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Class X practice studio

CLASS X · 2026-27 · MODEL PAPER

Class X Mathematics Standard (Code 041) Model Paper 4

Question paper

Maximum marks: 80

Time: 3 hours

Subject code: 041

Practice, understand, improve.

Instructions

All 38 questions are compulsory, with one selected option for each internal choice.

Section A has 18 MCQs and 2 assertion-reason questions; Section E has 1+1+2-mark case subparts.

Calculators are not allowed; draw labelled figures where needed.

Section A

Question 1

1 mark

Mcq

Choose the correct answer.

(a) Given class intervals 10–20 (f=5), 20–30 (f=8), 30–40 (f=6), the modal class is: [1 mark]

A. 10–20
B. 20–30
C. 30–40
D. 15–25

Question 2

1 mark

Mcq

Choose the correct answer.

(a) A toy is made by joining a right circular cone to a hemisphere of the same base radius r. If l is the slant height of the cone, its total painted surface area is [1 mark]

A. $\pi rl + 2\pi r^2$
B. $\pi rl + \pi r^2$
C. $3\pi r^2$
D. $\pi rl + 3\pi r^2$

Question 3

1 mark

Mcq

Choose the correct answer.

(a) A 90° sector of radius 5 cm has its triangular region (formed by the radii) removed. What is the remaining area? [1 mark]

A. 25π/2 − 25/2 cm²
B. 25π/4 − 25/2 cm²
C. 25π/4 + 25/2 cm²
D. 25π/4 − 5 cm²

Question 4

1 mark

Mcq

Choose the correct answer.

(a) In the fair example, if Akhila played Hoopla y times and took x rides, which relation represents “the number of Hoopla games is half the number of rides”? [1 mark]

A. y = 2x
B. y = x/2
C. x = y/2
D. x + y = 2

Question 5

1 mark

Mcq

Choose the correct answer.

(a) If M is the midpoint of segment AB, which of the following is always true? [1 mark]

A. AM = MB
B. A, M, B are not collinear
C. AM = AB + MB
D. AB = AM − MB

Question 6

1 mark

Mcq

Choose the correct answer.

(a) A cone and a hemisphere of equal radius are joined at their flat circular faces. Which listed surface is hidden at the joint and therefore excluded from the exposed total surface area? [1 mark]

A. Curved surface of the cone
B. Flat circular base of the cone
C. Curved surface of the hemisphere
D. Both curved surfaces

Question 7

1 mark

Mcq

Choose the correct answer.

(a) In the median formula Median = l + ((n/2 − cf)/f) × h, what does 'cf' represent? [1 mark]

A. frequency of median class
B. cumulative frequency of class preceding median class
C. class width
D. lower class boundary

Question 8

1 mark

Mcq

Choose the correct answer.

(a) In Fig. 10.6(iii), from external point P two tangents PT_1 and PT_2 meet the circle. Which relation holds? [1 mark]

A. $PT_1 = PT_2$
B. $PT_1 > PT_2$
C. $PT_1 < PT_2$
D. $PT_1 + PT_2$ equals the diameter

Question 9

1 mark

Mcq

Choose the correct answer.

(a) Find the area of a 90° sector in a circle of radius 7 cm. [1 mark]

A. 49π/2 cm²

B. 49π/4 cm²

C. 7π/2 cm²

D. 14π cm²

Question 10

1 mark

Mcq

Choose the correct answer.

(a) When solving a problem with two observation points A and B looking at the top of the same tower, what is the first construction step? [1 mark]

A. Draw two right-angled triangles sharing the same vertical height from the tower to the two observation points

B. Draw a single triangle using only the combined horizontal distance to one point

C. Measure the angle of depression instead of elevation

D. Use the sine ratio directly without constructing triangles

Question 11

1 mark

Mcq

Choose the correct answer.

