**YEAR 10 YEARLY PART A 2009**

**SECTION A – 30 Marks (1 mark each)**

1. Solve $3-2x<7$

A $x<-2$ B $x>-2$ C $x<2$ D $x>2$

2. $x^{\frac{3}{4}}$ is equivalent to:

A $\sqrt[3]{x^4}$ B $\sqrt[4]{x^3}$ C $\frac{3}{x^4}$ D $\frac{x^3}{4}$

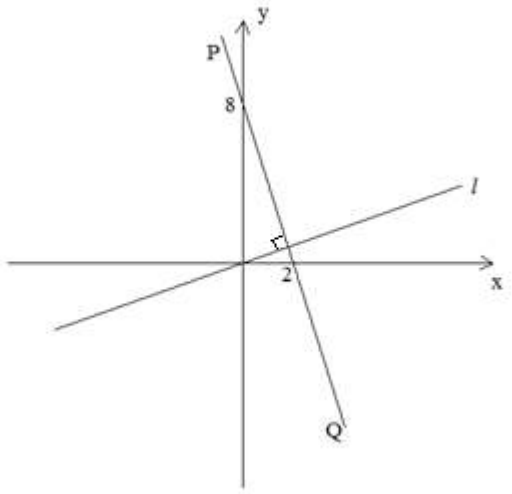
3. If $\cos x° > 0$ and $\tan x° < 0$, then

A $0 < x < 90$ B $90 < x < 180$

C $180 < x < 270$ D $270 < x < 360$

4. Sarah borrowed $2500 from a bank for 3 years. She was charged simple interest on the loan. Altogether she repaid $3287.50. What was the rate of interest charged per annum?

A 7.98% B 10.5% C 23.95% D 31.5%

5. 


The equation of the line *l* through the origin and perpendicular to the line PQ is

A $y=4x$

B $y=-4x$

C $y=\frac{1}{4}x$

D $y=-\frac{1}{4x}$

6. What is the reciprocal of $\left(\frac{1}{a}+2a\right)$ ?

A $\frac{a}{1+2a^2}$ B $\frac{1+2a^2}{a}$ C $a+\frac{1}{2a}$ D $\frac{1}{1+2a}$

7. Solve $x^2 + 5x - 3 = 0$

A $x = \frac{-5\pm\sqrt{37}}{2}$ B $x = \frac{5\pm\sqrt{37}}{2}$

C $x = \frac{-5\pm\sqrt{13}}{2}$ D $x = \frac{5\pm\sqrt{13}}{2}$

8. Which equation represents the line through $(-3, 2)$ parallel to $y = 3 - 4x$ ?

A $y + 2 = -4(x + 3)$ B $y - 2 = -3(x + 3)$

C $y - 2 = -4(x + 3)$ D $y - 2 = 3(x + 3)$

9. Events *A* and *B* are subsets of the sample space *S* in which all outcomes are equally likely.

If $n(A) = 10,\ n(B) = 15,\ n(S) = 30$ and $P(A \cup B) = \frac{3}{5}$, then $n(A \cap B)$ is equal to:

A 7 B 9 C 18 D 25

10. The base of a triangle is twice as long as a side of a square and their areas are the same. Then the ratio of the altitude of the triangle to the side of the square is:

A 1 : 4 B 1 : 2 C 1 : 1 D 2 : 1

11. At 2:15pm, the hour and minute hands of a clock form an angle of:

A 30º B 5º C $22\frac{1}{2}^\circ$ D $7\frac{1}{2}^\circ$

12. If $8 . 2^x = 5^{y+8}$, then when $y = -8,\ x =$

A $-4$ B $-3$ C 0 D 4

13. The graph $y = 2x^2 + 4x + 3$ has its

A lowest point at (-1, 1)

B highest point at (-1, 1)

C lowest point at (-1, 9)

D highest point at (-1, 9)

14. A straight line joins the points (-1, 1) and (3, 9). Its *x*-intercept is:

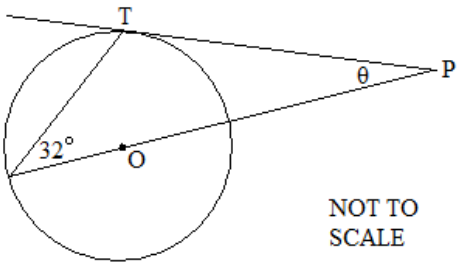
A $-\frac{3}{2}$ B $-\frac{2}{3}$ C $\frac{2}{5}$ D 2

15. The diameters of two circles are 8cm and 12cm respectively. The ratio of the area of the smaller to the area of the larger circle is:

A 2 : 3 B 1 : 2 C 9 : 4 D 4 : 9

16. When simplified, $(x^{-1}+y^{-1})^{-1}$ is equal to:

A $x+y$ B $\frac{xy}{x+y}$ C $xy$ D $\frac{1}{xy}$

17. 


