Sydney Technical High School

Name: ..... **Maths Class:** .....

Year 10

Mathematics

Assessment 4

October 2020

Time allowed: 75 minutes

General Instructions:

- Marks for each question are indicated on the question.
- Approved calculators may be used
- All necessary working should be shown
- Full marks may not be awarded for careless work or illegible writing
- ***Begin each question on a new page***
- Write using black or blue pen
- All answers are to be in the writing booklet provided

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Section 1 Multiple Choice

Questions 1-5

5 Marks

Section II Questions 6-10

60 Marks

SECTION 1

MULTIPLE CHOICE (5 marks)

Choose one of the four answers (A,B,C or D) and fill in the circle in your answer booklet

1

Mr H has lost one of his year 10 papers. Nevertheless he does his statistics on the other 29 students and arrives at a mean mark for the class of 75 and a standard deviation of 4.7.

He then finds the missing paper, marks it and finds that it is worth 77.

Which of the following statements is now true?

A. The mean is unchanged but the standard deviation has dropped
B. The mean has risen but the standard deviation has dropped
C. The mean has risen and the standard deviation has risen
D. The mean has risen but the standard deviation has not changed

2

The minimum y-value of the parabola $y = 3x^2 - 6x + 4$ occurs when $x =$

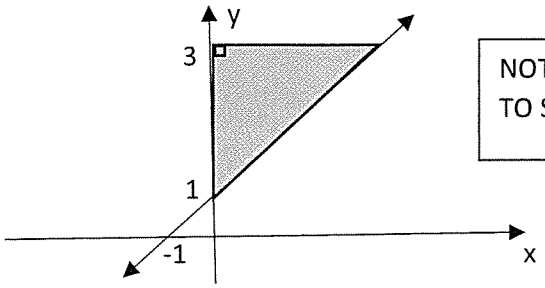
A. -1 B. 1 C. -6 D. 6

3

For the statistics in this table:

x	f
12	3
13	5
15	3
16	4

A. The mean is 14 and the median is 13
B. The mean and median are both 14
C. The mode is 13 and the median is 14
D. The mode is 13 and the mean is 13

4	If two dice are rolled 36 times how many times would you expect a "double six" to occur? A. 1 B. 6 C. 12 D. 18
5	 NOT DRAWN TO SCALE The area of the shaded section above is: A. 2 $units^2$ B. 3 $units^2$ C. 4 $units^2$ D. 6 $units^2$

SECTION 2

QUESTION 6: (12 marks)

(a) Given the points A(-1, 3) and B (5, 7), find the distance AB, leaving your answer in exact form **1**

(b) Solve the equation for x: **2**

$$x^2 + 7x - 30 = 0$$

(c) Solve the simultaneous equations **2**

$$x + y = 3$$

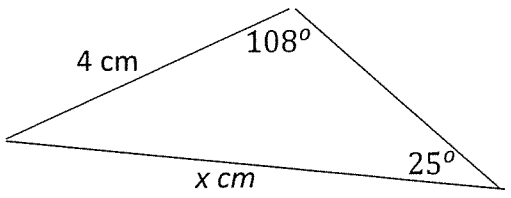
$$2x + 3y - 10 = 0$$

(d) In a given class, it is found that of the 30 students, 18 study Physics, 15 study Chemistry while 8 take no Science at all.

(i) Draw a Venn Diagram showing all of this data **2**

(ii) If a student is randomly chosen from this class, what is the probability that he will study Physics ONLY? **1**

