

Year	Questions	Marks
2012	20	20
2013	15	15
2014	20	20
2015	20	20
2016	20	20
Total	95	95

1. The expression $2x^3 + ax^2 + bx + 3$, where a and b are constants, has a factor of $x - 1$ and leaves a remainder of 15 when divided by $x + 2$. Find the value of a and b respectively.

- (A) -3, 8 (B) 3, -8 (C) -3, -8 (D) 3, 8

Answer: B

Solution: Given, $p(x) = 2x^3 + ax^2 + bx + 3$

$G(x) = x - 1$

$H(x) = x + 2$

Now,

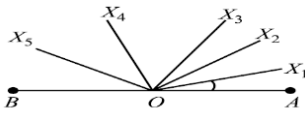
$G(1) \ a + b = -5 \dots (i)$

$H(-2) \ 2a - b = 14 \dots (ii)$

Upon solving (i) & (ii), $a = 3; b = -8$.

[2012]

2. In the given figure, AOB is a straight line and $\angle AOX_3 = 57^\circ$, $\angle X_1OX_4 = 97^\circ$, $\angle X_3OB = 123^\circ$ and $\angle X_4OB = 68^\circ$, Find $\angle AOX_1$.



- (A) 40° (B) 30° (C) 25° (D) 15°

Answer: A

Solution: $\angle AOX_3 = 57^\circ$, $\angle X_1OX_4 = 97^\circ$, $\angle X_3OB = 123^\circ$, $\angle X_4OB = 68^\circ$ (Given) $\angle AOX_1 = \angle X_1OX_4 - \angle AOX_3 = 97^\circ - 57^\circ = 40^\circ$

[2013]

3. Find the value of $\frac{9^{3/2} - 3 \times 5^0 - \left[\frac{1}{81}\right]^{-1/2}}{\left(\frac{64}{125}\right)^{-2/3} + \frac{1}{\left(\frac{256}{625}\right)^{1/4}} + \left(\frac{\sqrt{25}}{3}\right)^{2/3}}$

- (A) $\frac{15}{13}$ (B) 0 (C) $\frac{16}{5}$ (D) $\frac{48}{13}$

Answer: D

Solution: Numerator = $27 - 3 - 9 = 15$

Denominator = $25/16 + 5/4 + 5/4 = 65/16$

So, the value = $15 / (65/16) = (15 \times 16) / 65 = 48/13$.

[2014]

4. Which of the following statements is INCORRECT?

- (A) There can be a real number which is both rational and irrational.
 (B) The sum of any two irrational numbers is not always irrational.
 (C) For any Positive integers x and y, $x < y \Rightarrow x^2 < y^2$
 (D) Every integer is a rational number.

Answer: A

Solution: No, it's either rational or irrational but not both. A rational number can be expressed as the ratio of two integers an irrational number is one that cannot be expressed as the ratio of two integers.

[2015]

5. The factors of $8a^3 + b^3 - 6ab + 1$ are

- (A) $(2a + b - 1)(4a^2 + b^2 + 1 - 3ab - 2a)$ (B) $(2ab - b + 1)(4a^2 + b^2 - 4ab + 1 - 2a + b)$
 (C) $(2a + b + 1)(4a^2 + b^2 + 1 - 2ab - b - 2a)$ (D) $(2a - 1 + b)(4a^2 + 1 - 4a - b - 2ab)$

Answer: A

Solution: Multiplying $(2a + b + 1)(4a^2 + b^2 + 1 - 2ab - b - 2a) = 8a^3 + b^3 - 6ab + 1$.

[2016]

6. if 'l', 'b' and 'h' of a cuboid are increased, decreased and increased by 1%, 3% and 2% respectively, then the volume of the cuboid _____.

- (A) Increases
 (B) Decreases
 (C) Increases or decreases depending on original dimensions
 (D) Can't be calculated with given data

Answer: B

Solution: Volume of cuboid = LBH

New measurements,

$$l_1 = \frac{101}{100}L; b_1 = \frac{97}{100}B; h_1 = \frac{102}{100}H$$

$$\text{Hence, new volume} = \frac{999294}{1000000}LBH < LBH$$

Therefore, the volume decreases.

[2012]

7. The area of the triangle formed by $2x + 3y = 6$ and the coordinate axes is _____.

- (A) 3 sq. units (B) 2 sq. units (C) 6 sq. units (D) 5 sq. units

Answer: C

Solution: Coordinate axes of $2x + 3y = 6$ are 6 sq. units

[2013]

8. Evaluate $(2x - y + 3z)(4x^2 + y^2 + 9z^2 + 2xy + 3yz - 6xz)$

- (A) $8x^3 - y^3 + 27z^3 - 18xyz$ (B) $8x^3 - y^3 + 27z^3 + 18xyz$
 (C) $8x^3 + y^3 + 27z^3 + 18xyz$ (D) $8x^3 + y^3 - 27z^3 + 18xyz$

Answer: B

Solution: $(a - b + c)(a^2 + b^2 + c^2 - ab - bc + ca) = a^3 - b^3 + c^3 + 3abc$

Here $a = 2x, B = -y, C = 3z$

So, the given expression can be written as

$$(2x)^3 - y^3 + (3z)^3 + 3(2x)(-y)(3z) = 8x^3 - y^3 + 27z^3 + 18xyz$$

[2014]

9. Find the value of l, so that $y - 2p$ is a factor of $\frac{y^3}{4p^2} - 2y + lp$.

- (A) 0 (B) 1 (C) 2 (D) 3

Answer: C

Solution: Given $Y = 2p$ is factor of $-2y + lp$

At $y=2p$ we get given polynomial equation to zero.

$$-2(2p) + lp = 0$$

14. The number of dimensions, a point has
 (A) 0 (B) 1 (C) 2 (D) 3

Answer: A

Solution: A point has zero dimensions, as it can be marked anywhere.