PT is a tangent to the circle, centre O.
T is the point of contact.
What is the size of $\theta$?

A 32° B 26°
C 64° D 58°

18. If a worker receives a 20 percent cut in wages, he may regain his original pay exactly by obtaining a raise of:

A 20 percent B 25 percent
C $20 D $25

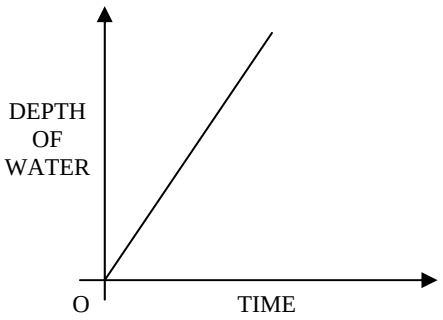
19.

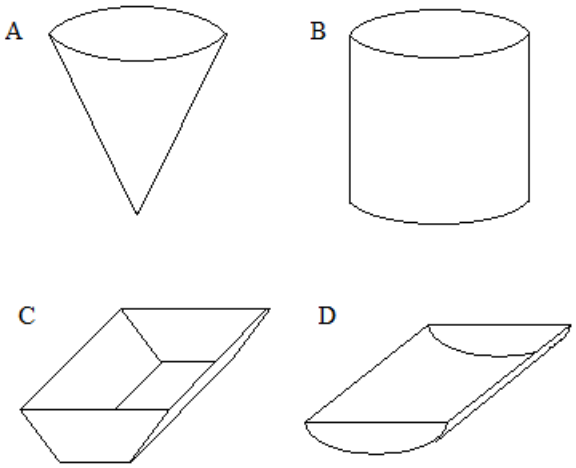
| Subject | Mean Mark | SD |
|---|---|---|
| English | 50 | 6 |
| Maths | 60 | 8 |

What mark in Maths is equivalent to a mark of 62 in English?

A 68 B 66 C 76 D 74

20. Water is poured into a container at a constant rate. The graph shows the depth of water in the container as it was being filled.
Which of the following containers could have been used?




21. $x^{-2}y^{\frac{1}{3}} =$

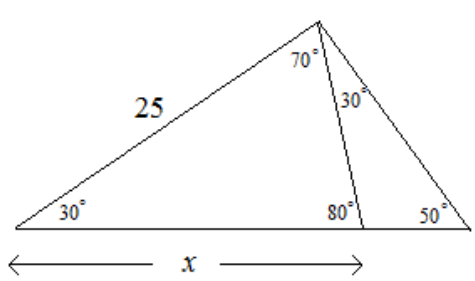
A $\frac{x}{2\sqrt[3]{y}}$ B $\frac{2\sqrt[3]{y}}{x}$ C $\frac{\sqrt[3]{y}}{x^2}$ D $\frac{x^2}{\sqrt[3]{y}}$

22. A square and an equilateral triangle have equal perimeters. The area of the triangle is $9\sqrt{3}$ cm$^2$. Expressed in centimetres, the diagonal of the square is:

A $\frac{9}{2}$ B $2\sqrt{5}$ C $4\sqrt{2}$ D $\frac{9\sqrt{2}}{2}$

23. If the parabola $y = ax^2 + bx + c$ passes through the points (–1,12), (0,5) and (2,–3), the value of $a + b + c$ is:

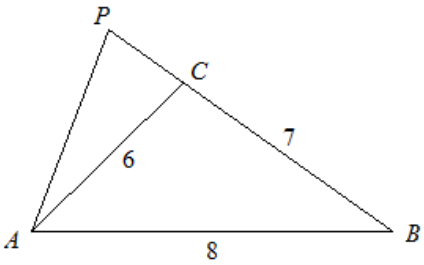
A –4 B –2 C 0 D 1

24. 


From this diagram, which statement is correct?

