

UPPSC-AE

2024 | Preliminary
Examination

PRACTICE BOOK of ENGINEERING APTITUDE

2000+

Solved Practice Questions

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Examination

Practice book of Engineering Aptitude

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Solved Practice Questions

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General Principles of Design & Drawing

1

Q.1 Trial runs are recommended for which of the following reasons?

1. Trial runs provide an opportunity to remedy the situation during the experiment.
2. Trial runs provide a final chance to fine-tune levels of a factor.
3. Trial runs provide a chance to make any needed changes in the experimental plan during experiment.
4. Trial runs can help considerably in estimating the time to complete a run, the logistical support required for level changes and total time needed to complete an experiment.

Select the correct answer using the code given below:

- (a) 1, 2, 3 and 4 (b) 1 and 3 only
(c) 2 and 4 only (d) 2, 3 and 4 only

Q.2 In EVAD method the results are entered on diagram giving an evaluation profile for each idea. The profiles are compared in a

- (a) Qualitative (b) Quantitative
(c) Both (a) and (b) (d) None of the above

Q.3 Dimensions in series may be placed in any one of the following ways except

- (a) Progressive dimensioning
(b) Proportional dimensioning
(c) Continuous dimensioning
(d) Chain dimensioning

Q.4 Points to be remembered while dimensioning:

1. Dimensions are to be placed on the view which clearly express the relevant features.
2. Once dimension is marked in one view, it should not be repeated in another view.
3. Dimensions are to be drawn from hidden lines.
4. Dimensions should be given from the base line or centre line of a hole.

Which of the above statements are correct?

- (a) 1, 2, and 3 only (b) 1, 2 and 4 only
(c) 1, 3, and 4 only (d) 2, 3, and 4 only

Q.5 On a multi view drawing a visible or invisible line represents the following:

1. Intersection of two surfaces
 2. Edge view of surface
 3. Limiting elements of a surface
- Which of the above points are correct?

- (a) 1 and 2 only (b) 2 and 3 only
(c) 1 and 3 only (d) 1, 2 and 3

Q.6 Which one of the following is/are used for drawing curves which cannot be drawn with a compass?

- (a) Scale (b) Protractor
(c) French curves (d) Set square

Q.7 Which of the following pencil leads is hardest?

- (a) H (b) HB
(c) B (d) F

Q.8 A device which combines the function of a T-square, set square, protractor and scale is called

- (a) mini drafter (b) combination set
(c) fasteners (d) templates

Q.9 Parallel lines can be drawn with the help of

- (a) T-square (b) Mini drafter
(c) Pair of set-square (d) All of these

Q.10 The length-to-height ratio of a closed filled arrow head is

- (a) 2 : 1 (b) 1 : 1
(c) 3 : 1 (d) 1 : 3

Q.11 The line passing through the focus and perpendicular to the directrix is called

- (a) Axis (b) Vertex
(c) Eccentricity (d) Conic

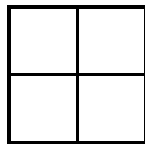
Q.12 longitudinal section of Reflectors of head lamps of automobiles are having shape of

- (a) Ellipse (b) Parabola
(c) Hyperbola (d) Square

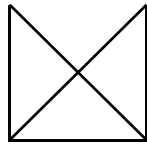
Q.13 For orthographic projection method, BIS recommends the following projection

- (a) First angle projection
(b) Second angle projection
(c) Third angle projection
(d) Fourth angle projection

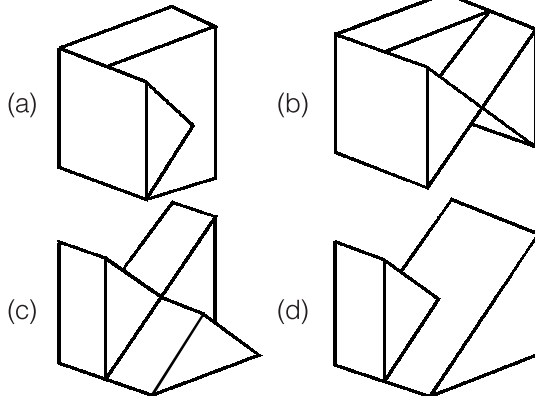
Q.14 For the given Top view and Front view orthographic projections, identify the correct pictorial view.



