UCAT

Quantitative Reasoning 1

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Topics to be Covered

Percentages

Ratios

Geometry

Percentages

The percentage is defined as a fraction with a pre-determined denominator of 100. For example, 20% means 20 parts out of 100. That is 20%=20/100=⅕.

We can also convert any ratio to a percent. Say, we had to convert 1/5 into percent. Simply multiply the ratio by 100 to convert it into percent. So, ⅕ is equal to 1/5*100 = 20%.

If we are given an initial value and final value, we can find the percentage change as, %Change = (Difference between Final and Initial)/Original *100 .

Successive Percentage Change

If the value of an object x is successively changed by a%, b%, and then by c%, the final value is $x\ (1 \pm a/100)\ (1 \pm b/100)\ (1 \pm c/100)$, where the positive sign indicates an increment while the negative sign indicates a decrement.

Compounding Interest

The exponential function P for population looks like the following:

$$\mathbf{P_t = P_0\,(1+ r)^t}$$

where:

- **t** is the input variable representing the number of time periods elapsed.
- $\mathbf{P_0}$ is the *initial population*, or the population when **t = 0**.
- **r** describes how the population is changing.

Ratio and Proportion

Ratio:

A ratio compares quantities and can be expressed as a fraction.

$a : b \Rightarrow a/b$

Proportion Formula:

$a : b :: c : d \Rightarrow a/b = c/d$

Proportion(Direct and Inverse)

Two quantities a and b are said to be in **Direct** proportion if they increase or decrease together. In other words, the ratio of their corresponding values remains constant.

a is directly proportional to b.

This can be written using the symbol as: $\mathbf{a \propto b}$ i.e., $a/b = k$, where k is a positive number, then the quantities a and b are said to vary directly.

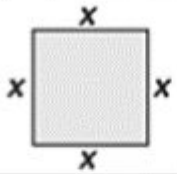
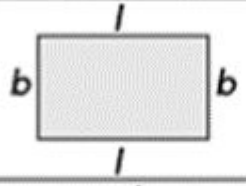
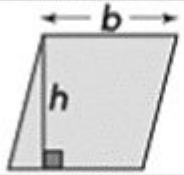
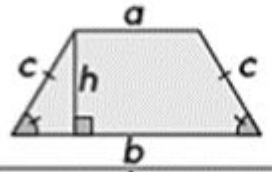
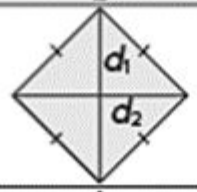
Proportion(Direct and Inverse)

Two quantities a and b are said to be in **inverse** proportion if an increase in quantity a, there will be a decrease in quantity b, and vice-versa. In other words, the product of their corresponding values should remain constant.

The statement ‘a is inversely proportional to b is written as $\mathbf{a \propto 1/b}$ i.e., if ab = k, then a and b are said to vary inversely.

Geometry: Quadrilaterals

Type	Properties
Parallelogram 	• Opposite sides are equal and parallel • Opposite angles are equal
Rectangle 	• Opposite sides are equal and parallel • All angles are right angles (90°)
Square 	• Opposite sides are parallel • All sides are equal • All angles are right angles (90°)
Rhombus 	• Opposite sides are parallel • All sides are equal • Opposite angles are equal • Diagonals bisect each other at right angles (90°)
Trapezoid 	• One pair of opposite sides is parallel

Quadrilateral		Area Formula
Square		x^2
Rectangle		$l \times b$
Parallelogram		$b \times h$
Trapezoid		$\frac{1}{2}(a + b)h$
Rhombus		$\frac{1}{2} \times d_1 \times d_2$

Geometry: Circles

Area (circle) = πr^2.