[2015]

15. A solid iron rectangular block of dimensions (2.2 m × 1.2 m × 1 m) is cast into a hollow cylindrical pipe of internal radius 35 cm and thickness 5 cm. Find the length of the pipe.
 (A) 20.5 m (B) 24.5 m (C) 22.4 m (D) 18.4 m

Answer: C

Solution: Dimensions of cuboidal block = 2.2 m ×

$$= 220 \text{ CM} \times 120 \text{ CM} \times 100 \text{ CM}$$

$$\therefore \text{Volume of cuboidal block} = 220 \times 120 \times 100 \text{ cm}^3$$

Internal radius of the hollow cylinder (r) = 35 m

Thickness of the hollow cylinder = 5 cm

\therefore External radius of the hollow cylinder pipe be h cm

\therefore Volume of the hollow pipe = $\pi (R^2 - r^2) h$

$$= \frac{22}{7} (40^2 - 35^2) \times h \text{ cm}^3$$

$$= \frac{22}{7} \times (40-35) \times (40 + 35) \times h \text{ cm}^3$$

$$= \frac{22}{7} \times 5 \times 75 \times h \text{ cm}^3$$

Here, volume of cuboidal block = Volume of hollow cylinder

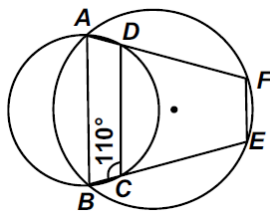
$$\therefore 220 \times 120 \times 100 = \frac{22}{7} \times 5 \times 75 \times h$$

$$\therefore h = \frac{220 \times 120 \times 100 \times 7}{22 \times 5 \times 75} = 2240 \text{ cm} = 22.40 \text{ m}$$

\therefore Length of the pipe = 22.4 m

[2016]

16. In given figure, ABCD and ABEF are two cyclic quadrilaterals. If $\angle BCD = 110^\circ$, then $\angle BEF = ?$



- (A) 55° (B) 70° (C) 90° (D) 110°

Answer: D

Solution: We know that opposite angles of cyclic quadrilateral are supplementary.

So, angle $BAD = 70^\circ$.

Hence angle $BEF = 110^\circ$

[2012]

17. In which quadrant does the point P(x, y) lie if $xy < 0$?

- (A) I or II (B) II or IV (C) I or III (D) III or IV

Answer: B

[2013]

18. If $x^2 + \frac{1}{x^2} = 98$, then find the value of $x^3 + \frac{1}{x^3}$.

- (A) 890 (B) 970 (C) 990 (D) 1110

Answer: B

Solution: $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
 $x^3 + (1/x^3) = (x + 1/x)(x^2 - (x)(1/x) + 1/x^2)$
 $= (x + 1/x)(x^2 + 1/x^2 - 1) \dots \dots \dots (1)$

Also
 $(x + 1/x)^2 = (x^2 + 2(x)(1/x) + 1/x^2) = x^2 + 1/x^2 + 2 = 98 + 2 = 100$
 So, $x + 1/x = 10$.
 Now, $x^3 + (1/x^3) = (10)(98 - 1)$ (using 1) = 970

[2014]

19. The points, whose abscissa and ordinate have different signs, lie in _____ quadrants.
 (A) I and II (B) II and III (C) I and III (D) II and IV

Answer: D
Solution: Abscissa is the horizontal "X" and ordinate is the vertical "Y" values in a pair of coordinates (x,y) and their signs are in all four quadrants are : (x,y), (-x,y), (-x,- y), (x,-y). So, if abscissa and ordinate have different signs then they will lie in 2nd or 4th quadrant.

[2015]

20. Which of the following is a true statement?
 (A) Only a unique line can be drawn to pass through a given point.
 (B) Infinitely many lines can be drawn to pass through two given points.
 (C) If two circles are equal, then their radii are equal.
 (D) A line has a definite length.

Answer: C
Solution: If two circles are equal, then their radii are equal.

[2016]

21. The value of $3 \left[\frac{(a^2-b^2)^3 + (b^2-c^2)^3 + (c^2-a^2)^3}{(a-b)^3 + (b-c)^3 + (c-a)^3} \right] = ?$
 (A) $3(a + b)(b + c)(c + a)$ (B) $3(a - b)(b - c)(c - a)$
 (C) $(a - b)(b - c)(c - a)$ (D) 1

Answer: B
Solution: Let us assume, $a=0$; $b=1$; $c=2$; LHS = 6
 On substituting the values in the given options, we have,
 $3(a-b)(b-c)(c-a) = 6$

[2012]

22. The degree of the polynomial $3x^2 + 12 - (\sqrt{3}x + \sqrt{12})^2 + 12x + 4$ is
 (A) 1 (B) 2 (C) 4 (D) 0

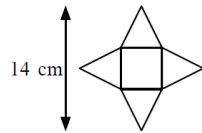
Answer: B [2013]

23. Simplify: $\frac{2}{\sqrt{5}+\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{2}} - \frac{3}{\sqrt{5}+\sqrt{2}}$
 (A) 3 (B) 2 (C) 4 (D) 0

Answer: D
Solution: Rationalizing the denominator, we get
 $2/(\sqrt{5} + \sqrt{3}) = 2(\sqrt{5} - \sqrt{3}) / (\sqrt{5} + \sqrt{3})(\sqrt{5} - \sqrt{3})$
 $= \sqrt{5} - \sqrt{3} \dots \dots (1)$
 Similarly we can find the value of the following as
 $1/(\sqrt{3} + \sqrt{2}) = \sqrt{3} - \sqrt{2} \dots \dots (2)$
 And $3/(\sqrt{5} + \sqrt{2}) = \sqrt{5} - \sqrt{2} \dots \dots (3)$
 Adding 1, 2 and 3, we get
 $2/(\sqrt{5} + \sqrt{3}) + 1/(\sqrt{3} + \sqrt{2}) + 3/(\sqrt{5} + \sqrt{2}) = \sqrt{5} - \sqrt{3} + \sqrt{3} - \sqrt{2} - \sqrt{5} + \sqrt{2} = 0$

[2014]

24. The figure below is the net of a prism made up of identical triangles. What is the total area of the faces of the prism, if the side of the square is 6 cm?



- (A) 75 cm^2 (B) 84 cm^2 (C) 95 cm^2 (D) 56 cm^2

Answer: B

[2015]

25. The mean of 25 numbers is 8. If 2 are added to every number, what will be the new mean?

- (A) 10 (B) 6 (C) 8 (D)

Answer: A

Solution: $= 200 + 2 \times 25 = 250$ Mean $= (250/25) = 10$

[2016]

26. How many planes can be made to pass through three distinct points?

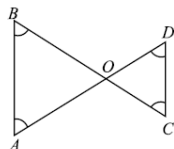
- (A) One if they are collinear (B) Infinite if they are collinear
(C) Only one if they are non collinear (D) Both (B) and (C)

Answer: D

Solution: If the points are collinear then an infinite number of planes can be made to pass through them. If three distinct points are non-collinear then exactly one plane passes through them.

[2012]

27. In the given figure, $\angle B < \angle A$ and $\angle C < \angle D$.



Then which of the following statements is true regarding the relationship between AD and BC?

- (A) $AD = BC$ (B) $AD < BC$ (C) $AD > BC$ (D) Nothing can be said

Answer: D

[2013]

28. Euclid stated that all right angles are equal to each other in the form of a/an _____.

- (A) Axiom (B) Definition (C) Postulate (D) Proof

Answer: C

Solution: The given statement is a postulate.

