Name:_____ Date:_____

Math 8 Honours: Ch3 Waterloo University Problems on Rates, Ratios, and Percentages

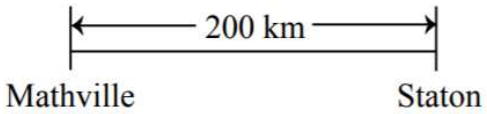
1	Rich and Ben ate an entire chocolate cake. The ratio of the amount eaten by Rich to the amount eaten by Ben is 3 : 1. What percentage of the cake did Ben eat? **(A)** 66% **(B)** 50% **(C)** 75% **(D)** 25% **(E)** 10%
2	10% of 200 is equal to 20% of **(A)** 40 **(B)** 50 **(C)** 100 **(D)** 400 **(E)** 800
3	Gaby lists the numbers 3, 4, 5, 6, 7, 8, and 9. In her list, the ratio of the number of prime numbers to the number of composite numbers is **(A)** 3 : 4 **(B)** 5 : 2 **(C)** 2 : 5 **(D)** 3 : 7 **(E)** 1 : 6
4	Which of the following is equal to 110% of 500? **(A)** 610 **(B)** 510 **(C)** 650 **(D)** 505 **(E)** 550
5	Mathy Manuel's autograph was once worth \$100. The autograph then dropped 30% in value. If it then increased by 40%, its value would be **(A)** \$98 **(B)** \$48 **(C)** \$100 **(D)** \$78 **(E)** \$90
6	A map has a scale of 1 : 600 000. On the map, the distance between Gausstown and Piville is 2 cm. What is the actual distance between the towns? **(A)** 12 km **(B)** 1.2 km **(C)** 120 km **(D)** 1200 km **(E)** 12 000 km
7	If Francis spends $\frac{1}{3}$ of his day sleeping, $\frac{1}{4}$ of his day studying and $\frac{1}{8}$ of his day eating, how many hours in the day does he have left? **(A)** 4 **(B)** 6 **(C)** 5 **(D)** 7 **(E)** 9
8	At Mathville Junior High School, 30 boys and 20 girls wrote the Pascal Contest. Certificates were awarded to 30% of the boys and 40% of the girls. What percentage of all of the participating students received certificates? **(A)** 34 **(B)** 35 **(C)** 36 **(D)** 17 **(E)** 70
9	When the numbers $5.07\overline{6}$, $5.0\overline{76}$, 5.07, 5.076, $5.\overline{076}$ are arranged in increasing order, the number in the middle is **(A)** $5.07\overline{6}$ **(B)** $5.0\overline{76}$ **(C)** 5.07 **(D)** 5.076 **(E)** $5.\overline{076}$
10	There are 400 students at Cayley H.S., where the ratio of boys to girls is 3 : 2. There are 600 students at Fermat C.I., where the ratio of boys to girls is 2 : 3. When considering all the students from both schools, what is the ratio of boys to girls? **(A)** 2 : 3 **(B)** 12 : 13 **(C)** 1 : 1 **(D)** 6 : 5 **(E)** 3 : 2
11	If 10% of s is t, then s equals **(A)** $0.1t$ **(B)** $0.9t$ **(C)** $9t$ **(D)** $10t$ **(E)** $90t$

12	The ratio of apples to bananas in a box is $3:2$. The total number of apples and bananas in the box *cannot* be equal to **(A)** 40 **(B)** 175 **(C)** 55 **(D)** 160 **(E)** 72
13	Nate is driving to see his grandmother. If he drives at a constant speed of 40 km/h, he will arrive 1 hour late. If he drives at a constant speed of 60 km/h, he will arrive 1 hour early. At what constant speed should he drive to arrive just in time? **(A)** 56 km/h **(B)** 80 km/h **(C)** 54 km/h **(D)** 48 km/h **(E)** 58 km/h
14	A bag contains only green, yellow and red marbles. The ratio of green marbles to yellow marbles to red marbles in the bag is $3:4:2$. If 63 of the marbles in the bag are *not* red, the number of red marbles in the bag is **(A)** 14 **(B)** 18 **(C)** 27 **(D)** 36 **(E)** 81
15	Nerissa writes five mathematics tests, each worth the same amount, and obtains an average of 73%. After her teacher deletes one of her test marks, Nerissa's new average is 76%. What was the mark on the test that the teacher deleted? **(A)** 60% **(B)** 61% **(C)** 62% **(D)** 63% **(E)** 64%
16	The distance from Coe Hill to Calabogie is 150 kilometres. Pat leaves Coe Hill at 1:00 p.m. and drives at a speed of 80 km/h for the first 60 km. How fast must he travel for the remainder of the trip to reach Calabogie at 3:00 p.m.? **(A)** 65 km/h **(B)** 70 km/h **(C)** 72 km/h **(D)** 75 km/h **(E)** 90 km/h
17	X is 20% of 50. 40 is 20% of Y. 40 is Z% of 50. What does $X + Y + Z$ equal? **(A)** 218 **(B)** 335 **(C)** 98 **(D)** 290 **(E)** 380
18	On a science test, Janine got 80% of the 10 multiple choice questions correct and 70% of the 30 short answer questions correct. What percentage of the 40 questions on the test did she answer correctly? **(A)** 74% **(B)** 72.5% **(C)** 76% **(D)** 73% **(E)** 73.5%
19	Carl and André are running a race. Carl runs at a constant speed of x m/s. André runs at a constant speed of y m/s. Carl starts running, and then André starts running 20 s later. After André has been running for 10 s, he catches up to Carl. The ratio $y : x$ is equivalent to **(A)** $20:1$ **(B)** $2:1$ **(C)** $1:3$ **(D)** $3:1$ **(E)** $1:2$
20	The gas tank in Catherine's car is $\frac{1}{8}$ full. When 30 litres of gas are added, the tank becomes $\frac{3}{4}$ full. If the gas costs Catherine \$1.38 per litre, how much will it cost her to fill the remaining quarter of the tank? **(A)** \$8.80 **(B)** \$13.80 **(C)** \$16.56 **(D)** \$24.84 **(E)** \$41.40

