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Class X practice studio

CLASS X · 2026-27 · MODEL PAPER

Class X Mathematics Standard (Code 041) Model Paper 5

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 sin θ = 3/5 for an acute angle θ, what is tan θ? [1 mark]

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

Question 2

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 3

1 mark

Mcq

Choose the correct answer.

(a) Tangents PT_1 and PT_2 from an external point P touch a circle with centre O at T_1 and T_2. Which pair of right triangles is compared by RHS to prove $PT_1=PT_2$? [1 mark]

A. ΔOPT_1 and ΔOPT_2
B. ΔOPT_1 and ΔPT_1T_2
C. ΔOPT_2 and ΔPT_1T_2
D. ΔOT_1T_2 and ΔPT_1T_2

Question 4

1 mark

Mcq

Choose the correct answer.

(a) Which of the following correctly identifies a line that meets a circle at exactly one point? [1 mark]

A. Tangent
B. Secant
C. Chord
D. Non-intersecting line

Question 5

1 mark

Mcq

Choose the correct answer.

(a) How many terms are there in the AP 7, 14, 21, ..., 70? [1 mark]

A. 9
B. 10
C. 11
D. 12

Question 6

1 mark

Mcq

Choose the correct answer.

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

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

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

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

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

Question 7

1 mark

Mcq

Choose the correct answer.

(a) In constructing a factor tree for 462, which prime is used immediately after dividing by 2? [1 mark]

A. 2

B. 3

C. 5

D. 7

Question 8

1 mark

Mcq

Choose the correct answer.

(a) In the section formula $P((m \cdot x_2 + n \cdot x_1)/(m + n), (m \cdot y_2 + n \cdot y_1)/(m + n))$, the ratio PA:PB equals which of the following? [1 mark]

A. m:n
B. n:m
C. m:(m+n)
D. (m+n):m

Question 9

1 mark

Mcq

Choose the correct answer.

(a) The discriminant of the equation $3x^2 + 2x + 1 = 0$ is: [1 mark]

A. −8
B. 1
C. 4
D. 5

Question 10

1 mark

Mcq

Choose the correct answer.

(a) Which expression represents cot θ in terms of sin θ and cos θ? [1 mark]

A. cos θ/sin θ
B. sin θ/cos θ
C. 1/(sin θ·cos θ)
D. tan θ

Question 11

1 mark

Mcq

Choose the correct answer.

(a) A student on level ground looks up at the top of a tower. In tanθ = tower height / horizontal distance, θ is the: [1 mark]

A. Angle of elevation
B. Angle of depression
C. Angle between height and base
D. Angle of incidence

Question 12

1 mark

Mcq

Choose the correct answer.

(a) In triangle ABC right-angled at B, which expression represents cos A? [1 mark]

A. AB/AC
B. BC/AC
C. AB/BC
D. AC/AB

Question 13

1 mark

Mcq

Choose the correct answer.

(a) Which of the following cannot be a valid probability value? [1 mark]

A. –0.2
B. 0
C. 0.75
D. 1

Question 14

1 mark

Mcq

Choose the correct answer.

(a) Which of the following best defines the angle of elevation of an object from an observer's eye? [1 mark]

A. The angle between the line of sight and the horizontal when looking upward at an object above the horizontal.

B. The angle between the line of sight and the vertical when looking upward.

C. The angle between the line of sight and the horizontal when looking downward.

D. The angle between the object and its base on the ground.

Question 15

1 mark

Mcq

Choose the correct answer.

(a) In right triangle PQR with $\angle Q = 90°$, which side is the hypotenuse? [1 mark]

A. PQ

B. QR

C. PR

D. Not enough information

Question 16

1 mark

Mcq

Choose the correct answer.

(a) Which configuration best describes advanced heights and distances problems involving two right triangles? [1 mark]

A. Two right triangles sharing a common vertical side (height)

B. Two obtuse triangles sharing the base

C. A right triangle and an acute triangle sharing an angle

D. Two isosceles triangles with equal base lengths

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) In the Sridharacharya formula for roots of $ax^2 + bx + c = 0$, what does the expression under the square root represent? [1 mark]

A. Sum of the roots

B. Product of the roots

C. Discriminant

D. Coefficient ratio

Question 19

1 mark

Assertion Reason

Choose the correct answer.

(a) Assertion (A): When x_i is less than the assumed mean a, the deviation $d_i = x_i - a$ is negative. Reason (R): By definition $d_i = x_i - a$, so if $x_i < a$ then subtracting a from x_i yields a negative value. [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): The angle of depression is measured between the vertical and the line of sight.
Reason (R): The angle of depression is the angle formed by the line of sight with the horizontal when the point viewed is below the horizontal level. [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) In an AP, the 15th term is 70 and the common difference is 4. Determine the first term. [2 marks]

OR

Option B

Answer the question with working and reasons where needed.