[2014]

29. The graph of line $y = 6$ is a line

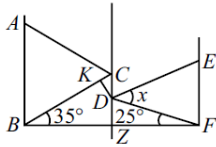
- (A) Parallel to x-axis at a distance of 6 units from the origin.
(B) Parallel to y-axis at a distance of 6 units from the origin.
(C) Making an intercept of 6 units on the x-axis.
(D) Making an intercept of 6 units on both the axis.

Answer: A

[2015]

30. In the given figure, it is given that

- (i) $AB \perp BF$ and $EF \perp BF$
- (ii) $AC = BC$
- (iii) KD is perpendicular to BC and DE



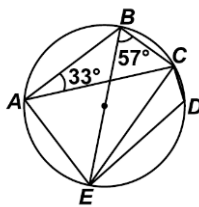
Find the measure of x .

- (A) 75°
- (B) 30°
- (C) 60°
- (D) 45°

Answer: C

[2016]

31. The line BE is a diameter of the given circle. If $\angle BAC = 33^\circ$ and $\angle EBC = 57^\circ$. Then $\angle CAE =$



- (A) 57°
- (B) 33°
- (C) 48°
- (D) 90°

Answer: A

Solution: Since $\angle BAE$ is an angle in the semicircle,
 $\angle BAE = \angle EAC + \angle CAB$ { $\angle CAB = 33^\circ$ }
 Therefore, $\angle CAE = 57^\circ$

[2012]

32. $ABCD$ is a field in the form of a quadrilateral whose sides are $AB = 40$ m, $BC = 15$ m, $CD = 28$ m and $AD = 9$ m. If $\angle DAB = 90^\circ$, the area of the field is

- (A) 306 m^2
- (B) 312 m^2
- (C) 126 m^2
- (D) 218 m^2

Answer: C

[2013]

33. If $2^x = 4^y = 8^z$ and $\left(\frac{1}{2x} + \frac{1}{4y} + \frac{1}{6z}\right) = \frac{24}{7}$, then the value of z is

- (A) $\frac{7}{16}$
- (B) $\frac{7}{32}$
- (C) $\frac{7}{48}$
- (D) $\frac{7}{64}$

Answer: C

Solution: Given $2^x = 4^y = 8^z$
 This gives $x = 2y = 3z$
 Putting these value in the other give statement $\frac{1}{2x} + \frac{1}{4y} + \frac{1}{6z} = \frac{24}{7}$, we get
 $\frac{1}{6z} + \frac{1}{6z} + \frac{1}{6z} = \frac{24}{7}$
 So, $z = \frac{7}{48}$

[2014]

34. Number of zero of the zero polynomial is

- (A) 0
- (B) 1
- (C) 2
- (D) Infinite

Answer: D

Solution: A polynomial function of degree has n zeros, provided multiple zeros are counted more than once and Provided complex zeros are counted.

[2015]

35. The perimeter of a triangle is $6p^2 - 4p + 9$ and two of its sides are $p^2 - 2p + 1$ and $3p^2 - 5p + 3$. Find the third side of the triangle.

- (A) $8p^2 + 11p - 7$ (B) $2p^2 + 3p + 5$ (C) $3p^2 + 5p - 4$ (D) $5p^2 - 5p + 9$

Answer: B

Solution: Perimeter = A + B + C

$$6p^2 - 4p + 9 = p^2 - 2p + 1 + 3p^2 - 5p + 3 + c$$

$$C = 6p^2 - 4p + 9 - p^2 + 2p - 1 - 3p^2 + 5p - 3$$

$$C = 2p^2 + 3p + 5$$

[2016]

36. The term containing the highest power of x in the polynomial $f(x)$ is $2x^4$. Two of the roots of the equation $f(x) = 0$ are -1 and 2 . Given that $x^2 - 3x + 1$ is a quadratic factor of $f(x)$, find the remainder when $f(x)$ is divided by $2x - 1$.

- (A) $1\frac{1}{8}$ (B) 2 (C) $9/8$ (D) $-1/3$

Answer: C

Solution: Given -1 and 2 are roots of $f(x)$.

So, the polynomial will be $(x + 1)(x - 2) = x^2 - x - 2$

Also $x^2 - 3x + 1$ is a quadratic factor and $2x^4$ is a highest power of $f(x)$

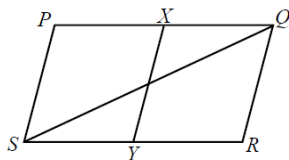
So, the polynomial $f(x) = 2(x^2 - x - 2)(x^2 - 3x + 1) = 2x^4 - 8x^3 + 4x^2 + 10x - 4$

According to question it is divided by $2x - 1$, so putting $x = \frac{1}{2}$ we get the remainder as

$$2(1/2)^4 - 8(1/2)^3 + 4(1/2)^2 + 10(1/2) - 4 = 9/8$$

[2012]

37. PQRS is a parallelogram. If X and Y are mid-points of PQ and SR respectively and diagonal SQ is joined the ratio $ar(\text{||gm XQRY}) : ar(\angle QSR) =$



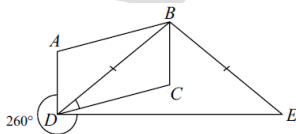
- (A) 1:4 (B) 2:1 (C) 1:2 (D) 1:1

Answer: B

Solution: Area (||gm XQRY): Area (Triangle QSR) = $b \times h : \frac{1}{2} b \times h = 2:1$

[2013]

38. In the given figure, ABCD is a rectangle. $BD = BE$, $\angle BED = 40^\circ$ and $\angle EDA = 260^\circ$. Find $\angle CDB$.

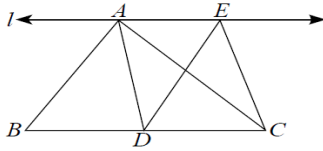


- (A) 25° (B) 30° (C) 40° (D) 45°

Answer: B

[2014]

39. In the given figure, $l \parallel BC$ and D is the mid-point of BC .
If area $(\triangle ABC) = x \times$ area $(\triangle EDC)$, then find the value of x .



- (A) 1 (B) 2 (C) 3 (D) 4

Answer: B

[2015]

40. Each edge of a cube is increased by 50%. Find the percentage increase in the surface area of the cube.
(A) 125 (B) 50 (C) 100 (D) 150

Answer: A

Solution: Each edge is 50% so Length + breath + height = 125%

[2016]

41. The sum of a number and its reciprocal is thrice the difference of the number and its reciprocal. The number is _____.
(A) $\pm\sqrt{2}$ (B) $\pm \frac{1}{\sqrt{2}}$ (C) $\pm\sqrt{3}$ (D) Both (A) and (B)

Answer: A

Solution: Let the number be 'y'

Given,

$$y + \frac{1}{y} = 3 \times \left(y - \frac{1}{y}\right)$$

$$\frac{y^2+1}{y} = 3\left(\frac{y^2-1}{y}\right)$$

$$\frac{y^2+1}{y^2+1} = \frac{3}{1}$$

Applying Component & Dividend,

$$Y^2 = 2 \text{ or, } y = \pm \sqrt{2}$$

[2012]

42. The probability of selecting a boy in a class is 0.6 and there are 45 students in a class. Find the number of girls in the class.
(A) 18 (B) 19 (C) 20 (D) 15

Answer: A

Solution: Total number of students = 45

Number of boys = 0.6 of 45 = 27

Number of girls = 45 - 27 = 18

[2013]

43. Fill in the blanks:

If a straight line falling on two straight lines makes the interior angles on the same side of it taken together _____ than two right angles, then the two straight lines, if produced indefinitely, meet on that side on which the sum of angles is less than right angles.

