

# Rates and Work

---

For questions in the Quantitative Comparison format (“Quantity A” and “Quantity B” given), the answer choices are always as follows:

- (A) Quantity A is greater.
- (B) Quantity B is greater.
- (C) The two quantities are equal.
- (D) The relationship cannot be determined from the information given.

For questions followed by a numeric entry box , you are to enter your own answer in the

box. For questions followed by fraction-style numeric entry boxes 


, you are to enter your answer in the form of a fraction. You are not required to reduce fractions. For example, if the answer is  $\frac{1}{4}$ , you may enter 25/100 or any equivalent fraction.

All numbers used are real numbers. All figures are assumed to lie in a plane unless otherwise indicated. Geometric figures are not necessarily drawn to scale. You should assume, however, that lines that appear to be straight are actually straight, points on a line are in the order shown, and all geometric objects are in the relative positions shown. Coordinate systems, such as  $xy$ -planes and number lines, as well as graphical data presentations such as bar charts, circle graphs, and line graphs, *are* drawn to scale. A symbol that appears more than once in a question has the same meaning throughout the question.

---

1. Roger took 2 hours to walk from his home to a store 3 miles away, and then returned home along the same path. If Roger’s average rate for the round trip was 2 miles per hour, at what rate, in miles per hour, did Roger return home?
- 10

(A) 3

(B) 3

5

(C) 2

(D) 2

(E) 1
2. Running on a 10-mile loop in the same direction, Sue ran at a constant rate of 8 miles per hour and Rob ran at a constant rate of 6 miles per hour. If they began running at the same point on the loop, how many hours later did Sue complete exactly 1 more lap than Rob?
- (A) 3

(B) 4

- (C) 5
- (D) 6
- (E) 7

3. Svetlana ran the first 5 kilometers of a 10-kilometer race at a constant rate of 12 kilometers per hour. If she completed the entire 10-kilometer race in 55 minutes, at what constant rate did she run the last 5 kilometers of the race, in kilometers per hour?

- (A) 15
- (B) 12
- (C) 11
- (D) 10
- (E) 8

4. A standard machine fills paint cans at a rate of 1 gallon every 4 minutes. A deluxe machine fills gallons of paint at twice the rate of a standard machine. How many hours will it take a standard machine and a deluxe machine, working together, to fill 135 gallons of paint?

- (A) 1
- (B) 1.5
- (C) 2
- (D) 2.5
- (E) 3

5. Wendy builds a birdhouse in 15 hours and Michael builds an identical birdhouse in 10 hours. How many hours will it take Wendy and Michael, working together at their respective constant rates, to build a birdhouse? (Assume that they can work on the same birdhouse without changing each other's work rate.)

- (A) 5
- (B) 6
- (C) 7
- (D) 8
- (E) 9

6. Machine A, which produces 15 golf clubs per hour, fills a production lot in 6 hours. Machine B fills the same production lot in 1.5 hours. How many golf clubs does Machine B produce per hour?

golf clubs per hour

7. Davis drove from Amityville to Beteltown at 50 miles per hour, and returned by the same route at 60 miles per hour.

Quantity A

Quantity B

Davis' average speed for the round trip, in miles per hour

55

$\frac{1}{30}$

8. If a turtle traveled  $\frac{1}{30}$  of a mile in 5 minutes, what was its speed in miles per hour?

- (A) 0.02
- (B)  $0.\overline{16}$

- (C) 0.4
- (D) 0.6
- (E) 2.5

9. Akilah traveled at a rate of  $x$  miles per hour for  $2x$  hours

Quantity A

The number of miles Akilah traveled

Quantity B

$3x$

$\frac{2}{3}$

10. Claudette travels the first  $\frac{2}{3}$  of a 60-mile trip at 20 miles per hour (mph) and the remainder of the trip at 30 mph. How many minutes later would she have arrived if she had completed the entire trip at 20 mph?

minutes

11. Rajesh traveled from home to school at 30 miles per hour, then returned home at 40 miles per hour to retrieve a forgotten item, and finally returned back to school at 60 miles per hour, all along the same route. What was his average speed for the entire trip, in miles per hour?

