

# Proportions: worked answers

GRADE 7 • ALL 13 WORKSHEET PAGES

Complete solutions to examples and independent practice, with proportion setups, calculations and checks. Reflection responses are examples to adapt honestly.

## Worksheet page 1

### Stop & Jot!

Write any information that you learned and can explain from this lesson.

**Sample response: A proportion says that two ratios are equal. I can test a proportion by checking whether the cross products are equal, or by checking whether the same multiplier changes both parts of one ratio into the other.**

1. Choose an idea from the lesson, such as equivalent ratios.
2. Explain it in your own words.
3. Add an example:  $3/5 = 12/20$  because multiplying both 3 and 5 by 4 gives 12 and 20.

### Turn and talk with your partner

Use one of the following Meta Stems for your Stop and Jot partner work: “So, the big idea is ...”; “I have a question about ...”; “What’s important here is ...”

**Sample response: “What’s important here is that both parts of a ratio must be multiplied by the same number. For example,  $2/5$  becomes  $24/60$  because both parts are multiplied by 12.”**

1. Choose one of the three sentence starters.
2. Complete the sentence with a math idea or a genuine question.
3. Explain an example to your partner and listen to their explanation.

### Do Now

Stephanie pays \$12.95 for a 3 pound bag of almonds. What is the unit price of the almonds?

**About \$4.32 per pound**

1. A unit price is the cost of 1 pound.
2. Divide the total cost by the number of pounds:  $12.95 \div 3 = 4.31666...$
3. Round to the nearest cent. The third decimal digit is 6, so 4.31 rounds up to 4.32.
4. The almonds cost about \$4.32 per pound.

Note:  $3 \div 12.95$  gives pounds per dollar, rather than dollars per pound.

## Worksheet page 2

### Example: $3/5 = 12/20$

Check the example proportion:  $3/5 = 12/20$ .

#### True: the ratios are equivalent

1. Find the cross products:  $3 \times 20 = 60$  and  $5 \times 12 = 60$ .
2. The cross products match, so the proportion is true.
3. Another way:  $3 \times 4 = 12$  and  $5 \times 4 = 20$ . Both parts use the same multiplier, 4.

### Example: test a proportional relationship

Tell whether  $5/6$  and  $12/15$  demonstrate a proportional relationship. Step 1: Find the cross products.

#### No: $5/6$ and $12/15$ are not equivalent

1. Multiply the numerator of the first ratio by the denominator of the second:  $5 \times 15 = 75$ .
2. Multiply the other diagonal:  $6 \times 12 = 72$ .
3.  $75 \neq 72$ , so the ratios do not form a true proportion.

## Worksheet page 3

### Example: $2/5 = 24/60$

For  $2/5 = 24/60$ : Step 1: 2 times what number gives me 24? Step 2: 5 times what number gives me 60? Is this value the same for both?

**12 for both steps. Yes, the multiplier is the same, so the ratios are proportional.**

1. Find the first multiplier:  $24 \div 2 = 12$ .
2. Find the second multiplier:  $60 \div 5 = 12$ .
3. The two multipliers are equal.
4. Therefore  $(2 \times 12)/(5 \times 12) = 24/60$ , so the ratios form a proportional relationship.

### Proportional reasoning example, 1

Use proportional reasoning to see if the ratios form a proportional relationship:  $3/4 = 12/16$ .

**Yes: both parts are multiplied by 4**

1. To change 3 to 12, multiply by 4:  $3 \times 4 = 12$ .
2. To change 4 to 16, also multiply by 4:  $4 \times 4 = 16$ .
3. The multiplier is the same for both parts, so  $3/4$  and  $12/16$  are equivalent.
4. Check:  $3 \times 16 = 48$  and  $4 \times 12 = 48$ .

### Proportional reasoning example, 2

Use proportional reasoning to see if the ratios form a proportional relationship:  $10/20 = 30/70$ .