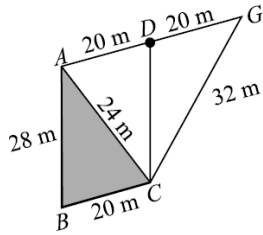
- (A) Less, three (B) More, two (C) Less, two (D) More, one

Answer: C

Solution: Euclid postulate.

[2014]

44. Find the ratio of the shaded area to the area of the quadrilateral ABCD.



- (A) $2 + \sqrt{6} : \sqrt{6}$ (B) $3 : 2 + \sqrt{6}$ (C) $\sqrt{6} : 2 + \sqrt{6}$ (D) $\sqrt{6} : 4 + \sqrt{6}$

Answer: C

[2015]

45. Three statements are given below:

- (i) In a ||gm, the angle bisectors of two adjacent angles enclose a right angle.
- (ii) The angle bisectors of a ||gm form a rectangle.
- (iii) The triangle formed by joining the mid-points of the sides of an isosceles triangle is not necessarily an isosceles triangle.

Which is true?

- (A) (i) only (B) (ii) only (C) (i) and (ii) only (D) (ii) and (iii) only

Answer: C

Solution: A rectangle is a parrallogram whose opposite sides are equal, and from a right angle. Hence the option (C) is well defined.

[2016]

46. Solve for X: $\frac{2^{X-3}}{8^{-X}} = \frac{32}{4^{(\frac{1}{2})^X}}$.

- (A) $2\frac{1}{5}$ (B) $1\frac{1}{5}$ (C) $3\frac{1}{5}$ (D) $\frac{8}{5}$

Answer: D

Solution: $2^{X-3}/8^{-X} = 32/4^{(1/2)^X}$
 So, $2^{2X} \times 8^X = 2^8$ or $2^{2X} \times 2^{3X} = 2^8$
 Comparing both sides, we get
 $X = 8/5$

[2012]

47. Simplify: $\frac{1}{\sqrt{7}+\sqrt{6}} - \frac{5}{1-\sqrt{6}} - \sqrt{7}$

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

Answer: A

Solution: $1 / (\sqrt{7} + \sqrt{6}) - 5 / (1 - \sqrt{6}) - \sqrt{7}$
 $= 1 / (\sqrt{7} + \sqrt{6}) \times (\sqrt{7} - \sqrt{6}) / (\sqrt{7} - \sqrt{6}) - 5 / (1 - \sqrt{6}) \times (1 + \sqrt{6}) / (1 + \sqrt{6}) - \sqrt{7}$
 $= (\sqrt{7} - \sqrt{6}) / 7 - 6 - 5(1 + \sqrt{6}) / 1 - 6 - \sqrt{7}$
 $= \sqrt{7} - \sqrt{6} + \sqrt{6} - \sqrt{7}$
 $= 0$

[2013]

48. The weight, in kg, of 50 students is given below.

40	45	55	62	50	51	56	69	61	36
60	56	69	38	35	63	57	50	57	48
40	63	53	64	47	42	56	51	42	60
55	39	64	57	64	44	66	35	59	59
73	62	49	63	37	63	54	72	44	60

Find the mean, median and mode respectively for the given data.

- (A) 55 kg, 57 kg, 64 kg (B) 55 kg, 57 kg, 62 kg
 (C) 53.92 kg, 56 kg, 63 kg (D) None of these

Answer: D

Solution: Sum of numbers = 2695

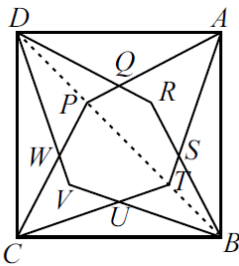
So, mean = 2695/50 = 53.9

If we consider the exact value, we can say that no option is matching.

If we round off then option C is correct.

[2014]

49. The figure below is made up of a square ABCD and two rhombuses, ATCP and DRBV.



Given that $\angle BVD = 135^\circ$ and $AT = BR$, then find $\angle PCT$ and $\angle ABD$ respectively.

- (A) $135^\circ, 135^\circ$ (B) $135^\circ, 45^\circ$ (C) $45^\circ, 135^\circ$ (D) $45^\circ, 45^\circ$

Answer: D

[2015]

50. If $\sqrt{\frac{9^{(r+\frac{1}{4})}\sqrt{3.3^{-r}}}{3\sqrt{3^{-r}}}} = k$, then the value of k is

- (A) 3 (B) 3^2 (C) 3^3 (D) $\sqrt[3]{3}$

Answer: (B)

Solution: $3^{2r+1/2+1/2-r/2+r/2-1} = 3^2$

[2016]

51. $2.6 - 0.82 =$ _____.

- (A) $\frac{182}{99}$ (B) $\frac{180}{999}$ (C) $\frac{175}{99}$ (D) $\frac{184}{999}$

Answer: A

Solution:

Let, a = 2.6 = 2.6666.... 10a = 26.666.... (-) _____ 9a = 24 a = 249	Let, b = 0.82 = 0.828282... 100b = 82.828282 (-) _____ 99b = 82 b = 8299
---	---

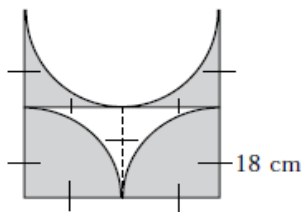
Hence,

$$2.6 - 0.82 = \frac{24}{9} - \frac{82}{99}$$

$$= \frac{182}{99}$$

[2012]

52. What is the area of the shaded part in the given figure? ($\pi = \frac{22}{7}$)?



- (A) 72 cm² (B) 108 cm² (C) 324 cm² (D) 648 cm²

Answer: D

Solution: The area of shaded region = $(\pi \times r^2)/2 + 36 \times 18) - (\pi \times r^2)/2$ (where $r = 18$ cm)

So, area = $36 \times 18 = 648$ sq cm

[2013]

53. Select the correct match.

- (A) When $x = 5$, $y = 2.5$ and when $y = 5$, $x = 10$, then x and y are inversely proportional.
 (B) When $x = 10$, $y = 5$ and when $x = 20$, $y = 2.5$, then $xy = \text{constant}$.
 (C) If x and y vary inversely, then on decreasing x , y will decrease in proportion.
 (D) If x and y vary directly, then on decreasing x , y will increase in proportion.