- (A) 32
- (B) 36
- (C) 40
- (D) 45
- (E) 47

12. Jack traveled the first 75% of an 80-mile trip at 45 miles per hour and the remainder at 30 miles per hour. What was Jack's average speed for the entire 80-mile trip, in miles per hour?

- (A) 37.5
- (B) 38.25
- (C) 40
- (D) 41.25
- (E) 42.5

13. Lamont traveled 80 miles in 2.5 hours, at a constant rate. He then decreased his speed by 25% and traveled 120 additional miles at the new constant rate. How many hours did the entire journey take?

- (A) 6.25
- (B) 7.5
- (C) 8.75
- (D) 10
- (E) 11.25

14. Twelve workers pack boxes at a constant rate of 60 boxes in 9 minutes. How many minutes would it take 27 workers to pack 180 boxes, if all workers work at the same constant rate?

- (A) 12
- (B) 13
- (C) 14
- (D) 15
- (E) 16

15. Four editors can proofread 4 documents in 4 hours. How many editors would be required to proofread 80 documents in 2 hours, if all editors proofread all documents at the same constant rate?
- (A) 120  
(B) 130  
(C) 140  
(D) 150  
(E) 160
16. To service a single device in 12 seconds, 700 nanorobots are required, with all nanorobots working at the same constant rate. How many hours would it take for a single nanorobot to service 12 devices?
- (A)  $\frac{7}{3}$   
(B) 28  
(C) 108  
(D) 1,008  
(E) 1,680
17. Working at a constant rate, Sarita answered  $x$  verbal test questions in 3 hours. Separately, she solved math problems at a constant rate of  $y$  math problems every 30 minutes.

**Quantity A**

The number of verbal test questions Sarita answered in 1 hour

**Quantity B**

The number of math problems Sarita solved in 1 hour

18. If 45 people built  $\frac{1}{2}$  of a pyramid in 288 days, how many days did it take 65 people to build the next  $\frac{1}{6}$  the pyramid, rounded to the nearest integer, assuming each person works at the same constant rate?

days

19. A machine purifies 100 cubic feet ( $\text{ft}^3$ ) of water in 4 minutes. How many minutes will it take the machine to purify the contents of a 15 foot  $\times$  15 foot  $\times$  10 foot tank that is  $\frac{1}{2}$  of full of water?
- (A) 20  
(B) 30  
(C) 45  
(D) 60  
(E) 75
20. If a baker made 60 pies in the first 5 hours of his workday, by how many pies per hour did he increase his rate in the last 3 hours of the workday in order to complete 150 pies in the entire 8-hour period?

- (A) 12  
(B) 14  
(C) 16  
(D) 18  
(E) 20

21. A stockbroker worked 10 hours a day on Monday, Wednesday, and Friday, 11 hours a day on Tuesday and Thursday, and 8 hours on Saturday. She earned \$600 each weekday and \$300 on Saturday.

Quantity A

Quantity B

The stockbroker's average earnings, in dollars per hour, over the 6-day period.

50

22. Two coal carts, A and B, started simultaneously from opposite ends of a 400-yard track. Cart A traveled at a constant rate of 40 feet per second; Cart B traveled at a constant rate of 56 feet per second. After how many seconds of travel did the two carts collide? (1 yard = 3 feet)

(A) 75

(B) 48

(C)  $23\frac{1}{3}$

(D)  $12\frac{1}{2}$

(E)  $4\frac{1}{6}$

23. Nine identical machines, each working at the same constant rate, can stitch 27 jerseys in 4 minutes. How many minutes would it take 4 such machines to stitch 60 jerseys?