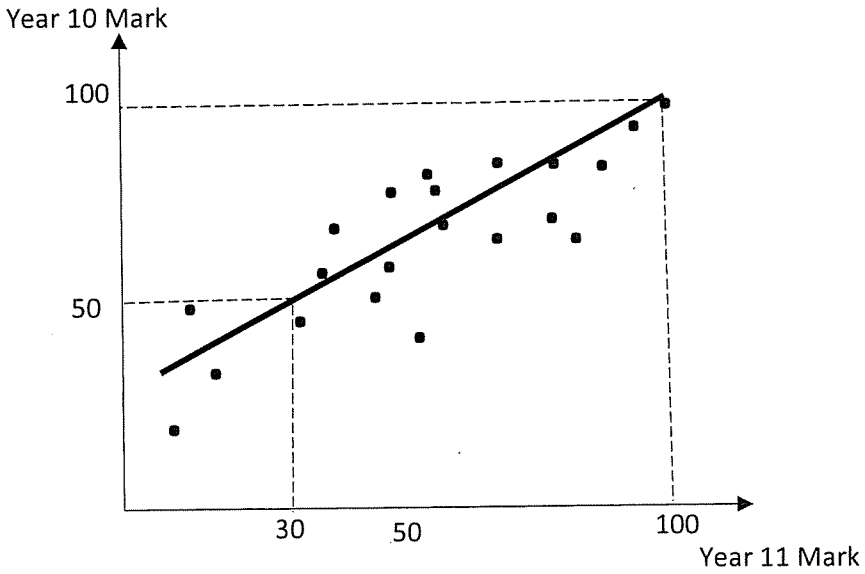
(e) Find the value of *x* in this triangle, correct to 2 dec. places **2**



QUESTION 6 continues overleaf....)

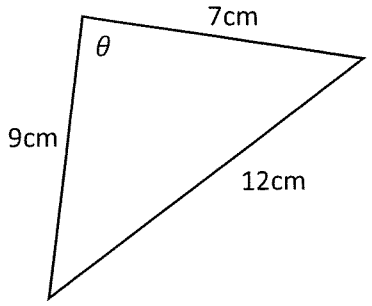
QUESTION 6 continued.....

(f) What could be the equation of the Line of Best Fit shown for this data? **2**



QUESTION 7: (12 Marks) (Start a new page)

(a) Find the value of θ in the following triangle, giving your answer correct to the nearest degree: **3**



(b) You are given the curve $y = (x+1)^2 - 4$

(i) Find the co-ordinates of the vertex **1**

(ii) Find the y-intercept **1**

(iii) Find the x-intercepts **2**

(iv) Sketch the curve $y = (x+1)^2 - 4$ showing all of the information above **2**

(c) Find the exact value of (i) $\cos 45^o$ **3**

(ii) $\sin 240^o$

(iii) $\tan^2(420^o)$

QUESTION 8: (12 Marks) (Start a new page)

(a) John is bored in isolation and decides to make up his own game.

He throws a normal 6-sided die and the rules are:

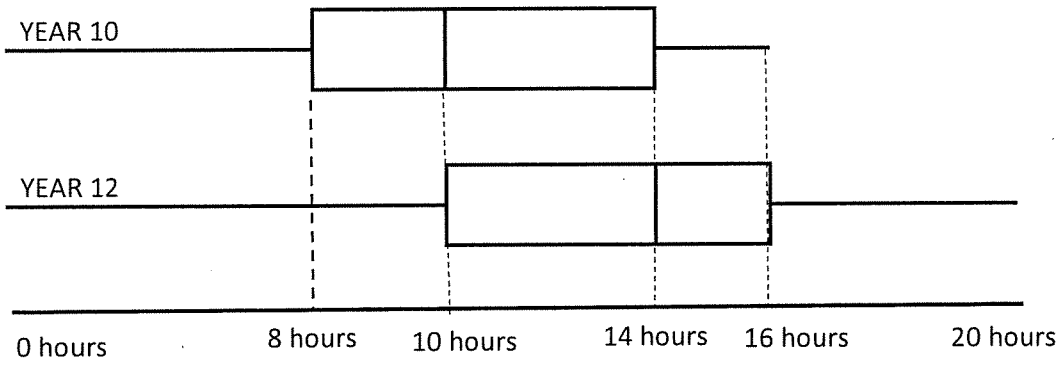
** If he throws a "six" , he wins
** If he throws an odd number, he throws again
** If he throws any other number (ie a 2 or a 4), he loses.

