Grade 12

CREST Mental Maths Olympiad (CMMO)

Sample Paper

Pattern and Marking Scheme				
Grade	**Topic/Section**	**No. of Questions**	**Marks per Question**	**Total Marks**
Grade 12	Basique	80	1	80
	Avance	20	2	40
Grand Total		**100**		**120**

The total duration of the exam is 60 minutes.

Syllabus

Number System

a. Integers and rational numbers
b. Simplification

Algebra

a. Polynomials
b. Quadratic equations

Comparing Quantities

a. Time and distance
b. Simple interest
c. Compound interest
d. Profit and loss
e. Problems on ages
f. Time and work
g. Boats and streams
h. Average and Percentage
i. Partnership
j. Ratio and proportion

Geometry

a. Lines and angles

Mensuration

a. Surface area of cube
b. Surface area of cuboid
c. Surface area of cylinder
d. Surface area of cone, etc.
e. Volume of cube
f. Volume of cuboid
g. Volume of cylinder
h. Volume of cone, etc.
i. Heights and distance
j. Area of a quadrilateral, Area of triangle & Area related to circles

Playing with Numbers

a. Number series
b. Alphanumeric series
c. Tests of divisibility
d. Exponents
e. Factorisation

Data Handling

a. Statistics
b. Probability
c. Data interpretation

For more details, visit https://www.crestolympiads.com/mental-maths-mmo

Basique (Each Question is 1 Mark)

1. Simplify the expression:
(−5 + 72) [3 − (−6)3] + (−11 − 2) (8 − 12).

a. 1125
b. 1248
c. 1459
d. 1585

2. Simplify:
$\left(\frac{3}{2}-\frac{2}{5}\right) \div \left(\frac{1}{3}+\frac{3}{4}\right)$

a. $3\frac{4}{65}$
b. $5\frac{7}{65}$
c. $2\frac{1}{17}$
d. $1\frac{1}{65}$

3. What is the value of $7\sqrt{6}$ x $5\sqrt{24}$?

a. 420
b. 240
c. 360
d. 430

4. An elevator descends into a mine shaft at the rate of 7 m/min. If it starts from 5 m above the ground level. How long will it take to reach 205 m down the earth?

a. 20 min
b. 30 min
c. 40 min
d. 50 min

5. Convert the recurring decimals to fractions:
$0.\dot{8}$

a. $\frac{8}{9}$
b. $\frac{2}{9}$
c. $\frac{3}{9}$
d. $\frac{88}{9}$

6. Convert this recurring fraction to decimal:
$1\frac{3}{11}$

a. 1.272727
b. 1.27
c. 1.2727……
d. 1.272

7. What is the range for the following data set:
1, 2, 8, 9, 7, 4, 1, 1, 3, 2, 3

a. 8
b. 9
c. 10
d. 11

8. The runs scored by 9 players of a cricket team are 44, 31, 50, 40, 50, 70, 11, 80 and 56. Find the median score.

a. 31
b. 40
c. 44
d. 50

9. Find the mean of the data given below:
10, 5, 13, 4, 9, 12, 11 and 24

a. 7
b. 9
c. 11
d. 13

10. If $f(x) = 2x^3 - 3x^2 + 12$, then find f (2).

a. 13
b. 15
c. 14
d. 16

11. Factorise:
$x (x^2 + y^2 - z^2) - z (x^2 + y^2 - z^2)$

a. $(x + y + z) (x^2 + y^2 + z^2)$
b. $(x - z) (x^2 + y^2 + z^2)$
c. $(x + y) (x^2 + y^2 + z^2)$
d. $(x^2 + y^2) + (x^2 + z^2)$

12. Simplify:
$x^2 - 13x - 42 = (x - 6) (x - 7)$

a. $3(2x - 3) (x + 8)$
b. $(2x – 3) (x + 4)$
c. $(2x - 3) (3x + 8)$
d. $3(x - 3) (x + 8)$

13. For what value of p, the quadratic equation, $x^2 - 4x + p = 0$, will have real and distinct roots?

a. 5
b. 2
c. 3
d. 4

14. What are the quadratic equations whose roots are 3 and 4?

a. $x^2 - 7x + 12 = 0$
b. $x^2 - 3x + 4 = 0$
c. $x^2 - 6x + 9 = 0$
d. $x^2 - 2x - 8 = 0$

