Math 6 Unit 4 worksheet: Finding a missing value in a pair of equal ratios (answer key)

ANSWERS AT A GLANCE

1. (a) 35 (b) 63 (c) 42 (d) 3 (e) 88 (f) 9
2. (a) 15 (b) 12 (c) 10.5 (d) 7.5 (e) 21 (f) $1\frac{7}{8}$
3. 54 spoonfuls of activator
4. 56 players
5. 7.5 meters
6. 7 adults
7. (a) Equal ratios multiply both parts by the same number; taking away the same amount changes the comparison. (b) 4

WORKED SOLUTIONS

1. Find the missing value. Use a whole scaling number, across or within, and check by scaling.

(a) $6 : 5 = 42 : ?$ (b) $9 : 4 = ? : 28$ (c) $8 : 56 = 6 : ?$ (d) $36 : 27 = 4 : ?$

(e) $3 : 24 = 11 : ?$ (f) $45 : 10 = ? : 2$

ANSWER

(a) 35 (b) 63 (c) 42 (d) 3 (e) 88 (f) 9

SOLUTION

(a) Across: 42 ÷ 6 = 7, so 5 × 7 = 35. Check: 6 : 5 = 42 : 35, both parts times 7.

(b) Across: 28 ÷ 4 = 7, so 9 × 7 = 63. Check: 9 : 4 = 63 : 28.

(c) Within: 56 ÷ 8 = 7, so the second part is 7 times the first, and 6 × 7 = 42. (Across would need 6 ÷ 8 = 0.75.) Check: 8 × 0.75 = 6 and 56 × 0.75 = 42.

(d) Scaling down: 36 ÷ 4 = 9, so divide the other part by 9 too: 27 ÷ 9 = 3. Check: 4 × 9 = 36 and 3 × 9 = 27.

(e) Within: 24 ÷ 3 = 8, so 11 × 8 = 88. Check: across, 88 ÷ 24 = 11 ÷ 3, the same scaling number $3\frac{2}{3}$ for both parts.

(f) Scaling down: 10 ÷ 2 = 5, so 45 ÷ 5 = 9. Check: 9 : 2 times 5 is 45 : 10.

2. Find the missing value. When no whole scaling number works, go through a friendlier ratio first. Write a fraction answer as a mixed number.

(a) $6 : 10 = 9 : ?$ (b) $8 : 6 = ? : 9$ (c) $10 : 7 = 15 : ?$ (d) $9 : 12 = ? : 10$

(e) $6 : 4 = ? : 14$ (f) $8 : 5 = 3 : ?$

ANSWER

(a) 15 (b) 12 (c) 10.5 (d) 7.5 (e) 21 (f) $1\frac{7}{8}$

SOLUTION

(a) 6 and 9 share the factor 3. Divide by 2: 6 : 10 = 3 : 5. Then × 3: 3 : 5 = 9 : 15. The missing value is 15.

(b) 6 and 9 share the factor 3. Divide by 2: 8 : 6 = 4 : 3. Then × 3: 4 : 3 = 12 : 9. The missing value is 12.

(c) 10 and 15 share the factor 5. Divide by 2: 10 : 7 = 5 : 3.5. Then × 3: 5 : 3.5 = 15 : 10.5. The missing value is 10.5.

(d) 12 and 10 share the factor 2. Divide by 6: 9 : 12 = 1.5 : 2. Then × 5: 1.5 : 2 = 7.5 : 10. The missing value is 7.5.

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(e) 4 and 14 share the factor 2. Divide by 2: 6 : 4 = 3 : 2. Then × 7: 3 : 2 = 21 : 14. The missing value is 21.

(f) 8 and 3 share no factor except 1, so go down to one part: divide by 8, $8 : 5 = 1 : \frac{5}{8}$. Then × 3: $3 \times \frac{5}{8} = \frac{15}{8} = 1\frac{7}{8}$. Check with the across number $\frac{3}{8}$: $8 \times \frac{3}{8} = 3$ and $5 \times \frac{3}{8} = \frac{15}{8}$.