A $\frac{x}{sin70°} = \frac{25}{sin30°}$ B $\frac{x}{sin100°} = \frac{25}{sin80°}$

C $\frac{x}{sin70°} = \frac{25}{sin50°}$ D $\frac{x}{sin70°} = \frac{25}{sin80°}$

25. 


In $\Delta ABC$, $AB = 8$, $BC = 7$, $CA = 6$ and side $BC$ is extended, as shown in the figure, to a point $P$ so that $\Delta PAB$ is similar to $\Delta PCA$. The length of $PC$ is:

A 6 B 7 C 8 D 9

26. In $\Delta ABC$, $\angle BAC = 60°$ and $BC = 9$. Find the length of the diameter of the circle.

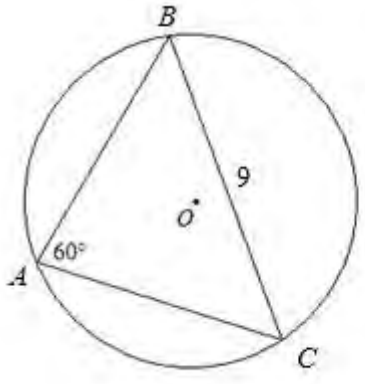



Diagram not to scale

A $11\frac{1}{2}$ B $\frac{9\sqrt{3}}{2}$ C $12\frac{1}{2}$ D $6\sqrt{3}$

27. There are two natural ways to inscribe a square in a given isosceles right triangle. If it is done as in Figure 1 below, then one finds that the area of the square is 441cm$^2$. What is the area (in cm$^2$) of the square inscribed in the same $\Delta ABC$ as shown in Figure 2 below?

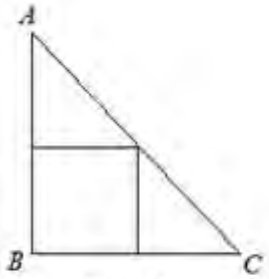


Figure 1

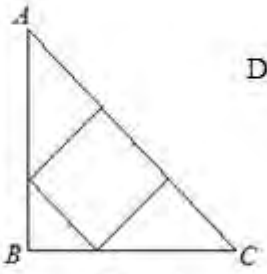


Figure 2

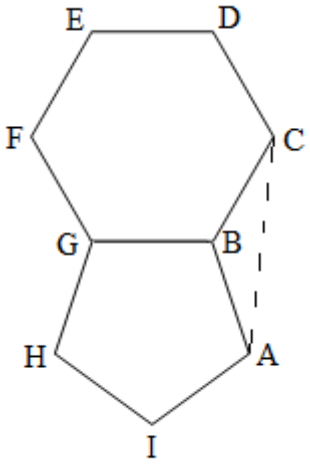
Diagram not to scale

A 378 B 392 C 400 D 441

28. It takes 30 seconds to fill a 5 litre bucket with water. What is the rate of flow in litres per hour?

A 10 B 150 C 600 D 1200

29. A regular hexagon and a regular pentagon have a common edge as shown. Find the size of $< BAC$.




A 24° B 30°

C 36° D 45°

30. If $x$ varies directly as the cube of $y$, and $y$ varies directly as the fifth root of $z$, then $x$ varies directly as the $n^{th}$ power of $z$, where $n$ is:

A $\frac{1}{15}$ B $\frac{5}{3}$ C $\frac{3}{5}$ D 15

**END OF SECTION A**

## Question 31. (20 marks) Start a new page

marks

a) What is the exact value of $\cos(180^0 - 60^0)$? **1**

b) Solve $\cos x = 1$ for $0^0 \leq x \leq 360^0$ **1**

c) Solve $2x - 7\sqrt{x} = 15$. **4**

d) What is the domain and range of $y = -\sqrt{25 - (x-2)^2} + 3$? **2**

e) Find the remainder when $P(x) = x^3 - 2x^2 + x - 1$ is divided by $(x + 2)$. **2**

f) A certain integer is between 10 and 100. Its value is 8 times the sum of its digits and if the integer is reduced by 45, its digits are reversed. By forming a pair of simultaneous equations or otherwise find the integer. **3**