15. For what value of k will the equation $5y^2 - 20y + (k - 1) = 0$ have real and equal roots?

a. 24
b. 17
c. 21
d. 19

16. Solve:
$(7^3 + 20) \times (3^5 \div 3^0)$

a. 523
b. 606
c. 640
d. 680

17. Evaluate:
$81 \times 9 + 3^2 \times 3$

a. 729
b. 756
c. 783
d. 810

18. Evaluate:
$(1331 \div 121) + 2^5$

a. 43
b. 45
c. 47
d. 49

19. In a 300 m race, Rex beats Max by 60 m or 15 s. Find Rex speed (in m/s).

a. 2
b. 3
c. 5
d. 4

20. A train 300 m long crosses a pole in 15 s. Find the time taken by the train to cross a platform of length 180 m (in seconds).

a. 22
b. 20
c. 23
d. 24

21. How many km/h does a man walk who passes through a street 600 m long in 5 minutes?

a. $\frac{24}{5}$ km/h
b. $\frac{36}{5}$ km/h
c. 22 km/h
d. $\frac{32}{5}$ km/h

22. How many years will it take for the amount of $600 to yield $120 as interest at 10% per annum of simple interest?

a. 3 years
b. 4 years
c. 2 years
d. 5 years

23. What is simple interest of $1800 on 2% per annum for 2 years?

a. $72
b. $78
c. $64
d. $76

24. Leo buys a coloured TV for $10,000 and sells it for $12,000. Find his gain %.

a. 30%
b. 40%
c. 20%
d. 60%

25. The cost price of 4 articles is the same as the selling price of 3 articles. Find the profit percent.

a. 24.30%
b. 33.33%
c. 25%
d. 50%

26. After 10 years, the age of a father will be twice that of his son. Five years ago, he was 5 times as old as his son. What is the age of father?

a. 28 years
b. 30 years
c. 32 years
d. 25 years

27. Ten years ago, father was 4 times as old as his son. After 10 years, the father will be twice as old as his son. What is the present age of son?

a. 20 years
b. 23 years
c. 18 years
d. 21 years

28. One year ago, the ratio of Harry and Sam age was 6 : 7 respectively. Four years hence their ratio would become 7 : 8. How old is Sam?

a. 38 years
b. 30 years
c. 32 years
d. 36 years

29. Ten men can do a piece of work in 12 days. How many men are needed to complete the work in 20 days?

a. 5
b. 7
c. 6
d. 4

30. 30 men can plant 60 trees in 5 hours. If 5 men leave the job, how many trees will be planted in 10 hours?

a. 134
b. 100
c. 145
d. 97

31. If the speed of a swimmer in still water is 9 km/h. Find the downstream speed of the swimmer, when the river is flowing at the speed of 6 km/h.

a. 15 km/h
b. 16 km/h
c. 17 km/h
d. 18 km/h

32. A man can row at 12 km/hr and downstream at 12 km/hr. Find man's rate in still water.

a. 8 km/h
b. 10 km/h
c. 9 km/h
d. 12 km/h

33. Nikson spent $35645 on buying a bike, $24355 on buying a television and the remaining 20% of the total amount he had as cash with him. What was the total amount?

a. $72,360
b. $78,700
c. $77,000
d. $75,000

34. The average age of 30 girls is 13 years. The average of first 18 girls is 15 years. Find out the average age of remaining 12 girls.

a. 10 years
b. 12 years
c. 14 years
d. 13 years

35. A, B, and C are partners. A receives $\frac{2}{5}$ of the profit and B and C share the remaining profit equally. A's income is increased by $420 when the profit rises from 8% to 10%. Find the capital invested by B and C together.

a. $31250
b. $31500
c. $30250
d. $30500

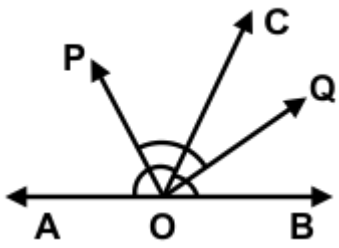
36. A began a business with $4500 and was joined afterwards by B with $3000. When did B join if the profits at the end of the year were divided in the ratio 2 : 1?

