



MATHS

BOOKS - OBJECTIVE RD SHARMA

MATHS VOL I (HINGLISH)

**DIFFERENTIALS, ERRORS AND
APPROXIMATIONS**

Illustration

1. If $y = x^4 - 10$ and if x changes from 2 to 1.99, what is the approximate change in y ?

Also, find the changed value of y .

A. 0.32

B. -0.32

C. 5.68

D. 6.32

Answer: B



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2. A circular metal plate expands under heating so that its radius increases by 2%. Find the approximate increase in the area of the plate if the radius of the plate before heating is 10 cm.

A. 2π

B. 3π

C. π

D. 4π

Answer: D



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3. If in a triangle ABC , the side c and the angle C remain constant, while the remaining elements are changed slightly, show that

$$\frac{da}{\cos A} + \frac{db}{\cos B} = 0.$$

A. 0

B. 1

C. -1

D. none of these

Answer: A



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4. If a triangle ABC , inscribed in a fixed circle, be slightly varied in such way as to have its vertices always on the circle, then

$$\frac{da}{\cos A} + \frac{db}{\cos B} + \frac{dc}{\cos C} = .$$

A. 0

B. 1

C. -1

D. none of these

Answer: A



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5. Find the percentage error in calculating the volume of a cubical box if an error of 1% is made in measuring the length of edges of the cube.

A. 1 %

B. 2 %

C. 3 %

D. $3/2$ %

Answer: C



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6. Use differentials to approximate $\sqrt{25.2}$

A. 5.01

B. 5.02

C. 5.03

D. none of these

Answer: B



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Section I Solved Mcqs

1. If the percentage error in the edge of a cube is 1, then error in its volume, is

A. 0.01

B. 2 %

C. 3 %

D. none of these

Answer: C



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2. If the percentage error in the radius of a sphere is α , find the percentage error in its volume.

A. $\frac{3}{2}a \%$

B. $\frac{2}{3}a \%$

C. $3a \%$

D. none of these

Answer: A



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3. In a ΔABC if sides a and b remain constant such that δa is the error in C , then relative error in its area, is

A. $a \cot C$

B. $a \sin C$

C. $a \tan C$

D. $a \cos C$

Answer: A



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4. The approximate value of $(1.0002)^{3000}$, is

A. 1.2

B. 1.4

C. 1.6

D. 1.8

Answer: C



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5. The focal length of a mirror is given by

$\frac{1}{v} - \frac{1}{u} = \frac{2}{f}$. If equal errors α are made

in measuring u and v . Then relative error in f

is

A. $\frac{2}{a}$

B. $a(1/u+1/v)$

C. $a\left(\frac{1}{u} - \frac{1}{v}\right)$

D. none of these

Answer: B



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6. In a triangle ABC , the sides b, c are given. If there is an error δA in measuring angle A . Then side a is error δa in the side a is

A. $\frac{S}{2a} \Delta A$

B. $\frac{2S}{2a} \Delta A$

C. $bc \sin A \Delta A$

D. none of these

Answer: B



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7. The value of $(127)^{1/3}$ to four decimal places,
is

A. 5.0267

B. 5.4267

C. 5.5267

D. 5.001

Answer: A



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8. If $T = 2\pi\sqrt{\frac{l}{g}}$, then relative errors in T and l are in the ratio

are in the ratio

A. $1/2$

B. 2

C. $1/2\pi$

D. none of these

Answer: A



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9. If errors of 1% each are made in the base radius and height of a cylinder, then the percentage error in its volume, is

A. 1 %

B. 2 %

C. 3 %

D. none of these

Answer: C



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10. If an error of 1° is made in measuring the angle of a sector of radius 30 cm, then the approximate error in its area, is

A. 450cm^2

B. $25\pi\text{cm}^2$

C. $2.5\pi\text{cm}^2$

D. none of these

Answer: C



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11. The semi-vertical angle of a cone is 45° . If the height of the cone is 20.025, then its approximate lateral surface area, is

A. $401\sqrt{2}\pi$

B. $400\sqrt{2}\pi$

C. $399\sqrt{2}\pi$

D. none of these

Answer: A



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12. A point on the parabola $y^2 = 18x$ at which the ordinate increases at twice the rate of the

abscissa is (2,6) (b) $(2, -6)$ $\left(\frac{9}{8}, -\frac{9}{2}\right)$ (d)
 $\left(\frac{9}{8}, \frac{9}{2}\right)$

A. $(9/8, 9/2)$

B. $(2,-4)$

C. $(-9/8, 9/2)$

D. $(2,4)$

Answer: A



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13. The period of oscillation T of a pendulum of length l at a place of acceleration due to gravity g is given by $T = 2\pi\sqrt{\frac{l}{g}}$. If the calculated length is 0.992 times the actual length and if the value assumed for g is 1.002 times its actual value, the relative error in the computed value of T , is

A. 0.005

B. -0.005

C. 0.003

D. -0.003

Answer: B



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14. The area of a triangle is computed using the formula $S = \frac{1}{2}bc \sin A$. If the relative errors made in measuring b, c and calculating S are respectively $0.02, 0.01$ and 0.13 the approximate error in A when $A = \pi/6$, is

