REAL NUMBERS- CASE STUDY

CASE STUDY 1.

To enhance the reading skills of grade X students, the school nominates you and two of your friends to set up a class library. There are two sections- section A and section B of grade X. There are 32 students in section A and 36 students in section B.

1. What is the minimum number of books you will acquire for the class library, so that they can be distributed equally among students of Section A or Section B?
   a) 144
   b) 128
   c) 288
   d) 272

2. If the product of two positive integers is equal to the product of their HCF and LCM is true then, the HCF (32 , 36) is
   a) 2
   b) 4
   c) 6
   d) 8

3. 36 can be expressed as a product of its primes as

a) $2^2 \times 3^2$

b) $2^1 \times 3^3$

c) $2^3 \times 3^1$

d) $2^0 \times 3^0$

4. $7 \times 11 \times 13 \times 15 + 15$ is a

a) Prime number

b) Composite number

c) Neither prime nor composite

d) None of the above

5. If p and q are positive integers such that p = ab^2 and q= a^2b, where a , b are prime numbers, then the LCM (p, q) is

a) ab

b) a^2b^2

c) a^3b^2

d) a^3b^3

ANSWERS

1. c) 288
2. b) 4
3. a) $2^2 \times 3^2$
4. b) composite number
5. b) a^2b^2

CASE STUDY 2:

A seminar is being conducted by an Educational Organisation, where the participants will be educators of different subjects. The number of participants in Hindi, English and Mathematics are 60, 84 and 108 respectively.

1. In each room the same number of participants are to be seated and all of them being in the same subject, hence maximum number participants that can accommodated in each room are
    a) 14
    b) 12
    c) 16
    d) 18

2. What is the minimum number of rooms required during the event?
    a) 11
    b) 31
    c) 41
    d) 21

3. The LCM of 60, 84 and 108 is
    a) 3780
    b) 3680
    c) 4780
    d) 4680

4. The product of HCF and LCM of 60,84 and 108 is
    a) 55360
    b) 35360
    c) 45500
    d) 45360

5. 108 can be expressed as a product of its primes as
    a) $2^3 \times 3^2$
    b) $2^3 \times 3^3$
    c) $2^2 \times 3^2$
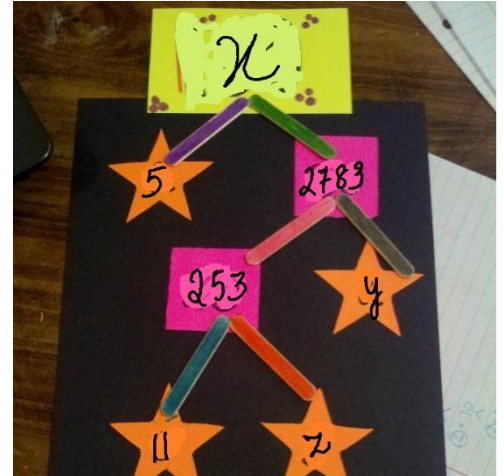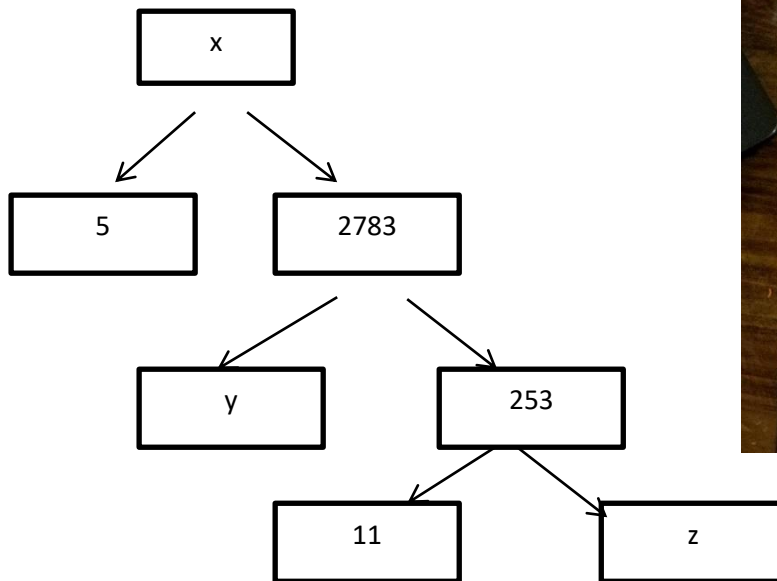   d) $2^2 \times 3^3$

ANSWERS

1. b) 12
2. d) 21
3. a)3780
4. d)45360
5. d)$2^2 \times 3^3$

CASE STUDY 3:

A Mathematics Exhibition is being conducted in your School and one of your friends is making a model of a factor tree. He has some difficulty and asks for your help in completing a quiz for the audience.

Observe the following factor tree and answer the following:

1. What will be the value of x?
a) 15005
b) 13915
c) 56920
d) 17429

2. What will be the value of y?
a) 23
b) 22
c) 11
d) 19

3. What will be the value of z?
a) 22
b) 23
c) 17
d) 19

4. According to Fundamental Theorem of Arithmetic 13915 is a

a) Composite number

b) Prime number

c) Neither prime nor composite

d) Even number

5. The prime factorisation of 13915 is

a) $5 \times 11^3 \times 13^2$

b) $5 \times 11^3 \times 23^2$

c) $5 \times 11^2 \times 23$

d) $5 \times 11^2 \times 13^2$

ANSWERS

1. b) 13915
2. c) 11
3. b) 23
4. a) composite number
5. c) $5 \times 11^2 \times 23$

POLYNOMIALS- CASE STUDY

CASE STUDY 1:

The below picture are few natural examples of parabolic shape which is represented by a quadratic polynomial. A parabolic arch is an arch in the shape of a parabola. In structures, their curve represents an efficient method of load, and so can be found in bridges and in architecture in a variety of forms.

1. In the standard form of quadratic polynomial, $ax^2 + bx + c$, a, b and c are

   a) All are real numbers.

   b) All are rational numbers.

   c) 'a' is a non zero real number and b and c are any real numbers.

   d) All are integers.

2. If the roots of the quadratic polynomial are equal, where the discriminant D = $b^2 - 4ac$, then

   a) D > 0

   b) D < 0

   c) D ≥ 0

   d) D = 0

3. If $\alpha \; and \; \dfrac{1}{\alpha}$ are the zeroes of the qudratic polynomial $2x^2 - x + 8k,$ then k is

   a) 4

   b) $\dfrac{1}{4}$

   c) $\dfrac{-1}{4}$

   d) 2

4. The graph of $x^2+1=0$

   a) Intersects x-axis at two distinct points.

   b) Touches x-axis at a point.

   c) Neither touches nor intersects x-axis.

   d) Either touches or intersects x- axis.

5. If the sum of the roots is –p and product of the roots is $-\dfrac{1}{p}$, then the quadratic polynomial is

   a) k $\left(-px^2 + \dfrac{x}{p} + 1\right)$

b) $k \left(px^2 - \frac{x}{p} - 1\right)$

c) $k \left(x^2 + px - \frac{1}{p}\right)$

d) $k \left(x^2 - px + \frac{1}{p}\right)$

ANSWERS

1. c) 'a' is a non zero real number and b and c are any real numbers.
2. d) D=0
3. b) $\frac{1}{4}$
4. c) Neither touches nor intersects x-axis.
5. c) $k \left(x^2 + px - \frac{1}{p}\right)$

CASE STUDY 2:

An asana is a body posture, originally and still a general term for a sitting meditation pose, and later extended in hatha yoga and modern yoga as exercise, to any type of pose or position, adding reclining, standing, inverted, twisting, and balancing poses. In the figure, one can observe that poses can be related to representation of quadratic polynomial.
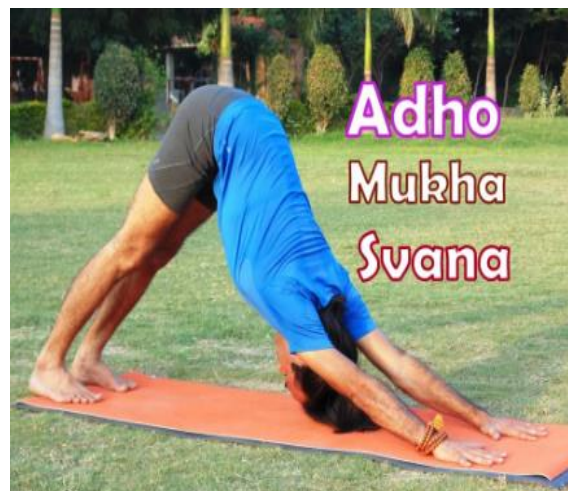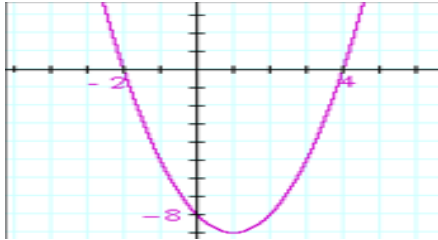

1. The shape of the poses shown is
   a) Spiral
   b) Ellipse
   c) Linear
   d) Parabola
2. The graph of parabola opens downwards, if _____

a) $a \geq 0$

b) $a = 0$

c) $a < 0$

d) $a > 0$

3. In the graph, how many zeroes are there for the polynomial?

a) 0

b) 1

c) 2

d) 3

4. The two zeroes in the above shown graph are

a) 2, 4

b) -2, 4

c) -8, 4

d) 2,-8

5. The zeroes of the quadratic polynomial $4\sqrt{3}x^2 + 5x - 2\sqrt{3}$ are

a) $\frac{2}{\sqrt{3}}, \frac{\sqrt{3}}{4}$

b) $-\frac{2}{\sqrt{3}}, \frac{\sqrt{3}}{4}$

c) $\frac{2}{\sqrt{3}}, -\frac{\sqrt{3}}{4}$

d) $-\frac{2}{\sqrt{3}}, -\frac{\sqrt{3}}{4}$

ANSWERS

1. Parabola

2. c) $a < 0$

3. c) 2

4. b) -2, 4

5. b) $-\frac{2}{\sqrt{3}}, \frac{\sqrt{3}}{4}$

CASE STUDY 3:

Basketball and soccer are played with a spherical ball. Even though an athlete dribbles the ball in both sports, a basketball player uses his hands and a soccer player uses his feet. Usually, soccer is played outdoors on a large field and basketball is played indoor on a court made out of wood. The projectile (path traced) of soccer ball and basketball are in the form of parabola representing quadratic polynomial.
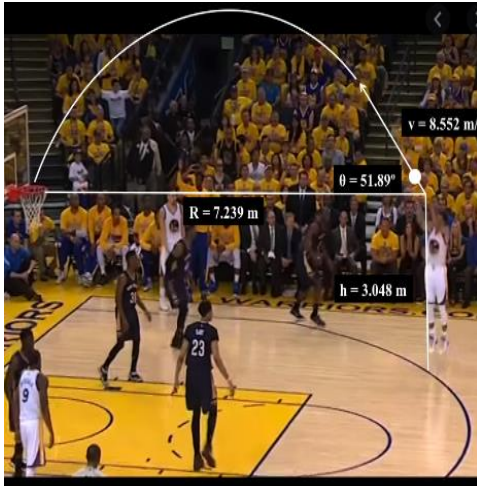
1. The shape of the path traced shown is

   a) Spiral

   b) Ellipse

   c) Linear

   d) Parabola

2. The graph of parabola opens upwards, if _____

   a) a = 0

   b) a < 0

   c) a > 0

   d) a ≥ 0

3. Observe the following graph and answer
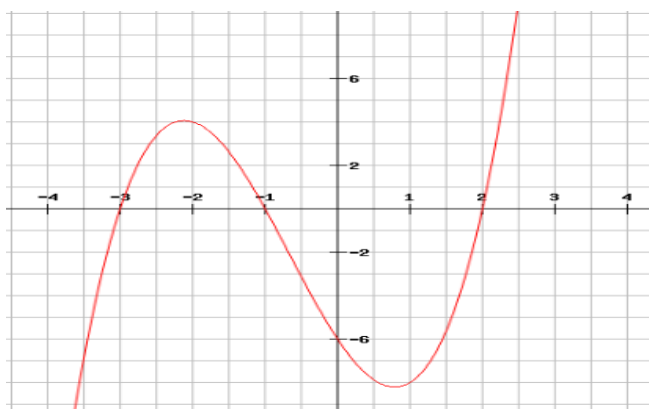
In the above graph, how many zeroes are there for the polynomial?

