Answer **all** the questions.

1 Factorise fully

(a) $(k+1)^2 - 25k^2$,

(b) $p^2q^2 - 3p^2q - 3pq^2 + pq^3$.

Answer (a) .... [2]

(b) .... [2]

---

2 Simplify

$$\frac{c^2 - 8c + 16}{c^2 - 2c} \times \frac{c-2}{c-4}$$

Answer .... [2]

---

3 One of the solution of $3x^2 + kx - 4 = 0$ is $x = 4$.
Find
(i) the value of k,
(ii) the other solution of the equation.

Answer (i).......................... [1]

(ii).......................... [1]

---

4 Express as a single fraction in its simplest form.

$$2 - \frac{m - 3n}{2n + m}$$

Answer .... [2]

---

5 **(a)** Given that $4^{17} \div 16 \times 2^{0} = 4^{k}$, find the value of k.

(b) Given that $m = 4.15 \times 10^{2}$ and $n = 2.12 \times 10^{-4}$, evaluate $\frac{3n}{m}$, giving your answer in standard form.

Answer (a) .... [2]

(b) .... [1]

---

6 Simplify each the following, expressing your answers in **positive** index form.

(a) $\sqrt{\frac{49b^{6}}{a^{8}}} \div \frac{a^{-1}b^{6}}{2}$,

(b) $\frac{x^{3}y^{-3}}{3z} \times \left(\frac{x}{y}\right)^{-2}$

Answer (a) .... [2]

(b) .... [2]

---

7 **(a)** Given that p and q are integers where $-1 \leq p \leq 4$ and $0 \leq q \leq 3$, find

(i) the least possible value of $\frac{2q}{p}$,

(ii) the largest possible value of $q^2 - p^2$.

Answer (a)(i) ....[1]

(ii) ....[1]

(b) Solve the inequality $11 + 2x \leq x + 3 < 20$.

Answer (b).....................................[2]

8 **(a)** Stephen borrowed a sum of \$1000 from the bank. The bank charges an interest of 24% per annum compounded half yearly. Calculate the amount of money he has to return at the end of 2 years, correct to the nearest cent.

(b) Given that $m = \sqrt{\dfrac{30}{n+2}}$, calculate the value of n when $m = 2$.

Answer (a) \$.................................. [2]

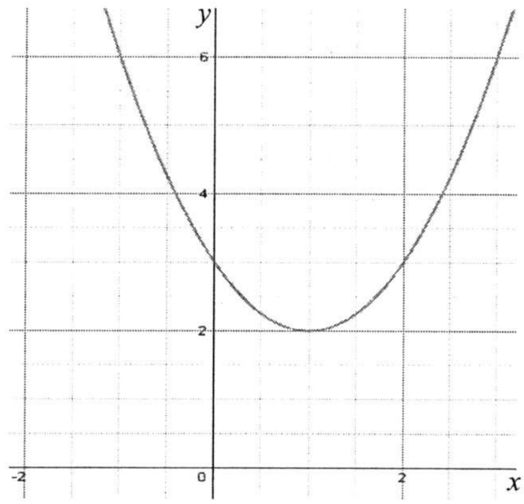
(b) .... [2]

---

9 **(a)** Solve the equation $\dfrac{2x}{x+1} = \dfrac{3}{x-2}$.

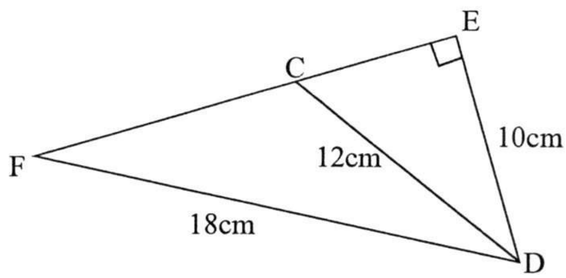
Answer (a) .... [2]

(b) A quadratic graph in the form of $y = (x+a)^2 + b$ is shown below. Determine the values of a and b, where a and b are integers.



Answer (b) ………………………………….. [2]

10 In ΔDEF shown below, C is a point on EF and $\angle DEF = 90^\circ$. $DE = 10$ cm, $DF = 18$ cm and $CD = 12$ cm.



(a) Express $\sin \angle DCF$ as a fraction in its simplest form.

Answer (a) .... [1]

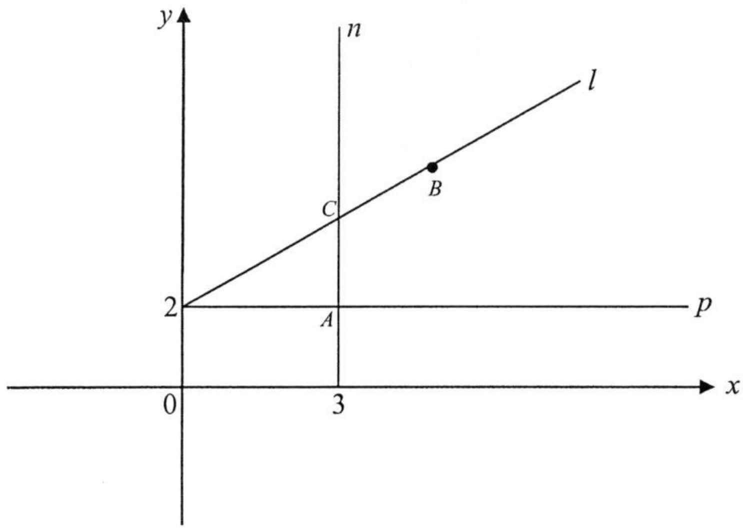
(b) Calculate $\angle EFD$.

