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Class X practice studio

CLASS X · 2026-27 · MODEL PAPER

Class X Mathematics Standard (Code 041) Model Paper 2

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) If the graph of y = p(x) passes through the point (-1,0), which of the following is a factor of p(x)? [1 mark]

A. x−1
B. x+1
C. x
D. 1−x

Question 2

1 mark

Mcq

Choose the correct answer.

(a) According to the profit model $P(x)=2x^2-10x+12$, which production levels x (in hundreds of units) make the company break even? [1 mark]

A. x=−2 and x=−3
B. x=2 and x=3
C. x=5 and x=6
D. x=−5 and x=−6

Question 3

1 mark

Mcq

Choose the correct answer.

(a) For the linear polynomial $p(x)=2x+3$, what is its unique zero? [1 mark]

A. $-3/2$
B. 1.5
C. -3
D. 3

Question 4

1 mark

Mcq

Choose the correct answer.

(a) Which of the following correctly relates the zeros α, β of ax^2+bx+c to its coefficients? [1 mark]

A. $\alpha+\beta=c/a$ and $\alpha\beta=-b/a$
B. $\alpha+\beta=-b/a$ and $\alpha\beta=c/a$
C. $\alpha+\beta=b/a$ and $\alpha\beta=c/a$
D. $\alpha+\beta=-c/a$ and $\alpha\beta=b/a$

Question 5

1 mark

Mcq

Choose the correct answer.

(a) In a tower height-and-distance problem, why may a horizontal line be drawn from the top of the tower? [1 mark]

A. To form right triangles for trigonometric ratios
B. To measure vertical angles directly
C. To construct a circle radius
D. To create a chord

Question 6

1 mark

Mcq

Choose the correct answer.

(a) Which condition is necessary and sufficient for a number to be irrational? [1 mark]

A. It cannot be written as p/q for integers p,q

B. Its decimal expansion terminates

C. Its decimal expansion repeats periodically

D. It can be expressed as a root of a prime

Question 7

1 mark

Mcq

Choose the correct answer.

(a) A student uses the diameter d instead of the radius r in the area formula and computes area as πd^2. How many times larger is this result than the correct area πr^2? [1 mark]

A. 4

B. 2

C. 1/2

D. 1/4

Question 8

1 mark

Mcq

Choose the correct answer.

(a) Which of the following is not a polynomial in the variable x? [1 mark]

A. $\sqrt{x} + 3$

B. $3x - 2$

C. $x^2 + 1$

D. $x^3 - x$

Question 9

1 mark

Mcq

Choose the correct answer.

(a) Which formula gives the solutions of $ax^2 + bx + c = 0$? [1 mark]

A. $x = (-b \pm \sqrt{(b^2 + 4ac)}) / 2a$
B. $x = (-b \pm \sqrt{(b^2 - 4ac)}) / 2a$
C. $x = (b \pm \sqrt{(b^2 - 4ac)}) / 2a$
D. $x = (-b + \sqrt{(4ac - b^2)}) / a$

Question 10

1 mark

Mcq

Choose the correct answer.

(a) Which of the following points lies on the y-axis? [1 mark]

A. (0, 5)
B. (5, 0)
C. (−3, 4)
D. (2, −1)

Question 11

1 mark

Mcq

Choose the correct answer.

(a) The graph of a pair of linear equations in two variables always consists of: [1 mark]

A. a single straight line
B. two straight lines
C. a parabola
D. a circle

Question 12

1 mark

Mcq

Choose the correct answer.

(a) Using the distance formula, find the distance between P(2, 3) and Q(5, 7). [1 mark]

A. 5 units
B. √10 units
C. √13 units
D. √20 units

Question 13

1 mark

Mcq

Choose the correct answer.

(a) A solid is made by joining a cylinder and a hemisphere without overlap. How is its volume found? [1 mark]

A. Add the cylinder volume and the hemisphere volume
B. Multiply the two volumes
C. Subtract the hemisphere volume from the cylinder volume
D. Add their curved surface areas

Question 14

1 mark

Mcq

Choose the correct answer.

(a) A non-overlapping composite figure consists of an equilateral triangle of side r and a 60° sector of a circle of radius r. Which expression gives its total area? [1 mark]

A. $r^2(\pi/6 + \sqrt{3}/4)$
B. $r^2(\pi/6 - \sqrt{3}/4)$
C. $r^2(\pi/3 + \sqrt{3}/4)$
D. $r^2(\pi/4 + \sqrt{3}/2)$

Question 15

1 mark

Mcq

Choose the correct answer.