a. 4 months
b. 2 months
c. 7 months
d. 3 months

37. The banker's gain on a bill due 1 year hence at 15% p.a. is $9. The true discount is:

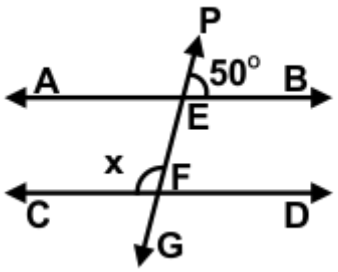
a. $60
b. $56
c. $64
d. $50

38. In the figure, if OP is the bisector of ∠AOC and OQ is the bisector of ∠BOC, then find ∠POQ.



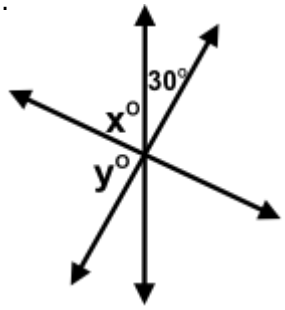
a. 65°
b. 75°
c. 80°
d. 90°

39. In figure, ∠PEB = 50° and AB||CD, then find the value of x.



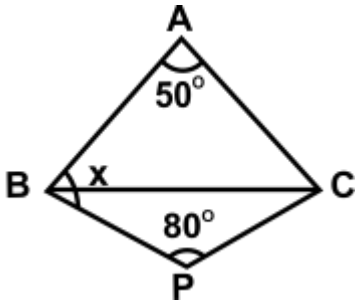
a. 110°
b. 130°
c. 125°
d. 90°

40. Find the value of x + y.



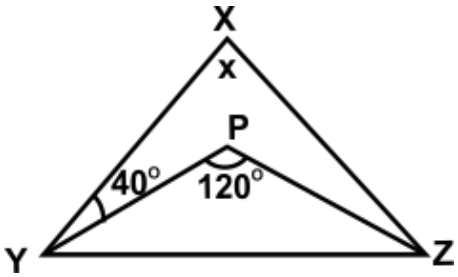
a. 150°
b. 110°
c. 120°
d. 100°

41. In the figure, ΔABC and ΔPBC are two isosceles triangles. Find x.



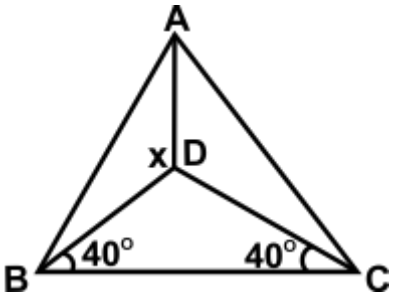
a. 120°
b. 110°
c. 115°
d. 100°

42. ΔXYZ and ΔPYZ are two isosceles triangles on the same base YZ. If ∠P = 120° and ∠XYP = 40°. Find x.



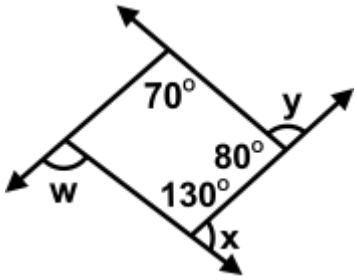
a. 40°
b. 50°
c. 45°
d. 60°

43. In ABC, AB = AC. ∠DBC = ∠DCB = 40°. Find x.



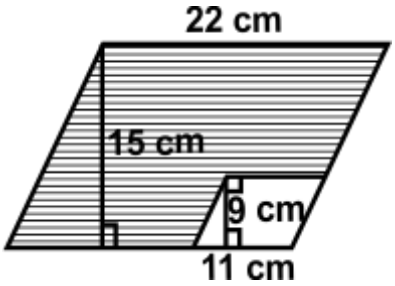
a. 125°
b. 130°
c. 135°
d. 140°

44. What is the value of x + y + w?



a. 210°
b. 310°
c. 280°
d. 250°

45. Find the area of the shaded portion.



a. 235 cm^2
b. 230 cm^2
c. 231 cm^2
d. 238 cm^2

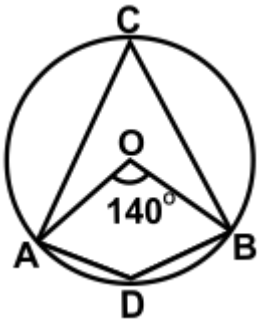
46. A wire is in the shape of a square of side 44 cm. If it is refolded into a circular ring, find the radius of the ring.

