Trial

1 The average of four numbers is 85. If 80 is added to make a fifth number, what is the new average?

A. 81 B. 82 C. 83 D. 84

2 20 students at school play football or rugby. 5 students do both. If 7 students play football only, how many play rugby?

A. 5 B. 8 C. 13 D. 15

3 If $10^{2y} = 25$, then what is 10^{-y} ?

A. $\frac{1}{125}$ B. $\frac{1}{50}$ C. $\frac{1}{25}$ D. $\frac{1}{5}$

4 The time shown on a 12-hour clock face is exactly 2:15. What is the angle between the hour hand and the minute hand?

A. 5^{o} B. $22\frac{1}{2}^{o}$ C. 28^{o} D. 30^{o}

5 A rectangle has an area of 24. The graph of the length as a function of its width is:

A. a parabola that opens upward

B. a parabola that opens downward

C. a hyperbola

D. one branch of a hyperbola

Set 1

1 If the line with equation $x + 2y + 3 = 0$ is perpendicular to the line with equation $ax + 3y + 2 = 0$, then a =

a –6 b –2 c $-\frac{3}{2}$ d $-\frac{1}{2}$

2 What is the sum of the integers from 1 to 100, inclusive, which are not divisible by 6?

a 816 b 4234 c 4330 d 5034

3 If $\sqrt{x+3} = 3$, then $(x+3)^3$ =

a $3\sqrt{3}$ b 27 c 81 d 729

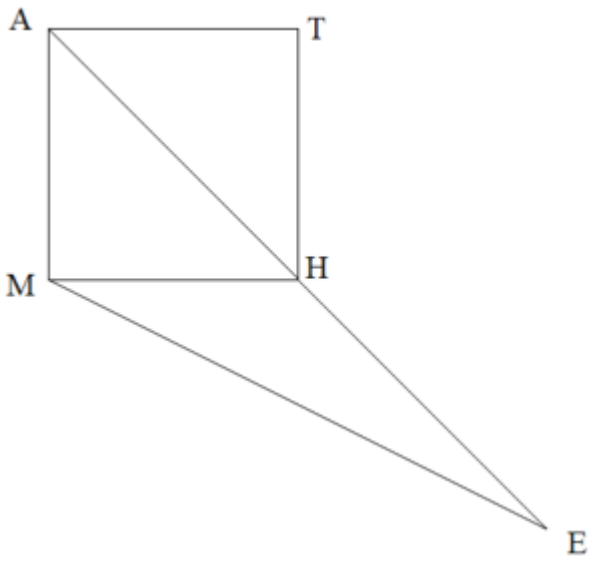
4 The perimeter of a semi-circle is equal to its area. The radius of the semi-circle is

a $\frac{2}{\pi}$ b 2 c $\frac{2+\pi}{\pi}$ d $\frac{4}{\pi} + 2$

5 If "MATH" is a square and H is the midpoint of AE, then $\measuredangle$AME is

a less than 112.5° b 112.5°

c Greater than 112.5° d Cannot tell from the data



Set 2

6 A coin is tossed three times. Given that at least one head appears, what is the probability that the three coins show exactly two heads?

a $\frac{3}{8}$ b $\frac{3}{7}$ c $\frac{5}{8}$ d $\frac{7}{8}$

7 If the base of a triangle is increased by 20% and the altitude relative to that base is decreased by 20%, what is the percentage change in the area of the triangle?

a A decrease of 6% b No change

c A an increase of 6% d A decrease of 4%

8 In the formula $K = \frac{Ro}{bo+t}$, R, b, and t are positive constants and o is any positive integer. As o increases in value, then K will

a decrease in value b remain the same

c increase in value d decrease first and then increase

9 If we expand the expression $((x+y)^3(x+2y)^3)^2$ and simplify, the number of terms of the resulting expression is

a 18 b 13 c 12 d 8

10 If twelve numbers are inserted between 2 and 287 to make an arithmetic sequence, then the sum of this sequence is

a 2022 b 2023 c 2033 d 2044

Set 3

11 Let *n* be the *smallest* non-prime integer greater than 1 with no prime factor less than 10. Its factors are different. Then