**No: the two parts do not have the same multiplier**

1. To change 10 to 30, multiply by 3.
2. If you multiply 20 by the same number, you get  $20 \times 3 = 60$ , not 70.
3. The denominator would need to be 60 to match the multiplier 3, so the printed ratios are not equivalent.
4. Check:  $10 \times 70 = 700$ , while  $20 \times 30 = 600$ . The cross products are different.

### Example: solve for x

Solve for x:  $8/12 = 6/x$ . The missing value is \_\_\_\_.

**x = 9**

1. Cross multiply:  $8 \times x = 12 \times 6$ .
2. Calculate the known product:  $8x = 72$ .
3. Divide both sides by 8:  $x = 72 \div 8 = 9$ .

4. Check:  $8/12$  simplifies to  $2/3$ , and  $6/9$  also simplifies to  $2/3$ .

Note: The answer is 9. The value 72 is a cross product, not the missing denominator.

## Worksheet page 4

### Missing-value example, 1

Use cross multiplication and/or proportional reasoning to find the missing value:  $x/10 = 10/20$ .

**$x = 5$**

1. The denominator changes from 10 to 20 by multiplying by 2.
2. The numerator must use the same multiplier:  $x \times 2 = 10$ .
3. Divide by 2:  $x = 5$ .
4. Cross-product check:  $5 \times 20 = 100$  and  $10 \times 10 = 100$ .

### Missing-value example, 2

Find the missing value:  $12/15 = 60/x$ .

**$x = 75$**

1. To change 12 to 60, multiply by 5.
2. Multiply the denominator by the same number:  $15 \times 5 = 75$ .
3. So  $x = 75$ .
4. Cross-multiplication check:  $12 \times 75 = 900$  and  $15 \times 60 = 900$ .

### Practice, first question

Is  $2/12 = 5/28$  a true proportion?

**No: the cross products are 56 and 60**

1. Find one cross product:  $2 \times 28 = 56$ .
2. Find the other cross product:  $12 \times 5 = 60$ .
3.  $56 \neq 60$ , so this is not a true proportion.

### Practice, second question

Is  $15/20 = 30/50$  a true proportion?

**No: the cross products are 750 and 600**

1. Find one cross product:  $15 \times 50 = 750$ .
2. Find the other cross product:  $20 \times 30 = 600$ .
3.  $750 \neq 600$ , so this is not a true proportion.
4. You can also notice that  $15 \times 2 = 30$ , but  $20 \times 2 = 40$ , not 50.

## Worksheet page 5

### Solve for x: first proportion

Solve for x:  $x/11 = 3/33$ .

**x = 1**

1. The right-hand denominator changes from 33 to 11 when you divide by 3.
2. Do the same to the numerator:  $3 \div 3 = 1$ , so  $3/33 = 1/11$ .
3. Now  $x/11 = 1/11$ , so  $x = 1$ .
4. Check:  $1 \times 33 = 11 \times 3 = 33$ . The cross-products are equal.

Note: When simplifying, divide both numerator and denominator by the same number.

### Solve for x: second proportion

Solve for x:  $4/x = 8/12$ .

**x = 6**

1. The numerator 8 becomes 4 when you divide by 2.
2. Divide the denominator by 2 as well:  $12 \div 2 = 6$ .
3. So  $8/12 = 4/6$ , which means  $x = 6$ .
4. Check:  $4 \times 12 = 6 \times 8 = 48$ .

Note: Use the same scale factor for both parts of a ratio.

### Proportional relationship: first pair

Use proportional reasoning to decide whether  $25/30$  and  $100/110$  form a proportional relationship.

**No; the ratios are not equivalent.**

1.  $25 \times 4 = 100$ , so test a scale factor of 4.
2.  $30 \times 4 = 120$ , not 110. The same scale factor does not work for both parts.
3. Check the cross-products:  $25 \times 110 = 2,750$  and  $30 \times 100 = 3,000$ .
4. Since the cross-products differ, the ratios are not equivalent and the relationship is not proportional.

