

# Mansfield and Pinxton Railway

## Mansfield and Pinxton Railway by numbers

### LEARNING ACTIVITIES - KS1

1. Task sheet 1: How many rails – and what was the cost?

*How many rails and padstones would they need to build the railway? Remember that each railway needed 2 tracks, one for each side of the wagon and that there were 2 railways, one for trucks going from Pinxton to Mansfield and one for trucks going from Mansfield to Pinxton.*

#### **ANSWER:**

Calculation: 1,000 rails (per kilometre) x  
10 kilometres x 4 rail tracks  
= **40,000 rails & 40,000 padstones.**

*The company who made the rails charged the railway company by weight. In other words, not by how many rails they made but how many tonnes of iron was used to make the rails. We know that each rail weighed 20 kilograms (kg) each.*

- A. How many rails would we get from 1 tonne of iron (1 tonne contains 1,000 kilograms)?*
- B. How many tonnes of iron would be needed to make 52,000 rails?*
- C. If 1 tonne of iron cost £7.00, how much did the railway company have to pay for the full number of rails that they needed?*

#### **ANSWER:**

- A.  $1,000 \div 20 = 50$  rails.
- B.  $40,000 \div 20 = 2,000$  tonnes .
- C.  $2,000 \times 7 = \pounds 14,000$ .

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### LEARNING ACTIVITIES - KS1

2. Task sheet 2: How much did it cost to transport coal?

*A. If 1 factory owner wanted 100 tonnes of coal:*

*1. How many wagons of coal would be needed if each wagon carried 2 tonnes?*

**Answer:**  $100 \div 2 = 50$  wagons.

*2. How many journeys would have to be made to deliver the coal if 5 wagons were pulled by 3 horses each time?*

**Answer:**  $50 \text{ wagons} \div 5 = 10$  journeys.

*B. How much would 100 tonnes of coal cost the factory owner if 1 tonne costs 50 pence?*

**Answer:**  $100 \text{ tonnes} \times 50 \text{ pence} = 5,000 \text{ pence}$   
 $\div 100 = \text{£}50.00$ .

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TEACHER'S NOTES

### LEARNING ACTIVITIES - KS1

#### 3. Task sheet 3: Sizes and shapes on the railway

A. Looking at the plan view (top picture) of the viaduct, work out:

1. How far is it to walk all the way around the viaduct (this is known as the perimeter)?

**Answer:**  $50 + 50 + 10 + 10 = 120$  metres.

2. Can you work out how many square metres are inside the viaduct?

**Answer:**  $50 \times 10 = 500$  square metres.

B. Looking at both views of the viaduct can you find:

1. A rectangle?
2. An arch?
3. How many arches can you see?

**Answer:** 5.

C. Looking at the bottom view of the viaduct:

- a. How many right-angles can you find?

**Answer:** 14.

D. Looking at both views of the viaduct which shapes are symmetrical?

**Answer:** Arch, railway track, plan view of the viaduct in both directions (length and across).

**Note to the teacher:** the side view of the viaduct is not symmetrical because one end is bigger than the other.

E. Looking at both drawings of the viaduct what parts are parallel?

**Answer:** Rails, the long walls of the viaduct, the ends of the viaduct on both drawings, the walls of the arches before they become rounded.

F. The following is a drawing of an individual rail from 1819; Is it symmetrical?

**Answer:** No.

G. The following is a sketch of a rail coach from 1848 and a wagon from 1826; They are symmetrical; draw a line through the centre of symmetry.

