SECTION A (1 Mark Each)

(1) 0.0025 m^3 is the same as

(A) 0.25 cm^3 (B) 2.5 cm^3 (C) 25 cm^3 (D) 2500 cm^3

(2) The expression $x^5\left(x+\frac{1}{x}\right)\left(1+\frac{1}{x}+\frac{1}{x^3}\right)$ is a polynomial of degree

(A) 2 (B) 3 (C) 6 (D) 8

(3) The value of $(\sqrt{5}-1)^2$ is

(A) 4 (B) 6 (C) $6-2\sqrt{5}$ (D) $6-\sqrt{10}$

(4) The exact value of $\sin(480^{\text{o}})$ is

(A) $\frac{1}{2}$ (B) $\frac{1}{\sqrt{2}}$ (C) $\frac{\sqrt{3}}{2}$ (D) $\frac{1}{\sqrt{3}}$

(5) The best description of the graph of the equation $(x+y)^2 = x^2 + y^2$ is

(A) a hyperbola (B) one point only (C) two intersecting lines (D) a circle

(6) The value of $\left(\frac{1}{4}\right)^{-\frac{1}{4}}$ is

(A) -16 (B) $\frac{-1}{\sqrt{2}}$ (C) $\sqrt{2}$ (D) $\frac{1}{256}$

(7) The equation $x^3 - x + 2 = 0$ may be solved by drawing a line on the graph $y = x^3$.
The equation of the line is

(A) $y = x+2$ (B) $y = x-2$ (C) $y = -x+2$ (D) $y = -x-2$

(8) The equation of the axis of symmetry of the graph of $y = 2x^2 - 8x + 5$ is

(A) $x = 2$ (B) $y = 2$ (C) $y = -2$ (D) $x = -2$

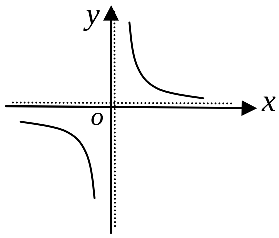
(9) The number of integers that satisfy the inequality $\frac{3}{7} < \frac{n}{14} < \frac{2}{3}$ is

(A) 0 (B) 2 (C) 3 (D) 4

(10) If $p(x) = ax^2 + bx + c$ and $p(3) = 15$ and $p(-3) = 9$ then the value of b is

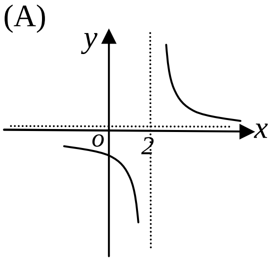
(A) 2 (B) 3 (C) 1 (D) -2

(11) This is the graph of the function $y = f(x)$.

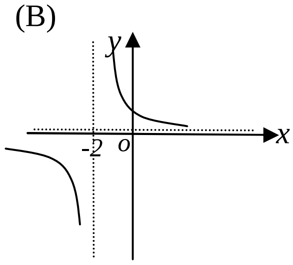


Which of the following shows the graph of $y = -f(x+2)$.

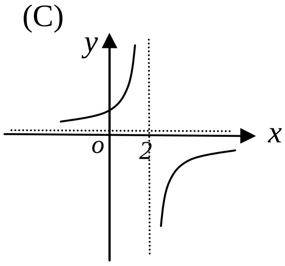
(A)



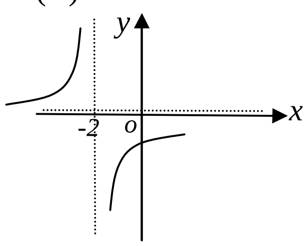
(B)



(C)



(D)



(12) If $x^2 - 5x + 6 < 0$ and $Y = x^2 + 5x + 6$ then Y can take any real value such that

(A) $20 < Y < 30$ (B) $0 < Y < 20$ (C) $Y < 0$ (D) $Y > 30$

(13) The smallest value of $x^2 + 8x$ for real values of x is

(A) -16.25 (B) -16 (C) 16 (D) -8

(14) If b men take c days to lay f bricks, then the number of days it will take c men working at the same rate to lay b bricks is

(A) fb^2 (B) $\frac{b}{f^2}$ (C) $\frac{f^2}{b}$ (D) $\frac{b^2}{f}$

(15) Successive discounts of 10% followed by 20% are equivalent to a single discount of

(A) 15% (B) 22% (C) 28% (D) 32%

(16) Given that $\frac{1}{a} = \frac{1}{b} + \frac{1}{c}$, then $c =$

(A) $a - b$ (B) $\frac{a-b}{a+b}$ (C) $\frac{ab}{b-a}$ (D) $\frac{b-a}{ab}$

(17) If another score of 5 is added to this set of scores,

Score	Frequency
2	2
3	3
4	1
5	4
6	7
7	3

the measure that will change is the

(A) Mean (B) Median (C) Mode (D) Range

(18) A shop advertised a 45% discount on all clothes in the store. Angela bought a coat and paid \$88 after the discount. Angela saved

(A) \$16.00 (B) \$39.60 (C) \$48.40 (D) \$72.00

(19) The probability that a randomly drawn positive factor of 60 is less than 7 is

(A) $\frac{1}{6}$ (B) $\frac{1}{4}$ (C) $\frac{1}{3}$ (D) $\frac{1}{2}$

(20) If $\tan A = \frac{-24}{7}$, where $90^o < A < 180^o$, then the exact value of $\cos A$ is

(A) $\frac{7}{25}$ (B) $\frac{-7}{25}$ (C) $\frac{24}{25}$ (D) $\frac{-24}{25}$

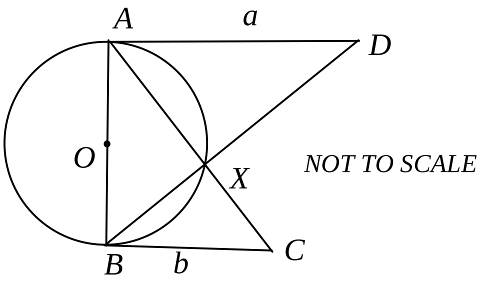
(21) In an examination, 10% of the students gained 70 marks, 25% got 80 marks, 20% got 85 marks, 15% gained 90 marks and the rest received 95 marks. The median mark is

(A) 80 (B) 85 (C) 87.5 (D) 90

(22) The mean height of 1000 men was found to be 1.80 m. The standard deviation was 0.02 m. Assuming that the heights of the men are normally distributed, then the number of men expected to be taller than 1.82 m is

(A) 50 (B) 160 (C) 340 (D) 680

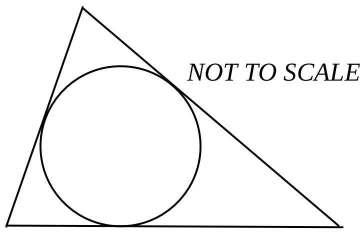
(23) AB is a diameter of a circle. Tangents AD and BC are drawn so that AC and BD intersect on the circle at point X.