3. A class makes slime with 3 bottles of glue for every 6 spoonfuls of activator. For a slime day the whole grade uses 27 bottles of glue. How many spoonfuls of activator keep the same ratio?

ANSWER
54 spoonfuls of activator

SOLUTION
The question is $3 : 6 = 27 : ?$. The glue is known in both ratios: 27 ÷ 3 = 9, so the scaling number is 9.

Apply it to the activator: 6 × 9 = 54. The grade needs 54 spoonfuls of activator. Check: 3 : 6 = 27 : 54, both parts times 9.

4. A soccer league has 3 coaches for every 24 players. Next season it will have 7 coaches. How many players can it take and keep the same ratio? Say whether you reasoned across or within, and why.

ANSWER
56 players

SOLUTION
The question is $3 : 24 = 7 : ?$. Across, the scaling number is $7 \div 3 = 2\frac{1}{3}$, not whole. Within, the players are 24 ÷ 3 = 8 times the coaches, a whole number, so reason within: 7 × 8 = 56.

The league can take 56 players. Check across: $24 \times 2\frac{1}{3} = 48 + 8 = 56$.

5. A robotics club uses 3 meters of wire for every 4 robots it builds. This year the club will build 10 robots. How many meters of wire does it need?

ANSWER
7.5 meters

SOLUTION
The question is $3 : 4 = ? : 10$. Across, 10 ÷ 4 = 2.5, not whole. The numbers 4 and 10 share the factor 2, so divide both parts by 2: 3 : 4 = 1.5 : 2. From 2 to 10 is × 5:

$$1.5 : 2 = 7.5 : 10$$

The club needs 7.5 meters of wire. Check: 3 × 2.5 = 7.5 and 4 × 2.5 = 10. Wire can be cut to half a meter, so 7.5 fits the setting.

6. The rule for a school trip is at least 2 adults for every 15 students. 50 students are going. How many adults must go?

ANSWER
7 adults

SOLUTION

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The question is $2 : 15 = ? : 50$. Across, $50 \div 15 = 3\frac{1}{3}$, not whole. The numbers 15 and 50 share the factor 5, so divide both parts by 3: $2 : 15 = \frac{2}{3} : 5$. From 5 to 50 is × 10:

$$\frac{2}{3} : 5 = 6\frac{2}{3} : 50$$

The equal ratio says $6\frac{2}{3}$ adults, and a trip cannot take part of an adult. The rule sets the fewest adults, so round up. Test with the within number: the students may be 15 ÷ 2 = 7.5 times the adults. 6 adults cover 6 × 7.5 = 45 students, fewer than 50; 7 adults cover 7 × 7.5 = 52.5, enough. So 7 adults must go.

7. Omar solves $6 : 15 = ? : 10$. He writes: "From 15 to 10 is 5 less, so the first part is 5 less too. The missing value is 6 – 5 = 1."

(a) Explain what is wrong with Omar's reasoning.

(b) Find the missing value and check it by scaling.

ANSWER

(a) Equal ratios multiply both parts by the same number; taking away the same amount changes the comparison. (b) 4

SOLUTION

(a) Two ratios are equal when one is a scaled copy of the other: both parts are multiplied by the same number. Omar took the same amount away from both parts, which does not keep the comparison. In 6 : 15 the second part is 15 ÷ 6 = 2.5 times the first, but in 1 : 10 it is 10 times the first, so 1 : 10 is not equal to 6 : 15.

(b) The numbers 15 and 10 share the factor 5. Divide both parts by 3: 6 : 15 = 2 : 5. Then × 2: 2 : 5 = 4 : 10. The missing value is 4. Check: the across number is $10 \div 15 = \frac{2}{3}$, and $6 \times \frac{2}{3} = 4$, $15 \times \frac{2}{3} = 10$.

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