











To provide an idea about what this book contains, only few pages taken randomly from the book are shown here.

GCE 'O' Level Mathematics (Yearly)

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J u n e 2 0 0 9

PAPER 1

 means " before that, do this ! "



Answer all questions.

Neither Electronic Calculators Nor Mathematical Tables
May Be Used In This Paper.

1 Topic: 1 Numbers

Question 1

Thinking Process

- (a)  Recall BODMAS rules.
 (b)  Multiply by 100.

Solution

(a) $17 - 5 \times 3 + 1$
 $= 17 - 15 + 1$
 $= 3$ Ans.

(b) $0.82 \times 100 = \frac{82}{100} \times 100 = 82\%$ Ans.

2 Topic: 1 Numbers

Questions are not shown
in Preview
Question 2

Thinking Process

- (a) Evaluate the given expression.
 (b) Take LCM and simplify.

Solution



(a) $\frac{8}{9} \times \frac{3}{4} = \frac{2}{3}$ Ans.

(b) $\frac{3}{4} - \frac{2}{3}$
 $= \frac{9-8}{12} = \frac{1}{12}$ Ans.

3 Topic: 1 Numbers

Questions are not shown
in Preview
Question 3

Thinking Process

- (a)  Think of numbers between 10 and 100 whose cube roots are whole numbers.
 (b)  Recall, prime numbers are whole numbers that cannot be exactly divided by any number except 1 and themselves.


Solution

- (a) The two cube numbers are 27 and 64 Ans.
 (b) The two prime numbers are 31 and 37 Ans.

4 Topic: 4 Algebraic Expressions and Manipulations

Question 4

Thinking Process

- (a) Recall $a^2 - b^2 = (a + b)(a - b)$
 (b)  Apply the formula given in part (a).

Solution

(a) $x^2 - y^2 = (x + y)(x - y)$ Ans.

(b) $102^2 - 98^2$
 $= (102 + 98)(102 - 98)$
 $= (200)(4) = 800$ Ans.

J u n e 2 0 0 9
PAPER 2

 means “ before that, do this ! ”

Section A [52 marks]



Answer **all** the questions in this section.

2 *Topic: 1a*

Questions are not shown
in Preview

Question 2

Thinking Process

- (a) (i) To find the average profit per second
 convert 20 weeks into seconds.
- (ii)  Find the increment in profit.
- (iii) Reduce the given ratio into smallest integers.
- (b) Convert 480 euros into dollars first and then find 2% commission.

Solution

- (a) (i) 20 weeks = $20 \times 7 = 140$ days
140 days $\times 24 = 3360$ hours
3360 hours $\times 3600 = 12096000$ seconds
\$378 million = \$ 378000000
 \therefore profit in one second = $\frac{378000000}{12096000}$
= \$ 31.25 **Ans.**

Note that, 1 hour = 60 minutes
= 60×60
= 3600 seconds

- (ii) Percentage increase

$$= \frac{945000000 - 378000000}{378000000} \times 100$$

$$= \frac{567000000}{378000000} \times 100 = 150\% \quad \text{Ans.}$$

- (iii) 378000000 : 945000000

$$378 : 945$$

$$2 : 5 \quad \text{Ans.}$$

- (b) 0.6 euros = \$ 1

$$480 \text{ euros} = \frac{1}{0.6} \times 480 = \$800$$

Bank's commission = 2% of \$800

$$= \frac{2}{100} \times 800 = \$16 \quad \text{Ans.}$$

3 *Topic: 14*

Questions are not shown
in Preview

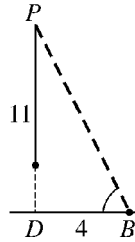
Question 3

Thinking Process

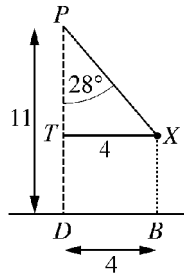
- (a) (i) Find angle PBD .
 (ii) (a) To find PX ✎ draw a horizontal line from X to PD and apply $\sin \theta = \frac{\text{opp}}{\text{hyp}}$.
 (b) ✎ Apply $\tan \theta = \frac{\text{opp}}{\text{adj}}$ to the triangle formed in part (ii)(a) above.
 (b) ✎ Apply formula of volume of a sphere.

