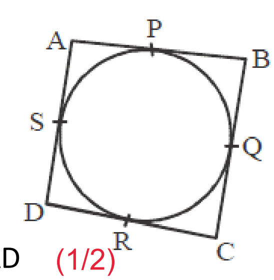
# COMMON PRE-BOARD EXAMINATION 2022-23

## Subject: MATHEMATICS (STANDARD) 041

Date:

Marking Scheme - Set 1

| Q. No | SECTION A | |
|---|---|---|
| 1 | (B) $14\pi$ cm | 1 |
| 2 | (D) parallel | 1 |
| 3 | (B) 14 | 1 |
| 4 | (D) 15 | 1 |
| 5 | (A) -1 | 1 |
| 6 | (C) 1 : 3 | 1 |
| 7 | (D) no real roots | 1 |
| 8 | (C) 30 | 1 |
| 9 | (D) 36 feet | 1 |
| 10 | (B)90° | 1 |
| 11 | (C) 2 | 1 |
| 12 | (B) $\frac{\mathrm{BE}}{\mathrm{EC}}$ | 1 |
| 13 | (D) 24.5 | 1 |
| 14 | (C) 32 cm | 1 |
| 15 | (D) 40 | 1 |
| 16 | (A) $\frac{7}{25}$ | 1 |
| 17 | (C) 338 | 1 |
| 18 | (A) (6, 3) | 1 |
| 19 | (b) | 1 |
| 20 | (d) | 1 |

| Q. No. | SECTION B | |
|---|---|---|
| 21 | $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}, \Rightarrow \frac{c}{12} = \frac{3}{c} = \frac{3-c}{-c}$ | (1/2) |
| | $\frac{c}{12} = \frac{3}{c} \Rightarrow c^2 = 36, c = \pm 6$ ...(i) | (1/2) |
| | $\frac{3}{c} = \frac{3-c}{-c} \Rightarrow -3c = c(3 - c)$ | |
| | $\Rightarrow -3c = 3c - c^2 \Rightarrow c^2 - 6c = 0$ | |
| | $\Rightarrow c(c - 6) = 0 \Rightarrow c = 0$ or $c = 6$....(ii) | (1/2) |
| | From (i) and (ii), c = 6 | (1/2) |
| 22 | Let the circle touches the sides AB, BC, CD and AD at P, Q, R and S respectively | |
| | ∴ AP = AS,<br>BP = BQ,<br>DR = DS,<br>CR = CQ } Tangents from an external point | (1) |
| | (AP + BP) + (DR + CR) = (AS + DS) + (BQ+ CQ) | (1/2) |
| |  | |
| | ∴ AB + CD = BC + AD | (1/2) |

**23**

5 tan θ = 3 ⟹ tan θ = $\frac{3}{5}$ (1/2)

$$\frac{5\sin\theta - 3\cos\theta}{4\sin\theta + 3\cos\theta} = \frac{5\frac{\sin\theta}{\cos\theta} - 3}{4\frac{\sin\theta}{\cos\theta} + 3} = \frac{5\tan\theta - 3}{4\tan\theta + 3}$$ (1)

$$= \frac{5 \times \frac{3}{5} - 3}{4 \times \frac{3}{5} + 3} = \frac{3 - 3}{\frac{12}{5} + 3} = 0$$ (1/2)

**OR**

cos(A – B) = $\frac{\sqrt{3}}{2}$ = cos 30°

sin(A + B) = $\frac{\sqrt{3}}{2}$ = sin 60°

A – B = 30° ……(i) (1/2)

A + B = 60° …….(ii) (1/2)

Adding (i) and (ii),

2A= 90°

⟹ A = 45° (1/2)

Substituting this value of A in equation (1),

we get B = 15° (1/2)

**24**

∠ADE = ∠AED and $\frac{AD}{DB} = \frac{AE}{EC}$ (Given)

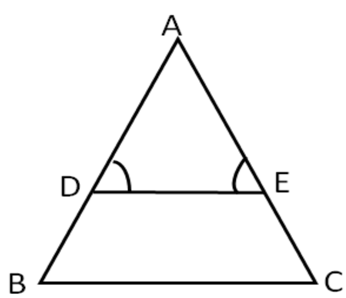
By converse of BPT, DE ∥ BC (1/2)

∠ADE = ∠ABC and
∠AED = ∠ACB } corresponding ∠s (1/2)

Given ∠ADE = ∠AED (1/2)

⟹ ∠ABC = ∠ACB (1/2)

∴ BAC is an isosceles triangle.




