NAME: _____

TEACHER: _____

THE SCOTS COLLEGE

Assessment Task 4 Term 4
Year 10 5.3 Mathematics
Wednesday 7th November 2018

Weighting: 40%
Time allowed: 2 Hours

General Instructions

- Show all necessary working.
- Attempt all questions.
- Board approved calculators may be used.
- Answer multiple choice on the sheet provided.
- Answer each of questions 11 to 15 on a separate booklet provided.

SECTION I	Multiple Choice	10 Marks
SECTION II	Extended Response Questions	75 Marks
	TOTAL	85 Marks

SECTION I MULTIPLE CHOICE QUESTIONS (10 Marks)

CIRCLE THE MOST CORRECT RESPONSE ON YOUR ANSWER SHEET

Question 1

$\frac{\sqrt{2}}{\sqrt{3}-\sqrt{2}}$ simplifies to

A) 2 B) $\frac{2}{1-2\sqrt{6}}$

C) $\sqrt{6}-2$ D) $\sqrt{6}+2$

Question 2

The solution of $2x+3-(3x-4)=-5$ is

A) $x=12$ B) $x=-12$

C) $x=6$ D) $x=-6$

Question 3

Consider the set of values

45, 23, 17, 2, 75, 40

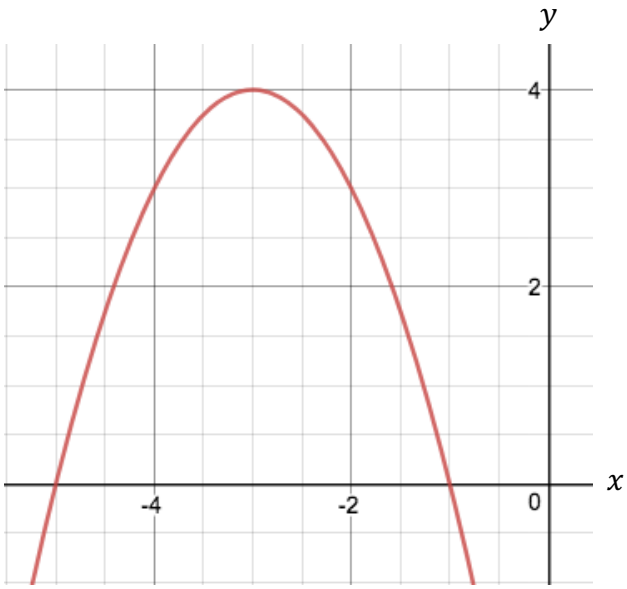
The Interquartile Range is:

A) 52 B) 73

C) 28 D) 31.5

Question 4

The graph below is most likely to be



A) $y = (x + 3)^2 + 4$

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

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

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

Question 5

The bearing of A from B is 137°, therefore the bearing of B from A must be

A) 43°

B) 223°

C) 137°

D) 317°

Question 6

If $log_c b = a$ then

A) $\frac{log_b a}{log_b c} = 1$

B) $a^b = c$

C) $c^a = b$

D) $b^c = a$

Question 7

When $3x^3 - 2x^2 + 4x - 1$ is divided by $x + 2$ the remainder is

A) -41

B) 23

C) -25

D) -2

Question 8

In a group of 29 students 12 take Art, 20 take Biology and 4 take neither subject. How many take both subjects?

A) 4

B) 5

C) 6

D) 7

Question 9

The mean of a set of 4 values is 23, when a 5th value is added the mean is 30. What was the 5th value?

A) 56 B) 57

C) 58 D) 59

Question 10

The mid-point of AB is M. If A=(2, -6) and M=(11, -1) what are the co-ordinates of B?

