**3 DEDUCTIVE REASONING**

**Introduction**

In deductive reasoning we talk about syllogism.

A syllogism is a deductive argument relating two premises and a conclusion all of which are qualified propositions *i.e.* propositions joining concepts by using words such as 'some' and 'all'.

**Relevance in CAT**

Questions on deductive reasoning are very important from the CAT exam point of view. To have a grip on this topic, you should strive hard to visualize the venn diagram and not to draw it, as venn diagrams are nothing but crutches and unnecessarily take time.

**DEDUCTIVE LOGIC**

Consider the following example.

1. All birds have wings.

2. Parrot is a bird.

3. Parrot has wings.

Irrespective of any other characteristics of a Parrot, *i.e.* it is green in colour etc., the conclusion that parrot has wings holds good, if (1) and (2) above are true.

Some characteristics of deductive logic:

a. It is a valid argument.

b. Nothing can further strengthen this argument, *i.e.* no statement can make the conclusion more valid.

c. Another way of looking at deductive logic is that when a 'specific' conclusion is derived from a set of general state- ments, then it is a deductive logic.

The premises in deductive logic can be either affirmative or negative and can also be universal or particular. Thus, we have basically four types of premises.

Let understand each of these four statement in their entirety\_

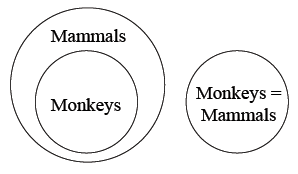
**All Monkeys are Mammals**

This statement means that there is no monkey which is not mammal. If we use the concepts of set theory, it means that monkey is a sub-set of mammals.

One of the most common mistake, made in interpreting this statement is that there are certain mammals which are not monkeys. This is false at it. It is just a possibility that there are certain mammals that are not monkeys but we cannot be sure of it. It is quite possible that the entire set of monkeys and mammals overlap with each other.

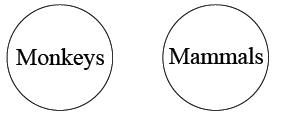
Similarly, we also cannot conclude that 'All mammals are monkeys' as there is a possibility of some mammals not being monkeys.

Thus, there are two possible venn diagrams for this statement:



**No Monkey is Mammal**

This statement is the simplest and has just one interpretation *i.e.* the two sets of monkey and mammals are disjoint or do not overlap.



Thus, we can conclude that no monkey is a mammal and also that no mammal is a monkey.

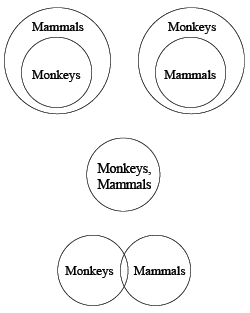
**Some Monkeys are Mammals**

The meaning of this statement is that there is atleast one monkey which is a mammal.

Thus, we can also conclude from this statement that 'some mammals are monkeys because there is atleast one entity which is both a monkey and mammal.

This statement is most prone to be misunderstood. One of the most common misunderstandings of this statement is the conclusion 'Some monkeys are not mammals.' 'Some monkeys are mammals' does not mean 'Some monkeys are not mammals'.

In fact, there are FOUR possible venn diagrams for this statement.



**Some Monkeys are not Mammals**

Again here all that we know is that there is atleast one monkey which is not a mammal.

Please note that 'atleast'. It is quite possible that no monkey may be a mammal. Thus, the conclusion that 'Some monkeys are mammals' cannot follow this statement.

To summarize:

|  |  |  |
| --- | --- | --- |
|  | **Correct**  **conclusion** | **Commonly made wrong conclusion** |
| All Monkeys are Mammals | Some Mammals are Monkey | All Mammals are Monkey |
| No Monkey is Mammal | No Mammal is Monkey | **\_\_\_\_** |
| Some Monkeys are Mammals | Some Mammals are Monkey | Some Monkeys are not Mammals |
| Some Monkeys are not Mammals | \_\_\_\_ | Some Mammals are not Monkeys |

**1. All monkeys are mammals; All lions are animals**

There is no monkey which are outside mammals and also no mammal which is outside animals. Thus, no monkey is outside animals and we can conclude that – All monkeys are animals. We can also conclude that some animals are monkey (it is also possible that all animals are monkey)

**2. All monkeys are mammals. Some mammals are animals.**

Some mammals are animals that there is atleast one which is both mammal and animal. However, we cannot be sure whether this entity (which is both mammal and animal) is also a monkey as we are not sure that all mammals are monkeys. Thus, we cannot draw any conclusion.