Area (sector) = $\theta/360 * \pi r^2$ (r is the radius and θ is the angle of the sector)

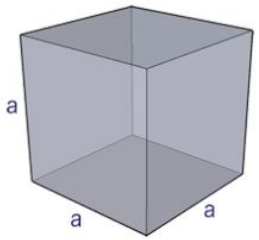
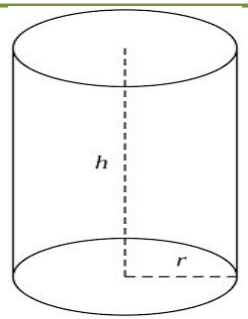
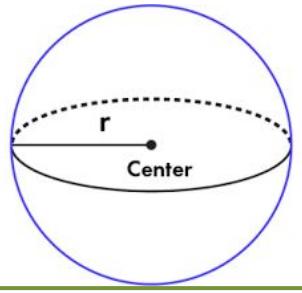
Circumference = $2\pi r$

Length of arc = $\theta/360 * 2\pi r$

The number of degrees of arc in a circle is 360.

The number of radians of the circle is 2π.

Geometry: Solid Geometry

	Cube	Rectangular Solid	Cylinder	Sphere	Cone
					
Surface Area	$6a^2$	$2\ (lw + wh + lh)$	$2\pi rh + 2\pi r^2$	$4\pi(r)^2$	$\pi rl + \pi r^2$
Volume	a^3	lwh	$\pi r^2 h$	$(4/3)\pi(r)^3$	$(⅓)(r)^2 h$
Longest Diagonal	$\sqrt{3}\ *a$	$\sqrt{(l^2+w^2+h^2)}$			

Class Questions

Q1) Suppose you bought something that was priced at $6.95, and the total bill including tax was $7.61. What is the sales tax rate in the city?

Class Questions

Q2) A computer software retailer used a markup rate of 40%. How much is the selling price of a computer game that cost the retailer $25?

Class Questions

Q3) A shoe store uses 40% mark up on the cost price. What is the cost of a pair of shoes that sells for $63?

Class Questions

Q4) An item originally priced at $55 is marked 25% off. What is the sale price?

Class Questions

Q5) In a mixture of 28 litres, the ratio of milk and water is 5:2. If 2 litres of water is added to the mixture, what is the ratio of milk and water in the new mixture?

A. 2:1
B. 3:2
C. 2:3
D. 4:3

Class Questions

Q6) A sum of Rs.7000 is divided among A, B, C in such a way that shares of A and B are in the ratio 2:3 and those of B and C are in the ratio 4:5. What amount does C receive?

A. 2500
B. 2800
C. 3000
D. 3500

Class Questions

Q7) Twenty litres of a mixture contains milk and water in the ratio 5:3. If 4 litres of the mixture is replaced by 4 litres of milk, the ratio of milk to water in the new mixture would be ?

A. 2:1
B. 7:3
C. 5:2
D. 7:2

Class Questions

Q8) A merchant marks the price of an article 20% above its actual cost and then offers some discount to gain a profit of 10 %. By what percentage is the selling price of the article less than the marked price? (Roundoff your answer to the nearest tenth)

Class Questions

Q9) The present age of Alexa and Joe is in the ratio 3:4. Five years back, the ratio of their ages was 2:3. What is the present age of Alexa?