a. 28 m
b. 23 m
c. 32 m
d. 20 m

47. Diameter of a wheel of a car is 70 cm. How much distance will it cover in 10 revolutions?

a. 22 m
b. 20 m
c. 26 m
d. 27 m

48. In the figure, ∠AOB = 140°. Find ∠ADB.

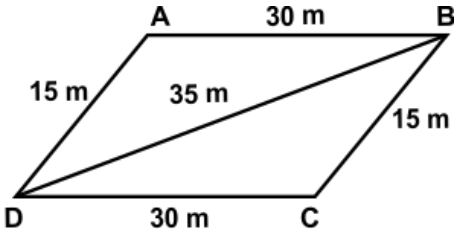


a. 110°
b. 125°
c. 130°
d. 120°

49. In a triangle ABC, s is the semi-perimeter and a, b, and c are the sides of the triangle. If a = 3b = 6c, then s = z × c. Identify z.

a. $\frac{5}{7}$
b. $\frac{9}{2}$
c. $\frac{7}{9}$
d. $\frac{11}{2}$

50. In the adjoining figure, find the value of semi perimeter for ΔABD and ΔBCD.



a. 35 m
b. 38 m
c. 30 m
d. 40 m

51. What is the diameter of a circle with an area of 121π?

a. 18 units
b. 22 units
c. 20 units
d. 24 units

52. The archery target has three concentric circular regions. The diameter of the regions are in 1 : 2 : 3. What is the ratio of their areas?

a. 2 : 3 : 4
b. 1 : 2 : 3
c. 1 : 4 : 9
d. 2 : 5 : 7

53. The cost of fencing a circular field at the rate of $10 per meter is $440. What is the radius of the circular field?

a. 7 m
b. 6 m
c. 5 m
d. 8 m

54. If the height of the frustum is 4 cm and the radii of two bases are 3 cm and 6 cm respectively, find the slant height of the frustum.

a. 4 cm
b. 8 cm
c. 7 cm
d. 5 cm

55. Cube of sides 2 cm is cut down into cubes of sides 1 cm. What is the ratio of surface area of smaller cubes to that of larger cubes?

a. 2 : 4
b. 2 : 5
c. 1 : 4
d. 1 : 3

56. If a sphere of diameter 12 cm is melted and drawn into a wire of diameter 0.2 cm, find the length of the wire.

a. 256 m
b. 288 m
c. 264 m
d. 225 m

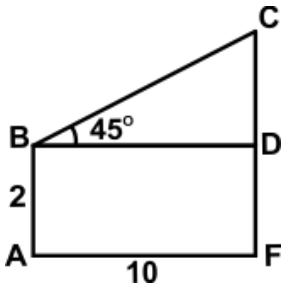
57. Find the radius of the largest right circular cone that can be cut out of a cube whose edge is 9 cm.

a. 4.5 cm
b. 2.5 cm
c. 5.5 cm
d. 3.5 cm

58. What will be the volume of a cylindrical tank whose radius is 7 cm and height is 5 cm?

a. 270 cm^3
b. 370 cm^3
c. 570 cm^3
d. 770 cm^3

59. In the figure, find the value of CF.



a. 9 units
b. 11 units
c. 12 units
d. 14 units

60. At a point 30 m away from the foot of a tower the angle of elevation of the top of the tower is 60^o. Find the height of the tower.