Answer: B

Solution: In first case Value of $xy = 10 \times 5 = 50$

In second case

Value of $xy = 20 \times 2.5 = 50$

So, $xy = \text{constant}$

[2014]

54. The numbers 7.478478... And 1.101001000100001...is

- (A) Rational and irrational respectively (B) Both rational
 (C) Both irrationals (D) none of these

Answer: A

Solution: 7.478478.... = 7.478, the decimal expansion is none terminating recurring then it is a rational number.

1.101001000100001... the decimal expansion is non terminating non-recurring then it is an irrational number

[2015]

55. Based on the given information, find the probability of people with age (60, 61 & 64) who can drive.

Age (in years)	Number of persons of different age who can drive the car
60	16,090
61	11,490
62	8,012
63	5,448
64	3,607
65	2,320

- (A) $\frac{36071}{41490}$ (B) $\frac{31187}{46967}$ (C) $\frac{31232}{41149}$ (D) $\frac{31232}{41609}$

Answer: B

Solution: Total persons of different age = 46967 = A

Total persons of age group 60, 61, 64 = 31187 = B

Probability = B/A = 31187/46967.

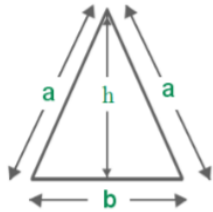
[2016]

56. The base of an isosceles triangle is 4 cm and its area is 16 cm². If one of the two equal sides of the triangle is k cm, the approximate value of k – 1.24 is _____.

- (A) 9 cm (B) 7 cm (C) 10 cm (D) 8 cm

Answer: B

Solution: Considering here k = a



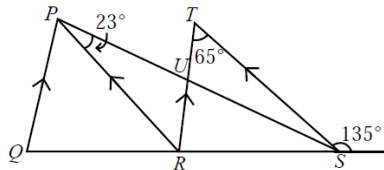
Area = $\frac{1}{2} (b) (h)$ where $h = \sqrt{a^2 - b^2 / 4}$

So, $16 = \frac{1}{2} \times 4 \times \sqrt{a^2 - 16/4}$ Or $a = 8.24$

So, $a - 1.24 = 7$ cm

[2012]

57. The given figure is not drawn to scale. Find the values of $\angle QPS$ and $\angle TRQ$ respectively.



- (A) 78°, 140° (B) 88°, 110° (C) 62°, 150° (D) 82°, 110°

Answer: B

Solution: PQ and TR are parallel lines and PR is a transversal

Thus $\angle P = \angle T$ (Corresponding angles are equal)

$\angle RTS = \angle QPR = 65^\circ$

$\angle QPS = 65^\circ + 23^\circ = 88^\circ$

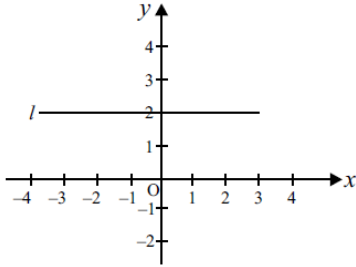
$\angle TSR = 180 - 135 = 45^\circ$

$\angle TRS = 180 - (45 + 65) = 180 - 110 = 70^\circ$

Thus $\angle TRQ = 180^\circ - 70^\circ = 110^\circ$ (Linear pair angles)

[2013]

58. Study the given graph and answer the following question.



Calculate the area enclosed by the lines l , $x = -3$, $y = -2$ and $y = -x + 2$.

- (A) 16 sq. units (B) 19 sq. units (C) 20 sq. units (D) 22 sq. units

Answer: C

Solution: The area of the rectangle formed by l , $x = -3$, $y = -2$ and y -axis = $3 \times 4 = 12$ sq units
 The area of right triangle formed by y -axis, $y = -2$ and $y = -x + 2 = \frac{1}{2} \times 4 \times 4 = 8$ sq units
 So, the total area = $12 + 8 = 20$ sq units.

[2014]

59. Factories: $x^4 + 5x^3 + 5x^2 - 5x - 6$

- (A) $(x^2 - 1)(x^2 + 6)$ (B) $(x - 1)(x + 2)^3$ (C) $(x^2 - 1)(x + 3)(x + 2)$ (D) $(x - 1)(x + 2)(x^2 + 3)$

Answer: C

Solution: $P(x) = x^4 + 5x^3 + 5x^2 - 5x - 6$. I start with the standard guess that $x = -2$ is a root.
 $155 - 5 - 6 - 2 - 626 - 213 - 1 - 3 = 0$ Therefore the following is true.

$x^4 + 5x^3 + 5x^2 - 5x - 6 = (x + 2)x^3 + 3x^2 - x - 3$ (4) Now let's break down the degree three thing.

$x = -213 - 1 - 3 - 2 - 26 - 211 - 33$ so $x = -2$ does not work.

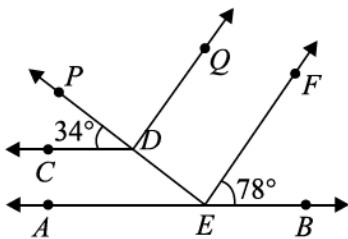
$x = -113 - 1 - 3 - 1 - 23 - 112 - 30$ so $x = -1$ does indeed work.

$x^3 + 3x^2 - x - 3 = (x + 1)x^2 + 2x - 3 = (x + 1)(x + 3)(x - 1)$ Putting this together with (4), we get the following.

$P(x) = (x + 2)(x + 1)(x + 3)(x - 1)$ the roots are $x = -2, -1, -3, 1$.

[2015]

60. In the given figure $AB \parallel CD$ and $EF \parallel DQ$. Determine $\angle PDQ$, $\angle AED$ and $\angle DEF$ respectively.



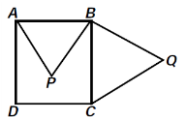
- (A) $34^\circ, 68^\circ, 68^\circ$ (B) $68^\circ, 34^\circ, 68^\circ$ (C) $68^\circ, 68^\circ, 68^\circ$ (D) $34^\circ, 34^\circ, 68^\circ$

Answer: B

Solution: Angle $AED = 34$ (Corresponding angles are equal)
 Angle $DEF = 68$ (Since AEB is a straight line $180 - 34 - 78 = 68$),
 Angle $PDQ =$ Angle $DEF = 34$ (Corresponding angles are equal)

[2016]

61. $ABCD$ is a rectangle. If ABP and BCQ are equilateral triangles, $\angle PBQ =$ ____.