Answer (b) ....° [2]

(c) Calculate the length of CF.

Answer (c) ....cm [2]

11



The diagram above shows three lines n, p and l. The point B has coordinate (4, 4) and C is the point of intersection of lines n and l. Lines p and n intersect at A.

(a) Write down the equation of lines n and p.

Answer (a) ....

.... [2]

(b) Hence determine the coordinates of point A

Answer (b) .... [1]

(c) Find the gradient of line l and hence write down the equation of line l.

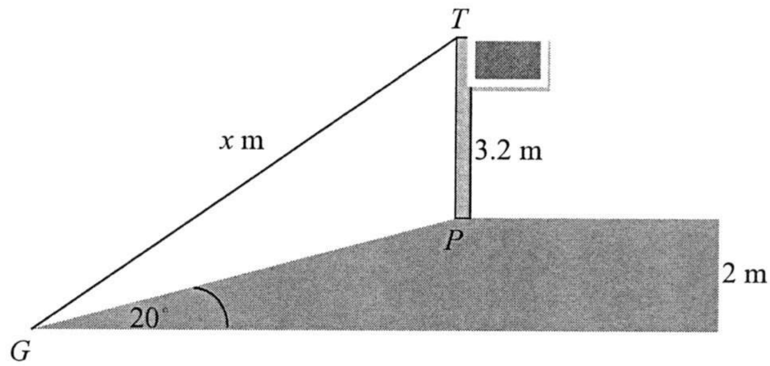
Answer (c) Gradient: .... [1]

Equation of line l: .... [1]

(d) Given that point C has coordinates (x, y), determine the values of x and y.

Answer (d) .... [2]

12 The diagram below shows a flag pole of 3.2m standing at a point P on the top of a slope which is inclined at $20°$ to the horizontal ground. The flag pole is 2m above the ground level. A x m taut rope at the top of the flag pole at point T is attached to point G at the end of the slope.



(a) Find $\angle TPG$.

Answer (a) ....$^{\circ}$ [1]

(b) Find the length of the slope GP.

Answer (b) ....m [2]

(c) Find x.

Answer (c) ....m [3]

(d) Hence, calculate the angle of elevation from point G to point T.

Answer (d) ....° [3]

End of paper1

Answer **all** the questions.

1 **(a)** Factorise completely $ac - 2bc + 5ak - 10bk$. [2]

(b) Express as a single fraction in its simplest form $\frac{8x+1}{(3x-1)^2} + \frac{2}{(1-3x)}$. [2]

(c) Given that $\frac{2}{p} = \sqrt{\frac{p-q}{q}}$, express q in terms of p. [3]

2 **(a)** Simplify $\frac{(2a)^3}{b^4} \div \frac{4a^{-2}}{b^2}$, leaving your answer in **positive index**. [2]

(b) Patrick went to a car showroom to buy a new car. After looking at the cars, he decided to buy a new Toyota Camry. He needs a loan of \$138 000 to buy the car.
Bank A charges an interest rate of 2.25% per annum compounded monthly.
Bank B charges a simple interest rate of 2.35% per annum.
Which bank should he borrow from if he were to take a five year loan?
Justify your answer. You must show all your working clearly. [3]

(c) Determine if 2^{5000} or 6^{2000} is greater. Explain your answer. [2]

3 **(a)** It is estimated that a female adult human body has 24 trillion red blood cells in 5000 cm^3 of blood.

(i) Express 24 trillion in standard form. [1]

(ii) Find the number of red blood cells in 1 cm^3 of blood, giving your answer in standard form. [1]

(b) The population of Singapore in the year 2015 is approximately 5.54 million. This is a growth of 1.2% from the year 2014, the slowest in more than a decade.

(i) 5.54 million can be written as $k \times 10^8$.
Find the value of k. [1]

(ii) Find the estimated population of Singapore in the year 2014, giving your answer as an ordinary number, correct to three significant figures. [1]

4 (i) Given that $P(1, 5)$ and $Q(-3, 0)$, find

(a) the length of the line segment PQ, giving your answer in exact form, [2]

(b) the gradient of PQ, [1]

(c) the equation of the line which is parallel to PQ and passing through the point (8, 6). [2]

(ii) If $x = 1$ is the line of symmetry of triangle PQR, state the coordinates of point R. [1]

(iii) If the coordinate of S is $(7, -2)$ and $PQST$ forms a parallelogram, state the coordinates of the point T. [1]

5 (i) Solve the inequality $8\frac{1}{2} - x < 2x + 13 \leq \frac{x+33}{2}$. [3]

(ii) Hence, write down the integral values of x that satisfy this inequality. [1]

6 Abigail has a budget of \$180 to buy lemon-honey tarts for her friends .

(a) Given that the price of each lemon-honey tart is \$$x$, write down an expression, in terms of x, for the number of lemon-honey tarts she can buy. [1]

