

FORMULA SHEET - GMAT - Walletless

①

① Percent Formula

$$\% = \frac{\text{Part}}{\text{Whole}}$$

Eg. What is 12% of 25?

$$\frac{12}{100} = \frac{x}{25}$$

$$\Rightarrow x = \frac{25 \times 12}{100} = \underline{\underline{3\%}}$$

② % Increase & % Decrease

$$\% \text{ Increase or Decrease} = \frac{\Delta}{\text{Original}} \times 100$$

where Δ = Difference

Eg. Price goes up from 80 to 100. What is the % Increase?

$$\frac{100-80}{80} \times 100 = \underline{\underline{25\%}}$$

⑥ Price goes down from 100 to 80. What is % decrease?

$$\frac{100-80}{100} \times 100 = \underline{\underline{20\%}}$$

③ Recognize multiples of 4, 6, 9, 12, 11

4 : Last two digits are multiples of 4 (Eg. 816)

6 : Sum of digits is multiple of 3, last digit is even

9 : Sum of digits is multiple of 9

12 : Sum of digits is multiple of 3, last two digits is multiple of 4.

11 : Difference between sum of alternate #'s is multiple of 11

Eg: 5 4 2 4 1 : $5+2+1 = 8$
 $4+4 = 8$

Difference = 0, which is multiple of 11, So 54241 is multiple of 11

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④ Common Factors of 135 & 225

②

$$\begin{array}{r|l} 5 & 135, 225 \\ 3 & 27, 45 \\ 3 & 9, 15 \\ 3 & 3, 5 \\ 5 & 1, 5 \\ & 1 \end{array}$$

Common Factors (Prime)

3, 3, 5, 5

Common Factors

3, 5, 9, 15, 45

⑤ Least Common Multiple (LCM)

LCM of 28 & 42

$$28 = 2 \times 2 \times 7$$

$$42 = 2 \times 3 \times 7$$

$$\therefore \text{LCM} = 2 \times 7 \times 3 \times 2 = 84$$

⑥ Greatest Common Divisor (GCD)

GCD of 28 & 42

$$28 = 2 \times 2 \times 7$$

$$42 = 2 \times 3 \times 7$$

$$\therefore \text{GCD} = 2 \times 7 = 14$$

⑦ Average of Evenly spaced numbers

= Average of Smallest & Largest #

Eg. Average of 13, 15, 17, 19, 21 ... 211

$$= \frac{211 + 13}{2} = \frac{224}{2} = \underline{\underline{112}}$$

⑧ Probability

$$\frac{\text{\# of favorable Outcome}}{\text{\# of all possible outcomes}}$$

Eg. Probability that if 2 coins are tossed, you get Heads on both

Favourable Outcome : HH (1)

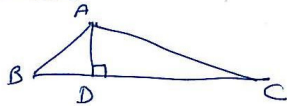
Possible Outcomes :

H	H	}	4
H	T		
T	H		
T	T		

$$\therefore \text{Probability} = \frac{1}{4}$$

⑨ Area of Triangle

Formula #1 : Area = $\frac{1}{2} \times \text{Base} \times \text{Height}$



$$\left. \begin{array}{l} \overline{BC} = 8\text{cm} \\ \overline{AD} = 5\text{cm} \end{array} \right\} \text{Area} = \frac{1}{2} \times 8 \times 5 = 20 \text{ Sq. cm}$$

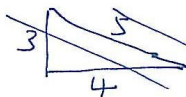
~~Formula #2~~

~~Area of Δ with sides S_1, S_2 & S_3~~

$$= \sqrt{p(p-S_1)(p-S_2)(p-S_3)}$$

~~where $p = \text{Perimeter} = S_1 + S_2 + S_3$~~

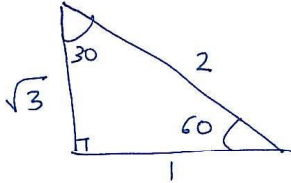
Eg.



$$p = 12 \therefore \text{Area} = \sqrt{12(12-5)(12-4)(12-3)} = \sqrt{12 \times 7 \times 8 \times 9} = \sqrt{6048} =$$