    a) 0

    b) 1

    c) 2

    d) 3

4. The three zeroes in the above shown graph are

    b) 2, 3,-1

    c) -2, 3, 1

    d) -3, -1, 2

    e) -2, -3, -1

5. What will be the expression of the polynomial?

    a) $x^3 + 2x^2 - 5x - 6$

    b) $x^3 + 2x^2 - 5x + 6$

    c) $x^3 + 2x^2 + 5x - 6$

    d) $x^3 + 2x^2 + 5x + 6$

ANSWERS

1. d) parabola

2. c) a > 0

3. d) 3

4. c) -3, -1, 2

5. a) $x^3 + 2x^2 - 5x - 6$

LINEAR EQUATIONS INTWO VARIABLES

CASE STUDY-1:

A test consists of 'True' or 'False' questions. One mark is awarded for every correct answer while ¼ mark is deducted for every wrong answer. A student knew answers to some of the questions. Rest of the questions he attempted by guessing. He answered 120 questions and got 90 marks.

Type of Question	Marks given for correct answer	Marks deducted for wrong answer
True/False	1	0.25

1. If answer to all questions he attempted by guessing were wrong, then how many questions did he answer correctly?
2. How many questions did he guess?
3. If answer to all questions he attempted by guessing were wrong and answered 80 correctly, then how many marks he got?
4. If answer to all questions he attempted by guessing were wrong, then how many questions answered correctly to score 95 marks?

Answers:

Let the no of questions whose answer is known to the student x and questions attempted by cheating be y

x + y =120

x-1/4y =90

solving these two

x=96 and y= 24

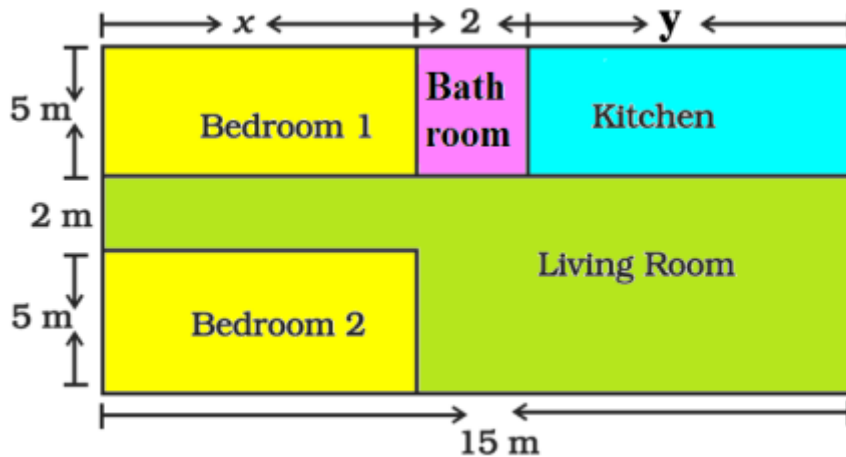1. He answered 96 questions correctly.
2. He attempted 24 questions by guessing.
3. Marks = 80- ¼ 0f 40 =70
4. x – ¼ 0f (120-x) =95

   5x=500,   x = 100

CASE STUDY-2:

Amit is planning to buy a house and the layout is given below. The design and the measurement has been made such that areas of two bedrooms and kitchen together is 95 sq.m.

Based on the above information, answer the following questions:

1. Form the pair of linear equations in two variables from this situation.
2. Find the length of the outer boundary of the layout.
3. Find the area of each bedroom and kitchen in the layout.
4. Find the area of living room in the layout.
5. Find the cost of laying tiles in kitchen at the rate of Rs. 50 per sq.m

ANSWER:

1. Area of two bedrooms= 10x sq.m

   Area of kitchen = 5y sq.m

   10x + 5y = 95

   2x + y =19

   Also, x + 2+ y = 15

   x + y = 13

2. Length of outer boundary= 12 + 15 + 12 + 15= 54m

3. On solving two equation part(i)

   x= 6m and y =7m

   area of bedroom = 5 x 6= 30m

   area of kitchen = 5 x 7= 35m

4. Area of living room = (15x7)-30 = 105-30 = 75 sq.m

5. Total cost of laying tiles in the kitchen = Rs 50 x35 = Rs 1750

Case study-3 :

It is common that Governments revise travel fares from time to time based on various factors such as inflation (a general increase in prices and fall in the purchasing value of money) on different types of vehicles like auto, Rickshaws, taxis, Radio cab etc. The auto charges in a city comprise of a fixed charge together with the charge for the distance covered. Study the following situations

Name of the city	Distance travelled (Km)	Amount paid (Rs.)
City A	10	75
	15	110
City B	8	91
	14	145

Situation 1: In city A, for a journey of 10 km, the charge paid is Rs 75 and for a journey of 15 km, the charge paid is Rs 110.

Situation 2: In a city B, for a journey of 8km, the charge paid is Rs91 and for a journey of 14km, the charge paid is Rs 145.

Refer situation 1

1. If the fixed charges of auto rickshaw be Rs x and the running charges be Rs y km/hr, the pair of linear equations representing the situation is
   a) x + 10y =110, x + 15y = 75
   b) x + 10y =75,   x + 15y = 110
   c) 10x + y =110,   15x + y = 75
   d) 10x + y = 75,   15 x + y =110

2. A person travels a distance of 50km. The amount he has to pay is

a) Rs.155

b) Rs.255

c) Rs.355

d) Rs.455

Refer situation 2

3. What will a person have to pay for travelling a distance of 30km?

a) Rs.185

b) Rs.289

c) Rs.275

d) Rs.305

4. The graph of lines representing the conditions are: (situation 2)

ANSWERS:

1. B

2. C

3. B
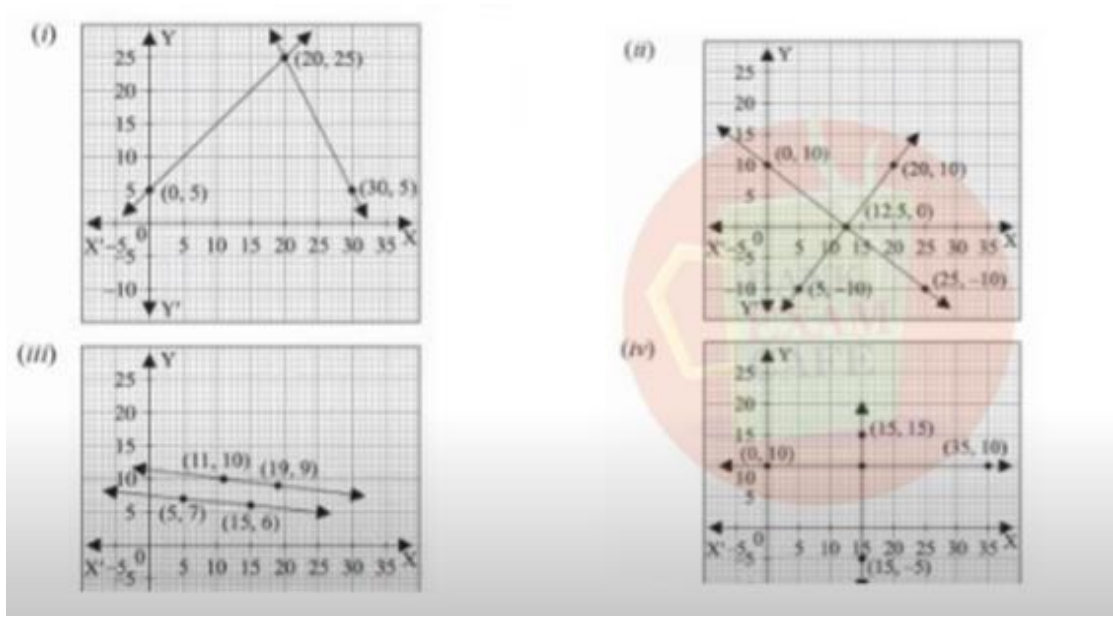
4. (iii)

QUADRATIC EQUATIONS

CASE STUDY 1:

Raj and Ajay are very close friends. Both the families decide to go to Ranikhet by their own cars. Raj's car travels at a speed of x km/h while Ajay's car travels 5 km/h faster than Raj's car. Raj took 4 hours more than Ajay to complete the journey of 400 km.


1. What will be the distance covered by Ajay's car in two hours?

a) $2(x + 5)$ km

b) $(x - 5)$ km

c) $2(x + 10)$ km

d) $(2x + 5)$ km

2. Which of the following quadratic equation describe the speed of Raj's car?

a) $x^2 - 5x - 500 = 0$

b) $x^2 + 4x - 400 = 0$

c) $x^2 + 5x - 500 = 0$

d) $x^2 - 4x + 400 = 0$

3. What is the speed of Raj's car?

a) 20 km/hour

b) 15 km/hour

c) 25 km/hour

d) 10 km/hour

4. How much time took Ajay to travel 400 km?

a) 20 hour

b) 40 hour

c) 25 hour

d) 16 hour

1. a) 2(x + 5)km
2. c) 25km/ hour
3. a) 20km/ hour
4. d) 16 hour

CASE STUDY 2:

The speed of a motor boat is 20 km/hr. For covering the distance of 15 km the boat took 1 hour more for upstream than downstream.
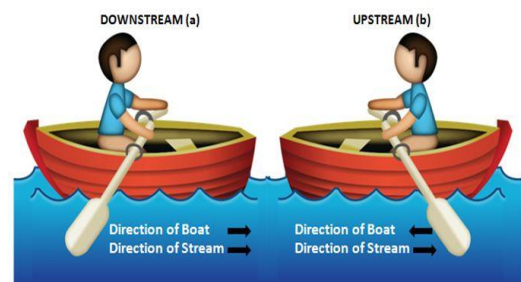
1. Let speed of the stream be *x* km/hr. then speed of the motorboat in upstream will be

a) 20 km/hr
b) (20 + *x*) km/hr
c) (20 - *x*) km/hr
d) 2 km/hr

2. What is the relation between speed ,distance and time?

a) speed = (distance)/time
b) distance = (speed)/time
c) time = speed x distance
d) speed = distance x time

3. Which is the correct quadratic equation for the speed of the current ?

a) $x^2 + 30x - 200 = 0$
b) $x^2 + 20x - 400 = 0$
c) $x^2 + 30x - 400 = 0$
d) $x^2 - 20x - 400 = 0$

4. What is the speed of current ?

a) 20 km/hour
b) 10 km/hour

c) 15 km/hour

d) 25 km/hour

5. How much time boat took in downstream?

a) 90 minute

b) 15 minute

c) 30 minute

d) 45 minute

<div align="center">

ANSWERS:

</div>

1. c) $(20 - x)$km/hr

2. b) distance=(speed)/ time

3. c) $x^2 + 30x - 400 = 0$

4. b) 10 km/hour

5. c) 45 minute

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ARITHMETIC PROGRESSION

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CASE STUDY 1:

India is competitive manufacturing location due to the low cost of manpower and strong technical and engineering capabilities contributing to higher quality production runs. The production of TV sets in a factory increases uniformly by a fixed number every year. It produced 16000 sets in 6th year and 22600 in 9th year.

