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Year 12 2 Unit Advanced

Test #4 Answers

QUESTION 1

a $9{\cdot}09$

b $\dfrac{3(a+1)+2(a-1)-4a}{(a-1)(a+1)} = \dfrac{a+1}{(a-1)(a+1)} = \dfrac{1}{a-1}$

c $3(x-4)+20=5x$

$3x+8=5x$

$x=4$

d $5x(y-2)(y+2)$

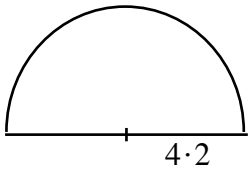
e $3x+y=13$ +

$4x-y=22$

$7x=35 \quad (5,-2)$

$x=5,\ y=-2$

f



$\text{Per} = 42\pi + 4{\cdot}2\times 2$

$\neq 21{\cdot}59 \ \ 2\text{dp}$

QUESTION 2

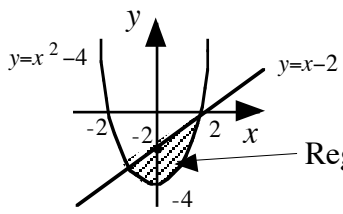
a **i** $\dfrac{dy}{dx} = 2xe^{x^2+3}$

ii $\dfrac{dy}{dx} = \dfrac{(x^2+3)\times 3 - 3x\times 2x}{(x^2+3)^2} = \dfrac{9-3x^2}{(x^2+3)^2}$ (Quot. rule)

iii $\dfrac{dy}{dx} = -\dfrac{10}{3x^2}$

iv $\dfrac{dy}{dx} = 8x^3\sqrt{5x-4} + \dfrac{5x^4}{\sqrt{5x-4}}$ (Product Rule)

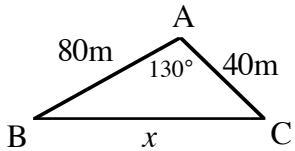
b



Region $y \geq x^2 - 4 \cap y \leq x - 2$

QUESTION 3

a



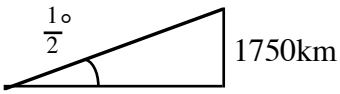
i $\text{Area } \Delta ABC = \dfrac{1}{2}\times 80\times 40\times \sin 130°$

$\neq 1226\,\text{m}^2 \ \ (\text{nearest } 1\text{m}^2)$

ii $x^2 = 40^2 + 80^2 - 2\times 40\times 80\times \cos 130°$

$x \neq 110\,\text{m} \ (\text{nearest } 1\text{m})$

b

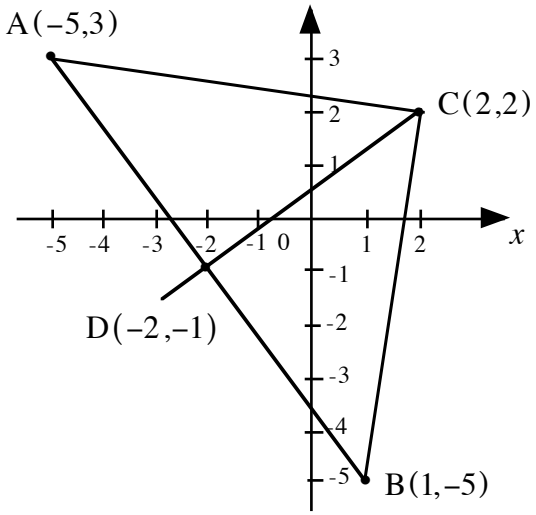


Distance to moon

$=1750 \div \tan\frac{1}{2}° - 1750\,\text{km}$

$\neq 199000\text{km}$ (nearest 1000km)

QUESTION 4



b Length of BC $=\sqrt{7^2+1^2} = \sqrt{50}$

c Slope BA $=\frac{3+5}{-5-1} = -\frac{4}{3}$

d Equat of AB $3y = -4x + b$

$(-5,3)$ $9 = 20 + b$

$b = -11$

$\therefore\ 4x + 3y + 11 = 0$

e Dist C to AB $=\frac{|ax_1 + by_1 + 2|}{\sqrt{a^2+b^2}}$

$=5$

f Slope CN $=\frac{3}{4}$, Equat CN $3x - 4y + 2 = 0$

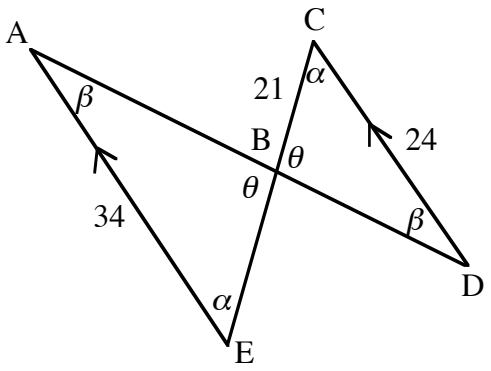
g Coord N $(-2,-1)$ Solve 2 simult equations

h Area $\Delta ABC = \frac{1}{2} \times 10 \times 5 = 25u^2$

(AB = 10, CN = 5)

QUESTION 5

a



i In ΔABE, ΔCBD

$\angle BAE = \angle CDB = \beta$ (alt and AE//CD)

