SeaHawk Tutors

1. Evaluate, giving your answer in standard form: [2]

   $2.1 \times 10^5 + 1.8 \times 10^4$

   $= 2.1 \times 10^5 + 0.18 \times 10^5$ (MI)

   $= 2.28 \times 10^5$ (AI)

   2 marks for correct answer in SF.
   1 mark for 228000 no working

2.

   a. Expand and simplify: $(x - 2)(2x - 4)$ [2]

   $(x-2)(2x-4) = 2x^2 - 4x - 4x + 8$ (MI)

   $= 2x^2 - 8x + 8$ (AI)

   b. Factorise: $x^2 + 5x - 24$ [2]

   $(x+8)(x-3)$ (AI)

	-24
1	24
2	12
3	8
4	6

   (MI) oe

   c. Solve: $x^2 + 10x + 24 = 0$ [3]

   (MI)

   $(x+4)(x+6) = 0$ (MI)

   $x = ^-4$ or $^-6$. (AI)

   d. Make t the subject of the equation: $p - t = \frac{1}{2}(t + a)$ [2]

   $2(p-t) = t+a$

   $2p - 2t = t + a$ (MI)

   $2p - a = 3t$

   $t = \dfrac{2p-a}{3}$ oe (AI)

3. A cuboid has sides 3cm, 8cm and $x$cm. The surface area of the cuboid is 158cm. Find x. [3]

$SA = (2 \times 3x) + (2 \times 8x) + (2 \times 24)$ (M1)

$158 = 6x + 16x + 48$

$110 = 22x$ (M1)

$x = 5$ (A1)

4. Find $\frac{dy}{dx}$ for the equation $y = 2x^4 - \frac{1}{8x^4}$ $= 2x^4 - \frac{1}{8}x^{-4}$ (M1) [2]

$\frac{dy}{dx} = 8x^3 + \frac{1}{2}x^{-3}$ (A1) oe

2 marks for correct answer without working

5. Calculate, giving your answers as mixed numbers in their simplest form. You must show your working.

a. $3\frac{3}{4} \times 4\frac{2}{3}$ $= \frac{15}{4} \times \frac{14}{3}$ (M1) $= \frac{35}{2} = 17\frac{1}{2}$ (A1) [2]

b. $9\frac{3}{5} - 5\frac{1}{4}$ (1) $\frac{48}{5} - \frac{21}{4} = \frac{192}{20} - \frac{105}{20} = \frac{87}{20}$ [2]

(2) $9 - 5 = 4$

$\frac{3}{5} - \frac{1}{4} = \frac{12}{20} - \frac{5}{20}$

$= \frac{7}{20}$ (A1)

$4\frac{7}{20}$

$= 4\frac{7}{20}$ (A1)

c. $3\frac{1}{8} \div 1\frac{2}{3}$ [2]

$\frac{25}{8} \div \frac{5}{3} = \frac{25}{8} \times \frac{3}{5}$ (M1) $= \frac{15}{8} = 1\frac{7}{8}$ (A1)

6.
  a. Evaluate:
    i. $3^5 \div 3^2$ [1]

3^3 (A1)

    ii. $(2^3)^2$ [1]

2^6 (A1)

    iii. $\left(\frac{64}{27}\right)^{-\frac{1}{3}}$ [2]

$= \left(\frac{27}{64}\right)^{\frac{1}{3}}$ $= \frac{3}{4}$ (A1) 2 marks for correct answer without working

or $3\sqrt{\frac{27}{64}}$ (M1)

  b. Write down the value of:
    i. 10^{-2} (as a decimal) [1]

0.01 (A1)

    ii. 3.17^0 [1]

1 (A1)

  c. Simplify: $(16x^3)^{\frac{1}{2}}$ [2]

$= \sqrt{4} \cdot \left(x^3\right)^{\frac{1}{2}} = 2x^{\frac{3}{2}}$ (A1)

(M1) oe

2 marks for correct answer no working

7. a, 12 and b are three integers, written in size order, smallest first.
   The mean of the three numbers is 13.
   The range of the three numbers is 7.