If $AD = a$ units and $BC = b$ units and $a \neq b$, the diameter of the circle is

(A) $\dfrac{a+b}{2}$ units (B) $\sqrt{ab}$ units (C) $\dfrac{ab}{a+b}$ units (D) $\dfrac{ab}{2(a+b)}$ units

(24) The area of a triangle is numerically equal to its perimeter.



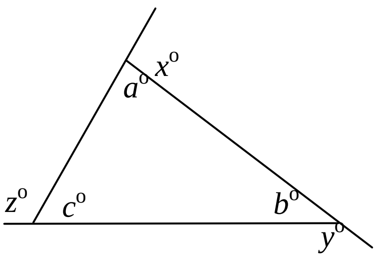
The radius of the inscribed circle is

(A) 2 units (B) 3 units (C) 4 units (D) 5 units

(25) The maximum value of the function $f(x) = \dfrac{6}{4 + 2\sin x}$ is

(A) 0 (B) 1 (C) 1.5 (D) 3

(26) The exterior angles of a triangle, x^o, y^o, z^o, are in the ratio $4:5:6$.



NOT TO SCALE

The interior angles, a^o, b^o, c^o, are in the ratio

(A) $7:5:3$ (B) $3:2:1$ (C) $4:2:1$ (D) $8:5:2$

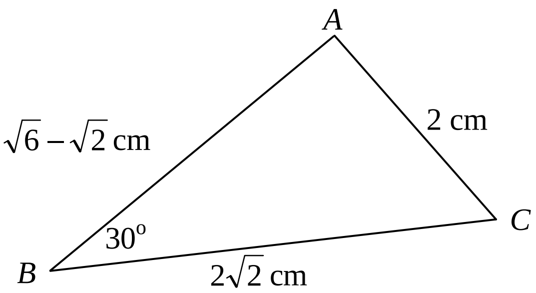
(27) The number 0.010599 written to 4 significant figures is

(A) 0.01060 (B) 0.011 (C) 0.0106 (D) 0.010599

(28) Jane is paid \$9.50 per hour for the first 36 hours she works in a week. She is paid time and a half for every extra hour worked. This week Jane worked 41 hours. Her pay for this week is

(A) \$389.50 (B) \$413.25 (C) \$460.75 (D) 584.25

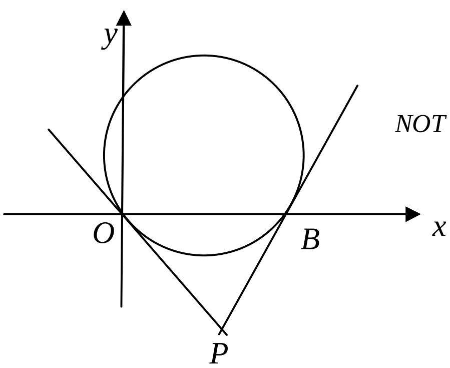
(29) The value of $\angle BAC$ in the triangle below is



NOT TO SCALE

(A) 45° (B) 60° (C) 90° (D) 135°

(30) A circle with centre at $(3, 2)$ intersects the x-axis at the origin O and at the point B. The tangents to the circle at O and B intersect at the point P.



NOT TO SCALE

The y-coordinate of P is

(A) -3.5 (B) -4 (C) -4.5 (D) -5

question 31 over page

SECTION B

Question 31 (20 marks) START A NEW PAGE **Marks**

(a) Write $\dfrac{\sqrt{3}+4\sqrt{2}}{2\sqrt{3}-\sqrt{2}}$ as a fraction in simplest terms with a rational denominator. **2**

(b) Solve the equations for x:

(i) $3x^2+2x-2=0$. **2**

(ii) $5^x \times 25^{x+1}=0.2$ **2**

(c) Sketch the graph of $y=(x-1)^3(x+2)$. **3**

(d) Find the perpendicular distance from the point $(2,-1)$ to the line $3x-4y-2=0$. **2**

(e) Find the values of x which satisfy the inequality $3x^2+2x-8<0$. **3**

(f) The distance (d) to the horizon varies directly as the square root of the height (h) of the observer above the ground.

From the branch of a tree 4 m above the ground a person can see 5.2 km.

(i) Write an equation relating d and h **2**

(ii) What distance would a helicopter pilot, 625 m above the ground, expect to be able to see? **1**

(g) Prove that $(1-\cos\theta)(1+\sec\theta)=\sin\theta\tan\theta$ **3**

Question 32 (20 marks) START A NEW PAGE

(a) Simplify the following expressions

(i) $\left(\dfrac{a^2-b^2}{ab}\right)-\left(\dfrac{ab-b^2}{ab-a^2}\right)$ **2**

(ii) $\dfrac{4\times 3^n-9\times 3^{n-1}}{3^{n+3}-8\times 3^{n+1}}$ **2**

(b) Solve the equation for x: $\sqrt{16-8x}=2x-1$ **3**

(c) A line with equation $y=x+2$, intersects the circle with equation $x^2+y^2=10$, at points A and B. Find the coordinates of A and B. **3**