Based on the above information, answer the following questions:

1. Find the production during first year.
2. Find the production during 8th year.
3. Find the production during first 3 years.
4. In which year, the production is Rs 29,200.
5. Find the difference of the production during 7th year and 4th year.

ANSWER:

1. Rs 5000
2. Production during 8th year is (a+7d)= 5000 + 2(2200) =20400
3. Production during first 3 year= 5000 + 7200 + 9400=21600
4. N=12
5. Difference= 18200-11600=6600

CASE STUDY 2:

Your friend Veer wants to participate in a 200m race. He can currently run that distance in 51 seconds and with each day of practice it takes him 2 seconds less.He wants to do in 31 seconds .
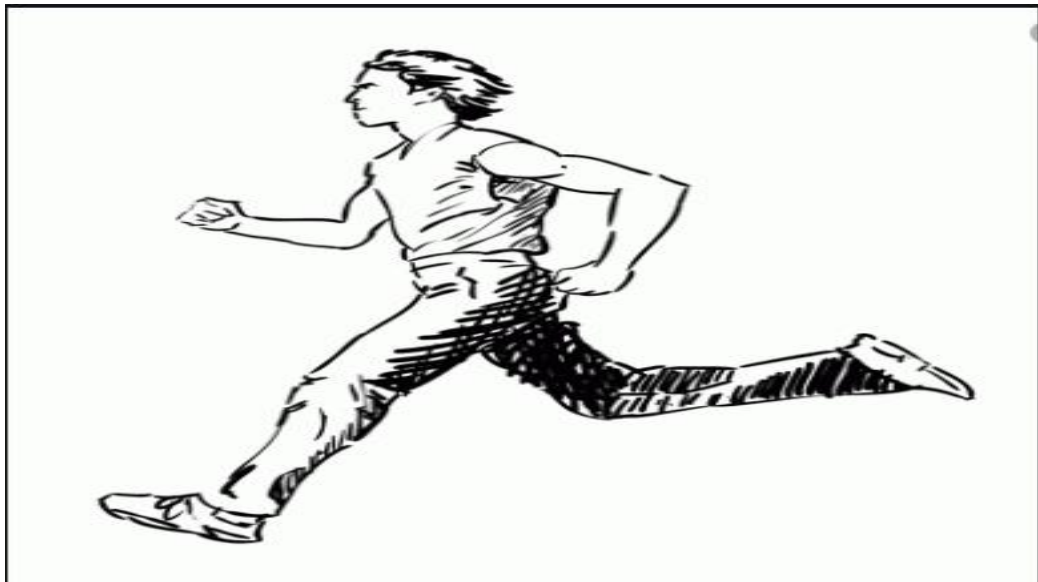
1. Which of the following terms are in AP for the given situation
a) 51,53,55….
b) 51, 49, 47….

c) -51, -53, -55….

d) 51, 55, 59…

2. What is the minimum number of days he needs to practice till his goal is achieved

a) 10

b) 12

c) 11

d) 9

3. Which of the following term is not in the AP of the above given situation

a) 41

b) 30

c) 37

d) 39

4. If n^{th} term of an AP is given by

 $a_n = 2n + 3$ then common difference of an AP is

a) 2

b) 3

c) 5

d) 1

5. The value of x, for which 2x, x+ 10, 3x + 2 are three consecutive terms of an AP

a) 6

b) -6

c) 18

d) -18

ANSWER:

1. b

2. c

3. b

4. a

5. a

CASE STUDY 3:

Your elder brother wants to buy a car and plans to take loan from a bank for his car. He repays his total loan of Rs 1,18,000 by paying every month starting with the first instalment of Rs 1000. If he increases the instalment by Rs 100 every month , answer the following:

1. The amount paid by him in 30th installment is

a) 3900

b) 3500

c) 3700

d) 3600

2. The amount paid by him in the 30 installments is

a) 37000

b) 73500

c) 75300

d) 75000

3. What amount does he still have to pay offer 30th installment?

a) 45500

b) 49000

c) 44500

d) 54000

4. If total installments are 40 then amount paid in the last installment?

a) 4900

b) 3900

c) 5900

d) 9400

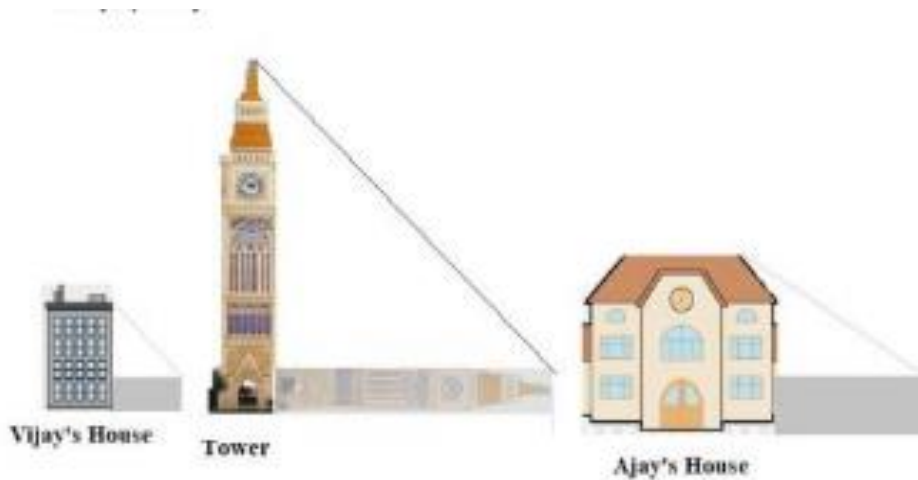**5.** The ratio of the 1st installment to the last installment is

a) 1:49

b) 10:49

c) 10:39

d) 39:10

Answer:

1. a) 3900
2. b) 73500
3. c) 44500
4. a) 4900
5. b) 10 : 49

SIMILAR TRIANGLES

CASE STUDY 1:

Vijay's House   Tower

Ajay's House

Vijay is trying to find the average height of a tower near his house. He is using the properties of similar triangles.The height of Vijay's house if 20m when Vijay's house casts a shadow 10m long on the ground. At the same time, the tower casts a shadow 50m long on the ground and the house of Ajay casts 20m shadow on the ground.

1. What is the height of the tower?

a) 20m

b) 50m

c) 100m

d) 200m

2. What will be the length of the shadow of the tower when Vijay's house casts a shadow of 12m?

a) 75m

b) 50m

c) 45m

d) 60m

3. What is the height of Ajay's house?

a) 30m

b) 40m

c) 50m

d) 20m

4. When the tower casts a shadow of 40m, same time what will be the length of the shadow of Ajay's house?

a) 16m

b) 32m

c) 20m

d) 8m

5. When the tower casts a shadow of 40m, same time what will be the length of the shadow of Vijay's house?

a) 15m

b) 32m

c) 16m

d) 8m

ANSWER:

1. c)100m

2. d)60m

3. b)40m

4. a)16m

5. d) 8m

CASE STUDY 2:

Rohan wants to measure the distance of a pond during the visit to his native. He marks points A and B on the opposite edges of a pond as shown in the figure below. To find the distance between the points, he makes a right-angled triangle using rope connecting B with another point C are a distance of 12m, connecting C to point D at a distance of 40m from point C and the connecting D to the point A which is are a distance of 30m from D such the $\angle ADC = 90^0$.
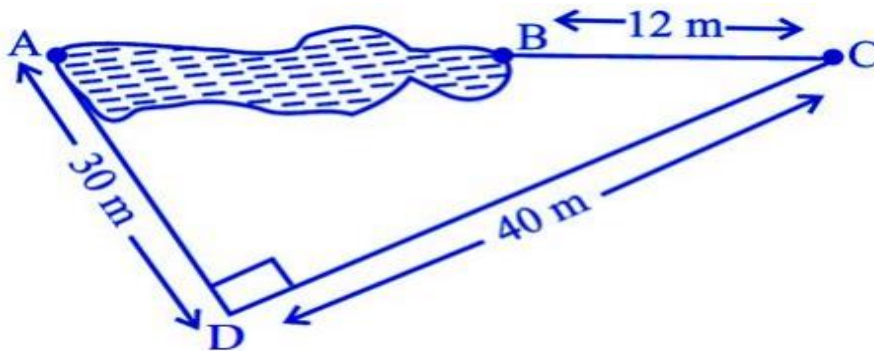
1. Which property of geometry will be used to find the distance AC?

a) Similarity of triangles

b) Thales Theorem

c) Pythagoras Theorem

d) Area of similar triangles

2. What is the distance AC?

a) 50m

b) 12m

c) 100m

d) 70m

3. Which is the following does not form a Pythagoras triplet?

a) (7,24,25)

b) (15,8,17)

c) (5,12,13)

d) (21,20,28)

4. Find the length AB?

a) 12m

b) 38m

c) 50m

d) 100m

5. Find the length of the rope used.

a) 120m

b) 70m

c) 82m

d) 22m

ANSWER:

1. c)Pythagoras Theorem
2. a)50m
3. d)(21,20,28)
4. b)38m
5. c)82m

SCALE FACTOR

Case study;

A scale drawing of an object is the same shape at the object but a different size. The scale of a drawing is a comparison of the length used on a drawing to the length it represents. The scale is written as a ratio. The ratio of two corresponding sides in similar figures is called the scale factor

Scale factor= length in image / corresponding length in object

If one shape can become another using revising, then the shapes are similar. Hence, two shapes are similar when one can become the other after a resize, flip, slide or turn. In the photograph below showing the side view of a train engine. Scale factor is 1:200

This means that a length of 1 cm on the photograph above corresponds to a length of 200cm or 2 m, of the actual engine. The scale can also be written as the ratio of two lengths.

1. If the length of the model is 11cm, then the overall length of the engine in the photograph above, including the couplings(mechanism used to connect) is:
a) 22cm
b) 220cm
c) 220m
d) 22m

2. What will affect the similarity of any two polygons?
a) They are flipped horizontally
b) They are dilated by a scale factor
c) They are translated down
d) They are not the mirror image of one another.