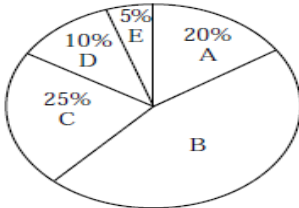
- (A) 65° (B) 75° (C) 60° (D) 90°

Answer: D

Solution: Since, Triangle ABP is equilateral, implies $\angle ABP = 60^\circ$
 Similarly, Triangle BCQ is equilateral, implies $\angle CBQ = 60^\circ$
 $\angle ABC = 90^\circ$, since, ABCD is a square.
 So, $\angle PBC = 90^\circ - \angle ABP = 30^\circ$
 Therefore, $\angle PBQ = \angle PBC + \angle CBQ = 90^\circ$

[2012]

62. The pie chart shows the grades attained by a group of students for a common test.



If 240 students sat for the common test and those who obtained Grade D and E failed the test, how many students passed the test?

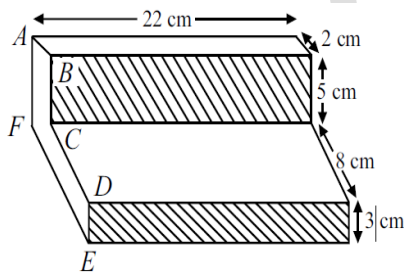
- (A) 42 (B) 182 (C) 215 (D) 204

Answer: D

Solution: Total number of students = 240
 Number of students appear in C = 25% of 240 = 60
 Number of students appear in D = 10% of 240 = 24
 Number of students appear in E = 5% of 240 = 12
 Number of students appear in A = 20% of 240 = 48
 Percentage of students appear in B = $100 - (25 + 10 + 5 + 20) = 40\%$
 So the number of students appear in B = 40% of 240 = 96
 Number of students passed = $(C + A + B) = 60 + 48 + 96 = 204$

[2013]

63. In the given figure, the shape of a solid copper piece (made up of two pieces with dimensions as shown in the figure) is shown. The face ABCDEFA is the uniform cross-section. Assume that the angles at A, B, C, D, E and F are right angles. Calculate the volume of the piece.



- (A) 528 cm^3 (B) 880 cm^3 (C) 580 cm^3 (D) 940 cm^3

Answer: B

Solution: Volume of the whole cube without cut = $22 \times 10 \times 8 = 1760 \text{ cm}^3$.
 Volume of the cut part = $22 \times 8 \times 5 = 880 \text{ cm}^3$
 So, the resultant volume = $1760 - 880 = 880 \text{ cm}^3$.

[2014]

64. 'Lines are parallel if they do not intersect' is stated in the form of

- (A) An axiom (B) A postulate (C) A definition (D) A proof

Answer: C

[2015]

65. Water flows in a tank 150 m × 100 m at the base, through a pipe whose cross-section is 2dm by 1.5dm at the speed of 15 km per hour. In what time, will the water be 3 meters deep?
 (A) 50 hrs. (B) 150 hrs. (C) 100 hrs. (D) 200 hrs.

Answer: C

Solution: Volume of tank = 150 × 100 × 3 = 4500 cubic meter
 Volume of water flowing in 1 hr. = 0.2 × 0.15 × 15000 cubic meter
 Thus, time taken by the pipe to fill the tank =

[2016]

66. A certain distance is covered at a certain speed (s_1). If half of this distance is covered in double the time at speed (s_2). Find the ratio of the two speeds. Also, if s_1 is 60 km/hr., find s_2 .
 (A) 1:16, 3.75 km/hr. (B) 4:1, 15 km/hr. (C) 2:1, 30 km/hr. (D) 2:8, 240 km/hr.

Answer: B

[2012]

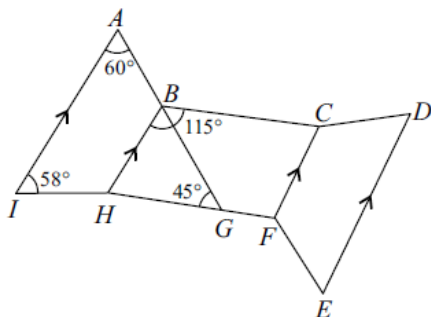
67. Three cubes of metal whose edges are in the ratio 3:4:5 are melted to form a cube whose diagonal is $12\sqrt{3}$ cm. Find the edges (in cm) of the three cubes.
 (A) 6, 8, 10 (B) 9, 12, 15 (C) 8, 9, 11 (D) 3, 4, 5

Answer: A

Solution: Ratio of the lengths of the edges of the cubes = 3:4:5
 Let the edges of the cubes be $3x$, $4x$ and $5x$
 Volumes of the cubes = $(3x)^3$ cu units, $(4x)^3$ cu units, $(5x)^3$ cu units
 = $27x^3$ cu units, $64x^3$ cu units, $125x^3$ cu units
 Total volume = $(27x^3 + 64x^3 + 125x^3)$
 = $216x^3$ cu units ----- (1)
 Diagonal of the new cube formed = $12\sqrt{3}$
 Let the edge of the new cube formed = 'l' units
 Diagonal = $l\sqrt{3}$
 So, $l\sqrt{3} = 12\sqrt{3}$ or $l = 12$ units
 Volume of the new cube formed = $(12)^3$ cu units
 Now, from (1), we get $216x^3 = (12)^3$
 So, $x = 2$
 Thus, the edges are 6 cm, 8 cm, and 10 cm

[2013]

68. Study the figure shown here (not drawn to scale), If ABG is a straight line, then find $\angle ABH$ and reflex $\angle ABC$ respectively.



- (A) 110° , 220° (B) 120° , 225° (C) 120° , 235° (D) 110° , 215°

Answer: C

Solution: IAIHIB

So, angle ABH = 120° (angle at the same side of transversal)

Now, reflex angle ABC = $120^{\circ} + 115^{\circ} = 235^{\circ}$

[2014]

69. The mean of a set of seven numbers is 81. If one of the numbers is discarded, then the mean of the remaining number is 78. The value of discarded number is

- (A) 98 (B) 99 (C) 100 (D) 101

Answer: B

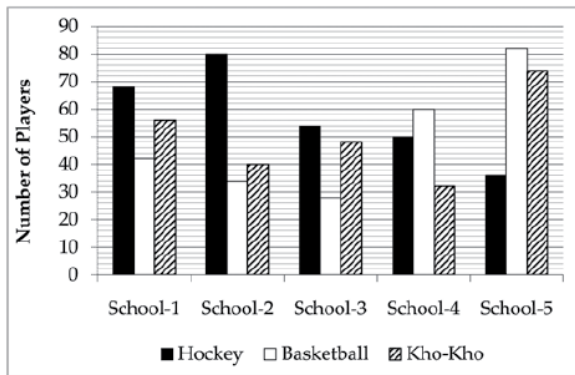
Solution: $(7 \times 81) - x = 6 \times 78$

$567 - x = 468$

$x = 567 - 468 = 99.$

[2015]

70. Number of players participating in three different games in five different schools.



Number of players participating in Kho-Kho from School-4 is what percent of number of players participating in hockey from School-2?