Also please realize that all the following are possibilities (but not a conclusion *i.e.* not a necessity)

But all of the following conclusions are valid simply because of the word 'maybe':

a. Some monkeys may be animals

b. All monkeys may be animals

c. Some monkeys may not be animals

d. All monkeys may not be animals

In most problems involving a 'particular - affirmative' premise, focusing on the common element helps one solve the problem quickly.

**3. All monkeys are animals. Some monkeys are mammals.**

Focus on the entity which is both monkey and mammal. Also, since this entity is a monkey, it also has to be an animal. Thus, we have found atleast one entity which is a mammal and animal and hence, we can conclude that 'some mammals are animals' or alternatively 'some animals are mammals'.

**4. All monkeys are mammals. All mammals are animals.**

This is straightforward as we know that no monkey is outside mammals and the sets of mammals and animals are disjoint and thus, we can conclude that 'All monkeys are not animals' and also 'All animals are not monkeys'.

**5. Some monkeys are mammals. Some mammals are not animals.**

Again here focus on the entity which is both a monkey and a mammal. Is this entity an animal or not? We just know that there exists atleast one mammal which is not an animal. Whether this mammal, which is not an animal, is the same mammal which a monkey is not known. It may also be or may even not be. Thus, we cannot draw any conclusion.

The above examples should provide the general approach to these types of problems.

**Practice Exercise – Easy**

**Directions (Q. Nos. 1 − 13):** *In each question a set of six statements is given, followed by four answer choices. Each of the answer choices has a combination of three statements from the given set of six statements. You are required to identify the answer choice in which the statements are logically related.*

