SATPREP
Assignment : *Ratio, Proportion and Rate*

Easy

1. If an object travels at 15 feet per minute, how many feet does it travel in 1.5 seconds?
    a) 22.5
    b) 1
    c) 0.1
    d) $\frac{3}{8}$

2. How many pounds of flour are needed to make 15 rolls of bread if 20 pounds of flour are needed to make 100 rolls of bread?
    a) 3
    b) 4
    c) 5
    d) 3.5

3. The ratio of 1.5 to 1 is equal to which of the following ratios?
    a) 1 to 2
    b) 2 to 1
    c) 3 to 1
    d) 3 to 2

4. A certain graph chart shows ♥ = 500 viewers in a particular TV show. Approximately how many viewers are represented by the symbols ♥♥♥♥?
    a) 1000
    b) 2000
    c) 3500
    d) 4500

5. Worker A can install a toy in 12 minutes. Worker B takes 10 minutes to install the same toy. In 5 hours, how many more toys can be installed by worker B than by worker A?
    a) 10
    b) 8
    c) 7
    d) 5

6. How many gallons are needed to travel 550 miles for a certain car that needs 17.5 gallons to travel 350 miles?
   a) 17.5
   b) 20
   c) 27
   d) 27.5

7. How many more minutes would it take to burn a full 640 gallon tank of gasoline for a certain rocket engine that can burn a full 480 gallon tank in 15 minutes?
   a) 5
   b) 10
   c) 15
   d) 20

8. If 60 pounds of force can stretch a spring 5 inches, how many inches will the spring be stretched by a force of 84 pounds? Assume the force needed to stretch a spring varies directly with its stretch distance.
   a) 10
   b) 9
   c) 7
   d) 6

9. If John has $90.00 and he spends $30 on video games and $25 on food, what fraction of the original $90.00 does John have left?

10. John takes 8 minutes to bike 3 miles. At this rate, how many minutes will it take him to bike 4.5 miles?
    a) 10
    b) 12
    c) 14
    d) 16

11. If $\frac{x}{y} = \frac{4}{5}$, what is the value of $\frac{10x}{4y} =$?
    a) 1
    b) 2
    c) 3
    d) 4

12. The number of lollipops Sam gets on her birthday varies directly with her age. If Sam got 15 lollipops when she was 6 years old, how many lollipops will she get when Sam is 18 years old?
    a) 45
    b) 50
    c) 55
    d) 60

13. How many toy parts can a machine make in 10 minutes if this machine can make 36 toy parts in 1 hour?
    a) Two
    b) Three
    c) Five
    d) Six

14. If a small dog can run 12 miles in 1.5 hours and a mountain cat can travel twice as far in half the time, what was mountain cat's speed, in miles per hour?
    a) 18
    b) 24
    c) 28
    d) 32

15. A jaguar can run at speeds up to 70 miles per hour. About how many miles can a jaguar run in 5 seconds?
    a) 0.1
    b) 0.2
    c) 0.3
    d) 0.4

16. For a certain type of heater, the increase in gas bills is directly proportional to the temperature setting (in Fahrenheit). If the gas bills increased by $20 when the temperature setting is increased by 4 degrees Fahrenheit, by how much will expenses increase when the temperature setting is increased by 10 degrees Fahrenheit?
    a) $35
    b) $40
    c) $50
    d) $60

17. If $\frac{20}{x} = \frac{y}{14}$, what is the value of xy?
    a) 300
    b) 280
    c) 210
    d) 240

18. Kim spent 2.5 hours installing 700 square feet of solar panels. At this rate, how many hours will she require to install 4200 square feet of solar panels?

19. A worker can complete the assembly of 10 toys in 20 minutes. At the same rate, how many minutes does he need to assemble 20 toys?