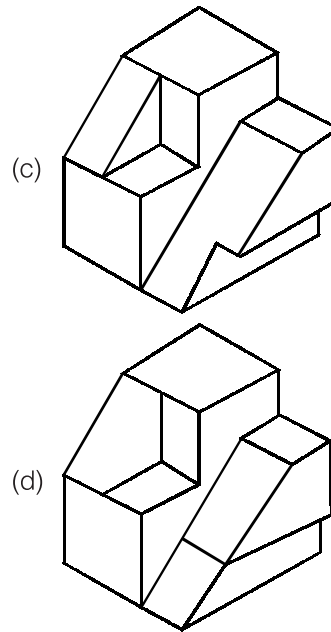
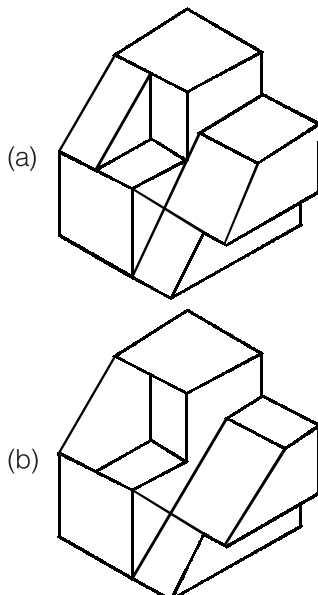
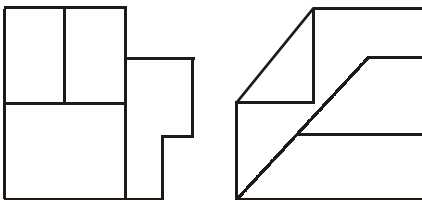
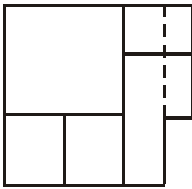
Top View



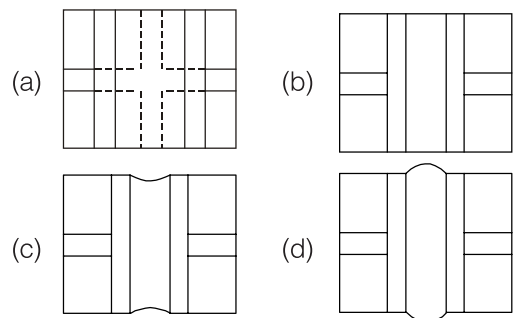
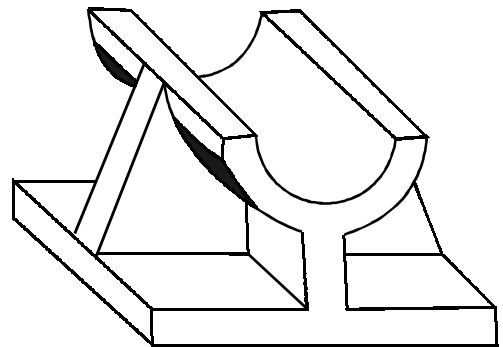
Front View



Q.15 Identify correct pictorial view of given orthographic projections



Q.16 What will be the correct Top view of given pictorial view.



Q.17 A point is lying in the H.P. and its top view is above reference line. Its front view is

- (a) Above reference line
- (b) On reference line
- (c) Below reference line
- (d) Any of the above

Q.18 The elevation of a point is 40 mm above reference line and the plan is 50 mm below reference line. The point is

- (i) 40 mm below HP
- (ii) 40 mm above HP
- (iii) 50 mm in front of V.P.
- (iv) 50 mm behind V.P.

Of the above statements, true statements are

- (a) (i) and (iii) (b) (i) and (iv)
- (c) (ii) and (iv) (d) (ii) and (iii)

Q.19 If a line is perpendicular to the V.P. and its V.T. coincides with its front view which is a point, then

- (a) V.T. is a point on H.P.
- (b) H.T. is a point on V.P.
- (c) it has no V.T.
- (d) it has no H.T.

Q.20 If a line is inclined to the H.P. and parallel to the V.P., then it has

- (a) No trace
- (b) Only V.T. but no H.T.
- (c) Both H.T. and V.T.
- (d) Only H.T. but no V.T.

Q.21 For a line situated in the first quadrant, which of the following statements is not correct?

- (a) HT and VT may lie above xy
- (b) HT and VT may lie below xy
- (c) HT may lie above xy and VT below xy
- (d) HT may lie below xy and VT above xy

Q.22 If both the front and top views of a line are perpendicular to the reference line, the true inclination of line with H.P. and V.P. may be respectively

- (a) 30° and 60° (b) 20° and 70°
- (c) Both 45° (d) Any of these

Q.23 The internal angle of a hexagon is

- (a) 108° (b) 120°
- (c) 72° (d) 110°

Q.24 If a circular plane is inclined at 30° with the H.P. and 60° with the V.P., its side view will be

- (a) Straight line (b) Ellipse
- (c) True shape (d) Circle

Q.25 A cube is resting on a face in the H.P. with vertical faces equally inclined to the V.P. It is cut by an A.I.P. The true shape of the section can be

- (a) Triangle (b) Rhombus
- (c) Hexagon (d) Any of these

Q.26 Which one of the following statements is correct in the development of lateral surfaces of solids?

- (a) The development of a right cone is a triangle
- (b) Triangulation is the recommended method in the development of a prism
- (c) The development of the lateral surface of a right circular cylinder is a rectangle
- (d) The elements of an elliptical cone are equal in length

Q.27 Parallel line development method is suitable for development of

- I. Tetrahedron
- II. Hexahedron
- III. Pentagonal prism
- IV. Cylinder

Which of the statement is correct?