Note: Both quantities getting larger is not enough. Their ratio must stay the same.

### Proportional relationship: second pair

Use proportional reasoning to decide whether  $9/12$  and  $36/48$  form a proportional relationship.

**Yes; the ratios are equivalent.**

1.  $9 \times 4 = 36$  and  $12 \times 4 = 48$ .
2. The same scale factor, 4, works for both parts, so the ratios are proportional.
3. Check:  $9 \times 48 = 432$  and  $12 \times 36 = 432$ . The cross-products are equal.
4. Both ratios also simplify to  $\frac{3}{4}$ .

Note: Check both numerator and denominator before deciding.

## Worksheet page 6

### Dog food: 3 cans

The unit rate is \$2 per can of dog food. What would be the cost for 3 cans of dog food?

**\$6**

1. Each can costs \$2.
2. Cost = price per can  $\times$  number of cans.
3.  $\$2 \times 3 = \$6$ , so 3 cans cost \$6.

Note: The answer needs dollar units, not can units.

### Dog food: 10 cans

At the same \$2-per-can unit rate, what would be the cost for 10 cans of dog food?

**\$20**

1. The unit price stays \$2 per can.
2. Cost =  $\$2 \times 10 = \$20$ .
3. Check:  $\$20 \div 10 \text{ cans} = \$2 \text{ per can}$ .

Note: Use all 10 cans in the calculation.

### Example 1: find the whole

60 is 75% of what number? Use a proportion to find your answer.

**80**

1. Let  $n$  be the whole number. The part is 60 and the percent is 75%.
2. Use part/whole = percent/100:  $60/n = 75/100$ .
3. Cross-multiply:  $60 \times 100 = 75n$ , so  $6,000 = 75n$ .
4. Divide both sides by 75:  $n = 80$ .
5. Check:  $0.75 \times 80 = 60$ .

Note: Do not find 75% of 60. The question already tells you that 60 is the 75% part.

### Example 2: find the whole

20 is 25% of what number? Use a proportion to find your answer.

**80**

1. Let  $n$  be the whole number.
2. Write part/whole = percent/100:  $20/n = 25/100$ .

3. Cross-multiply:  $20 \times 100 = 25n$ , so  $2,000 = 25n$ .

4. Divide both sides by 25:  $n = 80$ .

5. Check: 25% is one fourth, and one fourth of 80 is 20.

Note: 20 is already one fourth of the whole, so the whole must be larger than 20.

### Example 3: lightning distance

If you hear thunder 15 seconds after you see lightning, you are about 3 miles from the lightning. What is your distance from the lightning if you hear thunder 10 seconds after you see lightning? Set up a proportion.

#### About 2 miles

1. Let  $d$  be the distance in miles.

2. Keep the units in the same order:  $3 \text{ miles}/15 \text{ seconds} = d \text{ miles}/10 \text{ seconds}$ .

3. Cross-multiply:  $3 \times 10 = 15d$ , so  $30 = 15d$ .

4. Divide by 15:  $d = 2$ . The distance is about 2 miles.

5. Check:  $15 \div 3 = 5$  seconds per mile, and  $10 \div 5 = 2$  miles.

Note: Do not reverse the unit order in only one fraction. The distance is approximate because the worksheet gives an approximate model.

## Worksheet page 7

### Example 1: gasoline unit price

A customer bought 16 gallons of gasoline for \$52. What is the price per gallon of the gasoline?

**\$3.25 per gallon**

1. Write dollars/gallons of gas =  $\$52/16$  gallons.
2. Divide the total cost by the gallons:  $52 \div 16 = 3.25$ .
3. The unit-rate ratio is  $\$3.25/1$  gallon.
4. Fill the blank with 3.25: The customer paid \$3.25 per gallon.
5. Check:  $16 \times \$3.25 = \$52$ .

