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Class X practice studio

CLASS X · 2026-27 · MODEL PAPER

Class X Mathematics Standard (Code 041) Model Paper 3

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) A rectangular garden has length 3 m more than its breadth. If its area is 18 m², which quadratic equation models the scenario? [1 mark]

A. $x^2 + 3x - 18 = 0$
B. $x^2 - 3x - 18 = 0$
C. $x^2 + x - 18 = 0$
D. $3x^2 + x - 18 = 0$

Question 2

1 mark

Mcq

Choose the correct answer.

(a) In ΔABC and ΔPQR, $AB/PQ = AC/PR$ and $\angle A = \angle P$. Which criterion justifies $\Delta ABC \sim \Delta PQR$? [1 mark]

A. AA
B. SSS
C. SAS
D. RHS

Question 3

1 mark

Mcq

Choose the correct answer.

(a) Which identity follows from $\sin^2\theta + \cos^2\theta = 1$ when divided by $\cos^2\theta$? [1 mark]

A. $1 + \tan^2\theta = \sec^2\theta$

B. $1 + \cot^2\theta = \text{cosec}^2\theta$

C. $\tan^2\theta + 1 = \text{cosec}^2\theta$

D. $\sin^2\theta + \sec^2\theta = 1$

Question 4

1 mark

Mcq

Choose the correct answer.

(a) For which set of coefficients will the equation $x^2 + 4x + 4 = 0$ have equal real roots? [1 mark]

A. a=1, b=4, c=4

B. a=1, b=5, c=6

C. a=2, b=3, c=1

D. a=1, b=3, c=1

Question 5

1 mark

Mcq

Choose the correct answer.

(a) Which statement correctly describes the relationship between congruence and similarity? [1 mark]

A. All similar figures are congruent

B. All congruent figures are similar

C. Similar figures have equal size but not necessarily the same shape

D. Congruent figures may not be similar

Question 6

1 mark

Mcq

Choose the correct answer.

(a) Using substitution on the equation x + 2y = 3, which expression for x is correct? [1 mark]

A. x = 3 + 2y
B. x = 2y – 3
C. x = 3 – 2y
D. x = y – 3

Question 7

1 mark

Mcq

Choose the correct answer.

(a) The LCM of 12 and 15 is: [1 mark]

A. 60
B. 30
C. 12
D. 15

Question 8

1 mark

Mcq

Choose the correct answer.

(a) For a minor segment of radius r whose central angle θ is measured in degrees, which expression gives its area? [1 mark]

A. $(\theta/360)\pi r^2 + \frac{1}{2}r^2 \sin\theta$
B. $(\theta/360)\pi r^2 - \frac{1}{2}r^2 \sin\theta$
C. $(\theta/180)\pi r^2 - \frac{1}{2}r^2 \cos\theta$
D. $(\theta/360)\pi r^2$

Question 9

1 mark

Mcq

Choose the correct answer.

(a) Which of the following events is impossible when rolling a fair six-sided die? [1 mark]

A. Getting 1
B. Getting 4
C. Getting an even number
D. Getting 7

Question 10

1 mark

Mcq

Choose the correct answer.

(a) According to the definition of similar triangles, two triangles are similar if they satisfy which of the following? [1 mark]

A. All corresponding angles are equal and all corresponding sides are proportional
B. All corresponding angles are equal but sides may not be proportional
C. All corresponding sides are proportional but angles may not be equal
D. They have the same perimeter and area

Question 11

1 mark

Mcq

Choose the correct answer.

(a) A cone and a hemisphere of the same radius are joined at their flat circular faces to make a toy. Which areas add to its exposed total surface area? [1 mark]

A. Curved area of the cone plus curved area of the hemisphere
B. Both curved areas plus both joined circular faces
C. Only the cone’s curved area
D. Only the hemisphere’s curved area

Question 12

1 mark

Mcq

Choose the correct answer.

(a) Find the sum of the first 7 terms of the AP 4, 9, 14, ... [1 mark]

A. 133
B. 136
C. 140
D. 129

Question 13

1 mark

Mcq

Choose the correct answer.

(a) Consider the system 2x+3y=5 and 4x+6y=10. Which statement is correct about its solutions? [1 mark]

A. Exactly one solution
B. No solution
C. Infinitely many solutions
D. Two solutions

Question 14

1 mark

Mcq

Choose the correct answer.

(a) A 3 m tall pole casts a 4 m shadow. At the same time, a building casts a 20 m shadow. What is the height of the building? [1 mark]

A. 12 m
B. 15 m
C. 18 m
D. 20 m

Question 15

1 mark

Mcq

Choose the correct answer.

(a) How many tangents can be drawn from a point lying on the circle? [1 mark]

A. Zero
B. One
C. Two
D. Infinitely many

Question 16

1 mark

Mcq

Choose the correct answer.

(a) Which trigonometric ratio is primarily used to relate the height of an object to its horizontal distance in heights and distances problems? [1 mark]

A. tan
B. sin
C. cos
D. cot

Question 17

1 mark

Mcq

Choose the correct answer.

(a) Which pair of equations represents two parallel lines? [1 mark]

A. $2x+3y=5$ and $4x+6y=10$
B. $2x+3y=5$ and $4x+6y=8$
C. $x–y=2$ and $2x–2y=4$
D. $x+y=3$ and $2x+2y=6$

Question 18

1 mark

Mcq

Choose the correct answer.