1. A. Actors know acting.

B. He does not know acting.

C. He is an actor.

D. He is not an actor.

E. He knows Spanish.

F. He should know acting.

a. ADB

b. AEF

c. DEA

d. ACF

2. A. All businessman are logical.

B. Ram is rational.

C. Ram is a logical businessman.

D. Ram is a man.

E. Some men are businessman.

F. All men are rational.

a. DEC

b. EAF

c. BCF

d. FDB

3. A. Some rings are round.

B. All balls are rings.

C. All balls are round.

D. No ring is round.

E. A few rounds are rings.

F. No round is a ball.

a. BCA

b. DFB

c. CDE

d. EFD

4. A. All girls are smart.

B. A few girls are beautiful.

C. Some beautiful are girls.

D. All smart are beautiful.

E. No beautiful is girl.

F. No smart is a girl.

a. AEF

b. AFC

c. ADC

d. BEF

5. A. Loreal is a shampoo.

B. Some shampoos contain ammonia.

C. All shampoos do not contain ammonia.

D. All shampoos contain chemicals.

E. Loreal has ammonia.

F. Loreal contains chemicals.

a. BCE

b. AEB

c. FDA

d. AEF

6. A. Some actors are comedian.

B. Rohan is a comedian.

C. Bali is an actor.

D. Bali is a guitarist

E. All guitarists are actors.

F. Rohan is an actor.

a. BED

b. ADC

c. DEC

d. ABF

7. A. Some novels are fiction.

B. All magazines are fictions.

C. Some magazines are glamorous.

D. Some magazines may be glamorous.

E. Some fictions are glamorous.

F. Some glamorous books are not magazines.

a. BEC

b. DEB

c. ABC

d. BED

8. A. Riddhima is cunning.

B. Some bold people are cunning.

C. All cunning people are smart.

D. Not all cunning people are bold.

E. Riddhima is smart.

F. Riddhima is bold.

a. CAE

b. CEA

c. ADF

d. DFA

9. A. All lions are animals.

B. All animals are not lions.

C. All animals are crazy.

D. All lions are dangerous.

E. All animals are dangerous.

F. Lions are crazy.

a. ADE

b. BED

c. ABE

d. ACF

10. A. Some men are not dumb.

B. Some men are dumb.

C. Not all men are dumb.

D. Not all men are not dumb.

E. Govil is a man.

F. Govil is not dumb.

a. EFA

b. EFB

c. ACD

d. EFD

11. A. No woman is rude.

B. No rude person is a woman.

C. All teachers are women.

D. No teacher is rude.

E. All women are teachers.

F. Some women are not rude.

a. EFD

b. CAD

c. ABD

d. ECB

12. A. All cats are bats.

B. All bats are mats.

C. No bats are rats.

D. No bats are mats.

E. All rats are mats.

F. All mats are rats.

a. ABE

b. DBE

c. FAB

d. AFE

13. A. Smoking causes cancer.

B. Smoking causes illness.

C. Smoking sometimes causes pollution.

D. Illness causes cancer.

E. Smoking causes pollution and cancer.

F. All smokers cause pollution and cancer.

a. ABE

b. FEC

c. DBF

d. BDA

**Directions (Q. Nos. 14 − 20):** *In each question four sets of three sentences are given. You have to identify whether the three sentences in each of these sets are logically related.*

14. A. All men are humans. All humans have brain. All brains are intellectual.

B. All women are pretty. All heroines are pretty. All women acts.

C. Mango is a seasonal fruit. Grape is a seasonal fruit. Mangoes are grapes.

D. All cones are cylindrical. All tanks are cylindrical. Some tanks may be cones.

a. D

b. A and B

c. C and B

d. B

15. A. Laxman is a good boy. Kanishk is a good boy.

Laxman likes Kanishk.

B. Some engineers are magicians. All magicians are rational. All engineers are rational.

C. Some dumb are intelligent. Some who are intelligent are smart. Some dumb are smart.

D. All merchants are trained. All who are trained are professional. All merchants are professional.

a. B

b. C

c. A

d. D

16. A. Suman is fair. An MBA marries only fair girls. Suman

is married to an MBA.

B. Sachin Tendulkar is a sportsman. Sportsmen are healthy. Sachin Tendulkar is healthy.

C. Lalit is honest. All honest are boys. Lalit is a boy.

D. Some flies are insects. Some insects are carnivorous. Some flies are carnivorous.

a. B

b. D

c. B and C

d. A

17. A. Directors are actors. Actors are distributors. Directors are distributors.

B. Toys are plastic. Plastics are utensils. Some toys are not utensils.

C. Radha goes to school. Radha is rarely absent from school. Radha is intelligent.

D. Climbers need stamina. Khushi is a climber. Khushi needs stamina.

a. A and D

b. A and B

c. B and C

d. C and D

18. A. Elephants live in jungles. Houses are in jungles. El elephants live in houses.

B. Chairs play lawn tennis. Lawn tennis is an easy game. Chairs cannot play difficult games.

C. No poor person is polite. Some sportsmen are poor. Sportsmen are not polite.

D. Engineers are absent minded. No absent minded persons are crazy. Engineers are not crazy.

a. A

b. B

c. C

d. D

19. A. Consuming Tobacco is injurious to the lungs. Rohan consumes tobacco. Rohan cannot be a cancer patient.

B. All colleagues are friends. Hari and Govind are colleagues. Hari and Govind are friends.

C. Some movies are suspense thriller. All movies are informative. Some movies are suspense thriller and informative.

D. Some kites have wings. All wings are heavy. All kites are heavy.

a. A and B

b. B and C

c. C

d. D

20. A. All quadrilaterals are 4 sided. This has 4 sides. This is a quadrilateral.

B. Some petals are flowers. No flower is rose. Some petals are rose.

C. Some chocolates are bitter. Some fruits are bitter. Some chocolates are fruits.

D. All pigs are dirty. Dirt leads to disease. Pigs are not diseased.

a. A

b. B

c. C

d. D

**Practice Exercise – Medium**

**Directions (Q. Nos. 1 − 2):***In each question four sets of three sentences are given. You have to identify whether the three sentences in each of these sets are logically related.*

