Verbal Descriptions to Direct-Variation Equations y = kx

Grading Rubric

Rubric criteria for scoring each scenario.

Criterion	Points
Defines both variables in words	1
Writes general form y = kx with chosen names	1
Substitutes known values and solves for k	1
States final equation with numerical k	1
Answers follow-up by substituting and solving	1
Shows a check (substitute back or ratio)	1
Uses consistent units and labels k	1

Verbal Descriptions to Direct-Variation Equations y = kx

Complete worked example / separate answer key

A recipe uses 3 cups of flour for every 2 cups of sugar. Write a direct-variation equation relating cups of flour F to cups of sugar S. Then find how many cups of flour are needed for 5 cups of sugar.

Answer: F = 1.5S; for S = 5, F = 7.5 cups of flour.

Reason: The description gives a constant ratio: 3 cups flour to 2 cups sugar. Let F be flour and S be sugar. Since F varies directly as S, write F = kS. Substitute F = 3 when S = 2: 3 = k(2), so k = 1.5. The equation is F = 1.5S. For S = 5, F = 1.5(5) = 7.5. Check: 7.5/5 = 1.5, which matches k.

Verbal Descriptions to Direct-Variation Equations y = kx

Original tasks 1, 2, 3 / complete keys

Task 1

The distance D a car travels varies directly as the time t in hours. In 3 hours, the car travels 150 miles. Write the equation relating D and t, and find the distance traveled in 5 hours.

Answer: D = 50t; in 5 hours, D = 250 miles.

Reason: Let D be distance in miles and t be time in hours. Write D = kt. Substitute D = 150 when t = 3: 150 = k(3), so k = 50. The equation is D = 50t. For t = 5, D = 50(5) = 250 miles.

Check: Substitute t = 5 into D = 50t to get 250. Check the ratio: 250/5 = 50, which matches k.

Task 2

The cost C of buying n notebooks varies directly as the number of notebooks. If 4 notebooks cost $10, write the equation and find the cost of 7 notebooks.

Answer: C = 2.5n; 7 notebooks cost $17.50.

Reason: Let C be total cost in dollars and n be the number of notebooks. Write C = kn. Substitute C = 10 when n = 4: 10 = k(4), so k = 2.5. The equation is C = 2.5n. For n = 7, C = 2.5(7) = 17.5 dollars.

Check: Substitute n = 7 into C = 2.5n to get 17.5. Check the ratio: 17.5/7 = 2.5, which matches k.

Task 3

The amount of water W in gallons used by a shower varies directly as the number of minutes m. A 6-minute shower uses 12 gallons. Write the equation and find the water used in a 9-minute shower.

Answer: W = 2m; a 9-minute shower uses 18 gallons.

Reason: Let W be water in gallons and m be minutes. Write W = km. Substitute W = 12 when m = 6: 12 = k(6), so k = 2. The equation is W = 2m. For m = 9, W = 2(9) = 18 gallons.

Check: Substitute m = 9 into W = 2m to get 18. Check the ratio: 18/9 = 2, which matches k.

Verbal Descriptions to Direct-Variation Equations y = kx

Original tasks 4 / complete keys

Task 4

The number of pages P printed varies directly as the number of minutes t. A printer prints 45 pages in 3 minutes. Write the equation and find how many minutes it takes to print 120 pages.

Answer: P = 15t; it takes 8 minutes to print 120 pages.

Reason: Let P be pages and t be minutes. Write P = kt. Substitute P = 45 when t = 3: 45 = k(3), so k = 15. The equation is P = 15t. To find t when P = 120, solve 120 = 15t, so t = 8 minutes.

Check: Substitute t = 8 into P = 15t to get 120. Check the ratio: 120/8 = 15, which matches k.

Verbal Descriptions to Direct-Variation Equations y = kx

Worked example, Task 1, Task 2, Task 3, Task 4 / Check Methods

Substitute-back and ratio checks for each scenario.

Scenario	Check
1	250/5 = 50 matches k.
2	17.5/7 = 2.5 matches k.
3	18/9 = 2 matches k.
4	120/8 = 15 matches k.
5	7.5/5 = 1.5 matches k.
6	120/8 = 15 matches k.

Verbal Descriptions to Direct-Variation Equations y = kx

Worked example, Task 1, Task 2, Task 3, Task 4 / Answer Key: Worked Solutions for All 6 Scenarios

Full worked solutions with equation, k, follow-up answer, and check for each scenario.

Scenario	Equation	k	Follow-up answer
1. Car distance	D = 50t	50 miles per hour	D = 250 miles in 5 hours
2. Notebook cost	C = 2.5n	2.5 dollars per notebook	C = $17.50 for 7 notebooks
3. Shower water	W = 2m	2 gallons per minute	W = 18 gallons in 9 minutes
4. Printer pages	P = 15t	15 pages per minute	t = 8 minutes for 120 pages
5. Recipe flour/sugar	F = 1.5S	1.5 cups flour per cup sugar	F = 7.5 cups flour for 5 cups sugar
6. Hourly earnings	y = 15x	15 dollars per hour	y = $120 for 8 hours

Verbal Descriptions to Direct-Variation Equations y = kx

Source rubric / reflection

- [ ] Defines both variables in words before writing the equation.
- [ ] Writes the general form y = kx using the chosen variable names.
- [ ] Substitutes the known values correctly and solves for k.
- [ ] States the final equation with the numerical value of k.
- [ ] Answers the follow-up question by substituting and solving.
- [ ] Shows a check by substituting back or verifying the ratio.
- [ ] Uses consistent units and labels k with appropriate units.

Reflection: What did you check, what did you change, and what will you try next?