**Answer:** The line should go down the middle of each sketch vertically.

H. Looking at the coach:

1. How many squares can you see?

**Answer:** 8 (3 windows, 3 door panels and 2 axles).

2. How many circles can you see?

**Answer:** 2 (wheels).

I. Looking at the wagon:

1. How many circles can you see?

**Answer:** 4 (2 wheels and 2 hubs).

2. What parallel parts can you see?

**Answer:** 8 The chassis with the top edge and the planks of wood.

# Mansfield and Pinxton Railway

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### LEARNING ACTIVITIES - KS1

#### 4. Task sheet 4: Weigh up your goods on the railway

*A. If someone ordered 12 tonnes of stone to build a house:*

1. *How many wagons would be needed?*

**Answer:**  $12 \text{ (tonnes)} \div 4 \text{ (tonnes per wagon)} = 3 \text{ wagons.}$

2. *How heavy would the load be including the wagons?*

**Answer:**  $12 \text{ (tonnes of stone)} + 3 \text{ (1 tonne for each wagon)} = 15 \text{ tonnes.}$

3. *How many horses would be needed to pull this load?*

**Answer:** If one horse can pull 10 tonnes then two horses can pull 20 tonnes; since 15 tonnes is more than one horse can pull (10 tonnes) but less than two horses can pull (20 tonnes) then we will need two horses.

*B. If someone ordered 20 tonnes of coal for their factory boiler:*

1. *How many wagons would be needed?*

**Answer:**  $20 \text{ (tonnes)} \div 4 \text{ (tonnes per wagon)} = 5 \text{ wagons.}$

2. *How heavy would the load be including the wagons?*

**Answer:**  $20 \text{ (tonnes of coal)} + 5 \text{ (1 tonne for each wagon)} = 25 \text{ tonnes.}$

3. *How many horses would be needed to pull this load?*

**Answer:** If one horse can pull 10 tonnes then two horses can pull 20 tonnes and three horses can pull 30 tonnes; since 25 tonnes is more than two horses can pull (20 tonnes) but less than three horses can pull (30 tonnes) then we will need three horses.

# Mansfield and Pinxton Railway

## Mansfield and Pinxton Railway by numbers



### LEARNING ACTIVITIES - KS2

1. Task sheet 1: How many rails – and what was the cost?

*Why would 4 additional padstones be required?*

#### **ANSWER:**

You would need 1 additional padstone at the start of each track (one track for each side of the wagon making 2). There are two railways going in opposite directions making 4 additional padstones in total.

*How many rails and padstones would they need to build the railway? Remember that each railway needed 2 tracks, one for each side of the wagon and that there were 2 railways, one for trucks going from Pinxton to Mansfield and one for trucks going from Mansfield to Pinxton.*

#### **ANSWER:**

Calculation: 1,000 rails x 13 kilometres x 4 rail tracks  
= **52,000 rails and 52,004 padstones.**

*The company who made the rails charged the railway company by weight. In other words, not by how many rails they made but how many tonnes of iron was used to make the rails. We know that each rail weighed 15 kilograms (kg) each.*

- A. *How many rails would we get from 1 tonne of iron (1 tonne contains 1,000 kilograms)?*
- B. *How many tonnes of iron would be needed to make 52,000 rails?*
- C. *If 1 tonne of iron cost £7.00, how much did the railway company have to pay for the full number of rails that they needed?*

#### **ANSWER:**

- A.  $1,000 \div 15 = 66$  rails.
- B.  $52,000 \div 66 = 788$  tonnes .
- C.  $788 \times 7 = \text{£}5,516$ .

# Mansfield and Pinxton Railway

## Mansfield and Pinxton Railway by numbers

### LEARNING ACTIVITIES - KS2

2. Task sheet 2: How much did it cost to transport coal?

*A. If 1 factory owner wanted 96 tonnes of coal:*

1. *How many wagons of coal would be needed if each wagon carried 3 tonnes?*

**Answer:  $96 \div 3 = 32$  wagons.**

2. *How many journeys would have to be made to deliver the coal if 3 wagons were pulled by 2 horses each time?*

**Answer:  $32 \text{ wagons} \div 3 = 11$  journeys.**

*B. How much would 96 tonnes of coal cost the factory owner if 1 tonne costs 40 pence?*