20. Rachel has either blue or black pens in her pencil case. If the ratio of the number of blue pens to the number of black pens is $\frac{1}{4}$, Rachel could have the following number of pens in her pencil case EXCEPT?
    a) 8
    b) 15
    c) 20
    d) 30

21. If $x \neq 0$ and x is inversely proportional to y, which of the following is directly proportional to $\frac{1}{x^3}$?
    a) $\frac{1}{y^3}$
    b) $-\frac{1}{y^3}$
    c) y^3
    d) y^2

22. Sam drove from home at an average speed of 50 miles per hour to her working place and then returned along the same route at an average speed of 40 miles per hour. If the entire trip took her 2.25 hours, what is the entire distance, in miles, for the round trip?
    a) 90
    b) 100
    c) 120
    d) 125

23. The fruits provided in the student lounge contain pears, apples, and oranges. The ratio of the numbers of pears to apples is 3 : 4 and the ratio of the numbers of pears to oranges is 2 : 5. Find the ratio of the numbers of apples to oranges?
    a) 3 : 10
    b) 8 : 15
    c) 10 : 3
    d) 15 : 8

24. In a 100 mile biking competition, John biked at an average of 8 miles per hour for the first h hours. In terms of h, where $h < 12.5$, how many miles remained until the end after h hours? Ⓡ
    a) $8h$
    b) $100 - 8h$
    c) $108h$
    d) $100 - h$

25. A machine can assemble toys at the rate of one toy per second. If the machine works 10 hours a day, how many days does it take the machine to assemble 720,000 toys?
    a) 20
    b) 1,00
    c) 2,000
    d) 10,000

26. A bike traveled 84 miles in 4 hours. At this rate, how many miles would the bike travel in 5 hours?
    a) 67
    b) 90
    c) 100
    d) 105

Medium

27. If y is inversely proportional to x and y is equal to 12 when x is equal to 8, what is the value of y when $x = 24$?
    a) $\frac{1}{6}$
    b) $\frac{1}{4}$
    c) 4
    d) 2

28. If y is directly proportional to x and y is equal to 40 when x is equal to 6, what is the value of y when $x = 9$?

   a) 60
   b) 55
   c) 50
   d) 45

29. On a map, $\frac{1}{3}$ of an inch represents 18 miles. If a river is 45 miles long, what is its length, in inches, on the map?

   a) $\frac{5}{6}$
   b) $\frac{1}{2}$
   c) $\frac{1}{3}$
   d) 1

30. Machine A makes 200 toys per hour. Machine B makes 300 toys per hour. If both machines begin running at the same time, how many minutes will it take the two machines to make a total of 1000 toys?

   a) 150
   b) 130
   c) 120
   d) 100

31. The ratio of 2.5 to 30 is the same as the ratio of x to 6. What is the value of x?

   a) $\frac{1}{2}$
   b) $\frac{1}{4}$
   c) 1
   d) 2

32. In the figure above, each square is one-fourth of the area of the square immediately larger than it. The area of the smallest square is what fraction of the area of the biggest square?

33. Vehicle A ran 15 miles an hour for 4 hours. The total distance A traveled was twice the distance of Vehicle B after Vehicle B traveled 5 miles an hour for X hours. What is X?
    a) 6
    b) 5.5
    c) 5
    d) 4.5

34. At a pet's store, if the ratio of cats to dogs is 12 to 5, which of the following could be the total number of cats and dogs?
    a) 70
    b) 75
    c) 80
    d) 85

35. In Sam's birthday party, if the ratio of the boys to girls is 3 to 4, which of the following could be the total number of boys and girls in the party?
    a) 12
    b) 14
    c) 18
    d) 20

36. The number of cats is inversely proportional to the number of mice in the city park. One year ago, there were 20 cats and 70 mice in the park. How many cats are in the park if there are 140 mice in the park today?
    a) 10
    b) 20
    c) 30
    d) 40

37. A recipe of a cake for 8 people requires 1.2 pounds of flour. Assuming the amount of flour needed is directly proportional to the number of people eating the cake, how many pounds of flour are required to make a big cake for 240 people?
    a) 20
    b) 25
    c) 30
    d) 36

38. The ratio of I to 3J is the same as the ratio of I + 1 to 3J + 4. Which of the following must be true if I and J are positive numbers? ®

       i. $I = J$
      ii. $I = \frac{3}{4}$
     iii. $I = \frac{3}{4}J$

   a) None
   b) i only
   c) ii only
   d) iii only

39. The ratio of action movies to dramas in Albert's DVD collection is 4 to 3. If the total number of DVDs in the collection is greater than 20 but less than 30, what could be a possible number of DVDs in Albert's collection?

40. To make fruit punch, grapefruit juice, orange juice, and lemonade are mixed in with a ratio of 5:3:2 by volume, respectively. In order to make 5 liters of this drink, how much orange juice, in liters, is needed?

   a) 1
   b) 1.5
   c) 2
   d) 2.5

41. If each cubical block has edges of length 6 inches, what is the number of such blocks needed to fill a rectangular box with inside dimensions of 30 inches by 36 inches by 42 inches?