$\angle BEA = \angle DCB = \alpha$ (alt and AE//CD)

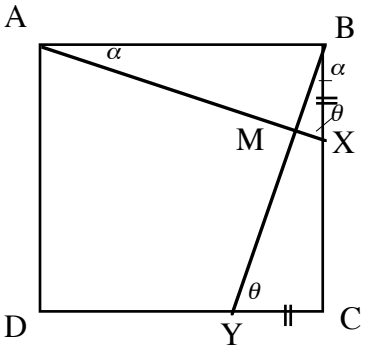
$\angle ABE = \angle CBD = \theta$ (vert opp)

$\therefore \Delta ABE // \Delta CBD$ (A.A.A.)

ii $\dfrac{BE_{\beta}}{BC_{\beta}} = \dfrac{AE_{\theta}}{CD_{\theta}}$ (similar Δ's)

$\therefore BE = 21 \times \dfrac{34}{24} = 29\dfrac{3}{4}$cm

b



i In Δ's ABX, BCY

AB = BC (sides of SQ)

BY = CY (data)

$\angle ABX = \angle BCY = 90°$ (angle of square)

$\therefore \Delta ABX \equiv \Delta BCY$ (S.A.S.)

$\therefore$ AX = BY corresp sides in cong Δ's

ii Let $\angle BAX = \angle CBY = \alpha$ (corresp angles in cong Δ's)

Similarly $\angle BYC = \angle BXA = \theta$

Now in ΔBCY, $\alpha + \theta + 90° = 180°$ $(\sum \angle s \Delta)$

$\therefore \alpha + \theta = 90°$

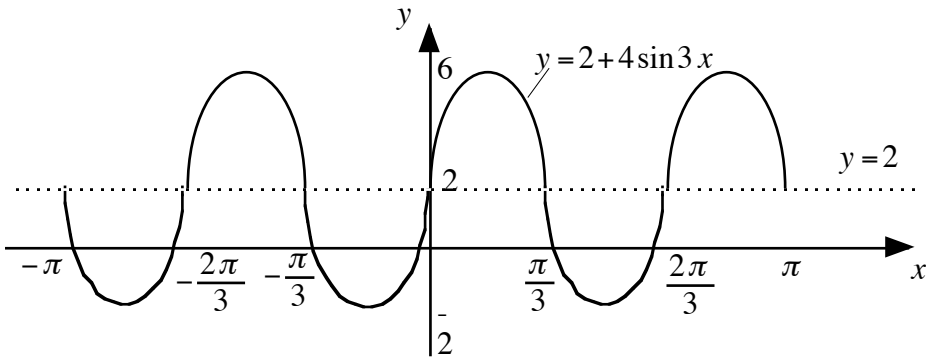
In ΔBMX $\alpha + \theta + \angle BMX = 180°$

$\therefore \angle BMX = 90°$ ie $BY \perp AX$

QUESTION 6

a **i** $y = 2 + 4\sin 3x$ period $= \dfrac{2\pi}{3}$; amplitude $= 4$

ii



QUESTION 6 (Cont)

b $T_3 = a+2d = 2 \qquad 8d = 42 \qquad a+10\frac{1}{2} = 2$

i $T_{11} = a+10d = 44 \qquad d = 5\frac{1}{4} \qquad a = -8\frac{1}{2}$

ii $S_{25} = \frac{25}{2}\left[-17+24\times 5\frac{1}{4}\right] = 1362\frac{1}{2}$

c **i** Pr (2 clubs) $= \frac{13}{52}\times\frac{12}{51}$

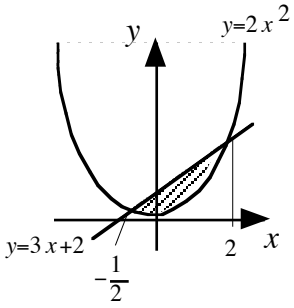
$= \frac{1}{17}$

ii Pr (2 same suit) $= 4\times\frac{1}{17}$

$= \frac{4}{17}$

QUESTION 7

a



$y = 2x^2 \cap y = 3x+2$

when $2x^2 - 3x - 2 = 0$

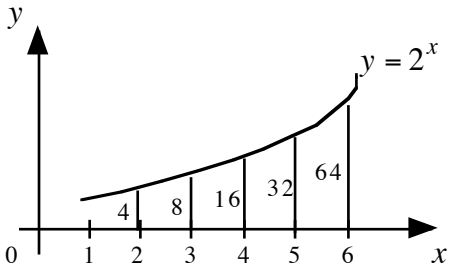
$(2x+1)(x-2) = 0$

$x = -\frac{1}{2}$ or 2

$$\text{Area} = \int_{-\frac{1}{2}}^{2} -2x^2 + 3x + 2\,dx = -\frac{2}{3}x^3 + \frac{3}{2}x^2 + 2x\Big|_{-\frac{1}{2}}^{2}$$

$= 5\frac{5}{24}$

b



$$\text{Area} \approx \frac{2}{6}[4+4\times 8+2\times 16+4\times 32+64] \approx \frac{260}{3} \approx 86\frac{2}{3}$$

c **i** -2 **ii** $-\frac{4}{3}$ **iii** $\frac{\alpha^2+\beta^2}{\alpha\beta} = -5$