   Work out the values of a and b. [2]

   Any method allowed w/working including trial & error

$\frac{a+12+b}{3} = 13$ $\Rightarrow a+b+12 = 39 \Rightarrow a+b = 27$

$b - a = 7$
$b + a = 27$

(M1) for any relevant working

$2b = 34$ $b = 17$ $a = 10$ (A1)

8. A quadrilateral is drawn so that each corner touches the circumference of the circle. The angles of the quadrilateral are as shown. Calculate the size in degrees of the missing angle.
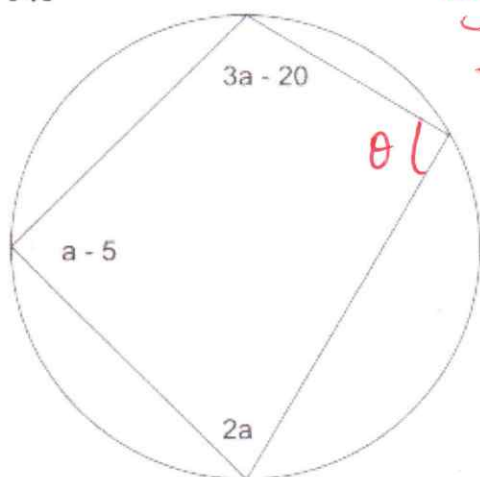[4]

3a - 20

θ

a - 5

2a

Diagram not drawn accurately.

Cyclic quadrilateral

$\Rightarrow (3a - 20) + 2a = 180$ (M1)

$\Rightarrow 5a = 200$

$\Rightarrow a = 40°$ (M1)

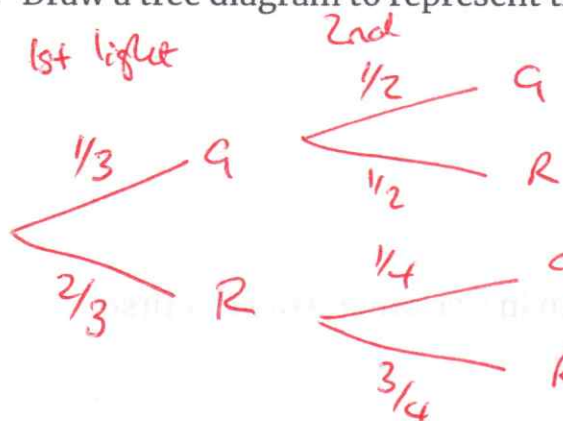$a - 5 = 35 \Rightarrow \theta = 180 - 35$ (M1)

$= 145°$ (A1)

9. On my way to work I have to drive through 2 sets of traffic lights.
The probability that the first set is green is $\frac{1}{3}$.
The probability that the second set is green is $\frac{1}{2}$ if the first light is green, if not it is $\frac{1}{4}$.

a. Draw a tree diagram to represent this information. [3]

1st light

2nd

$\frac{1}{3}$ G

$\frac{1}{2}$ G

$\frac{1}{2}$ R

$\frac{2}{3}$ R

$\frac{1}{4}$ G

$\frac{3}{4}$ R (✗)

(A1) for tree with correct R/G labels

(A2) for any 2 correct probability pairs.

b. What is the probability that I am forced to stop at red lights at both junctions? [2]

$P(R, R) = \frac{2}{3} \times \frac{3}{4} = \frac{1}{2}$

(M1)   oe (A1)

10 $f(x) = 2x + 3$ and $g(x) = -x^2$

a. Find f(−5) [1]

$$-10 + 3 = \underline{-7}$$ Ⓐ1

b. Find a given that f(a) = 8 [2]

$$8 = 2a + 3 \quad \boxed{M1} \text{ allow } x \text{ for } a$$
$$2a = 5 \qquad a = 2\tfrac{1}{2} \text{ oe}$$
Ⓐ1

c. Find gf(x) [2]

$$gf(x) = \underline{-(2x+3)^2} \quad \leftarrow 2 \text{ marks for this}$$
$$= -(4x^2 + 12x + 9) \quad \text{Any correct version}$$
$$\text{allowed for } \boxed{A2}$$
$$= \underline{-4x^2 - 12x - 9}$$

d. State the range of g(x) [1]

$$g(x) \leq 0 \qquad \boxed{A1}$$

10. A company makes painted vases in 2 sizes, large and small. The large vase has a surface area of 135cm² while the small vase has a surface area of 60cm².