A) (6.5, -3.5) B) (13, -7)

C) (20, 4) D) (4, 20)

SECTION II (75 Marks)

Question 11 (Answer on a separate booklet) (22 Marks)

(a) Express $0.\dot{4}\dot{5}$ as a fraction in its simplest form. (3)

(b) Simplify the following expression

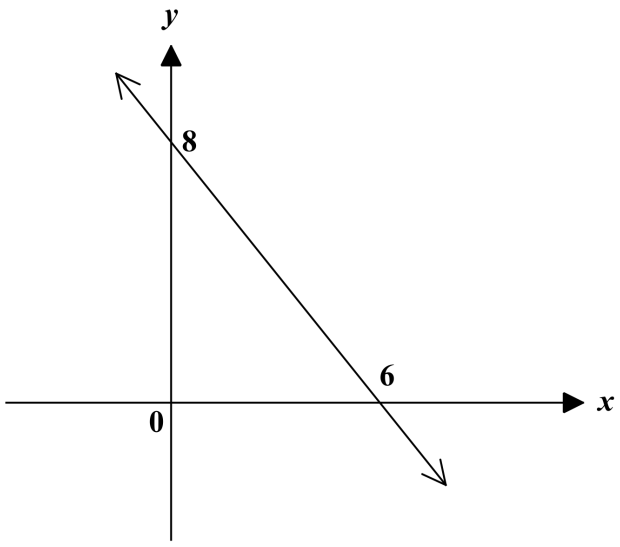
$$(3\sqrt{2} - 2\sqrt{3})^2 \quad (2)$$

(c) Express in simplest form with positive indices

(i) $-5x^3y^2 \times 7x^5y^4$ (2)

(ii) $\frac{25a^{-3}b^5}{15a^2b^{-4}}$ (2)

(d) Find the equation of the line below, giving you answer in general form (2)



(e) Consider the points $A(0,-1), B(-3,4)$ & $C(2,7)$.
Show that ∠ABC is 90°.
(Hint: Start by finding the gradient of AB) (3)

(f) If $3\times4^{x}=2$ find the value of x correct to 2 decimal places. (2)

(g) Consider the function $f(x)=x^{2}-8x+18$.

(i) Express $f(x)$ in the form $f(x)=(x+a)^{2}+b$, stating the values of a and b. (3)

(ii) Sketch the graph of $y=f(x)$ labelling the vertex and the y-intercept. (2)

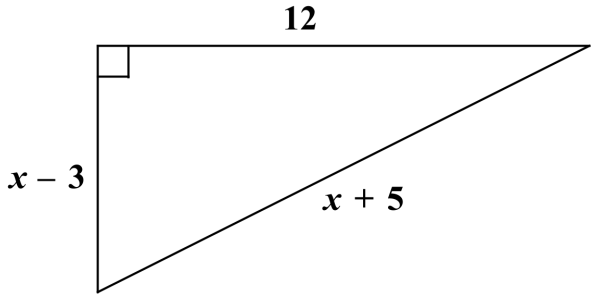
(iii) Consider $f(x)=x^{2}-8x+18$. State the largest positive domain for which $f(x)$ has an inverse function. (1)

Question 12 (Answer on a separate booklet) (18 Marks)

(a) By first factorising the numerator and denominator simplify

$$\frac{2x^{2}+7x-15}{x^{2}-25}$$ (3)

(b) Use Pythagoras' theorem to find the value of x in the triangle below (3)



(c) Solve the equation $x^2 - 6x + 7 = 0$, leaving your answers in simplified surd form. (3)

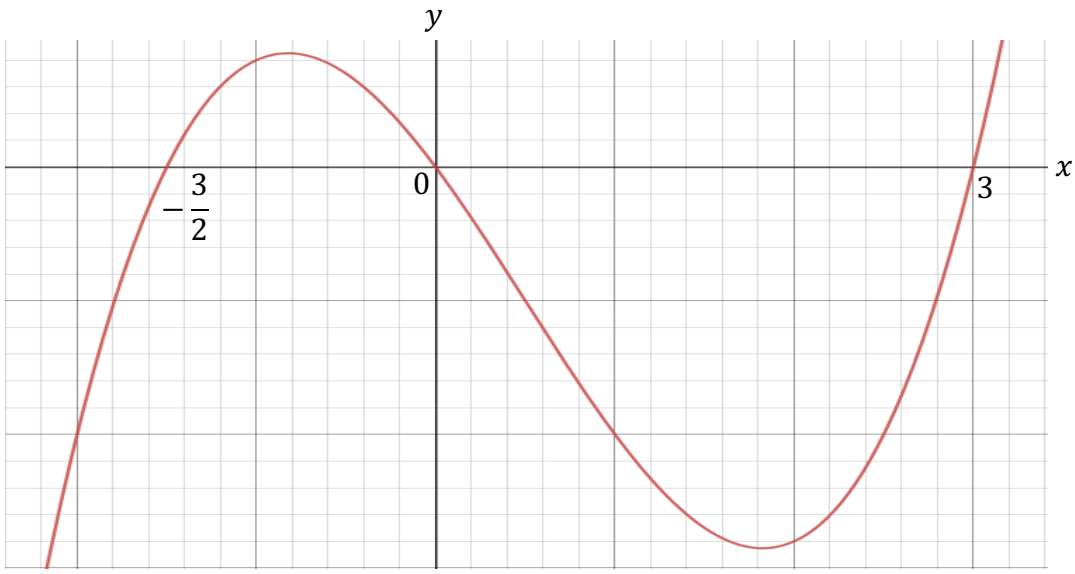
(d) Sketch the curve $y = 2^x - 3$, clearly showing the following features:

(i) The asymptote.
(ii) The y intercept.
(iii) A point on the curve other than the y intercept which has integer co-ordinates. (4)

(e) Express the cubic below in the form

$$y = x(ax + b)(cx + d)$$

where $a, b, c \text{ and } d$ are integers (2)



(f) Given that $P(x) = x^3 + ax^2 + 3x - 6$ and $P(2) = 10$, find the value of a. (3)

Question 13 (Answer on a separate booklet) **(13 Marks)**

(a) A boat sails from Port P on a bearing of 080° for 20km to reach buoy Q, it then sails for 40km on a bearing of 150° to reach buoy R.

(i) Sketch a diagram showing the information above. (2)

(ii) Explain why $\angle PQR = 110^\circ$. (1)

(iii) Find the distance PR to 1 decimal place. (3)

(iv) Find the bearing of P from R to the nearest degree (2)

(b) Find the value of $tan150^\circ$ in exact form (2)

(c) Sketch, on the same diagram, the graphs of $y = sinx$ and $y = cosx$ for $0^\circ \leq x \leq 360^\circ$. Hence or otherwise find the number of solutions of the equation $sinx = cosx$ for $0 \leq x \leq 360^\circ$. (3)

Question 14 (Answer on a separate booklet) **(15 Marks)**

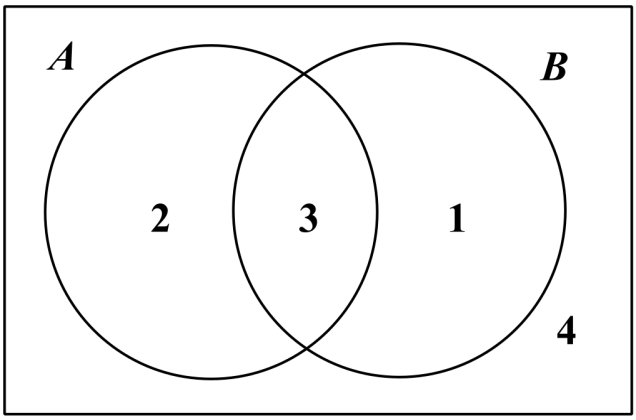
(a) A bag contains 4 Red marbles and 2 Blue marbles, if 2 marbles are selected at random, without replacement, find the probability that:

(i) They are both Red (2)

(ii) They are the same colour (2)

(iii) They are different colours (2)

(b) Consider the Venn diagram below



Write down the following probabilities

(i) $P(A)$ (ii) $P(B')$ (iii) $P(A|B)$ (3)

(iv) Find $P(A \cup B)$.

(v) Show that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ (2)

(c) Consider the following 2 way table

	A	A'	
B	12	15	27
B'	20	25	45
	32	40	72

Write down and simplify the values of

(i) $P(A)$ (ii) $P(A|B)$ (2)