- (a) I (b) II
- (c) II and III (d) II, III and IV

Q.28 The nature of surface of sphere is

- (a) plane surface
- (b) single curved surface
- (c) double curved surface
- (d) none

Q.29 The method by which the development of surface of an oblique solid is obtained is

- (a) radial line method
- (b) parallel line method
- (c) triangulation method
- (d) approximation method

Q.30 If a semicircular thin sheet is folded to form a cone, then the front view of the cone appears as an

- (a) equilateral triangle
- (b) isosceles triangle
- (c) rectangle
- (d) semicircle

Q.31 A semi-circular sheet is folded to form a cone. The apex angle of the cone formed is

- (a) 30° (b) 60°
- (c) 90° (d) 120°

Q.32 Match **List-I** with **List-II** and select the correct answer using the codes given below the lists:

List-I

- A. Concentric circle method
- B. Intersecting arc method
- C. Reflector of head lamps of automobiles

List-II

1. Ellipse
2. Parabola
3. Hyperbola

Codes:

| | A | B | C |
|-----|---|---|---|
| (a) | 2 | 3 | 1 |
| (b) | 1 | 2 | 3 |
| (c) | 1 | 3 | 2 |
| (d) | 3 | 1 | 2 |

- Q.33** Sum of exterior angles of an equilateral triangle - Sum of exterior angles of a regular hexagon is equal to
 (a) 180° (b) 0°
 (c) 60° (d) 360°
- Q.34** The face of an octahedron is a
 (a) Square (b) Triangle
 (c) Pentagon (d) Hexagon
- Q.35** Consider the following phases of Embodiment Design.
 1. Designing special purpose parts and selection of standard components.
 2. Determining exact values, dimensions and tolerances of components.
 3. Setting and arrangement of physical elements of the design in to groupings.
 What is the correct sequence of order for design process?
 (a) 3, 2 and 1 (b) 3, 1 and 2
 (c) 1, 3 and 2 (d) 2, 3 and 1
- Q.36** RF of a drawing of a sphere is 10. The front view is a circle of radius 1 cm. The volume of actual object is:
 (a) 4189 cm^3 (b) 4.189 cm^3
 (c) 418.9 cm^3 (d) $4.189 \times 10^{-3} \text{ cm}^3$
- Q.37** Consider the following statements:
 1. Least count of vernier scale is | Primary scale division - vernier scale division|.
 2. In backward vernier scale n division on the vernier scale is equal to $(n + 1)$ division on main scale.
 3. It is easier to measure with backward vernier scale as compared to forward vernier scale.
 Which of the above statements are correct?
 (a) 1, 2 and 3 (b) 1 and 2 only
 (c) 1 only (d) 1 and 3 only
- Q.38** The front view and top view of a point A coincides and lies 2 cm above the reference line. The front and top views of another point B coincides and lies 4 cm below the reference line. Projectors of A and B are 3 cm apart. The distance between A and B is
 (a) 9 cm (b) $6\sqrt{3}$ cm
 (c) $\sqrt{29}$ cm (d) $3\sqrt{5}$ cm
- Q.39** Consider the following statements:
 1. Sphere is a double curved surface.
 2. Only approximate methods are used for development of sphere.
 3. An oblique cone is a cone whose base is elliptical.
 Which of the above statements is/are correct?
 (a) 1 only (b) 1 and 2 only
 (c) 2 and 3 only (d) 1, 2 and 3
- Q.40** Which of the following statements is incorrect regarding the requirements of engineering drawings?
 (a) Engineering drawings must be unambiguous.
 (b) Engineering drawing may rely on other drawings for complete specification.
 (c) There can be more than one interpretation for any part of a component.
 (d) Drawings must be suitable for duplication.
- Q.41** Which of the following methods of development is used for making transition pieces to join square pipes with cylindrical pipes?
 (a) Parallel line method
 (b) Radial line method
 (c) Triangulation method
 (d) Polyconic method
- Q.42** Which of the following is a methodology for creativity based on reasoning by analogy?
 (a) Stereotyping (b) Brainstorming
 (c) Fixation (d) Synectics
- Q.43** In engineering drawing continuous narrow lines with zig-zag is used to represent:
 1. Limit of section
 2. Cutting planes
 3. Limit of interrupted view
 (a) 1 only (b) 3 only
 (c) 1 and 3 only (d) 1, 2 and 3

Q.44 For dimensions in series, in which method of dimensioning, dimensions are aligned in such a way that an arrowhead of one dimension touches tip-to-tip the arrowhead of the adjacent dimension?

- (a) Chain dimensioning
- (b) Progressive dimensioning
- (c) proportional dimensioning
- (d) Parallel dimensioning

Q.45 A curve generated by a point fixed to a circle, within or outside its circumference as the circle rolls along a straight line is called:

- (a) Cycloid
- (b) Epi-cycloid
- (c) Trochoid
- (d) Hypo-cycloid

Directions for Q.46 to Q.47

Each of the next **Three (03)** items consists of two statements, one labelled as the 'Statement (I)' and the other as 'Statement (II)'. You are to examine these two statements carefully and select the answers to these items using the codes given below:

Codes:

- (a) Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I).
- (b) Both Statement (I) and Statement (II) are individually true but Statement (II) is NOT the correct explanation of Statement (I).
- (c) Statement (I) is true but Statement (II) is false.
- (d) Statement (I) is false but Statement (II) is true.