1. A. He is either a hockey player or a basketball player. He is a hockey player. He is a basketball player.

B. Krishan has impeccable manners. CEO have impeccable manners. Krishna is a CEO.

C. Something from Pluto are dogs. Nothing from Pluto is real. Dogs from Pluto are unreal.

D. All pigs are dirty. Dirt leads to disease. Pigs are not diseased.

a. A and C

b. B and C

c. C

d. D

2. A. Painting is an art. Painting is learnt. Learning is an art.

B. Most boys commit blunders. Professors are boys. Professors cannot commit blunders.

C. All flowers are red. All fruits are red. All flowers are fruits.

D. No toy is a car. All cars are plastics. Some plastics are not toys.

a. A and B

b. A and C

c. A

d. D

**Directions (Q. Nos. 3 − 4):** *Each question has a set of four statements. Each statement has three segments. Choose the alternative where the third segment in the statement can be logically deduced using both the preceding two, but not just from one of them.*

3. A. All earthquakes cause havoc. Some landslides cause havoc. Some earthquakes cause landslides.

B. All glass things are transparent. Some curios are glass things. Some curios are transparent.

C. All clay objects are brittle. All XY are clay objects. Some XY are brittle.

D. No criminal is a patriot. Ram is not a patriot. Ram is a criminal.

a. D only

b. B only

c. C and B

d. A only

4. A. All IIMs are in India. No BIMs are in India. No IIMs are BIMs.

B. All IIMs are in India. No BIMs are in India. No BIMs are IIMs.

C. Some IIMs are not in India. Some BIMs are not in India. Some IIMs are BIMs.

D. Some IIMs are not in India. BIMs are not in India. Some BIMs are IIMs.

a. A and B

b. C and D

c. A only

d. B only

**Directions (Q. Nos. 5 − 6):** *Each question consists of five statements followed by options consisting of three statements put together in a specific order. Choose the option which indicates a valid argument, that is, where the third statement is a conclusion drawn from the preceding two statements.*

5. A. Apples are not sweets.

B. Some apples are sweet.

C. All sweets are tasty.

D. Some apples are not tasty.

E. No apple is tasty.

a. CEA

b. BDC

c. CBD

d. EAC

6. A. All actors are handsome.

B. Some actors are popular.

C. Ram is handsome.

D. Ram is a popular actor.

E. Some popular people are handsome.

a. ACD

b. ABE

c. DCA

d. EDC

**Directions (Q. Nos. 7 − 8):** *Each question contains four arguments of three sentences each. Choose the set in which the third statement is a logical conclusion of the first two.*

7. A. Some icicles are cycles. All cycles are men. Some icicles are men.

B. All girls have teeth. No teeth are yellow. No girls are yellow.

C. No hand is foot. Some feet are heads. Some hands are heads.

D. Every man has a wife. All wives are devoted. No devoted has a husband.

a. A, B and C

b. A and B

c. C and B

d. A, B and C and D

8. A. Sun is white. All moon is sun. All moon is white.

B. All windows are open. No open space is allocated. All window is closed space.

C. No German can fire. All Americans bombard. Germans are Americans can fight.

D. No X is Z. No Z is Y. No X is Y.

a. A only

b. B only

c. C only

d. D only

**Directions (Q. Nos. 9 − 20):** *In each question a set of six statements is given, followed by four answer choices. Each of the answer choices has a combination of three statements from the given set of six statements. You are required to identify the answer choice in which the statements are logically related.*