(i) What is the probability he wins on the first go? **1**

(ii) What is the probability it takes until the second go to win? **1**

(iii) What is the probability that he takes at most 2 goes to win? **1**

(b) The number of hours studied over a week for students in years 10 and 12 were represented in these stem and leaf plots:



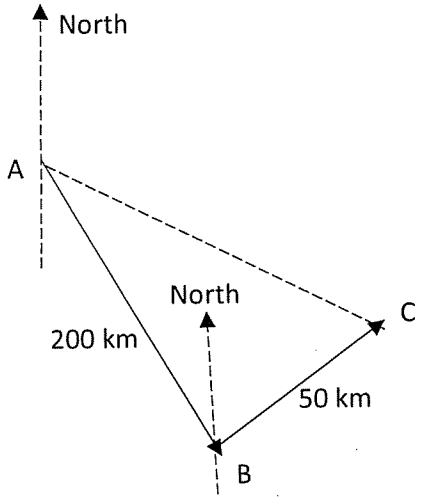
(i) Find the Inter-Quartile Range of the year 10 group **1**

(ii) What percentage of the year 12 group study more than ANY of the year 10 group? **1**

QUESTION 8 continues overleaf....)

QUESTION 8 continued....

(c) A ship sails from a port A on a bearing of 160^o T. After travelling for 200 km, it lands at another port B.

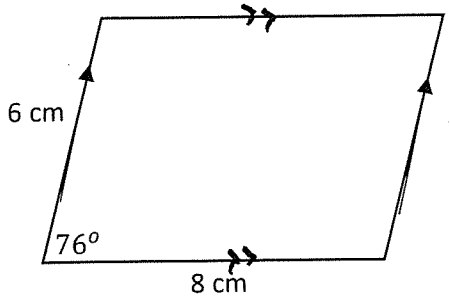


(i) What is the bearing of A from B? **1**

(ii) From B it now sails 50 km on a bearing of 70^oT before anchoring at a point C. How far is point C away from its port of origin, A? **1**

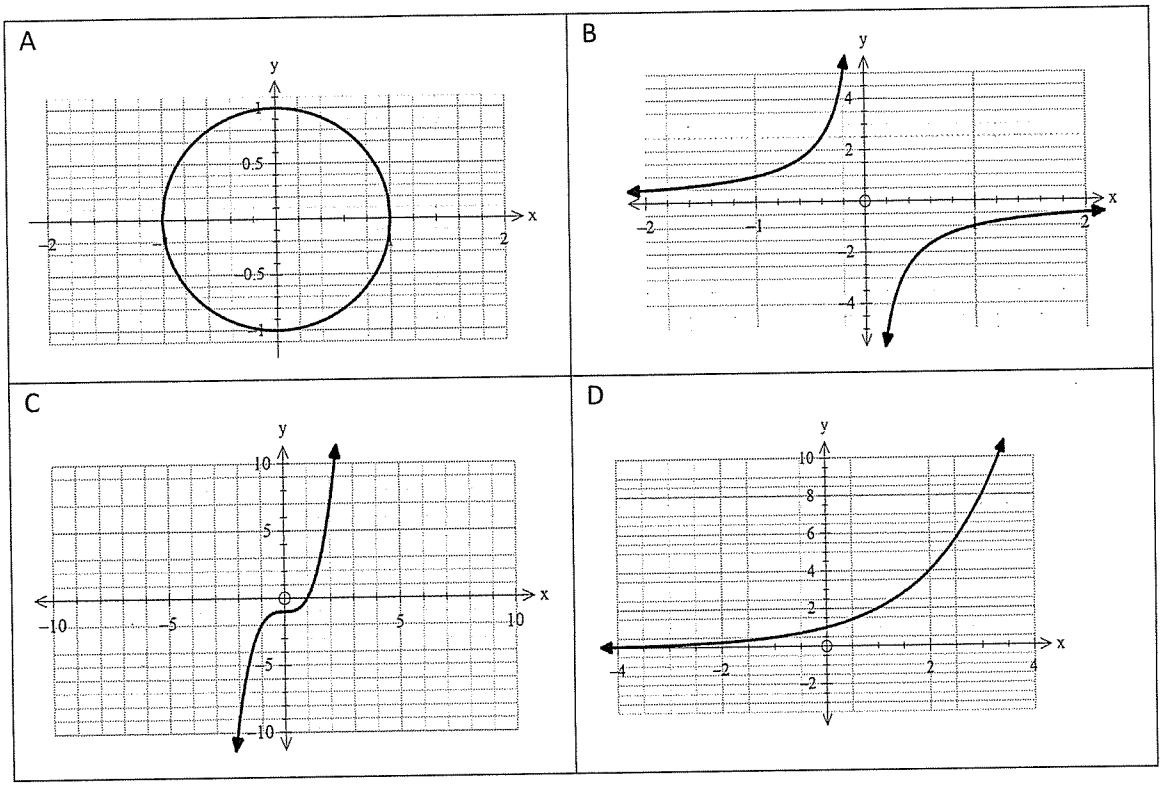
(iii) What is the bearing of C from A? **2**

