CBSE 2024 Maths Standard — Set 2 — Answer Key

English Medium

Time Allowed: 3 Hours | Maximum Marks: 80

General Instructions:

1. This question paper contains 38 questions. All questions are compulsory.
2. Section A has 20 MCQs carrying 1 mark each.
3. Section B has 6 questions carrying 2 marks each.
4. Section C has 6 questions carrying 3 marks each.
5. Section D has 4 questions carrying 5 marks each.
6. Section E has 3 case-study based questions carrying 4 marks each.
7. Draw neat figures wherever required.

Section A

Multiple Choice Questions (1 mark each)

Q.1 [1 mark]

The value of k for which the system of equations 3x - y + 8 = 0 and 6x - ky + 16 = 0 has infinitely many solutions, is

(a) -2

(b) 2 <<

(c) 1/2

(d) -1/2

Explanation:

For infinitely many solutions: a1/a2 = b1/b2 = c1/c2. Here 3/6 = (-1)/(-k) = 8/16. So 1/2 = 1/k, giving k = 2.

Q.2 [1 mark]

Point P divides the line segment joining the points A(4, -5) and B(1, 2) in the ratio 5:2. Co-ordinates of point P are

(a) (5/2, -3/2)

(b) (11/7, 0)

(c) (13/7, 0) <<

(d) (0, 13/7)

Explanation:

Using section formula: P = ((5*1 + 2*4)/(5+2), (5*2 + 2*(-5))/(5+2)) = (13/7, 0).

Q.3 [1 mark]

The common difference of an A.P. in which a(15) - a(11) = 48, is

(a) 12 <<

(b) 16

(c) -12

(d) -16

Explanation:

a(15) - a(11) = (a + 14d) - (a + 10d) = 4d = 48. So d = 12.

Q.4 [1 mark]

The quadratic equation x^2 + x + 1 = 0 has _____ roots.

(a) real and equal

(b) irrational

(c) real and distinct

(d) not-real <<

Explanation:

Discriminant D = b^2 - 4ac = 1 - 4(1)(1) = -3 < 0. Since D < 0, the roots are not real.

Q.5 [1 mark]

If the HCF(2520, 6600) = 40 and LCM(2520, 6600) = 252 * k, then the value of k is

(a) 1650 <<

(b) 1600

(c) 165

(d) 1625

Explanation:

HCF * LCM = product of the two numbers.

40 * 252k = 2520 * 6600. k = (2520 * 6600) / (40 * 252) = 16632000 / 10080 = 1650.

Q.6 [1 mark]

In the given figure, triangle ABC is shown. DE is parallel to BC. If AD = 5 cm, DB = 2.5 cm and BC = 12 cm, then DE is equal to

(a) 10 cm

(b) 6 cm

(c) 8 cm <<

(d) 7.5 cm

Explanation:

Since DE || BC, by Basic Proportionality Theorem: AD/AB = DE/BC.

AB = AD + DB = 7.5 cm.

DE = 12 * (5/7.5) = 12 * (2/3) = 8 cm.

Q.7 [1 mark]

If sin theta = cos theta, (0 < theta < 90), then value of (sec theta . sin theta) is

(a) 1/sqrt(2)

(b) sqrt(2)

(c) 1 <<

(d) 0

Explanation:

sin theta = cos theta implies theta = 45. sec 45 * sin 45 = sqrt(2) * (1/sqrt(2)) = 1.

Q.8 [1 mark]

Two dice are rolled together. The probability of getting the sum of the two numbers to be more than 10, is

(a) 1/9

(b) 1/6

(c) 7/12

(d) 1/12 <<

Explanation:

Total outcomes = 36. Sum > 10 means sum = 11 or 12. Sum 11: (5,6),(6,5) = 2 ways.

Sum 12: (6,6) = 1 way.

Total favorable = 3. P = 3/36 = 1/12.

Q.9 [1 mark]

If alpha and beta are zeroes of the polynomial 5x^2 + 3x - 7, the value of 1/alpha + 1/beta is

(a) -3/7

(b) 3/5

(c) 3/7 <<

(d) 5/7

Explanation:

1/alpha + 1/beta = (alpha + beta)/(alpha * beta).