A. 10
B. 15
C. 20
D. 25

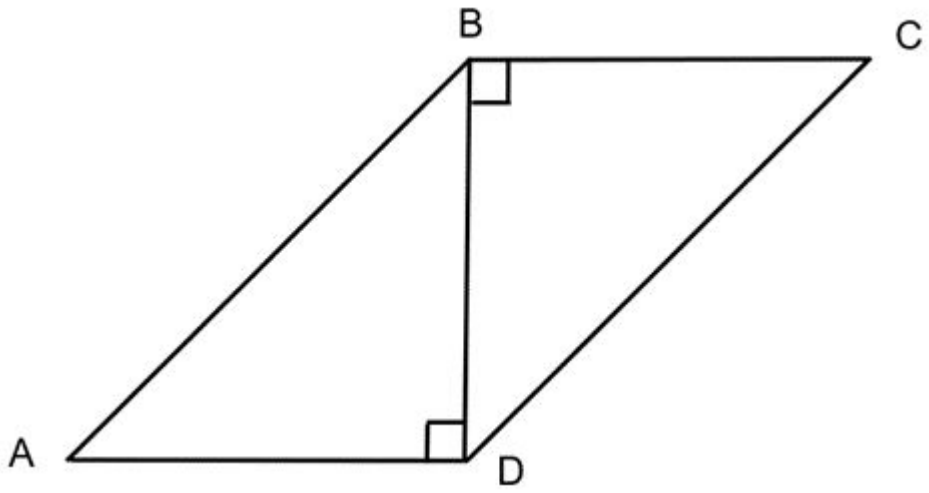
Class Questions

Q10) Dr. Goldberg, a noted dietician, mixes different solutions as part of her research into sugar substitutes. By weight, she mixes 40% of a sample of A and 70% of a sample of Substitute B to create substitute C. If Dr. initially had 60 grams of substitute A and 110 grams of substitute B, then what would be the weight, in grams, of substitute C?

A. 24
B. 77
C. 101
D. 170

Class Questions

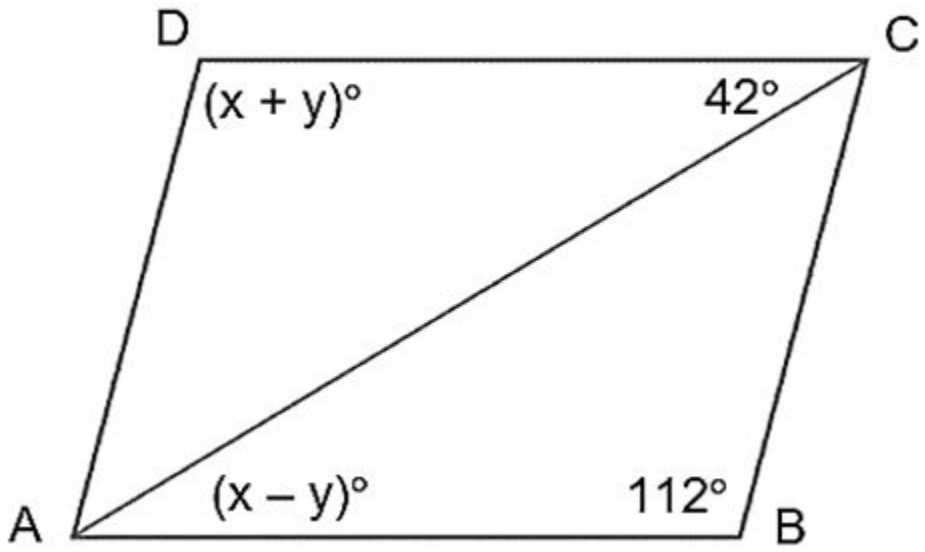
Q11) If AD = 2CD and BD = BC = 6, what is the length of side AB?



A. $6\sqrt{2}$
B. 12
C. $12\sqrt{2}$
D. 18

Class Questions

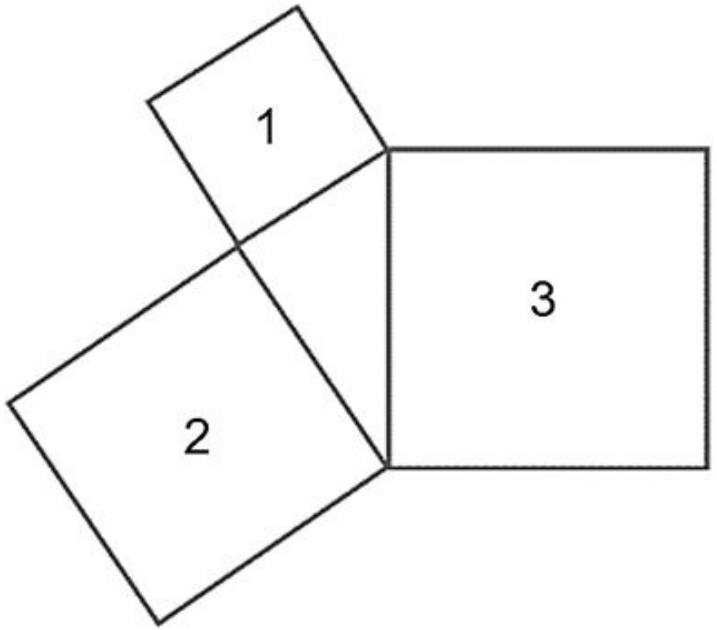
Q12) Figure ABCD is a parallelogram. What is the product of xy?