a $120 < n < 130$ b $130 < n < 140$

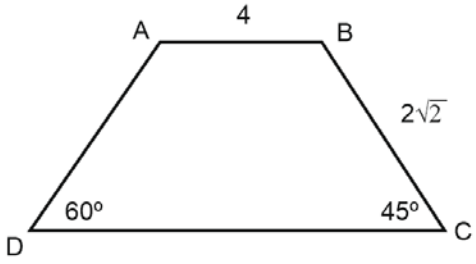
c $140 < n < 150$ d $150 < n < 160$

12 Brothers Marco and Roberto go to the same school. They use the same route to school. Marco averages 90 steps per minute, each of his steps is 75 cm long and it takes him 16 minutes to get to school. Roberto averages 100 steps per minute, and his step is 60 cm long. How long does it take Roberto to get to school?

a 18 min. b 16 min

c 15 min. d $14\frac{2}{9}$ min.

13 Figure ABCD is a trapezoid with AB||DC.



Find the length of DC.

a $6+\frac{2}{3}\sqrt{3}$ b $6+\frac{2}{3}\sqrt{2}$

c $6+\sqrt{3}$ d $7\frac{1}{2}$

14 If a sequence is defined by

$a_1 = 3$

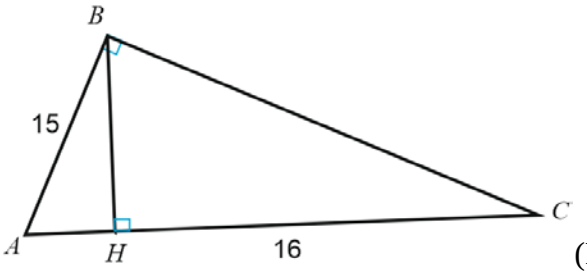
$a_{n+1} = a_n + 3n$, with $n \geq 1$

Find a_{100}

a 14850 b 14 853

c 29 700 d 29703

15 A right triangle *ABC* has side *AB* = 15. Altitude *BH* is drawn and *HC* = 16. Find the area of triangle *ABC*.



(Figure not to scale)

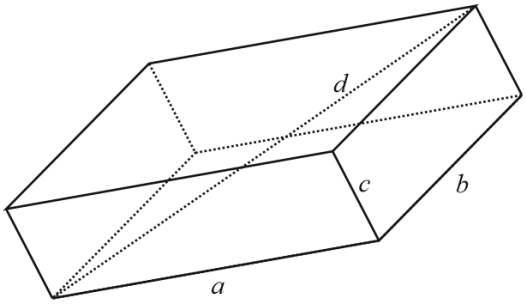
a 120 b 144 c 150 d 216

Set 4

16 What is the number of digits in $4^{18}5^{27}$ when written in the usual base 10 form?

a 27 b 30 c 36 d 45

17 The total area of all the faces of a rectangular solid is 22 cm^2, and the total length of all its edges is 24 cm. What is the length of any of its internal diagonals?



a $\sqrt{12}$ b $\sqrt{13}$ c $\sqrt{14}$ d $\sqrt{15}$

18 A box contains 20 balls numbered 1 through 20. A ball is randomly chosen from the box. What is the probability that the number on the ball is prime or a multiple of three?

a 0.4 b $\frac{13}{20}$ c 0.7 d 0.75

19 A 2.5 m ladder leans against the vertical wall of a tall building. The foot of the ladder is 0.7 m away from the base of the building. If the top of the ladder slides down the wall 0.4 m, then the foot of the ladder will slide away from the building by:

a 0.8 m b 0.7 m c 0.5 m d 0.4 m

20 Lukas bought a new car for €30 000. One month later he sold it to Sophia with a profit of 10%. Sophia did not like the car, so she sold it to Lukas back at a loss of 10%. Then:

a Lukas comes out even b Lucas makes €3300 profit

c Lucas makes €3000 profit d Lukas loses €900

Set 5

21 Which terms we must remove from the following sum to make it equal to 1?

$\frac{1}{2}+\frac{1}{4}+\frac{1}{6}+\frac{1}{8}+\frac{1}{10}+\frac{1}{12}$

a $\frac{1}{4}\&\frac{1}{8}$ b $\frac{1}{4}\&\frac{1}{12}$

c $\frac{1}{6}\&\frac{1}{10}$ d $\frac{1}{8}\&\frac{1}{10}$

22 In some computer languages, when there are no parentheses in an algebraic expression, the operations are grouped from right to left. Thus, $a \times b - c$ means the $a(b - c)$ in ordinary algebraic notation. If $x \div y - z + t$ is evaluated in such a language, the result in ordinary algebraic notation would be

a $\frac{a}{b-c-d}$ b $\frac{a}{b-c+d}$

c $\frac{a}{b+c-d}$ d $\frac{b-c-d}{a}$

23 At a party, a total of 35 handshakes took place. Each participant shook hands once with everyone else. The number of people present was

