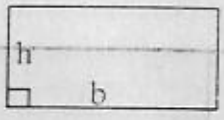
BASIC GEOMETRICAL SHAPES

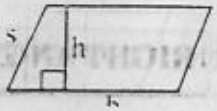
Not every concept or formula of solid geometry is covered on the test. You need not to memorize a long list of formulae to solve each and every question. Following concepts and formulae in addition to some basic concepts already known to intermediate level students are required to solve almost all questions on the test.

Rectangle



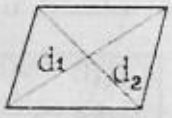
Opposite Sides are of equal length
Perimeter = 2(h + b)
All angles are of measure=90°
Area = bh

Parallelogram



Opposite Sides are of equal length
Perimeter = 2(s + b)
Opposite angles are equal but not of 90°
Area = bh

Rhombus



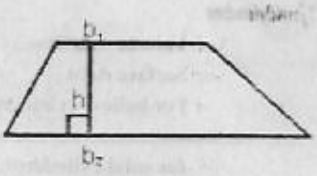
All sides are of equal length
Perimeter = 4S
Opposite angles are equal but not of 90°

Area = $\frac{1}{2}$(d1 × d2)

Square

All sides are of equal length
Perimeter = 4S
All angles are of 90°
Area = S^2 or ½ d^2

Trapezoid =



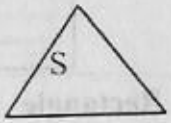
All sides are of different lengths
Perimeter = S1+S2+S3+S4
All angles are of different measures

Area = $\frac{1}{2}$ h (b1 + b2)

Equilateral Triangle

Perimeter = 3S

Area = $\frac{\sqrt{3}}{4} S^2$

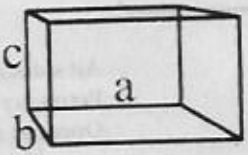


RIGHT ANGLE TRIANGLE

Pythagorean Theorem $c^2 = a^2 + b^2$ where "c" is the side opposite the 90° angle

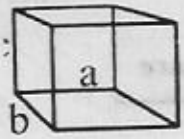
Circle

AB = D = Diameter
Circumference = $2\pi r$
AC = BC = Radius = r
Area = πr^2



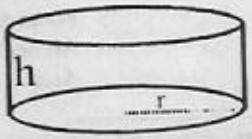
Rectangular Solid

Volume = abc
Surface Area = 2ab + 2bc + 2ac



Cube

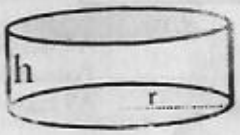
a = b = c
Volume = a^3
Surface Area = $6a^2$



Cylinder

Volume = $\pi r^2 h$
Surface Area
For hollow cylinder = $2\pi rh$

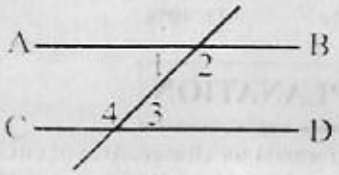
for solid cylinder = $2\pi rh + 2\pi r^2$



Complementary Angles:

If the two lines are cut by a transversal, the alternate angles are congruent.

If AB ∥ CD, then ∠1 = ∠3 and ∠2 = ∠4

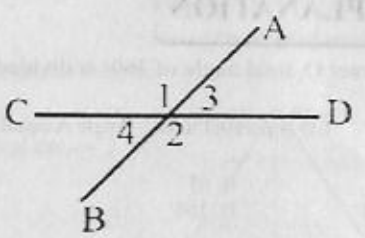


Supplementary Angles:

If two lines intersect each other, then the Opposite angles are equal.
∠1 = ∠2 and ∠3 = ∠4

Complementary Angles:
If the sum of two angles is 90°, the angles are said to be complementary angles.

Supplementary Angles:
If the sum of two angles is 180°, the angles are said to be supplementary angles.



SOLVED EXAMPLES

DIRECTIONS:
You are given following questions from the topic, with four choices A through D. Select the choice which will answer the question best. (The answers and explanations of the questions has been given at the bottom of the question)

Answer of each question has been given at the end of each question.

Use the space at the right of the options for scratch work.

