

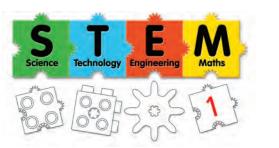
Based on the UK National Curriculum with Educational and Fun Activities





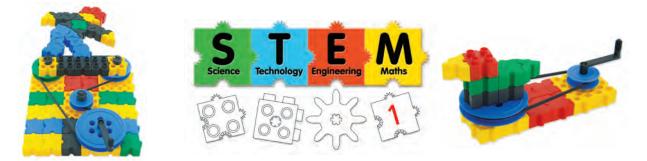
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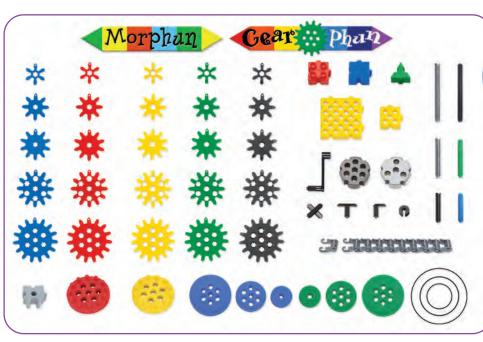
LT396 VI 09/20



Morphun Gearphun Junior Activity Workcards Chapter 6 Pulleys

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Storehouse Sheet - Pieces required for Activities Page 12



Gearphun Range of Brick Pieces - (Not all sets have all pieces shown).



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Area of Learning: STEM

Duration: 30 minutes

Learning Intentions:

- To explore the basic physics of movement and rotation *(including the effects of friction, creating power)*, and how simple machines need and use pulleys.
- To be able to know the difference between two numbers.

Resources: Morphun - Gearphun Junior Box; instructions for Pulleys Model Level 6A.

Key Vocabulary: Pulleys, Pulley Bands, Diameter, 25 Hole Square, Flat Square, Long Joiners, Long Axle, Squares with Studs, Triangle, Wheels, Handle, Chain Links, End Cap, 5 Hole Square, Spinning Gears and Driving Gears 'T' Joiner, Medium Joiner, Directions, Clockwise, Anticlockwise.

Introduction:

Lesson Structure

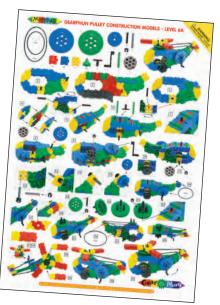
- Using the numbers 12 and 17 on a number line, ask the pupils to find out the difference (*answer: 5*). Have several of these equations up on the board for the pupils to answer.
- Have a pre-built example of the model you will be building, to show the pupils what the end result will look like.



Activity Sheet 1

- Have pupils build model Level 6A (*front of sheet*), steps 1-23. It may help to divide the groups to start with, to build steps 1, 2, and 3 separately.
- 1. Question: What happens when you turn the handle clockwise?
- 2. Question: What happens when you turn the handle anticlockwise?
- Keep the models that pupils have built for the next session.





Gearphun Pulley Construction Models 6A

Plenary: Storehouse Sheet - At the end of selected activities have the pupils fill out the sheet noting down how many of each part was used.			
Differentiation	-		
Easy	-	How many of each were used.	
Medium	-	How many of each were used plus naming the brick pieces used.	
Hard	-	How many of each were used, naming the brick pieces and matching up the bottom box (Joiners, Axles).	



Free play: Let pupils experiment with the remaining blocks in the set.

ANSWERS: Have each group answer questions 1 & 2 on their table before discussing with the whole class. (The teacher may cover this when making copies).

- 1. The helicopter's tail at the back turns clockwise, because the pulleys are connected by a pulley belt; the small black piece on the other side of the back brick turns anticlockwise.
- 2. The helicopter's tail at the back turns anticlockwise, because the pulleys are connected by a pulley belt; the small black piece on the other side of the back brick turns clockwise.



Area of Learning: STEM

Duration: 30 minutes

Learning Intentions:

- To explore the basic physics of movement and rotation *(including the effects of friction, creating power)*, and how simple machines need and use pulleys.
- To be able to know the difference between two numbers.

Resources: Morphun - Gearphun Junior Box; instructions for Pulleys Model Level 6A.