Note:  $16 \div 52$  gives gallons per dollar, which is the reverse of what was asked.

### Example 2: hourly pay

A grocery-store bagger worked for 20 hours last week and was paid \$150. How much does the worker earn per hour?

**\$7.50 per hour**

1. Write dollars/hours =  $\$150/20$  hours.
2. Divide:  $150 \div 20 = 7.5$ .
3. Write money with two decimal places:  $\$7.50/1$  hour.
4. Fill the blank with 7.50: The worker earns \$7.50 per hour.
5. Check:  $20 \times \$7.50 = \$150$ .

Note: \$7.50 and \$7.05 are different amounts. 7.5 dollars is 7 dollars and 50 cents.

### Example 3: lever force

A person can lift a 10-pound weight by applying 30 pounds of force to a lever. If the required force is directly proportional to the weight lifted, how much force is needed to lift a 25-pound weight?

**75 pounds of force**

1. Find the force per pound of lifted weight:  $30 \div 10 = 3$ .
2. The relationship requires 3 pounds of force for each pound of weight.
3. For a 25-pound weight, multiply:  $3 \times 25 = 75$ .
4. The person needs 75 pounds of force under the relationship given.

Note: Keep force and lifted weight in matching positions in both ratios.

## Worksheet page 8

### Example 4: better plate deal

Sturdy's paper plates cost \$3.12 for 24 plates. Paperoni's paper plates cost \$4.32 for 36 paper plates. Which brand is the better deal? The better deal is the cheaper unit rate.

**Paperoni's is the better deal: \$0.12 per plate, compared with Sturdy's \$0.13 per plate.**

1. Find Sturdy's unit price:  $\$3.12 \div 24 = \$0.13$  per plate.
2. Find Paperoni's unit price:  $\$4.32 \div 36 = \$0.12$  per plate.
3. Compare prices for the same unit: 12 cents per plate is less than 13 cents per plate.
4. Choose Paperoni's. It costs 1 cent less per plate.

Note: The lower package price is not necessarily the better deal. Compare the unit prices.

### State Test Question: discount and service fee

A concert ticket originally cost \$75. A coupon gave a 20% discount, then the website applied a 10% service fee to the discounted price. The final ticket price was less than the original price by what percent?

**C. 12%**

1. Find the discount: 20% of \$75 =  $0.20 \times \$75 = \$15$ .
2. Subtract it:  $\$75 - \$15 = \$60$ .
3. Find the service fee from the discounted price: 10% of \$60 =  $0.10 \times \$60 = \$6$ .
4. Add the fee:  $\$60 + \$6 = \$66$ .
5. Find the savings from the original price:  $\$75 - \$66 = \$9$ .
6. Divide savings by original price:  $\$9 \div \$75 = 0.12$ .
7. Convert to a percent:  $0.12 \times 100\% = 12\%$ . Choose C.

Note: Subtracting 10% from 20% does not work because the two percentages use different base prices.

## Worksheet page 9

### self-assessment

I can determine that a proportion is a statement of equality between two ratios. (NY-7.RP.2a)  
Use a check to assess your understanding of this standard.

**Choose the description that honestly matches your understanding. There is no single correct confidence rating.**

1. A ratio compares two quantities, such as 2 red counters to 3 blue counters.
2. A proportion states that two ratios are equal, such as  $\frac{2}{3} = \frac{4}{6}$ .
3. Check:  $2 \times 6 = 12$  and  $3 \times 4 = 12$ , so the ratios are equal.
4. Choose “Yes! I got this?”, “I can do this with a little help”, or “I need help!” based on your own understanding.

Note: This is a self-assessment, so the learner should select their own confidence level honestly.

### reflection-1

“Here’s the thing...” I got most of it. The part I am struggling with is...