Q.46 Statement (I): Concurrent engineering is a team based approach in which all aspects of the product development process are represented on a closely communicating team.

Statement (II): Concurrent engineering is greatly facilitated by the use of computer aided engineering.

Q.47 Statement (I): A minimum of two orthographic views are necessary to show length, width and height of an object.

Statement (II): The dimension perpendicular to the projectors is projected as a point in the corresponding view, hence its true length cannot be shown.

Q.48 Statement (I): The purpose of the Failure Modes and Effects Analysis (FMEA) is to take actions to eliminate or reduce failures, starting with the highest-priority ones.

Statement (II): FMEA is used during design to prevent failures.

- (a) Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I).
- (b) Both Statement (I) and Statement (II) are individually true but Statement (II) is NOT the correct explanation of Statement (I).
- (c) Statement (I) is true but Statement (II) is false.
- (d) Statement (I) is false but Statement (II) is true.

Q.49 Statement (I): The plane of projection is assumed to be transparent in 3rd angle.

Statement (II): The plane of projection is assumed to be non-transparent in 1st angle.

- (a) Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I).
- (b) Both Statement (I) and Statement (II) are individually true but Statement (II) is NOT the correct explanation of Statement (I).
- (c) Statement (I) is true but Statement (II) is false.
- (d) Statement (I) is false but Statement (II) is true.

Q.50 Which of the following types of design occurs when a known solution is applied to satisfy a different need and a completely new application is produced?

- (a) Innovative design
- (b) Adaptive design
- (c) Selection design
- (d) Redesign

Q.51 Product design specification is done at stage of

- (a) Problem definition
- (b) Generate feasible solution
- (c) Product dispatching
- (d) Synthesis

Q.52 Consider the following statements regarding sequential engineering:

1. It is the process of marketing, engineering design, manufacturing, testing and production where each stage of the development process is carried out separately.
2. The information flows in only one direction.
3. It is greatly facilitated by the use of computer aided engineering.

Which of the above statements are correct?

- (a) 1 and 2 (b) 1 only
(c) 2 and 3 (d) 1 and 3

Q.53 Which of the following customer requirements according to Kano is related to the product features that make the product unique and distinguish it from the competition?

- (a) Expecters (b) Spoken
(c) Unspoken (d) Exciters

Q.54 Match **List-I** (Barriers to creative thinking) with **List-II** (Characteristics) and select the correct answer using the codes given below the lists:

List-I

- A. Perceptual blocks
B. Cultural blocks
C. Emotional blocks
D. Intellectual blocks

List-II

1. When person does not have sufficient knowledge of topic.
2. Feeling discouraged to consider new ideas.
3. Prevents clear understanding of design problem or information regarding it.
4. Restriction strictly applied by society.

Codes:

| | A | B | C | D |
|-----|---|---|---|---|
| (a) | 2 | 3 | 1 | 4 |
| (b) | 3 | 4 | 2 | 1 |
| (c) | 4 | 2 | 3 | 1 |
| (d) | 3 | 4 | 1 | 2 |

Q.55 Consider the following statements regarding Pugh chart:

1. It compares each concept relative to a reference or datum concept and for each criterion determines whether the concept in question is better than, poorer than, or about the same as the reference concept.
2. A major advantage of the Pugh method is that it helps the team to develop better insights into the types of features that strongly satisfy the design requirements.

Which of the above statements is/are correct?

- (a) 1 only (b) 2 only
(c) Both 1 and 2 (d) None of the above

Q.56 Consider the following statements regarding design evaluation (EVAD) method:

1. This method is particularly recommended for the evaluation and it can also be applied to concept selection.
2. In this method, a list of evaluation criteria is established and each criterion is standardized according to the strategic objectives of the company.
3. The profiles are compared in a quantitative manner rather than qualitative manner.

Which of the above statements are correct?

- (a) 1 and 2 (b) 2 and 3
(c) 1 and 3 (d) 1, 2 and 3

Q.57 Which of the following design process of a product has the objective to set values for the design variables that will produce the best possible design, considering both performance and cost?

- (a) Product architecture
(b) Configuration design
(c) Parametric design
(d) Detail design

Q.58 In the context of the spiral curve, the distance from any point on the curve to the pole is

- (a) Radius vector (b) Focus of the curve
(c) Spiral vector (d) Locus

Q.59 Consider the following statements regarding rules for dimensioning:

1. Mark the dimensions outside the view.
2. Centre line (axis) itself shall not be used as a dimension line with arrow heads at its ends.
3. Dimensioning from a centre line is incorrect, except when the centre line passes through the centre of a hole.