**25**

Angle subtended in 1 minute = $\frac{360}{60}$ = 6°

Angle subtended in 35 minutes= 35×6° = 210° (1/2)

Area swept by the minute hand

= Area of a sector= $\frac{\theta}{360} \times \pi r^2$ (1/2)

= $\frac{210}{360} \times \frac{22}{7} \times 14 \times 14$ (1/2)

= $\frac{1078}{3}$ cm² (1/2)

**OR**

Central angle of major sector

360°-45° = 315° (1/2)

Area of a sector= $\frac{\theta}{360} \times \pi r^2$ (1/2)

= $\frac{315}{360} \times \frac{22}{7} \times 28 \times 28$ (1/2)

= 2156 cm² (1/2)

**26**

Given a circle with centre O, an external point T and two tangents TP and TQ to the circle, where P, Q are the points of contact

To prove:∠ PTQ = 2 ∠ OPQ (1/2)

Proof: Let ∠ PTQ = θ

TP = TQ(Tangents from an external point)

So, TPQ is an isosceles triangle. (1/2)

Therefore, ∠ TPQ = ∠ TQP = $\frac{1}{2}(180° - \theta)$

= 90° - $\frac{1}{2}\theta$ (1)

∠ OPT = 90°(∠ between the tangent and radius) (1/2)

∠OPQ = ∠ OPT – ∠TPQ = 90° - $\left(90° - \frac{1}{2}\theta\right)$

= $\frac{1}{2}\theta$ = $\frac{1}{2}$∠PTQ ⟹∠PTQ = 2∠OPQ (1/2)

**26**

**OR**

OB is radius, QT is tangent at B$\Longrightarrow \angle OBP = 90^\circ$ (1/2)

OA = OB(radii)

$\angle OAB = \angle OBA = 30^\circ$(angles opposite to equal sides) (1/2)

$\angle AOB = 180^\circ - (30^\circ + 30^\circ) = 120^\circ$ (1)

$\angle ABP = \angle OBP - \angle OBA$

$= 90^\circ - 30^\circ = 60^\circ$ (1)

**27**

Let $\sqrt{3}$ be a rational number

$\sqrt{3} = \frac{a}{b}$ (a and b are integers and co-prime) (1/2)

On Squaring both the sides, $3 = \frac{a^2}{b^2}$ (1/2)

$\Longrightarrow 3b^2 = a^2 \Longrightarrow a^2$ is divisible by 3

$\Longrightarrow$a is divisible by 3 -----------------(1) (1/2)

We can write a = 3c for some c (integer)

$a^2 = 9c^2$

$3b^2 = 9c^2 \Longrightarrow b^2 = 3c^2$

$b^2$ is divisible by 3 $\Longrightarrow$ b is divisible by 3 --------(2)

from (1) and (2) we get (1/2)

3 is a factor of 'a' and 'b'. (1/2)

Which is contradicting the fact that a and b are co-prime. Hence our assumption (1/2

that $\sqrt{3}$ is rational number is false. So $\sqrt{3}$ is irrational number.

**28**

$$\text{L.H.S.} = \frac{\cos A}{1 - \tan A} - \frac{\sin^2 A}{\cos A - \sin A}$$

$$= \frac{\cos^2 A}{\cos A - \sin A} - \frac{\sin^2 A}{\cos A - \sin A} \quad (1)$$

$$= \frac{\cos^2 A - \sin^2 A}{\cos A - \sin A} = \cos A + \sin A \quad (2)$$

$$= \text{R.H.S.}$$

**29**

Prime numbers from 1 to 20 are 2, 3, 5, 7, 11, 13, 17, 19 i.e. 8

(i)P(prime number) = $\frac{8}{20} = \frac{2}{5}$ (1)

(ii) Composite number from 1 to 20 are

4, 6, 8, 9, 10, 12, 14, 15, 16, 18, 20 i.e. 11

P(Composite number) = $\frac{11}{20}$ (1)

(iii)Number divisible by 3 from 1 to 20 are

3, 6, 9, 12, 15, 18 i.e 6

P(number divisible by 3) = $\frac{6}{20} = \frac{3}{10}$ (1)

**30**

$\alpha\beta = \frac{2}{3}$, $\alpha + \beta = \frac{-8}{3}$ (1)

$\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta$ (1/2)

$= \frac{64}{9} - \frac{4}{9} = \frac{60}{9}$ (1)

$= 6\frac{6}{9} = 6\frac{2}{3}$ (1/2)

**31**

Tabular column

$y = 2x - 10$

| $x$ | 5 | 6 | 3 |
|---|---|---|---|
| $y$ | 0 | 2 | $-4$ |

$x = 15 + 3y$

| $x$ | 18 | 0 | 15 |
|---|---|---|---|
| $y$ | 1 | $-5$ | 0 |

(1/2)

Correct graph of two lines (1 + 1)

Solution x = 3 , y = 4 (1/2)

**31**

**OR**

Let the speed of the car I from *A* be $x$ and speed of the car II from *B* be $y$. (1/2)

**Same Direction:**

Distance covered by car I = 150 + (distance covered by car II)

$15x = 150 + 15y$

$15x - 15y = 150$

$x - y = 10$ ...(1) (1)

**Opposite Direction:**

Distance covered by car I + distance covered by car II

= 150 km

$x + y = 150$ ...(2) (1)

Adding equation (1) and (2), we have $x = 80$.