(A) 8

(B) 12

(C) 16

(D) 18

(E) 20

24. Brenda walked a 12-mile scenic loop in 3 hours. If she then reduced her walking speed by half, how many hours would it take Brenda to walk the same scenic loop two more times?

(A) 6

(B) 8

(C) 12

(D) 18

(E) 24

25. A gang of criminals hijacked a train heading due south. At exactly the same time, a police car located 50 miles north of the train started driving south toward the train on an adjacent roadway parallel to the train track. If the train traveled at a constant rate of 50 miles per hour, and the police car traveled at a constant rate of 80 miles per hour, how long after the hijacking did the police car catch up with the train?

(A) 1 hour

(B) 1 hour and 20 minutes

(C) 1 hour and 40 minutes

(D) 2 hours

(E) 2 hours and 20 minutes

26. Each working at a constant rate, Rachel assembles a brochure every 10 minutes and Terry assembles a brochure every 8 minutes.

Quantity AQuantity B

The number of minutes it will take Rachel and Terry, working together, to assemble 9 brochures

40

27. With 4 identical servers working at a constant rate, a new Internet search provider processes 9,600 search requests per hour. If the search provider adds 2 more identical servers, and server work rate never varies, the search provider can process 216,000 search requests in how many hours?

(A) 15  
(B) 16  
(C) 18  
(D) 20  
(E) 24

28. A pipe siphons ink from an 800-liter drum at a rate of  $r$  liters per minute. If two such pipes were used, the drum could be emptied 100 minutes faster than when one pipe is used.

Quantity AQuantity B

$r$

5

29. If Sabrina can assemble a tank in 8 hours, and Janis can assemble a tank in 13 hours, then Sabrina and Janis working together at their constant respective rates can assemble a tank in approximately how many hours?

(A) 21  
(B) 18  
(C) 7  
(D) 5  
(E) 2

30. Etienne began to eat 20 cookies at exactly the same time Jacques began making more cookies, one at a time, at a constant rate of 16 cookies per hour. If Etienne ate 20 cookies per hour, after how many hours were there no cookies?

hours

31. Phil collects virtual gold in an online computer game, and then sells the virtual gold for real dollars. After playing 10 hours a day for 6 days, he collected 540,000 gold pieces. If he immediately sold this virtual gold at a rate of \$1 per 1,000 gold pieces, what were his average earnings per hour, in real dollars?

(A) 5  
(B) 6  
(C) 7  
(D) 8  
(E) 9

32. After completing a speed training, Alyosha translates Russian literature into English at a rate of 10 more than twice as many words per hour as he was able to translate before the training. If he was previously able to translate 10 words per minute, how many words can he now translate in an hour?

(A) 30

- (B) 70
- (C) 610
- (D) 1,210
- (E) 1,800

$\frac{1}{2}$

33. Jenny takes 3 hours to sand a picnic table; Laila can do the same job in  $\frac{1}{2}$  hour. Working together at their respective constant rates, Jenny and Laila can sand a picnic table in how many hours?

- (A)  $\frac{1}{6}$
- (B)  $\frac{2}{9}$
- (C)  $\frac{1}{3}$
- (D)  $\frac{3}{7}$
- (E)  $\frac{5}{6}$

34.

One worker strings 2 violins in 3 minutes. All workers string violins at the same constant rate.

**Quantity A**

**Quantity B**

The number of minutes required for 12 workers to string 720 violins	The number of violins that 5 workers can string in 24 minutes
--	--

35. Riders board the Jelly Coaster in groups of 4 every 15 seconds. If there are 200 people in front of Kurt in line, in approximately how many minutes will Kurt board the Jelly Coaster?

- (A) 5
- (B) 8
- (C) 10
- (D) 13
- (E) 20

36. Machines A and B both shrink-wrap CDs continuously, each working at a constant rate, but Machine B works 50% faster than Machine A. If Machine B shrink-wraps 48,000 more CDs in a 24-hour period than Machine A does, what is Machine A's shrink-wrapping rate in CDs per hour?