Key Vocabulary: Pulleys, Pulley Bands, Diameter, 25 Hole Square, Flat Square, Long Joiners, Long Axle, Squares with Studs, Triangle, Wheels, Handle, Chain Links, End Cap, 5 Hole Square, Spinning Gears and Driving Gears 'T' Joiner, Medium Joiner, Directions, Clockwise, Anticlockwise.

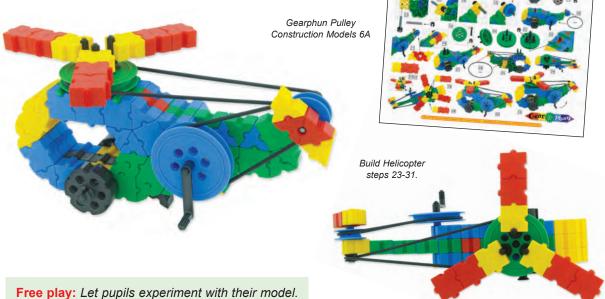
Lesson Structure

- Using the numbers 12 and 17 on a number line, ask the pupils to find out the difference *(answer: 5).* Have several of these equations up on the board for the pupils to figure out.
- Hand out the models that pupils built in Session 1 and explain that you will be working with these models.
- Have a pre-built example of the model you will be building, to show the pupils what the end result will look like.

Activity Sheet 2

Introduction:

- Have pupils build steps 23-31.
- 1. Question: What happens when you turn the handle clockwise?
- 2. Question: What happens when you turn the handle anticlockwise?



ANSWERS: Have each group answer questions 1 & 2 on their table before discussing with the whole class. (The teacher may cover this when making copies).

- 1. The blades on the top of the helicopter turn anticlockwise.
- 2. The blades on the top of the helicopter turn clockwise.



Area of Learning: STEM

Duration: 30 minutes

Learning Intentions:

- To explore the basic physics of movement and rotation *(including the effects of friction, creating power),* and how simple machines need and use pulleys.
- To be able to count in 10s.
- To be able to experiment with different sized pulleys (30, 50, 70).
- To know the difference between clockwise and anticlockwise.

Resources: Morphun - Gearphun Junior Box; instructions for Pulleys Model Levels 3A, 4A.

Key Vocabulary: Pulleys, Pulley Bands, Diameter, 25 Hole Square, Flat Square, Long Joiners, Long Axle, Squares with Studs, Triangle, Wheels, Handle, Chain Links, End Cap, 5 Hole Square, Spinning Gears and Driving Gears 'T' Joiner, Medium Joiner, Directions, Clockwise, Anticlockwise.

Introduction:

Lesson Structure

• Divide the class into groups and give each group one of the following challenges to complete. Each challenge should have at least one pulley belt included.

Activity Sheet 3

- 1. Challenge: 1. Build a model that has two pulleys that turn in the same direction.
- 2. Challenge: 2. Build a model that has two pulleys that turn in the same direction and one wheel that turns in the opposite direction.
- Additional tips:
 - Pupils can use as many pieces and whatever sized pulleys/pulley bands they want to.
 - Encourage pupils to be creative with their model, for example, making one that looks like a helicopter.
 - If a group completes their challenge quickly, have them try another challenge, or help the other groups with their challenges.
- When pupils have finished their models, test them as a class to see if the challenge has been completed.
 - If the model works as it should, discuss how and why.
 - If the model doesn't work as it should, ask the class to discuss why and how it could be fixed.



- **ANSWERS:** (The teacher may cover this when making copies).
- 1. An example would be Model Level 3A (top half of the sheet).
- An example would be Model Level 4A (back of sheet).



Area of Learning: STEM

Duration: 30 minutes

Learning Intentions:

- To explore the basic physics of movement and rotation *(including the effects of friction, creating power)*, and how simple machines need and use pulleys.
- To be able to complete one of the challenges.
- To be able to discuss the positives and negatives to their models.

Resources: Morphun - Gearphun Junior Box; instructions for Pulleys Model Levels 4A & 6A.

Key Vocabulary: Pulleys, Pulley Bands, Diameter, 25 Hole Square, Flat Square, Long Joiners, Long Axle, Squares with Studs, Triangle, Wheels, Handle, Chain Links, End Cap, 5 Hole Square, Spinning Gears and Driving Gears 'T' Joiner, Medium Joiner, Directions, Clockwise, Anticlockwise.