3. What is the actual width of the door if the width of the door in photograph is 0.35cm?
a) 0.7m
b) 0.7cm
c) 0.07cm
d) 0.07m

4. If two similar triangles have a scale factor 5:3 which statement regarding the two triangles is true?
   a) The ratio of their perimeters is 15:1
   b) Their altitudes have a ratio 25:15
   c) Their medians have a ratio 10:4
   d) Their angle bisectors have a ratio 11:5

5. The length of AB in the given figure:
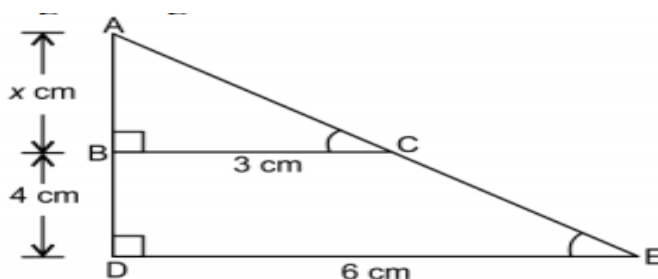
a) 8cm

b) 6cm

c) 4cm

d) 10cm

ANSWERS:

1. a)22m

2. d)They are not the mirror image of one another

3. a)0.7m

4. b)Their altitudes have a ratio 25:15

5. c)4cm

Coordinate Geometry

CASE STUDY 1:

In order to conduct Sports Day activities in your School, lines have been drawn with chalk powder at a distance of 1 m each, in a rectangular shaped ground ABCD, 100 flowerpots have been placed at a distance of 1 m from each other along AD, as shown in given figure below. Niharika runs 1/4 th the distance AD on the 2nd line and posts a green flag. Preet runs 1/5 th distance AD on the eighth line and posts a red flag.
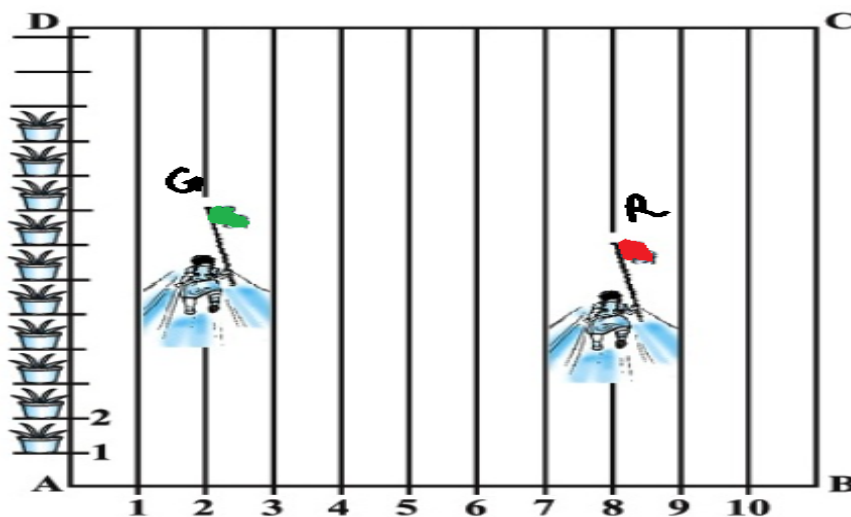
1. Find the position of green flag

a) (2,25)

b) (2,0.25)

c) (25,2)

d) (0, -25)

2. Find the position of red flag

a) (8,0)

b) (20,8)

c) (8,20)

d) (8,0.2)

3. What is the distance between both the flags?

1. √41

a) √11

b) √61

c) √51

4. If Rashmi has to post a blue flag exactly halfway between the line segment joining the two flags, where should she post her flag?

a) (5, 22.5)

b) (10,22)

c) (2,8.5)

d) (2.5,20)

5. If Joy has to post a flag at one-fourth distance from green flag ,in the line segment joining the green and red flags, then where should he post his flag?

a) (3.5,24)

b) (0.5,12.5)

c) (2.25,8.5)

d) (25,20)

<u>**ANSWERS:**</u>

1. a) (2,25)

2. c) (8,20)

3. c) √61

4. a) (5, 22.5)

5. a) (3.5,24)

<u>**CASE STUDY 2:**</u>

The class X students school in krishnagar have been allotted a rectangular plot of land for their gardening activity. Saplings of Gulmohar are planted on the boundary at a distance of 1 m from each other. There is triangular grassy lawn in the plot as shown in the figure. The students are to sow seeds of flowering plants on the remaining area of the plot.
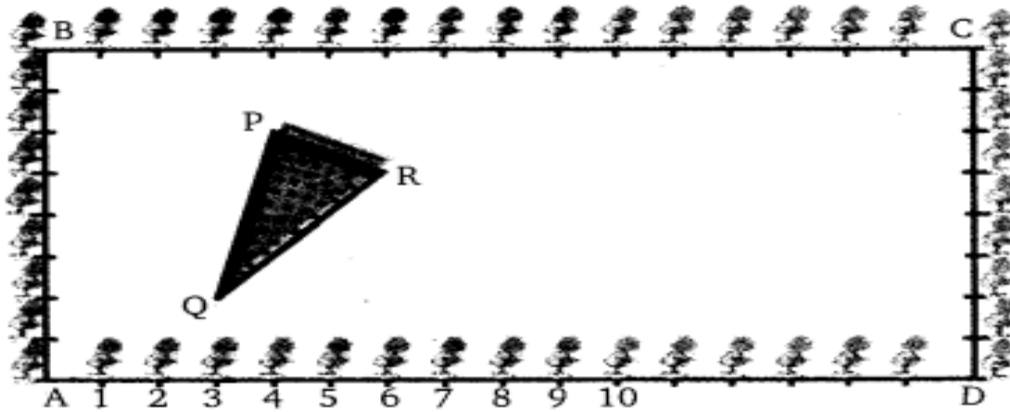
1. Taking A as origin, find the coordinates of P
   a) (4,6)
   b) (6,4)
   c) (0,6)
   d) (4,0)

2. What will be the coordinates of R, if C is the origin?
   a) (8,6)
   b) (3,10)
   c) (10,3)
   d) (0,6)

3. What will be the coordinates of Q, if C is the origin?
   a) (6,13)
   b) b) (-6,13)
   c) (-13,6)
   d) (13,6)

4. Calculate the area of the triangles if A is the origin
   a) 4.5
   b) 6
   c) 8

    d) 6.25

5. Calculate the area of the triangles if C is the origin

   a) 8

    b) 5

    c) 6.25

    d) 4.5

ANSWERS:

1. a) (4,6)

2. c) (10,3)

3. d) (13,6)

4. a) 4.5

5. d) 4.5

Circles:

CASE STUDY 1:

A Ferris wheel (or a big wheel in the United Kingdom) is an amusement ride consisting of a rotating upright wheel with multiple passenger-carrying components (commonly referred to as passenger cars, cabins, tubs, capsules, gondolas, or pods) attached to the rim in such a way that as the wheel turns, they are kept upright, usually by gravity.

After taking a ride in Ferris wheel, Aarti came out from the crowd and was observing her friends who were enjoying the ride . She was curious about the different angles and measures that the wheel will form. She forms the figure as given below.
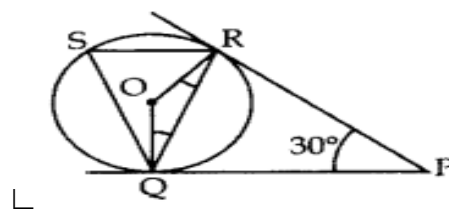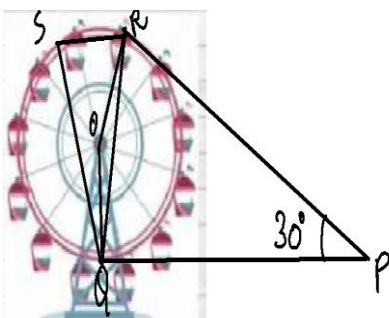
1. In the given figure find ∠ROQ

   a) 60

   b) 100

   c) 150

   d) 90

2. Find ∠RQP

   a) 75

   b) 60

   c) 30

   d)   90

3. Find ∠RSQ

   a) 60

   b) 75

   c) 100

   d) 30

4. Find ∠ORP

a) 90

b) 70

c) 100

d) 60

<u>**ANSWERS:**</u>

1. c) 150

2. a) 75

3. b) 75

4. a) 90

<u>CASE STUDY 2:</u>

Varun has been selected by his School to design logo for Sports Day T-shirts for students and staff . The logo design is as given in the figure and he is working on the

fonts and different colours according to the theme. In given figure, a circle with centre O is

inscribed in a ΔABC, such that it touches the sides AB, BC and CA at points D, E and F respectively. The lengths of sides AB, BC and CA are 12 cm, 8 cm and 10 cm respectively.
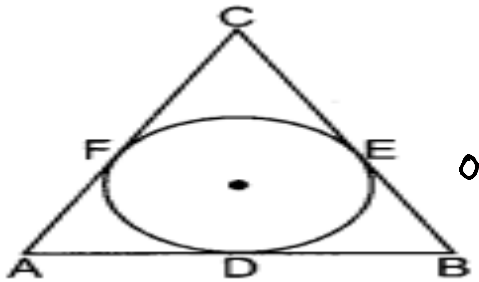
1. Find the length of AD
   a) 7
   b) 8
   c) 5
   d) 9

2. Find the Length of BE
   a) 8
   b) 5
   c) 2
   d) 9

3. Find the length of CF
   a) 9
   b) 5
   c) 2
   d) 3

4. If radius of the circle is 4cm, Find the area of ΔOAB
   a) 20
   b) 36
   c) 24
   d) 48

5. Find area of ΔABC
   a) 50
   b) 60
   c) 100
   d) 90

SOME APPLICATION OF TRIGONOMETRY

CASE STUDY 1:

A group of students of class X visited India Gate on an education trip. The teacher and students had interest in history as well. The teacher narrated that **India Gate**, official name **Delhi Memorial**, originally called **All-India War Memorial**, monumental sandstone arch in New Delhi, dedicated to the troops of British India who died in wars fought between 1914 and 1919.The teacher also said that India Gate, which is located at the eastern end of the Rajpath (formerly called the Kingsway), is about 138 feet (42 metres) in height.


1. What is the angle of elevation if they are standing at a distance of 42m away from the monument?
   a) 30°
   b) 45°
   c) 60°
   d) 0°

2. They want to see the tower at an angle of 60°. So, they want to know the distance where they should stand and hence find the distance.

a) 25.24 m

b) 20.12 m

c) 42 m

d) 24.64 m

3. If the altitude of the Sun is at 60°, then the height of the vertical tower that will cast a shadow of length 20 m is

a) $20\sqrt{3}$ m

b) $\frac{20}{\sqrt{3}}$ m

c) $\frac{15}{\sqrt{3}}$ m

d) $15\sqrt{3}$ m

4. The ratio of the length of a rod and its shadow is 1:1 . The angle of elevation of the Sun is

a) 30°

b) 45°

c) 60°

d) 90°

5. The angle formed by the line of sight with the horizontal when the object viewd is below the horizontal level is

a) corresponding angle

b) angle of elevation

c) angle of depression

d) complete angle

ANSWERS:

1. b) 45°

2. a) 25.24 m

3. a) $20\sqrt{3}$ m

4. b) 45°

5. a) corresponding angle

CASE STUDY 2:
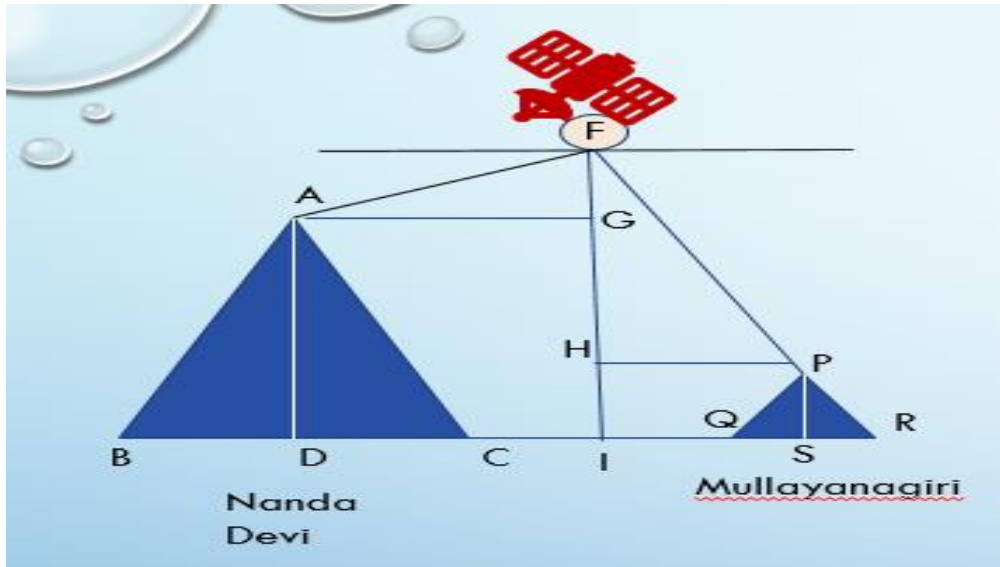
A Satellite flying at height h is watching the top of the two tallest mountains in Uttarakhand and Karnataka ,them being Nanda Devi(height 7,816m) and Mullayanagiri (height 1,930 m). The angles of depression from the satellite , to the top of Nanda Devi and Mullayanagiri are 30° and 60° respectively. If the distance between the peaks of two mountains is 1937 km , and the satellite is vertically above the midpoint of the distance between the two mountains.