(d) Sketch on a number plane the solution set to:

$$\{(x,y):2x+3y-1>0\}\cap\{(x,y):3x-y+2\geq 0\}$$ **3**

question 32 continued over page

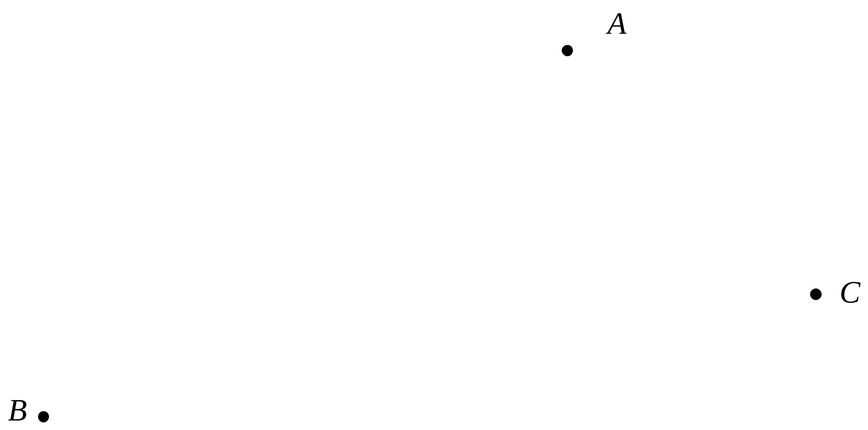
Question 32 continued

REMOVE THIS PAGE AND ATTACH IT TO YOUR QUESTION 32 ANSWERS

Name: ________________________________ **Maths Class____________**

Marks

(e) Using only a pair of compasses and a ruler, neatly construct a circle through the points A, B and C shown below. Show all construction lines. **3**

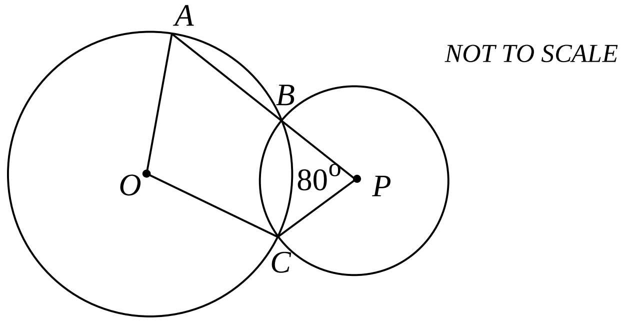


question 32 continued over page

Question 32 continued **Marks**

(f) Two unequal circles, with centres at *O* and *P*, intersect at points *B* and *C* such that $\angle BPC = 80^{o}$.

The line *PB* produced, meets the circle, with centre *O*, at point *A*.



(i) Copy the diagram and find the size of $\angle AOC$, giving reasons. **3**

(ii) What type of quadrilateral is *AOCP*. Give a reason for your answer. **1**

Question 33 (20 marks) START A NEW PAGE

(a) The line ℓ, which has the equation of $2x + y - 9 = 0$, meets the interval joining $A(-2, 3)$ and $B(8, 8)$ at point P.

(i) Find the equation of the line passing through *A* and *B*. **2**

(ii) Show that the coordinates of *P* are $(2, 5)$. **2**

(iii) Find the ratio in which *P* divides the interval *AB*. **2**

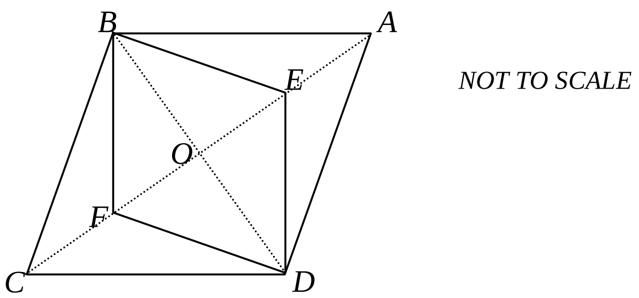
(b) The function $f(x)$ has the equation $y = 3 - \sqrt{16 - (x+2)^2}$.

(i) Sketch the graph of $f(x)$. **2**

(ii) State the domain and range of $f(x)$. **2**

(c) Rhombus *ABCD* is similar to rhombus *BFDE*.

The area of *ABCD* is 24 units^2 and $\angle BAD = 60^{o}$.



(i) The diagonals of *ABCD* intersect at point *O*. **3**

Show that $OB : OA = 1 : \sqrt{3}$, giving reasons.

(ii) Calculate the area of *BFDE*, giving reasons. **2**

question 33 continued over page

Question 33 continued **Marks**

(d) Solve the equation for x: $\frac{3}{x-2} - \frac{12}{x^2-4} = 1$ **3**

(e) The line described by the equation $3x - 4y - 1 + k(2x + 3y - 5) = 0$ has a gradient of 2. Calculate the value of k. **2**

Question 34 (20 marks) START A NEW PAGE

(a) Coast station A receives a radio transmission from a ship on a bearing of 110°T. At the same time the radio transmission is also heard by coast station B, which is 550 km North of A. The bearing of the ship from B is 135°T.

(i) Draw a diagram showing the given information. **1**

(ii) Calculate the distance (to the nearest km) from coast station A to the ship. **3**

(b) Box A contains 5 sheets of blue paper and 2 sheets of white paper. Box B has 4 blue envelopes and 1 white envelope. Two pieces of paper are chosen from Box A to write a letter and an envelope is selected from Box B. All are chosen at random.

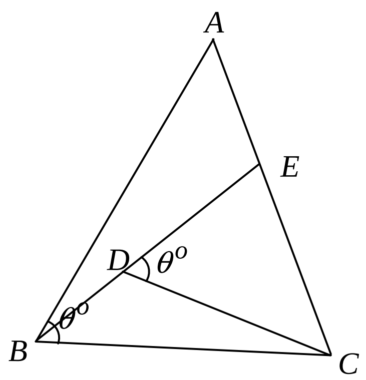
(i) Calculate the probability that the two sheets of paper and the envelope are all of the same colour. **2**

(ii) What is the probability that at least one of the sheets of paper chosen is the same colour as the selected envelope? **2**

(c) (i) Solve the equation $1 + 2\cos 3x = 0$ for $0^{\circ} \le x \le 180^{\circ}$ **3**

(ii) Sketch the graph of $y = 1 + 2\cos 3x$ for $0^{\circ} \le x \le 180^{\circ}$. **3**

(d) In the diagram below $DE = 6$ units, $BC = BE = 8$ units, $AB = AC = x$ units, and $\angle ABC = \angle EDC = \theta^{\circ}$.