Introduction:

Lesson Structure

• Divide the class into groups and give each group one of the following challenges to complete. Each challenge should have at least one pulley belt included.

Activity Sheet 4

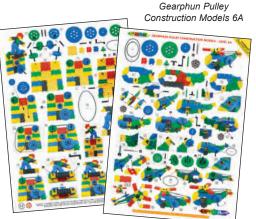
1. Challenge: **1.** Build a model that has two pulleys that turn in the same direction and one wheel that turns in the opposite direction.

2. Challenge: 2. Build a model that uses a pulley belt to change the angle of motion (e.g. where one wheel is vertical, and one wheel is horizontal).

- Additional tips:
 - Pupils can use as many pieces and whatever sized pulleys/pulley bands they want to.
 - Encourage pupils to be creative with their model, for example, making one that looks like a helicopter.
 - If a group completes their challenge quickly, have them try another challenge, or help the other groups with their challenges.
- When pupils have finished their models, test them as a class to see if the challenge has been completed.
 - If the model works as it should, discuss how and why.
 - If the model doesn't work as it should, ask the class to discuss why and how it could be fixed.



Free play: Encourage pupils to try out each other's models.



Gearphun Pulley Construction Models 4A

ANSWERS: (The teacher may cover this when making copies).

- 1. An example would be Model Level 4A (back of sheet).
- 2. An example would be Model Level 6A (front of sheet).

Ask the pupils to fill out the 'Plenary' exercise shown on Page 2 for this activity.

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Area of Learning: STEM

Duration: 30 minutes

Learning Intentions:

- To explore the basic physics of movement and rotation *(including the effects of friction, creating power),* and how simple machines need and use pulleys.
- To be able to measure and cut a piece of string to 60cm.
- To be able to tie the string onto the wheel and object.

Resources: Morphun - Gearphun Junior Box; instructions for Pulleys Model Level 4A, ruler *(CM)*, scissors, string.

Key Vocabulary: Pulleys, Pulley Bands, Diameter, 25 Hole Square, Flat Square, Long Joiners, Long Axle, Squares with Studs, Triangle, Wheels, Handle, Chain Links, End Cap, 5 Hole Square, Spinning Gears and Driving Gears 'T' Joiner, Medium Joiner, Directions, Clockwise, Anticlockwise, String.

Lesson Structure

Introduction:

- Start by having each pupil measure and cut a piece of string of 60cms.
- Practice threading the string through the hole of the 50mm wheel (step 15) (pupils may need to take turns to do this).

Gearphun Pulley Construction Models 4A

Step 18

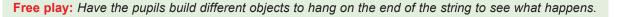
• Have a pre-built example of the model you will be building, to show the pupils what the end result will look like.

Activity Sheet 5

• In pairs have the pupils build the fish (step 16).

- Have pupils build model Level 4A (top front of sheet), steps 1-13.
- Tie the other end of the string to the fish, as shown in step 18. Do not attach the wheel to the model yet.
- Have pupils hold the wheel with the string attached, and put it over the small wheel, so that when they pull/release the string, the fish moves up or down.
- 1. Question: What happens when you pull the string?
- 2. Question: What happens when you release the string?
- Keep the models that pupils have built for the next session.





ANSWERS: Let the pupils experiment and discuss what is happening. Ask one table question 1 and another table question 2. (The teacher may cover this when making copies).

- 1. The fish moves up.
- 2. The fish moves down.



Step 13

P6



Area of Learning: STEM

Duration: 30 minutes

Learning Intentions:

• To explore the basic physics of movement and rotation *(including the effects of friction, creating power)*, and how simple machines need and use pulleys.

Resources: Morphun - Gearphun Junior Box; instructions for Pulleys Model Level 4A, ruler *(CM)*, scissors, string.

Key Vocabulary: Pulleys, Pulley Bands, Diameter, 25 Hole Square, Flat Square, Long Joiners, Long Axle, Squares with Studs, Triangle, Wheels, Handle, Chain Links, End Cap, 5 Hole Square, Spinning Gears and Driving Gears 'T' Joiner, Medium Joiner, Directions, Clockwise, Anticlockwise, String.