(d) In the following diagram, find the area of the parallelogram, to the nearest 2 dec. places **3**



QUESTION 9: (12 Marks) (Start a new page)

(a) You are given the graphs of 4 curves, A, B, C and D below. **3**



Put the letter (A,B,C or D) which corresponds to the graph whose equation is given as:

(i) $y = 2^x$

(ii) $xy = -1$

(iii) $x^2 + y^2 = 1$

(iv) $y = x^3 - 1$

(b) Solve the equation $x - \frac{6}{x} = 5$ **2**

QUESTION 9 continues overleaf.....)

QUESTION 9 continued .....

(c) (i) On the one set of axes, and using about one-third of a page, neatly sketch $y = 2x^2 - 1$ and $y = 6x + 2$, labelling each one. **2**

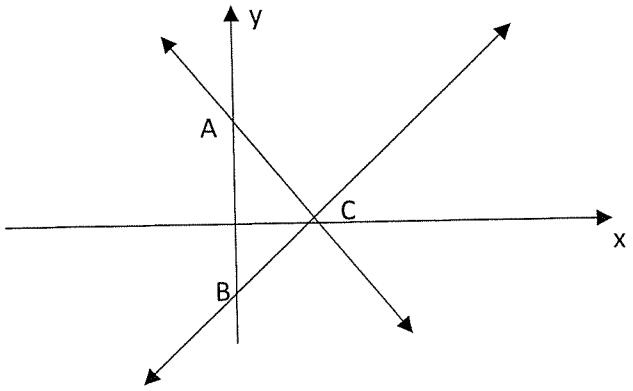
(ii) Using algebraic methods, not graphically, find the ***x-value(s)*** of the point(s) of intersection of the two graphs, correct to 2 decimal places. **2**

(d) Solve the equation $\cos x = -0.4$ for $0 \leq x \leq 360^o$, correct to the nearest minute. **3**

QUESTION 10: (12 Marks) (Start a new page)

(a) In the diagram below, the line BC has equation $y = \frac{2}{3}x - 3$ while the line AC is perpendicular to BC.

The line BC cuts the x-axis at C and the y-axis at B
The line AC cuts the y-axis at A