NOT TO SCALE

(i) Copy the diagram and prove that $\Delta ABC \parallel\!| \Delta BCE$, giving reasons. **3**

(ii) Name one other triangle which is similar to ΔABC. (Do not prove similarity). **1**

(iii) Calculate the exact length of AB. **2**

END OF EXAMINATION

YEAR 10 YEARLY 2010 EXAMINATION

ANSWER SHEET

SECTION A: 30 QUESTIONS [1 MARK EACH]

NAME: ANSWERS

CLASS:

Mark the appropriate answer with an cross X

1	A	B	C	X
2	A	B	X	D
3	A	B	X	D
4	A	B	X	D
5	A	B	X	D
6	A	B	X	D
7	A	X	C	D
8	X	B	C	D
9	A	B	X	D
10	A	B	X	D
11	A	B	C	X
12	X	B	C	D
13	A	X	C	D
14	A	B	C	X
15	A	B	X	D
16	A	B	X	D
17	A	X	C	D
18	A	B	C	X
19	A	B	C	X
20	A	X	C	D
21	A	X	C	D
22	A	X	C	D
23	A	X	C	D
24	X	B	C	D
25	A	B	C	X
26	X	B	C	D
27	X	B	C	D
28	A	X	C	D
29	A	B	C	X
30	A	B	X	D

Question	Mark
Section A	
1 - 30	/ 30
Section B	
31	/ 20
32	/ 20
33	/ 20
34	/ 20
TOTAL	/ 110

HAND IN SEPARATELY AT THE END OF EXAM

SECTION A.

1) $0{\cdot}0025\,m^3 = 0{\cdot}0025 \times (100)^3$ D

$= 2500\ cm^2$

2) $x^5\left(x+\frac{1}{x}\right)\left(1+\frac{1}{x}+\frac{1}{x^3}\right)$ C

~~Max degree~~ Leading term is x^6

$\therefore$ Degree $= 6$

3) $(\sqrt{5}-1)^2 = 5-2\sqrt{5}+1 = 6-2\sqrt{5}$ C

4) $\sin(480^\circ) = \sin(120) = \frac{\sqrt{3}}{2}$ C

5) $(x+y)^2 = x^2+y^2$

$x^2+2xy+y^2 = x^2+y^2$

$2xy = 0 \quad \therefore x=0$ or $y=0.$ C

$\therefore$ 2 lines

6) $\left(\frac{1}{4}\right)^{-\frac{1}{4}} = \sqrt[4]{4} = \sqrt{2}$ C

7) $x^3 - x + 2 = 0$ B

$x^3 = x-2. \quad \therefore y = x-2$

8) $y = 2x^2 - 8x + 5$

Axis $x = -b/2a = 8/4 = 2$ A

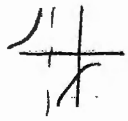
9) $\frac{3}{7} < \frac{n}{14} < \frac{2}{3}$

$18 < 3n < 28 \qquad 6 < n < 9\frac{1}{3} \qquad n = 7, 8, 9$ C

10) $p(x) = ax^2+bx+c \qquad \left.\begin{array}{l} p(3) = 9a+3b+c \\ p(-3) = 9a-3b+c \end{array}\right\} \begin{array}{l} 6b=6 \\ b=1 \end{array}$ C

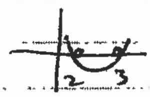
11) Reflect about x axis D

Move graph to left.



12) $x^2-5x+6<0$ $\quad 2<x<3$ A

$(x-3)(x-2)<0$



$Y = x^2+5x+6 \qquad Y(2) = 20 \quad Y(3) = 30$

$\therefore 20 < Y < 30$

13) x^2+8x

$x^2+8x+16-16 = (x+4)^2-16$ min value $= -16$ B

14) $\underset{\text{bricks}}{f} = k\overset{\text{men}}{b}\overset{\text{days}}{c}$ $\quad \therefore b = \frac{f \times \text{days}}{bk} \quad \therefore \frac{b^2}{f} = \text{days}$ D

$k = \frac{f}{bc}$

15) start with $\$100 \xrightarrow{10\% \text{ discount}} \$90 \xrightarrow{20\%} \$72. = 28\%$ discount C

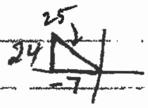
28% discount

16) $\frac{1}{a} - \frac{1}{b} = \frac{1}{c}$ ∴ $\frac{1}{c} = \frac{b-a}{ab}$ ∴ $c = \frac{ab}{b-a}$ C

17) Before new score: Mean $= \frac{100}{20} = 5$ ∴ no change
Old median $= 5\frac{1}{2}$ new median $= 5$ ∴ change B
Mode $= 7$ Range $= 5$

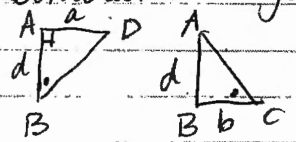
18) \$88 = 55% ∴ 100% = \$160 ∴ saved \$160 − \$88
= \$72 D

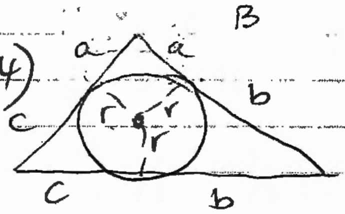
19) Factors $\boxed{1\ 2\ 3\ 4\ 5\ 6}$ 10 15 12 20 30 60 = 12 factors D
$P(<7) = \frac{6}{12} = \frac{1}{2}$

20) $\tan A = \frac{-24}{7}$  ∴ $\cos A = \frac{-7}{25}$ B

21) Median = middle mark = 85 B

22) 1.82 is one SD above mean
∴ 50% − 34% = 16% ⇒ 160 men B

23) Using similar triangles

$\frac{a}{d} = \frac{d}{b}$ B
∴ $d^2 = ab$ ∴ $d = \sqrt{ab}$

24) 
$P = 2a + 2b + 2c$
$A = 2\left[\frac{1}{2}ar + \frac{1}{2}br + \frac{1}{2}cr\right]$ A
$A = P$
∴ $r(a+b+c) = 2a + 2b + 2c$
$r = 2$

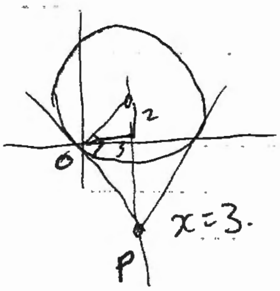
25) $f(x) = \frac{6}{4 + 2\sin x}$ min value $= \frac{6}{4-2} = 3$ D

26) Exterior angles 4:5:6 = 96:120:140
∴ Interior angles 84: 60: 36 = 7:5:3 A

27) 0.010599 = 0.01060 (4 sig figs) A

28) $[(41-36) \times 1.5 + 36] \times \$9.50 = \$413.25$ B

29) $\cos A = \frac{4 + (6-\sqrt{2})^2 - 8}{4(\sqrt{6}-\sqrt{2})}$ use calculator $A = 135°$ D
* note $A \neq 45°$

30) 
eqⁿ of OP ⇒ $y = -\frac{3}{2}x$
$x = 3$
$y = \frac{-9}{2} = -4.5$ C

SECTION B.