Solution

- (a) (i) $\tan \hat{PBD} = \frac{11}{4}$
 $\hat{PBD} = 70.0^\circ$
 \therefore angle of elevation
 $= 70^\circ$ **Ans.**



- (ii) (a) In $\triangle PXT$
 $\sin 28^\circ = \frac{4}{PX}$
 $PX = \frac{4}{\sin 28^\circ}$
 $= 8.52 \text{ m}$ **Ans.**



- (b) In $\triangle PXT$
 $\tan 28^\circ = \frac{4}{PT}$
 $PT = \frac{4}{\tan 28^\circ}$
 $= 7.523 \text{ m}$
 $BX = 11 - PT$
 $= 11 - 7.523$
 $= 3.477 \approx 3.48 \text{ m (3sf)}$ **Ans.**

- (b) Volume of sphere $= \frac{4}{3} \pi r^3$
 $96 = \frac{4}{3} \pi r^3$
 $r^3 = \frac{96 \times 3}{4\pi}$
 $= 22.915$
 $r = 2.84$
 \therefore radius $= 2.84 \text{ cm}$ **Ans.**

4 Topic: 11 & 13

Questions are not shown in Preview

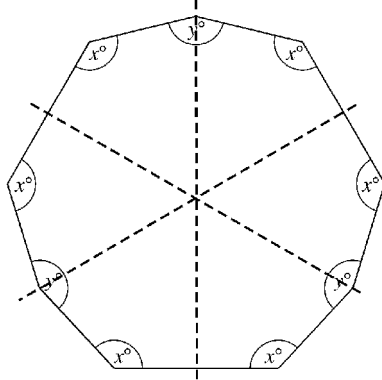
Question 4

Thinking Process

- (a) (i) (a) & (b) Understand the definition of line symmetry and rotational symmetry.
 (ii) (a) Interior angle sum $= (n-2)180$
 (b) To find the required expression ✎ Add up all the interior angles of polygon.
 (c) Solve the given equation and the equation found in (b) above simultaneously for x .
 (b) (i) $BC \parallel EF$, therefore $\angle FEB$ and $\angle CBE$ are supplementary.
 (ii) Note that $\angle CBE$ is an exterior angle of $\triangle ABE$.
 (iii) Note that $\angle AGD$ is an exterior angle of $\triangle ABG$.

Solution with **TEACHER'S COMMENTS**

5 Topic: 8



- (a) (i) (a) Number of lines of symmetry = 3
 (b) Order of rotational symmetry = 3
 (ii) (a) Sum of interior angles = $(n - 2)180$
 $= (9 - 2)180$
 $= 1260^\circ$ **Shown.**

- (b) Sum of interior angles of the polygon
 $= 6x + 3y$
 given sum of interior angles = 1260°
 $\therefore 6x + 3y = 1260$
 $2x + y = 420$
 $y = 420 - 2x$ **Ans.**

- (c) $y = 12 + x$
 From (ii) (b), $y = 420 - 2x$
 $\Rightarrow 12 + x = 420 - 2x$
 $3x = 408$
 $x = 136$ **Ans.**

- (b) (i) Since $AC \parallel DF$
 $\therefore \hat{CBE} + \hat{FEB} = 180^\circ$ interior angles between \parallel lines
 $66^\circ + \hat{FEB} = 180^\circ$
 $\hat{FEB} = 180^\circ - 66^\circ$
 $= 114^\circ$ **Ans.**

- (ii) $\hat{BAE} + \hat{BEA} = \hat{CBE}$
 $24^\circ + \hat{BEA} = 66^\circ$ Ext. \angle of a Δ = sum of opp. int \angle s
 $\hat{BEA} = 66^\circ - 24^\circ$
 $= 42^\circ$ **Ans.**

- (iii) $\hat{ABD} = \hat{BDE} = 39^\circ$ (alt \angle s)
 $\hat{AGD} = \hat{BAG} + \hat{ABD}$
 $= 24^\circ + 39^\circ$ Ext. \angle of a Δ = sum of opp. int \angle s
 $= 63^\circ$ **Ans.**

November 2009

PAPER 2

means "before that, do this!"

Section A [52 marks]

Answer all the questions in this section.

1 Topic: 5

Questions are not shown
in Preview

Question 1

Thinking Process

- (a) Write 8 in index form.
- (b) Expand and solve for p .
- (c) Make a common denominator on the left hand side and solve.
- (d) Apply quadratic formula.

Solution

- (a) $2^y = 8$
 $2^y = 2^3$
 $\therefore y = 3$ **Ans.**

- (b) $3p + 4 = 8 - 2(p - 3)$
 $3p + 4 = 8 - 2p + 6$
 $3p + 2p = 8 + 6 - 4$
 $5p = 10$
 $p = 2$ **Ans.**

- (c) $\frac{18}{q} - \frac{16}{q+2} = 1$
 $\frac{18(q+2) - 16q}{q(q+2)} = 1$
 $18q + 36 - 16q = q(q+2)$
 $2q + 36 = q^2 + 2q$
 $q^2 = 36$
 $q = \pm 6$ **Ans.**

(d) $5x^2 + x - 7 = 0$

Applying quadratic formula,

$$x = \frac{-1 \pm \sqrt{(1)^2 - 4(5)(-7)}}{2(5)}$$

$$= \frac{-1 \pm \sqrt{141}}{10}$$

$$x = \frac{-1 + \sqrt{141}}{10} \quad \text{or} \quad x = \frac{-1 - \sqrt{141}}{10}$$

$$= 1.0874 \quad \text{or} \quad x = -1.2874$$

$\therefore x = 1.09$ or -1.29 (to 2 dp) **Ans.**

2 Topic: 9

Questions are not shown
in Preview

Question 2

Thinking Process

- (a) (i) $ABCD$ is a rectangle with $AP = CR$.
- (ii) Prove that $BQ = SD$. Observe that triangles are congruent by SAS property.
- (iii) PB is parallel to DR , $\angle BPR = \angle DRP$, and $\angle BPQ = \angle DRS$.
- (b) Note that PQ is parallel to SR .