Sum of zeroes = -3/5. Product of zeroes = -7/5. So (-3/5)/(-7/5) = 3/7.

Q.10 [1 mark]

The perimeters of two similar triangles ABC and PQR are 56 cm and 48 cm respectively. PQ/AB is equal to

(a) 7/8

(b) 6/7 <<

(c) 7/6

(d) 8/7

Explanation:

For similar triangles, ratio of corresponding sides = ratio of perimeters.

PQ/AB = 48/56 = 6/7.

Q.11 [1 mark]

AB and CD are two chords of a circle intersecting at P. Choose the correct statement from the following:

(a) triangle ADP ~ triangle CBA

(b) triangle ADP ~ triangle BPC

(c) triangle ADP ~ triangle BCP

(d) triangle ADP ~ triangle CBP <<

Explanation:

When two chords intersect inside a circle, by AA similarity (vertically opposite angles at P and angles subtended by the same arc), triangle ADP ~ triangle CBP.

Q.12 [1 mark]

If value of each observation in a data is increased by 2, then median of the

new data

(a) increases by 2 <<

(b) increases by 2n

(c) remains same

(d) decreases by 2

Explanation:

When each observation is increased by a constant k, the median also increases by k. Here k = 2, so the median increases by 2.

Q.13 [1 mark]

A box contains cards numbered 6 to 55. A card is drawn at random from the box. The probability that the drawn card has a number which is a perfect square, is

(a) 7/50

(b) 7/55

(c) 1/10 <<

(d) 5/49

Explanation:

Total cards = 55 - 6 + 1 = 50. Perfect squares from 6 to 55: 9, 16, 25, 36, 49 = 5 numbers.

P = 5/50 = 1/10.

Q.14 [1 mark]

In the given figure, tangents PA and PB to the circle centred at O, from point P are perpendicular to each other. If PA = 5 cm, then length of AB is equal to

(a) 5 cm

(b) 5*sqrt(2) cm <<

(c) 2*sqrt(5) cm

(d) 10 cm

Explanation:

PA = PB = 5 cm (tangents from external point).

angle APB = 90. OAPB is a square (OA perp PA, OB perp PB, OA = OB = PA = PB = 5).

AB is the diagonal of the square = 5*sqrt(2) cm.

Q.15 [1 mark]

XOYZ is a rectangle with vertices X(-3, 0), O(0, 0), Y(0, 4) and Z(x, y). The length of its each diagonal is

(a) 5 units <<

(b) sqrt(5) units

(c) x^2 + y^2 units

(d) 4 units

Explanation:

Diagonal XY = sqrt((-3-0)^2 + (0-4)^2) = sqrt(9 + 16) = sqrt(25) = 5 units.

Q.16 [1 mark]

Which term of the A.P. -29, -26, -23, ..., 61 is 16?

(a) 11th

(b) 16th <<

(c) 10th

(d) 31st

Explanation:

a = -29, d = 3. a(n) = a + (n-1)d.

16 = -29 + (n-1)*3. 45 = 3(n-1).

n-1 = 15. n = 16. So 16 is the 16th term.

Q.17 [1 mark]

In the given figure, AT is tangent to a circle centred at O. If angle CAT = 40, then angle CBA is equal to

(a) 70

(b) 50 <<

(c) 65

(d) 40

Explanation:

angle OAT = 90 (radius perpendicular to tangent).

angle OAC = 90 - 40 = 50. OA = OC (radii), so triangle OAC is isosceles and angle OCA = 50. angle AOC = 80. angle CBA = (1/2) * reflex angle AOC is not applicable here.

Using the inscribed angle theorem with B on the major arc, angle CBA = angle OAC = 50.

Q.18 [1 mark]

After an examination, a teacher wants to know the marks obtained by maximum number of students in her class. She requires to calculate _____ of marks.

(a) median

(b) mode <<

(c) mean

(d) range

Explanation:

Mode gives the most frequently occurring value.

To find marks obtained by the maximum number of students, calculate the mode.

Q.19 [1 mark]

Assertion (A): If sin A = 1/3 (0 < A < 90), then the value of cos A is 2*sqrt(2)/3.