Q31 a) $\dfrac{(\sqrt{3}+4\sqrt{2})}{(2\sqrt{3}-\sqrt{2})} \times \dfrac{(2\sqrt{3}+\sqrt{2})}{(2\sqrt{3}+\sqrt{2})} = \dfrac{6+\sqrt{6}+8\sqrt{6}+8}{12-2}$ 1

$= \dfrac{14+9\sqrt{6}}{10}$ 1

b) i) $3x^2+2x-2=0$

$x = \dfrac{-2 \pm \sqrt{4-4(3)(-2)}}{6}$ 1

$= \dfrac{-2 \pm \sqrt{28}}{6}$

$= \dfrac{-2 \pm 2\sqrt{7}}{6}$

$= \dfrac{-1 \pm \sqrt{7}}{3}$ 1

ii) $5^x \times 25^{x+1} = 0{\cdot}2.$

$5^x \times 5^{2(x+1)} = 5^{-1}$ 1

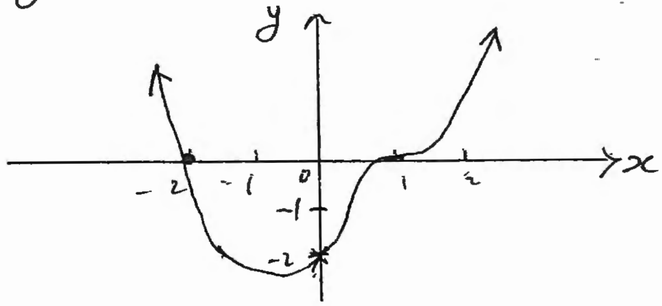
$x+2x+2 = -1$

$3x = -3$

$x = -1$ 1

c)

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



x intercepts at $x=1$, $x=2$.
y intercept at $y = -2$
"flat" at $x=1$
"(horizontal point of inflexion)"

$\frac{1}{2}$ $(-2,0)$
$\frac{1}{2}$ $(1,0)$
$\frac{1}{2}$ y intercept
$\frac{1}{2}$ direction
1 shape.

* turning point is NOT on y axis.

Q31 (2)

d) $$d = \frac{|3(2) - 4(-1) - 2|}{\sqrt{3^2+4^2}} = \frac{8}{5}$$

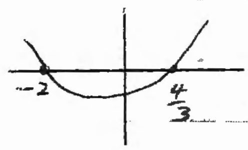
perpendicular distance $= 1\frac{3}{5}$ units

① formula + sub values
① Answer

e) $3x^2 + 2x - 8 < 0$

$(3x - 4)(x + 2) < 0$

$\therefore \; -2 < x < 1\frac{1}{3}$



① factorise
① endpoints
① inequality signs.

f) (i) $d = k\sqrt{h}$

$5{\cdot}2 = k\sqrt{4} \quad \therefore k = 2{\cdot}6$

$\therefore \; d = 2{\cdot}6\sqrt{h}$

① formula
① k value

(ii) $d = 2{\cdot}6\sqrt{625}$

$= 65$

distance $= 65$ km.

① Answer

g) $(1-\cos\theta)(1+\sec\theta) = \sin\theta\tan\theta$

$$LHS = (1-\cos\theta)\left(1+\frac{1}{\cos\theta}\right)$$

$$= \cancel{1} + \frac{1}{\cos\theta} - \cos\theta - \cancel{1}$$

$$= \frac{1-\cos^2\theta}{\cos\theta}$$

$$= \frac{\sin^2\theta}{\cos\theta}$$

$$= \sin\theta \times \frac{\sin\theta}{\cos\theta}$$

$$= \sin\theta\tan\theta = RHS.$$

½ $\sec\theta = \frac{1}{\cos\theta}$
½ multiply
½ common denominator
1 $\sin^2\theta$
½ $\tan\theta = \frac{\sin\theta}{\cos\theta}$

Question 32

32 a) (i)

$$\left(\frac{a^2-b^2}{ab}\right) - \left(\frac{ab-b^2}{ab-a^2}\right)$$

$$= \frac{a^2-b^2}{ab} - \frac{b\cancel{(a-b)}^{-1}}{a\cancel{(b-a)}}$$ — ① factorising

$$= \frac{a^2-b^2+b^2}{ab}$$ — ½ common denominator

$$= \frac{a^2}{ab} = \frac{a}{b}.$$ — ½ simplified answer

(ii)

$$\frac{4\times 3^n - 9\times 3^{n-1}}{3^{n+3} - 8\times 3^{n+1}} = \frac{4\times 3^n - 3^{n+1}}{3^{n+3} - 8\times 3^{n+1}}$$

$$= \frac{3^n(4-3)}{3^{n+1}(9-8)}$$ — Factorising

$$= \frac{1\times 1}{3\times 1} = \frac{1}{3}$$ — Simplifying

b)

$$\sqrt{16-8x} = 2x-1$$
$$16-8x = (2x-1)^2$$
$$16-8x = 4x^2-4x+1$$ — ①
$$0 = 4x^2+4x-15$$
$$0 = (2x+5)(2x-3)$$
$$x = -2\tfrac{1}{2} \text{ or } x = 3/2$$ — ①

but $2x-1>0 \therefore x > \frac{1}{2}$

$\therefore x = -2\frac{1}{2}$ not a solution

$\therefore x = 3/2$ only — ①

c)