a. The small vase is 12cm tall. How tall is the large vase? [3]

		Large	Small
Length	cm		12
	SF	3 :	2 ← Ⓜ1
Area	cm	13·5	60
	SF	9 :	4 ← Ⓜ1

$$\frac{12}{2} \times 3 = \underline{18\,cm} \; \boxed{A1}$$

b. The large vase has a volume of 648ml. What is the volume of the small vase? [2]

$$\text{Vol SF} = 3^3 : 2^3 = 27:8 \qquad \boxed{M1}$$

$$\frac{648 \times 8}{27} = \underline{192\,ml} \qquad \boxed{A1}$$

11. A group of children is surveyed on the sports that they enjoy playing. The survey form is as shown.

> Which sports do you enjoy playing? Please put in an X in the box. You can pick as many or as few as you like. If you do not like any of these, please leave all the boxes empty.
>
> Football ☐
>
> Swimming ☐
>
> Athletics ☐

The responses were as follows:

 22 children like swimming
 30 did NOT tick the football box
 7 like football and athletics
 11 like athletics and swimming
 4 like both football and swimming but **not** athletics
 6 children like all three sports
 27 only ticked one box
 7 did not tick any of the boxes

 a. Draw a Venn Diagram to represent this information. [5]
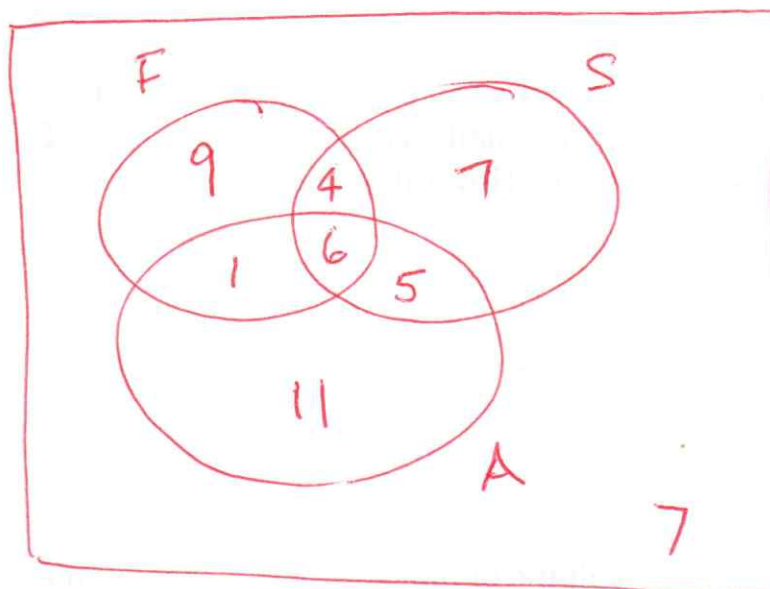
Marker's notes: M1 for correct 3-ring diagram in box.
A4 for correct data. Subtract 1 for each incorrect figure.

 b. A student who likes swimming is picked at random. What is the probability that this student also likes athletics? [2]