- (A) 42 (B) 48 (C) 36 (D) 40

Answer: D

Solution: Difference = $80 - 30 = 50$

Percentage = 50% of $80 =$

[2016]

71. If product of abscissa and ordinate of a point is positive, then the point lies in

- (A) I quadrant (B) III quadrant (C) IV quadrant (D) Both (A) and (B)

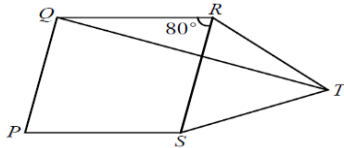
Answer: D

Solution:

Quadrant	Abscissa	Ordinate	Product
I	x	y	xy
II	-x	y	-xy
III	-x	-y	xy
IV	x	-y	-xy

[2012]

72. PQRS is a rhombus and SRT is an equilateral triangle. If $\angle QRS = 80^\circ$, then $\angle QTR =$



- (A) 40° (B) 20° (C) 30° (D) 50°

Answer: B

Solution: Since $\angle QRS = 80^\circ$ And SRT is an equilateral triangle i.e. all the measure of a triangle SRT are of 60° .

So $\angle R = 80 + 60 = 140^\circ$

$\angle Q = \angle T = 20^\circ$ as opposite angles of an isosceles triangles are equal $\angle QTR = 20^\circ$

[2013]

73. The value of π up to 35 decimal places is given below:

3.14159265358979323846264338327950288

Find the probability of occurring 8 in it.

- (A) $1/3$ (B) $1/5$ (C) $5/36$ (D) $1/7$

Answer: C

Solution: Probability of occurring 8 = Number of 8/Total number of digits = $5/36$

[2014]

74. Find the values of the integers a and b respectively, for which the solution of the equation

$$x\sqrt{24} = x\sqrt{3} + \sqrt{6} \text{ is } \frac{a+\sqrt{b}}{7}.$$

- (A) 4, 2 (B) 2, 6 (C) 3, 2 (D) 9, 5

Answer: A

Solution: Given $x\sqrt{24} = x\sqrt{3} + \sqrt{6}$

$$x\sqrt{2} \times 2 \times 2 \times 3 = x\sqrt{3} + \sqrt{2} \times 3$$

$$2x\sqrt{2} \times 3 = x\sqrt{3} + \sqrt{2} \times 3$$

$$x\sqrt{3} (2\sqrt{2} - 1) = \sqrt{2} \times \sqrt{3}$$

$x =$ upon solving by doing RF, we get $x = =$

Now compare it with given solution is, we get $a = 4$ & $b = 2$.

[2015]

75. 25% of the numbers of the players participating in hockey from School-5 are females. What is the number of the hockey players who are males in School-5?

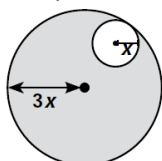
- (A) 15 (B) 18 (C) 30 (D) 27

Answer: D

Solution: Data from the graph could not be clearly seen, so not able to calculate accurately.

[2016]

76. The two circles have radii x and $3x$. A point is chosen, at random, inside the larger circle. Find, in its simplest fractional form, the probability that this point is in the shaded area.



- (A) $7/8$ (B) $8/9$ (C) $1/9$ (D) $1/8$

Answer: B

Solution: Probability = Shaded area / Total area = $\{ \pi (3x)^2 - \pi x^2 \} / \pi (3x)^2 = 8/9$

[2012]

77. John is of the same age as Mohan. Ram is also of the same age as Mohan. State the Euclid's axiom that illustrates the relative ages of John and Ram.

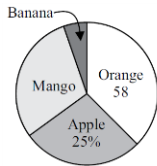
- (A) First Axiom (B) Second Axiom (C) Third Axiom (D) Fourth Axiom

Answer: A

Solution: Things which are equal to the same thing are also equal to one another.

[2014]

78. Direction (31-32): The pie chart below shows the number of fruits sold on a particular day at a fruit stall.



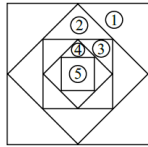
The ratio of the number of mangoes sold to the number of apples sold is 6:5. What percentage of the total sales came from the sale of mangoes?

- (A) 20% (B) 30% (C) 45% (D) 60%

Answer: B

[2015]

79. In the figure shown, square 2 is formed by joining the mid-points of square 1; square 3 is formed by joining the mid-points of square 2 and so on. In this way total five squares are drawn. The side of the square 1 is 'a' cm. What is the sum of perimeters of all the five squares?



- (A) $\frac{(4\sqrt{2}+1)a}{(\sqrt{2}+1)}$ (B) $\frac{5}{6} a$ (C) $(7 + 3\sqrt{2})a$ (D) None of these

Answer: C

[2016]

80. Find the missing value. $\frac{(13)^3+7^3}{(13)^2+7^2-?} = 20$

- (A) 6 (B) 20 (C) 91 (D) 19

Answer: C

Solution: Given equation is $\frac{(13)^3+(7)^3}{(13)^2+(7)^2-?} = 20$ or, $\frac{2197+343}{169+49-?} = 20$ or, $\frac{2540}{218-?} = 20$ or, $127 = 218 - ?$ Therefore = 91

[2012]

81. The given question is followed by three statements. You have to study the question and all the three statements to decide whether any information provided in the statement(s) is/are redundant and can be dispensed with while answering the given question.

What is the marked price of the suitcase?

- I. When a discount of 15% is offered, the profit earned is 10.5%.
- II. The cost price of the suitcase is ₹ 1500.
- III. The marked price is 30% above the cost price.

- (A) I only (B) either I or III (C) Any one of the three (D) All I, II and III are required

Answer: B

Solution: Using I and II the required answer can be obtained. Also using II and III we can get the result required. [2014]

82. If the total number of fruits sold were 200. Then how many bananas were sold on that day?
 (A) 20 (B) 30 (C) 32 (D) 48

Answer: C

[2015]

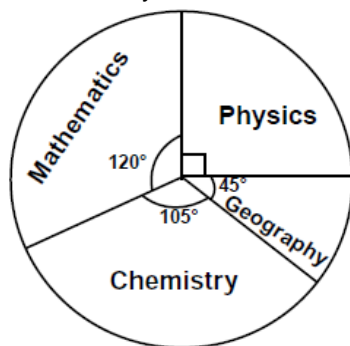
83. Two men start from points A and B respectively, 42 km apart. One walks from A to B at 4 km/hr. and another walks from B to A at a certain uniform speed they meet each other after 6 hours. Find the speed of the second man.
 (A) 3km/hr. (B) 5 km/hr. (C) 7 km/hr. (D) 8 km/hr.