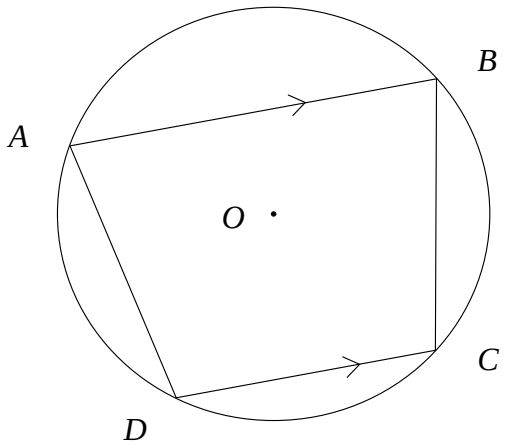
g) i) Write down the centre and the radius of the circle with equation $(x + 2)^2 + (y + 3)^2 = 4$. **2**

ii) Find the shortest distance from the line $x - 2y - 8 = 0$ to the centre of the circle in (i). **2**

iii) Hence or otherwise determine the length of the chord cut off from the line by the circle. (Giving reasons for your answer). **3**

## Question 32. (20 marks) Start a new page

a) $ABCD$ is a cyclic quadrilateral in which $AB$//$DC$. Given that $O$ is the centre of the circle, $\angle AOD = 130^0$, $\angle CBD = 20^0$ and $DC$ is produced to $E$:




i) Copy the diagram **neatly** and include **all** of the given information. **1**

ii) Find the value of $\angle BCE$ giving full reasons. **3**

**QUESTION 32 continued over the page!**

b) i) Neatly draw the graph of $y = 3\sin 2x$ for $0^0 \leq x \leq 360^0$. **2**

ii) State the amplitude and period for $y = 3\sin 2x$. **2**

iii) Solve $3\sin 2x = -3$ for $0^0 \leq x \leq 360^0$. **1**

c) i) On your answer sheet about 6cm below your final answer for b) draw an 8cm interval on your page. Label the interval *AB*. **1**

ii) Construct using compass and ruler only a $60^0$ angle with its vertex at *A*. Show all construction lines. **2**

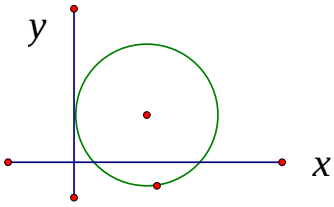
iii) Construct a perpendicular at *B*. Show all construction lines. **2**

d) Solve $2^{2n+2} - 2^{2n-1} = 1792$. **3**

e) Find the solution set to $6k^2 + 13k < 8$. **3**

## Question 33. (20 marks) Start a new page

a) In the diagram below *A* is the point (4,0) and *B* is (9,0) find the coordinates of *P*; giving reasons. **3**




b) A hill with a uniform slope is inclined at $14^0$ to the horizontal. From the bottom of the hill *A*, the angle of elevation of *T*, the top of a tower *TB* standing on a hill is $25^0$. On moving 50m up the hill to a point *C*, the angle of elevation of *T* is $55^0$.

i) Draw a **neat** diagram to represent this data. (Use a ruler). **1**

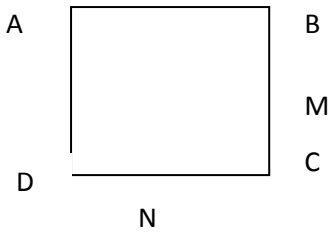
ii) Find the size of $\angle ATC$. **2**

iii) Find the length of *TA* correct to one decimal place. **2**

iv) Find the height of the tower *TB* correct to two decimal places. **2**

**QUESTION 33 continued over the page!**

c) *ABCD* is a square with *M* the midpoint of *BC* and *N* is the midpoint of *CD*. *AM* and *BN* intersect at *P*.




i) Draw the diagram **neatly** to represent this data. (mark on **all given data**). **1**

ii) Prove $\Delta ABM \equiv \Delta BCN$. **3**

iii) Prove $\Delta BPM$ /// $\Delta BCN$. **3**

iv) Find the area of the quadrilateral *APND* if *AB* = 10cm. **3**

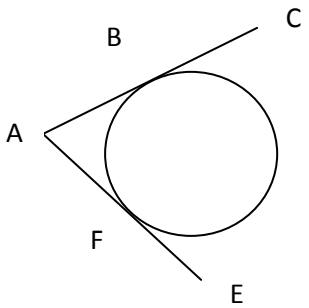
## Question 34. (20 marks) Start a new page

a) Two dice are thrown. What is the probability of getting a sum under seven if it is known that at least one of the two dice shows a two? **2**