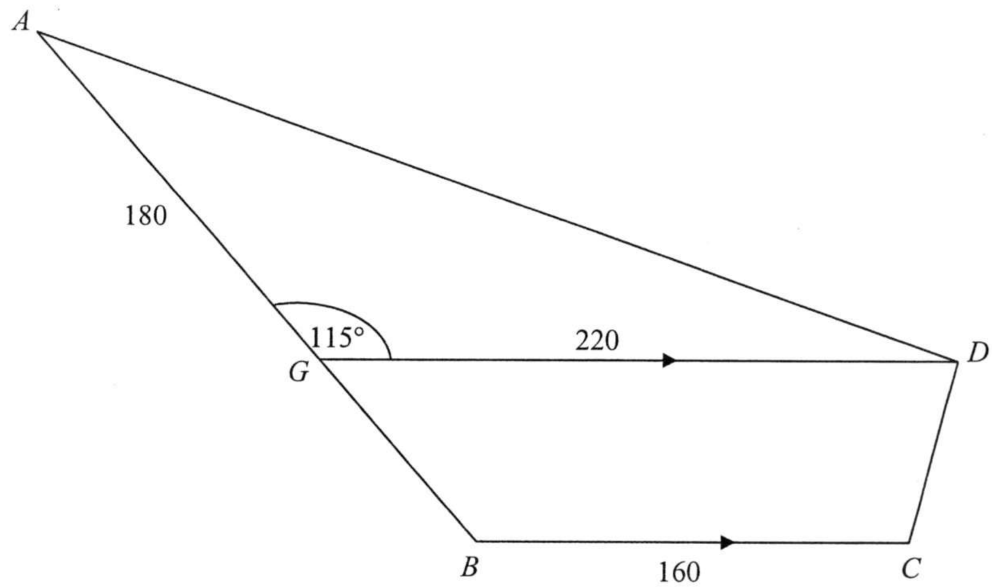
(b) At the shop, she discovers that the price of each lemon-honey tart has risen by 60 cents. Write down an expression, in terms of x, for the number of lemon-honey tarts she can buy now. [1]

(c) Due to the increase in price, Abigail could buy 4 fewer lemon-honey tarts. Write down an equation in x to represent this information, and show that it reduces to $5x^2 + 3x - 135 = 0$. [3]

(d) Solve the equation $5x^2 + 3x - 135 = 0$, giving your answers correct to two decimal places. [4]

(e) Hence, calculate the number of honey-lemon tarts she could buy before the increase in price. [1]

7



The diagram shows a park *ABCD* in the shape of a quadrilateral on horizontal ground.

G is a point on *AB* such that $AG : GB = 3 : 2$ and *GD* is parallel to *BC*.

$AG = 180$ m, $GB = 220$ m, $BC = 160$ m and angle $AGD = 115°$.

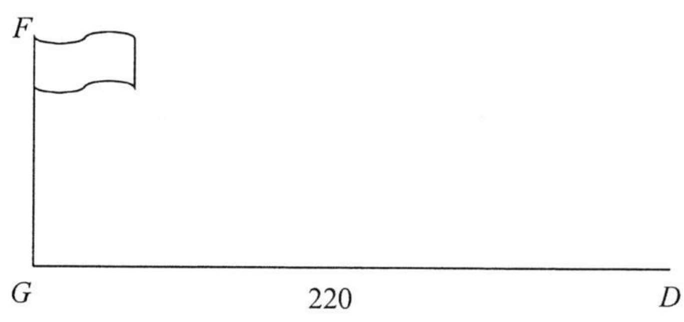
(a) Calculate

(i) *AD*, [3]

(ii) angle *GDA*, [2]

(iii) area of the park. [4]

(b) The base of a vertical flagpole, *GF*, is at vertex *G* on the park.



Given that the angle of elevation of *F* from *D* is 3.5°, find the height of the flagpole. [2]

End of Paper 2

(Have you checked your work?)

Answer **all** the questions.

1 Factorise each of the following expressions completely:

(a) $(k+1)^2 - 25k^2$,

(b) $p^2q^2 - 3p^2q - 3pq^2 + pq^3$.

(a) $(k+1)^2 - (5k)^2$

$= (k+1-5k)(k+1+5k)$ M1

$= (1-4k)(1+6k)$ A1

OR

$k^2+2k+1-25k^2$

$= -24k^2+2k+1$ M1

$= (-4k+1)(6k+1)$ A1

(b) $p^2q(q-3) - pq^2(3-q)$

$= p^2q(q-3) + pq^2(q-3)$ M1 – ω

$= (p^2q + pq^2)(q-3)$

$= pq(p+q)(q-3)$ A1

Answer (a) $(1-4k)(1+6k)$ [2]

(b) $pq(p+q)(q-3)$ [2]

---

2 Simplify

$$\frac{c^2-8c+16}{c^2-2c} \times \frac{c-2}{c-4},$$

$$\frac{(c-4)^2}{c(\cancel{c-2})} \times \frac{\cancel{c-2}}{\cancel{c-4}} = \frac{c-4}{c}$$

M1 A1

Answer $\frac{c-4}{c}$ [2]

3 One of the solution of $3x^2 + kx - 4 = 0$ is $x = 4$.
Find
(i) the value of k,
(ii) the other solution of the equation.