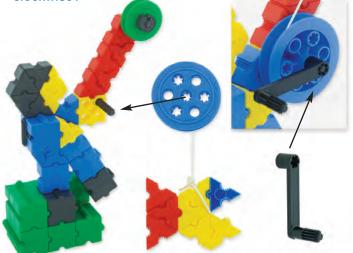
Introduction:

Lesson Structure

- Hand out the models that pupils built in Session 5 and explain that you will be working with these models.
- Have a pre-built example of the model you will be building, to show the pupils what the end result will look like.

Activity Sheet 6

- Have pupils add the wheel tied to the string to their model, as shown in steps 17-21. They may need to wrap the string around the wheel. Start with the fish in the position shown in step 21.
- 1. What happens when you turn the handle one full turn anticlockwise?
- 2. What happens when you turn the handle one full turn clockwise?







Free play: Have the pupils build different objects to hang on the end of the string to see what happens.

ANSWERS: Let the pupils experiment and discuss what is happening. Ask one table question 1 and another table question 2. (The teacher may cover this when making copies).

- 1. The fish moves up.
- 2. The fish moves down.



Area of Learning: STEM

Duration: 30 minutes

Learning Intentions:

- To explore the basic physics of movement and rotation (including the effects of friction, creating power), and how simple machines need and use pulleys.
- To be able to measure and cut and piece of string to 60cms.
- To be able to tie the string onto the wheel and object.

Resources: Morphun - Gearphun Junior Box; instructions for Pulleys Model Level 4A, ruler (CM), scissors, string.

Key Vocabulary: Pulleys, Pulley Bands, Diameter, 25 Hole Square, Flat Square, Long Joiners, Long Axle, Squares with Studs, Triangle, Wheels, Handle, Chain Links, End Cap, 5 Hole Square, Spinning Gears and Driving Gears 'T' Joiner, Medium Joiner, Directions, Clockwise, Anticlockwise, String.

Lesson Structure

Introduction:

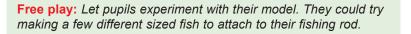
- Recap introduction from session 5 measuring and cutting the string to 60cms.
- Practice threading the string through the hole of the 70mm wheel (step 8) (pupils may need to take turns to do this).

Gearphun Pulley Construction Models 4A

- In pairs have the pupils build the fish (step 9) ready for the main activity.
- Have a pre-built example of the model you will be building, to show the pupils what the end result will look like.

Activity Sheet 7

- Have pupils build model level 4A (front of sheet, bottom), steps 1-11.
- Have pupils attach a handle to the front wheel, that has the string attached to it.
- 1. Question: What happens when you turn the handle clockwise?
- 2. Question: What happens when you turn the handle anticlockwise?
- 3. Question: While holding the fishing rod up, what happens if you let go of the handle you have been turning?
- · Keep the models that pupils have built for the next session.



Ask the pupils to fill out the 'Plenary' exercise shown on Page 2 for this activity.

ANSWERS: (The teacher may cover this when making copies).

- 1. The fish moves up; If turned too much, the fish flips over the wheel.
- 2. The fish moves down; If turned too much, the string wraps around the wheel and the fish moves up again, until the fish flips over the wheel.
- The fish falls down and the string unravels.

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Area of Learning: STEM

Duration: 30 minutes

Learning Intentions:

- To explore the basic physics of movement and rotation *(including the effects of friction, creating power)*, and how simple machines need and use pulleys.
- To be able to measure and cut and piece of string to 60cms.
- To be able to tie the string onto the wheel and object.

Resources: Morphun - Gearphun Junior Box; instructions for Pulleys Model Level 4A, ruler *(CM)*, scissors, string.

Key Vocabulary: Pulleys, Pulley Bands, Diameter, 25 Hole Square, Flat Square, Long Joiners, Long Axle, Squares with Studs, Triangle, Wheels, Handle, Chain Links, End Cap, 5 Hole Square, Spinning Gears and Driving Gears 'T' Joiner, Medium Joiner, Directions, Clockwise, Anticlockwise, String.

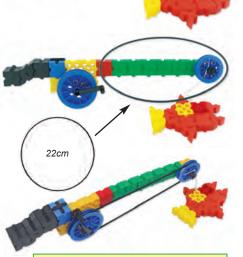
Lesson Structure

Introduction:

- Hand out the models that pupils built in Session 7 and explain that you will be working with these models.
- Have a pre-built example of the model you will be building, to show the pupils what the end result will look like.