a. $15\sqrt{3}$ m
b. $30\sqrt{3}$ m
c. $28\sqrt{2}$ m
d. $27\sqrt{2}$ m

61. Simplify:
(6990 ÷ 15) × (468 ÷ 18) = ?

a. 12161
b. 12116
c. 14000
d. 13342

62. Simplify:
$\frac{3}{5}^{th}$ of 24% of 500 - 32 = ?

a. 20
b. 30
c. 50
d. 40

63. What will come in place of question mark (?) in the number series?
6, 11, 21, 36, 56, ?

a. 42
b. 51
c. 81
d. 24

64. What will come in place of question mark (?) in the number series?
10, 18, 28, 40, 54, 70, ?

a. 85
b. 86
c. 87
d. 88

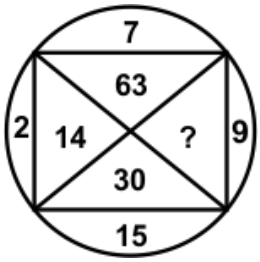
65. If L stands for x, M stands for /, P stands for + and Q stands for -, which one of the following equations is correct?
1 6 P 2 4 M 8 Q 6 M 2 L 3 = ?

a. 12
b. 11
c. 10
d. 14

66. If + means /, - means +, x means -, and / means x, then 8 / 4 - 6 + 3 x 4 = ?

a. 26
b. 30
c. 28
d. 35

67. What will come in place of question mark (?) in the diagram?



a. 135
b. 154
c. 144
d. 125

68. Which number is divisible by 17?
123445, 133365, 32376, 245346

a. 32376
b. 123445
c. 133365
d. 245346

69. Which number is divisible by 2 and 8?
23462, 773292, 204120, 956482

a. 23462
b. 773292
c. 956482
d. 204120

70. Which number is divisible by 14?
57248, 124556, 89534, 484176

a. 89534
b. 124556
c. 484176
d. 57248

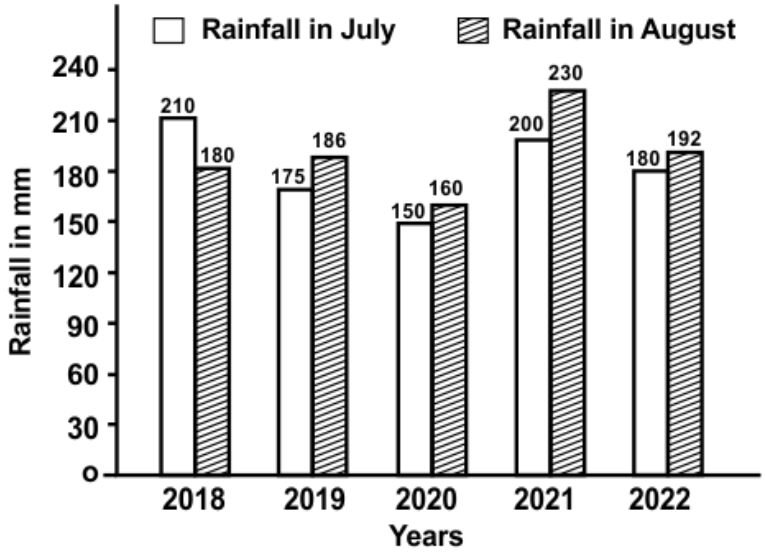
71. Factorise:
$m - 1 - (m - 1)^2 + ax - a$

a. (2 - x + a)(2x + 1)
b. (2 - x + a)(2x - 1)
c. (2 - x + a)(x - 1)
d. (2 - x + a)(x + 1)

