

Class 8 Direct and Inverse Proportion Worksheet

By Thinking Juggernaut

Class: 8th Standard

Subject: Mathematics

Total Questions: 24

Total Marks: 24

🎯 Understanding Direct and Inverse Proportion

What is Proportion?

Proportion is a relationship between two quantities where the change in one quantity causes a change in the other quantity.

✓ DIRECT PROPORTION

Definition: Two quantities x and y are in direct proportion if they increase or decrease together in such a way that the ratio x/y remains constant.

Formula: $x_1/y_1 = x_2/y_2$

Symbol: $x \propto y$ (x is directly proportional to y)

Examples:

- More items → More cost
- More distance → More time (at same speed)
- More workers → More work (in same time)
- More speed → More distance (in same time)

✗ INVERSE PROPORTION

Definition: Two quantities x and y are in inverse proportion if an increase in one causes a decrease in the other in such a way that the product $x \times y$ remains constant.

Formula: $x_1 \times y_1 = x_2 \times y_2$

Symbol: $x \propto 1/y$

Examples:

- More speed → Less time (for same distance)
- More workers → Less time (for same work)
- More bags → Less days (for same rice)
- More taps → Less time (to fill tank)

🔑 Key Formulas:

Direct Proportion: If x_1, x_2, y_1, y_2 are in direct proportion:

$$x_1/y_1 = x_2/y_2 \text{ or } x_1/x_2 = y_1/y_2 \text{ or } x_1y_2 = x_2y_1$$

Inverse Proportion: If x_1, x_2, y_1, y_2 are in inverse proportion:

$$x_1 \times y_1 = x_2 \times y_2 \text{ or } x_1/x_2 = y_2/y_1$$

How to Identify?

- **Direct:** When one increases, the other also increases ($\uparrow\uparrow$) or both decrease ($\downarrow\downarrow$)
- **Inverse:** When one increases, the other decreases ($\uparrow\downarrow$) or vice versa ($\downarrow\uparrow$)

Unitary Method:

First find the value for ONE unit, then multiply to find the value for required units.

Sample Problem with Visual Explanation

Problem: 15 workers can build a wall in 12 days. How many days will 10 workers take to build the same wall?

Step-by-Step Solution

Step 1: Identify the Type of Proportion

More workers → Less days (for same work)

This is INVERSE PROPORTION 

Step 2: Write the Given Information

Workers₁ = 15, Days₁ = 12

Workers₂ = 10, Days₂ = ?

Step 3: Apply Inverse Proportion Formula

Workers₁ × Days₁ = Workers₂ × Days₂

15 × 12 = 10 × Days₂

180 = 10 × Days₂

Step 4: Solve for Days₂

$$\text{Days}_2 = 180 \div 10 = 18 \text{ days}$$

Understanding the Logic:

- Fewer workers (15→10) means MORE time needed to complete the same work
- This confirms it's inverse proportion
- The product (workers × days) stays constant: $15 \times 12 = 180 = 10 \times 18$
- **Verification:** 15 workers × 12 days = 180 worker-days
10 workers × 18 days = 180 worker-days ✓

Part A: Warm-up Practice

★ Easy Level - 8 Questions

Q1. If 5 pens cost ₹75, what is the cost of 8 pens?

Q2. A car travels 60 km in 1 hour. How far will it travel in 3 hours at the same speed?

Q3. Is the relationship between speed and time (for fixed distance) direct or inverse proportion?

Q4. 6 workers can complete a job in 10 days. How many days will 5 workers take?

Q5. Fill in the blank: In direct proportion, if one quantity increases, the other quantity _____.

Q6. If 12 books weigh 6 kg, what is the weight of 20 books?

Q7. True or False: The relationship between number of articles and their total cost is direct proportion.

Q8. A tap fills a tank in 6 hours. How long will 2 identical taps take to fill the same tank?

Part B: Practice Zone

★★ Medium Level - 10 Questions

Q9. A train travels 360 km in 4 hours. How far will it travel in 7 hours at the same speed?

Q10. Word Problem: Rahul can type 450 words in 10 minutes. How many words can he type in 25 minutes at the same speed?

Q11. 20 workers can build a house in 30 days. How many workers are needed to build the house in 15 days?

Q12. Match the situations with the type of proportion:

Column A	Column B
(i) Distance and time (constant speed)	(a) Inverse Proportion
(ii) Speed and time (constant distance)	(b) Direct Proportion
(iii) Number of items and total cost	(c) Neither
(iv) Workers and days (same work)	

Write your answers: (i) → ___, (ii) → ___, (iii) → ___, (iv) → ___

Q13. Picture-based Problem: A car travels from City A to City B at 60 km/h and takes 5 hours. If it travels at 75 km/h, how much time will it take?