Substituting $x = 80$ in equation (1),

we have $y = 70$.

Speed of the car I from *A* = 80 km/hr and speed of the car II from *B* = 70 km/hr. (1/2)

**SECTION D**

**32**

Let the sides of the two squares be x m and y m. (1/2)

$x^2 + y^2 = 468$ (1/2)

$4x - 4y = 24 \Longrightarrow x - y = 6 \Longrightarrow y = x - 6$ (1)

$x^2 + (x - 6)^2 = 468$ (1/2)

$2x^2 - 12x - 432 = 0 \Longrightarrow x^2 - 6x - 216 = 0$ (1)

$(x + 12)(x - 18) = 0$ (1)

x = -12(rejected), x = 18

The sides of the squares are 18 m and 12 m. (1/2)

**32**

**OR**

$\frac{3}{x+1} + \frac{4}{x-1} = \frac{29}{4x-1}$; $x \neq -1, 1, \frac{1}{4}$

$\frac{3x-3+4x+4}{(x+1)(x-1)} = \frac{29}{4x-1}$ (1)

$\frac{7x+1}{x^2-1} = \frac{29}{4x-1} \Longrightarrow (7x + 1)(4x - 1) = 29x^2 - 29$ (1/2)

$28x^2 - 7x + 4x - 1 = 29x^2 - 29$ (1)

$28x^2 - 3x - 1 = 29x^2 - 29$ (1/2)

$x^2 + 3x - 28 = 0$ (1/2)

$(x + 7)(x - 4) = 0$ (1)

x = 4, x = -7 (1/2)

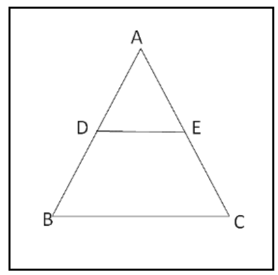
**33**

For the Theorem: Given, To prove,

Construction and figure (1 1/2)

Proof (1 1/2)

AD = DB Given D is the midpoint of AB........(i) (1/2)



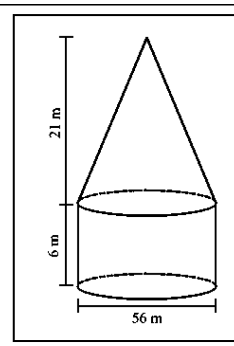

$\therefore \frac{AD}{DB} = 1$ (1/2)

$\frac{AD}{DB} = \frac{AE}{EC}$ Basic Proportionality Th. (1/2)

$\therefore \frac{AE}{EC} = 1 \Longrightarrow AE = EC$ (1/2)

∴ E is the midpoint of AC.

**34**




Cylinder:

$h_1 = 6$ m, r = 28 m (1/2)

Cone:

$h_2 = 21\ m$, r = 28m (1/2)

$l^2 = 21^2 + 28^2 = 1225$

$l = 35$ m (1)

TSA of tent $= 2\pi r h_1 + \pi r l = \pi r(2h_1 + l)$ (1)

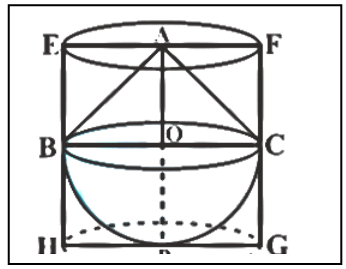
$= \frac{22}{7} \times 28(2\times6 + 35) = 4136\ m^2$ (2)

The required area of the canvas is 4136 $m^2$.