1. A rectangle is 16 cm long and 10 cm wide. If the length is reduced by k cm and its width is increased also by k cm so as to make it a square then its area changes by:

A. 169 B. 256
C. 100 D. 9
E. None of the above.

EXPLANATION

Initial area of the rectangle = 16 × 10 = 160

As the rectangle becomes square after change, so both sides are equal. $(16 - K) = (10 - K) \Rightarrow K = 3$. Therefore, the new area is 169. The change in area is 9.

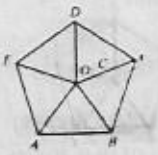
21. If the radius of a circle is increased by 20% then the area is increased by :

A. 44% B. 120%
C. 144% D. 40%

EXPLANATION

Apply formula for change. Area of circle $= \pi r^2$. Put $\pi = 1$ (no change) and $r = 1.2$ (20% increase). New area $= 1 \times 1.22 = 1.44$. Which shows 44% increase.

22. AB = BC = CD = DE = EA and OA = OB = OC = OD = OE. ∠BOA = ?

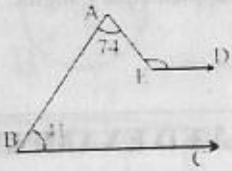


A. 15 B. 30
C. 45 D. 72

EXPLANATION

At center O, total angle of 360° is divided in five equal parts.

23. ED is parallel to BC. Angle A equals 74°. Angle B equal 41°. Angle AED equals

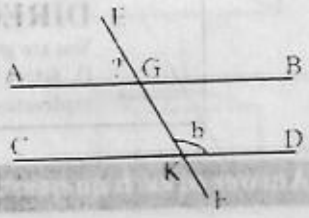


A. 41 B. 65°
C. 115 D. 106

EXPLANATION

Extend AE to touch the side BC. The angle E is the exterior angle of the triangle. Exterior angle is equal to the sum of the opposite interior angles of the triangle. Hence ∠E = 74 + 41 = 115°.

24. Angle EGA equals

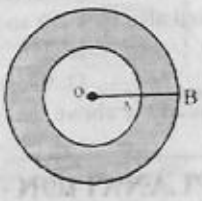


A. b B. b-180
C. 90-b D. 180-b

EXPLANATION

Angle AGE + angle EGB = 180. Angle G = angle b. Hence, angle AGE = 180 - b.

25. Radius OA equals 6. AB equals 2. The area of the shaded portion equals



A. 4π B. 18π
C. 28π D. 32π

EXPLANATION

Area of shaded portion = Area of large circle – area of small circle. $64\pi - 36\pi = 28\pi$

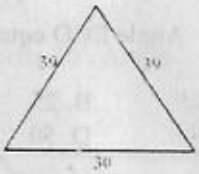
26. An angle is 30° more than one–half its complement. Find the angle.

A. 20 B. 30
C. 50 D. 60

EXPLANATION

$x - 30 = \frac{1}{2}(90 - x)$, $x = 50°$

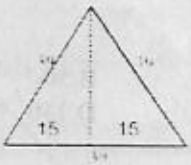
27. The area of the triangle is



A. 780 B. 585
C. 1170 D. 540

EXPLANATION

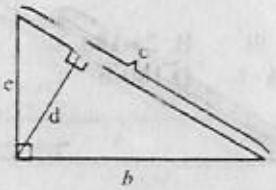
Draw perpendicular as shown in the figure. By applying triad (5, 12, 13) or Pythagoras theorem the length of the perpendicular = 36. Area of each triangle = $\frac{1}{2} \times 15 \times 36 = 270$. Total area = 2 × 270 = 540



28. $\frac{be}{2}$ is equal to

A. $\frac{cd}{2}$ B. $\frac{ce}{2}$

C. be D. $\frac{bd}{2}$



EXPLANATION

Find the area of the triangle by taking d as height and c as base.

29. A rectangular lot 50 feet by 100 feet is surrounded on all sides by a concrete walk 5 feet wide. Find the number of square feet in the surface of the walk.

A. 1600 B. 5250
C. 5500 D. 6100

Explanation

Existing area = 50 × 100 = 5000. Each side is increased by 10 feet. New area = 60 × 110 = 6600. Area of the walk = 6600 – 5000 = 1600.

PRACTICE EXERCISE

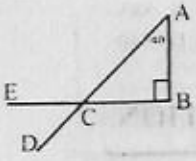
DIRECTIONS:
You are given following questions from the topic, with four choices A through D. Select the choice that will answer the question best.

