3 (rate at 7kN strength each in the snow type).
- 50m belayline 11mm rope 30kN
- Edge protection
- Cordalette 10m x 8mm 15kN
- Webbing 25mm 18kN
- Steel carabiners x 2 50kN
- Alloy carabiners 24kN

**9. In placing the rescue belay where you have what consideration did you take into account? Why have you placed it where you did?**

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**10. Describe the rescue belay system you intend to set up. What are the elements?**

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## Task C

You have been tasked to undertake a systems analysis, estimate the load on the anchors and static system safety for the mainline.

- 11. On the rigging worksheet undertake a systems analysis showing all your working.**
- 12. If the load was 2kN what would the estimated static system safety factor be when the load is being reset? (Use the minimum breaking strengths from the equipment listed in the resources).**

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# Scenario 3 Cave rescue

## Situation

A caver needs to be evacuated up to safety after a fall hurting their leg. Your team has been tasked with setting up a 30m pitch of the rescue effort. The patient is expected to arrive at the pitch in about 1.5hrs and you need to be ready to clip the stretcher on and start hauling.

## Task A

You have been tasked to set up a pulley system for the raise the patient up the pitch. Due to the pitch narrowing half way up your team leader has decided that the patient should be pulled up by themselves with a the attendant ascending along side to guide the stretcher. Set up the an efficient pulley system with the equipment and space available. (different to the pulley system in Scenario 1 and 2).

## Resources for pulley system

- Prusik Minding Pulley (PMP) 50mm sheave 36kN
- Personal Pulley, 30mm sheave x4 (0.70 efficient) 24kN
- Tandem Prusiks x2 sets 8mm 15kN
- Anchor plate 50kN
- Rock anchors
- 80m mainline 11mm rope 30kN
- Natural high directional
- Cordalette 8mm 15kN
- Webbing 25mm 18kN
- Alloy carabiners 28kN
- 4 haulers

**13. Draw a plan view of the rescue site, the pulley system and rescue belay you intend to build (on the following page)?**







**14. What is the ideal mechanical advantage of the pulley system you have built?**

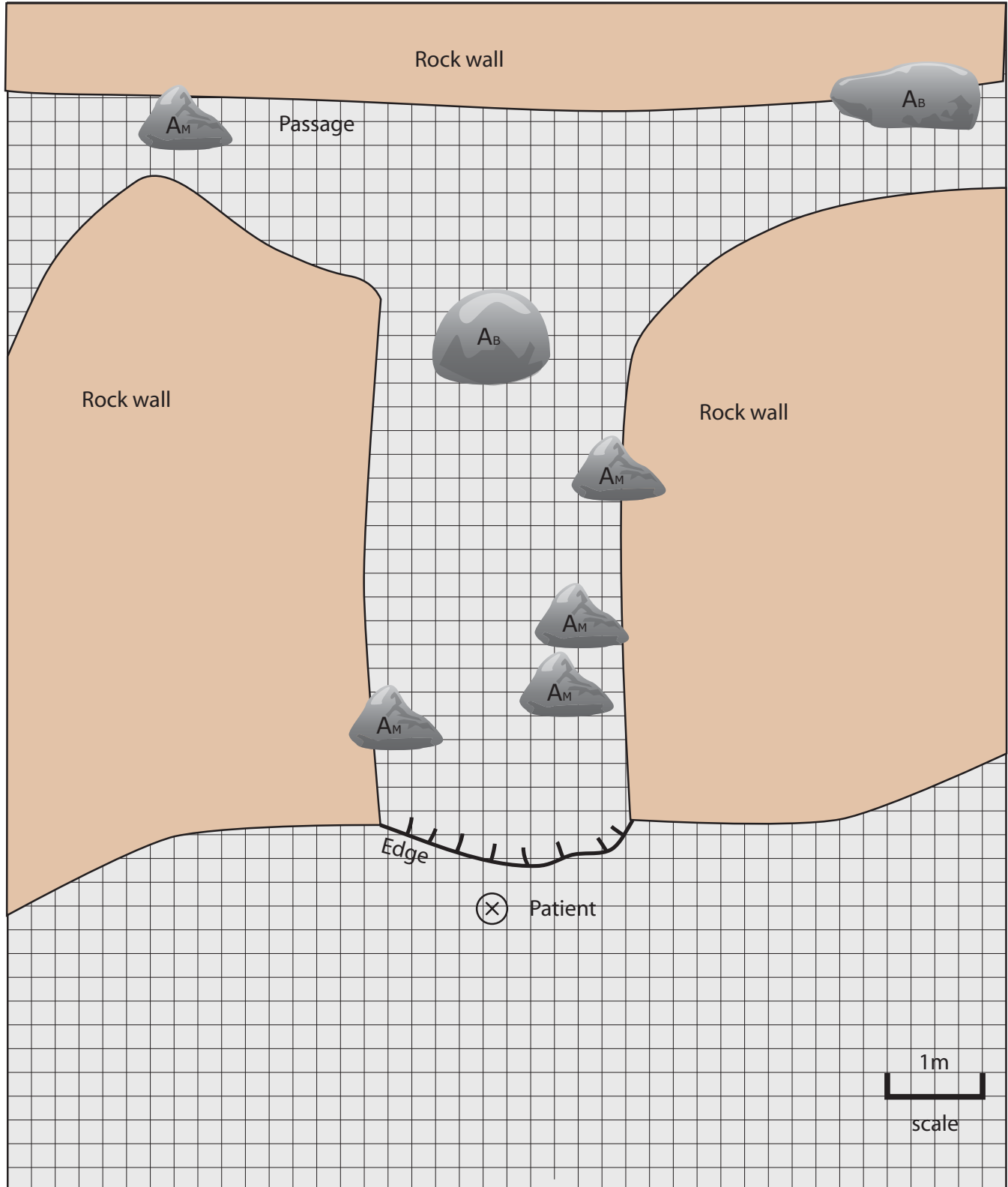
**15. What is the practical mechanical advantage of the pulley system you have built using the efficiencies from the resources?**