⑩ SPECIAL TRIANGLES

30-60-90

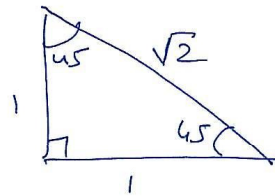


Side opp. 30 = x

Side opp. 60 = $\sqrt{3} \cdot x$

Side opp. 90 = $2x$

45-45-90

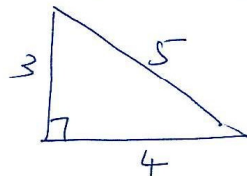


Side opp. 45 = x

Side opp. 90 = $\sqrt{2}x$

Right L Triangles

Pythagorean

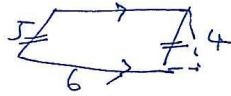


(Side opp. 90)² = Sum of Square of other two sides

$$5^2 = 3^2 + 4^2$$

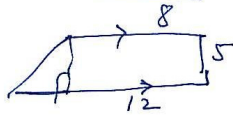
⑪ Area of Parallelogram

$$\text{Area} = \text{base} \times \text{height}$$



$$\text{Area} = 6 \times 4 = 24$$

⑫ Area of Trapezoid



Method-I

$$\text{Area} = \frac{1}{2} (\text{Sum of parallel sides}) \times \text{Height}$$

$$= \frac{1}{2} \times \left(\frac{8+12}{2} \right) \times 5$$

$$= 50$$

Method II

$$\text{Area of } \square = ~~12 \times 5~~ 8 \times 5 = 40$$

$$\text{Area of } \Delta = \frac{1}{2} \times (12-8) \times 5$$

$$= \frac{1}{2} \times 20 = 10$$

$$\therefore \text{Total Area} = 40 + 10 = 50$$

⑬ Circumference of Circle

$$= 2\pi r$$

$$= \pi d$$

$$\left. \begin{array}{l} \\ \end{array} \right\} \begin{array}{l} r = \text{radius} \\ d = \text{diameter} \end{array}$$

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(14) Area of Circle = πr^2

(6)

(15) Distance between two points (x_1, y_1) & (x_2, y_2)
$$= \sqrt{(y_2 - y_1)^2 + (x_2 - x_1)^2}$$

Eg. Distance between points $(2, 3)$ & ~~$(0, 3)$~~ $(-1, -1)$
$$= \sqrt{(-1 - 2)^2 + (-1 - 3)^2} = \sqrt{9 + 16} = 5$$

(16) Slope of line passing through (x_1, y_1) & (x_2, y_2)
$$= \frac{y_2 - y_1}{x_2 - x_1}$$

Eg. $(2, 3)$ & $(-1, -1)$
$$\text{slope} = \frac{-1 - 3}{-1 - 2} = \frac{-4}{-3} = \frac{4}{3}$$

(17) Simple Interest

$$= \frac{P \times n \times r}{100}$$

where

P = Principal

n = # of years

r = Rate of Interest in decimal

Eg. \$12,000 is deposited in an account earning 6% Simple Interest for 9 months. Calculate the Interest

$$\text{Interest} = 12000 \times \frac{9}{12} \times 0.06 = \underline{\underline{\$540}}$$

(18) Compound Interest

$$A = P \left[1 + \frac{r}{c} \right]^{nc}$$

where

A = final Amount

C = # of times compounded Annually

Ex.

\$10,000 Invested @ 8% annual interest ~~Compounded~~ semi-annually for 1 yr.

$$A = 10000 \left[1 + \frac{0.08}{2} \right]^{1 \times 2}$$

$$= 10000 (2.08)^2$$

(19) $n \% 7 = 5$

Find $(2n) \% 7$

note % is shorthand for remainder
so when 'n' is divided by 7, the remainder is 5

Solve by example

if $n = 12$, then $12 \% 7 = 5$

$$\therefore 24 \% 7 = \underline{\underline{3}}$$

(20) Average Round-trip time

$$= \frac{2ab}{a+b} \quad \left. \begin{array}{l} \text{where} \\ a \ \& \ b \text{ are the } \text{average} \text{ speed at each trip} \end{array} \right\}$$

Ex. While going to work, I drive at 40 m/h, & while returning I drive at 60 m/h.

$$\text{Average Round-trip time} = \frac{2 \times 40 \times 30}{40+30} = \underline{\underline{48 \text{ m/h}}}$$

(21)

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$$\frac{1}{r} + \frac{1}{s} = \frac{1}{t} \quad \left\{ \begin{array}{l} \text{where} \\ r = \text{time taken by first person} \\ s = \text{time taken by second person} \\ t = \text{time taken together} \end{array} \right.$$

Ex.