72. What will come in place of question mark (?) in the following number series?
1, 3, 6, 10, 15, ?

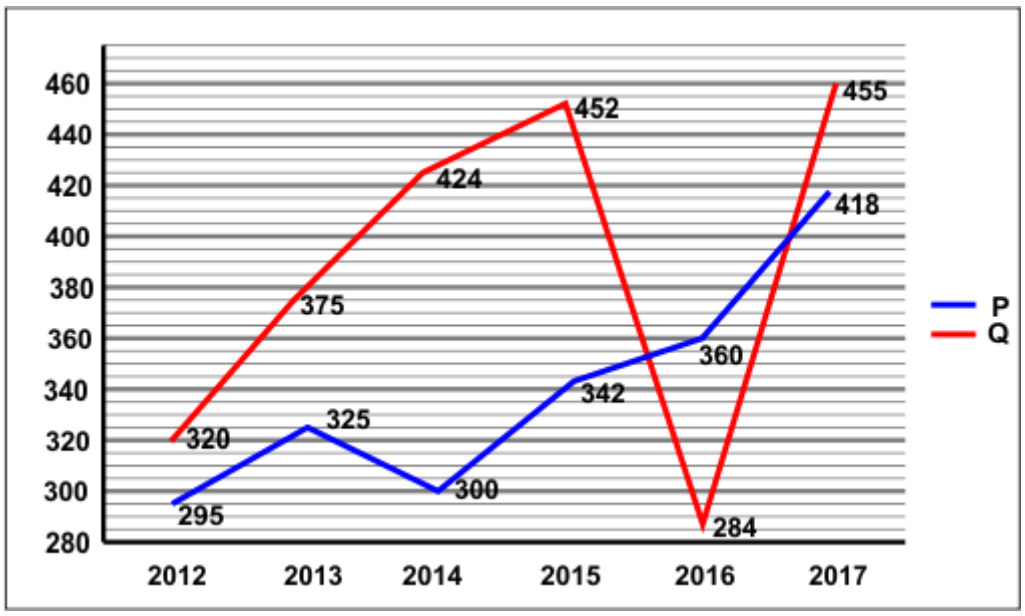
a. 17
b. 19
c. 21
d. 23

73. Study the bar graph carefully to answer the following question:
Find out the difference between the total rainfall in July 2018 and 2022 together and the total rainfall in august 2019 and 2020 together.



a. 48 mm
b. 44 mm
c. 40 mm
d. 46 mm

74. The line graph shows the number of candidates applied for post P and post Q of a company between 2012 to 2017.
The number of candidates who applied for the post P in 2015 is approximately what percent of the total number of candidates who applied for post Q in all the years?



a. 11%
b. 13%
c. 15%
d. 18%

75. A coin is tossed 500 times with following frequencies: -
Head - 245, Tail - 255.
What is the probability of getting head?

a. $\frac{44}{100}$
b. $\frac{42}{100}$
c. $\frac{47}{100}$
d. $\frac{49}{100}$

76. In 250 consecutive days, weather forecasts were correct 175 times. Find the probability of getting 'not correct' forecast.

a. $\frac{3}{10}$
b. $\frac{5}{10}$
c. $\frac{11}{10}$
d. $\frac{7}{10}$

77. In a bag there are 5 white, 6 black and 3 green cards. One card is drawn at random. What is the probability of having a card which is not green?

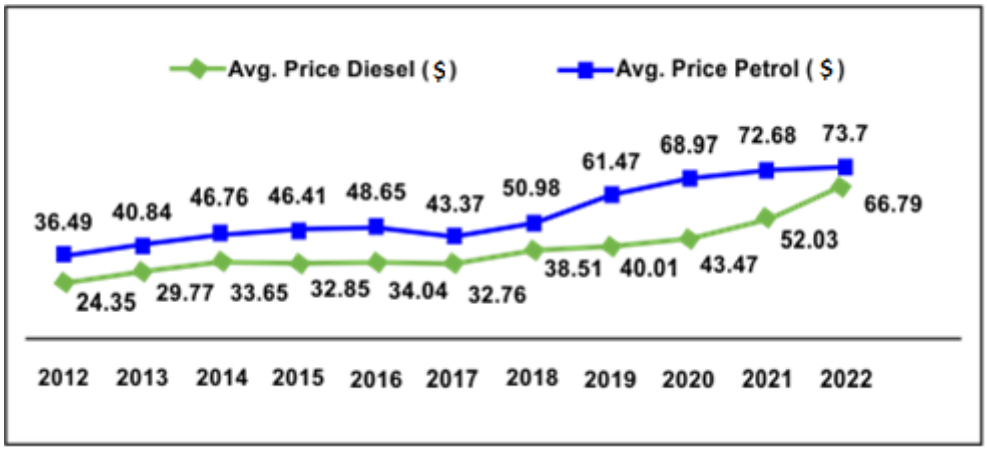
a. $\frac{9}{14}$

b. $\frac{17}{14}$

c. $\frac{11}{14}$

d. $\frac{13}{14}$

78. Observe the graph below and answer the question.
What is the average of Diesel prices over the years 2020–2022?



a. 52.5

b. 54.09

c. 58.8

d. 57.25

79. What will come in place of question mark (?) in the following number series?
2, 3, 5, 8, 12, ?

a. 13

b. 15

c. 17

d. 19

80. What will come in place of question mark (?) in the following equation? (approx.)
1599 × 199 ÷ 49 – 1398 + 3877 = ?

a. 9000

b. 9500

c. 10000

d. 10500

Avance (Each Question is 2 Marks)