Which of the above statements are correct?

- (a) 1 and 2 (b) 2 and 3
(c) 1 and 3 (d) 1, 2 and 3

Q.60 When a straight line rolls on the circumference of a semi-circle the locus of its end point is called

- (a) Cycloid (b) Epicycloid
(c) Hypocycloid (d) Involute

Q.61 An ellipse of major axis 120 mm and distance between directrix is 150 mm. The eccentricity would be

- (a) 0.2 (b) 0.4
(c) 0.6 (d) 0.8

Q.95 Listing of all design requirements and reduction of these to a complete set of logically related performance specification is called

- (a) Synthesis (b) Analysis
(c) Evaluation (d) Communication

Q.96 Consider the following statements about Brainstorming and Synectics:

1. Criticism is not allowed in both activities.
2. Synectics session is much longer than Brainstorming.
3. In both activities, a group tries to work collectively towards a particular solution.

Which of the above statement are correct?

- (a) 1 and 2 (b) 2 and 3
(c) 1 and 3 (d) 1, 2 and 3

Q.97 Which method is most suitable for the development of pyramid?

- (a) Parallel Line Method
(b) Radial Line Method
(c) Triangulation Method
(d) Approximation Method

Q.98 Which of the following is NOT the advantage of concurrent design and manufacturing over sequential design and manufacturing?

- (a) Less material waste
(b) Better communication between disciplines

- (c) Allows early correction of part
(d) Reduces cost in short term

Q.99 Statement-I : If a plane is parallel to any plane, the view obtained on that plane will be true shape of the plane.

Statement-II : If a plane is perpendicular to V.P., the vertical trace of plane will be a point on H.P.

- (a) Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I).
(b) Both Statement (I) and Statement (II) are individually true but Statement (II) is NOT the correct explanation of Statement (I).
(c) Statement (I) is true but Statement (II) is false.
(d) Statement (I) is false but Statement (II) is true.

Q.100 Four stage model of descriptive design is consist of

- (a) Evaluation, exploration, generation, communication
(b) Communication, exploration, generation, evaluation
(c) Communication, generation, evaluation, exploration
(d) Exploration, generation, evaluation, communication



Answer Key : General Principles of Design & Drawing

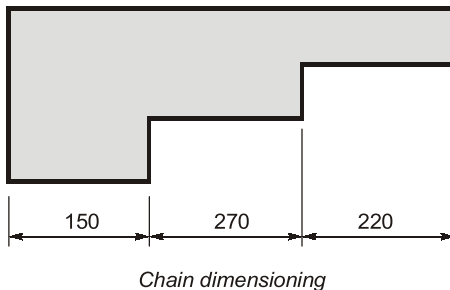
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|---------|---------|---------|----------|---------|---------|---------|---------|
| 1. (a) | 2. (a) | 3. (b) | 4. (b) | 5. (d) | 6. (c) | 7. (a) | 8. (a) |
| 9. (d) | 10. (c) | 11. (a) | 12. (b) | 13. (a) | 14. (c) | 15. (c) | 16. (a) |
| 17. (b) | 18. (d) | 19. (d) | 20. (d) | 21. (c) | 22. (d) | 23. (b) | 24. (a) |
| 25. (d) | 26. (c) | 27. (d) | 28. (c) | 29. (c) | 30. (a) | 31. (b) | 32. (c) |
| 33. (b) | 34. (b) | 35. (b) | 36. (d) | 37. (a) | 38. (a) | 39. (b) | 40. (c) |
| 41. (c) | 42. (d) | 43. (c) | 44. (a) | 45. (c) | 46. (b) | 47. (c) | 48. (b) |
| 49. (b) | 50. (b) | 51. (a) | 52. (a) | 53. (d) | 54. (b) | 55. (c) | 56. (a) |
| 57. (c) | 58. (a) | 59. (d) | 60. (d) | 61. (d) | 62. (c) | 63. (c) | 64. (b) |
| 65. (b) | 66. (b) | 67. (d) | 68. (c) | 69. (c) | 70. (d) | 71. (d) | 72. (d) |
| 73. (b) | 74. (d) | 75. (d) | 76. (d) | 77. (c) | 78. (b) | 79. (a) | 80. (c) |
| 81. (c) | 82. (b) | 83. (c) | 84. (d) | 85. (c) | 86. (b) | 87. (a) | 88. (c) |
| 89. (b) | 90. (a) | 91. (d) | 92. (d) | 93. (a) | 94. (b) | 95. (b) | 96. (a) |
| 97. (b) | 98. (d) | 99. (c) | 100. (d) | | | | |

Explanations : General Principles of Design & Drawing

3. (b)

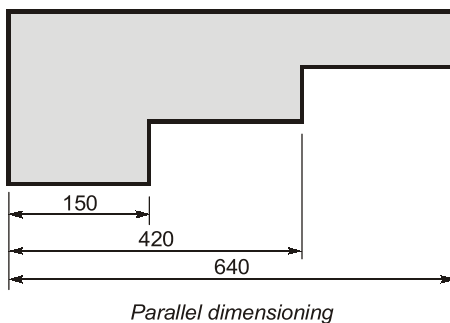
1. Chain dimensioning / continuous dimensioning

: When successive dimensions are arranged in a straight line, the method is known as chain dimensioning. Note that the chain of dimensions shall be arranged in a continuous straight line.