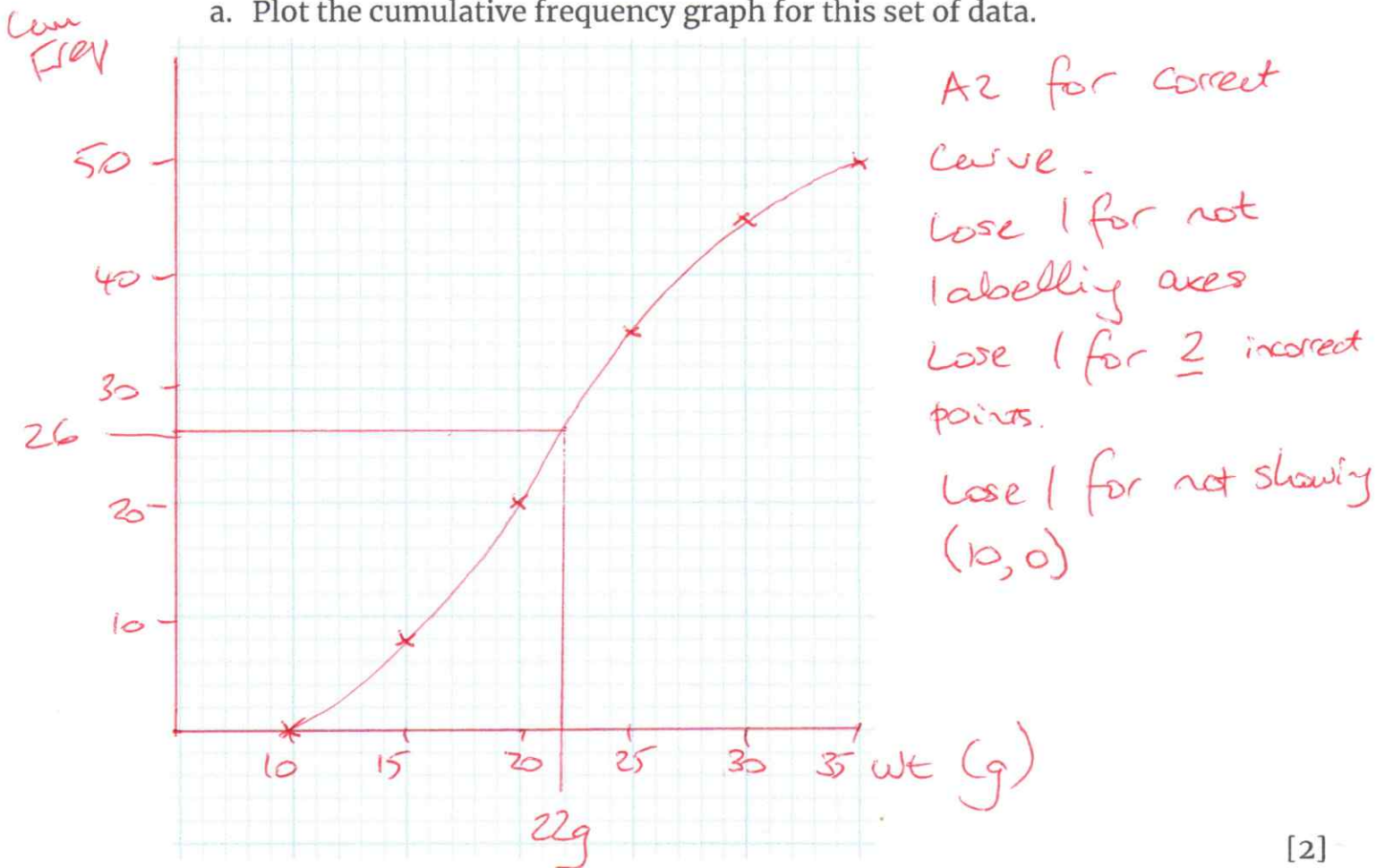$$\frac{11}{22} = \frac{1}{2}$$ A1

Marker's notes: M1 for one correct figure in correct place.

12. The table shows the weight, w, of a number of plums picked from a fruit tree.

Weight (g)	Number of plums
$10 \leqslant w < 15$	8
$15 \leqslant w < 20$	12
$20 \leqslant w < 25$	15
$25 \leqslant w < 30$	10
$30 \leqslant w < 35$	5

Cum freq
8
20
35
45
50

a. Plot the cumulative frequency graph for this set of data.

Cum Freq

A2 for correct curve.

Lose 1 for not labelling axes

Lose 1 for 2 incorrect points.

Lose 1 for not showing (10, 0)

22g

Wt (g)

[2]

b. The grower can only sell the plums that are at least 22g in weight. Use your graph to estimate the percentage of the fruit that can be sold.   [3]

M1 for 26 (±1) on CF axis

M1 for 50 − 26 = 24 plums ⩾ 22g

A1 for $\dfrac{24}{50}$ (oe $\dfrac{12}{25}$ = 0.48 = 48%)