MEASUREMENTS, AREA, HEIGHTS AND DISTANCES

DRILL 1 - TRIANGLE

For any triangle, Area = base x height /2

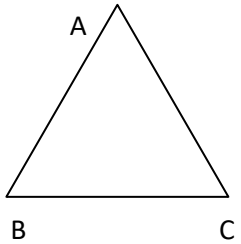
any side x length of perpendicular dropped on that side / 2

√s(s-a)(s-b)(s-c), where s = a+b+c / 2

TYPE	DESCRIPTION	HEIGHT	AREA	PERIMETER
Equilateral	All sides and angles are equal, say a = b = c	(√3 / 2) * side	(√3 / 4) * ($side^2$)	3 * side
Isosceles	Two sides (not base, b) are equal, say a = c	√($4a^2 – b^2$) / 2	B * √($4a^2 – b^2$) / 4	a + b + c
Right angled triangle	Side opposite to 90® is hypotenuse. Also has a base and height	√($base^2$ + $height^2$)	Base * height / 2	Base + height + hypotenuse
Isosceles right angled triangle	Side opposite to 90® is hypotenuse. Base = height	Height = base. Hypotenuse = a√2	A^2/2	H(√2 + 1)

- Find the number of trees which can be planted in a triangular piece of ground having its sides 51m, 37m and 20m respectively, and each tree occupies $6m^2$ of space.
  a. 50 b. 51 c. 52 d. CBD

- In the adjoining equilateral triangle ABC, three perpendiculars OX, OY AND OZ are drawn from point O to the three sides. If the perpendiculars measure 6m, 7m and 8m respectively, find the area of the triangle.



  a. 256.4 b. 264.5 c. 254.6 d. 266.5

- A lawn is in the form of an isosceles triangle. The cost of turfing it came Rs. 1200 at Rs. 4 per square meter. If the base be 40m long, find the length of each side.
  a. 25 m b. 27 m c. 30 m d. NOTA

- The base of a right angled triangle is 48 m and the difference between the hypotenuse and perpendicular is 36 m. Find the hypotenuse and perpendicular.

DRILL 2 – QUADRILATERAL

TYPE	DESCRIPTION	AREA
PARALLELOGRAM	Opposite sides are equal and parallel Height = distance between the base and top. Acute angle between adjacent sides	Base * height
SQUARE	All sides are equal. Diagonals are equal and bisect each other at 90®.	Side^2
RECTANGLE	Opposite sides are equal and parallel. Diagonals are equal and bisect each other at 90®.	Base * height
RHOMBUS	All sides are equal. Diagonals bisect each other at 90®, but not equal. Height = distance between the base and top	Base * height (d1 x d2) /2

- The area of the parallelogram is 338m^2. If its altitude is twice the corresponding base, determine the base and the altitude.

- The diagonals of the rhombus are 72 m and 96m. Find the side, area and height of the rhombus.

- The area of the wall carpet in the form of the rhombus is 72 m^2 and the perimeter is 36 m. Find the perpendicular breadth.

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

DRILL 3 - CIRCLES

Area	πr^2
Circumference	$2\pi r$

Length of an arc	(Angle / 360) x Circumference of the circle
Chord of the arc	2√(h (d-h)), where h – height of the arc
Area of the sector	(Angle / 360) x Area of the circle

- A piece of wire is bent in the shape of an equilateral triangle of each side 8.8 m. It is re bent to form a circular ring. Find the diameter of the ring.
  a. 8.4 m b. 8.8 m c. 9.2 m 10. NOTA

- The diameter of a driving wheel of the bus is 1.4 m. How many revolutions per minute must the wheel make in order to keep a speed of 66 km/hour?
  a. 220 rpm b. 240 rpm c. 250 rpm d. 275 rpm

- The area of the sector is 88 m^2, the radius of the circle is 12 m. Find the angle of the sector.
  a. 60˚ b. 70˚ c. 80 ˚ d. CBD

DRILL 4 - PATHWAY

RECTANGULAR PLOT

ABCD is a rectangular plot with length = l, breadth = b and width = w

Area of the pathway made outside the plot = Area of the pathway = 2w(l + b + 2w)

Area of the pathway made inside the plot = Area of the pathway = 2w(l + b - 2w)

- A rectangular grass plot is 112 m x 78 m. It has a gravel path 2.5 m wide all around it on the inside. Find the area of the path and the cost of construction it at Rs. 3.40 per m2.
  a. Rs. 3200 b. Rs. 3195 c. Rs. 3165 d. Rs. 3145