Activity Sheet 8

- Have pupils add the pulley belt as shown in step 15.
- 1. Question: What happens when you turn the handle clockwise?
- 2. Question: What happens when you turn the handle anticlockwise?
- 3. Question: While holding the fishing rod up, what happens if you let go of the handle you have been turning?
- Have pupils turn the handle until the string is hanging down at it's full length.
- Have pupils measure the pulley belt to find out which is 22cms in diameter.
- Have pupils add the pulley belt as shown in steps 12-14. The black piece should be sticking out, as shown in step 16.
- 4. Question: What happens if you turn the handle?



Free play: Let pupils experiment with their model. They could try making a few different sized fish to attach to their fishing rod.

Ask the pupils to fill out the 'Plenary' exercise shown on Page 2 for this activity.

ANSWERS: Ask question 4 to each group. (The teacher may cover this when making copies).

- 1. The small wheel also turns clockwise because it is attached by the pulley belt; The fish moves up.
- 2. The small wheel also turns anticlockwise because it is attached by the pulley belt; the fish moves down; If turned too much, the string wraps around the wheel and the fish moves up again.
- 3. The fish stays where it is, because the pulley belt is holding the wheel in place.
- 4. The fish moves slightly up or down, because the handle is blocked, so it can't turn more than once.

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Area of Learning: STEM

Duration: 30 minutes

Learning Intentions:

- To explore the basic physics of movement and rotation *(including the effects of friction, creating power)*, and how simple machines need and use pulleys.
- To be able to complete one of the two challenges.

Resources: Morphun - Gearphun Junior Box; instructions for Pulleys Model Level 4A, ruler *(CM)*, scissors, string.

Key Vocabulary: Pulleys, Pulley Bands, Diameter, 25 Hole Square, Flat Square, Long Joiners, Long Axle, Squares with Studs, Triangle, Wheels, Handle, Chain Links, End Cap, 5 Hole Square, Spinning Gears and Driving Gears 'T' Joiner, Medium Joiner, Directions, Clockwise, Anticlockwise, String.

Introduction:

Lesson Structure

- Using the numbers 12 and 17 on a number line, ask the pupils to find out the difference (answer: 5). Have several of these equations up on the board for the pupils to figure out.
- Hand out the models that pupils built in Session 1 and explain that you will be working with these models.
- Have a pre-built example of the model you will be building, to show the pupils what the end result will look like.

Activity Sheet 9

- 1. Challenge: 1. Build a model that moves a load up and down by turning a handle.
- 2. Challenge: 2. Build a model that moves a load up and down by turning a handle, that includes at least two pulleys.
- Additional tips:
 - Pupils can use as many pieces and whatever sized pulleys/pulley bands they want to.
 - Encourage pupils to be creative with their model, for example, making one that looks like a fishing rod.
 - If a group completes their challenge quickly, have them try another challenge, or help the other groups with their challenges.
- When pupils have finished their models, test them as a class to see if the challenge has been completed.
 - If the model works as it should, discuss how and why.
 - If the model doesn't work as it should, ask the class to discuss why and how it could be fixed.





Free play: Encourage pupils to try out each other's models.

ANSWERS: (The teacher may cover this when making copies).

- 1. An example would be Model Level 4A (top front of sheet).
- 2. An example would be Model Level 4A (top front of sheet).

Ask the pupils to fill out the 'Plenary' exercise shown on Page 2 for this activity.



Area of Learning: STEM

Duration: 30 minutes

Learning Intentions:

- To explore the basic physics of movement and rotation *(including the effects of friction, creating power)*, and how simple machines need and use pulleys.
- To be able to complete one of the three challenges.

Resources: Morphun - Gearphun Junior Box; instructions for Pulleys Model Level 4A, ruler *(CM)*, scissors, string.

Key Vocabulary: Pulleys, Pulley Bands, Diameter, 25 Hole Square, Flat Square, Long Joiners, Long Axle, Squares with Studs, Triangle, Wheels, Handle, Chain Links, End Cap, 5 Hole Square, Spinning Gears and Driving Gears 'T' Joiner, Medium Joiner, Directions, Clockwise, Anticlockwise, String.