1. The distance of the satellite from the top of Nanda Devi is
   a) 1139.4 km
   b) 577.52 km
   c) 1937 km
   d) 1025.36 km

2. The distance of the satellite from the top of Mullayanagiri is
   a) 1139.4 km
   b) 577.52 km
   c) 1937 km
   d) 1025.36 km

3. The distance of the satellite from the ground is
   a) 1139.4 km
   b) 577.52 km
   c) 1937 km
   d) 1025.36 km

4. What is the angle of elevation if a man is standing at a distance of 7816m from Nanda Devi?

   a) 30°

   b) 45°

   c) 60°

   d) 0°

5. If a mile stone very far away from, makes 45° to the top of Mullanyangiri montain .So, find the distance of this mile stone form the mountain.

   a) 1118.327 km

   b) 566.976 km

   c) 1937 km

   d) 1025.36 km

ANSWERS:

1. a) 1139.4 km

2. c) 1937 km

3. b) 577.52 km

**4.** b) 45°

5. c) 1937 km

AREAS RELATED TO CIRCLES

CASE STUDY 3:

Pookalam is the flower bed or flower pattern designed during Onam in Kerala. It is similar as Rangoli in North India and Kolam in Tamil Nadu.

During the festival of Onam , your school is planning to conduct a Pookalam competition. Your friend who is a partner in competition , suggests two designs given below.

Observe these carefully.
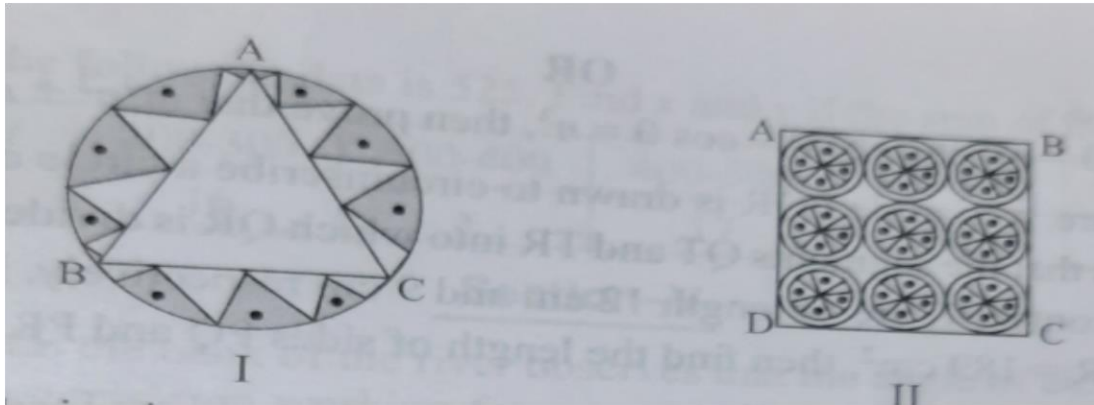
Design I: This design is made with a circle of radius 32cm leaving equilateral triangle ABC in the middle as shown in the given figure.

Design II: This Pookalam is made with 9 circular design each of radius 7cm.

Refer Design I:

1. The side of equilateral triangle is

    a) $12\sqrt{3}$ cm

    b) $32\sqrt{3}$ cm

    c) 48cm

    d) 64cm

2. The altitude of the equilateral triangle is

    a) 8 cm

    b) 12 cm

    c) 48cm

    d) 52cm

Refer Design II:

3. The area of square is

    a) 1264 cm^2

    b) 1764 cm^2

    c) 1830 cm^2

    d) 1944 cm^2

4. Area of each circular design is

    a) 124 cm^2

    b) 132 cm^2

c) 144 cm^2

d) 154 cm^2

5. Area of the remaining portion of the square ABCD is

a) 378 cm^2

b) 260 cm^2

c) 340 cm^2

d) 278 cm^2

ANSWERS:

1. b) $32\sqrt{3}$ cm
2. c) 48cm
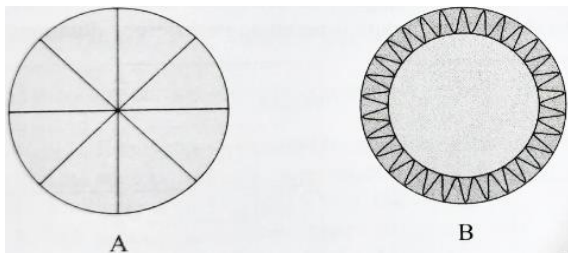3. b) 1764 cm^2
4. d) 154 cm^2
5. a) 378 cm^2

A Brooch

CASE STUDY 4:

A brooch is a small piece of jewellery which has a pin at the back so it can be fastened on a dress, blouse or coat.

Designs of some brooch are shown below. Observe them carefully.

Design A: Brooch A is made with silver wire in the form of a circle with diameter 28mm. The wire used for making 4 diameters which divide the circle into 8 equal parts.

Design B: Brooch b is made two colours_ Gold and silver. Outer part is made with Gold. The circumference of silver part is 44mm and the gold part is 3mm wide everywhere.

Refer to Design A

1. The total length of silver wire required is

a) 180 mm

b) 200 mm

c) 250 mm

d) 280 mm

2. The area of each sector of the brooch is

a) 44 mm^2

b) 52 mm^2

c) 77 mm^2

d) 68 mm^2

Refer to Design B

3. The circumference of outer part (golden) is

a) 48.49 mm

b) 82.2 mm

c) 72.50 mm

d) 62.86 mm

4. The difference of areas of golden and silver parts is

a) $18 \, \pi$

b) $44 \, \pi$

c) $51 \, \pi$

d) $64 \, \pi$

5. A boy is playing with brooch B. He makes revolution with it along its edge. How many complete revolutions must it take to cover $80 \, \pi$ mm ?

a) 2

b) 3

c) 4

d) 5

<div align="center">

ANSWERS:

</div>

1. b) 200mm

2. c) 77m m^2

3. d) 62.86 mm

4. c) $51 \, \pi$

5. c) 4

<div align="center">

SURFACE AREAS AND VOLUMES

</div>

CASE STUDY 1:

Adventure camps are the perfect place for the children to practice decision making for themselves without parents and teachers guiding their every move. Some students of a school reached for adventure at Sakleshpur. At the camp, the waiters served some students with a welcome drink in a cylindrical glass and some students in a hemispherical cup whose dimensions are shown below. After that they went for a jungle trek. The jungle trek was enjoyable but tiring. As dusk fell, it was time to take shelter. Each group of four students was given a canvas of area 551m^2. Each group had to make a conical tent to accommodate all the four students. Assuming that all the stitching and wasting incurred while cutting, would amount to 1m^2, the students put the tents. The radius of the tent is 7m.


$d = 7$ cm
$h = 10.5$ cm

$d = 7$ cm

Area = 551 m^2

$r = 7$ m
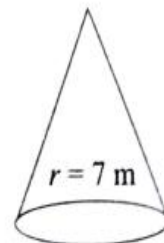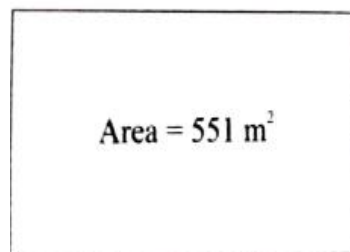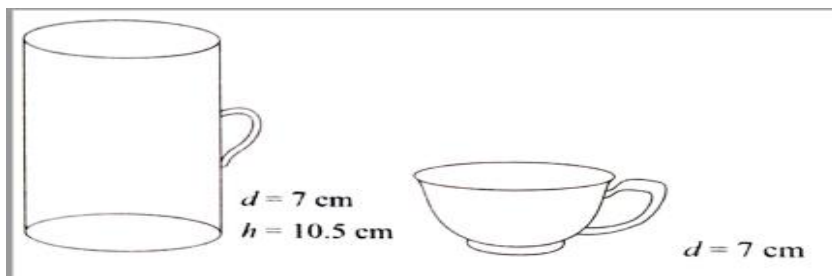
1. The volume of cylindrical cup is
   a) 295.75cm^3

b) 7415.5cm^3

c) 384.88cm^3

d) 404.25cm^3

2. The volume of hemispherical cup is

a) 179.67cm^3

b) 89.83 cm^3

c) 172.25 cm^3

d) 210.60 cm^3

3. Which container had more juice and by how much?

a) Hemispherical cup, 195 cm^3

b) Cylindrical glass, 207 cm^3

c) Hemispherical cup, 280.85 cm^3

d) Cylindrical glass, 314.42 cm^3

4. The height of the conical tent prepared to accommodate four students is

a) 18m

b) 10m

c) 24m

d) 14m

5. How much space on the ground is occupied by each student in the conical tent

a) 54m^2

b) 38.5m^2

c) 86m^2

d) 24m^2

Answers

1. d) 404.25cm^3

2. b) 89.83 cm^3

3. d) Cylindrical glass, 314.42 cm^3

4. c) 24m

5. b) 38.5m^2

CASE STUDY 2:
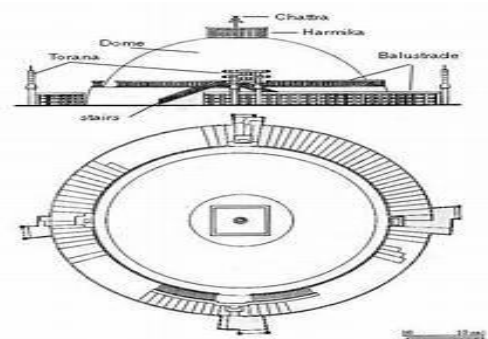
The Great **Stupa** at **Sanchi** is one of the oldest stone structures in India, and an important monument of Indian Architecture. It was originally commissioned by the emperor Ashoka in the 3rd century BCE. Its nucleus was a simple hemispherical brick structure built over the relics of the Buddha. .It is a perfect example of combination of solid figures. A big hemispherical dome with a cuboidal structure mounted on it. (Take $\pi = \frac{22}{7}$)

1. Calculate the volume of the hemispherical dome if the height of the dome is 21 m –

   a) 19404 cu. m

   b) 2000 cu .m

   c) 15000 cu. m

   d) 19000 cu. m

2. The formula to find the Volume of Sphere is-

   a) $\frac{2}{3}\pi r^3$

   b) $\frac{4}{3}\pi r^3$

   c) $4\pi r^2$

   d) $2\pi r^2$

3. The cloth require to cover the hemispherical dome if the radius of its base is 14m is

   a) 1222 sq.m

   b) 1232 sq.m

   c) 1200 sq.m

   d) 1400 sq.m

4. The total surface area of the combined figure i.e. hemispherical dome with radius 14m and cuboidal shaped top with dimensions 8m × 6m × 4m is

a) 1200 sq. m

b) 1232 sq. m

c) 1392 sq.m

d) 1932 sq. m

5. The volume of the cuboidal shaped top is with dimensions mentioned in question 4

a) 182.45 m^3

b) 282.45 m^3

c) 292m^3

d) 192m^3

Answers

1. a) 19404 cu. m
2. b) $\frac{4}{3}\pi r^3$
3. b) 1232 sq.m
4. c) 1392 sq.m
5. d) 192m^3