Answer: A

Solution: Time taken to cover 42 km for A = $42/4 = 10.5$ hrs.
 So in 6hrs distance covered by A would be 24 km.
 For B distance covered would be $42 - 24 = 18$
 Speed of B = $18/6 = 3$ km/hr.

[2016]

84. The students in a college were asked to vote for their favorite subject. The pie chart represents the number of votes for each subject. Mathematics obtained 25 more votes than Chemistry. Calculate the number of students who took part in the survey.



- (A) 250 (B) 500 (C) 450 (D) 600

Answer: D

Solution: As per the given conditions, each sector of the circle represents the number of students, which definitely has to be a natural number.

This means, $\frac{\text{Angle of Sector}}{360^\circ} = N$; N=Set of natural numbers so; the number students who have Chemistry as favorite subject are, $\frac{105^\circ}{360^\circ} = \frac{7}{24}$ of the total number of students. From the given options, only 600 are perfectly divisible by 24. Therefore, the total number students surveyed are 600.

[2012]

85. The area of the triangle formed by the points A (2, 0), B (6, 0) and C (4, 6) is _____.
 (A) 24 sq. units (B) 12 sq. units (C) 10 sq. units (D) None of these

Answer: B

Solution: Applying the formula
 Area of $\Delta ABC = \frac{1}{2}[(x_2 - x_1)(y_3 - y_1) - (x_3 - x_1)(y_2 - y_1)]$
 Area = $\frac{1}{2} \{(4)(6) - (2)(0)\} = 24/2 = 12$ sq units

[2014]

86. The graph of the linear equation $y = x$ passes through the point
 (A) $(\frac{3}{2}, -\frac{3}{2})$ (B) $(0, \frac{3}{2})$ (C) $(1, 1)$ (D) $(-\frac{1}{2}, \frac{1}{2})$

Answer: C

Solution: As the equation of line is $Y = X$ which passes through origin and values of X & Y are equal, then $(1, 1)$ is the only point from the options which satisfies the equation $Y = X$.

[2015]

87. Sides of a triangle are in the ratio 13:14:15 and its perimeter is 84 cm. Find its area.
 (A) 226 cm^2 (B) 412 cm^2 (C) 162 cm^2 (D) 336 cm^2

Answer: D

Solution: Side A =
 Side B =
 Side C =
 $2s = A + B + C = 84$
 Area = = = = 336 cm^2

[2016]

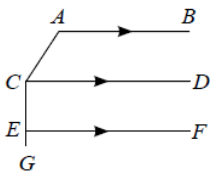
88. A cuboidal metal block of dimensions $20 \text{ cm} \times 16 \text{ cm} \times 12 \text{ cm}$ weighs 6 kg. Find the weight of block of the same metal of size $10 \text{ cm} \times 8 \text{ cm} \times 8 \text{ cm}$.
 (A) 3 kg (B) 8 kg (C) 7 kg (D) 1 kg

Answer: D

Solution: Given dimensions of the 6 kg block is $20 \times 16 \times 12 \text{ cm}^3 = 3840 \text{ cm}^3$
 Weight per cubic cm = $\frac{6}{3840} \text{ kg}$ given dimensions of the 2nd block is $10 \times 8 \times 8 = 640 \text{ cm}^3$
 Therefore, weight of the 2nd block is $\frac{6}{3840} \times 640 = 1 \text{ kg}$

[2012]

89. In the given figure, $AB \parallel CD \parallel EF$. CE is joined and produced to G. If $\angle BAC = 130^\circ$, $\angle ACE = 140^\circ$, then find $\angle DCE$ and $\angle FEG$ respectively.



- (A) $50^\circ, 130^\circ$ (B) $90^\circ, 90^\circ$ (C) $140^\circ, 40^\circ$ (D) $45^\circ, 135^\circ$

Answer: B

Solution: Angle $ACD = 180^\circ - 130^\circ = 50^\circ$
 Also
 Angle $ECD = 140^\circ - 50^\circ = 90^\circ$
 Angle $FEG = 90^\circ$ (Corresponding angle)

[2014]

90. If the perpendicular distance of a point P from the x-axis is 5 units and the foot of the perpendicular lies on the negative direction of x-axis, then the point P has
 (A) Abscissa = -5 (B) Ordinate = 5 (C) Ordinate = -5 (D) Ordinate = 5 or -5 .

Answer: D

[2015]

91. If $x = \frac{1}{2-\sqrt{3}}$, find the value of $x^3 - 2x^2 - 7x + 5$
 (A) 2 (B) 1 (C) 4 (D) 3

Answer: D

[2016]

92. What percentage of a day is six hours and 45 minutes?
 (A) 7.218% (B) 8.3% (C) 28.125% (D) None of these

Answer: C

Solution: Given time is 6 hours 45 minutes

This can also be represented as, $6 + \frac{3}{4} = \frac{27}{4}$ hours

As a percentage of 'a day', i.e. 24 hours, it could be represented as, $\frac{\frac{27}{4}}{24} \times 100\% = 28.125\%$

[2012]

93. Find the value of a and b respectively, if $\frac{5+\sqrt{3}}{7-4\sqrt{3}} = 47a + \sqrt{3}b$
 (A) 2, 1 (B) 1, 27 (C) 11, 28 (D) 2, 38

Answer: B

Solution: By rationalizing, we get

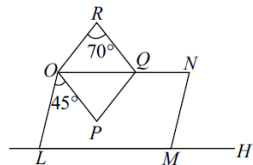
$$\begin{aligned} (5 + \sqrt{3}) / (7 - 4\sqrt{3}) &= (5 + \sqrt{3}) (7 + 4\sqrt{3}) / (7 - 4\sqrt{3}) (7 + 4\sqrt{3}) \\ &= 35 + 7\sqrt{3} + 20\sqrt{3} + 12 \\ &= 47 + 27\sqrt{3} \end{aligned}$$

Comparing above by RHS of the given statement, we get

A = 1 and b = 27

[2014]

94. In the given figure (not drawn to scale), LMNO is a parallelogram and OPQR is a rhombus. Find $\angle NMH$ given that LMH is a straight line.

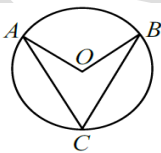


- (A) 80° (B) 60° (C) 70° (D) 50°

Answer: A

[2015]

95. In the given figure, 'O' is the center of circle, $\angle CAO = 25^\circ$ and $\angle CBO = 35^\circ$. What is the value of $\angle AOB$?



- (A) 55° (B) 110° (C) 120° (D) Data insufficient

Answer: C

Solution: Since $OA = OC =$ radius, Angle $AOC = 130$ and $OC = OB =$ radius, Angle $BOC = 140$, Hence $AOC + BOC = 240$, Total $360 - 240 = 120$.

[2016]