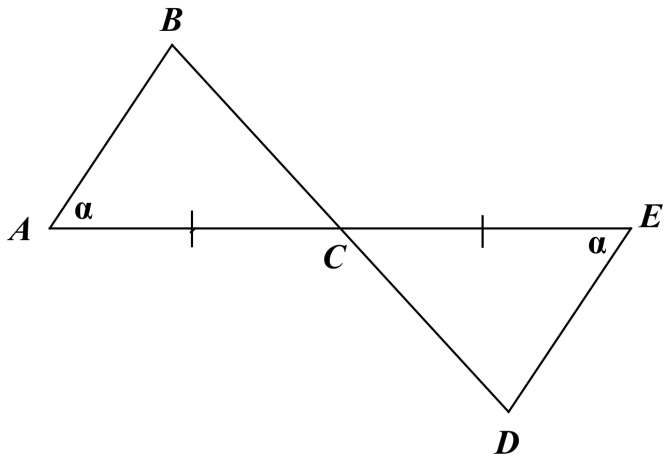
(iii) Hence or otherwise, explain if the events A and B are independent. (1)

(d) Use your calculator to find the standard deviation of the set of data below, giving your answer to 2 decimal places.

-2, 3, 5, 14 (1)

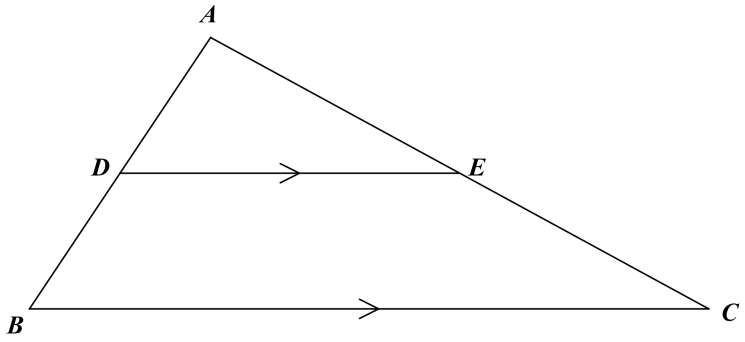
Question 15 (Answer on a separate booklet) **(7 Marks)**

(a) Consider the diagram below



Is ΔABC congruent to ΔEDC ? Justify your answer (2)

(b) Consider the diagram below



(i) Prove that ΔABC is similar to ΔADE (2)

(ii) Given that $AE = 6, DE = 8$ & $BC = 15$,
find the value of EC (3)

END OF EXAMINATION

10-5.3-2018 T4 ANSWERS 11:26

MC

(1) $\dfrac{\sqrt{2}}{(\sqrt{3}-\sqrt{2})}\dfrac{(\sqrt{3}+\sqrt{2})}{(\sqrt{3}+\sqrt{2})} = \dfrac{\sqrt{6}+2}{1} = \sqrt{6}+2$

(D)

(2) $2x+3-3x+4 = -5$

$-x = -12$

$x = 12$

(A)

(3) 2, (17) 23, | 40, (45), 75

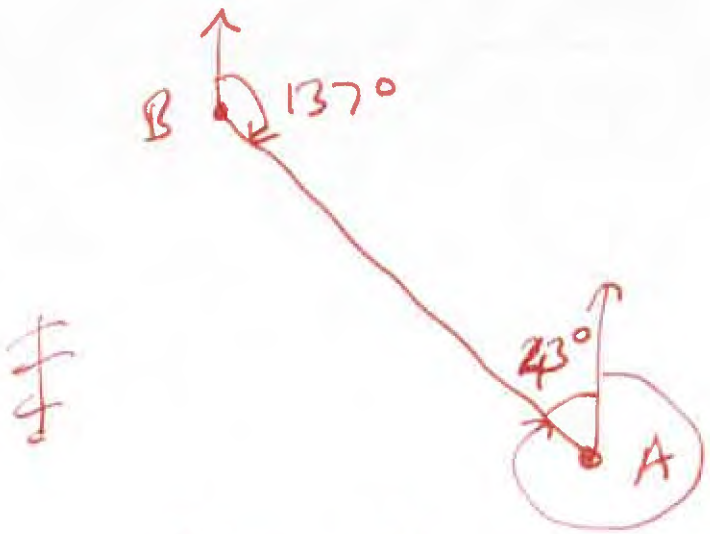
$45 - 17 = 28$

(C)

(4) $y = -(x+3)^2+4$

(C)

(5)



$360 - 43 = 317°$

(D)

MC

(6) $c^a = b$ (C)

(7) $P(-2) = -24 - 8 - 8 - 1$

$= -41$ (A)

(8)



$36 - x = 29$

$x = 7$

(D)