CASE STUDY 3:

On a Sunday, your Parents took you to a fair. You could see lot of toys displayed, and you wanted them to buy a RUBIK's cube and strawberry ice-cream for you. Observe the figures and answer the questions-:
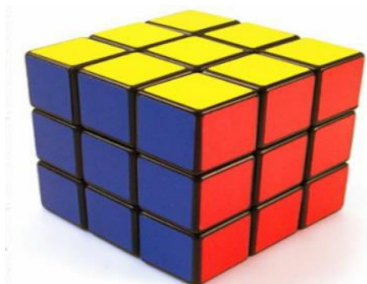
1. The length of the diagonal if each edge measures 6cm is

a) $3\sqrt{3}$

b) $3\sqrt{6}$

c) $\sqrt{12}$

d) $6\sqrt{3}$

2. Volume of the solid figure if the length of the edge is 7cm is-

a)256 cm^3

b) 196 cm^3

c) 343 cm^3

d) 434 cm^3

3. What is the curved surface area of hemisphere (ice cream) if the base radius is 7cm?

a) 309 cm^2

b) 308 cm^2

c) 803 cm^2

d) 903 cm^2

4. Slant height of a cone if the radius is 7cm and the height is 24 cm___

a) 26cm

b) 25 cm

c) 52 cm

d) 62cm

5. The total surface area of cone with hemispherical ice cream is

a) 858 cm^2

b) 885 cm^2

c) 588 cm^2

d) 855 cm^2

ANSWERS

1. d) $6\sqrt{3}$

2. c) 343 cm^3

3. b) 308 cm^2

4. b) 25 cm

5. a) 858 cm^2

STATISTICS

CASE STUDY 1:

COVID-19 Pandemic

The COVID-19 pandemic, also known as coronavirus pandemic, is an ongoing pandemic of coronavirus disease caused by the transmission of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) among humans.

The following tables shows the age distribution of case admitted during a day in two different hospitals

Table 1

Age (in years)	5-15	15-25	25-35	35-45	45-55	55-65
No. of cases	6	11	21	23	14	5

Table 2

Age (in years)	5-15	15-25	25-35	35-45	45-55	55-65
No. of cases	8	16	10	42	24	12

Refer to table 1

1. The average age for which maximum cases occurred is

   a) 32.24

b) 34.36

c) 36.82

d) 42.24

2. The upper limit of modal class is

a) 15

b) 25

c) 35

d) 45

3. The mean of the given data is

a) 26.2

b) 32.4

c) 33.5

d) 35.4

Refer to table 2

4. The mode of the given data is

a) 41.4

b) 48.2

c) 55.3

d) 64.6

5. The median of the given data is

a) 32.7

b) 40.2

c) 42.3

d) 48.6

ANSWERS

1. c) 36.82

2. d) 45

3. d) 35.4

4. a) 41.4

5. b) 40.2

Electricity Energy Consumption

CASE STUDY 2:

Electricity energy consumption is the form of energy consumption that uses electric energy. Global electricity consumption continues to increase faster than world population, leading to an increase in the average amount of electricity consumed per person (per capita electricity consumption).

Tariff	: LT - Residential	Bill Number	: 384756
Type of Supply	: Single Phase	Connected Load	: 3 kW
Meter Reading Date	: 31-11-13	Meter Reading	: 65789
Previous Reading Date	: 31-10-13	Previous Meter Reading	: 65500
		Units Consumed	: 289

A survey is conducted for 56 families of a Colony A. The following tables gives the weekly consumption of electricity of these families.

Weekly consumption (in units)	0-10	10-20	20-30	30-40	40-50	50-60
No. of families	16	12	18	6	4	0

The similar survey is conducted for 80 families of Colony B and the data is recorded as below:

Weekly consumption (in units)	0-10	10-20	20-30	30-40	40-50	50-60
No. of families	0	5	10	20	40	5

Refer to data received from Colony A

1. The median weekly consumption is
   a) 12 units
   b) 16 units
   c) 20 units
   d) None of these

2. The mean weekly consumption is
   a) 19.64 units
   b) 22.5 units
   c) 26 units
   d) None of these

3. The modal class of the above data is I

   a) 0-10

   b) 10-20

   c) 20-30

   d) 30-40

Refer to data received from Colony B

   4. The modal weekly consumption is

   a) 38.2 units

   b) 43.6 units

   c) 26 units

   d) 32 units

   5. The mean weekly consumption is

   a) 15.65 units

   b) 32.8 units

   c) 38.75 units

   d) 48 units

ANSWERS

   1. c) 20 units

   2. a) 19.64 units

   3. c) 20-30 units

   4. b) 43.6 units

   5. c) 38.75 units

PROBABILITY

CASE STUDY 1:

On a weekend Rani was playing cards with her family .The deck has 52 cards.If her brother drew one card .

1. Find the probability of getting a king of red colour.

a) $\frac{1}{26}$

b) $\frac{1}{13}$

c) $\frac{1}{52}$

d) $\frac{1}{4}$

2. Find the probability of getting a face card.

a) $\frac{1}{26}$

b) $\frac{1}{13}$

c) $\frac{2}{13}$

d) $\frac{3}{13}$

3. Find the probability of getting a jack of hearts.

a) $\frac{1}{26}$

b) $\frac{1}{52}$

c) $\frac{3}{52}$

d) $\frac{3}{26}$

4. Find the probability of getting a red face card.

a) $\frac{3}{13}$

b) $\frac{1}{13}$

c) $\frac{1}{52}$

d) $\frac{1}{4}$

5. Find the probability of getting a spade.

a) $\frac{1}{26}$

b) $\frac{1}{13}$

c) $\frac{1}{52}$

d) $\frac{1}{4}$

1. a) $\frac{1}{26}$

2. d) $\frac{3}{13}$

3. b) $\frac{1}{26}$

4. a) $\frac{3}{13}$

5. d) $\frac{1}{4}$

CASE STUDY 2 :

Rahul and Ravi planned to play Business (board game) in which they were supposed to use two dice.

1. Ravi got first chance to roll the dice. What is the probability that he got the sum of the two numbers appearing on the top face of the dice is 8?

   a) $\frac{1}{26}$

   b) $\frac{5}{36}$

   c) $\frac{1}{18}$

   d) 0

2. Rahul got next chance. What is the probability that he got the sum of the two numbers appearing on the top face of the dice is 13?

   a) 1

   b) $\frac{5}{36}$

   c) $\frac{1}{18}$

   d) 0

3. Now it was Ravi's turn. He rolled the dice. What is the probability that he got the sum of the two numbers appearing on the top face of the dice is less than or equal to 12 ?

   a) 1

   b) $\frac{5}{36}$

   c) $\frac{1}{18}$

   d) 0

4. Rahul got next chance. What is the probability that he got the sum of the two numbers appearing on the top face of the dice is equal to 7 ?

   a) $\frac{5}{9}$

   b) $\frac{5}{36}$

   c) $\frac{1}{6}$

   d) 0

5. Now it was Ravi's turn. He rolled the dice. What is the probability that he got the sum of the two numbers appearing on the top face of the dice is greater than 8 ?

   a) 1

   b) $\frac{5}{36}$

   c) $\frac{1}{18}$

   d) $\frac{5}{18}$

ANSWERS

1. b) $\frac{5}{36}$

2. d) 0

3. a) 1

4. c) $\frac{1}{6}$

5. d) $\frac{5}{18}$

1. Savita has a lamp placed at the centre of her square yard, each side measuring 20 m. The light of lamp covers a circle of radius 10 m on yard. What area of the yard is NOT lit by the lamp?

A. 400π sq. m
B. 100π sq. m
C. (40 - 10π) sq. m
D. (400 - 100π) sq. m

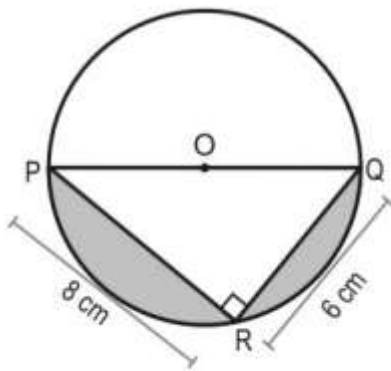2. In the Δ ABC shown below, ∠X : ∠Y = 1:2.
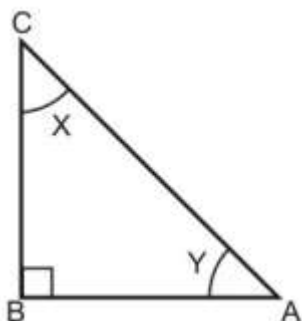
What is tan x?

A. $\dfrac{1}{\sqrt{3}}$

B. 1

C. $\dfrac{\sqrt{3}}{2}$

D. $\sqrt{3}$

3. Which of the following numbers can be written as a non-terminating but recurring decimal?

A. 9

B. $\dfrac{43}{8}$

C. √6

D. $\dfrac{5}{12}$

4. In the figure given below, O is the centre of the circle. PR and RQ are chords of the circle. The radius of the circle is 5 cm. PR = 8 cm, QR = 6 cm and ∠PRQ = 90°.

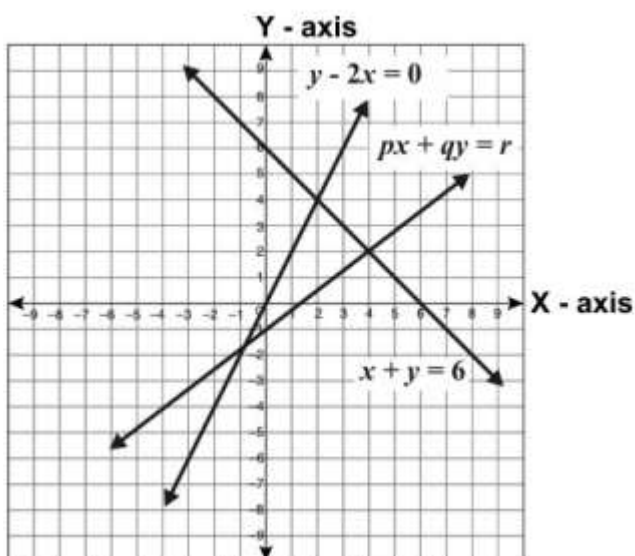**(Note: The figure is not to scale.)**

What is the approximate area of the shaded region?

A. $\left(\dfrac{25}{4} \pi - 24 \right)$ cm²

B. $\left(\dfrac{25}{2} \pi - 24 \right)$ cm²

C. $\left(\dfrac{25}{4} \pi \right)$ cm²

D. $\left(\dfrac{25}{2} \pi \right)$ cm²

5. Shown below are the graphs of the lines $y - 2x = 0$, $x + y = 6$ and $px + qy = r$.

Which of these is the solution for the pair of equations $x + y = 6$ and $px + qy = r$.

A. $x = 2, y = 4$

B. $x = 4, y = 2$

C. $x = 3, y = 2$

D. (We cannot say for sure as the values of p and q are not known.)

---

6. A vessel having 30 m³ of water is emptied through two openings, one small and the other large. Water flows out through the smaller opening at the rate of U m³/h and through the larger one at the rate of V m³/h. Given that 3U + 2V = 70 and that the vessel gets fully emptied in 1 hour, what is V?