(i) $\cancel{4}$ $3(4)^2 - 4k - 4 = 0$
$48 - 4k - 4 = 0$
$-4k = 44$
$k = -11$ B1

(ii) $3x^2 - 11k - 4 = 0$
$(3x + 1)(x - 4) = 0$

$x = 4$ or $x = -\frac{1}{3}$ B1

Answer (i)...$k = -11$... [1]

(ii)...$x = -\frac{1}{3}$... [1]

---

4 Express as a single fraction in its simplest form.

$$2 - \frac{m - 3n}{2n + m},$$

$\dfrac{2(2n+m) - m + 3n}{2n+m}$ M1

$= \dfrac{4n + 2m - m + 3n}{2n+m}$

$= \cancel{3n+5n}\ \dfrac{7n+m}{2n+m}$ A1

Answer ...$\dfrac{7n+m}{2n+m}$... [2]

5 **(a)** Given that $4^{17} \div 16 \times 2^{0} = 4^{k}$, find the value of k.

(b) Given that $m = 4.15 \times 10^{2}$ and $n = 2.12 \times 10^{-4}$, evaluate $\frac{3n}{m}$, giving your answer in standard form.

(a) $4^{17-2} = 4^{k}$ M1 – any law of indices applied.

$k = 15$ A1

Answer (a) .... $k = 15$ .... [2]

(b) .... 1.53×10^{-6} B1 .... [1]

---

6 Simplify each the following, expressing your answers in **positive** index form.

(a) $\sqrt{\frac{49b^{6}}{a^{8}}} \div \frac{a^{-1}b^{6}}{2}$,

(b) $\frac{x^{3}y^{-3}}{3z} \times \left(\frac{x}{y}\right)^{-2}$

(a) $\frac{7b^{3}}{a^{4}} \times \frac{2}{a^{-1}b^{6}} = \frac{14}{a^{3}b^{3}}$ A1

M1

(b) $\frac{x^{3}y^{-3}}{3z} \times \frac{x^{-2}}{y^{-2}}$ M1

$= \frac{xy^{-1}}{3z} = \frac{x}{3yz}$ A1

Answer (a) .... $\frac{14}{a^{3}b^{3}}$ .... [2]

(b) .... $\frac{x}{3yz}$ .... [2]

7 **(a)** Given that p and q are integers where $-1 \le p \le 4$ and $0 \le q \le 3$, find

(i) the least possible value of $\frac{2q}{p}$,

(ii) the largest possible value of $q^2 - p^2$.

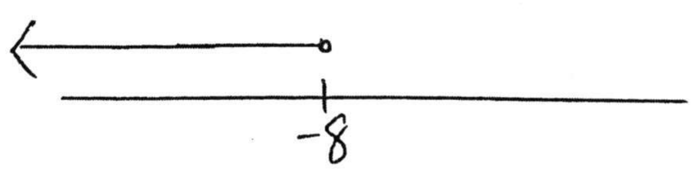
Answer (a)(i) .... -6 B1 ....[1]

(ii) .... 9 B1 ....[1]

(b) Solve the inequality $11 + 2x \le x + 3 < 20$.
Show your answer on a number line.

$11 + 2x \le x + 3$ and $x + 3 < 20$

$x \le -8$ $x < 17$ B1



Answer (b) .... $x \le -8$ B1 ....[2]

8 (a) Stephen borrowed a sum of \$1000 from the bank. The bank charges an interest of 24% per annum compounded half yearly. Calculate the amount of money he has to return at the end of 2 years, correct to the nearest cent.

(b) Given that $m = \sqrt{\frac{30}{n+2}}$, calculate the value of n when $m = 2$.

(a) $A = 1000\left[1 + \frac{\frac{24}{2}}{100}\right]^4$ M1

$= \$1573.\cancel{xx}52$ A1

(b) $2 = \sqrt{\frac{30}{n+2}}$

$4 = \frac{30}{n+2}$ M1

$n+2 = \frac{30}{4}$

$n = \frac{30}{4} - 2 = 5\frac{1}{2}$ A1

Answer (a) \$1573.52 [2]

(b) $5\frac{1}{2}$ or 5.5 [2]

---

9 (a) Solve the equation $\frac{2x}{x+1} = \frac{3}{x-2}$.

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

$2x^2 - 7x - 3 = 0$

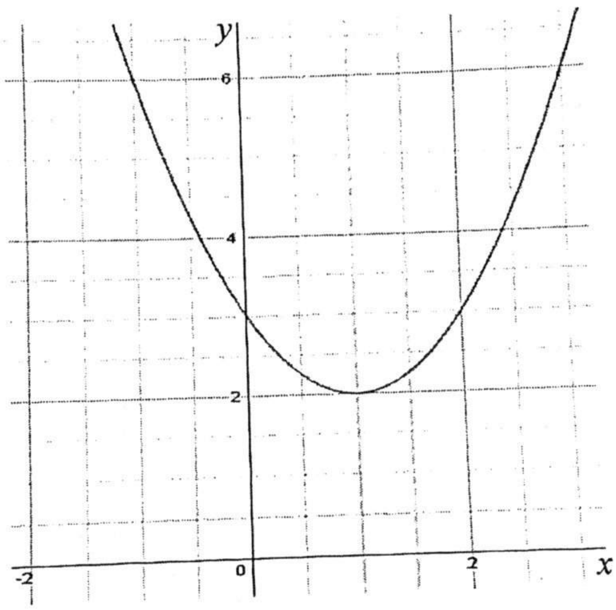
$x = \frac{7 \pm \sqrt{49+24}}{4}$ M1

$x = \frac{7+8.544}{4}$ or $x = \frac{7-8.544}{4}$

$= 3.89$ $= -0.386$ A1

Answer (a) $x = 3.89$ or -0.386 [2]

(b) A quadratic graph in the form of $y=(x+a)^2+b$ is shown below. Determine the values of a and b.