**Personal response. Example, if it fits: “I need practice keeping the same quantities in the numerators and denominators.”**

1. Think about which step is hardest: writing ratios in the same order, finding equivalent ratios, or solving for a missing value.
2. Write the step you actually need help with.

Note: This is an example response, not a claim about the learner.

### reflection-2

A question I still have

**Personal response. Example: “How do I know whether to compare one part with another part or with the whole?”**

1. Choose a question you genuinely want explained.
2. If you understand everything, you may write “I have no questions right now” and give a proportion example to check your understanding.

## Worksheet page 10

### 1

What is an example of a proportional relationship?

**Example: notebooks cost \$3 each, so total cost  $C = 3n$ , where  $n$  is the number of notebooks.**

1. 1 notebook costs \$3; 2 cost \$6; 3 cost \$9.
2. For every nonzero number of notebooks,  $\text{cost} \div \text{number} = 3$ .
3. The ratio is constant, so the relationship is proportional.

Note: Other correct examples are acceptable.

### 2

What is the constant of proportionality?

**The constant of proportionality is the fixed multiplier  $k$  in  $y = kx$ . It equals  $y \div x$  when  $x \neq 0$ . In the notebook example,  $k = 3$  dollars per notebook.**

1. Multiply each  $x$ -value by the same number to get  $y$ .
2. That number is  $k$ , the constant of proportionality.
3. For example,  $\$6 \div 2 \text{ notebooks} = \$3 \text{ per notebook}$ .

Note: The question asks for a definition; the notebook example from question 1 illustrates it.

### Ask Yourself

A percent is a ratio of a number to 100. How can that help you write one ratio in a proportion?

**Write the percent as percent/100. Then set part/whole equal to percent/100.**

1. Percent means "per hundred," so a percent  $p$  can be written as  $p/100$ .
2. For example, 23% is  $23/100$ .
3. For 23% of 80, write  $x/80 = 23/100$ .

### 3

Set up a proportion that could be used to find 10% of 30.

**$x/30 = 10/100$ ;  $x = 3$**

1. Let  $x$  be the unknown part. Use  $\text{part/whole} = \text{percent}/100$ .
2. The whole is 30 and the percent is 10, so  $x/30 = 10/100$ .
3. Cross-multiply:  $100x = 30 \times 10 = 300$ .
4. Divide both sides by 100:  $x = 300 \div 100 = 3$ .

Note: The worksheet asks for the proportion. The value of  $x$  is also included to show the full solution. Equivalent consistent proportions are valid.

#### 4

Set up a proportion that could be used to find 23% of 80.

$$\mathbf{x/80 = 23/100; x = 18.4}$$

1. Let  $x$  be the unknown part. Use part/whole = percent/100.
2. The whole is 80 and the percent is 23, so  $x/80 = 23/100$ .
3. Cross-multiply:  $100x = 80 \times 23 = 1840$ .
4. Divide both sides by 100:  $x = 1840 \div 100 = 18.4$ .

Note: The worksheet asks for the proportion. The value of  $x$  is also included to show the full solution. Equivalent consistent proportions are valid.

#### 5

Set up a proportion that could be used to find 2% of 65.

$$\mathbf{x/65 = 2/100; x = 1.3}$$

1. Let  $x$  be the unknown part. Use part/whole = percent/100.
2. The whole is 65 and the percent is 2, so  $x/65 = 2/100$ .
3. Cross-multiply:  $100x = 65 \times 2 = 130$ .
4. Divide both sides by 100:  $x = 130 \div 100 = 1.3$ .

Note: The worksheet asks for the proportion. The value of  $x$  is also included to show the full solution. Equivalent consistent proportions are valid.