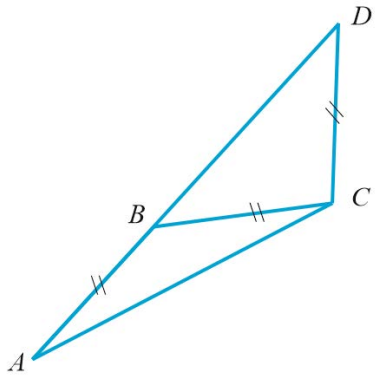
a 70 b 69

c 36 d Impossible to happen

24 Four holes, each with 1 cm radius, are to be drilled along the center line of a rectangular metal piece so that their centers are 2.35 cm apart. The two end holes must be 1.75 cm away from their corresponding ends. What is the length of the metal piece?

a 12.90 b 12.55 c 11.75 d 11. 15

25 In the diagram, Side AB of isosceles triangle ABC is extended to D such that triangle BCD is now isosceles. If ∡A = θ°, then ∡BCD = ?



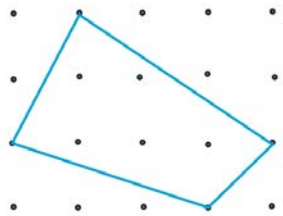
a 2θ° b 180 - 2θ° c 180 - 4θ° d 4θ°

Set 6

26 Two sections of a class took the same test. One section of 20 students made an average of 85%; the other section of 30 students made an average of 75%. The average for all students in both sections is

a 80% b 79% c 77% d 76%

27 Pegs are put in a board 1 cm apart both horizontally and vertically. A rubber band is stretched over 4 pegs as shown in the figure, forming a quadrilateral. Find its area in cm^2.

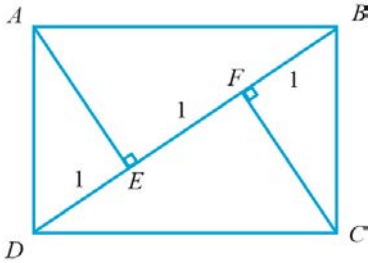


a 4.5 b 5 c 5.5 d 6

28 If a and b are positive real numbers such that $a^b = b^a$ and $b = 9a$, what is the value of a?

a $\sqrt{3}$ b 9 c $\sqrt[4]{3}$ d $\sqrt[3]{9}$

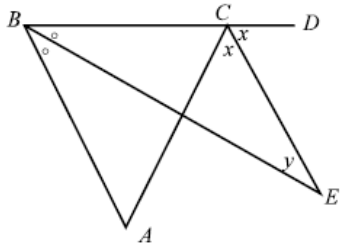
29 AE and CF are perpendicular to diagonal BD of rectangle $ABCD$ and divide it into three segments of 1 cm length each. Find the area of $ABCD$.



a $3\sqrt{2}$ b $2\sqrt{3}$ c $\frac{3}{2}\sqrt{2}$ d $3\sqrt{3}$

30 In the diagram, if angle $BEC = y$, then angle BAC equals

a $90° - y$ b $90° - \frac{y}{2}$ c $2y$ d $180° - y$



Set 7

31 The product
$\left(1-\frac{1}{2^2}\right)\left(1-\frac{1}{3^2}\right)\ldots\left(1-\frac{1}{9^2}\right)\left(1-\frac{1}{10^2}\right)$ is