- A room 4.9 m long and 3.5 m broad is carpeted with a carpet, leaving an uncovered margin of 25 cm all around the room. If the breadth of the carpet is 80 cm, find its cost at Rs. 15 per meter.
  a. Rs. 247.50 b. Rs. 252.75 c. Rs. 265.80 d. Rs. 270

- A rectangular grass plot 80 m x 60 m has two roads, each 10 m wide, running in the middle of it; one parallel to the length and the other parallel to the breadth. Find the cost of gravelling the roads at Rs. 2 per square meter.
  a. Rs. 2200 b. Rs. 2400 c. Rs. 2600 d. Rs. 2800

CIRCULAR PLOT

Area of circular path outside = $\pi W(2r + W)$

Area of circular path inside = $\pi W(2r - W)$

- The area of the two concentric circles is 154 m^2 and 308 m^2 respectively. Find the breadth of the ring.
  a. 2.9 m b. 3.5 m c. 4.2 m d. NOTA

- A circular grass plot, whose diameter is 70 m, contains a gravel walk 5m wide round it, 15m from the edge. Find what will cost to turf the grass plot at Rs. 2 per m^2
  a. Rs. 6500 b. Rs. 6600 c. Rs. 7200 d. Rs. 7500

DRILL 5 - SOLIDS

	Volume	**TSA**	**Diagonal**
Cube	$(Side)^3$	$6(side)^2$	Side √3
Cuboid	L x B x H	2(lb + bh + lh)	$\sqrt{(l^2 + b^2 + h^2)}$
Cylinder	$\Pi r^2 h$	$2\Pi(r + h)$	-
Sphere	$4/3\ \pi r^3$	$4\pi r^2$	-
Right circular cone	$1/3\ \pi r^2 h$	$\pi r\ (l + r)$	-

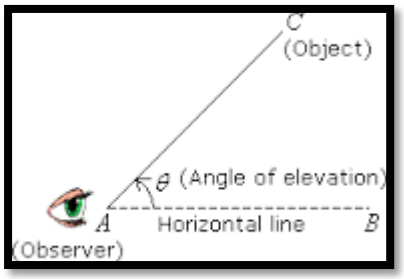
- Find the length of the rectangular solid whose volume is 44 m^3, and breadth and depth are 4 m and 2.2 m respectively.
  a. 5 m b. 5.5 c. 5.71 m d. NOTA

- A closed box (with lid)have external dimensions as 33cm X 27 cm X 22cm. How many cubic centimetres of wood are required to build it, with 1 cm thick wood? Find the capacity of the each box.

- A rectangular sheet of paper, 36 m x 22m, is rolled along its length to form a cylinder. Find the volume of the cylinder so formed.
  a. 1250 cm^3 b. 1790 cm^3 c. 2268 cm^3 d. 2563 cm^3

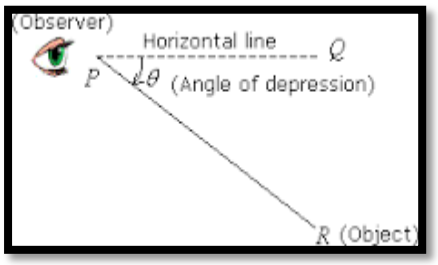
DRILL 6 - HEIGHTS AND DISTANCE

Angle of elevation



- Object **C** is at higher level than observer
- Line **AC** is the observation line

Angle of Depression



- Object **R** is at lower level than observer
- Line **PR** is the line of observation line

➢ A ladder 15 m long just reaches the top of a wall and makes an angle of 60˚ with the wall. Find the distance of foot of the ladder from the wall?

a. 12 m b. 13 m c. 14 m d. NOTA

➢ From a tower 125m high, the angle of a depression of a car is 30˚. Find how far the car is from the tower.

a. 202.4 m b. 216.5 m c. 224.2 m d. CBD

➢ If the elevation of the sun changed from 30˚to 60˚, then find the difference between the lengths of shadows of a pole 20 m high, made at these positions.

a. 20√3 b. 10/√3 c. 40√3 d. 40/√3

PROBABILITY, PERMUTATION AND COMBINATION

Probability of any event = $\frac{\mathbf{n(E)}}{\mathbf{n(S)}}$

DRILL – 1 – RANDOM EXPERIMENT

A. **Tossing a coin**, the number of sample space = 2^n, where n is the number of coins.

When tossing a coin, Sample space = {H, T}; **n(S) = 2**

If two coins are tossed, Sample space = {HH, HT, TT, TH}; **n(S) = 4**

If three coins are tossed, Sample space = {HHH, HHT, HTH, THH, TTH, THT, HTT, TTT}; **n(S) = 8**