A. 0.05 radians

B. 0.01 radians

C. 0.05 degree

D. 0.01 degree

Answer: A



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15. The circumference of a scircle is measured as 56 cm with an error 0.02 cm. The percentage error in its area, is

A. $\frac{1}{7}$

B. $\frac{1}{28}$

C. $\frac{1}{14}$

D. $\frac{1}{56}$

Answer: C



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Exercise

1. If there is an error of 2% in measuring the length of simple pendulum, then percentage error in its period is: 1% (b) 2% (c) 3% (d) 4%

A. 1 %

B. 2 %

C. 3 %

D. 4 %

Answer: A



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2. If there is an error of $a\%$ in measuring the edge of a cube, then percentage error in its surface is $2a\%$ (b) $\frac{a}{2}\%$ (c) $3a\%$ (d) none of these

A. $2a\%$

B. $\frac{a}{2}\%$

C. 3%

D. none of these

Answer: A



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3. If an error of $k\%$ is made in measuring the radius of a sphere, then percentage error in its volume. $k\%$ (b) $3k\%$ (c) $3k\%$ (d) $\frac{k}{3}\%$

A. $K\%$

B. $3k\%$

C. $2k\%$

D. $k/3\%$

Answer: B



4. The height of a cylinder is equal to the radius. If an error of $\alpha\%$ is made in the height, then percentage error in its volume is $\alpha\%$ (b) $2\alpha\%$ (c) $3\alpha\%$ (d) none of these

A. $a\%$

B. $2a\%$

C. $3a\%$

D. none of these

Answer: C



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5. While measuring the side of an equilateral triangle an error of $k\%$ is made, the percentage error in its area is $k\%$ (b) $2k\%$
(c) $\frac{k}{2}\%$ (d) $3k\%$

A. $K\%$

B. $2k\%$

C. $\frac{k}{2}\%$

D. $3k\%$

Answer: B



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6. Use differentials to find the approximate value of $(\log)_e(4.01)$, having given that $(\log)_e 4 = 1.3863$.

A. 1.3968`

B. 1.3898

C. 1.3893

D. none of these

Answer: C



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7. A sphere of radius 100 mm shrinks to radius 98 mm, then the approximate decrease in its volume is $12000 \pi \text{ mm}^3$ (b) $800 \pi \text{ mm}^3$ (c) $80000 \pi \text{ mm}^3$ (d) $120 \pi \text{ mm}^3$

A. $12000\pi mm^3$

B. $800\pi mm^3$

C. $80000\pi mm^3$

D. $120\pi mm^3$

Answer: C



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8. If the ratio of base radius and height of a cone is 1:2 and percentage error in radius is

$\lambda\%$, then the error in its volume is $\lambda\%$ (2) 2

$\lambda\%$ (c) $3\lambda\%$ (d) none of these

A. $\delta\%$

B. $2\delta\%$

C. $3\delta\%$

D. none of these

Answer: C



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9. The pressure p and the volume V of a gas are connected by the relation, $pV^{1/4} = k$, where k is a constant. Find the percentage increase in the pressure, corresponding to a diminution of 0.5% in the volume

A. $\frac{1}{2}$

B. $\frac{1}{4}\%$

C. $\frac{1}{8}\%$

D. none of these

Answer: C



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10. If $y = x^n$, then the ratio of relative errors in y and x is 1:1 (b) 2:1 (c) 1:n (d) n:1

A. 1:1

B. 2:1

C. 1:n

D. n:1

Answer: D



11. The approximate value of $(33)^{1/5}$ is (a) 2.0125 (b) 2.1 (c) 2.01 (d) none of these

A. 2.0125

B. 2.1

C. 2.01

D. none of these

Answer: A



12. The circumference of a circle is measured as 28cm with an error of 0.01cm. The percentage error in the area is $\frac{1}{14}$ (b) 0.01 (c) $\frac{1}{7}$ (d) none of these

A. $\frac{1}{14}$

B. 0.01

C. $\frac{1}{7}$

D. none of these

Answer: A



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13. In a right angled

ΔABC , $\cos^2 A + \cos^2 B \cos^2 C =$

A. $2R$

B. π

C. 0

D. none of these

Answer: C



14. If there is an error of 0.01 cm in the diameter of a sphere, then percentage error in surface area when the radius = 5 cm, is

A. 0.005 %

B. 0.05 %

C. 0.1 %

D. 0.2 %

Answer: A



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15. If $1^\circ = 0.017$ radians, then the approximate value of $\sin 46^\circ$, is

A. $\frac{1}{\sqrt{2}}$

B. $\frac{0.017}{\sqrt{2}}$

C. $\frac{1.017}{\sqrt{2}}$

D. none of these

Answer: C



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16. Using differentials, find the approximate value of $\sqrt{401}$

A. 20.100

B. 20.025

C. 20.030

D. 20.125

Answer: B



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17. Using differentials, the approximate value if

$(627)^{1/4}$, is

A. 5.002

B. 5.003

C. 5.005

D. 5.004

Answer: D



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