b) It takes 45 hours for one cleaner to clean the school. How many hours are saved if six cleaners are cleaning the school at the same rate? **2**

c) *AC* is a tangent to the circle at *B*. *AE* is a tangent to the circle at *F*. Given that <CBD is $63^0$

and <DFE is $49^0$ , find the values of *x* and *y* giving reasons. **4**




d) Prove that $\cot A(\operatorname{cosec} A - \cot A) = \frac{\cos A}{1+\cos A}$ **3**

e) Solve $\sin^2\theta - 2\sin\theta\cos\theta = 8\cos^2\theta$ to the nearest minute for $-180^0 \leq \theta \leq 180^0$ **4**

f) i) Write down the equation of the line through *L*(-1,2) with gradient *m*. **1**

ii) Hence, determine the equation of the line through *L*, if *L* divides the intercepts with the coordinate axis in the ratio -2**:**5. **4**

***END OF EXAM***

# YEAR 10 YEARLY 2009 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 | D |
| 2 | A | **B** | C | D |
| 3 | A | B | C | **D** |
| 4 | A | **B** | C | D |
| 5 | A | B | **C** | D |
| 6 | **A** | **B** | C | D |
| 7 | **A** | B | C | D |
| 8 | A | B | **C** | D |
| 9 | **A** | B | C | D |
| 10 | A | B | **C** | D |
| 11 | A | B | **C** | D |
| 12 | A | **B** | C | D |
| 13 | **A** | B | C | D |
| 14 | **A** | B | C | D |
| 15 | A | B | C | **D** |
| 16 | A | **B** | C | D |
| 17 | A | **B** | C | D |
| 18 | A | **B** | C | D |
| 19 | A | B | **C** | D |
| 20 | A | **B** | C | D |
| 21 | A | B | **C** | D |
| 22 | A | B | C | **D** |
| 23 | A | B | **C** | D |
| 24 | A | B | C | **D** |
| 25 | A | B | C | **D** |
| 26 | A | B | C | **D** |
| 27 | A | **B** | C | D |
| 28 | A | B | **C** | D |
| 29 | **A** | B | C | D |
| 30 | A | B | **C** | 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

# Year 10 yrly 2009

## Question 31

a) $\cos(180^\circ - 60^\circ) = -\cos 60^\circ$ (1mk right or wrong)

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

b) $\cos x = 1$ for $0^\circ \le x \le 360^\circ$

$x = 0^\circ$ or $360^\circ$ ($\frac{1}{2}$ each)

c) $2x - 7\sqrt{x} - 15 = 0$

let $\sqrt{x} = m$

$\therefore 2m^2 - 7m - 15 = 0$ (1mk)

$(2m+3)(m-5) = 0$ (1mk)

$m = -1\frac{1}{2}$ or $m = 5$

$\sqrt{x} = -1\frac{1}{2}$ or $\sqrt{x} = 5$ (1mk)

no real solution

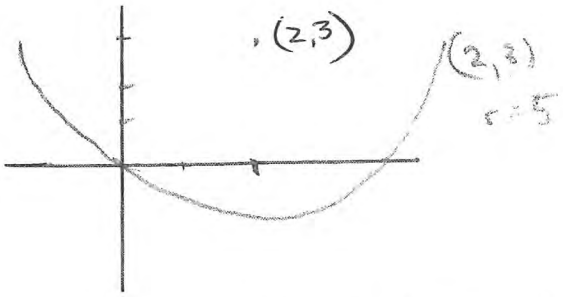
($\frac{1}{2}$mk) as $\sqrt{x} \ge 0$

$\therefore x = 25$

($\frac{1}{2}$mk) only

d) $y = -\sqrt{25 - (x-2)^2} + 3$

$(y-3)^2 = 25 - (x-2)^2$




Domain is $-3 \le x \le 7$ (1mk)

Range is $-2 \le y \le 3$ (1mk)

e) $P(x) = x^3 - 2x^2 + x - 1$

$P(-2) = -8 - 8 - 2 - 1$

$\therefore P(-2) = -19$ (2mks)

f) no. is 72 (3mks)

g(i) centre is $(-2, -3)$ (1mk)

radius is 2 (1mk)