Reason (R): For every angle theta, sin^2(theta) + cos^2(theta) = 1.

(a) Both A and R are true. R is the correct explanation of A. <<

(b) Both A and R are true. R does not give correct explanation of A.

(c) A is true but R is not true.

(d) A is not true but R is true.

Explanation:

cos A = sqrt(1 - sin^2 A) = sqrt(1 - 1/9) = sqrt(8/9) = 2*sqrt(2)/3. Both A and R are true, and R (the Pythagorean identity) is exactly the method used to derive cos A from sin A.

Q.20 [1 mark]

Assertion (A): Two cubes each of edge length 10 cm are joined together. The total surface area of newly formed cuboid is 1200 cm^2.

Reason (R): Area of each surface of a cube of side 10 cm is 100 cm^2.

(a) Both A and R are true. R is the correct explanation of A.

(b) Both A and R are true. R does not give correct explanation of A.

(c) A is true but R is not true.

(d) A is not true but R is true. <<

Explanation:

Joining two cubes of edge 10 cm gives a cuboid of dimensions 20 x 10 x 10. TSA = 2(20*10 + 10*10 + 20*10) = 2(200+100+200) = 1000 cm^2, not 1200. So A is false.
R is true since each face = 10*10 = 100 cm^2.

Section B

Very Short Answer Questions (2 marks each)

Q.21 [2 marks]

Can the number (15)^n, n being a natural number, end with the digit 0? Give reasons.

Answer: No

Explanation:

For a number to end with 0, it must have both 2 and 5 as prime factors.
15^n = (3*5)^n = 3^n * 5^n.
Since 2 is not a factor, 15^n can never end with 0.

Q.22 [2 marks]

Find the type of triangle ABC formed whose vertices are A(1, 0), B(-5, 0) and

C(-2, 5).

Answer: Isosceles

Explanation:

AB = sqrt(36) = 6. BC = sqrt(9+25) = sqrt(34).

AC = sqrt(9+25) = sqrt(34).

Since BC = AC, triangle ABC is isosceles.

Q.23 [2 marks]

Evaluate: 2 sin^2(30) sec(60) + tan^2(60).

Answer: 4

Explanation:

2*(1/2)^2*2 + (sqrt(3))^2 = 2*(1/4)*2 + 3 = 1 + 3 = 4.

OR

Q.23 [2 marks]

If 2 sin(A + B) = sqrt(3) and cos(A - B) = 1, then find the measures of angles A and B. 0 <= A, B, (A + B) <= 90.

Answer: A = 30, B = 30

Explanation:

sin(A+B) = sqrt(3)/2 => A+B = 60. cos(A-B) = 1 => A-B = 0. Solving: A = 30, B = 30.

Q.24 [2 marks]

In the given figure, AB and CD are tangents to a circle centred at O. Is angle BAC = angle DCA? Justify your answer.

Answer: Yes

Explanation:

OA perp AB and OC perp CD (radius to tangent).

So angle BAC = 90 - angle OAC and angle DCA = 90 - angle OCA.

Since OA = OC (radii), triangle OAC is isosceles, so angle OAC = angle OCA.

Therefore angle BAC = angle DCA.

Q.25 [2 marks]

In what ratio is the line segment joining the points (3, -5) and (-1, 6) divided by the line y = x?

Answer: 8:7

Explanation:

Let the ratio be k:1. Division point = ((-k+3)/(k+1), (6k-5)/(k+1)).

For this point to lie on y = x: -k+3 = 6k-5. So 7k = 8, k = 8/7. The ratio is 8:7.

OR

Q.25 [2 marks]

A(3, 0), B(6, 4) and C(-1, 3) are vertices of a triangle ABC. Find the length of its median BE.

Answer: 5*sqrt(5)/2

Explanation:

E is the midpoint of AC = ((3-1)/2, (0+3)/2) = (1, 3/2).

BE = sqrt((6-1)^2 + (4-3/2)^2) = sqrt(25 + 25/4) = sqrt(125/4) = 5*sqrt(5)/2.

OR

Q.26 [2 marks]

In an A.P., the sum of three consecutive terms is 24 and the sum of their squares is 194. Find the numbers.