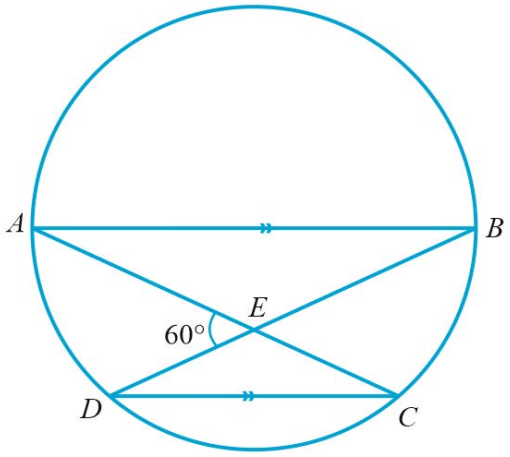
a $\frac{5}{12}$ b $\frac{1}{2}$ c $\frac{11}{20}$ d $\frac{2}{3}$

32 University books are expensive. A student bought 12 books and calculated the average cost per book to be \$82. One of the books was mistakenly written as \$67 rather than \$76. The correct average price is

a \$81.50 b \$82 c \$82.50 d \$82.75

33 *AB* is a diameter of the circle in the diagram, *CD* is a chord parallel to *AB*. *AC* and *BD* intersect at *E*, and angle *AED* has a measure of 60°. Find the ratio of the area of triangle *ABE* to the area of triangle *CDE*.

a 4 b $\frac{2\sqrt{3}}{3}$ c 2 d $\frac{4}{3}$



34 A parabola $y = ax^2 + bx + c$ has vertex (4, 2).
(2, 0) is a point on this parabola. Find *abc*.

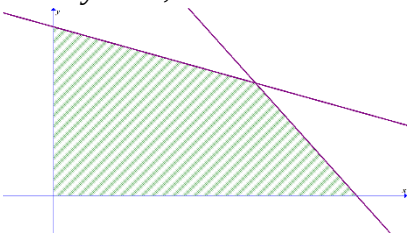
a –12 b –6 c 6 d 12

35 Dimensions of a rectangular box are consecutive terms of a geometric sequence, its volume is 8 m^3, and its total surface area is 32 m^2. The sum of the lengths of all the edges of this box is

a 28 b 32 c 36 d 44

Set 8

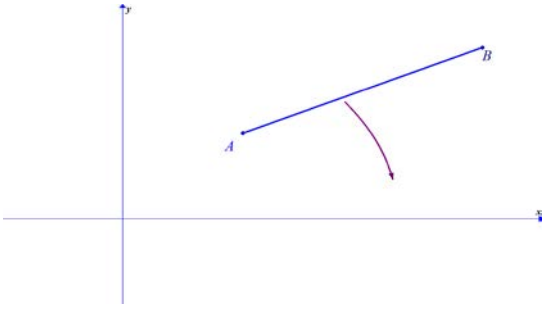
36 The shaded region in the diagram below is bounded by the lines $3x + 2y = 18$, $3x + 8y = 36$, and the coordinate axes. The area of this region is



a 54 b 36
c 27 d 19

37 In a coordinate plane, if the point $B(3, 2)$ is rotated 90° clockwise about point $A(1, 1)$, the image will be

a (0, 3) b (2, -3) c (1, -2) d (2, -1)



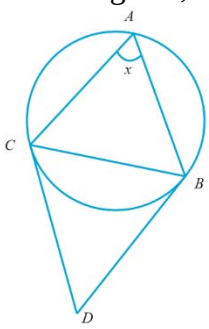
38 A park is in the shape of a regular hexagon 2 km on a side. Starting at a corner, you walk along the perimeter of the park for a distance of 5 km. How many km (air distance) away are you from the starting point?

a $\sqrt{13}$ km b $\sqrt{14}$ km c $\sqrt{15}$ km d 4 km

39 If k is an integer and the numbers $9 + k$, $27 + 3k$, and $15 + 5k$, are divisible by 2, 3, and 5, then the smallest value of k lies in the interval

a 2 to 31 b 32 to 61 c 62 to 91 d 92 to 121

40 Angle BAC is an acute angle on the circumference of a circle with $AB = AC$. It has a measure of x radians. Tangents to the circle at B and C meet at point D. If angle ABC is twice angle D, then x is (remember that π radians is equivalent to 180°)



a $\frac{3\pi}{7}$ b $\frac{4\pi}{9}$
c $\frac{5\pi}{11}$ d $\frac{6\pi}{13}$