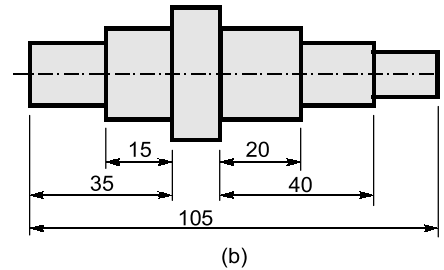
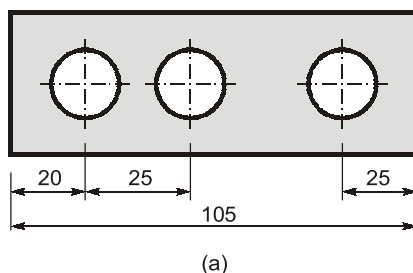


2. Parallel dimensioning/progressive dimensioning:

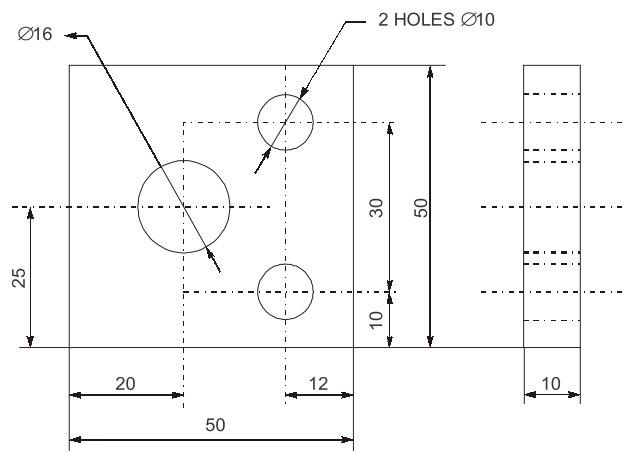
Parallel dimensioning is the placement of a number of single dimension lines parallel to one another from a common origin. It is used where a number of dimensions have a common origin. Cumulative error is avoided by this method.



3. Combined dimensioning: When chain dimensioning and parallel dimensioning are used in single drawing, it is called Combined Dimensioning.



4. (b)



You can observe that dimensioning between hidden lines is avoided. In side view holes are appearing as hidden lines and hence distance between holes and their diameter is not dimensioned in side view.

Dimensions are always placed in view which clearly express relevant features. In front view all width and height dimensions are placed whereas in side view the remaining depth dimension is marked.

Repetition of dimensions is avoided. Height dimension is visible in side view also but since it is dimensioned in front view repetition is avoided.

You can observe that in the front view hole locations are dimensioned from their center lines.

5. (d)

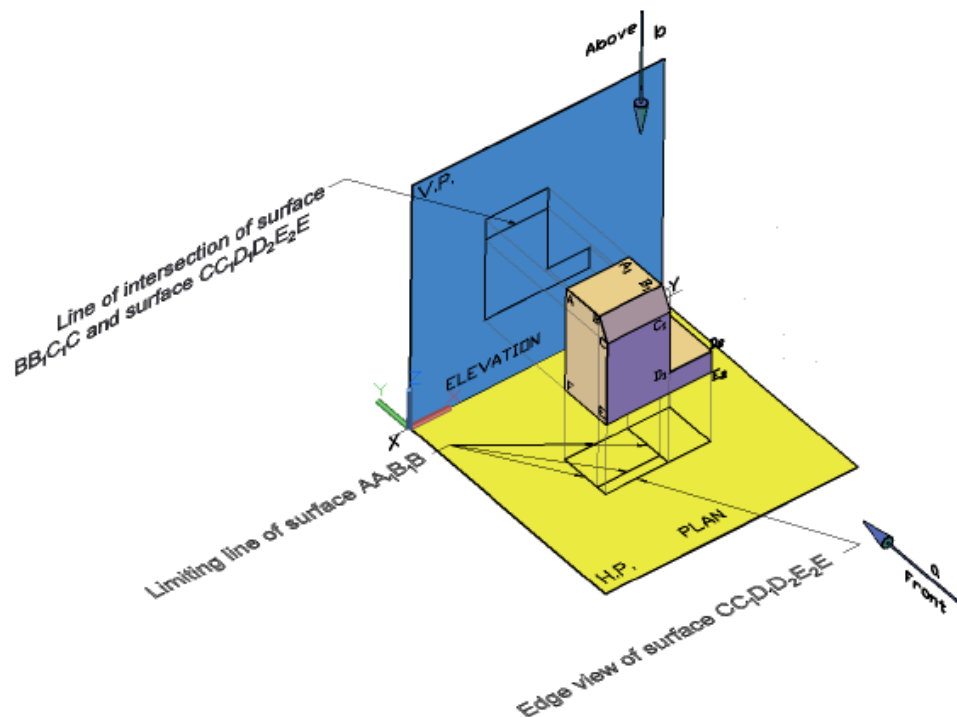
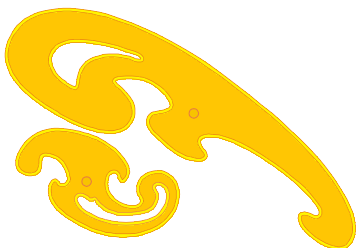