Q14. A hostel has provisions for 250 students for 40 days. If 50 more students join, for how many days will the provisions last?

Q15. The cost of 15 kg of sugar is ₹675. Find the cost of 22 kg of sugar at the same rate.

Q16. Real-life Problem: A contractor estimates that 8 workers can complete laying tiles in a room in 12 days. After 4 days, 2 more workers join. In how many more days will the work be completed?

Q17. If 36 men can do a piece of work in 25 days, in how many days will 15 men do it?

Q18. A bicycle wheel makes 5000 revolutions in covering 11 km. How many revolutions will it make in covering 66 km?

Part C: Challenge Yourself!

★★★ Hard Level - 6 Questions

Q19. A fort had provisions for 300 soldiers for 90 days. After 20 days, 50 soldiers left the fort. How long will the remaining food last?

Q20. Complex Problem: 15 workers working 8 hours a day can complete a work in 20 days. How many days will 12 workers take, working 10 hours a day, to complete the same work?

Q21. A car covers a certain distance in 4 hours at a speed of 60 km/h. If the speed is increased by 20 km/h, how much time will it take to cover the same distance?

Q22. Application Problem: In a school, there are 180 students and food provisions last for 15 days. If 45 students leave after 5 days, for how many more days will the remaining food last for the remaining students?

Q23. If x and y vary inversely and $x = 12$ when $y = 5$, find the value of x when $y = 3$.

Q24. Challenge Problem: A group of workers promised to complete a job in 15 days. 10 workers started the work but after 6 days, 5 workers left. The remaining

workers completed the work in 12 more days. How many days would it have taken if all the workers had continued from the beginning?



Answer Key

Part A: Warm-up Practice (Easy)

Q1. Direct Proportion: 5 pens = ₹75

$$1 \text{ pen} = 75/5 = ₹15$$

$$8 \text{ pens} = 15 \times 8 = ₹120$$

Q2. Direct Proportion: Distance = $60 \times 3 = 180$ km

Q3. Inverse Proportion (More speed → Less time for same distance)

Q4. Inverse Proportion: $6 \times 10 = 5 \times \text{days}$

$$\text{Days} = 60/5 = 12 \text{ days}$$

Q5. increases (also increases)

Q6. Direct Proportion: 12 books = 6 kg

$$1 \text{ book} = 6/12 = 0.5 \text{ kg}$$

$$20 \text{ books} = 0.5 \times 20 = 10 \text{ kg}$$

Q7. True

Q8. Inverse Proportion: 1 tap = 6 hours

$$2 \text{ taps} \times \text{time} = 1 \times 6$$

$$\text{Time} = 6/2 = 3 \text{ hours}$$

Part B: Practice Zone (Medium)

Q9. Direct Proportion

$$\text{Speed} = 360/4 = 90 \text{ km/h}$$

$$\text{Distance in 7 hours} = 90 \times 7 = 630 \text{ km}$$

Q10. Direct Proportion

$$10 \text{ minutes} = 450 \text{ words}$$

$$1 \text{ minute} = 45 \text{ words}$$

$$25 \text{ minutes} = 45 \times 25 = 1,125 \text{ words}$$

Q11. Inverse Proportion: $20 \times 30 = \text{workers} \times 15$

$$\text{Workers} = 600/15 = 40 \text{ workers}$$

Q12. (i) → (b), (ii) → (a), (iii) → (b), (iv) → (a)**Q13. Inverse Proportion**

$$\text{Distance} = 60 \times 5 = 300 \text{ km (constant)}$$

$$75 \times \text{time} = 300$$

$$\text{Time} = 300/75 = 4 \text{ hours}$$

Q14. Inverse Proportion

$$\text{Total students now} = 250 + 50 = 300$$

$$250 \times 40 = 300 \times \text{days}$$

$$\text{Days} = 10,000/300 = 33.33 \approx 33 \text{ days (approx)}$$

Q15. Direct Proportion

$$15 \text{ kg} = ₹675$$

$$1 \text{ kg} = ₹45$$

$$22 \text{ kg} = 45 \times 22 = ₹990$$

Q16. Work completed in 4 days = $4/12 = 1/3$

$$\text{Remaining work} = 2/3$$

$$8 \text{ workers for remaining work would take: } 2/3 \times 12 = 8 \text{ days}$$