A. 10 m³/h

B. 20 m³/h

C. 30 m³/h

D. 50 m³/h

---

7. The sum of the digits of a two-digit number is 9. If 27 is subtracted from the number, its digits are interchanged. Which of these is the product of the digits of the number?

A. 8
B. 14
C. 18
D. 20

---

8. For the given pair of equations, two statements are given below - one labelled Assertion (A) and the other labelled Reason (R). Read the statements carefully and choose the option that correctly describes statements (A) and (R).

$$\frac{2}{x} + 5y = 15$$

$$\frac{3}{x} + 6y = 7$$

Assertion (A): The given pair of equations can be reduced to a pair of linear equations in two variables.

Reason (R): In the given equations, *y* can be substituted by $\frac{1}{p}$.

A. Both (A) and (R) are true and (R) is correct explanation of the (A).
B. Both (A) and (R) are true but (R) is not the correct explanation of the (A).
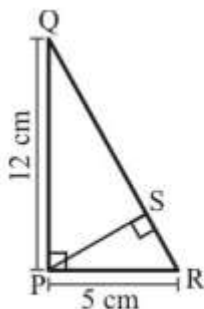C. (A) is true but (R) is false.
D. (A) is false but (R) is true.

---

9. How many zero(es) does (*x* - 2) (*x* + 3) have?

A. zero
B. one
C. two
D. three

---

10. $\dfrac{1}{\tan\theta + \cot\theta} =$

A. $\cos\theta \sin\theta$
B. $\sec\theta \sin\theta$
C. $\tan\theta \cot\theta$
D. $\sec\theta \operatorname{cosec}\theta$

---

11. In the figure below, PQR is a right-angled triangle, right angled at P. A perpendicular line PS is drawn from P to QR. PR = 5 cm and PQ = 12 cm.
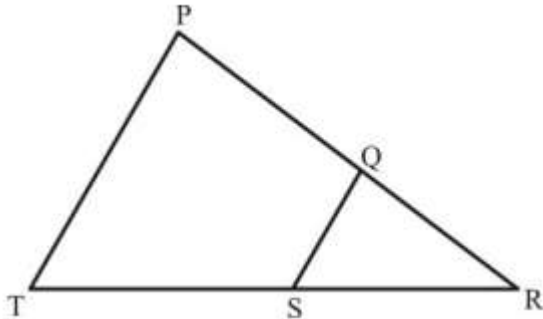

(Note: The figure is not to scale.)

What is RS:SQ?

A. 5:12
B. 13:17
C. 13:60
D. 25:144

12. In the following figure, Q is a point on PR and S is a point on TR. QS is drawn and ∠RPT = ∠RQS.

Which of these criteria can be used to prove that ΔRSQ is similar to ΔRTP?

A. AAA similarity criterion
B. SAS similarity criterion
C. SSS similarity criterion
D. RHS similarity criterion

13. Which of these is a RATIONAL number?

A. 3π
B. 5√5
C. 0.3466666...
D. 0.345210651372849...

14. Shown below are three triangles. The measures of two adjacent sides and included angle are given for each triangle.
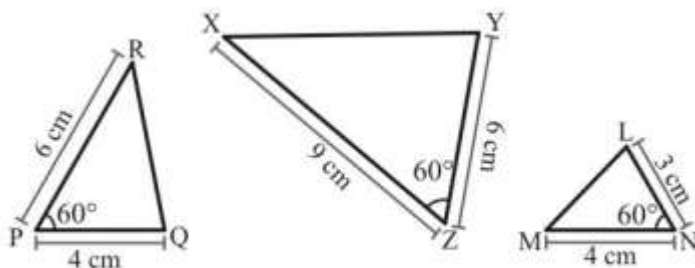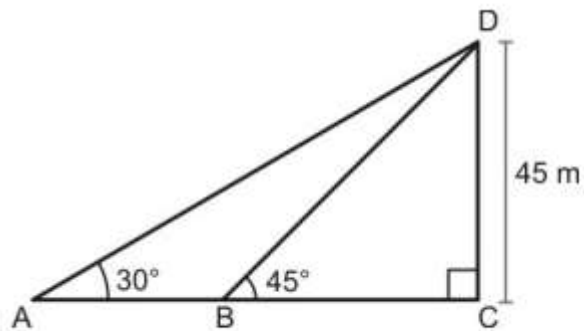

(Note: The figure is not to scale.)

Which of these triangles are similar?

A. ΔRPQ and ΔXZY
B. ΔRPQ and ΔMNL
C. ΔXZY and ΔMNL
D. ΔRPQ, ΔXZY and ΔMNL are similar to one another

15. In the figure below, what is the length of AB?

(Note: The figure is not to scale.)

A. 45√3 m

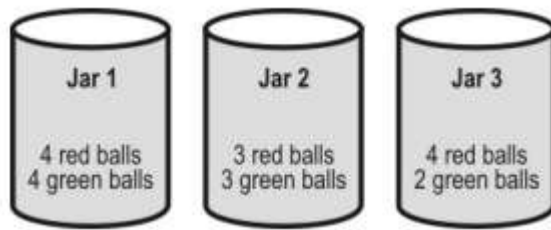B. $\dfrac{45}{\sqrt{3}}$ m

C. 45 (√3 - 1) m

D. 45 (√3 + 1) m

16. Which of these is the polynomial whose zeroes are $\dfrac{1}{3}$ and $\left(\dfrac{-3}{4}\right)$?

A. $12x^2 + 5x - 3$

B. $12x^2 - 5x - 3$

C. $12x^2 + 13x + 3$

D. $12x^2 - 13x - 3$

17. Which of these numbers can be expressed as a product of two or more prime numbers?

i) 15

ii) 34568

iii) (15 × 13)

A. only (ii)

B. only (iii)

C. only (i) and (ii)

D. all - (i), (ii) and (iii)

18. Romy is blindfolded and asked to pick one ball from each of the jars.

Jar 1	Jar 2	Jar 3
4 red balls	3 red balls	4 red balls
4 green balls	3 green balls	2 green balls

The chance of Romy picking a red ball is same in

A. jars 2 and 3
B. jars 1 and 3
C. jars 1 and 2
D. all the three jars

---

19. 1245 is a factor of the numbers p and q.

Which of the following will ALWAYS have 1245 as a factor?
(i) $p + q$
(ii) $p \times q$
(iii) $p \div q$

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

---

20. Look at the numbers shown below.

| (i) -0.5 | (ii) 0.00001 | (iii) $\frac{1}{2}$ |
| (iv) 1 | (v) 1.00001 | (vi) 99% |

Which of the above numbers represent probabilities of events?

A. only (i) and (iii)
B. only (i), (ii), (iii) and (iv)

C. only (ii), (iii), (iv) and (v)
D. only (ii), (iii), (iv) and (vi)

---

21. A fire engine, standing near a building, extends its ladder to a length of 10 metres to reach a certain window in the building.

(Note: The figure is not to scale.)

What is the height of the window from the ground?

A. 6 m
B. 8 m
C. 9 m
D. 11 m

---

22. Two statements are given below - one labelled Assertion (A) and the other labelled Reason (R). Read the statements carefully and choose the option that correctly describes statements (A) and (R).

Assertion (A): 9 x + 12 y - 7 = 0 and 6 x + 8 y - 14 = 0 form a consistent pair of linear equations.

Reason (R): A pair of linear equations, $px + qy + r = 0$ and $fx + gy + h = 0$, has no solution if $\frac{p}{f} = \frac{q}{g} \neq \frac{r}{h}$.

A. Both (A) and (R) are true and (R) is the correct explanation of the (A).
B. Both (A) and (R) are true but (R) is not the correct explanation of the (A).
C. (A) is true but (R) is false.
D. (A) is false but (R) is true.

23. Two identical fair dice have numbers 1 to 6 written on their faces. Both are tossed simultaneously. What is the probability that the product of the numbers that turn up is 12?

A. $\dfrac{1}{36}$

B. $\dfrac{1}{9}$

C. $\dfrac{1}{6}$

D. $\dfrac{1}{3}$

---

24. How many zero(es) does the polynomial $293x^2 - 293x$ have?

A. 0
B. 1
C. 2
D. 3

---

25. What is the value of q if $\dfrac{p}{2} + 3q = 6$ and $2p - 2q = 10$?
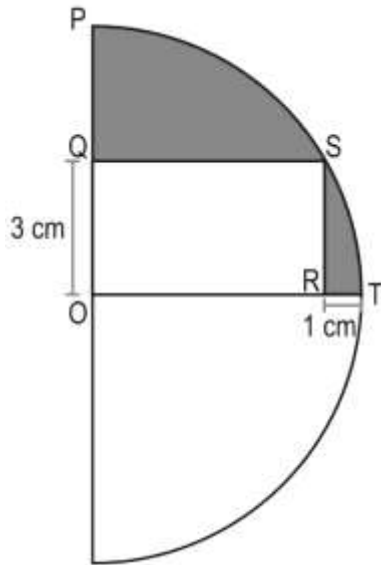
A. 1
B. 4
C. 6
D. 16

---

26. What is the value of k such that the following pair of equations have infinitely many solutions?
   $x - 2\,y = 3,$
   $-3\,x + k\,y = -9$

A. (-6)

B. (-3)
C. 3
D. 6

---

27. In the figure below RT = 1 cm and OQ = 3 cm.

What is the area of the shaded region?

A. $(12.5\pi - 12)$ cm^2
B. $(6.25\pi - 12)$ cm^2
C. $(12.5\pi - 15)$ cm^2
D. $(6.25\pi - 15)$ cm^2

---

28. Shown below is a board divided into 6 identical sectors, with a pointer that can be spun on it.


When the pointer is spun, it spins for some time and comes to a stop on a sector. The chances of it stopping on any sector are equal. Arif wants to colour some sectors green. How

many sectors should he colour green so that the probability of the pointer stopping on a green sector is 1/3?

A. 1
B. 2
C. 3
D. 4

---

29. In the figure below, the square JKLM is inscribed within a circle and ΔJMN is a right-angled isosceles triangle. The point marked O is the centre of the circle.
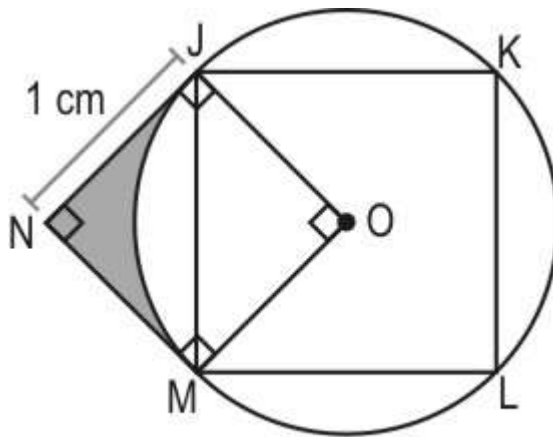
(Note: Figure is not to scale.)

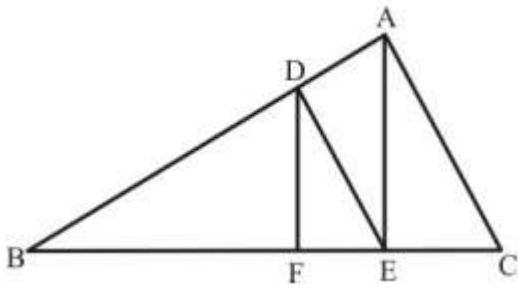What is the area of the shaded part of the figure?