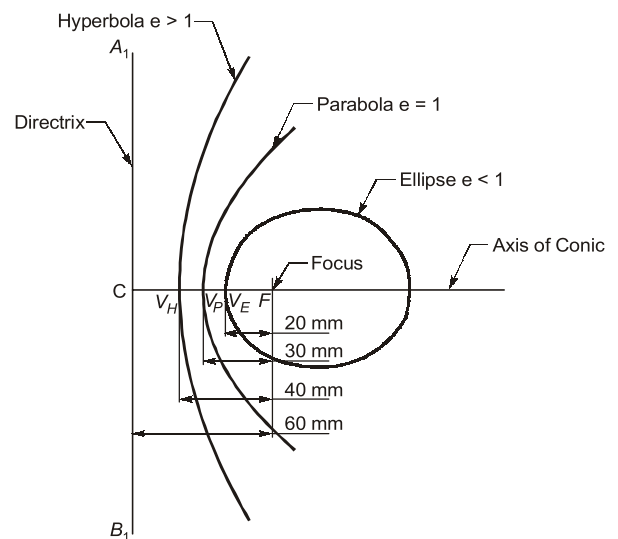
Figure above shows all three conditions.

6. (c)

In manual drafting, French curves are used for drawing curves which cannot be drawn by compass. Faint freehand curve is first drawn through the known points. Longest possible curves exactly coinciding with the freehand curve are then found out from the French curve. Finally, neat continuous curve is drawn with the aid of the French curve. Care should be taken to see that no corner is formed anywhere within the drawn curve.



- If $e=1$ then path of moving point P is called a parabola
- If $e>1$ then path of moving point P is called a hyperbola



11. (a)

$$e = \frac{\text{Distance of moving point P from focus}}{\text{Distance of moving point P from directrix}}$$

- If $e < 1$ then path of moving point P is called an ellipse

19. (d)

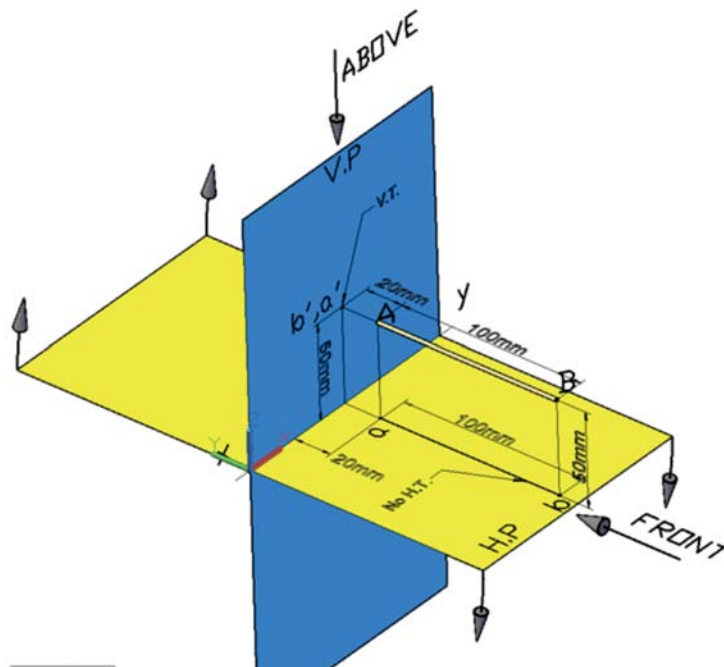
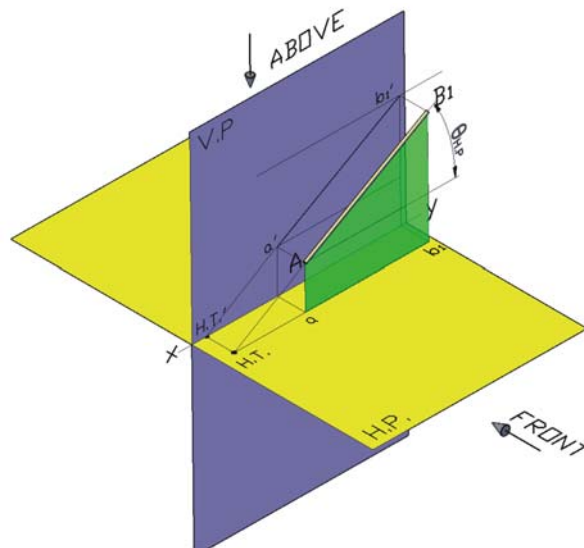


Figure above shows a line perpendicular to V.P. From 3-D model. It is clear that Vertical trace is on V.P. hence statement (a) & (c) are wrong. A line perpendicular to V.P. is always parallel to H.P. and it never intersects H.P. & has no H.T. hence statement (d) is correct.