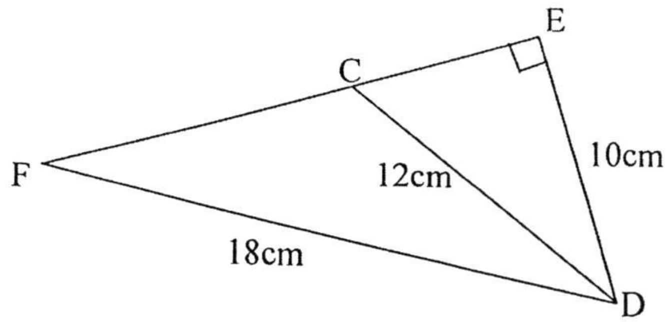


$y=(x-1)^2+2$

B1 B1

Answer (b) ....$a=-1$, $b=2$.................... [2]

10 In ΔDEF shown below, C is a point on EF and $\angle DEF = 90°$. $DE = 10$ cm, $DF = 18$ cm and $CD = 12$ cm.



(a) Express $\sin \angle DCF$ as a fraction in its simplest form.

$\frac{5}{6}$ B1

Answer (a) .... [1]

(b) Calculate $\angle EFD$.

$EF^2 = \sqrt{18^2 - 10^2}$

$= 224$

$EF = \sqrt{224}$

$\tan E\hat{F}D = \frac{10}{\sqrt{224}}$

M1

$E\hat{F}D = \tan^{-1}\left[\frac{10}{\sqrt{224}}\right] \approx 33.7°$

A1

Answer (b) ....33.7........................... ° [2]

(c) Calculate the length of CF.

$C\hat{D}F = 180° - 33.7° - 123.6°$

$= 22.7°$

Using sine rule,

M1

$\frac{18}{\sin D\hat{C}F} = \frac{CF}{\sin 22.7°}$ $\therefore CF \approx 8.34$ cm

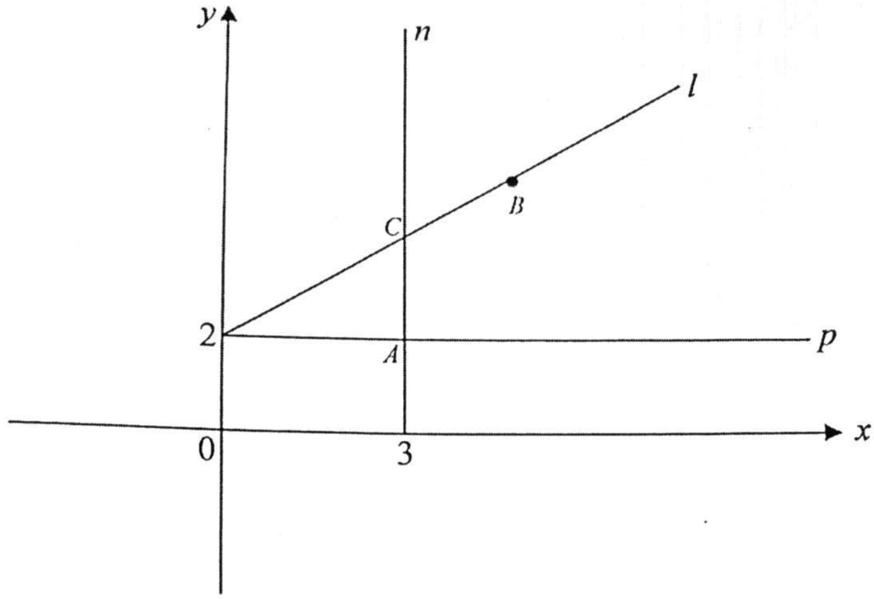
OR $CF = \sqrt{18^2 - 10^2} - \sqrt{12^2 - 10^2}$ M1

$= \sqrt{224} - \sqrt{44} \approx 8.33$ cm

A1

Answer (c) ....8.34 cm........................... cm [2]

11



The diagram above shows three lines n, p and l. The point B has coordinate (4, 4) and C is the point of intersection of lines n and l. Lines p and n intersect at A.

(a) Write down the equation of lines n and p.

Answer (a) $x = 3$ B1

$y = 2$ B1 [2]

(b) Hence determine the coordinates of point A

Answer (b) $(3, 2)$ B1 [1]

(c) Find the gradient of line l and hence write down the equation of line l.

$\text{Gradient} = \frac{4-2}{4-0} = \frac{2}{4} = \frac{1}{2}.$

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

Sub $(0,2)$ into eqn above,

$2 = \frac{1}{2}(0) + c \Rightarrow c = 2.$

$\therefore y = \frac{1}{2}x + 2.$

Answer (c) Gradient: $\frac{1}{2}$ B1 [1]

Equation of line l: $y = \frac{1}{2}x + 2$. B1 [1]

(d) Given that point C has coordinates (x, y), determine the values of x and y.