**Answer:  $96 \text{ tonnes} \times 40 \text{ pence} = 3,840 \text{ pence} \div 100 = \text{£}38.40$ .**

*C. Apart from paying for the coal a fee, known as a toll, also had to be paid to use the railway. If 1 penny had to be paid for every kilometre that the wagons travelled, how much toll money would have to be paid to deliver the 96 tonnes (the line is 13 kilometres long)?*

**Answer:  $11 \text{ journeys} \times 13 \text{ kilometres} \times 1 \text{ penny} = 143 \text{ pennies} = \text{£}1.43$ .**

*D. If the factory owner had to pay the toll as well as the cost of the coal, how much would he have to pay, in total for his coal?*

**Answer:  $\text{£}38.40 + \text{£}1.43 = \text{£}39.83$ .**

# Mansfield and Pinxton Railway

## Mansfield and Pinxton Railway by numbers

### LEARNING ACTIVITIES - KS2

#### 3. Task sheet 3: What is the gradient of 'The Summit'?

There is a useful clip on BBC Bite size to explain how to work out gradients:  
[www.bbc.co.uk/bitesize/topics/zvhs34j/articles/z4ctng8](http://www.bbc.co.uk/bitesize/topics/zvhs34j/articles/z4ctng8)

A. *If you are going up one hill and your friend is going up another hill, who will be the highest after walking 100 metres if your hill has a gradient of  $\frac{3}{100}$  (0.03) and your friend's hill has a gradient of  $\frac{5}{100}$  (0.05)?*

**Answer: Friend.**

B. *You and your friend were at the top of a hill, but one side was steeper than the other. You both rolled a ball down the hill at the same time, one on one side of the hill and the other ball on the other side, whose ball should reach the bottom first if: the gradient on your side was  $\frac{20}{100}$  (0.2) but the gradient on your friend's side was  $\frac{5}{100}$  (0.05)?*

**Answer: Your ball.**

C. *If you walked up a hill that had a gradient of  $\frac{5}{100}$  (0.05) and the distance that you walked forward was 300 metres, how much higher would you now be than when you started?*

**Answer: 15 metres.**

D. *Using the graph, below, work out how much higher you would be from when you first started after travelling*

1. *7 kilometres if the gradient was  $\frac{3}{100}$  (0.03)*

**Answer: 210 metres.**

2. *3 kilometres if the gradient was  $\frac{5}{100}$  (0.05)*

**Answer: 150 metres.**

3. *9 kilometres if the gradient was  $\frac{6}{100}$  (0.06)*

**Answer: 540 metres.**

E. *Now we are going to work out the gradient on the Mansfield and Pinxton railway by using the following sketch:*

1. *What is the gradient of the railway when going from Pinxton to The Summit?*

**Answer: 80 metres high and 8,000 long =  $\frac{80}{8,000} = \frac{8}{800} = 0.01$ .**

2. *What is the gradient of the railway when going from The Summit to Mansfield?*