(9) $\frac{4 \times 23 + x}{5} = 30$

$x = 58$ (C)

(10) $\frac{2 + x}{2} = 11$

$x = 20$ (C)

11:34

SECTION II

Qu 11

(a) $x = 0.\dot{4}5\dot{}$
$100x = 45.\dot{4}5\dot{}$ ✓

$99x = 45$ ✓

$x = \frac{45}{99} = \frac{5}{11}$ ✓

(b) $9\times2 - 12\sqrt{6} + 4\times3$ ✓

$30 - 12\sqrt{6}$ ✓

(c) (i) $-35x^8y^6$ ✓ ✓

(ii) $\frac{5b^9}{3a^5}$ ✓ ✓

(d) $m = -\frac{8}{6} = -\frac{4}{3}$ ✓

$y = -\frac{4}{3}x + 8$ ✓

$3y = -4x + 24$

$4x + 3y - 24 = 0$ ✓

Qu 11

(e) $m_{AB} = \frac{5}{3}$ ✓ $\quad m_{BC} = -\frac{3}{5}$ ✓

$\frac{5}{3} \times -\frac{3}{5} = -1 \quad \therefore \angle ABC = 90°$ ✓

(f) $4^x = \frac{2}{3}$

$x \log 4 = \log\left(\frac{2}{3}\right)$ ✓

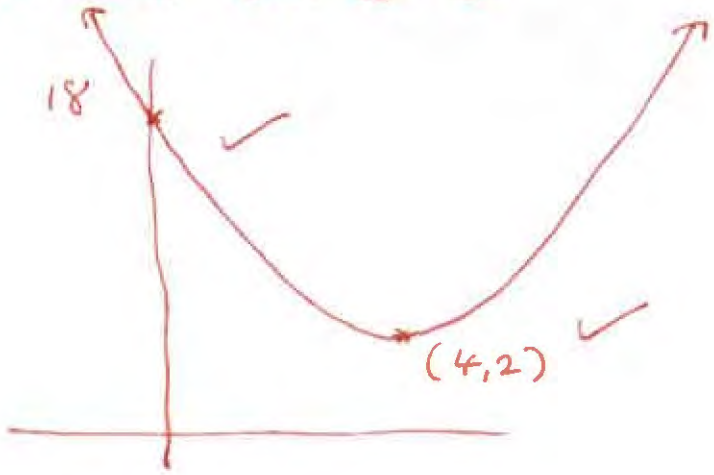
$x = \frac{\log\left(\frac{2}{3}\right)}{\log 4}$

$x = -0.29$ ✓

(g) (i) $f(x) = (x-4)^2 + 2$ ✓ ✓

$a = -4 \quad b = 2$ ✓

(ii)

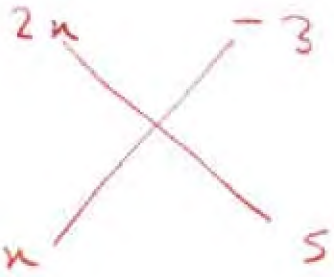


✓ ✓

(iii) $x \geq 4$ ✓

Qu 12

(a)