If four coins are tossed, Sample space = {HHHH, HHHT, HHTH, HHTT, HTHH, HTHT, HTTH, HTTT, THHH, THHT, THTH, THTT, TTHH, TTHT, TTTH, TTTT}; **n(S) = 16**

No. of coins tossed	Probability of one head	Probability of 2 tails	Probability of at least one tail	Probability of at most 3 heads
1				
3				
4				

B. **Throwing a die**, the number of sample space n(S) = 6^n, where n is the number of die thrown

When a die is thrown, Sample space = {1, 2, 3, 4, 5, 6}; **n(S) = 6**

When two dies are thrown, Sample space = {(1, 1) (1, 2) (1, 3) (1, 4) (1, 5) (1, 6)

(2, 1) (2, 2).....(2, 6)

(3, 1) (3, 2).....(3, 6)

(4, 1) (4, 2).....(4, 6)

(5, 1) (5, 2).....(5, 6)

(6, 1) (6, 2).....(6, 6)}; **n(S) = 36**

When two dies are thrown, Sample space = {(1,1,1) (1,1,2) (1,1,3) (1,1,4) (1,1,5) (1,1,6)(1,2,1) (1,2,2) (1,2,3) (1,2,4) (1,2,5) (1,2,6)(1,3,1) (1,3,2) (1,3,3) (1,3,4) (1,3,5) (1,3,6)(1,4,1) (1,4,2) (1,4,3) (1,4,4) (1,4,5) (1,4,6)(1,5,1) (1,5,2) (1,5,3) (1,5,4) (1,5,5) (1,5,6)(1,6,1) (1,6,2) (1,6,3) (1,6,4) (1,6,5) (1,6,6)(2,1,1) (2,1,2) (2,1,3) (2,1,4) (2,1,5) (2,1,6)(2,2,1) (2,2,2) (2,2,3) (2,2,4) (2,2,5) (2,2,6)(2,3,1) (2,3,2) (2,3,3) (2,3,4) (2,3,5) (2,3,6)(2,4,1) (2,4,2) (2,4,3) (2,4,4) (2,4,5) (2,4,6)(2,5,1) (2,5,2) (2,5,3) (2,5,4) (2,5,5) (2,5,6)(2,6,1) (2,6,2) (2,6,3) (2,6,4) (2,6,5) (2,6,6)(3,1,1) (3,1,2) (3,1,3) (3,1,4) (3,1,5)(3,1,6) (3,2,1) (3,2,2) (3,2,3) (3,2,4) (3,2,5) (3,2,6)(3,3,1) (3,3,2) (3,3,3) (3,3,4) (3,3,5) (3,3,6)(3,4,1) (3,4,2) (3,4,3) (3,4,4) (3,4,5) (3,4,6)(3,5,1) (3,5,2) (3,5,3) (3,5,4) (3,5,5) (3,5,6)(3,6,1) (3,6,2) (3,6,3) (3,6,4) (3,6,5) (3,6,6)

(4,1,1) (4,1,2) (4,1,3) (4,1,4) (4,1,5) (4,1,6)(4,2,1) (4,2,2) (4,2,3) (4,2,4) (4,2,5) (4,2,6)(4,3,1)
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(5,5,6)(5,6,1) (5,6,2) (5,6,3) (5,6,4) (5,6,5) (5,6,6)(6,1,1) (6,1,2) (6,1,3) (6,1,4) (6,1,5)
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(6,5,6)(6,6,1) (6,6,2) (6,6,3) (6,6,4) (6,6,5) (6,6,6)}; **n(S) = 216**

No. of dice thrown	Probability of all even numbers	Probability of getting a sum of 6	Probability of at least one odd value
1			
2			
3			

C. PACK OF CARDS

A pack of cards has 52 cards.
It has 13 cards of each suit, name **Spades, Clubs, Hearts and Diamonds**.
Cards of spades and clubs are **black cards**.
Cards of hearts and diamonds are **red cards**.
There are 4 honours of each unit.
There are **Kings, Queens and Jacks**. These are all called **face cards**.

