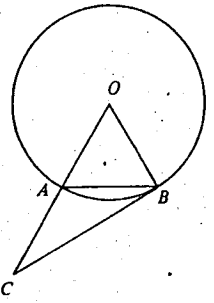


SECTION A

$(x^2 + 4x + 4) - (y - 1)^2$
 $= (x + 2)^2 - (y - 1)^2$
 $= [(x + 2) + (y - 1)][(x + 2) - (y - 1)]$
 $= (x + y + 1)(x - y + 3)$

If a cand. wrote $(x+2)^2 - (y-1)^2 = 0$ etc, withhold last 2A.

(a) Correct reason for $\angle ABC = 30^\circ$.



(b) Correct reason to establish CB is a tangent.

(a) 54.5

$$\text{Mean} = \frac{44.5(100) + 54.5(300) + 64.5(400) + 74.5(200)}{1000}$$

= 61.5

$2 \cos^2 \theta + 5 \sin \theta + 1 = 0$
 $2(1 - \sin^2 \theta) + 5 \sin \theta + 1 = 0$
 $2 \sin^2 \theta - 5 \sin \theta - 3 = 0$
 $(2 \sin \theta + 1)(\sin \theta - 3) = 0$
 $\sin \theta = 3$ or $-\frac{1}{2}$

Rejecting $\sin \theta = 3$

$\theta = 210^\circ$ or 330°

For answers in radian measure: $\theta = \frac{7\pi}{6}$ or $\frac{11\pi}{6}$
(or any figure which rounded to 3.67 or 5.76)

If more than 2 answers given, deduct 1 mark for each wrong answer from the marks scored in the answer only.

1. (a) $a : b = 3 : 4$
 $= 6 : 8$
 $a : c = 2 : 5$
 $= 6 : 15$
 $a : b : c = 6 : 8 : 15$

(b) Let $\frac{a}{6} = \frac{b}{8} = \frac{c}{15} = k$
 $\frac{ac}{a^2 + b^2} = \frac{(6k)(15k)}{6^2k^2 + 8^2k^2}$
 $= 0.9$

5. (a) $OC = 30 - 15 = 15$
 $\cos \angle AOC = \frac{15}{30}$
 $\angle AOC = 60^\circ$ or $\frac{\pi}{3}$

(b) $\widehat{AB} = \frac{60}{360} \times 2\pi(30)$ or $30 \times \frac{\pi}{3}$
 $= 10\pi$

6. $1000[(1.1)^3 - 1] = 1000 \times \frac{r}{100} \times 3$
 $1000[0.331] = 1000 \times \frac{r}{100} \times 3$

$3r = 33.1$
 $r = 11.0333$
 ≈ 11.03

$2 \cos^2 \theta + 5 \sin \theta + 1 = 0$
 $2(1 - \sin^2 \theta) + 5 \sin \theta + 1 = 0$
 $2 \sin^2 \theta - 5 \sin \theta - 3 = 0$
 $(2 \sin \theta + 1)(\sin \theta - 3) = 0$
 $\sin \theta = 3$ or $-\frac{1}{2}$

Rejecting $\sin \theta = 3$

$\theta = 210^\circ$ or 330°

For answers in radian measure: $\theta = \frac{7\pi}{6}$ or $\frac{11\pi}{6}$

(or any figure which rounded to 3.67 or 5.76)

If more than 2 answers given, deduct 1 mark for each wrong answer from the marks scored in the answer only.

ALTERNATIVELY,
 $\frac{ac}{a^2 + b^2} = \frac{c}{a}$
 $= 0.9$

This may be omitted provided OC is correct. Or any figure which rounded to 60.

Accept 9.9π to 10.1π

$CA = SA$ or $CJ = SJ$
 2A for "A"
 1A for R.S., 1A for L.S.
 If a cand. wrote compound int. = $\$1000(1.1)^3$, deduct 1 mark.
 If a cand. wrote simple interest = $\$1000(1 + r \times 3)$, deduct 1 mark.
 Or any figure which rounded to 11.03.
 Accept 11.03%.