(a) Which of the following best describes the angle of elevation of an object? [1 mark]

A. The angle between the horizontal and the line of sight when looking at a point higher than the observer's eye level

B. The angle between the vertical and the line of sight when looking at a point higher than the observer's eye level

C. The angle between the horizontal and the line of sight when looking at a point lower than the observer's eye level

D. The angle between the vertical and the line of sight when looking at a point lower than the observer's eye level

Question 19

1 mark

Assertion Reason

Choose the correct answer.

(a) Assertion (A): Tangents drawn to a circle from an external point are equal in length. Reason (R): The triangles formed by the center, the external point, and the points of contact are right triangles congruent by the RHS criterion. [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): If all three pairs of corresponding sides of two triangles are proportional, then the triangles are similar. Reason (R): This is the SSS similarity criterion. [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) Using a 45°–45°–90° triangle, derive and state the exact value of cos 45° in simplest form. [2 marks]

OR

Option B

Answer the question with working and reasons where needed.

(a) Express sec A first in terms of cos A and then in terms of the sides of a right triangle. [2 marks]

Question 22

2 marks

Short Answer

Attempt one option.

Option A

Answer the question with working and reasons where needed.

(a) State the step-deviation method formula for mean and explain the term u_i. [2 marks]

OR

Option B

Answer the question with working and reasons where needed.

(a) In the following frequency distribution, determine the median class: Class intervals: 0–10 (f=5), 10–20 (f=8), 20–30 (f=6). [2 marks]

Question 23

2 marks

Short Answer

Answer the question with working and reasons where needed.

(a) Two positive numbers sum to 7 and their product is 10. Let x be one of the numbers; form the quadratic equation satisfied by x. [2 marks]

Question 24

2 marks

Short Answer

Answer the question with working and reasons where needed.

(a) Solve the system of equations $x - y = 4$ and $3x + 2y = 7$ using the substitution method. [2 marks]

Question 25

2 marks

Short Answer

Answer the question with working and reasons where needed.

(a) A warehouse roof is made by placing a half-cylinder of radius 2 m and length 12 m atop a cuboid of length 12 m, breadth 4 m and height 3 m. Find the volume enclosed by the roof. [2 marks]

Section C

Question 26

3 marks

Short Answer

Answer the question with working and reasons where needed.

(a) Using π = 22/7, verify that the volume of Shanta's shed (a cuboid 15 m×7 m×8 m surmounted by a half-cylinder of diameter 7 m and length 15 m) is 1128.75 m³. [3 marks]

Question 27

3 marks

Short Answer

Answer the question with working and reasons where needed.

(a) Apply the step-deviation method to find the mean of: Class intervals: 10–20 (f=4), 20–30 (f=6), 30–40 (f=5) with assumed mean a=25 and h=10. [3 marks]

Question 28

3 marks

Short Answer

Attempt one option.

Option A

Answer the question with working and reasons where needed.

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

OR

Option B

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 29

3 marks

Short Answer

Answer the question with working and reasons where needed.

(a) Using complementary-angle identities, prove $\sin(90° - A) = \cos A$ and express $\sec(90° - A)$ in terms of cosec A. [3 marks]

Question 30

3 marks

Short Answer

Answer the question with working and reasons where needed.

(a) Derive the coordinates of a point P(x,y) that divides the line segment joining $A(x_1,y_1)$ and $B(x_2,y_2)$ internally in the ratio m:n. [3 marks]

Question 31

3 marks

Short Answer

Attempt one option.

Option A

Answer the question with working and reasons where needed.

(a) If the area of a sector of a circle is 154 cm² and its central angle is 70°, determine the radius of the circle. Use π = 22/7. [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) A rectangular garden has an area of 200 m². 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) Two numbers differ by 3 and their product is 10. Find the numbers using the quadratic formula. [3 marks]

Question 33

5 marks

Long Answer

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

(a) Outline the key steps in the proof that √3 is irrational, highlighting the contradiction reached. [2 marks]

(b) Prove that √3 is irrational by contradiction using prime factorisation. [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) State the probability of a sure event and the probability of an impossible event. [2 marks]

(b) Give an example of a sure event and an impossible event when rolling a fair die, state their probabilities, and verify that both probabilities lie between 0 and 1. [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) Two fair dice are rolled. Calculate the probability that the sum of the points is 8. [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) Define what it means for a real number k to be a zero of a polynomial p(x). Then, illustrate your definition by identifying a zero of p(x)=3x−9. [2 marks]

(b) The graph of a quadratic polynomial y=p(x) crosses the x-axis at x=−2 and x=5 and also passes through the point (1,−8). Determine the explicit form of p(x). [3 marks]

OR

Option B

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

(a) A quadratic polynomial has zeros at 3 and −2. Write the monic quadratic polynomial having these zeros. [2 marks]

(b) The sum of the reciprocals of the zeros of a monic quadratic polynomial is 4/3, and their sum is 5. Find the polynomial equation. [3 marks]

Section E

Question 36

4 marks

Case Based

A surveyor wants to determine the height of a lighthouse. From point P on level ground, the angle of elevation to the top is 45°. He then moves 15 m closer to the lighthouse to point Q and finds the angle of elevation to be 60°. Let h be the height of the lighthouse and x be the horizontal distance from P to the base of the lighthouse.

(a) According to the passage, what is the numerical value of tan 45°? [1 mark]

(b) Write the expression relating h and x using the measurement at point P. [1 mark]

Attempt one of the final two-mark options.

Option A

(c) (i) Write the equation that represents tan 60° at point Q in terms of h and x. (ii) Eliminate h to derive an equation in x only. [2 marks]

OR

Option B

(c) Use $h=x$ and $\tan 60°=h/(x-15)$ to find the lighthouse height in exact form. [2 marks]

Question 37

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 38

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]