$y = x+2 \quad x^2+y^2=10$

$x^2+(x+2)^2 = 10$ — ①

$x^2+x^2+4x+4=10$

$2x^2+4x-6=0$

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

$(x-1)(x+3)=0$ — ①

$x=1$ or $x=-3$

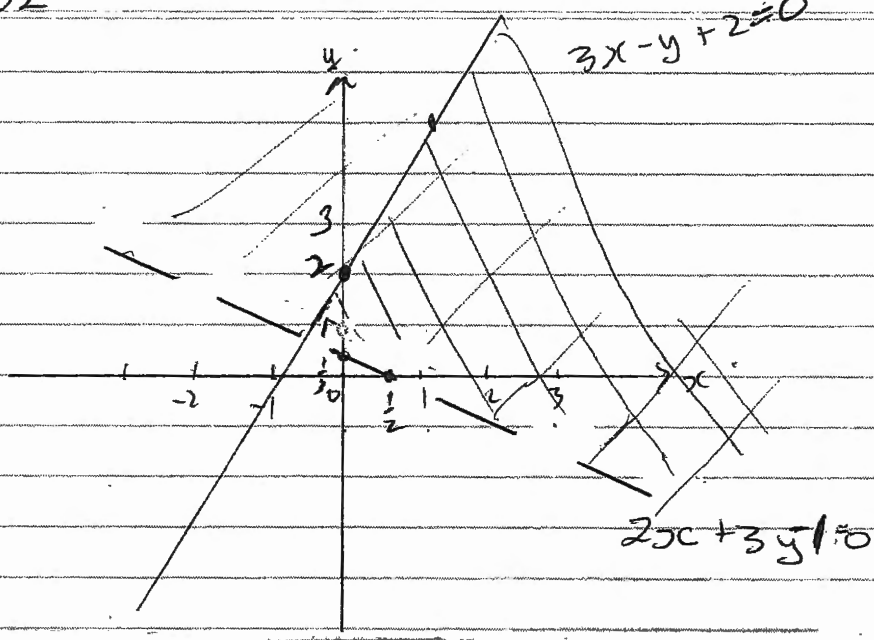
$\therefore y=3 \quad y=-1$

Intersection points $(1,3)$ and $(-3,-1)$ — ①

④

Q32

d)

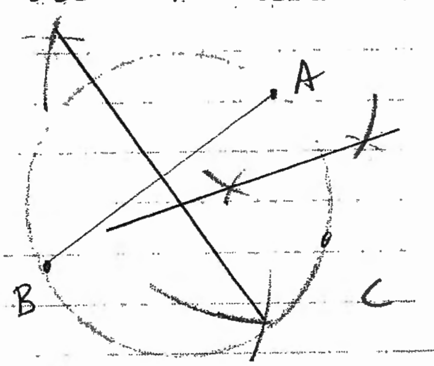


① each line

+ ①

① connect shaded region (or ½ for each shaded side of line).

(e) 32 See Attached.

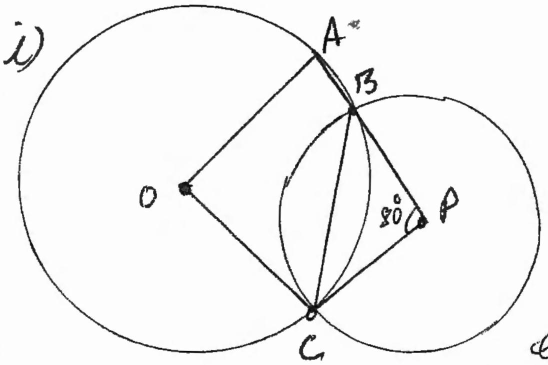


① for each chord bisector

① circle construction lines must be shown on bisectors

32.

f) i)



Construct BC

BP = PC (equal radii)

$\angle PBC = \angle PCB$

(equal angles opposite equal sides in ΔPBC)

$\angle PBC + \angle PCB + \angle BPC = 180°$

(angle sum of $\Delta PBC = 180°$).

$\therefore 2\angle PBC + 80° = 180°$ ①

$\therefore \angle PBC = 50°$

$\therefore \angle ABC + \angle PBC = 180°$

(angle sum of straight angle $PBA = 180°$)

$\therefore \angle ABC = 130°$ ①

$\therefore$ Reflex $\angle AOC = 2 \times 130°$

$= 260°$

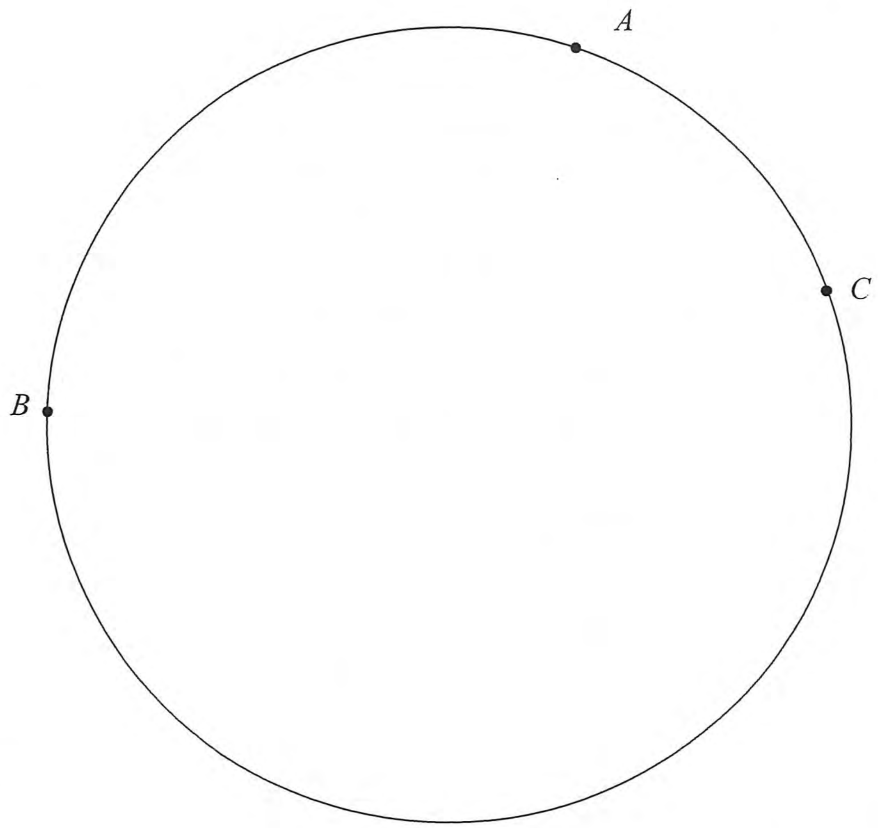
$\therefore \angle AOC = 360° - 260°$ (angle at point is 360°) ①

$= 100°$.

REMOVE THIS PAGE AND ATTACH IT TO YOUR QUESTION 34 ANSWERS

Question 34 continued

(e) Using only a pair of compasses and ruler accurately construct a circle through points A, B and C shown below.
Show all construction lines.



Question 32.

(ii) AOCP is a cyclic quadrilateral as opposite angles add to 180° (1)

$\angle AOC + \angle APC = 180°$.

Question 33.