81. Division of 133 by 19 gives remainder = 0. What is the H.C.F. (133, 9)?

a. 16
b. 19
c. 18
d. 17

82. Convert the recurring decimals to fractions:
$2.\overline{917}$

a. $2\frac{917}{999}$
b. $\frac{219}{999}$
c. $\frac{217}{999}$
d. $1\frac{917}{999}$

83. There are three consecutive positive integers such that sum of the square of the first and product of other two, is 29. What are the integers?

a. 4, 5, 6
b. 3, 4, 5
c. 1, 3, 4
d. 4, 3, 1

84. Factorise:
$x^4 + x^2y^2 + y^4$

a. $(x^2 + y^2)^2 - x^2y^2$
b. $(x^2 - y^2)^2 - x^2y^2$
c. $(x^2 - y^2)^2 - xy^2$
d. $(x^2 - y^2)^2 - x^2y$

85. $600 are invested at 5% simple interest p.a. In how much time will it double itself?

a. 20 years
b. 24 years
c. 22 years
d. 25 years

86. Michael purchased 40 kg of wheat at $12.50 per kg and 25 kg of wheat at $15.10 per kg. He mixed the two qualities of wheat for selling. At what rate should it be sold to gain 10%?

a. $21
b. $13.63
c. $34
d. $14.85

87. A man can row at 24 km/hr in still water. It takes him thrice as long to row up as to row down the river. Find the rate of stream.

a. 14 km/h
b. 23 km/h
c. 12 km/h
d. 18 km/h

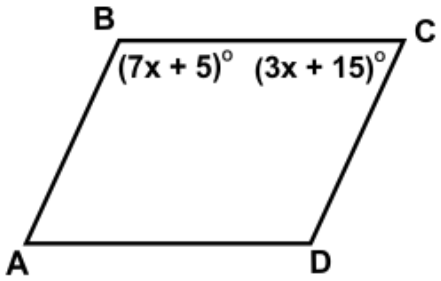
88. A and B enter into a partnership with capitals in the ratio 5 : 6. At the end of 8 months, A withdraws his capital. If they receive profits in the ratio of 5 : 9, find how long B's capital was used.

a. 8 months
b. 12 months
c. 10 months
d. 9 months

89. The marked price of a radio is $480. The shopkeeper allows a discount of 10% and gains 8%. If no discount is allowed, find his gain%.

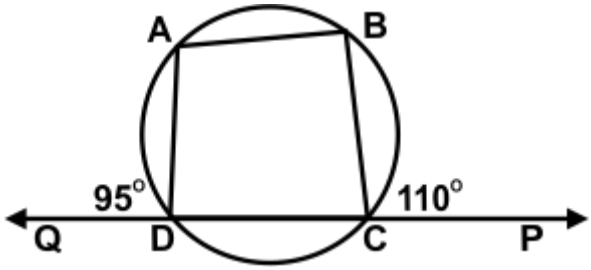
a. 17%
b. 22%
c. 20%
d. 25%

90. In the parallelogram shown below, find ∠ABC.



a. 110°
b. 125°
c. 130°
d. 117°

91. In the figure, ABCD is a cyclic quadrilateral. Side CD is produced to both sides so that ∠BCP = 110° and ∠ADQ = 95°. What is the sum of angles ∠A and ∠B?



a. 235°
b. 205°
c. 230°
d. 210°

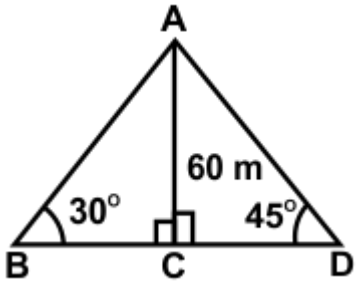
92. Find the area of a triangle whose sides are 50 m, 78 m, 112 m respectively.