34

**OR**

The radius BO of the hemisphere (as well as of the cone) = $\frac{1}{2}\times$ 4 cm = 2 cm (1/2)




Vol. of toy =

$\frac{2}{3}\pi r^3 + \frac{1}{3}\pi r^2 h$ (1/2)

$= \left[\frac{2}{3} \times 3.14 \times (2)^3 + \frac{1}{3} \times 3.14 \times (2)^2 \times 2\right] cm^3 = 25.12\ cm^3$ (2)

the volume required = volume of the right circular cylinder – volume of the toy (1/2)

= (3.14 × $2^2$ × 4 – 25.12) $cm^3$ (1)

= 25.12 $cm^3$ (1/2)

35

| Classes | Class mark ($x_i$) (1) | Frequency ($f_i$) | $f_i x_i$ (1) |
|---|---|---|---|
| 10-30 | 20 | 5 | 100 |
| 30-50 | 40 | 8 | 320 |
| 50-70 | 60 | 12 | 720 |
| 70-90 | 80 | 20 | 1600 |
| 90-110 | 100 | 3 | 300 |
| 110-130 | 120 | 2 | 240 |
| | | 50 | 3280 |

Mean = $\frac{\Sigma f_i x_i}{\Sigma f_i}$ (1/2)

$= \frac{3280}{50} = 65.6$ (1/2)

Mode:

$f_0$ = 12, $f_1$ = 20, $f_2$= 3, $l$ = 70, h = 20 (1)

Mode = $l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right)h$

$= 70 + \left(\frac{20-12}{2\times20-12-3}\right) \times 20$ (1/2)

$= 70 + \left(\frac{8}{25}\right) \times 20 = 70 + 6.4 = 76.4$ (1/2)

## SECTION E

**36**

(I) (0, -9) (1)

(II) 6 units (1)

(III) Centre forward(-3, 8), Full back(5, -5) (1)

Distance= $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

= $\sqrt{(-3 - 5)^2 + (8 + 5)^2}$

=$\sqrt{(-8)^2 + (13)^2}$

=$\sqrt{64 + 169}$ = $\sqrt{233}$ units (1)

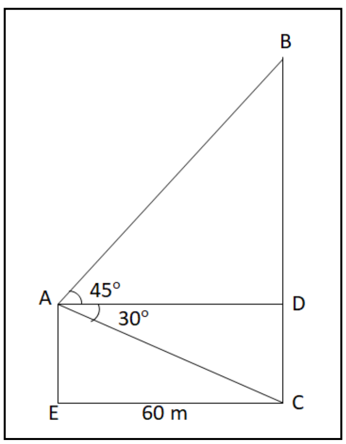
**OR**

Centre Forward(3, 8), Side Midfielder(7, 2) (1)

$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$ = $\left(\frac{3+7}{2}, \frac{8+2}{2}\right)$ = (5, 5) (1)

**37**

(I)




(1)

(II) cos 45° = $\frac{60}{AB} \Longrightarrow \frac{60}{AB} = \frac{1}{\sqrt{2}}$

AB = $60\sqrt{2}$ m

The required distance is $60\sqrt{2}$ m (1)

(III)tan 45° = $\frac{BD}{60} \Longrightarrow 1 = \frac{BD}{60} \Longrightarrow \text{BD} = 60 \text{ m}$ (1/2)

tan 30° = $\frac{DC}{60} \Longrightarrow \frac{1}{\sqrt{3}} = \frac{DC}{60} \Longrightarrow \text{DC} = \frac{60}{\sqrt{3}} \text{ m}$

$= 20\sqrt{3}$ m (1)

Height of the tower = 60 + $20\sqrt{3}$ = 20(3 + $\sqrt{3}$ )m (1/2)

**37**

**OR**

tan 30° = $\frac{DC}{60}$ (1/2)

$\Longrightarrow \frac{1}{\sqrt{3}} = \frac{DC}{60}$ (1/2)

$\Longrightarrow \text{DC} = \frac{60}{\sqrt{3}} \text{ m} = 20\sqrt{3} \text{ m}$ (1/2)

$\text{AE} = \text{DC} = 20\sqrt{3} \text{ m}$ (1/2)

The required height is 20 $\sqrt{3}$ m.

**38**

(I) $a_6$ = 800, $a_9$ = 1130

a + 5d = 800.....(i)

a + 8d = 1130.....(ii)

Solving (i) and (ii),

d = 110, a = 250

Production in the first year = 250 rollers (1)

(II)Increase in the company's production every year

d = 110 (1)

(III)$a_n$ = $(a + (n - 1)d)$

1460 = 250 + (n-1)110 (1)

1210 = (n-1)×110⟹121 = (n-1)11

⟹n = 12 (1)

**OR**

$S_n = \frac{n}{2}(2a + (n - 1)d)$

$S_6 = \frac{6}{2}(2 \times 250 + (7)110)$ (1)

= 3(500 + 770) = 3 (1270) = 3810 (1)