20. (d)

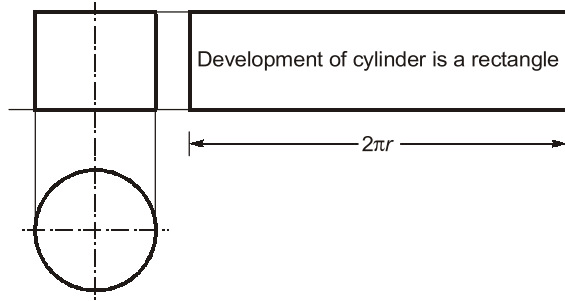


In pictorial diagram shown you can see a straight line AB₁ parallel to V.P. and inclined to H.P. Since line is inclined to H.P. on extension it intersects H.P. and has horizontal trace. Since line is parallel to V.P. it will never intersect V.P. and therefore it will have no vertical trace.

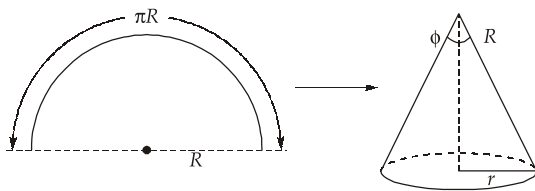
Hence correct answer is (d) only H.T. but no V.T.

26. (c)

The development of cylinder is Rectangle.



31. (b)

Let R be the radius of semi-circular sheet.

$$\text{Radius of cone, } r = \frac{\pi R}{2\pi} = \frac{R}{2}$$

Apex angle, $\phi =$

$$2 \times \sin^{-1}\left(\frac{r}{R}\right) = 60^\circ$$

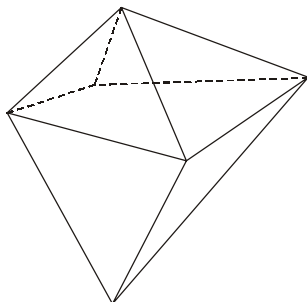
32. (c)

- Longitudinal section of reflectors of head lamps of automobile have parabolic shape.
- Hyperbola can be constructed using intersecting arc method and general (focus directrix method) method.
- Ellipse can be constructed using general, arcs of circle method, concentric circle method and oblong method.

33. (b)

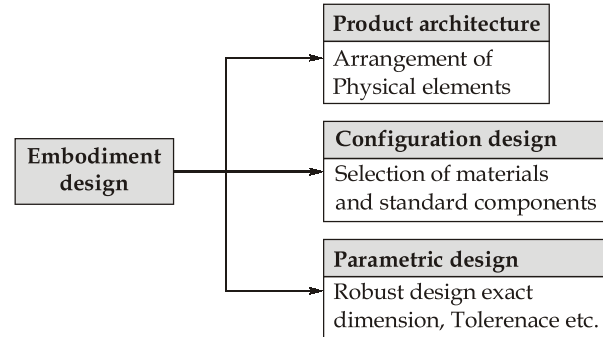
Sum of exterior angles of any regular polygon is 360° . So answer should be 0° .

34. (b)



The face of an octahedron is a triangle.

35. (b)



36. (d)

Radius of actual object

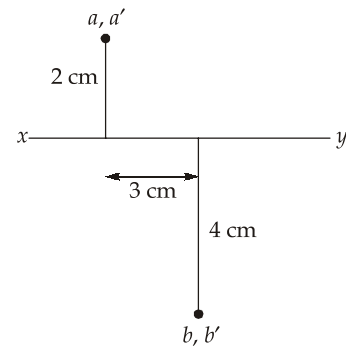
$$= \frac{\text{Radius of drawing}}{\text{R.F.}} = 0.1 \text{ cm}$$

$$\text{Volume of actual object} = \frac{4}{3} \pi \times (0.1)^3 \text{ cm}^3 = 4.189 \times 10^{-3} \text{ cm}^3$$

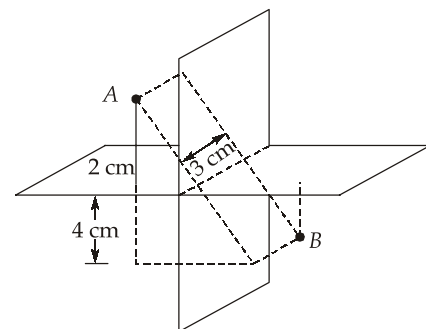
37. (a)

All the statements are correct.

38. (a)



Point A lies in second quadrant and point B lies in fourth quadrant.



$$AB = \sqrt{(4+2)^2 + (4+2)^2 + 3^2} = \sqrt{81} = 9 \text{ cm}$$