Answer: 7, 8, 9

Explanation:

Let the terms be a-d, a, a+d.

Sum = 3a = 24, so a = 8. Sum of squares: (8-d)^2 + 64 + (8+d)^2 = 194. 192 + 2d^2 = 194. d^2 = 1, d = 1. Numbers: 7, 8, 9.

Section C

Short Answer Questions (3 marks each)

Q.30 [3 marks]

In a test, the marks obtained by 100 students (out of 50) are given below:

Marks obtained: 0-10, 10-20, 20-30, 30-40, 40-50
Number of students: 12, 23, 34, 25, 6

Find the mean marks of the students.

Answer: 24

Explanation:

Class marks: 5, 15, 25, 35, 45. Sum(fi*xi) = 60 + 345 + 850 + 875 + 270 = 2400. Mean = 2400/100 = 24.

Q.31 [3 marks]

In a 2-digit number, the digit at the unit's place is 5 less than the digit at the ten's place. The product of the digits is 36. Find the number.

Answer: 94

Explanation:

Let ten's digit = x, unit's digit = x-5. x(x-5) = 36. x^2 - 5x - 36 = 0. (x-9)(x+4) = 0. x = 9. The number is 94.

Q.32 [3 marks]

Using graphical method, solve the following system of equations: 3x + y + 4 = 0 and 3x - y + 2 = 0.

Answer: x = -1, y = -1

Explanation:

From 3x + y + 4 = 0: y = -3x - 4. From 3x - y + 2 = 0: y = 3x + 2. Setting equal: -3x - 4 = 3x + 2, so x = -1, y = -1.

OR

Q.32 [3 marks]

Tara scored 40 marks in a test, getting 3 marks for each right answer and losing 1 mark for each wrong answer. Had 4 marks been awarded for each correct answer and 2 marks been deducted for each wrong answer, then Tara would have scored 50 marks. Assuming that Tara attempted all questions, find the total number of questions in the test.

Answer: 20

Explanation:
Let correct = x, wrong = y.
3x - y = 40 and 4x - 2y = 50 (i.e.
2x - y = 25).
Subtracting: x = 15, y = 5. Total = 20.

Section D

Long Answer Questions (5 marks each)

Q.34 [5 marks]

From the top of a 45 m high light house, the angles of depression of two ships, on the opposite side of it, are observed to be 30 and 60. If the line joining the ships passes through the foot of the light house, find the distance between the ships. (Use sqrt(3) = 1.73)

Answer: 103.8 m

Explanation:
d1 = 45/tan(30) = 45*sqrt(3).
d2 = 45/tan(60) = 45/sqrt(3) = 15*sqrt(3).
Total = 60*sqrt(3) = 60*1.73 = 103.8 m.

Q.35 [5 marks]

The perimeter of a certain sector of a circle of radius 5.6 m is 20.0 m. Find the area of the sector.

Answer: 24.64 sq m

Explanation:

Perimeter = 2r + arc length = 20. Arc length = 20 - 11.2 = 8.8 m.

Area = (1/2) * r * arc = (1/2) * 5.6 * 8.8 = 24.64 sq m.

Q.36(a) [5 marks]

A ball is thrown in the air so that t seconds after it is thrown, its height h metre above its starting point is given by the polynomial h = 25t - 5t^2. Write zeroes of the given polynomial.

Answer: 0 and 5

Explanation:

h = 25t - 5t^2 = 5t(5-t). Setting h = 0: t = 0 or t = 5.

Q.36(b) [5 marks]

A ball is thrown in the air so that t seconds after it is thrown, its height h metre above its starting point is given by the polynomial h = 25t - 5t^2. Find the maximum height achieved by the ball.

Answer: 31.25 m

Explanation:

h = -5t^2 + 25t.

Maximum at t = -b/(2a) = 25/10 = 2.5 s.

h(2.5) = 25(2.5) - 5(6.25) = 62.5 - 31.25 = 31.25 m.

Q.36(c) [5 marks]

A ball is thrown in the air so that t seconds after it is thrown, its height h metre above its starting point is given by the polynomial h = 25t - 5t^2. After throwing upward, how much time did the ball take to reach the height of 30 m?