#### 6

Set up a proportion that could be used to find 150% of 31.

$$\mathbf{x/31 = 150/100; x = 46.5}$$

1. Let  $x$  be the unknown part. Use part/whole = percent/100.
2. The whole is 31 and the percent is 150, so  $x/31 = 150/100$ .
3. Cross-multiply:  $100x = 31 \times 150 = 4650$ .
4. Divide both sides by 100:  $x = 4650 \div 100 = 46.5$ .
5. Check: 150% is 100% plus 50%, so  $31 + 15.5 = 46.5$ .

Note: The worksheet asks for the proportion. The value of  $x$  is also included to show the full solution. Equivalent consistent proportions are valid.

## 7

How could you set up a proportion to answer the question, “3 is 20% of what number”? Is the proportion different from the one you would use to find 20% of 3?

**For “3 is 20% of what number?”, use  $3/n = 20/100$ , so  $n = 15$ . Yes, it is different from “20% of 3”: that uses  $x/3 = 20/100$ , so  $x = 0.6$ .**

1. Use part/whole = percent/100 in both problems.
2. In “3 is 20% of what number?”, 3 is the part and the whole  $n$  is unknown, so  $3/n = 20/100$ .
3. Cross-multiply:  $3 \times 100 = 20n$ , so  $300 = 20n$  and  $n = 15$ .
4. In “20% of 3”, 3 is the whole and the part  $x$  is unknown, so  $x/3 = 20/100$ .
5. Cross-multiply:  $100x = 3 \times 20 = 60$ , so  $x = 0.6$ .
6. The proportions are different because 3 is the part in the first question and the whole in the second.

## 8

A customer leaves a \$3 tip at a restaurant. If that tip is equal to 15% of his total bill, what is his total bill?

**\$20**

1. Let  $b$  be the bill before adding the tip.
2. Write part/whole = percent/100:  $3/b = 15/100$ .
3. Cross-multiply:  $15b = 300$ . Divide by 15:  $b = 20$ .
4. Check:  $15\% \text{ of } \$20 = 0.15 \times \$20 = \$3$ .

Note: The requested bill is \$20. The amount paid including the tip would be \$23.

## Worksheet page 11

**9**

Use a proportion to solve: What is 10% of 50?

**5**

1. Let  $x$  be the unknown part. Use  $\text{part/whole} = \text{percent}/100$ .
2. Write  $x/50 = 10/100$ .
3. Cross-multiply:  $100x = 50 \times 10 = 500$ .
4. Divide by 100:  $x = 5$ .

**10**

Use a proportion to solve: What is 35% of 70?

**24.5**

1. Let  $x$  be the unknown part. Use  $\text{part/whole} = \text{percent}/100$ .
2. Write  $x/70 = 35/100$ .
3. Cross-multiply:  $100x = 70 \times 35 = 2450$ .
4. Divide by 100:  $x = 24.5$ .

**11**

Use a proportion to solve: 36 is what percent of 40?

**90%**

1. Let  $p$  be the unknown percent. Use  $\text{part/whole} = \text{percent}/100$ .
2. Write  $36/40 = p/100$ .
3. Cross-multiply:  $40p = 36 \times 100 = 3600$ .
4. Divide by 40:  $p = 90$ .
5. The answer is 90%.

**12**

Use a proportion to solve: 1 is what percent of 50?

**2%**

1. Let  $p$  be the unknown percent. Use  $\text{part/whole} = \text{percent}/100$ .
2. Write  $1/50 = p/100$ .
3. Cross-multiply:  $50p = 1 \times 100 = 100$ .

4. Divide by 50:  $p = 2$ .

5. The answer is 2%.

### 13

A cheetah runs 87 meters in 3 seconds. What is the cheetah's unit rate of speed?

**29 meters per second**

1. A unit rate gives the distance for 1 second.

2. Divide distance by time:  $87 \text{ meters} \div 3 \text{ seconds} = 29 \text{ meters per second}$ .

3. Check:  $29 \times 3 = 87 \text{ meters}$ .

### 14

If 6 cans of tomatoes cost \$9, how much would it cost to buy 8 cans?