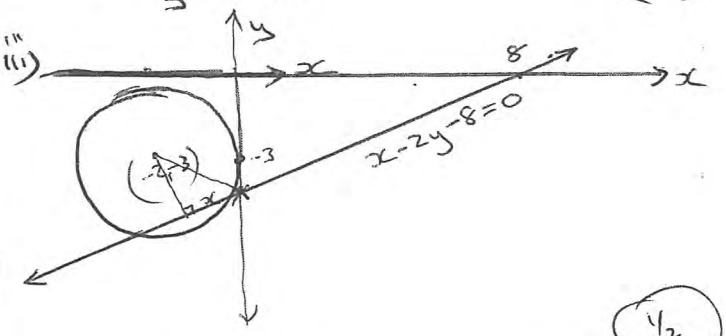
(ii) $d = \left| \frac{1x-2 + -2x-3-8}{\sqrt{1+4}} \right|$ (1mk)

$= \left| \frac{-2+6-8}{\sqrt{5}} \right|$

$= \frac{4}{\sqrt{5}}$

$= \frac{4\sqrt{5}}{5}$ units (1mk)

(iii)




(1) $2^2 = \left(\frac{4}{\sqrt{5}}\right)^2 + x^2$ ($\frac{1}{2}$) (by Pythagoras)

$4 - \frac{16}{5} = x^2$

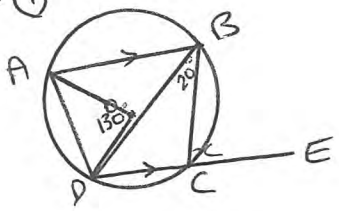
$x = \frac{2}{\sqrt{5}}$ ($\frac{1}{2}$) as $x > 0$

$\therefore$ chord is $\frac{4}{\sqrt{5}}$ ($\frac{1}{2}$) (perpendicular line from centre bisects the chord.)

total 20mks

# Question 32 (20 marks)

(a) (i)




1 mk (but they must have all of the information and on a neat diagram to get the mark).

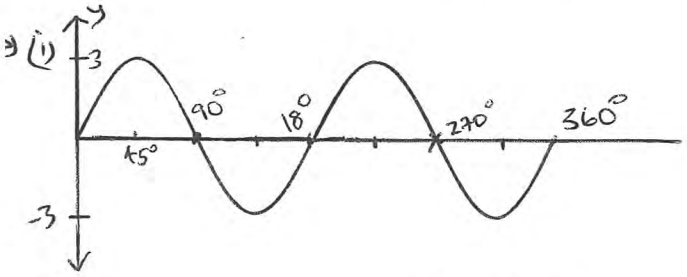
(ii) let $B\hat{C}E = x$ (2 mks)

(1) $A\hat{B}D = 65°$ (the angle at the circumference is half the angle at the centre on the same arc).

(1) $A\hat{B}C = 65° + 20$ (sum of adjacent angles)
$= 85°$

(1) $\therefore B\hat{C}E = 85°$ (alternate angles are equal; AB // DC).

(b) (i)



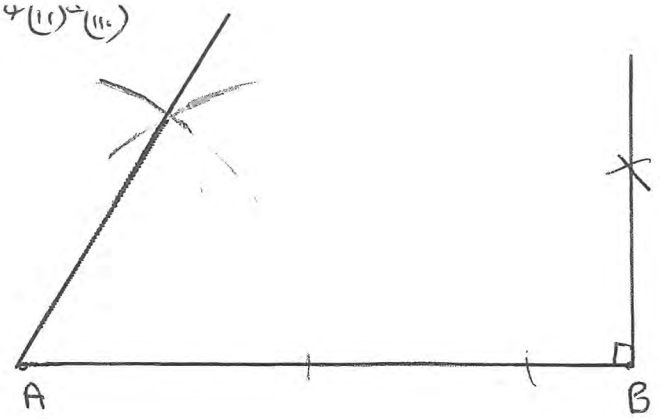

(2 mks) ← ½ shape, ½ x-intercepts, ½ y-axis scale, ½ for correct period

(ii) amplitude is 3 (1 mk)
period is 180° (1 mk)

(i) $3\sin 2x = -3$ for $0° \le x \le 360°$

$x = 135°$ or $315°$ (1 mk)

(c) (i) (ii) (iii)




(i) 1 mk (8cm and A & B labelled)
(ii) 2 mks (deduct marks if there's no construction).
(iii) 2 mks " " "

(d) $2^{2n+2} - 2^{2n-1} = 1792$

$2^{2n-1}(2^3 - 1) = 1792$ (1)

(1792 ÷ 7)