$$\frac{(2x-3)(x+5)}{(x-5)(x+5)} = \frac{2x-3}{x-5}$$ ✓

(b) $12^2 + (x-3)^2 = (x+5)^2$ ✓

$144 + x^2 - 6x + 9 = x^2 + 10x + 25$ ✓

$16x = 128$

$x = 8$ ✓

(c) $x = \frac{6 \pm \sqrt{36-28}}{2}$ ✓

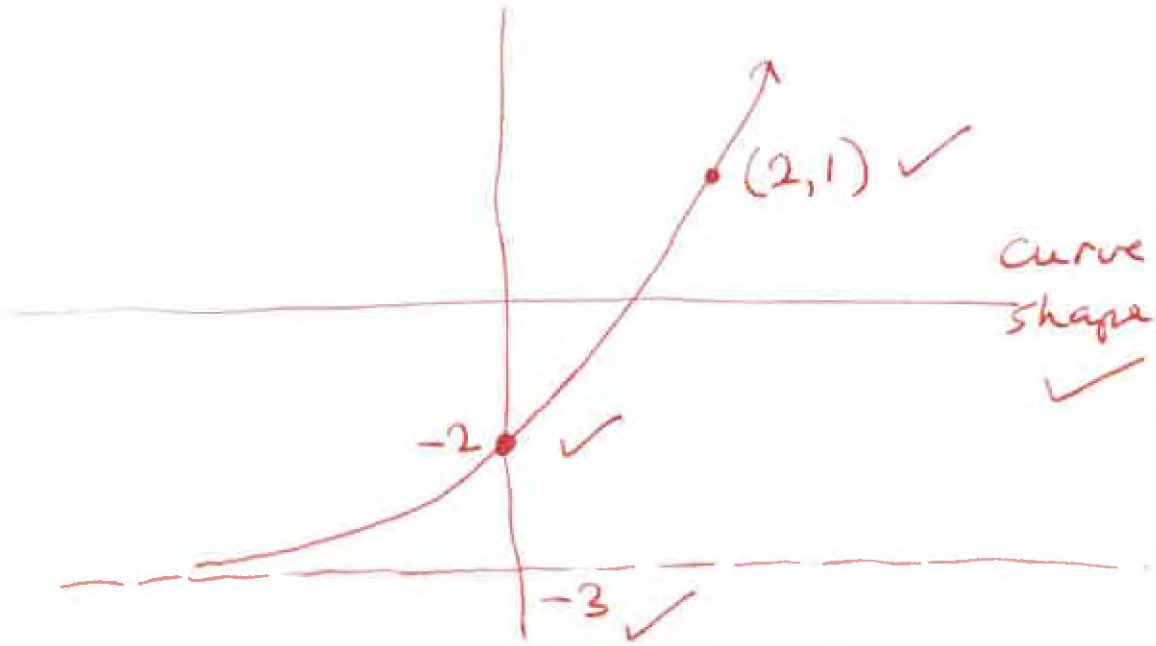
$= \frac{6 \pm \sqrt{8}}{2}$

$= \frac{6 \pm 2\sqrt{2}}{2}$ ✓

$= 3 \pm \sqrt{2}$ ✓

Qu 12

(d)



(e) Roots $x = -\frac{3}{2}, 0, 3$.

$\therefore$ factors $2x+3,\ x,\ x-3$.

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

$\downarrow$ $\frac{1}{2}$ mark for $(x+\frac{3}{2})$

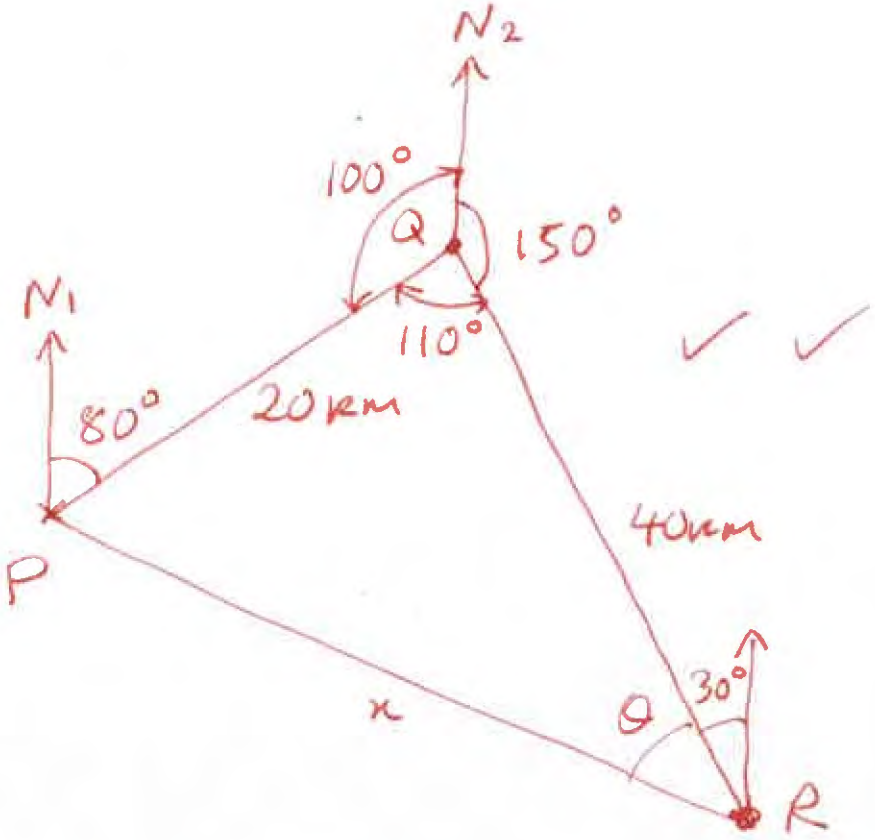
(f) $10 = 8 + 4a + 6 - 6$

$2 = 4a$

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

Qu 13 11:45

(a)(i)