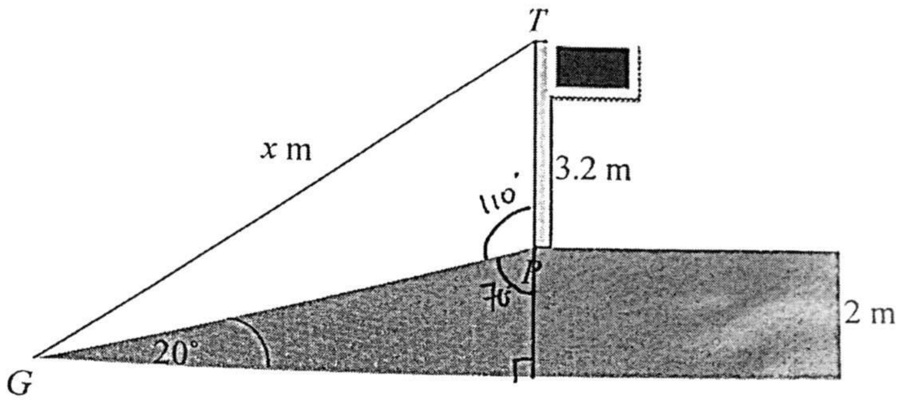
Sub $x = 3$ into the eqn of line l,

$y = \frac{1}{2}(3) + 2 = 3\frac{1}{2}.$

Answer (d) $x = 3$, $y = 3\frac{1}{2}$ [2]

B1 B1

12 The diagram below shows a flag pole of 3.2m standing at a point P on the top of a slope which is inclined at $20°$ to the horizontal ground. The flag pole is 2m above the ground level. A x m taut rope at the top of the flag pole at point T is attached to point G at the end of the slope.



(a) Find $\angle TPG$.

Answer (a) ......110° B1...... ° [1]

(b) Find the length of the slope GP.

$\sin 20° = \frac{2}{GP}$

$\therefore GP = \frac{2}{\sin 20°} = 5.8476\text{m}$ M1

$\approx 5.85\text{m}$

Answer (b) ......5.85 A1...... m [2]

(c) Find x. Using cosine rule,

$$x^2 = (3.2)^2 + (5.8476)^2 - 2(3.2)(5.8476)\cos 110^\circ$$

M1

$$= 57.2675$$

M1

$$\therefore x = \sqrt{57.2675} = 7.5675$$

A1

$$\approx 7.57\text{m}$$

Answer (c) ....7.57..........m [3]

(d) Hence, calculate the angle of elevation from point G to point T.

Using sine rule,

$$\frac{7.5675}{\sin 110^\circ} = \frac{3.2}{\sin T\hat{G}P} \quad \text{M1}$$

$$T\hat{G}P = \sin^{-1}\left[\frac{3.2\sin 110^\circ}{7.5675}\right]$$

$$\approx 23.4^\circ$$

Hence $\measuredangle$ of elevation

$$= 23.4^\circ + 20^\circ \quad \text{M1}$$

$$= 43.4^\circ$$

A1

Answer (d) ....43.4..........° [3]

End of paper1

SEC 3 EXP E-MATHS SA1 (PAPER 2)

1(a) $ac - 2bc + 5ak - 10bk = c(a-2b) + 5k(a-2b)$ [M1]

$= (a-2b)(c+5k)$ *. [A1]

1(b) $\dfrac{8x+1}{(3x-1)^2} + \dfrac{2}{1-3x} = \dfrac{8x+1}{(3x-1)^2} - \dfrac{2}{3x-1}$ [M1]

* Many studs complicated the sol^n by doing this: $\dfrac{(8x+1)(1-3x)+2(3x-1)^2}{(3x-1)^2(1-3x)}$

And they did not factorise to simplify their answer at the end.

* many studs did not put this bracket.

$= \dfrac{8x+1-2(3x-1)}{(3x-1)^2}$

$= \dfrac{8x+1-6x+2}{(3x-1)^2}$

$= \dfrac{2x+3}{(3x-1)^2}$ *. [A1]

1(c) $\dfrac{2}{p} = \sqrt{\dfrac{p-q}{q}}$

$\dfrac{4}{p^2} = \dfrac{p-q}{q}$ [M1]

$4q = p^3 - p^2 q$

$4q + p^2 q = p^3$

$q(4+p^2) = p^3$ [M1]

$\therefore q = \dfrac{p^3}{4+p^2}$ *. [A1]

* Many studs could only square both sides to get rid of the square root sign; and they were stuck after that.

* Many studs could not factorise to isolate q

↳ Common mistake:

① $4q + qp^2 = p^3$

$5q = \dfrac{p^3}{p^2}$ (ERROR)

② $4q = p^3 - p^2 q$

$\dfrac{4q}{q} = p^3 - p^2$

2(a) $\dfrac{(2a)^3}{b^4} \div \dfrac{4a^{-2}}{b^2} = \dfrac{[8a^3]}{b^4} \times \dfrac{b^2}{4a^{-2}}$ → [M1]

$= \dfrac{2a^5}{b^2}$ * [A1]

* Common mistake:

$(2a)^3 = 6a^3$ or $2a^3$.