Joe takes 4 hours to paint a room

Mary takes 8 hours to paint same room

If they work together, how much time do they take?

$$\frac{1}{t} = \frac{1}{4} + \frac{1}{8}$$

$$= \frac{3}{8}$$

$$\therefore t = \frac{8}{3} \text{ hrs}$$

(22) Dilution & Mixture ProblemMethod - I

5 lb of Raisins costing \$1.00 / lb

2 lb of Almonds costing \$2.40 / lb.

If mixed, how much is the cost per pound?

$$\frac{(5 \times 1) + (2 \times 2.40)}{5 + 2} = \$1.40 / \text{lb}$$

Method - II

$$[A(d-w) \times w_a] = [A(s-d) \times s_a]$$

where

d = % strength or cost of desired solution

w = % or cost of weaker solution

s = % or cost of stronger solution

w_a = Amount of weaker solutions_a = Amount of stronger solution

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⑨

Example

How many litres of solution that consists of 10% alcohol must be added to 2 litres of solution with 50% alcohol to get a solution with 15% alcohol

Here

$$d = 15$$

$$w = 10$$

$$S = 50$$

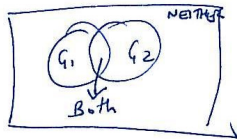
$$W_a = ?$$

$$S_a = 2$$

$$\therefore W_a (15 - 10) = 2 (50 - 15)$$

$$W_a = \frac{2 \times 35}{5} = \underline{\underline{14}}$$

②③ Venn Diagram



$$\text{Total} = G_1 + G_2 + \text{Neither} - \text{Both}$$

Eg.

From 120 students, 65 study French, 51 study Spanish & 53 study Neither. How many study both?

$$120 = 65 + 51 + 53 - \text{Both}$$

$$\Rightarrow \text{Both} = \underline{\underline{49}}$$

(24) Permutation

of ways to arrange : Order important

$${}_nP_k = \frac{n!}{(n-k)!}$$

Eg. From a race of 5 people, How many different ways can you arrange Gold, Silver & Bronze winners?

$${}_5P_3 = \frac{5!}{(5-3)!} = \frac{5 \cdot 4 \cdot 3 \cdot \cancel{2!}}{\cancel{2!}} = 60$$

(25) Combinations

of ways to select : order NOT important

$${}_nC_k = \frac{n!}{(n-k)!k!}$$

Eg. How many different winners can you choose from 5 people, if a race can have 3 winners.

$${}_5C_3 = \frac{5!}{(5-3)!3!} = \frac{5 \cdot 4 \cdot \cancel{3!}}{\cancel{2!} \cdot \cancel{3!}} = 10$$

(26) Multiple Event Probability

Step #1 : Find probability of individual event

Step #2 : Multiply the individual probabilities.

Eg. A class consists of 3 girls & 2 boys.

If 2 people are randomly selected, what is the probability that both are boys?

→ Probability that first is boy = $\frac{2}{5}$

Probability that ~~the~~ second is boy = $\frac{1}{4}$

$$\therefore \text{Probability that both are boys} = \frac{2}{5} * \frac{1}{4} = \boxed{\frac{1}{10}}$$

(27) Standard Deviation

(11)

$$SD = \sqrt{\frac{\sum (x - \bar{x})^2}{n}}$$

where
 x = Each number
 \bar{x} = mean of numbers
 n = total number of elements

Ex: calculate S.D of

$$54, 61, 70, 49, 56 \Rightarrow (n=5)$$

$$\bar{x} = \frac{54+61+70+49+56}{5} = 58$$

x	$(x - \bar{x})$	$(x - \bar{x})^2$
54	-4	16
61	3	9
70	12	144
49	-9	81
56	2	4
		254

$$\therefore S.D = \sqrt{\frac{254}{5}} \approx 7.1$$

(12)

(28) Linear Equation of a line

$$y = mx + c$$

where : m = slope of line

c = y -intercept of line

(29) Polygon's

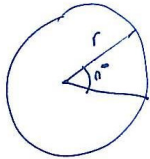
(a) Sum of angles of polygon with ' n ' sides

$$= (n-2) \times 180$$

(b) measure of each angle of a regular polygon of n -sides

$$= \frac{(n-2) \times 180}{n} \quad \left(\begin{array}{l} \text{All angles are equal} \end{array} \right)$$