(a) In the system 3x+2y=6 and 5x+2y=10, which operation will eliminate y? [1 mark]

A. Add the two equations

B. Subtract the first from the second

C. Multiply the first by 2

D. Multiply the second by 3

Question 12

1 mark

Mcq

Choose the correct answer.

(a) When an observer at the top of a tower looks down at a point on the ground, the angle of depression is 30°. The angle of elevation of the tower from that point on the ground is: [1 mark]

A. 30°
B. 60°
C. 45°
D. 90°

Question 13

1 mark

Mcq

Choose the correct answer.

(a) What is the volume of a solid obtained by joining a right circular cylinder of radius r and height h to a hemisphere of radius r? [1 mark]

A. $\pi r^2 h + (2/3)\pi r^3$
B. $\pi r^2 h - (2/3)\pi r^3$
C. $2\pi r^3 + \pi r^2 h$
D. $(4/3)\pi r^3 + \pi r^2 h$

Question 14

1 mark

Mcq

Choose the correct answer.

(a) A bag contains 4 red balls and 1 blue ball. One ball is drawn at random. What is the probability of drawing a red ball? [1 mark]

A. 1/5
B. 4/5
C. 1/4
D. 2/3

Question 15

1 mark

Mcq

Choose the correct answer.

(a) The reciprocal of tan θ is: [1 mark]

A. cot θ

B. sec θ

C. cosec θ

D. cos θ

Question 16

1 mark

Mcq

Choose the correct answer.

(a) If an arc length equals half the circumference of its circle, what is the measure of the central angle? [1 mark]

A. 90°

B. 180°

C. 120°

D. 60°

Question 17

1 mark

Mcq

Choose the correct answer.

(a) Shanta's shed is a cuboid of length 15 m, breadth 7 m, height 8 m, with a half cylinder of diameter 7 m and length 15 m on top. Which expression gives the shed's total internal volume? [1 mark]

A. $15\times7\times8 + \frac{1}{2}\times\pi\times(3.5)^2\times15$

B. $15+7+8 + \frac{1}{2}\times\pi\times7^2\times15$

C. $15\times7\times8 + \pi\times(3.5)^2\times15$

D. $15\times7\times8 + \frac{1}{2}\times\pi\times7\times15$

Question 18

1 mark

Mcq

Choose the correct answer.

(a) A fair six-sided die is rolled once. What is the probability of obtaining a prime number? [1 mark]

A. 1/2
B. 1/3
C. 1/6
D. 1/4

Question 19

1 mark

Assertion Reason

Choose the correct answer.

(a) Assertion (A): If $a_1/a_2 = b_1/b_2 = c_1/c_2$ then the pair of equations has infinitely many solutions. Reason (R): Coincident lines share every point in common. [1 mark]

A. Both A and R true and R explains A
B. Both A and R true but R does not explain A
C. A true, R false
D. A false, R true

Question 20

1 mark

Assertion Reason

Choose the correct answer.

(a) Assertion (A): Exactly two tangents can be drawn to a circle from a point outside it. Reason (R): The two tangent segments from an external point have equal lengths. [1 mark]

A. Both A and R true and R explains A
B. Both A and R true but R does not explain A
C. A true, R false
D. A false, R true

Section B

Question 21

2 marks

Short Answer

Attempt one option.

Option A

Answer the question with working and reasons where needed.

(a) A tree casts a shadow of 15 m when the angle of elevation of the sun is 30°. Find the height of the tree. [2 marks]

OR

Option B

Answer the question with working and reasons where needed.

(a) From a point on level ground, the angle of elevation to the top of a pole is 45°, and the pole's height is 20 m. Calculate the horizontal distance of the point from the base of the pole. [2 marks]

Question 22

2 marks

Short Answer

Attempt one option.

Option A

Answer the question with working and reasons where needed.

(a) Why does the mode formula for grouped data involve the frequencies f_0, f_1, and f_2 of the modal class and its two adjacent classes? [2 marks]

OR

Option B

Answer the question with working and reasons where needed.