The company's total production for the first 6 years= 3810

# COMMON PRE-BOARD EXAMINATION 2022-23

## Subject: MATHEMATICS (STANDARD) 041

MARKING SCHEME – SET 2 and SET 3

| Qn. No | SET 1 | | SET 2 | | SET 3 |
|---|---|---|---|---|---|
| SECTION A | | SECTION B | | SECTION C | |
| 1 | (B) $14\pi$ cm | 1 | (A) (6, 3) | 1 | (D) 36 feet |
| 2 | (D) parallel | 2 | (D) no real roots | 2 | (D) parallel |
| 3 | (B) 14 | 3 | (C) 338 | 3 | (C) 30 |
| 4 | (D) 15 | 4 | (A)$\frac{7}{25}$ | 4 | (C) 1 : 3 |
| 5 | (A) -1 | 5 | (D) 40 | 5 | (A)(6, 3) |
| 6 | (C) 1 : 3 | 6 | (D) 24.5 | 6 | (C) 338 |
| 7 | (D) no real roots | 7 | (D) parallel | 7 | (D) no real roots |
| 8 | (C) 30 | 8 | (C) 2 | 8 | (A)$\frac{7}{25}$ |
| 9 | (D) 36 feet | 9 | (B)90° | 9 | (D) 40 |
| 10 | (B)90° | 10 | (D) 36 feet | 10 | (D) 24.5 |
| 11 | (C) 2 | 11 | (C) 30 | 11 | (A) -1 |
| 12 | (B) $\frac{BE}{EC}$ | 12 | (C) 32 cm | 12 | (B) $\frac{BE}{EC}$ |
| 13 | (D) 24.5 | 13 | (C) 32 cm | 13 | (D) 15 cm |
| 14 | (C) 32 cm | 14 | (B) $\frac{BE}{EC}$ | 14 | (C) 32 cm |
| 15 | (D) 40 | 15 | (A) -1 | 15 | (B) 14 |
| 16 | (A) $\frac{7}{25}$ | 16 | (D) 15 cm | 16 | (B) $14\pi$ cm |
| 17 | (C) 338 | 17 | (B) 14 | 17 | (B)90° |
| 18 | (A) (6, 3) | 18 | (B) $14\pi$ cm | 18 | (C) 2 |
| 19 | (b) | 19 | (d) | 19 | (b) |
| 20 | (d) | 20 | (b) | 20 | (d) |

| SECTION B | | SECTION B | | SECTION B | |
|---|---|---|---|---|---|
| 21 | | 21 | SET 1 Qn. No: 25 | 21 | SET 1 Qn. No: 23 |
| 22 | | 22 | SET 1 Qn. No: 24 | 22 | SET 1 Qn. No: 22 |
| 23 | | 23 | SET 1 Qn. No: 23 | 23 | SET 1 Qn. No: 25 |
| 24 | | 24 | SET 1 Qn. No: 22 | 24 | SET 1 Qn. No: 24 |
| 25 | | 25 | SET 1 Qn. No: 21 | 25 | SET 1 Qn. No: 21 |
| **SECTION C** | | **SECTION C** | | **SECTION C** | |
| 26 | | 26 | SET 1 Qn. No: 31 | 26 | SET 1 Qn. No: 26 |
| 27 | | 27 | SET 1 Qn. No: 30 | 27 | SET 1 Qn. No: 31 |
| 28 | | 28 | SET 1 Qn. No: 29 | 28 | SET 1 Qn. No: 30 |
| 29 | | 29 | SET 1 Qn. No: 26 | 29 | SET 1 Qn. No: 27 |
| 30 | | 30 | SET 1 Qn. No: 28 | 30 | SET 1 Qn. No: 28 |
| 31 | | 31 | SET 1 Qn. No: 27 | 31 | SET 1 Qn. No: 29 |
| **SECTION D** | | **SECTION D** | | **SECTION D** | |
| 32 | | 32 | SET 1 Qn. No: 34 | 32 | SET 1 Qn. No: 35 |
| 33 | | 33 | SET 1 Qn. No: 35 | 33 | SET 1 Qn. No: 34 |
| 34 | | 34 | SET 1 Qn. No: 32 | 34 | SET 1 Qn. No: 33 |
| 35 | | 35 | SET 1 Qn. No: 33 | 35 | SET 1 Qn. No: 32 |
| **SECTION E** | | **SECTION E** | | **SECTION E** | |
| 36 | | 36 | SET 1 Qn. No: 37 | 36 | SET 1 Qn. No: 38 |
| 37 | | 37 | SET 1 Qn. No: 38 | 37 | SET 1 Qn. No: 36 |
| 38 | | 38 | SET 1 Qn. No: 36 | 38 | SET 1 Qn. No: 37 |
| | | | | | |
| | | | | | |