(a) What is the midpoint of the points P(−2, 7) and Q(4, 1)? [1 mark]

A. (1, 4)
B. (2, 3)
C. (−1, 8)
D. (6, 2)

Question 16

1 mark

Mcq

Choose the correct answer.

(a) If P(E) = 0.3 for some event E, what is P($\bar{E}$), where $\bar{E}$ is the complement of E? [1 mark]

A. 0.7
B. 0.3
C. 1.3
D. 0

Question 17

1 mark

Mcq

Choose the correct answer.

(a) In an AP, the first term is 7 and the fifth term is 19. What is the common difference? [1 mark]

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

Question 18

1 mark

Mcq

Choose the correct answer.

(a) Express the circumference of a circle in terms of its diameter d. [1 mark]

A. 2πd

B. πd

C. πd²

D. 2πr

Question 19

1 mark

Assertion Reason

Choose the correct answer.

(a) Assertion (A): A line intersecting a circle at two points is a tangent to the circle. Reason (R): A tangent touches the circle at exactly one point. [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): In a heights and distances problem, the angle of depression from the top of a tower equals the angle of elevation of the tower from the point on the ground. Reason (R): A horizontal line drawn through the top of the tower is parallel to the ground level, making alternate interior angles equal.
[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 student standing 100 m away from the base of a vertical tower measures the angle of elevation of its top as 45°. Calculate the height of the tower. [2 marks]

OR

Option B

Answer the question with working and reasons where needed.

(a) A vertical tower has a height of $10\sqrt{3}$ m. From a point on level ground, the angle of elevation of its top is found to be 60°. Determine the horizontal distance from the point to the base of the tower. [2 marks]

Question 22

2 marks

Short Answer

Attempt one option.

Option A

Answer the question with working and reasons where needed.

(a) Express the equation $4x - 5 + x^2 = 0$ in the standard form of a quadratic equation and identify the coefficients a, b, and c. [2 marks]

OR

Option B

Answer the question with working and reasons where needed.

(a) Solve the quadratic equation $x^2 - x - 12 = 0$ by factorisation. [2 marks]

Question 23

2 marks

Short Answer

Answer the question with working and reasons where needed.

(a) A cylinder and a hemisphere are joined without overlap to form one solid. State how to find the volume of the new solid and explain why the joined circular faces are not subtracted. [2 marks]

Question 24

2 marks

Short Answer

Answer the question with working and reasons where needed.

(a) Define a tangent and a secant to a circle, and state one key difference between them. [2 marks]

Question 25

2 marks

Short Answer

Answer the question with working and reasons where needed.

(a) Express 360 and 540 as products of primes and determine their HCF and LCM using the Fundamental Theorem of Arithmetic. [2 marks]

Section C

Question 26

3 marks

Short Answer

Answer the question with working and reasons where needed.

(a) Calculate the mean of the following grouped data by the direct method: Class intervals: 0–10 (f=5), 10–20 (f=8), 20–30 (f=7). [3 marks]

Question 27

3 marks

Short Answer

Answer the question with working and reasons where needed.

(a) Determine the mode for the following frequency distribution: Class intervals: 20–30 (f=4), 30–40 (f=9), 40–50 (f=6). [3 marks]

Question 28

3 marks

Short Answer

Attempt one option.

Option A

Answer the question with working and reasons where needed.

(a) Show by contradiction that $\sqrt{5}$ is irrational, citing the role of unique prime factorisation. [3 marks]

OR

Option B

Answer the question with working and reasons where needed.

(a) Prove that $\sqrt{3}$ is irrational by contradiction using prime factorisation. [3 marks]

Question 29

3 marks

Short Answer

Answer the question with working and reasons where needed.

(a) For A(1,2) and B(7,8), the point P divides AB internally at P(4,5). Determine the ratio AP:PB. [3 marks]

Question 30

3 marks

Short Answer

Answer the question with working and reasons where needed.

(a) A 3 m tall lamppost casts a 4 m shadow. At the same time, a tree casts a 10 m shadow. Find the height of the tree, showing all steps and units. [3 marks]

Question 31

3 marks

Short Answer

Attempt one option.

Option A

Answer the question with working and reasons where needed.