(i) Find the co-ordinates of the points B and C **2**

(ii) Find the equation of the line AC **2**

(iii) Hence find the point A **1**

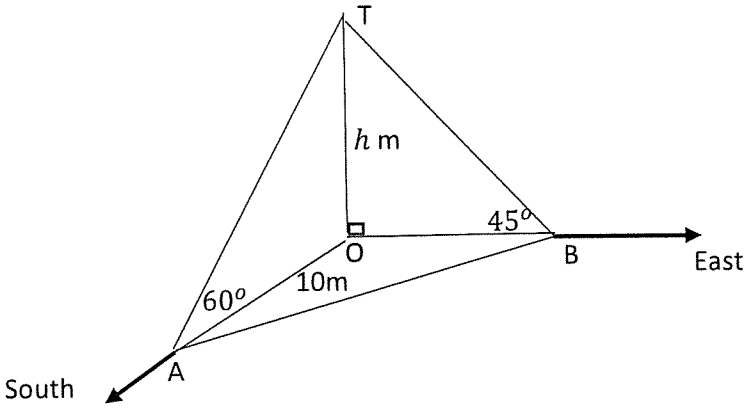
(iv) Hence find the area of Δ ABC **1**

(b) Prove that $\frac{sin\theta}{cos\theta} + \frac{cos\theta}{sin\theta} = sec\theta cosec\theta$ **2**

QUESTION 10 continues overleaf....)

QUESTION 10 continued.....)

(c)



From an observer A, standing 10 m due south of a vertical tower (OT), the angle of elevation to the top of the tower is 60^o.

Another observer at B, due east of the tower (and on level ground with it) has the angle of elevation to the top of the tower as 45^o.

(i) If the height of the tower is given by h m, find the value of h in exact terms. **1**

(ii) What is the distance of the observer at B from the foot of the tower? **1**

(iii) How far apart are A and B? **2**

End of examination

YEAR 10 TERM 4 TEST 2020

SOLUTIONS

M/C

1/ (B)

2/ $x = -\frac{b}{2a}$

$= \frac{6}{6}$ ∴ (B)

$= 1$

3/ $\bar{x} = \frac{36 + 65 + 45 + 64}{15}$

$= \frac{210}{15}$ ∴ (A)

$= 14$

Median is 13

4/ $P(2 \times 6) = \frac{1}{36}$ (A)

∴ once

5/

Area $= \frac{1}{2} \times 2 \times 2$ ∴ (A)

$= 2 \mu^2$

QUESTION 6:

(a) $AB = \sqrt{(5 - -1)^2 + (7 - 3)^2}$

$= \sqrt{36 + 16}$

$= \sqrt{52}$

1 MARK

(b) $(x + 10)(x - 3) = 0$

∴ $x = -10$ or $x = 3$.

1 MARK for each answer

(c) $x + y = 3$ (1)

$2x + 3y - 10 = 0$ (2)

(2) − (1) × 2 $y - 10 = -6$

∴ $\begin{cases} y = 4 \\ x = -1 \end{cases}$

2 MARKS for either method

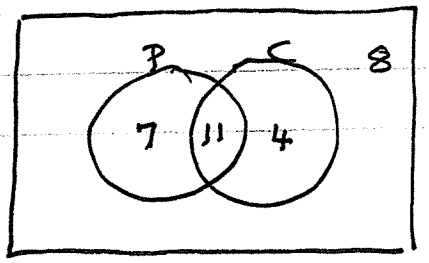
OR // into (2) $y = 3 - x$

$2x + 9 - 3x - 10 = 0$

$\begin{cases} x = -1 \\ y = 4. \end{cases}$

(d)

(i)



(ii) $P(\text{Physics}) = \frac{7}{30}$

(e) $\frac{x}{\sin 108^\circ} = \frac{4}{\sin 25^\circ}$

$\therefore x = \frac{4 \sin 108^\circ}{\sin 25^\circ}$

$= 9.00$

(f) $\text{Slope} = \frac{100 - 50}{100 - 30}$

$= \frac{5}{7}$

y-intercept $= 30$

$\therefore y = \frac{5}{7}x + 30$

OR, $5x - 7y + 210 = 0$

OR, $7y = 5x + 210$

(i) 2 MARKS for Venn Diagram (check for subsequent errors here and in part (ii))

(ii) 1 MARK (see above)

1 for sine rule
1 for answer (ignore dec places)

1 for slope

1 for close to y-intercept

} accept any

QUESTION 7:

(a) $\cos\theta = \dfrac{7^2 + 9^2 - 12^2}{2 \times 7 \times 9}$

$\therefore \quad \theta \approx 96°$

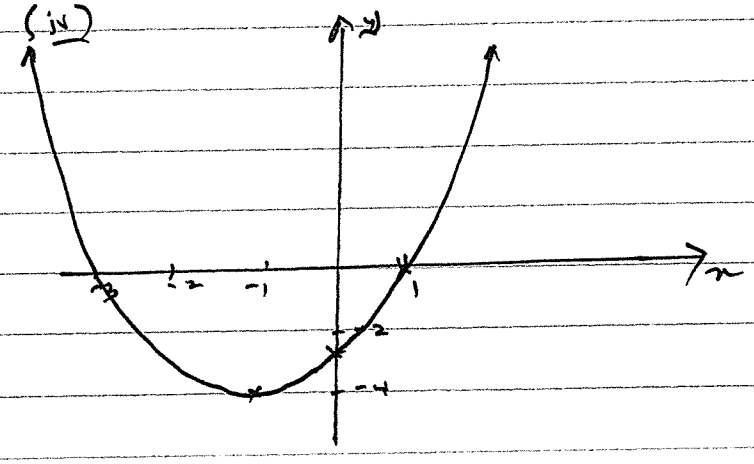
1 for cosine rule
1 for θ
1 for nearest degree

(b) (i) $(-1, -4)$ 1 MARK

(ii) y-intercept $= -3$ or $(0, -3)$ 1 MARK

(iii) x-intercept $(1, 0)$ or $(-3, 0)$ } 1 each answer.
or just $x = 1$ or $x = -3$

(iv)



1 for shape
1 for all info above

(c) (i) $1/\sqrt{2}$

(ii) $-\sqrt{3}/2$

(iii) $(\sqrt{3})^2 = 3$

} 1 for each.

QUESTION 8:

(a) (i) $P(6) = 1/6$

(ii) $P(\text{throw } 2) = 1/2 \times 1/6 = 1/12$

(iii) $P(\text{most 2 throws}) = 1/6 + 1/12$

(wins on 1st OR wins on second)

$= 1/4$

1 MARK for each (consider subsequent error)

(b) (i) 1 OR = 6 hours

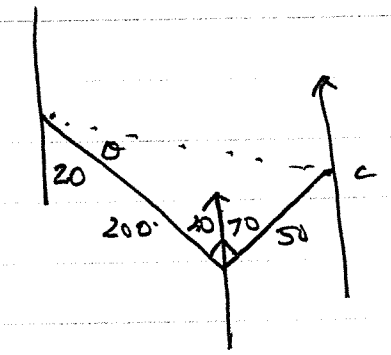
(ii) 25%.

1 each answ.

(c)(i) 340°

1 MARK

(ii)



$d^2 = 200^2 + 50^2$

$= 40000 + 2500$

$= 42,500$

$\therefore$ distance $= \sqrt{42,500}$.

≈ 206 km.

1 MARK

(iii) $\tan\theta = 5/20$

$\therefore \theta = 14.04$.

$\therefore$ Bearing $= 180° - (20 + 14.04)$

$= 155.96°$

1 for finding θ

1 for Bearing.

(d) $A_{half} = 1/2 \times 6 \times 8 \times \sin 76°$

≈ 23.29

$\therefore$ TOTAL Area ≈ 46.57 or 46.58

1 for half the area

1 for whole area

[check S.E

Ignore dec places

QUESTION 9:

(a) (i) D (ii) B (iii) A (iv) C

1 for each correct to a max of 3.