9. A. An ostrich lays eggs.

B. All birds lay eggs.

C. Some birds can fly.

D. An ostrich cannot fly.

E. An ostrich is a bird.

F. An ostrich cannot swim.

a. BEA

b. ABE

c. DEC

d. ECB

10. A. Some furniture is wood.

B. All wood is good.

C. All that is good is wood.

D. All wood is furniture.

E. All furniture is good.

F. Some furniture is good.

a. BED

b. BDF

c. FAB

d. FBA

11. A. Some bands are rubber.

B. All tyres are band.

C. All rubbers are band.

D. No band is tyre.

E. No rubber is band.

F. Some rubber is tyre.

a. BCA

b. AFE

c. DEC

d. CEA

12. A. Some sparrows are flies.

B. Some flies are mosquitoes.

C. All mosquitoes are flies.

D. Some bats are flies.

E. All bats are mosquitoes.

F. Some mosquitoes are not bats.

a. ABC

b. CEF

c. ADE

d. EDB

13. A. Ten is Six.

B. Six is not two.

C. Some six is fifteen.

D. Some ten is eleven.

E. Some eleven is six.

F. Some fifteen is two.

a. ADE

b. ABC

c. AEF

d. EDC

14. A. Some men are bad.

B. All men are sad.

C. All bad things are men.

D. All bad things are sad.

E. Some sad things are men.

F. Some sad things are bad.

a. AFE

b. BCF

c. BDA

d. BCE

15. A. All vegetarians eat meat.

B. All those who eat meat are not vegetarians.

C. All those who eat meat are herbivorous.

D. All vegetarians are carnivorous.

E. All those who eat meat are carnivorous.

F. Vegetarians are herbivorous.

a. BCE

b. ABE

c. ACD

d. ACF

16. A. Some abra are dabra.

B. All abra are cabra.

C. All dabra are abra.

D. All dabra are not abra.

E. Some cabra are abra.

F. Some cabra are dabra.

a. AEF

b. BCF

c. ABD

d. BCE

17. A. No game is a plane.

B. All rains are planes.

C. No rain is a game.

D. Some rains are not games.

E. Some games are rains.

F. Some planes are not games.

a. ACD

b. ADF

c. ABC

d. CDF

18. A. All girls are beautiful.

B. All dolls are beautiful.

C. All dolls are girls.

D. Some dolls are beautiful.

E. Some beautiful are girls.

F. No girl is beautiful.

a. CDE

b. CEF

c. ACD

d. BEF

19. A. Some buildings are not skyscrapers.

B. Some skyscrapers are not buildings.

C. No structure is a sky scrapper.

D. All skyscrapers are structures.

E. Some skyscrapers are buildings.

F. Some structures are not buildings.

a. ACE

b. BDF

c. FDA

d. ACF

20. A. All bowls are containers.

B. No container is a utensil.

C. No bowl is a utensil.

D. Some utensils are containers.

E. Some bowls are utensils.

F. No utensil is a bowl.

a. BDE

b. ACB

c. CDF

d. ABF

**Practice Exercise – Difficult**

**Directions (Q. Nos. 1 − 4):** *Each question has a set of four statements. Each statement has three segments. Choose the alternative where the third segment in the statement can be logically deduced using both the preceding two, but not just from one of them.*

1. A. No cowboys laugh. Some who laugh are sphinxes. Some sphinxes are not cowboys.

B. All ghosts are florescent. Some ghosts do not sing. Some singers are not florescent.

C. Cricketers indulge in swearing. Those who swear are hanged. Some who are hanged are not cricketers.

D. Some crazy people are pianists. All crazy people are whistlers. Some whistlers are pianists.

a. A and B

b. C only

c. A and D

d. D only

2. A. All good people are knights. All warriors are good people. All knights are warriors.

B. No footballers are ministers. All footballers are tough. Some ministers are players.

C. All pizzas are snacks. Some meals are pizzas. Some meals are snacks.

D. Some barkers are musk deer. All barkers are sloth bears. Some sloth bears are musk deer.

a. C and D

b. B and C

c. A only

d. C only

3. A. Dinosaurs are prehistoric creatures. Water-buffaloes are not dinosaurs. Water - buffaloes are not prehistoric creatures.