(a) How many terms are there in the AP 7, 14, 21, …, 105? [2 marks]

Question 22

2 marks

Short Answer

Attempt one option.

Option A

Answer the question with working and reasons where needed.

(a) Which similarity criterion applies when two angles of one triangle are respectively equal to two angles of another triangle? [2 marks]

OR

Option B

Answer the question with working and reasons where needed.

(a) In triangles ABC and DEF, $\angle A = \angle D$ and $\angle B = \angle E$. State the steps to prove that $\Delta ABC \sim \Delta DEF$. [2 marks]

Question 23

2 marks

Short Answer

Answer the question with working and reasons where needed.

(a) Explain why 1/40 has a terminating decimal expansion, while 1/18 does not, using the Fundamental Theorem of Arithmetic. [2 marks]

Question 24

2 marks

Short Answer

Answer the question with working and reasons where needed.

(a) Briefly justify, using congruent triangles, why the lengths of two tangents from an external point are equal. [2 marks]

Question 25

2 marks

Short Answer

Answer the question with working and reasons where needed.

(a) Write the formula for calculating the mean by the assumed mean method and define the term d_i.

[2 marks]

Section C

Question 26

3 marks

Short Answer

Answer the question with working and reasons where needed.

(a) A cube of side a is joined to a hemisphere of radius a/2 by attaching one face of the cube to the base of the hemisphere. Find the total surface area of the resulting solid in terms of a. [3 marks]

Question 27

3 marks

Short Answer

Answer the question with working and reasons where needed.

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

Question 28

3 marks

Short Answer

Attempt one option.

Option A

Answer the question with working and reasons where needed.

(a) Find the HCF and LCM of 84 and 120 by prime factorisation, and verify that their product equals 84 × 120. [3 marks]

OR

Option B

Answer the question with working and reasons where needed.

(a) Prove that √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) Find the exact values of sin 60°, cos 30° and tan 45° with brief justification for each. [3 marks]

Question 30

3 marks

Short Answer

Answer the question with working and reasons where needed.

(a) A composite solid consists of a right circular cylinder of radius 5 cm and height 20 cm with two hemispheres of the same radius attached to its ends. Find the volume of this solid. (Use π = 3.14). [3 marks]

Question 31

3 marks

Short Answer

Attempt one option.

Option A

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]

OR

Option B

Answer the question with working and reasons where needed.

(a) Solve the system of equations by substitution: $4x - y = 5$ and $2x + 3y = 13$. [3 marks]

Section D

Question 32

5 marks

Long Answer

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

(a) For the quadratic polynomial $p(x)=2x^2-4x+1$, find the sum and product of its zeros without solving for the zeros. [2 marks]

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

Question 33

5 marks

Long Answer

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

(a) Check whether ΔPQR with sides 4 cm, 6 cm, 8 cm and ΔXYZ with sides 2 cm, 3 cm, 4 cm are similar, stating the criterion used. [2 marks]

(b) In ΔABC and ΔDEF, $AB/DE = AC/DF = 3/4$ and $\angle A = \angle D$. Prove that the triangles are similar. [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) Factorize the quadratic polynomial $p(x)=x^2-2x+1$ and state its zero, indicating its multiplicity. [2 marks]

(b) Prove algebraically that any non-zero linear polynomial $p(x)=ax+b$, with $a\neq0$, has exactly one zero. [3 marks]

OR

Option B

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

(a) For the linear polynomial $p(x)=4x-8$, determine its zero and the coordinates of the point where the graph of $y=p(x)$ meets the x-axis. [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]

Question 35

5 marks

Long Answer

Attempt one option.

Option A

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

(a) A relay tower must divide AB in the ratio 1:2, where A is (0,0) and B is (36,15). Find its coordinates. [2 marks]

(b) 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]

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

Section E

Question 36

4 marks

Case Based

A circular park has centre O and radius 28 m. A chord AB subtends 60° at O, dividing the park into a minor sector AOB and a major sector. Additionally, a radial line OC bisects the minor sector AOB, creating two equal sectors of 30° each.

(a) Using the scenario below, calculate the length of arc AB in the circular park. [1 mark]

(b) In the same park scenario, find the area of the minor sector AOB. [1 mark]

Attempt one of the final two-mark options.

Option A

(c) (i) Still using the park details, compute the area of one of the two smaller sectors (for example AOC).
(ii) Using the same data, determine the area of the minor segment APB formed by chord AB. [2 marks]

OR

Option B

(c) Find the area of the major sector of the park left after the 60° minor sector is removed. [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

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]