For $\cos^2 \theta = 1 - \sin^2 \theta$
 If a candidate wrote $\sin \theta = -\frac{1}{2}$ only, award 2 marks.

Accept " $\theta = 210^\circ, 330^\circ$," or " $\theta = 210^\circ$ and 330° ."

General solution, no marks.

SECTION B

(a) (3 marks)

Volume of hemisphere = $\frac{1}{2} \times \frac{4}{3} \pi r^3$ _____

$\pi r^2 h = \frac{1}{2} \times \frac{4}{3} \pi r^3$ _____

$2r = 3h$

$r : h = 3 : 2$ _____

b: c No mark

(b) (9 marks)

(i) Perimeter of section = $\pi r + 2h + 2r$ _____

$\pi r + 2h + 2r = 136$ _____

$\pi r + \frac{4}{3} r + 2r = 136$ _____

$r(\pi + \frac{4}{3} + 2) = 136$

$r = \frac{136}{\pi + \frac{4}{3} + 2}$

≈ 21 _____

(ii) Total external surface area

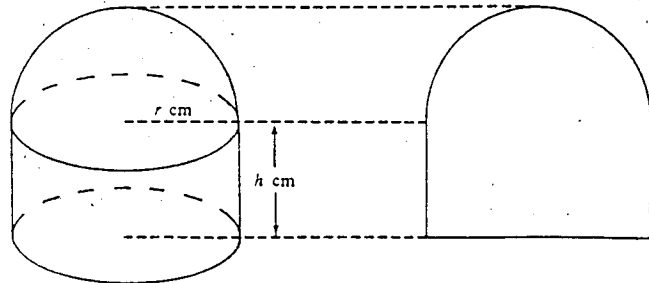
= $2\pi r^2 + 2\pi rh + \pi r^2$ _____

= $3\pi r^2 + 2\pi r \cdot \frac{2}{3}r$

= $3\pi r^2 + \frac{4}{3}\pi r^2$

= $\frac{13}{3}\pi r^2$

$\approx 6000 \text{ cm}^2$ _____



Write r:h=3:2 only award 1 mark

1A

1A

1A

Accept $r : h = \frac{3}{2} : 1$

or $1 : \frac{2}{3}$ or $\frac{3}{2}$

or $\frac{r}{h} = \frac{3}{2}$ or $3 : 2$

2A

1M

For perimeter = 136

1M

For sub. $h = \frac{2}{3}r$

or sub. $r = \frac{3h}{2}$

1A

Or any figure which rounded to 21.

1A

Accept $r = 21 \text{ cm}$.

2M

For 2 correct terms, award 1 mark.

1A

Accept area = 6000.
Accept area ≈ 6000 .
For wrong unit, do not award this mark.

9. For (a), (b), and (c), if a cand. mentioned $\angle ABC = 45^\circ$ or $\angle ACB = 45^\circ$ or $\angle ODC = 45^\circ$, accept answers without any intermediate step.

(a) (2 marks)

Let $B = (h, 0)$

$\frac{2-0}{8-h} = 1$ _____

$h = 6$ _____

[Note: If a cand. wrote $\angle ABC = 45^\circ$ only, award 1M.]

(b) (2 marks)

Let $C = (k, 0)$

$(8-k)^2 + (2-0)^2 = (8-6)^2 + (2-0)^2$ _____

$(8-k)^2 = 4$

$8-k = \pm 2$

$k = 10$ or 6

$C = (10, 0)$ _____

(c) (3 marks)

AC: $\frac{y-0}{x-10} = \frac{2-0}{8-10}$ _____

$x + y - 10 = 0$ _____

Put $x = 0, y = 10$
 $D = (0, 10)$ _____

(d) (5 marks)