* Common mistake:

$\dfrac{8a^3}{b^4} \times \dfrac{b^2}{4a^{-2}}$

$= \dfrac{8a^3}{b^4} \times 4a^2b^2$

2(b) Bank A

Compound Int $= 138000\left(1+\dfrac{\frac{2.25}{12}}{100}\right)^{5\times 12} - 138000$ [M1]

$= \$\,16415.70489$

$\approx \$\,16415.70$ * (2d.p.)

* Many studs do not know the compound int. formula & the simple int. formula.

Bank B

Simple Int $= \dfrac{138000\,(2.35)(5)}{100}$ → [M1] $= \$16215$ *

* Many studs compared total amount with simple int.

Patrick should borrow from Bank B as he will pay a lower interest. [A1]

2(c) $2^{5000} = (2^5)^{1000} = 32^{1000}$

$6^{2000} = (6^2)^{1000} = 36^{1000}$ } [M1]

Given the same indices, since $36 > 32$,

$\therefore 6^{2000}$ is greater in value. [A1]

* Many studs presented only $2^5 = 32$ and $6^2 = 36$ without taking into account the index 1000.

* Many studs claimed that 6^{2000} is bigger because it has a bigger base.

* Common mistake:

$6^{2000} = 3(2^{2000})$

* 2^{5000} = Math error

6^{2000} = Math error

⇒ Neither is greater than the other.

3(a)(i) 24 trillion $= 24 \times 10^{12}$

$= 2.4 \times 10^{13}$ #. [B1]

* Many studs did not recognise that trillion $= 10^{12}$

* Common mistake: 2.4^{13}.

3(a)(ii) $\dfrac{2.4 \times 10^{13}}{5000} = 4.8 \times 10^{9}$ #. [B1]

3(b)(i) 5.54 million $= 5.54 \times 10^{6}$

$= 0.0554 \times 10^{8}$

$\therefore k = 0.0554$ #. [B1]

3(b)(ii) $\dfrac{5.54 \times 10^{6}}{101.2} \times 100 = 5474308.3$

$\approx 5\,470\,000$ #. [B1]

* Common mistake:

$100\% - 1.2\% = 98.8\%$

$\therefore \dfrac{98.8}{100} \times 5540000 = 5473520$

≈ 5470000

4(i) (a) Length of PQ $= \sqrt{(1-(-3))^2 + (5-0)^2}$ [M1]

* Common mistake:

length $= \sqrt{(1-(-3)^2 + (5-0)^2}$

$= \sqrt{41}$ #. [A1]

* Many studs did not leave answer in exact form.

* Many studs think that writing 10 digits is leaving answer in exact form

4(i) (b) Grad of PQ $= \dfrac{5-0}{1-(-3)} = \dfrac{5}{4}$ #. [B1]

4(i) (c) $y = \dfrac{5}{4}x + c$

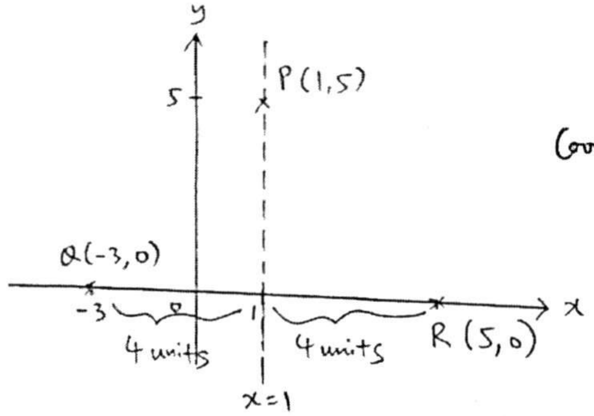
When $x = 8$, $y = 6$, we have,

$6 = \dfrac{5}{4}(8) + c$ [M1]

$c = -4$

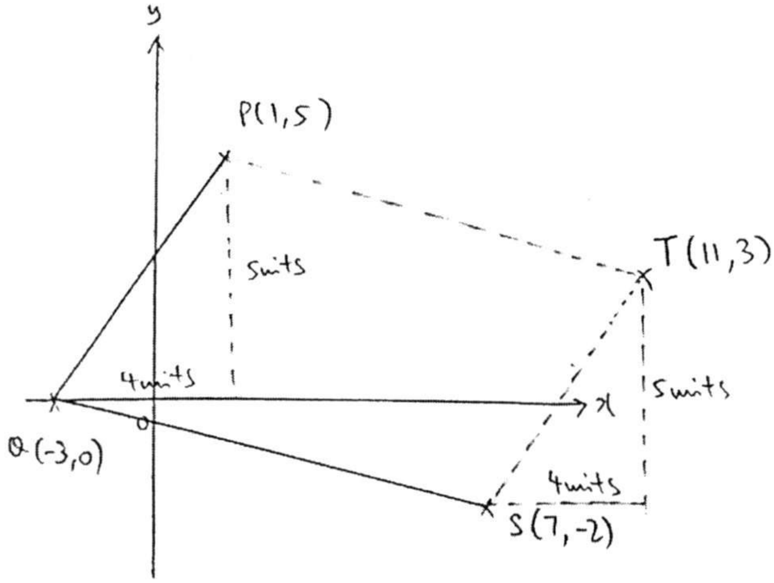
$\therefore$ eq^n of the line is $y = \dfrac{5}{4}x - 4$ #. [A1]

4(ii)