a. 1460 m^2
b. 1540 m^2
c. 1080 m^2
d. 1680 m^2

93. A rectangular box 14 cm long, 10 cm wide and 5 cm high is to be made with cardboard. Find the area of cardboard to make that box.

a. 420 cm^2
b. 380 cm^2
c. 520 cm^2
d. 480 cm^2

94. In the figure, two men are on the opposite sides of a tower. If the height of the tower is 60 m. Find the distance between them.



a. 60 + 60√3
b. 70 + 60√3
c. 80 + 60√3
d. 50 + 60√3

95. Simplify:
$\frac{17}{29} \; x \; \frac{8}{102} \; x \; \frac{48}{27} \; x \; \frac{3}{2} = ?$

a. $\frac{36}{244}$
b. $\frac{46}{212}$
c. $\frac{32}{261}$
d. $\frac{35}{265}$

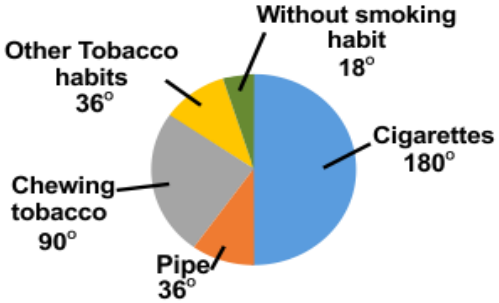
96. Which number is divisible by 19?
650864, 345645, 2753533, 887773

a. 887773
b. 2753533
c. 345645
d. 650864

97. Factorise:
$x^3 - x^2 - mx - m + x - 1$

a. $(x - 1)(x^2 + a + 1)$
b. $(x - 1)(x^2 - a + 1)$
c. $(x - 1)(x^2 + a - 1)$
d. $(x + 1)(x^2 + a + 1)$

98. The Pie – chart shows the result of a survey among 119060 people concerning the use of tobacco. Study the Pie – chart and answer the question.
Calculate the number of people smoking cigarettes.



a. 59676
b. 59354
c. 59530
d. 59878

99. Consider the given data of an examination with three subjects.
How many candidates failed in all the subjects?

a.	Candidates appeared	100
b.	Candidates passed in all the three subjects	460
c.	Candidates passed in two subjects only	280
d.	Candidates passed in one subject only	240
e.	Candidates failed in Physics only	80
f.	Candidates failed in Chemistry only	60
g.	Candidates failed in Maths only	140

a. 30
b. 20
c. 40
d. 10

100. What will come in place of question mark (?) in the following equation? (approx.)
4433.764 – 2211.993 – 1133.667 + 3377.442 = ?

a. 4466
b. 4520
c. 4687
d. 4895

Answer Key

1.	c	2.	d	3.	a	4.	b	5.	a	6.	c	7.	a
8.	d	9.	c	10.	d	11.	b	12.	a	13.	d	14.	a
15.	c	16.	b	17.	b	18.	a	19.	c	20.	d	21.	b
22.	c	23.	a	24.	c	25.	b	26.	b	27.	a	28.	d
29.	c	30.	b	31.	a	32.	d	33.	d	34.	a	35.	b
36.	d	37.	a	38.	d	39.	b	40.	a	41.	c	42.	a
43.	b	44.	d	45.	c	46.	d	47.	a	48.	a	49.	b
50.	d	51.	b	52.	c	53.	a	54.	d	55.	c	56.	b
57.	a	58.	d	59.	c	60.	b	61.	b	62.	d	63.	c
64.	d	65.	c	66.	b	67.	a	68.	c	69.	d	70.	c
71.	c	72.	c	73.	b	74.	c	75.	d	76.	a	77.	c
78.	b	79.	c	80.	a	81.	b	82.	a	83.	b	84.	a
85.	a	86.	d	87.	c	88.	b	89.	c	90.	d	91.	b
92.	d	93.	c	94.	a	95.	c	96.	d	97.	a	98.	c
99.	b	100.	a										