(a) Define the class mark of an interval and give its formula. [2 marks]

Question 23

2 marks

Short Answer

Answer the question with working and reasons where needed.

(a) Define the angle of elevation and the angle of depression, highlighting the difference between them. [2 marks]

Question 24

2 marks

Short Answer

Answer the question with working and reasons where needed.

(a) Find the 20th term of the AP 7, 12, 17, …. [2 marks]

Question 25

2 marks

Short Answer

Answer the question with working and reasons where needed.

(a) Use prime factorisation to find the least common multiple (LCM) of 84 and 126. [2 marks]

Section C

Question 26

3 marks

Short Answer

Answer the question with working and reasons where needed.

(a) A circle has centre O and radius 7 cm. From a point P such that OP = 25 cm, two tangents PA and PB are drawn. Calculate the length PA. [3 marks]

Question 27

3 marks

Short Answer

Answer the question with working and reasons where needed.

(a) In ΔABC and ΔDEF, $\angle A = \angle D$ and $\angle B = \angle E$. If AB = 5 cm, BC = 7 cm and DE = 15 cm, find EF. [3 marks]

Question 28

3 marks

Short Answer

Attempt one option.

Option A

Answer the question with working and reasons where needed.

(a) The incomes of two persons are in the ratio 9:7 and their expenditures are in the ratio 4:3. Each saves ₹2000. Find their monthly incomes. [3 marks]

OR

Option B

Answer the question with working and reasons where needed.

(a) For each of the following pairs, determine whether the system is dependent (infinitely many solutions) or inconsistent (no solution), and justify using coefficient ratios: (i) $x - 2y = 3$ and $2x - 4y = 6$ (ii) $x - 2y = 3$ and $2x - 4y = 8$ [3 marks]

Question 29

3 marks

Short Answer

Answer the question with working and reasons where needed.

(a) Prove that the tangent at any point of a circle is perpendicular to the radius at the point of contact. [3 marks]

Question 30

3 marks

Short Answer

Answer the question with working and reasons where needed.

(a) Shakila deposits ₹100 on her daughter's first birthday and increases the deposit by ₹50 each subsequent birthday. How much money does she deposit in total by the time of the daughter's 15th birthday? Show all steps. [3 marks]

Question 31

3 marks

Short Answer

Attempt one option.

Option A

Answer the question with working and reasons where needed.

(a) Find the area of the minor segment of a circle with radius 7 cm when the central angle is 60°. Take π = 22/7. Show all calculations clearly. [3 marks]

OR

Option B

Answer the question with working and reasons where needed.

(a) In a circle of radius 10 cm, calculate (a) the length of the arc and (b) the area of the sector subtended by a central angle of 144°. Use π = 3.14. Show your steps. [3 marks]

Section D

Question 32

5 marks

Long Answer

Answer both connected parts. Show the required method, explanation and units.

(a) Find the 20th term of the arithmetic progression 5, –1, –7, …. [2 marks]

(b) Reena's annual salary starts at ₹8000 and increases by ₹500 each year. Calculate her salary in the 30th year of employment. Include all steps and the formula used. [3 marks]

Question 33

5 marks

Long Answer

Answer both connected parts. Show the required method, explanation and units.

(a) State the primary Pythagorean trigonometric identity relating sin θ and cos θ, and briefly explain its origin. [2 marks]

(b) Prove the trigonometric identity $\tan^2 A + 1 = \sec^2 A$ starting from $\sin^2 A + \cos^2 A = 1$. [3 marks]

Question 34

5 marks

Long Answer

Attempt one option.

Option A

Answer both connected parts. Show the required method, explanation and units.

(a) Calculate the distance between P(1,2) and Q(4,6). [2 marks]

(b) Find the distance between P(3,4) and Q(-1,2), giving your answer in simplest radical form. [3 marks]

OR

Option B

Answer both connected parts. Show the required method, explanation and units.