**\$12**

1. Find the cost per can:  $\$9 \div 6 = \$1.50$ .

2. Multiply by 8 cans:  $\$1.50 \times 8 = \$12$ .

3. Proportion check:  $9/6 = 12/8 = 1.5 \text{ dollars per can}$ .

### 15

A person can lift a 10-pound weight by applying 30 pounds of force to a lever. If the amount of force needed is proportional to the weight lifted, how much force is needed to lift a 25-pound weight?

**75 pounds of force**

1. Find the constant ratio of force to weight:  $30 \div 10 = 3$ .

2. Multiply the new weight by 3:  $25 \times 3 = 75$ .

3. The person needs 75 pounds of force under the stated proportional relationship.

4. Proportion check:  $30/10 = 75/25 = 3$ .

### 16

A real estate agent earns a commission on every house she sells. She sells a house for \$120,000 and earns \$4,800. What is the rate of her commission?

**4%**

1. The commission is the part, and the sale price is the whole.

2. Divide:  $4,800 \div 120,000 = 0.04$ .

3. Convert:  $0.04 \times 100\% = 4\%$ .

4. Check:  $4\%$  of  $\$120,000 = 0.04 \times \$120,000 = \$4,800$ .

## 17

A \$62 handbag is on sale for 35% off. What is the sale price of the handbag? Show or explain how you found your answer.

**\$40.30**

1. Find the discount:  $0.35 \times \$62 = \$21.70$ .
2. Subtract the discount:  $\$62.00 - \$21.70 = \$40.30$ .
3. Check: You pay  $100\% - 35\% = 65\%$ ;  $0.65 \times \$62 = \$40.30$ .

## Worksheet page 12

### 1a

Solve  $x/4 = 7$  without using cross multiplication.

**$x = 28$**

1. Multiply both sides by 4:  $4 \times (x/4) = 4 \times 7$ .
2. Simplify:  $x = 28$ .
3. Check:  $28/4 = 7$ .

### 1b

Solve  $y/20 = 7/4$  without using cross multiplication.

**$y = 35$**

1. Multiply both sides by 20:  $y = 20 \times (7/4)$ .
2. Simplify  $20 \div 4 = 5$ , then  $5 \times 7 = 35$ .
3. Check:  $35/20$  simplifies to  $7/4$ .

### 1c

Solve  $c/30 = 11/5$  without using cross multiplication.

**$c = 66$**

1. Multiply both sides by 30:  $c = 30 \times (11/5)$ .
2. Simplify  $30 \div 5 = 6$ , then  $6 \times 11 = 66$ .
3. Check:  $66/30$  simplifies to  $11/5$ .

### 2a

Solve  $10/m = 5/2$  by using cross multiplication.

**$m = 4$**

1. Cross-multiply:  $10 \times 2 = 5m$ .
2. Simplify:  $20 = 5m$ .
3. Divide both sides by 5:  $m = 4$ .
4. Check:  $10/4 = 5/2$ .

### 2b

Solve  $2/7 = 8/y$  by using cross multiplication.

**$y = 28$**

1. Cross-multiply:  $2y = 7 \times 8$ .
2. Simplify:  $2y = 56$ .
3. Divide both sides by 2:  $y = 28$ .
4. Check:  $8/28$  simplifies to  $2/7$ .

**2c**

Solve  $12/c = 3/2$  by using cross multiplication.

**$c = 8$**

1. Cross-multiply:  $12 \times 2 = 3c$ .
2. Simplify:  $24 = 3c$ .
3. Divide both sides by 3:  $c = 8$ .
4. Check:  $12/8$  simplifies to  $3/2$ .

**3**

In a hand of cards, the ratio of black cards to red cards was 5 to 3. If the hand contained 15 black cards, which proportion could be solved to find the number of red cards,  $r$ ?

