The CENTRE for EDUCATION
in MATHEMATICS and COMPUTING

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Topic Generator - Problem Set
Problems

1. The value of $\left(\frac{4}{5}\right)\left(\frac{5}{6}\right)\left(\frac{6}{7}\right)\left(\frac{7}{8}\right)\left(\frac{8}{9}\right)$ is
   (A) $\frac{4}{9}$ (B) 1   (C) $\frac{6}{7}$ (D) 36   (E) $\frac{36}{25}$

2. If $\frac{1}{3}x = 12$, then $\frac{1}{4}x$ equals
   (A) 1   (B) 16   (C) 9   (D) 144   (E) 64

3. $\frac{1}{2} + \frac{1}{4} + \frac{1}{8}$ is equal to
   (A) 1   (B) $\frac{1}{64}$ (C) $\frac{3}{14}$ (D) $\frac{7}{8}$ (E) $\frac{3}{8}$

4. Rounded to 2 decimal places, $\frac{7}{9}$ is
   (A) 0.7   (B) 0.77   (C) 0.78   (D) 0.79   (E) 0.8

5. A recipe calls for $4\frac{1}{2}$ cups of flour. If you only make half of the recipe, then how many cups of flour do you need?
   (A) $2\frac{1}{2}$ (B) $2\frac{1}{4}$ (C) 9   (D) 2   (E) $2\frac{3}{4}$

6. Which of these fractions is larger than $\frac{1}{2}$?
   (A) $\frac{2}{5}$ (B) $\frac{3}{7}$ (C) $\frac{4}{7}$ (D) $\frac{3}{8}$ (E) $\frac{4}{9}$

7. A box of fruit contains 20 apples, 10 oranges, and no other fruit. When a fruit is randomly chosen from the box, what is the probability that the fruit is an orange?
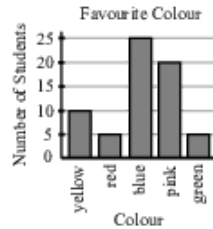   (A) $\frac{1}{10}$ (B) $\frac{1}{20}$ (C) $\frac{1}{30}$ (D) $\frac{1}{3}$ (E) $\frac{2}{3}$

8. Students were surveyed about their favourite colour and the results are displayed in the graph shown. What is the ratio of the number of students who chose pink to the number of students who chose blue?


(A) $4:5$ (B) $3:5$ (C) $1:5$ (D) $2:5$ (E) $5:3$

9. Matilda and Ellie divide a white wall in their bedroom in half, each taking half of the wall. Matilda paints half of her section red. Ellie paints one third of her section red. The fraction of the entire wall that is painted red is

(A) $\frac{5}{12}$ (B) $\frac{2}{5}$ (C) $\frac{2}{3}$ (D) $\frac{1}{6}$ (E) $\frac{1}{2}$

10. A circular spinner is divided into 4 sections, as shown. The angles at the centre of the circle in the sections labelled Green and Blue each measure $90°$.
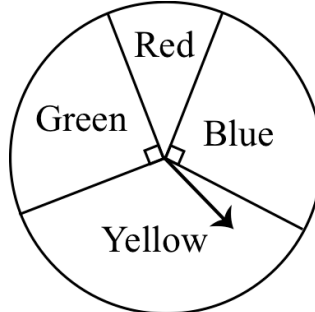
An arrow is attached to the centre of the spinner. The arrow is spun once. What is the probability that the arrow lands on either Red or Yellow?

(A) $\frac{1}{8}$ (B) $\frac{1}{4}$ (C) $\frac{3}{8}$ (D) $\frac{1}{2}$ (E) $\frac{3}{4}$

11. Harry charges $4 to babysit for the first hour. For each additional hour, he charges 50% more than he did for the previous hour. How much money in total would Harry earn for 4 hours of babysitting?

(A) $16.00   (B) $19.00   (C) $32.50   (D) $13.50   (E) $28.00

12. Keiko and Leah run on a track that is 150 m around. It takes Keiko 120 seconds to run 3 times around the track, and it takes Leah 160 seconds to run 5 times around the track. Who is the faster runner and at approximately what speed does she run?
    (A) Keiko, 3.75 m/s   (B) Keiko, 2.4 m/s   (C) Leah, 3.3 m/s
    (D) Leah, 4.69 m/s   (E) Leah, 3.75 m/s

13. At a potluck, the ratio of vegetarians to non-vegetarians is 3 : 7. If there are 21 vegetarians at the potluck, what is the *total* number of people at the potluck?
    (A) 30   (B) 25   (C) 49   (D) 70   (E) 79

14. A survey of 400 students at Cayley University found that the ratio of students who commute to students who live on campus is 3 : 2. A survey of 600 students at Fermat University found that the ratio of students who commute to students who live on campus is 2 : 3. When considering all the surveyed students from both universities, what is the ratio of students who commute to students who live on campus?
    (A) 2 : 3   (B) 12 : 13   (C) 1 : 1   (D) 6 : 5   (E) 3 : 2

15. One soccer ball and one soccer shirt together cost $100. Two soccer balls and three soccer shirts together cost $262. What is the cost of one soccer ball?
    (A) $38   (B) $50   (C) $87.30   (D) $45   (E) $40