The answers of the questions have been given at the next page after exercise.

Use the space at the right of the options for scratch work.

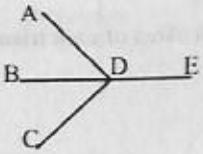
1. Angle ECD equals

A. 20 B. 25
C. 40 D. 50



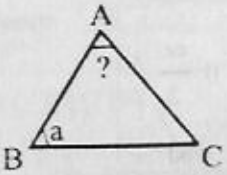
2. AD is perpendicular to CD. Angle ADE = 140°. Angle EDC equals

A.40 B.50
C.120 D.130



3. AB = AC, angle B = a. A = ?

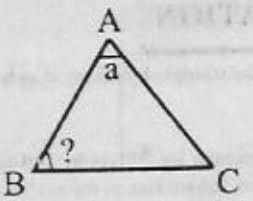
A.a-180 B. 2a-180
C. 180-2a D.180-b



4. AB = AC, angle A = a, angle B = ?

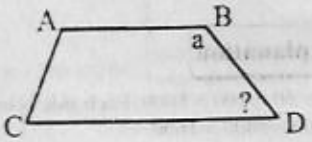
A. b-180 B. b-90

C. $\frac{180-a}{2}$ D. 180-a



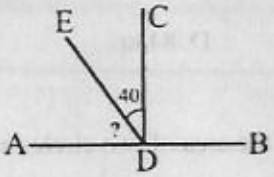
5. AB is parallel of DC. Angle B equals a. angle D equals=?

A. a B. 90-a



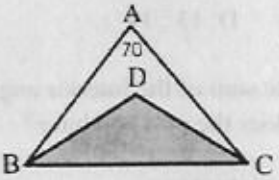
C. $\frac{180-2}{2}$ D. 180-a

6. CD is perpendicular to AB. Angle CDE equals 40°. Angle EDA equals=?



A. 40 B. 50
C. 90 D. 130

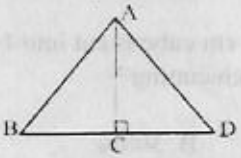
7. DB and DC are angle bisectors of isosceles triangle ABC. Angle A equals 70°. Angle BDC equals



A. 55 B. 70

C. 110 D. 125

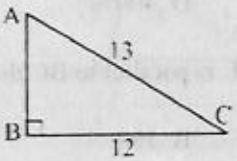
8. In triangle ABD, AD equals 13, AB equals AD, and Altitude AC equals 12, BD equals = ?



A. 5 B. 10

C. 110 D. 125

9. Area of a triangle ABC equals



A. 30 B. 39

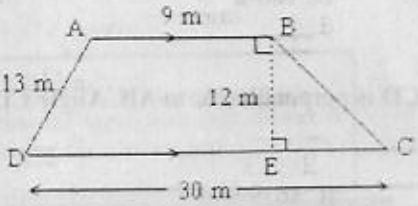
C. 80 D. 78

10. The area of the cross, formed by cutting four equal squares from square equals 20. The perimeter of the cross equals

A. 24 B. $12\sqrt{2}$

C. $16\sqrt{2}$ D. 48

11. A plot of land is in the shape of a trapezium whose dimensions are given in the figure below :



Hence the perimeter of the field is

A. 50 m B. 64 m

C. 72 m D. 84 m

12. If the area of two circles are in the ratio 169 : 196 then the ratio of their radii is

A. 13 : 11 B. 10 : 13

C. 14 : 13 D. 13 : 14

13. If the sum of the interior angles of a regular polygon measures 1440 degrees, how many sides does the polygon have?

A. 10 sides B. 8 sides

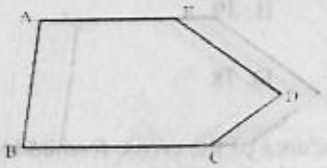
C. 12 sides D. 9 sides

14. A 4 cm cube is cut into 1 cm cubes. What is the percentage increase in the surface area after such cutting?

A. 4% B. 300%

C. 75% D. 400%

15. If AE is parallel to BC then angle E + angle D + angle C equals



A. 60 B. 100

C. 180 D. 360

ANSWERS

1	D	2	D	3	C	4	C	5	D
6	B	7	D	8	B	9	A	10	A
11	C	12	D	13	A	14	B	15	D