**Choice (1):  $15/r = 5/3$ . Solving gives  $r = 9$  red cards.**

1. Keep black cards over red cards in both ratios.
2. The actual hand gives  $15/r$ , and the stated ratio gives  $5/3$ .
3. Therefore  $15/r = 5/3$ , choice (1).
4. To solve:  $15 \times 3 = 5r$ , so  $45 = 5r$  and  $r = 9$ .

**4**

A person has a jar full of just pennies and nickels. The ratio of pennies to nickels is 8 to 3. Which is the ratio of nickels to the number of all the coins?

**Choice (1): 3 to 11**

1. The ratio has 8 parts pennies and 3 parts nickels.
2. All coins make  $8 + 3 = 11$  parts.
3. Nickels to all coins is 3 to 11.

Note: The worksheet has a numbering typo: both right-column choices are printed "(4)." The correct answer is clearly the first choice, 3 to 11.

## Worksheet page 13

### 5a

Students in an art teacher's classes could choose to make a sculpture or paint a picture as their final project. The ratio of those who chose a sculpture to those who chose a picture was 3 to 7. There were 24 students who chose a sculpture. Let  $p$  be the number who chose a picture. Set up a proportion that will allow you to solve for  $p$ . Solve the proportion to find the number of students that chose to paint a picture.

**$24/p = 3/7$ ;  $p = 56$  students**

1. Keep sculpture/picture on both sides:  $24/p = 3/7$ .
2. Cross-multiply:  $24 \times 7 = 3p$ , so  $168 = 3p$ .
3. Divide by 3:  $p = 56$ .
4. Check by scaling:  $24 \div 3 = 8$ ;  $7 \times 8 = 56$ .

### 5b

Students in an art teacher's classes could choose to make a sculpture or paint a picture as their final project. The ratio of those who chose a sculpture to those who chose a picture was 3 to 7. There were 24 students who chose a sculpture. Let  $p$  be the number who chose a picture. What is the total number of students?

**80 students**

1. There are 24 making sculptures and 56 painting pictures.
2. Add both groups:  $24 + 56 = 80$  students.

### 5c

Students in an art teacher's classes could choose to make a sculpture or paint a picture as their final project. The ratio of those who chose a sculpture to those who chose a picture was 3 to 7. There were 24 students who chose a sculpture. Let  $p$  be the number who chose a picture. What is the ratio of the number of students who painted pictures to the total number of students? State in simplest form.

**7 to 10**

1. Pictures to all students is 56 to 80.
2. Divide both parts by 8:  $56 \div 8 = 7$  and  $80 \div 8 = 10$ .
3. The simplest ratio is 7 to 10.
4. Check using ratio parts:  $7/(3 + 7) = 7/10$ .

**6a**

A holiday decoration involves blue and white lights. The ratio of blue lights to white lights is 3 to 2. The box stated that the number of blue lights was 114 but did not give the number of white lights or the total number of lights. What is the ratio of the number of blue lights to the total number of lights? Explain.

**3 to 5**

1. There are 3 blue parts and 2 white parts.
2. The total is  $3 + 2 = 5$  parts.
3. Blue lights to all lights is 3 to 5.

**6b**

A holiday decoration involves blue and white lights. The ratio of blue lights to white lights is 3 to 2. The box stated that the number of blue lights was 114 but did not give the number of white lights or the total number of lights. If the total number of lights is represented by  $t$ , create a proportion that you can use to solve for  $t$  and solve it.

 **$114/t = 3/5$ ;  $t = 190$  lights**

1. Keep blue/total on both sides:  $114/t = 3/5$ .
2. Cross-multiply:  $114 \times 5 = 3t$ , so  $570 = 3t$ .
3. Divide by 3:  $t = 190$ .
4. Check:  $114 \div 3 = 38$  lights per ratio part;  $5 \times 38 = 190$  total lights.

Note: Extra check: white lights  $= 2 \times 38 = 76$ ;  $114 + 76 = 190$ .