42. Gina drove at an average of 30 miles per hour from her house to a bookstore. Along the same route, she returned at an average of 60 miles per hour. If the entire trip took her 1 hour, how many miles did Gina drive in total?

43. If a certain kind of bird can fly at 5 feet per second, how many feet can it fly in half an hour?

44. Freddy's family owns two different types of cars, a sedan and an SUV. The sedan has gas mileage of 25 miles per gallon, and the SUV has gas mileage of 20 miles per gallon. If both cars use the same amount of gasoline and the sedan travels 100 miles, how many miles does the SUV travel?

Hard

Questions 45 − 46 refer to the following information:
The fluid dynamics continuity model states that the rate at which mass enters a system is equal to the rate at which mass leaves the system. The rate of mass at any cross section in a pipe is the product of the cross sectional area and the speed of the fluid.
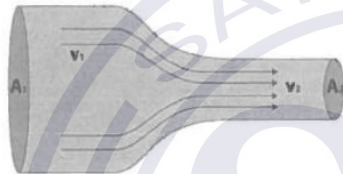

45. If water runs through a pipe with cross sectional area 0.4 m² at a speed of 6 m/s, calculate the speed of the water in the pipe when the pipe tapers off to a cross sectional area of 0.3 m².
    a) 8.0 m/s
    b) 7.5 m/s
    c) 7.0 m/s
    d) 5.5 m/s

46. If water enters a certain type of garden hose with a diameter of 1.5 cm at a speed of 5 m/s, calculate the speed of water when it travels to the nozzle, which has diameter 0.7 cm.
    a) 30.66 m/s
    b) 22.96 m/s
    c) 17.23 m/s
    d) 14.21 m/s

47. Sean needs to finish reading his book in four days. He read $\frac{1}{3}$ of the book on the first day, $\frac{1}{4}$ of the book on the second day, $\frac{1}{5}$ of the book on the third day. If he has 13 pages to finish on the fourth day, how many pages are there in the book?

48. In a mixture of flour and sugar, the ratio of flour to sugar is 5 to 3 when measured by cups. How many cups of sugar will be used for 4 cups of this mixture?

49. Let the function f be defined by $f(t) = 5(t^3 - 4)$. When $f(t) = -155$, what is the value of $2 - t$?
    a) 4
    b) 5
    c) 6
    d) 7

50. To get a job done, a machine needs to produce x boxes of toys, in which each box contains y toys. If this machine produces an average of z toys per minute, how many hours will it take to finish the job? ®
    a) $\frac{xy}{z}$
    b) $\frac{xy}{60z}$
    c) $\frac{xyz}{60}$
    d) $\frac{60z}{xy}$

51. Bob drove to the school at an average rate of 30 miles per hour. He returned home along the same route at an average rate of 40 miles per hour. If his entire trip took 42 minutes, how many miles did he drive on his way back from school?

Questions 52 – 53 refer to the following information:

Air Compressor
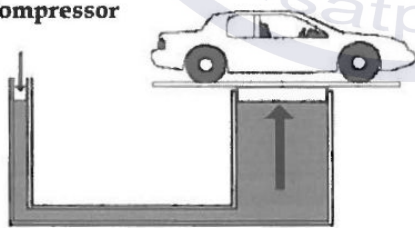
The hydraulics system in the figure above uses liquids to create pressure and lift heavy objects. The pressure from one end of the hydraulics system (the air compressor)

will always be equal to the pressure on the other end (the car). Pressure is defined as force divided by the cross sectional area:

$$Pressure = \frac{Force}{Area}$$

52. The cross sectional area of the cylinder underneath the car is 700 cm² and the cross sectional area of the cylinder at the end with the air compressor is 8 cm². If a car is lifted by a force of 2,800 kg, what force should be exerted by the air compressor?
    a) 32 kg
    b) 28 kg
    c) 24 kg
    d) 20 kg

53. In order to lift a car by a force of 2,800kg, a 5 kg force is applied at the air compressor end. Find the ratio of the radii of the cylinder at the car end to the air compressor end.
    a) 27.3
    b) 25.5
    c) 23.7
    d) 15.3