$\angle BOD = 90^\circ$,

$\therefore BD$ is a diameter,

Centre of circle = $(3, 5)$ _____

Radius = $\sqrt{3^2 + 5^2}$ _____

Equation: $(x-3)^2 + (y-5)^2 = 34$ _____

ALTERNATIVELY,

Let the equation of circle be

$x^2 + y^2 + 2gx + 2fy + c = 0$, _____

this passes through $(0, 0)$, $c = 0$ _____

this passes through $(6, 0)$, $36 + 12g = 0$ _____

this passes through $(0, 10)$, $100 + 20f = 0$ _____

Equation: $x^2 + y^2 - 6x - 10y = 0$ _____

ALTERNATIVELY,

AB: $\frac{y-2}{x-8} = 1$ 1M

$x - y - 6 = 0$

When $y = 0, x = 6$

$B = (6, 0)$ 1A

ALTERNATIVELY,

By symmetry,

$C = (10, 0)$ 1M+1A

1M

1A

1M

1A

1M

1A

1A

1A

1A

1M+1A

1M

1A

1A

1A

QUESTION B

(a) (3 marks)

Volume of hemisphere = $\frac{1}{2} \times \frac{4}{3} \pi r^3$ _____

$\pi r^2 h = \frac{1}{2} \times \frac{4}{3} \pi r^3$ _____

$2r = 3h$
 $r : h = 3 : 2$ _____

6:4 No mark

1A

1A

1A

With $r:h = 3:2$ only
 award 1 mark

Accept $r : h = \frac{3}{2} : 1$

or $1 : \frac{2}{3}$ or $\frac{3}{2}$

or $\frac{r}{h} = \frac{3}{2}$ or $3 : 2$

(b) (9 marks)

(i) Perimeter of section = $\pi r + 2h + 2r$ _____

$\pi r + 2h + 2r = 136$ _____

$\pi r + \frac{4}{3}r + 2r = 136$ _____

$r(\pi + \frac{4}{3} + 2) = 136$

$r = \frac{136}{\pi + \frac{4}{3} + 2}$

≈ 21 _____

2A

1M

1M

1A

1A

For perimeter = 136

For sub. $h = \frac{2}{3}r$

or sub. $r = \frac{3h}{2}$

Or any figure which rounded to 21.

Accept $r = 21$ cm.

(ii) Total external surface area

= $2\pi r^2 + 2\pi rh + \pi r^2$ _____

= $3\pi r^2 + 2\pi r \cdot \frac{2}{3}r$

= $3\pi r^2 + \frac{4}{3}\pi r^2$

= $\frac{13}{3}\pi r^2$

≈ 6000 cm² _____

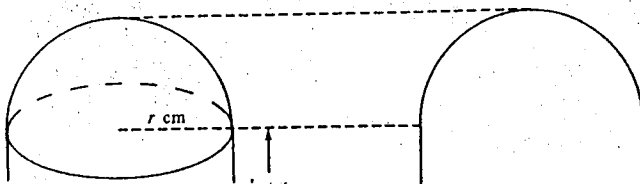
2M

1A

For 2 correct terms, award 1 mark.

Accept area = 6000

Accept area ≈ 6000 .
 For wrong unit, do not award this mark.



3. If unit omitted in answer of any part, deduct at most 1 mark (NOT as pp) from answer.

(a) (3 marks)

Distance travelled = $(10 + 10 \times \frac{3}{4} \times 2)$ m _____

= 25 m _____

2A

1A

(b) (6 marks)

Distance travelled =

$10 + 2 \times 10 \times \frac{3}{4} + 2 \times 10 \times (\frac{3}{4})^2 + \dots + 2 \times 10 \times (\frac{3}{4})^k$

IM $10 + \frac{2 \times 10 \times \frac{3}{4} [1 - (\frac{3}{4})^k]}{1 - \frac{3}{4}}$ _____

= $10 + 60 [1 - (\frac{3}{4})^k]$ m _____

or $[70 - 60 (\frac{3}{4})^k]$ m

or $[70 - 80 (\frac{3}{4})^{k+1}]$ m

1M+1M+1A

1M

2A

1M For counting "10" once.
 1M For counting some other terms twice

For $S_n = \frac{a(1-r^n)}{1-r}$

(c) (3 marks)

Distance travelled

$10 + \frac{a}{1-r}$ _____

1M+1M

1M For "10";

1M For $\frac{a}{1-r}$

= $10 + \frac{2 \times 10 \times \frac{3}{4}}{1 - \frac{3}{4}}$

= 70 m _____

1A

NOTE:

If a cand. wrote

Dist. travelled = $70 - 60 (\frac{3}{4})^{k+1}$ or $80 - 60 (\frac{3}{4})^k$

in (b) and obtained 70 or 80 as answer in (c) by letting $k \rightarrow \infty$, award 2M.