$\therefore 2^{2n-1} = 256$

$2^{2n-1} = 2^8$ (1)

$\therefore 2n - 1 = 8$

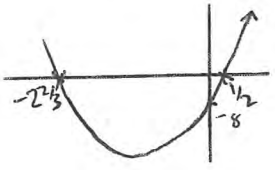
$2n = 9$

$\therefore n = 4\frac{1}{2}$ (1)

(e) $6k^2 + 13k < 8$

$6k^2 + 13k - 8 < 0$ (½)

$(3k + 8)(2k - 1) < 0$ (1)




(½)

$\therefore -2\frac{2}{3} < k < \frac{1}{2}$ (1)

## Question 35 (20 marks)

a) $OP^2 = OA \cdot OB$ (1½) (tangent squared equals the product of the intercepts on the secant) (1½).

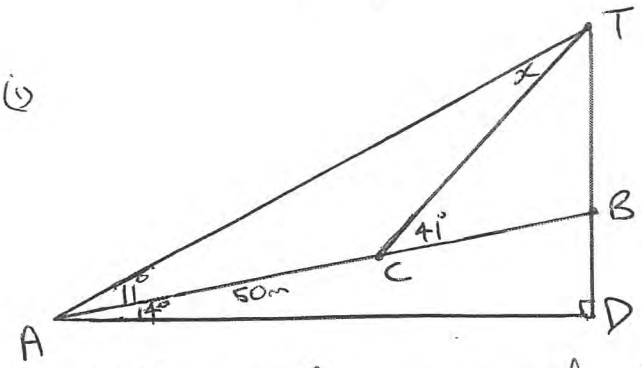
$OP^2 = 4 \times 9$

$OP^2 = 36$ (½)

$OP = 6$ (as $OP > 0$ its a length) (1½)

$\therefore$ P is $(0, 6)$ (½) (½)

b)(i)




1mK (all info necessary for 1mK)

(ii) ① $T\hat{A}C = 11°$ ($25° - 14°$)

② $A\hat{T}C = 41° - 11°$ (exterior angle of $\triangle TAC$ equals sum of 2 interior opposite angles).

$= 30°$ ①

(iii) $A\hat{C}T = 139°$ (angle sum of a triangle is 180°). (½)

$\frac{50}{\sin 30°} = \frac{TA}{\sin 139°}$ (½)

$100 \times \sin 139° = TA$

$TA = 65.6059029$ (½)

$TA = 65.6m$ (1 d.p.). (½)

(iv) $A\hat{B}D = 76°$ (angle sum of $\triangle ABD$ is 180°).

$C\hat{B}T = 104°$ (sum of adjacent angles on a st. angle is 180°).

In $\triangle ATC$,

$\frac{TC}{\sin 11°} = \frac{50}{\sin 30°}$

$TC = 100 \cdot \sin 11°$

In $\triangle CBT$,

$\frac{TB}{\sin 41°} = \frac{TC}{\sin 104°}$

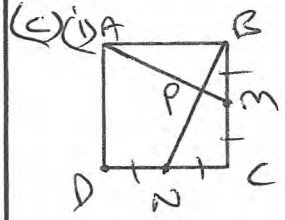
$TB = \frac{100 \sin 11° \sin 41°}{\sin 104°}$

$= \frac{12.51819642}{0.970295726}$

$= 12.90142385$

$\therefore$ Towe is 12.9m high.

(c)(i)




1mk (all data must be present).

(ii) In $\triangle$s ABM, BCN

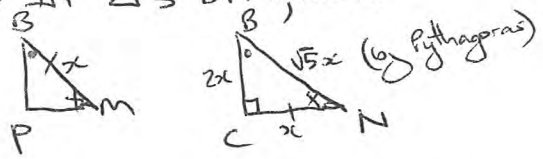
$AB = BC$ (sides of a square are all equal).

$BM = CN$ (midpoints of equal sides)

$A\hat{B}M = B\hat{C}N$ (all angles in a square are 90°).

$\therefore \triangle ABM \equiv \triangle BCN$ (SAS).