A. 2,695
B. 2,940
C. 4,704
D. 6,468

Class Questions

Q13) Each of the quadrilaterals in the figure above is a square. The area of the smallest square (square 1) is 16 square units, and the area of the medium square (square 2) is 48 square units. What is the area, in square units, of largest square (square 3)?



A. 56
B. 64
C. 78
D. 96

Class Questions

Q14) A marble slab in the shape of a right rectangular prism has dimensions of 100 centimeters by 80 centimeters by 5 centimeters. The slab has a density of 2.6 grams per cubic centimeter. What is the mass of the marble slab, in grams? (Density is mass per unit volume.)

A. 481
B. 10,400
C. 15,384
D. 104,000

Class Questions

Q15) If a right cylinder with a radius of 2 cm has a volume of 100π cm^3, what is the height, in centimetres, of the cylinder?

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

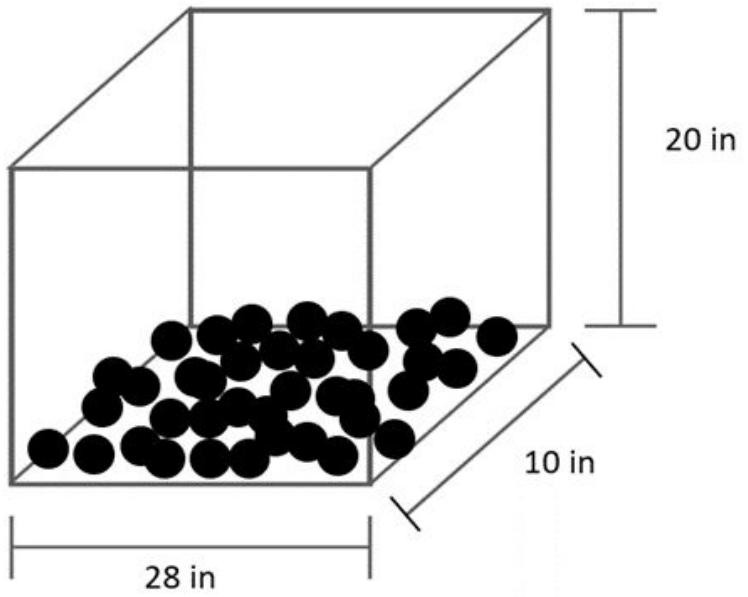
Class Questions

Q16) A cube and a rectangular solid are equal in volume. If the lengths of the edges of the rectangular solid are 4, 8, and 16, what is the length of an edge of the cube?

Class Questions

Q17) The bottom of the fish tank shown is filled with rocks. The tank is then filled with water to a height of 18 inches. When the rocks are removed, the height of the water drops to 16.5 inches. How many cubic inches of water do the rocks displace?

A. 280
B. 420
C. 560
D. 980



Class Questions

Q18) What is the radius of the largest sphere that can be placed inside a cube that has a volume of 64 cubic units?

A. 2
B. $2\sqrt{2}$
C. 4
D. 8

Answer Key

Q. no.	Answer
1	9.5
2	35
3	45
4	41.25
5	A
6	C
7	B
8	8.3
9	B

Q. no.	Answer
10	C
11	160
12	C
13	C
14	D
15	B
16	8
17	B
18	A

Thank you