SOLUTIONS STEPS

MARKS

NOTES

(a) (3 marks)

Required probability = $(0.6)^3$ *may be omitted*
 = 0.216

2A
1A

Accept $\frac{216}{1000}$ or $\frac{27}{125}$

(b) (3 marks)

Probability of answering a question wrongly = 0.4
 Required probability = $(0.4)^3$
 = 0.064

1A
1M
1A

Accept $\frac{8}{125}$ or $\frac{64}{1000}$

(c) (4 marks)

Probability of answering Q.1 correctly but Q.2, Q.3 wrongly = $(0.6)(0.4)^2$
 Required Probability = $3(0.6)(0.4)^2$
 = 0.288

2A
1M
1A

If $(0.6)(0.4)^2$ is given as the answer, award 2 marks.
 Accept $\frac{36}{125}$ or $\frac{288}{1000}$

(d) (2 marks)

Required Probability = $3(0.6)^2(0.4)$
 = 0.432

1M
1A

Accept $\frac{54}{125}$ or $\frac{432}{1000}$

ALTERNATIVELY,

Probability = $1 - 0.216 - 0.064 - 0.288$
 = 0.432

1M
1A

NOTE:

If "required probability" or "P" omitted in all the four parts, deduct one mark as pp.

SOLUTIONS STEPS

MARKS

NOTES

12. (a) (3 marks)

Graphs of the 3 lines _____

1A+1A+1A

Labelling may be omitted.
 Accuracy of lines:
accept deviation of 1 unit.

(b) (3 marks)

Correct region _____

3A

Award 3 or 0 marks.
 Accuracy of line:
 if deviation > 2 units,
 deduct 2 marks for ^{each} ~~of~~ ^{extremity} ~~line~~.

(c) (6 marks)

(1) Testing optimization by either substituting (10, 20), (30, 0), (60, 0), (15, 30) in P or drawing the line $3x + 2y = k$

2M

If testing of some of the vertices omitted, award 1 mark.

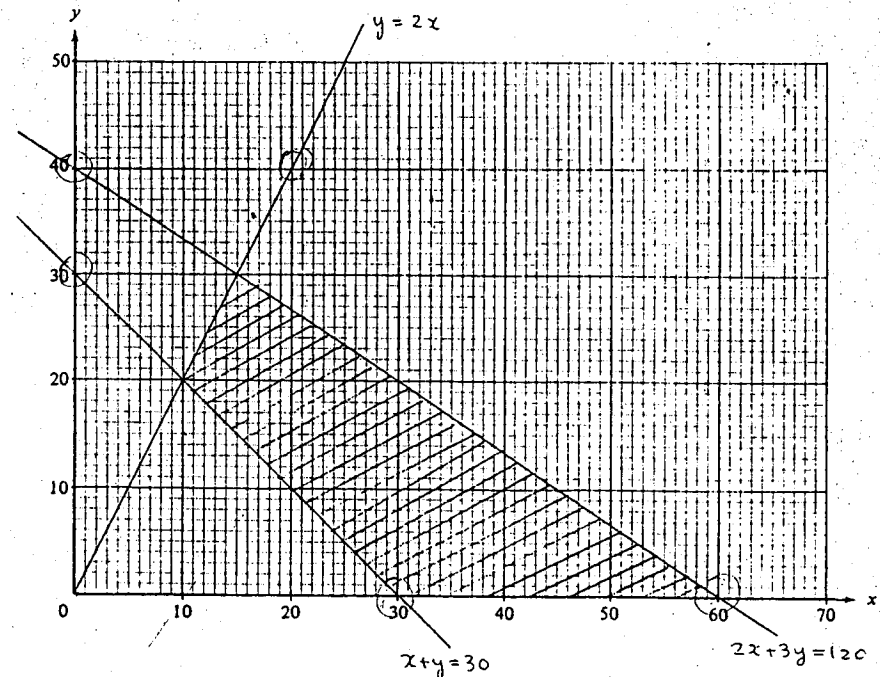
Maximum of P = 180
 Minimum of P = 70

1A
1A

(ii) If $x \leq 45$,

Maximum of P = 155
 Minimum of P = 70

1A
1A



(a) (6 marks)

For answer without unit, deduct 1 mark.