(30) Length of an ARC



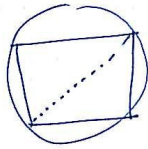
$$\text{Length of Arc} = 2\pi r \times \frac{n}{360}$$

(31) Area of Sector



$$\text{Area of Sector} = \pi r^2 \times \frac{n}{360}$$

(32) Area of Inscribed Figure



Area of Square = 36 (\because Each side = 6)

Find Circumference of Circle

Diagonal of Square forms 45-45-90 Δ

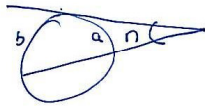
\therefore length of diagonal = $\sqrt{2} \times 6 = 6\sqrt{2}$

\therefore Radius = $3\sqrt{2}$

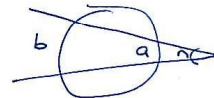
\therefore Circumference = $2\pi \cdot 3\sqrt{2}$

$$= \underline{6\sqrt{2}\pi}$$

(33) Angle outside Circle

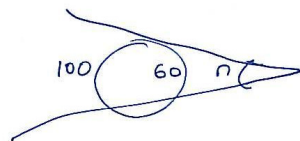


OR



$$n = \frac{|a-b|}{2}$$

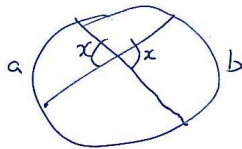
Eg.



$$n = \frac{|100-60|}{2}$$

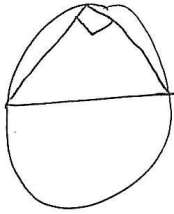
$$= \underline{\underline{20^\circ}}$$

(34) Angle inside Circle



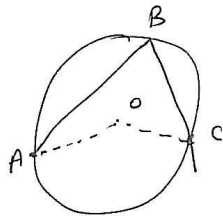
$$x = \frac{a+b}{2}$$

35



If Endpoints of a Δ consist of 2 Endpoints that form the diameter of a circle, and the 3rd Endpoint is on the edge of circle, then the angle formed at the Edge of Circle = 90°

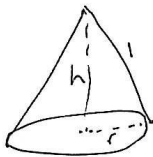
36 Inscribed Angle = $\frac{1}{2} \times \text{Arc}$



$$\angle ABC = \frac{1}{2} \times \angle AOC$$

37

Cone

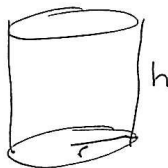


$$\text{Area} = \pi r l + \pi r^2$$

$$\text{Volume} = \frac{1}{3} \pi r^2 h$$

38

Cylinder



$$\text{Area} = 2\pi r(r+h)$$

$$\text{Volume} = \pi r^2 h$$

(39) sphere

$$\text{Area} = 4\pi r^2$$

$$\text{Volume} = \frac{4}{3}\pi r^3$$

(40) Arithmetic Progression (A.P.)

$$a, (a+d), (a+2d), \dots, [a+(n-1)d], \dots$$

$$(i) n^{\text{th}} \text{ term} = a + (n-1)d$$

$$(ii) \text{Sum of first } n \text{ terms} = \frac{n}{2} [2a + (n-1)d]$$

(41) Geometric Progression (G.P.)

$$a, ar, ar^2, ar^3, \dots, ar^{n-1}, \dots$$

$$(i) n^{\text{th}} \text{ term} = ar^{n-1}$$

$$(ii) \text{Sum of first } n \text{ terms} = \frac{a(1-r^n)}{(1-r)} \quad (\text{where } r \neq 1)$$

(42) Binomial Probability

$$= {}^nC_r \times p^r \times q^{(n-r)}$$

where

p = Probability of favorable outcome
 q = " " unfavorable outcome
 $= (1-p)$

n = # of events

r = # of desired outcomes

Eg. Joe hits a target 4 out of 5 times.

What is the probability that he hits 7 out of 9 times
 $p = \frac{4}{5}$, $q = 1 - \frac{4}{5} = \frac{1}{5}$, $n = 9$, $r = 7$

$$\therefore \text{Probability} = {}^9C_7 \times \left(\frac{4}{5}\right)^7 \times \left(\frac{1}{5}\right)^2 \quad \boxed{\text{OVER}}$$

43) In an equilateral triangle, the centroid of the triangle cuts the altitude in the ratio 2:1, with the shorter segment closer to the side with which the altitude forms a right-angle