Coord of R = (5, 0) #. [B1]

4(iii)



Coord of T = (11, 3) # [B1]

5 (i) $$8\tfrac{1}{2} - x < 2x + 13 \le \frac{x+33}{2}$$

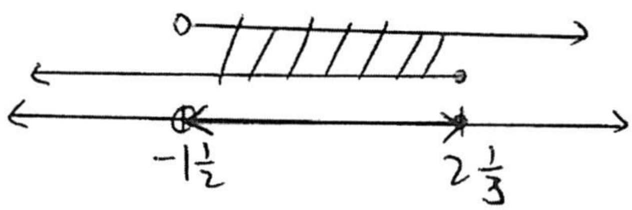
$8\tfrac{1}{2} - x < 2x + 13$ and $2x + 13 \le \dfrac{x+33}{2}$

$17 - 2x < 4x + 26$ $\qquad$ $4x + 26 \le x + 33$

$-6x < 9$ $\qquad$ $3x \le 7$

$x > -1\tfrac{1}{2}$ [M1] $\qquad$ $x \le 2\tfrac{1}{3}$ [M1]

* Many studs did not solve the inequality. Many left the answer $-1\tfrac{1}{2} < x \le 2\tfrac{1}{3}$ as part (ii)'s answer.



Ans : $-1\tfrac{1}{2} < x \le 2\tfrac{1}{3}$ #. [A1]

5 (ii) The integers are $-1, 0, 1, 2$ #. [B1]

* Many did not know that -1 and 0 are integers.

6(a) $\dfrac{180}{x}$ #. [B1]

6(b) $\dfrac{180}{x+0.6}$ #. [B1]

6(c) $\dfrac{180}{x} - \dfrac{180}{x+0.6} = 4$ [B1]

* many studs stop at the line $4x^2+2.4x-108=0$.

$180(x+0.6) - 180x = 4x(x+0.6)$ [B1]

$180x + 108 - 180x = 4x^2 + 2.4x$

$$\left.\begin{aligned} 4x^2+2.4x-108 &= 0 \\ 40x^2+24x-1080 &= 0 \\ 5x^2+3x-135 &= 0 \text{ \#. (shown)} \end{aligned}\right\} \text{[B1]}$$

6(d) $5x^2+3x-135=0$

$\therefore x = \dfrac{\boxed{-3} \pm \sqrt{(3)^2-4(5)(-135)}}{\boxed{2(5)}}$ → Discriminant [B1]

[B1]

* Many studs still give this line $(x-4.90)(x+5.50)=0$.

* Many studs rejected -5.50 in part (d).

$= \dfrac{-3 \pm \sqrt{2709}}{10}$

$= 4.904805472$ or -5.504805472

≈ 4.90 # (2d.p) [B1] or -5.50 # (2d.p) [B1]

6(e) Since money cannot be negative, $x = -5.50$ is rejected.

∴ No. of honey-lemon tarts Abigail could buy before the increase in price $= \dfrac{180}{4.904805472}$

$= 36.69870314$

≈ 36 #. [B1]

7(a)(i) $AD^2 = 180^2 + 220^2 - 2(180)(220)\cos 115°$ [M1]

$\therefore AD = \sqrt{114271.3663}$ [M1]

$= 338.0404803$

$\approx 338 \text{ m}_{\#} (3 \text{ s.f.})$ [A1]

7(a)(ii) $\dfrac{\sin \measuredangle GDA}{180} = \dfrac{\sin 115°}{338.0404803}$

$\therefore \measuredangle GDA = \sin^{-1}\left(\dfrac{180 \sin 115°}{338.0404803}\right)$ [M1]

$= 28.85478243$

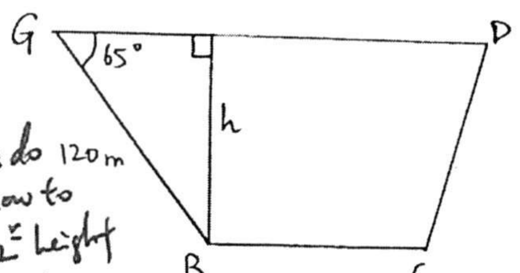
$\approx 28.9°_{\#} (1 \text{ d.p.})$ [A1]

7(a)(iii) Area of $\Delta AGD = \frac{1}{2}(180)(220)\sin 115°$ [M1]

$= 17944.89418 \text{ m}^2$

Length of $GB = \dfrac{180}{3} \times 2 = 120 \text{ m}$

Let the vertical height of the trapezium GBCD be h.



* Most studs do not know how to find the ⊥ height of the trapezium.

$\sin(180° - 115°) = \dfrac{h}{120}$

$\therefore h = 120 \sin 65°$ [M1]

$= 108.7569344$

Area of trapezium $= \frac{1}{2}(160 + 220)(120 \sin 65°)$ [M1]

$= 20663.81754 \text{ m}^2$

$\therefore$ Total area of the park $= 17944.89418 + 20663.81754$

$= 38608.71173$

$\approx 38600 \text{ m}^2{}_{\#} (3 \text{ s.f.})$ [A1]

7(b) $\tan 3.5° = \dfrac{FG}{220}$

$FG = 220 \tan 3.5°$ [M1]

$\approx 13.5 \text{ m}_{\#} (3 \text{ s.f.})$ [A1]