21 A group of friends are sharing a bag of candy.
On the first day, they eat $\frac{1}{2}$ of the candies in the bag.
On the second day, they eat $\frac{2}{3}$ of the remaining candies.
On the third day, they eat $\frac{3}{4}$ of the remaining candies.
On the fourth day, they eat $\frac{4}{5}$ of the remaining candies.
On the fifth day, they eat $\frac{5}{6}$ of the remaining candies.
At the end of the fifth day, there is 1 candy remaining in the bag.
How many candies were in the bag before the first day?

(A) 512 **(B)** 720 **(C)** 1024 **(D)** 1440 **(E)** 2048

22 Anca and Bruce left Mathville at the same time. They drove along a straight highway towards Staton. Bruce drove at 50 km/h. Anca drove at 60 km/h, but stopped along the way to rest. They both arrived at Staton at the same time. For how long did Anca stop to rest?



(A) 40 minutes **(B)** 10 minutes **(C)** 67 minutes
(D) 33 minutes **(E)** 27 minutes

23 Car X and Car Y are travelling in the same direction in two different lanes on a long straight highway. Car X is travelling at a constant speed of 90 km/h and has a length of 5 m. Car Y is travelling at a constant speed of 91 km/h and has a length of 6 m. Car Y starts behind Car X and eventually passes Car X. The length of time between the instant when the front of Car Y is lined up with the back of Car X and the instant when the back of Car Y is lined up with the front of Car X is t seconds. The value of t is

(A) 39.6 **(B)** 18.0 **(C)** 21.6 **(D)** 46.8 **(E)** 32.4

24 Mike and Alain play a game in which each player is equally likely to win. The first player to win three games becomes the champion, and no further games are played. If Mike has won the first game, what is the probability that Mike becomes the champion?

(A) $\frac{1}{4}$ **(B)** $\frac{5}{8}$ **(C)** $\frac{11}{16}$ **(D)** $\frac{3}{5}$ **(E)** $\frac{3}{4}$

25 At the beginning of the winter, there were at least 66 students registered in a ski class. After the class started, eleven boys transferred into this class and thirteen girls transferred out. The ratio of boys to girls in the class was then 1 : 1. Which of the following is not a possible ratio of boys to girls before the transfers?

(A) 4 : 7 **(B)** 1 : 2 **(C)** 9 : 13 **(D)** 5 : 11 **(E)** 3 : 5

26

Residents were surveyed in order to determine which flowers to plant in the new Public Garden. A total of N people participated in the survey. Exactly $\frac{9}{14}$ of those surveyed said that the colour of the flower was important. Exactly $\frac{7}{12}$ of those surveyed said that the smell of the flower was important. In total, 753 people said that both the colour and smell were important. How many possible values are there for N?

(A) 22 **(B)** 23 **(C)** 21 **(D)** 24 **(E)** 25

27

Pascal High School organized three different trips. Fifty percent of the students went on the first trip, 80% went on the second trip, and 90% went on the third trip. A total of 160 students went on all three trips, and all of the other students went on exactly two trips. How many students are at Pascal High School?

(A) 1400 **(B)** 600 **(C)** 1200 **(D)** 800 **(E)** 1600

28

Nadia walks along a straight path that goes directly from her house (N) to her Grandmother's house (G). Some of this path is on flat ground, and some is downhill or uphill. Nadia walks on flat ground at 5 km/h, walks uphill at 4 km/h, and walks downhill at 6 km/h. It takes Nadia 1 hour and 36 minutes to walk from N to G and 1 hour and 39 minutes to walk from G to N. If 2.5 km of the path between N and G is on flat ground, the total distance from N to G is closest to

(A) 8.0 km **(B)** 8.2 km **(C)** 8.1 km **(D)** 8.3 km **(E)** 7.9 km

29

Dolly, Molly and Polly each can walk at 6 km/h. Their one motorcycle, which travels at 90 km/h, can accommodate at most two of them at once (and cannot drive by itself!). Let t hours be the time taken for all three of them to reach a point 135 km away. Ignoring the time required to start, stop or change directions, what is true about the smallest possible value of t?

(A) $t < 3.9$ **(B)** $3.9 \leq t < 4.1$ **(C)** $4.1 \leq t < 4.3$
(D) $4.3 \leq t < 4.5$ **(E)** $t \geq 4.5$

30

There are four people in a room.
For every two people, there is a 50% chance that they are friends.
Two people are *connected* if:

- they are friends, or
- a third person is friends with both of them, or
- they have different friends who are friends of each other.

What is the probability that every pair of people in this room is connected?

(A) $\frac{18}{32}$ **(B)** $\frac{20}{32}$ **(C)** $\frac{22}{32}$ **(D)** $\frac{19}{32}$ **(E)** $\frac{21}{32}$