Introduction:

Lesson Structure

- This session will be a recap of the previous four sessions in this module.
- Divide the class into groups and give each group one of the following challenges to complete. Each challenge should have at least one pulley belt and one piece of string included.

Activity Sheet 10

- 1. Challenge: 1. Build a model that moves a load up and down by turning a handle, that includes at least two pulleys.
- 2. Challenge: 2. Build a model that moves a load up and down by turning a handle and doesn't drop the load when the handle is not being held.
- Additional tips:
 - Pupils can use as many pieces and whatever sized pulleys/pulley bands they want to.
 - Encourage pupils to be creative with their model, for example, making one that looks like a fishing rod
 - If a group completes their challenge quickly, have them try another challenge, or help the other groups with their challenges
- When pupils have finished their models, test them as a class to see if the challenge has been completed.
 - If the model works as it should, discuss how and why.
 - If the model doesn't work as it should, ask the class to discuss why and how it could be fixed.



Free play: Encourage pupils to try out each other's models.

ANSWERS: (The teacher may cover this when making copies).

- 1. An example would be Model Level 4A (top front of sheet).
- 2. An example would be Model level 4A (front of sheet, bottom).

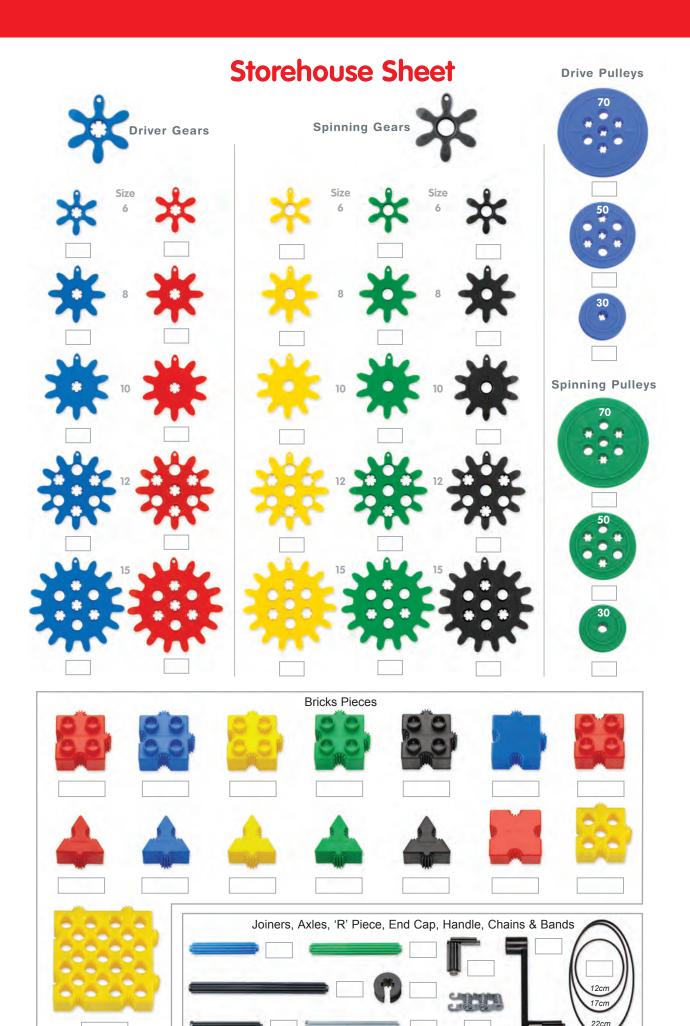
Ask the pupils to fill out the 'Plenary' exercise shown on Page 2 for this activity.



Gearphun Pulley Construction Models 4A







Not all sets have all pieces.

Morphan



For further information about our other Gearphun Pulley model instructions and guide books, please visit our website.

www.morphun.com





Teacher Gearphun Junior Activity Workcards Chapter 6 Pulleys - Thinkplay Ltd. 7 Chesterfield Road, Chiswick, London W4 3HG, United Kingdom. Contact us at www.morphun.com/contact.php or visit www.morphun.com - All Products are EN71 CPSIA and ASTM tested. Model colours shown are only examples, actual brick colour mix will vary. Design your own models from available colours. Patents and design registrations granted. Morphun® is a registered trade mark. Made in Europe.

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