(iii) In $\triangle$s BPM, BCN




$A\hat{M}B = B\hat{N}C$ (corresponding angles in congruent triangles are equal)

$\hat{B}$ is common

$\therefore \triangle BPM \parallel\parallel \triangle BCN$ (equiangular) (3)

(iv) AB is 10cm data

area of $\triangle ABM = \frac{1}{2} \times 10 \times 5$

$= 25cm^2$

area of $\triangle BNC = 25cm^2$ (3)

ratio of $\triangle BPM : \triangle BCN = 1 : \sqrt{5}$

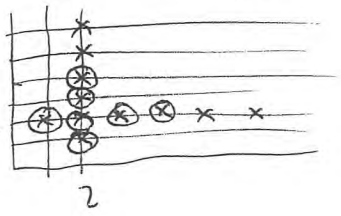
ratio of areas $= 1 : 5$

$= x : 25$ $\therefore x = 5cm^2$

area of APND $= 100 - 25 - 25 + 5 = 55cm^2$

# Question 34 (20mks)

(a) $P(\text{sum} < 7)$.



sample space = 11 (1)

$\therefore P(\text{sum} < 7) = \frac{7}{11}$ (1)

(b) 45 hours for 1 cleaner

$\frac{45}{6}$ for 6 cleaners $= 7\frac{1}{2}$

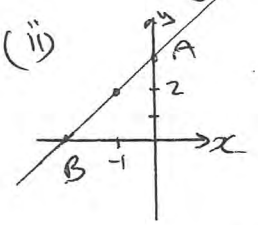
hours saved $= 45 - 7\frac{1}{2}$ (2)

$= 37\frac{1}{2}$ hours.

(c)(i) $y - 2 = m(x+1)$

$y = mx + m + 2$ (1)

(ii)



A $(0, m+2)$ (1/2)

B $\left(\frac{-m-2}{m}, 0\right)$ (1/2)

x intercept : y intercept

$-2 : 5$

$\left(\frac{-m-2}{m}, 0\right) \left(0, m+2\right)$ (1/2)

$-2 : 5$

$(-1, 2) = \left(\frac{-2\times 0 + 5\left(\frac{-m-2}{m}\right)}{3}, \frac{5\times 0 + -2(m+2)}{3}\right)$ (1/2)

$-3 = \frac{-5m-10}{m}$ or $2 = \frac{-2m-4}{3}$

$-3m = -5m - 10$ $\quad$ $6 = -2m - 4$

$2m = -10$ $\quad$ $2m = -10$

$m = -5$ (1) $\quad$ $m = -5$

$\therefore y = -5x - 5 + 2$

ie $y = -5x - 3$

or $5x + y + 3 = 0$ (1)

(d) LHS. $= \cot A(\operatorname{cosec} A - \cot A)$

$= \frac{\cos A}{\sin A}\left(\frac{1}{\sin A} - \frac{\cos A}{\sin A}\right)$ (1)

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

$= \frac{\cos A(1-\cos A)}{(1-\cos A)(1+\cos A)}$ (1)

$= \frac{\cos A}{1 + \cos A}$ (1)

$=$ RHS.

(e) $\sin^2\theta - 2\sin\theta.\cos\theta - 8\cos^2\theta = 0$

$\tan^2\theta - 2\tan\theta - 8 = 0$ (1)

$(\tan\theta - 4)(\tan\theta + 2) = 0$ (1/2)

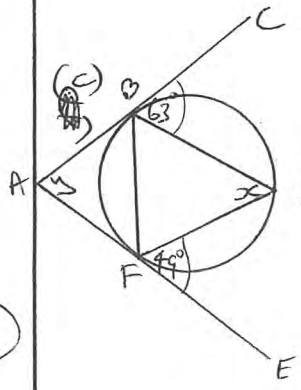
$\tan\theta = 4$ or $\tan\theta = -2$ (1/2)

$\theta = +75^\circ 58'$ $\quad$ $\theta = -63^\circ 26'$

$\therefore \theta = 75^\circ 58', -104^\circ 2', -63^\circ 26', 116^\circ 34'$

(1) (1)

(f)



Join B to F

$B\hat{F}D = 63^\circ$ (angle in the alternate segment equals angle between chord & tangent).

Similarly $F\hat{B}D = 49^\circ$

$\therefore x = 180^\circ - 49 - 63^\circ$ (angle sum of $\triangle BDF$ is $180^\circ$)

$\therefore x = 68^\circ$

$A\hat{B}F = 68^\circ$ (angle sum of $ABC$ is $180^\circ$).

Similarly $A\hat{F}B = 68^\circ$

$\therefore y = 180^\circ - 2(68^\circ)$ (angle sum of $\triangle ABF$ is $180^\circ$).

$y = 44^\circ$