- (A) 4,000
- (B) 6,000
- (C) 8,000
- (D) 12,000
- (E) 16,000

37. A team of 8 chefs produce 3,200 tarts in 5 days. All chefs produce tarts at the same constant rate.

**Quantity A**

**Quantity B**

The number of chefs needed to produce 3,600 tarts in 3 days	The number of days that 4 chefs need to produce 4,800 tarts
--	--

38. Working together at their respective constant rates, robot A and robot B polish 88 pounds of gemstones in 6 minutes. If robot A's rate of polishing is  $\frac{3}{5}$  that of robot B, how many minutes would it take robot A alone to

polish 165 pounds of gemstones?

- (A) 15.75
- (B) 18
- (C) 18.75
- (D) 27.5
- (E) 30

39. Car A started driving north from point  $X$ , traveling at a constant rate of 40 miles per hour. One hour later, car B started driving north from point  $X$  at a constant rate of 30 miles per hour. Neither car changed direction of travel. If each car started with 8 gallons of fuel, which is consumed at a rate of 30 miles per gallon, how many miles apart were the two cars when car A ran out of fuel?

- (A) 30
- (B) 60
- (C) 90
- (D) 120
- (E) 150

40. A population of bacteria doubled at a constant rate, increasing from 50 to 3,200 bacteria in exactly two days.

**Quantity A**

Twice the population of bacteria after 16 more  
hours

**Quantity B**

The population of bacteria after 32 more  
hours

41. One robot, working independently at a constant rate, can assemble a doghouse in 12 minutes. What is the maximum number of complete doghouses that can be assembled by 10 such identical robots, each working on

separate doghouses at the same rate for  $2\frac{1}{2}$  hours?

- (A) 20
- (B) 25
- (C) 120
- (D) 125
- (E) 150

42. A semiconductor company predicts that it will be able to double the density of transistors on its circuits (measured in transistors per square mm) every 18 months. If this prediction holds true, and the company's circuits currently have a density of 5 million transistors per square mm, what will be the density of transistors on the company's circuits, measured in millions of transistors per square mm, exactly 30 years from now?

- (A)  $5 \times 2^{18}$
- (B)  $5 \times 2^{20}$
- (C)  $5 \times 2^{26}$
- (D)  $5 \times 2^{36}$
- (E)  $5 \times 2^{45}$

43. Working continuously 24 hours a day, a factory bottles Soda Q at a rate of 500 liters per second and Soda V at a rate of 300 liters per second. If twice as many bottles of Soda V as of Soda Q are filled at the factory each day, what is the ratio of the volume of a bottle of Soda Q to a bottle of Soda V?



- (A)  $\frac{3}{10}$
- (B)  $\frac{5}{6}$
- (C)  $\frac{6}{5}$
- (D)  $\frac{8}{3}$
- (E)  $\frac{10}{3}$

44. Working alone at their respective constant rates, Audrey can complete a certain job in 4 hours, while Ferris can do the same job in 3 hours. Audrey and Ferris worked together on the job and completed it in 2 hours, but while Audrey worked this entire time, Ferris worked for some of the time and took 3 breaks of equal length. How many minutes long was each of Ferris's breaks?

- (A) 5
- (B) 10
- (C) 15
- (D) 20
- (E) 25

45. A turtle climbed to the top of a plateau at a rate of 4 miles an hour, crossed the plateau at a rate of  $x$  miles per hour, and descended the other side of the plateau at a rate of  $x^2$  miles per hour. If each portion of the journey was equal in distance, what was the turtle's average speed for the entire trip, in terms of  $x$ ?

- (A)  $\frac{2x}{x+2}$
- (B)  $\frac{(x+2)^2}{3}$
- (C)  $(x+2)^2$
- (D)  $\frac{4x^2}{(x+2)^2}$
- (E)  $\frac{12x^2}{(x+2)^2}$