AC = 50 _____

1A

In $\triangle BCH$, $\tan 30^\circ = \frac{50}{BC}$ _____

1M

BC = $50\sqrt{3}$ _____

1A

Or any figure which lies between 86.6 to 87.

In $\triangle ABC$, $AB^2 = AC^2 + BC^2$ _____
 $= 50^2 + (50\sqrt{3})^2$ _____
 $= 10\,000$ _____

1M

For Pythagoras' Theorem

1M

AB = 100 m _____

1A

(b) (6 marks)

Do not deduct marks for answers with no unit.

(i) Area of $\triangle ABC = \frac{1}{2} AC \times BC$ _____
 $= \frac{1}{2} \times 50(50\sqrt{3})$ _____

Area of $\triangle ABC = \frac{1}{2} (AB)(CP)$ _____
 $= \frac{1}{2} (100)CP$ _____

$\frac{1}{2} (100)(CP) = \frac{1}{2} (50)(50)(\sqrt{3})$ _____

2M

CP = $25\sqrt{3}$ _____

1A

Or any figure which rounded to 43.

= 43 (m) _____

1A

ALTERNATIVELY,

In $\triangle ABC$,

$\cos \angle A = \frac{50}{100}$ or $\tan \angle A = \frac{50\sqrt{3}}{50}$, $\sin \angle A = \frac{50\sqrt{3}}{100}$

1M

ALTERNATIVELY,

$\angle A = 60^\circ$

$\tan \angle B = \frac{50}{50\sqrt{3}}$, ... 1M

$\angle B = 30^\circ$

In $\triangle CPA$, $\sin \angle A = \frac{CP}{AC}$ _____

1M

In $\triangle CPB$,

$\sin 60^\circ = \frac{CP}{50}$ _____

$\sin \angle B = \frac{CP}{BC}$ _____ 1M

CP = $50 \frac{\sqrt{3}}{2}$ _____

CP = $25\sqrt{3}$ _____ 1A
 = 43 _____ 1A

= $25\sqrt{3}$ _____

1A

Or any figure which rounded to 43.

= 43 (m) _____

1A

(ii) In $\triangle PCH$, $\tan \angle CPH = \frac{50}{25\sqrt{3}}$ _____
 $= \frac{2}{\sqrt{3}}$ _____

1M

$\angle CPH = 49.1066^\circ$
 $\approx 49^\circ$ _____

1A

14. (a) (5 marks)

$\alpha + \beta = 2m$ _____
 $\alpha\beta = n$ _____

1A

1A

(i) $(m - \alpha) + (m - \beta)$ _____
 $= 2m - (\alpha + \beta)$ _____
 $= 2m - 2m$ _____
 $= 0$ _____

1A

(ii) $(m - \alpha) \times (m - \beta)$ _____
 $= m^2 - (\alpha + \beta)m + \alpha\beta$ _____
 $= m^2 - 2m^2 + n$ _____
 $= -m^2 + n$ _____

1M

1A

(b) (3 marks)

The equation is $[x - (m - \alpha)][x - (m - \beta)] = 0$ _____

1M

$x^2 - [(m - \alpha) + (m - \beta)]x + (m - \alpha)(m - \beta) = 0$ _____

1M

$x^2 - m^2 + n = 0$ _____

1A

(c) (4 marks)

$n = 4$ _____
 For real roots, $4m^2 - 16 \geq 0$ _____
 $m^2 - 4 \geq 0$ _____
 $m \geq 2$ or $m \leq -2$ _____

1M+1A

1M for $\Delta \geq 0$

2A

If a cand. wrote $m > 2$ or $m < -2$, award 1 mark.

一定要

or

or

may be omitted
 分 = 0
 给 - 1/2