(a) Town A is at (10,20) km and town B is at (16,28) km on a coordinate grid. Find their straight-line distance in km using the distance formula. [2 marks]

(b) With A(0,0), B(3,4) and C(3,0), verify by calculation whether triangle ABC is right-angled. [3 marks]

Question 35

5 marks

Long Answer

Attempt one option.

Option A

Answer both connected parts. Show the required method, explanation and units.

(a) Two fair coins are tossed together. Find the probability of obtaining exactly one head. [2 marks]

(b) Two fair dice are rolled. Calculate the probability that the sum of the points is 8. [3 marks]

OR

Option B

Answer both connected parts. Show the required method, explanation and units.

(a) In a single toss of a fair coin, let E be the event ‘head appears’. Calculate P(E), P(not E), and verify that P(E)+P(not E)=1. [2 marks]

(b) A letter is chosen at random from the letters of the word ‘MATHEMATICS’. Find the probability that it is a vowel. [3 marks]

Section E

Question 36

4 marks

Case Based

A surveyor wants to determine the height of a tall tree without climbing it. She places a 2 m staff vertically on level ground and measures its shadow as 3 m at a particular time. At that same time, the tree's shadow measures 15 m. Assuming the sun's rays are parallel, she applies the principle of similar triangles to find the tree's height.

(a) Refer to the scenario: A surveyor places a 2 m staff vertically on level ground. At a certain instant, the staff's shadow measures 3 m and the shadow of a nearby tree measures 15 m. Assuming the sun's rays are parallel, identify the two triangles that are similar. [1 mark]

(b) Using the similar triangles from the scenario, write the correct proportional relation connecting the staff height (2 m), tree height (h), staff shadow (3 m), and tree shadow (15 m). [1 mark]

Attempt one of the final two-mark options.

Option A

(c) (i) Calculate the height of the tree based on the proportionality you have written. (ii) Which concept from Chapter 6 justifies the use of proportional triangles to find the tree's height indirectly? [2 marks]

OR

Option B

(c) Another tree casts a 9 m shadow at the same instant. Calculate its height and state why the staff ratio applies. [2 marks]

Question 37

4 marks

Case Based

In a classroom activity, students are given two composite numbers, 180 and 210. They factorise each number completely into primes and record: 180 = 2^2 × 3^2 × 5; 210 = 2 × 3 × 5 × 7. They will then use these factorisations to determine the highest common factor (HCF) and the least common multiple (LCM).

(a) Refer to the activity described in the case. Which prime numbers appear in the factorisations of both 180 and 210? [1 mark]

(b) According to the case, which exponents of the common primes determine the HCF of 180 and 210? [1 mark]

Attempt one of the final two-mark options.

Option A

(c) (i) Using the information in the case, calculate the HCF of 180 and 210. (ii) Using the case data, find the LCM of 180 and 210. [2 marks]

OR

Option B

(c) Verify the relation HCF(180,210) × LCM(180,210) = 180 × 210 using the values found from the prime factors. [2 marks]

Question 38

4 marks

Case Based

A rectangular garden has length exceeding its breadth by 4 m. The garden's area is 45 m². If the breadth is x metres, then the length is (x + 4) metres, leading to the equation $x(x + 4) = 45$, which simplifies to $x^2 + 4x - 45 = 0$.

(a) Write the equation $x(x + 4) = 45$ in the standard form $ax^2 + bx + c = 0$ as presented in the passage. [1 mark]

(b) From the standard form $x^2 + 4x - 45 = 0$ given in the passage, state the values of a, b and c. [1 mark]

Attempt one of the final two-mark options.

Option A

(c) (i) Factorise the quadratic $x^2 + 4x - 45$ from the passage into two linear factors. (ii) Compute the discriminant of $x^2 + 4x - 45 = 0$ and state what it tells you about the roots. [2 marks]

OR

Option B

(c) Find the physically possible breadth and length of the garden from $x^2+4x-45=0$. [2 marks]