Q 33

(a) $m_{AB} = \frac{8-3}{8+2} = \frac{5}{10} = \frac{1}{2}$. (1)

$y - y_1 = m(x - x_1)$

$y - 8 = \frac{1}{2}(x - 8)$

$2y - 16 = x - 8$

$0 = x - 2y + 8$

or $y = \frac{1}{2}x + 4$ } (1)

Solve Simultaneously

$y = \frac{1}{2}x + 4$

$2x + y - 9 = 0$

$2x + \frac{1}{2}x + 4 - 9 = 0$

$\frac{5x}{2} = 5$

$x = \frac{10}{5} = 2$. (1)

$y = \frac{1}{2}x + 4$

$= \frac{1}{2} \times 2 + 4$

$= 5$ (1)

$\therefore P = (2,5)$

Alternatively Test (2,5) in:

$2x + y - 9 = 0$

LHS $= 2(2) + 5 - 9$

$= 0$

$=$ RHS

AND $y = \frac{1}{2}x + 4$

RHS $= \frac{1}{2}(2) + 4$

$= 5$

$=$ LHS

Must use correct setting out if testing solutions

Question 33.

33 (a)(iii) $(2,5) = \left[\dfrac{8m-2n}{m+n}, \dfrac{8m+3n}{m+n}\right]$

use either x or y coordinate

$$2 = \frac{8m-2n}{m+n}$$

$$2m+2n = 8m-2n$$ ① correct relationship

$$4n = 6m$$

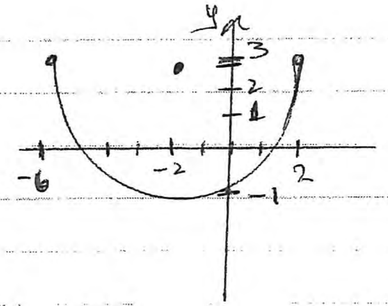
$$\therefore \frac{m}{n} = \frac{4}{6} = \frac{2}{3}$$

$\therefore$ Radio is $(2:3)$ ① solution

(b)(i) $y = 3 - \sqrt{16-(x+2)^2}$

Lower semi circle centre $(-2,3)$ ①$\frac{1}{2}$

radius 4 units. ①$\frac{1}{2}$



①$\frac{1}{2}$ lower $\frac{1}{2}$circle

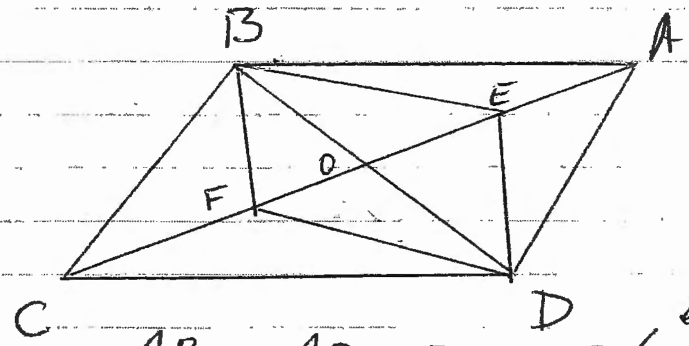
①$\frac{1}{2}$ shape/axes etc

(ii) Domain $-6 \le x \le 2$. ①

Range $-1 \le y \le 3$ ①

Question 33 (7)

(c)



$AB = AD = DC = CB$ (equal sides of rhombus) ($\frac{1}{2}$)

Let $AB = x$ and as $\angle BAD = 60^\circ$

ΔABD is equilateral ($\frac{1}{2}$)

$\therefore AB = AD = BD = x$.

$\angle BOD = 90^\circ$

$OB = \frac{1}{2} BD = \frac{1}{2}x$ ($\frac{1}{2}$)

(Diagonals of rhombus bisect each other at right angles) ($\frac{1}{2}$)

$\therefore$ In Δ OAB

$OB^2 + OA^2 = AB^2$ (Pythagoras) ($\frac{1}{2}$)

$(\frac{1}{2}x)^2 + OA^2 = x^2$

$\therefore OA^2 = x^2 - \frac{1}{4}x^2$

$= \frac{3}{4}x^2$

$\therefore OA = \frac{\sqrt{3}}{2} x$. $OA > 0$ ($\frac{1}{2}$)

$\therefore \frac{OB}{OA} = \frac{\frac{1}{2}x}{\frac{\sqrt{3}}{2}x} = \frac{1}{\sqrt{3}}$

$OB : OA = 1 : \sqrt{3}$

$\frac{|BFDE|}{|ABCD|} = \left(\frac{1}{\sqrt{3}}\right)^2$ ($\frac{1}{2}$)

(Ratio of similar areas is equal to ratio of lengths squared) ($\frac{1}{2}$)

$\therefore \frac{|BFDE|}{24} = \frac{1}{3}$

$\therefore |BFDE| = 8$

Area BFDE $= 8 \text{ cm}^2$. (1)

Question 33 (8)

Q33 d) $\frac{3}{x-2} - \frac{12}{x^2-4} = 1 \quad x \neq \pm 2.$

$\frac{3(x+2)}{x^2-4} - \frac{12}{x^2-4} = 1$ (1)

$3x + 6 - 12 = x^2 - 4$

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

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

$\therefore x = 2 \text{ or } x = 1$ (1)

but $x \neq 2$. (from above)

$\therefore x = 1$ only. (1)

e) $3x - 4y - 1 + k(2x + 3y - 5) = 0$

$3x + 2kx + 3ky - 4y - 1 - 5k = 0$

$x(3+2k) + y(3k-4) - 1 - 5k = 0$

$m = -a/b \Rightarrow \frac{3+2k}{3k-4} = \frac{2}{1}$ (1)

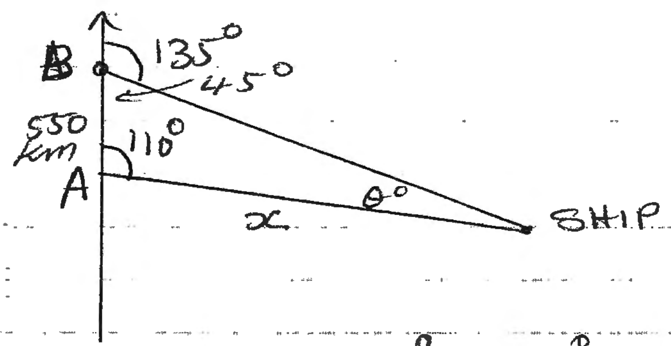
$\therefore 3 + 2k = 6k - 8$

$\therefore 11 = 4k$

$\therefore k = \frac{11}{4}$ (1)