- From a pack of 52 cards, one card is drawn at random. What is the probability that the card drawn is a ten?
  a. 1/13 b. ¼ c. 13/52 d. 10/52

- A cards is drawn at random from a pack of 52 cards. The probability that the card is red?
  a. 3/20 b. ¼ c. ½ d. 13/52

DRILL 2 –Use of Conjunction AND and OR

AND ⟹ $P(A) \times P(B)$

OR ⟹ $P(A) + P(B)$

- From a pack of 52 cards, one card is drawn at random. What is the probability that the card drawn is a ten or a spade?

  a. 4/13 b. c. 1/13 d. 1/26

- Two cards are drawn together from a pack of 52 cards. The probability that one is a spade and one is a heart is:

  a. 3/20 b. 29/34 c. 47/100 d. 13/102

- Two cards are drawn together from a pack of 52 cards. The probability that either both are red or both are kings is:

  a. 7/13 b. 3/26 c. 63/221 d. 55/221

- In a simultaneous throw of two dice, what is the probability of getting a total of 10 or 11?

  a. ¼ b. 1/6 c. 7/12 d. 5/36

DRILL 3 – Deductions – nPr and nCr

N	R	${}^nC_r$	${}^nP_r$
12		495	11880
6	2		
7			210

DRILL 4 – Word arrangement

WORDS	VOWELS ALWAYS COMES TOGETHER	VOWELS ARE NEVER TOGETHER
DETAIL		
AUCTION		
BANKING		

PRACTICE PROBLEMS

1. A cistern 6m long and 4 m wide contains water up to a depth of 1m and 25cm. The total area of the wet surface is
   a. 49 m2 b. 48m2 c. 52 m2 d. CBD
2. How many bricks each measuring 25cm x 12.5cm x 7.5cm required to construct 6m x 5m x 0.5m?
   a. 507 bricks b. 540 bricks c. 608 bricks d. 640 bricks
3. A horse is tied by the rope in the open field. The horse may be allowed to graze over 792 sq.m. Find the length of the rope.
   a. 6√7 m b. 6 m c. 42 m d. 36√7 m
4. The area of the rectangular field is 144 m^2. If the length is increased by 5 metres, its area increases by 40m^2. Find the length of the field?
   a. 15 m b. 18 m c. 20 m d. 22 m

5. How many spherical bullets can be made out of a lead cylinder 28cm high with base radius 6 cm, each bullet being 1.5 cm in diameter?
   a. 1695 b. 1792 c. 1804 d. CBD
6. A man walking at a speed of 4kmph crosses a square field diagonally in 3 minutes. The area of the field is
   a. 200 meters b. 200√2 meters c. 20 km d. 100√2 km
7. How many iron rods, each of length 7*m* and diameter 2*cm* can be made out of 0.88 cubic metre of iron?
   a. 350 b. 375 c. 400 d. NOTA
8. Two circular cylinder of equal volume have their height in the ratio 1:2. The ratio if their radii is
   a. 1:√2 b. √2:1 c. 1:√3 d. √3:1
9. The height and radius of the base of a cone each are increased by 100%. The volume of the cone then increases by
   a. 4 times b. 6 times c. 2 times d. 8 times
10. Find the percentage change if the area of a rectangle is obtained by decreasing its length and increasing its breadth by 5%
    a. Decreases by 0.25% b. Increases by 0.25%
    c. Decreases by 25% d. Increases by 25%
11. Find the probability that a year chosen at random will have 53 Sundays?
    a. 2/7 b. 3/8 c. 1/3 d. NOTA
12. In a throw of a dice, find the probability of getting a prime number?
    a. 1/3 b. ½ c. ¼ d. 1/6
13. In a throw of 2 dice, find the probability of getting one prime and one composite number?
    a. 1/3 b. ½ c. ¼ d. 1/6
14. In a throw of 2 dice, find the probability of getting a sum divisible by 2 or 4?
    a. 1/3 b. ½ c. 3/4 d. 2/3
15. In a throw of dice, find the probability of getting the sum as a prime number less than 8?
    a. 11/13 b. 1/13 c. 1/4 d. 13/36
16. How many words can be formed by using all letters of the word **'BIHAR'** ?
    a. 25 b. 75 c. 100 d. 120
17. How many words can be formed by using all the letters of the word **'DAUGHTER'** so that the vowels always come together?
    a. 720 b. 4320 c. 3250 d. 720 x 6!
18. How many words can be formed from the letters of the word **'EXTRA'** so that the vowels are never together?
    a. 48 x 2! b. 5! x 2 c. 120 d. NOTA
19. In how many ways can a group of 5 men and 2 women be made out of a total of 7 men and 3 women?
    a. 63 b. 90 c. 126 d. 45
20. In how many ways can a panel of 8 doctors be formed from 6 surgeons and 7 physicians if the panel has to include more surgeons than physicians?
    a) 231 b) 546 c) 210 d) 340