Solution

(a) (i) Given that $AB = DC$ and $AP = RC$

$$\begin{aligned} \therefore PB &= AB - AP \\ &= DC - RC \\ &= RD \quad \text{Shown.} \end{aligned}$$

(ii) Given that, $BC = AD$ and $QC = AS$

$$\begin{aligned} \Rightarrow BQ &= BC - QC \\ &= AD - AS \\ &= DS \end{aligned}$$

$$\therefore BQ = DS$$

from part (a) (i): $PB = RD$

$$\text{also } \widehat{PBQ} = \widehat{RDS} = 90^\circ$$

$\therefore \triangle PBQ \cong \triangle RDS$ (SAS) **Shown.**

(iii) $ABCD$ is a rectangle, therefore PB is parallel to DR .

$$\Rightarrow \widehat{BPR} = \widehat{DRP} \quad (\text{alternate } \angle s)$$

$$\text{and } \widehat{BPQ} = \widehat{DRS} \quad (\triangle PBQ \cong \triangle RDS)$$

now,

$$\begin{aligned} \widehat{BPQ} + \widehat{RPQ} &= \widehat{BPR} \\ \widehat{RPQ} &= \widehat{BPR} - \widehat{BPQ} \\ &= \widehat{DRP} - \widehat{DRS} \\ &= \widehat{PRS} \end{aligned}$$

$\therefore \widehat{RPQ} = \widehat{PRS}$ **Shown.**

(b) From (a) (iii), $\widehat{RPQ} = \widehat{PRS}$

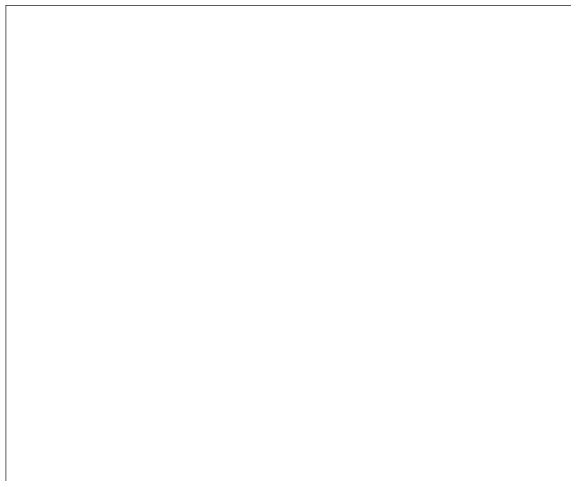
$$\Rightarrow PQ \text{ is parallel to } SR$$

$\therefore PQRS$ is a parallelogram. **Ans.**

3 Topic: 14

Questions are not shown in Preview

Question 3



Thinking Process

(a) Apply $\sin \theta = \frac{\text{opp}}{\text{hyp}}$.

(b) Apply $\sin \theta = \frac{\text{opp}}{\text{hyp}}$.

(c) (i) To find angle BMC find angle MBA .

(ii) Apply $\sin M\widehat{BC} = \frac{\text{opp}}{\text{hyp}}$.

Solution

$$(a) \sin 15^\circ = \frac{d}{50}$$

$$d = \sin 15^\circ \times 50$$

$$= 12.941 \approx 12.9 \text{ m (3sf) Ans.}$$

(b) In $\triangle AMB$,

$$\sin 15^\circ = \frac{10}{AB}$$

$$AB = \frac{10}{\sin 15^\circ}$$

$$= 38.637 \approx 38.6 \text{ m (3sf) Ans.}$$

(c) (i) In $\triangle AMB$, $\widehat{AMB} = 90^\circ$

$$\therefore M\widehat{BA} = 90^\circ - 15^\circ = 75^\circ$$

Point C is nearest to point M ,

$$\therefore M\widehat{CB} = 90^\circ$$

In $\triangle BMC$,

$$B\widehat{MC} = 90^\circ - M\widehat{BC}$$

$$= 90^\circ - 75^\circ$$

$$= 15^\circ \quad \text{Ans.}$$

(ii) In $\triangle BMC$,

$$\sin M\widehat{BC} = \frac{CM}{BM}$$

$$\sin 75^\circ = \frac{CM}{10}$$

$$CM = \sin 75^\circ \times 10$$

$$= 9.659 \approx 9.66 \text{ m (3sf) Ans.}$$