16. Chris received a mark of 50% on a recent test. Chris answered 13 of the first 20 questions correctly. Chris also answered 25% of the remaining questions on the test correctly. If each question on the test was worth one mark, how many questions in total were on the test?
    (A) 23   (B) 38   (C) 32   (D) 24   (E) 40

17. Brodie and Ryan are driving directly towards each other. Brodie is driving at a constant speed of 50 km/h. Ryan is driving at a constant speed of 40 km/h. If they are 120 km apart, how long will it take before they meet?
    (A) 1 h 12 min (B) 1 h 25 min (C) 1 h 15 min (D) 1 h 33 min (E) 1 h 20 min

18. Jeff and Ursula each run 30 km. Ursula runs at a constant speed of 10 km/h. Jeff also runs at a constant speed. If Jeff's time to complete the 30 km is 1 hour less than Ursula's time to complete the 30 km, at what speed does Jeff run?
    (A) 6 km/h   (B) 11 km/h   (C) 12 km/h   (D) 15 km/h   (E) 22.5 km/h

19. Tobias downloads m apps. Each app costs \$2.00 plus 10% tax. He spends \$52.80 in total on these m apps. What is the value of m?
    (A) 20   (B) 22   (C) 18   (D) 24   (E) 26

20. 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

21. Unit squares are arranged to form a rectangular grid that is m units wide and n units tall, where m and n are positive integers with $2n < m < 3n$. The region below one of the diagonals of the rectangle is shaded as shown. For certain pairs m and n, there is a unit square in the grid that is not completely shaded but whose shaded area is greater than 0.999. The smallest possible value of mn for which this is true satisfies
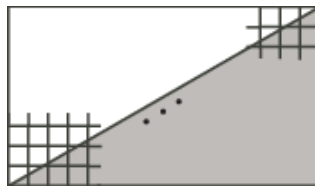

    (A) $496 \leq mn \leq 500$ (B) $501 \leq mn \leq 505$ (C) $506 \leq mn \leq 510$
    (D) $511 \leq mn \leq 515$ (E) $516 \leq mn \leq 520$

22. 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) $t \geq 4.5$

23. Angie has a jar that contains 2 red marbles, 2 blue marbles, and no other marbles. She randomly draws 2 marbles from the jar. If the marbles are the same colour, she discards one and puts the other back into the jar. If the marbles are different colours, she discards the red marble and puts the blue marble back into the jar. She repeats this process a total of three times. What is the probability that the remaining marble is red?

(A) $\frac{1}{2}$　　　(B) $\frac{1}{4}$　　　(C) $\frac{2}{3}$　　　(D) $\frac{1}{3}$　　　(E) 0

24. A network of pathways lead from a single opening to three bins, labelled A, B, C as shown. If a ball is dropped into the opening, it will follow a path and land in one of the bins. Every time a path splits, it is equally likely for the ball to follow either of the downward paths.
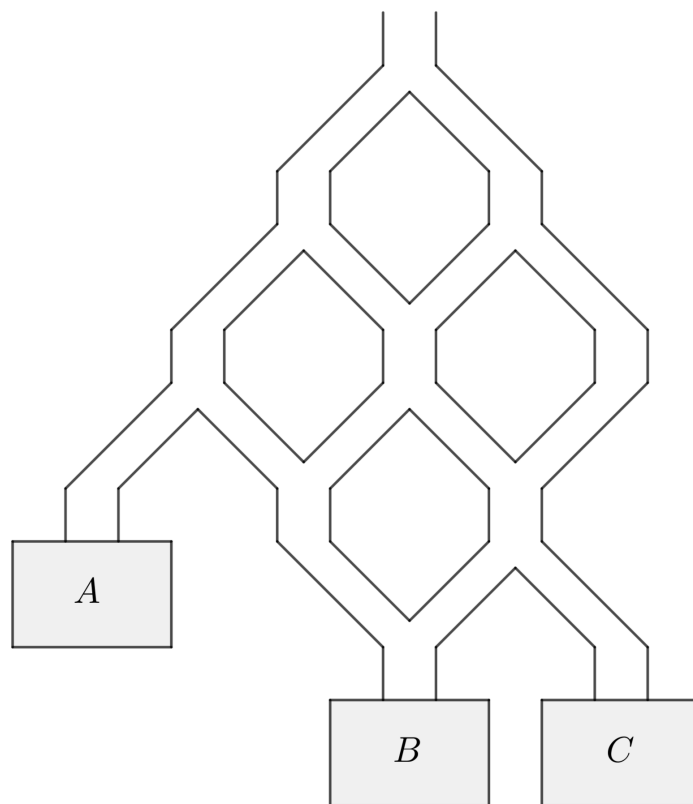
Ellen drops two balls, one after the other, into the opening. What is the probability that the two balls land in different bins?

(A) $\frac{17}{32}$　　　(B) $\frac{27}{50}$　　　(C) $\frac{25}{64}$　　　(D) $\frac{1}{3}$　　　(E) $\frac{15}{32}$

25. Consider positive integers $a \leq b \leq c \leq d \leq e$. There are N lists a, b, c, d, e with a mean of 2023 and a median of 2023, in which the integer 2023 appears more than once, and in which no other integer appears more than once. What is the sum of the digits of N?