Answer: 2 s and 3 s

Explanation:

30 = 25t - 5t^2. t^2 - 5t + 6 = 0. (t-2)(t-3) = 0. t = 2 s (going up) and t = 3 s (coming

down).

OR

Q.36(c) [5 marks]

A ball is thrown in the air so that t seconds after it is thrown, its height h metre above its starting point is given by the polynomial h = 25t - 5t^2. Find the two different values of t when the height of the ball was 20 m.

Answer: 1 s and 4 s

Explanation:

20 = 25t - 5t^2. t^2 - 5t + 4 = 0. (t-1)(t-4) = 0. t = 1 or t = 4.

Q.37(a) [4 marks]

A circus tent is cylindrical upto a height of 8 m and conical above it. The diameter of the base is 28 m and total height of the tent is 18.5 m. Find the slant height of the conical part.

Answer: 17.5 m

Explanation:

Cone height = 18.5 - 8 = 10.5 m.

Radius = 14 m.

Slant height = sqrt(14^2 + 10.5^2) = sqrt(196 + 110.25) = sqrt(306.25) = 17.5 m.

Q.37(b) [4 marks]

A circus tent is cylindrical upto a height of 8 m and conical above it. The diameter of the base is 28 m and total height of the tent is 18.5 m. Determine the floor area of the tent.

Answer: 616 sq m

Explanation:

Floor area = pi * r^2 = (22/7) * 14^2 = (22/7) * 196 = 616 sq m.

Q.37(c) [4 marks]

A circus tent is cylindrical upto a height of 8 m and conical above it. The

diameter of the base is 28 m and total height of the tent is 18.5 m. Find the area of the cloth used for making the tent.

Answer: 1474 sq m

Explanation:

CSA of cylinder = 2*pi*r*h = 2*(22/7)*14*8 = 704 sq m.

CSA of cone = pi*r*l = (22/7)*14*17.5 = 770 sq m.

Total = 704 + 770 = 1474 sq m.

OR

Q.37(c) [4 marks]

A circus tent is cylindrical upto a height of 8 m and conical above it. The diameter of the base is 28 m and total height of the tent is 18.5 m. Find the total volume of air inside an empty tent.

Answer: 7084 cu m

Explanation:

Volume of cylinder = pi*r^2*h = 616*8 = 4928 cu m.

Volume of cone = (1/3)*pi*r^2*h = (1/3)*616*10.5 = 2156 cu m.

Total = 4928 + 2156 = 7084 cu m.

Q.38(a) [4 marks]

In a survey on holidays, 120 people were asked to state which type of transport they used. The pie chart shows sectors: Train, Bus, Car (177 degrees), Ship (33 degrees), Aeroplane. If one person is selected at random, find the probability that he/she travelled by bus or ship.

Answer: 169/360

Explanation:

From the pie chart, Bus = 136 degrees, Ship = 33 degrees.

P(bus or ship) = (136 + 33)/360 = 169/360.

Q.38(b) [4 marks]

In a survey on holidays, 120 people were asked to state which type of transport they used. The pie chart shows sectors for Train, Bus, Car (177 degrees), Ship (33 degrees), Aeroplane. Which is the most favourite mode of transport and how many people used it?

Answer: Car, 59 people

Explanation:

Car has the largest sector angle of 177 degrees.

Number of people = (177/360) * 120 = 59 (approximately).

Q.38(c) [4 marks]

In a survey on holidays, 120 people were asked to state which type of transport they used. If the probability that a randomly selected person did not use train is 4/5, find the number of people who used train.

Answer: 24

Explanation:

P(not train) = 4/5. P(train) = 1/5. Number who used train = (1/5) * 120 = 24.

OR

Q.38(c) [4 marks]

In a survey on holidays, 120 people were asked to state which type of transport they used. The probability that a randomly selected person used aeroplane is 7/60. Find the revenue collected by the air company at the rate of Rs 5000 per person.

Answer: Rs 70000

Explanation:

Number who used aeroplane = (7/60) * 120 = 14. Revenue = 14 * 5000 = Rs 70,000.