✓ ✓

(ii) $\angle PQN_2 = 100°$ (co-int $\angle$s $\nearrow\nearrow$) ✓

$\angle PQR = 110°$ (∠s at a point) ✓

(iii) $x^2 = 20^2 + 40^2 - 2 \times 20 \times 40 \times \cos 110°$ ✓ ✓

$x = \underline{50.5}$ km. ✓

(iv) $\frac{\sin\theta}{20} = \frac{\sin 110°}{50.47}$ ✓

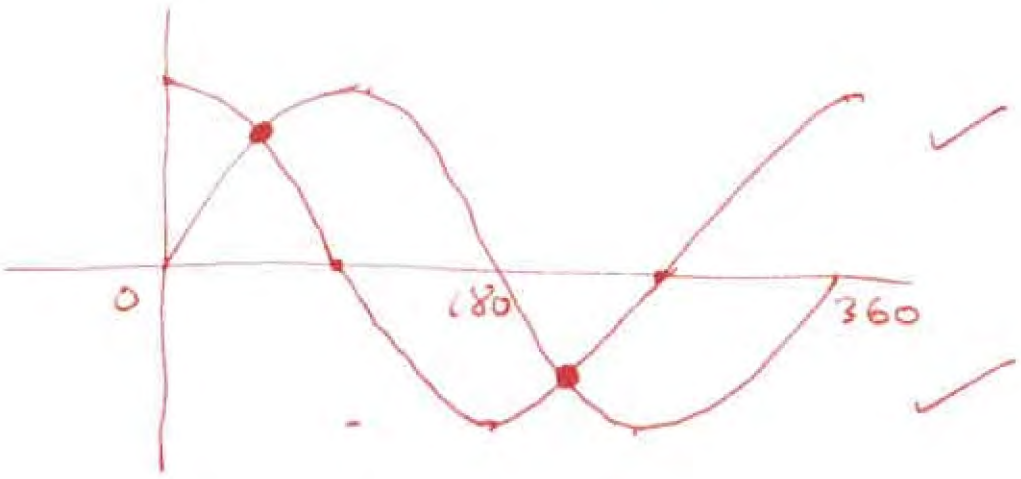
$\theta = 22°$ ✓

Qu 13

(b) $\tan 150° = -\tan 30°$ ✓

$= -\frac{1}{\sqrt{3}}$ ✓

(c)