Question 34

a)



(1)

$\theta = 180° - 110° - 45°$

$= 25°$ (1)

$\frac{x}{\sin 45°} = \frac{550}{\sin 25°}$ (1)

$x = 920.23645$ ($\frac{1}{2}$)

Dist $= 920$ km (nearest km) ($\frac{1}{2}$)

Question 34

Q34 b)

A	B
5B	4B
2W	1W

(i)

Paper — Envelope

BB — B

WW — W

$P(BBB) = \frac{5}{7}\times\frac{4}{6}\times\frac{4}{5} = \frac{8}{21}$

$P(WWW) = \frac{2}{7}\times\frac{1}{6}\times\frac{1}{5} = \frac{1}{105}$ } $1\frac{1}{2}$

$P(\text{all same colour}) = \frac{41}{105}$ $\frac{1}{2}$

(ii) P (atleast one that colour = envelope)

$= 1 - P(\text{paper diff colour to envelope})$

$= 1 - [P(BBW) + P(WWB)]$ $\frac{1}{2}$

$= 1 - \left(\frac{5}{7}\times\frac{4}{6}\times\frac{1}{5} + \frac{2}{7}\times\frac{1}{6}\times\frac{4}{5}\right)$ 1

$= 1 - \left(\frac{2}{21} + \frac{4}{105}\right)$

$= 1 - \frac{2}{15}$

$= \frac{13}{15}$ $\frac{1}{2}$

Alternatively

$P(BBB) + P(BWB) + P(WBB) +$
$P(WWW) + P(WBW) + P(BWW)$ 1

$\frac{8}{21} + \frac{4}{21} + \frac{4}{21} + \frac{1}{105} + \frac{1}{21} + \frac{1}{21} = \frac{13}{15}$ 1

c)(i) $1 + 2\cos 3x = 0 \qquad 0^\circ \le x \le 180^\circ$

$\cos 3x = -\frac{1}{2}$ $\frac{1}{2}$

$3x^\circ = 180^\circ - 60^\circ$ or $180^\circ + 60^\circ$

$3x = 120$ or 240 1
$\quad\; +360 \qquad \cancel{+360}$

or 480 $\frac{1}{2}$

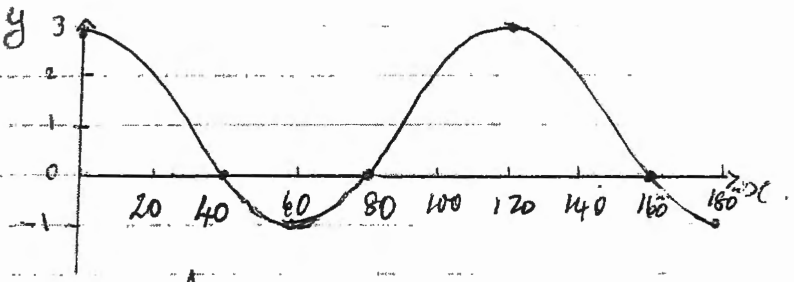
$\therefore x = \frac{120}{3}$ or $\frac{240}{3}$ or $\frac{480}{3}$

$= 40$ or 80 or 160 } 1

Question 34

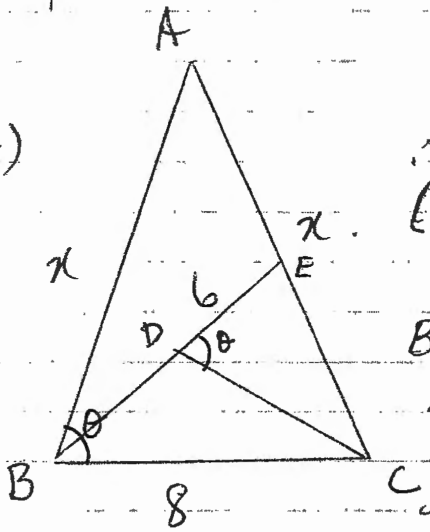
(10)

c) (ii)



① max pts
① min pts.
① { x intercepts
shape.

d) (i)



$AB = AC$ (given)
$\therefore \angle ABC = \angle ACB = \theta$
(equal angles opposite equal sides in $\triangle ABC$) ($\frac{1}{2}$)

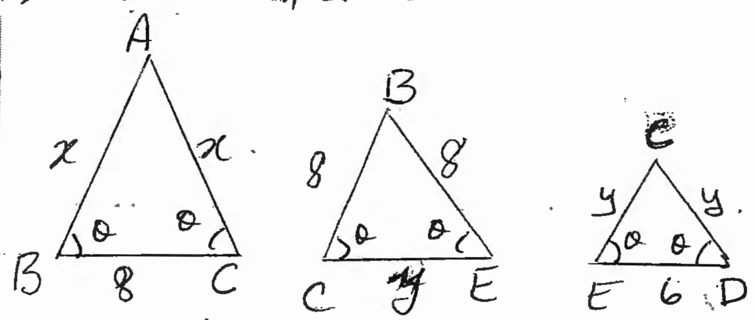
$BC = BE$ (given
$\therefore \angle BCE = \angle BEC = \theta$
(equal angles opposite equal sides in $\triangle BCE$) ($\frac{1}{2}$)

can say similarly

$\therefore$ In $\triangle ABC$ and $\triangle BCE$
$\angle ABC = \angle BEC = \theta$ (from above) ①
$\angle BCE$ is common (also equal to θ) ($\frac{1}{2}$)
$\therefore \triangle ABC \parallel\!\mid \triangle BCE$ (equiangular) ($\frac{1}{2}$)

(ii) $\triangle DEC \parallel\!\mid \triangle ABC$ ①

(iii)



Reasons not required

in $\triangle$ BEC and $\triangle$ ECD.

$$\frac{y}{6} = \frac{8}{y}$$ (matching sides in similar triangles are in same ratio)

① Ratio

$\therefore y^2 = 48$
$y = 4\sqrt{3}$ $\quad y > 0$.

In $\triangle ABC$ and $\triangle BEC$.

$$\frac{x}{8} = \frac{8}{y}.$$ (matching sides in similar triangles are in same ratio)

$$x = \frac{64}{4\sqrt{3}} = \frac{16}{\sqrt{3}}$$

① Answer.