B. All politicians are frank. No frank people are crocodiles. No crocodiles are politicians.

C. No diamond is quartz. No opal is quartz. Diamonds are opals.

D. All monkeys like bananas. Some GI joes like bananas. Some GI joes are monkeys.

a. C only

b. B only

c. A and D

d. B and C

4. A. MD is an actor. Some actors are pretty. MD is pretty.

B. Some men are cops. All cops are brave. Some brave people are cops.

C. All actors are brave. Some Men are cops. Some men are brave.

D. All actors are pretty. MD is not an actor. MD is not pretty.

a. A and D

b. B only

c. C only

d. B and D

**Directions (Q. Nos. 5):** *Each question consists of five statements followed by options consisting of three statements put together in a specific order. Choose the option which indicates a valid argument, that is, where the third statement is a logical conclusion drawn from the preceding two statements.*

5. A. No patriot is a criminal.

B. Bundelas is not a criminal.

C. Bundelas is a patriot.

D. Bogusdas is not a patriot.

E. Bogausdas is a criminal.

a. ACB

b. ABC

c. ADE

d. ABE

**Directions (Q. Nos. 6 − 7):** *Each question contains four arguments of three sentences each. Choose the set in which the third statement is a logically conclusion of the first two.*

6. A. Some Xs are Ps. Some Ps are Ys. Some Xs are Ys.

B. All sons are bright. Some bright are crazy. Some sons are crazy.

C. No faith is strong. Only strong have biceps. No faith has biceps.

D. All men are weak. Some weak are strong. Something are weak.

a. A and D

b. C only

c. D only

d. None of these

7. A. All triangles are squares. All squares are rectangular. All triangles are rectangular.

B. Some fat are elongated. Some elongated things are huge.

C. Idiots are bumblers. Bumblers fumble. Idiots fumble.

D. Water is good for health. Health food are rare. Water is rare.

a. D only

b. C only

c. Both A and C

d. All of these

**Directions (Q. Nos. 8 − 15):** *In each question a set of six statements is given, followed by four answer choices. Each of the answer choices has a combination of three statements from the given set of six statements. You are required to identify the answer choice in which the statements are logically related.*

8. A. Ice creams are sweet.

B. All ice creams are chocolates.

C. Some sweets are chocolates.

D. Some ice creams are chocolates.

E. All sweets are bitter.

F. Some chocolates are bitter.

a. DAC

b. CDA

c. BCA

d. EFC

9. A. Diamonds are stones.

B. Diamonds are colourful.

C. Stones are colourful.

D. Ornaments are colourful.

E. Stones are ornaments.

F. Ornaments are hard.

a. ACB

b. FED

c. CEA

d. ABC

10. A. Cows sleep in the open.

B. Buffaloes sleep in doors.

C. Cows are like buffaloes.

D. All indoors are buffaloes.

E. Some cows are not buffaloes.

F. Some open are not buffaloes.

a. AFE

b. DCA

c. ABE

d. None of these

11. A. Some nail are made of aluminium.

B. All aluminium is made of iron.

C. All irons is used for nails.

D. Some aluminium is iron.

E. Some nails are used for aluminium.

F. Some iron is used for nail.

a. ABC

b. CEF

c. CDA

d. ABE

12. A. No wife is a life.

B. All life is strife.

C. Some wife is strife.

D. All that is wife is life.

E. All wife is strife.

F. No wife is strife.

a. BEF

b. FCB

c. ABF

d. BDE

13. A. Poor girls want to marry rich boys.

B. Rich girls want to marry rich boys.

C. Poor girls want to marry poor girls.

D. Rich boys want to marry rich girls.

E. Poor girls want to marry rich girls.

F. Rich boys want to marry poor girls.

a. ADE

b. ABC

c. BCE

d. DEF

14. A. All Toms are clever.

B. No clever Toms are Jerry.

C. Some Toms are Jerry.

D. Some Jerry are clever.

E. No Tom is a Jerry.

F. No Jerry is a Tom.

a. ABC

b. BEF

c. ABF

d. CDA

15. A. No triangle is a rectangle.

B. All squares are rectangles.

C. No square is a triangle.

D. Some squares are not triangles.

E. Some triangles are squares.

F. Some rectangles are not triangles.

a. ABC

b. ACB

c. DFA

d. BDA