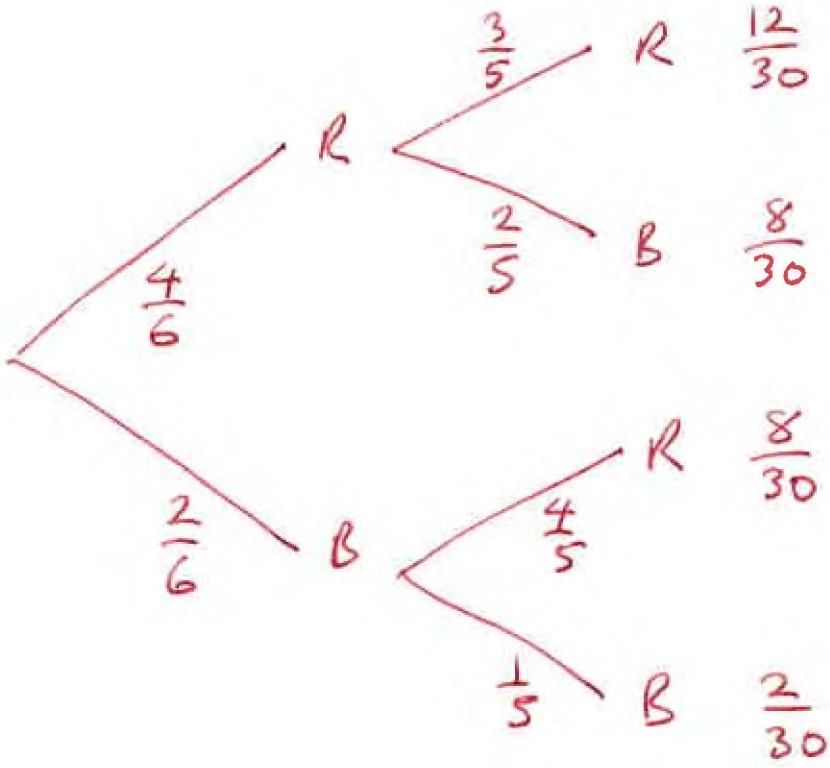


✓ ✓

2 solutions ✓

Qu 14

(a)



(Tree) ✓✓✓

(i) $\frac{12}{30} = \frac{2}{5}$ ✓

(ii) $\frac{12}{30} + \frac{2}{30} = \frac{14}{30} = \frac{7}{15}$ ✓

(iii) $\frac{8}{15}$ ✓

(b) (i) $P(A) = \frac{5}{10} = \frac{1}{2}$ ✓ (ii) $P(B') = \frac{6}{10} = \frac{3}{5}$ ✓

(iii) $P(A|B) = \frac{3}{4}$ ✓ (iv) $P(A \cup B) = \frac{6}{10} = \frac{3}{5}$ ✓

(v) $P(A) + P(B) - P(A \cap B)$

$= \frac{5}{10} + \frac{4}{10} - \frac{3}{10} = \frac{6}{10} = \frac{3}{5} = P(A \cup B)$

✓

Qu 14

(c) (i) $P(A) = \frac{32}{72}$ ✓ (ii) $P(A|B) = \frac{12}{27}$ ✓

$\frac{32}{72} = \frac{4}{9}$ $\quad$ $\frac{12}{27} = \frac{4}{9}$

$P(A|B) = P(A) \Rightarrow$ Independent ✓

(d) $\sigma = 5.79$ ✓

12:02

Qu 15

(a) $\angle BAC = \angle CED$ (Given) ✓

$\angle ACB = \angle DCE$ (Vert opp $\angle$'s)

$AC = CE$ Given ✓

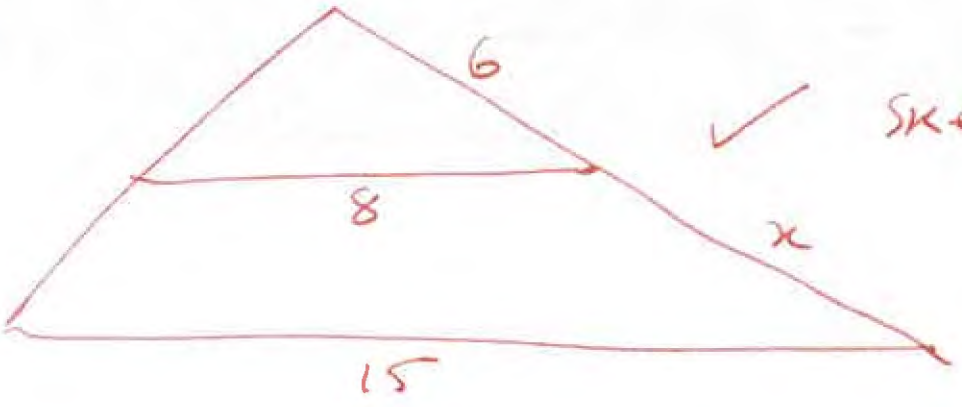
$ABC \equiv DCE$ ASA

(b) (i) $\angle DAE = \angle BAC$ (common angle) ✓

$\left.\begin{array}{l} \angle ADE = \angle ABC \\ \angle AED = \angle ACB \end{array}\right\}$ corres $\angle$'s in $\parallel$ ✓

$\therefore \triangle ABC \,|||\, \triangle ADE$

(ii)



✓ Sketch

$\frac{x+6}{6} = \frac{15}{8}$ ✓

$x = 5\frac{1}{4}$ ✓