**Answer: 40 metres high and 5,000 long =  $\frac{40}{5,000} = \frac{4}{500} = 0.008$ .**

# Mansfield and Pinxton Railway

## Mansfield and Pinxton Railway by numbers

### LEARNING ACTIVITIES - KS2

#### 4. Task sheet 4: Sizes and shapes on the railway

A. Looking at the plan view of the viaduct, work out:

1. The perimeter around the outside of the viaduct

**Answer:**  $50 + 50 + 9.1 + 9.1 = 118.2$  metres.

2. The total area covered by the viaduct

**Answer:**  $50 \times 9.1 = 455$  square metres.

3. The total area of the inside of the viaduct

**Answer:**  $50 \times 8.3 = 415$  square metres.

B. Looking at the side view of the viaduct, work out:

1. The perimeter around the whole viaduct

**Answer:**  $50 + 50 + 10 + 10 = 120$  metres.

2. The perimeter around 1 arch

**Answer:**  $((6.6 \times 3.142) \div 2) + (2 \times 3.5) + 6.6 = 23.97$  metres.

3. The area of 1 arch

**Answer:**  $((3.3 \times 3.3 \times 3.142) \div 2) + (3.5 \times 6.6) = 40.2$  square metres.

4. The area of the viaduct without the arches

**Answer:**  $(50 \times 10) - (5 \times 40.2) = 299$  square metres.

C. Looking at both views of the viaduct which shapes are symmetrical?

**Answer:** Arch, railway track, plan view of the viaduct in both directions (length and across).

D. Looking at both drawings of the viaduct what parts are parallel?

**Answer:** Rails, the long walls of the viaduct, the walls of the arches before they become rounded.

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**Answer:** No.

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**Answer:** 8 (3 windows, 3 door panels and 2 axles).

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1. How many circles can you see?

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2. What parallel parts can you see?

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TEACHER'S NOTES

## LEARNING ACTIVITIES - KS2

5. Task sheet 5: Work out the angles of a rail wagon

### ANSWERS:

- A. (B) Right angle.
- B. (A) Acute angle.
- C. (A) Acute angle.
- D. (C) Obtuse angle.
- E. (A) Acute angle.
- F. (C) Obtuse angle.
- G. (D) Reflex angle.

# Mansfield and Pinxton Railway

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### LEARNING ACTIVITIES - KS2

#### 6. Task sheet 6: Weigh up your goods on the railway

A. If a factory owner wanted 48 cubic metres of coal.

1. How many wagons would be needed to deliver it?

**Answer:** 3,000 divided by 750 = 4. Therefore 4 cubic metres of coal will fit into each wagon. Then divide 48 by 4 = 12 wagons.

2. How heavy would 48 cubic metres of coal weigh in tonnes?

**Answer:**  $48 \times 750 = 36,000 \text{ kg} = 36 \text{ tonnes}$ .

B. However, the next time the factory owner wanted something to burn in his boilers he decided to try coke instead of coal but wasn't sure if it would work, so he ordered less, to try it out before ordering a large amount. He ordered 24 cubic metres of coke.

1. How many wagons would be needed to deliver it?

**Answer:**  $3,000 \div 600 = 5$ . Therefore 5 cubic metres will fit into each wagon. Then divide 24 by 5 = 4.8 wagons.

2. How heavy would 24 cubic metres of coke weigh in tonnes?

**Answer:**  $24 \times 600 = 14,400 \text{ kg} = 14.4 \text{ tonnes}$ .

C. A builder ordered 50 tonnes of limestone blocks to build a house.

1. How many wagons would be needed to transport his stone?

**Answer:**  $50,000 \div 3,000 = 16.7 \text{ wagons}$ .

2. To make sure that he had ordered the right amount he decided to calculate how many cubic metres 50 tonnes would be, to see if that would be enough to build the walls, please calculate.

**Answer:**  $50,000 \div 2,700 = 18.5 \text{ cubic metres}$ .

D. The builder also needed sand and estimated that he needed 12 cubic metres

1. How heavy would his sand weigh?

**Answer:**  $12 \times 1,600 = 19,200 \text{ kg} = 19.2 \text{ tonnes}$ .

2. How many wagons would be needed to deliver his sand?

**Answer:**  $19.2 \div 3.0 = 6.4 \text{ wagons}$ .

E. Another factory owner used oil lamps so that his workers could see better in the dark days of winter, he wanted 10,000 litres of oil delivering. There are 1,000 litres in 1 cubic metre.

1. What is the largest number of litres that could be carried in each wagon?

**Answer:**  $3,000 \text{ kg} \div 900 \text{ kg} = 3.33 \text{ cubic metres} = 3,330 \text{ litres}$ .

2. How many wagons would be needed for his delivery?

**Answer:**  $10,000 \div 3,330 = 3 \text{ wagons}$ .