(b) $x^2 - 6 = 5x$

$x^2 - 5x - 6 = 0$

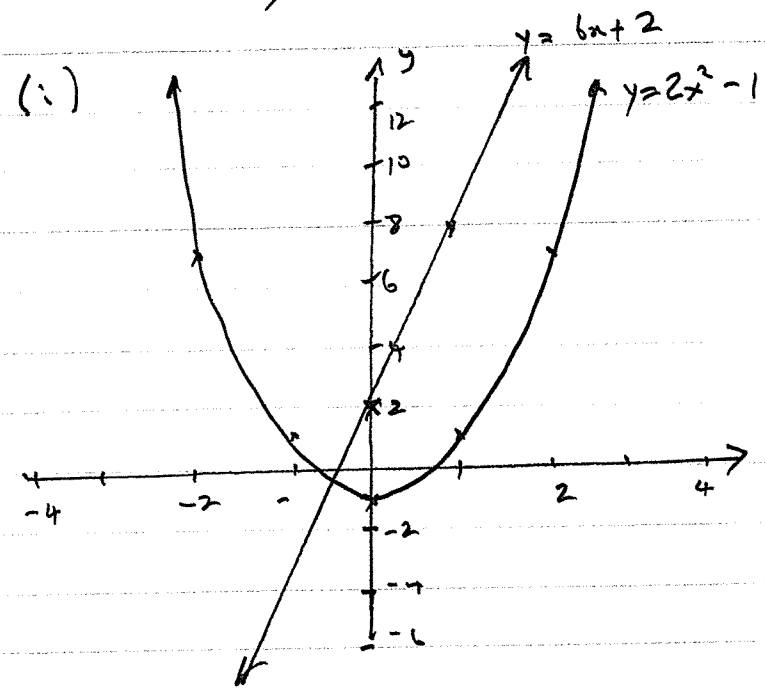
$(x-6)(x+1) = 0$

$\therefore x = 6$ OR $x = -1$

1 for conversion

1 for BOTH answers

(c) (i)



1 for straight line

1 for parabola (take note of) "shape"

{ IGNORE x-intercepts
CONSIDER strongly y-intercepts.

(ii) $2x^2 - 1 = 6x + 2$

$2x^2 - 6x - 3 = 0$

$x = \dfrac{6 \pm \sqrt{36 + 24}}{4}$

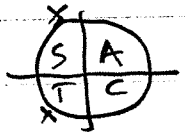
$= \dfrac{6 \pm \sqrt{60}}{4}$

≈ 3.44 OR -0.44

1 each answer

(d) $\cos x = -0.4$

for $x \approx 66^\circ 25'$ OR $113^\circ 35'$ OR $246^\circ 25'$



$\therefore x = 113^\circ 35'$ OR $246^\circ 25'$

1 for BASIC angle.

1 for correct quadrants each (= 2)

(Ignore nearest minute)

QUESTION 10:

(a) (i) $y = \frac{2}{3}x - 3$

$\therefore$ At $x = 0$, $y = -3$ $\quad B$ is $(0, -3)$ — 1 for B

At $y = 0$, $x = \frac{9}{2}$ $\quad \therefore C$ is $(\frac{9}{2}, 0)$ — 1 for C

(ii) slope $AC = -\frac{3}{2}$

$\therefore y - 0 = -\frac{3}{2}(x - \frac{9}{2})$

$\therefore 2y = -3x + \frac{27}{2}$

$\therefore \begin{cases} 6x + 4y - 27 = 0 \\ \text{or, } y = -\frac{3}{2}x + \frac{27}{4} \end{cases}$ — 1 for m, 1 for either

(iii) At A, $x = 0 \Rightarrow y = \frac{27}{4}$

$\therefore A$ is $(0, \frac{27}{4})$ — 1 for A.

(iv) Area $\triangle ABC = \frac{1}{2} \cdot \frac{9}{2} \cdot AB$

$= \frac{9}{4} \cdot (\frac{39}{4})$

$= \frac{351}{16}$ units^2 — 1 MARK

(b) $\frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\sin\theta} = \frac{\sin^2\theta + \cos^2\theta}{\cos\theta \sin\theta}$ ← 1 for getting here

$= \frac{1}{\cos\theta} \cdot \frac{1}{\sin\theta}$

$= \sec\theta \operatorname{cosec}\theta$ — 1 for simplifying here

(c) (i) $\frac{h}{10} = \tan 60°$

$\therefore h = 10\sqrt{3}$ — 1 for h

(ii) $10\sqrt{3}$ m — 1 MARK

(iii) $d^2 = 10^2 + (10\sqrt{3})^2$

$= 400$

$\therefore AB = 20$ — 2 MARKS