$$\text{Now 10 workers (8+2): } 8 \times 8 = 10 \times \text{days}$$

$$\text{Days} = 64/10 = 6.4 \text{ days}$$

Q17. Inverse Proportion

$$36 \times 25 = 15 \times \text{days}$$

$$\text{Days} = 900/15 = 60 \text{ days}$$

Q18. Direct Proportion $11 \text{ km} = 5000 \text{ revolutions}$ $1 \text{ km} = 5000/11 \text{ revolutions}$ $66 \text{ km} = (5000/11) \times 66 = 30,000 \text{ revolutions}$ **Part C: Challenge Questions (Hard)****Q19. Food consumed in 20 days by 300 soldiers** $\text{Remaining food for: } 300 \times (90-20) = 300 \times 70 = 21,000 \text{ soldier-days}$ $\text{Remaining soldiers} = 300 - 50 = 250$ $\text{Days} = 21,000/250 = 84 \text{ days}$ **Q20. Total work = 15 workers \times 8 hours \times 20 days = 2,400 worker-hours** $\text{For 12 workers working 10 hours/day:}$ $12 \times 10 \times \text{days} = 2,400$ $\text{Days} = 2,400/120 = 20 \text{ days}$ **Q21. Distance = $60 \times 4 = 240 \text{ km}$** $\text{New speed} = 60 + 20 = 80 \text{ km/h}$ $\text{Time} = 240/80 = 3 \text{ hours}$ **Q22. Food consumed in 5 days by 180 students = $180 \times 5 = 900 \text{ student-days}$** $\text{Remaining food} = 180 \times 15 - 900 = 2,700 - 900 = 1,800 \text{ student-days}$ $\text{Remaining students} = 180 - 45 = 135$ $\text{Days} = 1,800/135 = 13.33 \approx 13 \text{ days (approx)}$ **Q23. Inverse variation: $x_1 y_1 = x_2 y_2$** $12 \times 5 = x \times 3$ $x = 60/3 = 20$ **Q24. 10 workers worked for 6 days****5 workers worked for 12 more days** $\text{Total work} = (10 \times 6) + (5 \times 12) = 60 + 60 = 120 \text{ worker-days}$ **If all 10 workers continued: $120/10 = 12 \text{ days}$**

Scoring Guide

Total Questions: 24 | Total Marks: 24

Score Range	Performance Level	What to Do Next
20-24	★★★ Excellent!	Outstanding! You've mastered direct and inverse proportion. Move on to time-speed-distance advanced problems, compound proportion, and variation in algebra.
15-19	★★ Very Good!	Great work! Practice more multi-step problems involving both worker-days and changing conditions. Focus on complex word problems.
10-14	★ Good Effort!	Keep practicing! First master identifying direct vs inverse proportion. Create a list of common scenarios. Practice 10-15 problems daily using the unitary method.
0-9	Keep Trying!	Review the concept section carefully. Start with simple direct proportion problems, then inverse. Learn to identify the relationship first before solving. Focus on one type at a time.

Tips for Improvement:

- **Identify first, solve later:** Always determine if it's direct or inverse before calculating
- **Key question:** "If one increases, does the other increase (direct) or decrease (inverse)?"
- **Direct → Divide then Multiply:** Find unit value, then multiply
- **Inverse → Use product:** $x_1 \times y_1 = x_2 \times y_2$
- **Draw diagrams:** Visual representation helps in complex word problems
- **Check reasonability:** Does your answer make sense? (More workers = less time?)
- **Practice word problem keywords:** "same work", "same distance", "constant speed"

Common Mistakes to Avoid:

- **✗ Confusing direct and inverse proportion types**
- **✗ Using direct proportion formula for inverse problems (and vice versa)**
- **✗ Not identifying what remains constant (work, distance, food, etc.)**
- **✗ Forgetting to calculate remaining work/food in multi-step problems**
- **✗ Arithmetic errors in cross-multiplication**

- **✗** Not using unitary method properly (finding value for 1 unit first)
- **✗** In worker-hour problems, not converting hours to same units
- **✗** Not checking if answer is reasonable (e.g., negative days, or more time with more workers)

🎓 Quick Reference Chart:

Situation	Type	Formula
Items \leftrightarrow Cost	Direct	$x_1/y_1 = x_2/y_2$
Speed \leftrightarrow Time (same distance)	Inverse	$x_1 \times y_1 = x_2 \times y_2$
Workers \leftrightarrow Days (same work)	Inverse	$x_1 \times y_1 = x_2 \times y_2$
Distance \leftrightarrow Time (same speed)	Direct	$x_1/y_1 = x_2/y_2$

✨ Great Job Completing This Worksheet! ✨

Keep practicing proportion and you'll master it in no time!

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