**16. How much rope have you used in the pulley system?**

# Rigging worksheet

## KEY

	MAINLINE	A	ANCHOR	P	PRUSIK		LOAD # PAX
⋯	BELAYLINE	A <sub>M</sub>	MARGINAL ANCHOR	P <sub>R</sub>	RATCHET PRUSIK		PMP
⊕	BELAY	A <sub>B</sub>	BOMBPROOF ANCHOR	P <sub>H</sub>	HAUL PRUSIK		PULLEY
	PRUSIK	A <sub>FT</sub>	FOCUSED ANCHOR	H	HAULER		EDGE
	BRAKE	FT	FRONT-TIE	LD	LOW DIRECTIONAL		
		BT	BACK-TIE	HD	HIGH DIRECTIONAL		
				R	REDIRECT		



## Task B

You have been tasked to set up a rescue belay system for the raise up the cave pitch with a patient. Set up the an efficient rescue belay system that can protect the mainline in case of failure.

### Resources for rescue belay

- Cordalette 8mm x 10m 15kN
- Tandem Prusik set 8mm 15kN
- Rock anchors
- 40m belayline 11mm rope 30kN
- Edge protection
- Webbing 25mm 18kN
- Steel carabiners x2 50kN
- Alloy carabiners 24kN

**17. In placing the rescue belay where you have what consideration did you take into account? Why have you placed it where you did?**

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**18. Describe the rescue belay system you intend to set up. What are the elements?**

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## Task C

You have been tasked to undertake a systems analysis, estimate the load on the anchors and static system safety for the mainline.

19. On the TSO worksheet undertake a systems analysis showing all your working.
20. If the load was 1kN what would the estimated static system safety factor be when the haulers are pulling on the rope? (Use the minimum breaking strengths from the equipment listed in the resources).

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# Advanced Rope Rescue – Assessment – Student Results

<p>This column lists the performance criteria that the student will have to demonstrate to the assessor to be deemed competent.</p> <p>A student must be assessed as competent in all aspects to be awarded the standard.</p>	<p>This column records your results. If you wish to challenge the findings of the assessor you can either make a statement on this page or attach it to this record. This will go to the Tai Poutini Polytechnic SAR Programme Coordinator.</p>
Competency Demonstrated	Results of Exercises
<b>Scenario 1 Car off the road</b>	
Task A Pulley system	C / NYC
Task B Belay system	C / NYC
Task C Systems analysis	C / NYC
<b>Scenario 2 Crevasse rescue</b>	
Task A Pulley system	C / NYC
Task B Belay system	C / NYC
Task C Systems analysis	C / NYC
<b>Scenario 2 Cave rescue</b>	
Task A Pulley system	C / NYC
Task B Belay system	C / NYC
Task C Systems analysis	C / NYC
Assessor comments	
Assessor name:	
Assessor signature:	
Date:	

The following can be used when the student wishes to challenge the findings of the assessor:

<p>Student: I have sighted my assessment result above and wish to challenge the findings of the assessor. I have made a statement, which is attached.</p>	
Signed Student:	Date:
<p>Student statement</p>	