A. $\left(\frac{\pi}{4} - \frac{1}{2}\right)$ cm²
B. $\left(\pi - \frac{1}{2}\right)$ cm²
C. $\left(1 - \frac{\pi}{4}\right)$ cm²
D. $(1 - \pi)$ cm²

30. α is an acute angle.
(sin α + cos α) is

A. greater than 1.
B. less than 1.
C. equal to 1.
D. (We cannot say any of these as it depends on the value of α.)

---

31. In the figure below, DE || AC and DF || AE. Which of these is equal to $\frac{BF}{FE}$?

A. $\dfrac{DF}{AE}$

B. $\dfrac{BE}{EC}$

C. $\dfrac{BA}{AC}$

D. $\dfrac{FE}{EC}$

---

32. x -axis divides the join of (2, -3) and (5, 6) in the ratio _____.

A. 1:2
B. 2:1
C. 2:5
D. 5:2

---

33. A number of the form 8^n , where n is a natural number greater than 1, cannot be divisible by _____.

A. 1
B. 40
C. 64
D. 2^{2n}

34. The fraction $\dfrac{7}{q}$ has a terminating decimal expansion.
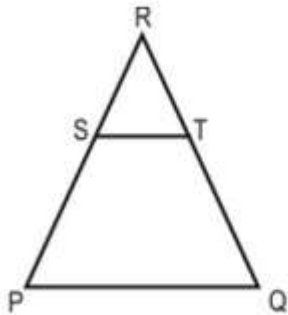
Which of these CANNOT be q?

A. 8×2
B. 8×3
C. 8×4
D. 8×5

---

35. In the triangle PQR below,

- S and T are 2 points on the sides RP and RQ respectively such that ST is parallel to PQ.

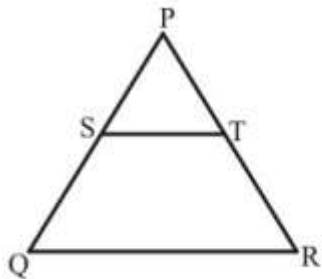- The ratio of RT to TQ is 1:2.

The area of ΔRST = 100 sq. units.

(Note: The figure is not to scale.)

What is the area of PQTS?

A. 200 sq. units
B. 300 sq. units
C. 600 sq. units
D. 800 sq. units

---

36. In the following figure, ST || QR, point S divides PQ in the ratio 4:5. If ST = 1.6 cm, what is the length of QR?

(Note: The figure is not to scale.)

A. 0.71 cm
B. 2 cm
C. 3.6 cm
D. (cannot be calculated from the given data.)

---

37. P and Q are two positive integers such that P = p^3q and Q = $(pq)^2$, where p and q are prime numbers.

What is LCM(P, Q)?

A. pq
B. p^2q^2
C. p^3q^2

D. p^5q^3

---

38. Given that $\cos^2 \theta - \sin^2 \theta = \frac{3}{4}$.

What is the value of $\cos \theta$?

A. $\dfrac{\sqrt{3}}{2}$

B. $\dfrac{1}{2}$

C. $\dfrac{\sqrt{7}}{2}$

D. $\dfrac{\sqrt{7}}{\sqrt{8}}$

---

39. p and q are the zeroes of the polynomial $4y^2 - 4y + 1$.

What is the value of $\dfrac{1}{p} + \dfrac{1}{q} + pq$?

A. $\dfrac{-15}{4}$

B. $\dfrac{-3}{4}$

C. $\dfrac{5}{4}$

D. $\dfrac{17}{4}$

---

40. Which of the following will have the MAXIMUM number of 6's when written in decimal form?

A. $\dfrac{666}{1000}$

B. $\dfrac{3}{6}$

C. $\dfrac{3}{5}$

D. $\dfrac{2}{3}$

Look at the information given below and answer the questions that follow.

Shown below is the top view of a stadium. There is a badminton court at the centre. The stadium is surrounded by a jogging track. The track is semi-circular in shape at the top and the bottom of the court. The fountains converge at the centre of the respective semicircles. The jogging track has a uniform width of 2 m.
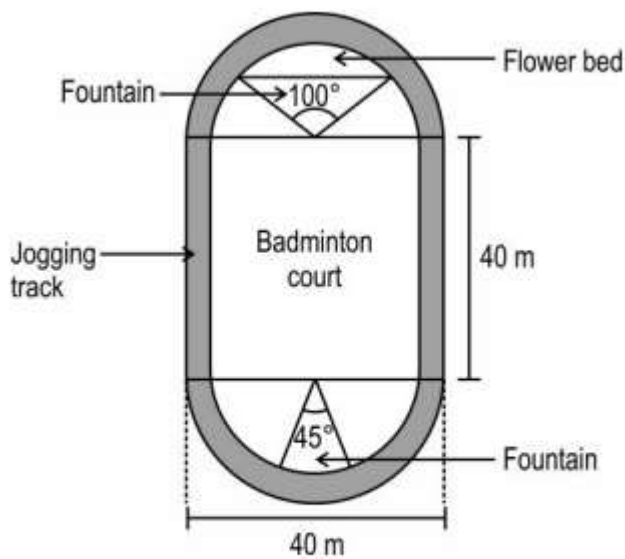
(Note: The figure is not to scale.)
(Note: Use π = 3.14)

41. What is the area of the jogging track?

   A. 160 m²

   B. 172.56 m²

   C. 238.64 m²

   D. 398.64 m²

42. What is the area occupied by the fountain shown below the court in the figure?

   A. 63.59 m²

   B. 127.17 m²

   C. 157 m²

   D. 282.6 m²

43. The cost of gardening is Rs 300/m^2 and the area of the fountain next to the flower bed is 150 m^2.

What is the cost of gardening the flower bed?

A. Rs 39780

B. Rs 45000

C. Rs 59664

D. Rs 84780

44. If the rate of fencing is Rs 150/m, what is the cost of fencing the flower bed ONLY on the curved portion of its boundary?
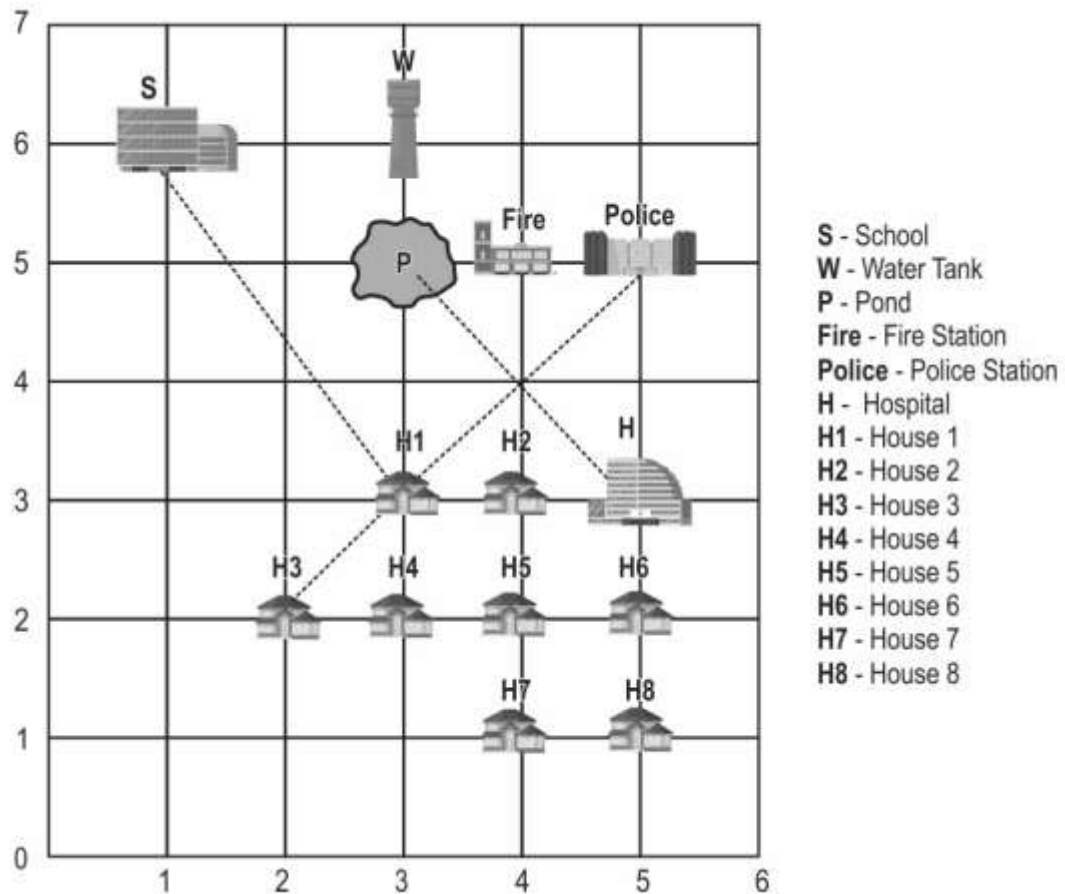
A. Rs 2355

B. Rs 4710

C. Rs 5233

D. Rs 10110

45. What is the length of the boundary of the stadium?

A. 62.8 m

B. 125.6 m

C. 160 m

D. 205.6 m

Study the given information and answer the questions that follow.

Shown below is a town plan on a coordinate grid, where 1 unit = 1 km. Consider the co-ordinates of each building to be the point of intersection of the respective grid lines.

(Note: Consider the horizontal axis as the x-axis and the vertical axis as the y-axis.)

46. Which of the following pairs of houses has the same abscissa (or *x*-coordinate)?
A. House 5 and House 6
B. House 5 and House 7
C. House 5 and House 8
D. House 5 and House 1

47. What is the distance between the school and House 1 along the path shown?
A. √13 km
B. √97 km
C. 13 km
D. 97 km

48. A well is dug at a point along the path joining the pond and the hospital. The ratio of the distance between the pond and the well to that of the well and the hospital is 4:1 respectively.

What is the *x*-coordinate of the well?
A. 3.4
B. 4.25
C. 4.6
D. 5.75

49. What is the ratio in which House 1 divides the path joining House 3 and the Police station?
A. 1:2√2
B. 1:√2
C. 1:3
D. 1:2

50. Which of the following pair of buildings are separated by the same distance as that of School and Police station?
A. Pond and House 8
B. School and House 1
C. Water tank and House 3
D. Fire station and House 3

x-x-x-x-x-x-x-x-x-x-x-x-x

Answer key and student performance data.

The following table shows the key answer and the percentage of class 10 students who answered each question correctly, wherever the responses are available.

Sl.no	Key answer	Performance (in %)	Sl.no	Key answer	Performance (in %)
1	D	82.7	26	D	55.5
2	A	70.4	27	B	36.9
3	D	50.2	28	B	78.3
4	B	69.3	29	C	35.8
5	B	55.5	30	A	33.9
6	B	53.4	31	B	56.8
7	C	65.1	32	A	42.7
8	B	NA	33	B	39.8
9	C	77.4	34	B	58.8
10	A	57.9	35	D	23.7
11	D	NA	36	C	40.3
12	A	54.4	37	C	69.3
13	C	41.2	38	D	27.3
14	A	50.9	39	D	41.1
15	C	55.1	40	D	80.4
16	A	53.3	41	D	NA
17	D	61.3	42	B	NA
18	C	61.9	43	A	NA
19	B	23.1	44	B	NA
20	D	57.0	45	D	NA
21	D	47.2	46	B	NA
22	D	NA	47	A	NA
23	B	50.9	48	C	NA
24	C	62.1	49	D	NA
25	A	51.8	50	C	NA