(a) A man 1.7 m tall stands 10 m away from a tower and measures the angle of elevation to its top as 30°. Find the height of the tower. [3 marks]

OR

Option B

Answer the question with working and reasons where needed.

(a) A tree is observed from a point 20 m away at an angle of elevation of 30°. Determine the height of the tree. [3 marks]

Section D

Question 32

5 marks

Long Answer

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

(a) Explain how a tangent at a point on a circle can be viewed as the limiting position of a secant and state the key distinguishing feature of a tangent compared to a secant. [2 marks]

(b) Prove that the tangents drawn at the endpoints of a diameter of a circle are parallel. [3 marks]

Question 33

5 marks

Long Answer

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

(a) State the trigonometric ratio sin A in terms of the sides of a right triangle. [2 marks]

(b) In right triangle PQR, $\angle Q = 90°$, PQ = 12 cm and PR = 13 cm. Calculate tan P showing all steps. [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 sum of the first 10 terms of the AP 2, 5, 8, …. [2 marks]

(b) Derive the formula for the sum S_n of the first n terms of an arithmetic progression by adding the series written forwards and backwards. Present each step clearly. [3 marks]

OR

Option B

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

(a) A ladder has rungs whose lengths decrease uniformly by 2 cm from bottom to top. If the bottom rung is 45 cm long, what is the length of the 8th rung from the bottom? [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 35

5 marks

Long Answer

Attempt one option.

Option A

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

(a) Calculate the discriminant of the equation $x^2 - 6x + 9 = 0$ and state the nature of its roots. [2 marks]

(b) For the quadratic equation $3x^2 + 6x + k = 0$, determine the value of k for which the roots are equal and find the common root. [3 marks]

OR

Option B

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

(a) A rectangular garden has an area of 200 m^2. Its length exceeds its breadth by 5 metres. If the breadth is x metres, form and simplify the quadratic equation satisfied by x. [2 marks]

(b) Solve the quadratic equation $6x^2 + x - 2 = 0$ by splitting the middle term and factorisation. [3 marks]

Section E

Question 36

4 marks

Case Based

In a botanical garden, a circular pond has centre O and radius 8 m. A straight rod AB lies along the tangent to the pond at its contact point P. A point Q lies 15 m from O outside the pond. From Q, two ropes touch the pond at T_1 and T_2, and $QT_1 = QT_2$.

(a) According to the passage, what is a tangent to a circle? [1 mark]

(b) What relationship between the rod AB at P and the radius OP is described by the theorem referenced in the passage? [1 mark]

Attempt one of the final two-mark options.

Option A

(c) (i) How many tangents can be drawn from point Q to the pond, and what are they named in the passage? (ii) Which property of the lengths QT_1 and QT_2, mentioned in the passage, illustrates a theorem about tangents from an external point? [2 marks]

OR

Option B

(c) Calculate the length of each rope QT_1 and QT_2 from the external point Q. [2 marks]

Question 37

4 marks

Case Based

In an experiment, two unbiased coins are tossed together. The possible outcomes of this random experiment are equally likely. Consider events based on this experiment.

(a) List the sample space for the experiment described in the passage. [1 mark]

(b) If E is the event “exactly one head appears,” find P(E). [1 mark]

Attempt one of the final two-mark options.

Option A

(c) (i) For the event F = “at least one head appears,” determine whether it is a sure event, an impossible event, or neither. (ii) Let G be the event “both tosses show tails.” Find P(G′) and verify that P(G)+P(G′)=1. [2 marks]

OR

Option B

(c) Find the probability of at least one tail, then the probability of its complementary event. [2 marks]

Question 38

4 marks

Case Based

A water storage tank at the fire station has the shape of a right circular cylinder of radius 3 m and height 10 m, with two hemispheres of the same radius attached at both ends. The tank is made of steel and needs painting on its external surface and its internal capacity is used for water storage.

(a) Which parts of the tank’s surface will require painting on the outside? [1 mark]

(b) Write an expression using standard surface-area formulas to compute the tank’s total external surface area. [1 mark]

Attempt one of the final two-mark options.

Option A

(c) (i) Formulate the expression for the tank’s internal volume (its capacity). (ii) Explain why the circular faces at the joins are not counted in the external surface area. [2 marks]

OR

Option B

(c) Calculate the tank's total external surface area using its given radius and cylinder height. [2 marks]